

Wavelengths, Transition Probabilities, and Energy Levels for the Spectra of Sodium (Na_I – Na_{XI})

Cite as: J. Phys. Chem. Ref. Data **37**, 1659 (2008); <https://doi.org/10.1063/1.2943652>

Submitted: 21 April 2008 . Accepted: 19 May 2008 . Published Online: 10 September 2008

J. E. Sansonetti



View Online



Export Citation

ARTICLES YOU MAY BE INTERESTED IN

Wavelengths, Transition Probabilities, and Energy Levels for the Spectra of Rubidium (RbI through RbXXXVII)

Journal of Physical and Chemical Reference Data **35**, 301 (2006); <https://doi.org/10.1063/1.2035727>

Atomic Transition Probabilities of Sodium and Magnesium. A Critical Compilation

Journal of Physical and Chemical Reference Data **37**, 267 (2008); <https://doi.org/10.1063/1.2735328>

Wavelengths, Transition Probabilities, and Energy Levels for the Spectra of Potassium (KI through KXIX)

Journal of Physical and Chemical Reference Data **37**, 7 (2008); <https://doi.org/10.1063/1.2789451>



Wavelengths, Transition Probabilities, and Energy Levels for the Spectra of Sodium (Na I–Na XI)

J. E. Sansonetti^{a)}

Atomic Physics Division, National Institute of Standards and Technology, Mail Stop 8422, Gaithersburg, Maryland 20899, USA

(Received 21 April 2008; revised manuscript received 28 April 2008; accepted 19 May 2008; published online 10 September 2008)

Energy levels, with classifications and uncertainties, have been compiled for the spectra of the neutral atom and all positive ions of sodium ($Z=11$). Wavelengths with classifications, intensities, and transition probabilities are also tabulated. In addition, ground states and ionization energies are listed. Where available, the hyperfine structure constants and the percentages of the leading components of the energy levels are included. For all ionization stages of sodium, at least some experimental data are available; however, for those for which only a few transitions have been measured, theoretical calculations or values obtained by isoelectronic fitting are reported. Similarly, theoretical or isoelectronically determined ionization energies are given when they are thought to be more accurate than the available experimental data would produce. © 2008 by the U.S. Secretary of Commerce on behalf of the United States. All rights reserved.
[DOI: 10.1063/1.2943652]

CONTENTS

1. Introduction.	1659	7. Observed spectral lines of Na IV.	1722
2. Wavelength Tables.	1660	8. Energy levels of Na IV.	1725
3. Energy Level Tables.	1660	9. Observed spectral lines of Na V.	1728
4. Uncertainties and Significant Figures.	1661	10. Energy levels of Na V.	1730
5. References for the Introduction.	1661	11. Observed spectral lines of Na VI.	1733
6. Ionization Stages.	1661	12. Energy levels of Na VI.	1736
6.1. Na I.	1661	13. Observed spectral lines of Na VII.	1740
6.2. Na II.	1683	14. Energy levels of Na VII.	1743
6.3. Na III.	1711	15. Observed spectral lines of Na VIII.	1747
6.4. Na IV.	1721	16. Energy levels of Na VIII.	1748
6.5. Na V.	1727	17. Observed spectral lines of Na IX.	1751
6.6. Na VI.	1732	18. Energy levels of Na IX.	1752
6.7. Na VII.	1739	19. Observed spectral lines of Na x.	1754
6.8. Na VIII.	1746	20. Energy levels of Na x.	1754
6.9. Na IX.	1750	21. Spectral lines of Na XI.	1757
6.10. Na X.	1753	22. Energy levels of Na XI.	1760
6.11. Na XI.	1756		
7. Acknowledgments.	1761		
8. References.	1761		

List of Tables

1. Observed spectral lines of Na I.	1663
2. Energy levels of Na I.	1672
3. Observed spectral lines of Na II.	1684
4. Energy levels of Na II.	1707
5. Observed spectral lines of Na III.	1712
6. Energy levels of Na III.	1718

^{a)}Electronic mail: jean.sansonetti@nist.gov.

© 2008 by the U.S. Secretary of Commerce on behalf of the United States. All rights reserved.

1. Introduction

Sodium is the sixth most abundant element on earth and the most abundant alkali metal. Sodium is also present in abundance in stars and its D lines (transitions between the $1s^22s^22p^63s^2S$ and $1s^22s^22p^63p^2P$ levels) are very prominent features in the solar spectrum. The element was long known in compounds but not isolated until 1807 when Davy used electrolysis to dissociate caustic soda (NaOH) [08DAV]. It is a very reactive, electropositive, alkaline element and it also has a very low ionization energy. It oxidizes rapidly, may ignite upon contact with water, and is not found free in nature. It appears silvery and is soft, with a melting point of 97.80 °C. Its atomic number is 11, the atomic weight is 22.989 770(2), its boiling point is 883 °C, and its specific gravity at 20 °C is 0.971. Although 17 isotopes of sodium are recognized, the only isotope with a measurable natural abundance is ^{23}Na , which has nuclear spin of

$I=3/2$ and a nuclear magnetic moment of $+2.217\,52$ nuclear magneton [05CRC]. When heated in a flame sodium, its salts give off a characteristic yellow color due to the first doublet in the principal series of Na I, which falls in the yellow region. The most common compound of sodium is table salt, which is sodium chloride. Both metallic sodium and its salts are used extensively in manufacture, commercial chemicals, and household products.

For this compilation of spectral data, the literature for each ionization stage of sodium has been reviewed and lists of the most accurate wavelengths and energy levels have been assembled. A brief summary of the history of research for each spectrum and details regarding the data included in this compilation are given. Where available, experimental data are presented; however, when only fitted data or theoretically calculated data are available, these are included. To clarify which data are not obtained by experimental observation, wavelengths, energy levels, and ionization energies which have been obtained by isoelectronic fitting are indicated by being enclosed in square brackets, while theoretical values are presented enclosed in parentheses.

2. Wavelength Tables

In the tables of wavelengths, the following information is included:

- (i) **Wavelengths** are reported in units of ångströms, with all lines with wave numbers below $10\,000\text{ cm}^{-1}$ or above $50\,000\text{ cm}^{-1}$ given as vacuum wavelengths and those between $10\,000$ and $50\,000\text{ cm}^{-1}$ as air wavelengths. The index of refraction used for conversions is obtained using the three-term formula of Peck and Reeder [72PEC/REE]. Occasionally wavelengths calculated from optimized energy levels (known as Ritz wavelengths) are given because they are much more accurate than experimentally observed ones, in which case the calculated wavelength is followed by the notation "R."
- (ii) **Uncertainty** in the wavelength measurement or calculation is also in ångströms.
- (iii) **Wave number** of the transition is given in units of cm^{-1} .
- (iv) **Intensity** is as observed by the original investigator, except as noted in the discussion for a particular spectrum. Since in general there is no way to normalize data taken from different sources, this means that intensities taken from different sources are not on the same scale and should not be used for comparison. Intensities marked by an asterisk indicate that the measured spectral line either is blended with another line or has two identifications. In either case the intensity cannot be assumed to be entirely due to the transition indicated in the classification.
- (v) **Line codes** indicate additional descriptive information about the appearance of the spectral line. In general, the character of a line depends on the spectroscopic source used and the resolution of the spectrometer.

For ease of use, we utilize a uniform set of line codes to describe the line characteristics provided by various authors. They have the following meanings:

- a = asymmetric
- b = blend
- c = complex
- d = lines consists of two unresolved lines
- h = hazy
- l = shaded to longer wavelengths
- p = perturbed by close line
- r = easily self-reversed
- s = shaded to shorter wavelengths
- u = unresolved shoulder on strong line
- w = wide
- * = intensity may be affected by nearby line
- ? = classification is uncertain

- (vi) **Transition probabilities** (A_{ki}) for transitions from the upper state (k) to the lower (i) are given in units of s^{-1} . Exponential notation is used for these values; thus, for example, $3.2\text{E}+5$ stands for 3.2×10^5 . Virtually all transition probabilities are theoretically calculated. The method used is discussed in the text.
- (vii) **Lower level** and **upper level** indicate the classification given for the transition.
- (viii) **λ Ref.** and **A_{ki} Ref.** indicate the references for the wavelength measurement and transition probability, respectively. The list of references for each ionization stage is located at the bottom of the discussion for that particular spectrum.

3. Energy Level Tables

The energy level tables contain the following information:

- (i) **Configuration** of the energy level. For visual clarity, only the first member of the term has the configuration written out. All members of the same term are grouped together and set off from other terms by a blank line.
- (ii) **Term** is listed for each energy level. There are several kinds of coupling indicated for the energy levels. Most configurations are described in *LS* coupling, with the state of the core indicated in parentheses when needed. Some levels are given in either J_1j or J_1J_2 coupling, with the angular momentum of the core and of the final electron or group of electrons in parentheses. Levels best described by pair coupling, or J_1l , notation, have J value of the core state listed first with the value of $K=J_1+l$ in square brackets, where l is the orbital angular momentum of the final electron.
- (iii) **J value** is also listed for each energy level.
- (iv) **Level value** is given in the customary units of cm^{-1} . As reported in [05MOH/TAY], the unit cm^{-1} is related to the SI unit for energy, the joule, by $1\text{ cm}^{-1} = 1.986\,445\,61(34) \times 10^{-23}\text{ J}$. As discussed above, values enclosed in parentheses are calculated and those

in square brackets are obtained by isoelectronic fitting.

- (v) **Uncertainty** of the level value, also given in cm^{-1} .
- (vi) **Leading percentages** of components of the level configurations are included if there is significant configuration mixing and if they are available.
- (vii) **Hyperfine structure constants**, the magnetic dipole constant A and the magnetic quadrupole constant B , given in units of megahertz.
- (viii) **Reference** refers to the source of the energy level value or hyperfine structure data. The list of references can be found at the end of the discussion for that ionization stage.

4. Uncertainties and Significant Figures

The energy levels, wavelengths, and ionization energies reported here are given with uncertainties, as reported by the original authors. In the case of energy levels, it was sometimes necessary to calculate uncertainties from the reported uncertainties of the transitions involved. Many theoretical papers do not contain estimates of the uncertainty of the reported values and hence we are unable to include that information in our tables. The estimated uncertainty of the wave number of a transition can be calculated from that of the wavelength. Most transition probabilities contained herein are calculated values whose uncertainties are unknown. Since the scatter between transition probabilities from different sources is substantial (virtually always greater than 10% and frequently much more) it would be prudent to check the details of the calculations in the original source if the uncertainty of the transition probability is important.

In general the number of significant figures included here is such that the uncertainty in the last digit is between 1 and 15. If a decimal point follows a value which is a whole number, this implies that the last digit given is significant, even if it is a zero. If there is no decimal point, the uncertainty is greater than 15.

5. References for the Introduction

- | | |
|------------|---|
| 08DAV | H. Davy, <i>Philos. Trans. R. Soc. (London)</i> 98 , 1 (1808). |
| 72PEC/REE | E. R. Peck and K. Reeder, <i>J. Opt. Soc. Am.</i> 63 , 958 (1972). |
| 05CRC | <i>CRC Handbook of Chemistry and Physics</i> , 86th ed., edited by D. R. Lide (Taylor & Francis, New York, 2005), pp. 4–31. |
| 05MOH/TAYP | P. J. Mohr and B. N. Taylor, <i>Rev. Mod. Phys.</i> 77 , 1 (2005). |

6. Ionization Stages

6.1. Na I

Na isoelectronic sequence

Ground state $1s^2 2s^2 2p^6 3s^2 S_{1/2}$

Ionization energy 41 449.451(2) cm^{-1} ;
5.139 076 4(3) eV

Many Na I spectral lines were reported early in the 20th century by researchers such as Paschen [08PAS], Wood and Fortrat [16WOO/FOR], Hetzler *et al.* [35HET/BOR], and Meggers [35MEG]. The earliest wavelengths retained in Table 1 are from Meissner and Luft [37MEI/LUF]. In one of the first spectroscopic applications of an atomic beam excited by electron impact, they made interferometric measurements of the Na I spectrum between 4664 Å and 8195 Å. The lines in Table 1 with wavelengths given to four decimal places are taken from their work, as corrected by Martin and Zalubas [81MAR/ZAL] for an improved measurement of the standard line used. Risberg [56RIS] remeasured the spectrum from 2800 Å to 11 400 Å, observing ns levels for $n=3-12$, np levels for $n=3-8$, nd levels for $n=3-11$, and nf levels for $n=4-10$. Johansson [61JOH] used measurements in the infrared to produce an improved value for the $4f$ and $5f^2F^\circ$ levels, which are included below. (Johansson's estimates of the line intensities, s, m , and f listed in Table 1, stand for strong, medium, and faint, respectively.) The $4f-5g$ transition in the infrared was reported by Litzén [70LIT]. Formulas for calculating levels in the nl series for s, p, d, f, g, h , and i electrons were reported by Martin [80MAR] and the resulting values up to $n=50$ were included in the energy level compilation of Martin and Zalubas [81MAR/ZAL]. The wavelengths of the D_1 and D_2 lines of sodium have been measured by many research groups, but the values retained here are taken from the precision laser measurement of Juncar *et al.* [81JUN/PIN]. Due to the uncertainty in the index of refraction used to calculate the air wavelength given in Table 1, it is advised that those needing the full accuracy use the wave number given. The $4s$ level value and hyperfine splitting constant were determined by Arqueros [88ARQ] using Doppler-free two-photon spectroscopy. Energies for the $10p, 10d$, and $11p$ levels were determined by precision Stark spectroscopy by Baugh *et al.* [98BAU/BUR]. All available data for the f, g , and h levels were used by Dyubko *et al.* [97DYU/EFR] to produce formulas for the quantum defects used in calculating the levels shown in brackets in Table 2. Baig *et al.* [95BAI/AKR, 07BAI/MAH] have used laser pumping to more accurately measure the $3p-nd$ Rydberg transitions.

Although not included in Table 1, $ns-np$ and $ns-(n+1)p$ transition frequencies have been measured by Dyubko *et al.* [95DYU/EFI] for $n=22-32$ and by Fabre *et al.* [80FAB/HAR] for $n=23-36$. Splittings between the $nd^2D_{3/2}$ and $^2D_{5/2}$ levels for $n=15-34$ have been determined by Conover and Doogue [01CON/DOO] by observing microwave absorption. Combining their data with the best-known values for $n=4-14$, they developed a formula for calculating the splitting for other values of n .

Configurations involving excitations from the $2p$ or $2s$ shell have been identified in the interpretation of photoabsorption spectra below 410 Å. Connerade *et al.* [71CON/GAR] observed 38 transitions between 298 Å and 346 Å,

including those with upper levels in the $2s^22p^53s^2$ configuration. Wolff *et al.* [72WOL/RAD] focused on the region 322–403 Å, with most of the lines falling below 350 Å. Sugar *et al.* [79SUG/LUC] used a laser to selectively populate the $2s^22p^63p$ level, then used absorption to detect 18 transitions between 356 Å and 398 Å, which were assigned upper levels in the even-parity $2s^22p^53s3p$ and $2s^22p^53s4p$ configurations. Having used a pulsed hollow-cathode source to selectively populate the metastable $2p^53s3p^4S_{3/2}$ and $2p^53s3p^4D_{7/2}$ levels, Holmgren *et al.* [85HOL/WAL] used a tunable laser to determine the splittings between the $2p^53s3p$, $3s3d$, and $3s4s$ quartet levels. Gaardsted and Andersen [88GAA/AND] verified the measurements by Holmgren *et al.* [85HOL/WAL] and observed 16 additional lines, some of which connected established levels and some of which produced values for new quartet levels. Excitation of one of the $2s$ electrons was reported by La Villa *et al.* [81LAV/MEH], who published values for 11 odd-parity $2s2p^6nl'n'l'$ levels listed in Table 2. In the region around 400 Å, Pedrotti *et al.* [85PED/MEN] identified seven transitions to the $2p^53s3p$ and $3s3d$ configurations. The region between 320 Å and 400 Å was remeasured with smaller claimed uncertainties by Baig *et al.* [94BAI/MAH]. The data were grouped into 22 series of the types $2p^53sns$, $3snd$, $3pnp$, $3dns$, $3dnd$, $4sns$, and $4snd$, which were presented in J_CK notation. The lines represent unresolved groups of transitions to levels with $J=1/2$ or $3/2$; for many of them, the J_C value can be determined, but the value of K remains undetermined. To avoid ambiguous level names, a lowercase letter has been added to the term for configurations where the $J=1/2$ and $3/2$ levels have distinct values, but which is which is uncertain.

The hyperfine structure of $^{23}\text{Na I}$ has been investigated by many groups utilizing a wide variety of methods, so we will discuss here only those whose values are retained below. The magnetic dipole constant A of the ground state was determined by Beckmann *et al.* [74BEC/BOK] using the atomic beam magnetic resonance technique. For the $2s^22p^63p^2P_{1/2}^\circ$ state, the A value cited here was measured by Griffith *et al.* [77GRI/ISA] using the optical heterodyne method. Polarization quantum-beat spectroscopy enabled Yei *et al.* [93YEI/SIE] to determine the splitting constants for the $2s^22p^63p^2P_{3/2}^\circ$ state. The magnetic dipole constant of the $2s^22p^64p^2P_{1/2}^\circ$ state was measured by Bhattacharya *et al.* [03BAT/HAI] in atoms confined in a magneto-optical trap. Tsekeris *et al.* [76TSE/LIA] determined the hyperfine splitting of the $5s$ level retained in Table 2 by radio frequency spectroscopy. The hyperfine splitting of the ground state of $^{21}\text{Na I}$ (which has a nuclear spin of $I=3/2$) has been measured by Rowe *et al.* [99ROW/FRE], resulting in a magnetic dipole constant $A=953.235\,935(100)$ MHz. The $^{22}\text{Na I}$ constants ($I=3$) for the $2s^22p^63p^2P_{3/2}^\circ$ level have been reported by Gangrsky *et al.* [98GAN/KAR] to be $A=7.31(4)$ and $B=4.7(3)$ MHz.

Though most transition probabilities for spectroscopic transitions are calculated values, in sodium measurements of the lifetimes of the $3p^2P^\circ$ levels by Gaupp *et al.* [82GAU/

KUS], Jones *et al.* [96JON/JUL], Oates *et al.* [96OAT/VOG], and Volz *et al.* [96VOL/MAJ] provide experimental values for the D_1 and D_2 lines. The probabilities for transitions with upper levels in the $4p$ and $5p$ configurations are obtained from Lowe and Biémont [94LOW/BIE], who normalized calculated values according to experimentally observed lifetimes. Most of the transition probabilities of the other allowed transitions of Na I have been reported by Froese Fischer *et al.* [06FRO/TAC] using a multiconfiguration Hartree-Fock formulation. An extensive compilation has been done by Kelleher and Podobedova [08KEL/POD]. For transitions from high ns and nd levels to $3p^2P_{3/2}^\circ$, we have retained the probabilities determined by Miculus and Meyer [05MIC/MEY] using a model potential method. Values for transitions in which the upper level is $9f$ or $10f$ are taken from Anderson and Zilitis [64AND/ZIL]. Holmgren *et al.* [85HOL/WAL] used the Hartree-Fock method to derive transition probabilities for the lines they measured.

The $2s^22p^6^1S_0$ ionization energy cited above was determined by Ciocca *et al.* [92CIO/BUR] using a combination of precision optical data and Stark spectroscopy. The $2s^22p^5nl$ ionization limits listed in Table 2 are obtained by adding the [92CIO/BUR] limit to the Na II energy level. The limits obtained by Baig *et al.* [94BAI/MAH] are consistently 4 cm^{-1} higher than this, suggesting that the calibration for their wavelengths might have been too low by $0.003\text{ Å}-0.004\text{ Å}$. The $2s2p^63s$ series limits have been obtained by adding the Na I ionization limit above to the Na II $2s2p^63s$ level measured by Dorn [94DOR].

References for Na I

- | | |
|-----------|---|
| 08PAS | F. Paschen, <i>Ann. Phys.</i> 4 , 537 (1908). |
| 16WOO/FOR | R. W. Wood and R. Fortrat, <i>Astrophys. J.</i> 43 , 73 (1916). |
| 35HET/BOR | C. W. Hetzler, R. W. Boreman, and K. Burns, <i>Phys. Rev.</i> 48 , 656 (1935). |
| 35MEG | W. F. Meggers, <i>J. Res. Natl. Bur. Stand.</i> 14 , 487 (1935). |
| 37MEI/LUF | K. W. Meissner and K. F. Luft, <i>Ann. Phys.</i> 29 , 698 (1937). |
| 56RIS | P. Risberg, <i>Ark. Fys.</i> 10 , 583 (1956). |
| 61JOH | I. Johansson, <i>Ark. Fys.</i> 20 , 135 (1961). |
| 64AND/ZIL | E. M. Anderson and V. A. Zilitis, <i>Opt. Spectrosc.</i> 16 , 99 (1964). |
| 70LIT | U. Litzen, <i>Phys. Scr.</i> 1 , 253 (1970). |
| 71CON/GAR | J. P. Connerade, W. R. S. Garton, and M. W. D. Mansfield, <i>Astrophys. J.</i> 165 , 203 (1971). |
| 72WOL/RAD | H. W. Wolff, K. Radler, B. Sonntag, and R. Haensel, <i>Z. Phys. A</i> 257 , 353 (1972). |
| 74BEC/BOK | A. Beckmann, K. D. Böklen, and D. Elke, <i>Z. Phys.</i> 270 , 173 (1974). |
| 76TSE/LIA | P. Tsekeris, K. H. Liao, and R. Gupta, <i>Phys. Rev. A</i> 13 , 2309 (1976). |
| 77GRI/ISA | J. A. R. Griffith, G. R. Isaak, R. New, M. |

	P. Ralls, and C. P. van Zyl, J. Phys. B 10 , L91 (1977).	95DYU/EFI	J. Phys. B 28 , 1421 (1995).
79SUG/LUC	J. Sugar, T. B. Lucatorto, T. J. McIlrath, and A. W. Weiss, Opt. Lett. 4 , 109 (1979).		S. F. Dyubko, M. N. Efimenko, V. A. Efremov, and S. V. Podnos, Quantum Electron. 25 , 914 (1995).
80FAB/HAR	C. Fabre, S. Haroche, and P. Goy, Phys. Rev. A 22 , 778 (1980).	96JON/JUL	K. M. Jones, P. S. Julienne, P. D. Lett, W. D. Phillips, E. Tiesinga, and C. J. Williams, Europhys. Lett. 35 , 85 (1996).
80MAR	W. C. Martin, J. Opt. Soc. Am. 70 , 784 (1980).	96OAT/VOG	C. W. Oates, K. R. Vogel, and J. L. Hall, Phys. Rev. Lett. 76 , 2866 (1996).
81JUN/PIN	P. Juncar, J. Pinard, J. Hamond, and A. Chartier, Metrologia 17 , 77 (1981).	96VOL/MAJ	U. Volz, M. Majerus, H. Liebel, A. Schmitt, and H. Schmoranzner, Phys. Rev. Lett. 76 , 2862 (1996).
81LAV/MEH	R. E. LaVilla, G. Mehlman, and E. B. Saloman, J. Phys. B 14 , L1 (1981).	97DYU/EFR	S. Dyubko, V. Efremov, S. Podnos, X. Sun, and K. B. MacAdam, J. Phys. B 30 , 2345 (1997).
81MAR/ZAL	W. C. Martin and R. Zalubas, J. Phys. Chem. Ref. Data 10 , 153 (1981).	98BAU/BUR	J. F. Baugh, C. E. Burkhardt, J. J. Leventhal, and T. Bergeman, Phys. Rev. A 58 , 1585 (1998).
82GAU/KUS	A. Gaupp, P. Kuske, and H. J. Andrä, Phys. Rev. A 26 , 3351 (1982).	98GAN/KAR	Yu. P. Gangrsky, D. V. Karaivanov, K. P. Markov, L. M. Melnikova, and G. V. Mishinsky, Eur. Phys. J. 3 , 313 (1998).
85HOL/WAL	D. E. Holmgren, D. J. Walker, D. A. King, and S. E. Harris, Phys. Rev. A 31 , 677 (1985).	99ROW/FRE	M. A. Rowe, S. J. Freedman, B. K. Fujikawa, G. Gwinner, S.-Q. Shang, and P. A. Vetter, Phys. Rev. A 59 , 1869 (1999).
85PED/MEN	K. D. Pedrotti, A. J. Mendelsohn, R. W. Falcone, J. F. Young, and S. E. Harris, J. Opt. Soc. Am. B 2 , 1942 (1985).	01CON/DOO	C. W. S. Conover and M. C. Doogue, Phys. Rev. A 63 , 032504 (2001).
88ARQ	F. Arqueros, Opt. Commun. 67 , 341 (1988).	03BAT/HAI	M. Battacharya, C. Haimberger, and N. P. Bigelow, Phys. Rev. Lett. 91 , 213004-1 (2003).
88GAA/AND	J. O. Gaarsted and T. Andersen, Phys. Rev. A 37 , 1497 (1988).	05MIC/MEY	K. Miculis and W. Meyer, J. Phys. B 38 , 2097 (2005).
92CIO/BUR	M. Ciocca, C. E. Burkhardt, J. J. Leventhal, and T. Bergman, Phys. Rev. A 45 , 4720 (1992).	06FRO/TAC	C. Froese Fischer, G. Tachiev, and A. Irmia, At. Data Nucl. Data Tables 92 , 607 (2006).
93YEI/SIE	W. Yeï, A. Sieradzan, and M. D. Harvey, Phys. Rev. A 48 , 1909 (1993).	07BAI/MAH	M. A. Baig, M. S. Mahmood, M. A. Kalyar, M. Rafiq, N. Amin, and S. U. Haq, Eur. Phys. J. D 44 , 9 (2007).
94BAI/MAH	M. A. Baig, M. S. Mahmood, K. Sommer, and J. Hormes, J. Phys. B 27 , 389 (1994).	08KEL/POD	D. E. Kelleher and L. Podobedova, J. Phys. Chem. Ref. Data 37 , 267 (2008).
94DOR	A. Dorn, Ph.D. thesis, University of Freiburg, 1994, as quoted in O. I. Zatsarinny, J. Phys. B 28 , 4759 (1995).		
94LOW/BIE	R. M. Lowe and E. Biémont, J. Phys. B 27 , 2161 (1994).		
95BAI/AKR	M. A. Baig, M. Akram, N. K. Piracha, M. S. Mahmood, S. A. Batti, and N. Ahmad,		

TABLE 1. Observed spectral lines of Na I

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>									
157.1	0.1	636 600				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ (² S)3d4p(³ P°) ² P°	81LAV/MEH	
158.8	0.2	629 700				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ (² S)4s5p(³ P°) ² P°	81LAV/MEH	
161.6	0.1	618 900				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ (² S)4s4p(³ P°) ² P°	81LAV/MEH	
166.7	0.1	600 000				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ (² S)3p(³ P°)6s ² P°	81LAV/MEH	
167.7	0.1	596 400				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ 3p(³ P°)5s ² P°	81LAV/MEH	
168.2	0.1	594 600				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ 3p(³ P°)3d ² P°	81LAV/MEH	
169.1	0.1	591 400				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ 3p(¹ P°)4s ² P°	81LAV/MEH	
170.6	0.1	586 200				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ 3p(³ P°)4s ² P°	81LAV/MEH	
178.7	0.1	559 600				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ 3s(³ S)4p ² P°	81LAV/MEH	
182.9	0.1	546 600				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ (² S)3s3p(¹ P°) ² P°	81LAV/MEH	
186.80	0.07	535 330				2p ⁶ 3s ² S _{1/2}	2s2p ⁶ (² S)3s3p(³ P°) ² P°	81LAV/MEH	
267.33	0.01	374 070				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{1/2} °)3d(³ D ₁ °)16s [1] _{1/2,3/2}	94BAI/MAH	

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
267.38	0.01	374 000				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)15s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
267.44	0.01	373 916				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)14s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
267.54	0.01	373 776				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)13s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
267.64	0.01	373 636				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)11d^\circ$	94BAI/MAH	
267.66	0.01	373 608				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)12s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
267.77	0.01	373 455				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)10d^\circ$	94BAI/MAH	
267.83	0.01	373 371				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)11s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
267.97	0.01	373 176				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)9d^\circ$	94BAI/MAH	
268.06	0.01	373 051				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)10s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
268.24	0.01	372 800				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)8d^\circ$	94BAI/MAH	
268.27	0.01	372 759				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)14d^\circ$	94BAI/MAH	
268.34	0.01	372 662				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)13d^\circ$	94BAI/MAH	
268.38	0.01	372 606				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)9s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
268.42	0.01	372 550				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)12d^\circ$	94BAI/MAH	
268.53	0.01	372 398				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)11d^\circ$	94BAI/MAH	
268.62	0.01	372 273				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)7d^\circ$	94BAI/MAH	
268.66	0.01	372 218				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)10d^\circ$	94BAI/MAH	
268.71	0.01	372 148				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3F_2^\circ)11d$	94BAI/MAH	
268.86	0.01	371 941	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3F_2^\circ)10d$	94BAI/MAH	
268.86	0.01	371 941	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)9d^\circ$	94BAI/MAH	
268.86	0.01	371 941	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)8s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
268.94	0.01	371 830				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)9d$	94BAI/MAH	
269.06	0.01	371 664				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3F_2^\circ)9d$	94BAI/MAH	
269.13	0.01	371 568				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)8d^\circ$	94BAI/MAH	
269.14	0.01	371 554				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)10s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
269.20	0.01	371 471				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)8d$	94BAI/MAH	
269.22	0.01	371 443				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)6d^\circ$	94BAI/MAH	
269.37	0.01	371 237	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3F_2^\circ)8d$	94BAI/MAH	
269.37	0.01	371 237	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)10s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
269.53	0.01	371 016	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)9s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
269.53	0.01	371 016	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)7d^\circ$	94BAI/MAH	
269.61	0.01	370 906				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)7d$	94BAI/MAH	
269.67	0.01	370 824				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)7s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
269.80	0.01	370 645				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3P_2^\circ)10s[2]_{3/2}^\circ$	94BAI/MAH	
269.81	0.01	370 631				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3F_2^\circ)7d$	94BAI/MAH	
269.88	0.01	370 535		b		$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)9s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
270.06	0.01	370 288				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)8s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
270.12	0.01	370 206				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)6d^\circ$	94BAI/MAH	
270.17	0.01	370 137				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3P_2^\circ)9s[2]_{3/2}^\circ$	94BAI/MAH	
270.20	0.01	370 096				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)6d$	94BAI/MAH	
270.276	0.008	369 992				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)5d^\circ$	94BAI/MAH	
270.53	0.01	369 645				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3F_2^\circ)6d$	94BAI/MAH	
270.67	0.01	369 454				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3P_2^\circ)8s[2]_{3/2}^\circ$	94BAI/MAH	
270.76	0.01	369 331				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)8s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
270.98	0.01	369 031				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)7s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
271.04	0.01	368 949				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)6s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
271.19	0.01	368 745	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)5d$	94BAI/MAH	
271.19	0.01	368 745	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)5d^\circ$	94BAI/MAH	
271.527	0.008	368 287				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3P_2^\circ)7s[2]_{3/2}^\circ$	94BAI/MAH	
271.773	0.008	367 954				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3F_2^\circ)5d$	94BAI/MAH	
272.180	0.008	367 404				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)4d^\circ$	94BAI/MAH	
272.32	0.01	367 215				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)7s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
272.53	0.01	366 932				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)6s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
272.907	0.008	366 425				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)4d^\circ$	94BAI/MAH	
273.07	0.01	366 206	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)4d$	94BAI/MAH	
273.07	0.01	366 205	*			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3P_2^\circ)6s[2]_{3/2}^\circ$	94BAI/MAH	
273.98	0.01	364 990				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)5s[1]_{1/2,3/2}^\circ$	94BAI/MAH	

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
274.148	0.008	364766				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3F_2^\circ)4d$	94BAI/MAH	
275.59	0.01	362 858				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)6s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
276.09	0.01	362 201				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)5s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
276.205	0.008	362 050				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3P_2^\circ)5s[2]_{3/2}^\circ$	94BAI/MAH	
276.688	0.008	361 418				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)4s(^1P_1^\circ)3d^\circ$	94BAI/MAH	
276.912	0.008	361 126				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)3d^\circ$	94BAI/MAH	
277.142	0.008	360 826				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)3d$	94BAI/MAH	
281.20	0.01	355 619				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3d(^3D_1^\circ)4s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
284.29	0.01	351 753				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)4s(^3P_1^\circ)5s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
285.35	0.01	350 447				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^1P_1^\circ)4s[1]_{1/2,3/2}^\circ$	94BAI/MAH	
285.701	0.008	350 016				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3d(^3P_2^\circ)4s[2]_{3/2}^\circ$	94BAI/MAH	
285.71	0.01	350 005	d			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)19p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
285.73	0.01	349 981	d			$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)18p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
285.77	0.01	349 932				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)17p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
285.82	0.01	349 871				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)16p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
285.86	0.01	349 822				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)15p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
285.93	0.01	349 736				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)14p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
286.01	0.01	349 638				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)13p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
286.11	0.01	349 516				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)12p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
286.22	0.01	349 382				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)11p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
286.397	0.008	349 166				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)10p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
286.621	0.008	348 893				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)9p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
286.944	0.008	348 500				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)8p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
287.420	0.008	347 923				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)7p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
288.163	0.008	347 026				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)6p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
289.453	0.008	345 479				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)5p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
291.874	0.008	342 614				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1S_0)4p[1]_{1/2,3/2}^\circ$	94BAI/MAH	
292.8	0.1	341 500				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(P_1^3)15p(\text{II})$	94BAI/MAH	
292.9	0.1	341 400				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)14p(\text{II})$	94BAI/MAH	
293.0	0.1	341 300				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)13p(\text{II})$	94BAI/MAH	
293.1	0.1	341 200				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)12p(\text{II})$	94BAI/MAH	
293.16	0.01	341 111				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)13p(\text{I})$	94BAI/MAH	
293.24	0.01	341 018				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)11p(\text{II})$	94BAI/MAH	
293.30	0.01	340 948				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)12p(\text{I})$	94BAI/MAH	
293.41	0.01	340 820				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)10p(\text{II})$	94BAI/MAH	
293.46	0.01	340 762				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)14p$	94BAI/MAH	
293.51	0.01	340 704				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)11p(\text{I})$	94BAI/MAH	
293.54	0.01	340 669				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)13p$	94BAI/MAH	
293.64	0.01	340 553		*		$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)12p$	94BAI/MAH	
293.64	0.01	340 553		*		$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)9p(\text{II})$	94BAI/MAH	
293.77	0.01	340 402				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)11p$	94BAI/MAH	
293.79	0.01	340 379				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)10p(\text{I})$	94BAI/MAH	
293.95	0.01	340 194				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)10p$	94BAI/MAH	
293.97	0.01	340 171				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)8p(\text{II})$	94BAI/MAH	
294.18	0.01	339 928		*		$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)9p$	94BAI/MAH	
294.18	0.01	339 928		*		$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)9p(\text{I})$	94BAI/MAH	
294.44	0.01	339 628				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)7p(\text{II})$	94BAI/MAH	
294.49	0.01	339 570				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)8p$	94BAI/MAH	
294.54	0.01	339 512				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3p(^1D_2)10p$	94BAI/MAH	
294.75	0.01	339 271				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)8p(\text{I})$	94BAI/MAH	
294.77	0.01	339 248				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3p(^1D_2)9p$	94BAI/MAH	
294.99	0.01	338 995				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)7p$	94BAI/MAH	
295.11	0.01	338 857				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3p(^1D_2)8p$	94BAI/MAH	
295.12	0.01	338 845				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)6p(\text{II})$	94BAI/MAH	
295.595	0.008	338 301				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{3/2}^\circ)3p(^1D_2)7p$	94BAI/MAH	
295.71	0.01	338 169				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^3P_1)7p(\text{I})$	94BAI/MAH	
295.728	0.008	338 149				$2p^6 3s^2 S_{1/2}$	$2p^5(^2P_{1/2}^\circ)3p(^1P_1)6p$	94BAI/MAH	

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
296.368	0.008	337 418				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(¹ D ₂)6p	94BAI/MAH	
296.51	0.01	337 257				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{1/2} ^o)3p(³ P ₁)5p(II)	94BAI/MAH	
296.980	0.008	336 723				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{1/2} ^o)3p(¹ P ₁)5p	94BAI/MAH	
297.39	0.01	336 259				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{1/2} ^o)3p(³ P ₁)6p(I)	94BAI/MAH	
297.610	0.008	336 010				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(¹ D ₂)5p	94BAI/MAH	
298.85	0.01	334 616				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{1/2} ^o)3p(³ P ₁)4p(II)	94BAI/MAH	
299.21	0.01	334 213				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)16p [1] _{1/2,3/2} ^o	94BAI/MAH	
299.25	0.01	334 169				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)15p [1] _{1/2,3/2} ^o	94BAI/MAH	
299.325	0.008	334 085				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)14p [1] _{1/2,3/2} ^o	94BAI/MAH	
299.362	0.008	334 044				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{1/2} ^o)3p(¹ P ₁)4p	94BAI/MAH	
299.415	0.008	333 985				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)13p [1] _{1/2,3/2} ^o	94BAI/MAH	
299.521	0.008	333 866				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)12p [1] _{1/2,3/2} ^o	94BAI/MAH	
299.645	0.008	333 728				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)11p [1] _{1/2,3/2} ^o	94BAI/MAH	
299.834	0.008	333 518				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)10p [1] _{1/2,3/2} ^o	94BAI/MAH	
300.084	0.008	333 240				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)9p [1] _{1/2,3/2} ^o	94BAI/MAH	
300.247	0.008	333 059				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(¹ D ₂)4p	94BAI/MAH	
300.424	0.008	332 863				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)8p [1] _{1/2,3/2} ^o	94BAI/MAH	
300.75	0.01	332 502				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{1/2} ^o)3p(³ P ₁)5p(I)	94BAI/MAH	
300.940	0.008	332 292				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)7p [1] _{1/2,3/2} ^o	94BAI/MAH	
301.769	0.008	331 379				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)6p [1] _{1/2,3/2} ^o	94BAI/MAH	
303.154	0.008	329 865				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)5p [1] _{1/2,3/2} ^o	94BAI/MAH	
305.960	0.008	326 840				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{3/2} ^o)3p(³ S ₁)4p [1] _{1/2,3/2} ^o	94BAI/MAH	
308.8	0.1	323 834				2p ⁶ 3s ² S _{1/2}	2p ⁵ (² P _{1/2} ^o)3p(³ P ₁)4p(I)	94BAI/MAH	
320.32	0.025	312 190				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3p2 °	71CON/GAR	
321.57	0.025	310 970				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3p2 °	71CON/GAR	
322.67	0.01	309 914				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)20d°	94BAI/MAH	
322.70	0.01	309 885				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)19d°	94BAI/MAH	
322.75	0.01	309 837				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)18d°	94BAI/MAH	
322.79	0.01	309 799				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)17d°	94BAI/MAH	
322.84	0.01	309 751				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)16d°	94BAI/MAH	
322.90	0.01	309 693				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)15d°	94BAI/MAH	
322.984	0.008	309 613				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)14d°	94BAI/MAH	
323.01	0.01	309 588				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)15s [1] _{1/2,3/2} ^o	94BAI/MAH	
323.077	0.008	309 524				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)13d°	94BAI/MAH	
323.13	0.01	309 473				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)14s [1] _{1/2,3/2} ^o	94BAI/MAH	
323.203	0.008	309 403				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)12d°	94BAI/MAH	
323.263	0.008	309 346				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)13s [1] _{1/2,3/2} ^o	94BAI/MAH	
323.366	0.008	309 247				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)11d°	94BAI/MAH	
323.443	0.008	309 173				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)12s [1] _{1/2,3/2} ^o	94BAI/MAH	
323.579	0.008	309 044				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)10d°	94BAI/MAH	
323.679	0.008	308 948				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)11s [1] _{1/2,3/2} ^o	94BAI/MAH	
323.862	0.008	308 773				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)9d°	94BAI/MAH	
324.001	0.008	308 641				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)10s [1] _{1/2,3/2} ^o	94BAI/MAH	
324.277	0.008	308 378				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)8d°	94BAI/MAH	
324.470	0.008	308 195				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)9s [1] _{1/2,3/2} ^o	94BAI/MAH	
324.823	0.008	307 860				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)7d°	94BAI/MAH	
325.178	0.008	307 524				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)8s [1] _{1/2,3/2} ^o	94BAI/MAH	
325.4	0.1	307 300				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ₀ ^o)17s [0] _{1/2} ^o	94BAI/MAH	
325.517	0.008	307 204				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ₀ ^o)16s [0] _{1/2} ^o	94BAI/MAH	
325.614	0.008	307 112				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ₀ ^o)15s [0] _{1/2} ^o	94BAI/MAH	
325.700	0.008	307 031				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ₀ ^o)14s [0] _{1/2} ^o	94BAI/MAH	
325.840	0.008	306 899		*		2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ₀ ^o)13s [0] _{1/2} ^o	94BAI/MAH	
325.840	0.008	306 899		*		2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)6d°	94BAI/MAH	
326.039	0.008	306 712				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ₀ ^o)12s [0] _{1/2} ^o	94BAI/MAH	
326.239	0.008	306 524				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ₀ ^o)11s [0] _{1/2} ^o	94BAI/MAH	
326.325	0.008	306 443				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ₁ ^o)7s [1] _{1/2,3/2} ^o	94BAI/MAH	
326.45	0.01	306 326				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ₀ ^o)9d [2] _{3/2} ^o	94BAI/MAH	

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
326.51	0.01	306 269				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 13s [1]_{1/2,3/2}^o$	94BAI/MAH	
326.618	0.008	306 168				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 10s [0]_{1/2}^o$	94BAI/MAH	
326.674	0.008	306 116				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 12s [1]_{1/2,3/2}^o$	94BAI/MAH	
326.837	0.008	305 963				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 8d [2]_{3/2}^o$	94BAI/MAH	
326.907	0.008	305 897				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 11s [1]_{1/2,3/2}^o$	94BAI/MAH	
326.96	0.01	305 848				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 16s [2]_{3/2}^o$	94BAI/MAH	
327.05	0.01	305 764				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 15s [2]_{3/2}^o$	94BAI/MAH	
327.13	0.01	305 689	*			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 13d^o$	94BAI/MAH	
327.13	0.01	305 689	*			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 9s [0]_{1/2}^o$	94BAI/MAH	
327.175	0.008	305 647	b			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 14s [2]_{3/2}^o$	94BAI/MAH	
327.266	0.008	305 562	*			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 12d^o$	94BAI/MAH	
327.266	0.008	305 562	*			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 10s [1]_{1/2,3/2}^o$	94BAI/MAH	
327.326	0.008	305 506	b			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 13s [2]_{3/2}^o$	94BAI/MAH	
327.432	0.008	305 407	*			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 11d^o$	94BAI/MAH	
327.432	0.008	305 407	*			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^1P^o) 5d^o$	94BAI/MAH	
327.486	0.008	305 357				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 12s [2]_{3/2}^o$	94BAI/MAH	
327.526	0.008	305 319				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 7d [2]_{3/2}^o$	94BAI/MAH	
327.62	0.01	305 232				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 8d^o$	94BAI/MAH	
327.639	0.008	305 214				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 10d^o$	94BAI/MAH	
327.712	0.008	305 146				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 11s [2]_{3/2}^o$	94BAI/MAH	
327.715	0.008	305 143				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 9s [1]_{1/2,3/2}^o$	94BAI/MAH	
327.818	0.008	305 047				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 8s [0]_{1/2}^o$	94BAI/MAH	
327.931	0.008	304 942				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 9d^o$	94BAI/MAH	
328.057	0.008	304 825				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 10s [2]_{3/2}^o$	94BAI/MAH	
328.12	0.01	304 767				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 7d^o$	94BAI/MAH	
328.290	0.008	304 609				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 8d^o$	94BAI/MAH	
328.357	0.008	304 547				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 6d [2]_{3/2}^o$	94BAI/MAH	
328.460	0.008	304 451	*			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 8s [1]_{1/2,3/2}^o$	94BAI/MAH	
328.460	0.008	304 451	*			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^1P^o) 6s [1]_{1/2,3/2}^o$	94BAI/MAH	
328.546	0.008	304 371				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 9s [2]_{3/2}^o$	94BAI/MAH	
328.889	0.008	304 054				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 7d^o$	94BAI/MAH	
328.975	0.008	303 974				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 7s [0]_{1/2}^o$	94BAI/MAH	
329.23	0.01	303 739				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 6d^o$	94BAI/MAH	
329.291	0.008	303 683				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 8s [2]_{3/2}^o$	94BAI/MAH	
329.37	0.15	303 610						72WOL/RAD	
329.47	0.15	303 520						72WOL/RAD	
329.597	0.008	303 401				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 7s [1]_{1/2,3/2}^o$	94BAI/MAH	
329.70	0.15	303 310						72WOL/RAD	
329.779	0.008	303 233	b			$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 6d^o$	94BAI/MAH	
330.10	0.15	302 940						72WOL/RAD	
330.218	0.008	302 830				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 5d [2]_{3/2}^o$	94BAI/MAH	
330.375	0.008	302 686				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 7s [2]_{3/2}^o$	94BAI/MAH	
330.624	0.008	302 458				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^1P^o) 4d\ q^o$	94BAI/MAH	
330.667	0.008	302 419				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^1P^o) 4d\ p^o$	94BAI/MAH	
330.97	0.01	302 142				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 5d^o$	94BAI/MAH	
331.152	0.008	301 976				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 6s [0]_{1/2}^o$	94BAI/MAH	
331.578	0.008	301 588				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 5d^o$	94BAI/MAH	
331.69	0.15	301 490						72WOL/RAD	
331.760	0.008	301 423				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 6s [1]_{1/2,3/2}^o$	94BAI/MAH	
332.27	0.15	300 960						72WOL/RAD	
332.472	0.008	300 777				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 6s [2]_{3/2}^o$	94BAI/MAH	
332.645	0.008	300 621				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^1P^o) 5s [1]_{1/2,3/2}^o$	94BAI/MAH	
333.07	0.025	300 240				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^1P^o) 5s [1]_{1/2,3/2}^o$	71CON/GAR	
333.289	0.008	300 040				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 4d [2]_{3/2}^o$	94BAI/MAH	
333.95	0.01	299 446				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 4d\ l^o$	94BAI/MAH	
333.99	0.01	299 410				$2p^6 3s\ ^2S_{1/2}$	$2p^5 3s(^3P^o) 4d\ k^o$	94BAI/MAH	
334.46	0.15	298 990						72WOL/RAD	

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
335.177	0.008	298 350				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)4d ^o	94BAI/MAH	
335.742	0.008	297 848				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)5s [0] _{1/2} ^o	94BAI/MAH	
335.881	0.008	297 724				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)5s [1] <i>f</i> ^o _{1/2,3/2}	94BAI/MAH	
335.971	0.008	297 645				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)5s [1] <i>i</i> ^o _{1/2,3/2}	94BAI/MAH	
336.616	0.008	297 074				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)5s [2] _{3/2} ^o	94BAI/MAH	
338.11	0.15	295 760						72WOL/RAD	
338.380	0.008	295 526				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ^o)3d <i>h</i> ^o	94BAI/MAH	
338.646	0.008	295 294				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ^o)3d <i>g</i> ^o	94BAI/MAH	
340.679	0.008	293 531				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)3d [2] _{3/2} ^o	94BAI/MAH	
341.18	0.01	293 100				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)3d <i>f</i> ^o	94BAI/MAH	
341.28	0.15	293 010						72WOL/RAD	
342.10	0.15	292 310						72WOL/RAD	
342.36	0.01	292 090				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)3d <i>e</i> ^o	94BAI/MAH	
343.194	0.008	291 380				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)3d <i>d</i> ^o	94BAI/MAH	
343.49	0.15	291 130						72WOL/RAD	
343.895	0.008	290 786				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)3d <i>c</i> ^o	94BAI/MAH	
344.247	0.008	290 489				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ^o)4s [1] <i>b</i> ^o _{1/2,3/2}	94BAI/MAH	
344.550	0.008	290 234				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(¹ P ^o)4s [1] <i>a</i> ^o _{1/2,3/2}	94BAI/MAH	
345.83	0.15	289 160						72WOL/RAD	
346.07	0.15	288 960						72WOL/RAD	
346.678	0.008	288 452				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)4s [0] _{1/2} ^o	94BAI/MAH	
347.853	0.008	287 478				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)4s [1] _{1/2,3/2} ^o	94BAI/MAH	
347.983	0.008	287 370				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)4s [1] _{1/2,3/2} ^o	94BAI/MAH	
348.624	0.008	286 842				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s(³ P ^o)4s [2] _{3/2} ^o	94BAI/MAH	
350.22	0.15	285 530						72WOL/RAD	
351.69	0.15	284 340						72WOL/RAD	
353.44	0.15	282 930		*		2p ⁶ 4s ² S _{1/2}	2p ⁵ 3s(¹ P ^o)9d ^o	72WOL/RAD	
353.44	0.15	282 930		*		2p ⁶ 4s ² S _{1/2}	2p ⁵ 3s(¹ P ^o)10s [1] _{1/2,3/2} ^o	72WOL/RAD	
356.94	0.02	280 160				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ 3s(¹ P ^o)4p ² P _{1/2}	79SUG/LUC	
357.03	0.02	280 090				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ 3s(¹ P ^o)4p ² D _{3/2}	79SUG/LUC	
357.35	0.02	279 840				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ 3s(¹ P ^o)4p ² P _{3/2}	79SUG/LUC	
357.59	0.02	279 650				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ 3s(¹ P ^o)4p ² S _{1/2}	79SUG/LUC	
357.65	0.02	279 600				2p ⁶ 3p ² P ^o _{3/2}	2p ⁵ 3s(¹ P ^o)4p ² D _{5/2}	79SUG/LUC	
358.05	0.15	279 290						72WOL/RAD	
359.59	0.02	278 090				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ 3s(³ P ^o)4p ² D _{3/2}	79SUG/LUC	
359.71	0.15	278 000						72WOL/RAD	
363.30	0.15	275 250						72WOL/RAD	
375.14	0.10	266 570	895			2p ⁶ 3d ² D _{5/2,3/2}	2p ⁵ 3s(¹ P ^o)3d ² D ^o	85PED/MEN	
376.83	0.02	265 370				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(¹ P ^o) ² P _{1/2}	79SUG/LUC	
377.21	0.02	265 100				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(¹ P ^o) ² D _{3/2}	79SUG/LUC	
378.70	0.02	264 060				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(¹ P ^o) ² P _{3/2}	79SUG/LUC	
379.05	0.02	263 820				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(¹ P ^o) ² S _{1/2}	79SUG/LUC	
379.33	0.02	263 620				2p ⁶ 3p ² P ^o _{3/2}	2p ⁵ (² P ^o)3s3p(¹ P ^o) ² D _{5/2}	79SUG/LUC	
390.21	0.02	256 270				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ² S _{1/2}	79SUG/LUC	
393.84	0.02	253 910				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ² P _{3/2}	79SUG/LUC	
394.29	0.02	253 620				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ² P _{1/2}	79SUG/LUC	
394.91	0.02	253 220				2p ⁶ 3p ² P ^o _{3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ² D _{5/2}	79SUG/LUC	
395.62	0.02	252 770				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ² D _{3/2}	79SUG/LUC	
396.88	0.02	251 970				2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{3/2}	79SUG/LUC	
397.52	0.02	251 560				2p ⁶ 3p ² P ^o _{3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{5/2}	79SUG/LUC	
398.98	0.10	250 640	338			2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{1/2}	85PED/MEN	
399.42	0.10	250 360	152			2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	85PED/MEN	
400.14	0.10	249 910	64			2p ⁶ 3p ² P ^o _{3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{5/2}	85PED/MEN	
400.80	0.025	249 500				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s ² P ^o _{1/2}	71CON/GAR	
402.97	0.025	248 160				2p ⁶ 3s ² S _{1/2}	2p ⁵ 3s ² P ^o _{3/2}	71CON/GAR	
405.26	0.10	246 760	190			2p ⁶ 3p ² P ^o _{1/2,3/2}	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ S _{3/2}	85PED/MEN	

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Air</i>									
2 543.841	0.004	39 298.85			4.46E+4	2p ⁶ 3s ² S _{1/2}	2p ⁶ 8p ² P _{3/2} ^o	56RIS	08KEL/POD
2 543.872	0.004	39 298.38			4.35E+4	2p ⁶ 3s ² S _{1/2}	2p ⁶ 8p ² P _{1/2} ^o	56RIS	08KEL/POD
2 593.869	0.004	38 540.91			8.13E+4	2p ⁶ 3s ² S _{1/2}	2p ⁶ 7p ² P _{3/2} ^o	56RIS	08KEL/POD
2 593.919	0.004	38 540.17			7.96E+4	2p ⁶ 3s ² S _{1/2}	2p ⁶ 7p ² P _{1/2} ^o	56RIS	08KEL/POD
2 680.340	0.004	37 297.62			1.84E+5	2p ⁶ 3s ² S _{1/2}	2p ⁶ 6p ² P _{3/2} ^o	56RIS	08KEL/POD
2 680.433	0.004	37 296.37			1.81E+5	2p ⁶ 3s ² S _{1/2}	2p ⁶ 6p ² P _{1/2} ^o	56RIS	08KEL/POD
2 852.811	0.004	35 042.86	16		5.96E+5	2p ⁶ 3s ² S _{1/2}	2p ⁶ 5p ² P _{3/2} ^o	56RIS	94LOW/BIE
2 853.013	0.004	35 040.40	15		5.95E+5	2p ⁶ 3s ² S _{1/2}	2p ⁶ 5p ² P _{1/2} ^o	56RIS	94LOW/BIE
2 893.618	0.004	34 548.68	1			2p ⁶ 3s ² S _{1/2}	2p ⁶ 4d ² D _{3/2}	56RIS	
3 302.369	0.005	30 272.57	19		2.19E+6	2p ⁶ 3s ² S _{1/2}	2p ⁶ 4p ² P _{3/2} ^o	56RIS	94LOW/BIE
3 302.979	0.005	30 266.98	18		2.17E+6	2p ⁶ 3s ² S _{1/2}	2p ⁶ 4p ² P _{1/2} ^o	56RIS	94LOW/BIE
3 416.2	0.2	29 263.9			1.5E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ S _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{3/2} ^o	85HOL/WAL	85HOL/WAL
3 426.862	0.005	29 172.85	6			2p ⁶ 3s ² S _{1/2}	2p ⁶ 3d ² D _{3/2}	56RIS	
3 427.3	0.2	29 169.1	9		2.8E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ S _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ F _{5/2} ^o	85HOL/WAL	85HOL/WAL
3 489.0	0.2	28 653.3	130		4.2E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ S _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{5/2} ^o	85HOL/WAL	85HOL/WAL
3 502.5	0.2	28 542.9	160		8.8E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ S _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{3/2} ^o	85HOL/WAL	85HOL/WAL
3 511.0	0.2	28 473.8	130		1.15E+8	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ S _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{1/2} ^o	85HOL/WAL	85HOL/WAL
3 833.6	0.2	26 077.7				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{5/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{3/2} ^o	88GAA/AND	
3 848.0	0.2	25 980.2	5		2.8E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{5/2}	2p ⁵ 3s(³ P ^o)3d ⁴ F _{5/2} ^o	85HOL/WAL	
3 852.3	0.5	25 951				2p ⁵ (² P ^o)3s3p(³ P ^o) D1/24	2p ⁵ 3s(³ P ^o)3d ⁴ F _{3/2} ^o	88GAA/AND	
3 865.5	0.2	25 862.5	130		5.8E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{7/2}	2p ⁵ 3s(³ P ^o)3d ⁴ F _{7/2} ^o	85HOL/WAL	85HOL/WAL
3 872.9	0.2	25 813.1	19		1.2E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{7/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{5/2} ^o	85HOL/WAL	85HOL/WAL
3 881.8	0.2	25 753.9	420		1.63E+8	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{7/2}	2p ⁵ 3s(³ P ^o)3d ⁴ F _{9/2} ^o	85HOL/WAL	85HOL/WAL
3 885.7	0.2	25 728.1	36		6.2E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{3/2} ^o	85HOL/WAL	85HOL/WAL
3 900.4	0.2	25 631.1	15		7.7E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ F _{5/2} ^o	85HOL/WAL	85HOL/WAL
3 911.8	0.2	25 556.4				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{1/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{1/2} ^o	88GAA/AND	
3 917.9	0.2	25 516.7	160		6.6E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{5/2}	2p ⁵ 3s(³ P ^o)3d ⁴ F _{7/2} ^o	85HOL/WAL	85HOL/WAL
3 925.6	0.2	25 466.6	85		4.5E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{5/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{5/2} ^o	85HOL/WAL	85HOL/WAL
3 930.6	0.2	25 434.2	15		2.5E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{1/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{3/2} ^o	85HOL/WAL	85HOL/WAL
3 942.6	0.2	25 356.8	32		2.1E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{5/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{3/2} ^o	85HOL/WAL	85HOL/WAL
3 980.3	0.2	25 116.6	14		5.E+6	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{5/2} ^o	85HOL/WAL	85HOL/WAL
3 997.7	0.2	25 007.3	14		8.E+6	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{3/2} ^o	85HOL/WAL	85HOL/WAL
4 008.8	0.2	24 938.1	27		1.5E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{1/2} ^o	85HOL/WAL	85HOL/WAL
4 056.6	0.2	24 644.2				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{1/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{1/2} ^o	88GAA/AND	
4 127.90	0.02	24 218.6				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 20d ² D _{3/2}	95BAI/AKR	
4 130.82	0.02	24 201.4		*	8.62E+3	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 20d ² D _{3/2}	95BAI/AKR	05MIC/MEY
4 130.82	0.02	24 201.4		*	5.17E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 20d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 132.91	0.02	24 189.2				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 19d ² D _{3/2}	95BAI/AKR	
4 134.81	0.02	24 178.1				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 20s ² S _{1/2}	95BAI/AKR	
4 135.84	0.02	24 172.1		*	1.01E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 19d ² D _{3/2}	95BAI/AKR	05MIC/MEY
4 135.84	0.02	24 172.1		*	6.06E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 19d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 137.74	0.02	24 161.0			3.40E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 20s ² S _{1/2}	95BAI/AKR	05MIC/MEY
4 138.90	0.02	24 154.2				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 18d ² D _{3/2}	95BAI/AKR	
4 141.08	0.02	24 141.5				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 19s ² S _{1/2}	95BAI/AKR	
4 141.84	0.02	24 137.1		*	1.12E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 18d ² D _{3/2}	95BAI/AKR	05MIC/MEY
4 141.84	0.02	24 137.1		*	6.72E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 18d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 144.03	0.02	24 124.3			4.01E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 19s ² S _{1/2}	95BAI/AKR	05MIC/MEY
4 145.98	0.02	24 113.0				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 17d ² D _{3/2}	95BAI/AKR	
4 146.2	0.4	24 112				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{3/2} ^o	88GAA/AND	
4 148.61	0.02	24 097.7				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 18s ² S _{1/2}	95BAI/AKR	
4 148.93	0.02	24 095.8		*	1.42E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 17d ² D _{3/2}	95BAI/AKR	05MIC/MEY
4 148.93	0.02	24 095.8		*	8.52E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 17d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 151.75	0.02	24 079.4			4.78E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 18s ² S _{1/2}	95BAI/AKR	05MIC/MEY
4 154.44	0.02	24 063.8				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 16d ² D _{3/2}	95BAI/AKR	
4 157.0	0.4	24 049				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{1/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{1/2} ^o	88GAA/AND	
4 157.40	0.02	24 046.7		*	1.71E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 16d ² D _{3/2}	95BAI/AKR	05MIC/MEY

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
4 157.40	0.02	24 046.7		*	1.03E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 16d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 157.60	0.02	24 045.6				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 17s ² S _{1/2}	95BAI/AKR	
4 160.57	0.02	24 028.4			5.76E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 17s ² S _{1/2}	95BAI/AKR	05MIC/MEY
4 164.70	0.02	24 004.6				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 15d ² D _{3/2}	95BAI/AKR	
4 167.67	0.02	23 987.5		*	2.09E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 15d ² D _{3/2}	95BAI/AKR	05MIC/MEY
4 167.67	0.02	23 987.5		*	1.25E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 15d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 176.7	0.2	23 935.6	82		3.5E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{5/2}	2p ⁵ 3s(³ P ^o)3d ⁴ F _{7/2} ^o	85HOL/WAL	85HOL/WAL
4 177.23	0.02	23 932.6				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 14d ² D _{3/2}	95BAI/AKR	
4 168.58	0.02	23 982.2				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 16s ² S _{1/2}	95BAI/AKR	
4 171.56	0.02	23 965.1			7.03E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 16s ² S _{1/2}	95BAI/AKR	05MIC/MEY
4 180.22	0.02	23 915.4		*	2.58E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 14d ² D _{3/2}	95BAI/AKR	05MIC/MEY
4 180.22	0.02	23 915.4		*	1.55E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 14d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 182.09	0.02	23 904.8				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 15s ² S _{1/2}	95BAI/AKR	
4 185.09	0.02	23 887.6			8.70E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 15s ² S _{1/2}	95BAI/AKR	05MIC/MEY
4 185.5	0.2	23 885.3	150		4.9E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{5/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{5/2} ^o	85HOL/WAL	85HOL/WAL
4 192.97	0.02	23 842.7				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 13d ² D _{3/2}	95BAI/AKR	
4 195.98	0.02	23 825.6		*	3.27E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 13d ² D _{3/2}	95BAI/AKR	05MIC/MEY
4 195.98	0.02	23 825.6		*	1.96E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 13d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 199.14	0.02	23 807.7				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 14s ² S _{1/2}	95BAI/AKR	
4 202.16	0.02	23 790.6			1.09E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 14s ² S _{1/2}	95BAI/AKR	05MIC/MEY
4 204.9	0.2	23 775.1	46		2.5E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{5/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{3/2} ^o	85HOL/WAL	85HOL/WAL
4 213.09	0.02	23 728.9				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 12d ² D _{3/2}	95BAI/AKR	
4 216.13	0.02	23 711.8		*	4.20E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 12d ² D _{3/2}	95BAI/AKR	05MIC/MEY
4 216.13	0.02	23 711.8		*	2.52E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 12d ² D _{5/2}	95BAI/AKR	05MIC/MEY
4 220.76	0.02	23 685.7				2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 13s ² S _{1/2}	95BAI/AKR	
4 223.81	0.02	23 668.6			1.40E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 13s ² S _{1/2}	95BAI/AKR	05MIC/MEY
4 238.987	0.008	23 583.89	2			2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 11d ² D _{3/2}	56RIS	
4 242.082	0.008	23 566.71	3	*	5.54E+4	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 11d ² D _{3/2}	56RIS	05MIC/MEY
4 242.082	0.008	23 566.71	3	*	3.32E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 11d ² D _{5/2}	56RIS	05MIC/MEY
4 249.410	0.008	23 526.06	1			2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 12s ² S _{1/2}	56RIS	
4 252.520	0.008	23 508.85	2		1.84E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 12s ² S _{1/2}	56RIS	05MIC/MEY
4 253.8	0.2	23 501.8	17		5.E+6	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ D _{5/2} ^o	85HOL/WAL	85HOL/WAL
4 273.642	0.008	23 392.67	4		1.17E+6	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 10d ² D _{3/2}	56RIS	06FRO/TAC
4 273.9	0.2	23 391.3	23		1.6E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{3/2} ^o	85HOL/WAL	85HOL/WAL
4 276.787	0.008	23 375.44	5	*	2.32E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 10d ² D _{3/2}	56RIS	06FRO/TAC
4 276.787	0.008	23 375.44	5	*	1.39E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 10d ² D _{5/2}	56RIS	06FRO/TAC
4 286.7	0.2	23 321.4	46		2.8E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{3/2}	2p ⁵ 3s(³ P ^o)3d ⁴ P _{1/2} ^o	85HOL/WAL	85HOL/WAL
4 287.838	0.008	23 315.21	2			2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 11s ² S _{1/2}	56RIS	
4 291.006	0.008	23 297.98	3		2.47E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 11s ² S _{1/2}	56RIS	05MIC/MEY
4 321.400	0.008	23 134.14	6			2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 9d ² D _{3/2}	56RIS	
4 324.615	0.008	23 116.92	7	*	1.14E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 9d ² D _{3/2}	56RIS	05MIC/MEY
4 324.615	0.008	23 116.92	7	*	6.84E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 9d ² D _{5/2}	56RIS	05MIC/MEY
4 326.3	0.4	23 108				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ S _{3/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{3/2} ^o	88GAA/AND	
4 341.489	0.008	23 027.09	4		3.26E+5	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 10s ² S _{1/2}	56RIS	08KEL/POD
4 344.736	0.008	23 009.87	5		6.50E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 10s ² S _{1/2}	56RIS	08KEL/POD
4 390.029	0.008	22 772.49	8		9.83E+5	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 8d ² D _{3/2}	56RIS	08KEL/POD
4 393.340	0.008	22 755.33	9	*	1.17E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 8d ² D _{5/2}	56RIS	08KEL/POD
4 393.340	0.008	22 755.33	9	*	1.95E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 8d ² D _{3/2}	56RIS	08KEL/POD
4 419.885	0.008	22 618.70	6		2.82E+5	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 9s ² S _{1/2}	56RIS	08KEL/POD
4 423.246	0.008	22 601.46	7		5.61E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 9s ² S _{1/2}	56RIS	08KEL/POD
4 432.3	0.2	22 555.3	310		1.4E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ S _{3/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{5/2} ^o	85HOL/WAL	85HOL/WAL
4 494.177	0.009	22 244.76	10		1.23E+6	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 7d ² D _{3/2}	56RIS	08KEL/POD
4 497.658	0.009	22 227.55	11	*	1.46E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 7d ² D _{5/2}	56RIS	08KEL/POD
4 497.658	0.009	22 227.55	11	*	2.44E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 7d ² D _{3/2}	56RIS	08KEL/POD
4 541.633	0.009	22 012.36	7		3.76E+5	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 8s ² S _{1/2}	56RIS	08KEL/POD
4 545.186	0.009	21 995.133	8		7.50E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 8s ² S _{1/2}	56RIS	08KEL/POD
4 664.810 7	0.0005	21 431.117	1		2.08E+6	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 6d ² D _{3/2}	37MEI/LUF	08KEL/POD

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
4 668.559 5	0.0005	21 413.908	2	*	4.14E+5	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 6d ² D _{3/2}	37MEI/LUF	08KEL/POD
4 668.559 5	0.0005	21 413.908	2	*	2.49E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 6d ² D _{5/2}	37MEI/LUF	08KEL/POD
4 747.941 0	0.0005	21 055.891	1		6.19E+5	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 7s ² S _{1/2}	37MEI/LUF	08KEL/POD
4 751.821 8	0.0005	21 038.695	2		1.23E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 7s ² S _{1/2}	37MEI/LUF	08KEL/POD
4 975.3	0.3	20 093.7				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{1/2} ^o	88GAA/AND	
4 978.541 4	0.0005	20 080.622	1		4.09E+6	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 5d ² D _{3/2}	37MEI/LUF	08KEL/POD
4 982.813 4	0.0005	20 063.402	2		4.88E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 5d ² D _{5/2}	37MEI/LUF	08KEL/POD
5 019.8	0.2	19 915.6				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{5/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{3/2} ^o	88GAA/AND	
5 049.4	0.2	19 798.8				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{1/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{1/2} ^o	88GAA/AND	
5 071.2	0.2	19 713.7	270		4.1E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{7/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{5/2} ^o	85HOL/WAL	85HOL/WAL
5 109.6	0.2	19 565.6				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{3/2} ^o	88GAA/AND	
5 148.838 1	0.0005	19 416.463 8	1		1.14E+6	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 6s ² S _{1/2}	37MEI/LUF	08KEL/POD
5 153.402 4	0.0005	19 399.267 2	2		2.27E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 6s ² S _{1/2}	37MEI/LUF	08KEL/POD
5 162.5	0.2	19 365.1	83		1.5E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{5/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{5/2} ^o	85HOL/WAL	85HOL/WAL
5 256.4	0.2	19 019.1	7		2.E+6	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ D _{3/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{5/2} ^o	85HOL/WAL	85HOL/WAL
5 411.0	0.4	18 475.7				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{3/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{1/2} ^o	88GAA/AND	
5 451.9	0.2	18 337.1				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{5/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{3/2} ^o	88GAA/AND	
5 466.4	0.5	18 288.5				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{1/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{1/2} ^o	88GAA/AND	
5 569.9	0.9	17 948.7				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{1/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{3/2} ^o	88GAA/AND	
5 621.0	0.2	17 785.5	42		1.4E+7	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{5/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{5/2} ^o	85HOL/WAL	85HOL/WAL
5 628.5	0.5	17 761.8				2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{1/2}	2p ⁵ 3s(³ P ^o)4s ⁴ P _{3/2} ^o	88GAA/AND	
5 682.633 3	0.0005	17 592.606 0	5		1.01E+7	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 4d ² D _{3/2}	37MEI/LUF	08KEL/POD
5 688.193 4	0.0005	17 575.409 7	1		2.02E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 4d ² D _{3/2}	37MEI/LUF	08KEL/POD
5 688.204 6	0.0005	17 575.375 1	9		1.21E+7	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 4d ² D _{5/2}	37MEI/LUF	08KEL/POD
5 744.2	0.2	17 404.0	12		4.E+6	2p ⁵ (² P ^o)3s3p(³ P ^o) ⁴ P _{3/2}	2p ⁵ 3s(³ P ^o)4s4P _{5/2} ^o	85HOL/WAL	85HOL/WAL
5 889.950 954	0.000015	16 973.36616	80000		6.161(5)E+7	2p ⁶ 3s ² S _{1/2}	2p ⁶ 3p ² P _{3/2} ^o	81JUN/PIN	96JON/JUL
5 895.924 237	0.000015	16 956.17025	40000		6.135(7)E+7	2p ⁶ 3s ² S _{1/2}	2p ⁶ 3p ² P _{1/2} ^o	81JUN/PIN	96VOL/MAJ
6 154.225 3	0.0005	16 244.513 2	1		2.50E+6	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 5s ² S _{1/2}	37MEI/LUF	08KEL/POD
6 160.747 0	0.0005	16 227.316 9	2		4.98E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 5s ² S _{1/2}	37MEI/LUF	08KEL/POD
7 373.23	0.02	13 558.84	2		5.42E+4	2p ⁶ 4s ² S _{1/2}	2p ⁶ 8p ² P _{3/2} ^o	56RIS	08KEL/POD
7 373.49	0.02	13 558.36	1		5.30E+4	2p ⁶ 4s ² S _{1/2}	2p ⁶ 8p ² P _{1/2} ^o	56RIS	08KEL/POD
7 809.78	0.02	12 800.94	4		9.91E+4	2p ⁶ 4s ² S _{1/2}	2p ⁶ 7p ² P _{3/2} ^o	56RIS	08KEL/POD
7 810.24	0.02	12 800.18	3		9.72E+4	2p ⁶ 4s ² S _{1/2}	2p ⁶ 7p ² P _{1/2} ^o	56RIS	08KEL/POD
8 183.255 6	0.0005	12 216.721 1	5		4.29E+7	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 3d ² D _{3/2}	37MEI/LUF	08KEL/POD
8 194.790 5	0.0005	12 199.525 1	1		8.57E+6	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 3d ² D _{3/2}	37MEI/LUF	08KEL/POD
8 194.823 7	0.0005	12 199.475 7	9		5.14E+7	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 3d ² D _{5/2}	37MEI/LUF	08KEL/POD
8 649.92	0.02	11 557.63	7		2.25E+5	2p ⁶ 4s ² S _{1/2}	2p ⁶ 6p ² P _{3/2} ^o	56RIS	08KEL/POD
8 650.89	0.02	11 556.33	6		2.21E+5	2p ⁶ 4s ² S _{1/2}	2p ⁶ 6p ² P _{1/2} ^o	56RIS	08KEL/POD
8 942.96	0.02	11 178.91	2	*	3.71E+5	2p ⁶ 3d ² D _{5/2}	2p ⁶ 10f ² F _{7/2} ^o	56RIS	64AND/ZIL
8 942.96	0.02	11 178.91	2	*	2.47E+4	2p ⁶ 3d ² D _{5/2}	2p ⁶ 10f ² F _{5/2} ^o	56RIS	64AND/ZIL
9 153.88	0.02	10 921.33	4	*	5.3E+5	2p ⁶ 3d ² D _{5/2}	2p ⁶ 9f ² F _{7/2} ^o	56RIS	64AND/ZIL
9 153.88	0.02	10 921.33	4	*	3.5E+4	2p ⁶ 3d ² D _{5/2}	2p ⁶ 9f ² F _{5/2} ^o	56RIS	64AND/ZIL
9 465.94	0.02	10 561.29	6	*	9.57E+5	2p ⁶ 3d ² D _{5/2}	2p ⁶ 8f ² F _{7/2} ^o	56RIS	08KEL/POD
9 465.94	0.02	10 561.29	6	*	6.38E+4	2p ⁶ 3d ² D _{5/2}	2p ⁶ 8f ² F _{5/2} ^o	56RIS	08KEL/POD
9 961.28	0.03	10 036.12	7	*	1.27E+6	2p ⁶ 3d ² D _{5/2}	2p ⁶ 7f ² F _{7/2} ^o	56RIS	08KEL/POD
9 961.28	0.03	10 036.12	7	*	8.45E+4	2p ⁶ 3d ² D _{5/2}	2p ⁶ 7f ² F _{5/2} ^o	56RIS	08KEL/POD
10 566.00	0.03	9 461.73	1		4.96E+5	2p ⁶ 4p ² P _{1/2} ^o	2p ⁶ 8d ² D _{3/2}	56RIS	08KEL/POD
10 572.28	0.03	9 456.11	3	*	5.92E+5	2p ⁶ 4p ² P _{3/2} ^o	2p ⁶ 8d ² D _{5/2}	56RIS	08KEL/POD
10 572.28	0.03	9 456.11	3	*	9.88E+4	2p ⁶ 4p ² P _{3/2} ^o	2p ⁶ 8d ² D _{3/2}	56RIS	08KEL/POD
10 746.44	0.03	9 302.86	10		5.91E+5	2p ⁶ 4s ² S _{1/2}	2p ⁶ 5p ² P _{3/2} ^o	56RIS	94LOW/BIE
10 749.29	0.03	9 300.39	9		5.89E+5	2p ⁶ 4s ² S _{1/2}	2p ⁶ 5p ² P _{1/2} ^o	56RIS	94LOW/BIE
10 834.87	0.03	9 226.93	8	*	2.23E+6	2p ⁶ 3d ² D _{5/2}	2p ⁶ 6f ² F _{7/2} ^o	56RIS	08KEL/POD
10 834.87	0.03	9 226.93	8	*	1.49E+5	2p ⁶ 3d ² D _{5/2}	2p ⁶ 6f ² F _{5/2} ^o	56RIS	08KEL/POD
11 190.19	0.03	8 933.95	1		6.29E+5	2p ⁶ 4p ² P _{1/2} ^o	2p ⁶ 7d ² D _{3/2}	56RIS	08KEL/POD
11 197.21	0.03	8 928.35	2	*	7.52E+5	2p ⁶ 4p ² P _{3/2} ^o	2p ⁶ 7d ² D _{5/2}	56RIS	08KEL/POD
11 197.21	0.03	8 928.35	2	*	1.25E+5	2p ⁶ 4p ² P _{3/2} ^o	2p ⁶ 7d ² D _{3/2}	56RIS	08KEL/POD
11 381.45	0.03	8 783.82	11		8.80E+6	2p ⁶ 3p ² P _{1/2} ^o	2p ⁶ 4s ² S _{1/2}	56RIS	08KEL/POD

TABLE 1. Observed spectral lines of Na I—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
11 403.78	0.03	8 766.62	12		1.76E+7	2p ⁶ 3p ² P _{3/2} ^o	2p ⁶ 4s ² S _{1/2}	56RIS	08KEL/POD
12 679.17	0.03	7 884.80	m	*	4.70E+6	2p ⁶ 3d ² D _{5/2}	2p ⁶ 5f ² F _{7/2} ^o	61JOH	08KEL/POD
12 679.17	0.03	7 884.80	m	*	3.13E+5	2p ⁶ 3d ² D _{5/2}	2p ⁶ 5f ² F _{5/2} ^o	61JOH	08KEL/POD
14 767.54	0.03	6 769.758	m		2.18E+6	2p ⁶ 4p ² P _{1/2} ^o	2p ⁶ 5d ² D _{3/2}	61JOH	08KEL/POD
14 779.75	0.03	6 764.166	m		2.61E+6	2p ⁶ 4p ² P _{3/2} ^o	2p ⁶ 5d ² D _{5/2}	61JOH	08KEL/POD
16 373.87	0.03	6 105.624	f		5.85E+5	2p ⁶ 4p ² P _{1/2} ^o	2p ⁶ 6s ² S _{1/2}	61JOH	08KEL/POD
16 388.85R	0.03	6 100.043			1.17E+6	2p ⁶ 4p ² P _{3/2} ^o	2p ⁶ 6s ² S _{1/2}		08KEL/POD
18 465.39	0.03	5 414.058	s	*	1.40E+7	2p ⁶ 3d ² D _{5/2}	2p ⁶ 4f ² F _{7/2} ^o	61JOH	08KEL/POD
18 465.39	0.03	5 414.058	s	*	9.35E+5	2p ⁶ 3d ² D _{5/2}	2p ⁶ 4f ² F _{5/2} ^o	61JOH	08KEL/POD
<i>Vacuum</i>									
22 056.40	0.03	4 532.594	s		6.96E+6	2p ⁶ 4s ² S _{1/2}	2p ⁶ 4p ² P _{3/2} ^o	61JOH	94LOW/BIE
22 083.66	0.03	4 526.999	s		6.94E+6	2p ⁶ 4s ² S _{1/2}	2p ⁶ 4p ² P _{1/2} ^o	61JOH	94LOW/BIE
23 348.38	0.03	4 281.784	s		5.84E+6	2p ⁶ 4p ² P _{1/2} ^o	2p ⁶ 4d ² D _{3/2}	61JOH	08KEL/POD
23 379.14	0.03	4 276.150	s		7.01E+6	2p ⁶ 4p ² P _{3/2} ^o	2p ⁶ 4d ² D _{5/2}	61JOH	08KEL/POD
40 431.88	0.16	2 472.622				2p ⁶ 4f ² F ^o	2p ⁶ 5g ² G	70LIT	

TABLE 2. Energy levels of Na I

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁶ 3s	² S	1/2	0.000 00		81MAR/ZAL	885.813 064 4(5)		74BEC/BOK
2p ⁶ 3p	² P ^o	1/2	16 956.170 25	0.000 04	81JUN/PIN	94.465(10)		77GRI/ISA
		3/2	16 973.366 19	0.00005	81JUN/PIN	18.534(15)	2.72(3)	93YEI/SIE
2p ⁶ 4s	² S	1/2	25 739.999	0.003	88ARQ	203.6(2)		88ARQ
2p ⁶ 3d	² D	5/2	29 172.837	0.002	81MAR/ZAL,81JUN/PIN			
		3/2	29 172.887	0.002	81MAR/ZAL,81JUN/PIN			
2p ⁶ 4p	² P ^o	1/2	30 266.99	0.02	56RIS	30.6(1)		03BAT/HAI
		3/2	30 272.58	0.02	56RIS			
2p ⁶ 5s	² S	1/2	33 200.673	0.002	81MAR/ZAL,81JUN/PIN	77.6(2)		76TSE/LIA
2p ⁶ 4d	² D	5/2	34 548.729	0.002	81MAR/ZAL,81JUN/PIN			
		3/2	34 548.764	0.002	81MAR/ZAL,81JUN/PIN			
2p ⁶ 4f	² F ^o	5/2, 7/2	34 586.92	0.02	61JOH			
2p ⁶ 5p	² P ^o	1/2	35 040.38	0.02	56RIS			
		3/2	35 042.85	0.02	56RIS			
2p ⁶ 6s	² S	1/2	36 372.618	0.002	81MAR/ZAL,81JUN/PIN			
2p ⁶ 5d	² D	5/2	37 036.752	0.002	81MAR/ZAL,81JUN/PIN			
		3/2	37 036.772	0.002	81MAR/ZAL,81JUN/PIN			
2p ⁶ 5f	² F ^o	5/2, 7/2	37 057.65	0.02	56RIS			
2p ⁶ 5g	² G	7/2, 9/2	37 059.54	0.07	70LIT			
2p ⁶ 6p	² P ^o	1/2	37 296.32	0.02	56RIS			
		3/2	37 297.61	0.02	56RIS			
2p ⁶ 7s	² S	1/2	38 012.042	0.002	81MAR/ZAL,81JUN/PIN			
2p ⁶ 6d	² D	5/2	38 387.255	0.002	81MAR/ZAL,81JUN/PIN			
		3/2	38 387.268	0.002	81MAR/ZAL,81JUN/PIN			
2p ⁶ 6f	² F ^o	5/2, 7/2	38 399.79	0.02	56RIS			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁶ 6g	² G	7/2	[38 400.900]	0.002	97DYU/EFR			
		9/2	[38 400.904]	0.002	97DYU/EFR			
2p ⁶ 6h	² H°	11/2	[38 401.147]	0.002	97DYU/EFR			
		9/2	[38 401.153]	0.002	97DYU/EFR			
2p ⁶ 7p	² P°	1/2	38 540.18	0.02	56RIS			
		3/2	38 540.93	0.02	56RIS			
2p ⁶ 8s	² S	1/2	38 968.51	0.02	56RIS			
2p ⁶ 7d	² D	3/2, 5/2	39 200.93	0.02	56RIS			
2p ⁶ 7f	² F°	5/2, 7/2	39 208.98	0.02	56RIS			
2p ⁶ 7g	² G	7/2, 9/2	[39 209.725]	0.002	97DYU/EFR			
2p ⁶ 7h	² H°	9/2, 11/2	[39 209.887]	0.002	97DYU/EFR			
2p ⁶ 8p	² P°	1/2	39 298.35	0.02	56RIS			
		3/2	39 298.84	0.02	56RIS			
2p ⁶ 9s	² S	1/2	39 574.85	0.02	56RIS			
2p ⁶ 8d	² D	3/2, 5/2	39 728.70	0.02	56RIS			
2p ⁶ 8f	² F°	5/2, 7/2	39 734.16	0.02	56RIS			
2p ⁶ 8g	² G	7/2, 9/2	[39 734.678]	0.002	97DYU/EFR			
2p ⁶ 8h	² H°	9/2, 11/2	[39 734.790]	0.002	97DYU/EFR			
2p ⁶ 9p	² P°	1/2	[39 794.479]	0.002	95DYU/EFI			
		3/2	[39 794.810]	0.002	95DYU/EFI			
2p ⁶ 10s	² S	1/2	39 983.27	0.02	56RIS			
2p ⁶ 9d	² D	3/2, 5/2	40 090.31	0.02	56RIS			
2p ⁶ 9f	² F°	5/2, 7/2	40 094.19	0.02	56RIS			
2p ⁶ 9g	² G	7/2, 9/2	[40 094.581]	0.002	97DYU/EFR			
2p ⁶ 9h	² H°	9/2, 11/2	[40 094.660]	0.002	97DYU/EFR			
2p ⁶ 10p	² P°	1/2	40 136.810	0.002	98BAU/BUR			
		3/2	40 137.043	0.002	98BAU/BUR			
2p ⁶ 11s	² S	1/2	40 271.396	0.002	92CIO/BUR			
2p ⁶ 10d	² D	5/2	40 348.915	0.002	98BAU/BUR			
		3/2	40 348.918	0.002	98BAU/BUR			
2p ⁶ 10f	² F°	5/2, 7/2	[40 351.761]	0.002	97DYU/EFR			
2p ⁶ 10g	² G	7/2, 9/2	[40 352.015]	0.002	97DYU/EFR			
2p ⁶ 10h	² H°	9/2, 11/2	[40 352.073]	0.002	97DYU/EFR			
2p ⁶ 11p	² P°	1/2	40 382.925	0.002	98BAU/BUR			
		3/2	40 383.097	0.002	98BAU/BUR			
2p ⁶ 12s	² S	1/2	40 482.236	0.002	92CIO/BUR			
2p ⁶ 11d	² D	5/2	[40 540.093]	0.002	97DYU/EFR			
		3/2	[40 540.095]	0.002	97DYU/EFR			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁶ 11f	² F°	5/2, 7/2	[40 542.293]	0.002	97DYU/EFR			
2p ⁶ 11g	² G	7/2, 9/2	[40 542.484]	0.002	97DYU/EFR			
2p ⁶ 12p	² P°	1/2	[40 565.783]	0.002	95DYU/EFI			
		3/2	[40 565.913]	0.002	95DYU/EFI			
2p ⁶ 13s	² S	1/2	[40 641.148]	0.002	95DYU/EFI			
2p ⁶ 12d	² D	5/2	[40 685.509]	0.002	97DYU/EFR			
		3/2	[40 685.509]	0.002	97DYU/EFR			
2p ⁶ 12f	² F°	5/2, 7/2	[40 687.203]	0.002	97DYU/EFR			
2p ⁶ 12g	² G	7/2, 9/2	[40 687.352]	0.002	97DYU/EFR			
2p ⁶ 13p	² P°	1/2	[40 705.344]	0.002	95DYU/EFI			
		3/2	[40 705.444]	0.002	95DYU/EFI			
2p ⁶ 14s	² S	1/2	[40 763.884]	0.002	95DYU/EFI			
2p ⁶ 13d	² D	5/2	[40 798.642]	0.002	97DYU/EFR			
		3/2	[40 798.644]	0.002	97DYU/EFR			
2p ⁶ 13f	² F°	5/2, 7/2	[40 799.974]	0.002	97DYU/EFR			
2p ⁶ 13g	² G	7/2, 9/2	[40 800.091]	0.002	97DYU/EFR			
2p ⁶ 14p	² P°	1/2	[40 814.273]	0.002	95DYU/EFI			
		3/2	[40 814.352]	0.002	95DYU/EFI			
2p ⁶ 15s	² S	1/2	[40 860.648]	0.002	95DYU/EFI			
2p ⁶ 14d	² D	5/2	[40 888.386]	0.002	97DYU/EFR			
		3/2	[40 888.387]	0.002	97DYU/EFR			
2p ⁶ 14f	² F°	5/2, 7/2	[40 889.452]	0.002	97DYU/EFR			
2p ⁶ 14g	² G	7/2, 9/2	[40 889.546]	0.002	97DYU/EFR			
2p ⁶ 15p	² P°	1/2	[40 900.922]	0.002	95DYU/EFI			
		3/2	[40 900.985]	0.002	95DYU/EFI			
2p ⁶ 16s	² S	1/2	[40 938.281]	0.002	95DYU/EFI			
2p ⁶ 15d	² D	3/2, 5/2	[40 960.771]	0.002	97DYU/EFR			
2p ⁶ 15f	² F°	5/2, 7/2	[40 961.637]	0.002	97DYU/EFR			
2p ⁶ 15g	² G	7/2, 9/2	[40 961.714]	0.002	97DYU/EFR			
2p ⁶ 16p	² P°	1/2	[40 970.976]	0.002	95DYU/EFI			
		3/2	[40 971.028]	0.002	95DYU/EFI			
2p ⁶ 17s	² S	1/2	[41 001.515]	0.002	95DYU/EFI			
2p ⁶ 16d	² D	5/2	[41 020.000]	0.002	97DYU/EFR			
		3/2	[41 020.001]	0.002	97DYU/EFR			
2p ⁶ 16f	² F°	5/2, 7/2	[41 020.714]	0.002	97DYU/EFR			
2p ⁶ 16g	² G	7/2, 9/2	[41 020.777]	0.002	97DYU/EFR			
2p ⁶ 17p	² P°	1/2	[41 028.419]	0.002	95DYU/EFI			
		3/2	[41 028.462]	0.002	95DYU/EFI			
2p ⁶ 18s	² S	1/2	[41 053.701]	0.002	95DYU/EFI			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁶ 17d	² D	5/2	[41 069.079]	0.002	97DYU/EFR			
		3/2	[41 069.080]	0.002	97DYU/EFR			
2p ⁶ 17f	² F ^o	5/2, 7/2	[41 069.674]	0.002	97DYU/EFR			
2p ⁶ 17g	² G	7/2, 9/2	[41 069.727]	0.002	97DYU/EFR			
2p ⁶ 18p	² P ^o	1/2	[41 076.106]	0.002	95DYU/EFI			
		3/2	[41 076.141]	0.002	95DYU/EFI			
2p ⁶ 19s	² S	1/2	[41 097.271]	0.002	95DYU/EFI			
2p ⁶ 18d	² D	3/2, 5/2	[41 110.202]	0.002	97DYU/EFR			
2p ⁶ 18f	² F ^o	5/2, 7/2	[41 110.703]	0.002	97DYU/EFR			
2p ⁶ 18g	² G	7/2	[41 110.747]	0.002	97DYU/EFR			
		9/2	[41 110.748]	0.002	97DYU/EFR			
2p ⁶ 19p	² P ^o	1/2	[41 116.126]	0.002	95DYU/EFI			
		3/2	[41 116.156]	0.002	95DYU/EFI			
2p ⁶ 20s	² S	1/2	[41 134.023]	0.002	95DYU/EFI			
2p ⁶ 19d	² D	5/2	[41 144.999]	0.002	97DYU/EFR			
		3/2	[41 145.000]	0.002	97DYU/EFR			
2p ⁶ 19f	² F ^o	5/2, 7/2	[41 145.425]	0.002	97DYU/EFR			
2p ⁶ 19g	² G	7/2, 9/2	[41 145.463]	0.002	97DYU/EFR			
2p ⁶ 20p	² P ^o	1/2	[41 150.040]	0.002	95DYU/EFI			
		3/2	[41 150.066]	0.002	95DYU/EFI			
2p ⁶ 20d	² D	3/2, 5/2	[41 174.705]	0.002	97DYU/EFR			
2p ⁶ 20f	² F ^o	5/2, 7/2	[41 175.070]	0.002	97DYU/EFR			
2p ⁶ 20g	² G	7/2, 9/2	[41 175.102]	0.002	97DYU/EFR			
Na II (2p ⁶ ¹ S ₀)	Limit	—	41 449.451	0.002	92CIO/BUR			
2p ⁵ 3s ²	² P ^o	3/2	248 159	15	71CON/GAR			
		1/2	249 503	15	71CON/GAR			
2p ⁵ (² P ^o)3s3p(³ P ^o)	⁴ S	3/2	263 773	15	85PED/MEN			
2p ⁵ (² P ^o)3s3p(³ P ^o)	⁴ D	7/2	266 614	15	85HOL/WAL,88GAA/AND			
		5/2	266 960	15	85HOL/WAL,88GAA/AND			
		3/2	267 309	15	85HOL/WAL,88GAA/AND			
		1/2	267 603	15	85HOL/WAL,88GAA/AND			
2p ⁵ (² P ^o)3s3p(³ P ^o)	⁴ P	5/2	268 543	15	85HOL/WAL,88GAA/AND			
		3/2	268 926	15	85HOL/WAL,88GAA/AND			
		1/2	269 113	15	88GAA/AND			
2p ⁵ (² P ^o)3s3p(³ P ^o)	² D	3/2	269 727	15	79SUG/LUC			
		5/2	270 196	15	79SUG/LUC			
2p ⁵ (² P ^o)3s3p(³ P ^o)	² P	1/2	270 582	15	79SUG/LUC			
		3/2	270 881	15	79SUG/LUC			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁵ (² P°)3s3p(³ P°)	² S	1/2	273 240	15	79SUG/LUC			
2p ⁵ (² P°)3s3p(¹ P°)	² D	5/2	280 596	15	79SUG/LUC			
		3/2	282 063	15	79SUG/LUC			
2p ⁵ (² P°)3s3p(¹ P°)	² S	1/2	280 785	15	79SUG/LUC			
2p ⁵ (² P°)3s3p(¹ P°)	² P	3/2	281 032	15	79SUG/LUC			
		1/2	282 334	15	79SUG/LUC			
2p ⁵ 3s(³ P ₂ °)4s	[2]°	5/2	286 328	15	85HOL/WAL,88GAA/AND			
		3/2	286 842	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ °)4s	[1]°	1/2	287 370	7	94BAI/MAH			
		3/2	287 478	7	94BAI/MAH			
2p ⁵ 3s(³ P ₀ °)4s	[0]°	1/2	288 452	7	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ °)4s	[1]a° [1]b°	1/2, 3/2	290 234	7	94BAI/MAH			
		1/2, 3/2	290 489	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ °)3d	c° d°	1/2, 3/2	290 786	7	94BAI/MAH			
		1/2, 3/2	291 380	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ °)3d	e° f°	1/2, 3/2	292 090	9	94BAI/MAH			
		1/2, 3/2	293 100	9	94BAI/MAH			
2p ⁵ 3s(³ P°)3d	⁴ P°	1/2	292 247	15	85HOL/WAL,88GAA/AND			
		3/2	292 316	15	85HOL/WAL,88GAA/AND			
		5/2	292 427	15	85HOL/WAL,88GAA/AND			
2p ⁵ 3s(³ P°)3d	⁴ F°	9/2	292 368	15	85HOL/WAL,88GAA/AND			
		7/2	292 476	15	85HOL/WAL,88GAA/AND			
		5/2	292 941	15	85HOL/WAL,88GAA/AND			
		3/2	293 554	15	88GAA/AND			
2p ⁵ 3s(³ P°)3d	⁴ D°	3/2	293 037	15	85HOL/WAL,88GAA/AND			
		1/2	293 159	15	88GAA/AND			
2p ⁵ 3s(³ P ₀ °)3d	[2]°	3/2	293 531	7	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ °)3d	g° h°	1/2, 3/2	295 294	7	94BAI/MAH			
		1/2, 3/2	295 526	7	94BAI/MAH			
2p ⁵ 3s(³ P°)4p	² D	3/2	295 054	15	79SUG/LUC			
2p ⁵ 3s(¹ P°)4p	² D	5/2	296 576	15	79SUG/LUC			
		3/2	297 048	15	79SUG/LUC			
2p ⁵ 3s(¹ P°)4p	² S	1/2	296 618	15	79SUG/LUC			
2p ⁵ 3s(¹ P°)4p	² P	3/2	296 808	15	79SUG/LUC			
		1/2	297 121	15	79SUG/LUC			
2p ⁵ 3s(³ P ₂ °)5s	[2]°	3/2	297 074	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ °)5s	[1]i° [1]j°	1/2, 3/2	297 645	7	94BAI/MAH			
		1/2, 3/2	297 724	7	94BAI/MAH			
2p ⁵ 3s(³ P ₀ °)5s	[0]°	1/2	297 848	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ °)4d	°	1/2, 3/2	298 350	7	94BAI/MAH			
2p ⁵ 3s(³ P°)4d?	°	1/2, 3/2	298 990	150	72WOL/RAD			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁵ 3s(³ P ₁ ^o)4d	<i>k</i> ^o	1/2, 3/2	299 410	9	94BAI/MAH			
	<i>l</i> ^o	1/2, 3/2	299 446	9	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)4d	[2] ^o	3/2	300 040	7	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)5s	[1] <i>m</i> ^o	1/2, 3/2	300 240	20	71CON/GAR			
	[1] <i>n</i> ^o	1/2, 3/2	300 621	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)6s	[2] ^o	3/2	300 777	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)6s	[1] ^o	1/2, 3/2	301 423	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)5d	^o	1/2, 3/2	301 588	7	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)6s	[0] ^o	1/2	301 976	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)5d	^o	1/2, 3/2	302 142	9	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)4d	<i>p</i> ^o	1/2, 3/2	302 419	7	94BAI/MAH			
	<i>q</i> ^o	1/2, 3/2	302 458	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)7s	[2] ^o	3/2	302 686	7	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)5d	[2] ^o	3/2	302 830	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)6d	^o	1/2, 3/2	303 233	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)7s	[1] ^o	1/2, 3/2	303 401	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)8s	[2] ^o	3/2	303 683	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)6d	^o	1/2, 3/2	303 739	9	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)7s	[0] ^o	1/2	303 974	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)7d	^o	1/2, 3/2	304 054	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)9s	[2] ^o	3/2	304 371	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)8s	[1] ^o	1/2, 3/2	304 451	7	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)6s	[1] ^o	1/2, 3/2	304 451	7	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)6d	[2] ^o	3/2	304 547	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)8d	^o	1/2, 3/2	304 609	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)7d	^o	1/2, 3/2	304 767	9	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)10s	[2] ^o	3/2	304 825	7	94BAI/MAH			
	^o	1/2, 3/2	304 894	20	81MAR/ZAL			
2p ⁵ 3s(³ P ₂ ^o)9d	^o	1/2, 3/2	304 942	7	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)8s	[0] ^o	1/2	305 047	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)9s	[1] ^o	1/2, 3/2	305 143	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)11s	[2] ^o	3/2	305 146	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)10d	^o	1/2, 3/2	305 214	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)8d	^o	1/2, 3/2	305 232	9	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)7d	[2] ^o	3/2	305 319	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)12s	[2] ^o	3/2	305 357	7	94BAI/MAH			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁵ 3s(³ P ₂ ^o)11d	°	1/2, 3/2	305 407	7	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)5d	°	1/2, 3/2	305 407	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)13s	[2] ^o	3/2	305 506	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)12d	°	1/2, 3/2	305 562	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)10s	[1] ^o	1/2, 3/2	305 562	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)14s	[2] ^o	3/2	305 647	7	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)13d	°	1/2, 3/2	305 689	9	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)9s	[0] ^o	1/2	305 689	9	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)15s	[2] ^o	3/2	305 764	9	94BAI/MAH			
2p ⁵ 3s(³ P ₂ ^o)16s	[2] ^o	3/2	305 848	9	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)11s	[1] ^o	1/2, 3/2	305 897	7	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)8d	[2] ^o	3/2	305 963	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)12s	[1] ^o	1/2, 3/2	306 116	7	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)10s	[0] ^o	1/2	306 168	7	94BAI/MAH			
2p ⁵ 3s(³ P ₁ ^o)13s	[1] ^o	1/2, 3/2	306 269	9	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)9d	[2] ^o	3/2	306 326	9	94BAI/MAH			
Na II (2p⁵3s ³P₂^o)	<i>Limit</i>	—	306 373.8	0.2	92CIO/BUR,81MAR/ZAL			
2p ⁵ 3s(¹ P ₁ ^o)7s	[1] ^o	1/2, 3/2	306 443	8	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)11s	[0] ^o	1/2	306 524	8	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)12s	[0] ^o	1/2	306 712	8	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)13s	[0] ^o	1/2	306 899	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)6d	°	1/2, 3/2	306 899	8	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)14s	[0] ^o	1/2	307 031	8	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)15s	[0] ^o	1/2	307 112	8	94BAI/MAH			
Na II (2p⁵3s ³P₁^o)	<i>Limit</i>	—	307 139.1	0.2	92CIO/BUR,81MAR/ZAL			
2p ⁵ 3s(³ P ₀ ^o)16s	[0] ^o	1/2	307 204	8	94BAI/MAH			
2p ⁵ 3s(³ P ₀ ^o)17s	[0] ^o	1/2	307 310	100	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)8s	[1] ^o	1/2, 3/2	307 524	8	94BAI/MAH			
Na II (2p⁵3s ³P₀^o)	<i>Limit</i>	—	307 731.1	0.2	92CIO/BUR,81MAR/ZAL			
2p ⁵ 3s(¹ P ₁ ^o)7d	°	1/2, 3/2	307 860	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)9s	[1] ^o	1/2, 3/2	308 195	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)8d	°	1/2, 3/2	308 378	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)10s	[1] ^o	1/2, 3/2	308 641	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)9d	°	1/2, 3/2	308 773	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)11s	[1] ^o	1/2, 3/2	308 948	8	94BAI/MAH			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁵ 3s(¹ P ₁ ^o)10d	°	1/2, 3/2	309 044	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)12s	[1] ^o	1/2, 3/2	309 173	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)11d	°	1/2, 3/2	309 247	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)13s	[1] ^o	1/2, 3/2	309 346	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)12d	°	1/2, 3/2	309 403	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)14s	[1] ^o	1/2, 3/2	309 473	10	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)13d	°	1/2, 3/2	309 524	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)15s	[1] ^o	1/2, 3/2	309 588	10	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)14d	°	1/2, 3/2	309 613	8	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)15d	°	1/2, 3/2	309 693	10	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)16d	°	1/2, 3/2	309 751	10	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)17d	°	1/2, 3/2	309 799	10	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)18d	°	1/2, 3/2	309 837	10	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)19d	°	1/2, 3/2	309 885	10	94BAI/MAH			
2p ⁵ 3s(¹ P ₁ ^o)20d	°	1/2, 3/2	309 914	10	94BAI/MAH			
Na II (2p⁵3s ¹P₁^o)	<i>Limit</i>	—	310 212.4	0.2	92CIO/BUR,81MAR/ZAL			
2p ⁵ 3p ²	°	1/2, 3/2	310 977	25	71CON/GAR			
2p ⁵ 3p ²	°	1/2, 3/2	312 188	25	71CON/GAR			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 4p(I)	°	1/2, 3/2	323 830	100	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 4p	[1] ^o	1/2, 3/2	326 840	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 5p	[1] ^o	1/2, 3/2	329 865	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 6p	[1] ^o	1/2, 3/2	331 379	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 7p	[1] ^o	1/2, 3/2	332 292	9	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 5p(I)	°	1/2, 3/2	332 502	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 8p	[1] ^o	1/2, 3/2	332 863	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ¹ D ₂ 4p	°	1/2, 3/2	333 059	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 9p	[1] ^o	1/2, 3/2	333 240	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 10p	[1] ^o	1/2, 3/2	333 518	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 11p	[1] ^o	1/2, 3/2	333 728	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 12p	[1] ^o	1/2, 3/2	333 866	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 13p	[1] ^o	1/2, 3/2	333 985	9	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 4p	°	1/2, 3/2	334 044	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 14p	[1] ^o	1/2, 3/2	334 085	9	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 15p	[1] ^o	1/2, 3/2	334 169	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ³ S ₁ 16p	[1] ^o	1/2, 3/2	334 213	11	94BAI/MAH			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 4p(II)	°	1/2, 3/2	334 616	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ¹ D ₂ 5p	°	1/2, 3/2	336 010	9	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 6p(I)	°	1/2, 3/2	336 259	11	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 5p	°	1/2, 3/2	336 723	9	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 5p(II)	°	1/2, 3/2	337 257	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ¹ D ₂ 6p	°	1/2, 3/2	337 418	9	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 6p	°	1/2, 3/2	338 149	9	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 7p(I)	°	1/2, 3/2	338 169	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ¹ D ₂ 7p	°	1/2, 3/2	338 301	9	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 6p(II)	°	1/2, 3/2	338 845	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ¹ D ₂ 8p	°	1/2, 3/2	338 857	11	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 7p	°	1/2, 3/2	338 995	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ¹ D ₂ 9p	°	1/2, 3/2	339 248	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 8p(I)	°	1/2, 3/2	339 271	12	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3p ¹ D ₂ 10p	°	1/2, 3/2	339 512	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 8p	°	1/2, 3/2	339 570	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 7p(II)	°	1/2, 3/2	339 628	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 9p	°	1/2, 3/2	339 928	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 9p(I)	°	1/2, 3/2	339 928	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 8p(II)	°	1/2, 3/2	340 171	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 10p	°	1/2, 3/2	340 194	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 10p(I)	°	1/2, 3/2	340 379	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 11p	°	1/2, 3/2	340 402	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 12p	°	1/2, 3/2	340 553	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 9p(II)	°	1/2, 3/2	340 553	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 13p	°	1/2, 3/2	340 669	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 11p(I)	°	1/2, 3/2	340 704	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ¹ P ₁ 14p	°	1/2, 3/2	340 762	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 10p(II)	°	1/2, 3/2	340 820	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 12p(I)	°	1/2, 3/2	340 948	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 11p(II)	°	1/2, 3/2	341 018	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 13p(I)	°	1/2, 3/2	341 111	12	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 12p(II)	°	1/2, 3/2	341 200	120	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 13p(II)	°	1/2, 3/2	341 380	120	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3p ³ P ₁ 14p(II)	°	1/2, 3/2	341 410	120	94BAI/MAH			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁵ (² P _{1/2})3p ³ P ₁ 15p(II)	°	1/2, 3/2	341 530	120	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 4p	[1]°	1/2, 3/2	342 614	9	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 5p	[1]°	1/2, 3/2	345 479	10	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 6p	[1]°	1/2, 3/2	347 026	10	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 7p	[1]°	1/2, 3/2	347 923	10	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 8p	[1]°	1/2, 3/2	348 500	10	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 9p	[1]°	1/2, 3/2	348 893	10	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 10p	[1]°	1/2, 3/2	349 166	10	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 11p	[1]°	1/2, 3/2	349 382	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 12p	[1]°	1/2, 3/2	349 516	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 13p	[1]°	1/2, 3/2	349 638	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 14p	[1]°	1/2, 3/2	349 736	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 15p	[1]°	1/2, 3/2	349 822	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 16p	[1]°	1/2, 3/2	349 871	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 17p	[1]°	1/2, 3/2	349 932	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 18p	[1]°	1/2, 3/2	349 981	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3p ¹ S ₀ 19p	[1]°	1/2, 3/2	350 005	12	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ³ P ₂ [°] 4s	[2]°	3/2	350 016	10	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ¹ P ₁ [°] 4s	[1]°	1/2, 3/2	350 447	12	94BAI/MAH			
2p ⁵ (² P _{3/2})4s ³ P ₁ [°] 5s	[1]°	1/2, 3/2	351 753	12	94BAI/MAH			
2p ⁵ (² P _{1/2})3d ³ D ₁ [°] 4s	[1]°	1/2, 3/2	355 619	13	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ¹ P ₁ [°] 3d	°	1/2, 3/2	360 826	10	94BAI/MAH			
2p ⁵ (² P _{3/2})4s ³ P ₁ [°] 3d	°	1/2, 3/2	361 126	10	94BAI/MAH			
2p ⁵ (² P _{1/2})4s ¹ P ₁ [°] 3d	°	1/2, 3/2	361 418	10	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ³ F ₂ [°] 5s	[2]°	3/2	362 050	10	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ¹ P ₁ [°] 5s	[1]°	1/2, 3/2	362 201	13	94BAI/MAH			
2p ⁵ (² P _{3/2})4s ³ P ₁ [°] 6s	[1]°	1/2, 3/2	362 858	13	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ³ F ₂ [°] 4d	°	1/2, 3/2	364 766	11	94BAI/MAH			
2p ⁵ (² P _{1/2})3d ³ D ₁ [°] 5s	[1]°	1/2, 3/2	364 990	13	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ³ P ₂ [°] 6s	[2]°	3/2	366 205	13	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ¹ P ₁ [°] 4d	°	1/2, 3/2	366 206	13	94BAI/MAH			
2p ⁵ (² P _{3/2})4s ³ P ₁ [°] 4d	°	1/2, 3/2	366 425	11	94BAI/MAH			
2p ⁵ (² P _{3/2})3d ¹ P ₁ [°] 6s	[1]°	1/2, 3/2	366 932	13	94BAI/MAH			
2p ⁵ (² P _{3/2})4s ³ P ₁ [°] 7s	[1]°	1/2, 3/2	367 215	13	94BAI/MAH			
2p ⁵ (² P _{1/2})4s ¹ P ₁ [°] 4d	°	1/2, 3/2	367 404	11	94BAI/MAH			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁵ (² P _{3/2} ^o)3d 3F ₂ ^o 5d	°	1/2, 3/2	367 954	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3P ₂ ^o 7s	[2] ^o	3/2	368 287	11	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 5d	°	1/2, 3/2	368 745	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 5d	°	1/2, 3/2	368 745	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 6s	[1] ^o	1/2, 3/2	368 949	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 7s	[1] ^o	1/2, 3/2	369 031	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 8s	[1] ^o	1/2, 3/2	369 331	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3P ₂ ^o 8s	[2] ^o	3/2	369 454	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3F ₂ ^o 6d	°	1/2, 3/2	369 645	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)4s 1P ₁ ^o 5d	°	1/2, 3/2	369 992	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 6d	°	1/2, 3/2	370 096	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3P ₂ ^o 9s	[2] ^o	3/2	370 137	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 6d	°	1/2, 3/2	370 206	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 8s	[1] ^o	1/2, 3/2	370 288	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 9s	[1] ^o	1/2, 3/2	370 535	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3F ₂ ^o 7d	°	1/2, 3/2	370 631	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3P ₂ ^o 10s	[2] ^o	3/2	370 645	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 7s	[1] ^o	1/2, 3/2	370 824	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 7d	°	1/2, 3/2	370 906	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 9s	[1] ^o	1/2, 3/2	371 016	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 7d	°	1/2, 3/2	371 016	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3F ₂ ^o 8d	°	1/2, 3/2	371 237	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 10s	[1] ^o	1/2, 3/2	371 237	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)4s 1P ₁ ^o 6d	°	1/2, 3/2	371 443	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 8d	°	1/2, 3/2	371 471	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 10s	[1] ^o	1/2, 3/2	371 554	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 8d	°	1/2, 3/2	371 568	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3F ₂ ^o 9d	°	1/2, 3/2	371 664	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 1P ₁ ^o 9d	°	1/2, 3/2	371 830	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3F ₂ ^o 10d	°	1/2, 3/2	371 941	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 9d	°	1/2, 3/2	371 941	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 8s	[1] ^o	1/2, 3/2	371 941	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)3d 3F ₂ ^o 11d	°	1/2, 3/2	372 148	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 10d	°	1/2, 3/2	372 218	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)4s 1P ₁ ^o 7d	°	1/2, 3/2	372 273	15	94BAI/MAH			

TABLE 2. Energy levels of Na I—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference	Hyperfine constants		Hyperfine reference
						A (MHz)	B (MHz)	
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 11d	°	1/2, 3/2	372 398	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 12d	°	1/2, 3/2	372 550	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 9s	[1]°	1/2, 3/2	372 606	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 13d	°	1/2, 3/2	372 662	15	94BAI/MAH			
2p ⁵ (² P _{3/2} ^o)4s 3P ₁ ^o 14d	°	1/2, 3/2	372 759	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)4s 1P ₁ ^o 8d	°	1/2, 3/2	372 800	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 10s	[1]°	1/2, 3/2	373 051	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)4s 1P ₁ ^o 9d	°	1/2, 3/2	373 176	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 11s	[1]°	1/2, 3/2	373 371	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)4s 1P ₁ ^o 10d	°	1/2, 3/2	373 455	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 12s	[1]°	1/2, 3/2	373 608	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)4s 1P ₁ ^o 11d	°	1/2, 3/2	373 636	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 13s	[1]°	1/2, 3/2	373 776	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 14s	[1]°	1/2, 3/2	373 916	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 15s	[1]°	1/2, 3/2	374 000	15	94BAI/MAH			
2p ⁵ (² P _{1/2} ^o)3d 3D ₁ ^o 16s	[1]°	1/2, 3/2	374 070	15	94BAI/MAH			
2s(2S)2p63s3p(³ P ^o)	2P ^o	1/2, 3/2	535 330	200	81LAV/MEH			
2s(2S)2p63s3p(¹ P ^o)	2P ^o	1/2, 3/2	546 600	300	81LAV/MEH			
2s2p63s(3S)4p	2P ^o	1/2, 3/2	559 600	300	81LAV/MEH			
Na II (2s2p63s 3S ₁)	Limit	—	572 350	200	94DOR			
Na II (2s2p63s 1S ₀)	Limit	—	575 750	200	94DOR			
2s2p63p(³ P ^o)4s	2P ^o	1/2, 3/2	586 200	300	81LAV/MEH			
2s2p63p(¹ P ^o)4s	2P ^o	1/2, 3/2	591 400	300	81LAV/MEH			
2s2p63p(³ P ^o)3d	2P ^o	1/2, 3/2	594 600	400	81LAV/MEH			
2s2p63p(³ P ^o)5s	2P ^o	1/2, 3/2	596 400	400	81LAV/MEH			
2s2p63p(³ P ^o)6s	2P ^o	1/2, 3/2	600 000	400	81LAV/MEH			
2s2p6(2S)4s4p(³ P ^o)	2P ^o	1/2, 3/2	618 900	400	81LAV/MEH			
2s2p6(2S)4s5p(³ P ^o)	2P ^o	1/2, 3/2	629 700	800	81LAV/MEH			
2s2p6(2S)3d4p(³ P ^o)	2P ^o	1/2, 3/2	636 600	400	81LAV/MEH			

6.2. Na II

Ne isoelectronic sequence

Ground state 1s²2s²2p⁶ 1S₀

Ionization energy 381 390(2) cm⁻¹; 47.2867(3) eV

The foundation of the analysis of the Na II spectrum is the research by Bowen [28BOW] and Frisch [31FRI], who iden-

tified the resonance transitions at 375 Å and lines involving the 2s²2p⁵3s, 3p, and 3d configurations between 2500 Å and 3700 Å. The spectrum from 270 Å to 6566 Å was remeasured to greater accuracy by Wu [71WU], who also reanalyzed and extended the known energy levels. The autoionizing 2s2p⁶np 1P₁^o levels were observed by Lucatorto and McIlrath [76LUC/MCI] in absorption for 3 ≤ n ≤ 8. Electron impact excitation was used by Breuckmann *et al.* [77BRE/

BRE] to locate the $2s2p^63s^3S$ and 1S and $2s2p^63p^3P^\circ$ levels. More recently Dorn *et al.* [94DOR, 95DOR/NIE, 95DOR/WIN, 97NIE/ZAT] started with neutral sodium and used one- and two-step laser excitations, along with electron impact excitation, to observe higher members of the $2s2p^6ns$, np , and nd series. For many of these, the triplet and singlet states were unresolved and thus only the $3s$, $4s$, and $3p-8p$ levels are included here. In 1981, Martin and Zalubas [81MAR/ZAL] integrated the extant energy level data for Na II into a consistent set of values. Except for the newly available data of [95DOR/NIE, 94DOR], the energy level values and leading percentages are taken from [81MAR/ZAL] (see Tables 3 and 4).

The transition probabilities of allowed transitions of Na II have been calculated by Hibbert *et al.* [93HIB/DOU] using a modified Breit-Pauli Hamiltonian, and Froese Fischer and Tachiev [04FRO/TAC], who used a multiconfiguration Hartree-Fock approach. Träbert [96TRA] measured the lifetimes of the $2p^53s^1P_1^\circ$ and $^3P_1^\circ$ levels, from which the transition probabilities can be calculated. Most of these values have been critically evaluated and incorporated into a compilation of sodium transition probabilities by Kelleher and Podobedova [08KEL/POD]. The ionization energy cited above was determined by Wu [71WU] from the $2s^22p^5nf$ series for $n=4-6$.

References for Na II

28BOW I. S. Bowen, Phys. Rev. **31**, 967 (1928).
31FRI S. Frisch, Z. Phys. **70**, 498 (1931).

71WU C.-M. Wu, Ph.D. thesis, University of British Columbia, 1971.
76LUC/MCI T. B. Lucatorto and T. J. McIlrath, Phys. Rev. Lett. **37**, 428 (1976).
77BRE/BRE E. Breuckmann, B. Breuckmann, W. Melhorn, and W. Schmitz, J. Phys. B **10**, 3135 (1977).
81MAR/ZAL W. C. Martin and R. Zalubas, J. Phys. Chem. Ref. Data **10**, 153 (1981).
93HIB/DOU A. Hibbert, M. Le Dourneuf, and M. Mohan, At. Data Nucl. Data Tables **53** 23 (1993).
94DOR A. Dorn, Ph.D. thesis, University of Freiburg, 1994, as quoted in O. I. Zatsarinny, J. Phys. B **28**, 4759 (1995).
95DOR/NIE A. Dorn, J. Nienhaus, M. Wetzstein, C. Winnewisser, U. Eichmann, W. Sander, and W. Mehlhorn, J. Phys. B **28**, L225 (1995).
95DOR/WIN A. Dorn, C. Winnewisser, M. Wetzstein, J. Nienhaus, A. N. Grum-Grzhimailo, O. I. Zatsarinny, and W. Mehlhorn, J. Electron Spectrosc. Relat. Phenom. **76**, 245 (1995).
96TRA E. Träbert, Phys. Scr. **53**, 167 (1996).
97NIE/ZAT J. Nienhaus, O. I. Zatsarinny, A. Dorn, and W. Mehlhorn, J. Phys. B **30** 3511 (1997).
04FRO/TAC C. Froese Fischer and G. Tachiev, At. Data Nucl. Data Tables **87**, 1 (2004).
08KEL/POD D. E. Kelleher and L. Podobedova, J. Phys. Chem. Ref. Data **37**, 267 (2008).

TABLE 3. Observed spectral lines of Na II

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>									
156.88	0.05	637 430				$2p^6^1S_0$	$2s2p^68p^1P_1^\circ$	76LUC/MCI	
157.55	0.05	634 720				$2p^6^1S_0$	$2s2p^67p^1P_1^\circ$	76LUC/MCI	
158.67	0.05	630 240				$2p^6^1S_0$	$2s2p^66p^1P_1^\circ$	76LUC/MCI	
160.66	0.05	622 430				$2p^6^1S_0$	$2s2p^65p^1P_1^\circ$	76LUC/MCI	
164.92	0.05	606 360				$2p^6^1S_0$	$2s2p^64p^1P_1^\circ$	76LUC/MCI	
177.24	0.05	564 210			5.29E+9	$2p^6^1S_0$	$2s2p^63p^1P_1^\circ$	76LUC/MCI	93HIB/DOU
263.06	0.05	380 140	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)13d^2[3/2]_1^\circ$	76LUC/MCI	
263.06	0.05	380 140	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)14s^2[3/2]_1^\circ$	76LUC/MCI	
263.39	0.05	379 660	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)13s^2[3/2]_1^\circ$	76LUC/MCI	
263.39	0.05	379 660	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)12d^2[3/2]_1^\circ$	76LUC/MCI	
263.81	0.05	379 060	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)11d^2[3/2]_1^\circ$	76LUC/MCI	
263.81	0.05	379 060	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)12s^2[3/2]_1^\circ$	76LUC/MCI	
264.34	0.05	378 300	*	b		$2p^6^1S_0$	$2p^5(^2P_{3/2}^\circ)13s^2[3/2]_1^\circ$	76LUC/MCI	
264.34	0.05	378 300	*	b		$2p^6^1S_0$	$2p^5(^2P_{3/2}^\circ)10d^2[3/2]_1^\circ$	76LUC/MCI	
264.34	0.05	378 300	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)11s^2[3/2]_1^\circ$	76LUC/MCI	
264.34	0.05	378 300	*	b		$2p^6^1S_0$	$2p^5(^2P_{3/2}^\circ)12d^2[3/2]_1^\circ$	76LUC/MCI	
264.76	0.05	377 700	*	b		$2p^6^1S_0$	$2p^5(^2P_{3/2}^\circ)11d^2[3/2]_1^\circ$	76LUC/MCI	
264.76	0.05	377 700	*	b		$2p^6^1S_0$	$2p^5(^2P_{3/2}^\circ)12s^2[3/2]_1^\circ$	76LUC/MCI	
265.08	0.05	377 240	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)9d^2[3/2]_1^\circ$	76LUC/MCI	
265.08	0.05	377 240	*	b		$2p^6^1S_0$	$2p^5(^2P_{1/2}^\circ)10s^2[3/2]_1^\circ$	76LUC/MCI	
265.30	0.05	376 930	*	b		$2p^6^1S_0$	$2p^5(^2P_{3/2}^\circ)11s^2[3/2]_1^\circ$	76LUC/MCI	
265.30	0.05	376 930	*	b		$2p^6^1S_0$	$2p^5(^2P_{3/2}^\circ)10d^2[3/2]_1^\circ$	76LUC/MCI	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
266.06	0.05	375 860	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)9d 2[3/2] ₁ ^o	76LUC/MCI	
266.06	0.05	375 860	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)9s 2[3/2] ₁ ^o	76LUC/MCI	
266.06	0.05	375 860	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)10s 2[3/2] ₁ ^o	76LUC/MCI	
266.06	0.05	375 860	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)8d 2[3/2] ₁ ^o	76LUC/MCI	
267.06	0.05	374 450	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)8d 2[3/2] ₁ ^o	76LUC/MCI	
267.06	0.05	374 450	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)9s 2[3/2] ₁ ^o	76LUC/MCI	
267.61	0.05	373 680	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)8s 2[3/2] ₁ ^o	76LUC/MCI	
267.61	0.05	373 680	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)7d 2[3/2] ₁ ^o	76LUC/MCI	
268.88	0.05	371 910	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)7d 2[3/2] ₁ ^o	76LUC/MCI	
268.88	0.05	371 910	*	b		2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)8s 2[3/2] ₁ ^o	76LUC/MCI	
269.993	0.003	370 380	10			2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)7s 2[1/2] ₁ ^o	71WU	
270.947	0.003	369 076	7			2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)7s 2[3/2] ₁ ^o	71WU	
271.373	0.003	368 496	5			2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)6d 2[1/2] ₁ ^o	71WU	
273.940	0.003	365 043	12			2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)6s 2[1/2] ₁ ^o	71WU	
274.023	0.003	364 933	12			2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)5d 2[3/2] ₁ ^o	71WU	
274.931	0.003	363 728	20			2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)6s 2[3/2] ₁ ^o	71WU	
275.003	0.003	363 632	20			2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)5d 2[3/2] ₁ ^o	71WU	
275.218	0.003	363 348	5			2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)5d 2[1/2] ₁ ^o	71WU	
281.691	0.003	354 999	25			2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)5s 2[1/2] ₁ ^o	71WU	
281.788	0.003	354 877	25			2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)4d 2[3/2] ₁ ^o	71WU	
282.709	0.003	353 721	35			2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)5s 2[3/2] ₁ ^o	71WU	
282.803	0.003	353 603	35			2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)4d 2[3/2] ₁ ^o	71WU	
283.258	0.003	353 035	15			2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)4d 2[1/2] ₁ ^o	71WU	
300.153	0.003	333 163	160		1.18E+9	2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)4s 2[1/2] ₁ ^o	71WU	08KEL/POD
300.202	0.003	333 109	160		1.17E+9	2p ⁶ 1S ₀	2p ⁵ (² P _{1/2} ^o)3d 2[3/2] ₁ ^o	71WU	08KEL/POD
301.318	0.003	331 875	90		3.62E+8	2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)4s 2[3/2] ₁ ^o	71WU	04FRO/TAC
301.436	0.003	331 745	100		3.33E+9	2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)3d 2[3/2] ₁ ^o	71WU	08KEL/POD
302.446	0.003	330 638	60		5.95E+7	2p ⁶ 1S ₀	2p ⁵ (² P _{3/2} ^o)3d 2[1/2] ₁ ^o	71WU	04FRO/TAC
365.584	0.003	273 535	7					71WU	
372.075	0.003	268 763	300		3.13E+9	2p ⁶ 1S ₀	2p ⁵ 3s 1P ₁ ^o	71WU	96TRA
375.340	0.003	266 425	40					71WU	
375.730	0.003	266 149	45					71WU	
376.379	0.003	265 690	350		1.7E+8	2p ⁶ 1S ₀	2p ⁵ 3s 3P ₁ ^o	71WU	96TRA
376.921	0.003	265 308	45					71WU	
383.399	0.003	260 825	12					71WU	
389.362	0.003	256 830	7					71WU	
394.904	0.003	253 226	2					71WU	
479.385	0.003	208 601	2					71WU	
516.715	0.003	193 530.3	5					71WU	
534.714	0.003	187 015.9	10					71WU	
544.509	0.003	183 651.7	30					71WU	
573.639	0.003	174 325.7	5					71WU	
617.415	0.003	161 965.6	7					71WU	
619.876	0.003	161 322.6	10					71WU	
623.704	0.003	160 332.5	5					71WU	
638.832	0.003	156 535.7	5					71WU	
642.524	0.003	155 636.2	7					71WU	
644.400	0.003	155 183.1	30					71WU	
659.378	0.003	151 658.1	5					71WU	
681.896	0.003	146 649.9	7					71WU	
689.605	0.003	145 010.5	20					71WU	
691.799	0.003	144 550.7	12					71WU	
706.677	0.003	141 507.4	7					71WU	
719.891	0.003	138 909.9	7					71WU	
745.157	0.003	134 199.9	50					71WU	
757.331	0.003	132 042.7	60					71WU	
757.892	0.003	131 944.9	45					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
759.225	0.003	131 713.3	60					71WU	
765.788	0.003	130 584.4	20					71WU	
766.429	0.003	130 475.2	20					71WU	
776.668	0.003	128 755.1	20					71WU	
778.413	0.003	128 466.5	40					71WU	
780.422	0.003	128 135.8	12					71WU	
781.171	0.003	128 012.9	12					71WU	
781.752	0.003	127 917.8	20					71WU	
782.900	0.003	127 730.2	30					71WU	
785.088	0.003	127 374.3	40					71WU	
786.009	0.003	127 225	30					71WU	
786.477	0.003	127 149.3	15					71WU	
788.369	0.003	126 844.2	25					71WU	
789.177	0.003	126 714.3	20					71WU	
790.546	0.003	126 494.9	70					71WU	
796.301	0.003	125 580.7	20					71WU	
798.013	0.003	125 311.2	15					71WU	
802.197	0.003	124 657.7	20					71WU	
809.413	0.003	123 546.3	15					71WU	
815.631	0.003	122 604.5	20					71WU	
830.105	0.003	120 466.7	20					71WU	
831.528	0.003	120 260.5	30					71WU	
844.341	0.003	118 435.6	12					71WU	
868.738	0.003	115 109.5	30					71WU	
871.473	0.003	114 748.2	12					71WU	
893.899	0.003	111 869.5	25					71WU	
895.054	0.003	111 725.1	20					71WU	
899.342	0.003	111 192.4	20					71WU	
900.904	0.003	110 999.6	30					71WU	
902.763	0.003	110 771	25					71WU	
911.067	0.003	109 761.4	25					71WU	
911.815	0.003	109 671.4	20					71WU	
915.217	0.003	109 263.7	20					71WU	
922.829	0.003	108 362.4	25					71WU	
948.887	0.003	105 386.6	20					71WU	
952.570	0.003	104 979.2	25					71WU	
954.299	0.003	104 789	20					71WU	
956.676	0.003	104 528.6	20					71WU	
958.020	0.003	104 382	20					71WU	
958.450	0.003	104 335.1	30					71WU	
960.686	0.003	104 092.3	20					71WU	
966.112	0.003	103 507.7	25					71WU	
969.865	0.003	103 107.1	30					71WU	
978.207	0.003	102 227.9	50					71WU	
990.613	0.003	100 947.6	45					71WU	
993.054	0.003	100 699.5	40					71WU	
1006.185	0.003	99 385.3	30					71WU	
1009.428	0.003	99 066	30					71WU	
1034.162	0.003	96 696.6	45					71WU	
1059.066	0.003	94 422.8	35					71WU	
1067.165	0.003	93 706.2	35					71WU	
1068.016	0.003	93 631.6	40					71WU	
1080.885	0.003	92 516.8	45					71WU	
1081.079	0.003	92 500.2	30					71WU	
1081.836	0.003	92 435.5	35					71WU	
1083.594	0.003	92 285.5	20					71WU	
1085.003	0.003	92 165.6	40					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1087.238	0.003	91 976.2	20					71WU	
1087.701	0.003	91 937	15					71WU	
1087.895	0.003	91 920.6	25					71WU	
1088.699	0.003	91 852.8	50					71WU	
1093.447	0.003	91 453.9	25					71WU	
1125.502	0.003	88 849.2	50					71WU	
1133.390	0.003	88 230.9	160					71WU	
1137.020	0.003	87 949.2	60					71WU	
1143.185	0.003	87 474.9	60					71WU	
1146.157	0.003	87 248.1	60					71WU	
1147.967	0.003	87 110.5	60					71WU	
1157.291	0.003	86 408.7	40					71WU	
1165.548	0.003	85 796.6	60					71WU	
1170.046	0.003	85 466.7	35					71WU	
1172.698	0.003	85 273.4	50					71WU	
1172.969	0.003	85 253.7	40					71WU	
1176.794	0.003	84 976.6	160					71WU	
1177.238	0.003	84 944.6	60					71WU	
1177.426	0.003	84 931	60					71WU	
1178.256	0.003	84 871.2	130					71WU	
1178.777	0.003	84 833.7	60					71WU	
1179.212	0.003	84 802.4	60					71WU	
1179.623	0.003	84 772.8	40					71WU	
1180.153	0.003	84 734.8	60					71WU	
1183.109	0.003	84 523.1	70					71WU	
1183.498	0.003	84 495.3	30					71WU	
1184.421	0.003	84 429.4	70					71WU	
1198.237	0.003	83 455.9	25					71WU	
1198.767	0.003	83 419	40					71WU	
1199.941	0.003	83 337.4	35					71WU	
1200.079	0.003	83 327.8	30					71WU	
1213.998	0.003	82 372.5	30					71WU	
1217.472	0.003	82 137.4	45					71WU	
1242.048	0.003	80 512.2	15					71WU	
1242.650	0.003	80 473.2	20					71WU	
1243.427	0.003	80 422.9	30					71WU	
1244.511	0.003	80 352.8	20					71WU	
1254.813	0.003	79 693.1	30					71WU	
1255.354	0.003	79 658.8	25					71WU	
1264.891	0.003	79 058.2	12					71WU	
1268.947	0.003	78 805.5	25					71WU	
1282.348	0.003	77 982	15					71WU	
1285.384	0.003	77 797.8	30					71WU	
1293.974	0.003	77 281.3	60			2p ⁵ 3s ³ P ₁ [°]	2p ⁵ (² P _{1/2} [°])4p ² [1/2] ₁	71WU	
1294.696	0.003	77 238.2	15					71WU	
1295.164	0.003	77 210.3	30					71WU	
1297.856	0.003	77 050.2	12			2p ⁵ 3s ³ P ₁ [°]	2p ⁵ (² P _{1/2} [°])4p ² [3/2] ₁	71WU	
1298.142	0.003	77 033.2	15					71WU	
1299.018	0.003	76 981.2	30			2p ⁵ 3s ³ P ₂ [°]	2p ⁵ (² P _{3/2} [°])4p ² [3/2] ₂ [?]	71WU	
1299.895	0.003	76 929.3	60					71WU	
1303.957	0.003	76 689.6	15			2p ⁵ 3s ³ P ₀ [°]	2p ⁵ (² P _{1/2} [°])4p ² [1/2] ₁	71WU	
1304.546	0.003	76 655	15					71WU	
1306.618	0.003	76 533.5	20			2p ⁵ 3s ³ P ₂ [°]	2p ⁵ (² P _{3/2} [°])4p ² [5/2] ₂	71WU	
1307.936	0.003	76 456.3	10			2p ⁵ 3s ³ P ₀ [°]	2p ⁵ (² P _{1/2} [°])4p ² [3/2] ₁	71WU	
1310.078	0.003	76 331.3	45					71WU	
1311.158	0.003	76 268.5	10					71WU	
1312.026	0.003	76 218	30			2p ⁵ 3s ³ P ₁ [°]	2p ⁵ (² P _{3/2} [°])4p ² [3/2] ₂ [?]	71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1312.587	0.003	76 185.4	20					71WU	
1316.530	0.003	75 957.3	12					71WU	
1319.815	0.003	75 768.2	30			$2p^5 3s \ ^3P_1^\circ$	$2p^5 ({}^2P_{3/2}^\circ) 4p \ ^2[5/2]_2$	71WU	
1322.295	0.003	75 626.1	12					71WU	
1327.742	0.003	75 315.8	50			$2p^5 3s \ ^2P_2^\circ$	$2p^5 ({}^2P_{3/2}^\circ) 4p \ ^2[1/2]_1$	71WU	
1328.497	0.003	75 273	12			$2p^5 3p \ ^3S_1$	$2p^5 ({}^2P_{3/2}^\circ) 6d \ ^2[1/2]_1^\circ$	71WU	
1329.354	0.003	75 224.5	30					71WU	
1336.112	0.003	74 844	25					71WU	
1338.575	0.003	74 706.3	35					71WU	
1341.369	0.003	74 550.7	35			$2p^5 3s \ ^3P_1^\circ$	$2p^5 ({}^2P_{3/2}^\circ) 4p \ ^2[1/2]_1$	71WU	
1342.401	0.003	74 493.4	20					71WU	
1347.210	0.003	74 227.5	35					71WU	
1347.543	0.003	74 209.1	45			$2p^5 3s \ ^1P_1^\circ$	$2p^5 ({}^2P_{1/2}^\circ) 4p \ ^2[1/2]_1$	71WU	
1349.602	0.003	74 095.9	15					71WU	
1349.876	0.003	74 080.9	25					71WU	
1351.799	0.003	73 975.5	12			$2p^5 3s \ ^1P_1^\circ$	$2p^5 ({}^2P_{1/2}^\circ) 4p \ ^2[3/2]_1$	71WU	
1352.118	0.003	73 958	35			$2p^5 3s \ ^3P_0^\circ$	$2p^5 ({}^2P_{3/2}^\circ) 4p \ ^2[1/2]_1$	71WU	
1352.904	0.003	73 915.1	130					71WU	
1359.055	0.003	73 580.5	20					71WU	
1361.217	0.003	73 463.7	15					71WU	
1366.242	0.003	73 193.5	15					71WU	
1373.451	0.003	72 809.3	15					71WU	
1374.688	0.003	72 743.8	90			$2p^5 3p \ ^2D_2$	$2p^5 ({}^2P_{1/2}^\circ) 7s \ ^2[1/2]_1^\circ$	71WU	
1375.618	0.003	72 694.6	15			$2p^5 3s \ ^1P_1^\circ$	$2p^5 ({}^2P_{3/2}^\circ) 4p \ ^2[5/2]_2$	71WU	
1380.623	0.003	72 431.1	12					71WU	
1381.236	0.003	72 398.9	30			$2p^5 3p \ ^2D_2$	$2p^5 ({}^2P_{1/2}^\circ) 6d \ ^2[3/2]_1^\circ$	71WU	
1381.633	0.003	72 378.1	12					71WU	
1384.794	0.003	72 212.9	10			$2p^5 3p \ ^3D_1$	$2p^5 ({}^2P_{1/2}^\circ) 7s \ ^2[1/2]_1^\circ$	71WU	
1385.296	0.003	72 186.7	10					71WU	
1385.465	0.003	72 177.9	12					71WU	
1386.076	0.003	72 146.1	10					71WU	
1392.072	0.003	71 835.4	15					71WU	
1392.316	0.003	71 822.8	10			$2p^5 3p \ ^3S_1$	$2p^5 ({}^2P_{1/2}^\circ) 6s \ ^2[1/2]_1^\circ$	71WU	
1392.940	0.003	71 790.6	15			$2p^5 3p \ ^3S_1$	$2p^5 ({}^2P_{1/2}^\circ) 6s \ ^2[1/2]_0^\circ$	71WU	
1395.193	0.003	71 674.7	10					71WU	
1398.143	0.003	71 523.4	12			$2p^5 3p \ ^3S_1$	$2p^5 ({}^2P_{1/2}^\circ) 5d \ ^2[3/2]_2^\circ$	71WU	
1399.070	0.003	71 476.1	30			$2p^5 3s \ ^1P_1^\circ$	$2p^5 ({}^2P_{3/2}^\circ) 4p \ ^2[1/2]_1$	71WU	
1399.860	0.003	71 435.7	12			$2p^5 3p \ ^2D_2$	$2p^5 ({}^2P_{3/2}^\circ) 7s \ ^2[3/2]_1^\circ$	71WU	
1404.675	0.003	71 190.8	90			$2p^5 3p \ ^1D_2$	$2p^5 ({}^2P_{1/2}^\circ) 7s \ ^2[1/2]_1^\circ$	71WU	
1406.850	0.003	71 080.8	15					71WU	
1407.308	0.003	71 057.7	25					71WU	
1410.374	0.003	70 903.2	12			$2p^5 3p \ ^3D_1$	$2p^5 ({}^2P_{3/2}^\circ) 7s \ ^2[3/2]_1^\circ$	71WU	
1411.536	0.003	70 844.8	7			$2p^5 3p \ ^1D_2$	$2p^5 ({}^2P_{1/2}^\circ) 6d \ ^2[3/2]_1^\circ$	71WU	
1415.762	0.003	70 633.3	10					71WU	
1418.579	0.003	70 493.1	20			$2p^5 3p \ ^1P_1$	$2p^5 ({}^2P_{1/2}^\circ) 7s \ ^2[1/2]_1^\circ$	71WU	
1419.311	0.003	70 456.7	15					71WU	
1420.216	0.003	70 411.8	12			$2p^5 3p \ ^3S_1$	$2p^5 ({}^2P_{3/2}^\circ) 5d \ ^2[3/2]_1^\circ$	71WU	
1421.889	0.003	70 329	7			$2p^5 3p \ ^3D_1$	$2p^5 ({}^2P_{3/2}^\circ) 6d \ ^2[1/2]_1^\circ$	71WU	
1422.996	0.003	70 274.3	12			$2p^5 3p \ ^3P_2$	$2p^5 ({}^2P_{1/2}^\circ) 7s \ ^2[1/2]_1^\circ$	71WU	
1425.499	0.003	70 150.9	7			$2p^5 3p \ ^1P_1$	$2p^5 ({}^2P_{1/2}^\circ) 6d \ ^2[3/2]_1^\circ$	71WU	
1426.048	0.003	70 123.9	7			$2p^5 3p \ ^3S_1$	$2p^5 ({}^2P_{3/2}^\circ) 5d \ ^2[1/2]_1^\circ$	71WU	
1428.889	0.003	69 984.4	7					71WU	
1429.963	0.003	69 931.9	10			$2p^5 3p \ ^3P_2$	$2p^5 ({}^2P_{1/2}^\circ) 6d \ ^2[3/2]_1^\circ$	71WU	
1430.166	0.003	69 922.0	7					71WU	
1431.015	0.003	69 880.5	7			$2p^5 3p \ ^1D_2$	$2p^5 ({}^2P_{3/2}^\circ) 7s \ ^2[3/2]_1^\circ$	71WU	
1431.228	0.003	69 870.1	15			$2p^5 3p \ ^3P_1$	$2p^5 ({}^2P_{1/2}^\circ) 7s \ ^2[1/2]_1^\circ$	71WU	
1435.054	0.003	69 683.8	10					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1435.776	0.003	69 648.7	10			2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{1/2} ^o)6d ² [3/2] ₁ ^o	71WU	
1442.907	0.003	69 304.5	30			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)6d ² [1/2] ₁ ^o	71WU	
1454.976	0.003	68 729.7	15					71WU	
1455.969	0.003	68 682.8	12			2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)7s ² [3/2] ₁ ^o	71WU	
1459.748	0.003	68 505.0	15					71WU	
1460.775	0.003	68 456.8	10					71WU	
1462.160	0.003	68 392.0	10			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)6d ² [1/2] ₁ ^o	71WU	
1470.916	0.003	67 984.8	10			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)6d ² [1/2] ₁ ^o	71WU	
1472.642	0.003	67 905.2	7					71WU	
1473.826	0.003	67 850.6	12					71WU	
1474.687	0.003	67 811.0	12					71WU	
1475.411	0.003	67 777.7	15					71WU	
1475.530	0.003	67 772.3	15					71WU	
1476.301	0.003	67 736.9	10					71WU	
1476.673	0.003	67 719.8	10					71WU	
1481.578	0.003	67 495.6	15			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1483.570	0.003	67 405.0	15			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{1/2} ^o)6s ² [1/2] ₁ ^o	71WU	
1485.443	0.003	67 320.0	20					71WU	
1485.987	0.003	67 295.3	25			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1486.300	0.003	67 281.2	25					71WU	
1489.261	0.003	67 147.4	50					71WU	
1492.371	0.003	67 007.5	20					71WU	
1494.943	0.003	66 892.2	20					71WU	
1495.212	0.003	66 880.1	45			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)6s ² [1/2] ₁ ^o	71WU	
1496.011	0.003	66 844.4	40			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)6s ² [1/2] ₀ ^o	71WU	
1497.731	0.003	66 767.7	45			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1500.006	0.003	66 666.4	25					71WU	
1501.427	0.003	66 603.3	35					71WU	
1501.995	0.003	66 578.1	25			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1502.661	0.003	66 548.6	30					71WU	
1503.469	0.003	66 512.8	35					71WU	
1506.407	0.003	66 383.1	80			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1506.914	0.003	66 360.8	60			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₂ ^o	71WU	
1507.869	0.003	66 318.8	35					71WU	
1508.981	0.003	66 269.9	30					71WU	
1510.518	0.003	66 202.5	35					71WU	
1510.701	0.003	66 194.4	35			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1511.040	0.003	66 179.6	40					71WU	
1513.102	0.003	66 089.4	70			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₁ ^o	71WU	
1513.487	0.003	66 072.6	50					71WU	
1513.953	0.003	66 052.2	35					71WU	
1514.21	0.10	66 041.0						71WU	
1514.241	0.003	66 039.7	30					71WU	
1514.632	0.003	66 022.6	30					71WU	
1515.229	0.003	65 996.6	30			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1515.709	0.003	65 975.7	30			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₂ ^o	71WU	
1516.219	0.003	65 953.5	25					71WU	
1517.604	0.003	65 893.3	30					71WU	
1518.042	0.003	65 874.3	30					71WU	
1518.505	0.003	65 854.2	35			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)6s ² [1/2] ₁ ^o	71WU	
1518.664	0.003	65 847.4	35					71WU	
1519.005	0.003	65 832.6	40					71WU	
1519.629	0.003	65 805.5	60			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1523.388	0.003	65 643.2	30					71WU	
1525.311	0.003	65 560.4	30			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₁ ^o	71WU	
1526.021	0.003	65 529.9	15					71WU	
1527.555	0.003	65 464.1	15			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₁ ^o	71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1527.985	0.003	65 445.7	20			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₂ ^o	71WU	
1528.532	0.003	65 422.2	20					71WU	
1529.208	0.003	65 393.3	15					71WU	
1531.497	0.003	65 295.6	20					71WU	
1533.176	0.003	65 224.1	10					71WU	
1534.163	0.003	65 182.1	10			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)5d ² [1/2] ₁ ^o	71WU	
1534.538	0.003	65 166.2	25			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)5d ² [1/2] ₀ ^o	71WU	
1534.737	0.003	65 157.7	12			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)6s ² [1/2] ₁ ^o	71WU	
1539.895	0.003	64 939.5	12			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)6s ² [1/2] ₁ ^o	71WU	
1540.688	0.003	64 906.1	7					71WU	
1543.665	0.003	64 780.9	12					71WU	
1547.066	0.003	64 638.5	15			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1549.392	0.003	64 541.4	20			2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1549.507	0.003	64 536.7	20*	b		2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)6s ² [1/2] ₁ ^o	71WU	
1549.507	0.003	64 536.7	20*	b		2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₁ ^o	71WU	
1550.095	0.003	64 512.2	15					71WU	
1550.348	0.003	64 501.6	20			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)6s ² [1/2] ₀ ^o	71WU	
1551.793	0.003	64 441.6	20			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1552.203	0.003	64 424.6	20			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1556.370	0.003	64 252.1	15			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1556.753	0.003	64 236.3	12			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1557.557	0.003	64 203.1	7					71WU	
1558.678	0.003	64 156.9	7			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)5d ² [1/2] ₁ ^o	71WU	
1565.838	0.003	63 863.6	12					71WU	
1566.262	0.003	63 846.3	12					71WU	
1568.673	0.003	63 748.1	10			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1569.264	0.003	63 724.1	20			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₂ ^o	71WU	
1570.024	0.003	63 693.3	12					71WU	
1571.205	0.003	63 645.4	7					71WU	
1573.430	0.003	63 555.4	10			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1574.110	0.003	63 528.0	12			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1574.664	0.003	63 505.6	7			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₂ ^o	71WU	
1575.039	0.003	63 490.5	10					71WU	
1575.749	0.003	63 461.9	15			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)5d ² [1/2] ₁ ^o	71WU	
1576.118	0.003	63 447.0	12			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)5d ² [1/2] ₀ ^o	71WU	
1578.807	0.003	63 339.0	12*	b		2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1578.807	0.003	63 339.0	12*	b		2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₁ ^o	71WU	
1579.180	0.003	63 324.0	15					71WU	
1579.408	0.003	63 314.9	12					71WU	
1579.993	0.003	63 291.4	20					71WU	
1581.108	0.003	63 246.8	25			2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1581.835	0.003	63 217.7	20			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)6s ² [3/2] ₁ ^o	71WU	
1584.173	0.003	63 124.4	20			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1587.080	0.003	63 008.8	30					71WU	
1587.807	0.003	62 979.9	5					71WU	
1588.764	0.003	62 942.0	15					71WU	
1588.983	0.003	62 933.3	7			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)5d ² [3/2] ₂ ^o	71WU	
1591.321	0.003	62 840.9	15			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)5d ² [1/2] ₁ ^o	71WU	
1591.712	0.003	62 825.4	7			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)5d ² [1/2] ₀ ^o	71WU	
1594.752	0.003	62 705.7	2					71WU	
1604.888	0.003	62 309.6	25					71WU	
1607.514	0.003	62 207.9	45					71WU	
1617.896	0.003	61 808.7	10					71WU	
1621.940	0.003	61 654.6	12			2p ⁵ 3p ³ S ₁	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1622.347	0.003	61 639.1	12			2p ⁵ 3p ³ S ₁	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₀ ^o	71WU	
1626.372	0.003	61 486.5	20			2p ⁵ 3p ³ S ₁	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1630.579	0.003	61 327.9	1					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1634.057	0.003	61 197.4	15					71WU	
1635.194	0.003	61 154.8	20					71WU	
1635.948	0.003	61 126.6	10					71WU	
1637.293	0.003	61 076.4	10					71WU	
1639.260	0.003	61 003.1	12					71WU	
1646.018	0.003	60 752.7	12					71WU	
1651.601	0.003	60 547.3	5					71WU	
1652.921	0.003	60 499.0	20			2p ⁵ 3p ³ S ₁	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₁ ^o	71WU	
1657.918	0.003	60 316.6	60			2p ⁵ 3p ³ S ₁	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₂ ^o	71WU	
1668.569	0.003	59 931.6	35			2p ⁵ 3p ³ S ₁	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1669.817	0.003	59 886.8	20					71WU	
1671.886	0.003	59 812.7	35			2p ⁵ 3p ³ S ₁	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₁ ^o	71WU	
1673.649	0.003	59 749.7	15			2p ⁵ 3p ³ S ₁	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₀ ^o	71WU	
1743.309	0.003	57 362.2	15			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₁ ^o	71WU	
1746.996	0.003	57 241.1	0			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1752.185	0.003	57 071.6	12			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1759.572	0.003	56 832.0	30			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₁ ^o	71WU	
1763.325	0.003	56 711.0	7			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1763.841	0.003	56 694.5	30			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₀ ^o	71WU	
1768.603	0.003	56 541.8	7			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1769.878	0.003	56 501.1	30					71WU	
1773.550	0.003	56 384.1	12					71WU	
1776.571	0.003	56 288.21	90			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₂ ^o	71WU	
1778.243	0.003	56 235.28	40			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₃ ^o	71WU	
1778.905	0.003	56 214.36	0			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1779.906	0.003	56 182.74	0			2p ⁵ 3p ¹ S ₀	2p ⁵ (² P _{1/2} ^o)6s ² [1/2] ₁ ^o	71WU	
1783.043	0.003	56 083.90	60			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₁ ^o	71WU	
1783.475	0.003	56 070.31	15			2p ⁵ 3p ¹ S ₀	2p ⁵ (² P _{1/2} ^o)5d ² [3/2] ₁ ^o	71WU	
1785.989	0.003	55 991.39	12			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)4d ² [7/2] ₃ ^o	71WU	
1787.189	0.003	55 953.79	80			2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)4d ² [7/2] ₄ ^o	71WU	
1788.846	0.003	55 901.96	45			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₂ ^o	71WU	
1790.565	0.003	55 848.29	2			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₃ ^o	71WU	
1791.224	0.003	55 827.75	35			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1791.862	0.003	55 807.87	30			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₁ ^o	71WU	
1795.772	0.003	55 686.36	1			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1798.410	0.003	55 604.67	80			2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [7/2] ₃ ^o	71WU	
1800.048	0.003	55 554.07	25			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₁ ^o	71WU	
1801.256	0.003	55 516.82	45*	b		2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1801.256	0.003	55 516.82	45*	b		2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1804.623	0.003	55 413.24	30					71WU	
1805.998	0.003	55 371.05	12			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₂ ^o	71WU	
1806.061	0.003	55 369.12	10			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)4d ² [5/2] ₃ ^o	71WU	
1807.092	0.003	55 337.53	90			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1808.375	0.003	55 298.27	60			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1814.474	0.003	55 112.39	25			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₁ ^o	71WU	
1818.473	0.003	54 991.19	5			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1818.628	0.003	54 986.51	7			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1819.024	0.003	54 974.54	20			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₀ ^o	71WU	
1821.695	0.003	54 893.93	50			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₁ ^o	71WU	
1822.568	0.003	54 867.64	5			2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₁ ^o	71WU	
1824.098	0.003	54 821.62	0			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1825.730	0.003	54 772.61	7			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1830.124	0.003	54 641.11	20			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1831.172	0.003	54 609.83	12			2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₁ ^o	71WU	
1831.402	0.003	54 602.98	1			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1833.873	0.003	54 529.40	45			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₁ ^o	71WU	
1835.217	0.003	54 489.47	80			2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₁ ^o	71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1836.367	0.003	54 455.35	2			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)4d ² [5/2] ₃ ^o	71WU	
1837.522	0.003	54 421.12	15			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1837.890	0.003	54 410.22	45			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1839.270	0.003	54 369.40	20			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1839.835	0.003	54 352.70	25			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)5s ² [1/2] ₀ ^o	71WU	
1840.032	0.003	54 346.88	20			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₂ ^o	71WU	
1841.822	0.003	54 294.06	60			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₃ ^o	71WU	
1845.016	0.003	54 200.07	70			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1850.150	0.003	54 049.67	45			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [7/2] ₃ ^o	71WU	
1851.194	0.003	54 019.19	70			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1853.166	0.003	53 961.71	80			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1857.265	0.003	53 842.61	25			2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₁ ^o	71WU	
1857.576	0.003	53 833.60	40			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₁ ^o	71WU	
1862.832	0.003	53 681.71	20					71WU	
1863.090	0.003	53 674.27	25					71WU	
1863.898	0.003	53 651.00	15			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₂ ^o	71WU	
1865.139	0.003	53 615.31	35			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₁ ^o	71WU	
1865.433	0.003	53 606.86	20					71WU	
1866.452	0.003	53 577.59	45			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1871.517	0.003	53 432.59	40			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₂ ^o	71WU	
1873.369	0.003	53 379.77	45			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₃ ^o	71WU	
1874.098	0.003	53 359.00	15			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)4d ² [5/2] ₂ ^o	71WU	
1875.075	0.003	53 331.20	60			2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₁ ^o	71WU	
1877.365	0.003	53 266.15	20			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1879.240	0.003	53 213.00	30*	b		2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1879.240	0.003	53 213.00	30*	b		2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₁ ^o	71WU	
1880.040	0.003	53 190.36	25					71WU	
1881.090	0.003	53 160.67	35					71WU	
1881.912	0.003	53 137.45	160			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)4d ² [7/2] ₃ ^o	71WU	
1883.460	0.003	53 093.77	20			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₁ ^o	71WU	
1883.804	0.003	53 084.08	20			2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₀ ^o	71WU	
1885.091	0.003	53 047.84	50			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1885.742	0.003	53 029.52	45			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)5s ² [3/2] ₂ ^o	71WU	
1889.317	0.003	52 929.18	30			2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₁ ^o	71WU	
1899.523	0.003	52 644.80	30*	b		2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₁ ^o	71WU	
1899.523	0.003	52 644.80	30*	b		2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)4d ² [3/2] ₂ ^o	71WU	
1903.831	0.003	52 525.67	15			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₁ ^o	71WU	
1906.112	0.003	52 462.81	15			2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)4d ² [1/2] ₀ ^o	71WU	
1946.206	0.003	51 382.02	35					71WU	
1948.531	0.003	51 320.71	7					71WU	
1967.634	0.003	50 822.46	90					71WU	
1991.001	0.003	50 225.99	60					71WU	
1991.718	0.003	50 207.91	20					71WU	
2000.455	0.003	49 988.63	30					71WU	
<i>Air</i>									
2009.567	0.003	49 745.881	7					71WU	
2010.093	0.003	49 732.865	10					71WU	
2017.137	0.003	49 559.219	160					71WU	
2018.409	0.003	49 527.991	40					71WU	
2019.219	0.003	49 508.126	25					71WU	
2050.877	0.003	48 744.008	80					71WU	
2059.617	0.003	48 537.190	2					71WU	
2077.178	0.003	48 126.897	20					71WU	
2104.516	0.003	47 501.798	7					71WU	
2109.585	0.003	47 387.673	7					71WU	
2114.551	0.003	47 276.396	20					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
2116.143	0.003	47 240.834	60					71WU	
2119.428	0.003	47 167.622	15					71WU	
2127.627	0.003	46 985.878	35					71WU	
2155.774	0.003	46 372.473	60					71WU	
2166.769	0.003	46 137.188	50			$2p^5(^2P_{1/2}^\circ)5s\ ^2[1/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)5s\ ^2[1/2]_1^\circ$	71WU	
2172.490	0.003	46 015.704	0			$2p^5(^2P_{1/2}^\circ)4d\ ^2[3/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)4d\ ^2[3/2]_1^\circ$	71WU	
2213.281	0.003	45 167.717	5					71WU	
2216.560	0.003	45 100.906	7			$2p^5(^2P_{3/2}^\circ)3d\ ^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[5/2]_{2,3}$	71WU	
2228.529	0.003	44 858.702	80			$2p^5(^2P_{3/2}^\circ)5s\ ^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)5s\ ^2[3/2]_1^\circ$	71WU	
2229.156	0.003	44 846.086	30					71WU	
2231.399	0.003	44 801.011	15					71WU	
2235.549	0.003	44 717.852	15					71WU	
2247.464	0.003	44 480.802	25					71WU	
2260.495	0.003	44 224.409	10*			$2p^5(^2P_{3/2}^\circ)3d\ ^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[7/2]_3$	71WU	
2260.495	0.003	44 224.409	10*			$2p^5(^2P_{3/2}^\circ)3d\ ^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[5/2]_{2,3}$	71WU	
2262.665	0.003	44 182.000	5*			$2p^5(^2P_{3/2}^\circ)3d\ ^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[5/2]_{2,3}$	71WU	
2262.665	0.003	44 182.000	5*			$2p^5(^2P_{3/2}^\circ)3d\ ^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[7/2]_{3,4}$	71WU	
2273.808	0.003	43 965.502	10			$2p^5(^2P_{3/2}^\circ)3d\ ^2[1/2]_0^\circ$	$2p^5(^2P_{3/2}^\circ)8f\ ^2[3/2]_1$	71WU	
2286.264	0.003	43 725.991	15			$2p^5(^2P_{3/2}^\circ)3d\ ^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)8f\ ^2[3/2]_{1,2}$	71WU	
2287.822	0.003	43 696.217	7					71WU	
2291.198	0.003	43 631.838	2					71WU	
2302.923	0.003	43 409.712	20			$2p^5(^2P_{3/2}^\circ)3d\ ^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)8f\ ^2[7/2]_{3,4}$	71WU	
2303.263	0.003	43 403.305	20					71WU	
2303.582	0.003	43 397.295	80			$2p^5(^2P_{3/2}^\circ)3d\ ^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)8f\ ^2[9/2]_{4,5}$	71WU	
2306.968	0.003	43 333.605	60			$2p^5(^2P_{3/2}^\circ)3d\ ^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)8f\ ^2[9/2]_4$	71WU	
2315.647	0.003	43 171.206	300		1.05E+7	$2p^53s\ ^3P_1$	$2p^53p\ ^1S_0$	71WU	08KEL/POD
2318.687	0.003	43 114.609	7					71WU	
2320.130	0.003	43 087.797	30*	b		$2p^5(^2P_{1/2}^\circ)3d\ ^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[5/2]_{2,3}$	71WU	
2320.130	0.003	43 087.797	30*	b		$2p^5(^2P_{1/2}^\circ)3d\ ^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[7/2]_3$	71WU	
2322.264	0.003	43 048.205	40*	b		$2p^5(^2P_{1/2}^\circ)3d\ ^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[5/2]_{2,3}$	71WU	
2322.264	0.003	43 048.205	40*	b		$2p^5(^2P_{1/2}^\circ)3d\ ^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[7/2]_{3,4}$	71WU	
2324.927	0.003	42 998.902	15			$2p^5(^2P_{3/2}^\circ)3d\ ^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)7f\ ^2[5/2]_{2,3}$	71WU	
2328.805	0.003	42 927.305	30			$2p^5(^2P_{1/2}^\circ)3d\ ^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[5/2]_{2,3}$	71WU	
2331.444	0.003	42 878.719	15					71WU	
2332.109	0.003	42 866.493	30			$2p^5(^2P_{3/2}^\circ)3d\ ^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)8f\ ^2[7/2]_3$	71WU	
2334.403	0.003	42 824.372	40			$2p^5(^2P_{3/2}^\circ)3d\ ^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)8f\ ^2[7/2]_{3,4}$	71WU	
2337.377	0.003	42 769.888	15			$2p^5(^2P_{3/2}^\circ)3d\ ^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)8f\ ^2[3/2]_{1,2}$	71WU	
2339.724	0.003	42 726.989	20			$2p^5(^2P_{1/2}^\circ)4s\ ^2[1/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)8f\ ^2[5/2]_2$	71WU	
2355.743	0.003	42 436.470	15					71WU	
2368.510	0.003	42 207.743	20					71WU	
2372.658	0.003	42 133.959	20					71WU	
2373.329	0.003	42 122.048	25			$2p^5(^2P_{3/2}^\circ)3d\ ^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)7f\ ^2[7/2]_3$	71WU	
2375.731	0.003	42 079.464	35			$2p^5(^2P_{3/2}^\circ)3d\ ^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)7f\ ^2[7/2]_{3,4}$	71WU	
2378.039	0.003	42 038.627	20					71WU	
2379.218	0.003	42 017.797	20					71WU	
2382.291	0.003	41 963.601	25					71WU	
2383.918	0.003	41 934.963	25					71WU	
2385.609	0.003	41 905.241	25					71WU	
2386.289	0.003	41 893.300	35					71WU	
2387.022	0.003	41 880.437	350					71WU	
2387.817	0.003	41 866.494	35					71WU	
2388.289	0.003	41 858.221	60			$2p^5(^2P_{3/2}^\circ)3d\ ^2[1/2]_0^\circ$	$2p^5(^2P_{3/2}^\circ)7f\ ^2[3/2]_1$	71WU	
2390.452	0.003	41 820.348	30					71WU	
2392.324	0.003	41 787.626	35					71WU	
2393.275	0.003	41 771.023	130*	b		$2p^5(^2P_{3/2}^\circ)3d\ ^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)7f\ ^2[3/2]_2$	71WU	
2393.275	0.003	41 771.023	130*	b		$2p^5(^2P_{3/2}^\circ)3d\ ^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)7f\ ^2[3/2]_1$	71WU	
2393.612	0.003	41 765.142	350					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
2395.642	0.003	41 729.754	30			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)8f^2[7/2]_3$	71WU	
2396.559	0.003	41 713.788	30					71WU	
2401.014	0.003	41 636.396	100			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[5/2]_{2,3}$	71WU	
2402.019	0.003	41 618.977	45			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[3/2]_2$	71WU	
2403.299	0.003	41 596.812	30					71WU	
2405.938	0.003	41 551.189	30					71WU	
2409.098	0.003	41 496.691	30					71WU	
2410.549	0.003	41 471.715	30					71WU	
2412.544	0.003	41 437.423	30					71WU	
2417.121	0.003	41 358.964	30					71WU	
2419.965	0.003	41 310.362	70			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[7/2]_{3,4}$	71WU	
2420.991	0.003	41 292.856	300			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[9/2]_{4,5}$	71WU	
2422.071	0.003	41 274.445	35					71WU	
2423.724	0.003	41 246.298	60			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[7/2]_{3,4}$	71WU	
2424.729	0.003	41 229.203	300			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[9/2]_4$	71WU	
2427.437	0.003	41 183.212	35					71WU	
2427.968	0.003	41 174.206	35					71WU	
2429.322	0.003	41 151.259	35					71WU	
2433.840	0.003	41 074.875	35					71WU	
2434.541	0.003	41 063.048	35					71WU	
2437.112	0.003	41 019.733	35					71WU	
2439.144	0.003	40 985.563	200			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)7f^2[7/2]_3$	71WU	
2441.495	0.003	40 946.099	250			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)7f^2[7/2]_{3,4}$	71WU	
2442.513	0.003	40 929.035	80					71WU	
2443.541	0.003	40 911.817	45					71WU	
2444.439	0.003	40 896.789	35					71WU	
2445.779	0.003	40 874.384	40					71WU	
2446.200	0.003	40 867.349	40					71WU	
2447.195	0.003	40 850.735	35					71WU	
2448.715	0.003	40 825.379	200			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)7f^2[5/2]_{2,3}$	71WU	
2449.773	0.003	40 807.749	40					71WU	
2452.180	0.003	40 767.696	200			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[7/2]_3$	71WU	
2452.657	0.003	40 759.768	100			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[5/2]_{2,3}$	71WU	
2453.718	0.003	40 742.144	15			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[3/2]_1$	71WU	
2454.628	0.003	40 727.041	60			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[7/2]_{3,4}$	71WU	
2457.477	0.003	40 679.829	20					71WU	
2460.776	0.003	40 625.296	40			$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)7f^2[5/2]_2$	71WU	
2466.368	0.003	40 533.193	20					71WU	
2493.149	0.003	40 097.822	1000		4.15E+8	$2p^53s^1P_1^\circ$	$2p^53p^1S_0$	71WU	08KEL/POD
2494.661	0.003	40 073.521	130					71WU	
2497.84	0.10	40 022.523	130					71WU	
2498.124	0.003	40 017.973	70					71WU	
2502.839	0.003	39 942.590	300		2.74E+7	$2p^53p^3S_1$	$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	71WU	04FRO/TAC
2504.285	0.003	39 919.529	25					71WU	
2504.791	0.003	39 911.465	25			$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[5/2]_2$	71WU	
2506.301	0.003	39 887.421	450		2.73E+7	$2p^53p^3S_1$	$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_1^\circ$	71WU	08KEL/POD
2514.412	0.003	39 758.760	45			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[5/2]_3$	71WU	
2515.455	0.003	39 742.276	600		2.25E+7	$2p^53p^3S_1$	$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	71WU	08KEL/POD
2525.647	0.003	39 581.911	50		2.78E+5	$2p^53p^3S_1$	$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	71WU	08KEL/POD
2527.705	0.003	39 549.686	40					71WU	
2531.538	0.003	39 489.808	600		8.44E+7	$2p^53p^3S_1$	$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_0^\circ$	71WU	08KEL/POD
2545.095	0.003	39 279.471	25					71WU	
2546.279	0.003	39 261.207	35					71WU	
2546.939	0.003	39 251.034	20					71WU	
2558.022	0.003	39 080.984	15					71WU	
2559.971	0.003	39 051.233	10			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[5/2]_3$	71WU	
2565.476	0.003	38 967.442	15					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
2568.104	0.003	38 927.568	12					71WU	
2571.103	0.003	38 882.165	30			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[7/2]_3$	71WU	
2573.910	0.003	38 839.764	35			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[7/2]_{3,4}$	71WU	
2575.703	0.003	38 812.729	15					71WU	
2577.645	0.003	38 783.489	15					71WU	
2586.308	0.003	38 653.590	550		5.81E+7	$2p^53p^3S_1$	$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_1^\circ$	71WU	04FRO/TAC
2589.269	0.003	38 609.389	60			$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_0^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_1$	71WU	
2593.269	0.003	38 549.840	40			$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_2$	71WU	
2594.958	0.003	38 524.750	600		3.71E+7	$2p^53p^3S_1$	$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_1^\circ$	71WU	08KEL/POD
2600.325	0.003	38 445.241	45		4.93E+5	$2p^53p^3S_1$	$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	71WU	08KEL/POD
2602.974	0.003	38 406.118	25					71WU	
2603.563	0.003	38 397.430	130			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_3$	71WU	
2605.388	0.003	38 370.536	45			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_2$	71WU	
2607.393	0.003	38 341.032	80					71WU	
2608.856	0.003	38 319.532	30					71WU	
2611.812	0.003	38 276.166	850		2.16E+8	$2p^53p^3S_1$	$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_2^\circ$	71WU	04FRO/TAC
2613.486	0.003	38 251.650	60					71WU	
2616.833	0.003	38 202.728	25					71WU	
2625.515	0.003	38 076.408	60			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[7/2]_{3,4}$	71WU	
2626.368	0.003	38 064.042	40			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_3$	71WU	
2627.414	0.003	38 048.889	300			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[9/2]_5$	71WU	
2629.909	0.003	38 012.794	60			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[7/2]_{3,4}$	71WU	
2630.766	0.003	38 000.412	35			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_{2,3}$	71WU	
2631.812	0.003	37 985.310	300			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[9/2]_4$	71WU	
2636.127	0.003	37 923.137	35					71WU	
2637.505	0.003	37 903.324	90					71WU	
2647.785	0.003	37 756.174	30					71WU	
2648.532	0.003	37 745.525	160			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[7/2]_3$	71WU	
2650.534	0.003	37 717.017	35					71WU	
2651.313	0.003	37 705.936	200			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[7/2]_4$	71WU	
2652.430	0.003	37 690.058	80			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_3$	71WU	
2654.331	0.003	37 663.066	50			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_2$	71WU	
2659.029	0.003	37 596.527	60					71WU	
2659.810	0.003	37 585.488	200			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[5/2]_3$	71WU	
2660.997	0.003	37 568.723	850		1.65E+8	$2p^53p^3S_1$	$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	71WU	08KEL/POD
2662.394	0.003	37 549.011	70					71WU	
2663.460	0.003	37 533.984	200			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[7/2]_3$	71WU	
2664.358	0.003	37 521.334	80			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_{2,3}$	71WU	
2666.458	0.003	37 491.785	350			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[7/2]_4$	71WU	
2667.395	0.003	37 478.616	90			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_3$	71WU	
2669.372	0.003	37 450.860	60			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_2$	71WU	
2670.027	0.003	37 441.673	100			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_2$	71WU	
2670.406	0.003	37 436.360	130					71WU	
2671.826	0.003	37 416.464	1000		2.64E+8	$2p^53p^3S_1$	$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_1^\circ$	71WU	08KEL/POD
2672.027	0.003	37 413.650	60			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_1$	71WU	
2674.035	0.003	37 385.557	200			$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[5/2]_2$	71WU	
2675.266	0.003	37 368.355	50					71WU	
2675.941	0.003	37 358.930	60					71WU	
2678.085	0.003	37 329.023	850		3.01E+8	$2p^53p^3S_1$	$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_0^\circ$	71WU	08KEL/POD
2679.252	0.003	37 312.764	150			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_2$	71WU	
2682.194	0.003	37 271.840	45					71WU	
2683.622	0.003	37 252.008	25					71WU	
2685.083	0.003	37 231.739	20					71WU	
2693.712	0.003	37 112.479	15					71WU	
2698.048	0.003	37 052.839	15					71WU	
2710.08	0.10	36 888	25					71WU	
2714.73	0.10	36 825	70					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
2720.50	0.10	36 747	25					71WU	
2723.93	0.10	36 701	45					71WU	
2731.82	0.10	36 594	25					71WU	
2738.74	0.10	36 502	15					71WU	
2741.27	0.10	36 469	25					71WU	
2746.77	0.10	36 396	130					71WU	
2748.98	0.10	36 366	25					71WU	
2749.649	0.003	36 357.528	130*	b		$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[7/2]_{3,4}$	71WU	
2749.649	0.003	36 357.528	130*	b		$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_2^\circ$	71WU	
2750.51	0.10	36 346	60					71WU	
2759.797	0.003	36 223.846	35			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_3$	71WU	
2761.861	0.003	36 196.776	25			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_2^\circ$	71WU	
2762.78	0.10	36 185	25					71WU	
2767.61	0.10	36 122	35					71WU	
2775.113	0.003	36 023.935	20			$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_2^\circ$	71WU	
2781.70	0.10	35 939	15					71WU	
2785.78	0.10	35 886	15					71WU	
2786.11	0.10	35 882	15					71WU	
2788.49	0.10	35 851	70					71WU	
2789.35	0.10	35 840	20					71WU	
2792.86	0.10	35 795	15					71WU	
2799.211	0.003	35 713.826	80		2.64E+6	$2p^53p^3D_3$	$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	71WU	08KEL/POD
2806.94	0.10	35 615	60					71WU	
2807.75	0.10	35 605	90					71WU	
2808.706	0.003	35 593.099	650		1.93E+6	$2p^53p^3D_3$	$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	71WU	08KEL/POD
2809.520	0.003	35 582.787	850		5.95E+7	$2p^53s^3P_2^\circ$	$2p^53p^3P_1$	71WU	08KEL/POD
2810.64	0.10	35 569	130					71WU	
2811.43	0.10	35 559	80					71WU	
2811.840	0.003	35 553.430	160		1.01E+6	$2p^53p^3D_3$	$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	71WU	08KEL/POD
2813.900	0.003	35 527.403	250		1.24E+7	$2p^53p^3D_2$	$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	71WU	04FRO/TAC
2817.21	0.10	35 486	50					71WU	
2818.288	0.003	35 472.091	350		6.92E+6	$2p^53p^3D_2$	$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_1^\circ$	71WU	04FRO/TAC
2820.71	0.10	35 442	25					71WU	
2821.49	0.10	35 432	25					71WU	
2824.41	0.10	35 395	25					71WU	
2828.35	0.10	35 346	35					71WU	
2829.868	0.003	35 326.944	600		3.35E+7	$2p^53p^3D_2$	$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	71WU	08KEL/POD
2831.92	0.10	35 301	35					71WU	
2832.26	0.10	35 297	35					71WU	
2833.61	0.10	35 280	45					71WU	
2836.07	0.10	35 250	80					71WU	
2839.564	0.003	35 206.322	800		1.11E+8	$2p^53p^3D_2$	$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	71WU	08KEL/POD
2841.724	0.003	35 179.563	1000		8.92E+7	$2p^53s^3P_2^\circ$	$2p^53p^3P_2$	71WU	08KEL/POD
2842.762	0.003	35 166.718	30		5.23E+5	$2p^53p^3D_2$	$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	71WU	08KEL/POD
2848.63	0.10	35 094	60					71WU	
2849.11	0.10	35 088	40					71WU	
2850.02	0.10	35 077	35					71WU	
2850.72	0.10	35 069	35					71WU	
2851.16	0.10	35 063	40					71WU	
2856.508	0.003	34 997.498	650		8.02E+6	$2p^53p^3D_1$	$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	71WU	04FRO/TAC
2859.488	0.003	34 961.027	800		2.19E+7	$2p^53s^3P_2^\circ$	$2p^53p^3P_1$	71WU	08KEL/POD
2861.019	0.003	34 942.320	350		6.43E+7	$2p^53p^3D_1$	$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_1^\circ$	71WU	08KEL/POD
2862.96	0.10	34 919	40					71WU	
2863.66	0.10	34 910	60					71WU	
2867.96	0.10	34 858	50					71WU	
2868.31	0.10	34 854	60					71WU	
2869.30	0.10	34 841	50					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
2871.275	0.003	34 817.514	750		2.75E+7	2p ⁵ 3s ³ P ₁ ^o	2p ⁵ 3p ³ P ₁	71WU	08KEL/POD
2872.954	0.003	34 797.167	650		2.63E+7	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
2875.73	0.10	34 764	50					71WU	
2877.38	0.10	34 744	70					71WU	
2879.041	0.003	34 723.601	130					71WU	
2881.146	0.003	34 698.233	900		2.50E+8	2p ⁵ 3s ³ P ₁ ^o	2p ⁵ 3p ³ P ₀	71WU	08KEL/POD
2884.249	0.003	34 660.904	90					71WU	
2886.257	0.003	34 636.792	850		1.07E+8	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₂ ^o	71WU	08KEL/POD
2887.95	0.10	34 616	100					71WU	
2888.95	0.10	34 605	80					71WU	
2889.61	0.10	34 597	70					71WU	
2890.51	0.10	34 586	50					71WU	
2891.21	0.10	34 577	70					71WU	
2893.949	0.003	34 544.733	700		1.48E+8	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{1/2} ^o)4s ² [1/2] ₀ ^o	71WU	08KEL/POD
2896.61	0.10	34 513	60					71WU	
2897.40	0.10	34 504	70					71WU	
2901.139	0.003	34 459.123	900		1.48E+8	2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)3d ² [5/2] ₃ ^o	71WU	08KEL/POD
2904.716	0.003	34 416.691	800		1.04E+7	2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)3d ² [5/2] ₂ ^o	71WU	08KEL/POD
2904.915	0.003	34 414.333	1100		7.30E+7	2p ⁵ 3s ³ P ₁ ^o	2p ⁵ 3p ³ P ₂	71WU	08KEL/POD
2907.40	0.10	34 385	250			2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	2p ⁵ (² P _{1/2} ^o)5f ² [5/2] ₃	71WU	
2907.52	0.10	34 384	250			2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	2p ⁵ (² P _{1/2} ^o)5f ² [7/2] ₃	71WU	
2908.56	0.10	34 371	160					71WU	
2917.52	0.10	34 266	1100		7.92E+7	2p ⁵ 3s ³ P ₂ ^o	2p ⁵ 3p ¹ D ₂	71WU	08KEL/POD
2919.049	0.003	34 247.707	1100		1.60E+8	2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₂ ^o	71WU	04FRO/TAC
2919.850	0.003	34 238.312	1200		1.33E+8	2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₁ ^o	71WU	04FRO/TAC
2920.945	0.003	34 225.477	1300		6.66E+7	2p ⁵ 3s ³ P ₀ ^o	2p ⁵ 3p ³ P ₁	71WU	08KEL/POD
2923.485	0.003	34 195.743	1000		1.41E+7	2p ⁵ 3s ³ P ₁ ^o	2p ⁵ 3p ¹ P ₁	71WU	08KEL/POD
2930.882	0.003	34 109.443	750		9.83E+7	2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₁ ^o	71WU	08KEL/POD
2934.079	0.003	34 072.279	850		9.20E+8	2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [5/2] ₃ ^o	71WU	93HIB/DOU
2935.55	0.10	34 055	130					71WU	
2937.735	0.003	34 029.878	950		1.28E+8	2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [5/2] ₂ ^o	71WU	08KEL/POD
2942.657	0.003	33 972.961	450		7.08E+7	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)4s ² [1/2] ₁ ^o	71WU	04FRO/TAC
2945.702	0.003	33 937.844	800		2.50E+6	2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₃ ^o	71WU	08KEL/POD
2947.449	0.003	33 917.729	950		1.03E+7	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₁ ^o	71WU	04FRO/TAC
2951.235	0.003	33 874.220	1200		4.33E+8	2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₄ ^o	71WU	08KEL/POD
2952.396	0.003	33 860.900	1100		1.80E+7	2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₂ ^o	71WU	04FRO/TAC
2960.116	0.003	33 772.594	850		5.60E+7	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
2961.67	0.10	33 755	80					71WU	
2965.742	0.003	33 708.531	450		4.61E+5	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₁ ^o	71WU	04FRO/TAC
2968.48	0.10	33 677	80			2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₂ ^o	2p ⁵ (² P _{1/2} ^o)5f ² [5/2] ₃	71WU	
2968.97	0.10	33 672	90					71WU	
2970.727	0.003	33 651.969	500		1.03E+7	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₃ ^o	71WU	08KEL/POD
2972.72	0.10	33 629	160					71WU	
2974.235	0.003	33 612.279	600		2.02E+7	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₂ ^o	71WU	08KEL/POD
2974.988	0.003	33 603.772	750		6.47E+7	2p ⁵ 3s ³ P ₀ ^o	2p ⁵ 3p ¹ P ₁	71WU	08KEL/POD
2976.686	0.003	33 584.604	400					71WU	
2977.125	0.003	33 579.652	1000		1.05E+7	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₁ ^o	71WU	08KEL/POD
2979.657	0.003	33 551.118	1100		1.96E+8	2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₃ ^o	71WU	08KEL/POD
2980.627	0.003	33 540.200	1100		3.30E+5	2p ⁵ 3p ³ D ₃	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
2984.186	0.003	33 500.201	1300*	b	1.74E+7	2p ⁵ 3s ³ P ₁ ^o	2p ⁵ 3p ¹ D ₂	71WU	08KEL/POD
2984.186	0.003	33 500.201	1300*	b	2.36E+8	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)3d ² [5/2] ₂ ^o	71WU	08KEL/POD
2986.451	0.003	33 474.795	300					71WU	
2987.213	0.003	33 466.256	300			2p ⁵ (² P _{3/2} ^o)3d ² [5/2] ₃ ^o	2p ⁵ (² P _{1/2} ^o)5f ² [5/2] ₃	71WU	
2996.89	0.10	33 358	40					71WU	
3 000.86	0.10	33 314.1	130					71WU	
3 002.92	0.10	33 291.2	130					71WU	
3004.149	0.003	33 277.597	550		2.97E+7	2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)4s ² [1/2] ₁ ^o	71WU	04FRO/TAC

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
3007.442	0.003	33 241.161	750		1.68E+7	2p ⁵ 3s ³ P ₂ ^o	2p ⁵ 3p ³ D ₁	71WU	08KEL/POD
3009.137	0.003	33 222.438	750		1.73E+7	2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₁ ^o	71WU	08KEL/POD
3009.482	0.003	33 218.629	450			2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₀ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [3/2] ₁	71WU	
3011.51	0.10	33 196.3	60					71WU	
3013.10	0.10	33 178.7	160			2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [5/2] ₂	71WU	
3015.395	0.003	33 153.493	600		1.51E+7	2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
3017.341	0.003	33 132.111	450			2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [3/2] ₂	71WU	
3018.324	0.003	33 121.322	160					71WU	
3019.98	0.10	33 103.2	80					71WU	
3021.37	0.10	33 087.9	200					71WU	
3022.348	0.003	33 077.225	160		6.91E+5	2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
3024.00	0.10	33 059.2	130		9.89E+7	2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)4s ² [1/2] ₁ ^o	71WU	04FRO/TAC
3025.31	0.10	33 044.8	60					71WU	
3027.062	0.003	33 025.717	300			2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [5/2] ₃	71WU	
3029.070	0.003	33 003.824	400		2.33E+6	2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₁ ^o	71WU	04FRO/TAC
3029.320	0.003	33 001.101	40		6.32E+6	2p ⁵ 3p ³ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	71WU	08KEL/POD
3031.26	0.10	32 980.0	200			2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [3/2] ₂	71WU	
3037.076	0.003	32 916.827	400		2.55E+8	2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₂ ^o	71WU	08KEL/POD
3038.72	0.10	32 899.0	350					71WU	
3040.13	0.10	32 883.8	160					71WU	
3042.461	0.003	32 858.568	350		7.49E+5	2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
3043.10	0.10	32 851.7	200					71WU	
3045.600	0.003	32 824.703	400		6.92E+7	2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{1/2} ^o)4s ² [1/2] ₀ ^o	71WU	08KEL/POD
3048.95	0.10	32 788.6	200					71WU	
3050.210	0.003	32 775.095	350		8.80E+6	2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{1/2} ^o)4s ² [1/2] ₁ ^o	71WU	08KEL/POD
3053.666	0.003	32 738.003	550		2.99E+8	2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₃ ^o	71WU	08KEL/POD
3055.347	0.003	32 719.992	550		1.34E+8	2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₁ ^o	71WU	08KEL/POD
3055.822	0.003	32 714.906	45			2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₄ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [7/2] ₄	71WU	
3056.161	0.003	32 711.278	550		7.46E+7	2p ⁵ 3s ³ P ₂ ^o	2p ⁵ 3p ³ D ₂	71WU	08KEL/POD
3057.375	0.003	32 698.289	550		4.51E+7	2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₂ ^o	71WU	08KEL/POD
3057.95	0.10	32 692.1	550			2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₄ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [5/2] ₃	71WU	
3058.720	0.003	32 683.912	550		2.18E+7	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₁ ^o	71WU	08KEL/POD
3060.251	0.003	32 667.561	700			2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₄ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [9/2] ₅	71WU	
3061.350	0.003	32 655.834	800		3.75E+7	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)4s ² [1/2] ₁ ^o	71WU	04FRO/TAC
3061.792	0.003	32 651.120	25			2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₃ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [7/2] ₃	71WU	
3064.375	0.003	32 623.599	500		7.62E+6	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
3066.223	0.003	32 603.938	500			2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₃ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [9/2] ₄	71WU	
3066.535	0.003	32 600.621	500		1.25E+8	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₁ ^o	71WU	04FRO/TAC
3070.829	0.003	32 555.037	350		8.70E+6	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₁ ^o	71WU	93HIB/DOU
3074.334	0.003	32 517.922	550		1.41E+8	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [5/2] ₃ ^o	71WU	93HIB/DOU
3078.318	0.003	32 475.839	550*	b	1.17E+8	2p ⁵ 3s ³ P ₁ ^o	2p ⁵ 3p ³ D ₁	71WU	08KEL/POD
3078.318	0.003	32 475.839	550*	b	3.57E+5	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [5/2] ₂ ^o	71WU	93HIB/DOU
3078.752	0.003	32 471.261	170		3.59E+6	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	71WU	08KEL/POD
3080.254	0.003	32 455.428	550		2.81E+8	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
3082.93	0.10	32 427.3	30					71WU	
3083.57	0.10	32 420.5	25					71WU	
3085.57	0.10	32 399.5	35					71WU	
3087.060	0.003	32 383.877	450		1.66E+7	2p ⁵ 3p ³ D ₁	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₀ ^o	71WU	08KEL/POD
3088.263	0.003	32 371.263	450			2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₂ ^o	2p ⁵ (² P _{1/2} ^o)5f ² [7/2] ₃	71WU	
3089.99	0.10	32 353.2	130					71WU	
3092.035	0.003	32 331.774	550			2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₃ ^o	2p ⁵ (² P _{1/2} ^o)5f ² [7/2] ₄	71WU	
3092.732	0.003	32 324.488	550		2.09E+8	2p ⁵ 3s ³ P ₂ ^o	2p ⁵ 3p ³ D ₃	71WU	08KEL/POD
3093.089	0.003	32 320.757	400					71WU	
3094.449	0.003	32 306.553	650		1.10E+6	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₂ ^o	71WU	04FRO/TAC
3094.67	0.10	32 304.2	200					71WU	
3095.552	0.003	32 295.042	650		3.97E+5	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₂ ^o	71WU	08KEL/POD
3096.48	0.10	32 285.4	70					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
3096.71	0.10	32 283.0	70					71WU	
3097.73	0.10	32 272.3	60			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[3/2]_2$	71WU	
3099.02	0.10	32 258.9	60					71WU	
3099.80	0.10	32 250.8	45					71WU	
3102.77	0.10	32 219.9	40					71WU	
3103.578	0.003	32 211.529	500			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)5f^2[5/2]_3$	71WU	
3104.403	0.003	32 202.969	500		5.63E+7	$2p^53p^3P_1$	$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_0^\circ$	71WU	08KEL/POD
3107.370	0.003	32 172.222	350			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[7/2]_3$	71WU	
3109.538	0.003	32 149.792	300			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[5/2]_2$	71WU	
3110.23	0.10	32 142.6	130					71WU	
3111.453	0.003	32 130.005	450			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[7/2]_4$	71WU	
3112.924	0.003	32 114.823	70					71WU	
3113.693	0.003	32 106.892	500			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[5/2]_3$	71WU	
3114.130	0.003	32 102.387	10			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[3/2]_1$	71WU	
3116.01	0.10	32 083.0	60			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[9/2]_4$	71WU	
3117.231	0.003	32 070.453	300			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[5/2]_2$	71WU	
3118.134	0.003	32 061.165	15			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[3/2]_2$	71WU	
3119.15	0.10	32 050.7	40					71WU	
3121.759	0.003	32 023.937	350			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[3/2]_2$	71WU	
3122.935	0.003	32 011.879	400					71WU	
3124.415	0.003	31 996.716	1700		7.12E+7	$2p^53p^1D_2$	$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	71WU	04FRO/TAC
3125.212	0.003	31 988.556	600		9.72E+6	$2p^53p^1P_1$	$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_1^\circ$	71WU	08KEL/POD
3126.44	0.10	31 976.0	100					71WU	
3129.377	0.003	31 945.983	600		1.28E+8	$2p^53s^3P_1^\circ$	$2p^53p^3D_2$	71WU	08KEL/POD
3129.821	0.003	31 941.451	80			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)5f^2[5/2]_2$	71WU	
3132.30	0.10	31 916.2	80					71WU	
3135.483	0.003	31 883.774	2500		7.42E+7	$2p^53s^3P_0^\circ$	$2p^53p^3D_1$	71WU	08KEL/POD
3137.861	0.003	31 859.612	1700		1.41E+8	$2p^53p^1P_1$	$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_1^\circ$	71WU	08KEL/POD
3138.94	0.10	31 848.7	100					71WU	
3140.52	0.10	31 832.6	35					71WU	
3140.95	0.10	31 828.3	35					71WU	
3141.21	0.10	31 825.6	35					71WU	
3141.82	0.10	31 819.5	30					71WU	
3142.67	0.10	31 810.9	35					71WU	
3145.706	0.003	31 780.161	950		4.48E+7	$2p^53p^1P_1$	$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	71WU	04FRO/TAC
3146.94	0.10	31 767.7	45					71WU	
3149.283	0.003	31 744.066	2000		8.24E+7	$2p^53s^1P_1^\circ$	$2p^53p^1P_1$	71WU	08KEL/POD
3150.49	0.10	31 731.9	60					71WU	
3150.78	0.10	31 729.0	55					71WU	
3151.44	0.10	31 722.3	50					71WU	
3152.03	0.10	31 716.4	40					71WU	
3153.24	0.10	31 704.2	40					71WU	
3153.77	0.10	31 698.9	60					71WU	
3154.98	0.10	31 686.7	45					71WU	
3155.48	0.10	31 681.7	45					71WU	
3155.85	0.10	31 678.0	45					71WU	
3158.42	0.10	31 652.2	250					71WU	
3159.527	0.003	31 641.148	70		1.38E+5	$2p^53p^3P_2$	$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_1^\circ$	71WU	08KEL/POD
3161.154	0.003	31 624.863	250		4.36E+6	$2p^53s^1P_1^\circ$	$2p^53p^3P_0$	71WU	08KEL/POD
3162.53	0.10	31 611.1	90		7.16E+5	$2p^53p^1P_1$	$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_2^\circ$	71WU	04FRO/TAC
3163.246	0.003	31 603.949	350		6.10E+6	$2p^53p^3P_2$	$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	71WU	04FRO/TAC
3163.736	0.003	31 599.054	2000		1.05E+8	$2p^53p^1D_2$	$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	71WU	08KEL/POD
3165.25	0.10	31 583.9	70					71WU	
3166.36	0.10	31 572.9	30					71WU	
3166.77	0.10	31 568.8	30					71WU	
3167.484	0.003	31 561.665	200		9.26E+6	$2p^53p^3P_2$	$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	71WU	08KEL/POD
3169.58	0.10	31 540.8	300					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
3171.62	0.10	31 520.5	25					71WU	
3172.70	0.10	31 509.8	25					71WU	
3173.42	0.10	31 502.6	15					71WU	
3175.086	0.003	31 486.101	700		6.25E+7	2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₁ ^o	71WU	04FRO/TAC
3179.064	0.003	31 446.703	1000		3.94E+7	2p ⁵ 3p ¹ D ₂	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	71WU	08KEL/POD
3180.94	0.10	31 428.2	160					71WU	
3186.24	0.10	31 375.9	40					71WU	
3187.78	0.10	31 360.7	80					71WU	
3188.127	0.003	31 357.312	80		6.66E+7	2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₁ ^o	71WU	08KEL/POD
3189.002	0.003	31 348.709	200					71WU	
3189.790	0.003	31 340.965	1700		7.30E+7	2p ⁵ 3s ¹ P ₁ ^o	2p ⁵ 3p ³ P ₂	71WU	08KEL/POD
3192.06	0.10	31 318.7	40					71WU	
3192.21	0.10	31 317.2	35					71WU	
3194.14	0.10	31 298.3	80					71WU	
3195.79	0.10	31 282.1	25					71WU	
3198.93	0.10	31 251.4	20					71WU	
3200.300	0.003	31 238.042	60		1.54E+6	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₁ ^o	71WU	93HIB/DOU
3204.21	0.10	31 199.9	45					71WU	
3204.89	0.10	31 193.3	25					71WU	
3208.51	0.10	31 158.1	20					71WU	
3212.190	0.003	31 122.418	1600		1.12E+8	2p ⁵ 3s ¹ P ₁ ^o	2p ⁵ 3p ¹ P ₁	71WU	08KEL/POD
3212.820	0.003	31 116.316	200					71WU	
3214.77	0.10	31 097.4	130					71WU	
3216.283	0.003	31 082.814	450		1.45E+7	2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)3d ² [7/2] ₃ ^o	71WU	08KEL/POD
3217.52	0.10	31 070.9	35					71WU	
3221.175	0.003	31 035.610	60			2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₂ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [7/2] ₃	71WU	
3221.47	0.10	31 032.8	30					71WU	
3222.34	0.10	31 024.4	40					71WU	
3223.506	0.003	31 013.168	60			2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₂ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [5/2] ₂	71WU	
3224.37	0.10	31 004.9	50					71WU	
3225.290	0.003	30 996.014	35			2p ⁵ (² P _{1/2} ^o)3d ² [5/2] ₃ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [7/2] ₄	71WU	
3225.977	0.003	30 989.414	450		1.83E+7	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)4s ² [3/2] ₂ ^o	71WU	04FRO/TAC
3229.11	0.10	30 959.3	80					71WU	
3231.41	0.10	30 937.3	45					71WU	
3234.927	0.003	30 903.679	700		1.83E+7	2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
3236.70	0.10	30 886.8	20					71WU	
3238.20	0.10	30 872.4	12					71WU	
3239.22	0.10	30 862.7	15					71WU	
3240.324	0.003	30 852.208	40			2p ⁵ (² P _{1/2} ^o)3d ² [3/2] ₂ ^o	2p ⁵ (² P _{3/2} ^o)5f ² [5/2] ₃	71WU	
3242.06	0.10	30 835.7	15					71WU	
3244.52	0.10	30 812.3	15					71WU	
3244.88	0.10	30 808.9	20					71WU	
3247.42	0.10	30 784.8	40					71WU	
3247.91	0.10	30 780.2	20					71WU	
3248.46	0.10	30 774.9	35					71WU	
3250.949	0.003	30 751.378	400		9.65E+6	2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	71WU	08KEL/POD
3251.68	0.10	30 744.5	300					71WU	
3254.39	0.10	30 718.9	30					71WU	
3254.71	0.10	30 715.8	30					71WU	
3255.11	0.10	30 712.1	40					71WU	
3257.964	0.003	30 685.167	1500		1.03E+8	2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
3260.210	0.003	30 664.029	650		4.65E+7	2p ⁵ 3p ¹ P ₁	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₀ ^o	71WU	08KEL/POD
3261.67	0.10	30 650.3	30					71WU	
3262.38	0.10	30 643.6	30					71WU	
3263.59	0.10	30 632.3	130					71WU	
3268.31	0.10	30 588.0	25					71WU	
3271.58	0.10	30 557.5	25					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
3272.74	0.10	30 546.6	70					71WU	
3274.220	0.003	30 532.825	950		4.29E+7	2p ⁵ 3p ³ P ₂	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	71WU	08KEL/POD
3278.02	0.10	30 497.4	40					71WU	
3278.77	0.10	30 490.5	35					71WU	
3280.25	0.10	30 476.7	35					71WU	
3282.78	0.10	30 453.2	90					71WU	
3285.602	0.003	30 427.057	1700		1.10E+8	2p ⁵ 3s ¹ P ₁ ^o	2p ⁵ 3p ¹ D ₂	71WU	08KEL/POD
3289.34	0.10	30 392.5	60					71WU	
3290.44	0.10	30 382.3	80					71WU	
3291.37	0.10	30 373.7	50					71WU	
3292.50	0.10	30 363.3	80					71WU	
3294.74	0.10	30 342.7	60					71WU	
3295.65	0.10	30 334.3	60					71WU	
3297.14	0.10	30 320.6	70					71WU	
3298.31	0.10	30 309.8	70					71WU	
3299.68	0.10	30 297.2	130					71WU	
3301.349	0.003	30 281.929	1700		4.54E+6	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)3d ² [3/2] ₂ ^o	71WU	08KEL/POD
3304.957	0.003	30 248.871	1500		3.60E+7	2p ⁵ 3p ³ P ₀	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	71WU	08KEL/POD
3307.88	0.10	30 222.1	200					71WU	
3312.68	0.10	30 178.4	60					71WU	
3313.76	0.10	30 168.5	90					71WU	
3314.08	0.10	30 165.6	70					71WU	
3318.039	0.003	30 129.613	1000		4.14E+7	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₁ ^o	71WU	08KEL/POD
3320.22	0.10	30 109.8	60					71WU	
3320.59	0.10	30 106.5	60					71WU	
3323.93	0.10	30 076.2	60					71WU	
3326.42	0.10	30 053.7	60					71WU	
3326.890	0.003	30 049.458	100					71WU	
3327.689	0.003	30 042.243	950		9.47E+7	2p ⁵ 3p ³ P ₁	2p ⁵ (² P _{3/2} ^o)3d ² [1/2] ₀ ^o	71WU	08KEL/POD
3333.07	0.10	29 993.7	60					71WU	
3333.68	0.10	29 988.3	60					71WU	
3334.45	0.10	29 981.3	70					71WU	
3338.01	0.10	29 949.4	70					71WU	
3338.71	0.10	29 943.1	50					71WU	
3339.21	0.10	29 938.6	40					71WU	
3339.82	0.10	29 933.1	45					71WU	
3341.77	0.10	29 915.7	80					71WU	
3342.26	0.10	29 911.3	100					71WU	
3343.17	0.10	29 903.1	70					71WU	
3346.29	0.10	29 875.3	60					71WU	
3347.57	0.10	29 863.8	50					71WU	
3349.47	0.10	29 846.9	60					71WU	
3351.96	0.10	29 824.7	90					71WU	
3353.89	0.10	29 807.6	300					71WU	
3354.16	0.10	29 805.2	300					71WU	
3355.76	0.10	29 790.9	50					71WU	
3360.19	0.10	29 751.7	500					71WU	
3362.33	0.10	29 732.7	160					71WU	
3362.79	0.10	29 728.7	160					71WU	
3364.01	0.10	29 717.9	130					71WU	
3364.74	0.10	29 711.4	130					71WU	
3368.632	0.003	29 677.116	160					71WU	
3369.39	0.10	29 670.4	200					71WU	
3372.22	0.10	29 645.5	160					71WU	
3374.80	0.10	29 622.9	50					71WU	
3375.48	0.10	29 616.9	50					71WU	
3378.71	0.10	29 588.6	35					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
3380.33	0.10	29 574.4	40					71WU	
3384.75	0.10	29 535.8	35					71WU	
3387.27	0.10	29 513.8	25					71WU	
3387.85	0.10	29 508.8	50					71WU	
3395.38	0.10	29 443.3	40					71WU	
3395.78	0.10	29 439.9	40					71WU	
3398.80	0.10	29 413.7	50					71WU	
3399.26	0.10	29 409.7	60					71WU	
3400.093	0.003	29 402.522	200		1.24E+6	2p ⁵ 3s ¹ P ₁ [°]	2p ⁵ 3p ³ D ₁	71WU	08KEL/POD
3410.83	0.10	29 310.0	12					71WU	
3421.35	0.10	29 219.8	60					71WU	
3423.59	0.10	29 200.7	70					71WU	
3424.03	0.10	29 197.0	130					71WU	
3425.30	0.10	29 186.2	30					71WU	
3431.71	0.10	29 131.6	25					71WU	
3433.49	0.10	29 116.5	40					71WU	
3439.25	0.10	29 067.8	30					71WU	
3440.12	0.10	29 060.4	35					71WU	
3443.36	0.10	29 033.1	50					71WU	
3450.17	0.10	28 975.8	20					71WU	
3450.88	0.10	28 969.8	20					71WU	
3455.28	0.10	28 932.9	25					71WU	
3457.03	0.10	28 918.3	15					71WU	
3458.95	0.10	28 902.2	15					71WU	
3462.491	0.003	28 872.672	450		3.61E+6	2p ⁵ 3s ¹ P ₁ [°]	2p ⁵ 3p ³ D ₂	71WU	08KEL/POD
3468.71	0.10	28 820.9	25					71WU	
3473.21	0.10	28 783.6	35					71WU	
3475.81	0.10	28 762.0	70					71WU	
3482.00	0.10	28 710.9	40					71WU	
3483.02	0.10	28 702.5	40					71WU	
3485.74	0.10	28 680.1	20					71WU	
3498.26	0.10	28 577.5	160					71WU	
3516.95	0.10	28 425.6	60					71WU	
3525.29	0.10	28 358.4	60					71WU	
3527.97	0.10	28 336.8	80					71WU	
3529.11	0.10	28 327.7	130					71WU	
3530.48	0.10	28 316.7	160					71WU	
3533.052	0.003	28 296.053	1500		8.81E+7	2p ⁵ 3s ³ P ₂ [°]	2p ⁵ 3p ³ S ₁	71WU	08KEL/POD
3540.23	0.10	28 238.7	70					71WU	
3541.36	0.10	28 229.7	60					71WU	
3550.57	0.10	28 156.4	60					71WU	
3551.92	0.10	28 145.7	45					71WU	
3552.50	0.10	28 141.2	60					71WU	
3554.12	0.10	28 128.3	60					71WU	
3566.18	0.10	28 033.2	130					71WU	
3570.48	0.10	27 999.4	130					71WU	
3597.42	0.10	27 789.8	35					71WU	
3598.37	0.10	27 782.4	25					71WU	
3609.55	0.10	27 696.4	60					71WU	
3615.58	0.10	27 650.2	40					71WU	
3631.272	0.003	27 530.711	1200		3.72E+7	2p ⁵ 3s ³ P ₁ [°]	2p ⁵ 3p ³ S ₁	71WU	08KEL/POD
3668.65	0.10	27 250.2	30					71WU	
3694.20	0.10	27 061.8	25					71WU	
3701.00	0.10	27 012.0	30					71WU	
3701.58	0.10	27 007.8	30					71WU	
3711.070	0.003	26 938.742	850		1.02E+7	2p ⁵ 3s ³ P ₀ [°]	2p ⁵ 3p ³ S ₁	71WU	08KEL/POD
3743.33	0.10	26 706.6	45					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
3798.25	0.10	26 320.4	130					71WU	
3806.53	0.10	26 263.2	130					71WU	
3813.12	0.10	26 217.8	100					71WU	
3814.61	0.10	26 207.6	60					71WU	
3820.50	0.10	26 167.2	70					71WU	
3858.32	0.10	25 910.7	500					71WU	
3871.26	0.10	25 824.1	300					71WU	
3878.96	0.10	25 772.8	160					71WU	
3887.22	0.10	25 718.0	90					71WU	
3888.87	0.10	25 707.1	130					71WU	
3895.78	0.10	25 661.5	130					71WU	
3896.92	0.10	25 654.0	70					71WU	
3901.67	0.10	25 622.8	90					71WU	
3903.69	0.10	25 609.5	80					71WU	
3904.74	0.10	25 602.6	100					71WU	
3910.26	0.10	25 566.5	100					71WU	
3926.71	0.10	25 459.4	100					71WU	
3936.96	0.10	25 393.1	100					71WU	
3939.45	0.10	25 377.1	60					71WU	
3941.50	0.10	25 363.9	80					71WU	
3942.98	0.10	25 354.4	130					71WU	
3985.85	0.10	25 081.7	30					71WU	
3996.97	0.10	25 011.9	130					71WU	
3998.78	0.10	25 000.6	70					71WU	
4003.63	0.10	24 970.3	45					71WU	
4004.98	0.10	24 961.9	100					71WU	
4027.93	0.10	24 819.6	40					71WU	
4056.007	0.003	24 647.828	50			$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_2$	71WU	
4059.67	0.10	24 625.6	45					71WU	
4081.369	0.003	24 494.667	200			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_3$	71WU	
4087.603	0.003	24 457.311	130		3.81E+5	$2p^53s\ ^1P_1^\circ$	$2p^53p\ ^3S_1$	71WU	08KEL/POD
4107.35	0.10	24 339.7	35					71WU	
4113.704	0.003	24 302.136	300		2.70E+7	$2p^53p\ ^1S_0$	$2p^5(^2P_{1/2}^\circ)4s\ ^2[1/2]_1^\circ$	71WU	04FRO/TAC
4123.082	0.003	24 246.861	250		3.71E+7	$2p^53p\ ^1S_0$	$2p^5(^2P_{1/2}^\circ)3d\ ^2[3/2]_1^\circ$	71WU	08KEL/POD
4127.03	0.10	24 223.7	80					71WU	
4149.07	0.10	24 095.0	90			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[7/2]_4$	71WU	
4165.27	0.10	24 001.3	40					71WU	
4168.03	0.10	23 985.4	60					71WU	
4171.93	0.10	23 963.0	160					71WU	
4172.88	0.10	23 957.5	160					71WU	
4174.13	0.10	23 950.3	150					71WU	
4194.02	0.10	23 836.8	60					71WU	
4202.764	0.003	23 787.163	130			$2p^5(^2P_{3/2}^\circ)4s\ ^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_3$	71WU	
4204.84	0.10	23 775.4	60					71WU	
4208.72	0.10	23 753.5	80					71WU	
4216.27	0.10	23 711.0	160					71WU	
4230.96	0.10	23 628.6	50					71WU	
4232.72	0.10	23 618.8	130			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_2$	71WU	
4233.26	0.10	23 615.8	250			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[7/2]_3$	71WU	
4240.37	0.10	23 576.2	200*	b		$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_2$	71WU	
4240.37	0.10	23 576.2	200*	b		$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_3$	71WU	
4240.903	0.003	23 573.246	250			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[7/2]_4$	71WU	
4242.81	0.10	23 562.7	70					71WU	
4243.41	0.10	23 559.3	70					71WU	
4246.83	0.10	23 540.3	50					71WU	
4260.58	0.10	23 464.4	200					71WU	
4290.38	0.10	23 301.4	60					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
4292.488	0.003	23 289.960	250			$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4292.864	0.003	23 287.920	250			$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_0^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_1$	71WU	
4302.19	0.10	23 237.4	70					71WU	
4304.53	0.10	23 224.8	60					71WU	
4305.87	0.10	23 217.6	60					71WU	
4306.75	0.10	23 212.8	70					71WU	
4308.817	0.003	23 201.700	250			$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4309.043	0.003	23 200.484	250			$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_1$	71WU	
4320.751	0.003	23 137.618	5			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4320.913	0.003	23 136.751	250			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	71WU	
4326.98	0.10	23 104.3	130					71WU	
4334.42	0.10	23 064.7	80					71WU	
4337.294	0.003	23 049.370	250			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4337.520	0.003	23 048.169	5			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_1$	71WU	
4344.108	0.003	23 013.216	250		4.32E+7	$2p^53p\ ^1S_0$	$2p^5(^2P_{3/2}^\circ)4s\ ^2[3/2]_1^\circ$	71WU	08KEL/POD
4353.60	0.10	22 963.0	60					71WU	
4368.600	0.003	22 884.198	200		3.59E+7	$2p^53p\ ^1S_0$	$2p^5(^2P_{3/2}^\circ)3d\ ^2[3/2]_1^\circ$	71WU	08KEL/POD
4375.215	0.003	22 849.599	200			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[7/2]_4$	71WU	
4378.19	0.10	22 834.1	60					71WU	
4384.194	0.003	22 802.803	160			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	71WU	
4387.489	0.003	22 785.678	200			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[7/2]_3$	71WU	
4392.814	0.003	22 758.058	250			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[9/2]_5$	71WU	
4396.317	0.003	22 739.925	160			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4401.41	0.10	22 713.6	90					71WU	
4405.113	0.003	22 694.519	200			$2p^5(^2P_{3/2}^\circ)3d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[9/2]_4$	71WU	
4435.18	0.10	22 540.7	60					71WU	
4438.47	0.10	22 524.0	130					71WU	
4441.00	0.10	22 511.1	100					71WU	
4442.59	0.10	22 503.1	160					71WU	
4443.20	0.10	22 500.0	130					71WU	
4445.928	0.003	22 486.180	160					71WU	
4446.695	0.003	22 482.301	200			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_2$	71WU	
4447.411	0.003	22 478.682	200			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[7/2]_3$	71WU	
4451.83	0.10	22 456.4	60					71WU	
4454.564	0.003	22 442.587	5			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_2$	71WU	
4454.736	0.003	22 441.720	200			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_3$	71WU	
4455.224	0.003	22 439.262	200			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[7/2]_4$	71WU	
4457.025	0.003	22 430.195	20			$2p^5(^2P_{3/2}^\circ)4s\ ^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4457.223	0.003	22 429.199	200			$2p^5(^2P_{3/2}^\circ)4s\ ^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	71WU	
4459.51	0.10	22 417.7	80					71WU	
4472.10	0.10	22 354.6	100					71WU	
4472.74	0.10	22 351.4	90					71WU	
4474.633	0.003	22 341.932	200			$2p^5(^2P_{3/2}^\circ)4s\ ^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4478.623	0.003	22 322.028	100			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_2$	71WU	
4478.797	0.003	22 321.161	200			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_3$	71WU	
4480.423	0.003	22 313.060	130					71WU	
4481.664	0.003	22 306.882	200			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[7/2]_3$	71WU	
4487.79	0.10	22 276.4	130					71WU	
4490.162	0.003	22 264.665	200			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[7/2]_4$	71WU	
4490.869	0.003	22 261.160	200			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4491.037	0.003	22 260.327	10			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	71WU	
4496.15	0.10	22 235.0	130					71WU	
4499.431	0.003	22 218.800	20			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4499.615	0.003	22 217.891	200			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	71WU	
4503.693	0.003	22 197.774	130					71WU	
4506.972	0.003	22 181.624	200			$2p^5(^2P_{3/2}^\circ)3d\ ^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4508.997	0.003	22 171.663	130			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_1$	71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
4510.475	0.003	22 164.397	160					71WU	
4514.41	0.10	22 145.1	60					71WU	
4517.380	0.003	22 130.519	130			$2p^5(^2P_{3/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4519.201	0.003	22 121.601	200			$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_2$	71WU	
4524.977	0.003	22 093.364	200			$2p^5(^2P_{3/2}^\circ)3d^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4526.61	0.10	22 085.4	40					71WU	
4529.31	0.10	22 072.2	90			$2p^5(^2P_{1/2}^\circ)4p^2[1/2]_1$	$2p^5(^2P_{1/2}^\circ)6s^2[1/2]_1^\circ$	71WU	
4533.323	0.003	22 052.690	200			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4538.03	0.10	22 029.8	60					71WU	
4547.845	0.003	21 982.274	80					71WU	
4549.50	0.10	21 974.3	45					71WU	
4551.518	0.003	21 964.535	200			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4551.787	0.003	21 963.237	80			$2p^5(^2P_{3/2}^\circ)4s^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_1$	71WU	
4558.32	0.10	21 931.8	50					71WU	
4569.07	0.10	21 880.2	70					71WU	
4570.443	0.003	21 873.587	130					71WU	
4573.55	0.10	21 858.7	50					71WU	
4578.42	0.10	21 835.5	60					71WU	
4584.383	0.003	21 807.076	80					71WU	
4590.933	0.003	21 775.963	160		1.98E+6	$2p^53p^1S_0$	$2p^5(^2P_{3/2}^\circ)3d^2[1/2]_1^\circ$	71WU	93HIB/DOU
4598.19	0.10	21 741.6	50					71WU	
4599.74	0.10	21 734.3	60					71WU	
4613.38	0.10	21 670.0	130					71WU	
4614.55	0.10	21 664.5	50					71WU	
4633.94	0.10	21 573.9	50					71WU	
4646.20	0.10	21 516.9	70					71WU	
4689.64	0.10	21 317.6	50			$2p^5(^2P_{3/2}^\circ)4d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)8f^2[9/2]_5$	71WU	
4722.333	0.003	21 170.051	160			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[7/2]_3$	71WU	
4728.60	0.10	21 142.0	40					71WU	
4731.141	0.003	21 130.640	160			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[7/2]_4$	71WU	
4732.502	0.003	21 124.563	100			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4733.74	0.10	21 119.0	45					71WU	
4741.669	0.003	21 083.724	160			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	71WU	
4749.85	0.10	21 047.4	40			$2p^5(^2P_{3/2}^\circ)4d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)8f^2[7/2]_4$	71WU	
4757.71	0.10	21 012.6	50			$2p^5(^2P_{1/2}^\circ)4d^2[3/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)8f^2[5/2]_2$	71WU	
4761.31	0.10	20 996.8	45			$2p^5(^2P_{1/2}^\circ)3d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4768.902	0.003	20 963.326	160			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	71WU	
4788.79	0.10	20 876.3	100			$2p^5(^2P_{1/2}^\circ)3d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4794.49	0.10	20 851.4	45					71WU	
4802.82	0.10	20 815.3	45					71WU	
4810.03	0.10	20 784.1	45					71WU	
4814.75	0.10	20 763.7	50			$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	71WU	
4835.259	0.003	20 675.638	50			$2p^5(^2P_{1/2}^\circ)4s^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	71WU	
4841.88	0.10	20 647.4	45					71WU	
4885.40	0.10	20 463.4	45					71WU	
4907.93	0.10	20 369.5	40					71WU	
4923.80	0.10	20 303.8	45					71WU	
4973.26	0.10	20 101.9	60					71WU	
5133.75	0.10	19 473.5	100					71WU	
5143.11	0.10	19 438.1	60			$2p^5(^2P_{3/2}^\circ)4d^2[1/2]_0^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[3/2]_1$	71WU	
5187.15	0.10	19 273.0	45			$2p^5(^2P_{3/2}^\circ)4d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[5/2]_{2,3}$	71WU	
5191.65	0.10	19 256.3	100			$2p^5(^2P_{3/2}^\circ)4d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[3/2]_2$	71WU	
5195.23	0.10	19 243.1	100					71WU	
5203.33	0.10	19 213.1	50			$2p^5(^2P_{3/2}^\circ)4d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[9/2]_{4,5}$	71WU	
5206.08	0.10	19 203.0	45					71WU	
5208.55	0.10	19 193.9	80			$2p^5(^2P_{3/2}^\circ)4d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[7/2]_{3,4}$	71WU	
5209.94	0.10	19 188.7	40					71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
5213.49	0.10	19 175.7	45			$2p^5(^2P_{3/2}^\circ)4d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[9/2]_4$	71WU	
5228.19	0.10	19 121.8	35					71WU	
5235.31	0.10	19 095.8	45					71WU	
5239.43	0.10	19 080.7	45			$2p^5(^2P_{1/2}^\circ)4d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)7f^2[7/2]_3$	71WU	
5260.66	0.10	19 003.7	50					71WU	
5275.72	0.10	18 949.5	45			$2p^5(^2P_{3/2}^\circ)4d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)7f^2[7/2]_{3,4}$	71WU	
5291.65	0.10	18 892.4	70					71WU	
5304.47	0.10	18 846.8	40					71WU	
5307.36	0.10	18 836.5	45					71WU	
5309.14	0.10	18 830.2	50					71WU	
5360.41	0.10	18 650.1	50					71WU	
5362.46	0.10	18 643.0	40					71WU	
5379.02	0.10	18 585.6	45*	b		$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_1$	$2p^5(^2P_{3/2}^\circ)7g^2[5/2]_2^\circ$	71WU	
5379.02	0.10	18 585.6	200*	b		$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_2$	$2p^5(^2P_{3/2}^\circ)7g^2[5/2]_{2,3}^\circ$	71WU	
5390.63	0.10	18 545.6	60			$2p^5(^2P_{3/2}^\circ)4f^2[9/2]_{4,5}$	$2p^5(^2P_{3/2}^\circ)7g^2[11/2]_{5,6}^\circ$	71WU	
5399.41	0.10	18 515.4	45*	b		$2p^5(^2P_{1/2}^\circ)4f^2[7/2]_{3,4}$	$2p^5(^2P_{1/2}^\circ)7g^2[7/2]_{3,4}^\circ$	71WU	
5399.41	0.10	18 515.4	45*	b		$2p^5(^2P_{1/2}^\circ)4f^2[7/2]_{3,4}$	$2p^5(^2P_{1/2}^\circ)7g^2[9/2]_{4,5}^\circ$	71WU	
5400.464	0.003	18 511.781	70			$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_2$	$2p^5(^2P_{1/2}^\circ)7g^2[7/2]_3^\circ$	71WU	
5402.07	0.10	18 506.3	45*	b		$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	$2p^5(^2P_{3/2}^\circ)7g^2[7/2]_{3,4}^\circ$	71WU	
5402.07	0.10	18 506.3	45*	b		$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	$2p^5(^2P_{3/2}^\circ)7g^2[7/2]_3^\circ$	71WU	
5414.546	0.003	18 463.636	90			$2p^5(^2P_{3/2}^\circ)4f^2[7/2]_{3,4}$	$2p^5(^2P_{3/2}^\circ)7g^2[9/2]_{4,5}^\circ$	71WU	
5441.20	0.10	18 373.2	80					71WU	
5485.90	0.10	18 223.5	35					71WU	
5521.11	0.10	18 107.3	80					71WU	
5533.72	0.10	18 066.0	50					71WU	
5598.30	0.10	17 857.6	50					71WU	
5607.74	0.10	17 827.5	50					71WU	
5655.63	0.10	17 676.6	80					71WU	
5664.78	0.10	17 648.0	100					71WU	
5700.07	0.10	17 538.8	130					71WU	
5706.00	0.10	17 520.6	130					71WU	
5708.12	0.10	17 514.0	130					71WU	
5709.61	0.10	17 509.5	130					71WU	
5716.17	0.10	17 489.4	100					71WU	
5721.38	0.10	17 473.5	100					71WU	
5731.94	0.10	17 441.3	60					71WU	
5748.11	0.10	17 392.2	50					71WU	
5765.37	0.10	17 340.1	60					71WU	
5826.84	0.10	17 157.2	70					71WU	
5836.87	0.10	17 127.7	90					71WU	
5921.35	0.10	16 883.4	130					71WU	
5940.90	0.10	16 827.8	130					71WU	
5973.59	0.10	16 735.7	70					71WU	
6026.67	0.10	16 588.3	50					71WU	
6063.27	0.10	16 488.2	60					71WU	
6121.46	0.10	16 331.5	50					71WU	
6175.25	0.10	16 189.2	60			$2p^5(^2P_{3/2}^\circ)4d^2[1/2]_0^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_1$	71WU	
6187.66	0.10	16 156.7	60					71WU	
6199.26	0.10	16 126.5	70			$2p^5(^2P_{3/2}^\circ)4d^2[1/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_2$	71WU	
6232.22	0.10	16 041.2	60					71WU	
6234.68	0.10	16 034.9	70			$2p^5(^2P_{3/2}^\circ)4d^2[3/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_2$	71WU	
6260.01	0.10	15 970.0	80			$2p^5(^2P_{3/2}^\circ)4d^2[7/2]_4^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[9/2]_5$	71WU	
6274.74	0.10	15 932.5	80			$2p^5(^2P_{3/2}^\circ)4d^2[7/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[9/2]_4$	71WU	
6294.66	0.10	15 882.1	70					71WU	
6310.80	0.10	15 841.5	60			$2p^5(^2P_{1/2}^\circ)4d^2[3/2]_2^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[5/2]_2$	71WU	
6352.83	0.10	15 736.7	60			$2p^5(^2P_{3/2}^\circ)4d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[7/2]_3$	71WU	
6358.05	0.10	15 723.7	60			$2p^5(^2P_{3/2}^\circ)4d^2[5/2]_2^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_{2,3}$	71WU	

TABLE 3. Observed spectral lines of Na II—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
6361.15	0.10	15 716.1	70			$2p^5(^2P_{3/2}^\circ)4d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[7/2]_{3,4}$	71WU	
6366.41	0.10	15 703.1	70			$2p^5(^2P_{3/2}^\circ)4d^2[5/2]_3^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[5/2]_{2,3}$	71WU	
6378.91	0.10	15 672.3	60			$2p^5(^2P_{1/2}^\circ)4d^2[3/2]_1^\circ$	$2p^5(^2P_{1/2}^\circ)6f^2[5/2]_2$	71WU	
6404.79	0.10	15 609.0	60					71WU	
6438.75	0.10	15 526.7	50					71WU	
6444.85	0.10	15 512.0	50					71WU	
6450.76	0.10	15 497.8	45					71WU	
6462.21	0.10	15 470.3	60					71WU	
6471.33	0.10	15 448.5	50					71WU	
6475.290	0.003	15 439.057	50			$2p^5(^2P_{3/2}^\circ)5s^2[3/2]_1^\circ$	$2p^5(^2P_{3/2}^\circ)6f^2[3/2]_1$	71WU	
6514.210	0.003	15 346.815	90			$2p^5(^2P_{3/2}^\circ)4f^2[3/2]_1$	$2p^5(^2P_{3/2}^\circ)6g^2[5/2]_2^\circ$	71WU	
6524.68	0.10	15 322.2	80			$2p^5(^2P_{3/2}^\circ)4f^2[9/2]_{4,5}$	$2p^5(^2P_{3/2}^\circ)6g^2[9/2]_{4,5}^\circ$	71WU	
6530.698	0.003	15 308.070	130			$2p^5(^2P_{3/2}^\circ)4f^2[9/2]_{4,5}$	$2p^5(^2P_{3/2}^\circ)6g^2[11/2]_{5,6}^\circ$	71WU	
6544.036	0.003	15 276.869	130			$2p^5(^2P_{1/2}^\circ)4f^2[5/2]_3$	$2p^5(^2P_{1/2}^\circ)6g^2[7/2]_{3,4}^\circ$	71WU	
6545.753	0.003	15 272.862	130			$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_3$	$2p^5(^2P_{3/2}^\circ)6g^2[7/2]_{3,4}^\circ$	71WU	
6552.432	0.003	15 257.294	80			$2p^5(^2P_{3/2}^\circ)4f^2[5/2]_2$	$2p^5(^2P_{3/2}^\circ)6g^2[5/2]_{2,3}^\circ$	71WU	
6565.850	0.003	15 226.115	15			$2p^5(^2P_{3/2}^\circ)4f^2[7/2]_{3,4}$	$2p^5(^2P_{3/2}^\circ)6g^2[7/2]_{3,4}^\circ$	71WU	
6609.30	0.10	15 126.0	60					71WU	
6651.50	0.10	15 030.1	70					71WU	
6689.00	0.10	14 945.8	45					71WU	
6774.10	0.10	14 758.0	45					71WU	
6789.50	0.10	14 724.6	40					71WU	
6837.80	0.10	14 620.6	25					71WU	

TABLE 4. Energy levels of Na II

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
$2s^22p^6$	1S	0	0.00	2		81MAR/ZAL
$2s^22p^53s$	$^3P^\circ$	2	264 924.32	0.10	100%	81MAR/ZAL
		1	265 689.62	0.10	96%	81MAR/ZAL
		0	266 281.62	0.10	100%	81MAR/ZAL
$2s^22p^53s$	$^1P^\circ$	1	268 762.96	0.10	96%	81MAR/ZAL
$2s^22p^53p$	3S	1	293 220.33	0.10	99%	81MAR/ZAL
$2s^22p^53p$	3D	3	297 248.82	0.10	100%	81MAR/ZAL
		2	297 635.61	0.10	88%	81MAR/ZAL
		1	298 165.44	0.10	91%	81MAR/ZAL
$2s^22p^53p$	1D	2	299 189.96	0.10	65%	81MAR/ZAL
$2s^22p^53p$	1P	1	299 885.37	0.10	60%	81MAR/ZAL
$2s^22p^53p$	3P	2	300 103.92	0.10	67%	81MAR/ZAL
		0	300 387.82	0.10	100%	81MAR/ZAL
		1	300 507.11	0.10	66%	81MAR/ZAL
$2s^22p^53p$	1S	0	308 860.80	0.10	100%	81MAR/ZAL
$2s^22p^5(^2P_{3/2}^\circ)3d$	$^2[1/2]^\circ$	0	330 549.35	0.10	97%	81MAR/ZAL
		1	330 636.75	0.10	74%	81MAR/ZAL
$2s^22p^5(^2P_{3/2}^\circ)3d$	$^2[3/2]^\circ$	2	330 789.05	0.10	56%	81MAR/ZAL
		1	331 745.06	0.10	52%	81MAR/ZAL
$2s^22p^5(^2P_{3/2}^\circ)3d$	$^2[7/2]^\circ$	4	331 123.04	0.10	100%	81MAR/ZAL
		3	331 186.70	0.10	99%	81MAR/ZAL

TABLE 4. Energy levels of Na II—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ⁵ (² P _{3/2} ^o)4s	² [3/2] ^o	2	331 496.51	0.10	68%	81MAR/ZAL
		1	331 873.93	0.10	63%	81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)3d	² [5/2] ^o	2	331 665.59	0.10	88%	81MAR/ZAL
		3	331 707.90	0.10	89%	81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)4s	² [1/2] ^o	0	332 710.11	0.10	97%	81MAR/ZAL
		1	333 162.94	0.10	79%	81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)3d	² [5/2] ^o	2	332 802.21	0.10	88%	81MAR/ZAL
		3	332 841.93	0.10	89%	81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)3d	² [3/2] ^o	2	332 962.57	0.10	85%	81MAR/ZAL
		1	333 107.74	0.10	83%	81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4p	² [1/2]	1	340 239.8	0.5	87%	81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4p	² [5/2] ^o	3	341 255.6	0.5	100%	81MAR/ZAL
		2	341 457.7	0.5	81%	81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4p	² [3/2]	2?	341 907.0	0.5	83%	81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)4p	² [3/2]	1	342 738.6	0.5	94%	81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)4p	² [1/2]	1	342 971.0	0.5	87%	81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4d	² [1/2] ^o	0	352 969.8	0.5		81MAR/ZAL
		1	353 032.9	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4d	² [3/2] ^o	2	353 151.8	0.5		81MAR/ZAL
		1	353 600.6	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4d	² [7/2] ^o	4	353 202.6	0.5		81MAR/ZAL
		3	353 240.4	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4d	² [5/2] ^o	2	353 463.2	0.5		81MAR/ZAL
		3	353 483.8	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)5s	² [3/2] ^o	2	353 536.7	0.5		81MAR/ZAL
		1	353 719.3	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4f	² [3/2]	1	353 837.23	0.10		81MAR/ZAL
		2	353 838.44	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4f	² [9/2]	5	353 881.13	0.10		81MAR/ZAL
		4	353 881.16	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4f	² [5/2]	3	353 925.81	0.10		81MAR/ZAL
		2	353 926.69	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)4f	² [7/2]	3	353 972.42	0.10		81MAR/ZAL
		4	353 972.63	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)4d	² [5/2] ^o	2	354 526.3	0.5		81MAR/ZAL
		3	354 559.2?	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)4d	² [3/2] ^o	2	354 707.0	0.5		81MAR/ZAL
		1	354 876.5	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)5s	² [1/2] ^o	0	354 859.8	0.5		81MAR/ZAL
		1	354 997.8	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)4f	² [7/2] ^o	3	355 280.89	0.10		81MAR/ZAL
		4	355 281.16	0.10		81MAR/ZAL

TABLE 4. Energy levels of Na II—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ⁵ (² P _{1/2} ^o)4f	² [5/2] ^o	3	355 283.70	0.10		81MAR/ZAL
		2	355 284.53	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)5d	² [1/2] ^o	0	363 332.2	0.5		81MAR/ZAL
		1	363 347.4	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)5d	² [3/2] ^o	2	363 441.7	0.5		81MAR/ZAL
		1	363 631.9	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6s	² [3/2] ^o	2	363 610.2	0.5		81MAR/ZAL
		1	363 725.8	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)5f	² [3/2] ^o	1	363 767.98	0.5		81MAR/ZAL
		2	363 769.03	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)5f	² [9/2] ^o	5	363 790.60	0.5		81MAR/ZAL
		4	363 790.64	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)5f	² [5/2] ^o	3	363 814.78	0.5		81MAR/ZAL
		2	363 815.38	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)5f	² [7/2] ^o	3	363 837.82	0.5		81MAR/ZAL
		4	363 837.94	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)5d	² [3/2] ^o	2	364 744.1	0.5		81MAR/ZAL
		1	364 931.1	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)6s	² [1/2] ^o	0	365 009.9	0.5		81MAR/ZAL
		1	365 043.5	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)5f	² [7/2] ^o	3	365 173.42	0.10		81MAR/ZAL
		4	365 173.7	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)5f	² [5/2] ^o	3	365 174.10	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6d	² [1/2] ^o	1	368 494.1	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7s	² [3/2] ^o	1	369 070.5	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6f	² [3/2] ^o	1	369 158.71	0.10		81MAR/ZAL
		2	369 159.46	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6f	² [9/2] ^o	5	369 171.93	0.10		81MAR/ZAL
		4	369 172.01	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6g	² [5/2] ^o	2,3	369 184.02	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6f	² [5/2] ^o	3	369 186.50	0.10		81MAR/ZAL
		2	369 186.73	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6g	² [11/2] ^o	5,6	369 189.22	0.10		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6g	² [7/2] ^o	3,4	369 198.7	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6f	² [7/2] ^o	3,4	369 199.6	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)6g	² [9/2] ^o	4,5	369 203.4	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)6d	² [3/2] ^o	1	370 035.6	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)7s	² [1/2] ^o	1	370 378.6	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)6f	² [7/2] ^o	3,4	370 547.8	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)6f	² [5/2] ^o	3	370 548.06?	0.10		81MAR/ZAL
		2	370 548.50?	0.10		81MAR/ZAL

TABLE 4. Energy levels of Na II—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ⁵ (² P _{1/2} ^o)6g	² [9/2] ^o	4,5	370 560.6	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)6g	² [7/2] ^o	3,4	370 560.6	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7f	² [3/2] ^o	1	372 407.6	0.5		81MAR/ZAL
		2	372 407.9	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7f	² [9/2] ^o	4,5	372 415.9	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7g	² [5/2] ^o	2,3	372 423.4	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7f	² [5/2] ^o	2,3	372 425.4	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7g	² [11/2] ^o	5,6	372 426.7	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7g	² [7/2] ^o	3,4	372 432.3	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7f	² [7/2] ^o	3,4	372 433.3	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)7g	² [9/2] ^o	4,5	372 436.2	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)7f	² [7/2] ^o	3,4	373 787.8	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)7f	² [5/2] ^o	2,3	373 788.1	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)7g	² [9/2] ^o	4,5	373 796.4	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)7g	² [7/2] ^o	3,4	373 796.4	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)8f	² [3/2] ^o	1,2	374 514.9	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)8f	² [9/2] ^o	4,5	374 520.3	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{3/2} ^o)8f	² [7/2] ^o	3,4	374 532.1	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)8f	² [7/2] ^o	3,4	375 890.0	0.5		81MAR/ZAL
2s ² 2p ⁵ (² P _{1/2} ^o)8f	² [5/2] ^o	2,3	375 890.0	0.5		81MAR/ZAL
Na III (2s²2p⁵ ²P_{3/2}^o)	<i>Limit</i>	—	381 390.2	2		81MAR/ZAL
Na III (2s²2p⁵ ²P_{1/2}^o)	<i>Limit</i>	—	382 756.5	2		81MAR/ZAL
2s2p ⁶ 3s	³ S	1	530 900	200		94DOR
2s2p ⁶ 3s	¹ S	0	534 300	200		94DOR
2s2p ⁶ 3p	³ P ^o	0,1,2	562 300	200		95DOR/NIE
2s2p ⁶ 3p	¹ P ^o	1	564 200	200		95DOR/NIE
2s2p ⁶ 4s	³ S	1	596 000	200		94DOR
2s2p ⁶ 4s	¹ S	0	597 000	200		94DOR
2s2p ⁶ 4p	³ P ^o	0,1,2	605 800	200		95DOR/NIE
2s2p ⁶ 4p	¹ P ^o	1	606 500	200		95DOR/NIE
2s2p ⁶ 5p	¹ P ^o	1	622 400	200		81MAR/ZAL
2s2p ⁶ 6p	¹ P ^o	1	630200	200		81MAR/ZAL
2s2p ⁶ 7p	¹ P ^o	1	634700	200		81MAR/ZAL
2s2p ⁶ 8p	¹ P ^o	1	637 400	200		81MAR/ZAL
Na III (2s2p⁶ ²S_{1/2})	<i>Limit</i>	—	645 800	200		81MAR/ZAL

6.3. Na III

F isoelectronic sequence**Ground state** $1s^2 2s^2 2p^5 \ ^2P_{3/2}^\circ$ **Ionization energy** [557 654(10) cm^{-1}]; [71.6205(12) eV]

A flurry of early activity established many levels of the Na III spectrum. Mack and Sawyer [30MAC/SAW] reported two lines which determined the ground state splitting and the location of the $2s^2 2p^6 \ ^2S_{1/2}$ level. Vance [32VAN] measured 11 lines between 230 Å and 380 Å and Söderqvist [32SOD, 34SOD] added a further 27 transitions and extended the range of measurements down to 183 Å. The analysis of the spectrum was enhanced even more by Tomboulion [38TOM] who observed transitions in the 1100 Å–2560 Å region between levels of the $2s^2 2p^4 nl$ configurations. The Na III spectrum has been remeasured and analyzed by Lundström and Minnhagen [72LUN/MIN], Minnhagen and Nietsche [72MIN/NIE], and Minnhagen [75MIN]. Lundström and Minnhagen [72LUN/MIN] gave wavelengths for 90 Na III lines in the 180 Å–380 Å range and a measurement of the $2s^2 2p^6 \ ^2S_{1/2}$ – $2s^2 2p^4 (^4P) 3p^2 \ ^2P_{3/2}^\circ$ line. Minnhagen and Nietsche [72MIN/NIE] reported classifications of 177 lines in the region 1325 Å–2638 Å. Minnhagen [75MIN] measured 80 lines between 1755 and 2010 Å which are classified as $2s^2 2p^4 3d$ – $4f$ transitions. The energy levels reported below have been compiled by Martin and Zalubas [81MAR/ZAL], while the leading percentages for $3d$ and $3p$ levels are from [72MIN/NIE] and those for $4f$ levels are from [75MIN]. The forbidden transition between levels in the ground state has recently been observed by Feuchtgruber *et al.* [97FEU/LUT], resulting in an improved value for the $2s^2 2p^5 \ ^2P_{1/2}^\circ$ level. Because there is a large amount of configuration mixing, the terms for the $J=5/2$ levels at 464 390 cm^{-1} , 49 495 cm^{-1} , and 465 398 cm^{-1} cannot be unambiguously assigned; hence the term designations are chosen so each level has a unique name, even though the name given might not be that of the largest component. The uncertainty of the $n=3$ and $4s$ and $4f$ levels with respect to the ground term is about $\pm 3 \text{ cm}^{-1}$; however, their internal consistency is much better, as indicated by the uncertainties in the table. Johannesson and Lundström [73JOH/LUN] derived the ionization energy cited above using isoelectronic interpolation. No estimate of the error was given, but it is probably close to the $\pm 10 \text{ cm}^{-1}$ which they gave for their Mg IV limit determination (see Tables 5 and 6).

The transition probabilities of allowed transitions of Na III have been calculated by McPeake and Hibbert [00MCP/HIB] using a modified Breit–Pauli Hamiltonian and compiled by Kelleher and Podobedova [08KEL/POD] along with multi-configuration Hartree-Fock calculations of Tachiev and Froese Fischer [02TAC/FROa, 02TAC/FROb]. For transitions to levels with $n=4$, Kelleher and Podobedova [08KEL/POD] reported the Opacity Project values of Butler and Zeippen [95BUT/ZEI] since these transitions were not calculated by the more accurate methods. Values for the $2s^2 2p^4 (^3P) 3s \ ^2P$ – $2s^2 2p^4 (^3P) 3p \ ^2D^\circ$ transition probabilities

have been taken from Froese Fischer and Tachiev [04FRO/TAC], which were also obtained using the multiconfiguration Hartree-Fock method.

References for Na III

- | | |
|------------|---|
| 30MAC/SAW | J. E. Mack and R. A. Sawyer, <i>Phys. Rev.</i> 35 , 299 (1930). |
| 32SOD | J. Söderqvist, <i>Z. Phys.</i> 79 , 634 (1932). |
| 32VAN | B. B. Vance, <i>Phys. Rev.</i> 41 , 480 (1932). |
| 34SOD | J. Söderqvist, <i>Nova Acta Regiae Soc. Sci. Ups.</i> 9 , 1 (1934). |
| 38TOM | D. H. Tomboulion, <i>Phys. Rev.</i> 54 , 347 (1938). |
| 72LUN/MIN | T. Lundström and L. Minnhagen, <i>Phys. Scr.</i> 5 , 243 (1972). |
| 72MIN/NIE | L. Minnhagen and H. Nietsche, <i>Phys. Scr.</i> 5 , 237 (1972). |
| 73JOH/LUN | G. A. Johannesson and T. Lundström, <i>Phys. Scr.</i> 8 , 53 (1973). |
| 75MIN | L. Minnhagen, <i>Phys. Scr.</i> 11 , 38 (1975). |
| 81MAR/ZAL | W. C. Martin and R. Zalubas, <i>J. Phys. Chem. Ref. Data</i> 10 , 153 (1981). |
| 97FEU/LUT | H. Feuchtgruber, D. Lutz, D. A. Beintma, E. A. Valentijn, O. H. Bauer, D. R. Boxhoorn, T. De Graauw, L. N. Haser, G. Haerendel, A. M. Heras, R. O. Katterloher, D. J. M. Kester, F. Lahuis, K. J. Leech, P. W. Morris, P. R. Roelfsma, S. G. Schaeidt, H. W. W. Spoon, B. Vanden-Bussche, and E. Wieprecht, <i>Astrophys. J.</i> 487 , 963 (1997). |
| 00MCP/HIB | D. McPeake and A. Hibbert, <i>J. Phys. B</i> 33 , 2809 (2000). |
| 02TAC/FROa | G. Tachiev and C. Froese Fischer, http://www.vuse.vanderbilt.edu/~cff/mchf_collection/ (downloaded December 2002). |
| 02TAC/FROb | G. Tachiev and C. Froese Fischer, <i>Astron. Astrophys.</i> 385 , 716 (2002). |
| 04FRO/TAC | C. Froese Fischer and G. Tachiev, <i>At. Data Nucl. Data Tables</i> 87 , 1 (2004). |
| 08KEL/POD | D. E. Kelleher and L. Podobedova, <i>J. Phys. Chem. Ref. Data</i> 37 , 267 (2008). |

TABLE 5. Observed spectral lines of Na III

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>									
181.023	0.002	552 416.				2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)5s 2D _{5/2}	72LUN/MIN	
181.023	0.002	552 416.	3*			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)5s 2D _{3/2}	72LUN/MIN	
181.476	0.002	551 037.	3	w		2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)5s 2D _{3/2}	72LUN/MIN	
182.511	0.002	547 912.	1			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ S)4s 2S _{1/2}	72LUN/MIN	
182.968	0.002	546 544.	1			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ S)4s 2S _{1/2}	72LUN/MIN	
183.515	0.002	544 915.	1			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)4d 2F _{5/2}	72LUN/MIN	
183.556	0.002	544 793.	3	b		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)4d 2D _{3/2}	72LUN/MIN	
183.571	0.002	544 748.	4	b		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)4d 2D _{5/2}	72LUN/MIN	
183.729	0.002	544 280.	3	b		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)4d 2P _{1/2}	72LUN/MIN	
183.747	0.002	544 227.	4	b		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)4d 2P _{3/2}	72LUN/MIN	
183.946	0.002	543 638.	5	w		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)4d 2S _{1/2}	72LUN/MIN	
184.019	0.002	543 422.	4			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)4d 2D _{3/2}	72LUN/MIN	
184.193	0.002	542 909.	4	b		2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)4d 2P _{1/2}	72LUN/MIN	
184.206	0.002	542 870.	4	w		2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)4d 2P _{3/2}	72LUN/MIN	
184.409	0.002	542 273.	4			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)4d 2S _{1/2}	72LUN/MIN	
188.858	0.002	529 498.	3	b	5.42E+8	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ S)3d 2D _{3/2}	72LUN/MIN	08KEL/POD
188.8739	0.002	529 454.	4	b	3.34E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ S)3d 2D _{5/2}	72LUN/MIN	08KEL/POD
189.3488	0.002	528 126.	5		3.07E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ S)3d 2D _{3/2}	72LUN/MIN	08KEL/POD
191.000	0.002	523 560.	5	b		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)5s 2P _{1/2}	72LUN/MIN	
191.3070	0.002	522 720.	4			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)5s 2P _{3/2}	72LUN/MIN	
191.5118	0.002	522 161.	3			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)5s 2P _{1/2}	72LUN/MIN	
191.808	0.002	521 355.	2	w		2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)5s 2P _{3/2}	72LUN/MIN	
193.8043	0.002	515 984.	5			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 2P _{3/2}	72LUN/MIN	
194.0372	0.002	515 365.	5	w		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 2D _{5/2}	72LUN/MIN	
194.1213	0.002	515 142.	4			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 2P _{1/2}	72LUN/MIN	
194.1689	0.002	515 016.	5	w		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 2D _{3/2}	72LUN/MIN	
194.2926	0.002	514 688.	5			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 2F _{5/2}	72LUN/MIN	
194.3228	0.002	514 608.	4*			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4d 2P _{3/2}	72LUN/MIN	
194.3228	0.002	514 608.	4*			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 4P _{5/2}	72LUN/MIN	
194.4617	0.002	514 240.	5			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 4F _{3/2}	72LUN/MIN	
194.530	0.002	514 060.	2	b		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 4P _{3/2}	72LUN/MIN	
194.550	0.002	514 007.	5	b		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4d 4F _{5/2}	72LUN/MIN	
194.6392	0.002	513 771.	5			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4d 2P _{1/2}	72LUN/MIN	
194.6842	0.002	513 652.	6			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4d 2D _{3/2}	72LUN/MIN	
194.9795	0.002	512 874.	5			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4d 4F _{3/2}	72LUN/MIN	
195.0447	0.002	512 703.	3			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4d 4P _{3/2}	72LUN/MIN	
195.5321	0.002	511 425.	6*			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)4s 2D _{5/2}	72LUN/MIN	
195.5321	0.002	511 425.	6*			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)4s 2D _{3/2}	72LUN/MIN	
196.0546	0.002	510 062.	5			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)4s 2D _{3/2}	72LUN/MIN	
201.845	0.002	495 430.	2			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)3d 2F _{5/2}	72LUN/MIN	
202.1499	0.002	494 682.	6		1.40E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)3d 2D _{3/2}	72LUN/MIN	08KEL/POD
202.1862	0.002	494 594.	6		7.21E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)3d 2D _{5/2}	72LUN/MIN	08KEL/POD
202.4947	0.002	493 840.	8		1.59E+10	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)3d 2S _{1/2}	72LUN/MIN	08KEL/POD
202.709	0.002	493 318.	5	b	6.40E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)3d 2D _{3/2}	72LUN/MIN	08KEL/POD
202.721	0.002	493 289.	7	b	6.72E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)3d 2P _{1/2}	72LUN/MIN	08KEL/POD
202.7645	0.002	493 183.	8		1.26E+10	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)3d 2P _{3/2}	72LUN/MIN	08KEL/POD
203.055	0.002	492 477.	8	b	1.03E+10	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)3d 2S _{1/2}	72LUN/MIN	08KEL/POD
203.284	0.002	491 923.	8		9.24E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)3d 2P _{1/2}	72LUN/MIN	08KEL/POD
203.326	0.002	491 821.	3		2.73E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)3d 2P _{3/2}	72LUN/MIN	08KEL/POD
206.8743	0.002	483 385.	6			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4s 2P _{1/2}	72LUN/MIN	
207.297	0.002	482 400.	10			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4s 2P _{3/2}	72LUN/MIN	
207.4609	0.002	482 019.	6			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4s 2P _{1/2}	72LUN/MIN	
207.746	0.002	481 357.	1			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4s 4P _{1/2}	72LUN/MIN	
207.8859	0.002	481 033.	7			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4s 2P _{3/2}	72LUN/MIN	
207.9964	0.002	480 778.	5			2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4s 4P _{3/2}	72LUN/MIN	
208.338	0.002	479 989.	1	b		2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4s 4P _{1/2}	72LUN/MIN	

TABLE 5. Observed spectral lines of Na III—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
208.343	0.002	479 978.	1	b,w		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{5/2}	72LUN/MIN	
208.591	0.002	479 407.	2			2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{3/2}	72LUN/MIN	
214.2237	0.002	466 802.	7		5.16E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ² P _{3/2}	72LUN/MIN	08KEL/POD
214.5885	0.002	466 008.	8		3.33E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ² P _{1/2}	72LUN/MIN	08KEL/POD
214.860	0.002	465 419.	6	b	5.65E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3d ² P _{3/2}	72LUN/MIN	08KEL/POD
214.874	0.002	465 389.	8	b		2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ² D _{5/2}	72LUN/MIN	
215.047	0.002	465 015.	8	b	4.49E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ² D _{3/2}	72LUN/MIN	08KEL/POD
215.082	0.002	464 939.	8	b	6.06E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	72LUN/MIN	08KEL/POD
215.218	0.002	464 645.	3	b	6.06E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3d ² P _{1/2}	72LUN/MIN	08KEL/POD
215.228	0.002	464 624.	15	b	1.65E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	72LUN/MIN	08KEL/POD
215.324	0.002	464 416.	2	b	6.36E+7	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2}	72LUN/MIN	08KEL/POD
215.340	0.002	464 382.	10	b	5.31E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ² F _{5/2}	72LUN/MIN	08KEL/POD
215.4819	0.002	464 076.	8		6.98E+8	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2}	72LUN/MIN	08KEL/POD
215.659	0.002	463 695.	7	b	2.21E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2}	72LUN/MIN	08KEL/POD
215.683	0.002	463 643.	7	b	9.78E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3d ² D _{3/2}	72LUN/MIN	08KEL/POD
215.8607	0.002	463 262.	12		1.72E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	72LUN/MIN	08KEL/POD
215.964	0.002	463 040.	1		3.03E+7	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2}	72LUN/MIN	08KEL/POD
216.1187	0.002	462 709.	12		1.57E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2}	72LUN/MIN	08KEL/POD
217.043	0.002	460 738.	1		1.23E+7	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2}	72LUN/MIN	08KEL/POD
217.1140	0.002	460 588.	3		2.44E+7	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	72LUN/MIN	08KEL/POD
217.1982	0.002	460 409.	2	h	6.79E+6	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	72LUN/MIN	08KEL/POD
217.6861	0.002	459 377.	2		2.55E+7	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2}	72LUN/MIN	08KEL/POD
217.757	0.002	459 227.	1		4.92E+6	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	72LUN/MIN	08KEL/POD
229.8693	0.002	435 030.	15		2.91E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ S)3s ² S _{1/2}	72LUN/MIN	08KEL/POD
230.5933	0.002	433 664.	12		1.59E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ S)3s ² S _{1/2}	72LUN/MIN	08KEL/POD
250.5168	0.002	399 175.	50*	s	6.10E+8	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)3s ² D _{3/2}	72LUN/MIN	08KEL/POD
250.5168	0.002	399 175.	50*	s	4.49E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (¹ D)3s ² D _{5/2}	72LUN/MIN	08KEL/POD
251.3720	0.002	397 817.	30		3.87E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (¹ D)3s ² D _{3/2}	72LUN/MIN	08KEL/POD
266.8965	0.002	374 677.	25		3.90E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3s ² P _{1/2}	72LUN/MIN	08KEL/POD
267.6458	0.002	373 628.	70		9.67E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3s ² P _{3/2}	72LUN/MIN	08KEL/POD
267.8740	0.002	373 310.	50		7.56E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3s ² P _{1/2}	72LUN/MIN	08KEL/POD
268.6261	0.002	372 265.	50		1.77E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3s ² P _{3/2}	72LUN/MIN	08KEL/POD
272.076	0.002	367 544.	20	b	1.27E+6	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3s ⁴ P _{1/2}	72LUN/MIN	08KEL/POD
272.4492	0.002	367 041.	20		3.37E+7	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2}	72LUN/MIN	08KEL/POD
273.0896	0.002	366 180.	3	b,w	1.46E+7	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3s ⁴ P _{1/2}	72LUN/MIN	08KEL/POD
273.103	0.002	366 162.	2	b	2.04E+6	2s ² 2p ⁵ 2P [°] _{3/2}	2s ² 2p ⁴ (³ P)3s ⁴ P _{5/2}	72LUN/MIN	08KEL/POD
273.4677	0.002	365 674.	3		3.46E+6	2s ² 2p ⁵ 2P [°] _{1/2}	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2}	72LUN/MIN	08KEL/POD
378.136	0.002	264 455.1	100		8.42E+9	2s ² 2p ⁵ 2P [°] _{3/2}	2s2p ⁶ ² S _{1/2}	72LUN/MIN	08KEL/POD
380.100	0.002	263 088.7	70		4.13E+9	2s ² 2p ⁵ 2P [°] _{1/2}	2s2p ⁶ ² S _{1/2}	72LUN/MIN	08KEL/POD
1 325.70	0.010	75 431.8	3		2.29E+8	2s ² 2p ⁴ (³ P)3p ² P _{3/2}	2s ² 2p ⁴ (¹ D)3d ² S _{1/2}	72MIN/NIE	08KEL/POD
1 336.76	0.010	74 807.7	7		4.27E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{1/2}	72MIN/NIE	95BUT/ZEI
1 337.358	0.005	74 774.3	7		1.61E+8	2s ² 2p ⁴ (³ P)3p ² P _{3/2}	2s ² 2p ⁴ (¹ D)3d ² P _{3/2}	72MIN/NIE	08KEL/POD
1 337.995	0.005	74 738.7	2		1.28E+8	2s ² 2p ⁴ (³ P)3p ² P _{1/2}	2s ² 2p ⁴ (¹ D)3d ² P _{1/2}	72MIN/NIE	08KEL/POD
1 340.674	0.005	74 589.3	8		2.29E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{3/2}	72MIN/NIE	95BUT/ZEI
1 342.390	0.005	74 494.0	9	b	8.44E+7	2s ² 2p ⁴ (³ P)3p ⁴ P _{1/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{1/2}	72MIN/NIE	95BUT/ZEI
1 342.729	0.005	74 475.2	10		1.06E+8	2s ² 2p ⁴ (³ P)3s ² P _{3/2}	2s ² 2p ⁴ (¹ D)3p ² P _{1/2}	72MIN/NIE	08KEL/POD
1 355.281	0.005	73 785.4	11		3.44E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{5/2}	72MIN/NIE	95BUT/ZEI
1 361.896	0.005	73 427.0	12*		2.24E+8	2s ² 2p ⁴ (³ P)3s ² P _{1/2}	2s ² 2p ⁴ (¹ D)3p ² P _{1/2}	72MIN/NIE	08KEL/POD
1 361.896	0.005	73 427.0	12*		1.45E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{5/2}	72MIN/NIE	95BUT/ZEI
1 372.340	0.005	72 868.2	11		5.81E+7	2s ² 2p ⁴ (³ P)3s ² P _{1/2}	2s ² 2p ⁴ (¹ D)3p ² P _{3/2}	72MIN/NIE	08KEL/POD
1 418.559	0.005	70 494.1	9*	b	2.87E+7	2s ² 2p ⁴ (¹ D)3p ² F _{5/2}	2s ² 2p ⁴ (¹ D)4s ² D _{5/2}	72MIN/NIE	95BUT/ZEI
1 418.559	0.005	70 494.1	9*	b	6.02E+8	2s ² 2p ⁴ (¹ D)3p ² F _{5/2}	2s ² 2p ⁴ (¹ D)4s ² D _{3/2}	72MIN/NIE	95BUT/ZEI
1 420.885	0.005	70 378.7	10		5.73E+8	2s ² 2p ⁴ (¹ D)3p ² F _{7/2}	2s ² 2p ⁴ (¹ D)4s ² D _{5/2}	72MIN/NIE	95BUT/ZEI
1 440.775	0.005	69 407.1	7		3.26E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{1/2}	72MIN/NIE	95BUT/ZEI
1 444.194	0.005	69 242.8	0		4.07E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{3/2}	72MIN/NIE	95BUT/ZEI
1 445.731	0.005	69 169.2	7		3.22E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{1/2}	2s ² 2p ⁴ (³ P)4s ⁴ P _{1/2}	72MIN/NIE	95BUT/ZEI
1 447.85	0.010	69 067.9	2		3.28E+8	2s ² 2p ⁴ (¹ S)3p ² P _{1/2}	2s ² 2p ⁴ (¹ S)4s ² S _{1/2}	72MIN/NIE	95BUT/ZEI

TABLE 5. Observed spectral lines of Na III—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1 448.73	0.010	69 026.0	3		6.55E+8	2s ² 2p ⁴ (¹ S)3p ² P _{3/2} ^o	2s ² 2p ⁴ (¹ S)4s ² S _{1/2}	72MIN/NIE	95BUT/ZEI
1 449.311	0.005	68 998.3	2		5.12E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{7/2} ^o	2s ² 2p ⁴ (³ P)4s ⁴ P _{5/2}	72MIN/NIE	95BUT/ZEI
1 452.911	0.005	68 827.3	8		2.03E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	2s ² 2p ⁴ (³ P)4s ⁴ P _{3/2}	72MIN/NIE	95BUT/ZEI
1 457.939	0.005	68 590.0	2		3.14E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{1/2} ^o	2s ² 2p ⁴ (³ P)4s ⁴ P _{3/2}	72MIN/NIE	95BUT/ZEI
1 461.153	0.005	68 439.1	7		1.12E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	2s ² 2p ⁴ (³ P)4s ⁴ P _{5/2}	72MIN/NIE	95BUT/ZEI
1 465.926	0.005	68 216.3	9		6.04E+8	2s ² 2p ⁴ (³ P)3p ² D _{3/2} ^o	2s ² 2p ⁴ (³ P)4s ² P _{1/2}	72MIN/NIE	95BUT/ZEI
1 468.000	0.005	68 119.9	1	b	5.43E+8	2s ² 2p ⁴ (³ P)3p ² D _{5/2} ^o	2s ² 2p ⁴ (³ P)4s ² P _{3/2}	72MIN/NIE	95BUT/ZEI
1 487.438	0.005	67 229.7	5		5.79E+7	2s ² 2p ⁴ (³ P)3p ² D _{3/2} ^o	2s ² 2p ⁴ (³ P)4s ² P _{3/2}	72MIN/NIE	95BUT/ZEI
1 523.548	0.005	65 636.3	7*		1.88E+7	2s ² 2p ⁴ (¹ D)3p ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D)4s ² D _{5/2}	72MIN/NIE	95BUT/ZEI
1 523.548	0.005	65 636.3	7*		2.54E+8	2s ² 2p ⁴ (¹ D)3p ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D)4s ² D _{3/2}	72MIN/NIE	95BUT/ZEI
1 525.301	0.005	65 560.8	9*		2.63E+8	2s ² 2p ⁴ (¹ D)3p ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D)4s ² D _{5/2}	72MIN/NIE	95BUT/ZEI
1 525.301	0.005	65 560.8	9*		2.82E+7	2s ² 2p ⁴ (¹ D)3p ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D)4s ² D _{3/2}	72MIN/NIE	95BUT/ZEI
1 526.883	0.005	65 492.9	6			2s ² 2p ⁴ (³ P)3p ² S _{1/2} ^o	2s ² 2p ⁴ (³ P)4s ² P _{3/2}	72MIN/NIE	
1 539.145	0.005	64 971.1	7	b	1.24E+8	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)4s ² P _{1/2}	72MIN/NIE	95BUT/ZEI
1 542.46	0.010	64 831.5	9	b	2.47E+8	2s ² 2p ⁴ (³ P)3p ² P _{1/2} ^o	2s ² 2p ⁴ (³ P)4s ² P _{1/2}	72MIN/NIE	95BUT/ZEI
1 562.870	0.005	63 984.8	11		2.98E+8	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)4s ² P _{3/2}	72MIN/NIE	95BUT/ZEI
1 563.61	0.010	63 954.6	3		8.51E+7	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)4s ⁴ P _{1/2}	72MIN/NIE	95BUT/ZEI
1 565.294	0.005	63 885.8	10*		2.38E+8	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D)4s ² D _{5/2}	72MIN/NIE	95BUT/ZEI
1 565.294	0.005	63 885.8	10*		3.95E+7	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D)4s ² D _{3/2}	72MIN/NIE	95BUT/ZEI
1 577.90	0.010	63 375.4	9	b	8.25E+7	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)4s ⁴ P _{3/2}	72MIN/NIE	95BUT/ZEI
1 579.117	0.005	63 326.5	8		1.93E+8	2s ² 2p ⁴ (¹ D)3p ² P _{1/2} ^o	2s ² 2p ⁴ (¹ D)4s ² D _{3/2}	72MIN/NIE	95BUT/ZEI
1 598.177	0.005	62 571.3	10		7.96E+7	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)4s ⁴ P _{5/2}	72MIN/NIE	95BUT/ZEI
1 688.942	0.005	59 208.7	11			2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{5/2}	72MIN/NIE	
1 699.293	0.005	58 848.0	10			2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{5/2}	72MIN/NIE	
1 701.970	0.005	58 755.4	8		1.35E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	72MIN/NIE	08KEL/POD
1 711.124	0.005	58 441.1	10		1.52E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	72MIN/NIE	08KEL/POD
1 712.482	0.005	58 394.8	9		8.91E+7	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	72MIN/NIE	08KEL/POD
1 728.273	0.005	57 861.2	11		4.10E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2}	72MIN/NIE	08KEL/POD
1 728.923	0.005	57 839.5	1		8.00E+6	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² F _{5/2}	72MIN/NIE	08KEL/POD
1 730.71	0.010	57 779.8	0		2.47E+6	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ² F _{7/2}	72MIN/NIE	08KEL/POD
1 731.113	0.005	57 766.3	10		1.87E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	72MIN/NIE	08KEL/POD
1 737.711	0.005	57 547.0	8		1.13E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2}	72MIN/NIE	08KEL/POD
1 755.475	0.005	56 964.6	10			2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	2s ² 2p ⁴ (³ P ₀)4f ² [3] _{7/2} ^o	75MIN	
1 761.018	0.005	56 785.3	3			2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	2s ² 2p ⁴ (³ P ₀)4f ² [3] _{5/2} ^o	75MIN	
1 761.428	0.005	56 772.1	3			2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2}	2s ² 2p ⁴ (³ P ₁)4f ² [3] _{7/2} ^o	75MIN	
1 766.700	0.005	56 602.7	8			2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2}	2s ² 2p ⁴ (³ P ₁)4f ² [4] _{9/2} ^o	75MIN	
1 771.35	0.010	56 454.1	2			2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	2s ² 2p ⁴ (³ P ₁)4f ² [4] _{7/2} ^o	75MIN	
1 778.402	0.005	56 230.3	7			2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	75MIN	
1 783.460	0.005	56 070.8	9			2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2}	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{3/2} ^o	75MIN	
1 801.267	0.005	55 516.5	3	b		2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{5/2} ^o	75MIN	
1 805.02	0.010	55 401.0	1			2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [1] _{1/2} ^o	75MIN	
1 805.764	0.005	55 378.2	7			2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{7/2} ^o	75MIN	
1 806.229	0.005	55 364.0	7			2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{5/2} ^o	75MIN	
1 806.684	0.005	55 350.0	7			2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2}	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{7/2} ^o	75MIN	
1 807.070	0.005	55 338.2	15			2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2}	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{9/2} ^o	75MIN	
1 810.071	0.005	55 246.5	2			2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2}	2s ² 2p ⁴ (³ P ₂)4f ² [1] _{1/2} ^o	75MIN	
1 810.767	0.005	55 225.2	10*			2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{7/2} ^o	75MIN	
1 810.767	0.005	55 225.2	10*			2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{5/2} ^o	75MIN	
1 811.671	0.005	55 197.7	11			2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{7/2} ^o	75MIN	
1 812.555	0.005	55 170.7	8			2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{3/2} ^o	75MIN	
1 816.812	0.005	55 041.5	10			2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{5/2} ^o	75MIN	
1 817.617	0.005	55 017.1	8			2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{3/2} ^o	75MIN	
1 832.39	0.010	54 573.5	7	b		2s ² 2p ⁴ (¹ D)3d ² G _{9/2}	2s ² 2p ⁴ (¹ D ₂)4f ² [4] _{7/2} ^o	75MIN	
1 835.223	0.0055	4 489.3	10	b	3.31E+8	2s ² 2p ⁴ (¹ D)3p ² F _{5/2}	2s ² 2p ⁴ (¹ D)3d ² F _{5/2}	72MIN/NIE	08KEL/POD
1 838.122	0.005	54 403.4	8	b	6.77E+7	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	72MIN/NIE	08KEL/POD
1 838.944	0.005	54 379.0	10		3.31E+8	2s ² 2p ⁴ (¹ D)3p ² F _{7/2}	2s ² 2p ⁴ (¹ D)3d ² F _{7/2}	72MIN/NIE	08KEL/POD
1 844.362	0.005	54 219.3	11		3.00E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	72MIN/NIE	08KEL/POD

TABLE 5. Observed spectral lines of Na III—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1 845.149	0.005	54 196.2	9		1.69E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2} ^o	72MIN/NIE	08KEL/POD
1 847.527	0.005	54 126.4	10	b		2s ² 2p ⁴ (¹ D)3d ² G _{9/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [5] _{11/2} ^o	75MIN	
1 847.589	0.005	54 124.6	10	b		2s ² 2p ⁴ (¹ D)3d ² G _{7/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [5] _{9/2} ^o	75MIN	
1 849.564	0.005	54 066.8	15		6.87E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2} ^o	72MIN/NIE	08KEL/POD
1 850.379	0.005	54 043.0	12		4.37E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2} ^o	72MIN/NIE	08KEL/POD
1 855.92	0.010	53 881.6	10	b	5.77E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2} ^o	72MIN/NIE	08KEL/POD
1 856.71	0.010	53 858.7	10	b	4.22E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2} ^o	72MIN/NIE	08KEL/POD
1 860.610	0.005	53 745.8	1		4.97E+7	2s ² 2p ⁴ (¹ D)3p ² F _{5/2} ^o	2s ² 2p ⁴ (¹ D)3d ² D _{3/2} ^o	72MIN/NIE	08KEL/POD
1 861.211	0.005	53 613.2	10		2.34E+8	2s ² 2p ⁴ (³ P)3p ⁴ P _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2} ^o	72MIN/NIE	08KEL/POD
1 865.177	0.005	53 614.2	8			2s ² 2p ⁴ (³ P)3d ⁴ F _{7/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [4] _{9/2} ^o	75MIN	
1 867.517	0.005	53 547.0	1		4.31E+7	2s ² 2p ⁴ (¹ D)3p ² F _{7/2} ^o	2s ² 2p ⁴ (¹ D)3d ² D _{5/2} ^o	72MIN/NIE	08KEL/POD
1 875.522	0.005	53 318.5	10	b		2s ² 2p ⁴ (¹ D)3d ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [2] _{5/2} ^o	75MIN	
1 876.155	0.005	53 300.5	8			2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2} ^o	2s ² 2p ⁴ (³ P ₀)4f ² [3] _{5/2} ^o	75MIN	
1 879.16	0.010	53 215.3	4			2s ² 2p ⁴ (¹ D)3d ² P _{1/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [2] _{3/2} ^o	75MIN	
1 880.663	0.005	53 172.7	10			2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [4] _{7/2} ^o	75MIN	
1 884.69	0.010	53 059.1	3			2s ² 2p ⁴ (³ P)3d ² F _{7/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [3] _{7/2} ^o	75MIN	
1 886.96	0.010	52 995.3	8*	b		2s ² 2p ⁴ (¹ D)3d ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [1] _{3/2} ^o	72MIN/NIE	
1 886.96	0.010	52 995.3	8*	b		2s ² 2p ⁴ (³ P)3p ⁴ D _{7/2} ^o	2s ² 2p ⁴ (³ P)3d ² F _{7/2} ^o	72MIN/NIE	
1 887.32	0.005	52 985.2	4	b		2s ² 2p ⁴ (³ P)3d ² F _{5/2} ^o	2s ² 2p ⁴ (³ P ₀)4f ² [3] _{7/2} ^o	75MIN	
1 887.39	0.005	52 983.2	10	b		2s ² 2p ⁴ (³ P)3d ⁴ F _{9/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [5] _{9/2} ^o	75MIN	95BUT/ZEI
1 887.472	0.005	52 980.9	20	b	1.25E+9	2s ² 2p ⁴ (³ P)3d ⁴ F _{9/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [5] _{11/2} ^o	75MIN	
1 888.375	0.005	52 955.6	8			2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [3] _{5/2} ^o	75MIN	
1 890.59	0.010	52 893.5	3	b		2s ² 2p ⁴ (³ P)3d ² F _{7/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [4] _{7/2} ^o	75MIN	
1 890.754	0.005	52 889.0	15	b		2s ² 2p ⁴ (³ P)3d ² F _{7/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [4] _{9/2} ^o	75MIN	
1 892.01	0.010	52 853.8	1*	b	2.21E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ² F _{5/2} ^o	72MIN/NIE	08KEL/POD
1 892.01	0.010	52 853.8	1*	b		2s ² 2p ⁴ (³ P)3d ² F _{7/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	72MIN/NIE	
1 895.864	0.005	52 746.4	6*			2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	75MIN	
1 895.864	0.005	52 746.4	6*			2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P ₀)4f ² [3] _{5/2} ^o	75MIN	
1 897.350	0.005	52 705.1	7			2s ² 2p ⁴ (³ P)3d ⁴ F _{9/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{9/2} ^o	75MIN	
1 899.718	0.005	52 639.4	9	b		2s ² 2p ⁴ (³ P)3d ² F _{5/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [3] _{7/2} ^o	75MIN	
1 900.164	0.005	52 627.0	15			2s ² 2p ⁴ (³ P)3d ⁴ F _{7/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [5] _{9/2} ^o	75MIN	
1 905.674	0.005	52 474.9	3			2s ² 2p ⁴ (³ P)3d ² F _{5/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [4] _{7/2} ^o	75MIN	
1 907.01	0.010	52 438.1	10	b	1.70E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² F _{5/2} ^o	72MIN/NIE	08KEL/POD
1 907.12	0.010	52 435.1	9*	b	1.68E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ² F _{7/2} ^o	72MIN/NIE	08KEL/POD
1 907.12	0.010	52 435.1	9*	b		2s ² 2p ⁴ (³ P)3d ² F _{5/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	72MIN/NIE	
1 908.15	0.010	52 406.8	3			2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{3/2} ^o	75MIN	
1 909.806	0.005	52 361.3	8			2s ² 2p ⁴ (³ P)3d ⁴ F _{7/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{7/2} ^o	75MIN	
1 910.660	0.005	52 337.9	6	b		2s ² 2p ⁴ (¹ D)3d ² S _{1/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [1] _{3/2} ^o	75MIN	
1 913.19	0.010	52 268.7	9		6.89E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{7/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{7/2} ^o	72MIN/NIE	08KEL/POD
1 914.910	0.005	52 221.8	0		2.19E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2} ^o	72MIN/NIE	08KEL/POD
1 915.436	0.005	52 207.4	8			2s ² 2p ⁴ (¹ D)3d ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [3] _{7/2} ^o	75MIN	
1 916.000	0.005	52 192.1	3			2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	75MIN	
1 917.344	0.005	52 155.5	9		1.65E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2} ^o	72MIN/NIE	08KEL/POD
1 918.453	0.005	52 125.3	10*		2.29E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2} ^o	72MIN/NIE	08KEL/POD
1 918.453	0.005	52 125.3	10*			2s ² 2p ⁴ (¹ D)3d ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [3] _{5/2} ^o	72MIN/NIE	
1 919.93	0.010	52 085.2	4	b		2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [3] _{7/2} ^o	75MIN	
1 922.58	0.010	52 013.4	3			2s ² 2p ⁴ (³ P)3d ² D _{3/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [3] _{5/2} ^o	75MIN	
1 923.963	0.005	51 976.1	11			2s ² 2p ⁴ (³ P)3d ² D _{5/2} ^o	2s ² 2p ⁴ (³ P ₀)4f ² [3] _{7/2} ^o	75MIN	
1 925.189	0.005	51 943.0	8*			2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{7/2} ^o	75MIN	
1 925.189	0.005	51 943.0	8*			2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{5/2} ^o	75MIN	
1 926.2		51 915.7	20	b		2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{7/2} ^o	75MIN	
1 926.259	0.005	51 914.1	14	b	8.94E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{7/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{9/2} ^o	72MIN/NIE	08KEL/POD
1 926.711	0.005	51 901.9	5			2s ² 2p ⁴ (³ P)3d ² F _{7/2} ^o	2s ² 2p ⁴ (³ P ₂)4f ² [5] _{9/2} ^o	75MIN	
1 927.237	0.005	51 887.8	11		5.66E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2} ^o	72MIN/NIE	08KEL/POD
1 927.59	0.010	51 878.3	3			2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	75MIN	
1 929.624	0.005	51 823.6	3			2s ² 2p ⁴ (¹ D)3d ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D ₂)4f ² [2] _{3/2} ^o	75MIN	
1 930.293	0.005	51 805.6	6	1		2s ² 2p ⁴ (³ P)3d ² D _{3/2} ^o	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	75MIN	

TABLE 5. Observed spectral lines of Na III—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
1 932.737	0.005	51 740.1	12		5.37E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2}	72MIN/NIE	08KEL/POD
1 933.885	0.005	51 709.4	13		6.33E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{7/2}	72MIN/NIE	08KEL/POD
1 934.335	0.005	51 697.4	3			2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{5/2} ^o	75MIN	
1 936.815	0.005	51 631.2	6			2s ² 2p ⁴ (³ P)3d ² D _{5/2}	2s ² 2p ⁴ (³ P ₁)4f ² [3] _{7/2} ^o	75MIN	
1 937.03	0.010	51 625.4	3			2s ² 2p ⁴ (³ P)3d ² F _{7/2}	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{9/2} ^o	75MIN	
1 938.41	0.010	51 588.7	4			2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2}	2s ² 2p ⁴ (³ P ₂)4f ² [1] _{3/2} ^o	75MIN	
1 938.637	0.005	51 582.6	6		8.39E+8	2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2}	2s ² 2p ⁴ (³ P ₂)4f ² [1] _{1/2} ^o	75MIN	95BUT/ZEI
1 939.559	0.005	51 558.1	3			2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{5/2} ^o	75MIN	
1 943.047	0.005	51 465.6	4			2s ² 2p ⁴ (³ P)3d ² D _{5/2}	2s ² 2p ⁴ (³ P ₁)4f ² [4] _{7/2} ^o	75MIN	
1 943.347	0.005	51 457.6	9			2s ² 2p ⁴ (¹ D)3d ² F _{5/2}	2s ² 2p ⁴ (¹ D ₂)4f ² [4] _{7/2} ^o	75MIN	
1 943.516	0.005	51 453.1	10			2s ² 2p ⁴ (¹ D)3d ² F _{7/2}	2s ² 2p ⁴ (¹ D ₂)4f ² [4] _{9/2} ^o	75MIN	
1 946.426	0.005	51 376.2	12		8.28E+8	2s ² 2p ⁴ (¹ D)3p ² F _{5/2} ^o	2s ² 2p ⁴ (¹ D)3d ² G _{7/2}	72MIN/NIE	08KEL/POD
1 947.324	0.005	51 352.5	1			2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{3/2} ^o	75MIN	
1 950.906	0.005	51 258.2	12		8.55E+8	2s ² 2p ⁴ (¹ D)3p ² F _{7/2} ^o	2s ² 2p ⁴ (¹ D)3d ² G _{9/2}	72MIN/NIE	08KEL/POD
1 951.237	0.005	51 249.5	14		2.38E+8	2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	72MIN/NIE	08KEL/POD
1 955.326	0.005	51 142.4	8			2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{5/2} ^o	75MIN	
1 956.314	0.005	51 116.5	6			2s ² 2p ⁴ (³ P)3p ² D _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{5/2}	72MIN/NIE	
1 960		51 020.4	12	b		2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{5/2} ^o	75MIN	
1 968.23	0.010	50 807.1	4			2s ² 2p ⁴ (³ P)3d ² P _{1/2}	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{3/2} ^o	75MIN	
1 970.221	0.005	50 755.7	2			2s ² 2p ⁴ (³ P)3d ² D _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{5/2} ^o	75MIN	
1 970.986	0.005	50 736.0	1		2.44E+7	2s ² 2p ⁴ (³ P)3p ² D _{5/2}	2s ² 2p ⁴ (³ P)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
1 972.780	0.005	50 689.9	7*			2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{7/2} ^o	75MIN	
1 972.780	0.005	50 689.9	7*			2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{5/2} ^o	75MIN	
1 973.86	0.010	50 662.2	1			2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{7/2} ^o	75MIN	
1 974.150	0.005	50 654.7	8		7.07E+8	2s ² 2p ⁴ (¹ S)3p ² P _{1/2}	2s ² 2p ⁴ (¹ S)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
1 975.617	0.005	50 617.1	3	b		2s ² 2p ⁴ (³ P)3d ² D _{3/2}	2s ² 2p ⁴ (³ P ₂)4f ² [3] _{5/2} ^o	75MIN	
1 976.700	0.005	50 589.4	8			2s ² 2p ⁴ (³ P)3d ² P _{3/2}	2s ² 2p ⁴ (³ P ₀)4f ² [3] _{5/2} ^o	75MIN	
1 977.161	0.005	50 577.6	10		8.46E+8	2s ² 2p ⁴ (¹ S)3p ² P _{3/2}	2s ² 2p ⁴ (¹ S)3d ² D _{5/2}	72MIN/NIE	08KEL/POD
1 985.03	0.010	50 377.1	4	b		2s ² 2p ⁴ (³ P)3d ² D _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{5/2} ^o	75MIN	
1 985.567	0.005	50 363.4	13		1.78E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2}	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	72MIN/NIE	08KEL/POD
1 990.240	0.005	50 245.2	8			2s ² 2p ⁴ (³ P)3d ² P _{3/2}	2s ² 2p ⁴ (³ P ₁)4f ² [3] _{5/2} ^o	75MIN	
1 990.989	0.005	50 226.3	8			2s ² 2p ⁴ (³ P)3p ² D _{3/2}	2s ² 2p ⁴ (³ P)3d ² D _{5/2}	72MIN/NIE	
1 991.633	0.005	50 210.1	5	b		2s ² 2p ⁴ (³ P)3d ² D _{5/2}	2s ² 2p ⁴ (³ P ₂)4f ² [4] _{7/2} ^o	75MIN	
1 995.675	0.005	50 108.4	10		8.12E+7	2s ² 2p ⁴ (³ P)3p ² D _{5/2}	2s ² 2p ⁴ (³ P)3d ² F _{5/2}	72MIN/NIE	08KEL/POD
1 998.584	0.005	50 035.4	5	b		2s ² 2p ⁴ (³ P)3d ² P _{3/2}	2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	75MIN	
<i>Air</i>									
1 999.748	0.005	49 990.1	6	b		2s ² 2p ⁴ (³ P)3d ² P _{1/2}	2s ² 2p ⁴ (³ P ₂)4f ² [1] _{3/2} ^o	75MIN	
2 004.215	0.005	49 878.7	10		2.07E+8	2s ² 2p ⁴ (³ P)3p ² S _{1/2}	2s ² 2p ⁴ (³ P)3d ² P _{3/2}	72MIN/NIE	08KEL/POD
2 005.217	0.005	49 853.8	11		9.67E+7	2s ² 2p ⁴ (³ P)3s ⁴ P _{1/2}	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	72MIN/NIE	08KEL/POD
2 005.546	0.005	49 845.6	9		1.50E+8	2s ² 2p ⁴ (³ P)3p ² D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
2 008.470	0.005	49 773.0	11		1.45E+8	2s ² 2p ⁴ (³ P)3p ² D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	72MIN/NIE	08KEL/POD
2 009.328	0.005	49 751.8		b		2s ² 2p ⁴ (³ P)3d ² P _{1/2}	2s ² 2p ⁴ (³ P ₂)4f ² [2] _{3/2} ^o	75MIN	
2 011.865	0.005	49 689.1	15		6.37E+8	2s ² 2p ⁴ (³ P)3p ² D _{5/2}	2s ² 2p ⁴ (³ P)3d ² F _{7/2}	72MIN/NIE	08KEL/POD
2 014.169	0.005	49 632.2	11		4.88E+8	2s ² 2p ⁴ (¹ D)3p ² D _{3/2}	2s ² 2p ⁴ (¹ D)3d ² F _{5/2}	72MIN/NIE	08KEL/POD
2 017.024	0.005	49 562.0	12		5.44E+8	2s ² 2p ⁴ (¹ D)3p ² D _{5/2}	2s ² 2p ⁴ (¹ D)3d ² F _{7/2}	72MIN/NIE	08KEL/POD
2 017.23	0.010	49 556.9	1		4.31E+7	2s ² 2p ⁴ (¹ D)3p ² D _{5/2}	2s ² 2p ⁴ (¹ D)3d ² F _{5/2}	72MIN/NIE	08KEL/POD
2 022.295	0.005	49 432.8	9		4.62E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{7/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	72MIN/NIE	08KEL/POD
2 023.225	0.005	49 410.1	6		3.29E+7	2s ² 2p ⁴ (³ P)3p ² D _{5/2}	2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2}	72MIN/NIE	08KEL/POD
2 028.553	0.005	49 280.4	12		1.93E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{7/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2}	72MIN/NIE	08KEL/POD
2 031.128	0.005	49 217.9	12		3.08E+8	2s ² 2p ⁴ (³ P)3p ² D _{3/2}	2s ² 2p ⁴ (³ P)3d ² F _{5/2}	72MIN/NIE	08KEL/POD
2 035.897	0.005	49 102.6	11		6.23E+8	2s ² 2p ⁴ (³ P)3p ² S _{1/2}	2s ² 2p ⁴ (³ P)3d ² P _{1/2}	72MIN/NIE	08KEL/POD
2 037.776	0.005	49 057.3	8		6.73E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	72MIN/NIE	08KEL/POD
2 041.661	0.005	48 964.0	12		1.64E+8	2s ² 2p ⁴ (³ P)3p ² D _{5/2}	2s ² 2p ⁴ (³ P)3d ⁴ F _{7/2}	72MIN/NIE	08KEL/POD
2 043.290	0.005	48 925.0	12		4.02E+8	2s ² 2p ⁴ (¹ D)3s ² D _{3/2}	2s ² 2p ⁴ (¹ D)3p ² P _{1/2}	72MIN/NIE	08KEL/POD
2 044.823	0.005	48 888.3	10		4.00E+8	2s ² 2p ⁴ (¹ D)3p ² D _{3/2}	2s ² 2p ⁴ (¹ D)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
2 045.443	0.005	48 873.5	10		1.05E+8	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	72MIN/NIE	08KEL/POD

TABLE 5. Observed spectral lines of Na III—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
2 047.97	0.010	48 813.2	1		4.69E+7	2s ² 2p ⁴ (¹ D)3p ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
2 048.313	0.005	48 805.0	6		6.54E+7	2s ² 2p ⁴ (¹ D)3p ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D)3d ² D _{5/2}	72MIN/NIE	08KEL/POD
2 048.719	0.005	48 795.3	7		8.11E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2}	72MIN/NIE	08KEL/POD
2 051.484	0.005	48 729.6	11		4.36E+8	2s ² 2p ⁴ (¹ D)3s ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D)3p ² D _{5/2}	72MIN/NIE	08KEL/POD
2 051.845	0.005	48 721.0	5		1.37E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{7/2}	72MIN/NIE	08KEL/POD
2 055.183	0.005	48 641.9	9		6.39E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	72MIN/NIE	08KEL/POD
2 058.73	0.010	48 558.1	4		6.95E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{1/2}	72MIN/NIE	08KEL/POD
2 060.360	0.005	48 519.7	10		8.12E+7	2s ² 2p ⁴ (³ P)3p ² D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2}	72MIN/NIE	08KEL/POD
2 062.990	0.005	48 457.8	5		2.21E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	72MIN/NIE	08KEL/POD
2 065.282	0.005	48 404.1	4		2.58E+7	2s ² 2p ⁴ (³ P)3p ⁴ D _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	72MIN/NIE	08KEL/POD
2 066.601	0.005	48 373.2	15		3.72E+8	2s ² 2p ⁴ (¹ D)3s ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	72MIN/NIE	08KEL/POD
2 066.905	0.005	48 366.1	8		1.57E+7	2s ² 2p ⁴ (¹ D)3s ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	72MIN/NIE	08KEL/POD
2 072.673	0.005	48 231.5	11		3.52E+8	2s ² 2p ⁴ (³ P)3p ² P _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ² P _{3/2}	72MIN/NIE	08KEL/POD
2 077.974	0.005	48 108.5	9			2s ² 2p ⁴ (³ P)3p ² S _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{3/2}	72MIN/NIE	
2 082.907	0.005	47 994.5	13			2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{5/2}	72MIN/NIE	
2 094.808	0.005	47 721.9	4		3.09E+7	2s ² 2p ⁴ (³ P)3p ² S _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	72MIN/NIE	08KEL/POD
2 099.563	0.005	47 613.8	6		8.62E+7	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
2 100.443	0.005	47 593.9	3		7.41E+7	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² P _{1/2}	72MIN/NIE	08KEL/POD
2 102.762	0.005	47 541.4	12		2.31E+8	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	72MIN/NIE	08KEL/POD
2 104.76	0.010	47 496.3	0		1.34E+8	2s ² 2p ⁴ (¹ D)3p ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D)3d ² P _{1/2}	72MIN/NIE	08KEL/POD
2 109.27	0.010	47 394.7	1		3.97E+7	2s ² 2p ⁴ (¹ D)3p ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D)3d ² P _{3/2}	72MIN/NIE	08KEL/POD
2 112.650	0.005	47 318.9	7		1.54E+8	2s ² 2p ⁴ (¹ D)3p ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D)3d ² P _{3/2}	72MIN/NIE	08KEL/POD
2 116.750	0.005	47 227.3	12		3.03E+8	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	72MIN/NIE	08KEL/POD
2 120.73	0.010	47 138.7	4	b	6.44E+7	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
2 124.510	0.005	47 054.8	10		1.86E+8	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D)3d ² D _{5/2}	72MIN/NIE	08KEL/POD
2 126.63	0.010	47 007.9	11		3.71E+8	2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{1/2}	72MIN/NIE	08KEL/POD
2 127.842	0.005	46 981.1	11			2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{5/2}	72MIN/NIE	
2 140.723	0.005	46 698.5	15		3.80E+8	2s ² 2p ⁴ (¹ D)3s ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D)3p ² D _{5/2} ^o	72MIN/NIE	08KEL/POD
2 141.068	0.005	46 690.9	9		3.11E+7	2s ² 2p ⁴ (¹ D)3s ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D)3p ² D _{5/2} ^o	72MIN/NIE	08KEL/POD
2 141.86	0.010	46 673.7	1			2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2}	72MIN/NIE	
2 144.202	0.005	46 622.7	7		1.98E+7	2s ² 2p ⁴ (¹ D)3s ² D _{5/2} ^o	2s ² 2p ⁴ (¹ D)3p ² D _{3/2} ^o	72MIN/NIE	08KEL/POD
2 144.542	0.005	46 615.3	14		3.88E+8	2s ² 2p ⁴ (¹ D)3s ² D _{3/2} ^o	2s ² 2p ⁴ (¹ D)3p ² D _{3/2} ^o	72MIN/NIE	08KEL/POD
2 145.231	0.005	46 600.4	9		8.27E+7	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
2 146.234	0.005	46 578.6	9		1.68E+8	2s ² 2p ⁴ (¹ D)3p ² P _{1/2} ^o	2s ² 2p ⁴ (¹ D)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
2 148.574	0.005	46 527.9	12		1.54E+8	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	72MIN/NIE	08KEL/POD
2 151.653	0.005	46 461.3	10		1.34E+8	2s ² 2p ⁴ (³ P)3p ² P _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ² D _{3/2}	72MIN/NIE	08KEL/POD
2 159.082	0.005	46 301.4	9		3.11E+8	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D)3d ² S _{1/2}	72MIN/NIE	08KEL/POD
2 159.71	0.010	46 288.0	1			2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2}	72MIN/NIE	
2 163.178	0.005	46 213.8	5		2.37E+7	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	72MIN/NIE	08KEL/POD
2 169.702	0.005	46 074.8	4		1.81E+7	2s ² 2p ⁴ (³ P)3p ² P _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ P _{3/2}	72MIN/NIE	08KEL/POD
2 174.53	0.010	45 972.5	10	b	1.00E+8	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ² F _{5/2}	72MIN/NIE	08KEL/POD
2 182.846	0.005	45 797.4	9		1.14E+7	2s ² 2p ⁴ (³ P)3s ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	72MIN/NIE	08KEL/POD
2 185.300	0.005	45 746.0	8		2.06E+8	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D)3d ² P _{1/2}	72MIN/NIE	08KEL/POD
2 185.498	0.005	45 741.8	8		2.02E+8	2s ² 2p ⁴ (¹ D)3p ² P _{1/2} ^o	2s ² 2p ⁴ (¹ D)3d ² S _{1/2}	72MIN/NIE	08KEL/POD
2 189.42	0.010	45 659.9	1		9.47E+6	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2}	72MIN/NIE	08KEL/POD
2 190.185	0.005	45 644.0	11		3.28E+8	2s ² 2p ⁴ (¹ D)3p ² P _{3/2} ^o	2s ² 2p ⁴ (¹ D)3d ² P _{3/2}	72MIN/NIE	08KEL/POD
2 196.11	0.010	45 520.8	3		1.67E+7	2s ² 2p ⁴ (³ P)3p ² P _{1/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{3/2}	72MIN/NIE	08KEL/POD
2 202.831	0.005	45 382.0	15		8.53E+7	2s ² 2p ⁴ (³ P)3s ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	72MIN/NIE	08KEL/POD
2 208.069	0.005	45 274.3	8		2.63E+7	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3d ⁴ F _{5/2}	72MIN/NIE	08KEL/POD
2 212.352	0.005	45 186.7	9		2.42E+8	2s ² 2p ⁴ (¹ D)3p ² P _{1/2} ^o	2s ² 2p ⁴ (¹ D)3d ² P _{1/2}	72MIN/NIE	08KEL/POD
2 214.208	0.005	45 148.8	10		5.14E+7	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3p ⁴ D _{1/2} ^o	72MIN/NIE	08KEL/POD
2 217.34	0.010	45 085.0	6		6.86E+7	2s ² 2p ⁴ (¹ D)3p ² P _{1/2} ^o	2s ² 2p ⁴ (¹ D)3d ² P _{3/2}	72MIN/NIE	08KEL/POD
2 225.280	0.005	44 924.2	5		1.09E+7	2s ² 2p ⁴ (³ P)3s ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3p ² P _{1/2} ^o	72MIN/NIE	08KEL/POD
2 225.927	0.005	44 911.1	15		1.82E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2} ^o	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	72MIN/NIE	08KEL/POD
2 230.328	0.005	44 822.5	30		3.64E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{5/2} ^o	2s ² 2p ⁴ (³ P)3p ⁴ D _{7/2} ^o	72MIN/NIE	08KEL/POD
2 232.187	0.005	44 785.2	16		2.34E+8	2s ² 2p ⁴ (³ P)3s ² P _{3/2} ^o	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	72MIN/NIE	08KEL/POD
2 239.484	0.005	44 639.3	13		3.09E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{1/2} ^o	2s ² 2p ⁴ (³ P)3p ⁴ D _{1/2} ^o	72MIN/NIE	08KEL/POD

TABLE 5. Observed spectral lines of Na III—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
2 246.706	0.005	44 495.8	20	w	2.72E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2}	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	72MIN/NIE	08KEL/POD
2 251.474	0.005	44 401.6	14		1.66E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{1/2}	2s ² 2p ⁴ (³ P)3p ⁴ D _{3/2} ^o	72MIN/NIE	08KEL/POD
2 278.413	0.005	43 876.6	15		2.98E+8	2s ² 2p ⁴ (³ P)3s ² P _{1/2}	2s ² 2p ⁴ (³ P)3p ² P _{1/2} ^o	72MIN/NIE	08KEL/POD
2 279.482	0.005	43 856.1	12		3.40E+8	2s ² 2p ⁴ (¹ S)3s ² S _{1/2}	2s ² 2p ⁴ (¹ S)3p ² P _{3/2} ^o	72MIN/NIE	08KEL/POD
2 281.620	0.005	43 815.0	10		3.39E+8	2s ² 2p ⁴ (¹ S)3s ² S _{1/2}	2s ² 2p ⁴ (¹ S)3p ² P _{1/2} ^o	72MIN/NIE	08KEL/POD
2 285.660	0.005	43 737.5	13		7.73E+7	2s ² 2p ⁴ (³ P)3s ² P _{1/2}	2s ² 2p ⁴ (³ P)3p ² P _{3/2} ^o	72MIN/NIE	08KEL/POD
2 309.988	0.005	43 277.0	15		3.08E+8	2s ² 2p ⁴ (³ P)3s ² P _{3/2}	2s ² 2p ⁴ (³ P)3p ² S _{1/2} ^o	72MIN/NIE	08KEL/POD
2 314.65	0.010	43 189.8	0			2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{3/2}	72MIN/NIE	
2 324.56	0.010	43 005.7	0			2s ² 2p ⁴ (³ P)3p ⁴ S _{3/2}	2s ² 2p ⁴ (³ P)3d ⁴ D _{5/2}	72MIN/NIE	
2 367.295	0.005	42 229.4	9		1.65E+7	2s ² 2p ⁴ (³ P)3s ² P _{1/2}	2s ² 2p ⁴ (³ P)3p ² S _{1/2} ^o	72MIN/NIE	08KEL/POD
2 386.992	0.005	41 881.0	18		3.05E+8	2s ² 2p ⁴ (¹ D)3s ² D _{5/2}	2s ² 2p ⁴ (¹ D)3p ² F _{7/2} ^o	72MIN/NIE	08KEL/POD
2 393.589	0.005	41 765.5	9		2.26E+7	2s ² 2p ⁴ (¹ D)3s ² D _{5/2}	2s ² 2p ⁴ (¹ D)3p ² F _{5/2} ^o	72MIN/NIE	08KEL/POD
2 394.032	0.005	41 757.8	17		2.80E+8	2s ² 2p ⁴ (¹ D)3s ² D _{3/2}	2s ² 2p ⁴ (¹ D)3p ² F _{5/2} ^o	72MIN/NIE	08KEL/POD
2 406.588	0.005	41 540.0	15		7.36E+7	2s ² 2p ⁴ (³ P)3s ² P _{3/2}	2s ² 2p ⁴ (³ P)3p ² D _{3/2} ^o	72MIN/NIE	04FRO/TAC
2 459.306	0.005	40 649.6	25		2.79E+8	2s ² 2p ⁴ (³ P)3s ² P _{3/2}	2s ² 2p ⁴ (³ P)3p ² D _{5/2} ^o	72MIN/NIE	04FRO/TAC
2 468.854	0.005	40 492.4	18		2.09E+8	2s ² 2p ⁴ (³ P)3s ² P _{1/2}	2s ² 2p ⁴ (³ P)3p ² D _{3/2} ^o	72MIN/NIE	04FRO/TAC
2 474.732	0.005	40 396.2	20		1.38E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{5/2}	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	72MIN/NIE	08KEL/POD
2 497.022	0.005	40 035.6	25		1.99E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{5/2}	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2} ^o	72MIN/NIE	08KEL/POD
2 510.264	0.005	39 824.5	17		2.19E+8	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2}	2s ² 2p ⁴ (³ P)3p ⁴ P _{1/2} ^o	72MIN/NIE	08KEL/POD
2 530.249	0.005	39 509.9	15		3.65E+7	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2}	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	72MIN/NIE	08KEL/POD
2 542.791	0.005	39 315.1	14		3.39E+7	2s ² 2p ⁴ (³ P)3s ⁴ P _{1/2}	2s ² 2p ⁴ (³ P)3p ⁴ P _{1/2} ^o	72MIN/NIE	08KEL/POD
2 553.54	0.010	39 149.5	4	h	5.52E+7	2s ² 2p ⁴ (³ P)3s ⁴ P _{3/2}	2s ² 2p ⁴ (³ P)3p ⁴ P _{5/2} ^o	34SOD	08KEL/POD
2 563.32	0.010	39 000.2	4	h	7.92E+7	2s ² 2p ⁴ (³ P)3s ⁴ P _{1/2}	2s ² 2p ⁴ (³ P)3p ⁴ P _{3/2} ^o	34SOD	08KEL/POD
2 637.45	0.010	37 904.1	0		2.15E+6	2s ² 2p ⁴ (³ P)3s ² P _{3/2}	2s ² 2p ⁴ (³ P)3p ⁴ D _{5/2} ^o	34SOD	08KEL/POD
<i>Vacuum</i>									
73 177	12	1 366.55			4.59E-2	2s ² 2p ⁵ ² P _{3/2} ^o	2s ² 2p ⁵ ² P _{1/2} ^o	97FEU/LUT	08KEL/POD

TABLE 6. Energy levels of Na III

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ⁵	² P ^o	3/2	0.00			
		1/2	1 366.55	0.22		97FEU/LUT
2s2p ⁶	² S	1/2	264 455.0	1.5		81MAR/ZAL
2s ² 2p ⁴ (³ P)3s	⁴ P	5/2	366 154.41	0.2		81MAR/ZAL
		3/2	367 040.66	0.2		81MAR/ZAL
		1/2	367 550.17	0.2		81MAR/ZAL
2s ² 2p ⁴ (³ P)3s	² P	3/2	373 632.32	0.2		81MAR/ZAL
		1/2	374 679.91	0.2		81MAR/ZAL
2s ² 2p ⁴ (¹ D)3s	² D	5/2	399 174.71	0.2		81MAR/ZAL
		3/2	399 182.31	0.2		81MAR/ZAL
2s ² 2p ⁴ (³ P)3p	⁴ P ^o	5/2	406 190.15	0.2	99%	81MAR/ZAL
		3/2	406 550.63	0.2	99%	81MAR/ZAL
		1/2	406 865.11	0.2	100%	81MAR/ZAL
2s ² 2p ⁴ (³ P)3p	⁴ D ^o	7/2	410 976.94	0.2	100%	81MAR/ZAL
		5/2	411 536.38	0.2	97%	81MAR/ZAL
		3/2	411 951.78	0.2	98%	81MAR/ZAL
		1/2	412 189.46	0.2	100%	81MAR/ZAL
2s ² 2p ⁴ (³ P)3p	² D ^o	5/2	414 281.85	0.2	98%	81MAR/ZAL
		3/2	415 172.28	0.2	98%	81MAR/ZAL

TABLE 6. Energy levels of Na III—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ⁴ (³ P)3p	² S°	1/2	416 909.31	0.2	80 % + 16 % 2s ² 2p ⁴ (³ P)3p ² P° _{1/2}	81MAR/ZAL
2s ² 2p ⁴ (³ P)3p	⁴ S°	3/2	417 403.98	0.2	99%	81MAR/ZAL
2s ² 2p ⁴ (³ P)3p	² P°	3/2	418 417.50	0.2	85 % + 13 % 2s ² 2p ⁴ (¹ D)3p ² P° _{3/2}	81MAR/ZAL
		1/2	418 556.54	0.2	69 % + 20 % 2s ² 2p ⁴ (³ P)3p ² S° _{1/2}	81MAR/ZAL
2s ² 2p ⁴ (¹ S)3s	² S	1/2	435 028.00	0.15		81MAR/ZAL
2s ² 2p ⁴ (¹ D)3p	² F°	5/2	440 940.20	0.2	100%	81MAR/ZAL
		7/2	441 055.67	0.2	100%	81MAR/ZAL
2s ² 2p ⁴ (¹ D)3p	² D°	3/2	445 797.52	0.2	99%	81MAR/ZAL
		5/2	445 873.20	0.2	100%	81MAR/ZAL
2s ² 2p ⁴ (¹ D)3p	² P°	3/2	447 547.96	0.2	86 % + 13 % 2s ² 2p ⁴ (³ P)3p ² P° _{3/2}	81MAR/ZAL
		1/2	448 107.31	0.2	86 % + 14 % 2s ² 2p ⁴ (³ P)3p ² P° _{1/2}	81MAR/ZAL
2s ² 2p ⁴ (³ P)3d	⁴ D	7/2	460 257.21	0.2	98%	81MAR/ZAL
		5/2	460 409.70	0.2	97%	81MAR/ZAL
		3/2	460 593.62	0.2	97%	81MAR/ZAL
		1/2	460 746.98	0.2	99%	81MAR/ZAL
2s ² 2p ⁴ (³ P)3d	⁴ F	9/2	462 891.04	0.2	100%	81MAR/ZAL
		7/2	463 245.76	0.2	82 % + 17 % 2s ² 2p ⁴ (³ P)3d ² F _{7/2}	81MAR/ZAL
		5/2	463 691.90	0.2	82 % + 9 % 2s ² 2p ⁴ (³ P)3d ² F _{5/2}	81MAR/ZAL
		3/2	464 077.16	0.2	90 % + 7 % 2s ² 2p ⁴ (³ P)3d ² D _{3/2}	81MAR/ZAL
2s ² 2p ⁴ (³ P)3d	² F	7/2	463 970.92	0.2	82 % + 16 % 2s ² 2p ⁴ (³ P)3d ⁴ F _{7/2}	81MAR/ZAL
		5/2	464 390.17	0.2	32 % + 44 % 2s ² 2p ⁴ (³ P)3d ² D _{5/2}	81MAR/ZAL
2s ² 2p ⁴ (³ P)3d	⁴ P	1/2	464 411.94	0.2	99%	81MAR/ZAL
		3/2	464 631.29	0.2	82 % + 10 % 2s ² 2p ⁴ (³ P)3d ² D _{3/2}	81MAR/ZAL
		5/2	464 945.37	0.2	56 % + 37 % 2s ² 2p ⁴ (³ P)3d ² F _{5/2}	81MAR/ZAL
2s ² 2p ⁴ (³ P)3d	² D	5/2	465 398.59	0.2	42 % + 35 % 2s ² 2p ⁴ (³ P)3d ⁴ P _{5/2}	81MAR/ZAL
		3/2	465 017.83	0.2	76 % + 14 % 2s ² 2p ⁴ (³ P)3d ⁴ P _{7/2}	81MAR/ZAL
2s ² 2p ⁴ (³ P)3d	² P	1/2	466 011.91	0.2	98%	81MAR/ZAL
		3/2	466 788.03	0.2	93 % + 6 % 2s ² 2p ⁴ (³ P)3d ² D _{3/2}	81MAR/ZAL
2s ² 2p ⁴ (¹ S)3p	² P°	1/2	478 842.99	0.2	99%	81MAR/ZAL
		3/2	478 884.07	0.2	99%	81MAR/ZAL
2s ² 2p ⁴ (³ P)4s	⁴ P	5/2	479 975.34	0.2		81MAR/ZAL
		3/2	480 779.21	0.2		81MAR/ZAL
		1/2	481 358.65	0.2		81MAR/ZAL
2s ² 2p ⁴ (³ P)4s	² P	3/2	482 402.20	0.2		81MAR/ZAL
		1/2	483 388.55	0.2		81MAR/ZAL
2s ² 2p ⁴ (¹ D)3d	² G	9/2	492 313.91	0.2	100%	81MAR/ZAL
		7/2	492 316.41	0.2	100%	81MAR/ZAL
2s ² 2p ⁴ (¹ D)3d	² P	3/2	493 192.06	0.2	99%	81MAR/ZAL
		1/2	493 293.98	0.2	99%	81MAR/ZAL
2s ² 2p ⁴ (¹ D)3d	² S	1/2	493 849.24	0.2	100%	81MAR/ZAL
2s ² 2p ⁴ (¹ D)3d	² D	5/2	494 602.73	0.2	99%	81MAR/ZAL
		3/2	494 685.86	0.2	99%	81MAR/ZAL
2s ² 2p ⁴ (¹ D)3d	² F	5/2	495 429.75	0.2	100%	81MAR/ZAL
		7/2	495 435.20	0.2	100%	81MAR/ZAL

TABLE 6. Energy levels of Na III—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ⁴ (¹ D)4s	² D	3/2	511 433.8	0.2		81MAR/ZAL
		5/2	511 434.3	0.2		81MAR/ZAL
2s ² 2p ⁴ (³ P)4d	⁴ F	5/2	514 007	6		81MAR/ZAL
		3/2	514 241	6		81MAR/ZAL
2s ² 2p ⁴ (³ P)4d	⁴ P	3/2	514 069	6		81MAR/ZAL
		5/2	514 608?	6		81MAR/ZAL
2s ² 2p ⁴ (³ P)4d	² F	5/2	514 688	6		81MAR/ZAL
2s ² 2p ⁴ (³ P)4d	² D	3/2	515 017	6		81MAR/ZAL
		5/2	515 365	6		81MAR/ZAL
2s ² 2p ⁴ (³ P)4d	² P	1/2	515 140	6		81MAR/ZAL
		3/2	515 984	6		81MAR/ZAL
2s ² 2p ⁴ (³ P ₂)4f	² [4] ^o	9/2	515 595.6	0.3	98%	81MAR/ZAL
		7/2	515 607.27	0.3	93% + 5% 2s ² 2p ⁴ (³ P ₂)4f ² [3] _{7/2} ^o	81MAR/ZAL
2s ² 2p ⁴ (³ P ₂)4f	² [3] ^o	5/2	515 635.09	0.3	98%	81MAR/ZAL
		7/2	515 635.4	0.3	93% + 5% 2s ² 2p ⁴ (³ P ₂)4f ² [4] _{7/2} ^o	81MAR/ZAL
2s ² 2p ⁴ (³ P ₂)4f	² [2] ^o	3/2	515 764.23	0.3	94% + 6% 2s ² 2p ⁴ (³ P ₁)4f ² [2] _{3/2} ^o	81MAR/ZAL
		5/2	515 773.67	0.3	93% + 5% 2s ² 2p ⁴ (³ P ₁)4f ² [2] _{5/2} ^o	81MAR/ZAL
2s ² 2p ⁴ (³ P ₂)4f	² [5] ^o	11/2	515 871.96	0.3	100%	81MAR/ZAL
		9/2	515 872.81	0.3	100%	81MAR/ZAL
2s ² 2p ⁴ (³ P ₂)4f	² [1] ^o	1/2	515 994.5	0.3	100%	81MAR/ZAL
		3/2	516 000.6	0.3	100%	81MAR/ZAL
2s ² 2p ⁴ (³ P ₁)4f	² [2] ^o	3/2	516 817.76	0.3	94% + 6% 2s ² 2p ⁴ (³ P ₂)4f ² [2] _{3/2} ^o	81MAR/ZAL
		5/2	516 823.62	0.3	93% + 5% 2s ² 2p ⁴ (³ P ₂)4f ² [2] _{5/2} ^o	81MAR/ZAL
2s ² 2p ⁴ (³ P ₁)4f	² [4] ^o	9/2	516 859.91	0.3	98%	81MAR/ZAL
		7/2	516 864.62	0.3	98%	81MAR/ZAL
2s ² 2p ⁴ (³ P ₁)4f	² [3] ^o	7/2	517 029.6	0.3	99%	81MAR/ZAL
		5/2	517 033.0	0.3	99%	81MAR/ZAL
2s ² 2p ⁴ (³ P ₀)4f	² [3] ^o	7/2	517 374.54	0.3	98%	81MAR/ZAL
		5/2	517 377.58	0.3	98%	81MAR/ZAL
2s ² 2p ⁴ (³ P)5s	² P	3/2	522 720	6		81MAR/ZAL
		1/2	523 527	6		81MAR/ZAL
2s ² 2p ⁴ (¹ S)3d	² D	5/2	529 461.64	0.2	100%	81MAR/ZAL
		3/2	529 497.70	0.2	99%	81MAR/ZAL
2s ² 2p ⁴ (¹ D)4d	² S	1/2	543 640	6		81MAR/ZAL
2s ² 2p ⁴ (¹ D)4d	² P	3/2	544 226	6		81MAR/ZAL
		1/2	544 278	6		81MAR/ZAL
2s ² 2p ⁴ (¹ D)4d	² D	5/2	544 749	6		81MAR/ZAL
		3/2	544 788	6		81MAR/ZAL
2s ² 2p ⁴ (¹ D)4d	² F	5/2	544 915	6		81MAR/ZAL
2s ² 2p ⁴ (¹ D ₂)4f	² [1] ^o	3/2	546 187.1?	0.3	100%	81MAR/ZAL
2s ² 2p ⁴ (¹ D ₂)4f	² [5] ^o	11/2	546 440.3	0.3	100%	81MAR/ZAL
		9/2	546 441.0	0.3	100%	81MAR/ZAL

TABLE 6. Energy levels of Na III—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ⁴ (¹ D ₂)4f	² [2] [°]	3/2	546 509.3	0.3	100%	81MAR/ZAL
		5/2	546 510.55?	0.3	100%	81MAR/ZAL
2s ² 2p ⁴ (¹ D ₂)4f	² [3] [°]	7/2	546 810.1	0.3	100%	81MAR/ZAL
		5/2	546 811	0.3	100%	81MAR/ZAL
2s ² 2p ⁴ (¹ D ₂)4f	² [4] [°]	7/2	546 887.36	0.3	100%	81MAR/ZAL
		9/2	546 888.34	0.3	100%	81MAR/ZAL
2s ² 2p ⁴ (¹ S)4s	² S	1/2	547 910.7	0.5		81MAR/ZAL
2s ² 2p ⁴ (¹ D)5s	² D	3/2	552 404	6		81MAR/ZAL
		5/2	552 416.?	6		81MAR/ZAL
Na IV (³ P ₂)	Limit	—	[577 654]	10		81MAR/ZAL
Na IV (³ P ₁)	Limit	—	[578 760]	10		81MAR/ZAL
Na IV (³ P ₀)	Limit	—	[579 230]	10		81MAR/ZAL
Na IV (¹ D ₂)	Limit	—	[608 494]	10		81MAR/ZAL
Na IV (¹ S ₀)	Limit	—	[644 150]	10		81MAR/ZAL

6.4. Na IV

O isoelectronic sequence

Ground state 1s²2s²2p⁴ ³P₂

Ionization energy [797 800] cm⁻¹; [98.92 eV]

The Na IV spectrum was first studied extensively by Söderqvist [32SOD, 34SOD, 46SOD] in the ultraviolet region between 129 Å and 412 Å, though Vance [32VAN] also reported observing seven of those transitions. Söderqvist established the ground configuration and levels in the 2s2p⁵ and 2s²2p³ns and nd configurations. A few of the 2s²2p³3s-3p and 3p-3d transitions were observed in a beam-foil spectrum and classified by Gaillard *et al.* [69GAI/CEY]. Minnhagen [76MIN] used observations between 136 Å and 412 Å and 1456 Å and 2156 Å to make a major extension of the analysis and improve the values of most of the previously identified levels. The forbidden lines in the visible region were reported by Bowen [60BOW] in nebular spectra. While not reporting measurements of the wavelengths, Gehrz *et al.* [94GEH/WOO] observed the forbidden transitions 2s²2p⁴ ³P₂-³P₁ at 9.039(12) μm and 2s²2p⁴ ³P₁-³P₀ at 21.29(6) μm in the spectrum of the nova V1974 Cygni. (These wavelengths and uncertainties are obtained from Ritz calculations by Kaufman and Sugar [86KAU/SUG].) In addition, Kelly and Lacy [95KEL/LAC] observed three hyperfine components of the 2s²2p⁴ ³P₂-³P₁ transition (see Table 7).

The energy levels and leading percentages retained here are taken from the compilation of Martin and Zalubas [81MAR/ZAL]. The uncertainties of the levels are given with respect to the ground state; however, it should be noted that the relative positions of the 2s²2p³nl levels given to the nearest 0.1 cm⁻¹ are known to about ±(0.2–0.4) cm⁻¹. The

level values for the quintet states are given with the notation “+x” to indicate that no intercombination lines to singlet or triplet levels have been observed. Thus the quintet level uncertainties are relative to other quintet levels. Martin and Zalubas [81MAR/ZAL] estimate that x is within ±300 cm⁻¹ of zero (see Table 8).

The transition probabilities of allowed transitions of Na IV have been calculated by Tachiev and Froese Fischer [02TAC/FROa, 02TAC/FROb] using the multiconfiguration Hartree-Fock technique and compiled by Kelleher and Podobedova [08KEL/POD] along with many-body perturbation theory calculations of Vilkas *et al.* [94VIL/MER]. For transitions involving 4d levels, where values were not available from these sources, [08KEL/POD] listed the Opacity Project values of Butler and Zeppen [95BUT/ZEI]. The ionization energy cited above was obtained by Edlén [64EDL] from data available for other members of the O I isoelectronic sequence.

References for Na IV

- | | |
|-----------|---|
| 32SOD | J. Söderqvist, Z. Phys. 79 , 634 (1932). |
| 32VAN | B. B. Vance, Phys. Rev. 41 , 480 (1932). |
| 34SOD | J. Söderqvist, Nova Acta Regiae Soc. Sci. Ups. IV 9 , 1 (1934). |
| 46SOD | J. Söderqvist, Ark. Mat. Astron. Fys. 32 , 1 (1946). |
| 60BOW | I. S. Bowen, Astrophys. J. 132 , 1 (1960). |
| 64EDL | B. Edlén, in <i>Encyclopedia of Physics</i> , edited by S. Flugge (Springer-Verlag, Berlin, 1964), Vol. 27, p. 198. |
| 69GAI/CEY | M. Gaillard, P. Ceyzeriat, A. Denis, and M. Dufay, C. R. Acad. Sci., Ser. B 269 , 526 (1969). |

76MIN	L. Minnhagen, J. Opt. Soc. Am. 66 , 659 (1976).	95BUT/ZEI	K. Butler and C. J. Zeippen, http://legacy.gsfc.nasa.gov/topbase (downloaded August 1995).
81MAR/ZAL	W. C. Martin and R. Zalubas, J. Phys. Chem. Ref. Data 10 , 153 (1981).	95KEL/LAC	D. M. Kelly and J. H. Lacy, Astrophys. J. 454 , L161 (1995).
86KAU/SUG	V. Kaufman and J. Sugar, J. Phys. Chem. Ref. Data 15 , 321 (1986).	02TAC/FROa	G. Tachiev and C. Froese Fischer, http://www.vuse.vanderbilt.edu/~cff/mchf_collection/ (downloaded December 2002).
94GEH/WOO	R. D. Gehrz, C. E. Woodward, M. A. Greenhouse, S. Starrfield, D. H. Wooden, F. C. Witteborn, S. A. Sandford, L. J. Allamandola, J. D. Bregman, and M. Klapisch, Astrophys. J. 421 , 762 (1994).	02TAC/FROb	G. Tachiev and C. Froese Fischer, Astron. Astrophys. 385 , 716 (2002).
94VIL/MER	M. J. Vilkas, G. Merkelis, R. Kisielius, G. Gaigalas, A. Bernotas, and Z. Rudzikas, Phys. Scr. 49 , 592 (1994).	08KEL/POD	D. E. Kelleher and L. Podobedova, J. Phys. Chem. Ref. Data 37 , 267 (2008).

TABLE 7. Observed spectral lines of Na IV

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref	A_{ki} Ref.
<i>Vacuum</i>									
136.4295	0.002	732 979.	3		1.74E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)4d ³ S ₁ °	76MIN	95BUT/ZEI
136.5513	0.002	732 326.	4		2.08E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)4d ³ P ₂ °	76MIN	95BUT/ZEI
136.6359	0.002	731 872.	3		1.04E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)4d ³ S ₁ °	76MIN	95BUT/ZEI
136.7540	0.002	731 240.	3		6.88E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)4d ³ P ₁ °	76MIN	95BUT/ZEI
136.8547	0.002	730 702.	4*		3.88E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)4d ³ D ₂ °	76MIN	95BUT/ZEI
136.8547	0.002	730 702.	4*		1.56E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)4d ³ D ₃ °	76MIN	95BUT/ZEI
137.0573	0.002	729 622.	4*		6.46E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)4d ³ D ₁ °	76MIN	95BUT/ZEI
137.0573	0.002	729 622.	4*		1.16E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)4d ³ D ₂ °	76MIN	95BUT/ZEI
137.1429	0.002	729 166.	3		8.59E+9	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² D°)4d ³ D ₁ °	76MIN	95BUT/ZEI
137.7117	0.002	726 155.	5		1.68E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)4d ¹ F ₃ °	76MIN	95BUT/ZEI
137.9415	0.002	724 945.	5			2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)4d ¹ D ₂ °	76MIN	
139.9613	0.002	714 483.	4			2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² P°)4s ³ P ₂ °	76MIN	
140.1811	0.002	713 363.	3*			2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)4s ³ P ₀ °	76MIN	
140.1811	0.002	713 363.	3*			2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)4s ³ P ₁ °	76MIN	
140.274	0.002	712 890.	1			2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² P°)4s ³ P ₁ °	76MIN	
142.2315	0.002	703 079.	7		3.06E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)4d ¹ F ₃ °	76MIN	95BUT/ZEI
142.3593	0.002	702 448.	6		2.77E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)4d ¹ D ₂ °	76MIN	95BUT/ZEI
142.6851	0.002	700 844.	5		1.70E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)4d ¹ P ₁ °	76MIN	95BUT/ZEI
144.9794	0.002	689 753.	4			2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)4s ³ D ₃ °	76MIN	
145.2046	0.002	688 683.	3			2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)4s ³ D ₂ °	76MIN	
145.300	0.002	688 231.	1			2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² D°)4s ³ D ₁ °	76MIN	
145.8426	0.002	685 671.	3			2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)4s ¹ P ₁ °	76MIN	
146.0644	0.002	684 630.	8*		7.40E+8	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (⁴ S°)4d ³ D ₁ °	76MIN	95BUT/ZEI
146.0644	0.002	684 630.	8*		2.68E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (⁴ S°)4d ³ D ₃ °	76MIN	95BUT/ZEI
146.0644	0.002	684 630.	8*		6.69E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (⁴ S°)4d ³ D ₂ °	76MIN	95BUT/ZEI
146.3015	0.002	683 520.	7		2.00E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (⁴ S°)4d ³ D ₂ °	76MIN	95BUT/ZEI
146.3991	0.002	683 064.	6	b	1.47E+10	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (⁴ S°)4d ³ D ₁ °	76MIN	95BUT/ZEI
150.2981	0.002	665 344.	9		2.38E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² P°)3d ³ D ₃ °	76MIN	08KEL/POD
150.459	0.002	664 633.	1		3.32E+8	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² P°)3d ¹ D ₂ °	76MIN	08KEL/POD
150.5427	0.002	664 263.	7		1.71E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)3d ³ D ₂ °	76MIN	08KEL/POD
150.642	0.002	663 825.	7	a	1.56E+10	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² P°)3d ³ D ₁ °	76MIN	08KEL/POD
150.6867	0.002	663 629.	8		9.87E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² P°)3d ³ P ₂ °	76MIN	08KEL/POD
150.7097	0.002	663 527.	5*		3.10E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)3d ¹ D ₂ °	76MIN	08KEL/POD
150.7097	0.002	663 527.	5*		5.51E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² P°)3d ³ P ₁ °	76MIN	08KEL/POD
150.9424	0.002	662 504.	5		2.73E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)3d ³ P ₂ °	76MIN	08KEL/POD
150.9667	0.002	662 398.	6		4.70E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)3d ³ P ₁ °	76MIN	08KEL/POD
151.0503	0.002	662 031.	6		1.71E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)3d ³ P ₀ °	76MIN	08KEL/POD
151.2994	0.002	660 941.	7		6.70E+9	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)4s ¹ D ₂ °	76MIN	95BUT/ZEI
153.8432	0.002	650 012.	3			2s ² 2p ⁴ ¹ S ₀	2s ² 2p ³ (² P°)4s ¹ P ₁ °	76MIN	
155.0826	0.002	644 818.	7		1.33E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (⁴ S°)4s ³ S ₁ °	76MIN	08KEL/POD

TABLE 7. Observed spectral lines of Na IV—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref	A_{ki} Ref.
155.2398	0.002	644 165.	7		1.88E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3d ³ S ₁ °	76MIN	08KEL/POD
155.3486	0.002	643 714.	5	b	1.48E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (⁴ S°)4s ³ S ₁ °	76MIN	08KEL/POD
155.368	0.002	643 633.	1	b		2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3d ¹ D ₂ °	76MIN	
155.4477	0.002	643 303.	7		3.45E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3d ³ P ₁ °	76MIN	08KEL/POD
155.4600	0.002	643 252.	3	b	6.30E+9	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (⁴ S°)4s ³ S ₁ °	76MIN	08KEL/POD
155.5104	0.002	643 044.	8*		1.40E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)3d ³ S ₁ °	76MIN	08KEL/POD
155.5104	0.002	643 044.	8*		4.81E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3d ³ P ₂ °	76MIN	08KEL/POD
155.6197	0.002	642 592.	6		5.13E+9	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² D°)3d ³ S ₁ °	76MIN	08KEL/POD
155.6872	0.002	642 314.	6*		5.93E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)3d ³ P ₀ °	76MIN	08KEL/POD
155.6872	0.002	642 314.	6*		1.79E+9	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)3d ¹ P ₁ °	76MIN	08KEL/POD
155.7129	0.002	642 208.	5		1.00E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)3d ³ P ₁ °	76MIN	08KEL/POD
155.7762	0.002	641 947.	7		1.50E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)3d ³ P ₂ °	76MIN	08KEL/POD
155.8276	0.002	641 735.	5		1.57E+10	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² D°)3d ³ P ₁ °	76MIN	08KEL/POD
156.5084	0.002	638 943.	6		6.45E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3d ³ D ₂ °	76MIN	08KEL/POD
156.5374	0.002	638 825.	8		2.92E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3d ³ D ₃ °	76MIN	08KEL/POD
156.7635	0.002	637 904.	5	b	1.07E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)3d ³ D ₁ °	76MIN	08KEL/POD
156.7798	0.002	637 837.	6	b	2.12E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)3d ³ D ₂ °	76MIN	08KEL/POD
156.8800	0.002	637 430.	7		1.52E+10	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² D°)3d ³ D ₁ °	76MIN	08KEL/POD
157.0841	0.002	636 602.	8		3.66E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)3d ¹ F ₃ °	76MIN	08KEL/POD
157.5948	0.002	634 539.	5		3.50E+9	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)3d ³ D ₂ °	76MIN	08KEL/POD
157.7792	0.002	633 797.	8		1.99E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)3d ¹ D ₂ °	76MIN	08KEL/POD
162.4479	0.002	615 582.	12		6.04E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)3d ¹ F ₃ °	76MIN	08KEL/POD
163.1895	0.002	612 785.	10		4.32E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)3d ¹ D ₂ °	76MIN	08KEL/POD
163.274	0.002	612 467.	1			2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)3d ³ P ₁ °	76MIN	
163.343	0.002	612 209.	1			2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)3d ³ P ₂ °	76MIN	
163.8396	0.002	610 353.	9	a	3.56E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)3d ¹ P ₁ °	76MIN	08KEL/POD
163.8412	0.002	610 347.	9		7.02E+10	2s ² 2p ⁴ ¹ S ₀	2s ² 2p ³ (² P°)3d ¹ P ₁ °	76MIN	08KEL/POD
168.093	0.002	594 909.	13*	b	3.33E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (⁴ S°)3d ³ D ₃ °	76MIN	08KEL/POD
168.093	0.002	594 909.	13*	b	8.38E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (⁴ S°)3d ³ D ₂ °	76MIN	08KEL/POD
168.093	0.002	594 909.	13*	b	9.35E+8	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (⁴ S°)3d ³ D ₁ °	76MIN	08KEL/POD
168.4110	0.002	593 785.	12*		2.45E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (⁴ S°)3d ³ D ₂ °	76MIN	08KEL/POD
168.4110	0.002	593 785.	12*		1.37E+10	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (⁴ S°)3d ³ D ₁ °	76MIN	08KEL/POD
168.5456	0.002	593 311.	10		1.81E+10	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (⁴ S°)3d ³ D ₁ °	76MIN	08KEL/POD
174.0047	0.002	574 697.	6		4.33E+9	2s ² 2p ⁴ ¹ S ₀	2s ² 2p ³ (² D°)3d ¹ P ₁ °	76MIN	08KEL/POD
175.4964	0.002	569 812.	6			2s2p ⁵ ³ P ₂ °	2s2p ⁴ (⁴ P)3d ³ D ₃ °	76MIN	
175.7965	0.002	568 840.	3			2s2p ⁵ ³ P ₁ °	2s2p ⁴ (⁴ P)3d ³ D ₂ °	76MIN	
175.930	0.002	568 408.	1			2s2p ⁵ ³ P ₀ °	2s2p ⁴ (⁴ P)3d ³ D ₁ °	76MIN	
181.7565	0.002	550 187.	8		6.07E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² P°)3s ³ P ₂ °	76MIN	08KEL/POD
181.7640	0.002	550 164.	6		3.33E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² P°)3s ³ P ₁ °	76MIN	08KEL/POD
182.1230	0.002	549 079.	6		2.42E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)3s ³ P ₂ °	76MIN	08KEL/POD
182.1322	0.002	549 052.	7*		8.44E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)3s ³ P ₀ °	76MIN	08KEL/POD
182.1322	0.002	549 052.	7*		2.04E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² P°)3s ³ P ₁ °	76MIN	08KEL/POD
182.2885	0.002	548 581.	6		3.10E+9	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² P°)3s ³ P ₁ °	76MIN	08KEL/POD
188.178	0.002	531 412.	1		4.43E+7	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3s ¹ D ₂ °	76MIN	08KEL/POD
190.1300	0.002	525 956.	8		9.39E+9	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)3s ¹ P ₁ °	76MIN	08KEL/POD
190.423	0.002	525 147.	2	b	2.72E+8	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3s ³ D ₁ °	76MIN	08KEL/POD
190.4337	0.002	525 117.	9	b	2.31E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3s ³ D ₂ °	76MIN	08KEL/POD
190.4453	0.002	525 085.	10		8.21E+9	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (² D°)3s ³ D ₃ °	76MIN	08KEL/POD
190.8273	0.002	524 034.	9		3.56E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)3s ³ D ₁ °	76MIN	08KEL/POD
190.8359	0.002	524 010.	9		5.87E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (² D°)3s ³ D ₂ °	76MIN	08KEL/POD
190.9992	0.002	523 562.	8		4.33E+9	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (² D°)3s ³ D ₁ °	76MIN	08KEL/POD
192.551	0.002	519 343.	1		6.42E+7	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² P°)3s ³ P ₂ °	76MIN	08KEL/POD
199.7722	0.002	500 570.	10		2.05E+10	2s ² 2p ⁴ ¹ D ₂	2s ² 2p ³ (² D°)3s ¹ D ₂ °	76MIN	08KEL/POD
203.9577	0.002	490 298.	8		9.54E+9	2s ² 2p ⁴ ¹ S ₀	2s ² 2p ³ (² P°)3s ¹ P ₁ °	76MIN	08KEL/POD
205.4869	0.002	486 649.	10	a	1.39E+10	2s ² 2p ⁴ ³ P ₂	2s ² 2p ³ (⁴ S°)3s ³ S ₁ °	76MIN	02TAC/FROa
205.9546	0.002	485 544.	9		8.19E+9	2s ² 2p ⁴ ³ P ₁	2s ² 2p ³ (⁴ S°)3s ³ S ₁ °	76MIN	02TAC/FROa
206.1533	0.002	485 076.	8		2.72E+9	2s ² 2p ⁴ ³ P ₀	2s ² 2p ³ (⁴ S°)3s ³ S ₁ °	76MIN	02TAC/FROa

TABLE 7. Observed spectral lines of Na IV—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref	A_{ki} Ref.
319.6436	0.002	312 848.4	10		2.52E+10	2s ² 2p ⁴ ¹ D ₂	2s2p ⁵ ¹ P ₁ ^o	76MIN	08KEL/POD
360.760	0.002	277 192.6	10		1.38E+9	2s ² 2p ⁴ ¹ S ₀	2s2p ⁵ ¹ P ₁ ^o	76MIN	08KEL/POD
408.6836	0.002	244 688.1	12		2.66E+9	2s ² 2p ⁴ ³ P ₂	2s2p ⁵ ³ P ₁ ^o	76MIN	08KEL/POD
409.6142	0.002	244 132.2	10		6.34E+9	2s ² 2p ⁴ ³ P ₁	2s2p ⁵ ³ P ₀ ^o	76MIN	08KEL/POD
410.3715	0.002	243 681.6	15		4.73E+9	2s ² 2p ⁴ ³ P ₂	2s2p ⁵ ³ P ₂ ^o	76MIN	08KEL/POD
410.5411	0.002	243 581.0	8		1.57E+9	2s ² 2p ⁴ ³ P ₁	2s2p ⁵ ³ P ₁ ^o	76MIN	08KEL/POD
411.3343	0.002	243 111.3	10		2.09E+9	2s ² 2p ⁴ ³ P ₀	2s2p ⁵ ³ P ₁ ^o	76MIN	08KEL/POD
412.2418	0.002	242 576.1	13		1.55E+9	2s ² 2p ⁴ ³ P ₁	2s2p ⁵ ³ P ₂ ^o	76MIN	08KEL/POD
1456.943	0.010	68 636.9	7		4.35E+8	2s ² 2p ³ (² D ^o)3p ¹ F ₃	2s ² 2p ³ (² D ^o)3d ¹ F ₃ ^o	76MIN	02TAC/FROa
1502.85	0.010	66 540.2		b	4.36E+8	2s ² 2p ³ (² D ^o)3p ³ D ₂	2s ² 2p ³ (² D ^o)3d ³ D ₃ ^o	76MIN	
1508.754	0.010	66 279.9	8		5.50E+8	2s ² 2p ³ (² D ^o)3p ³ D ₃	2s ² 2p ³ (² D ^o)3d ³ D ₃ ^o	76MIN	02TAC/FROa
1534.475	0.010	65 168.9	12	b	7.14E+8	2s ² 2p ³ (² D ^o)3s ¹ D ₂	2s ² 2p ³ (² D ^o)3p ¹ D ₂ ^o	76MIN	02TAC/FROa
1542.46	0.010	64 831.5	*	b	1.93E+8	2s ² 2p ³ (² P ^o)3p ³ D ₁	2s ² 2p ³ (² P ^o)3d ³ D ₁ ^o	76MIN	02TAC/FROa
1542.46	0.010	64 831.5	*	b	1.73E+8	2s ² 2p ³ (² P ^o)3p ³ D ₂	2s ² 2p ³ (² P ^o)3d ³ D ₂ ^o	76MIN	02TAC/FROa
1542.46	0.010	64 831.5	*	b	2.53E+8	2s ² 2p ³ (² P ^o)3p ³ D ₃	2s ² 2p ³ (² P ^o)3d ³ D ₃ ^o	76MIN	02TAC/FROa
1580.233	0.010	63 281.8	9		5.64E+8	2s ² 2p ³ (² D ^o)3p ³ D ₂	2s ² 2p ³ (² D ^o)3d ³ F ₃ ^o	76MIN	02TAC/FROa
1580.500	0.010	63 271.1	10		6.27E+8	2s ² 2p ³ (² D ^o)3p ³ D ₃	2s ² 2p ³ (² D ^o)3d ³ F ₄ ^o	76MIN	02TAC/FROa
1582.121	0.010	63 206.3	4	b	9.54E+8	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₁	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₀ ^o	76MIN	02TAC/FROa
1582.182	0.010	63 203.9	11	b	7.16E+8	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₁	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₁ ^o	76MIN	02TAC/FROa
1582.326	0.010	63 198.1	10		3.34E+8	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₁	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₂ ^o	76MIN	02TAC/FROa
1582.613	0.010	63 186.6	8		5.11E+8	2s ² 2p ³ (² D ^o)3p ³ D ₁	2s ² 2p ³ (² D ^o)3d ³ F ₂ ^o	76MIN	02TAC/FROa
1583.91	0.010	63 134.9	5	b	2.38E+8	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₂	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₁ ^o	76MIN	02TAC/FROa
1583.977	0.010	63 134.9	11	b	5.55E+8	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₂	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₂ ^o	76MIN	02TAC/FROa
1584.141	0.010	63 125.7	12		6.34E+8	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₂	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₃ ^o	76MIN	02TAC/FROa
1586.848	0.010	63 018.0	3*	b	6.31E+7	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₃	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₂ ^o	76MIN	02TAC/FROa
1586.848	0.010	63 018.0	3*	b	3.88E+6	2s ² 2p ³ (² D ^o)3p ³ D ₃	2s ² 2p ³ (² D ^o)3d ³ F ₂ ^o	76MIN	02TAC/FROa
1586.990	0.010	63 012.4	10	b	3.15E+8	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₃	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₃ ^o	76MIN	02TAC/FROa
1587.048	0.010	63 010.1	12	b	9.46E+8	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₃	2s ² 2p ³ (⁴ S ^o)3d ⁵ D ₄ ^o	76MIN	02TAC/FROa
1588.87	0.010	62 937.8	3	b	5.74E+7	2s ² 2p ³ (² D ^o)3p ³ F ₄	2s ² 2p ³ (² D ^o)3d ³ D ₃ ^o	76MIN	02TAC/FROa
1596.304	0.010	62 644.7	3	b	8.16E+8	2s ² 2p ³ (² P ^o)3p ³ D ₁	2s ² 2p ³ (² P ^o)3d ³ F ₂ ^o	76MIN	02TAC/FROa
1596.367	0.010	62 642.2	6	b	8.59E+8	2s ² 2p ³ (² P ^o)3p ³ D ₂	2s ² 2p ³ (² P ^o)3d ³ F ₃ ^o	76MIN	02TAC/FROa
1596.401	0.010	62 640.9	9	b	9.55E+8	2s ² 2p ³ (² P ^o)3p ³ D ₃	2s ² 2p ³ (² P ^o)3d ³ F ₄ ^o	76MIN	02TAC/FROa
1613.948	0.010	61 959.9	10		8.74E+8	2s ² 2p ³ (² D ^o)3p ³ F ₂	2s ² 2p ³ (² D ^o)3d ³ G ₃ ^o	76MIN	02TAC/FROa
1615.922	0.010	61 884.2	11		8.89E+8	2s ² 2p ³ (² D ^o)3p ³ F ₃	2s ² 2p ³ (² D ^o)3d ³ G ₄ ^o	76MIN	02TAC/FROa
1618.570	0.010	61 782.9	12		9.23E+8	2s ² 2p ³ (² D ^o)3p ³ F ₄	2s ² 2p ³ (² D ^o)3d ³ G ₅ ^o	76MIN	02TAC/FROa
1655.468	0.010	60 405.9	11		8.72E+8	2s ² 2p ³ (² D ^o)3p ¹ F ₃	2s ² 2p ³ (² D ^o)3d ¹ G ₄ ^o	76MIN	02TAC/FROa
1668.588	0.010	59 930.9	8	b	2.65E+8	2s ² 2p ³ (² D ^o)3p ³ F ₄	2s ² 2p ³ (² D ^o)3d ³ F ₄ ^o	76MIN	02TAC/FROa
1670.79	0.010	59 851.9		b	2.20E+8	2s ² 2p ³ (² D ^o)3p ³ F ₃	2s ² 2p ³ (² D ^o)3d ³ F ₃ ^o	76MIN	02TAC/FROa
1672.330	0.010	59 796.8	5		2.17E+8	2s ² 2p ³ (² D ^o)3p ³ F ₂	2s ² 2p ³ (² D ^o)3d ³ F ₂ ^o	76MIN	02TAC/FROa
1701.97	0.010	58 755.4	15	b	7.93E+8	2s ² 2p ³ (⁴ S ^o)3p ³ P ₂	2s ² 2p ³ (⁴ S ^o)3d ³ D ₃ ^o	76MIN	02TAC/FROa
1702.409	0.010	58 740.3	10		5.95E+8	2s ² 2p ³ (⁴ S ^o)3p ³ P ₁	2s ² 2p ³ (⁴ S ^o)3d ³ D ₂ ^o	76MIN	02TAC/FROa
1702.735	0.010	58 694.6	6		3.30E+8	2s ² 2p ³ (⁴ S ^o)3p ³ P ₁	2s ² 2p ³ (⁴ S ^o)3d ³ D ₁ ^o	76MIN	02TAC/FROa
1702.995	0.010	58 720.1	7		1.98E+8	2s ² 2p ³ (⁴ S ^o)3p ³ P ₂	2s ² 2p ³ (⁴ S ^o)3d ³ D ₂ ^o	76MIN	02TAC/FROa
1703.53	0.010	58 701.6	9	b	4.40E+8	2s ² 2p ³ (⁴ S ^o)3p ³ P ₀	2s ² 2p ³ (⁴ S ^o)3d ³ D ₁ ^o	76MIN	02TAC/FROa
1791.629	0.010	55 815.1	8		4.47E+8	2s ² 2p ³ (² P ^o)3s ¹ P ₁ ^o	2s ² 2p ³ (² P ^o)3p ¹ D ₂ ^o	76MIN	02TAC/FROa
1824.113	0.010	54 821.2	5		5.85E+8	2s ² 2p ³ (² P ^o)3p ¹ D ₂ ^o	2s ² 2p ³ (² P ^o)3s ¹ F ₃ ^o	76MIN	02TAC/FROa
1960.760	0.010	51 000.6	12		3.71E+8	2s ² 2p ³ (⁴ S ^o)3s ⁵ S ₂ ^o	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₂ ^o	76MIN	02TAC/FROa
1965.078	0.010	50 888.6	11		3.68E+8	2s ² 2p ³ (⁴ S ^o)3s ⁵ S ₂ ^o	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₃ ^o	76MIN	02TAC/FROa
1967.601	0.010	50 823.3	10		3.67E+8	2s ² 2p ³ (⁴ S ^o)3s ⁵ S ₂ ^o	2s ² 2p ³ (⁴ S ^o)3p ⁵ P ₁ ^o	76MIN	02TAC/FROa
1968.441	0.010	50 801.6	9		3.82E+8	2s ² 2p ³ (² D ^o)3s ³ D ₃ ^o	2s ² 2p ³ (² D ^o)3p ³ F ₄ ^o	76MIN	02TAC/FROa
1970.986	0.010	50 736.0	4	b	2.70E+7	2s ² 2p ³ (² D ^o)3s ³ D ₃ ^o	2s ² 2p ³ (² D ^o)3p ³ F ₃ ^o	76MIN	02TAC/FROa
1972.223	0.010	50 704.2	9		3.51E+8	2s ² 2p ³ (² D ^o)3s ³ D ₂ ^o	2s ² 2p ³ (² D ^o)3p ³ F ₃ ^o	76MIN	02TAC/FROa
1975.148	0.010	50 629.1	7		3.32E+8	2s ² 2p ³ (² D ^o)3s ³ D ₁ ^o	2s ² 2p ³ (² D ^o)3p ³ F ₂ ^o	76MIN	02TAC/FROa
1983.746	0.010	50 409.7	5		2.00E+8	2s ² 2p ³ (² P ^o)3s ³ P ₀ ^o	2s ² 2p ³ (² P ^o)3p ³ D ₁ ^o	76MIN	02TAC/FROa
1985.03	0.010	50 377.1	4	b	2.72E+8	2s ² 2p ³ (² P ^o)3s ³ P ₁ ^o	2s ² 2p ³ (² P ^o)3p ³ D ₂ ^o	76MIN	02TAC/FROa
1987.140	0.010	50 323.6	7		3.56E+8	2s ² 2p ³ (² P ^o)3s ³ P ₂ ^o	2s ² 2p ³ (² P ^o)3p ³ D ₃ ^o	76MIN	02TAC/FROa
1998.584	0.010	50 035.4	4	b	3.28E+8	2s ² 2p ³ (² P ^o)3s ¹ P ₁ ^o	2s ² 2p ³ (² P ^o)3p ¹ P ₁ ^o	76MIN	02TAC/FROa

TABLE 7. Observed spectral lines of Na IV—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref	A_{ki} Ref.
<i>Air</i>									
2018.137	0.010	49 534.7	5		3.45E+8	2s ² 2p ³ (⁴ S°)3s ³ S ₁ [°]	2s ² 2p ³ (⁴ S°)3p ³ P ₀	76MIN	02TAC/FROa
2018.384	0.010	49 528.6	10		3.44E+8	2s ² 2p ³ (⁴ S°)3s ³ S ₁ [°]	2s ² 2p ³ (⁴ S°)3p ³ P ₂	76MIN	02TAC/FROa
2019.188	0.010	49 508.9	9		3.44E+8	2s ² 2p ³ (⁴ S°)3s ³ S ₁ [°]	2s ² 2p ³ (⁴ S°)3p ³ P ₁	76MIN	02TAC/FROa
2106.327	0.010	47 461.0	12	b	2.72E+8	2s ² 2p ³ (² D°)3s ³ D ₃ [°]	2s ² 2p ³ (² D°)3p ³ D ₃	76MIN	02TAC/FROa
2113.099	0.010	47 308.9	4		4.70E+7	2s ² 2p ³ (² D°)3s ³ D ₃ [°]	2s ² 2p ³ (² D°)3p ³ D ₂	76MIN	02TAC/FROa
2114.533	0.010	47 276.8	10		2.10E+8	2s ² 2p ³ (² D°)3s ³ D ₂ [°]	2s ² 2p ³ (² D°)3p ³ D ₂	76MIN	02TAC/FROa
2115.13	0.010	47 263.5	3		7.05E+7	2s ² 2p ³ (² D°)3s ³ D ₂ [°]	2s ² 2p ³ (² D°)3p ³ D ₁	76MIN	02TAC/FROa
2116.158	0.010	47 240.5	7	b	2.04E+8	2s ² 2p ³ (² D°)3s ³ D ₁ [°]	2s ² 2p ³ (² D°)3p ³ D ₁	76MIN	02TAC/FROa
2124.875	0.010	47 046.7	4		2.34E+8	2s ² 2p ³ (² D°)3p ¹ D ₂ [°]	2s ² 2p ³ (² D°)3d ¹ D ₂ [°]	76MIN	02TAC/FROa
2155.762	0.010	46 372.7	10		2.97E+8	2s ² 2p ³ (² D°)3s ¹ D ₂ [°]	2s ² 2p ³ (² D°)3p ¹ F ₃	76MIN	02TAC/FROa
3241.68	0.10	30 839.3			6.13E-1	2s ² 2p ⁴ ³ P ₂	2s ² 2p ⁴ ¹ D ₂	60BOW	08KEL/POD
3362.20	0.10	29 733.9			1.83E-1	2s ² 2p ⁴ ³ P ₁	2s ² 2p ⁴ ¹ D ₂	60BOW	08KEL/POD

TABLE 8. Energy levels of Na IV

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ⁴	³ P	2	0.0			
		1	1 106.3	1.0		81MAR/ZAL
		0	1 576.0	1.0		81MAR/ZAL
2s ² 2p ⁴	¹ D	2	30 839.8	1.0		81MAR/ZAL
2s ² 2p ⁴	¹ S	0	66 496	2		81MAR/ZAL
2s2p ⁵	³ P°	2	243 681.9	1.0	99%	81MAR/ZAL
		1	244 687.6	1.0	99%	81MAR/ZAL
		0	245 238.8	1.0	99%	81MAR/ZAL
2s2p ⁵	¹ P°	1	343 688	2	99%	81MAR/ZAL
2s ² 2p ³ (⁴ S°)3s	⁵ S°	2	473 950.0+x	0.4	100%	81MAR/ZAL
2s ² 2p ³ (⁴ S°)3s	³ S°	1	486 650.2	10	100%	81MAR/ZAL
2s ² 2p ³ (⁴ S°)3p	⁵ P	1	524 773.3+x	0.4	100%	81MAR/ZAL
		2	524 838.6+x	0.4	100%	81MAR/ZAL
		3	524 950.6+x	0.4	100%	81MAR/ZAL
2s ² 2p ³ (² D°)3s	³ D°	3	525 085	10	100%	81MAR/ZAL
		2	525 117	10	100%	81MAR/ZAL
		1	525 139	10	100%	81MAR/ZAL
2s ² 2p ³ (² D°)3s	¹ D°	2	531 410	10	99%	81MAR/ZAL
2s ² 2p ³ (⁴ S°)3p	³ P	1	536 159.1	10	94 % + 5 % 2s ² 2p ³ (² D°)3p ³ P ₁	81MAR/ZAL
		2	536 178.8	10	94 % + 5 % 2s ² 2p ³ (² D°)3p ³ P ₂	81MAR/ZAL
		0	536 184.9	10	94 % + 5 % 2s ² 2p ³ (² D°)3p ³ P ₀	81MAR/ZAL
2s ² 2p ³ (² P°)3s	³ P°	1	550 157	10	99%	81MAR/ZAL
		0	550 158.?	10	99%	81MAR/ZAL
		2	550 186	10	99%	81MAR/ZAL
2s ² 2p ³ (² P°)3s	¹ P°	1	556 796	10	99%	81MAR/ZAL
2p ⁶	¹ S	0	570 823	2		81MAR/ZAL
2s ² 2p ³ (² D°)3p	³ P	1	572 379.5	10	92 % + 6 % 2s ² 2p ³ (² P°)3p ³ D ₁	81MAR/ZAL
		2	572 393.8	10	94 % + 5 % 2s ² 2p ³ (² P°)3p ³ D ₂	81MAR/ZAL
		3	572 546.0	10	95 % + 5 % 2s ² 2p ³ (² P°)3p ³ D ₃	81MAR/ZAL

TABLE 8. Energy levels of Na IV—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ³ (² D°)3p	³ F	2	575 768.1	10	99%	81MAR/ZAL
		3	575 821.0	10	99%	81MAR/ZAL
		4	575 886.6	10	100%	81MAR/ZAL
2s ² 2p ³ (² D°)3p	¹ F	3	577 782.7	10	100%	81MAR/ZAL
2s ² 2p ³ (⁴ S°)3d	⁵ D°	4	587 960.7+ <i>x</i>	0.4	100%	81MAR/ZAL
		3	587 964.3+ <i>x</i>	0.4	100%	81MAR/ZAL
		2	587 971.2+ <i>x</i>	0.4	100%	81MAR/ZAL
		1	587 977.2+ <i>x</i>	0.4	100%	81MAR/ZAL
		0	587 979.6+ <i>x</i>	0.4	100%	81MAR/ZAL
2s ² 2p ³ (⁴ S°)3d	³ D°	1	594 888.1	10	99%	81MAR/ZAL
		2	594 899.2	10	99%	81MAR/ZAL
		3	594 934	10	99%	81MAR/ZAL
2s ² 2p ³ (² D°)3p	¹ D	2	596 578.9	10	96%	81MAR/ZAL
2s ² 2p ³ (² P°)3p	³ D	3	600 509.6	10	95 % + 4 % 2s ² 2p ³ (² D°)3p ³ D ₃	81MAR/ZAL
		2	600 534.1	10	94 % + 5 % 2s ² 2p ³ (² D°)3p ³ D ₂	81MAR/ZAL
		1	600 567.7	10	94 % + 6 % 2s ² 2p ³ (² D°)3p ³ D ₁	81MAR/ZAL
2s ² 2p ³ (² P°)3p	¹ P	1	606 831?	10	75 % + 14 % 2s ² 2p ³ (² D°)3p ¹ P ₁	81MAR/ZAL
2s ² 2p ³ (² P°)3p	¹ D	2	612 611?	10	98%	81MAR/ZAL
2s ² 2p ³ (² D°)3d	³ F°	2	635 566.0	10	97%	81MAR/ZAL
		3	635 675.6	10	97%	81MAR/ZAL
		4	635 817.2	10	98%	81MAR/ZAL
2s ² 2p ³ (² D°)3d	³ G°	5	637 669.6	10	100%	81MAR/ZAL
		4	637 705.1	10	99%	81MAR/ZAL
		3	637 728.0	10	99%	81MAR/ZAL
2s ² 2p ³ (² D°)3d	¹ G°	4	638 188.6	10	99%	81MAR/ZAL
2s ² 2p ³ (² D°)3d	³ D°	3	638 825	10	98%	81MAR/ZAL
		2	638 943	10	99%	81MAR/ZAL
		1	639 007	10	99%	81MAR/ZAL
2s ² 2p ³ (² D°)3d	¹ P°	1	641 193	10	95%	81MAR/ZAL
2s ² 2p ³ (² D°)3d	³ P°	2	643 052	10	97%	81MAR/ZAL
		1	643 311	10	95%	81MAR/ZAL
		0	643 420?	10	98%	81MAR/ZAL
2s ² 2p ³ (² D°)3d	¹ D°	2	643 625.6	10	94 % + 6 % 2s ² 2p ³ (² P°)3d ¹ D ₂	81MAR/ZAL
2s ² 2p ³ (² D°)3d	³ S°	1	644 166	10	97%	81MAR/ZAL
2s ² 2p ³ (⁴ S°)4s	³ S°	1	644 819	10		81MAR/ZAL
2s ² 2p ³ (² D°)3d	¹ F°	3	646 419.6	10	100%	81MAR/ZAL
2s ² 2p ³ (² P°)3d	³ P°	0	663 137?	10	99%	81MAR/ZAL
		1	663 509	10	99%	81MAR/ZAL
		2	663 623	10	98%	81MAR/ZAL
2s ² 2p ³ (² P°)3d	³ F°	4	663 150.5	10	98%	81MAR/ZAL
		3	663 176.3	10	98%	81MAR/ZAL
		2	663 212.4	10	96%	81MAR/ZAL

TABLE 8. Energy levels of Na IV—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Leading percentages	Reference
2s ² 2p ³ (² P°)3d	¹ D°	2	664 637	10	86 % + 8 % 2s ² 2p ³ (² P°)3d ³ D° ₂	81MAR/ZAL
2s ² 2p ³ (² P°)3d	³ D°	3	665 344	10	98%	81MAR/ZAL
		2	665 370	10	91 % + 6 % 2s ² 2p ³ (² P°)3d ¹ D° ₂	81MAR/ZAL
		1	665 400	10	99%	81MAR/ZAL
2s ² 2p ³ (² P°)3d	¹ F°	3	667 442	10	100%	81MAR/ZAL
2s ² 2p ³ (² P°)3d	¹ P°	1	673 140	10	98%	81MAR/ZAL
2s ² 2p ³ (⁴ S°)4d	³ D°	2	684 626	10		81MAR/ZAL
		3	684 630	10		81MAR/ZAL
		1	684 640	10		81MAR/ZAL
2s ² 2p ³ (² D°)4s	³ D°	3	689 753	10		81MAR/ZAL
		2	689 789	10		81MAR/ZAL
		1	689 808	10		81MAR/ZAL
2s ² 2p ³ (² D°)4s	¹ D°	2	691 781	10		81MAR/ZAL
2s ² 2p ³ (² P°)4s	³ P°	0	714 468?	10		81MAR/ZAL
		1	714 468	10		81MAR/ZAL
		2	714 483	10		81MAR/ZAL
2s ² 2p ³ (² P°)4s	¹ P°	1	716 509	10		81MAR/ZAL
2s ² 2p ³ (² D°)4d	³ D°	3	730 702	10		81MAR/ZAL
		2	730 728	10		81MAR/ZAL
		1	730 742	10		81MAR/ZAL
2s ² 2p ³ (² D°)4d	¹ P°	1	731 684	10		81MAR/ZAL
2s ² 2p ³ (² D°)4d	³ P°	2	732 325	10		81MAR/ZAL
		1	732 346	10		81MAR/ZAL
2s ² 2p ³ (² D°)4d	³ S°	1	732 979	10		81MAR/ZAL
2s ² 2p ³ (² D°)4d	¹ D°	2	733 288	10		81MAR/ZAL
2s ² 2p ³ (² D°)4d	¹ F°	3	733 919	10		81MAR/ZAL
2s ² 2p ³ (² P°)4d	¹ D°	2	755 785	10		81MAR/ZAL
2s ² 2p ³ (² P°)4d	¹ F°	3	756 995	10		81MAR/ZAL
Na v (⁴ S° _{3/2})	Limit	—	[797 800]	10		81MAR/ZAL
2s2p ⁴ (⁴ P)3d	³ D	3	813 494	10		81MAR/ZAL
		2	813 527	10		81MAR/ZAL
		1	813 648?	10		81MAR/ZAL

6.5. Na v

N isoelectronic sequence

Ground state 1s²2s²2p³ ⁴S°_{3/2}Ionization energy 1 116 300(100) cm⁻¹; 138.40(0.01) eV

The Na v spectrum between 100 Å and 514 Å was first measured and analyzed by Söderqvist [34SOD, 46SOD], who reported 103 lines. Subsequently Goto *et al.* [73GOT/GAUa] measured nine additional lines between 150 Å and 1806 Å in a vacuum spark discharge and classified them as transitions between Söderqvist's levels. The doublet levels

were re-evaluated by Martin and Zalubas [81MAR/ZAL] using a quartet-doublet intersystem connection reported by Edlén [64EDL]. Since then the connection between the systems has been directly observed in the solar spectrum by Curdt *et al.* [01CUR/BRE]. The values of the doublet levels retained here are from compilation of the Martin and Zalubas [81MAR/ZAL], adjusted to reflect the improved values of the 2s²2p³ ⁴S°_{3/2}-2s²2p³ ²P°_{3/2,5/2} intervals. Some of the upper levels are only derived from a single weak line or blended lines. These are indicated in the table below by question marks after the level value. The ionization energy cited above was calculated by Söderqvist [46SOD] from series

data. Edlén [64EDL] fitted a semiempirical formula to the N I isoelectronic sequence, which agrees with the Söderqvist value within 100 cm^{-1} (see Tables 9 and 10).

For levels up to $2s^2 2p^2(^1S)3d$ ($867\,530\text{ cm}^{-1}$), the transition probabilities for Na V have been compiled by Kelleher and Podobedova [08KEL/POD] using the multiconfiguration Hartree-Fock calculations of Tachiev and Froese Fischer [02TAC/FROa, 02TAC/FROb] and the many-body perturbation results of Merkelis *et al.* [97MER/VIL]. For transitions involving levels above $867\,530\text{ cm}^{-1}$, the [08KEL/POD] values are taken from the nonrelativistic Opacity Project calculations of Burke and Lennon [95BUR/LEN]. Froese Fischer and Tachiev [04FRO/TAC] subsequently published slightly revised values for some of the transitions below.

References for Na V

34SOD	J. Söderqvist, <i>Nova Acta Regiae Soc. Sci. Ups.</i> 9 , 1 (1934).
46SOD	J. Söderqvist, <i>Ark. Mat. Astron. Fys.</i> 32 , 1 (1946).
64EDL	B. Edlén, in <i>Encyclopedia of Physics</i> , edited by S. Flugge (Springer-Verlag, Berlin, 1964), Vol. 27, p. 198.
73GOT/GAUa	T. Goto, M. S. Gautam, and Y. N. Joshi,

81MAR/ZAL	Physica (Utrecht) 66 , 70 (1973).
95BUR/LEN	W. C. Martin and R. Zalubas, <i>J. Phys. Chem. Ref. Data</i> 10 , 153 (1981).
97MER/VIL	V. M. Burke and D. J. Lennon (unpublished); http://legacy.gsfc.nasa.gov/topbase (downloaded August 1995).
01CUR/BRE	G. Merkelis, M. J. Vilkas, R. Kisielius, G. Gaigalas, and I. Martinson, <i>Phys. Scr.</i> 56 , 41 (1997).
02TAC/FROa	W. Curdt, P. Brekke, U. Feldman, K. Wilhelm, B. N. Dwivedi, U. Schühle, and P. Lemaire, <i>Astron. Astrophys.</i> 375 , 591 (2001).
02TAC/FROb	G. Tachiev and C. Froese Fischer, http://www.vuse.vanderbilt.edu/~cff/mchf_collection/ (downloaded December 2002).
04FRO/TAC	G. Tachiev and C. Froese Fischer, <i>Astron. Astrophys.</i> 385 , 716 (2002).
08KEL/POD	C. Froese Fischer and G. Tachiev, <i>At. Data Nucl. Data Tables</i> 87 , 1 (2004).
	D. E. Kelleher and L. Podobedova, <i>J. Phys. Chem. Ref. Data</i> 37 , 267 (2008).

TABLE 9. Observed spectral lines of Na V

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>								
100.88	0.010	991 280	10*	1.86E+10	$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^2(^1D)5d\ ^2D_{5/2}$	46SOD	08KEL/POD
100.88	0.010	991 280	10*	1.80E+10	$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^2(^1D)5d\ ^2D_{3/2}$	46SOD	08KEL/POD
100.945	0.010	990 640	10*		$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^2(^1D)5d\ ^2F_{7/2}$	46SOD	
100.945	0.010	990 640	10*		$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^2(^1D)5d\ ^2F_{5/2}$	46SOD	
103.482	0.010	966 350	10*		$2s^2 2p^3\ ^2P_{1/2}^\circ$	$2s^2 2p^2(^1D)5d\ ^2D_{3/2}$	46SOD	
103.482	0.010	966 350	10*		$2s^2 2p^3\ ^2P_{3/2}^\circ$	$2s^2 2p^2(^1D)5d\ ^2D_{5/2}$	46SOD	
106.278	0.010	940 930	100	6.44E+10	$2s^2 2p^3\ ^4S_{3/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^4P_{3/2}$	46SOD	08KEL/POD
106.302	0.010	940 720	100	6.41E+10	$2s^2 2p^3\ ^4S_{3/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^4P_{5/2}$	46SOD	08KEL/POD
106.399	0.010	939 860	100		$2s^2 2p^3\ ^4S_{3/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^4D_{1/2}$	46SOD	
106.490	0.010	939 060	100		$2s^2 2p^3\ ^4S_{3/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^4D_{5/2}$	46SOD	
107.934	0.010	926 490	200	2.58E+10	$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^2(^1D)4d\ ^2D_{5/2}^?$	46SOD	08KEL/POD
108.017	0.010	925 780	200*	3.85E+10	$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^2(^1D)4d\ ^2F_{7/2}$	46SOD	08KEL/POD
108.017	0.010	925 780	200*	3.59E+10	$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^2(^1D)4d\ ^2F_{5/2}$	46SOD	08KEL/POD
110.817	0.010	902 390	200	6.95E+10	$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^3(^3D^\circ)3p\ ^2F_{5/2}$	46SOD	08KEL/POD
110.878	0.010	901 890	200	7.45E+10	$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^3(^3D^\circ)3p\ ^2F_{7/2}$	46SOD	08KEL/POD
110.921	0.010	901 540	10	1.89E+10	$2s^2 2p^3\ ^2P_{3/2}^\circ$	$2s^2 2p^2(^1D)4d\ ^2D_{5/2}^?$	46SOD	08KEL/POD
111.512	0.010	896 760	100	1.74E+10	$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^2D_{5/2}$	46SOD	08KEL/POD
111.552	0.010	896 440	10	1.68E+10	$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^2D_{3/2}$	46SOD	08KEL/POD
111.879	0.010	893 820	10*		$2s^2 2p^3\ ^4S_{3/2}^\circ$	$2s^2 2p^2(^3P)4s\ ^4P_{5/2}$	46SOD	
111.879	0.010	893 820	10*		$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^2F_{7/2}$	46SOD	
112.009	0.010	892 780	300				46SOD	
112.077	0.010	892 240	10		$2s^2 2p^3\ ^4S_{3/2}^\circ$	$2s^2 2p^2(^3P)4s\ ^4P_{1/2}$	46SOD	
112.186	0.010	891 380	10		$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^4D_{1/2}$	46SOD	
112.347	0.010	890 100	10		$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^2P_{3/2}$	46SOD	
113.574	0.010	880 480	10*		$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^2(^1D)4s\ ^2D_{5/2}$	46SOD	
113.574	0.010	880 480	10*		$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^2(^1D)4s\ ^2D_{3/2}$	46SOD	
113.952	0.010	877 560	10		$2s^2 2p^3\ ^2P_{3/2}^\circ$	$2s^2 2p^3(^3D^\circ)3p\ ^2F_{5/2}$	46SOD	
114.700	0.010	871 840	100	3.95E+10	$2s^2 2p^3\ ^2P_{3/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^2D_{5/2}$	46SOD	08KEL/POD
114.738	0.010	871 550	100	3.29E+10	$2s^2 2p^3\ ^2P_{1/2}^\circ$	$2s^2 2p^2(^3P)4d\ ^2D_{3/2}$	46SOD	08KEL/POD
117.703	0.010	849 600	10		$2s^2 2p^3\ ^2D_{5/2}^\circ$	$2s^2 2p^2(^3P)4s\ ^2P_{3/2}$	92SOD	
117.876	0.010	848 350	10		$2s^2 2p^3\ ^2D_{3/2}^\circ$	$2s^2 2p^2(^3P)4s\ ^2P_{1/2}$	34SOD	

TABLE 9. Observed spectral lines of Na V—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
117.990	0.010	847 530	400	2.28E+10	2s ² 2p ³ 4S _{3/2} ^o	2s2p ³ (⁵ P*)3p 4P _{5/2}	46SOD	04FRO/TAC
120.040	0.010	833 060	100		2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (¹ D)3d 2D _{5/2}	46SOD	
121.263	0.010	824 660	10		2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (³ P)4s 2P _{3/2}	46SOD	
125.178	0.010	798 860	400	1.60E+11	2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (³ P)3d 4P _{1/2}	46SOD	04FRO/TAC
125.216	0.010	798 620	400	1.58E+11	2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (³ P)3d 4P _{3/2}	46SOD	04FRO/TAC
125.286	0.010	798 170	500	1.18E+11	2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (³ P)3d 4P _{5/2}	46SOD	04FRO/TAC
125.428	0.010	797 270	300		2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (³ P)3d 4D _{1/2}	46SOD	
125.461	0.010	797 060	300		2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (³ P)3d 4D _{5/2}	46SOD	
125.899	0.010	794 290	200	5.58E+10	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (¹ S)3d 4D _{5/2}	46SOD	04FRO/TAC
126.090	0.010	793 080	10	5.42E+10	2s2p ⁴ 4P _{5/2}	2s2p ³ (³ D°)3d 4S _{3/2} ^o	46SOD	08KEL/POD
126.210	0.010	792 330	100	5.75E+10	2s2p ⁴ 4P _{3/2}	2s2p ³ (³ D°)3d 4D _{7/2} ^o	46SOD	08KEL/POD
126.368	0.010	791 340	10	4.01E+10	2s2p ⁴ 4P _{3/2}	2s2p ³ (³ D°)3d 4D _{5/2} ^o	46SOD	08KEL/POD
126.458	0.010	790 780	10	2.38E+10	2s2p ⁴ 4P _{1/2}	2s2p ³ (³ D°)3d 4D _{3/2} ^o	46SOD	08KEL/POD
126.557	0.010	790 160	200	2.70E+10	2s ² 2p ³ 2D _{5/2} ^o	2s ² 2p ² (¹ D)3d 2P _{3/2}	46SOD	04FRO/TAC
126.608	0.010	789 840	100	3.42E+10	2s ² 2p ³ 2D _{3/2} ^o	2s ² 2p ² (¹ D)3d 2P _{1/2}	46SOD	04FRO/TAC
126.779	0.010	788 770	10	5.69E+10	2s2p ⁴ 4P _{5/2}	2s2p ³ (³ D°)3d 4P _{3/2} ^o	46SOD	08KEL/POD
126.814	0.010	788 560	100	8.83E+10	2s2p ⁴ 4P _{3/2}	2s2p ³ (³ D°)3d 4P _{5/2} ^o	46SOD	08KEL/POD
126.920	0.010	787 900	10	1.05E+11	2s2p ⁴ 4P _{3/2}	2s2p ³ (³ D°)3d 4P _{1/2} ^o	46SOD	08KEL/POD
126.985	0.010	787 500	10	3.78E+10	2s2p ⁴ 4P _{3/2}	2s2p ³ (³ D°)3d 4P _{5/2} ^o	46SOD	08KEL/POD
127.036	0.010	787 180	10	5.23E+10	2s2p ⁴ 4P _{1/2}	2s2p ³ (³ D°)3d 4P _{3/2} ^o	46SOD	08KEL/POD
127.444	0.010	784 660	400	7.01E+10	2s ² 2p ³ 2D _{5/2} ^o	2s ² 2p ² (¹ D)3d 2D _{5/2}	46SOD	04FRO/TAC
127.473	0.010	784 480	400	7.52E+10	2s ² 2p ³ 2D _{3/2} ^o	2s ² 2p ² (¹ D)3d 2D _{3/2}	46SOD	04FRO/TAC
128.025	0.010	781 100	400	1.25E+11	2s ² 2p ³ 2D _{3/2} ^o	2s ² 2p ² (¹ D)3d 2F _{5/2}	46SOD	04FRO/TAC
128.051	0.010	780 940	400	9.65E+10	2s ² 2p ³ 2D _{5/2} ^o	2s ² 2p ² (¹ D)3d 2F _{7/2}	46SOD	04FRO/TAC
129.942	0.010	769 570	100	5.14E+10	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (¹ D)3d 2S _{1/2}	46SOD	04FRO/TAC
130.680	0.010	765 230	200	5.48E+10	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (¹ D)3d 2P _{3/2}	46SOD	04FRO/TAC
130.723	0.010	764 980	100	4.18E+10	2s ² 2p ³ 2P _{1/2} ^o	2s ² 2p ² (¹ D)3d 2P _{1/2}	46SOD	04FRO/TAC
131.345	0.010	761 350	300	3.57E+10	2s ² 2p ³ 2D _{5/2} ^o	2s ² 2p ² (³ P)3d 2D _{5/2}	46SOD	04FRO/TAC
131.413	0.010	760 960	200	2.94E+10	2s ² 2p ³ 2D _{3/2} ^o	2s ² 2p ² (³ P)3d 2D _{3/2}	46SOD	04FRO/TAC
131.635	0.010	759 680	300*	4.93E+10	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (¹ D)3d 2D _{5/2}	46SOD	04FRO/TAC
131.635	0.010	759 680	300*	3.67E+10	2s ² 2p ³ 2P _{1/2} ^o	2s ² 2p ² (¹ D)5d 2D _{3/2}	46SOD	04FRO/TAC
133.162	0.010	750 970	500	5.20E+10	2s ² 2p ³ 2D _{5/2} ^o	2s ² 2p ² (³ P)3d 2F _{7/2}	46SOD	04FRO/TAC
133.388	0.010	749 690	400	3.63E+10	2s ² 2p ³ 2D _{3/2} ^o	2s ² 2p ² (³ P)3d 2F _{5/2}	46SOD	04FRO/TAC
134.183	0.010	745 250	10	5.36E+9	2s ² 2p ³ 2D _{3/2} ^o	2s ² 2p ² (³ P)3d 2P _{1/2}	46SOD	04FRO/TAC
134.272	0.010	744 760	200	9.66E+9	2s ² 2p ³ 2D _{5/2} ^o	2s ² 2p ² (³ P)3d 2P _{3/2}	46SOD	04FRO/TAC
135.791	0.010	736 430	300	5.92E+10	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (³ P)3d 2D _{5/2}	46SOD	04FRO/TAC
135.854	0.010	736 080	300	5.06E+10	2s ² 2p ³ 2P _{1/2} ^o	2s ² 2p ² (³ P)3d 2D _{3/2}	46SOD	04FRO/TAC
138.812	0.010	720 400	200	1.69E+10	2s ² 2p ³ 2P _{1/2} ^o	2s ² 2p ² (³ P)3d 2P _{1/2}	46SOD	04FRO/TAC
138.917	0.010	719 850	300	3.20E+10	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (³ P)3d 2P _{3/2}	46SOD	04FRO/TAC
140.171	0.010	713 410	10	7.17E+10	2s2p ⁴ 2D _{3/2}	2s2p ³ (³ D°)3d 2F _{5/2} ^o	46SOD	08KEL/POD
140.258	0.010	712 970	10	7.65E+10	2s2p ⁴ 2D _{5/2}	2s2p ³ (³ D°)3d 2F _{7/2} ^o	46SOD	08KEL/POD
142.232	0.010	703 080	200				46SOD	
142.415	0.010	702 170	10	1.01E+10	2s2p ⁴ 4P _{3/2}	2s2p ³ (³ P*)3s 4P _{1/2} ^o	46SOD	08KEL/POD
144.330	0.010	692 860	200	5.79E+10	2s2p ⁴ 4P _{5/2}	2s2p ³ (⁵ S°)3d 4D _{7/2} ^o	46SOD	08KEL/POD
144.546	0.010	691 820	200	4.04E+10	2s2p ⁴ 4P _{3/2}	2s2p ³ (⁵ S°)3d 4D _{5/2} ^o	46SOD	08KEL/POD
144.661	0.010	691 270	100	2.41E+10	2s2p ⁴ 4P _{1/2}	2s2p ³ (⁵ S°)3d 4D _{3/2} ^o	46SOD	08KEL/POD
147.897	0.010	676 150	200	1.48E+10	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (¹ S)3s 2S _{1/2}	46SOD	04FRO/TAC
148.642	0.010	672 760	400	1.30E+10	2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (³ P)3s 4P _{5/2}	46SOD	04FRO/TAC
148.856	0.010	671 790	300	1.29E+10	2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (³ P)3s 4P _{3/2}	46SOD	04FRO/TAC
149.001	0.010	671 140	200	1.28E+10	2s ² 2p ³ 4S _{3/2} ^o	2s ² 2p ² (³ P)3s 4P _{1/2}	46SOD	04FRO/TAC
150.968	0.010	662 390	200	1.67E+10	2s2p ⁴ 4P _{5/2}	2s2p ³ (³ D°)3s 4D _{7/2} ^o	46SOD	08KEL/POD
151.127	0.010	661 700	400*	1.61E+10	2s ² 2p ³ 2D _{5/2} ^o	2s ² 2p ² (¹ D)3s 2D _{5/2}	46SOD	04FRO/TAC
151.127	0.010	661 700	400*	1.53E+10	2s ² 2p ³ 2D _{3/2} ^o	2s ² 2p ² (¹ D)3s 2D _{3/2}	46SOD	04FRO/TAC
151.188	0.010	661 430	100	1.16E+10	2s2p ⁴ 4P _{3/2}	2s2p ³ (³ D°)3s 4D _{5/2} ^o	46SOD	08KEL/POD
151.303	0.010	660 920	100	6.90E+9	2s2p ⁴ 4P _{1/2}	2s2p ³ (³ D°)3s 4D _{3/2} ^o	46SOD	08KEL/POD
157.036	0.010	636 800	200*	4.81E+9	2s ² 2p ³ 2P _{1/2} ^o	2s ² 2p ² (¹ D)3s 2D _{3/2}	46SOD	04FRO/TAC
157.036	0.010	636 800	200*	5.79E+9	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (¹ D)3s 2D _{5/2}	46SOD	04FRO/TAC
157.209	0.010	636 100	300	1.89E+10	2s ² 2p ³ 2D _{5/2} ^o	2s ² 2p ² (³ P)3s 2P _{3/2}	46SOD	04FRO/TAC
157.511	0.010	634 880	200	2.17E+10	2s ² 2p ³ 2D _{3/2} ^o	2s ² 2p ² (³ P)3s 2P _{1/2}	46SOD	04FRO/TAC
163.616	0.010	611 190	300	1.38E+10	2s ² 2p ³ 2P _{3/2} ^o	2s ² 2p ² (³ P)3s 2P _{3/2}	46SOD	04FRO/TAC
163.662	0.010	611 020	5		2s2p ⁴ 2D _{5/2}	2s2p ³ (⁵ S°)3d 4D°	73GOT/GAUa	
163.930	0.010	610 020	200	1.06E+10	2s ² 2p ³ 2P _{1/2} ^o	2s ² 2p ² (³ P)3s 2P _{1/2}	46SOD	04FRO/TAC
167.510	0.010	596 980	100	2.00E+10	2s2p ⁴ 2D _{5/2}	2s2p ³ (³ D°)3s 2D _{5/2}	46SOD	08KEL/POD

TABLE 9. Observed spectral lines of Na V—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
170.631	0.010	586 060	100	1.41E+10	2s2p ⁴ 4P _{5/2}	2s2p ³ (⁵ S°)3s 4S° _{3/2}	46SOD	08KEL/POD
170.923	0.010	585 060	100	9.28E+9	2s2p ⁴ 4P _{3/2}	2s2p ³ (⁵ S°)3s 4S° _{3/2}	46SOD	08KEL/POD
171.076	0.010	584 540	100	4.62E+9	2s2p ⁴ 4P _{1/2}	2s2p ³ (⁵ S°)3s 4S° _{3/2}	46SOD	08KEL/POD
183.806	0.010	544 050	30		2s2p ⁴ 2S _{1/2}	2s2p ³ (³ D°)3s 2D° _{3/2}	73GOT/GAUa	
297.482	0.010	336 155	30	9.48E+8	2s ² 2p ² (³ P)3s 4P _{5/2}	2s2p ³ (³ D°)3d 4S° _{3/2}	73GOT/GAUa	08KEL/POD
307.152	0.010	325 572	800	2.10E+10	2s ² 2p ³ 2D° _{3/2}	2s2p ⁴ 2P _{1/2}	46SOD	08KEL/POD
308.264	0.010	324 397	1000	1.96E+10	2s ² 2p ³ 2D° _{5/2}	2s2p ⁴ 2P _{3/2}	46SOD	08KEL/POD
330.718	0.010	302 372	10		2s ² 2p ³ 2D° _{3/2}	2s2p ⁴ 2S _{1/2}	46SOD	
332.550	0.010	300 707	800	3.60E+9	2s ² 2p ³ 2P° _{1/2}	2s2p ⁴ 2P _{1/2}	46SOD	08KEL/POD
333.910	0.010	299 482	900	4.53E+9	2s ² 2p ³ 2P° _{3/2}	2s2p ⁴ 2P _{3/2}	46SOD	08KEL/POD
360.319	0.010	277 532	800	4.19E+9	2s ² 2p ³ 2P° _{3/2}	2s2p ⁴ 2S _{1/2}	46SOD	08KEL/POD
360.367	0.010	277 495	800	7.54E+9	2s ² 2p ³ 2P° _{3/2}	2s2p ⁴ 2S _{1/2}	46SOD	08KEL/POD
367.557	0.010	272 067	200	8.82E+9	2s2p ⁴ 2D _{3/2}	2p ⁵ 2P° _{1/2}	46SOD	08KEL/POD
369.743	0.010	270 458	300	7.91E+9	2s2p ⁴ 2D _{5/2}	2p ⁵ 2P° _{3/2}	46SOD	08KEL/POD
400.722	0.010	249 550	1000*	4.82E+9	2s ² 2p ³ 2D° _{3/2}	2s2p ⁴ 2D _{3/2}	46SOD	08KEL/POD
400.722	0.010	249 550	1000*	4.87E+9	2s ² 2p ³ 2D° _{5/2}	2s2p ⁴ 2D _{5/2}	46SOD	08KEL/POD
403.283	0.010	247 965	5*	2.55E+8	2s ² 2p ² (³ P)3s 4P _{1/2}	2s2p ³ (³ P°)3s 4P° _{1/2}	73GOT/GAUa	08KEL/POD
403.283	0.010	247 965	5*	6.40E+8	2s ² 2p ² (³ P)3s 4P _{1/2}	2s2p ³ (³ P°)3s 4P° _{3/2}	73GOT/GAUa	08KEL/POD
445.046	0.010	224 696	500	5.83E+8	2s ² 2p ³ 2P° _{1/2}	2s2p ⁴ 2D _{3/2}	46SOD	08KEL/POD
445.190	0.010	224 623	600	7.50E+8	2s ² 2p ³ 2P° _{3/2}	2s2p ⁴ 2D _{5/2}	46SOD	08KEL/POD
459.897	0.010	217 440	600	2.20E+9	2s ² 2p ³ 4S° _{3/2}	2s2p ⁴ 4P _{1/2}	46SOD	08KEL/POD
461.051	0.010	216 896	850	2.19E+9	2s ² 2p ³ 4S° _{3/2}	2s2p ⁴ 4P _{3/2}	46SOD	08KEL/POD
463.263	0.010	215 860	1000	2.15E+9	2s ² 2p ³ 4S° _{3/2}	2s2p ⁴ 4P _{5/2}	46SOD	08KEL/POD
510.102	0.010	196 039	10	3.70E+9	2s2p ⁴ 2P _{1/2}	2p ⁵ 2P° _{1/2}	46SOD	08KEL/POD
511.193	0.010	195 621	100	4.48E+9	2s2p ⁴ 2P _{3/2}	2p ⁵ 2P° _{3/2}	46SOD	08KEL/POD
514.350	0.010	194 420	10	8.46E+8	2s2p ⁴ 2P _{1/2}	2p ⁵ 2P° _{3/2}	46SOD	08KEL/POD
636.579	0.010	157 090	10		2s2p ³ (⁵ S°)3p 4P	2s2p ³ (³ D°)3d 4P° _{3/2}	73GOT/GAUa	
719.491	0.010	138 987	15	2.81E+8	2s2p ³ (⁵ S°)3s 4S° _{3/2}	2s ² 2p ² (³ P°)4d 4P° _{3/2}	73GOT/GAUa	08KEL/POD
831.868	0.010	120 211	5*	1.97E+7	2s ² 2p ² (³ P)3d 4P _{1/2}	2s2p ³ (³ P°)3s 4P° _{1/2}	73GOT/GAUa	08KEL/POD
831.868	0.010	120 211	5*	4.92E+7	2s ² 2p ² (³ P)3d 4P _{1/2}	2s2p ³ (³ P°)3s 4P° _{3/2}	73GOT/GAUa	08KEL/POD
1364.87	0.01	73 267.1	22	4.16E+0	2s ² 2p ³ 4S° _{3/2}	2s ² 2p ³ 2P° _{3/2}	01CUR/BRE	08KEL/POD
1365.51	0.01	73 232.7	22	1.68E+0	2s ² 2p ³ 4S° _{3/2}	2s ² 2p ³ 2P° _{1/2}	01CUR/BRE	08KEL/POD
1650.654	0.010	60 582.0	20*	1.69E+8	2s2p ³ (³ D°)3p 2F _{5/2}	2s2p ³ (³ D°)3d 2F° _{5/2}	73GOT/GAUa	08KEL/POD
1650.654	0.010	60 582.0	20*	1.40E+8	2s2p ³ (³ D°)3p 2F° _{7/2}	2s2p ³ (³ D°)3d 2F° _{7/2}	73GOT/GAUa	08KEL/POD
1806.170	0.010	55 365.8	25	1.75E+8	2s2p ³ (³ D°)3s 2D _{5/2}	2s2p ³ (³ D°)3p 2F° _{7/2}	73GOT/GAUa	08KEL/POD

TABLE 10. Energy levels of Na V

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s ² 2p ³	4S°	3/2	0		
2s ² 2p ³	2D°	5/2	48 343	5	81MAR/ZAL,01CUR/BRE
		3/2	48 379	5	81MAR/ZAL,01CUR/BRE
2s ² 2p ³	2P°	1/2	73 232.7	0.5	01CUR/BRE
		3/2	73 267.1	0.5	01CUR/BRE
2s2p ⁴	4P	5/2	215 860	5	81MAR/ZAL
		3/2	216 896	5	81MAR/ZAL
		1/2	217 440	5	81MAR/ZAL
2s2p ⁴	2D	5/2	297 893	10	81MAR/ZAL,01CUR/BRE
		3/2	297 929	10	81MAR/ZAL,01CUR/BRE
2s2p ⁴	2S	1/2	350 760	10	81MAR/ZAL,01CUR/BRE
2s2p ⁴	2P	3/2	372 744	10	81MAR/ZAL,01CUR/BRE
		1/2	373 945	10	81MAR/ZAL,01CUR/BRE
2p ⁵	2P°	3/2	568 361	15	81MAR/ZAL,01CUR/BRE
		1/2	569 990	15	81MAR/ZAL,01CUR/BRE

TABLE 10. Energy levels of Na V—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s ² 2p ² (³ P)3s	⁴ P	1/2	671 136	50	81MAR/ZAL
		3/2	671 790	50	81MAR/ZAL
		5/2	672 757	50	81MAR/ZAL
2s ² 2p ² (³ P)3s	² P	1/2	683 250	100	81MAR/ZAL,01CUR/BRE
		3/2	684 450	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)3s	² D	5/2, 3/2	710 050	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ S)3s	² S	1/2	749 420	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (³ P)3d	² P	3/2	793 120	100	81MAR/ZAL,01CUR/BRE
		1/2	793 630	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (³ P)3d	⁴ D	5/2, 3/2	797 060	100	81MAR/ZAL
		1/2	797 270	100	81MAR/ZAL
2s ² 2p ² (³ P)3d	² F	5/2	798 070	100	81MAR/ZAL,01CUR/BRE
		7/2	799 310	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (³ P)3d	⁴ P	5/2	798 170	100	81MAR/ZAL
		3/2	798 620	100	81MAR/ZAL
		1/2	798 860	100	81MAR/ZAL
2s2p ³ (⁵ S°)3s	⁴ S°	3/2	801 950	100	81MAR/ZAL
2s ² 2p ² (³ P)3d	² D	3/2	809 330	100	81MAR/ZAL,01CUR/BRE
		5/2	809 700	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)3d	² F	7/2	829 280	100	81MAR/ZAL,01CUR/BRE
		5/2	829 480	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)3d	² D	3/2	832 860	100	81MAR/ZAL,01CUR/BRE
		5/2	833 000	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)3d	² P	1/2	838 210	100	81MAR/ZAL,01CUR/BRE
		3/2	838 500	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)3d	² S	1/2	842 840	100	81MAR/ZAL,01CUR/BRE
2s2p ³ (⁵ S°)3p	⁴ P	1/2–5/2	847 540	100	81MAR/ZAL
2s ² 2p ² (¹ S)3d	² D	3/2, 5/2	867 540?	100	81MAR/ZAL,01CUR/BRE
2s2p ³ (³ P°)3s	⁴ S°	1/2–7/2	878 320	100	81MAR/ZAL
2s ² 2p ² (³ P)4s	⁴ P	1/2	892 240	100	81MAR/ZAL
		5/2	893 820	100	81MAR/ZAL
2s2p ³ (³ P°)3s	² D°	3/2, 5/2	894 870	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (³ P)4s	² P	1/2	896 730?	100	81MAR/ZAL,01CUR/BRE
		3/2	897 920?	100	81MAR/ZAL,01CUR/BRE
2s2p ³ (⁵ S°)3d	⁴ S°	1/2–7/2	908 710	100	81MAR/ZAL
2s2p ³ (³ P°)3s	⁴ P°	1/2–5/2	919 070	100	81MAR/ZAL
2s ² 2p ² (¹ D)4s	² D	5/2, 3/2	928 840?	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (³ P)4d	² P	3/2	938 440?	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (³ P)4d	⁴ D	5/2, 3/2	939 060	100	81MAR/ZAL
		1/2	939 860	100	81MAR/ZAL
2s ² 2p ² (³ P)4d	⁴ P	5/2	940 720	100	81MAR/ZAL
		3/2	940 930	100	81MAR/ZAL

TABLE 10. Energy levels of Na V—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s ² 2p ² (³ P)4d	² F	7/2	942 160?	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (³ P)4d	² D	3/2	944 803	100	81MAR/ZAL,01CUR/BRE
		5/2	945 113	100	81MAR/ZAL,01CUR/BRE
2s2p ³ (³ P°)3p	² F	7/2	950 233	100	81MAR/ZAL,01CUR/BRE
		5/2	950 773?	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)4d	² F	7/2,5/2	974 123?	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)4d?	² D?	3/2,5/2	974 813	100	81MAR/ZAL,01CUR/BRE
2s2p ³ (³ P°)3d	⁴ P°	5/2	1 004 400	100	81MAR/ZAL
		3/2	1 004 620	100	81MAR/ZAL
		1/2	1 004 790	100	81MAR/ZAL
2s2p ³ (³ P°)3d	⁴ S°	1/2–7/2	1 008 210	100	81MAR/ZAL
2s2p ³ (³ P°)3d	⁴ S°	3/2	1 008 940	100	81MAR/ZAL
2s2p ³ (³ P°)3d	² F°	7/2	1 010 860	100	81MAR/ZAL,01CUR/BRE
		5/2	1 011 340	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)5d	² F	7/2,5/2	1 038 980?	100	81MAR/ZAL,01CUR/BRE
2s ² 2p ² (¹ D)5d	² D	3/2,5/2	1 039 620?	100	81MAR/ZAL,01CUR/BRE
Na VI (³ P ₀)	Limit	—	1 116 300	100	81MAR/ZAL

6.6. Na VI

C isoelectronic sequence

Ground state 1s²2s²2p² ³P₀

Ionization energy 1 388 750(400) cm⁻¹; 172.18(5) eV

The first reported observations of the Na VI spectrum were made by Söderqvist [34SOD, 46SOD], who measured 134 lines in the range 80 Å–638 Å. Fawcett [71FAW] measured and classified the three 2s2p³–2p⁴ lines arising from the 2p⁴ ¹D₂ and ¹S₀ levels, giving a new value for the former level. Goto *et al.* [73GOT/GAUa] gave a number of new lines in the 119 Å–2205 Å range as belonging to Na VI. The level values were re-evaluated by Martin and Zalubas [81MAR/ZAL], confirming most of the prior levels and line classifications. Although Goto *et al.* [73GOT/GAUa] reported two intercombination lines involving the 2s2p³ ⁵S₂ level, the assignments are somewhat in doubt because, although the difference in wave numbers is correct, the intensity ratio of the two lines is anomalous and the wavelengths (974.034 Å and 985.190 Å) are somewhat shorter than expected. Feldman *et al.* [97FEL/BEH] report measuring a line in the solar corona at 988.71 Å, which they assign to the 2s²2p² ³P₂–2s2p³ ⁵S₂ transition. Their value agrees well with the level values predicted by Edlén [85EDL] using isoelectronic fitting. However, the transition to the 2s²2p² ³P₁ level is not observed even though calculations of the intensity ratio indicate that it should appear. We have retained the 2s2p³ ⁵S₂ level predicted by Edlén [85EDL] and indicate the uncertainty in the relative positions of the quintet and triplet levels

by adding the +x in the energy level table. In a second paper Goto *et al.* [73GOT/GAUb] report four additional Na VI transitions with 2s²2p3p ¹D₂ as the lower level. Recent measurements by Feuchtgruber *et al.* [97FEU/LUT] of light from planetary nebulae have yielded values for the forbidden transitions in the ground configuration; thus the ground state splitting has been established with improved accuracy. Levels based on single weak lines are included here but denoted as tentative with a question mark. The ionization energy cited above was determined by Martin and Zalubas [81MAR/ZAL] using the 2s²2pnd ¹F₃ positions (see Tables 11 and 12).

Transition probabilities for Na VI have been calculated by Tachiev and Froese Fischer [01TAC/FRO] using the multi-configuration Dirac-Fock (MCDF) technique and by Aggarwal *et al.* [01AGG/KEE] using the CIV3 code. These are compiled by Kelleher and Podobedova [08KEL/POD] along with nonrelativistic close-coupling calculations by Luo and Pradhan [89LUO/PRA] for the Opacity Project, which gave values for levels above 3d. For transitions involving the 2s2p²3s, 3p, and 3d levels the CIV3 calculations of Mendoza *et al.* [99MEN/ZEI] were retained by Kelleher and Podobedova. Further MCDF calculations by Froese Fischer and Tachiev [04FRO/TAC] include a few transitions not in the [08KEL/POD] compilation.

References for Na VI

- 34SOD J. Söderqvist, *Nova Acta Regiae Soc. Sci. Ups.* **9**, 1 (1934).

46SOD	J. Söderqvist, Ark. Mat. Astron. Fys. 32 , 1 (1946).	Haerendel, A. M. Heras, R. O. Katterloher, D. J. M. Kester, F. Lahuis, K. J. Leech, P. W. Morris, P. R. Roelfsma, S. G. Schaeidt, H. W. W. Spoon, B. Vanden-Bussche, and E. Wieprecht, Astrophys. J. 487 , 963, (1997).
71FAW	B. C. Fawcett, J. Phys. B 4 , 1115 (1971).	
73GOT/GAUa	T. Goto, M. S. Gautam, and Y. N. Joshi, Physica (Utrecht) 66 , 70 (1973).	
73GOT/GAUb	T. Goto, M. S. Gautam, and Y. N. Joshi, Can. J. Phys. 51 , 1244 (1973).	
81MAR/ZAL	W. C. Martin and R. Zalubas, J. Phys. Chem. Ref. Data 10 , 153 (1981).	99MEN/ZEI
85EDL	B. Edlén, Phys. Scr. 31 , 345 (1985).	
89LUO/PRA	D. Luo and A. K. Pradhan, J. Phys. B 22 , 3377 (1989).	01AGG/KEE
97FEL/BEH	U. Feldman, W. E. Behring, W. Curdt, U. Schühle, K. Wilhelm, P. Lemaire, and T. M. Moran, Astrophys. J. Suppl. Ser. 113 , 195 (1997).	01TAC/FRO
97FEU/LUT	H. Feuchtgruber, D. Lutz, D. A. Beintma, E. A. Valentijn, O. H. Bauer, D. R. Boxhoorn, T. De Graauw, L. N. Haser, G.	04FRO/TAC
		08KEL/POD
		C. Mendoza, C. J. Zeippen, and P. J. Storey, Astron. Astrophys. Suppl. Ser. 135 , 159 (1999).
		K. M. Aggarwal, F. P. Keenan, and A. Z. Msezane, Astrophys. J. Suppl. Ser. 136 , 763 (2001).
		G. Tachiev and C. Froese Fischer, Can. J. Phys. 79 , 955 (2001).
		C. Froese Fischer and G. Tachiev, At. Data Nucl. Data Tables 87 , 1 (2004).
		D. E. Kelleher and L. Podobedova, J. Phys. Chem. Ref. Data 37 , 267 (2008).

TABLE 11. Observed spectral lines of Na VI

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>								
80.345	0.010	1 244 630	10		2s ² 2p ² ¹ D ₂	2s ² 2p6d ¹ F ₃ ^o	46SOD	
80.645	0.010	1 240 000	10	4.81E+10	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)5d ⁵ P ₃	46SOD	08KEL/POD
81.498	0.010	1 227 020					46SOD	
81.543	0.010	1 226 350	100	3.91E+10	2s ² 2p ² ³ P ₂	2s ² 2p5d ³ D ₃ ^o	46SOD	08KEL/POD
81.584	0.010	1 225 730					46SOD	
83.639	0.010	1 195 610	100	5.11E+10	2s ² 2p ² ¹ D ₂	2s ² 2p5d ¹ F ₃ ^o	46SOD	89LUO/PRA
87.141	0.010	1 147 560	100	8.20E+10	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)4d ⁵ P ₂	46SOD	08KEL/POD
87.211	0.010	1 146 640	700	8.21E+10	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)4d ⁵ P ₃	46SOD	08KEL/POD
88.038	0.010	1 135 870	100		2s ² 2p ² ³ P ₁	2s ² 2p4d ³ P ₂ ^o	46SOD	
88.143	0.010	1 134 520	200		2s ² 2p ² ³ P ₂	2s ² 2p4d ³ P ₂ ^o	46SOD	
88.223	0.010	1 133 490	100	5.66E+10	2s ² 2p ² ³ P ₀	2s ² 2p4d ³ D ₁ ^o	46SOD	08KEL/POD
88.246	0.010	1 133 200	200	7.61E+10	2s ² 2p ² ³ P ₁	2s ² 2p4d ³ D ₂ ^o	46SOD	08KEL/POD
88.270	0.010	1 132 890	300	1.02E+11	2s ² 2p ² ³ P ₂	2s ² 2p4d ³ D ₃ ^o	46SOD	08KEL/POD
88.340	0.010	1 131 990	100	2.54E+10	2s ² 2p ² ³ P ₂	2s ² 2p4d ³ D ₂ ^o	46SOD	08KEL/POD
88.387	0.010	1 131 390	10		2s2p ³ ³ D ₃ ^o	2s2p ² (² D)4d ³ P ₂	46SOD	
88.460	0.010	1 130 450	100	2.61E+10	2s2p ³ ³ D ₃ ^o	2s2p ² (² D)4d ³ F ₄	46SOD	08KEL/POD
88.583	0.010	1 128 880	100		2s ² 2p ² ³ P ₂	2s ² 2p(² P)4d ¹ D ₂	46SOD	
90.468	0.010	1 105 360	300	1.04E+11	2s ² 2p ² ¹ D ₂	2s ² 2p4d ¹ F ₃ ^o	46SOD	89LUO/PRA
90.746	0.010	1 101 980	10		2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)4s ⁵ P ₃	46SOD	
91.268	0.010	1 095 670	100		2s ² 2p ² ¹ D ₂	2s ² 2p4d ¹ D ₂ ^o	46SOD	
91.414	0.010	1 093 920	10		2s2p ³ ³ P ₂ ^o	2s2p ² (² D)4d ³ P ₂	46SOD	
91.475	0.010	1 093 200	10		2s2p ³ ³ P ₂ ^o	2s2p ² (² D)4d ³ F ₃	46SOD	
91.737	0.010	1 090 070	10		2s ² 2p ² ³ P ₁	2s ² 2p4s ³ P ₂ ^o	46SOD	
91.836	0.010	1 088 900	10		2s ² 2p ² ³ P ₂	2s ² 2p4s ³ P ₂ ^o	46SOD	
94.208	0.010	1 061 480	100		2s2p ³ ³ D ₃ ^o	2p ³ (⁴ S ^o)3p ³ P ₂	46SOD	
94.827	0.010	1 054 550	10		2s2p ³ ³ D ₃ ^o	2s2p ² (⁴ P)4d ³ D ₃	46SOD	
95.182	0.010	1 050 620	100	7.33E+10	2s2p ³ ³ D ₃ ^o	2s2p ² (⁴ P)4d ³ F ₄	46SOD	08KEL/POD
95.263	0.010	1 049 720	100	6.51E+10	2s2p ³ ³ D ₂ ^o	2s2p ² (⁴ P)4d ³ F ₃	46SOD	08KEL/POD
95.319	0.010	1 049 110	10	6.17E+10	2s2p ³ ³ D ₁ ^o	2s2p ² (⁴ P)4d ³ F ₂	46SOD	08KEL/POD
95.933	0.010	1 042 390	300	6.64E+10	2s ² 2p ² ¹ D ₂	2s2p ² (² D)3p ¹ D ₂ ^o	46SOD	99MEN/ZEI
96.124	0.010	1 040 320	10		2s ² 2p ² ³ P ₀	2s2p ² (² D)3p ³ D ₁ ^o	46SOD	
96.196	0.010	1 039 540	100		2s ² 2p ² ³ P ₁	2s2p ² (² D)3p ³ D ₁ ^o	46SOD	
96.307	0.010	1 038 350	100		2s ² 2p ² ³ P ₂	2s2p ² (² D)3p ³ D ₃ ^o	46SOD	
96.475	0.010	1 036 540	300	7.30E+10	2s ² 2p ² ¹ D ₂	2s2p ² (² D)3p ¹ F ₃ ^o	46SOD	99MEN/ZEI
97.636	0.010	1 024 210	10		2s2p ³ ³ P ₂ ^o	2p ³ (⁴ S ^o)3p ³ P ₂	46SOD	
98.309	0.010	1 017 200	20	6.11E+10	2s2p ³ ³ P ₂ ^o	2s2p ² (⁴ P)4d ³ D ₃	46SOD	08KEL/POD

TABLE 11. Observed spectral lines of Na VI—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
99.004	0.010	1 010 060	10		2s2p ³ D ₃ ^o	2s2p ² (⁴ P)4s ³ P ₂	46SOD	
99.500	0.010	1 005 020	10*	1.68E+10	2s ² 2p ² ³ P ₀	2s2p ² (⁴ P)3p ³ P ₁ ^o	46SOD	99MEN/ZEI
99.500	0.010	1 005 020	10*	1.25E+10	2s ² 2p ² ³ P ₁	2s2p ² (⁴ P)3p ³ P ₂ ^o	46SOD	99MEN/ZEI
99.617	0.010	1 003 840	100	4.45E+10	2s ² 2p ² ³ P ₂	2s2p ² (⁴ P)3p ³ P ₂ ^o	46SOD	99MEN/ZEI
99.680	0.010	1 003 210	100	2.53E+10	2s ² 2p ² ³ P ₂	2s2p ² (⁴ P)3p ³ P ₁ ^o	46SOD	99MEN/ZEI
100.469	0.010	9 953 30	200	4.32E+10	2s ² 2p ² ³ P ₁	2s2p ² (⁴ P)3p ³ D ₂ ^o	46SOD	99MEN/ZEI
100.519	0.010	994 840	300	5.51E+10	2s ² 2p ² ³ P ₂	2s2p ² (⁴ P)3p ³ D ₃ ^o	46SOD	99MEN/ZEI
100.590	0.010	994 140	100	1.17E+10	2s ² 2p ² ³ P ₂	2s2p ² (⁴ P)3p ³ D ₂ ^o	46SOD	99MEN/ZEI
103.002	0.010	970 860	10	9.64E+9	2s ² 2p ² ³ P ₀	2s2p ² (⁴ P)3p ³ S ₁ ^o	46SOD	99MEN/ZEI
103.078	0.010	970 140	100	2.80E+10	2s ² 2p ² ³ P ₁	2s2p ² (⁴ P)3p ³ S ₁ ^o	46SOD	99MEN/ZEI
103.210	0.010	968 900	200	4.40E+10	2s ² 2p ² ³ P ₂	2s2p ² (⁴ P)3p ³ S ₁ ^o	46SOD	99MEN/ZEI
106.040	0.010	943 040	300	2.87E+11	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)3d ⁵ P ₁	46SOD	99MEN/ZEI
106.077	0.010	942 710	300	2.85E+11	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)3d ⁵ P ₂	46SOD	99MEN/ZEI
106.125	0.010	942 280	400	2.84E+11	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)3d ⁵ P ₃	46SOD	99MEN/ZEI
106.580	0.010	938 260	10		2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)3d ⁵ D _{2,3}	46SOD	
107.014	0.010	934 460	200	2.78E+10	2s ² 2p ² ³ P ₀	2s ² 2p3d ³ P ₁ ^o	46SOD	08KEL/POD
107.061	0.010	934 050	300	1.48E+11	2s ² 2p ² ³ P ₁	2s ² 2p3d ³ P ₀ ^o	46SOD	08KEL/POD
107.093	0.010	933 770	300	5.58E+10	2s ² 2p ² ³ P ₁	2s ² 2p3d ³ P ₁ ^o	46SOD	08KEL/POD
107.158	0.010	933 200	100	8.64E+9	2s ² 2p ² ³ P ₁	2s ² 2p3d ³ P ₂ ^o	46SOD	08KEL/POD
107.227	0.010	932 600	300	6.60E+10	2s ² 2p ² ³ P ₂	2s ² 2p3d ³ P ₁ ^o	46SOD	08KEL/POD
107.288	0.010	932 070	400	1.43E+11	2s ² 2p ² ³ P ₂	2s ² 2p3d ³ P ₂ ^o	46SOD	08KEL/POD
107.535	0.010	929 930	300	1.17E+11	2s2p ³ ³ D ₃ ^o	2s2p ² (² D)3d ³ D ₃	46SOD	99MEN/ZEI
107.553	0.010	929 770	300	1.65E+11	2s ² 2p ² ³ P ₀	2s ² 2p3d ³ D ₁ ^o	46SOD	08KEL/POD
107.608	0.010	929 300	400	2.21E+11	2s ² 2p ² ³ P ₁	2s ² 2p3d ³ D ₂ ^o	46SOD	08KEL/POD
107.683	0.010	928 650	500	2.57E+11	2s ² 2p ² ³ P ₂	2s ² 2p3d ³ D ₃ ^o	46SOD	08KEL/POD
107.742	0.010	928 140	200	3.18E+10	2s ² 2p ² ³ P ₂	2s ² 2p3d ³ D ₂ ^o	46SOD	08KEL/POD
107.934	0.010	926 490	200	6.28E+10	2s2p ³ ³ D ₃ ^o	2s2p ² (² D)3d ³ P ₂	46SOD	99MEN/ZEI
108.555	0.010	921 190	400	2.45E+11	2s2p ³ ³ D ₃ ^o	2s2p ² (² D)3d ³ F ₄	46SOD	99MEN/ZEI
108.678	0.010	920 150	10		2s ² 2p ² ³ P ₁	2s ² 2p3d ¹ D ₂ ^o	46SOD	
109.763	0.010	911 050	10	6.76E+9	2s ² 2p ² ¹ D ₂	2s ² 2p3d ¹ P ₁ ^o	46SOD	04FRO/TAC
109.896	0.010	909 950	500	2.95E+11	2s ² 2p ² ¹ D ₂	2s ² 2p3d ¹ F ₃ ^o	46SOD	08KEL/POD
110.085	0.010	908 390	200		2s2p ³ ¹ P ₁ ^o	2s2p ² (⁴ P)4d ³ D ₂	46SOD	
110.750	0.010	902 940	200	7.05E+10	2s2p ³ ³ P ₂	2s2p ² (² D)3d ³ S ₁	46SOD	99MEN/ZEI
111.725	0.010	895 060	100		2s ² 2p ² ¹ D ₂	2s ² 2p3d ³ D ₃ ^o	46SOD	
111.793	0.010	894 510	100		2s ² 2p ² ¹ D ₂	2s ² 2p3d ³ D ₂ ^o	46SOD	
112.009	0.010	892 780	300	8.47E+10	2s2p ³ ³ P ₂ ^o	2s2p ² (² D)3d ³ D ₃	46SOD	99MEN/ZEI
112.448	0.010	889 300	300	9.95E+10	2s2p ³ ³ P ₂ ^o	2s2p ² (² D)3d ³ P ₂	46SOD	99MEN/ZEI
112.950	0.010	885 350	400	5.76E+10	2s ² 2p ² ¹ D ₂	2s ² 2p3d ¹ D ₂ ^o	46SOD	08KEL/POD
113.125	0.010	883 980	400	4.03E+10	2s ² 2p ² ¹ D ₂	2s ² 2p3d ³ F ₂ ^o	46SOD	04FRO/TAC
114.666	0.010	872 100	400	1.69E+11	2s ² 2p ² ¹ S ₀	2s ² 2p3d ¹ P ₁ ^o	46SOD	04FRO/TAC
115.729	0.010	864 090	200	4.71E+10	2s2p ³ ³ D ₃ ^o	2s2p ² (⁴ P)3d ³ D ₃	46SOD	99MEN/ZEI
115.780	0.010	863 710	10	3.34E+10	2s2p ³ ³ D ₂ ^o	2s2p ² (⁴ P)3d ³ D ₂	46SOD	99MEN/ZEI
117.491	0.010	851 130	400	1.32E+11	2s2p ³ ³ D ₃ ^o	2s2p ² (⁴ P)3d ³ F ₄	46SOD	99MEN/ZEI
117.609	0.010	850 280	300	1.18E+11	2s2p ³ ³ D ₂ ^o	2s2p ² (⁴ P)3d ³ F ₃	46SOD	99MEN/ZEI
117.699	0.010	849 620	300	1.11E+11	2s2p ³ ³ D ₁ ^o	2s2p ² (⁴ P)3d ³ F ₂	46SOD	99MEN/ZEI
118.500	0.010	843 880	10	8.55E+9	2s2p ³ ³ D ₂ ^o	2s2p ² (⁴ P)3d ³ P ₁	46SOD	99MEN/ZEI
118.585	0.010	843 280	10	1.11E+10	2s2p ³ ³ D ₃ ^o	2s2p ² (⁴ P)3d ³ P ₂	46SOD	99MEN/ZEI
119.204	0.010	838 900	10	3.43E+10	2s2p ³ ¹ D ₂	2s2p ² (² D)3d ¹ P ₁	46SOD	99MEN/ZEI
119.415	0.010	837 420	5		2s2p ³ ³ D ₂ ^o	2s2p ² (⁴ P)3d ⁵ D _{2,3}	73GOT/GAUa	
119.684	0.010	835 530	300	1.73E+11	2s2p ³ ¹ D ₂	2s2p ² (² D)3d ¹ D ₂	46SOD	99MEN/ZEI
120.355	0.010	830 880	10		2s2p ³ ³ S ₁ ^o	2s2p ² (² D)3d ¹ P ₁	46SOD	
120.931	0.010	826 920	300	1.11E+11	2s2p ³ ³ P ₂ ^o	2s2p ² (⁴ P)3d ³ D ₃	46SOD	99MEN/ZEI
120.973	0.010	826 630	200	8.08E+10	2s2p ³ ³ P ₁ ^o	2s2p ² (⁴ P)3d ³ D ₂	46SOD	99MEN/ZEI
121.004	0.010	826 420	100	6.04E+10	2s2p ³ ³ P ₀ ^o	2s2p ² (⁴ P)3d ³ D ₁	46SOD	99MEN/ZEI
121.773	0.010	821 200	400	2.23E+10	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)3s ⁵ P ₃	46SOD	99MEN/ZEI
121.913	0.010	820 260	320	2.21E+10	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)3s ⁵ P ₂	46SOD	99MEN/ZEI
122.018	0.010	819 550	300	2.20E+10	2s2p ³ ⁵ S ₂ ^o	2s2p ² (⁴ P)3s ⁵ P ₁	46SOD	99MEN/ZEI
122.199	0.010	818 340	5		2s2p ³ ¹ D ₂ ^o	2s2p ² (² D)3d ³ P ₂	73GOT/GAUa	
123.134	0.010	812 120	400	3.02E+10	2s2p ³ ³ D ₃ ^o	2s2p ² (² D)3s ³ D ₃	46SOD	99MEN/ZEI

TABLE 11. Observed spectral lines of Na VI—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
123.744	0.010	808 120	400	7.94E+9	2s ² 2p ² ³ P ₁	2s ² 2p3s ³ P ₂ ^o	46SOD	08KEL/POD
123.868	0.010	807 310	300	1.05E+10	2s ² 2p ² ³ P ₀	2s ² 2p3s ³ P ₁ ^o	46SOD	08KEL/POD
123.929	0.010	806 910	500	2.38E+10	2s ² 2p ² ³ P ₂	2s ² 2p3s ³ P ₂ ^o	46SOD	08KEL/POD
123.970	0.010	806 650	200	7.83E+9	2s ² 2p ² ³ P ₁	2s ² 2p3s ³ P ₁ ^o	46SOD	08KEL/POD
124.059	0.010	806 070	400	5.63E+10	2s2p ³ ³ P ₂ ^o	2s2p ² (⁴ P)3d ³ P ₂	46SOD	99MEN/ZEI
124.153	0.010	805 460	400	1.32E+10	2s ² 2p ² ³ P ₂	2s ² 2p3s ³ P ₁ ^o	46SOD	08KEL/POD
124.850	0.010	800 960	10	3.00E+10	2s2p ³ ¹ P ₁ ^o	2s2p ² (² D)3d ¹ P ₁	46SOD	89LUO/PRA
125.383	0.010	797 560	10	7.26E+10	2s2p ³ ¹ P ₁ ^o	2s2p ² (² D)3d ¹ D ₂	46SOD	99MEN/ZEI
127.837	0.010	782 250	400	3.68E+10	2s ² 2p ² ¹ D ₂	2s ² 2p3s ¹ P ₁ ^o	46SOD	08KEL/POD
129.040	0.010	774 950	200	1.21E+10	2s2p ³ ³ P ₂ ^o	2s2p ² (² D)3s ³ D ₃	46SOD	99MEN/ZEI
133.825	0.010	747 240	200	1.78E+10	2s2p ³ ³ D ₃ ^o	2s2p ² (⁴ P)3s ³ P ₂	46SOD	99MEN/ZEI
134.021	0.010	746 150	100	1.65E+10	2s2p ³ ³ D ₂ ^o	2s2p ² (⁴ P)3s ³ P ₁	46SOD	99MEN/ZEI
134.135	0.010	745 520	10	2.15E+10	2s2p ³ ³ D ₁ ^o	2s2p ² (⁴ P)3s ³ P ₀	46SOD	99MEN/ZEI
134.532	0.010	743 320	300	1.12E+10	2s ² 2p ² ¹ S ₀	2s ² 2p3s ¹ P ₁ ^o	46SOD	08KEL/POD
137.589	0.010	726 800	10	1.95E+10	2s2p ³ ³ S ₁ ^o	2s2p ² (⁴ P)3d ³ P ₂	46SOD	99MEN/ZEI
138.693	0.010	721 020	200	2.25E+10	2s2p ³ ¹ D ₂ ^o	2s2p ² (² D)3s ¹ D ₂	46SOD	99MEN/ZEI
140.833	0.010	710 060	200	1.32E+10	2s2p ³ ³ P ₂ ^o	2s2p ² (⁴ P)3s ³ P ₂	46SOD	99MEN/ZEI
141.040	0.010	709 020	10	6.76E+9	2s2p ³ ³ P ₂ ^o	2s2p ² (⁴ P)3s ³ P ₁	46SOD	08KEL/POD
146.398	0.010	683 070	10	7.97E+9	2s2p ³ ¹ P ₁ ^o	2s2p ² (² D)3s ¹ D ₂	46SOD	99MEN/ZEI
149.442	0.010	669 160	10	2.98E+9	2s2p ³ ³ D ₃ ^o	2s ² 2p3p ³ P ₂	46SOD	08KEL/POD
149.621	0.010	668 360	10	2.65E+9	2s2p ³ ³ D ₂ ^o	2s ² 2p3p ³ P ₁	46SOD	08KEL/POD
158.225	0.010	632 010	5	2.15E+8	2s2p ³ ³ P ₂ ^o	2s ² 2p3p ³ P ₂	73GOT/GAUa	08KEL/POD
158.517	0.010	630 850	5	5.31E+8	2s2p ³ ³ S ₁ ^o	2s2p ² (⁴ P)3s ³ P ₂	73GOT/GAUa	99MEN/ZEI
166.367	0.010	601 080	40		2s2p ³ ¹ P ₁ ^o	2s2p ² (⁴ P)3s ³ P ₂	73GOT/GAUa	
177.637	0.010	562 950	30		2p ⁴ ³ P ₂	2s2p ² (² D)3p ³ D ₃ ^o	73GOT/GAUa	
178.061	0.010	561 600	20		2p ⁴ ³ P ₁	2s2p ² (² D)3p ³ D ₂ ^o	73GOT/GAUa	
178.244	0.010	561 030	15		2p ⁴ ³ P ₀	2s2p ² (² D)3p ³ D ₁ ^o	73GOT/GAUa	
189.473	0.010	527 780	10		2p ⁴ ³ P ₂	2s2p ² (⁴ P)3p ³ D ₁ ^o	73GOT/GAUa	
191.205	0.010	523 000	10		2s2p ³ ¹ P ₁ ^o	2s ² 2p3p ³ P ₂	34SOD	
293.887	0.010	340 267	30				73GOT/GAUa	
308.500	0.010	324 149	25		2s ² 2p3d ³ P ₁ ^o	2s2p ² (⁴ P)4d ³ D ₂	73GOT/GAUa	
311.921	0.010	320 594	400	2.79E+9	2s ² 2p ² ³ P ₀	2s2p ³ ³ S ₁ ^o	46SOD	08KEL/POD
312.608	0.010	319 889	300	8.37E+9	2s ² 2p ² ³ P ₁	2s2p ³ ³ S ₁ ^o	46SOD	08KEL/POD
313.748	0.010	318 727	500	1.40E+10	2s ² 2p ² ³ P ₂	2s2p ³ ³ S ₁ ^o	46SOD	08KEL/POD
317.641	0.010	314 821	600	1.57E+10	2s ² 2p ² ¹ D ₂	2s2p ³ ¹ P ₁ ^o	46SOD	08KEL/POD
361.250	0.010	276 817	800	1.15E+10	2s ² 2p ² ¹ D ₂	2s2p ³ ¹ D ₂ ^o	46SOD	08KEL/POD
362.444	0.010	275 905	400	3.69E+9	2s ² 2p ² ¹ S ₀	2s2p ³ ¹ P ₁ ^o	46SOD	08KEL/POD
363.774	0.010	274 896	200	9.49E+9	2s2p ³ ³ D ₁ ^o	2p ⁴ ³ P ₀	46SOD	08KEL/POD
364.477	0.010	274 366	300	7.07E+9	2s2p ³ ³ D ₂ ^o	2p ⁴ ³ P ₁	46SOD	08KEL/POD
366.110	0.010	273 142	400	8.02E+9	2s2p ³ ³ D ₃ ^o	2p ⁴ ³ P ₂	46SOD	08KEL/POD
366.240	0.010	273 045	10	1.54E+9	2s2p ³ ³ D ₂ ^o	2p ⁴ ³ P ₂	46SOD	08KEL/POD
383.783	0.010	260 564	25	1.67E+9	2s ² 2p3p ³ P ₂	2s ² 2p4d ³ D ₂ ^o	73GOT/GAUa	08KEL/POD
414.370	0.010	241 330	200	1.25E+9	2s ² 2p ² ³ P ₀	2s2p ³ ³ P ₁ ^o	46SOD	08KEL/POD
415.505	0.010	240 671	400	8.79E+8	2s ² 2p ² ³ P ₁	2s2p ³ ³ P ₂ ^o	46SOD	08KEL/POD
417.595	0.010	239 466	600	2.89E+9	2s ² 2p ² ³ P ₂	2s2p ³ ³ P ₂ ^o	46SOD	08KEL/POD
418.828	0.010	238 761	30		2s ² 2p3s ³ P ₁ ^o	2s2p ² (⁴ P)3d ⁵ P ₂ ^o	73GOT/GAUa	
421.465	0.010	237 268	100	1.05E+9	2s2p ³ ³ P ₂ ^o	2p ⁴ ³ P ₁	46SOD	08KEL/POD
423.821	0.010	235 949	200	1.57E+9	2s2p ³ ³ P ₂ ^o	2p ⁴ ³ P ₂	46SOD	08KEL/POD
436.96	0.05	228 854		1.47E+10	2s2p ³ ¹ P ₁ ^o	2p ⁴ ¹ S ₀	71FAW	08KEL/POD
440.266	0.010	227 135	300				46SOD	
444.686	0.010	224 878	20		2s2p ² (⁴ P)3d ³ F ₄	2s ² 2p6d ¹ F ₃ ^o	73GOT/GAUa	
465.460	0.010	214 841	5		2s2p ² (² D)3s ³ D ₂	2s ² 2p5d ¹ F ₃ ^o	73GOT/GAUa	
466.640	0.010	214 298	20		2s ² 2p3d ³ D ₂ ^o	2s2p ² (² D)3d ³ S ₁	73GOT/GAUa	
489.580	0.010	204 257	500	8.27E+8	2s ² 2p ² ³ P ₀	2s2p ³ ³ D ₁ ^o	46SOD	08KEL/POD
491.240	0.010	203 566	300	5.63E+8	2s ² 2p ² ³ P ₁	2s2p ³ ³ D ₁ ^o	46SOD	08KEL/POD
491.340	0.010	203 525	600	1.10E+9	2s ² 2p ² ³ P ₁	2s2p ³ ³ D ₂ ^o	46SOD	08KEL/POD
494.160	0.010	202 364	300	3.03E+8	2s ² 2p ² ³ P ₂	2s2p ³ ³ D ₂ ^o	46SOD	08KEL/POD
494.382	0.010	202 273	700	1.38E+9	2s ² 2p ² ³ P ₂	2s2p ³ ³ D ₃ ^o	46SOD	08KEL/POD
497.273	0.010	201 097	5	6.20E+8	2s ² 2p4d ³ D ₁ ^o	2s2p ² (² D)4d ³ F ₂	73GOT/GAUa	08KEL/POD

TABLE 11. Observed spectral lines of Na VI—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
499.115	0.010	200 354	20		2s ² 2p3p ¹ D ₂	2s2p ² (² D)3p ¹ D ₂ ^o	73GOT/GAUb	
504.541	0.010	198 200	30		2s ² 2p4d ³ P ₂ ^o	2s2p ² (² D)4d ³ F ₃	73GOT/GAUa	
516.00	0.05	193 798		5.60E+9	2s2p ³ ¹ D ₂ ^o	2p ⁴ ¹ D ₂	71FAW	08KEL/POD
528.730	0.010	189 132	10				46SOD	
632.90	0.05	158 003	10	1.32E+9	2s2p ³ ³ S ₁ ^o	2p ⁴ ³ P ₁	46SOD	08KEL/POD
638.21	0.05	156 688	10	1.27E+9	2s2p ³ ³ S ₁ ^o	2p ⁴ ³ P ₂	46SOD	08KEL/POD
641.87	0.05	155 795		5.86E+8	2s2p ³ ¹ P ₁ ^o	2p ⁴ ¹ D ₂	71FAW	08KEL/POD
699.093	0.010	143 042	20	8.30E+7	2s ² 2p3s ³ P ₁ ^o	2s2p ² (⁴ P)3s ³ P ₁	73GOT/GAUa	08KEL/POD
733.743	0.010	136 288	15		2s2p ² (² D)3p ¹ D ₂ ^o	2s2p ² (⁴ P)4s ³ P ₂	73GOT/GAUa	
798.320	0.010	125 263	10		2s ² 2p4d ³ F ₂ ^o	2s2p ² (⁴ P)4d ³ F ₃	73GOT/GAUa	
810.183	0.010	123 429	25	2.99E+8	2s ² 2p3p ³ P ₁	2s2p ² (⁴ P)3p ³ D ₂ ^o	73GOT/GAUa	08KEL/POD
814.515	0.010	122 772	15				73GOT/GAUa	
818.096	0.010	122235	10		2s ² 2p4d ³ P ₂ ^o	2s2p ² (⁴ P)4d ³ D ₃	73GOT/GAUa	
827.909	0.010	120 786	5				73GOT/GAUa	
844.14	0.010	118 464	15		2s ² 2p3p ¹ D ₂ ^o	2s2p ² (⁴ P)3p ³ D ₂ ^o	73GOT/GAUb	
851.740	0.010	117 407	5		2s ² 2p3d ³ D ₂ ^o	2s2p ² (⁴ P)3d ³ P ₂	73GOT/GAUa	
854.790	0.010	116 988	20		2s ² 2p4d ³ P ^c _{irc2}	2s2p ² (⁴ P)4d ³ F ₂	73GOT/GAUa	
864.625	0.010	115 657	10				73GOT/GAUa	
867.537	0.010	115 269	5				73GOT/GAUa	
888.784	0.010	112 513	5		2s ² 2p4d ¹ F ₃ ^o	2s2p ² (⁴ P)4d ³ F ₂	73GOT/GAUa	
945.223	0.010	105 795	5		2s2p ² (² D)3d ³ F ₃	2s ² 2p5d ¹ F ₃ ^o	73GOT/GAUa	
946.064	0.010	105 701	20				73GOT/GAUa	
967.480	0.010	103 361	20		2s ² 2p3d ³ D ₂ ^o	2s2p ² (² D)3s ¹ D ₂	73GOT/GAUa	
974.034	0.010	102 666	10				73GOT/GAUa	
985.190	0.010	101 503	5				73GOT/GAUa	
988.71	0.01	101 142	2500				97FEL/BEH	
1 088.636	0.010	91 858	20				73GOT/GAUa	
1 116.780	0.010	89 543.2	15				73GOT/GAUa	
1 356.35	0.010	73 727.3	200	1.30E+1	2s ² 2p ² ³ P ₁	2s ² 2p ² ¹ S ₀	97FEL/BEH	08KEL/POD
1 365.248	0.010	73 246.7	10	2.53E+2	2s ² 2p3p ³ P ₂	2s ² 2p3d ¹ P ₁ ^o	73GOT/GAUa	04FRO/TAC
1 429.430	0.010	69 958.0	10		2s2p ² (² D)3p ¹ D ₂ ^o	2s2p ² (² D)3d ¹ F ₃	73GOT/GAUa	
1 449.628	0.010	68 983.2	40	1.39E+7	2s ² 2p3p ¹ D ₂	2s ² 2p3d ¹ P ₁ ^o	73GOT/GAUb	04FRO/TAC
1 756.961	0.010	56 916.5	10	6.01E+2	2s ² 2p3p ¹ D ₂	2s ² 2p3d ³ P ₁ ^o	73GOT/GAUb	04FRO/TAC
<i>Air</i>								
2 204.59	0.01	45 345.7	25	1.63E+8	2s2p ² (⁴ P)3s ³ P ₂	2s2p ² (⁴ P)3p ³ D ₃ ^o	73GOT/GAUa	08KEL/POD
<i>Vacuum</i>								
86 106	9	1 161.36		2.07E-2	2s ² 2p ² ³ P ₁	2s ² 2p ² ³ P ₂	97FEU/LUT	08KEL/POD
143 964	21	694.62		5.98E-3	2s ² 2p ² ³ P ₀	2s ² 2p ² ³ P ₁	97FEU/LUT	08KEL/POD

TABLE 12. Energy levels of Na VI

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s ² 2p ²	³ P	0	0.00		
		1	694.62	0.10	97FEU/LUT
		2	1 855.98	0.19	97FEU/LUT
2s ² 2p ²	¹ D	2	35 498	15	81MAR/ZAL
2s ² 2p ²	¹ S	0	74 414	15	81MAR/ZAL
2s2p ³	⁵ S ^o	2	103 010+ <i>x</i>	15	85EDL
2s2p ³	³ D ^o	3	204 132	15	81MAR/ZAL
		2	204 223	15	81MAR/ZAL
		1	204 261	15	81MAR/ZAL
2s2p ³	³ P ^o	2,1,0	241 341	15	81MAR/ZAL

TABLE 12. Energy levels of Na VI—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s2p ³	¹ D°	2	312 315	15	81MAR/ZAL
2s2p ³	³ S°	1	320 589	15	81MAR/ZAL
2s2p ³	¹ P°	1	350 319	15	81MAR/ZAL
2p ⁴	³ P	2	477 277	15	81MAR/ZAL
		1	478 597	15	81MAR/ZAL
		0	479 157	15	81MAR/ZAL
2p ⁴	¹ D	2	506 114	15	81MAR/ZAL
2p ⁴	¹ S	0	579 173	15	81MAR/ZAL
2s ² 2p3s	³ P°	0			
		1	807 320	100	81MAR/ZAL
		2	808 800	100	81MAR/ZAL
2s ² 2p3s	¹ P°	1	817 740	100	81MAR/ZAL
2s ² 2p3p	³ P	0			
		1	872 580	100	81MAR/ZAL
		2	873 290	100	81MAR/ZAL
2s ² 2p3p	¹ D	2	877 550	100	73GOT/GAUb
2s ² 2p3d	³ F°	2	919 480	100	81MAR/ZAL
2s ² 2p3d	¹ D°	2	920 850	100	81MAR/ZAL
2s2p ² (⁴ P)3s	⁵ P	1	922 560+ <i>x</i>	100	81MAR/ZAL,85EDL
		2	923 270+ <i>x</i>	100	81MAR/ZAL,85EDL
		3	924 210+ <i>x</i>	100	81MAR/ZAL,85EDL
2s ² 2p3d	³ D°	1	929 774	100	81MAR/ZAL
		2	930 000	100	81MAR/ZAL
		3	930 510	100	81MAR/ZAL
2s ² 2p3d	³ P°	2	933 920	100	81MAR/ZAL
		1	934 460	100	81MAR/ZAL
		0	934 740?	100	81MAR/ZAL
2s ² 2p3d	¹ F°	3	945 450	100	81MAR/ZAL
2s ² 2p3d	¹ P°	1	946 530	100	81MAR/ZAL
2s2p ² (⁴ P)3s	³ P	0	949 780	100	81MAR/ZAL
		1	950 370	100	81MAR/ZAL
		2	951 390	100	81MAR/ZAL
2s2p ² (⁴ P)3p	³ S°	1	970 840	100	81MAR/ZAL
2s2p ² (⁴ P)3p	³ D°	1			
		2	996 010	100	81MAR/ZAL
		3	996 740	100	81MAR/ZAL
2s2p ² (⁴ P)3p	³ P°	0			
		1	1 005 070?	100	81MAR/ZAL
		2	1 005 710	100	81MAR/ZAL
2s2p ² (² D)3s	³ P	1,2,3	1 016 270	100	81MAR/ZAL
2s2p ² (² D)3s	¹ D	2	1 033 360	100	81MAR/ZAL
2s2p ² (² D)3p	³ D°	1,2,3	1 040 220	100	81MAR/ZAL

TABLE 12. Energy levels of Na VI—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s2p ² (⁴ P)3d	⁵ D	2,3	1 041 280+ <i>x</i> ?	100	81MAR/ZAL,85EDL
2s2p ² (⁴ P)3d	⁵ P	3	1 045 300+ <i>x</i>	100	81MAR/ZAL,85EDL
		2	1 045 720+ <i>x</i>	100	81MAR/ZAL,85EDL
		1	1 046 050+ <i>x</i>	100	81MAR/ZAL,85EDL
2s2p ² (⁴ P)3d	³ P	2	1 047 410	100	81MAR/ZAL
		1	1 048 100	100	81MAR/ZAL
		0			
2s2p ² (⁴ P)3d	³ F	2	1 053 880	100	81MAR/ZAL
		3	1 054 500	100	81MAR/ZAL
		4	1 055 260	100	81MAR/ZAL
2s2p ² (⁴ P)3d	³ P	1	1 067 760	100	81MAR/ZAL
		2	1 067 970	100	81MAR/ZAL
		3	1 068 260	100	81MAR/ZAL
2s2p ² (² D)3p	¹ F°	3	1 072 040	100	81MAR/ZAL
2s2p ² (² D)3p	¹ D°	2	1 077 890	100	81MAR/ZAL
2s ² 2p4s	³ P°	2	1 090 760	100	81MAR/ZAL
2s2p ² (² D)3d	³ F	2,3,4	1 125 320	100	81MAR/ZAL
2s ² 2p4d	³ F°	2	1 128 690	100	81MAR/ZAL
2s2p ² (² D)3d	³ P	0,1,2	1 130 630	100	81MAR/ZAL
2s ² 2p4d	¹ D°	2	1 131 170	100	81MAR/ZAL
2s ² 2p4d	³ D°	1	1 133 490	100	81MAR/ZAL
		2	1 133 870	100	81MAR/ZAL
		3	1 134 750	100	81MAR/ZAL
2s2p ² (² D)3d	³ P	1,2,3	1 134 090	100	81MAR/ZAL
2s ² 2p4d	³ P°	2	1 136 380	100	81MAR/ZAL
2s ² 2p4d	¹ F°	3	1 140 860	100	81MAR/ZAL
2s2p ² (² D)3d	³ S	1	1 144 280	100	81MAR/ZAL
2s2p ² (² D)3d	¹ D	2	1 147 860	100	81MAR/ZAL
2s2p ² (² D)3d	¹ P	1	1 151 280	100	81MAR/ZAL
2s2p ² (⁴ P)4s	⁵ P	3	1 204 990+ <i>x</i>	100	81MAR/ZAL,85EDL
2s2p ² (⁴ P)4s	³ P	2	1 214 190?	100	81MAR/ZAL
2s ² 2p5d	³ D°	3	1 228 210?	100	81MAR/ZAL
2s ² 2p5d	¹ F°	3	1 231 110	100	81MAR/ZAL
2s2p ² (⁴ P)4d	⁵ P	3	1 249 660+ <i>x</i> ?	100	81MAR/ZAL,85EDL
		2	1 250 580+ <i>x</i> ?	100	81MAR/ZAL,85EDL
		1			
2s2p ² (⁴ P)4d	³ F	2	1 253 370	100	81MAR/ZAL
		3	1 253 950	100	81MAR/ZAL
		4	1 254 750	100	81MAR/ZAL
2s2p ² (⁴ P)4d	³ P	1,2,3	1 258 610	100	81MAR/ZAL
2p ³ (⁴ S°)3p	³ P	0,1,2	1 265 580	100	81MAR/ZAL

TABLE 12. Energy levels of Na VI—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s ² 2p6d	¹ F°	3	1 280 130	100	81MAR/ZAL
2s2p ² (² D)4d	³ F	2,3,4	1 334 580	100	81MAR/ZAL
2s2p ² (² D)4d	³ P	0,1,2	1 335 520	100	81MAR/ZAL
2s2p ² (⁴ P)5d	⁵ P	3	1 343 010+ <i>x</i> ?	100	81MAR/ZAL,85EDL
Na VII (² P _{1/2})	<i>Limit</i>	—	1 388 750	400	81MAR/ZAL

6.7. Na VII

Be isoelectronic sequence

Ground state 1s²2s²2p²P_{1/2}°

Ionization energy 1 681 750(250) cm⁻¹; 208.51(0.03) eV

The Na VII spectrum was first measured by Söderqvist [34SOD, 44SOD, 46SOD], who measured 158 lines in the range 60 Å–500 Å. Fawcett [70FAW] measured and classified the 2s2p²2P-2p³2D° doublet near 780 Å, with results agreeing with the values calculated from Söderqvist's levels. The level values were re-evaluated by Martin and Zalubas [81MAR/ZAL], confirming most of the earlier analysis except for adjusting the values of the 2s²4d²D_{5/2} and 2p²(¹D)3p²D° levels. Edlén [81EDL, 83EDL] studied the available data for boronlike ions and produced a critical compilation of the *n*=2 energy levels using isoelectronic fitting. Recent measurements by Feuchtgruber *et al.* [97FEU/LUT] of light from planetary nebulae have yielded a value for the forbidden transition in the ground configuration; thus the ground state splitting has been established with improved accuracy. By observing the solar corona, Feldman *et al.* [97FEL/BEH] have established the connection between the doublet and quartet levels. This connection has been used here to adjust the values of higher quartet levels. In keeping with the compilation of Martin and Zalubas [81MAR/ZAL], levels based on single weak lines are included here but denoted as tentative with a question mark (see Tables 13 and 14).

The transition probabilities of Na VII transitions have been calculated for the Opacity Project by Fernley *et al.* [99FER/HIB] and compiled by Kelleher and Podobedova [08KEL/POD] along with multiconfiguration Hartree-Fock calculations of Tachiev and Froese Fischer [02TAC/FROa, 02TAC/FROb]. Many-body perturbation theory calculations by Merkelis *et al.* [95MER/VIL], the SUPERSTRUCTURE calculations of Galvís *et al.* [98GAL/MEN], and relativistic multibody perturbation results of Safronova *et al.* [99SAF/JOHa] were also incorporated in the [08KEL/POD] compilation for transitions only involving low-lying energy levels. It should also be noted that Doerfert and Träbert [93DOE/TRA] have measured intensity ratios of the 1s²2s²2p²P_{1/2,3/2}°-1s²2s2p²P_{1/2}° transitions to within a few percent. In addition, Tordoir *et al.* [99TOR/BIE] measured lifetimes of several *n*=2 levels and also reported oscillator

strengths for the *n*=2–2 transitions. Except for the intercombination lines, the transition probabilities agreed with [08KEL/POD] within ±15%, but for the intercombination lines, the consistency between the relativistic Hartree-Fock and the MCDF values was in the ±40% to 50% range. The ionization energy cited above was determined by Martin and Zalubas [81MAR/ZAL] using the 2s²nd²D_{5/2} series.

References for Na VII

- 34SOD J. Söderqvist, *Nova Acta Regiae Soc. Sci. Ups.* **9**, 1 (1934).
 44SOD J. Söderqvist, *Ark. Mat. Astron. Fys.* **30**, 1 (1944).
 46SOD J. Söderqvist, *Ark. Mat. Astron. Fys.* **32**, 1 (1946).
 70FAW B. C. Fawcett, *J. Phys. B* **3**, 1152 (1970).
 81EDL B. Edlén, *Phys. Scr.* **23**, 1079 (1981).
 81MAR/ZAL W. C. Martin and R. Zalubas, *J. Phys. Chem. Ref. Data* **10**, 153 (1981).
 83EDL B. Edlén, *Phys. Scr.* **28**, 483 (1983).
 93DOE/TRA J. Doerfert and E. Träbert, *Phys. Scr.* **47**, 524 (1993).
 95MER/VIL G. Merkelis, M. J. Vilkas, G. Gaigalas, and R. Kisielius, *Phys. Scr.* **51**, 233 (1995).
 97FEL/BEH U. Feldman, W. E. Behring, W. Curdt, U. Schühle, K. Wilhelm, P. Lemaire, and T. M. Moran, *Astrophys. J., Suppl. Ser.* **113**, 195 (1997).
 97FEU/LUT H. Feuchtgruber, D. Lutz, D. A. Beintma, E. A. Valentijn, O. H. Bauer, D. R. Boxhoorn, T. De Graauw, L. N. Haser, G. Haerendel, A. M. Heras, R. O. Katterloher, D. J. M. Kester, F. Lahuis, K. J. Leech, P. W. Morris, P. R. Roelfsma, S. G. Schaeidt, H. W. W. Spoon, B. Vanden-Bussche, and E. Wieprecht, *Astrophys. J.* **487**, 963, (1997).
 98GAL/MEN M. E. Galvís, C. Mendoza, and C. J. Zeippen, *Astron. Astrophys. Suppl. Ser.* **131**, 499 (1998).
 99FER/HIB J. A. Fernley, A. Hibbert, A. E. Kingston, and M. J. Seaton, *J. Phys. B* **32**, 5507 (1999).

99SAF/JOHa	U. I. Safronova, W. R. Johnson, and A. E. Livingston, Phys. Rev. A 60 , 996 (1999).	mchf_collection/ (downloaded December 2002).
99TOR/BIE	X. Tordoir, E. Biémont, H. P. Garnir, P.-D. Dumont, and E. Träbert, Eur. Phys. J. D 6 , 1 (1999).	02TAC/FROb G. Tachiev and C. Froese Fischer, Astron. Astrophys. 385 , 716 (2002).
02TAC/FROa	G. Tachiev and C. Froese Fischer, http://www.vuse.vanderbilt.edu/~cff/	08KEL/POD D. E. Kelleher and L. Podobedova, J. Phys. Chem. Ref. Data 37 , 267 (2008).

TABLE 13. Observed spectral lines of Na VII

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>								
62.725	0.010	1 594 300	10		2s ² 2p ² P _{3/2} ^o	2s ² 8d ² D _{5/2}	44SOD	
63.185	0.010	1 582 700	10	1.65E+10	2s ² 2p ² P _{1/2} ^o	2s2p(³ P ^o)5p ² D _{3/2}	44SOD	08KEL/POD
63.227	0.010	1 581 600	10	1.97E+10	2s ² 2p ² P _{3/2} ^o	2s2p(³ P ^o)5p ² D _{5/2}	44SOD	08KEL/POD
63.361	0.010	1 578 300	10	1.93E+10	2s ² 2p ² P _{1/2} ^o	2s2p(³ P ^o)5p ² P _{1/2}	44SOD	08KEL/POD
63.442	0.010	1 576 200	10	2.40E+10	2s ² 2p ² P _{3/2} ^o	2s2p(³ P ^o)5p ² P _{3/2}	44SOD	08KEL/POD
63.778	0.010	1 567 900	10		2s ² 2p ² P _{3/2} ^o	2s ² 7d ² D _{5/2}	44SOD	
64.113	0.010	1 559 700	10	1.25E+10	2s ² 2p ² P _{3/2} ^o	2s2p(¹ P ^o)4p ² D _{5/2}	44SOD	08KEL/POD
64.904	0.010	1 540 700	10	3.36E+10	2s2p ² ⁴ P _{5/2}	2s2p(³ P ^o)6d ⁴ D _{7/2} ^o	44SOD	08KEL/POD
65.388	0.010	1 529 300	100*		2s ² 2p ² P _{3/2} ^o	2s ² 6d ² D _{5/2}	44SOD	
65.388	0.010	1 529 300	100*	2.28E+10	2s2p ² ⁴ P _{5/2}	2p ² (³ P)4p ⁴ D _{7/2} ^o	44SOD	08KEL/POD
65.474	0.010	1 527 300	100	2.35E+10	2s ² 2p ² P _{3/2} ^o	2s ² 6d ² D _{5/2}	44SOD	08KEL/POD
67.826	0.010	1 474 400	100*	4.97E+9	2s2p ² ⁴ P _{3/2}	2s2p(³ P ^o)5d ⁴ P _{3/2} ^o	44SOD	08KEL/POD
67.826	0.010	1 474 400	100*	2.89E+10	2s2p ² ⁴ P _{1/2}	2s2p(³ P ^o)5d ⁴ D _{3/2} ^o	44SOD	08KEL/POD
67.877	0.010	1 473 300	100	2.61E+10	2s2p ² ⁴ P _{5/2}	2s2p(³ P ^o)5d ⁴ P _{5/2} ^o	44SOD	08KEL/POD
67.912	0.010	1 472 500	200	6.89E+10	2s2p ² ⁴ P _{5/2}	2s2p(³ P ^o)5d ⁴ D _{7/2} ^o	44SOD	08KEL/POD
68.422	0.010	1 461 500	10	3.32E+10	2s ² 2p ² P _{1/2} ^o	2s ² 5d ² D _{3/2}	44SOD	08KEL/POD
68.519	0.010	1 459 400	100	3.97E+10	2s ² 2p ² P _{3/2} ^o	2s ² 5d ² D _{5/2}	44SOD	08KEL/POD
68.866	0.010	1 452 100	10	3.23E+10	2s ² 2p ² P _{1/2} ^o	2s2p(³ P ^o)4p ² D _{3/2}	44SOD	08KEL/POD
68.908	0.010	1 451 200	100	3.87E+10	2s ² 2p ² P _{3/2} ^o	2s2p(³ P ^o)4p ² D _{5/2}	44SOD	08KEL/POD
69.314	0.010	1 442 700	10	2.97E+10	2s ² 2p ² P _{1/2} ^o	2s2p(³ P ^o)4p ² P _{1/2}	44SOD	08KEL/POD
69.395	0.010	1 441 000	10	3.70E+10	2s ² 2p ² P _{3/2} ^o	2s2p(³ P ^o)4p ² P _{3/2}	44SOD	08KEL/POD
72.020	0.010	1 388 500	100	6.94E+10	2s2p ² ² D _{5/2}	2s2p(³ P ^o)5d ² F _{7/2} ^o	44SOD	08KEL/POD
72.079	0.010	1 387 370	100	6.47E+10	2s2p ² ² D _{3/2}	2s2p(³ P ^o)5d ² F _{5/2} ^o	44SOD	08KEL/POD
72.865	0.010	1 372 400	200*	3.09E+10	2s2p ² ² D _{5/2}	2s2p(¹ P ^o)4d ² F _{7/2} ^o	44SOD	08KEL/POD
72.865	0.010	1 372 400	200*	2.88E+10	2s2p ² ² D _{3/2}	2s2p(¹ P ^o)4d ² F _{5/2} ^o	44SOD	08KEL/POD
74.097	0.010	1 349 580	100	2.27E+10	2s2p ² ⁴ P _{3/2}	2s2p(³ P ^o)4d ⁴ P _{5/2} ^o	44SOD	08KEL/POD
74.180	0.010	1 348 070	200	5.30E+10	2s2p ² ⁴ P _{5/2}	2s2p(³ P ^o)4d ⁴ P _{5/2} ^o	44SOD	08KEL/POD
74.217	0.010	1 347 400	200	5.81E+10	2s2p ² ⁴ P _{1/2}	2s2p(³ P ^o)4d ⁴ D _{3/2} ^o	44SOD	08KEL/POD
74.255	0.010	1 346 710	300	9.76E+10	2s2p ² ⁴ P _{3/2}	2s2p(³ P ^o)4d ⁴ D _{5/2} ^o	44SOD	08KEL/POD
74.268	0.010	1 346 480	300	1.40E+11	2s2p ² ⁴ P _{5/2}	2s2p(³ P ^o)4d ⁴ D _{7/2} ^o	44SOD	08KEL/POD
74.861	0.010	1 335 810	300	7.26E+10	2s ² 2p ² P _{1/2} ^o	2s ² 4d ² D _{3/2}	44SOD	08KEL/POD
74.980	0.010	1 333 690	300	8.70E+10	2s ² 2p ² P _{3/2} ^o	2s ² 4d ² D _{5/2}	44SOD	08KEL/POD
76.501	0.010	1 307 170	10	3.80E+9	2s2p ² ⁴ P _{3/2}	2s2p(³ P ^o)4s ⁴ P _{5/2} ^o	44SOD	08KEL/POD
76.565	0.010	1 306 080	10	8.84E+9	2s2p ² ⁴ P _{5/2}	2s2p(³ P ^o)4s ⁴ P _{5/2} ^o	44SOD	08KEL/POD
76.827	0.010	1 301 630	10	1.37E+11	2p ³ ⁴ S _{3/2} ^o	2p ² (³ P)4d ⁴ P _{3/2}	44SOD	08KEL/POD
76.862	0.010	1 301 030	10	1.37E+11	2p ³ ⁴ S _{3/2} ^o	2p ² (³ P)4d ⁴ P _{5/2}	44SOD	08KEL/POD
77.353	0.010	1 292 780	100	2.61E+9	2s ² 2p ² P _{3/2} ^o	2s ² 4s ² S _{1/2}	44SOD	08KEL/POD
78.459	0.010	1 274 550	10		2s2p ² ² S _{1/2}	2s2p(¹ P ^o)4s ² P ^o	44SOD	
78.771	0.010	1 269 500	10	3.78E+9	2s2p ² ² D _{3/2}	2s2p(³ P ^o)4d ² P _{1/2} ^o	44SOD	08KEL/POD
78.907	0.010	1 267 320	300	1.10E+11	2s2p ² ² D _{5/2}	2s2p(³ P ^o)4d ² F _{7/2} ^o	44SOD	08KEL/POD
78.982	0.010	1 266 110	200	1.02E+11	2s2p ² ² D _{3/2}	2s2p(³ P ^o)4d ² F _{5/2} ^o	44SOD	08KEL/POD
79.477	0.010	1 258 230	200*	1.34E+10	2s ² 2p ² P _{1/2} ^o	2s2p(¹ P ^o)3p ² S _{1/2}	44SOD	08KEL/POD
79.477	0.010	1 258 230	200*	2.81E+10	2s2p ² ² D _{5/2}	2s2p(³ P ^o)4d ² D _{5/2} ^o	44SOD	08KEL/POD
79.571	0.010	1 256 740	100	2.68E+10	2s ² 2p ² P _{3/2} ^o	2s2p(¹ P ^o)3p ² S _{1/2}	44SOD	08KEL/POD
79.761	0.010	1 253 750	10	6.89E+9	2s2p ² ² P _{3/2} ^o	2s2p(¹ P ^o)4s ² P _{3/2} ^o	44SOD	08KEL/POD
79.786	0.010	1 253 350	10	2.23E+10	2s ² 2p ² P _{1/2} ^o	2s2p(¹ P ^o)3p ² P _{1/2} ^o	44SOD	08KEL/POD
79.893	0.010	1 251 670	300*	9.77E+9	2s ² 2p ² P _{1/2} ^o	2s2p(¹ P ^o)3p ² D _{3/2} ^o	44SOD	08KEL/POD
79.893	0.010	1 251 670	300*	2.77E+10	2s ² 2p ² P _{3/2} ^o	2s2p(¹ P ^o)3p ² P _{3/2} ^o	44SOD	08KEL/POD

TABLE 13. Observed spectral lines of Na VII—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
80.008	0.010	1 249 880	300	1.17E+10	2s2p ² 2P [°] _{3/2}	2s2p(1P [°])3p ² D _{5/2}	44SOD	08KEL/POD
80.133	0.010	1 247 920	10	9.30E+9	2s2p ² 4P [°] _{1/2}	2p ² (3P)3p ⁴ S _{3/2}	44SOD	08KEL/POD
80.174	0.010	1 247 290	10	1.86E+10	2s2p ² 4P [°] _{3/2}	2p ² (3P)3p ⁴ S _{3/2}	44SOD	08KEL/POD
80.245	0.010	1 246 180	100	2.77E+10	2s2p ² 4P [°] _{5/2}	2p ² (3P)3p ⁴ S _{3/2}	44SOD	08KEL/POD
81.430	0.010	1 228 050	100	3.33E+10	2s2p ² 4P [°] _{5/2}	2p ² (3P)3p ⁴ P _{5/2}	44SOD	08KEL/POD
81.498	0.010	1 227 020	200	1.91E+10	2s2p ² 2D _{5/2}	2s2p(3P [°])4s ² P _{3/2}	44SOD	08KEL/POD
81.855	0.010	1 221 670	400	3.24E+10	2s2p ² 4P [°] _{5/2}	2p ² (3P)3p ⁴ D _{7/2}	44SOD	08KEL/POD
82.636	0.010	1 210 130	10	4.05E+10	2s2p ² 2S _{1/2}	2s2p(3P [°])4d ² P _{1/2}	44SOD	08KEL/POD
82.685	0.010	1 209 410	10	4.05E+10	2s2p ² 2S _{1/2}	2s2p(3P [°])4d ² P _{3/2}	44SOD	08KEL/POD
84.221	0.010	1 187 350	400*	4.01E+10	2s2p ² 2D _{5/2}	2p ² (1D)3p ² D _{5/2}	44SOD	08KEL/POD
84.221	0.010	1 187 350	400*	3.86E+10	2s2p ² 2D _{3/2}	2p ² (1D)3p ² D _{3/2}	44SOD	08KEL/POD
84.832	0.010	1 178 800	10	2.49E+10	2s2p ² 2P [°] _{3/2}	2s2p(3P [°])4d ² D _{5/2}	44SOD	08KEL/POD
85.260	0.010	1 172 880	300	2.55E+10	2s2p ² 2D _{5/2}	2p ² (1D)3p ² F _{7/2}	44SOD	08KEL/POD
85.297	0.010	1 172 370	300*	2.38E+10	2s2p ² 2D _{3/2}	2p ² (1D)3p ² F _{5/2}	44SOD	08KEL/POD
85.297	0.010	1 172 370	300*	3.22E+10	2s2p ² 2P [°] _{1/2}	2s2p(3P [°])3p ² S _{1/2}	44SOD	08KEL/POD
85.458	0.010	1 170 160	400	6.39E+10	2s2p ² 2P [°] _{3/2}	2s2p(3P [°])3p ² S _{1/2}	44SOD	08KEL/POD
86.596	0.010	1 154 790	400	8.41E+10	2s2p ² 2P [°] _{1/2}	2s2p(3P [°])3p ² D _{3/2}	44SOD	08KEL/POD
86.652	0.010	1 154 040	500	1.01E+11	2s2p ² 2P [°] _{3/2}	2s2p(3P [°])3p ² D _{5/2}	44SOD	08KEL/POD
86.758	0.010	1 152 630	300	1.67E+10	2s2p ² 2P [°] _{3/2}	2s2p(3P [°])3p ² D _{3/2}	44SOD	08KEL/POD
87.141	0.010	1 147 560	100	5.39E+9	2s2p ² 2P [°] _{3/2}	2s2p(3P [°])4s ² P _{3/2}	44SOD	08KEL/POD
87.471	0.010	1 143 240	10*	8.07E+9	2s2p ² 2D _{5/2}	2p ² (3P)3p ² D _{5/2}	44SOD	08KEL/POD
87.471	0.010	1 143 240	10*	7.79E+9	2s2p ² 2D _{3/2}	2p ² (3P)3p ² D _{3/2}	44SOD	08KEL/POD
88.698	0.010	1 127 420	200	1.60E+10	2s2p ² 2P [°] _{1/2}	2s2p(3P [°])3p ² P _{3/2}	44SOD	08KEL/POD
88.747	0.010	1 126 800	300	6.39E+10	2s2p ² 2P [°] _{1/2}	2s2p(3P [°])3p ² P _{1/2}	44SOD	08KEL/POD
88.865	0.010	1 125 300	400	7.95E+10	2s2p ² 2P [°] _{3/2}	2s2p(3P [°])3p ² P _{3/2}	44SOD	08KEL/POD
88.914	0.010	1 124 680	200	3.17E+10	2s2p ² 2P [°] _{3/2}	2s2p(3P [°])3p ² P _{1/2}	44SOD	08KEL/POD
90.173	0.010	1 108 980	100	2.85E+10	2s2p ² 2P [°] _{1/2}	2p ² (1D)3p ² D _{3/2}	44SOD	08KEL/POD
90.252	0.010	1 108 010	400	3.42E+10	2s2p ² 2P [°] _{3/2}	2p ² (1D)3p ² D _{5/2}	44SOD	08KEL/POD
90.830	0.010	1 100 960	10*	1.18E+9	2s2p ² 2D _{5/2}	2s2p(1P [°])3d ² P _{3/2}	44SOD	08KEL/POD
90.830	0.010	1 100 960	10*	1.31E+9	2s2p ² 2D _{3/2}	2s2p(1P [°])3d ² P _{1/2}	44SOD	08KEL/POD
91.064	0.010	1 098 130	200*	3.29E+10	2s2p ² 2D _{5/2}	2s2p(1P [°])3d ² D _{5/2}	44SOD	08KEL/POD
91.064	0.010	1 098 130	200*	3.17E+10	2s2p ² 2D _{3/2}	2s2p(1P [°])3d ² D _{3/2}	44SOD	08KEL/POD
92.003	0.010	1 086 920	500*	1.77E+11	2s2p ² 2D _{5/2}	2s2p(1P [°])3d ² F _{7/2}	44SOD	08KEL/POD
92.003	0.010	1 086 920	500*	1.65E+11	2s2p ² 2D _{3/2}	2s2p(1P [°])3d ² F _{5/2}	44SOD	08KEL/POD
92.774	0.010	1 077 890	200	9.07E+10	2s2p ² 4P [°] _{1/2}	2s2p(3P [°])3d ⁴ P _{3/2}	44SOD	08KEL/POD
92.809	0.010	1 077 480	100	1.81E+11	2s2p ² 4P [°] _{3/2}	2s2p(3P [°])3d ⁴ P _{1/2}	44SOD	08KEL/POD
92.843	0.010	1 077 090	100	2.89E+10	2s2p ² 4P [°] _{3/2}	2s2p(3P [°])3d ⁴ P _{3/2}	44SOD	08KEL/POD
92.883	0.010	1 076 620	100	6.49E+10	2s2p ² 4P [°] _{3/2}	2s2p(3P [°])3d ⁴ P _{5/2}	44SOD	08KEL/POD
92.930	0.010	1 076 080	200	9.74E+10	2s2p ² 4P [°] _{5/2}	2s2p(3P [°])3d ⁴ P _{3/2}	44SOD	08KEL/POD
92.976	0.010	1 075 550	400	1.51E+11	2s2p ² 4P [°] _{5/2}	2s2p(3P [°])3d ⁴ P _{5/2}	44SOD	08KEL/POD
93.393	0.010	1 070 740	400	1.69E+11	2s2p ² 4P [°] _{1/2}	2s2p(3P [°])3d ⁴ D _{3/2}	44SOD	08KEL/POD
93.434	0.010	1 070 270	400	2.84E+11	2s2p ² 4P [°] _{3/2}	2s2p(3P [°])3d ⁴ D _{5/2}	44SOD	08KEL/POD
93.486	0.010	1 069 680	500	4.05E+11	2s2p ² 4P [°] _{5/2}	2s2p(3P [°])3d ⁴ D _{7/2}	44SOD	08KEL/POD
93.528	0.010	1 069 200	100	1.21E+11	2s2p ² 4P [°] _{5/2}	2s2p(3P [°])3d ⁴ D _{5/2}	44SOD	08KEL/POD
94.020	0.010	1 063 540	10	4.38E+10	2s2p ² 2P [°] _{3/2}	2p ² (3P)3p ² D _{5/2}	44SOD	08KEL/POD
94.288	0.010	1 060 580	600	2.20E+11	2s2p ² 2P [°] _{1/2}	2s23d ² D _{3/2}	44SOD	02TAC/FROa
94.468	0.010	1 058 560	700	2.63E+11	2s2p ² 2P [°] _{3/2}	2s23d ² D _{5/2}	44SOD	02TAC/FROa
96.845	0.010	1 032 580	100	3.63E+11	2p ³ 4S _{3/2}	2p ² (3P)3d ⁴ P _{1/2}	44SOD	08KEL/POD
96.872	0.010	1 032 290	200	3.63E+11	2p ³ 4S _{3/2}	2p ² (3P)3d ⁴ P _{3/2}	44SOD	08KEL/POD
96.922	0.010	1 031 760	300	3.62E+11	2p ³ 4S _{3/2}	2p ² (3P)3d ⁴ P _{5/2}	44SOD	08KEL/POD
97.790	0.010	1 022 600	100	3.83E+10	2s2p ² 2P [°] _{1/2}	2s2p(1P [°])3d ² P _{1/2}	44SOD	08KEL/POD
97.907	0.010	1 021 380	200	4.77E+10	2s2p ² 2P [°] _{3/2}	2s2p(1P [°])3d ² P _{3/2}	44SOD	08KEL/POD
98.016	0.010	1 020 240	100	3.39E+10	2p ³ 2D _{5/2}	2p ² (1D)3d ² P _{3/2}	44SOD	08KEL/POD
98.080	0.010	1 019 580	300	2.32E+11	2s2p ² 2P [°] _{1/2}	2s2p(1P [°])3d ² D _{3/2}	44SOD	08KEL/POD
98.188	0.010	1 018 450	300	2.78E+11	2s2p ² 2P [°] _{3/2}	2s2p(1P [°])3d ² D _{5/2}	44SOD	08KEL/POD
98.378	0.010	1 016 490	300	4.11E+11	2p ³ 2D _{5/2}	2p ² (1D)3d ² F _{7/2}	44SOD	08KEL/POD
98.394	0.010	1 016 320	300	3.84E+11	2p ³ 2D _{3/2}	2p ² (1D)3d ² F _{5/2}	44SOD	08KEL/POD

TABLE 13. Observed spectral lines of Na VII—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
99.421	0.010	1 005 820	400	2.58E+11	2s2p ² 2D _{5/2}	2s2p(3P°)3d ² F _{7/2}	44SOD	08KEL/POD
99.556	0.010	1 004 460	400	2.40E+11	2s2p ² 2D _{3/2}	2s2p(3P°)3d ² F _{5/2}	44SOD	08KEL/POD
99.680	0.010	1 003 210	100*	1.22E+11	2p ³ 2D _{5/2}	2p ² (1D)3d ² D _{5/2}	44SOD	08KEL/POD
99.680	0.010	1 003 210	100*	1.17E+11	2p ³ 2D _{3/2}	2p ² (1D)3d ² D _{3/2}	44SOD	08KEL/POD
100.718	0.010	992 870	200*	2.54E+10	2s2p ² 2D _{5/2}	2s2p(1P°)3s ² P _{3/2}	44SOD	08KEL/POD
100.718	0.010	992 870	200*	2.83E+10	2s2p ² 2D _{3/2}	2s2p(1P°)3s ² P _{1/2}	44SOD	08KEL/POD
101.785	0.010	982 460	300	1.02E+11	2s2p ² 2D _{5/2}	2s2p(3P°)3d ² D _{5/2}	44SOD	08KEL/POD
101.816	0.010	982 160	300	9.76E+10	2s2p ² 2D _{3/2}	2s2p(3P°)3d ² D _{3/2}	44SOD	08KEL/POD
102.226	0.010	978 220	100	1.06E+11	2p ³ 2D _{5/2}	2p ² (3P)3d ² D _{5/2}	44SOD	08KEL/POD
102.390	0.010	976 660	100	4.48E+10	2p ³ 2D _{5/2}	2p ² (3P)3d ² F _{7/2}	44SOD	08KEL/POD
102.448	0.010	976100	10	4.17E+10	2p ³ 2D _{3/2}	2p ² (3P)3d ² F _{5/2}	44SOD	08KEL/POD
103.354	0.010	967 550	100	1.08E+11	2p ³ 2P _{3/2}	2p ² (1D)3d ² P _{3/2}	44SOD	08KEL/POD
103.400	0.010	967 120	10	8.67E+10	2p ³ 2P _{1/2}	2p ² (1D)3d ² P _{1/2}	44SOD	08KEL/POD
103.779	0.010	963 590	300	1.80E+10	2s2p ² 4P _{3/2}	2s2p(3P°)3s ⁴ P _{5/2}	44SOD	02TAC/FROa
103.842	0.010	963 000	200	2.48E+10	2s2p ² 4P _{1/2}	2s2p(3P°)3s ⁴ P _{3/2}	44SOD	02TAC/FROa
103.891	0.010	962 550	400	4.19E+10	2s2p ² 4P _{5/2}	2s2p(3P°)3s ⁴ P _{5/2}	44SOD	02TAC/FROa
104.000	0.010	961 540	200	4.92E+10	2s2p ² 4P _{3/2}	2s2p(3P°)3s ⁴ P _{1/2}	44SOD	02TAC/FROa
104.036	0.010	961 210	220	2.67E+10	2s2p ² 4P _{5/2}	2s2p(3P°)3s ⁴ P _{3/2}	44SOD	02TAC/FROa
104.871	0.010	953 550	200	1.42E+11	2s2p ² 2S _{1/2}	2s2p(3P°)3d ² P _{1/2}	44SOD	08KEL/POD
104.955	0.010	952 790	300	1.42E+11	2s2p ² 2S _{1/2}	2s2p(3P°)3d ² P _{3/2}	44SOD	08KEL/POD
105.111	0.010	951 380	300	1.64E+10	2s ² 2p ² P _{1/2}	2s ² 3s ² S _{1/2}	44SOD	02TAC/FROa
105.205	0.010	950 520	200	1.18E+11	2p ³ 2P _{3/2}	2p ² (1D)3d ² D _{5/2}	44SOD	08KEL/POD
105.354	0.010	949 180	400	3.29E+10	2s ² 2p ² P _{3/2}	2s ² 3s ² S _{1/2}	44SOD	02TAC/FROa
107.061	0.010	934 050	300	1.43E+10	2s2p ² 2P _{1/2}	2s2p(3P°)3d ² P _{1/2}	44SOD	08KEL/POD
107.093	0.010	933 770	300	2.47E+10	2s2p ² 2S _{1/2}	2s2p(1P°)3s ² P _{3/2}	44SOD	08KEL/POD
108.079	0.010	925 250	10	8.53E+10	2p ³ 2P _{3/2}	2p ² (3P)3d ² D _{5/2}	44SOD	08KEL/POD
108.193	0.010	924 270	200	3.15E+10	2p ³ 4S _{3/2}	2p ² (3P)3s ⁴ P _{5/2}	44SOD	08KEL/POD
108.373	0.010	922 740	100	3.14E+10	2p ³ 4S _{3/2}	2p ² (3P)3s ⁴ P _{3/2}	44SOD	08KEL/POD
108.733	0.010	919 680	200	3.84E+10	2p ³ 2D _{5/2}	2p ² (1D)3s ² D _{5/2}	44SOD	08KEL/POD
108.829	0.010	918 870	100	3.69E+10	2p ³ 2D _{3/2}	2p ² (1D)3s ² D _{3/2}	44SOD	08KEL/POD
109.362	0.010	914 390	100	2.72E+10	2s2p ² 2P _{1/2}	2s2p(1P°)3s ² P _{1/2}	44SOD	08KEL/POD
109.519	0.010	913 080	200	3.39E+10	2s2p ² 2P _{3/2}	2s2p(1P°)3s ² P _{3/2}	44SOD	08KEL/POD
110.647	0.010	903 780	200	2.77E+10	2s2p ² 2P _{1/2}	2s2p(3P°)3d ² D _{3/2}	44SOD	08KEL/POD
110.778	0.010	902 710	300	3.32E+10	2s2p ² 2P _{3/2}	2s2p(3P°)3d ² D _{5/2}	44SOD	08KEL/POD
110.817	0.010	902 390	200	5.53E+9	2s2p ² 2P _{3/2}	2s2p(3P°)3d ² D _{3/2}	44SOD	08KEL/POD
111.211	0.010	899 190	300	2.87E+10	2s2p ² 2D _{5/2}	2s2p(3P°)3s ² P _{3/2}	44SOD	08KEL/POD
111.390	0.010	897 750	200	3.17E+10	2s2p ² 2D _{3/2}	2s2p(3P°)3s ² P _{1/2}	44SOD	08KEL/POD
115.361	0.010	866 840	10	1.24E+10	2p ³ 2P _{3/2}	2p ² (1D)3s ² D _{5/2}	44SOD	08KEL/POD
115.475	0.010	865 990	10	1.03E+10	2p ³ 2P _{1/2}	2p ² (1D)3s ² D _{3/2}	44SOD	08KEL/POD
118.840	0.010	841 470	10	8.78E+9	2p ³ 2D _{5/2}	2s2p(1P°)3p ² P _{3/2}	44SOD	08KEL/POD
118.902	0.010	841 030	10	9.72E+9	2p ³ 2D _{3/2}	2s2p(1P°)3p ² P _{1/2}	44SOD	08KEL/POD
119.014	0.010	840 240	100	9.84E+9	2s2p ² 2S _{1/2}	2s2p(3P°)3s ² P _{3/2}	44SOD	08KEL/POD
119.100	0.010	839 630	10		2p ³ 2D _{5/2}	2s2p(1P°)3p ² D _{5/2}	44SOD	
119.204	0.010	838 900	10	9.81E+9	2s2p ² 2S _{1/2}	2s2p(3P°)3s ² P _{1/2}	44SOD	08KEL/POD
122.018	0.010	819 550	300	2.38E+9	2s2p ² 2P _{3/2}	2s2p(3P°)3s ² P _{3/2}	44SOD	08KEL/POD
122.252	0.010	817 980	100	9.46E+8	2s2p ² 2P _{3/2}	2s2p(3P°)3s ² P _{1/2}	44SOD	08KEL/POD
124.532	0.010	803 010	10	3.22E+9	2s2p ² 2D _{5/2}	2s ² 3p ² P _{3/2}	44SOD	02TAC/FROa
126.779	0.010	788 770	10	2.41E+9	2p ³ 2P _{3/2}	2s2p(1P°)3p ² P _{3/2}	44SOD	08KEL/POD
126.814	0.010	788 560	100	1.93E+9	2p ³ 2P _{1/2}	2s2p(1P°)3p ² P _{1/2}	44SOD	08KEL/POD
139.867	0.010	714 960	200	2.17E+9	2p ³ 2D _{5/2}	2s2p(3P°)3p ² P _{3/2}	44SOD	08KEL/POD
350.645	0.010	285 189	500	2.03E+9	2s ² 2p ² P _{1/2}	2s2p ² 2P _{3/2}	44SOD	08KEL/POD
352.275	0.010	283 869	600	7.41E+9	2s ² 2p ² P _{1/2}	2s2p ² 2P _{1/2}	44SOD	08KEL/POD
353.294	0.010	283 050	800	9.88E+9	2s ² 2p ² P _{3/2}	2s2p ² 2P _{3/2}	44SOD	08KEL/POD
354.950	0.010	281 730	400	4.23E+9	2s ² 2p ² P _{3/2}	2s2p ² 2P _{1/2}	44SOD	08KEL/POD
378.22	0.04	264 396		2.52E+9	2s ² 2p ² P _{1/2}	2s2p ² 2S _{1/2}	70FAW	08KEL/POD
381.300	0.010	262 261	300	3.70E+9	2s ² 2p ² P _{3/2}	2s2p ² 2S _{1/2}	44SOD	08KEL/POD
385.061	0.010	259 699	10	4.39E+9	2s2p ² 2D _{5/2}	2p ³ 2P _{3/2}	44SOD	08KEL/POD

TABLE 13. Observed spectral lines of Na VII—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
385.254	0.010	259 569	10	5.06E+9	2s2p ² ² D _{3/2}	2p ³ ² P ^o _{1/2}	44SOD	08KEL/POD
396.335	0.010	252 312	200	1.84E+9	2s2p ² ⁴ P _{1/2}	2p ³ ⁴ S ^o _{3/2}	44SOD	08KEL/POD
397.490	0.010	251 579	300	3.64E+9	2s2p ² ⁴ P _{3/2}	2p ³ ⁴ S ^o _{3/2}	44SOD	08KEL/POD
399.182	0.010	250 512	400	5.39E+9	2s2p ² ⁴ P _{5/2}	2p ³ ⁴ S ^o _{3/2}	44SOD	08KEL/POD
483.216	0.010	206 947	200	2.54E+9	2s2p ² ² D _{3/2}	2p ³ ² D ^o _{3/2}	44SOD	08KEL/POD
483.328	0.010	206 899	300	2.71E+9	2s2p ² ² D _{5/2}	2p ³ ² D ^o _{5/2}	44SOD	08KEL/POD
486.740	0.010	205 448	400	1.17E+9	2s ² 2p ² P ^o _{1/2}	2s2p ² ² D _{3/2}	44SOD	08KEL/POD
491.950	0.010	203 273	400	1.33E+9	2s ² 2p ² P ^o _{3/2}	2s2p ² ² D _{5/2}	44SOD	08KEL/POD
777.83	0.05	128 526		5.48E+8	2s2p ² ² P _{1/2}	2p ³ ² D ^o _{3/2}	70FAW	08KEL/POD
786.35	0.05	127 121		6.17E+8	2s2p ² ² P _{3/2}	2p ³ ² D ^o _{5/2}	70FAW	08KEL/POD
869.60	0.03	114 995	500	3.68E+4	2s ² 2p ² P ^o _{1/2}	2s2p ² ⁴ P _{1/2}	97FEL/BEH	08KEL/POD
872.12	0.03	114 663	2000	2.84E+4	2s ² 2p ² P ^o _{3/2}	2s2p ² ⁴ P _{5/2}	97FEL/BEH	08KEL/POD
880.33	0.03	113 594	1500	7.77E+3	2s ² 2p ² P ^o _{3/2}	2s2p ² ⁴ P _{3/2}	97FEL/BEH	08KEL/POD
46 847	3.	2 134.61		8.77E-2	2s ² 2p ² P ^o _{1/2}	2s ² 2p ² P ^o _{3/2}	97FEU/LUT	02TAC/FROa

TABLE 14. Energy levels of Na VII

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s ² 2p	² P ^o	1/2	0.00		
		3/2	2 134.61	0.14	97FEU/LUT
2s2p ²	⁴ P	1/2	114 995	4	97FEL/BEH
		3/2	115 728	4	97FEL/BEH
		5/2	116 798	4	97FEL/BEH
2s2p ²	² D	5/2	205 412	10	81MAR/ZAL
		3/2	205 448	10	81MAR/ZAL
2s2p ²	² S	1/2	264 400	10	81MAR/ZAL
2s2p ²	² P	1/2	283 869	10	81MAR/ZAL
		3/2	285 189	10	81MAR/ZAL
2p ³	⁴ S ^o	3/2	367 308	10	81MAR/ZAL,97FEL/BEH
2p ³	² D ^o	5/2	412 311	10	81MAR/ZAL
		3/2	412 395	10	81MAR/ZAL
2p ³	² P ^o	1/2	465 017	10	81MAR/ZAL
		3/2	465 111	10	81MAR/ZAL
2s ² 3s	² S	1/2	951 350	100	81MAR/ZAL
2s ² 3p	² P ^o	3/2	1 008 420	100	81MAR/ZAL
2s ² 3d	² D	3/2	1 060 580	100	81MAR/ZAL
		5/2	1 060 700	100	81MAR/ZAL
2s2p(³ P ^o)3s	⁴ P ^o	1/2	1 077 270	100	81MAR/ZAL,97FEL/BEH
		3/2	1 078 000	100	81MAR/ZAL,97FEL/BEH
		5/2	1 079 330	100	81MAR/ZAL,97FEL/BEH
2s2p(³ P ^o)3s	² P ^o	1/2	1 103 220	100	81MAR/ZAL
		3/2	1 104 620	100	81MAR/ZAL
2s2p(³ P ^o)3p	² P	1/2	1 126 810	100	81MAR/ZAL
		3/2	1 127 430	100	81MAR/ZAL
2s2p(³ P ^o)3p	² D	3/2	1 154 780	100	81MAR/ZAL
		5/2	1 156 180	100	81MAR/ZAL

TABLE 14. Energy levels of Na VII—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s2p(³ P°)3p	² S	1/2	1 172 340	100	81MAR/ZAL
2s2p(³ P°)3d	⁴ D°	3/2	1 185 740	100	81MAR/ZAL,97FEL/BEH
		5/2	1 186 000	100	81MAR/ZAL,97FEL/BEH
		7/2	1 186 480	100	81MAR/ZAL,97FEL/BEH
2s2p(³ P°)3d	² D°	3/2	1 186 630	100	81MAR/ZAL
		5/2	1 187 890	100	81MAR/ZAL
2s2p(³ P°)3d	⁴ P°	5/2	1 192 350	100	81MAR/ZAL,97FEL/BEH
		3/2	1 192 870	100	81MAR/ZAL,97FEL/BEH
		1/2	1 193 210	100	81MAR/ZAL,97FEL/BEH
2s2p(¹ P°)3s	² P°	1/2	1 198 290	100	81MAR/ZAL
		3/2	1 198 290	100	81MAR/ZAL
2s2p(³ P°)3d	² F°	5/2	1 209 910	100	81MAR/ZAL
		7/2	1 211 240	100	81MAR/ZAL
2s2p(³ P°)3d	² P°	3/2	1 217 190	100	81MAR/ZAL
		1/2	1 217 950	100	81MAR/ZAL
2s2p(¹ P°)3p	² D	3/2	1 251 670	100	81MAR/ZAL
		5/2	1 252 010	100	81MAR/ZAL
2s2p(¹ P°)3p	² P	1/2	1 253 350	100	81MAR/ZAL
		3/2	1 253 780	100	81MAR/ZAL
2s2p(¹ P°)3p	² S	1/2	1 258 880	100	81MAR/ZAL
2p ² (³ P)3s	⁴ P	3/2	1 290 050	100	81MAR/ZAL,97FEL/BEH
		5/2	1 291 580	100	81MAR/ZAL,97FEL/BEH
2s2p(¹ P°)3d	² F°	5/2	1 292 330	100	81MAR/ZAL
		7/2	1 292 330	100	81MAR/ZAL
2s ² 4s	² S	1/2	1 294 910	100	81MAR/ZAL
2s2p(¹ P°)3d	² D°	3/2	1 303 450?	100	81MAR/ZAL
		5/2	1 303 610	100	81MAR/ZAL
2s2p(¹ P°)3d	² P°	1/2	1 306 470	100	81MAR/ZAL
		3/2	1 306 470	100	81MAR/ZAL
2p ² (¹ D)3s	² D	3/2	1 331 140	100	81MAR/ZAL
		5/2	1 331 970	100	81MAR/ZAL
2s ² 4d	² D	3/2	1 335 810	100	81MAR/ZAL
		5/2	1 335 830	100	81MAR/ZAL
2p ² (³ P)3p	⁴ D°	7/2	1 338 470	100	81MAR/ZAL,97FEL/BEH
2p ² (³ P)3p	⁴ P°	5/2	1 344 850	100	81MAR/ZAL,97FEL/BEH
2p ² (³ P)3p	² D°	3/2	1 348 720	100	81MAR/ZAL
		5/2	1 348 720	100	81MAR/ZAL
2p ² (³ P)3p	⁴ S°	3/2	1 362 970	100	81MAR/ZAL,97FEL/BEH
2p ² (¹ D)3p	² F°	5/2	1 377 820	100	81MAR/ZAL
		7/2	1 378 300	100	81MAR/ZAL
2p ² (³ P)3d	² F	5/2	1 388 500?	100	81MAR/ZAL
		7/2	1 388 970?	100	81MAR/ZAL

TABLE 14. Energy levels of Na VII—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2p ² (³ P)3d	² D	3/2	1 390 450?	100	81MAR/ZAL
		5/2	1 390 450?	100	81MAR/ZAL
2p ² (¹ D)3p	² D°	3/2	1 392 800	100	81MAR/ZAL
		5/2	1 392 800	100	81MAR/ZAL
2p ² (³ P)3d	⁴ P	5/2	1 399 070	100	81MAR/ZAL,97FEL/BEH
		3/2	1 399 600	100	81MAR/ZAL,97FEL/BEH
		1/2	1 399 890	100	81MAR/ZAL,97FEL/BEH
2p ² (¹ D)3d	² D	3/2	1 415 630	100	81MAR/ZAL
		5/2	1 415 630	100	81MAR/ZAL
2s2p(³ P°)4s	⁴ P°	5/2	1 422 890	100	81MAR/ZAL,97FEL/BEH
2p ² (¹ D)3d	² F	5/2	1 428 720	100	81MAR/ZAL
		7/2	1 428 800	100	81MAR/ZAL
2p ² (¹ D)3d	² P	1/2	1 432 140	100	81MAR/ZAL
		3/2	1 432 610	100	81MAR/ZAL
2s2p(³ P°)4s	² P°	3/2	1 432 600?	100	81MAR/ZAL
2s2p(³ P°)4p	² P	1/2	1 442 710	100	81MAR/ZAL
		3/2	1 443 170	100	81MAR/ZAL
2s2p(³ P°)4p	² D	3/2	1 452 100	100	81MAR/ZAL
		5/2	1 453 350	100	81MAR/ZAL
2s ² 5d	² D	3/2	1 461 520	100	81MAR/ZAL
		5/2	1 461 590	100	81MAR/ZAL
2s2p(³ P°)4d	⁴ D°	3/2	1 462 400	100	81MAR/ZAL,97FEL/BEH
		5/2	1 462 440	100	81MAR/ZAL,97FEL/BEH
		7/2	1 463 270	100	81MAR/ZAL,97FEL/BEH
2s2p(³ P°)4d	² D°	5/2	1 464 050	100	81MAR/ZAL
2s2p(³ P°)4d	⁴ P°	5/2	1 464 870	100	81MAR/ZAL,97FEL/BEH
2s2p(³ P°)4d	² F°	5/2	1 471 560	100	81MAR/ZAL
		7/2	1 472 730	100	81MAR/ZAL
2s2p(³ P°)4d	² P°	3/2	1 473 810?	100	81MAR/ZAL
		1/2	1 474 530?	100	81MAR/ZAL
2s ² 6d	² D	3/2,5/2	1 529 460	100	81MAR/ZAL
2s2p(¹ P°)4s	² P°	1/2,3/2	1 538 950?	100	81MAR/ZAL
2s2p(¹ P°)4p	² D	3/2,5/2	1 561 890?	100	81MAR/ZAL
2s ² 7d	² D	3/2,5/2	1 570 080	100	81MAR/ZAL
2s2p(¹ P°)4d	² F°	5/2,7/2	1 577 810?	100	81MAR/ZAL
2s2p(³ P°)5p	² P	1/2,3/2	1 578 350	100	81MAR/ZAL
2s2p(³ P°)5p	² D	3/2,5/2	1 583 740	100	81MAR/ZAL
2s2p(³ P°)5d	⁴ D°	1/2–7/2	1 589 290	100	81MAR/ZAL,97FEL/BEH
2s2p(³ P°)5d	⁴ P°	1/2–5/2	1 590 070	100	81MAR/ZAL,97FEL/BEH
2s2p(³ P°)5d	² F°	5/2	1 592 820	100	81MAR/ZAL
		7/2	1 593 920	100	81MAR/ZAL

TABLE 14. Energy levels of Na VII—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
2s ² 8d	² D	3/2, 5/2	1 596 400	100	81MAR/ZAL
2p ² (³ P)4p	⁴ D°	3/2–7/2	1 646 130	100	81MAR/ZAL,97FEL/BEH
2s2p(³ P°)6d	⁴ D°	1/2–7/2	1 657 540	100	81MAR/ZAL,97FEL/BEH
2p ² (³ P)4d	⁴ P	5/2	1 668 340?	100	81MAR/ZAL,97FEL/BEH
		3/2	1 668 940?	100	81MAR/ZAL,97FEL/BEH
Na VIII (¹ S ₀)	Limit	—	1 681 700	250	81MAR/ZAL

6.8. Na VIII

Be isoelectronic sequence

Ground state $1s^2 2s^2 \ ^1S_0$

Ionization energy 2 131 300(250) cm⁻¹; 264.25(3) eV

The Na VIII spectrum was first measured by Söderqvist [34SOD, 44SOD], who used a vacuum spark source to measure 82 lines in the 50–170 Å range, the $1s^2 2s 2p \ ^1P_1^\circ$ resonance line, and two of the $1s^2 2s 2p$ – $1s^2 2p^2$ transitions between 400 Å and 500 Å. Fawcett [70FAW] observed five additional $1s^2 2s 2p$ – $1s^2 2p^2$ transitions near 500 Å. The wavelength of the $1s^2 2s^2 \ ^1S_0$ – $1s^2 2s 2p \ ^3P_1^\circ$ transition was obtained by interpolation along the beryllium isoelectronic series by Edlén [79EDL] and is used to determine the relative positions of the singlet and triplet sets of levels. Edlén [79EDL] also used interpolation to obtain a wavelength for the $1s^2 2s 2p \ ^1P_1^\circ$ – $1s^2 2p^2 \ ^1D_2$ transition. The level values were re-evaluated by Martin and Zalubas [81MAR/ZAL], confirming most of the prior work. Since then the connection between the singlet and triplet sets of levels has been experimentally determined by observation of the $1s^2 2s^2 \ ^1S_0$ – $1s^2 2s 2p \ ^3P_1^\circ$ transition in the solar spectrum by Feldman *et al.* [97FEL/BEH] and Curdt *et al.* [04CUR/LAN]. The [81MAR/ZAL] triplet levels given below have been adjusted in accordance with the newly available data. Levels based on single weak lines are included here but denoted as tentative with a question mark (see Tables 15 and 16).

The transition probabilities of allowed transitions of Na VIII have recently been compiled by Kelleher and Podobedova [08KEL/POD] based primarily on the relativistic multibody perturbation theory calculations of Safronova *et al.* [99SAF/JOHb, 99SAF/DER] along with multiconfiguration Hartree-Fock calculations of Tachiev and Froese Fischer [02TAC/FROa, 02TAC/FROb]. Nonrelativistic close-coupling approximation values by Tully *et al.* [90TUL/SEA] were also included in the [08KEL/POD] compilation for transitions where other values were not available. The lifetime of the Na VIII $2s 2p \ ^1P_1^\circ$ level has been measured to be 0.21(1) ns in a beam-foil experiment by Tordoir *et al.* [99TOR/BIE], corresponding to a transition probability for the 411 Å transition of $4.8(2) \times 10^9 \text{ s}^{-1}$, which is somewhat

higher than the theoretical value listed below. The ionization energy cited above was determined by Martin and Zalubas [81MAR/ZAL] using the $2snd \ ^1D_2$ series.

References for Na VIII

- 34SOD J. Söderqvist, *Nova Acta Regiae Soc. Sci. Ups.* **9**, 1 (1934).
- 44SOD J. Söderqvist, *Ark. Mat. Astron. Fys.* **30**, 1 (1944).
- 70FAW B. C. Fawcett, *J. Phys. B* **3**, 1152 (1970).
- 79EDL B. Edlén, *Phys. Scr.* **20**, 129 (1979).
- 81MAR/ZAL W. C. Martin and R. Zalubas, *J. Phys. Chem. Ref. Data* **10**, 153 (1981).
- 90TUL/SEA J. A. Tully, M. J. Seaton, and K. A. Berrington, *J. Phys. B* **23**, 3811 (1990).
- 97FEL/BEH U. Feldman, W. E. Behring, W. Curdt, U. Schühle, K. Wilhelm, P. Lemaire, and T. M. Moran, *Astrophys. J. Suppl. Ser.* **113**, 195 (1997).
- 99SAF/DER U. I. Safronova, A. Derevianko, M. S. Safronova, and W. R. Johnson, *J. Phys. B* **32**, 3527 (1999).
- 99SAF/JOHb U. I. Safronova, W. R. Johnson, M. S. Safronova, and A. Derevianko, *Phys. Scr.* **59**, 286 (1999).
- 99TOR/BIE X. Tordoir, E. Biémont, H. P. Garnir, P.-D. Dumont, and E. Träbert, *Eur. Phys. J. D* **6**, 1 (1999).
- 02TAC/FROa G. Tachiev and C. Froese Fischer, http://www.vuse.vanderbilt.edu/~cff/mchf_collection/ (downloaded December 2002).
- 02TAC/FROb G. Tachiev and C. Froese Fischer, *Astron. Astrophys.* **385**, 716 (2002).
- 04CUR/LAN W. Curdt, E. Landi, and U. Feldman, *Astron. Astrophys.* **427**, 1045 (2004).
- 08KEL/POD D. E. Kelleher and L. Podobedova, *J. Phys. Chem. Ref. Data* **37**, 267 (2008).

TABLE 15. Observed spectral lines of Na VIII

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>								
51.316	0.010	1 948 700	10		1s ² 2s2p ³ P ₂ ^o	1s ² 2p6p ³ D ₃	44SOD	
51.789	0.010	1 930 900	10		1s ² 2s ² ¹ S ₀	1s ² 2s6p ¹ P ₁	44SOD	
53.750	0.010	1 860 500	10	1.78E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2p5p ³ P ₂	44SOD	08KEL/POD
54.380	0.010	1 838 900	100	4.44E+10	1s ² 2s ² ¹ S ₀	1s ² 2s5p ¹ P ₁ ^o	44SOD	08KEL/POD
55.345	0.010	1 806 800	10	2.50E+10	1s ² 2s2p ³ P ₁ ^o	1s ² 2s6d ³ D ₂ ?	44SOD	08KEL/POD
55.396	0.010	1 805 200	100	3.32E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2s6d ³ D ₃ ?	44SOD	08KEL/POD
57.096	0.010	1 751 400	10		1s ² 2p ² ³ P ₂	1s ² 2p6d ³ P ₂ ^o	44SOD	
57.119	0.010	1 750 700	10	4.50E+10	1s ² 2p ² ³ P ₂	1s ² 2p6d ³ D ₃	44SOD	08KEL/POD
57.230	0.010	1 747 300	10	4.04E+10	1s ² 2s2p ¹ P ₁ ^o	1s ² 2p5p ¹ D ₂	44SOD	08KEL/POD
58.070	0.010	1 722 100	10	4.04E+10	1s ² 2s2p ³ P ₁ ^o	1s ² 2s5d ³ D ₂ ?	44SOD	08KEL/POD
59.009	0.010	1 694 700	100	3.35E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2p4p ³ P ₂	44SOD	08KEL/POD
59.101	0.010	1 692 000	10	2.53E+10	1s ² 2s2p ¹ P ₁ ^o	1s ² 2s6d ¹ D ₂	44SOD	08KEL/POD
59.204	0.010	1 689 100	300	3.79E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2p4p ³ D ₃	44SOD	08KEL/POD
59.249	0.010	1 687 800	10	9.44E+9	1s ² 2s2p ³ P ₂ ^o	1s ² 2p4p ³ D ₂	44SOD	08KEL/POD
59.759	0.010	1 673 400	200	8.47E+10	1s ² 2s ² ¹ S ₀	1s ² 2s4p ¹ P ₁ ^o	44SOD	08KEL/POD
59.992	0.010	1 666 900	10	1.03E+10	1s ² 2p ² ³ P ₁	1s ² 2p5d ³ P ₁ ^o	44SOD	08KEL/POD
60.053	0.010	1 665 200	100	3.09E+10	1s ² 2p ² ³ P ₂	1s ² 2p5d ³ P ₂ ^o	44SOD	08KEL/POD
60.073	0.010	1 664 600	100	8.15E+10	1s ² 2p ² ³ P ₂	1s ² 2p5d ³ D ₃	44SOD	08KEL/POD
61.088	0.010	1 637 000	200	1.01E+11	1s ² 2p ² ¹ D ₂	1s ² 2p5d ¹ F ₃ ^o	44SOD	08KEL/POD
61.347	0.010	1 630 100	1	2.66E+10	1s ² 2p ² ¹ D ₂	1s ² 2p5d ¹ D ₂	44SOD	08KEL/POD
62.276	0.010	1 605 800	100	5.28E+10	1s ² 2s2p ¹ P ₁ ^o	1s ² 2s5d ¹ D ₂	44SOD	08KEL/POD
63.114	0.010	1 584 400	100	5.04E+10	1s ² 2s2p ¹ P ₁ ^o	1s ² 2p4p ¹ D ₂	44SOD	08KEL/POD
63.695	0.010	1 570 000	10	4.59E+10	1s ² 2s2p ¹ P ₁ ^o	1s ² 2p4p ¹ P ₁	44SOD	08KEL/POD
64.205	0.010	1 557 500	200	7.17E+10	1s ² 2s2p ³ P ₀ ^o	1s ² 2s4d ³ D ₁	44SOD	08KEL/POD
64.236	0.010	1 556 800	400	9.64E+10	1s ² 2s2p ³ P ₁ ^o	1s ² 2s4d ³ D ₂	44SOD	08KEL/POD
64.302	0.010	1 555 200	500	1.28E+11	1s ² 2s2p ³ P ₂ ^o	1s ² 2s4d ³ D ₃	44SOD	08KEL/POD
65.672	0.010	1 522 700	10		1s ² 2s2p ³ P ₁ ^o	1s ² 2s4s ³ S ₁	44SOD	
65.730	0.010	1 521 400	10		1s ² 2s2p ³ P ₂ ^o	1s ² 2s4s ³ S ₁	44SOD	
66.059	0.010	1 513 800	200	1.66E+10	1s ² 2s ² ¹ S ₀	1s ² 2p3d ¹ P ₁ ^o	44SOD	08KEL/POD
66.358	0.010	1 507 000	10	1.82E+10	1s ² 2p ² ³ P ₁	1s ² 2p4d ³ P ₁ ^o	44SOD	08KEL/POD
66.433	0.010	1 505 300	200	5.43E+10	1s ² 2p ² ³ P ₂	1s ² 2p4d ³ P ₂ ^o	44SOD	08KEL/POD
66.498	0.010	1 503 800	400	1.72E+11	1s ² 2p ² ³ P ₂	1s ² 2p4d ³ D ₃	44SOD	08KEL/POD
67.478	0.010	1 482 000	200		1s ² 2p ² ¹ D ₂	1s ² 2p4d ¹ P ₁ ^o	44SOD	
67.672	0.010	1 477 700	400	1.76E+11	1s ² 2p ² ¹ D ₂	1s ² 2p4d ¹ F ₃ ^o	44SOD	08KEL/POD
68.193	0.010	1 466 400	100	5.72E+10	1s ² 2p ² ¹ D ₂	1s ² 2p4d ¹ D ₂	44SOD	08KEL/POD
69.120	0.010	1 446 800	300	9.72E+10	1s ² 2s2p ¹ P ₁ ^o	1s ² 2s4d ¹ D ₂	44SOD	08KEL/POD
70.741	0.010	1 413 610	10		1s ² 2s2p ¹ P ₁ ^o	1s ² 2s4s ¹ S ₀	44SOD	
74.956	0.010	1 334 120	300	2.62E+10	1s ² 2s2p ³ P ₀ ^o	1s ² 2p3p ³ P ₁	44SOD	08KEL/POD
74.980	0.010	1 333 690	300	1.90E+10	1s ² 2s2p ³ P ₁ ^o	1s ² 2p3p ³ P ₁	44SOD	08KEL/POD
75.043	0.010	1 332 570	400	7.07E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2p3p ³ P ₂	44SOD	08KEL/POD
75.096	0.010	1 331 630	300	4.72E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2p3p ³ P ₁	44SOD	08KEL/POD
75.385	0.010	1 326 520	100	1.29E+10	1s ² 2s2p ³ P ₀ ^o	1s ² 2p3p ³ S ₁	44SOD	08KEL/POD
75.428	0.010	1 325 770	200	3.42E+10	1s ² 2s2p ³ P ₁ ^o	1s ² 2p3p ³ S ₁	44SOD	08KEL/POD
75.518	0.010	1 324 190	300	4.07E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2p3p ³ S ₁	44SOD	08KEL/POD
76.123	0.010	1 313 660	500	4.94E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2p3p ³ D ₃	44SOD	08KEL/POD
76.173	0.010	1 312 800	100	1.88E+10	1s ² 2s2p ³ P ₁ ^o	1s ² 2p3p ³ D ₁	44SOD	08KEL/POD
76.217	0.010	1 312 040	200	1.09E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2p3p ³ D ₂	44SOD	08KEL/POD
77.266	0.010	1 294 230	600	1.87E+11	1s ² 2s ² ¹ S ₀	1s ² 2s3p ¹ P ₁ ^o	44SOD	08KEL/POD
80.756	0.010	1 238 300	10	6.26E+10	1s ² 2s2p ¹ P ₁ ^o	1s ² 2p3p ¹ S ₀	44SOD	08KEL/POD
81.210	0.010	1 231 380	500	1.51E+11	1s ² 2s2p ¹ P ₁ ^o	1s ² 2p3p ¹ D ₂	44SOD	08KEL/POD
83.240	0.010	1 201 350	700	2.23E+11	1s ² 2s2p ³ P ₀ ^o	1s ² 2s3d ³ D ₁	44SOD	08KEL/POD
83.288	0.010	1 200 650	800	3.00E+11	1s ² 2s2p ³ P ₁ ^o	1s ² 2s3d ³ D ₂	44SOD	08KEL/POD
83.391	0.010	1 199 170	900	3.99E+11	1s ² 2s2p ³ P ₂ ^o	1s ² 2s3d ³ D ₃	44SOD	08KEL/POD
84.050	0.010	1 189 770	500	1.11E+11	1s ² 2s2p ¹ P ₁ ^o	1s ² 2p3p ¹ P ₁ ^o	44SOD	08KEL/POD
85.826	0.010	1 165 150	200	5.87E+10	1s ² 2p ² ³ P ₀	1s ² 2p3d ³ P ₁ ^o	44SOD	08KEL/POD
85.861	0.010	1 164 670	300	2.58E+11	1s ² 2p ² ³ P ₁	1s ² 2p3d ³ P ₀ ^o	44SOD	08KEL/POD

TABLE 15. Observed spectral lines of Na VIII—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
85.887	0.010	1 164 320	300	8.74E+10	1s ² 2p ² ³ P ₁	1s ² 2p3d ³ P ₁ ^o	44SOD	08KEL/POD
85.936	0.010	1 163 660	100	2.74E+10	1s ² 2p ² ³ P ₁	1s ² 2p3d ³ P ₂ ^o	44SOD	08KEL/POD
85.992	0.010	1 162 900	300	1.14E+11	1s ² 2p ² ³ P ₂	1s ² 2p3d ³ P ₁ ^o	44SOD	08KEL/POD
86.039	0.010	1 162 260	500	2.33E+11	1s ² 2p ² ³ P ₂	1s ² 2p3d ³ P ₂ ^o	44SOD	08KEL/POD
86.381	0.010	1 157 660	400	2.98E+11	1s ² 2p ² ³ P ₀	1s ² 2p3d ³ D ₁ ^o	44SOD	08KEL/POD
86.417	0.010	1 157 180	500	4.02E+11	1s ² 2p ² ³ P ₁	1s ² 2p3d ³ D ₂ ^o	44SOD	08KEL/POD
86.479	0.010	1 156 350	600	4.88E+11	1s ² 2p ² ³ P ₂	1s ² 2p3d ³ D ₃ ^o	44SOD	08KEL/POD
86.530	0.010	1 155 670	100	8.12E+10	1s ² 2p ² ³ P ₂	1s ² 2p3d ³ D ₂ ^o	44SOD	08KEL/POD
86.758	0.010	1 152 630	300	1.80E+10	1s ² 2p ² ¹ D ₂	1s ² 2p3d ¹ P ₁ ^o	44SOD	08KEL/POD
87.211	0.010	1 146 640	700	5.65E+11	1s ² 2p ² ¹ D ₂	1s ² 2p3d ¹ F ₃ ^o	44SOD	08KEL/POD
89.759	0.010	1 114 090	200	9.93E+9	1s ² 2s2p ³ P ₀ ^o	1s ² 2s3s ³ S ₁	44SOD	08KEL/POD
89.818	0.010	1 113 360	300	2.98E+10	1s ² 2s2p ³ P ₁ ^o	1s ² 2s3s ³ S ₁	44SOD	08KEL/POD
89.948	0.010	1 111 750	400	4.98E+10	1s ² 2s2p ³ P ₂ ^o	1s ² 2s3s ³ S ₁	44SOD	08KEL/POD
90.252	0.010	1 108 010	400	1.35E+11	1s ² 2p ² ¹ D ₂	1s ² 2p3d ¹ D ₂ ^o	44SOD	08KEL/POD
90.536	0.010	1 104 530	500	2.54E+11	1s ² 2s2p ¹ P ₁ ^o	1s ² 2s3d ¹ D ₂ ^o	44SOD	08KEL/POD
93.120	0.010	1 073 880	100	1.77E+10	1s ² 2p ² ³ P ₁	1s ² 2p3s ³ P ₂ ^o	44SOD	08KEL/POD
93.197	0.010	1 073 000	10	2.33E+10	1s ² 2p ² ³ P ₀	1s ² 2p3s ³ P ₁ ^o	44SOD	08KEL/POD
93.242	0.010	1 072 480	200	5.24E+10	1s ² 2p ² ³ P ₂	1s ² 2p3s ³ P ₂ ^o	44SOD	08KEL/POD
93.339	0.010	1 071 360	10	6.92E+10	1s ² 2p ² ³ P ₁	1s ² 2p3s ³ P ₀ ^o	44SOD	08KEL/POD
93.670	0.010	1 067 580	400	3.14E+11	1s ² 2p ² ¹ S ₀	1s ² 2p3d ¹ P ₁ ^o	44SOD	08KEL/POD
93.898	0.010	1 064 980	200	5.15E+10	1s ² 2p ² ¹ D ₂	1s ² 2p3s ¹ P ₁ ^o	44SOD	08KEL/POD
98.080	0.010	1 019 580	300	2.98E+10	1s ² 2s2p ¹ P ₁ ^o	1s ² 2s3s ¹ S ₀	44SOD	08KEL/POD
102.043	0.010	979 980	10	1.99E+10	1s ² 2p ² ¹ S ₀	1s ² 2p3s ¹ P ₁ ^o	44SOD	08KEL/POD
107.158	0.010	933 200	100	1.17E+10	1s ² 2p ² ¹ D ₂	1s ² 2s3p ¹ P ₁ ^o	44SOD	08KEL/POD
117.909	0.010	848 110	10	3.66E+8	1s ² 2p ² ¹ S ₀	1s ² 2s3p ¹ P ₁ ^o	44SOD	08KEL/POD
168.964	0.010	591 840	35		1s ² 2p3d ³ D ₁ ^o	1s ² 2p6p ³ D ₁ ^o	44SOD	
411.145	0.010	243 223	100	4.40E+9	1s ² 2s ² ¹ S ₀	1s ² 2s2p ¹ P ₁ ^o	44SOD	08KEL/POD
492.329	0.010	203 116	10	9.09E+8	1s ² 2s2p ³ P ₁ ^o	1s ² 2p ² ³ P ₂	44SOD	08KEL/POD
492.79	0.04	202 926		6.59E+9	1s ² 2s2p ¹ P ₁ ^o	1s ² 2p ² ¹ S ₀	70FAW	08KEL/POD
494.00	0.04	202 430		1.20E+9	1s ² 2s2p ³ P ₀ ^o	1s ² 2p ² ³ P ₁	70FAW	08KEL/POD
495.81	0.04	201 690		8.89E+8	1s ² 2s2p ³ P ₁ ^o	1s ² 2p ² ³ P ₁	70FAW	08KEL/POD
496.249	0.010	201 512	100	2.66E+9	1s ² 2s2p ³ P ₂ ^o	1s ² 2p ² ³ P ₂	44SOD	08KEL/POD
497.84	0.04	200 868		3.51E+9	1s ² 2s2p ³ P ₁ ^o	1s ² 2p ² ³ P ₀	70FAW	08KEL/POD
499.78	0.04	200 088		1.45E+9	1s ² 2s2p ³ P ₂ ^o	1s ² 2p ² ³ P ₁	70FAW	08KEL/POD
789.780	0.015	126 613		3.63E+4	1s ² 2s ² ¹ S ₀	1s ² 2s2p ³ P ₁ ^o	97FEL/BEH	08KEL/POD
847.91	0.03	117 937		6.66E+8	1s ² 2s2p ¹ P ₁ ^o	1s ² 2p ² ¹ D ₂	04CUR/LAN	08KEL/POD

TABLE 16. Energy levels of Na VIII

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
1s ² 2s ²	¹ S	0	0		
1s ² 2s2p	³ P ^o	0	125 881	10	81MAR/ZAL
		1	126 613	10	81MAR/ZAL
		2	128 219	10	81MAR/ZAL
1s ² 2s2p	¹ P ^o	1	243 208	10	81MAR/ZAL
1s ² 2p ²	³ P	0	327 477	10	81MAR/ZAL
		1	328 311	10	81MAR/ZAL
		2	329 730	10	81MAR/ZAL
1s ² 2p ²	¹ D	2	361 145	10	81MAR/ZAL
1s ² 2p ²	¹ S	0	446 136	10	81MAR/ZAL
1s ² 2s3s	³ S	1	1 239 975	100	81MAR/ZAL

TABLE 16. Energy levels of Na VIII—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
1s ² 2s3s	¹ S	0	1 262 780	100	81MAR/ZAL
1s ² 2s3p	¹ P ^o	1	1 294 230	100	81MAR/ZAL
1s ² 2s3d	³ D	1	1 327 230	100	81MAR/ZAL
		2	1 327 270	100	81MAR/ZAL
		3	1 327 390	100	81MAR/ZAL
1s ² 2s3d	¹ D	2	1 347 740	100	81MAR/ZAL
1s ² 2p3s	³ P ^o	0	1 399 670	100	81MAR/ZAL
		1	1 400 470	100	81MAR/ZAL
		2	1 402 200	100	81MAR/ZAL
1s ² 2p3s	¹ P ^o	1	1 426 120	100	81MAR/ZAL
1s ² 2p3p	¹ P	1	1 432 980	100	81MAR/ZAL
1s ² 2p3p	³ D	1	1 439 410?	100	81MAR/ZAL
		2	1 440 260?	100	81MAR/ZAL
		3	1 441 880	100	81MAR/ZAL
1s ² 2p3p	³ S	1	1 452 400	100	81MAR/ZAL
1s ² 2p3p	³ P	0			
		1	1 459 850	100	81MAR/ZAL
		2	1 460 770	100	81MAR/ZAL
1s ² 2p3d	¹ D ^o	2	1 469 150	100	81MAR/ZAL
1s ² 2p3p	¹ D	2	1 474 580	100	81MAR/ZAL
1s ² 2p3p	¹ S	0	1 481 510	100	81MAR/ZAL
1s ² 2p3d	³ D ^o	1	1 485 140	100	81MAR/ZAL
		2	1 485 340	100	81MAR/ZAL
		3	1 486 080	100	81MAR/ZAL
1s ² 2p3d	³ P ^o	2	1 491 980	100	81MAR/ZAL
		1	1 492 630	100	81MAR/ZAL
		0	1 492 980	100	81MAR/ZAL
1s ² 2p3d	¹ F ^o	3	1 507 790	100	81MAR/ZAL
1s ² 2p3d	¹ P ^o	1	1 513 730	100	81MAR/ZAL
1s ² 2s4s	³ S	1	1 649 480	100	81MAR/ZAL
1s ² 2s4s	¹ S	0	1 656 820	100	81MAR/ZAL
1s ² 2s4p	¹ P ^o	1	1 673 390	100	81MAR/ZAL
1s ² 2s4d	³ D	1	1 683 370	100	81MAR/ZAL
		2	1 683 370	100	81MAR/ZAL
		3	1 683 370	100	81MAR/ZAL
1s ² 2s4d	¹ D	2	1 689 970	100	81MAR/ZAL
1s ² 2p4p	¹ P	1	1 813 190	100	81MAR/ZAL
1s ² 2p4p	³ D	1			
		2	1 816 010?	100	81MAR/ZAL
		3	1 817 290	100	81MAR/ZAL
1s ² 2p4p	³ P	2	1 822 880	100	81MAR/ZAL
1s ² 2p4d	¹ D ^o	2	1 827 570	100	81MAR/ZAL
1s ² 2p4p	¹ D	2	1 827 640	100	81MAR/ZAL

TABLE 16. Energy levels of Na VIII—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
1s ² 2p4d	³ D°	3	1 833 530	100	81MAR/ZAL
1s ² 2p4d	³ P°	2	1 835 010	100	81MAR/ZAL
		1	1 835 290?	100	81MAR/ZAL
		0			
1s ² 2p4d	¹ F°	3	1 838 860	100	81MAR/ZAL
1s ² 2s5p	¹ P°	1	1 838 910	100	81MAR/ZAL
1s ² 2p4d	¹ P°	1	1 843 110	100	81MAR/ZAL
1s ² 2s5d?	³ D?	1	1 848 670?	100	81MAR/ZAL
		2	1 848 670?	100	81MAR/ZAL
		3	1 848 670?	100	81MAR/ZAL
1s ² 2s5d	¹ D	2	1 848 960	100	81MAR/ZAL
1s ² 2s6p	¹ P°	1	1 930 910	100	81MAR/ZAL
1s ² 2s6d?	³ D?	1	1 933 430	100	81MAR/ZAL
		2	1 933 430	100	81MAR/ZAL
		3	1 933 430	100	81MAR/ZAL
1s ² 2s6d	¹ D	2	1 935 230	100	81MAR/ZAL
1s ² 2p5p	³ P	2	1 988 680	100	81MAR/ZAL
1s ² 2p5p	¹ D	2	1 990 540	100	81MAR/ZAL
1s ² 2p5d	¹ D°	2	1 991 220	100	81MAR/ZAL
1s ² 2p5d	³ D°	3	1 994 370	100	81MAR/ZAL
1s ² 2p5d	³ P°	2	1 994 930	100	81MAR/ZAL
		1	1 995 200?	100	81MAR/ZAL
		0			
1s ² 2p5d	¹ F°	3	1 998 130	100	81MAR/ZAL
1s ² 2p6p?	³ D?	1	2 076 930?	100	81MAR/ZAL
		2	2 076 930?	100	81MAR/ZAL
		3	2 076 930?	100	81MAR/ZAL
1s ² 2p6d	³ D°	1	2 080 460	100	81MAR/ZAL
		2	2 080 460	100	81MAR/ZAL
		3	2 080 460	100	81MAR/ZAL
1s ² 2p6d	³ P°	2	2 081 170	100	81MAR/ZAL
		1	2 081 170	100	81MAR/ZAL
		0	2 081 170	100	81MAR/ZAL
1s ² 2p6d	¹ F°	3	2 083 210	100	81MAR/ZAL
Na IX (² S _{1/2})	Limit	—	2 131 300	250	81MAR/ZAL

6.9. Na IX

Li isoelectronic sequence

Ground state 1s²2s ²S_{1/2}

Ionization energy [2 418 570 cm⁻¹]; [299.867 eV]

The analysis of the Na IX spectrum line is based on the measurements of Söderqvist [44SOD], who used a vacuum spark source to measure 21 lines in the 44 Å–82 Å range plus the 1s²2s-1s²2p transition at 681 Å. Fawcett [70FAW] reported the value of the 1s²2s ²S_{1/2}-1s²2p ²P_{1/2} transition

observed in a laser-induced plasma and Purcell and Wilding [72PUR/WIL] measured it in a solar flare. Then Feldman *et al.* [97FEL/BEH] obtained an improved value from radiation in the solar corona. Feldman *et al.* [97FEL/BEH] also reported the wavelength of the 1s²2s ²S_{1/2}-1s²2p ²P_{3/2} transition. Fawcett [71FAW] observed the 1s²3d ²D-1s²4f ²F transition in a laser-produced plasma. The 2p ²P_{1/2}-2p ²P_{3/2} interval was determined by interpolation along the lithium isoelectronic series by Edlén [79EDL]. Measurements of satellites around the far ultraviolet He-like transitions in the

11 Å region [74FEL/DOS, 74AGL/BOI, 78BOI/FAE] established levels in the $1s2s2p$, $1s2p^2$, $1s2s3p$, and $1s2s3d$ configurations. Martin and Zalubas [81MAR/ZAL] combined these measurements with theoretical calculations by Vainshtein and Safronova [78VAI/SAF] to obtain the levels given below (see Tables 17 and 18).

The transition probabilities of allowed transitions of Na IX have been calculated by Zhang *et al.* [90ZHA/SAM] using relativistic multibody perturbation theory and Peach *et al.* [88PEA/SAR], who reported comparisons of several theoretical techniques. These, along with multiconfiguration Hartree-Fock calculations of Martin *et al.* [93MAR/KAR] and nonrelativistic close-coupling approximation values by Yan *et al.* [98YAN/TAM], were included in a comprehensive compilation of Na IX transition probabilities by Kelleher and Podobedova [08KEL/POD]. *Ab initio* Breit-Pauli R-matrix calculations by Nahar [02NAH], third-order many-body perturbation values from Johnson *et al.* [96JOH/LIU], and relativistic quantum defect orbital probabilities from Martin *et al.* [93MAR/KAR] all agree with the values by Kelleher and Podobedova [08KEL/POD] within $\pm 4\%$. The ionization energy cited above was reported by Edlén [79EDL] from an isoelectronic fit of the Li I isoelectronic sequence.

References for Na IX

44SOD J. Söderqvist, Ark. Mat. Astron. Fys. **30**, 1 (1944).
 70FAW B. C. Fawcett, J. Phys. B **3**, 1152 (1970).
 71FAW B. C. Fawcett, J. Phys. B **4**, 1115 (1971).
 72PUR/WIL J. D. Purcell and K. G. Widing, Astrophys. J. **176**, 239 (1972).
 74AGL/BOI E. V. Aglitskii, V. A. Boiko, S. M. Zakharov, S. A. Pikuz, and A. Ya. Faenov,

74FEL/DOS

78BOI/FAE

78VAI/SAF

79EDL

81MAR/ZAL

88PEA/SAR

90ZHA/SAM

93MAR/KAR

96JOH/LIU

97FEL/BEH

98YAN/TAM

02NAH

08KEL/POD

Sov. J. Quantum Electron. **4**, 500 (1974).
 U. Feldman, G. A. Doschek, D. J. Nagel, R. D. Cowan, and R. R. Whitlock, Astrophys. J. **192**, 213 (1974).
 V. A. Boiko, A. Ya. Faenov, and S. A. Pikuz, J. Quant. Spectrosc. Radiat. Transfer **19**, 11 (1978).
 L. A. Vainshtein and U. I. Safronova, At. Data Nucl. Data Tables **21**, 49 (1978).
 B. Edlén, Phys. Scr. **20**, 129 (1979).
 W. C. Martin and R. Zalubas, J. Phys. Chem. Ref. Data **10**, 153 (1981).
 G. Peach, H. E. Saraph, and M. J. Seaton, J. Phys. B **21**, 3669 (1988).
 H. L. Zhang, H. H. Sampson and C. J. Fontes, At. Data Nucl. Data Tables **44**, 31 (1990).
 I. Martin, J. Karwowski, G. H. F. Diercksen, and C. Barrientos, Astron. Astrophys. Suppl. Ser. **100**, 595 (1993).
 W. R. Johnson, Z. W. Liu, and J. Sapirstein, At. Data Nucl. Data Tables **64**, 279 (1996).
 U. Feldman, W. E. Behring, W. Curdt, W. Schühle, K. Wilhelm, P. Lemaire, and T. M. Moran, Astrophys. J. Suppl. Ser. **113**, 195 (1997).
 Z.-C. Yan, M. Tambasco, and G. W. F. Drake, Phys. Rev. A **57**, 1652 (1998).
 S. N. Nahar, Astron. Astrophys. **389**, 716 (2002).
 D. E. Kelleher and L. Podobedova, J. Phys. Chem. Ref. Data **37**, 267 (2008).

TABLE 17. Observed spectral lines of Na IX

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower Level	Upper Level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>									
11.088	0.003	9 018 759				$1s^2 2s^2 S_{1/2}$	$1s(2S_{1/2})2s2p(^1P_1^o)^2P_{1/2,3/2}^o$	78BOI/FAE	
11.155	0.003	8 964 590				$1s^2 2s^2 S_{1/2}$	$1s(2S_{1/2})2s2p(^3P_1^o)^2P_{1/2,3/2}^o$	78BOI/FAE	
11.202	0.003	8 926 977				$1s^2 2p^2 ^2P_{1/2,3/2}^o$	$1s2p^2 ^2D_{3/2,5/2}$	78BOI/FAE	
44.725	0.010	2 235 886	10*	d	1.23E+10	$1s^2 2s^2 S_{1/2}$	$1s^2 7p^2 P_{3/2}^o$	44SOD	08KEL/POD
44.725	0.010	2 235 886	10*	d	1.22E+10	$1s^2 2s^2 S_{1/2}$	$1s^2 7p^2 P_{1/2}^o$	44SOD	08KEL/POD
46.090	0.010	2 169 668	100*	d	1.95E+10	$1s^2 2s^2 S_{1/2}$	$1s^2 6p^2 P_{3/2}^o$	44SOD	08KEL/POD
46.090	0.010	2 169 668	100*	d	1.95E+10	$1s^2 2s^2 S_{1/2}$	$1s^2 6p^2 P_{1/2}^o$	44SOD	08KEL/POD
47.776	0.010	2 093 101	10		1.87E+10	$1s^2 2p^2 ^2P_{1/2}^o$	$1s^2 7d^2 D_{3/2}$	44SOD	08KEL/POD
47.836	0.010	2 090 476	100*	d	2.23E+10	$1s^2 2p^2 ^2P_{3/2}^o$	$1s^2 7d^2 D_{5/2}$	44SOD	08KEL/POD
47.836	0.010	2 090 476	100*	d	3.70E+9	$1s^2 2p^2 ^2P_{3/2}^o$	$1s^2 7d^2 D_{3/2}$	44SOD	08KEL/POD
48.553	0.010	2 059 605	200*	d	3.36E+10	$1s^2 2s^2 S_{1/2}$	$1s^2 5p^2 P_{3/2}^o$	44SOD	08KEL/POD
48.553	0.010	2 059 605	200*	d	3.37E+10	$1s^2 2s^2 S_{1/2}$	$1s^2 5p^2 P_{1/2}^o$	44SOD	08KEL/POD
49.326	0.010	2 027 328	100		3.04E+10	$1s^2 2p^2 ^2P_{1/2}^o$	$1s^2 6d^2 D_{3/2}$	44SOD	08KEL/POD
49.386	0.010	2 024 865	200*	d	3.65E+10	$1s^2 2p^2 ^2P_{3/2}^o$	$1s^2 6d^2 D_{5/2}$	44SOD	08KEL/POD
49.386	0.010	2 024 865	200*	d	6.07E+9	$1s^2 2p^2 ^2P_{3/2}^o$	$1s^2 6d^2 D_{3/2}$	44SOD	08KEL/POD
52.116	0.010	1 918 797	100		5.63E+10	$1s^2 2p^2 ^2P_{1/2}^o$	$1s^2 5d^2 D_{3/2}$	44SOD	08KEL/POD
52.186	0.010	1 916 223	200*	d	6.74E+10	$1s^2 2p^2 ^2P_{3/2}^o$	$1s^2 5d^2 D_{5/2}$	44SOD	08KEL/POD
52.186	0.010	1 916 223	200*	d	1.12E+10	$1s^2 2p^2 ^2P_{3/2}^o$	$1s^2 5d^2 D_{3/2}$	44SOD	08KEL/POD
52.487	0.010	1 905 234	1		8.88E+9	$1s^2 2p^2 ^2P_{3/2}^o$	$1s^2 5s^2 S_{1/2}$	44SOD	08KEL/POD

TABLE 17. Observed spectral lines of Na IX—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Int.	Line Code	A_{ki} (s ⁻¹)	Lower Level	Upper Level	λ Ref.	A_{ki} Ref.
53.860	0.010	1 856 665	300		6.40E+10	1s ² 2s ² S _{1/2}	1s ² 4p ² P _{3/2} ^o	44SOD	08KEL/POD
58.201	0.010	1 718 184	500		1.22E+11	1s ² 2p ² P _{1/2} ^o	1s ² 4d ² D _{3/2}	44SOD	08KEL/POD
58.279	0.010	1 715 884	600		1.46E+11	1s ² 2p ² P _{3/2} ^o	1s ² 4d ² D _{5/2}	44SOD	08KEL/POD
58.954	0.010	1 696 238	100		9.05E+9	1s ² 2p ² P _{1/2} ^o	1s ² 4s ² S _{1/2}	44SOD	08KEL/POD
59.042	0.010	1 693 710	200		1.82E+10	1s ² 2p ² P _{3/2} ^o	1s ² 4s ² S _{1/2}	44SOD	08KEL/POD
70.615	0.010	1 416 130	700		1.40E+11	1s ² 2s ² S _{1/2}	1s ² 3p ² P _{3/2} ^o	44SOD	08KEL/POD
70.653	0.010	1 415 368	600		1.40E+11	1s ² 2s ² S _{1/2}	1s ² 3p ² P _{1/2} ^o	44SOD	08KEL/POD
77.764	0.010	1 285 942	700		3.65E+11	1s ² 2p ² P _{1/2} ^o	1s ² 3d ² D _{3/2}	44SOD	08KEL/POD
77.911	0.010	1 283 516	800		4.36E+11	1s ² 2p ² P _{3/2} ^o	1s ² 3d ² D _{5/2}	44SOD	08KEL/POD
81.175	0.010	1 231 906	500		2.31E+10	1s ² 2p ² P _{1/2} ^o	1s ² 3s ² S _{1/2}	44SOD	08KEL/POD
81.350	0.010	1 229 256	500		4.62E+10	1s ² 2p ² P _{3/2} ^o	1s ² 3s ² S _{1/2}	44SOD	08KEL/POD
231.78	0.05	431 444				1s ² 3d ² D _{3/2,5/2}	1s ² 4f ² F _{5/2,7/2} ^o	71FAW	
681.725	0.015	146 687	350		6.598E +8	1s ² 2s ² S _{1/2}	1s ² 2p ² P _{3/2} ^o	97FEL/BEH	98YAN/ TAM
694.130	0.015	144 065	160		6.233E +8	1s ² 2s ² S _{1/2}	1s ² 2p ² P _{1/2} ^o	97FEL/BEH	98YAN/TAM

TABLE 18. Energy levels of Na IX

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
1s ² 2s	² S	1/2	0	5	81MAR/ZAL
1s ² 2p	² P ^o	1/2	144 062	5	81MAR/ZAL
		3/2	146 688	5	81MAR/ZAL
1s ² 3s	² S	1/2	1 375 950	100	81MAR/ZAL
1s ² 3p	² P ^o	1/2	1 415 370	100	81MAR/ZAL
		3/2	1 416 130	100	81MAR/ZAL
1s ² 3d	² D	3/2	1 430 000	100	81MAR/ZAL
		5/2	1 430 200	100	81MAR/ZAL
1s ² 4s	² S	1/2	1 840 350	100	81MAR/ZAL
1s ² 4p	² P ^o	1/2	[1 856 440]	100	81MAR/ZAL
		3/2	[1 856 770]	100	81MAR/ZAL
1s ² 4d	² D	3/2	1 862 250	100	81MAR/ZAL
		5/2	1 862 570	100	81MAR/ZAL
1s ² 4f	² F ^o	5/2	[1 862 930]	100	81MAR/ZAL
		7/2	[1 862 980]	100	81MAR/ZAL
1s ² 5s	² S	1/2	[2 051 520]	100	81MAR/ZAL
1s ² 5p	² P ^o	1/2	2 059 600	100	81MAR/ZAL
		3/2	2 059 600	100	81MAR/ZAL
1s ² 5d	² D	3/2	2 062 860	100	81MAR/ZAL
		5/2	2 062 910	100	81MAR/ZAL
1s ² 6p	² P ^o	1/2	2 169 670	100	81MAR/ZAL
		3/2	2 169 670	100	81MAR/ZAL
1s ² 6d	² D	3/2	2 171 390	100	81MAR/ZAL
		5/2	2 171 550	100	81MAR/ZAL
1s ² 7p	² P ^o	1/2	2 235 890	100	81MAR/ZAL
		3/2	2 235 890	100	81MAR/ZAL

TABLE 18. Energy levels of Na IX—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
1s ² 7d	² D	3/2	2 237 160	100	81MAR/ZAL
		5/2	2 237 170	100	81MAR/ZAL
Na x (¹ S ₀)	Limit	—	2 418 570	100	81MAR/ZAL
1s2s2	² S	1/2	(8 815 600)	100	81MAR/ZAL
1s(² S _{1/2})2s2p(³ P [°])	⁴ P [°]	1/2	(8 854 500)	100	81MAR/ZAL
		3/2	(8 855 100)	100	81MAR/ZAL
		5/2	(8 857 000)	100	81MAR/ZAL
1s(² S _{1/2})2s2p(³ P [°])	² P [°]	1/2	(8 963 700)	100	81MAR/ZAL
		3/2	(8 965 200)	100	81MAR/ZAL
1s2p ²	⁴ P	1/2	(9 008 000)	100	81MAR/ZAL
		3/2	(9 009 200)	100	81MAR/ZAL
		5/2	(9 010 500)	100	81MAR/ZAL
1s(² S _{1/2})2s2p(¹ P ₁ [°])	² P [°]	1/2	(9 016 900)	100	81MAR/ZAL
		3/2	(9 017 500)	100	81MAR/ZAL
1s2p ²	² D	5/2	(9 075 600)	100	81MAR/ZAL
		3/2	(9 076 400)	100	81MAR/ZAL
1s2p ²	² P	1/2	(9 095 100)	100	81MAR/ZAL
		3/2	(9 097 700)	100	81MAR/ZAL
1s2p ²	² S	1/2	(9 178 900)	100	81MAR/ZAL
Na x (1s2s ³ S ₁)	Limit	—	[11 353 910]	100	81MAR/ZAL

6.10. Na x

He isoelectronic sequence

Ground state 1s² ¹S₀

Ionization energy (11 817 106.7(2) cm⁻¹);
(1465.134 35(3) eV)

Measurements of light from a solar flare by Walker and Rugge [69WAL/RUG] in 1969 yielded the first experimental wavelength for the Na x spectrum—a blend of the transitions to the ground state from the 1s2p ¹P₁ and 1s2p ³P₁ levels. An increase in resolution allowed Aglitskii *et al.* [74AGL/BOI] and Boiko *et al.* [78BOI/FAE] to report separate wavelengths for those transitions and also the resonance transition from the 1s3p ¹P₁ level based on observations of laser-induced plasmas. Analysis of light from a nonflaring active area of the sun by Parkinson [75PAR] produced confirmation of the 1s2p ¹P₁ and 1s2p ³P₁ resonance wavelengths and the only experimental value for the parity-forbidden 1s² ¹S₀ to 1s2s ³S₁ transition. Although Parkinson gives an uncertainty of ±0.002 Å for strong lines, comparison of values for weak lines such as these for his two different detectors indicates discrepancies of at least ±0.004 Å. Feldman *et al.* [74FEL/DOS] used laser-produced plasmas to obtain values for transitions to the 1s2p levels from 2s2p and 2p², as well as a blend of lines classified as 1s3s-2p3s and 1s3p-2p3p transitions. The resonance transition from the 1s2p ¹P₁ level has also been observed by Kaastra *et al.* [00KAA/MEW] in the

spectrum of a Seyfert galaxy. Studies of solar flares allowed Curdt *et al.* [00CUR/LAN] to measure the 1s2s ³S₁-1s2p ³P₂ transition. This wavelength was refined by Feldman *et al.* [00FEL/CUR] using observations in the solar corona (see Table 19).

Although the experimental data are sparse, theoretical calculations of energy levels in this spectrum provide values for many more levels and also are expected to have substantially smaller uncertainties than the experimental values. Martin and Zalubas [81MAR/ZAL] drew together all the data available up to 1981 to produce a comprehensive compilation of energy levels. Since then there have been calculations of energies for the *n*=1 and *n*=2 levels of heliumlike sodium and the ionization energy by Drake [88DRA], who used the unified-theory method, and Plante *et al.* [94PLA/JOH], who performed a relativistic all-order many-body calculation. Vainshtein and Safronova [85VAI/SAF] obtained values for 1sns, 1snp, and 1snd levels up to *n*=5 using a relativistic perturbation theory. Kagawa and Safronova [92KAG/SAF] and Safronova *et al.* [94SAF/SAF] further developed the technique, giving coefficients for all but the Lamb shift contributions for *n*=1 and 2 and for doubly excited *n*=2 levels, respectively.

Since the theoretical values for the Na x energy levels have smaller uncertainties than the experimental ones, we retain them in Table 20. The ionization energy and *n*=1 and *n*=2 levels are taken from the theoretical calculations of

Plante *et al.* [94PLA/JOH], who claim the smallest uncertainty. For the higher levels, we retain the values of Martin and Zalubas [81MAR/ZAL], which agree somewhat better with the [94PLA/JOH] energies for the lowest levels than the works of Safronova [85VAI/SAF, 92KAG/SAF]. The [81MAR/ZAL] level values have been adjusted to be consistent with the adopted ionization energy and all uncertainties are given with respect to the $1s^2S_{1/2}$ limit.

Johnson *et al.* [95JOH/PLA] used a relativistic, iterative technique to calculate the $1s^2-1s2p$ transition probabilities cited. The [95JOH/PLA] paper also presents a detailed comparison of several methods of calculating transition probabilities for He-like ions. The $1s^2-1s3p$ transition probability, not available in [95JOH/PLA], was calculated by Khan *et al.* [88KHA/KHA] using a one-electron hydrogenic model.

References for Na X

- 69WAL/RUG A. B. C. Walker and H. R. Rugge, in *Solar Flares and Space Research*, edited by C. de Jager and Z. Svestka (North-Holland, Amsterdam, 1969), p. 102.
- 74AGL/BOI E. V. Aglitskii, V. A. Boiko, S. M. Zakharov, S. A. Pikuz, and A. Ya. Faenov, *Sov. J. Quantum Electron.* **4**, 500 (1974).
- 74FEL/DOS U. Feldman, G. A. Doschek, D. J. Nagel, R. D. Cowan, and R. R. Whitlock, *Astrophys. J.* **192**, 213 (1974).

- 75PAR J. H. Parkinson, *Solar Phys.* **42**, 183 (1975).
- 78BOI/FAE V. A. Boiko, A. Ya. Faenov, and S. A. Pikuz, *J. Quant. Spectrosc. Radiat. Trans.* **19**, 11 (1978).
- 85VAI/SAF L. A. Vainshtein and U. I. Safronova, *Phys. Scr.* **31**, 519 (1985).
- 88DRA G. W. F. Drake, *Can. J. Phys.* **66**, 586 (1988).
- 88KHA/KHA F. Khan, G. S. Khandelwal, and J. W. Wilson, *Astrophys. J.* **329**, 493 (1988).
- 92KAG/SAF T. Kagawa and U. I. Safronova, *Phys. Scr.* **45**, 569 (1992).
- 94PLA/JOH D. R. Plante, W. R. Johnson, and J. Sapirstein, *Phys. Rev. A* **49**, 3519 (1994).
- 94SAF/SAF U. I. Safronova, M. S. Safronova, N. J. Snyderman, and V. G. Pal'chikov, *Phys. Scr.* **50**, 29 (1994).
- 95JOH/PLA W. R. Johnson, D. R. Plante, and J. Sapirstein, *Adv. At. Mol. Opt. Phys.* **35**, 255 (1995).
- 00CUR/LAN W. Curdt, E. Landi, K. Wilhelm, and U. Feldman, *Phys. Rev. A* **62**, 022502 (2000).
- 00FEL/CUR U. Feldman, W. Curdt, E. Landi, and K. Wilhelm, *Astrophys. J.* **544**, 508 (2000).
- 00KAA/MEW J. S. Kaastra, R. Mewe, D. A. Liedahl, S. Komossa, and A. C. Brinkman, *Astron. Astrophys.* **354**, L83 (2000).

TABLE 19. Observed spectral lines of Na X

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	Line code	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>								
9.427	0.003	10 608 000		3.74E+12	$1s^2\ ^1S_0$	$1s3p\ ^1P_1^\circ$	74AGL/BOI	88KHA/KHA
10.06*		9 940 400	d		$1s3p\ ^{1,3}P^\circ$	$2p3p\ ^{1,3}P^{1,3}D$	74FEL/DOS	
10.06*		9 940 400	d		$1s3s\ ^{1,3}S$	$2p3s\ ^{1,3}P^\circ$	74FEL/DOS	
10.119*	0.001	9 882 400	d		$1s2p\ ^1P_1^\circ$	$2p^2\ ^1S_0$	74FEL/DOS	
10.119*	0.001	9 882 400	d		$1s2s\ ^1S_0$	$2s2p\ ^1P_1^\circ$	74FEL/DOS	
10.157	0.001	9 845 400			$1s2s\ ^3S_1$	$2s2p\ ^3P^\circ$	74FEL/DOS	
10.170	0.001	9 832 800			$1s2p\ ^3P^\circ$	$2p^2\ ^3P$	74FEL/DOS	
10.193	0.001	9 810 700			$1s2p\ ^1P_1^\circ$	$2p^2\ ^1D_2$	74FEL/DOS	
11.004	0.003	9 087 600		1.34E+13	$1s^2\ ^1S_0$	$1s2p\ ^1P_1^\circ$	74AGL/BOI	95JOH/PLA
11.088	0.003	9 018 800		1.40E+10	$1s^2\ ^1S_0$	$1s2p\ ^3P_1^\circ$	78BOI/FAE	95JOH/PLA
11.192	0.004	8 935 000			$1s^2\ ^1S_0$	$1s2s\ ^3S_1$	75PAR	
1111.759	0.017	89 947.6		1.27E+8	$1s2s\ ^3S_1$	$1s2p\ ^3P_2^\circ$	00FEL/CUR	95JOH/PLA

TABLE 20. Energy levels of Na X

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
$1s^2$	1S	0	0	0.2	
$1s2s$	3S	1	(8 935 368.6)	0.2	94PLA/JOH
$1s2p$	$^3P^\circ$	0	(9 022 385.5)	0.2	94PLA/JOH
		1	(9 022 908.5)	0.2	94PLA/JOH
		2	(9 025 315.7)	0.2	94PLA/JOH

TABLE 20. Energy levels of Na X—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
1s2s	¹ S	0	(9 028 021.4)	0.2	94PLA/JOH
1s2p	¹ P°	1	(9 088 735.1)	0.2	94PLA/JOH
1s3s	³ S	1	(10 558 946)	20	81MAR/ZAL
1s3p	³ P°	0	(10 582 781)	20	81MAR/ZAL
		1	(10 582 947)	20	81MAR/ZAL
		2	(10 583 658)	20	81MAR/ZAL
1s3s	¹ S	0	(10 583 431)	20	81MAR/ZAL
1s3d	³ D	1	(10 596 647)	20	81MAR/ZAL
		2	(10 596 667)	20	81MAR/ZAL
		3	(10 596 925)	20	81MAR/ZAL
1s3d	¹ D	2	(10 597 475)	20	81MAR/ZAL
1s3p	¹ P°	1	(10 601 080)	20	81MAR/ZAL
1s4s	³ S	1	(11 115 065)	20	81MAR/ZAL
1s4p	³ P°	0	(11 124 873)	20	81MAR/ZAL
		1	(11 124 944)	20	81MAR/ZAL
		2	(11 125 244)	20	81MAR/ZAL
1s4s	¹ S	0	(11 124 986)	20	81MAR/ZAL
1s4d	³ D	1,2,3	(11 130 639)	20	81MAR/ZAL
1s4d	¹ D	2	(11 131 017)	20	81MAR/ZAL
1s4f	³ F°	2,3,4	(11 131 051)	20	81MAR/ZAL
1s4f	¹ F°	3	(11 131 056)	20	81MAR/ZAL
1s4p	¹ P°	1	(11 132 393)	20	81MAR/ZAL
1s5s	³ S	1	(11 369 887)	20	81MAR/ZAL
1s5p	³ P°	0	(11 374 842)	20	81MAR/ZAL
		1	(11 374 879)	20	81MAR/ZAL
		2	(11 375 032)	20	81MAR/ZAL
1s5s	¹ S	0	(11 374 868)	20	81MAR/ZAL
1s5d	³ D	1,2,3	(11 377 767)	20	81MAR/ZAL
1s5d	¹ D	2	(11 377 984)	20	81MAR/ZAL
1s5f	³ F°	2,3,4	(11 377 987)	20	81MAR/ZAL
1s5f	¹ F°	3	(11 377 991)	20	81MAR/ZAL
1s5p	¹ P°	1	(11 378 646)	20	81MAR/ZAL
1s6s	³ S	1	(11 507 469)	20	81MAR/ZAL
1s6s	¹ S	0	(11 510 320)	20	81MAR/ZAL
1s6p	³ P°	0,1,2	(11 510 387)	20	81MAR/ZAL
1s6d	³ D	1,2,3	(11 512 003)	20	81MAR/ZAL
1s6f	³ F°	2,3,4	(11 512 130)	20	81MAR/ZAL
1s6f	¹ F°	3	(11 512 133)	20	81MAR/ZAL

TABLE 20. Energy levels of Na X—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Unc. (cm ⁻¹)	Reference
1s6d	¹ D	2	(11 512 137)	20	81MAR/ZAL
1s6p	¹ P°	1	(11 512 505)	20	81MAR/ZAL
1s7s	³ S	1	(11 590 091)	20	81MAR/ZAL
1s7s	¹ S	0	(11 591 874)	20	81MAR/ZAL
1s7p	³ P°	0,1,2	(11 591 920)	20	81MAR/ZAL
1s7p	¹ P°	1	(11 593 248)	20	81MAR/ZAL
1s8s	³ S	1	(11 643 558)	20	81MAR/ZAL
1s8s	¹ S	0	(11 644 747)	20	81MAR/ZAL
1s8p	³ P°	0,1,2	(11 644 781)	20	81MAR/ZAL
1s8p	¹ P°	1	(11 645 667)	20	81MAR/ZAL
1s9s	³ S	1	(11 680 134)	20	81MAR/ZAL
1s9s	¹ S	0	(11 680 966)	20	81MAR/ZAL
1s9p	³ P°	0,1,2	(11 680 991)	20	81MAR/ZAL
1s9p	¹ P°	1	(11 681 612)	20	81MAR/ZAL
1s10s	³ S	1	(11 706 251)	20	81MAR/ZAL
1s10s	¹ S	0	(11 706 856)	20	81MAR/ZAL
1s10p	³ P°	0,1,2	(11 706 875)	20	81MAR/ZAL
1s10p	¹ P°	1	(11 707 327)	20	81MAR/ZAL
Na XI (1s ² S _{1/2})	<i>Limit</i>	—	(11 817 106.7)		94PLA/JOH
2s ²	¹ S	0	(18 757 400)	2000	81MAR/ZAL
2s2p	³ P°	0	(18 780 000)	2000	81MAR/ZAL
		1	(18 781 500)	2000	81MAR/ZAL
		2	(18 784 900)	2000	81MAR/ZAL
2p ²	³ P	0	(18 856 100)	2000	81MAR/ZAL
		1	(18 857 800)	2000	81MAR/ZAL
		2	(18 860 700)	2000	81MAR/ZAL
2p ²	¹ D	2	(18 900 900)	2000	81MAR/ZAL
2s2p	¹ P°	1	(18 909 900)	2000	81MAR/ZAL
2p ²	¹ S	0	(19 034 800)	2000	81MAR/ZAL
Na XI (2p ² P _{1/2} °)	<i>Limit</i>	—	(21 788 480)		81MAR/ZAL

6.11. Na XI

H isoelectronic sequence

Ground state 1s ²S_{1/2}

Ionization energy (13 297 680(1) cm⁻¹;
(1648.7020(1) eV)

Although some spectral lines of the Na XI spectrum have been observed experimentally, more accurate values of the wavelengths and levels can be obtained from theoretical cal-

culations. The wavelength of the blended Lyman- α line (1s ²S_{1/2}-2p ²P°_{1/2,3/2}) was measured by Aglitskii *et al.* [74AGL/BOI] to be 10.026(3) Å. This line was also observed in a Seyfert galaxy by Kaastra *et al.* [00KAA/MEW]. Lyman- β (1s ²S_{1/2}-3p ²P°_{1/2,3/2}) was first measured by [74AGL/BOI] and later remeasured with a lower uncertainty by Seely and Feldman [86SEE/FEL], who reported the wavelength of 8.4588(7) Å. In studies by Kato *et al.* [90KAT/MIU, 90AZU/KAT, 94DAI/AZU] of

recombination-pumped lasers, the Balmer- α line (the group of transitions from $n=2$ to 3 levels with wavelengths of about 54.2 Å) was observed, but the wavelength was not determined (see Table 21).

Erickson [77ERI] calculated all energy levels of ^{23}Na for $n=1-11$. For levels with $n=12-20$, Erickson gives $ns\ ^2S_{1/2}$ and $np\ ^2P_{1/2}^\circ$ levels, in addition to the levels with $J=n-1/2$. The level values in [77ERI] given here are corrected for the 2002 CODATA recommended value of the Rydberg constant, $R=109\,737.315\,685\,25(73)\text{ cm}^{-1}$ [05MOH/TAY]. The wavelengths listed are computed using the differences of the levels. Only transitions involving lower levels with $n\leq 4$ are tabulated here. Uncertainties in the wavelengths are calculated from those given in [77ERI] for the energy levels; however, this is not a rigorous method since errors in the level value calculations are not statistically independent. Na XI energy level separations between levels with $n=1$ and 2 have been calculated by Mohr [83MOH] and Johnson and Soff [85JOH/SOF], who agree well with each other and have smaller reported uncertainties. To obtain a consistent set of results for a substantial number of levels, however, we have retained the [77ERI] values in these tables and report the uncertainties from that work, which are given relative to the ionization limit. The ionization energy given above is taken from Johnson and Soff [85JOH/SOF] and Mohr [83MOH]. It should be noted that although Erickson's reported uncertainty for the ionization potential is $\pm 2\text{ cm}^{-1}$, his value differs from the results of [85JOH/SOF] and [83MOH] by 9 cm^{-1} . It is likely that the values for other levels of [77ERI] may also have errors larger than those reported (see Table 22).

Relativistic transition probabilities obtained using point-nucleus Dirac eigenfunctions have been reported by Pal'chikov [98PAL] for transitions between levels with $n=1$ and 2 and by Jitrik and Bunge [04JIT/BUN] for a more extended set of spectral lines (available at the website http://www.fisica.unam.mx/research/tables/spectra/1el/set1/Tables/opt1/E1_Aki_Z_19). The two agree to the number of significant digits reported.

www.fisica.unam.mx/research/tables/spectra/1el/set1/Tables/opt1/E1_Aki_Z_19). The two agree to the number of significant digits reported.

References for Na XI

- 77ERI G. W. Erickson, J. Phys. Chem. Ref. Data **6**, 831 (1977).
- 83MOH P. J. Mohr, At. Data Nucl. Data Tables **29**, 453 (1983).
- 85JOH/SOF W. R. Johnson and G. Soff, At. Data Nucl. Data Tables **33**, 405 (1985).
- 86SEE/FEL J. F. Seely and U. Feldman, Phys. Scr. **33**, 110 (1986).
- 90AZU/KAT H. Azuma, Y. Kato, K. Yamakawa, T. Tachi, M. Nishio, H. Shiraga, S. Nakai, S. A. Ramsden, G. J. Pert, and S. J. Rose, Opt. Lett. **15**, 1011 (1990).
- 90KAT/MIU Y. Kato, E. Miura, T. Tachi, H. Shiraga, H. Nishimura, H. Daido, M. Yamanaka, T. Jitsuno, M. Takagi, P. R. Herman, H. Takabe, S. Nakai, C. Yamanaka, M. H. Key, G. J. Tallents, S. J. Rose, and P. T. Rumsby, Appl. Phys. B: Photophys. Laser Chem. **50**, 247 (1990).
- 94DAI/AZU H. Daido, H. Azuma, Y. Kato, K. Murai, K. Yamakawa, T. Togawa, T. Kanabe, M. Takagi, H. Takabe, and S. Nakai, J. Opt. Soc. Am. B **11**, 280 (1994).
- 98PAL V. G. Pal'chikov, Phys. Scr. **57**, 581 (1998).
- 00KAA/MEW J. S. Kaastra, R. Mewe, D. A. Liedahl, S. Komossa, and A. C. Brinkman, Astron. Astrophys. **354**, L83 (2000).
- 04JIT/BUN O. Jitrik and C. F. Bunge, J. Phys. Chem. Ref. Data **33**, 1059 (2004).
- 05MOH/TAY P. J. Mohr and B. N. Taylor, Rev. Mod. Phys. **77**, 1 (2005).

TABLE 21. Spectral lines of Na XI

λ (Å)	Unc. (Å)	σ (cm^{-1})	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
<i>Vacuum</i>							
(7.676 602 3)	0.000 001 2	(13 026 596.)	1.81E+11	1s $^2S_{1/2}$	7p $^2P_{3/2}^\circ$	77ERI	04JIT/BUN
(7.676 676 3)	0.000 001 2	(13 026 471.)	1.81E+11	1s $^2S_{1/2}$	7p $^2P_{1/2}^\circ$	77ERI	04JIT/BUN
(7.734 734 0)	0.000 001 2	(12 928 693.)	2.88E+11	1s $^2S_{1/2}$	6p $^2P_{3/2}^\circ$	77ERI	04JIT/BUN
(7.734 853 2)	0.000 001 2	(12 928 494.)	2.88E+11	1s $^2S_{1/2}$	6p $^2P_{1/2}^\circ$	77ERI	04JIT/BUN
(7.833 113 0)	0.000 001 2	(12 766 317.)	5.03E+11	1s $^2S_{1/2}$	5p $^2P_{3/2}^\circ$	77ERI	04JIT/BUN
(7.833 324 3)	0.000 001 2	(12 765 972.)	5.02E+11	1s $^2S_{1/2}$	5p $^2P_{1/2}^\circ$	77ERI	04JIT/BUN
(8.020 927 6)	0.000 001 3	(12 467 386.)	9.98E+11	1s $^2S_{1/2}$	4p $^2P_{3/2}^\circ$	77ERI	04JIT/BUN
(8.021 360 3)	0.000 001 3	(12 466 713.)	9.97E+11	1s $^2S_{1/2}$	4p $^2P_{1/2}^\circ$	77ERI	04JIT/BUN
(8.459 121 2)	0.000 001 4	(11 821 559.)	2.45E+12	1s $^2S_{1/2}$	3p $^2P_{3/2}^\circ$	77ERI	04JIT/BUN
(8.460 262 3)	0.000 001 4	(11 819 964.)	2.45E+12	1s $^2S_{1/2}$	3p $^2P_{1/2}^\circ$	77ERI	04JIT/BUN
(10.023 188)	0.000 002	(9 976 866.)	9.16E+12	1s $^2S_{1/2}$	2p $^2P_{3/2}^\circ$	77ERI	04JIT/BUN
(10.028 597)	0.000 002	(9 971 485.)	9.18E+12	1s $^2S_{1/2}$	2p $^2P_{1/2}^\circ$	77ERI	04JIT/BUN
(32.732 033)	0.000 002	(3 055 111.2)	3.84E+10	2p $^2P_{1/2}$	7d $^2D_{3/2}$	77ERI	04JIT/BUN
(32.733 316)	0.000 002	(3 054 991.4)	2.25E+9	2p $^2P_{1/2}$	7s $^2S_{1/2}$	77ERI	04JIT/BUN
(32.734 483)	0.000 002	(3 054 882.5)	2.63E+10	2s $^2S_{1/2}$	7p $^2P_{3/2}^\circ$	77ERI	04JIT/BUN
(32.735 827)	0.000 002	(3 054 757.1)	2.64E+10	2s $^2S_{1/2}$	7p $^2P_{1/2}^\circ$	77ERI	04JIT/BUN

TABLE 21. Spectral lines of Na XI—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
(32.789 335 1)	0.000 001 0	(3 049 772.12)	4.59E+10	2p ² P _{3/2} ^o	7d ² D _{5/2}	77ERI	04JIT/BUN
(32.789 783 7)	0.000 001 0	(3 049 730.40)	7.63E+9	2p ² P _{3/2} ^o	7d ² D _{3/2}	77ERI	04JIT/BUN
(32.791 071 8)	0.000 001 0	(3 049 610.59)	4.55E+9	2p ² P _{3/2} ^o	7s ² S _{1/2}	77ERI	04JIT/BUN
(33.815 685)	0.000 002	(2 957 207.6)	6.31E+10	2p ² P _{1/2} ^o	6d ² D _{3/2}	77ERI	04JIT/BUN
(33.817 860)	0.000 002	(2 957 017.3)	3.60E+9	2p ² P _{1/2} ^o	6s ² S _{1/2}	77ERI	04JIT/BUN
(33.818 298)	0.000 002	(2 956 979.1)	4.19E+10	2s ² S _{1/2}	6p ² P _{3/2}	77ERI	04JIT/BUN
(33.820 577)	0.000 002	(2 956 779.8)	4.20E+10	2s ² S _{1/2}	6p ² P _{1/2}	77ERI	04JIT/BUN
(33.876 566 1)	0.000 001 0	(2 951 893.05)	7.54E+10	2p ² P _{3/2} ^o	6d ² D _{5/2}	77ERI	04JIT/BUN
(33.877 326 5)	0.000 001 0	(2 951 826.80)	1.25E+10	2p ² P _{3/2} ^o	6d ² D _{3/2}	77ERI	04JIT/BUN
(33.879 510 3)	0.000 001 0	(2 951 636.53)	7.29E+9	2p ² P _{3/2} ^o	6s ² S _{1/2}	77ERI	04JIT/BUN
(35.780 338)	0.000 003	(2 794 831.0)	1.16E+11	2p ² P _{1/2} ^o	5d ² D _{3/2}	77ERI	04JIT/BUN
(35.783 261)	0.000 003	(2 794 602.7)	7.25E+10	2s ² S _{1/2}	5p ² P _{3/2}	77ERI	04JIT/BUN
(35.784 549)	0.000 003	(2 794 502.2)	6.32E+9	2p ² P _{1/2} ^o	5s ² S _{1/2}	77ERI	04JIT/BUN
(35.787 671)	0.000 003	(2 794 258.4)	7.27E+10	2s ² S _{1/2}	5p ² P _{1/2}	77ERI	04JIT/BUN
(35.847 886 9)	0.000 001 2	(2 789 564.70)	1.38E+11	2p ² P _{3/2} ^o	5d ² D _{5/2}	77ERI	04JIT/BUN
(35.849 358 2)	0.000 001 2	(2 789 450.22)	2.30E+10	2p ² P _{3/2} ^o	5d ² D _{3/2}	77ERI	04JIT/BUN
(35.853 585 0)	0.000 001 2	(2 789 121.37)	1.28E+10	2p ² P _{3/2} ^o	5s ² S _{1/2}	77ERI	04JIT/BUN
(40.065 710)	0.000 003	(2 495 899.8)	2.53E+11	2p ² P _{1/2} ^o	4d ² D _{3/2}	77ERI	04JIT/BUN
(40.069 366)	0.000 003	(2 495 672.1)	1.42E+11	2s ² S _{1/2}	4p ² P _{3/2}	77ERI	04JIT/BUN
(40.076 026)	0.000 003	(2 495 257.4)	1.26E+10	2p ² P _{1/2} ^o	4s ² S _{1/2}	77ERI	04JIT/BUN
(40.080 168)	0.000 003	(2 494 999.5)	1.42E+11	2s ² S _{1/2}	4p ² P _{1/2}	77ERI	04JIT/BUN
(40.148 668 6)	0.000 001 5	(2 490 742.62)	3.02E+11	2p ² P _{3/2} ^o	4d ² D _{5/2}	77ERI	04JIT/BUN
(40.152 273 1)	0.000 001 5	(2 490 519.03)	5.03E+10	2p ² P _{3/2} ^o	4d ² D _{3/2}	77ERI	04JIT/BUN
(40.162 633 2)	0.000 001 5	(2 489 876.58)	2.56E+10	2p ² P _{3/2} ^o	4s ² S _{1/2}	77ERI	04JIT/BUN
(54.051 971)	0.000 006	(1 850 071.3)	7.91E+11	2p ² P _{1/2} ^o	3d ² D _{3/2}	77ERI	04JIT/BUN
(54.058 580)	0.000 006	(1 849 845.1)	3.28E+11	2s ² S _{1/2}	3p ² P _{3/2}	77ERI	04JIT/BUN
(54.096 512)	0.000 006	(1 848 548.0)	3.10E+10	2p ² P _{1/2} ^o	3s ² S _{1/2}	77ERI	04JIT/BUN
(54.105 216)	0.000 006	(1 848 250.6)	3.30E+11	2s ² S _{1/2}	3p ² P _{1/2}	77ERI	04JIT/BUN
(54.194 067)	0.000 003	(1 845 220.42)	9.47E+11	2p ² P _{3/2} ^o	3d ² D _{5/2}	77ERI	04JIT/BUN
(54.209 636)	0.000 003	(1 844 690.49)	1.58E+11	2p ² P _{3/2} ^o	3d ² D _{3/2}	77ERI	04JIT/BUN
(54.254 438)	0.000 003	(1 843 167.19)	6.27E+10	2p ² P _{3/2} ^o	3s ² S _{1/2}	77ERI	04JIT/BUN
(82.875 330)	0.000 003	(1 206 631.69)	1.40E+10	3p ² P _{1/2} ^o	7d ² D _{3/2}	77ERI	04JIT/BUN
(82.880 019)	0.000 005	(1 206 563.43)	8.82E+9	3s ² S _{1/2}	7p ² P _{3/2}	77ERI	04JIT/BUN
(82.883 560)	0.000 003	(1 206 511.89)	1.53E+9	3p ² P _{1/2} ^o	7s ² S _{1/2}	77ERI	04JIT/BUN
(82.888 637)	0.000 005	(1 206 437.98)	8.85E+9	3s ² S _{1/2}	7p ² P _{1/2}	77ERI	04JIT/BUN
(82.981 936 0)	0.000 000 1	(1 205 081.550)	1.65E+10	3d ² D _{3/2}	7f ² F _{5/2}	77ERI	04JIT/BUN
(82.982 118)	0.000 002	(1 205 078.91)	1.68E+10	3p ² P _{3/2} ^o	7d ² D _{5/2}	77ERI	04JIT/BUN
(82.984 788 3)	0.000 000 2	(1 205 040.129)	6.80E+7	3d ² D _{3/2}	7p ² P _{3/2}	77ERI	04JIT/BUN
(82.984 991)	0.000 002	(1 205 037.19)	2.81E+9	3p ² P _{3/2} ^o	7d ² D _{3/2}	77ERI	04JIT/BUN
(82.993 242)	0.000 002	(1 204 917.39)	3.10E+9	3p ² P _{3/2} ^o	7s ² S _{1/2}	77ERI	04JIT/BUN
(82.993 428 4)	0.000 000 3	(1 204 914.678)	6.92E+8	3d ² D _{3/2}	7p ² P _{1/2}	77ERI	04JIT/BUN
(83.017 006 4)	0.000 000 1	(1 204 572.465)	1.77E+10	3d ² S _{3/2}	7f ² F _{7/2}	77ERI	04JIT/BUN
(83.018 443 1)	0.000 000 1	(1 204 551.618)	1.18E+9	3d ² D _{5/2}	7f ² F _{5/2}	77ERI	04JIT/BUN
(83.021 298 0)	0.000 000 2	(1 204 510.197)	5.15E+8	3d ² D _{5/2}	7p ² P _{3/2}	77ERI	04JIT/BUN
(90.193 440)	0.000 004	(1 108 728.09)	2.30E+10	3p ² P _{1/2} ^o	6d ² D _{3/2}	77ERI	04JIT/BUN
(90.198 982)	0.000 006	(1 108 659.96)	1.40E+10	3s ² S _{1/2}	6p ² P _{3/2}	77ERI	04JIT/BUN
(90.208 920)	0.000 004	(1 108 537.82)	2.48E+9	3p ² P _{1/2} ^o	6s ² S _{1/2}	77ERI	04JIT/BUN
(90.215 194)	0.000 006	(1 108 460.73)	1.40E+10	3s ² S _{1/2}	6p ² P _{1/2}	77ERI	04JIT/BUN
(90.317 720 6)	0.000 000 2	(1 107 202.434)	2.94E+10	3d ² D _{3/2}	6f ² F _{5/2}	77ERI	04JIT/BUN
(90.317 932)	0.000 002	(1 107 199.84)	2.75E+10	3p ² P _{3/2} ^o	6d ² D _{5/2}	77ERI	04JIT/BUN
(90.323 086 7)	0.000 000 3	(1 107 136.655)	1.15E+8	3d ² D _{3/2}	6p ² P _{3/2}	77ERI	04JIT/BUN
(90.323 337)	0.000 002	(1 107 133.59)	4.59E+9	3p ² P _{3/2} ^o	6d ² D _{3/2}	77ERI	04JIT/BUN
(90.338 862)	0.000 002	(1 106 943.32)	5.02E+9	3p ² P _{3/2} ^o	6s ² S _{1/2}	77ERI	04JIT/BUN
(90.339 343 4)	0.000 000 7	(1 106 937.424)	1.17E+9	3d ² D _{3/2}	6p ² P _{1/2}	77ERI	04JIT/BUN
(90.358 266 4)	0.000 000 2	(1 106 705.606)	3.14E+10	3d ² D _{5/2}	6f ² F _{7/2}	77ERI	04JIT/BUN
(90.360 969 4)	0.000 000 2	(1 106 672.502)	2.09E+9	3d ² D _{5/2}	6f ² F _{5/2}	77ERI	04JIT/BUN
(90.366 340 6)	0.000 000 3	(1 106 606.723)	1.04E+9	3d ² D _{5/2}	6p ² P _{3/2}	77ERI	04JIT/BUN
(105.668 981)	0.000 006	(946 351.51)	4.15E+10	3p ² P _{1/2} ^o	5d ² D _{3/2}	77ERI	04JIT/BUN
(105.676 561)	0.000 008	(946 283.63)	2.40E+10	3s ² S _{1/2}	5p ² P _{3/2}	77ERI	04JIT/BUN
(105.705 713)	0.000 006	(946 022.66)	4.43E+9	3p ² P _{1/2} ^o	5s ² S _{1/2}	77ERI	04JIT/BUN
(105.715 026)	0.000 008	(945 939.32)	2.41E+10	3s ² S _{1/2}	5p ² P _{1/2}	77ERI	04JIT/BUN
(105.834 216 9)	0.000 000 3	(944 874.002)	6.22E+10	3d ² D _{3/2}	5f ² F _{5/2}	77ERI	04JIT/BUN
(105.834 498)	0.000 003	(944 871.49)	4.97E+10	3p ² P _{3/2} ^o	5d ² D _{5/2}	77ERI	04JIT/BUN

TABLE 21. Spectral lines of Na XI—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
(105.846 951 1)	0.000 000 8	(944 760.326)	2.19E+8	3d ² D _{3/2} ^o	5p ² P _{3/2} ^o	77ERI	04JIT/BUN
(105.847 322)	0.000 003	(944 757.01)	8.28E+9	3p ² P _{3/2}	5d ² D _{3/2}	77ERI	04JIT/BUN
(105.884 178)	0.000 004	(944 428.16)	8.96E+9	3p ² P _{3/2}	5s ² S _{1/2}	77ERI	04JIT/BUN
(105.885 540 0)	0.000 001 1	(944 416.02)	2.23E+9	3d ² D _{3/2}	5p ² P _{1/2}	77ERI	04JIT/BUN
(105.887 193 2)	0.000 000 3	(944 401.273)	6.65E+10	3d ² D _{5/2}	5f ² F _{7/2}	77ERI	04JIT/BUN
(105.893 6072)	0.000 0003	(944 344.070)	4.43E+9	3d ² D _{5/2}	5f ² F _{5/2}	77ERI	04JIT/BUN
(105.906 355 8)	0.000 000 8	(944 230.394)	1.98E+9	3d ² D _{5/2}	5p ² P _{3/2}	77ERI	04JIT/BUN
(154.459 162)	0.000 012	(647 420.32)	8.59E+10	3p ² P _{1/2}	4d ² D _{3/2}	77ERI	04JIT/BUN
(154.475 225)	0.000 017	(647 353.00)	4.48E+10	3s ² S _{1/2}	4p ² P _{3/2}	77ERI	04JIT/BUN
(154.612 586)	0.000 014	(646 777.88)	8.99E+9	3p ² P _{1/2}	4s ² S _{1/2}	77ERI	04JIT/BUN
(154.635 889)	0.000 017	(646 680.41)	4.51E+10	3s ² S _{1/2}	4p ² P _{1/2}	77ERI	04JIT/BUN
(154.786 367 9)	0.000 000 7	(646 051.725)	1.89E+11	3d ² D _{3/2}	4f ² F _{5/2}	77ERI	04JIT/BUN
(154.786 922)	0.000 007	(646 049.41)	1.03E+11	3p ² P _{3/2}	4d ² D _{5/2}	77ERI	04JIT/BUN
(154.839 582)	0.000 002	(645 829.69)	5.10E+8	3d ² D _{3/2}	4p ² P _{3/2}	77ERI	04JIT/BUN
(154.840 511)	0.000 007	(645 825.82)	1.72E+10	3p ² P _{3/2}	4d ² D _{3/2}	77ERI	04JIT/BUN
(154.886 632 6)	0.000 000 7	(645 633.508)	2.02E+11	3d ² D _{5/2}	4f ² F _{7/2}	77ERI	04JIT/BUN
(154.913 437 6)	0.000 000 7	(645 521.793)	1.35E+10	3d ² D _{5/2}	4f ² F _{5/2}	77ERI	04JIT/BUN
(154.966 740)	0.000 002	(645 299.76)	4.61E+9	3d ² D _{5/2}	4p ² P _{3/2}	77ERI	04JIT/BUN
(154.994 694)	0.000 010	(645 183.38)	1.83E+10	3p ² P _{3/2}	4s ² S _{1/2}	77ERI	04JIT/BUN
(155.001 006)	0.000 005	(645 157.10)	5.19E+9	3d ² D _{3/2}	4p ² P _{1/2}	77ERI	04JIT/BUN
(178.608 808)	0.000 006	(559 882.80)	6.52E+9	4p ² P _{1/2}	7d ² D _{3/2}	77ERI	04JIT/BUN
(178.617 985)	0.000 010	(559 854.04)	4.13E+9	4s ² S _{1/2}	7p ² P _{3/2}	77ERI	04JIT/BUN
(178.647 035)	0.000 006	(559 763.00)	1.06E+9	4p ² P _{1/2}	7s ² S _{1/2}	77ERI	04JIT/BUN
(178.658 019)	0.000 010	(559 728.58)	4.15E+9	4s ² S _{1/2}	7p ² P _{1/2}	77ERI	04JIT/BUN
(178.809 943)	0.000 003	(559 253.016)	1.00E+10	4d ² D _{3/2}	7f ² F _{5/2}	77ERI	04JIT/BUN
(178.810 290)	0.000 003	(559 251.93)	7.82E+9	4p ² P _{3/2}	7d ² D _{5/2}	77ERI	04JIT/BUN
(178.823 188)	0.000 003	(559 211.595)	7.90E+7	4d ² D _{3/2}	7p ² P _{3/2}	77ERI	04JIT/BUN
(178.823 629)	0.000 003	(559 210.21)	1.30E+9	4p ² P _{3/2}	7d ² D _{3/2}	77ERI	04JIT/BUN
(178.861 948)	0.000 003	(559 090.41)	2.15E+9	4p ² P _{3/2}	7s ² S _{1/2}	77ERI	04JIT/BUN
(178.863 313)	0.000 003	(559 086.144)	8.03E+8	4d ² D _{3/2}	7p ² P _{1/2}	77ERI	04JIT/BUN
(178.874 674 9)	0.000 001 0	(559 050.632)	9.13E+9	4f ² F _{5/2}	7g ² G _{7/2}	77ERI	04JIT/BUN
(178.874 791)	0.000 003	(559 050.268)	1.08E+10	4d ² D _{5/2}	7f ² F _{7/2}	77ERI	04JIT/BUN
(178.881 308 3)	0.000 001 3	(559 029.901)	7.84E+6	4f ² F _{5/2}	7d ² D _{5/2}	77ERI	04JIT/BUN
(178.881 462)	0.000 003	(559 029.421)	7.17E+8	4d ² D _{5/2}	7f ² F _{5/2}	77ERI	04JIT/BUN
(178.894 658 7)	0.000 001 3	(558 988.182)	1.66E+8	4f ² F _{3/2}	7d ² D _{3/2}	77ERI	04JIT/BUN
(178.894 717)	0.000 003	(558 988.000)	7.15E+8	4d ² D _{5/2}	7p ² P _{3/2}	77ERI	04JIT/BUN
(178.906 423 9)	0.000 001 0	(558 951.422)	9.46E+9	4f ² F _{7/2}	7g ² G _{9/2}	77ERI	04JIT/BUN
(178.910 426 5)	0.000 001 0	(558 938.917)	3.38E+8	4f ² F _{7/2}	7g ² G _{7/2}	77ERI	04JIT/BUN
(178.917 062 6)	0.000 001 3	(558 918.186)	1.57E+8	4f ² F _{7/2}	7d ² D _{5/2}	77ERI	04JIT/BUN
(216.459 961)	0.000 009	(461 979.20)	1.05E+10	4p ² P _{1/2}	6d ² D _{3/2}	77ERI	04JIT/BUN
(216.473 381)	0.000 014	(461 950.56)	6.51E+9	4s ² S _{1/2}	6p ² P _{3/2}	77ERI	04JIT/BUN
(216.549 149)	0.000 009	(461 788.93)	1.75E+9	4p ² P _{1/2}	6s ² S _{1/2}	77ERI	04JIT/BUN
(216.566 783)	0.000 014	(461 751.33)	6.55E+9	4s ² S _{1/2}	6p ² P _{1/2}	77ERI	04JIT/BUN
(216.743 947)	0.000 004	(461 373.900)	1.76E+10	4d ² D _{3/2}	6f ² F _{5/2}	77ERI	04JIT/BUN
(216.744 435)	0.000 005	(461 372.86)	1.26E+10	4p ² P _{3/2}	6d ² D _{5/2}	77ERI	04JIT/BUN
(216.774 853)	0.000 004	(461 308.121)	1.38E+8	4d ² D _{3/2}	6p ² P _{3/2}	77ERI	04JIT/BUN
(216.775 562)	0.000 005	(461 306.61)	2.11E+9	4p ² P _{3/2}	6d ² D _{3/2}	77ERI	04JIT/BUN
(216.833 312 1)	0.000 001 4	(461 183.750)	1.94E+10	4f ² F _{5/2}	6g ² G _{7/2}	77ERI	04JIT/BUN
(216.833 473)	0.000 004	(461 183.409)	1.89E+10	4d ² D _{5/2}	6f ² F _{7/2}	77ERI	04JIT/BUN
(216.848 791)	0.000 002	(461 150.830)	1.50E+7	4f ² F _{3/2}	6d ² D _{5/2}	77ERI	04JIT/BUN
(216.849 038)	0.000 004	(461 150.305)	1.26E+9	4d ² D _{5/2}	6f ² F _{5/2}	77ERI	04JIT/BUN
(216.865 010)	0.000 005	(461 116.34)	3.54E+9	4p ² P _{3/2}	6s ² S _{1/2}	77ERI	04JIT/BUN
(216.868 515)	0.000 005	(461 108.89)	1.40E+9	4d ² D _{3/2}	6p ² P _{1/2}	77ERI	04JIT/BUN
(216.876 509 3)	0.000 001 4	(461 091.892)	2.01E+10	4f ² F _{7/2}	6g ² G _{9/2}	77ERI	04JIT/BUN
(216.879 949)	0.000 002	(461 084.580)	3.17E+8	4f ² F _{5/2}	6d ² D _{3/2}	77ERI	04JIT/BUN
(216.879 974)	0.000 004	(461 084.526)	1.25E+9	4d ² D _{5/2}	6p ² P _{3/2}	77ERI	04JIT/BUN
(216.885 849 5)	0.000 001 4	(461 072.035)	7.18E+8	4f ² F _{7/2}	6g ² G _{7/2}	77ERI	04JIT/BUN
(216.901 336)	0.000 002	(461 039.115)	3.00E+8	4f ² F _{7/2}	6d ² D _{5/2}	77ERI	04JIT/BUN
(333.775 45)	0.000 02	(299 602.62)	1.81E+10	4p ² P _{1/2}	5d ² D _{3/2}	77ERI	04JIT/BUN
(333.807 08)	0.000 03	(299 574.23)	1.08E+10	4s ² S _{1/2}	5p ² P _{3/2}	77ERI	04JIT/BUN
(334.142 21)	0.000 03	(299 273.77)	3.16E+9	4p ² P _{1/2}	5s ² S _{1/2}	77ERI	04JIT/BUN
(334.191 17)	0.000 03	(299 229.92)	1.08E+10	4s ² S _{1/2}	5p ² P _{1/2}	77ERI	04JIT/BUN
(334.397 310)	0.000 009	(299 045.468)	3.53E+10	4d ² D _{3/2}	5f ² F _{5/2}	77ERI	04JIT/BUN

TABLE 21. Spectral lines of Na XI—Continued

λ (Å)	Unc. (Å)	σ (cm ⁻¹)	A_{ki} (s ⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
(334.398 374)	0.000 011	(299 044.52)	2.18E+10	4p ² P _{3/2} ^o	5d ² D _{5/2}	77ERI	04JIT/BUN
(334.524 473)	0.000 011	(298 931.79)	2.76E+8	4d ² D _{3/2}	5p ² P _{3/2}	77ERI	04JIT/BUN
(334.526 439)	0.000 011	(298 930.03)	3.63E+9	4p ² P _{3/2}	5d ² D _{3/2}	77ERI	04JIT/BUN
(334.583 145)	0.000 003	(298 879.371)	6.01E+10	4f ² F _{5/2}	5g ² G _{7/2}	77ERI	04JIT/BUN
(334.583 476)	0.000 009	(298 879.076)	3.79E+10	4d ² D _{5/2}	5f ² F _{7/2}	77ERI	04JIT/BUN
(334.646 840)	0.000 007	(298 822.485)	3.52E+7	4f ² F _{5/2}	5d ² D _{5/2}	77ERI	04JIT/BUN
(334.647 525)	0.000 009	(298 821.873)	2.52E+9	4d ² D _{5/2}	5f ² F _{5/2}	77ERI	04JIT/BUN
(334.669 818)	0.000 003	(298 801.967)	6.23E+10	4f ² F _{7/2}	5g ² G _{9/2}	77ERI	04JIT/BUN
(334.708 252)	0.000 003	(298 767.656)	2.23E+9	4f ² F _{7/2}	5g ² G _{7/2}	77ERI	04JIT/BUN
(334.771 994)	0.000 007	(298 710.770)	7.07E+8	4f ² F _{7/2}	5d ² D _{5/2}	77ERI	04JIT/BUN
(334.774 878)	0.000 011	(298 708.20)	2.50E+9	4d ² D _{5/2}	5p ² P _{3/2}	77ERI	04JIT/BUN
(334.775 095)	0.000 007	(298 708.003)	7.45E+8	4f ² F _{5/2}	5d ² D _{3/2}	77ERI	04JIT/BUN
(334.894 85)	0.000 02	(298 601.18)	6.39E+9	4p ² P _{3/2}	5s ² S _{1/2}	77ERI	04JIT/BUN
(334.910 221)	0.000 011	(298 587.48)	2.81E+9	4d ² D _{3/2}	5p ² P _{1/2}	77ERI	04JIT/BUN

TABLE 22. Energy levels of Na XI

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference
1s	² S	1/2	(0.)	2	77ERI
2p	² P ^o	1/2	(9 971 484.9)	0.2	77ERI
		3/2	(9 976 865.74)	0.09	77ERI
2s	² S	1/2	(9 971 713.8)	0.2	77ERI
3p	² P ^o	1/2	(11 819 964.44)	0.05	77ERI
		3/2	(11 821 558.94)	0.03	77ERI
3s	² S	1/2	(11 820 032.92)	0.07	77ERI
3d	² D	3/2	(11 821 556.228)	0.001	77ERI
		5/2	(11 822 086.160)	0.001	77ERI
4p	² P ^o	1/2	(12 466 713.33)	0.02	77ERI
		3/2	(12 467 385.92)	0.01	77ERI
4s	² S	1/2	(12 466 742.32)	0.03	77ERI
4d	² D	3/2	(12 467 384.762)	0.008	77ERI
		5/2	(12 467 608.357)	0.008	77ERI
4f	² F ^o	5/2	(12 467 607.953)	0.003	77ERI
		7/2	(12 467 719.668)	0.003	77ERI
5p	² P ^o	1/2	(12 765 972.25)	0.01	77ERI
		3/2	(12 766 316.554)	0.007	77ERI
5s	² S	1/2	(12 765 987.11)	0.02	77ERI
5d	² D	3/2	(12 766 315.956)	0.005	77ERI
		5/2	(12 766 430.438)	0.005	77ERI
5f	² F ^o	5/2	(12 766 430.230)	0.003	77ERI
		7/2	(12 766 487.433)	0.003	77ERI
5g	² G	7/2	(12 766 487.324 1)	0.000 7	77ERI
		9/2	(12 766 521.635 5)	0.000 7	77ERI
6p	² P ^o	1/2	(12 928 493.652)	0.008	77ERI
		3/2	(12 928 692.883)	0.004	77ERI
6s	² S	1/2	(12 928 502.263)	0.009	77ERI

TABLE 22. Energy levels of Na XI—Continued

Configuration	Term	J	Energy (cm ⁻¹)	Uncertainty (cm ⁻¹)	Reference
6d	² D	3/2	(12 928 692.533)	0.004	77ERI
		5/2	(12 928 758.783)	0.004	77ERI
6f	² F°	5/2	(12 928 758.662)	0.003	77ERI
		7/2	(12 928 791.766)	0.003	77ERI
6g	² G	7/2	(12 928 791.703 1)	0.000 8	77ERI
		9/2	(12 928 811.560 1)	0.000 8	77ERI
6h	² H°	9/2	(12 928 811.521 2)	0.000 2	77ERI
		11/2	(12 928 824.757 2)	0.000 2	77ERI
7p	² P°	1/2	(13 026 470.906)	0.005	77ERI
		3/2	(13 026 596.357)	0.003	77ERI
7s	² S	1/2	(13 026 476.331)	0.006	77ERI
7d	² D	3/2	(13 026 596.135)	0.002	77ERI
		5/2	(13 026 637.854)	0.002	77ERI
7f	² F°	5/2	(13 026 637.778)	0.002	77ERI
		7/2	(13 026 658.625)	0.002	77ERI
7g	² G	7/2	(13 026 658.584 9)	0.000 7	77ERI
		9/2	(13 026 671.089 9)	0.000 7	77ERI
7h	² H°	9/2	(13 026 671.065 4)	0.000 2	77ERI
		11/2	(13 026 679.400 84)	0.000 2	77ERI
7i	² I	11/2	(13 026 679.3584 1)	0.000 07	77ERI
		13/2	(13 026 685.337 54)	0.000 07	77ERI
	Limit		(13 297 671.)	2	77ERI

7. Acknowledgments

The author would like to acknowledge the efforts of Victor Kaufman of NIST in preparing an extensive preliminary line list which was used in the creation of this compilation. She would also like to thank Joseph Reader of NIST for suggesting the need for a sodium compilation, doing an extensive review of this manuscript, and making many comments and suggestions for its improvement.

8. References

- 08DAV H. Davy, *Philos. Trans. R. Soc. (London)* **98**, 1 (1808).
 08PAS F. Paschen, *Ann. Phys.* **4**, 537 (1908).
 16WOO/FOR R. W. Wood and R. Fortrat, *Astrophys. J.* **43**, 73 (1916).
 28BOW I. S. Bowen, *Phys. Rev.* **31**, 967 (1928).
 30MAC/SAW J. E. Mack and R. A. Sawyer, *Phys. Rev.* **35**, 299 (1930).
 31FRI S. Frisch, *Z. Phys.* **70**, 498 (1931).
 32SOD J. Söderqvist, *Z. Phys.* **79**, 634 (1932).
 32VAN B. B. Vance, *Phys. Rev.* **41**, 480 (1932).
 34SOD J. Söderqvist, *Nova Acta Regiae Soc. Sci. Ups.* **9**, 1 (1934).
 35HET/BOR C. W. Hetzler, R. W. Boreman, and K. Burns, *Phys. Rev.* **48**, 656 (1935).
 35MEG W. F. Meggers, *J. Res. Natl. Bur. Stand.* **14**, 487 (1935).
 37MEI/LUF K. W. Meissner and K. F. Luft, *Ann. Phys.* **29**, 698 (1937).
 38TOM D. H. Tomboulion, *Phys. Rev.* **54**, 347 (1938).
 44SOD J. Söderqvist, *Ark. Mat., Astron. Fys.* **30**, 1 (1944).
 46SOD J. Söderqvist, *Ark. Mat., Astron. Fys.* **32**, 1 (1946).
 56RIS P. Risberg, *Ark. Fys.* **10**, 583 (1956).
 60BOW I. S. Bowen, *Astrophys. J.* **132**, 1 (1960).
 61JOH I. Johansson, *Ark. Mat.* **20**, 135 (1961).
 64AND/ZIL E. M. Anderson and V. A. Zilitis, *Opt. Spectrosc.* **16**, 99 (1964).
 64EDL B. Edlén, in *Encyclopedia of Physics*, edited by S. Flugge (Springer-Verlag, Berlin, 1964), Vol. 27, p. 198.
 69GAI/CEY M. Gaillard, P. Ceyzeriat, A. Denis, and M. Dufay, *C. R. Seances Acad. Sci., Ser. B* **269**, 526 (1969).
 69WAL/RUG A. B. C. Walker and H. R. Rugge, in *Solar Flares and Space Research*, edited by C. de Jager and Z. Svestka (North-Holland Pub. Co., Amsterdam, 1969), 102.
 70FAW B. C. Fawcett, *J. Phys. B* **3**, 1152 (1970).
 70LIT U. Litzen, *Publ. Astron. Soc. Jpn.* **1**, 253 (1970).
 71CON/GAR J. P. Connerade, W. R. S. Garton, and M. W. D. Mansfield, *Astrophys. J.* **165**, 203 (1971).
 71FAW B. C. Fawcett, *J. Phys. B* **4**, 1115 (1971).
 71WU C.-M. Wu, Ph.D. thesis, University of British Columbia, 1971.
 72LUN/MIN T. Lundström and L. Minnhagen, *Phys. Scr.* **5**, 243 (1972).
 72MIN/NIE L. Minnhagen and H. Nietsche, *Phys. Scr.* **5**, 237 (1972).
 72PEC/REE E. R. Peck and K. Reeder, *J. Opt. Soc. Am.* **63**, 958 (1972).
 72PUR/WIL J. D. Purcell and K. G. Widing, *Astrophys. J.* **176**, 239 (1972).
 72WOL/RAD H. W. Wolff, K. Radler, B. Sonntag, and R. Haensel, *Z. Phys. A* **257**, 353 (1972).
 73GOT/GAUa T. Goto, M. S. Gautam, and Y. N. Joshi, *Physica (Utrecht)* **66**, 70 (1973).
 73GOT/GAUb T. Goto, M. S. Gautam, and Y. N. Joshi, *Can. J. Phys.* **51**, 1244 (1973).
 73JOH/LUN G. A. Johansson and T. Lundström, *Phys. Scr.* **8**, 53 (1973).
 74GL/BOI E. V. Aglitskii, V. A. Boiko, S. M. Zakharov, S. A. Pikuz,

- and A. Ya. Faenov, *Sov. J. Quantum Electron.* **4**, 500 (1974).
- 74BEC/BOK A. Beckmann, K. D. Böklen, and D. Elke, *Z. Phys.* **270**, 173 (1974).
- 74FEL/DOS U. Feldman, G. A. Doschek, D. J. Nagel, R. D. Cowan, and R. R. Whitlock, *Astrophys. J.* **192**, 213 (1974).
- 75MIN L. Minnhagen, *Phys. Scr.* **11**, 38 (1975).
- 75PAR J. H. Parkinson, *Sol. Phys.* **42**, 183 (1975).
- 76LUC/MCI T. B. Lucatorto and T. J. McIlrath, *Phys. Rev. Lett.* **37**, 428 (1976).
- 76MIN L. Minnhagen, *J. Opt. Soc. Am.* **66**, 659 (1976).
- 76TSE/LIA P. Tsekeris, K. H. Liao, and R. Gupta, *Phys. Rev. A* **13**, 2309 (1976).
- 77BRE/BRE E. Breuckmann, B. Breuckmann, W. Melhorn, and W. Schmitz, *J. Phys. B* **10**, 3135 (1977).
- 77ERI G. W. Erickson, *J. Phys. Chem. Ref. Data* **6**, 831 (1977).
- 77GRI/ISA J. A. R. Griffith, G. R. Isaak, R. New, M. P. Ralls, and C. P. van Zyl, *J. Phys. B* **10**, L91 (1977).
- 78BOI/FAE V. A. Boiko, A. Ya. Faenov, and S. A. Pikuz, *J. Quant. Spectrosc. Radiat. Transf.* **19**, 11 (1978).
- 78VAI/SAF L. A. Vainshtein and U. I. Safronova, *At. Data Nucl. Data Tables* **21**, 49 (1978).
- 79EDL B. Edlén, *Phys. Scr.* **20**, 129 (1979).
- 79SUG/LUC J. Sugar, T. B. Lucatorto, T. J. McIlrath, and A. W. Weiss, *Opt. Lett.* **4**, 109 (1979).
- 80FAB/HAR C. Fabre, S. Haroche, and P. Goy, *Phys. Rev. A* **22**, 778 (1980).
- 80MAR W. C. Martin, *J. Opt. Soc. Am.* **70**, 784 (1980).
- 81EDL B. Edlén, *Phys. Scr.* **23**, 1079 (1981).
- 81JUN/PIN P. Juncar, J. Pinard, J. Hamond, and A. Chartier, *Metrologia* **17**, 77 (1981).
- 81LAV/MEH R. E. LaVilla, G. Mehlman, and E. B. Saloman, *J. Phys. B* **14**, L1 (1981).
- 81MAR/ZAL W. C. Martin and R. Zalubas, *J. Phys. Chem. Ref. Data* **10**, 153 (1981).
- 82GAU/KUS A. Gaupp, P. Kuske, and H. J. Andrä, *Phys. Rev. A* **26**, 3351 (1982).
- 83EDL B. Edlén, *Phys. Scr.* **28**, 483 (1983).
- 83MOH P. J. Mohr, *At. Data Nucl. Data Tables* **29**, 453 (1983).
- 85EDL B. Edlén, *Phys. Scr.* **31**, 345 (1985).
- 85HOL/WAL D. E. Holmgren, D. J. Walker, D. A. King, and S. E. Harris, *Phys. Rev. A* **31**, 677 (1985).
- 85JOH/SOF W. R. Johnson and G. Soff, *At. Data Nucl. Data Tables* **33**, 405 (1985).
- 85PED/MEN K. D. Pedrotti, A. J. Mendelsohn, R. W. Falcone, J. F. Young, and S. E. Harris, *J. Opt. Soc. Am. B* **2**, 1942 (1985).
- 85VAI/SAF L. A. Vainshtein and U. I. Safronova, *Phys. Scr.* **31**, 519 (1985).
- 86KAU/SUG V. Kaufman and J. Sugar, *J. Phys. Chem. Ref. Data* **15**, 321 (1986).
- 86SEE/FEL J. F. Seely and U. Feldman, *Phys. Scr.* **33**, 110 (1986).
- 88ARQ F. Arquerros, *Opt. Commun.* **67**, 341 (1988).
- 88DRA G. W. F. Drake, *Can. J. Phys.* **66**, 586 (1988).
- 88GAA/AND J. O. Gaarsted and T. Andersen, *Phys. Rev. A* **37**, 1497 (1988).
- 88KHA/KHA F. Khan, G. S. Khandelwal, and J. W. Wilson, *Astrophys. J.* **329**, 493 (1988).
- 88PEA/SAR G. Peach, H. E. Saraph, and M. J. Seaton, *J. Phys. B* **21**, 3669 (1988).
- 89LUO/PRA D. Luo and A. K. Pradhan, *J. Phys. B* **22**, 3377 (1989).
- 90AZU/KAT H. Azuma, Y. Kato, K. Yamakawa, T. Tachi, M. Nishio, H. Shiraga, S. Nakai, S. A. Ramsden, G. J. Pert, and S. J. Rose, *Opt. Lett.* **15**, 1011 (1990).
- 90KAT/MIU Y. Kato, E. Miura, T. Tachi, H. Shiraga, H. Nishimura, H. Daido, M. Yamanaka, T. Jitsuno, M. Takagi, P. R. Herman, H. Takabe, S. Nakai, C. Yamanaka, M. H. Key, G. J. Talents, S. J. Rose, and P. T. Rumsby, *Appl. Phys. B: Photophys. Laser Chem.* **50**, 247 (1990).
- 90TUL/SEA J. A. Tully, M. J. Seaton, and K. A. Berrington, *J. Phys. B* **23**, 3811 (1990).
- 90ZHA/SAM H. L. Zhang, H. H. Sampson, and C. J. Fontes, *At. Data Nucl. Data Tables* **44**, 31 (1990).
- 92CIO/BUR M. Ciocca, C. E. Burkhardt, J. J. Leventhal, and T. Bergman, *Phys. Rev. A* **45**, 4720 (1992).
- 92KAG/SAF T. Kagawa and U. I. Safronova, *Phys. Scr.* **45**, 569 (1992).
- 93DOE/TRA J. Doerfert and E. Träbert, *Phys. Scr.* **47**, 524 (1993).
- 93HIB/DOU A. Hibbert, M. Le Dourneuf, and M. Mohan, *At. Data Nucl. Data Tables* **53**, 23 (1993).
- 93MAR/KAR I. Martin, J. Karwowski, G. H. F. Dierksen, and C. Barrientos, *Astron. Astrophys. Suppl. Ser.* **100**, 595 (1993).
- 93YEI/SIE W. Yei, A. Sieradzian, and M. D. Harvey, *Phys. Rev. A* **48**, 1909 (1993).
- 94BAI/MAH M. A. Baig, M. S. Mahmood, K. Sommer, and J. Hormes, *J. Phys. B* **27**, 389 (1994).
- 94DAI/AZU H. Daido, H. Azuma, Y. Kato, K. Murai, K. Yamakawa, T. Togawa, T. Kanabe, M. Takagi, H. Takabe, and S. Nakai, *J. Opt. Soc. Am. B* **11**, 280 (1994).
- 94DOR A. Dorn, Ph.D. thesis, University of Freiburg, 1994, as quoted in O. I. Zatsarinny, *J. Phys. B* **28**, 4759 (1995).
- 94GEH/WOO R. D. Gehrz, C. E. Woodward, M. A. Greenhouse, S. Starfield, D. H. Wooden, F. C. Witteborn, S. A. Sandford, L. J. Allamandola, J. D. Bregman, and M. Klapisch, *Astrophys. J.* **421**, 762 (1994).
- 94LOW/BIE R. M. Lowe and E. Biémont, *J. Phys. B* **27**, 2161 (1994).
- 94PLA/JOH D. R. Plante, W. R. Johnson, and J. Sapirstein, *Phys. Rev. A* **49**, 3519 (1994).
- 94SAF/SAF U. I. Safronova, M. S. Safronova, N. J. Snyderman, and V. G. Pal'chikov, *Phys. Scr.* **50**, 29 (1994).
- 94VIL/MER M. J. Vilkas, G. Merkelis, R. Kisielius, G. Gaigalas, A. Bernotas, and Z. Rudzikas, *Phys. Scr.* **49**, 592 (1994).
- 95BAI/AKR M. A. Baig, M. Akram, N. K. Piracha, M. S. Mahmood, S. A. Batti, and N. Ahmad, *J. Phys. B* **28**, 1421 (1995).
- 95BUR/LEN V. M. Burke and D. J. Lennon (unpublished) <http://legacy.gsfc.nasa.gov/topbase>.
- 95BUT/ZEI K. Butler and C. J. Zeippen, <http://legacy.gsfc.nasa.gov/topbase> (downloaded August 1995).
- 95DOR/NIE A. Dorn, J. Nienhaus, M. Wetzstein, C. Winnewisser, U. Eichmann, W. Sander, and W. Mehlhorn, *J. Phys. B* **28**, L225 (1995).
- 95DOR/WIN A. Dorn, C. Winnewisser, M. Wetzstein, J. Nienhaus, A. N. Grum-Grzhimailo, O. I. Zatsarinny, and W. Mehlhorn, *J. Electron Spectrosc. Relat. Phenom.* **76**, 245 (1995).
- 95DYU/EFI S. F. Dyubko, M. N. Efimenko, V. A. Efremov, and S. V. Podnos, *Quantum Electron.* **25**, 914 (1995).
- 95JOH/PLA W. R. Johnson, D. R. Plante, and J. Sapirstein, *Adv. At., Mol., Opt. Phys.* **35**, 255 (1995).
- 95KEL/LAC D. M. Kelly and J. H. Lacy, *Astrophys. J.* **454**, L161 (1995).
- 95MER/VIL G. Merkelis, M. J. Vilkas, G. Gaigalas, and R. Kisielius, *Phys. Scr.* **51**, 233 (1995).
- 96JOH/LIU W. R. Johnson, Z. W. Liu, and J. Sapirstein, *At. Data Nucl. Data Tables* **64**, 279 (1996).
- 96JON/JUL K. M. Jones, P. S. Julienne, P. D. Lett, W. D. Phillips, E. Tiesinga, and C. J. Williams, *Europhys. Lett.* **35**, 85 (1996).
- 96OAT/VOG C. W. Oates, K. R. Vogel, and J. L. Hall, *Phys. Rev. Lett.* **76**, 2866 (1996).
- 96TRA E. Träbert, *Phys. Scr.* **53**, 167 (1996).
- 96VOL/MAJ U. Volz, M. Majerus, H. Liebel, A. Schmitt, and H. Schmoranz, *Phys. Rev. Lett.* **76**, 2862 (1996).
- 97DYU/EFER S. Dyubko, V. Efremov, S. Podnos, X. Sun, and K. B. MacAdam, *J. Phys. B* **30**, 2345 (1997).
- 97FEL/BEH U. Feldman, W. E. Behring, W. Curdt, U. Schühle, K. Wilhelm, P. Lemaire, and T. M. Moran, *Astrophys. J., Suppl. Ser.* **113**, 195 (1997).
- 97FEU/LUT H. Feuchtgruber, D. Lutz, D. A. Beintma, E. A. Valentijn, O. H. Bauer, D. R. Boxhoorn, T. De Graauw, L. N. Haser, G. Haerendel, A. M. Heras, R. O. Katterloher, D. J. M. Kester, F. Lahuis, K. J. Leech, P. W. Morris, P. R. Roelfsma, S. G. Schaeidt, H. W. W. Spoon, B. VandenBussche, and E. Wieprecht, *Astrophys. J.* **487**, 963 (1997).
- 97MER/VIL G. Merkelis, M. J. Vilkas, R. Kisielius, G. Gaigalas, and I. Martinson, *Phys. Scr.* **56**, 41 (1997).

- 97NIE/ZAT J. Nienhaus, O. I. Zatsarinny, A. Dorn, and W. Mehlhorn, *J. Phys. B* **30**, 3511 (1997).
- 98BAU/BUR J. F. Baugh, C. E. Burkhardt, J. J. Leventhal, and T. Bergeman, *Phys. Rev. A* **58**, 1585 (1998).
- 98GAL/MEN M. E. Galvis, C. Mendoza, and C. J. Zeippen, *Astron. Astrophys. Suppl. Ser.* **131**, 499 (1998).
- 98GAN/KAR Yu. P. Gangrsky, D. V. Karaivanov, K. P. Markov, L. M. Melnikova, and G. V. Mishinsky, *Eur. Phys. J. B* **3**, 313 (1998).
- 98PAL V. G. Pal'chikov, *Phys. Scr.* **57**, 581 (1998).
- 98YAN/TAM Z.-C. Yan, M. Tambasco, and G. W. F. Drake, *Phys. Rev. A* **57**, 1652 (1998).
- 99FER/HIB J. A. Fernley, A. Hibbert, A. E. Kingston, and M. J. Seaton, *J. Phys. B* **32**, 5507 (1999).
- 99MEN/ZEI C. Mendoza, C. J. Zeippen, and P. J. Storey, *Astron. Astrophys. Suppl. Ser.* **135**, 159 (1999).
- 99ROW/FRE M. A. Rowe, S. J. Freedman, B. K. Fujikawa, G. Gwinner, S.-Q. Shang, and P. A. Vetter, *Phys. Rev. A* **59**, 1869 (1999).
- 99SAF/DER U. I. Safronova, A. Derevianko, M. S. Safronova, and W. R. Johnson, *J. Phys. B* **32**, 3527 (1999).
- 99SAF/JOHa U. I. Safronova, W. R. Johnson, and A. E. Livingston, *Phys. Rev. A* **60**, 996 (1999).
- 99SAF/JOHb U. I. Safronova, W. R. Johnson, M. S. Safronova, and A. Derevianko, *Phys. Scr.* **59**, 286 (1999).
- 99TOR/BIE X. Tordoir, E. Biémont, H. P. Garnir, P.-D. Dumont, and E. Träbert, *Eur. Phys. J. D* **6**, 1 (1999).
- 00CUR/LAN W. Curdt, E. Landi, K. Wilhelm, and U. Feldman, *Phys. Rev. A* **62**, 022502 (2000).
- 00FEL/CUR U. Feldman, W. Curdt, E. Landi, and K. Wilhelm, *Astrophys. J.* **544**, 508 (2000).
- 00KAA/MEW J. S. Kaastra, R. Mewe, D. A. Liedahl, S. Komossa, and A. C. Brinkman, *Astron. Astrophys.* **354**, L83 (2000).
- 00MCP/HIB D. McPeake and A. Hibbert, *J. Phys. B* **33**, 2809 (2000).
- 01AGG/KEE K. M. Aggarwal, F. P. Keenan, and A. Z. Msezane, *Astrophys. J., Suppl. Ser.* **136**, 763 (2001).
- 01CON/DOO C. W. S. Conover and M. C. Doogue, *Phys. Rev. A* **63**, 032504 (2001).
- 01CUR/BRE W. Curdt, P. Brekke, U. Feldman, K. Wilhelm, B. N. Dwivedi, U. Schühle, and P. Lemaire, *Astron. Astrophys.* **375**, 591 (2001).
- 01TAC/FRO G. Tachiev and C. Froese Fischer, *Can. J. Phys.* **79**, 955 (2001).
- 02NAH S. N. Nahar, *Astron. Astrophys.* **389**, 716 (2002).
- 02TAC/FROa G. Tachiev and C. Froese Fischer, http://www.vuse.vanderbilt.edu/cff/mchf_collection/ (downloaded December 2002).
- 02TAC/FROb G. Tachiev and C. Froese Fischer, *Astron. Astrophys.* **385**, 716 (2002).
- 03BAT/HAI M. Battacharya, C. Haimberger, and N. P. Bigelow, *Phys. Rev. Lett.* **91**, 213004 (2003).
- 04CUR/LAN W. Curdt, E. Landi, and U. Feldman, *Astron. Astrophys.* **427**, 1045 (2004).
- 04FRO/TAC C. Froese Fischer and G. Tachiev, *At. Data Nucl. Data Tables* **87**, 1 (2004).
- 04JIT/BUN O. Jitrik and C. F. Bunge, *J. Phys. Chem. Ref. Data* **33**, 1059 (2004).
- 05CRC *CRC Handbook of Chemistry and Physics*, 86th ed., edited by D. R. Lide (Taylor & Francis, New York, 2005), pp. 4–31.
- 05MIC/MEY K. Miculis and W. Meyer, *J. Phys. B* **38**, 2097 (2005).
- 05MOH/TAY P. J. Mohr and B. N. Taylor, *Rev. Mod. Phys.* **77**, 1 (2005).
- 06FRO/TAC C. Froese Fischer, G. Tachiev, and A. Irmia, *At. Data Nucl. Data Tables* **92**, 607 (2006).
- 07BAI/MAH M. A. Baig, M. S. Mahmood, M. A. Kalyar, M. Rafiq, N. Amin, and S. U. Haq, *Eur. Phys. J. D* **44**, 9 (2007).
- 08KEL/POD D. E. Kelleher and L. Podobedova, *J. Phys. Chem. Ref. Data* **37**, 267 (2008).