Wavelengths, Transition Probabilities, and Energy Levels for the Spectra of Potassium (K I through K XIX)

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Energy levels, with classifications and uncertainties, have been compiled for the spectra of the neutral atom and all positive ions of potassium ($Z=19$). Wavelengths with classifications, intensities, and transition probabilities are also tabulated. In addition, ground states and ionization energies are listed. For many ionization stages experimental data are available; however for those for which only theoretical calculations or fitted values exist, these are reported. © *2008 by the U.S. Secretary of Commerce on behalf of the United States. All rights reserved.* [DOI: 10.1063/1.2789451]

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1. Introduction

Potassium, one of the earth's most abundant metals, was discovered in 1807 by Davy [08DAV], who isolated it using electrolysis. It is a very reactive and electropositive element and it also has one of the lowest ionization energies. It oxidizes rapidly and reacts vigorously with water, and hence is not found free in nature. It appears silvery and is soft, with a melting point of 63.38 °C. Its atomic number is 19; the atomic weight is 39.0983(1); its boiling point is 759 °C; and its specific gravity at 20 °C is 0.862 [05CRC]. When heated in a flame, potassium and its salts give off a characteristic violet color due to the first two doublets in the principal series of K I, which fall in the red and violet regions. The most common use of potassium is in the form of potash, which contains KOH and is used as a fertilizer. The salts of potassium are also used extensively in making glass and in chemical reactions.

For this compilation of spectral data the literature for each ionization stage of potassium 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 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 that have been obtained by isoelectronic fitting or series formulas are indicated by being enclosed in square brackets, whereas theoretical values are presented enclosed in parentheses.

Naturally occurring potassium is composed of 93.2581(44)% ^{39}K, 0.0117(1)% ^{40}K, and 6.7302(44)% ^{41}K [05CRC]. Only ^{40}K is radioactive, with a half-life of 1.26 $\times 10^9$ years. For most spectra in this compilation the data included are for the natural isotopic abundance. For neutral potassium there has been extensive work on each isotope separately, so at the end of the data for that spectrum, tables of energy levels and hyperfine structure constants for the individual isotopes are included. In addition, there are some spectra for which data for only a single isotope are available. This is noted in the discussion for that ionization stage.

2. Wavelength Tables

In the tables of wavelengths the following information is included:

(a) **Wavelengths** are reported in units of ångströms. For all values below 2000 Å and above 10 000 Å, vacuum wavelengths are given. For those between 2000 and 10 000 Å, wavelengths are in standard air. The index of refraction of air used for conversions is obtained using the three-term formula of Peck and Reeder [72PEC/REE].

(b) **Uncertainty** of the wavelength measurement or calculation, is also given in ångströms.

(c) **Wave number** of the transition is given in units of cm^{-1}.

(d) **Intensity** is listed as observed by the original investigator, except as noted in the discussion for a particular spectrum. Although intensities can be very helpful in identifying spectral features, 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.

(e) **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,
- h = hazy,
- r = easily self-reversed,
- w = wide,
- * = intensity may be affected by nearby line,
- ? = classification is uncertain.

(f) **Transition probabilities** (A_{ki}) are given in units of s^{-1}. Exponential notation is used for these values; thus, for example, 3.2E+5 stands for 3.2×10^5.

(g) **Lower level** and **upper level** indicate the classification given for the transition. If the classification is unknown these are left blank.

(h) **λ Ref.** and A_{ki} **Ref.** indicate the references for the wavelength measurement and transition probability, respectively. A list of references for an ionization stage is located at the end of the discussion for that particular spectrum.

3. Energy Level Tables

The energy level tables contain the following information:

(a) **Configuration** of the energy level, if known. 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 vertical space.

(b) **Term** is listed for each energy level, if known. Levels of odd parity are denoted by the symbol ° following the term. 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 $J_1 l$, 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. For additional information about coupling schemes and notation see Martin and Wiese [96MAR/WIE, 06MAR/WIE].

(c) ***J* value** is also listed for each energy level for which it has been determined. More than one J value may be listed if the levels are not resolved or if there is uncertainty as to which is correct.

(d) **Level value** is given in the customary units of cm^{-1}. As reported in Mohr and Taylor [05MOH/TAY, 07MOH/TAY] the unit cm^{-1} is related to the SI unit for energy, the joule, by $1\ cm^{-1} = 1.986\,445\,50(10) \times 10^{-23}$ J. As discussed earlier, values enclosed in parentheses are calculated and those in square brackets are obtained by isoelectronic fitting or series formulas.

(e) **Uncertainty** of the level is also given in cm^{-1}. The relative uncertainties of excited states are frequently much smaller than their uncertainty relative to the ground state. Therefore, we give the uncertainty of the energy difference between the ground state and lowest excited configuration as the ground state uncertainty and relative uncertainties between excited states to the higher states. Any exceptions to this rule are discussed in the introduction to the ionization stage.

(f) **Landé *g* values** are included for the few spectra in which they have been measured.

(g) **Reference** refers to the source of the energy level value. 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. 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. As 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 original source if the uncertainty of the transition probability is important. Where it can be obtained, information about the uncertainty of the transition probabilities is included in the discussions.

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. Acknowledgments

The author would like to thank Joseph Reader of NIST for suggesting the need for a potassium compilation, doing an extensive review of this manuscript, and making many comments and suggestions for its improvement.

6. References for the Introduction

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96MAR/WIE Martin, W. C., and Wiese, W. L., *Atomic, Molecular, and Optical Physics Handbook*, edited by G. W. F. Drake (AIP, Woodbury, NY, 1996), Chap. 10, pp. 135–153.

05CRC CRC Handbook of Chemistry and Physics, 86th ed., edited by D. R. Lide, (Taylor & Francis, New York, 2005), pp. 4–31.

05MOH/TAY Mohr, P. J., and Taylor, B. N., Rev. Mod. Phys. **77**, 1 (2005).

06MAR/WIE Martin, W. C., and Wiese, W. L., ”Atomic Spectroscopy: A Compendium of Basic Ideas, Notation, and Formulas”, http://physics.nist.gov/Pubs/AtSpec/index.html. National Institute of Standards and Technology, Gaithersburg, MD (downloaded 2006).

07MOH/TAY Mohr, P. J., and Taylor, B. N., “2006 CODATA Recommended Values of the Fundamental Physical Constants”, http://physics.nist.gov/constants (downloaded 2007).

7. Data Tables

7.1. K I

Ground state $1s^2 2s^2 2p^6 3s^2 3p^6 4s\ ^2S_{1/2}$

Ionization energy 35 009.8140(7) cm^{-1}
4.340 663 28(9) eV

Early reports of measurements of the K I spectrum by Fowler [22FOW] and Edlén [36EDL] established the positions of the $4s$–$13s$, $4p$–$10p$, $3d$–$11d$, and $4f$–$9f$ levels. The principal series $4s$–np for $n = 4$–79 was observed in absorption by Kratz [49KRA]. In 1956 Risberg [56RIS] remeasured the K I spectrum in the region 3101 to 11 772 Å and recalculated the energy levels, obtaining values up to $13s$, $10p$, $11d$, and $11f$. Johansson and Svendenius [72JOH/SVE] extended the measurements further into the infrared, going out to 37 350 Å. This greatly improved the accuracy of the relative values of the $5s$, $6s$, $4p$, $5p$, $3d$, and $4d$ levels. Bensoussan [75BEN] used three-photon absorption spectroscopy to extend the measurement of the nf levels to include $n = 12$, 13, and 14 and Litzen [70LIT] determined the $5g\ ^2G$

levels given here from spectral lines observed in emission from a hollow-cathode lamp. The fine-structure splitting of the nd states for $n=8-19$ was measured by Harper and Levenson [76HAR/LEV]. Gallagher and Cooke [78GAL/COO] measured the fine-structure intervals of 15d, 16d, 18d, and 20d terms with greater accuracy and Conover and Doogue [01CON/DOO] have continued the series up to $n=22$. Recently, Falke *et al.* [06FAL/TIE] reported improved values for the $4s-4p$ transitions in ^{39}K, ^{40}K, and ^{41}K using a frequency comb. The wavelengths reported for the D_1 and D_2 lines in Table 1 are obtained by weighted averaging of the isotopic data of Falke *et al.* [06FAL/TIE].

Investigation of levels with a $3p^5 4s$ core started with the discovery by Beutler and Guggenheimer [33BEU/GUG] of the levels of the $3p^5 4s^2$ configuration. Mansfield [75MAN] identified some $3p^5 4snd$ levels to $n=20$ and $3p^5 4sns$ levels to $n=21$, based on measurements of the absorption spectrum in the region from 350 to 700 Å. The analysis was further enhanced by Mansfield and Ottley [79MAN/OTT], who incorporated a compilation of measurements of the energy of ejected electrons to locate several additional levels. Emission from the quasimetastable states in K I were studied by Mendelsohn *et al.* [87MEN/BAR] and Gabrielyan *et al.* [84GAB/MAR]. Although many of its newly observed lines are unidentified, a higher resolution study of the absorption spectrum in the 400–570 Å region by Sommer *et al.* [87SOM/BAI] produced improved values for many of the established core-excited states. Sommer *et al.* [87SOM/BAI] report a series converging on 218 215 cm^{-1}, which they assign to a K II core state of $3p^5(3d+4s)$. However, the K II state which matches this energy to within the uncertainty of the measurements is $3p^5 4p\,^3S_1$. We have altered the core designations to $3p^5 4p\,^3S_1$ accordingly and note that for the upper level of the transition to have the correct parity the electron outside the core will have to be of odd parity. In addition, the identification of transitions to levels with a $3p^5 4s\ ^1P^\circ_1$ core is very difficult because of the overlap of the nd and $(n+1)s$ levels. For low values of n the separation is large enough to measure individual transitions. For high values of n the separation is so small that a single well-defined peak appears. However, for intermediate values of n the observed structures are broadened by autoionization and have sharp absorption features from other series superimposed upon them. We have retained the designations of Sommer *et al.* [87SOM/BAI] where given. For transitions to levels between $9s, 8d$ and $15s, 14d$ we include the line positions they reported, with the uncertainty left blank, for those broad features which could not be accurately measured.

In 1985 Sugar and Corliss [85SUG/COR] published a comprehensive compilation of the energy levels of potassium for the natural abundance of the isotopes. The Falke *et al.* [06FAL/TIE] wavelengths have been used here to produce the $4p\ ^2P^\circ$ energy levels. The compilation of Sugar and Corliss [85SUG/COR] is the source for all other levels in Table 2, up to and including the K II $3p^6\ ^1S_0$ limit, as well as those core-excited levels whose values have not been better established by the data of Sommer *et al.* [87SOM/BAI]. Ionization limits for the core-excited states are obtained by combining the K II $3p^6\ ^1S_0$ limit with measurements of K II energy levels by Pettersen *et al.* [07PET/EKB].

The transition probabilities given in the spectral line table vary widely in estimated uncertainty and in the methods used to obtain them. The largest number of available values come from the compilation of Wiese *et al.* [69WIE/SMI], who estimate the uncertainty of the probabilities to be between 25% and 50%. The experimental values obtained by Shabanova and Khlyustalov [85SHA/KHL] were reported as accurate to within 8%. The measurement of the lifetime of the $4p\ ^2P$ levels enabled Wang *et al.* [97WAN/LI] to give the transition probability of the resonance transitions to within 0.2%. Gamalii [97GAM] was able to measure the oscillator strength of the $4p\ ^2P^\circ_{3/2}-6s\ ^2S_{1/2}$ transition, but estimates the accuracy at ±40%. Transition probabilities for the forbidden $3d\ ^2D$ to $4s\ ^2S$ transitions have been calculated by Ali and Kim [88ALI/KIM], who give an error estimate of ±20%.

The ^{39}K I spectrum has been extensively explored by Lorentzen *et al.* [81LOR/NIE, 83LOR/NIE] and some transitions have also been measured by Banerjee *et al.* [04BAN/DAS, 04BAN/NAT] and Thompson *et al.* [83THO/OSU]. Their values are included in the ^{39}K table below. Values for the $3p^6 4p\ ^2P^\circ_{1/2,3/2}$ levels in ^{39}K, ^{40}K, and ^{41}K are taken from the frequency comb measurements of Falke *et al.* [06FAL/TIE].

The hyperfine structure of neutral potassium has been investigated by many research teams [52EIS/BED, 61FOX/SER, 71SVA, 73GUP/HAP, 74BEC/BOK, 75BEL/HOL, 85GLO/KRA, 85GLO/KRA2, 97SIE/STO, 06FAL/TIE, among many others], resulting in values for the hyperfine magnetic dipole (A) and electric quadrupole (B) constants for lower levels of the isotopes ^{39}K, ^{40}K, and ^{41}K, as summarized in Tables 3–5. For ^{39}K most energy levels have been measured in isotopically pure sources, whereas for ^{40}K and ^{41}K only the $3p^6 4p\ ^2P^\circ_{1/2,3/2}$ levels are available experimentally. To help the reader identify the energy level in question, level values are supplied for all levels, but those without isotopic energy level measurements only the integer part of the energy is listed.

References for K I

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71SVA Svanberg, S., Phys. Scr. **4**, 275 (1971).

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TABLE 1. Spectral lines of K I

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum									
405.774	0.007	246443		w				87SOM/BAI	
406.170	0.007	246203		a				87SOM/BAI	
406.764	0.007	245843		a		$3p^64s\ ^2S_{1/2}$	$3p^54d(^1P^\circ)nl$	87SOM/BAI	
409.259	0.007	244344		w				87SOM/BAI	
409.760	0.007	244045						87SOM/BAI	
411.016	0.007	243300		w				87SOM/BAI	
422.514	0.007	236678				$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)23s$	87SOM/BAI	
422.567	0.007	236649				$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)22s$	87SOM/BAI	
422.634	0.007	236612				$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)21s$	87SOM/BAI	
422.710	0.007	236569				$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^1)20s$	87SOM/BAI	
422.803	0.007	236517				$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)19s$	87SOM/BAI	
422.909	0.007	236457				$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)18s$	87SOM/BAI	
423.042	0.007	236383				$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)17s$	87SOM/BAI	

TABLE 1. Spectral lines of K 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.
423.191	0.007	236300				$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)16s$	87SOM/BAI	
423.374	0.007	236198		w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)15s$	87SOM/BAI	
423.603	0.007	236070		a,w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)14s$	87SOM/BAI	
423.862	0.007	235926		a,w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)13s$	87SOM/BAI	
424.227	0.007	235723		a,w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)12s$	87SOM/BAI	
424.715	0.007	235452		w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)11s$	87SOM/BAI	
436.251	0.007	229226						87SOM/BAI	
436.424	0.007	229135						87SOM/BAI	
436.626	0.007	229029						87SOM/BAI	
436.901	0.007	228885		w				87SOM/BAI	
437.230	0.007	228713		w				87SOM/BAI	
437.645	0.007	228496		w				87SOM/BAI	
437.880	0.007	228373						87SOM/BAI	
448.920	0.007	222757		w				87SOM/BAI	
450.074	0.007	222186		w				87SOM/BAI	
451.493	0.007	221487		a				87SOM/BAI	
451.798	0.007	221338						87SOM/BAI	
452.631	0.007	220931		w				87SOM/BAI	
453.085	0.007	220709				$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
453.208	0.007	220649						87SOM/BAI	
453.311	0.007	220599						87SOM/BAI	
453.467	0.007	220523				$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
453.667	0.007	220426				$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
454.033	0.007	220248				$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
454.518	0.007	220013						87SOM/BAI	
454.548	0.007	219999						87SOM/BAI	
455.097	0.007	219733		w		$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
455.503	0.007	219538		w				87SOM/BAI	
455.629	0.007	219477		a				87SOM/BAI	
458.586	0.007	218062				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
458.613	0.007	218049				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
458.646	0.007	218033				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
458.683	0.007	218016				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
458.719	0.007	217998				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
458.766	0.007	217976				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
458.816	0.007	217953				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
458.875	0.007	217924				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
458.945	0.007	217891				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
459.029	0.007	217851				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
459.128	0.007	217804				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
459.251	0.007	217746				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
459.401	0.007	217675				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
459.581	0.007	217590				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
459.800	0.007	217486				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
460.079	0.007	217354				$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
460.365	0.007	217219		h		$3p^64s\ ^2S_{1/2}$	$3p^54p(^3S_1)nl$	87SOM/BAI	
460.568	0.007	217123		a,w				87SOM/BAI	
461.030	0.007	216906		a				87SOM/BAI	
461.765	0.007	216560				$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
462.763	0.007	216094		a		$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
464.441	0.007	215313		a,w		$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
466.246	0.007	214479						87SOM/BAI	
466.695	0.007	214273						87SOM/BAI	
467.160	0.007	214059		a,w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)5s\ ^2P^\circ_{1/2,3/2}$	87SOM/BAI	
467.416	0.007	213942						87SOM/BAI	
468.420	0.007	213484						87SOM/BAI	
468.666	0.007	213371						87SOM/BAI	

TABLE 1. Spectral lines of K 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.
468.729	0.007	213343						87SOM/BAI	
469.028	0.007	213207						87SOM/BAI	
469.875	0.007	212823						87SOM/BAI	
469.988	0.007	212771						87SOM/BAI	
470.244	0.007	212656						87SOM/BAI	
470.590	0.007	212499						87SOM/BAI	
471.105	0.007	212267		a				87SOM/BAI	
471.669	0.007	212013		a,w		$3p^64s\ ^2S_{1/2}$	$3p^54pnl$	87SOM/BAI	
472.145	0.007	211800		w				87SOM/BAI	
472.271	0.007	211743		w				87SOM/BAI	
472.955	0.007	211437		w				87SOM/BAI	
473.533	0.007	211178		w				87SOM/BAI	
474.460	0.007	210766		w				87SOM/BAI	
475.540	0.007	210287		w				87SOM/BAI	
475.988	0.007	210089		w				87SOM/BAI	
476.603	0.007	209819		w				87SOM/BAI	
483.941	0.007	206637		a,w		$3p^64s\ ^2S_{1/2}$	$3p^5(^2P^\circ)3d^2(^1S)\ ^2P^\circ$	87SOM/BAI	
488.166	0.007	204848						87SOM/BAI	
488.209	0.007	204830						87SOM/BAI	
488.255	0.007	204811						87SOM/BAI	
488.312	0.007	204787						87SOM/BAI	
488.335	0.007	204777						87SOM/BAI	
488.378	0.007	204759						87SOM/BAI	
488.451	0.007	204729						87SOM/BAI	
488.574	0.007	204677		w				87SOM/BAI	
488.677	0.007	204634		w				87SOM/BAI	
488.819	0.007	204575		w				87SOM/BAI	
489.208	0.007	204412		w				87SOM/BAI	
489.433	0.007	204318		w				87SOM/BAI	
492.303	0.007	203127		w				87SOM/BAI	
493.166	0.007	202772		a,w				87SOM/BAI	
496.632	0.007	201356				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)33s,32d$	87SOM/BAI	
496.659	0.007	201346				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)32s,31d$	87SOM/BAI	
496.682	0.007	201336				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)31s,30d$	87SOM/BAI	
496.712	0.007	201324				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)30s,29d$	87SOM/BAI	
496.738	0.007	201313				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)29s,28d$	87SOM/BAI	
496.768	0.007	201301				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)28s,29d$	87SOM/BAI	
496.805	0.007	201286				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)27s,26d$	87SOM/BAI	
496.845	0.007	201270				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)26s,25d$	87SOM/BAI	
496.888	0.007	201253				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)25s,24d$	87SOM/BAI	
496.941	0.007	201231				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)24s,23d$	87SOM/BAI	
496.997	0.007	201208				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)23s,22d$	87SOM/BAI	
497.067	0.007	201180				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)22s,21d$	87SOM/BAI	
497.143	0.007	201149				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)21s,20d$	87SOM/BAI	
497.236	0.007	201112				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)20s,19d$	87SOM/BAI	
497.345	0.007	201068				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)19s,18d$	87SOM/BAI	
497.478	0.007	201014				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)18s,17d$	87SOM/BAI	
497.630	0.007	200952				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)17s,16d$	87SOM/BAI	
497.823	0.007	200875				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)16s,15d$	87SOM/BAI	
498.068	0.007	200776						87SOM/BAI	
498.075		200773				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)15s,14d$	87SOM/BAI	
498.088	0.007	200768						87SOM/BAI	
498.36		200660		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)14s,13d$	87SOM/BAI	
498.373	0.007	200653						87SOM/BAI	
498.403	0.007	200641						87SOM/BAI	
498.77		200490		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)13s,12d$	87SOM/BAI	
498.778	0.007	200490						87SOM/BAI	

TABLE 1. Spectral lines of K 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.
499.309	0.007	200277						87SOM/BAI	
499.33		200270		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)12s,11d$	87SOM/BAI	
499.362	0.007	200256						87SOM/BAI	
499.915	0.007	200034						87SOM/BAI	
499.945	0.007	200022						87SOM/BAI	
499.968	0.007	200013						87SOM/BAI	
499.995	0.007	200002						87SOM/BAI	
500.045	0.007	199982						87SOM/BAI	
500.05		199980		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)11s,10d$	87SOM/BAI	
500.091	0.007	199964						87SOM/BAI	
500.134	0.007	199946						87SOM/BAI	
500.177	0.007	199929						87SOM/BAI	
500.224	0.007	199911						87SOM/BAI	
500.287	0.007	199885						87SOM/BAI	
500.356	0.007	199858						87SOM/BAI	
500.519	0.007	199793						87SOM/BAI	
500.628	0.007	199749		h				87SOM/BAI	
500.747	0.007	199702						87SOM/BAI	
500.844	0.007	199663						87SOM/BAI	
500.867	0.007	199654				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)9d$	87SOM/BAI	
500.903	0.007	199639						87SOM/BAI	
500.936	0.007	199626						87SOM/BAI	
501.033	0.007	199588						87SOM/BAI	
501.086	0.007	199567						87SOM/BAI	
501.125	0.007	199551		h				87SOM/BAI	
501.13		199550		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)10s\ ^2P^\circ$	87SOM/BAI	
501.248	0.007	199502		h				87SOM/BAI	
501.324	0.007	199472		h				87SOM/BAI	
501.387	0.007	199447		h				87SOM/BAI	
501.487	0.007	199407		h				87SOM/BAI	
501.606	0.007	199360						87SOM/BAI	
501.629	0.007	199350						87SOM/BAI	
501.663	0.007	199337						87SOM/BAI	
501.696	0.007	199324						87SOM/BAI	
501.729	0.007	199311						87SOM/BAI	
501.769	0.007	199295						87SOM/BAI	
501.838	0.007	199267						87SOM/BAI	
501.908	0.007	199240						87SOM/BAI	
501.968	0.007	199216						87SOM/BAI	
502.034	0.007	199190						87SOM/BAI	
502.170	0.007	199136				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_2)14s$	87SOM/BAI	
502.236	0.007	199110						87SOM/BAI	
502.382	0.007	199052						87SOM/BAI	
502.409	0.007	199041				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3F^\circ_2)5d$	87SOM/BAI	
502.435	0.007	199031						87SOM/BAI	
502.534	0.007	198991				$3p^64s\ ^2S_{1/2}$	$3p^5(^2P^\circ)3d^2(^3P)\ ^2D^\circ$	87SOM/BAI	
502.611	0.007	198961						87SOM/BAI	
502.660	0.007	198941						87SOM/BAI	
502.7		198900		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)9s,8d$	87SOM/BAI	
502.849	0.007	198867						87SOM/BAI	
502.946	0.007	198829						87SOM/BAI	
503.028	0.007	198796						87SOM/BAI	
503.121	0.007	198759						87SOM/BAI	
503.304	0.007	198687						87SOM/BAI	
503.725	0.007	198521						87SOM/BAI	
504.116	0.007	198367						87SOM/BAI	
504.288	0.007	198299						87SOM/BAI	

TABLE 1. Spectral lines of K 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.
504.311	0.007	198290						87SOM/BAI	
504.341	0.007	198279		h		$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3F^\circ_2)5d$	87SOM/BAI	
504.374	0.007	198265						87SOM/BAI	
504.414	0.007	198250						87SOM/BAI	
504.444	0.007	198238						87SOM/BAI	
504.500	0.007	198216						87SOM/BAI	
504.557	0.007	198194						87SOM/BAI	
504.646	0.007	198159						87SOM/BAI	
504.686	0.007	198143						87SOM/BAI	
504.819	0.007	198091						87SOM/BAI	
504.845	0.007	198081						87SOM/BAI	
504.885	0.007	198065						87SOM/BAI	
504.921	0.007	198051				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)7d$	87SOM/BAI	
504.961	0.007	198035						87SOM/BAI	
505.004	0.007	198018						87SOM/BAI	
505.054	0.007	197999						87SOM/BAI	
505.110	0.007	197977						87SOM/BAI	
505.173	0.007	197952				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)8s\ ^2P^\circ$	87SOM/BAI	
505.233	0.007	197929						87SOM/BAI	
505.336	0.007	197888				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)8s\ ^2P^\circ$	87SOM/BAI	
505.425	0.007	197853				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3F^\circ_3)5d$	87SOM/BAI	
505.485	0.007	197830						87SOM/BAI	
505.548	0.007	197805				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_0)8d$	87SOM/BAI	
505.680	0.007	197754				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)9d$	87SOM/BAI	
505.763	0.007	197721						87SOM/BAI	
505.846	0.007	197689						87SOM/BAI	
505.906	0.007	197665				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_2)8d$	87SOM/BAI	
505.962	0.007	197643						87SOM/BAI	
506.025	0.007	197619						87SOM/BAI	
506.161	0.007	197566				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_2)8d$	87SOM/BAI	
506.360	0.007	197488				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_0)13s$	87SOM/BAI	
506.429	0.007	197461						87SOM/BAI	
506.489	0.007	197438						87SOM/BAI	
506.737	0.007	197341				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_2)9s\ ^2P^\circ$	87SOM/BAI	
506.883	0.007	197284				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_0)11d$	87SOM/BAI	
507.059	0.007	197216				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)8d$	87SOM/BAI	
507.231	0.007	197149						87SOM/BAI	
507.321	0.007	197114				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)8d$	87SOM/BAI	
507.347	0.007	197104						87SOM/BAI	
507.470	0.007	197056						87SOM/BAI	
507.566	0.007	197019						87SOM/BAI	
507.619	0.007	196998				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)9s$	87SOM/BAI	
507.682	0.007	196974						87SOM/BAI	
507.824	0.007	196918				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_0)7d$	87SOM/BAI	
507.854	0.007	196907						87SOM/BAI	
508.000	0.007	196850						87SOM/BAI	
508.050	0.007	196831				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)6d\ ^2D^\circ_{3/2}$	87SOM/BAI	
508.139	0.007	196796						87SOM/BAI	
508.219	0.007	196766						87SOM/BAI	
508.318	0.007	196727				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)6d\ ^2P^\circ_{1/2}$	87SOM/BAI	
508.457	0.007	196673						87SOM/BAI	
508.507	0.007	196654				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_2)7d$	87SOM/BAI	
508.557	0.007	196635						87SOM/BAI	
508.623	0.007	196609				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_0)9d$	87SOM/BAI	
508.669	0.007	196591						87SOM/BAI	
508.762	0.007	196555						87SOM/BAI	
508.825	0.007	196531				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_0)10s$	87SOM/BAI	

TABLE 1. Spectral lines of K 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.
508.908	0.007	196499						87SOM/BAI	
508.954	0.007	196481						87SOM/BAI	
509.017	0.007	196457						87SOM/BAI	
509.087	0.007	196430				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_1)9d$	87SOM/BAI	
509.163	0.007	196401						87SOM/BAI	
509.266	0.007	196361				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)6d\ ^2P^\circ_{3/2}$	87SOM/BAI	
509.316	0.007	196342						87SOM/BAI	
509.379	0.007	196318				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)7s\ ^2P^\circ$	87SOM/BAI	
509.514	0.007	196265						87SOM/BAI	
509.564	0.007	196246				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)7d$	87SOM/BAI	
509.720	0.007	196186						87SOM/BAI	
509.793	0.007	196158				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)7d$	87SOM/BAI	
509.859	0.007	196133						87SOM/BAI	
509.892	0.007	196120				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_2)10d$	87SOM/BAI	
510.025	0.007	196069						87SOM/BAI	
510.055	0.007	196057				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_0)8d$	87SOM/BAI	
510.151	0.007	196021						87SOM/BAI	
510.233	0.007	195989				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3D^\circ)5s\ ^2D^\circ_{3/2}$	87SOM/BAI	
510.429	0.007	195914				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_1)8d$	87SOM/BAI	
510.598	0.007	195849				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_1)8d$	87SOM/BAI	
510.671	0.007	195821						87SOM/BAI	
510.810	0.007	195768						87SOM/BAI	
510.913	0.007	195728				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_2)9d$	87SOM/BAI	
511.118	0.007	195650				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_2)10s$	87SOM/BAI	
511.184	0.007	195624				$3p^6 4s\ ^2S_{1/2}$	$3p^5(^2P^\circ)4p^2(^1S)\ ^2P^\circ$	87SOM/BAI	
511.509	0.007	195500						87SOM/BAI	
511.837	0.007	195375						87SOM/BAI	
511.874	0.007	195361						87SOM/BAI	
511.933	0.007	195338						87SOM/BAI	
511.999	0.007	195313						87SOM/BAI	
512.125	0.007	195265						87SOM/BAI	
512.205	0.007	195234				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_2)6d$	87SOM/BAI	
512.410	0.007	195156				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4d6d\ ^4F^\circ_{3/2}$	87SOM/BAI	
512.715	0.007	195040				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_1)7d$	87SOM/BAI	
512.874	0.007	194980				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_2)9s\ ^2P^\circ$	87SOM/BAI	
513.050	0.007	194913				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_0)7s\ ^2P^\circ$	87SOM/BAI	
513.099	0.007	194894						87SOM/BAI	
513.401	0.007	194780				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d5s\ ^4D^\circ_{3/2}$	87SOM/BAI	
513.503	0.007	194741				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_1)8s\ ^2P^\circ$	87SOM/BAI	
513.580	0.007	194712						87SOM/BAI	
513.695	0.007	194668				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ_1)8s\ ^2P^\circ$	87SOM/BAI	
513.911	0.007	194586				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)6d$	87SOM/BAI	
514.013	0.007	194547						87SOM/BAI	
514.100	0.007	194515				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)6d$	87SOM/BAI	
514.242	0.007	194461				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_1)7s$	87SOM/BAI	
514.706	0.007	194286				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^3P^\circ)6d\ ^2P^\circ_{3/2}$	87SOM/BAI	
514.898	0.007	194213						87SOM/BAI	
515.054	0.007	194155						87SOM/BAI	
515.213	0.007	194095						87SOM/BAI	
515.266	0.007	194075				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)5d\ ^2P^\circ_{3/2}$	87SOM/BAI	
515.607	0.007	193946				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)5d\ ^2P^\circ_{1/2}$	87SOM/BAI	
515.819	0.007	193867				$3p^6 4s\ ^2S_{1/2}$	$3p^5(^2P^\circ)4p^2(^1S)\ ^2P$	87SOM/BAI	
516.114	0.007	193756				$3p^6 4s\ ^2S_{1/2}$	$3p^5 4s(^1P^\circ_1)5d\ ^2D^\circ_{3/2}$	87SOM/BAI	
516.322	0.007	193678						87SOM/BAI	
516.395	0.007	193650				$3p^6 4s\ ^2S_{1/2}$	$3p^5 3d(^3P^\circ_0)6d$	87SOM/BAI	
516.630	0.007	193562						87SOM/BAI	
516.776	0.007	193508						87SOM/BAI	

TABLE 1. Spectral lines of K 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.
517.203	0.007	193348						87SOM/BAI	
517.266	0.007	193324				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_0)7s$	87SOM/BAI	
517.388	0.007	193278						87SOM/BAI	
517.445	0.007	193257				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)6d\ ^2P^\circ_{1/2}$	87SOM/BAI	
517.491	0.007	193240						87SOM/BAI	
517.750	0.007	193144						87SOM/BAI	
517.796	0.007	193126				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)6d\ ^2D^\circ_{3/2}$	87SOM/BAI	
517.942	0.007	193072				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)6s\ ^2P^\circ$	87SOM/BAI	
518.548	0.007	192846						87SOM/BAI	
518.620	0.007	192819				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ_1)7s$	87SOM/BAI	
519.514	0.007	192488				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_2)5d$	87SOM/BAI	
519.826	0.007	192372				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_2)5d$	87SOM/BAI	
520.094	0.007	192273				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)5d\ ^2P^\circ_{3/2}$	87SOM/BAI	
520.398	0.007	192160				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_1)5d$	87SOM/BAI	
521.031	0.007	191927				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_1)5d$	87SOM/BAI	
521.100	0.007	191902				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_1)5d$	87SOM/BAI	
521.478	0.007	191763						87SOM/BAI	
521.773	0.007	191652				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)5d\ ^4F^\circ_{3/2}$	87SOM/BAI	
522.140	0.007	191520				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ_0)6s$	87SOM/BAI	
522.541	0.007	191373	*	b		$3p^64s\ ^2S_{1/2}$	$3p^54s5d\ ^4D^\circ_{3/2}$	87SOM/BAI	
522.541	0.007	191373	*	b		$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_2)6s$	87SOM/BAI	
523.643	0.007	190970						87SOM/BAI	
523.689	0.007	190953				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)5d\ ^2P^\circ_{1/2}$	87SOM/BAI	
523.795	0.007	190914				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_0)5d$	87SOM/BAI	
523.947	0.007	190859				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_1)6s$	87SOM/BAI	
524.633	0.007	190610				$3p^64s\ ^2S_{1/2}$	$3p^5(^2P^\circ)3d^2(^3P)\ ^2P^\circ$	87SOM/BAI	
525.086	0.007	190445				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)5d\ ^2D^\circ_{3/2}$	87SOM/BAI	
525.281	0.007	190374				$3p^64s\ ^2S_{1/2}$	$3p^5(^2P^\circ)3d^2(^3P)\ ^2P^\circ$	87SOM/BAI	
525.864	0.007	190163						87SOM/BAI	
525.966	0.007	190126						87SOM/BAI	
526.281	0.007	190013		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ_1)6s$	87SOM/BAI	
526.582	0.007	189904				$3p^64s\ ^2S_{1/2}$	$3p^54s5d\ ^4P^\circ_{3/2}$	87SOM/BAI	
526.625	0.007	189888						87SOM/BAI	
526.777	0.007	189834				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ_1)6s$	87SOM/BAI	
528.508	0.007	189212				$3p^64s\ ^2S_{1/2}$	$3p^5(^2P^\circ)3d^2(^3P)\ ^2P^\circ$	87SOM/BAI	
529.127	0.007	188991				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ_2)6s$	87SOM/BAI	
529.435	0.007	188881		w		$3p^64s\ ^2S_{1/2}$	$3p^5(^2P^\circ)4p^2(^1D)\ ^2D^\circ$	87SOM/BAI	
530.272	0.007	188583				$3p^64s\ ^2S_{1/2}$	$3p^54d(^1P^\circ_1)4s\ ^2P^\circ_{3/2,1/2}$	87SOM/BAI	
531.492	0.007	188150				$3p^64s\ ^2S_{1/2}$	$3p^5(^2P^\circ)4p^2(^1D)\ ^2P$	87SOM/BAI	
531.780	0.007	188048				$3p^64s\ ^2S_{1/2}$	$3p^5(^2P^\circ)4p^2(^1D)\ ^2P$	87SOM/BAI	
532.475	0.007	187802		w		$3p^64s\ ^2S_{1/2}$	$3p^54d(^3D^\circ)4s\ ^2D^\circ_{3/2}$	87SOM/BAI	
532.627	0.007	187749						87SOM/BAI	
533.593	0.007	187409				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_2)4d$	87SOM/BAI	
534.731	0.007	187010				$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ_2)4d$	87SOM/BAI	
535.740	0.007	186658				$3p^64s\ ^2S_{1/2}$	$3p^54d(^1D^\circ)4s\ ^2D^\circ_{3/2}$	87SOM/BAI	
537.109	0.007	186182						87SOM/BAI	
538.164	0.007	185817						87SOM/BAI	
538.742	0.007	185618						87SOM/BAI	
538.772	0.007	185607						87SOM/BAI	
540.095	0.007	185153	*	b		$3p^64s\ ^2S_{1/2}$	$3p^54d4s\ ^4D^\circ_{1/2}$	87SOM/BAI	
540.095	0.007	185153	*	b		$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)5s\ ^2P^\circ_{1/2}$	87SOM/BAI	
540.095	0.007	185153	*	b		$3p^64s\ ^2S_{1/2}$	$3p^54d4s\ ^4D^\circ_{3/2}$	87SOM/BAI	
542.101	0.007	184467						87SOM/BAI	
542.455	0.007	184347				$3p^64s\ ^2S_{1/2}$	$3p^54s(^1P^\circ_1)5s\ ^2P^\circ_{3/2}$	87SOM/BAI	
543.262	0.007	184073						87SOM/BAI	
543.460	0.007	184006						87SOM/BAI	
544.871	0.007	183530		w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ)5s\ ^2P^\circ_{3/2}$	87SOM/BAI	

TABLE 1. Spectral lines of K 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.
545.499	0.007	183318		w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ)5s\ ^2P^\circ_{1/2}$	87SOM/BAI	
547.485	0.007	182653				$3p^64s\ ^2S_{1/2}$	$3p^54s5s\ ^4P^\circ_{1/2}$	87SOM/BAI	
548.986	0.007	182154		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)5s\ ^2P^\circ_{3/2}$	87SOM/BAI	
550.218	0.007	181746				$3p^64s\ ^2S_{1/2}$	$3p^53d5s\ ^4P^\circ_{3/2}$	87SOM/BAI	
550.905	0.007	181519				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)5s\ ^4P^\circ_{1/2}$	87SOM/BAI	
552.940	0.007	180850		w		$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ)5s\ ^4P^\circ_{3/2}$	87SOM/BAI	
553.120	0.007	180791		w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)4s\ ^2P^\circ_{3/2}$	87SOM/BAI	
553.860	0.007	180551		w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^1P^\circ_1)4s\ ^2P^\circ_{1/2}$	87SOM/BAI	
555.810	0.007	179918				$3p^64s\ ^2S_{1/2}$	$3p^54p^2\ ^4P$	87SOM/BAI	
555.906	0.007	179887		a		$3p^64s\ ^2S_{1/2}$	$3p^53d(^3D^\circ)4s\ ^2D^\circ_{3/2}$	87SOM/BAI	
571.281	0.007	175045						87SOM/BAI	
577.89	0.015	173043				$3p^64s\ ^2S_{1/2}$	$3p^54s(^3P^\circ_2)5s\ ^2P^\circ_{3/2}$	75MAN	
578.70	0.015	172800				$3p^64s\ ^2S_{1/2}$	$3p^53d4s\ ^4D^\circ_{1/2}$	75MAN	
579.30	0.015	172623				$3p^64s\ ^2S_{1/2}$	$3p^53d4s\ ^4D^\circ_{3/2}$	75MAN	
613.47	0.015	163006		h,w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ)4s\ ^2P^\circ_{3/2}$	75MAN	
615.75	0.015	162404		h,w		$3p^64s\ ^2S_{1/2}$	$3p^53d(^3P^\circ)4s\ ^2P^\circ_{1/2}$	75MAN	
626.26	0.015	159678				$3p^64s\ ^2S_{1/2}$	$3p^53d4s\ ^4P^\circ_{3/2}$	75MAN	
627.48	0.015	159367		h		$3p^64s\ ^2S_{1/2}$	$3p^53d4s\ ^4P^\circ_{1/2}$	75MAN	
653.23	0.015	153085		w		$3p^64s\ ^2S_{1/2}$	$3p^54s^2\ ^2P^\circ_{1/2}$	75MAN	
662.22	0.015	151008		w		$3p^64s\ ^2S_{1/2}$	$3p^54s^2\ ^2P^\circ_{3/2}$	75MAN	
673.6	0.3	148460	6			$3p^64p\ ^2P^\circ_{1/2}$	$3p^54s4p\ ^4S_{3/2}$	87MEN/BAR	
673.9	0.3	148390	23			$3p^64p\ ^2P^\circ_{3/2}$	$3p^54s4p\ ^4S_{3/2}$	87MEN/BAR	
691.7	0.3	144570	2			$3p^63d\ ^2D$	$3p^53d4s\ ^4F^\circ_{3/2}$	87MEN/BAR	
721.0	0.3	138700	27			$3p^63d\ ^2D$	$3p^53d4s\ ^4P^\circ_{5/2}$	87MEN/BAR	
752.9	0.5	132820	4			$3p^64d\ ^2D$	$3p^53d4s\ ^4P^\circ_{5/2}$	84GAB/MAR	
769.0	0.5	130040	1			$3p^65d\ ^2D$	$3p^53d4s\ ^4P^\circ_{5/2}$	84GAB/MAR	
778.2	0.5	128500	1			$3p^66d\ ^2D$	$3p^53d4s\ ^4P^\circ_{5/2}$	84GAB/MAR	
Air									
2992.108	0.005	33411.54			3.15E+3	$3p^64s\ ^2S_{1/2}$	$3p^610p\ ^2P^\circ_{3/2}$	49KRA	85SHA/KHL
2992.215	0.005	33410.34			2.17E+3	$3p^64s\ ^2S_{1/2}$	$3p^610p\ ^2P^\circ_{1/2}$	49KRA	85SHA/KHL
3034.751	0.005	32942.08			6.74E+3	$3p^64s\ ^2S_{1/2}$	$3p^69p\ ^2P^\circ_{3/2}$	49KRA	85SHA/KHL
3034.911	0.005	32940.34			4.78E+3	$3p^64s\ ^2S_{1/2}$	$3p^69p\ ^2P^\circ_{1/2}$	49KRA	85SHA/KHL
3101.791	0.005	32230.12			1.62E+4	$3p^64s\ ^2S_{1/2}$	$3p^68p\ ^2P^\circ_{3/2}$	49KRA	85SHA/KHL
3102.051	0.005	32227.42			1.22E+4	$3p^64s\ ^2S_{1/2}$	$3p^68p\ ^2P^\circ_{1/2}$	49KRA	85SHA/KHL
3217.151	0.005	31074.46			4.97E+4	$3p^64s\ ^2S_{1/2}$	$3p^67p\ ^2P^\circ_{3/2}$	49KRA	85SHA/KHL
3217.615	0.005	31069.98			3.98E+4	$3p^64s\ ^2S_{1/2}$	$3p^67p\ ^2P^\circ_{1/2}$	49KRA	85SHA/KHL
3446.376	0.005	29007.70			1.66E+5	$3p^64s\ ^2S_{1/2}$	$3p^66p\ ^2P^\circ_{3/2}$	49KRA	85SHA/KHL
3447.376	0.005	28999.29			1.45E+5	$3p^64s\ ^2S_{1/2}$	$3p^66p\ ^2P^\circ_{1/2}$	49KRA	85SHA/KHL
3648.841	0.005	27398.16	3			$3p^64s\ ^2S_{1/2}$	$3p^64d\ ^2D_{3/2}$	56RIS	
3648.981	0.005	27397.10	4			$3p^64s\ ^2S_{1/2}$	$3p^64d\ ^2D_{5/2}$	56RIS	
4044.136	0.005	24720.20	18		1.16E+6	$3p^64s\ ^2S_{1/2}$	$3p^65p\ ^2P^\circ_{3/2}$	49KRA	85SHA/KHL
4047.208	0.005	24701.44	17		1.07E+6	$3p^64s\ ^2S_{1/2}$	$3p^65p\ ^2P^\circ_{1/2}$	49KRA	85SHA/KHL
4641.876	0.008	21536.99	10		1.54E+2	$3p^64s\ ^2S_{1/2}$	$3p^63d\ ^2D_{3/2}$	56RIS	88ALI/KIM
4642.373	0.008	21534.68	11		1.54E+2	$3p^64s\ ^2S_{1/2}$	$3p^63d\ ^2D_{5/2}$	56RIS	88ALI/KIM
4740.914	0.009	21087.08	4		8.0E+4	$3p^64p\ ^2P^\circ_{1/2}$	$3p^613s\ ^2S_{1/2}$	56RIS	69WIE/SMI
4744.345	0.009	21071.83	6		9.8E+4	$3p^64p\ ^2P^\circ_{1/2}$	$3p^611d\ ^2D_{3/2}$	56RIS	69WIE/SMI
4753.934	0.009	21029.33	5		1.6E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^613s\ ^2S_{1/2}$	56RIS	69WIE/SMI
4757.389	0.009	21014.06	7		1.2E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^611d\ ^2D_{5/2}$	56RIS	69WIE/SMI
4786.491	0.009	20886.29	5		1.03E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^612s\ ^2S_{1/2}$	56RIS	69WIE/SMI
4791.049	0.009	20866.42	7		1.3E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^610d\ ^2D_{3/2}$	56RIS	69WIE/SMI
4799.754	0.009	20828.58	6		2.07E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^612s\ ^2S_{1/2}$	56RIS	69WIE/SMI
4804.348	0.009	20808.66	8		1.6E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^610d\ ^2D_{5/2}$	56RIS	69WIE/SMI
4849.865	0.009	20613.37	7		1.4E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^611s\ ^2S_{1/2}$	56RIS	69WIE/SMI
4856.090	0.009	20586.95	8		1.8E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^69d\ ^2D_{3/2}$	56RIS	69WIE/SMI
4863.483	0.009	20555.65	8		2.9E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^611s\ ^2S_{1/2}$	56RIS	69WIE/SMI
4869.757	0.009	20529.17	9		2.1E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^69d\ ^2D_{5/2}$	56RIS	69WIE/SMI
4942.002	0.002	20229.02	8*	b	2.13E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^610d\ ^2S_{1/2}$	72JOH/SVE	69WIE/SMI

TABLE 1. Spectral lines of K 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.
4950.815	0.010	20193.06	9		2.2E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^68d\ ^2D_{3/2}$	56RIS	69WIE/SMI
4956.1461	0.0015	20171.34	9		4.25E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^610d\ ^2S_{1/2}$	72JOH/SVE	69WIE/SMI
4965.031	0.010	20135.24	10		2.6E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^68d\ ^2D_{5/2}$	56RIS	69WIE/SMI
5084.226	0.008	19663.20	10		3.50E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^69s\ ^2S_{1/2}$	56RIS	69WIE/SMI
5097.171	0.008	19613.26	11		2.9E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^67d\ ^2D_{3/2}$	56RIS	69WIE/SMI
5099.200	0.008	19605.46	11		7.0E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^69s\ ^2S_{1/2}$	56RIS	69WIE/SMI
5112.249	0.008	19555.41	12		3.5E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^67d\ ^2D_{5/2}$	56RIS	69WIE/SMI
5323.276	0.009	18780.20	12		6.3E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^68s\ ^2S_{1/2}$	56RIS	69WIE/SMI
5339.688	0.009	18722.48	13		1.26E+6	$3p^64p\ ^2P^\circ_{3/2}$	$3p^68s\ ^2S_{1/2}$	56RIS	69WIE/SMI
5342.970	0.009	18710.98	12		4.0E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^66d\ ^2D_{3/2}$	56RIS	69WIE/SMI
5359.574	0.009	18653.01	14		4.6E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^66d\ ^2D_{5/2}$	56RIS	69WIE/SMI
5782.384	0.010	17289.11	16		1.23E+6	$3p^64p\ ^2P^\circ_{1/2}$	$3p^67s\ ^2S_{1/2}$	56RIS	69WIE/SMI
5801.752	0.010	17231.39	17		2.46E+6	$3p^64p\ ^2P^\circ_{3/2}$	$3p^67s\ ^2S_{1/2}$	56RIS	69WIE/SMI
5812.148	0.010	17200.58	15		2.8E+5	$3p^64p\ ^2P^\circ_{1/2}$	$3p^65d\ ^2D_{3/2}$	56RIS	69WIE/SMI
5831.887	0.010	17142.36	17		3.2E+5	$3p^64p\ ^2P^\circ_{3/2}$	$3p^65d\ ^2D_{5/2}$	56RIS	69WIE/SMI
6911.084	0.014	14465.52	19		2.72E+6	$3p^64p\ ^2P^\circ_{1/2}$	$3p^66s\ ^2S_{1/2}$	56RIS	69WIE/SMI
6936.284	0.014	14412.97	12		2.6E+4	$3p^64p\ ^2P^\circ_{1/2}$	$3p^64d\ ^2D_{3/2}$	56RIS	69WIE/SMI
6938.767	0.014	14407.81	20		3.9E+6	$3p^64p\ ^2P^\circ_{3/2}$	$3p^66s\ ^2S_{1/2}$	56RIS	97GAM
6964.18	0.015	14355.23	7		5.1E+3	$3p^64p\ ^2P^\circ_{3/2}$	$3p^64d\ ^2D_{3/2}$	56RIS	69WIE/SMI
6964.672	0.015	14354.22	12		3.1E+4	$3p^64p\ ^2P^\circ_{3/2}$	$3p^64d\ ^2D_{5/2}$	56RIS	69WIE/SMI
7664.899126	0.000001	13042.896027	25	r	3.80E+7	$3p^64s\ ^2S_{1/2}$	$3p^64p\ ^2P^\circ_{3/2}$	06FAL	97WAN/LI
7698.964562	0.000002	12985.185724	24	r	3.75E+7	$3p^64s\ ^2S_{1/2}$	$3p^64p\ ^2P^\circ_{1/2}$	06FAL	97WAN/LI
7741.07	0.05	12914.56				$3p^63d\ ^2D_{5/2}$	$3p^614f\ ^2F^\circ$	75BEN	
7742.46	0.05	12912.24				$3p^63d\ ^2D_{3/2}$	$3p^614f\ ^2F^\circ$	75BEN	
7795.17	0.05	12824.93				$3p^63d\ ^2D_{5/2}$	$3p^613f\ ^2F^\circ$	75BEN	
7796.56	0.05	12822.64				$3p^63d\ ^2D_{3/2}$	$3p^613f\ ^2F^\circ$	75BEN	
7864.47	0.05	12711.19				$3p^63d\ ^2D_{5/2}$	$3p^612f\ ^2F^\circ$	75BEN	
7865.87	0.05	12709.65				$3p^63d\ ^2D_{3/2}$	$3p^612f\ ^2F^\circ$	75BEN	
7955.37	0.02	12566.67	5			$3p^63d\ ^2D_{5/2}$	$3p^611f\ ^2F^\circ_{7/2}$	56RIS	
7956.83	0.02	12564.36	4			$3p^63d\ ^2D_{3/2}$	$3p^611f\ ^2F^\circ_{5/2}$	56RIS	
8078.11	0.02	12375.73	7			$3p^63d\ ^2D_{5/2}$	$3p^610f\ ^2F^\circ_{7/2}$	56RIS	
8079.62	0.02	12373.42	6			$3p^63d\ ^2D_{3/2}$	$3p^610f\ ^2F^\circ_{5/2}$	56RIS	
8250.18	0.02	12117.62	9*	b	6.4E+4	$3p^63d\ ^2D_{5/2}$	$3p^69f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
8250.18	0.02	12117.62	9*	b	9.6E+5	$3p^63d\ ^2D_{5/2}$	$3p^69f\ ^2F^\circ_{7/2}$	56RIS	69WIE/SMI
8251.74	0.02	12115.32	8		8.9E+5	$3p^63d\ ^2D_{3/2}$	$3p^69f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
8390.22	0.02	11915.36	3		3.2E+4	$3p^65s\ ^2S_{1/2}$	$3p^69p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
[8391.44]		[11913.]			3.2E+4	$3p^65s\ ^2S_{1/2}$	$3p^69p\ ^2P^\circ_{1/2}$	56RIS	69WIE/SMI
8417.54	0.02	11876.70	2		4.0E+4	$3p^63d\ ^2D_{5/2}$	$3p^610p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
8420.00	0.02	11873.23	1		4.4E+4	$3p^63d\ ^2D_{3/2}$	$3p^610p\ ^2P^\circ_{1/2}$	56RIS	69WIE/SMI
8503.45	0.02	11756.70	11*	b	9.2E+4	$3p^63d\ ^2D_{5/2}$	$3p^68f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
8503.45	0.02	11756.70	11*	b	1.4E+6	$3p^63d\ ^2D_{5/2}$	$3p^68f\ ^2F^\circ_{7/2}$	56RIS	69WIE/SMI
8505.11	0.02	11754.41	10		1.3E+6	$3p^63d\ ^2D_{3/2}$	$3p^68f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
8763.96	0.02	11407.24	4		6.0E+4	$3p^63d\ ^2D_{5/2}$	$3p^69p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
8767.05	0.02	11403.21	3		6.7E+4	$3p^63d\ ^2D_{3/2}$	$3p^69p\ ^2P^\circ_{1/2}$	56RIS	69WIE/SMI
8902.19	0.02	11230.11	13*	b	1.4E+5	$3p^63d\ ^2D_{5/2}$	$3p^67f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
8902.19	0.02	11230.11	13*	b	2.1E+6	$3p^63d\ ^2D_{5/2}$	$3p^67f\ ^2F^\circ_{7/2}$	56RIS	69WIE/SMI
8904.02	0.02	11227.80	12		2.0E+6	$3p^63d\ ^2D_{3/2}$	$3p^67f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
8923.31	0.02	11203.53	5		5.9E+4	$3p^65s\ ^2S_{1/2}$	$3p^68p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
8925.44	0.02	11200.86	4		5.9E+4	$3p^65s\ ^2S_{1/2}$	$3p^68p\ ^2P^\circ_{1/2}$	56RIS	69WIE/SMI
9347.24	0.03	10695.42	7		9.6E+4	$3p^63d\ ^2D_{5/2}$	$3p^68p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
9349.25	0.03	10693.11	3		1.1E+4	$3p^63d\ ^2D_{3/2}$	$3p^68p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
9351.59	0.03	10690.44	6		1.1E+5	$3p^63d\ ^2D_{3/2}$	$3p^68p\ ^2P^\circ_{1/2}$	56RIS	69WIE/SMI
9595.70	0.03	10418.47	15*	b	2.4E+5	$3p^63d\ ^2D_{5/2}$	$3p^66f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
9595.70	0.03	10418.47	15*	b	3.5E+6	$3p^63d\ ^2D_{5/2}$	$3p^66f\ ^2F^\circ_{7/2}$	56RIS	69WIE/SMI
9597.83	0.03	10416.17	14		3.3E+6	$3p^63d\ ^2D_{3/2}$	$3p^66f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
9949.67	0.03	10047.83	6		1.4E+5	$3p^65s\ ^2S_{1/2}$	$3p^67p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
9954.14	0.03	10043.32	5		1.4E+5	$3p^65s\ ^2S_{1/2}$	$3p^67p\ ^2P^\circ_{1/2}$	56RIS	69WIE/SMI

TABLE 1. Spectral lines of K 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.
10479.63	0.02	9539.71	9		1.7E+5	$3p^63d\ ^2D_{5/2}$	$3p^67p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
10482.15	0.02	9537.41	5		1.9E+4	$3p^63d\ ^2D_{3/2}$	$3p^67p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
10487.11	0.02	9532.90	8		1.9E+5	$3p^63d\ ^2D_{3/2}$	$3p^67p\ ^2P^\circ_{1/2}$	56RIS	69WIE/SMI
11019.87	0.02	9072.03	17*	b	4.4E+5	$3p^63d\ ^2D_{5/2}$	$3p^65f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
11019.87	0.02	9072.03	17*	b	6.6E+6	$3p^63d\ ^2D_{5/2}$	$3p^65f\ ^2F^\circ_{7/2}$	56RIS	69WIE/SMI
11022.67	0.02	9069.73	16		6.2E+6	$3p^63d\ ^2D_{3/2}$	$3p^65f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
11690.219	0.005	8551.819	17		2.20E+7	$3p^64p\ ^2P^\circ_{1/2}$	$3p^63d\ ^2D_{3/2}$	72JOH/SVE	69WIE/SMI
11769.637	0.005	8494.114	16		4.34E+6	$3p^64p\ ^2P^\circ_{3/2}$	$3p^63d\ ^2D_{3/2}$	72JOH/SVE	69WIE/SMI
11772.838	0.005	8491.805	17		2.59E+7	$3p^64p\ ^2P^\circ_{3/2}$	$3p^63d\ ^2D_{5/2}$	72JOH/SVE	69WIE/SMI
12432.274	0.010	8041.380	56		7.9E+6	$3p^64p\ ^2P^\circ_{1/2}$	$3p^65s\ ^2S_{1/2}$	72JOH/SVE	69WIE/SMI
12522.141	0.010	7983.670	98		1.56E+7	$3p^64p\ ^2P^\circ_{3/2}$	$3p^65s\ ^2S_{1/2}$	72JOH/SVE	69WIE/SMI
13377.86	0.04	7472.99			3.7E+5	$3p^63d\ ^2D_{5/2}$	$3p^66p\ ^2P^\circ_{3/2}$	56RIS	69WIE/SMI
13397.09	0.04	7462.26			4.1E+5	$3p^63d\ ^2D_{3/2}$	$3p^66p\ ^2P^\circ_{1/2}$	56RIS	69WIE/SMI
15163.08	0.05	6593.16	*	b	1.0E+6	$3p^63d\ ^2D_{5/2}$	$3p^64f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
15163.08	0.05	6593.16	*	b	1.5E+7	$3p^63d\ ^2D_{5/2}$	$3p^64f\ ^2F^\circ_{7/2}$	56RIS	69WIE/SMI
15168.40	0.05	6590.85			1.5E+7	$3p^63d\ ^2D_{3/2}$	$3p^64f\ ^2F^\circ_{5/2}$	56RIS	69WIE/SMI
Vacuum									
27073.97	0.03	3693.585	59		4.6E+6	$3p^65s\ ^2S_{1/2}$	$3p^65p\ ^2P^\circ_{3/2}$	72JOH/SVE	69WIE/SMI
27212.16	0.03	3674.827	36		4.5E+6	$3p^65s\ ^2S_{1/2}$	$3p^65p\ ^2P^\circ_{1/2}$	72JOH/SVE	69WIE/SMI
31392.63	0.04	3185.461	33		1.4E+6	$3p^63d\ ^2D_{5/2}$	$3p^65p\ ^2P^\circ_{3/2}$	72JOH/SVE	69WIE/SMI
31415.39	0.04	3183.153	7		1.5E+5	$3p^63d\ ^2D_{3/2}$	$3p^65p\ ^2P^\circ_{3/2}$	72JOH/SVE	69WIE/SMI
31601.61	0.04	3164.396	22		1.5E+6	$3p^63d\ ^2D_{3/2}$	$3p^65p\ ^2P^\circ_{1/2}$	72JOH/SVE	69WIE/SMI
36372.78	0.04	2749.309	4		1.6E+6	$3p^65p\ ^2P^\circ_{1/2}$	$3p^66s\ ^2S_{1/2}$	72JOH/SVE	69WIE/SMI
36622.60	0.04	2730.554	7		3.2E+6	$3p^65p\ ^2P^\circ_{3/2}$	$3p^66s\ ^2S_{1/2}$	72JOH/SVE	69WIE/SMI
37081.47	0.04	2696.765	3		2.9E+6	$3p^65p\ ^2P^\circ_{1/2}$	$3p^64d\ ^2D_{3/2}$	72JOH/SVE	69WIE/SMI
37341.19	0.04	2678.008	1		5.7E+5	$3p^65p\ ^2P^\circ_{3/2}$	$3p^64d\ ^2D_{3/2}$	72JOH/SVE	69WIE/SMI
37356.11	0.04	2676.938	5		3.4E+6	$3p^65p\ ^2P^\circ_{3/2}$	$3p^64d\ ^2D_{5/2}$	72JOH/SVE	69WIE/SMI
40169.32	0.16	2489.462				$3p^64f\ ^2F^\circ$	$3p^65g\ ^2G$	70LIT	

TABLE 2. Energy levels of K I

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^64s$	^2S	1/2	0.0000	0.0005	
$3p^64p$	$^2P^\circ$	1/2	12985.185724	0.000002	06FAL/TIE
		3/2	13042.896027	0.000004	06FAL/TIE
$3p^65s$	^2S	1/2	21026.551	0.005	72JOH/SVE
$3p^63d$	^2D	5/2	21534.680	0.005	72JOH/SVE
		3/2	21536.988	0.005	72JOH/SVE
$3p^65p$	$^2P^\circ$	1/2	24701.382	0.005	72JOH/SVE
		3/2	24720.139	0.005	72JOH/SVE
$3p^64d$	^2D	5/2	27397.077	0.005	72JOH/SVE
		3/2	27398.147	0.005	72JOH/SVE
$3p^66s$	^2S	1/2	27450.7104	0.003	83THO/OSU
$3p^64f$	$^2F^\circ$	5/2	28127.85	0.05	56RIS
		7/2	28127.85	0.05	56RIS
$3p^66p$	$^2P^\circ$	1/2	28999.27	0.05	56RIS
		3/2	29007.71	0.05	56RIS
$3p^65d$	^2D	5/2	30185.2439	0.003	83THO/OSU
		3/2	30185.7476	0.003	83THO/OSU

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^6 7s$	^2S	1/2	30274.2487	0.003	83THO/OSU
$3p^6 5f$	$^2F°$	5/2	30606.73	0.06	56RIS
		7/2	30606.73	0.06	56RIS
$3p^6 5g$	^2G	7/2	30617.31	0.01	70LIT
		9/2	30617.31	0.01	70LIT
$3p^6 7p$	$^2P°$	1/2	31069.90	0.06	56RIS
		3/2	31074.40	0.06	56RIS
$3p^6 6d$	^2D	5/2	31695.9005	0.003	83THO/OSU
		3/2	31696.1661	0.003	83THO/OSU
$3p^6 8s$	^2S	1/2	31765.3767	0.003	83THO/OSU
$3p^6 6f$	$^2F°$	5/2	31953.17	0.06	56RIS
		7/2	31953.17	0.06	56RIS
$3p^6 8p$	$^2P°$	1/2	32227.44	0.06	56RIS
		3/2	32230.11	0.06	56RIS
$3p^6 7d$	^2D	5/2	32598.2881	0.0007	81LOR/NIE
		3/2	32598.4437	0.0007	81LOR/NIE
$3p^6 9s$	^2S	1/2	32648.3511	0.0007	81LOR/NIE
$3p^6 7f$	$^2F°$	5/2	32764.80	0.06	56RIS
		7/2	32764.80	0.06	56RIS
$3p^6 9p$	$^2P°$	1/2	32940.2030	0.003	83LOR/NIE
		3/2	32941.9262	0.003	83LOR/NIE
$3p^6 8d$	^2D	5/2	33178.1339	0.0007	81LOR/NIE
		3/2	33178.2324	0.0007	81LOR/NIE
$3p^6 10s$	^2S	1/2	33214.2267	0.0007	81LOR/NIE
$3p^6 8f$	$^2F°$	5/2	33291.40	0.06	56RIS
		7/2	33291.40	0.06	56RIS
$3p^6 10p$	$^2P°$	1/2	33410.2306	0.003	83LOR/NIE
		3/2	33411.3986	0.003	83LOR/NIE
$3p^6 9d$	^2D	5/2	33572.0592	0.0007	81LOR/NIE
		3/2	33572.1249	0.0007	81LOR/NIE
$3p^6 11s$	^2S	1/2	33598.5597	0.0007	81LOR/NIE
$3p^6 9f$	$^2F°$	5/2	33652.32	0.06	56RIS
		7/2	33652.32	0.06	56RIS
$3p^6 11p$	$^2P°$	1/2	33736.4979	0.003	83LOR/NIE
		3/2	33737.3284	0.003	83LOR/NIE
$3p^6 10d$	^2D	5/2	33851.5956	0.0007	81LOR/NIE
		3/2	33851.6418	0.0007	81LOR/NIE
$3p^6 12s$	^2S	1/2	33871.4788	0.0007	81LOR/NIE
$3p^6 10f$	$^2F°$	5/2	33910.42	0.06	56RIS
		7/2	33910.42	0.06	56RIS
$3p^6 12p$	$^2P°$	1/2	33972.2064	0.003	83LOR/NIE
		3/2	33972.8148	0.003	83LOR/NIE

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^6 11d$	^2D	5/2	34057.0051	0.0007	81LOR/NIE
		3/2	34057.0385	0.0007	81LOR/NIE
$3p^6 13s$	^2S	1/2	34072.2393	0.0007	81LOR/NIE
$3p^6 11f$	$^2F^\circ$	5/2	34101.36	0.06	56RIS
		7/2	34101.36	0.06	56RIS
$3p^6 13p$	$^2P^\circ$	1/2	34148.0284	0.003	83LOR/NIE
		3/2	34148.4861	0.003	83LOR/NIE
$3p^6 12d$	^2D	5/2	34212.3139	0.0007	81LOR/NIE
		3/2	34212.3393	0.0007	81LOR/NIE
$3p^6 14s$	^2S	1/2	34224.2113	0.0007	81LOR/NIE
$3p^6 12f$	$^2F^\circ$	5/2	34246.37	0.05	75MAN
		7/2	34246.37	0.05	75MAN
$3p^6 14p$	$^2P^\circ$	1/2	34282.6573	0.003	83LOR/NIE
		3/2	34283.0181	0.003	83LOR/NIE
$3p^6 13d$	^2D	5/2	34332.5627	0.0007	81LOR/NIE
		3/2	34332.5823	0.0007	81LOR/NIE
$3p^6 15s$	^2S	1/2	34342.0150	0.0007	81LOR/NIE
$3p^6 13f$	$^2F^\circ$	5/2	34359.36	0.06	75MAN
		7/2	34359.36	0.06	75MAN
$3p^6 15p$	$^2P^\circ$	1/2	34388.0315	0.003	83LOR/NIE
		3/2	34388.3148	0.003	83LOR/NIE
$3p^6 14d$	^2D	5/2	34427.5513	0.0007	81LOR/NIE
		3/2	34427.5667	0.0007	81LOR/NIE
$3p^6 16s$	^2S	1/2	34435.1762	0.0007	81LOR/NIE
$3p^6 14f$	$^2F^\circ$	5/2	34448.98	0.07	75MAN
		7/2	34448.98	0.07	75MAN
$3p^6 16p$	$^2P^\circ$	1/2	34472.0505	0.003	83LOR/NIE
		3/2	34472.2798	0.003	83LOR/NIE
$3p^6 15d$	^2D	5/2	34503.8844	0.0007	81LOR/NIE
		3/2	34503.8967	0.0007	81LOR/NIE
$3p^6 17s$	^2S	1/2	34510.1190	0.0007	81LOR/NIE
$3p^6 17p$	$^2P^\circ$	1/2	34540.1250	0.003	83LOR/NIE
		3/2	34540.3088	0.003	83LOR/NIE
$3p^6 16d$	^2D	5/2	34566.1420	0.0007	81LOR/NIE
		3/2	34566.1522	0.0007	81LOR/NIE
$3p^6 18s$	^2S	1/2	34571.3017	0.0007	81LOR/NIE
$3p^6 18p$	$^2P^\circ$	1/2	34596.0448	0.003	83LOR/NIE
		3/2	34596.1996	0.003	83LOR/NIE
$3p^6 17d$	^2D	5/2	34617.5815	0.0007	81LOR/NIE
		3/2	34617.5899	0.0007	81LOR/NIE
$3p^6 19s$	^2S	1/2	34621.8976	0.0007	81LOR/NIE
$3p^6 19p$	$^2P^\circ$	3/2	34642.6698	0.003	83LOR/NIE

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^6 18d$	^2D	5/2	34660.5702	0.0007	81LOR/NIE
		3/2	34660.5772	0.0007	81LOR/NIE
$3p^6 20s$	^2S	1/2	34664.2161	0.0007	81LOR/NIE
$3p^6 20p$	$^2P^\circ$	3/2	34681.7220	0.003	83LOR/NIE
$3p^6 19d$	^2D	5/2	34696.8629	0.0007	81LOR/NIE
		3/2	34696.8689	0.0007	81LOR/NIE
$3p^6 21s$	^2S	1/2	34699.9692	0.0007	81LOR/NIE
$3p^6 21p$	$^2P^\circ$	3/2	34714.8646	0.003	83LOR/NIE
$3p^6 20d$	^2D	5/2	34727.7798	0.0007	81LOR/NIE
		3/2	34727.7849	0.0007	81LOR/NIE
$3p^6 22s$	^2S	1/2	34730.4476	0.0007	81LOR/NIE
$3p^6 21d$	^2D	5/2	34754.3327	0.0007	81LOR/NIE
		3/2	34754.3371	0.0007	81LOR/NIE
$3p^6 23s$	^2S	1/2	34756.6407	0.0007	81LOR/NIE
$3p^6 22d$	^2D	5/2	34777.3058	0.0007	81LOR/NIE
		3/2	34777.3096	0.0007	81LOR/NIE
$3p^6 24s$	^2S	1/2	34779.3147	0.0007	81LOR/NIE
$3p^6 23d$	^2D	5/2	34797.3141	0.0007	81LOR/NIE
		3/2	34797.3174	0.0007	81LOR/NIE
$3p^6 25s$	^2S	1/2	34799.0740	0.0007	81LOR/NIE
$3p^6 24d$	^2D	5/2	34814.8472	0.0007	81LOR/NIE
		3/2	34814.8502	0.0007	81LOR/NIE
$3p^6 26s$	^2S	1/2	34816.3971	0.0007	81LOR/NIE
$3p^6 25d$	^2D	5/2	34830.2969	0.0007	81LOR/NIE
		3/2	34830.2994	0.0007	81LOR/NIE
$3p^6 27s$	^2S	1/2	34831.6690	0.0007	81LOR/NIE
$3p^6 26d$	^2D	5/2	34843.9804	0.0007	81LOR/NIE
		3/2	34843.9827	0.0007	81LOR/NIE
$3p^6 28s$	^2S	1/2	34845.2004	0.0007	81LOR/NIE
$3p^6 27d$	^2D	5/2	34856.1570	0.0007	81LOR/NIE
		3/2	34856.1590	0.0007	81LOR/NIE
$3p^6 29s$	^2S	1/2	34857.2470	0.0007	81LOR/NIE
$3p^6 28d$	^2D	5/2	34867.0404	0.0007	81LOR/NIE
		3/2	34867.0423	0.0007	81LOR/NIE
$3p^6 30s$	^2S	1/2	34868.0180	0.0007	81LOR/NIE
$3p^6 29d$	^2D	5/2	[34876.8070]	0.0007	81LOR/NIE
		3/2	[34876.8087]	0.0007	81LOR/NIE
$3p^6 31s$	^2S	1/2	[34877.6871]	0.0007	81LOR/NIE
$3p^6 30d$	^2D	5/2	34885.6048	0.0007	81LOR/NIE
		3/2	34885.6062	0.0007	81LOR/NIE

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^6 32s$	^2S	1/2	34886.3999	0.0007	81LOR/NIE
$3p^6 31d$	^2D	5/2	[34893.5578]	0.0007	81LOR/NIE
		3/2	[34893.5591]	0.0007	81LOR/NIE
$3p^6 33s$	^2S	1/2	[34894.2785]	0.0007	81LOR/NIE
$3p^6 32d$	^2D	5/2	34900.7707	0.0007	81LOR/NIE
		3/2	34900.7719	0.0007	81LOR/NIE
$3p^6 34s$	^2S	1/2	34901.4264	0.0007	81LOR/NIE
$3p^6 33d$	^2D	5/2	[34907.3326]	0.0007	81LOR/NIE
		3/2	[34907.3337]	0.0007	81LOR/NIE
$3p^6 35s$	^2S	1/2	[34907.9301]	0.0007	81LOR/NIE
$3p^6 34d$	^2D	5/2	34913.3194	0.0007	81LOR/NIE
		3/2	34913.3204	0.0007	81LOR/NIE
$3p^6 36s$	^2S	1/2	34913.8657	0.0007	81LOR/NIE
$3p^6 35d$	^2D	5/2	[34918.7968]	0.0007	81LOR/NIE
		3/2	[34918.7976]	0.0007	81LOR/NIE
$3p^6 37s$	^2S	1/2	[34919.2976]	0.0007	81LOR/NIE
$3p^6 36d$	^2D	5/2	34923.8203	0.0007	81LOR/NIE
		3/2	34923.8212	0.0007	81LOR/NIE
$3p^6 38s$	^2S	1/2	34924.2808	0.0007	81LOR/NIE
$3p^6 37d$	^2D	5/2	[34928.4396]	0.0007	81LOR/NIE
		3/2	[34928.4403]	0.0007	81LOR/NIE
$3p^6 39s$	^2S	1/2	[34928.8634]	0.0007	81LOR/NIE
$3p^6 38d$	^2D	5/2	34932.6961	0.0007	81LOR/NIE
		3/2	34932.6969	0.0007	81LOR/NIE
$3p^6 40s$	^2S	1/2	34933.0874	0.0007	81LOR/NIE
$3p^6 39d$	^2D	5/2	[34936.6273]	0.0007	81LOR/NIE
		3/2	[34936.6279]	0.0007	81LOR/NIE
$3p^6 41s$	^2S	1/2	[34936.9892]	0.0007	81LOR/NIE
$3p^6 40d$	^2D	5/2	34940.2653	0.0007	81LOR/NIE
		3/2	34940.2660	0.0007	81LOR/NIE
$3p^6 42s$	^2S	1/2	34940.6009	0.0007	81LOR/NIE
$3p^6 41d$	^2D	5/2	[34943.6386]	0.0007	81LOR/NIE
		3/2	[34943.6393]	0.0007	81LOR/NIE
$3p^6 43s$	^2S	1/2	[34943.9500]	0.0007	81LOR/NIE
$3p^6 42d$	^2D	5/2	34946.7726	0.0007	81LOR/NIE
		3/2	[34946.7730]	0.0007	81LOR/NIE
$3p^6 44s$	^2S	1/2	34947.0620	0.0007	81LOR/NIE
$3p^6 43d$	^2D	5/2	[34949.6886]	0.0007	81LOR/NIE
		3/2	[34949.6892]	0.0007	81LOR/NIE
$3p^6 45s$	^2S	1/2	[34949.9585]	0.0007	81LOR/NIE

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^6 44d$	^2D	5/2	[34952.4071]	0.0007	81LOR/NIE
		3/2	[34952.4077]	0.0007	81LOR/NIE
$3p^6 46s$	^2S	1/2	34952.6589	0.0007	81LOR/NIE
$3p^6 45d$	^2D	5/2	[34954.9453]	0.0007	81LOR/NIE
		3/2	[34954.9458]	0.0007	81LOR/NIE
$3p^6 46d$	^2D	5/2	34957.3187	0.0007	81LOR/NIE
		3/2	[34957.3193]	0.0007	81LOR/NIE
K II ($3p^6\ ^1S_0$)	*Limit*	—	35009.8140	0.0007	81LOR/NIE
$3p^5 4s^2$	$^2P^\circ$	3/2	151008	3	75MAN
		1/2	153085	3	75MAN
$3p^5 3d(^3P^\circ)4s$	$^4P^\circ$	1/2	159367	4	75MAN
		3/2	159678	4	75MAN
		5/2	160245	65	79MAN/OTT
$3p^5 4s4p$	^4S	3/2	161473	65	79MAN/OTT
$3p^5 3d(^3P^\circ)4s$	$^2P^\circ$	1/2	162404	4	75MAN
		3/2	163006	4	75MAN
$3p^5 4s4p$	^4D	3/2	164506	65	79MAN/OTT
		1/2	164998	65	79MAN/OTT
$3p^5 3d4s$	$^4F^\circ$	7/2	165213	65	79MAN/OTT
		5/2	165729	65	79MAN/OTT
		3/2	166221	65	79MAN/OTT
$3p^5 3d(^3F^\circ)4s$	$^2F^\circ$	7/2	167528	65	79MAN/OTT
		5/2	167964	65	79MAN/OTT
$3p^5(^2P^\circ)4s4p(^3P^\circ)$	^2D	3/2	166506	65	79MAN/OTT
		5/2	166950	65	79MAN/OTT
$3p^5(^2P^\circ)4s4p(^3P^\circ)$	^2P	1/2	168378	65	79MAN/OTT
		3/2	168515	65	79MAN/OTT
$3p^5 4s5s$	$^4D^\circ$	7/2	172072	65	79MAN/OTT
		3/2	172623	4	75MAN
		1/2	172800	4	75MAN
$3p^5 4s(^3P^\circ)5s$	$^2P^\circ$	3/2	173043	4	75MAN
		1/2	174000	65	79MAN/OTT
$3p^5 3d(^1D^\circ)4s$	$^2D^\circ$	3/2	173198	4	79MAN/OTT
		5/2	173371	65	79MAN/OTT
$3p^5 4s5s$	$^4P^\circ$	3/2	174000	65	79MAN/OTT
		1/2	175037	5	75MAN
$3p^5 3d(^1F^\circ)4s$	$^2F^\circ$	7/2	174319	65	79MAN/OTT
		5/2	174577	65	79MAN/OTT
$3p^5(^2P^\circ)4s4p(^1P^\circ)$	^2D	5/2	175815	65	79MAN/OTT
		3/2	177775	65	79MAN/OTT
$3p^5(^2P^\circ)4s4p(^1P^\circ)$	^2S	1/2	176278	65	79MAN/OTT
$3p^5 3d(^3D^\circ)4s$	$^2D^\circ$	5/2	179549	65	79MAN/OTT
		3/2	179887	2	87SOM/BAI

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^54p^2$	$^4P°$		179918	2	87SOM/BAI
$3p^5(^2P°)4s4p(^1P°)$	^2P	3/2	180315	65	79MAN/OTT
$3p^53d(^1P°)4s$	$^2P°$	1/2	180551	2	87SOM/BAI
		3/2	180791	2	87SOM/BAI
$3p^54s(^3P°)5s$	$^4P°$	3/2	180850	2	87SOM/BAI
		1/2	181519	2	87SOM/BAI
$3p^53d5s$	$^4P°$	3/2	181746	2	87SOM/BAI
$3p^54s(^3P°)5s$	$^2P°$	3/2	182154	2	87SOM/BAI
$3p^53d(^3P°)5s$	$^2P°$	1/2	183318	2	87SOM/BAI
		3/2	183530	2	87SOM/BAI
$3p^54s(^1P°)5s$	$^2P°$	3/2	184347	2	87SOM/BAI
		1/2	185153	2	87SOM/BAI
$3p^54d(^3D°)4s$	$^4D°$	1/2,3/2	185153	2	87SOM/BAI
$3p^54d(^1D°)4s$	$^2D°$	3/2	186658	2	87SOM/BAI
$3p^53d(^3P^°_2)4d$	°	1/2,3/2	187010	2	87SOM/BAI
		1/2,3/2	187409	2	87SOM/BAI
$3p^54d(^3D°)4s$	$^2D°$	3/2	187802	2	87SOM/BAI
$3p^5(^2P°)4p^2(^1D)$	$^2P°$	1/2,3/2	188048	2	87SOM/BAI
		1/2,3/2	188150	2	87SOM/BAI
$3p^54d(^1P°)4s$	$^2P°$	1/2,3/2	188583	2	87SOM/BAI
$3p^5(^2P°)4p^2(^1D)$	$^2D°$	1/2,3/2	188881	2	87SOM/BAI
$3p^54s(^3P^°_2)6s$	°	1/2,3/2	188991	2	87SOM/BAI
$3p^5(^2P°)3d^2(^3P)$	$^2P°$	1/2,3/2	189212	3	87SOM/BAI
		1/2,3/2	190374	3	87SOM/BAI
$3p^54s(^3P^°_1)6s$	°	1/2,3/2	189834	3	87SOM/BAI
		1/2,3/2	190013	3	87SOM/BAI
$3p^54s(^3P°)5d$	$^4P°$	3/2	189904	3	87SOM/BAI
$3p^54s(^3P°)5d$	$^2D°$	3/2	190445	3	87SOM/BAI
$3p^5(^2P°)3d^2(^3P)$	$^2P°$	1/2,3/2	190610	3	87SOM/BAI
$3p^53d(^3P^°_1)6s$	°	1/2,3/2	190859	3	87SOM/BAI
$3p^53d(^3P^°_0)5d$	°	1/2,3/2	190914	3	87SOM/BAI
$3p^54s(^3P°)5d$	$^2P°$	1/2	190953	3	87SOM/BAI
		3/2	192273	3	87SOM/BAI
$3p^54s(^3P°)5d$	$^4D°$	3/2	191373	3	87SOM/BAI
$3p^53d(^3P^°_2)6s$	°	1/2,3/2	191373	3	87SOM/BAI
$3p^54s(^3P^°_0)6s$	°	1/2,3/2	191520	3	87SOM/BAI
$3p^54s(^3P°)5d$	$^4F°$	3/2	191652	3	87SOM/BAI
$3p^53d(^3P^°_1)5d$	°	1/2,3/2	191902	3	87SOM/BAI
		1/2,3/2	191927	3	87SOM/BAI
		1/2,3/2	192160	3	87SOM/BAI

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^5 3d(^3P^\circ_2)5d$	°	1/2,3/2	192372	3	87SOM/BAI
		1/2,3/2	192488	3	87SOM/BAI
$3p^5 4s(^3P^\circ_1)7s$	°	1/2,3/2	192819	3	87SOM/BAI
$3p^5 4s(^1P^\circ_1)6s$	$^2P^\circ$	1/2,3/2	193072	3	87SOM/BAI
$3p^5 4s(^3P^\circ)6d$	$^2D^\circ$	3/2	193126	3	87SOM/BAI
$3p^5 4s(^3P^\circ)6d$	$^2P^\circ$	1/2	193257	3	87SOM/BAI
		3/2	194275	6	75MAN
$3p^5 3d(^3P^\circ_0)7s$	°	1/2,3/2	193324	3	87SOM/BAI
$3p^5 3d(^3P^\circ_0)6d$	°	1/2,3/2	193650	3	87SOM/BAI
$3p^5 4s(^1P^\circ)5d$	$^2D^\circ$	3/2	193756	3	87SOM/BAI
$3p^5(^2P^\circ)4p^2(^1S)$	$^2P^\circ$	1/2,3/2	193867	3	87SOM/BAI
$3p^5 4s(^1P^\circ)5d$	$^2P^\circ$	1/2	193946	3	87SOM/BAI
		3/2	194075	3	87SOM/BAI
$3p^5 4s(^3P^\circ)6d$	$^2P^\circ$	3/2	194286	3	87SOM/BAI
$3p^5 3d(^3P^\circ_1)7s$	°	1/2,3/2	194461	3	87SOM/BAI
$3p^5 3d(^3P^\circ_1)6d$	°	1/2,3/2	194515	3	87SOM/BAI
		1/2,3/2	194586	3	87SOM/BAI
$3p^5 4s(^3P^\circ_1)8s$	°	1/2,3/2	194668	3	87SOM/BAI
		1/2,3/2	194741	3	87SOM/BAI
$3p^5 3d5s$	$^4D^\circ$	3/2	194780	3	87SOM/BAI
$3p^5 4s(^3P^\circ_0)7s$	°	1/2,3/2	194913	3	87SOM/BAI
$3p^5 4s(^3P^\circ_2)9s$	°	1/2,3/2	194980	3	87SOM/BAI
$3p^5 4s(^3P^\circ_1)7d$	°	1/2,3/2	195040	3	87SOM/BAI
$3p^5 4d6d$	$^4F^\circ$	3/2	195156	3	87SOM/BAI
$3p^5 4d6d$	$^4F^\circ$	3/2	195156	3	87SOM/BAI
$3p^5 3d(^3P^\circ_2)6d$	°	1/2,3/2	195234	3	87SOM/BAI
$3p^5(^2P^\circ)4p^2(^1S)$	$^2P^\circ$	1/2,3/2	195624	3	87SOM/BAI
$3p^5 4s(^3P^\circ_2)10s$	°	1/2,3/2	195650	3	87SOM/BAI
$3p^5 4s(^3P^\circ_2)9d$	°	1/2,3/2	195728	3	87SOM/BAI
$3p^5 4s(^3P^\circ_1)8d$	°	1/2,3/2	195849	3	87SOM/BAI
		1/2,3/2	195914	3	87SOM/BAI
$3p^5 3d(^3D^\circ)5s$	$^2D^\circ$	3/2	195989	3	87SOM/BAI
$3p^5 3d(^3P^\circ_0)8d$	°	1/2,3/2	196057	3	87SOM/BAI
$3p^5 4s(^3P^\circ_2)10d$	°	1/2,3/2	196120	3	87SOM/BAI
$3p^5 3d(^3P^\circ_1)7d$	°	1/2,3/2	196158	3	87SOM/BAI
		1/2,3/2	196246	3	87SOM/BAI

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^54s(^1P^\circ_1)7s$	$^2P^\circ$	1/2,3/2	196318	3	87SOM/BAI
$3p^54s(^1P^\circ)6d$	$^2P^\circ$	3/2	196361	3	87SOM/BAI
		1/2	196727	3	87SOM/BAI
$3p^54s(^3P^\circ_1)9d$	$^\circ$	1/2,3/2	196430	3	87SOM/BAI
$3p^53d(^3P^\circ_0)10s$	$^\circ$	1/2,3/2	196531	3	87SOM/BAI
$3p^53d(^3P^\circ_0)9d$	$^\circ$	1/2,3/2	196609	3	87SOM/BAI
$3p^53d(^3P^\circ_2)7d$	$^\circ$	1/2,3/2	196654	3	87SOM/BAI
$3p^54s(^1P^\circ_1)6d$	$^2D^\circ$	3/2	196831	3	87SOM/BAI
$3p^54s(^3P^\circ_0)7d$	$^\circ$	1/2,3/2	196918	3	87SOM/BAI
$3p^53d(^3P^\circ_1)9s$	$^\circ$	1/2,3/2	196998	3	87SOM/BAI
$3p^53d(^3P^\circ_1)8d$	$^\circ$	1/2,3/2	197114	3	87SOM/BAI
		1/2,3/2	197216	3	87SOM/BAI
$3p^53d(^3P^\circ_0)11d$	$^\circ$	1/2,3/2	197284	3	87SOM/BAI
$3p^53d(^3P^\circ_2)9s$	$^\circ$	1/2,3/2	197341	3	87SOM/BAI
$3p^53d(^3P^\circ_0)13s$	$^\circ$	1/2,3/2	197488	3	87SOM/BAI
$3p^53d(^3P^\circ_2)8d$	$^\circ$	1/2,3/2	197566	3	87SOM/BAI
		1/2,3/2	197665	3	87SOM/BAI
$3p^53d(^3P^\circ_1)9d$	$^\circ$	1/2,3/2	197754	3	87SOM/BAI
$3p^54s(^3P^\circ_0)8d$	$^\circ$	1/2,3/2	197805	3	87SOM/BAI
$3p^53d(^3F^\circ_3)5d$	$^\circ$	1/2,3/2	197853	3	87SOM/BAI
$3p^54s(^1P^\circ_1)8s$	$^2P^\circ$	1/2,3/2	197888	3	87SOM/BAI
		1/2,3/2	197952	3	87SOM/BAI
$3p^54s(^1P^\circ_1)7d$	$^2P^\circ$	1/2,3/2	198051	3	87SOM/BAI
$3p^53d(^3F^\circ_2)5d$	$^\circ$	1/2,3/2	198279	3	87SOM/BAI
$3p^54s(^1P^\circ_1)9s,8d$	$^\circ$	1/2,3/2	198900		87SOM/BAI
$3p^5(^2P^\circ)3d^2(^3P)$	$^2D^\circ$	1/2,3/2	198991	3	87SOM/BAI
$3p^53d(^3F^\circ_2)5d$	$^\circ$	1/2,3/2	199041	3	87SOM/BAI
$3p^53d(^3P^\circ_2)14s$	$^\circ$	1/2,3/2	199136	3	87SOM/BAI
$3p^54s(^1P^\circ_1)10s$	$^2P^\circ$	1/2,3/2	199567	3	87SOM/BAI
$3p^54s(^1P^\circ_1)9d$	$^\circ$	1/2,3/2	199654	3	87SOM/BAI
$3p^54s(^1P^\circ_1)11s,10d$	$^2P^\circ$	1/2,3/2	199980		87SOM/BAI
$3p^54s(^1P^\circ_1)12s,11d$	$^2P^\circ$	1/2,3/2	200270		87SOM/BAI
$3p^54s(^1P^\circ_1)13s,12d$	$^2P^\circ$	1/2,3/2	200490		87SOM/BAI
$3p^54s(^1P^\circ_1)14s,13d$	$^2P^\circ$	1/2,3/2	200660		87SOM/BAI
$3p^54s(^1P^\circ_1)15s,14d$	$^2P^\circ$	1/2,3/2	200773		87SOM/BAI
$3p^54s(^1P^\circ_1)16s,15d$	$^2P^\circ$	1/2,3/2	200875	3	87SOM/BAI

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^54s(^1P^\circ_1)17s, 16d$	$^2P^\circ$	1/2,3/2	200952	3	87SOM/BAI
$3p^54s(^1P^\circ_1)18s, 17d$	$^2P^\circ$	1/2,3/2	201014	3	87SOM/BAI
$3p^54s(^1P^\circ_1)19s, 18d$	$^2P^\circ$	1/2,3/2	201068	3	87SOM/BAI
$3p^54s(^1P^\circ_1)20s, 19d$	$^2P^\circ$	1/2,3/2	201112	3	87SOM/BAI
$3p^54s(^1P^\circ_1)21s, 20d$	$^2P^\circ$	1/2,3/2	201149	3	87SOM/BAI
$3p^54s(^1P^\circ_1)22s, 21d$	$^2P^\circ$	1/2,3/2	201180	3	87SOM/BAI
$3p^54s(^1P^\circ_1)23s, 22d$	$^2P^\circ$	1/2,3/2	201208	3	87SOM/BAI
$3p^54s(^1P^\circ_1)24s, 23d$	$^2P^\circ$	1/2,3/2	201231	3	87SOM/BAI
$3p^54s(^1P^\circ_1)25s, 24d$	$^2P^\circ$	1/2,3/2	201253	3	87SOM/BAI
$3p^54s(^1P^\circ_1)26s, 25d$	$^2P^\circ$	1/2,3/2	201270	3	87SOM/BAI
$3p^54s(^1P^\circ_1)27s, 26d$	$^2P^\circ$	1/2,3/2	201286	3	87SOM/BAI
$3p^54s(^1P^\circ_1)28s, 27d$	$^2P^\circ$	1/2,3/2	201301	3	87SOM/BAI
$3p^54s(^1P^\circ_1)29s, 28d$	$^2P^\circ$	1/2,3/2	201313	3	87SOM/BAI
$3p^54s(^1P^\circ_1)30s, 29d$	$^2P^\circ$	1/2,3/2	201324	3	87SOM/BAI
$3p^54s(^1P^\circ_1)31s, 30d$	$^2P^\circ$	1/2,3/2	201336	3	87SOM/BAI
$3p^54s(^1P^\circ_1)32s, 31d$	$^2P^\circ$	1/2,3/2	201346	3	87SOM/BAI
$3p^54s(^1P^\circ_1)33s, 32d$	$^2P^\circ$	1/2,3/2	201356	3	87SOM/BAI
K II $(3p^54s\ ^1P^\circ_1)$	*Limit*	-	201467.1	0.1	07PET/EKB
$3p^5(^2P^\circ)3d^2(^1S)$	$^2P^\circ$	1/2,3/2	206637	3	87SOM/BAI
$3p^53d(^1P^\circ_1)5s$	$^2P^\circ$	1/2,3/2	214059	3	87SOM/BAI
$3p^54pnl$	$^\circ$	1/2,3/2	212013	3	87SOM/BAI
$3p^54pnl$	$^\circ$	1/2,3/2	215313	3	87SOM/BAI
$3p^54pnl$	$^\circ$	1/2,3/2	216094	3	87SOM/BAI
$3p^54pnl$	$^\circ$	1/2,3/2	216560	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217219	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217354	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217486	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217590	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217675	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217746	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217804	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217851	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217891	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217924	3	87SOM/BAI
$3p^54p(^3S_1)nl$	$^\circ$	1/2,3/2	217953	3	87SOM/BAI

TABLE 2. Energy levels of K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
$3p^54p(^3S_1)nl$	°	1/2,3/2	217976	3	87SOM/BAI
$3p^54p(^3S_1)nl$	°	1/2,3/2	217998	3	87SOM/BAI
$3p^54p(^3S_1)nl$	°	1/2,3/2	218016	3	87SOM/BAI
$3p^54p(^3S_1)nl$	°	1/2,3/2	218033	3	87SOM/BAI
$3p^54p(^3S_1)nl$	°	1/2,3/2	218049	3	87SOM/BAI
$3p^54p(^3S_1)nl$	°	1/2,3/2	218062	3	87SOM/BAI
$3p^54pnl$	°	1/2,3/2	219733	3	87SOM/BAI
$3p^54pnl$	°	1/2,3/2	220248	3	87SOM/BAI
$3p^54pnl$	°	1/2,3/2	220426	3	87SOM/BAI
$3p^54pnl$	°	1/2,3/2	220523	3	87SOM/BAI
$3p^54pnl$	°	1/2,3/2	220709	3	87SOM/BAI
$3p^53d(^1P^\circ_1)11s$	$^2P^\circ$	1/2,3/2	235452	4	87SOM/BAI
$3p^53d(^1P^\circ_1)12s$	$^2P^\circ$	1/2,3/2	235723	4	87SOM/BAI
$3p^53d(^1P^\circ_1)13s$	$^2P^\circ$	1/2,3/2	235926	4	87SOM/BAI
$3p^53d(^1P^\circ_1)14s$	$^2P^\circ$	1/2,3/2	236070	4	87SOM/BAI
$3p^53d(^1P^\circ_1)15s$	$^2P^\circ$	1/2,3/2	236198	4	87SOM/BAI
$3p^53d(^1P^\circ_1)16s$	$^2P^\circ$	1/2,3/2	236300	4	87SOM/BAI
$3p^53d(^1P^\circ_1)17s$	$^2P^\circ$	1/2,3/2	236383	4	87SOM/BAI
$3p^53d(^1P^\circ_1)18s$	$^2P^\circ$	1/2,3/2	236457	4	87SOM/BAI
$3p^53d(^1P^\circ_1)19s$	$^2P^\circ$	1/2,3/2	236517	4	87SOM/BAI
$3p^53d(^1P^\circ_1)20s$	$^2P^\circ$	1/2,3/2	236569	4	87SOM/BAI
$3p^53d(^1P^\circ_1)21s$	$^2P^\circ$	1/2,3/2	236612	4	87SOM/BAI
$3p^53d(^1P^\circ_1)22s$	$^2P^\circ$	1/2,3/2	236649	4	87SOM/BAI
$3p^53d(^1P^\circ_1)23s$	$^2P^\circ$	1/2,3/2	236678	4	87SOM/BAI
K II ($3p^53d\ ^1P^\circ_1$)	*Limit*	···	236967.4	0.2	07PET/EKB
$3p^54d(^1P)nl$			245843	4	87SOM/BAI

TABLE 3. Energy levels of ^{39}K I

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference	Hyperfine Constants A (MHz)	Hyperfine Constants B (MHz)	Hyperfine reference
$3p^64s$	^2S	1/2	0.000000			230.85986(2)		75BEL/HOL
$3p^64p$	$^2P^\circ$	1/2	12985.185195	0.000002	06FAL/TIE	27.78(4)		06FAL/TIE
		3/2	13042.895496	0.000004	06FAL/TIE	6.093(25)	2.79(7)	06FAL/TIE
$3p^65s$	^2S	1/2	21026.			55.5(6)		73GUP/HAP
$3p^63d$	^2D	5/2	21534.			0.62(4)	<0.3	97SIE/STO
		3/2	21536.			0.96(4)	0.37(8)	97SIE/STO

TABLE 3. Energy levels of ^{39}K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference	Hyperfine Constants A (MHz)	Hyperfine Constants B (MHz)	Hyperfine reference
$3p^6 5p$	$^2P°$	1/2	24701.382	0.03	83LOR/NIE	8.99(15)		61FOX/SER
		3/2	24720.139	0.03	83LOR/NIE	1.973(12)	0.870(17)	71SVA
$3p^6 6s$	^2S	1/2	27450.7104	0.003	83THO/OSU	21.81(18)		73GUP/HAP
$3p^6 6p$	$^2P°$	1/2	28999.27	0.03	83LOR/NIE	4.05(7)		75BEL/HOL
		3/2	29007.71	0.03	83LOR/NIE	0.886(8)	0.370(15)	71SVA
$3p^6 5d$	^2D	5/2	30185.2439	0.003	83THO/OSU	±0.24(7)		75BEL/HOL
		3/2	30185.7476	0.003	83THO/OSU	±0.44(10)		75BEL/HOL
$3p^6 7s$	^2S	1/2	30274.2487	0.003	83THO/OSU	10.78(5)		75BEL/HOL
$3p^6 7p$	$^2P°$	1/2	31069.90	0.03	83LOR/NIE	2.18(5)		75BEL/HOL
		3/2	31074.40	0.03	83LOR/NIE	0.49(2)		75BEL/HOL
$3p^6 6d$	^2D	5/2	31695.9005	0.003	83THO/OSU	−0.12(4)		85GLO/KRA
		3/2	31696.1661	0.003	83THO/OSU	0.25(1)	0.05(2)	85GLO/KRA
$3p^6 8s$	^2S	1/2	31765.3767	0.003	83THO/OSU	5.99(8)		75BEL/HOL
$3p^6 8p$	$^2P°$	1/2	32227.44	0.03	83LOR/NIE			
		3/2	32230.11	0.03	83LOR/NIE			
$3p^6 7d$	^2D	5/2	32598.2881	0.0007	81LOR/NIE			
		3/2	32598.4437	0.0007	81LOR/NIE			
$3p^6 9s$	^2S	1/2	32648.3511	0.0007	81LOR/NIE			
$3p^6 9p$	$^2P°$	1/2	32940.203	0.003	83LOR/NIE			
		3/2	32941.926	0.003	83LOR/NIE			
$3p^6 8d$	^2D	5/2	33178.1339	0.0007	81LOR/NIE			
		3/2	33178.2324	0.0007	81LOR/NIE			
$3p^6 10s$	^2S	1/2	33214.2267	0.0007	81LOR/NIE			
$3p^6 10p$	$^2P°$	1/2	33410.231	0.003	83LOR/NIE			
		3/2	33411.399	0.003	83LOR/NIE			
$3p^6 9d$	^2D	5/2	33572.0592	0.0007	81LOR/NIE			
		3/2	33572.1249	0.0007	81LOR/NIE			
$3p^6 11s$	^2S	1/2	33598.5597	0.0007	81LOR/NIE			
$3p^6 11p$	$^2P°$	1/2	33736.498	0.003	83LOR/NIE			
		3/2	33737.328	0.003	83LOR/NIE			
$3p^6 10d$	^2D	5/2	33851.5956	0.0007	81LOR/NIE			
		3/2	33851.6418	0.0007	81LOR/NIE			
$3p^6 12s$	^2S	1/2	33871.4788	0.0007	81LOR/NIE			
$3p^6 12p$	$^2P°$	1/2	33972.206	0.003	83LOR/NIE			
		3/2	33972.815	0.003	83LOR/NIE			
$3p^6 11d$	^2D	5/2	34057.0051	0.0007	81LOR/NIE			
		3/2	34057.0385	0.0007	81LOR/NIE			
$3p^6 13s$	^2S	1/2	34072.2393	0.0007	81LOR/NIE			
$3p^6 13p$	$^2P°$	1/2	34148.028	0.003	83LOR/NIE			
		3/2	34148.486	0.003	83LOR/NIE			

TABLE 3. Energy levels of ^{39}K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference	Hyperfine Constants A (MHz)	Hyperfine Constants B (MHz)	Hyperfine reference
$3p^6 12d$	^2D	5/2	34212.3139	0.0007	81LOR/NIE			
		3/2	34212.3393	0.0007	81LOR/NIE			
$3p^6 14s$	^2S	1/2	34224.2113	0.0007	81LOR/NIE			
$3p^6 14p$	$^2P°$	1/2	34282.657	0.003	83LOR/NIE			
		3/2	34283.018	0.003	83LOR/NIE			
$3p^6 13d$	^2D	5/2	34332.5627	0.0007	81LOR/NIE			
		3/2	34332.5823	0.0007	81LOR/NIE			
$3p^6 15s$	^2S	1/2	34342.0150	0.0007	81LOR/NIE			
$3p^6 15p$	$^2P°$	1/2	34388.032	0.003	83LOR/NIE			
		3/2	34388.315	0.003	83LOR/NIE			
$3p^6 14d$	^2D	5/2	34427.5513	0.0007	81LOR/NIE			
		3/2	34427.5667	0.0007	81LOR/NIE			
$3p^6 16s$	^2S	1/2	34435.1762	0.0007	81LOR/NIE			
$3p^6 16p$	$^2P°$	1/2	34472.050	0.003	83LOR/NIE			
		3/2	34472.280	0.003	83LOR/NIE			
$3p^6 15d$	^2D	5/2	34503.8844	0.0007	81LOR/NIE			
		3/2	34503.8967	0.0007	81LOR/NIE			
$3p^6 17s$	^2S	1/2	34510.1190	0.0007	81LOR/NIE			
$3p^6 17p$	$^2P°$	1/2	34540.125	0.003	83LOR/NIE			
		3/2	34540.309	0.003	83LOR/NIE			
$3p^6 16d$	^2D	5/2	34566.1420	0.0007	81LOR/NIE			
		3/2	34566.1522	0.0007	81LOR/NIE			
$3p^6 18s$	^2S	1/2	34571.3017	0.0007	81LOR/NIE			
$3p^6 18p$	$^2P°$	1/2	34596.045	0.003	83LOR/NIE			
		3/2	34596.200	0.003	83LOR/NIE			
$3p^6 17d$	^2D	5/2	34617.5815	0.0007	81LOR/NIE			
		3/2	34617.5899	0.0007	81LOR/NIE			
$3p^6 19s$	^2S	1/2	34621.8976	0.0007	81LOR/NIE			
$3p^6 19p$	$^2P°$	3/2	34642.670	0.003	83LOR/NIE			
$3p^6 18d$	^2D	5/2	34660.5702	0.0007	81LOR/NIE			
		3/2	34660.5772	0.0007	81LOR/NIE			
$3p^6 20s$	^2S	1/2	34664.2161	0.0007	81LOR/NIE			
$3p^6 20p$	$^2P°$	3/2	34681.722	0.003	83LOR/NIE			
$3p^6 19d$	^2D	5/2	34696.8629	0.0007	81LOR/NIE			
		3/2	34696.8689	0.0007	81LOR/NIE			
$3p^6 21s$	^2S	1/2	34699.9692	0.0007	81LOR/NIE			
$3p^6 21p$	$^2P°$	3/2	34714.865	0.003	83LOR/NIE			
$3p^6 20d$	^2D	5/2	34727.7798	0.0007	81LOR/NIE			
		3/2	34727.7849	0.0007	81LOR/NIE			
$3p^6 22s$	^2S	1/2	34730.4476	0.0007	81LOR/NIE			

TABLE 3. Energy levels of ^{39}K I—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference	Hyperfine Constants A (MHz)	Hyperfine Constants B (MHz)	Hyperfine reference
$3p^6 21d$	^2D	5/2	34754.3327	0.0007	81LOR/NIE			
		3/2	34754.3371	0.0007	81LOR/NIE			
$3p^6 23s$	^2S	1/2	34756.6407	0.0007	81LOR/NIE			
$3p^6 22d$	^2D	5/2	34777.3058	0.0007	81LOR/NIE			
		3/2	34777.3096	0.0007	81LOR/NIE			
$3p^6 24s$	^2S	1/2	34779.3147	0.0007	81LOR/NIE			
$3p^6 23d$	^2D	5/2	34797.3141	0.0007	81LOR/NIE			
		3/2	34797.3174	0.0007	81LOR/NIE			
$3p^6 25s$	^2S	1/2	34799.0740	0.0007	81LOR/NIE			
$3p^6 24d$	^2D	5/2	34814.8472	0.0007	81LOR/NIE			
		3/2	34814.8502	0.0007	81LOR/NIE			
$3p^6 26s$	^2S	1/2	34816.3971	0.0007	81LOR/NIE			
$3p^6 25d$	^2D	5/2	34830.2969	0.0007	81LOR/NIE			
		3/2	34830.2994	0.0007	81LOR/NIE			
$3p^6 27s$	^2S	1/2	34831.6690	0.0007	81LOR/NIE			
$3p^6 26d$	^2D	5/2	34843.9804	0.0007	81LOR/NIE			
		3/2	34843.9827	0.0007	81LOR/NIE			
$3p^6 28s$	^2S	1/2	34845.2004	0.0007	81LOR/NIE			
$3p^6 27d$	^2D	5/2	34856.1570	0.0007	81LOR/NIE			
		3/2	34856.1590	0.0007	81LOR/NIE			
$3p^6 29s$	^2S	1/2	34857.2470	0.0007	81LOR/NIE			
$3p^6 28d$	^2D	5/2	34867.0404	0.0007	81LOR/NIE			
		3/2	34867.0423	0.0007	81LOR/NIE			
$3p^6 30s$	^2S	1/2	34868.0180	0.0007	81LOR/NIE			
$3p^6 29d$	^2D	5/2	[34876.8070]		81LOR/NIE			
		3/2	[34876.8087]		81LOR/NIE			
$3p^6 31s$	^2S	1/2	[34877.6871]		81LOR/NIE			
$3p^6 30d$	^2D	5/2	34885.6048	0.0007	81LOR/NIE			
		3/2	34885.6062	0.0007	81LOR/NIE			
$3p^6 32s$	^2S	1/2	34886.3999	0.0007	81LOR/NIE			
$3p^6 31d$	^2D	5/2	[34893.5578]		81LOR/NIE			
		3/2	[34893.5591]		81LOR/NIE			
$3p^6 33s$	^2S	1/2	[34894.2785]		81LOR/NIE			
$3p^6 32d$	^2D	5/2	34900.7707	0.0007	81LOR/NIE			
		3/2	34900.7719	0.0007	81LOR/NIE			
$3p^6 34s$	^2S	1/2	34901.4264	0.0007	81LOR/NIE			
K II ($3p^6\ ^1S_0$)	*Limit*	—	35009.8140	0.0007	81LOR/NIE			

TABLE 4. Energy levels of ^{40}K I

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference	Hyperfine constants A (MHz)	Hyperfine constants B (MHz)	Hyperfine reference
$3p^6 4s$	^{2}S	1/2	0.000000			−285.731(2)		52EIS/BED
$3p^6 4p$	^{2}P°	1/2	12985.189386	0.000002	06FAL/TIE	−34.523(25)		06FAL/TIE
		3/2	13042.899700	0.000003	06FAL/TIE	−7.585(10)	−3.44(9)	06FAL/TIE

TABLE 5. Energy levels of ^{41}K I

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference	Hyperfine constants A (MHz)	Hyperfine constants B (MHz)	Hyperfine reference
$3p^6 4s$	^{2}S	1/2	0.0000			127.006936(1)		74BEC/BOK
$3p^6 4p$	^{2}P°	1/2	12985.193050	0.000002	06FAL/TIE	15.245(42)		06FAL/TIE
		3/2	13042.903375	0.000004	06FAL/TIE	3.363(25)	3.35(7)	06FAL/TIE
$3p^6 5s$	^{2}S	1/2	21026.			30.75(75)		73GUP/HAP
$3p^6 3d$	^{2}D	5/2	21534.			0.40(2)	<0.2	97SIE/STO
		3/2	21536.			0.55(3)	0.51(8)	97SIE/STO
$3p^6 6s$	^{2}S	1/2	27450.			12.03(40)		73GUP/HAP
$3p^6 6d$	^{2}D	3/2	31696.			±0.14(2)	±0.05(2)	85GLO/KRA2

7.2. K II

Ar isoelectronic sequence

Ground state $1s^2 2s^2 2p^6 3s^2 3p^6\ ^1S_0$

Ionization energy 255 072.8(1.5) cm^{-1}
31.6250(2) eV

The analysis of the K II spectrum rests largely upon the early experimental studies of de Bruin [26DEB], Bowen [28BOW], and Ekefors [31EKE]. de Bruin measured the spectrum from 2000 to 7700 Å and determined the location of most levels in the $3p^5 4s$, $3p^5 3d$, $3p^5 4p$, $3p^5 4d$, and $3p^5 5s$ configurations. Bowen's observations in the region around 600 Å established the separation between the ground state and four of the lowest excited states. The measurements of Ekefors produced wavelengths from 150 to 1040 Å for several ionization stages of potassium, including many of the K II resonance lines.

Comparison of the observations with theoretical calculations has enabled the assignment of configuration names to the observed levels. Mansfield [74MAN] obtained the leading percentages and designations for the levels up through $3p^5 4d$, except $3p^5 3d\ ^1P_1$ and $3p^5 4d\ ^1P_1$. His identifications were also retained by Sugar and Corliss [85SUG/COR2] in their compilation of energy levels. As discussed by Hansen [72HAN], the calculation of the $3d$ and $4d\ ^1P_1$ levels is particularly difficult and requires the use of *LS* term dependent calculations to obtain results close to the experimentally observed data. A thorough reanalysis of the K II spectrum, based on over 120 newly reported lines, as well as the prior data, was recently completed by Pettersen *et al.* [07PET/EKB]. Their values for wavelengths, levels, classifications, and leading percentages are retained in Tables 6 and 7, where available. For the calculated energy levels (indicated by being enclosed in parentheses) an indication of the accuracy is the mean error of the least squares fit for experimentally determined levels. This is given by Pettersen *et al.* [07PET/EKB] as 24 cm^{-1} for even levels and 263 cm^{-1} for odd ones.

In an investigation of the photo absorption spectrum of K II, van Kampen *et al.* [95VAN/KIE] observed transitions to $J=1$ levels up to $8s$ and $8d$. They assigned the line at 443.0 Å to the resonance transition from the $3p^5 4d\ ^1P_1$ level. However, the later research of Pettersen *et al.* [07PET/EKB] casts serious doubts on the upper level and we have left the line unclassified.

The ionization energy cited above was determined by Pettersen *et al.* [07PET/EKB] from the $J=5$ levels of the $3p^5 nf$ configurations with $n=4$, 5, and 6. The g values listed in the energy level table with uncertainties are those measured by Semenov [65SEM]. Where Semenov's [65SEM] values are not available those calculated by Pettersen *et al.* [07PET/EKB] are given and enclosed in parentheses to indicate that they are calculated values.

The transition probabilities retained here are primarily from the relativistic Hartree–Fock calculations of Pettersen *et al.* [07PET/EKB]. Values for many of those transitions have also been obtained by Smirnov and Shapochkin [79SMI/SHA], who used experimental lifetimes from Andersen *et al.* [70AND/DES] and Kumar *et al.* [73KUM/ASS] and observed line intensities. For the shorter wavelengths Henderson *et al.* [97HEN/CUR] measured lifetimes of the $3p^5 4s\ ^3P_1$, $^1P_1$ and $3p^5 3d\ ^3P_1$ levels using foil excitation of a fast ion beam with a 20% estimated uncertainty. These lifetimes were used to produce the transition probabilities ascribed to Henderson *et al.* [97HEN/CUR] in Table 6. Below 670 Å values calculated by Ghosh *et al.* [93GHO/DAS] are included.

Although autoionizing states for K II are not compiled here, it should be noted that Aizawa *et al.* [85AIZ/WAK] have observed levels of the $3s3p^64s$, $3d$, $4p$, and $5s$ configurations, as well as $3p^44s^2$ and $3d4s$.

References for K II

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28BOW Bowen, I. S., Phys. Rev. **31**, 497 (1928).

31EKE Ekefors, E., Z. Phys. **71**, 53 (1931).

65SEM Semenov, R. I., Opt. Spect. **19**, 552 (1965).

70AND/DES Andersen, T., Desesquelles, J., Jessen, K. A., and Sorenson, G., J. Opt. Soc. Am. **60**, 1199 (1970).

72HAN Hansen, J. E., J. Phys. B **5**, 1083 (1972).

73KUM/ASS Kumar, C. K., Assousa, G. E., Brown, L., and Ford, W. K., Jr., Phys. Rev. A **7**, 112 (1973).

74MAN Mansfield, M. W. D., Proc. R. Soc. London, Ser. A **341**, 277 (1974).

79SMI/SHA Smirnov, Y. M., and Shapochkin, M. B., Opt. Spectrosc. **47**, 6 (1979).

85AIZ/WAK Aizawa, H., Wakiya, W., Suzuki, H., Koike, F., and Sasaki, F., J. Phys. B **18**, 289 (1985).

85SUG/COR2 Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 26 (1985).

93GHO/DAS Ghosh, T. K., Das, A. K., Castro, M., Canuto, S., and Mukherjee, P. K., Phys. Rev. A **48**, 2686 (1993).

95VAN/KIE van Kampen, P., Kiernan, L., Costello, J. T., Kennedy, E. T., van der Mullen, J. A. M., and O'Sullivan, G., J. Phys. B **28**, 4771 (1995).

97HEN/CUR Henderson, M., Curtis, L. J., Matulioniene, R., and Ellis, D. G., Phys. Rev. A **55**, 2723 (1997).

07PET/EKB Pettersen, K., Ekberg, J. O., Martinson, I., and Reader, J., Phys. Scr. **75**, 702 (2007).

TABLE 6. Observed spectral lines of K II

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum									
261.03	0.02	383100	5					31EKE	
261.20	0.02	382850	5					31EKE	
398.63	0.02	250859	15			$3p^6\ ^1S_0$	$3p^58d\ (1/2,3/2)^\circ_1$	31EKE	
400.9	0.7	249500				$3p^6\ ^1S_0$	$3p^58d\ (3/2,3/2)^\circ_1$	95VAN/KIE	
403.9	0.7	247600				$3p^6\ ^1S_0$	$3p^58d\ (3/2,5/2)^\circ_1$	95VAN/KIE	
405.6	0.7	246600			1.3E+9	$3p^6\ ^1S_0$	$3p^57d\ (1/2,3/2)^\circ_1$	95VAN/KIE	93GHO/DAS
406.8	0.7	245800				$3p^6\ ^1S_0$	$3p^58s\ (1/2,1/2)^\circ_1$	95VAN/KIE	
408.1	0.7	245000				$3p^6\ ^1S_0$	$3p^57d\ (3/2,5/2)^\circ_1$	95VAN/KIE	
409.6	0.7	244100				$3p^6\ ^1S_0$	$3p^57d\ (3/2,3/2)^\circ_1$	95VAN/KIE	
410.3	0.7	243700				$3p^6\ ^1S_0$	$3p^58s\ (3/2,1/2)^\circ_1$	95VAN/KIE	
411.8	0.7	242900			2.6E+9	$3p^6\ ^1S_0$	$3p^56d\ (1/2,3/2)^\circ_1$	95VAN/KIE	93GHO/DAS
414.9	0.7	241000		b	2.2E+8	$3p^6\ ^1S_0$	$3p^57s\ (1/2,1/2)^\circ_1$	95VAN/KIE	93GHO/DAS
414.9	0.7	241000		b		$3p^6\ ^1S_0$	$3p^56d\ (3/2,5/2)^\circ_1$	95VAN/KIE	
417.3	0.7	239600				$3p^6\ ^1S_0$	$3p^56d\ (3/2,3/2)^\circ_1$	95VAN/KIE	
418.4	0.7	239000				$3p^6\ ^1S_0$	$3p^57s\ (3/2,1/2)^\circ_1$	95VAN/KIE	
422.0	0.7	237000			4.0E+9	$3p^6\ ^1S_0$	$3p^55d\ (1/2,3/2)^\circ_1$	95VAN/KIE	93GHO/DAS
428.0	0.7	233700				$3p^6\ ^1S_0$	$3p^55d\ (3/2,5/2)^\circ_1$	95VAN/KIE	
429.9	0.7	232600				$3p^6\ ^1S_0$	$3p^56s\ (1/2,1/2)^\circ_1$	95VAN/KIE	
431.5	0.8	231700				$3p^6\ ^1S_0$	$3p^55d\ (3/2,3/2)^\circ_1$	95VAN/KIE	
433.8	0.8	230500				$3p^6\ ^1S_0$	$3p^56s\ (3/2,1/2)^\circ_1$	95VAN/KIE	
441.81	0.02	225337	25					31EKE	
443.0	0.8	225800						95VAN/KIE	
447.6		223400						95VAN/KIE	
457.0	0.8	218800				$3p^6\ ^1S_0$	$3p^54d\ ^3D^\circ_1$	95VAN/KIE	
464.2	0.9	215400				$3p^6\ ^1S_0$	$3p^54d\ ^3P^\circ_1$	95VAN/KIE	
465.08	0.02	215018	5		1.0E+9	$3p^6\ ^1S_0$	$3p^5(^2P^\circ_{1/2})5s\ 1/2[1/2]^\circ_1$	31EKE	93GHO/DAS
469.5	0.9	213000				$3p^6\ ^1S_0$	$3p^5(^2P^\circ_{3/2})5s\ 3/2[3/2]^\circ_1$	95VAN/KIE	
476.03	0.02	210071	10					31EKE	
482.11	0.02	207423	10					31EKE	
482.41	0.02	207293	10					31EKE	

TABLE 6. Observed spectral lines of K 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.
495.153	0.002	201957.8	15		6.7E+10	$3p^6\ ^1S_0$	$3p^53d\ ^1P^\circ_1$	07PET/EKB	97HEN/CUR
523.79	0.02	190916	25					31EKE	
527.06	0.02	189730	10					31EKE	
546.12	0.02	183109	15					31EKE	
550.32	0.02	181712	5					31EKE	
554.175	0.002	180448.4	30		1.06E+7	$3p^6\ ^1S_0$	$3p^53d\ ^3D^\circ_1$	07PET/EKB	97HEN/CUR
574.63	0.02	174024	5					31EKE	
600.755	0.002	166457.2	50		2.3E+9	$3p^6\ ^1S_0$	$3p^54s\ ^1P^\circ_1$	07PET/EKB	97HEN/CUR
607.932	0.002	164492.1	60		4.2E+8	$3p^6\ ^1S_0$	$3p^53d\ ^3P^\circ_1$	07PET/EKB	97HEN/CUR
612.625	0.002	163232.0	65		1.2E+8	$3p^6\ ^1S_0$	$3p^54s\ ^3P^\circ_1$	07PET/EKB	97HEN/CUR
1247.036	0.010	80190.1	5		6.88E+5	$3p^54s\ ^3P^\circ_2$	$3p^56f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1258.385	0.010	79466.9	2		8.68E+7	$3p^54s\ ^3P^\circ_1$	$3p^56f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
1261.664	0.010	79260.4	2		2.08E+8	$3p^53d\ ^3P^\circ_0$	$3p^56f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1278.623	0.010	78209.1	5		3.11E+8	$3p^53d\ ^3P^\circ_1$	$3p^56f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
1284.628	0.010	77843.5	8		5.46E+8	$3p^53d\ ^3P^\circ_2$	$3p^56f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1285.786	0.010	77773.4	2		1.41E+8	$3p^53d\ ^3P^\circ_2$	$3p^56f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
1298.693	0.010	77000.5	8		2.05E+6	$3p^54s\ ^3P^\circ_2$	$3p^55f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1338.358	0.010	74718.4	2		8.85E+6	$3p^54s\ ^3P^\circ_2$	$3p^55f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
1340.909	0.010	74576.3	5		7.43E+6	$3p^53d\ ^3P^\circ_2$	$3p^55f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1341.233	0.010	74558.3	15		1.04E+8	$3p^53d\ ^3P^\circ_2$	$3p^55f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
1349.075	0.010	74124.9	15		1.02E+7	$3p^54s\ ^3P^\circ_1$	$3p^55f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1351.844	0.010	73973.0	10		2.76E+7	$3p^54s\ ^3P^\circ_1$	$3p^55f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1355.513	0.010	73772.8	20		8.08E+7	$3p^53d\ ^3P^\circ_0$	$3p^55f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1374.990	0.010	72727.8	25		8.35E+7	$3p^53d\ ^3P^\circ_1$	$3p^55f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
1375.243	0.010	72714.4	40		4.32E+7	$3p^53d\ ^3P^\circ_1$	$3p^55f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1375.903	0.010	72679.5	20		1.63E+9	$3p^53d\ ^3F^\circ_4$	$3p^56f\ 3/2[9/2]_5$	07PET/EKB	07PET/EKB
1381.009	0.010	72410.8	20		1.86E+8	$3p^53d\ ^3P^\circ_2$	$3p^55f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1387.732	0.010	72060.0	5		6.19E+6	$3p^54s\ ^3P^\circ_0$	$3p^55f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1389.285	0.010	71979.5	8*	b	1.28E+8	$3p^53d\ ^3F^\circ_3$	$3p^56f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
1389.285	0.010	71979.5	8*	b	1.27E+8	$3p^53d\ ^3F^\circ_3$	$3p^56f\ 3/2[7/2]_4$	07PET/EKB	07PET/EKB
1389.970	0.010	71944.0	1		9.32E+6	$3p^53d\ ^3F^\circ_3$	$3p^56f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1390.803	0.010	71900.9	10		6.59E+8	$3p^53d\ ^3F^\circ_3$	$3p^56f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
1403.544	0.010	71248.2	1		3.49E+6	$3p^53d\ ^3F^\circ_2$	$3p^56f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1456.525	0.010	68656.6	15		2.52E+8	$3p^53d\ ^3F^\circ_3$	$3p^55f\ 1/2[7/2]_4$	07PET/EKB	07PET/EKB
1471.388	0.010	67963.0	25		4.32E+8	$3p^53d\ ^3F^\circ_2$	$3p^55f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
1484.555	0.010	67360.3	25		3.84E+6	$3p^53d\ ^3F^\circ_4$	$3p^55f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
1486.113	0.010	67289.6	3		6.81E+6	$3p^53d\ ^3F^\circ_4$	$3p^55f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1487.609	0.010	67222.0	40		1.15E+9	$3p^53d\ ^3F^\circ_4$	$3p^55f\ 3/2[9/2]_5$	07PET/EKB	07PET/EKB
1492.040	0.010	67022.3	15		2.81E+6	$3p^54s\ ^3P^\circ_2$	$3p^54f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1492.450	0.010	67003.9	15		3.98E+7	$3p^54s\ ^3P^\circ_2$	$3p^54f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
1503.177	0.010	66525.8	5		7.25E+6	$3p^53d\ ^3F^\circ_3$	$3p^55f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1503.581	0.010	66507.9	6		2.27E+7	$3p^53d\ ^3F^\circ_3$	$3p^55f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1505.024	0.010	66444.1	10		5.40E+8	$3p^53d\ ^3F^\circ_3$	$3p^55f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
1508.465	0.010	66292.6	10		2.92E+7	$3p^54s\ ^3P^\circ_1$	$3p^54f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1517.777	0.010	65885.8	15		2.41E+8	$3p^53d\ ^3F^\circ_2$	$3p^55f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
1518.974	0.010	65833.9	6		4.31E+7	$3p^53d\ ^3F^\circ_2$	$3p^55f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1519.379	0.010	65816.4	3		2.63E+6	$3p^53d\ ^3F^\circ_2$	$3p^55f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1522.492	0.010	65681.8	7		2.33E+6	$3p^53d\ ^3F^\circ_2$	$3p^55f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1537.685	0.010	65032.8	15		8.17E+7	$3p^53d\ ^3P^\circ_1$	$3p^54f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1548.479	0.010	64579.5	50		5.00E+8	$3p^53d\ ^3P^\circ_2$	$3p^54f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
1570.629	0.010	63668.8	40		2.96E+8	$3p^53d\ ^3P^\circ_0$	$3p^54f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1576.698	0.010	63423.7	5*	b	7.11E+7	$3p^53d\ ^1D^\circ_2$	$3p^56f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1576.698	0.010	63423.7	5*	b	3.49E+6	$3p^53d\ ^1D^\circ_2$	$3p^56f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1576.898	0.010	63415.6	10		6.31E+8	$3p^53d\ ^3D^\circ_3$	$3p^56f\ 3/2[7/2]_4$	07PET/EKB	07PET/EKB
1577.804	0.010	63379.2	1*	b	1.21E+6	$3p^53d\ ^3D^\circ_3$	$3p^56f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1577.804	0.010	63379.2	1*	b	1.15E+6	$3p^53d\ ^3D^\circ_3$	$3p^56f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1578.869	0.010	63336.5	6		1.63E+8	$3p^53d\ ^3D^\circ_3$	$3p^56f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB

TABLE 6. Observed spectral lines of K 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.
1590.453	0.010	62875.2	15		1.00E+8	$3p^53d\ ^3P^\circ_1$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1596.643	0.010	62631.4	40		4.04E+8	$3p^53d\ ^3P^\circ_1$	$3p^54f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
1597.217	0.010	62608.9	65		2.10E+8	$3p^53d\ ^3P^\circ_1$	$3p^54f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1601.544	0.010	62439.7	7		4.31E+7	$3p^53d\ ^3P^\circ_2$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1602.137	0.010	62416.6	75		8.69E+8	$3p^53d\ ^3P^\circ_2$	$3p^54f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1603.115	0.010	62378.6	5		2.06E+8	$3p^53d\ ^3D^\circ_2$	$3p^56f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1604.468	0.010	62326.0	7		1.63E+8	$3p^53d\ ^3D^\circ_1$	$3p^56f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1604.948	0.010	62307.3	2		4.82E+7	$3p^53d\ ^3D^\circ_2$	$3p^56f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
1607.833	0.010	62195.5	20		1.95E+8	$3p^53d\ ^3P^\circ_2$	$3p^54f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
1608.399	0.010	62173.6	15		1.95E+7	$3p^53d\ ^3P^\circ_2$	$3p^54f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
1609.959	0.010	62113.4	5		1.80E+8	$3p^53d\ ^1F^\circ_3$	$3p^56f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
1662.895	0.010	60136.1	12		4.34E+8	$3p^53d\ ^1D^\circ_2$	$3p^55f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
1691.754	0.010	59110.2	0		5.68E+7	$3p^53d\ ^3D^\circ_2$	$3p^55f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1692.213	0.010	59094.2	15		7.66E+8	$3p^53d\ ^3D^\circ_2$	$3p^55f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
1693.352	0.010	59054.5	20		4.26E+8	$3p^53d\ ^3D^\circ_1$	$3p^55f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1704.607	0.010	58664.5	75		6.94E+8	$3p^53d\ ^3F^\circ_3$	$3p^54f\ 1/2[7/2]_4$	07PET/EKB	07PET/EKB
1722.374	0.010	58059.4	15		7.83E+8	$3p^53d\ ^1D^\circ_2$	$3p^55f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
1723.800	0.010	58011.4	8		1.36E+9	$3p^53d\ ^3D^\circ_3$	$3p^55f\ 3/2[7/2]_4$	07PET/EKB	07PET/EKB
1723.912	0.010	58007.6	10		1.66E+8	$3p^53d\ ^1D^\circ_2$	$3p^55f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1724.070	0.010	58002.3	8		7.17E+7	$3p^53d\ ^3F^\circ_2$	$3p^54f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1724.439	0.010	57989.9	10		8.00E+6	$3p^53d\ ^1D^\circ_2$	$3p^55f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1724.602	0.010	57984.4	6		4.01E+6	$3p^53d\ ^3F^\circ_2$	$3p^54f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
1727.722	0.010	57879.7	10		4.29E+8	$3p^53d\ ^3D^\circ_3$	$3p^55f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
1741.002	0.010	57438.2	50		3.23E+8	$3p^53d\ ^3F^\circ_4$	$3p^54f\ 3/2[7/2]_4$	07PET/EKB	07PET/EKB
1748.832	0.010	57181.0	15		7.04E+7	$3p^53d\ ^3F^\circ_4$	$3p^54f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
1748.962	0.010	57176.8	70		2.92E+9	$3p^53d\ ^3F^\circ_4$	$3p^54f\ 3/2[9/2]_5$	07PET/EKB	07PET/EKB
1753.902	0.010	57015.7	4		7.19E+5	$3p^53d\ ^3D^\circ_2$	$3p^55f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
1755.504	0.010	56963.7	3		1.46E+7	$3p^53d\ ^3D^\circ_2$	$3p^55f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1757.231	0.010	56907.7	12		3.56E+8	$3p^53d\ ^3D^\circ_1$	$3p^55f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1765.025	0.010	56656.4	25*	b	5.57E+8	$3p^53d\ ^1F^\circ_3$	$3p^55f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
1765.025	0.010	56656.4	25*	b	2.88E+8	$3p^53d\ ^3F^\circ_3$	$3p^54f\ 3/2[7/2]_4$	07PET/EKB	07PET/EKB
1765.115	0.010	56653.5	25		2.37E+8	$3p^53d\ ^3F^\circ_3$	$3p^54f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
1768.786	0.010	56536.0	3		1.62E+7	$3p^53d\ ^3F^\circ_3$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1769.511	0.010	56512.8	8		4.58E+7	$3p^53d\ ^3F^\circ_3$	$3p^54f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
1773.060	0.010	56399.7	35		1.26E+9	$3p^53d\ ^3F^\circ_3$	$3p^54f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
1786.909	0.010	55962.6	50		6.15E+8	$3p^53d\ ^3F^\circ_2$	$3p^54f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
1790.679	0.010	55844.7	20		8.31E+7	$3p^53d\ ^3F^\circ_2$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
1993.007	0.010	50175.4	7		1.23E+7	$3p^53d\ ^1D^\circ_2$	$3p^54f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
1993.714	0.010	50157.6	15		4.16E+6	$3p^53d\ ^1D^\circ_2$	$3p^54f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
1994.285	0.010	50143.3	25		7.14E+8	$3p^53d\ ^1D^\circ_2$	$3p^54f\ 1/2[7/2]_3$	07PET/EKB	07PET/EKB
1995.557	0.010	50111.3	2		4.85E+6	$3p^53d\ ^3D^\circ_3$	$3p^54f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
Air									
2034.679	0.010	49132.0	5		8.81E+7	$3p^53d\ ^3D^\circ_2$	$3p^54f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
2035.408	0.010	49114.4	50		1.20E+9	$3p^53d\ ^3D^\circ_2$	$3p^54f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
2036.014	0.010	49099.8	10		3.89E+5	$3p^53d\ ^3D^\circ_2$	$3p^54f\ 1/2[7/2]_3$	07PET/EKB	07PET/EKB
2037.005	0.010	49075.9	45		6.74E+8	$3p^53d\ ^3D^\circ_1$	$3p^54f\ 1/2[5/2]_2$	07PET/EKB	07PET/EKB
2044.832	0.010	48888.1	10		7.49E+7	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 1/2[5/2]_3$	07PET/EKB	07PET/EKB
2045.283	0.010	48877.3	40		1.80E+9	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 1/2[7/2]_4$	07PET/EKB	07PET/EKB
2045.430	0.010	48873.8	15		7.78E+7	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 1/2[7/2]_3$	07PET/EKB	07PET/EKB
2076.798	0.010	48135.7	60		9.73E+8	$3p^53d\ ^1D^\circ_2$	$3p^54f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
2078.694	0.010	48091.8	70		1.85E+9	$3p^53d\ ^3D^\circ_3$	$3p^54f\ 3/2[7/2]_4$	07PET/EKB	07PET/EKB
2081.885	0.010	48018.1	25		2.39E+8	$3p^53d\ ^1D^\circ_2$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
2082.891	0.010	47994.9	25		1.26E+7	$3p^53d\ ^1D^\circ_2$	$3p^54f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
2083.942	0.010	47970.7	15		3.79E+6	$3p^53d\ ^3D^\circ_3$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
2084.933	0.010	47947.9	60		3.69E+8	$3p^53d\ ^3D^\circ_3$	$3p^54f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
2089.855	0.010	47835.0	50		5.71E+8	$3p^53d\ ^3D^\circ_3$	$3p^54f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
2094.558	0.010	47727.6	4		2.27E+7	$3p^53d\ ^3D^\circ_3$	$3p^54f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB

TABLE 6. Observed spectral lines of K 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.
2122.827	0.010	47092.1	15		9.37E+5	$3p^53d\ ^3D^\circ_2$	$3p^54f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
2128.138	0.010	46974.6	15		1.66E+7	$3p^53d\ ^3D^\circ_2$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
2129.190	0.010	46951.4	40		4.61E+8	$3p^53d\ ^3D^\circ_2$	$3p^54f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
2130.687	0.010	46918.4	50		4.00E+8	$3p^53d\ ^3D^\circ_1$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
2132.947	0.010	46868.7	10		5.12E+7	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 3/2[7/2]_4$	07PET/EKB	07PET/EKB
2133.061	0.010	46866.2	10		1.09E+8	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 3/2[7/2]_3$	07PET/EKB	07PET/EKB
2138.427	0.010	46748.6	1		1.06E+7	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 3/2[5/2]_2$	07PET/EKB	07PET/EKB
2139.246	0.010	46730.7	20		1.64E+8	$3p^53d\ ^3D^\circ_2$	$3p^54f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
2139.494	0.010	46725.3	10		3.98E+7	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 3/2[5/2]_3$	07PET/EKB	07PET/EKB
2140.277	0.010	46708.2	7		1.62E+7	$3p^53d\ ^3D^\circ_2$	$3p^54f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
2141.823	0.010	46674.5	5		2.03E+7	$3p^53d\ ^3D^\circ_1$	$3p^54f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
2142.860	0.010	46651.9	15		8.69E+7	$3p^53d\ ^3D^\circ_1$	$3p^54f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
2144.699	0.010	46611.9	50		6.90E+8	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 3/2[9/2]_4$	07PET/EKB	07PET/EKB
2149.667	0.010	46504.2	0		2.99E+6	$3p^53d\ ^1F^\circ_3$	$3p^54f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
2190.00	0.03	45662.1	6					26DEB	
2210.53	0.03	45238.0	4					26DEB	
2265.04	0.03	44149.3	5					26DEB	
2296.79	0.03	43525.6	1					26DEB	
2342.30	0.03	42679.8	3					26DEB	
2358.70	0.03	42383.2	1					26DEB	
2504.60	0.03	39914.6	3					26DEB	
2743.55	0.03	36438.4	4					26DEB	
2777.89	0.03	35987.8	2		2.82E+7	$3p^54p\ ^3S_1$	$3p^54d\ ^3D^\circ_2$	26DEB	07PET/EKB
2808.99	0.03	35589.6	3					26DEB	
2950.88	0.03	33878.3	2					26DEB	
3030.48	0.03	32989.1	2					26DEB	
3047.16	0.03	32807.9	2		1.92E+7	$3p^54p\ ^3D_3$	$3p^54d\ ^3D^\circ_2$	26DEB	07PET/EKB
3062.18	0.03	32647.0	5		8.82E+8	$3p^54p\ ^3S_1$	$3p^54d\ ^3P^\circ_2$	26DEB	07PET/EKB
3075.00	0.03	32510.9	3		4.30E+7	$3p^54p\ ^3D_2$	$3p^54d\ ^3D^\circ_2$	26DEB	07PET/EKB
3105.00	0.03	32196.8	6		4.97E+8	$3p^54p\ ^3S_1$	$3p^54d\ ^3P^\circ_1$	26DEB	07PET/EKB
3142.75	0.03	31810.1	2		1.98E+8	$3p^54p\ ^3S_1$	$3p^5(^2P^\circ_{1/2})5s\ 1/2[1/2]^\circ_1$	26DEB	07PET/EKB
3157.15	0.03	31665.0	2		2.73E+7	$3p^54p\ ^3D_1$	$3p^54d\ ^3D^\circ_2$	26DEB	07PET/EKB
3171.81	0.03	31518.6	2		1.09E+8	$3p^54p\ ^3S_1$	$3p^5(^2P^\circ_{1/2})5s\ 1/2[1/2]^\circ_0$	26DEB	07PET/EKB
3190.07	0.03	31338.2	5		3.19E+8	$3p^54p\ ^3D_3$	$3p^54d\ ^3D^\circ_3$	26DEB	07PET/EKB
3220.60	0.03	31041.2	4*	b	2.52E+8	$3p^54p\ ^1D_2$	$3p^54d\ ^3D^\circ_2$	07PET/EKB	07PET/EKB
3220.60	0.03	31041.2	4*	b	1.79E+8	$3p^54p\ ^3D_2$	$3p^54d\ ^3D^\circ_3$	07PET/EKB	07PET/EKB
3258.81	0.03	30677.2	3		2.53E+7	$3p^54p\ ^3D_3$	$3p^54d\ ^3F^\circ_2$	26DEB	07PET/EKB
3290.65	0.03	30380.4	5		4.72E+8	$3p^54p\ ^3D_2$	$3p^54d\ ^3F^\circ_2$	26DEB	07PET/EKB
3301.60	0.03	30279.6	3		9.17E+6	$3p^53d\ ^3P^\circ_1$	$3p^54p\ ^1S_0$	26DEB	07PET/EKB
3337.67	0.03	29952.4	1		4.78E+5	$3p^54p\ ^1P_1$	$3p^54d\ ^3D^\circ_2$	26DEB	07PET/EKB
3356.51	0.03	29784.3	2		5.88E+7	$3p^54p\ ^3S_1$	$3p^5(^2P^\circ_{3/2})5s\ 3/2[3/2]^\circ_1$	26DEB	07PET/EKB
3380.62	0.03	29571.9	6		1.59E+9	$3p^54p\ ^1D_2$	$3p^54d\ ^3D^\circ_3$	26DEB	07PET/EKB
3384.86	0.03	29534.9	6*	b	1.10E+9	$3p^54p\ ^3D_1$	$3p^54d\ ^3F^\circ_2$	07PET/EKB	07PET/EKB
3384.86	0.03	29534.9	6*	b	5.25E+7	$3p^54p\ ^3P_2$	$3p^54d\ ^3D^\circ_2$	07PET/EKB	07PET/EKB
3392.63	0.03	29467.2	3		3.72E+7	$3p^54p\ ^3D_3$	$3p^54d\ ^3P^\circ_2$	26DEB	07PET/EKB
3404.24	0.03	29366.7	6		2.20E+8	$3p^54p\ ^3S_1$	$3p^5(^2P^\circ_{3/2})5s\ 3/2[3/2]^\circ_2$	26DEB	07PET/EKB
3427.13	0.03	29170.6	2		1.72E+7	$3p^54p\ ^3D_2$	$3p^54d\ ^3P^\circ_2$	26DEB	07PET/EKB
3440.05	0.03	29061.0	7		1.12E+9	$3p^54p\ ^3P_1$	$3p^54d\ ^3D^\circ_2$	26DEB	07PET/EKB
3457.85	0.03	28911.4	2		8.91E+6	$3p^54p\ ^1D_2$	$3p^54d\ ^3F^\circ_2$	26DEB	07PET/EKB
3528.51	0.03	28332.5	1		2.39E+7	$3p^54p\ ^3D_2$	$3p^5(^2P^\circ_{1/2})5s\ 1/2[1/2]^\circ_1$	26DEB	07PET/EKB
3529.53	0.03	28324.3	3		3.13E+7	$3p^54p\ ^3D_1$	$3p^54d\ ^3P^\circ_2$	26DEB	07PET/EKB
3530.75	0.03	28314.5	7		2.26E+8	$3p^54s\ ^1P^\circ_1$	$3p^54p\ ^1S_0$	26DEB	07PET/EKB
3562.15	0.03	28064.9	4		6.49E+7	$3p^54p\ ^3P_2$	$3p^54d\ ^3D^\circ_3$	26DEB	07PET/EKB
3586.60	0.03	27873.6	2		2.52E+7	$3p^54p\ ^3D_1$	$3p^54d\ ^3P^\circ_1$	26DEB	07PET/EKB
3593.22	0.03	27822.2	2		3.46E+6	$3p^54p\ ^1P_1$	$3p^54d\ ^3F^\circ_2$	26DEB	07PET/EKB
3608.88	0.03	27701.5	5		3.64E+8	$3p^54p\ ^1D_2$	$3p^54d\ ^3P^\circ_2$	26DEB	07PET/EKB
3618.49	0.03	27628.0	6		8.14E+7	$3p^54s\ ^3P^\circ_2$	$3p^54p\ ^3P_1$	26DEB	07PET/EKB

TABLE 6. Observed spectral lines of K 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.
3626.42	0.03	27567.6	4		5.38E+8	$3p^53d\ ^1P^{\circ}_1$	$3p^54f\ 1/2[5/2]_2$	26DEB	07PET/EKB
3637.00	0.03	27487.3	3		7.62E+6	$3p^54p\ ^3D_1$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_1$	26DEB	07PET/EKB
3647.95	0.03	27404.8	2		5.37E+5	$3p^54p\ ^3P_2$	$3p^54d\ ^3F^{\circ}_2$	26DEB	07PET/EKB
3668.60	0.03	27250.6	3		3.67E+7	$3p^54p\ ^1D_2$	$3p^54d\ ^3P^{\circ}_1$	26DEB	07PET/EKB
3676.05	0.03	27195.3	3		8.36E+7	$3p^54p\ ^3D_1$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_0$	26DEB	07PET/EKB
3681.54	0.03	27154.8	6		1.56E+8	$3p^54s\ ^3P^{\circ}_2$	$3p^54p\ ^3P_2$	26DEB	07PET/EKB
3716.60	0.03	26898.6	5		1.48E+7	$3p^54s\ ^3P^{\circ}_1$	$3p^54p\ ^3P_1$	26DEB	07PET/EKB
3721.34	0.03	26864.4	5		1.44E+8	$3p^54p\ ^1D_2$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_1$	26DEB	07PET/EKB
3739.13	0.03	26736.6	5		2.36E+7	$3p^54s\ ^3P^{\circ}_2$	$3p^54p\ ^1P_1$	26DEB	07PET/EKB
3744.42	0.03	26698.8	5		1.07E+7	$3p^53d\ ^3P^{\circ}_0$	$3p^54p\ ^3P_1$	26DEB	07PET/EKB
3756.62	0.03	26612.1	3		4.40E+7	$3p^54p\ ^1P_1$	$3p^54d\ ^3P^{\circ}_2$	26DEB	07PET/EKB
3767.36	0.03	26536.2	6		1.01E+8	$3p^54s\ ^3P^{\circ}_1$	$3p^54p\ ^3P_0$	26DEB	07PET/EKB
3783.19	0.03	26425.2	6		1.49E+8	$3p^54s\ ^3P^{\circ}_1$	$3p^54p\ ^3P_2$	26DEB	07PET/EKB
3800.14	0.03	26307.3	6		2.75E+8	$3p^54p\ ^3D_2$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_1$	26DEB	07PET/EKB
3816.56	0.03	26194.2	6		2.42E+8	$3p^54p\ ^3P_2$	$3p^54d\ ^3P^{\circ}_2$	26DEB	07PET/EKB
3817.50	0.03	26187.7	7		5.73E+8	$3p^54p\ ^3D_3$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_2$	26DEB	07PET/EKB
3821.30	0.03	26161.7	3		6.88E+6	$3p^54p\ ^1P_1$	$3p^54d\ ^3P^{\circ}_1$	26DEB	07PET/EKB
3844.02	0.03	26007.1	1		1.12E+7	$3p^54s\ ^3P^{\circ}_1$	$3p^54p\ ^1P_1$	26DEB	07PET/EKB
3861.41	0.03	25890.0	3		1.26E+8	$3p^54p\ ^3D_2$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_2$	26DEB	07PET/EKB
3873.74	0.03	25807.5	5		2.91E+7	$3p^53d\ ^3P^{\circ}_0$	$3p^54p\ ^1P_1$	26DEB	07PET/EKB
3878.62	0.03	25775.1	4		9.88E+7	$3p^54p\ ^1P_1$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_1$	26DEB	07PET/EKB
3883.42	0.03	25743.2	3		1.71E+8	$3p^54p\ ^3P_2$	$3p^54d\ ^3P^{\circ}_1$	26DEB	07PET/EKB
3886.84	0.03	25720.6	2		2.01E+7	$3p^54p\ ^3P_1$	$3p^54d\ ^3P^{\circ}_2$	26DEB	07PET/EKB
3897.92	0.03	25647.5	8		3.63E+8	$3p^54s\ ^3P^{\circ}_2$	$3p^54p\ ^1D_2$	26DEB	07PET/EKB
3899.28	0.03	25638.5	3		5.16E+6	$3p^53d\ ^3P^{\circ}_1$	$3p^54p\ ^3P_1$	26DEB	07PET/EKB
3900.11	0.03	25633.1	3		7.75E+7	$3p^54p\ ^3P_0$	$3p^54d\ ^3P^{\circ}_1$	26DEB	07PET/EKB
3923.00	0.03	25483.5	5		5.55E+7	$3p^54p\ ^1P_1$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_0$	26DEB	07PET/EKB
3926.36	0.03	25461.7	5		1.36E+8	$3p^54p\ ^3D_1$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_1$	26DEB	07PET/EKB
3934.36	0.03	25409.9	5		7.10E+8	$3p^53d\ ^1P^{\circ}_1$	$3p^54f\ 3/2[5/2]_2$	26DEB	07PET/EKB
3942.53	0.03	25357.2	6		1.86E+8	$3p^54p\ ^3P_2$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_1$	26DEB	07PET/EKB
3955.21	0.03	25276.0	6		8.86E+7	$3p^53d\ ^3P^{\circ}_1$	$3p^54p\ ^3P_0$	26DEB	07PET/EKB
3956.10	0.03	25270.3	3		9.07E+7	$3p^54p\ ^3P_1$	$3p^54d\ ^3P^{\circ}_1$	26DEB	07PET/EKB
3959.84	0.03	25246.4	3		3.25E+6	$3p^54p\ ^3P_0$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_1$	26DEB	07PET/EKB
3966.72	0.03	25202.6	6		4.71E+7	$3p^53d\ ^3P^{\circ}_2$	$3p^54p\ ^3P_1$	26DEB	07PET/EKB
3972.58	0.03	25165.5	6*	b	5.88E+8	$3p^53d\ ^1P^{\circ}_1$	$3p^54f\ 3/2[3/2]_2$	07PET/EKB	07PET/EKB
3972.58	0.03	25165.5	6*	b	4.43E+7	$3p^53d\ ^3P^{\circ}_1$	$3p^54p\ ^3P_2$	07PET/EKB	07PET/EKB
3991.83	0.03	25044.3	4		2.29E+7	$3p^54p\ ^3D_1$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_2$	07PET/EKB	07PET/EKB
3995.10	0.03	25023.6	6		4.61E+7	$3p^54s\ ^3P^{\circ}_2$	$3p^54p\ ^3D_1$	26DEB	07PET/EKB
4001.24	0.03	24985.2	7		1.50E+8	$3p^54s\ ^3P^{\circ}_0$	$3p^54p\ ^3P_1$	26DEB	07PET/EKB
4012.10	0.03	24917.6	5		4.37E+7	$3p^54s\ ^3P^{\circ}_1$	$3p^54p\ ^1D_2$	26DEB	07PET/EKB
4017.52	0.03	24883.9	4		6.75E+7	$3p^54p\ ^3P_1$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_1$	26DEB	07PET/EKB
4024.88	0.03	24838.4	4		1.10E+8	$3p^54p\ ^1D_2$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_1$	26DEB	07PET/EKB
4039.69	0.03	24747.4	4		4.08E+7	$3p^53d\ ^3P^{\circ}_1$	$3p^54p\ ^1P_1$	26DEB	07PET/EKB
4042.59	0.03	24729.6	6		9.30E+7	$3p^53d\ ^3P^{\circ}_2$	$3p^54p\ ^3P_2$	26DEB	07PET/EKB
4065.23	0.03	24591.9	4		2.30E+7	$3p^54p\ ^3P_1$	$3p^5(^2P^{\circ}_{1/2})5s\ 1/2[1/2]^{\circ}_0$	26DEB	07PET/EKB
4093.69	0.03	24420.9	5		1.60E+8	$3p^54p\ ^1D_2$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_2$	26DEB	07PET/EKB
4112.14	0.03	24311.4	4		1.36E+7	$3p^53d\ ^3P^{\circ}_2$	$3p^54p\ ^1P_1$	26DEB	07PET/EKB
4114.99	0.03	24294.5	6		2.34E+8	$3p^54s\ ^3P^{\circ}_1$	$3p^54p\ ^3D_1$	26DEB	07PET/EKB
4134.72	0.03	24178.6	7		2.31E+8	$3p^54s\ ^3P^{\circ}_2$	$3p^54p\ ^3D_2$	26DEB	07PET/EKB
4149.19	0.03	24094.3	7*	b	4.41E+7	$3p^54s\ ^3P^{\circ}_0$	$3p^54p\ ^1P_1$	07PET/EKB	07PET/EKB
4149.19	0.03	24094.3	7*	b	1.68E+8	$3p^53d\ ^3P^{\circ}_0$	$3p^54p\ ^3D_1$	07PET/EKB	07PET/EKB
4186.24	0.03	23881.1	8		1.03E+9	$3p^54s\ ^3P^{\circ}_2$	$3p^54p\ ^3D_3$	26DEB	07PET/EKB
4209.49	0.03	23749.1	4		4.37E+7	$3p^54p\ ^1P_1$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_1$	26DEB	07PET/EKB
4222.97	0.03	23673.3	7		2.30E+8	$3p^54s\ ^1P^{\circ}_1$	$3p^54p\ ^3P_1$	26DEB	07PET/EKB
4225.67	0.03	23658.2	7		9.42E+7	$3p^53d\ ^3P^{\circ}_1$	$3p^54p\ ^1D_2$	26DEB	07PET/EKB
4263.40	0.03	23448.9	7		3.91E+8	$3p^54s\ ^3P^{\circ}_1$	$3p^54p\ ^3D_2$	26DEB	07PET/EKB
4284.89	0.03	23331.2	3*	b	9.52E+6	$3p^54p\ ^1P_1$	$3p^5(^2P^{\circ}_{3/2})5s\ 3/2[3/2]^{\circ}_2$	07PET/EKB	07PET/EKB

TABLE 6. Observed spectral lines of K 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.
4284.89	0.03	23331.2	3*	b	6.97E+6	$3p^54p\ ^3P_2$	$3p^5(^2P^\circ_{3/2})5s\ 3/2[3/2]^\circ_1$	07PET/EKB	07PET/EKB
4288.70	0.03	23310.5	4		1.16E+7	$3p^54s\ ^1P^\circ_1$	$3p^54p\ ^3P_0$	26DEB	07PET/EKB
4305.00	0.03	23222.3	7		8.66E+7	$3p^53d\ ^3P^\circ_2$	$3p^54p\ ^1D_2$	26DEB	07PET/EKB
4305.27	0.03	23220.8	0		4.52E+7	$3p^54p\ ^3P_0$	$3p^5(^2P^\circ_{3/2})5s\ 3/2[3/2]^\circ_1$	07PET/EKB	07PET/EKB
4309.10	0.03	23200.2	7		4.19E+8	$3p^54s\ ^1P^\circ_1$	$3p^54p\ ^3P_2$	26DEB	07PET/EKB
4340.03	0.03	23034.8	5		6.52E+7	$3p^53d\ ^3P^\circ_1$	$3p^54p\ ^3D_1$	26DEB	07PET/EKB
4362.96	0.03	22913.8	3		5.88E+7	$3p^54p\ ^3P_2$	$3p^5(^2P^\circ_{3/2})5s\ 3/2[3/2]^\circ_2$	26DEB	07PET/EKB
4388.16	0.03	22782.2	7		1.80E+8	$3p^54s\ ^1P^\circ_1$	$3p^54p\ ^1P_1$	26DEB	07PET/EKB
4423.73	0.03	22599.0	3		7.76E+6	$3p^53d\ ^3P^\circ_2$	$3p^54p\ ^3D_1$	26DEB	07PET/EKB
4455.00	0.03	22440.4	2		2.93E+7	$3p^54p\ ^3P_1$	$3p^5(^2P^\circ_{3/2})5s\ 3/2[3/2]^\circ_2$	26DEB	07PET/EKB
4466.65	0.03	22381.9	5		5.20E+7	$3p^54s\ ^3P^\circ_0$	$3p^54p\ ^3D_1$	26DEB	07PET/EKB
4505.33	0.03	22189.7	6*	b	6.16E+7	$3p^53d\ ^3P^\circ_1$	$3p^54p\ ^3D_2$	07PET/EKB	07PET/EKB
4505.33	0.03	22189.7	6*	b	8.27E+4	$3p^55s\ 1/2[1/2]^\circ_1$	$3p^55f\ 3/2[3/2]_1$	07PET/EKB	07PET/EKB
4595.65	0.03	21753.6	5		1.24E+7	$3p^53d\ ^3P^\circ_2$	$3p^54p\ ^3D_2$	26DEB	07PET/EKB
4608.45	0.03	21693.2	8		2.10E+8	$3p^54s\ ^1P^\circ_1$	$3p^54p\ ^1D_2$	26DEB	07PET/EKB
4659.38	0.03	21456.1	5		1.49E+7	$3p^53d\ ^3P^\circ_2$	$3p^54p\ ^3D_3$	26DEB	07PET/EKB
4744.92	0.03	21069.3	4		4.28E+5	$3p^54s\ ^1P^\circ_1$	$3p^54p\ ^3D_1$	26DEB	07PET/EKB
4829.23	0.03	20701.4	9		2.52E+8	$3p^54s\ ^3P^\circ_2$	$3p^54p\ ^3S_1$	26DEB	07PET/EKB
4938.75	0.03	20242.4	3		4.29E+7	$3p^54p\ ^1S_0$	$3p^5(^2P^\circ_{1/2})5s\ 1/2[1/2]^\circ_1$	26DEB	07PET/EKB
4943.24	0.03	20224.0	6		1.25E+7	$3p^54s\ ^1P^\circ_1$	$3p^54p\ ^3D_2$	26DEB	07PET/EKB
5005.60	0.03	19972.0	8		1.11E+8	$3p^54s\ ^3P^\circ_1$	$3p^54p\ ^3S_1$	26DEB	07PET/EKB
5056.27	0.03	19771.9	7		3.28E+7	$3p^53d\ ^3P^\circ_0$	$3p^54p\ ^3S_1$	26DEB	07PET/EKB
5310.24	0.03	18826.3	5		1.50E+7	$3p^53d\ ^3F^\circ_3$	$3p^54p\ ^3P_2$	26DEB	07PET/EKB
5470.13	0.03	18276.0	6		2.07E+7	$3p^53d\ ^3P^\circ_2$	$3p^54p\ ^3S_1$	26DEB	07PET/EKB
5488.06	0.03	18216.3	2		2.63E+7	$3p^54p\ ^1S_0$	$3p^5(^2P^\circ_{3/2})5s\ 3/2[3/2]^\circ_1$	26DEB	07PET/EKB
5512.69	0.03	18134.9	2		2.06E+6	$3p^53d\ ^3F^\circ_2$	$3p^54p\ ^3P_2$	26DEB	07PET/EKB
5536.01	0.03	18058.5	3		2.11E+6	$3p^54s\ ^3P^\circ_0$	$3p^54p\ ^3S_1$	26DEB	07PET/EKB
5642.73	0.03	17717.0	5		1.38E+7	$3p^53d\ ^3F^\circ_2$	$3p^54p\ ^1P_1$	07PET/EKB	07PET/EKB
5772.32	0.03	17319.3	4		8.32E+6	$3p^53d\ ^3F^\circ_3$	$3p^54p\ ^1D_2$	26DEB	07PET/EKB
5969.64	0.03	16746.8	2		1.35E+6	$3p^54s\ ^1P^\circ_1$	$3p^54p\ ^3S_1$	26DEB	07PET/EKB
6012.41	0.03	16627.6	1		1.19E+6	$3p^53d\ ^3F^\circ_2$	$3p^54p\ ^1D_2$	26DEB	07PET/EKB
6120.27	0.03	16334.6	8		1.68E+8	$3p^53d\ ^3F^\circ_4$	$3p^54p\ ^3D_3$	26DEB	07PET/EKB
6246.59	0.03	16004.3	6		6.13E+7	$3p^53d\ ^3F^\circ_2$	$3p^54p\ ^3D_1$	26DEB	07PET/EKB
6307.29	0.03	15850.3	7		8.91E+7	$3p^53d\ ^3F^\circ_3$	$3p^54p\ ^3D_2$	26DEB	07PET/EKB
6427.96	0.03	15552.7	5		1.56E+7	$3p^53d\ ^3F^\circ_3$	$3p^54p\ ^3D_3$	26DEB	07PET/EKB
6595.00	0.03	15158.8	2		1.18E+7	$3p^53d\ ^3F^\circ_2$	$3p^54p\ ^3D_2$	26DEB	07PET/EKB

TABLE 7. Energy levels of K II

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Landé g	Leading percentages	References
$3p^6$	^1S	0	0.0	0.3		100%	
$3p^54s$	$^3P^\circ$	2	162502.7	0.1	1.48(3)	95%	07PET/EKB
		1	163232.2	0.1	1.47(3)	68%+21% $3p^53d\ ^3P^\circ_1$+10% $3p^54s\ ^1P^\circ_1$	07PET/EKB
		0	165145.4	0.2		78%+22% $3p^53d\ ^3P^\circ_0$	07PET/EKB
$3p^53d$	$^3P^\circ$	0	163432.1	0.1		77%+22% $3p^54s\ ^3P^\circ_0$	07PET/EKB
		1	164492.0	0.1	1.38(3)	76%+14% $3p^54s\ ^3P^\circ_1$+9% $3p^54s\ ^1P^\circ_1$	07PET/EKB
		2	164927.9	0.1	1.47(3)	94%	07PET/EKB
$3p^54s$	$^1P^\circ$	1	166457.3	0.1	1.07(2)	81%+18% $3p^54s\ ^3P^\circ_1$	07PET/EKB
$3p^53d$	$^3F^\circ$	4	170049.2	0.1	(1.25)	100%	07PET/EKB
		3	170831.1	0.1	1.09(6)	98%	07PET/EKB
		2	171522.6	0.1	1.36(6)	98%	07PET/EKB
$3p^53d$	$^1D^\circ$	2	179349.2	0.1	(1.07)	56%+42% $3p^53d\ ^3D^\circ_2$	07PET/EKB

TABLE 7. Energy levels of K II—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Landé g	Leading percentages	References
$3p^53d$	$^3D^\circ$	3	179395.8	0.1	(1.20)	60% +40% $3p^53d$ $^1F^\circ_3$	07PET/EKB
		2	180392.7	0.1	(1.10)	57% +43% $3p^53d$ $^1D^\circ_2$	07PET/EKB
		1	180448.9	0.1	(0.50)	100%	07PET/EKB
$3p^53d$	$^1F^\circ$	3	180618.7	0.1	(1.13)	59% +39% $3p^53d$ $^3D^\circ_3$	07PET/EKB
$3p^54p$	^3S	1	183204.1	0.1	1.96(4)	97%	07PET/EKB
$3p^54p$	^3D	3	186383.8	0.1	1.35(3)	100%	07PET/EKB
		2	186681.4	0.1	1.11(2)	75% +23% $3p^54p$ $^1D_2$	07PET/EKB
		1	187527.0	0.1	0.72(2)	77% +14% $3p^54p$ $^1P_1$+9% $3p^54p$ $^3P_1$	07PET/EKB
$3p^54p$	^1D	2	188150.3	0.1	1.19(3)	52% +40% $3p^54p$ $^3P_2$+8% $3p^54p$ $^3D_2$	07PET/EKB
$3p^54p$	^1P	1	189239.5	0.1	0.95(2)	53% +24% $3p^54p$ $^3P_1$+23% $3p^54p$ $^3D_1$	07PET/EKB
$3p^54p$	^3P	2	189657.4	0.1	1.31(2)	57% +26% $3p^54p$ $^1D_2$+17% $3p^54p$ $^3D_2$	07PET/EKB
		0	189768.0	0.1		97%	07PET/EKB
		1	190130.7	0.1	1.38(3)	66% +32% $3p^54p$ $^1P_1$	07PET/EKB
$3p^54p$	^1S	0	194772.2	0.1		93% +3% $3p^54p$ $^3P_0$+3% $3p^55p$ $^1S_0$	07PET/EKB
$3p^53d$	$^1P^\circ$	1	201957.6	0.2	(1.00)	54% +42% $3p^54d$ $^1P^\circ_1$	07PET/EKB
$3p^5(^2P^\circ_{3/2})5s$	$3/2[3/2]^\circ$	2	212575.2	0.1	1.51(3)	100%	07PET/EKB
		1	212988.6	0.1	1.19(2)	97%	07PET/EKB
$3p^5(^2P^\circ_{1/2})5s$	$1/2[1/2]^\circ$	0	214722.7	0.2		83% +17% $3p^54d$ $^3P^\circ_0$	07PET/EKB
		1	215014.6	0.1	1.25(3)	85% +12% $3p^54d$ $^3P^\circ_1$	07PET/EKB
$3p^54d$	$^3P^\circ$	0	(215121)			82% +17% $3p^55s$ $^3P^\circ_0$	07PET/EKB
		1	215400.9	0.1	1.44(6)	84% +8% $3p^55s$ $^3P^\circ_1$+5% $3p^55s$ $^1P^\circ_1$	07PET/EKB
		2	215851.5	0.1	1.46(5)	89% +6% $3p^54d$ $^3D^\circ_2$+4% $3p^54d$ $^1D^\circ_2$	07PET/EKB
$3p^54d$	$^3F^\circ$	4	(215976)		(1.25)	100%	07PET/EKB
		3	(216455)		(1.09)	84% +10% $3p^54d$ $^1F^\circ_3$+5% $3p^54d$ $^3D^\circ_3$	07PET/EKB
		2	217061.9	0.2	(0.79)	70% +18% $3p^54d$ $^1D^\circ_2$+12% $3p^54d$ $^3D^\circ_2$	07PET/EKB
$3p^54d$	$^3D^\circ$	3	217722.3	0.2	(1.19)	55% +44% $3p^54d$ $^1F^\circ_3$	07PET/EKB
		1	(218992)		(0.53)	97%	07PET/EKB
		2	219192.1	0.2	(1.14)	54% +36% $3p^54d$ $^1D^\circ_2$+10% $3p^54d$ $^3P^\circ_2$	07PET/EKB
$3p^54d$	$^1D^\circ$	2	(218900)		(0.95)	42% +30% $3p^54d$ $^3F^\circ_2$+28% $3p^54d$ $^3D^\circ_2$	07PET/EKB
$3p^54d$	$^1F^\circ$	3	(219354)		(1.15)	45% +40% $3p^54d$ $^3D^\circ_3$+15% $3p^54d$ $^3F^\circ_3$	07PET/EKB
$3p^54f$	3/2[3/2]	1	227100.9	0.2	(0.50)	100%	07PET/EKB
		2	227123.2	0.1	(1.11)	98%	07PET/EKB
$3p^54f$	3/2[9/2]	5	227226.0	0.4	(1.20)	100%	07PET/EKB
		4	227230.6	0.2	(1.02)	100%	07PET/EKB
$3p^54f$	3/2[5/2]	3	227343.9	0.2	(1.21)	99%	07PET/EKB
		2	227367.2	0.1	(0.88)	99%	07PET/EKB
$3p^54f$	3/2[7/2]	3	227484.8	0.1	(0.94)	99%	07PET/EKB
		4	227487.5	0.1	(1.18)	99%	07PET/EKB
$3p^54f$	1/2[7/2]	3	229492.5	0.2	(0.84)	99%	07PET/EKB
		4	229495.9	0.3	(1.10)	99%	07PET/EKB
$3p^54f$	1/2[5/2]	3	229507.0	0.1	(1.18)	99%	07PET/EKB
		2	229524.9	0.2	(0.85)	99%	07PET/EKB

TABLE 7. Energy levels of K II—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Landé g	Leading percentages	References
$3p^55f$	3/2[3/2]	1	237204.7	0.3	(0.50)	100%	07PET/EKB
		2	237220.4	0.6	(1.11)	98%	07PET/EKB
$3p^55f$	3/2[9/2]	5	237271.2	0.5	(1.20)	100%	07PET/EKB
		4	237275.3	0.2	(1.02)	100%	07PET/EKB
$3p^55f$	3/2[5/2]	3	237339.0	0.2	(1.19)	100%	07PET/EKB
		2	237356.7	0.2	(0.85)	98%	07PET/EKB
$3p^55f$	3/2[7/2]	3	237408.5	0.2	(0.95)	100%	07PET/EKB
		4	237407.2	0.4	(1.19)	100%	07PET/EKB
$3p^55f$	1/2[7/2]	3	239485.4	0.3	(0.83)	100%	07PET/EKB
		4	239487.7	0.5	(1.09)	100%	07PET/EKB
$3p^55f$	1/2[5/2]	3	239486.7	0.4	(1.19)	100%	07PET/EKB
		2	239503.3	0.3	(0.87)	100%	07PET/EKB
$3p^56f$	3/2[3/2]	1	242692.6	0.5	(0.50)	100%	07PET/EKB
		2	242700.3	0.3	(1.11)	98%	07PET/EKB
$3p^56f$	3/2[9/2]	5	242728.7	0.5	(1.20)	100%	07PET/EKB
		4	242732.2	0.3	(1.02)	100%	07PET/EKB
$3p^56f$	3/2[5/2]	3	242771.2	0.3	(1.19)	100%	07PET/EKB
		2	242774.8	0.3	(0.85)	98%	07PET/EKB
$3p^56f$	3/2[7/2]	3	242810.6	0.5	(0.96)	100%	07PET/EKB
		4	242811.1	0.4	(1.19)	100%	07PET/EKB
$3p^56f$	1/2[7/2]	3	(244904)		(0.83)	100%	07PET/EKB
		4	(244905)		(1.09)	100%	07PET/EKB
$3p^56f$	1/2[5/2]	3	(244906)		(1.20)	100%	07PET/EKB
		2	(244916)		(0.88)	100%	07PET/EKB
$3p^56s$	$(3/2,1/2)^\circ$	1	230500	400		99%	95VAN/KIE
$3p^55d$	$(3/2,3/2)^\circ$	1	231700	400		71%+26% $3p^55d$ $(3/2,5/2)^\circ_1$	95VAN/KIE
$3p^56s$	$(1/2,1/2)^\circ$	1	232600	400		99%	95VAN/KIE
$3p^55d$	$(3/2,5/2)^\circ$	1	233700	400		43%+24% $3p^55d$ $(1/2,3/2)^\circ_1$ +24% $3p^55d$ $(3/2,3/2)^\circ_1$	95VAN/KIE
$3p^55d$	$(1/2,3/2)^\circ$	1	237000	400		60%+30% $3p^55d$ $(3/2,5/2)^\circ_1$	95VAN/KIE
$3p^57s$	$(3/2,1/2)^\circ$	1	239000	400		100%	95VAN/KIE
$3p^56d$	$(3/2,3/2)^\circ$	1	239600	400		79%+13% $3p^56d$ $(3/2,5/2)^\circ_1$	95VAN/KIE
$3p^57s$	$(1/2,1/2)^\circ$	1	241000	400		71%+29% $3p^56d$ $(3/2,5/2)^\circ_1$	95VAN/KIE
$3p^56d$	$(3/2,5/2)^\circ$	1	241000	400		38%+18% $3p^56d$ $(3/2,3/2)^\circ_1$ +16% $3p^57s$ $(1/2,1/2)^\circ_1$	95VAN/KIE
$3p^56d$	$(1/2,3/2)^\circ$	1	242900	400		67%+15% $3p^56d$ $(3/2,5/2)^\circ_1$	95VAN/KIE
$3p^58s$	$(3/2,1/2)^\circ$	1	243700	400		100%	95VAN/KIE
$3p^57d$	$(3/2,3/2)^\circ$	1	244100	400		84%+13% $3p^57d$ $(3/2,5/2)^\circ_1$	95VAN/KIE
$3p^57d$	$(3/2,5/2)^\circ$	1	245000	400		58%+14% $3p^56d$ $(1/2,3/2)^\circ_1$ +13% $3p^57d$ $(3/2,3/2)^\circ_1$	95VAN/KIE
$3p^58s$	$(1/2,1/2)^\circ$	1	245800	400		100%	95VAN/KIE

TABLE 7. Energy levels of K II—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Landé g	Leading percentages	References
$3p^57d$	$(1/2,3/2)^\circ$	1	246600	400		$63\% + 12\%$ $3p^57d$ $(3/2,5/2)^\circ_1$	95VAN/KIE
$3p^58d$	$(3/2,5/2)^\circ$	1	247600	400		$50\% + 28\%$ $3p^57d$ $(1/2,3/2)^\circ_1$	95VAN/KIE
$3p^58d$	$(3/2,3/2)^\circ$	1	249500	400		$45\% + 31\%$ $3p^58d$ $(1/2,3/2)^\circ_1$	95VAN/KIE
$3p^58d$	$(1/2,3/2)^\circ$	1	250859	13			31EKE
K III $(^2P^\circ_{3/2})$	*Limit*	⋯	255072.8	1.5			07PET/EKB

7.3. K III

Cl isoelectronic sequence

Ground state $1s^22s^22p^63s^23p^5\ ^2P^\circ_{3/2}$

Ionization energy [369 427(14) cm^{-1}]
[45.8031(17) eV]

The K III spectrum was first observed by Bowen [28BOW], who located the $3s3p^6\ ^2S$ and $3p^4(^3P)4s\ ^2P$ terms and measured the ground term splitting. The analysis was extended by de Bruin [29DEB], who reported measurements of transitions between the $3p^44s$ and $3p^44p$ configurations. The ultraviolet spectrum of doubly ionized potassium was observed by Ekefors [31EKE], which enabled others to identify transitions to the ground configuration. Using the Ekefors [31EKE] data, Ram [33RAM] located levels of the $3p^43d$, $4s$, and $5s$ configurations. By comparing Ram's assignments with the corresponding Ar II and Ca IV data, Tsien [39TSI] revised some of the assignments and found two new levels of the $3p^43d$ configuration. The $3p^4(^3P)4s$ term was identified by Edlén [37EDL] and positions of $3p^4(^3P)3d\ ^2P$ and ^2D were established by Svensson and Ekberg [68SVE/EKB]. The ground term splitting retained here was measured on the Infrared Space Observatory by Feuchtgruber *et al.* [97FEU/LUT] in the planetary nebula NGC 7027. Other than the ground term splitting, the energy level values are taken from the compilation of Sugar and Corliss [85SUG/COR2], who incorporated the research done before 1985. More recent theoretical calculations by Wilson *et al.* [00WIL/HIB] and Fawcett [87FAW2] indicate that because of configuration mixing there is significant uncertainty in the assignment of *LS*-coupling designations to levels in $3p^43d$. In both calculations the $3s^23p^4(^1D)3d\ ^2P$ and ^2D configurations were lower in energy than the lowest $3s^23p^4(^3P)3d$ term. These adjustments in configuration names are reflected in Tables 8 and 9.

There have been several calculations of transition probabilities of K III, with the most extensive of them being by Huang *et al.* [83HUA/KIM], Fawcett [87FAW2], Wilson *et al.* [00WIL/HIB], and Froese Fischer *et al.* [06FRO/TAC]. As the multiconfiguration Hartree–Fock calculations of Froese Fischer *et al.* [06FRO/TAC] incorporated more configurations, those values are retained here, where available. The transition probabilities of the resonance lines at 765 and 778 Å, and the similar transitions in the isoelectronic sequence have been closely scrutinized by Biémont and Träbert [00BIE/TRA] and Berrington *et al.* [01BER/PHE]. The following values reported are the Breit–Pauli *R*-matrix values of Berrington *et al.* [01BER/PHE]. The ionization energy cited earlier was determined by Biémont *et al.* [99BIE/FRE] using semiempirical fitting along the Cl isoelectronic sequence.

References for K III

28BOW Bowen, I. S., Phys. Rev. **31**, 497 (1928).
29DEB de Bruin, T. L., Z. Phys. **53**, 658 (1929).
31EKE Ekefors, E., Z. Phys. **71**, 53 (1931).
33RAM Ram, M., Indian J. Phys., **8**, 151 (1933).
37EDL Edlén, B., Z. Phys. **104**, 188 (1937).
39TSI Tsien, W.-Z., Chin. J. Phys. **3**, 117 (1939).
68SVE/EKB Svensson, L. Å., and Ekberg, J. O., Ark. Fys. **37**, 65 (1968).
83HUA/KIM Huang, K.-N., Kim, Y.-K., Cheng, K. T., and Desclaux, J. P., At. Data Nucl. Data Tables **28**, 355 (1983).
85SUG/COR2 Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 26 (1985).
87FAW2 Fawcett, B. C., At. Data Nucl. Data Tables **36**, 151 (1987).
97FEU/LUT Feuchtgruber, H., Lutz, D., Beintma, D. A., Valentijn, E. A., Bauer, O. H., Boxhoorn, D. R., De Graauw, T., Haser, L. N., Haerendel, G., Heras, A. M., Katterloher, R. O., Kester, D. J. M., Lahuis, F., Leech, K. J., Morris, P. W., Roelfsma, P. R., Schaeidt, S. G., Spoon, H. W. W., Vanden-Bussche, B., and Wieprecht, E., Astrophys. J. **487**, 963 (1997).
99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).
00BIE/TRA Biémont, E., and Träbert, E., J. Phys. B

33, 2939 (2000).
00WIL/HIB Wilson, N. J., Hibbert, A., and Bell, K. L., Phys. Scr. **61**, 603 (2000).
01BER/PHE Berrington, K. A., Phelan, J. C., and Waldock, J. A., J. Phys. B **34**, L419 (2001).
06FRO/TAC Froese Fischer, C., Tachiev, G., and Irmia, A., At. Data Nucl. Data Tables **92**, 607 (2006).

TABLE 8. Observed spectral lines of K III

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
325.28	0.02	307429	2				31EKE	
327.60	0.02	305246	5				31EKE	
329.05	0.02	303902	10		$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)3d\ ^2D_{3/2}$	31EKE	
330.68	0.02	302404	25		$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)3d\ ^2D_{5/2}$	31EKE	
331.42	0.02	301736	5		$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^3P)3d\ ^2D_{3/2}$	31EKE	
341.92	0.02	292463	30				31EKE	
345.40	0.02	289515	10		$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1D)5s\ ^2D_{3/2}$	31EKE	
348.00	0.02	287357	15		$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^1D)5s\ ^2D_{3/2}$	31EKE	
379.12	0.02	263770	30		$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)5s\ ^2P_{1/2}$	31EKE	
380.48	0.02	262828	25		$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)5s\ ^2P_{3/2}$	31EKE	
382.23	0.02	261623	30		$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^3P)5s\ ^2P_{1/2}$	31EKE	
398.63	0.02	250857	15	1.79E+10	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1D)3d\ ^2S_{1/2}$	31EKE	06FRO/TAC
402.10	0.02	248692	20	1.07E+10	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^1D)3d\ ^2S_{1/2}$	31EKE	06FRO/TAC
406.48	0.02	246012	30	5.32E+6	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1S)3d\ ^2D_{3/2}$	31EKE	06FRO/TAC
408.96	0.02	244523	40	1.88E+8	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1S)3d\ ^2D_{5/2}$	31EKE	06FRO/TAC
410.10	0.02	243842	40	2.36E+8	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^1S)3d\ ^2D_{3/2}$	31EKE	06FRO/TAC
412.29	0.02	242548	25	1.40E+10	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)3d\ ^2P_{1/2}$	31EKE	06FRO/TAC
413.79	0.02	241667	50	6.24E+9	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1S)4s\ ^2S_{1/2}$	31EKE	00WIL/HIB
414.87	0.02	241039	30	4.01E+10	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)3d\ ^2P_{3/2}$	31EKE	06FRO/TAC
416.00	0.02	240384	30	2.83E+10	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^3P)3d\ ^2P_{1/2}$	31EKE	06FRO/TAC
417.54	0.02	239501	30	1.03E+10	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^1S)4s\ ^2S_{1/2}$	31EKE	00WIL/HIB
418.62	0.02	238878	30	2.78E+9	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^3P)3d\ ^2P_{3/2}$	31EKE	06FRO/TAC
434.72	0.02	230032	75				31EKE	
435.68	0.02	229528	50				31EKE	
444.34	0.02	225051	75	4.03E+9	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1D)4s\ ^2D_{5/2}$	31EKE	06FRO/TAC
448.60	0.02	222918	75	3.52E+9	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^1D)4s\ ^2D_{3/2}$	31EKE	06FRO/TAC
466.79	0.02	214228	75	3.06E+9	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)4s\ ^2P_{1/2}$	31EKE	06FRO/TAC
470.09	0.02	212726	100	7.60E+9	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)4s\ ^2P_{3/2}$	31EKE	06FRO/TAC
471.57	0.02	212058	75	5.98E+9	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^3P)4s\ ^2P_{1/2}$	31EKE	06FRO/TAC
474.92	0.02	210562	45	1.19E+9	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^3P)4s\ ^2P_{3/2}$	31EKE	06FRO/TAC
479.18	0.02	208688	40	1.11E+8	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	31EKE	06FRO/TAC
482.11	0.02	207423	10	6.69E+6	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)4s\ ^4P_{5/2}$	31EKE	06FRO/TAC
482.41	0.02	207293	10	2.13E+7	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^3P)4s\ ^4P_{1/2}$	31EKE	06FRO/TAC
484.20	0.02	206526	5	9.40E+6	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	31EKE	06FRO/TAC
497.10	0.02	201165	75	2.23E+6	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^3P)3d\ ^2F_{5/2}$	31EKE	06FRO/TAC
514.94	0.02	194196	10				31EKE	
520.61	0.02	192082	50	1.68E+8	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1D)3d\ ^2D_{5/2}$	31EKE	06FRO/TAC
523.79	0.02	190915	25	4.54E+7	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1D)3d\ ^2D_{3/2}$	31EKE	06FRO/TAC
529.80	0.02	188752	40	1.30E+8	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^1D)3d\ ^2D_{3/2}$	31EKE	06FRO/TAC
539.73	0.02	185277	15	1.69E+7	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^4(^1D)3d\ ^2P_{3/2}$	31EKE	06FRO/TAC
546.12	0.02	183109	15	6.96E+6	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^1D)3d\ ^2P_{3/2}$	31EKE	06FRO/TAC
550.32	0.02	181712	5	1.33E+7	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s^23p^4(^1D)3d\ ^2P_{1/2}$	31EKE	06FRO/TAC
708.84	0.02	141076	20				31EKE	
765.31	0.02	130665	20				31EKE	
765.64	0.02	130609	30	3.23E+8	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s3p^6\ ^2S_{1/2}$	31EKE	01BER/PHE
778.53	0.02	128448	35	1.61E+8	$3s^23p^5\ ^2P^\circ_{1/2}$	$3s3p^6\ ^2S_{1/2}$	31EKE	01BER/PHE
872.31	0.02	114638	20				31EKE	
873.86	0.02	114434	10				31EKE	
874.04	0.02	114411	15				31EKE	
Air								
2550.02	0.03	39203.7	6	1.58E+8	$3s^23p^4(^3P)4s\ ^4P_{5/2}$	$3s^23p^4(^3P)4p\ ^4S^\circ_{3/2}$	29DEB	06FRO/TAC

TABLE 8. Observed spectral lines of K III—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
2635.11	0.03	37937.8	5	1.29E+8	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	$3s^23p^4(^3P)4p\ ^4S^\circ_{3/2}$	29DEB	06FRO/TAC
2689.90	0.03	37165.0	5	7.48E+7	$3s^23p^4(^3P)4s\ ^4P_{1/2}$	$3s^23p^4(^3P)4p\ ^4S^\circ_{3/2}$	29DEB	06FRO/TAC
2736.96	0.03	36526.1	1		$3s^23p^4(^3P)4s\ ^4P_{5/2}$	$3s^23p^4(^3P)4p\ ^2P^\circ_{3/2}$	37EDL	
2800.40	0.03	35698.7	3	4.97E+6	$3s^23p^4(^3P)4s\ ^4P_{5/2}$	$3s^23p^4(^3P)4p\ ^2D^\circ_{5/2}$	29DEB	06FRO/TAC
2877.35	0.03	34744.0	1	4.05E+6	$3s^23p^4(^3P)4s\ ^4P_{5/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{3/2}$	29DEB	06FRO/TAC
2898.90	0.03	34485.8	1		$3s^23p^4(^3P)4s\ ^4P_{1/2}$	$3s^23p^4(^3P)4p\ ^2P^\circ_{3/2}$	37EDL	
2903.36	0.03	34432.8	4	1.33E+7	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	$3s^23p^4(^3P)4p\ ^2D^\circ_{5/2}$	29DEB	06FRO/TAC
2938.45	0.03	34021.6	5	4.24E+7	$3s^23p^4(^3P)4s\ ^4P_{5/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{5/2}$	29DEB	06FRO/TAC
2948.94	0.03	33900.6	1		$3s^23p^4(^3P)4s\ ^2P_{3/2}$	$3s^23p^4(^3P)4p\ ^4S^\circ_{3/2}$	37EDL	
2954.33	0.03	33838.8	3	3.00E+7	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{1/2}$	29DEB	06FRO/TAC
2986.20	0.03	33477.6	5	1.18E+8	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{3/2}$	29DEB	06FRO/TAC
2992.42	0.03	33408.0	6	2.51E+8	$3s^23p^4(^3P)4s\ ^4P_{5/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{7/2}$	29DEB	06FRO/TAC
3023.43	0.03	33065.4	3	2.13E+8	$3s^23p^4(^3P)4s\ ^4P_{1/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{1/2}$	29DEB	06FRO/TAC
3052.07	0.03	32755.2	6	1.85E+8	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{5/2}$	29DEB	06FRO/TAC
3056.84	0.03	32704.0	5	1.18E+8	$3s^23p^4(^3P)4s\ ^4P_{1/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{3/2}$	29DEB	06FRO/TAC
3061.25	0.03	32656.9	3	1.31E+8	$3s^23p^4(^3P)4s\ ^2P_{3/2}$	$3s^23p^4(^3P)4p\ ^2P^\circ_{1/2}$	29DEB	06FRO/TAC
3201.95	0.03	31222.0	6	6.12E+7	$3s^23p^4(^3P)4s\ ^2P_{3/2}$	$3s^23p^4(^3P)4p\ ^2P^\circ_{3/2}$	29DEB	06FRO/TAC
3209.34	0.03	31150.1	6	3.94E+7	$3s^23p^4(^3P)4s\ ^2P_{1/2}$	$3s^23p^4(^3P)4p\ ^2P^\circ_{1/2}$	29DEB	06FRO/TAC
3253.98	0.03	30722.8	3	1.15E+8	$3s^23p^4(^3P)4s\ ^2P_{3/2}$	$3s^23p^4(^3P)4p\ ^2D^\circ_{3/2}$	29DEB	06FRO/TAC
3278.79	0.03	30490.3	6	1.09E+8	$3s^23p^4(^3P)4s\ ^4P_{5/2}$	$3s^23p^4(^3P)4p\ ^4P^\circ_{3/2}$	29DEB	06FRO/TAC
3289.06	0.03	30395.1	6	1.76E+8	$3s^23p^4(^3P)4s\ ^2P_{3/2}$	$3s^23p^4(^3P)4p\ ^2D^\circ_{5/2}$	37EDL	06FRO/TAC
3322.40	0.03	30090.1	6	1.52E+8	$3s^23p^4(^3P)4s\ ^4P_{5/2}$	$3s^23p^4(^3P)4p\ ^4P^\circ_{5/2}$	29DEB	06FRO/TAC
3358.43	0.03	29767.3	3	1.59E+8	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	$3s^23p^4(^3P)4p\ ^4P^\circ_{1/2}$	29DEB	06FRO/TAC
3364.22	0.03	29716.1	6	1.12E+8	$3s^23p^4(^3P)4s\ ^2P_{1/2}$	$3s^23p^4(^3P)4p\ ^2P^\circ_{3/2}$	29DEB	06FRO/TAC
3420.82	0.03	29224.4	6	2.76E+7	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	$3s^23p^4(^3P)4p\ ^4P^\circ_{3/2}$	29DEB	06FRO/TAC
3421.83	0.03	29215.8	4	6.87E+7	$3s^23p^4(^3P)4s\ ^2P_{1/2}$	$3s^23p^4(^3P)4p\ ^2D^\circ_{3/2}$	29DEB	06FRO/TAC
3448.01	0.03	28993.9	3	1.95E+7	$3s^23p^4(^3P)4s\ ^4P_{1/2}$	$3s^23p^4(^3P)4p\ ^4P^\circ_{1/2}$	29DEB	06FRO/TAC
3468.32	0.03	28824.2	6	2.97E+7	$3s^23p^4(^3P)4s\ ^4P_{3/2}$	$3s^23p^4(^3P)4p\ ^4P^\circ_{5/2}$	29DEB	06FRO/TAC
3481.11	0.03	28718.2	1	1.02E+7	$3s^23p^4(^3P)4s\ ^2P_{3/2}$	$3s^23p^4(^3P)4p\ ^4D^\circ_{5/2}$	37EDL	06FRO/TAC
3513.88	0.03	28450.4	5	4.35E+7	$3s^23p^4(^3P)4s\ ^4P_{1/2}$	$3s^23p^4(^3P)4p\ ^4P^\circ_{3/2}$	29DEB	06FRO/TAC
3885.50	0.03	25729.4	1		$3s^23p^4(^3P)4s\ ^2P_{3/2}$	$3s^23p^4(^3P)4p\ ^4P^\circ_{1/2}$	37EDL	
Vacuum								
46180.	5	2165.4		1.18E−1	$3s^23p^5\ ^2P^\circ_{3/2}$	$3s^23p^5\ ^2P^\circ_{1/2}$	97FEU/LUT	83HUA/KIM

TABLE 9. Energy levels of K III

Configuration	Term	*J*	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$3s^23p^5$	$^2P^\circ$	3/2	0.0	3	
		1/2	2165.4	0.2	97FEU/LUT
$3s3p^6$	^2S	1/2	130610	3	85SUG/COR2
$3s^23p^4(^1D)3d$	^2P	1/2	183878	7	85SUG/COR2
		3/2	185276	7	85SUG/COR2
$3s^23p^4(^1D)3d$	^2D	3/2	190917	7	85SUG/COR2
		5/2	192082	7	85SUG/COR2
$3s^23p^4(^3P)3d$	^2F	5/2	201165	8	85SUG/COR2
$3s^23p^4(^3P)4s$	^4P	5/2	207421.9	0.2	85SUG/COR2
		3/2	208687.8	0.2	85SUG/COR2
		1/2	209461.3	0.2	85SUG/COR2
$3s^23p^4(^3P)4s$	^2P	3/2	212725.4	0.2	85SUG/COR2
		1/2	214232.3	0.2	85SUG/COR2

TABLE 9. Energy levels of K III—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$3s^23p^4(^1D)4s$	^2D	5/2	225051	10	85SUG/COR2
		3/2	225084	10	85SUG/COR2
$3s^23p^4(^3P)4p$	$^4P°$	5/2	237512.0	0.3	85SUG/COR2
		3/2	237912.2	0.3	85SUG/COR2
		1/2	238455.1	0.3	85SUG/COR2
$3s^23p^4(^3P)4p$	$^4D°$	7/2	240829.9	0.3	85SUG/COR2
		5/2	241443.5	0.3	85SUG/COR2
		3/2	242165.3	0.3	85SUG/COR2
		1/2	242526.7	0.3	85SUG/COR2
$3s^23p^4(^3P)3d$	^2P	3/2	241042	12	85SUG/COR2
		1/2	242549	12	85SUG/COR2
$3s^23p^4(^1S)4s$	^2S	1/2	241667	12	85SUG/COR2
$3s^23p^4(^3P)4p$	$^2D°$	5/2	243120.6	0.4	85SUG/COR2
		3/2	243448.2	0.4	85SUG/COR2
$3s^23p^4(^3P)4p$	$^2P°$	3/2	243947.4	0.4	85SUG/COR2
		1/2	245382.3	0.4	85SUG/COR2
$3s^23p^4(^1S)3d$	^2D	5/2	244523	12	85SUG/COR2
		3/2	246010	12	85SUG/COR2
$3s^23p^4(^3P)4p$	$^4S°$	3/2	246625.6	0.5	85SUG/COR2
$3s^23p^4(^1D)3d$	^2S	1/2	250858	13	85SUG/COR2
$3s^23p^4(^3P)5s$	^2P	3/2	262828	14	85SUG/COR2
		1/2	263770	14	85SUG/COR2
$3s^23p^4(^1D)5s$	^2D	5/2	289400	17	85SUG/COR2
		3/2	289519	17	85SUG/COR2
$3s^23p^4(^3P)3d$	^2D	5/2	302404	18	85SUG/COR2
		3/2	303902	18	85SUG/COR2
K IV ($^3P_2$)	*Limit*	···	369427	14	99BIE/FRE

7.4. K IV

S isoelectronic sequence

Ground state $1s^22s^22p^63s^2\ 3p^4\ ^3P_2$

Ionization energy [491 330(150) cm^{-1}]
[60.92(2) eV]

Measurements of the K IV spectrum were first reported in the region between 730 and 760 Å by Hopfield and Dieke [26HOP/DIE]. Observations down to 200 Å by Ekefors [31EKE] and Bowen [34BOW] form the basis for most of the analysis of the energy level structure. Ram [33RAM] classified 30 lines with upper levels of the $3s^23p^33d$ and $4s$ triplets. Bowen [34BOW] suggested revisions in the Ram designations and used singlet and intercombination lines to locate the $^1D_2$ level of the ground configuration, as well as the ^1D levels of $3s^23p^33d$ and $3s^23p^34s$ and the $3s^23p^33d\ ^1P$ level. Bowen also located the $3s3p^4\ ^3P$ term and $3s^23p^35s\ ^3S$. Tsien [39TSI] added the identification of the $3s^23p^3(^4S)3d\ ^3D$ and $3s^23p^3(^2D)3d\ ^3P$ terms. The $3s^23p^3(^2P)4s\ ^3P_1$ and $3s^23p^4\ ^1S_0$ levels were located by Edlén [42EDL]. Astronomical measurements of forbidden transitions by Bowen [55BOW, 60BOW] and Feuchtgruber *et al.* [97FEU/LUT] provided a more accurate determination of the splitting in the ground term. Svensson and Ekberg [68SVE/EKB] contributed measurements of a few additional lines in the ultraviolet, added $3p^3$ parent states to the designations, and suggested a different value for the $3s^23p^3(^2D)3d\ ^1P_1$ level. More recent measurements by Smitt *et al.* [76SMI/SVE] have refined the values for several of the lowest energy levels. Other than the lowest nine levels, the energy level values retained in Tables 10 and 11 are taken from the compilation of Sugar and Corliss [85SUG/COR2], who incorporated the research done before 1985.

The transition probabilities of allowed transitions of K IV have been calculated by Fawcett [86FAW2], Chou *et al.* [96CHO/CHA], and Froese Fischer *et al.* [06FRO/TAC]. The calculations of Fawcett [86FAW2] produce energy level values in closer agreement with the experimental levels than Froese Fischer *et al.* [06FRO/TAC]. Although those levels calculated by Chou *et al.* [96CHO/CHA] agree fairly well with the observed values, the configuration $3s^23p^34s$ was omitted. As a result we have taken the values reported here from [86FAW2] where available for the allowed transitions. Several groups [83MEN/ZEI, 86KAU/SUG, 89SAL/KIM, 86BIE/HAN] have determined transition probabilities for forbidden lines in the ground term, with the values being in good agreement. The values retained here are from the relativistic Hartree–Fock calculations of Biémont and Hansen [86BIE/HAN]. The ionization energy cited earlier was determined by Biémont *et al.* [99BIE/FRE] using a semiempirical fit along the sulfur isoelectronic sequence.

References for K IV

26HOP/DIE Hopfield, J. J., and Dieke, G. H., Phys. Rev. **27**, 638 (1926).

31EKE Ekefors, E., Z. Phys. **71**, 53 (1931).

33RAM Ram, M., Indian J. Phys., **8**, 151 (1933).

34BOW Bowen, I. S., Phys. Rev. **46**, 791 (1934).

39TSI Tsien, W. Z., Chin. J. Phys. **3**, 117 (1939).

42EDL Edlén, B., Phys. Rev. **62**, 434 (1942).

55BOW Bowen, I. S., Astrophys. J. **121**, 306 (1955).

60BOW Bowen, I. S., Astrophys. J. **132**, 1 (1960).

68SVE/EKB Svensson, L. Å., and Ekberg, J. O., Ark. Fys. **37**, 65 (1968).

76SMI/SVE Smitt, R., Svensson, L. Å., and Outred, M., Phys. Scr. **13**, 293 (1976).

83MEN/ZEI Mendoza, C., and Zeippen, C. J., Mon. Not. R. Astron. Soc. **202**, 981 (1983).

85SUG/COR2 Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 26 (1985).

86BIE/HAN Biémont, E., and Hansen, J. E., Phys. Scr. **34**, 116 (1986).

86FAW2 Fawcett, B. C., At. Data Nucl. Data Tables **35**, 185 (1986).

86KAU/SUG Kaufman, V., and Sugar, J., J. Chem. Phys. Ref. Data **15**, 321 (1986).

89SAL/KIM Saloman, E. B., and Kim, Y.-K., At. Data Nucl. Data Tables **41**, 339 (1989).

96CHO/CHA Chou, H.-S., Chang, J.-Y., Chang, Y.-H., and Huang, K.-N., At. Data Nucl. Data Tables **62**, 77 (1996).

97FEU/LUT Feuchtgruber, H., Lutz, D., Beintma, D. A., Valentijn, E. A., Bauer, O. H., Boxhoorn, D. R., De Graauw, T., Haser, L. N., Haerendel, G., Heras, A. M., Katterloher, R. O., Kester, D. J. M., Lahuis, F., Leech, K. J., Morris, P. W., Roelfsma, P. R., Schaeidt, S. G., Spoon, H. W. W., Vanden-Bussche, B., and Wieprecht, E., Astrophys. J. **487**, 963 (1997).

99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).

06FRO/TAC Froese Fischer, C., Tachiev, G., and Irmia, A., At. Data Nucl. Data Tables **92**, 607 (2006).

TABLE 10. Observed spectral lines of K IV

λ Å	Unc. Å	σ (cm⁻¹)	Int.	A_{ki} (s⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
271.82		367891	150		$3s^23p^4\ ^3P_2$	$3s^23p^3(^4S^\circ)5s\ ^3S^\circ_1$	34BOW	
273.06	0.02	366213	100		$3s^23p^4\ ^3P_1$	$3s^23p^3(^4S^\circ)5s\ ^3S^\circ_1$	31EKE, 34BOW	
273.55		365569	50		$3s^23p^4\ ^3P_0$	$3s^23p^3(^4S^\circ)5s\ ^3S^\circ_1$	34BOW	
340.46	0.02	293720	300	1.85E+9	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2P^\circ)4s\ ^3P^\circ_2$	31EKE	86FAW2
340.74	0.02	293479	150	9.38E+8	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2P^\circ)4s\ ^3P^\circ_1$	31EKE	86FAW2
342.41	0.02	292048	150	9.44E+8	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2P^\circ)4s\ ^3P^\circ_2$	31EKE	86FAW2
342.80	0.02	291711	100	2.72E+9	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2P^\circ)4s\ ^3P^\circ_0$	31EKE	86FAW2
354.14		282375	300		$3s^23p^4\ ^3P_2$	$3s^23p^3(^2D^\circ)4s\ ^1D^\circ_2$	34BOW	
354.93		281748	300	3.25E+9	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2P^\circ)4s\ ^1P^\circ_1$	34BOW	86FAW2
356.26		280694	150		$3s^23p^4\ ^3P_1$	$3s^23p^3(^2D^\circ)4s\ ^1D^\circ_2$	34BOW	
359.73	0.02	277986	300	1.49E+9	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2D^\circ)4s\ ^3D^\circ_3$	31EKE	86FAW2
359.91	0.02	277847	200	4.63E+8	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2D^\circ)4s\ ^3D^\circ_2$	31EKE	86FAW2
360.57		277340	50	1.23E+8	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2P^\circ)4s\ ^3P^\circ_2$	34BOW	86FAW2
362.08	0.02	276182	250	8.55E+8	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2D^\circ)4s\ ^3D^\circ_2$	31EKE	86FAW2
362.15	0.02	276129	150	5.76E+8	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2D^\circ)4s\ ^3D^\circ_1$	31EKE	86FAW2
363.02	0.02	275467	150	5.57E+8	$3s^23p^4\ ^3P_0$	$3s^23p^3(^2D^\circ)4s\ ^3D^\circ_1$	31EKE	86FAW2
368.03	0.02	271717	200	2.46E+8	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2P^\circ)3d\ ^1D^\circ_2$	68SVE/EKB	86FAW2
375.96		265989	300	3.02E+9	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2D^\circ)4s\ ^1D^\circ_2$	34BOW	86FAW2
379.28	0.02	263658	100	1.42E+9	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_1$	68SVE/EKB	86FAW2

TABLE 10. Observed spectral lines of K IV—Continued

λ Å	Unc. Å	σ (cm⁻¹)	Int.	A_{ki} (s⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
379.88	0.02	263243	300	6.76E+10	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2P^\circ)3d\ ^1F^\circ_3$	68SVE/EKB	86FAW2
380.48	0.02	262828	250	1.43E+10	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_2$	68SVE/EKB	86FAW2
381.70	0.02	261985	200	2.60E+10	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_1$	68SVE/EKB	86FAW2
382.23	0.02	261623	300	6.49E+10	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_3$	68SVE/EKB	86FAW2
382.49		261445	150		$3s^23p^4\ ^1D_2$	$3s^23p^3(^2D^\circ)4s\ ^3D^\circ_2$	34BOW	
382.65	0.02	261338	200	3.62E+10	$3s^23p^4\ ^3P_0$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_1$	68SVE/EKB	86FAW2
382.91	0.02	261161	300	5.04E+10	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_2$	68SVE/EKB	86FAW2
384.10	0.02	260352	250	6.48E+10	$3s^23p^4\ ^1S_0$	$3s^23p^3(^2P^\circ)3d\ ^1P^\circ_1$	31EKE	86FAW2
388.92	0.02	257122	250	2.18E+10	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2P^\circ)3d\ ^3P^\circ_1$	68SVE/EKB	86FAW2
389.07	0.02	257024	250	6.17E+10	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2P^\circ)3d\ ^1D^\circ_2$	68SVE/EKB	86FAW2
390.42	0.02	256138	250	5.76E+10	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2P^\circ)3d\ ^3P^\circ_0$	68SVE/EKB	86FAW2
390.57	0.02	256033	300	4.51E+10	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2P^\circ)3d\ ^3P^\circ_2$	68SVE/EKB	86FAW2
391.46	0.02	255453	200	1.73E+10	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2P^\circ)3d\ ^3P^\circ_1$	68SVE/EKB	86FAW2
392.27	0.02	254924	100		$3s^23p^4\ ^1S_0$	$3s^23p^3(^2P^\circ)4s\ ^3P^\circ_1$	31EKE	
392.47	0.02	254799	200	1.80E+10	$3s^23p^4\ ^3P_0$	$3s^23p^3(^2P^\circ)3d\ ^3P^\circ_1$	68SVE/EKB	86FAW2
393.14	0.02	254361	500	1.19E+10	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2P^\circ)3d\ ^3P^\circ_2$	68SVE/EKB	86FAW2
400.21	0.02	249869	400	3.46E+10	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2D^\circ)3d\ ^3S^\circ_1$	68SVE/EKB	86FAW2
402.91	0.02	248196	300	1.71E+10	$3s^23p^4\ ^3P_1$	$3s^23p^3(^2D^\circ)3d\ ^3S^\circ_1$	68SVE/EKB	86FAW2
403.97	0.02	247545	250	5.26E+9	$3s^23p^4\ ^3P_0$	$3s^23p^3(^2D^\circ)3d\ ^3S^\circ_1$	68SVE/EKB	86FAW2
404.41	0.02	247273	150	1.14E+9	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_1$	68SVE/EKB	86FAW2
405.77	0.02	246443	100	1.30E+8	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_2$	68SVE/EKB	86FAW2
408.08	0.02	245050	250		$3s^23p^4\ ^1D_2$	$3s^23p^3(^2P^\circ)3d\ ^3D^\circ_3$	31EKE	
408.96	0.02	244523	400	4.59E+10	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2D^\circ)3d\ ^1P^\circ_1$	68SVE/EKB	86FAW2
417.28	0.02	239647	150		$3s^23p^4\ ^1D_2$	$3s^23p^3(^2P^\circ)3d\ ^3P^\circ_2$	68SVE/EKB	
442.30	0.02	226091	200		$3s^23p^4\ ^3P_2$	$3s^23p^3(^2D^\circ)3d\ ^3P^\circ_1$	68SVE/EKB	
442.52	0.02	225979	100		$3s^23p^4\ ^3P_1$	$3s^23p^3(^2D^\circ)3d\ ^3P^\circ_0$	31EKE	
443.57	0.02	225444	300	1.36E+8	$3s^23p^4\ ^3P_2$	$3s^23p^3(^2D^\circ)3d\ ^3P^\circ_2$	31EKE	86FAW2
445.61	0.02	224411	200		$3s^23p^4\ ^3P_1$	$3s^23p^3(^2D^\circ)3d\ ^3P^\circ_1$	31EKE	
446.83	0.02	223799	250		$3s^23p^4\ ^3P_1$	$3s^23p^3(^2D^\circ)3d\ ^3P^\circ_2$	31EKE	
446.92	0.02	223751	100		$3s^23p^4\ ^3P_0$	$3s^23p^3(^2D^\circ)3d\ ^3P^\circ_1$	31EKE	
448.60	0.02	222916	750				31EKE	
449.71	0.02	222366	200		$3s^23p^4\ ^1S_0$	$3s^23p^3(^2D^\circ)3d\ ^1P^\circ_1$	68SVE/EKB	
456.33	0.02	219140	400				31EKE	
473.21	0.02	211324	100		$3s^23p^4\ ^1S_0$	$3s^23p^3(^2D^\circ)3d\ ^3S^\circ_1$	31EKE	
499.99	0.02	200003	100	7.20E+8	$3s^23p^4\ ^1D_2$	$3s^23p^3(^2D^\circ)3d\ ^1D^\circ_2$	68SVE/EKB	86FAW2
523.00	0.02	191205	250		$3s^23p^4\ ^3P_2$	$3s^23p^3(^4S^\circ)3d\ ^3D^\circ_2$	31EKE	
526.45	0.02	189952	200		$3s^23p^4\ ^3P_2$	$3s^23p^3(^4S^\circ)3d\ ^3D^\circ_3$	31EKE	
527.06	0.02	189730	100		$3s^23p^4\ ^3P_1$	$3s^23p^3(^4S^\circ)3d\ ^3D^\circ_1$	31EKE	
527.62	0.02	189530	150		$3s^23p^4\ ^3P_1$	$3s^23p^3(^4S^\circ)3d\ ^3D^\circ_2$	31EKE	
528.88	0.02	189079	50		$3s^23p^4\ ^3P_0$	$3s^23p^3(^4S^\circ)3d\ ^3D^\circ_1$	31EKE	
584.314	0.008	171140.9	0		$3s^23p^4\ ^3P_2$	$3s3p^5\ ^1P^\circ_1$	76SMI/SVE	
646.181	0.008	154755.4	11	8.73E+8	$3s^23p^4\ ^1D_2$	$3s3p^5\ ^1P^\circ_1$	76SMI/SVE	86FAW2
737.146	0.008	135658.3	10	1.23E+8	$3s^23p^4\ ^3P_2$	$3s3p^5\ ^3P^\circ_1$	76SMI/SVE	86FAW2
741.941	0.008	134781.6	10	2.91E+8	$3s^23p^4\ ^3P_1$	$3s3p^5\ ^3P^\circ_0$	76SMI/SVE	86FAW2
745.258	0.008	134181.7	12	2.19E+8	$3s^23p^4\ ^3P_2$	$3s3p^5\ ^3P^\circ_2$	76SMI/SVE	86FAW2
746.342	0.008	133986.8	9	7.18E+7	$3s^23p^4\ ^3P_1$	$3s3p^5\ ^3P^\circ_1$	76SMI/SVE	86FAW2
749.979	0.008	133337.1	10	9.88E+7	$3s^23p^4\ ^3P_0$	$3s3p^5\ ^3P^\circ_1$	76SMI/SVE	86FAW2
754.187	0.008	132593.1	1		$3s^23p^4\ ^1S_0$	$3s3p^5\ ^1P^\circ_1$	76SMI/SVE	
754.658	0.008	132510.4	10	7.26E+7	$3s^23p^4\ ^3P_1$	$3s3p^5\ ^3P^\circ_2$	76SMI/SVE	86FAW2
Air								
4510.93	0.10	22162.2		3.18	$3s^23p^4\ ^1D_2$	$3s^23p^4\ ^1S_0$	60BOW	86BIE/HAN
6101.83	0.10	16384.0		8.39E−1	$3s^23p^4\ ^3P_2$	$3s^23p^4\ ^1D_2$	55BOW	86BIE/HAN
Vacuum								
59820	12	1671.68		1.04E−1	$3s^23p^4\ ^3P_2$	$3s^23p^4\ ^3P_1$	97FEU/LUT	86BIE/HAN

TABLE 11. Energy levels of K IV

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$3s^23p^4$	^3P	2	0.0	2	
		1	1671.7	0.3	97FEU/LUT
		0	2321.2	2	76SMI/SVE
$3s^23p^4$	^1D	2	16384.0	0.3	55BOW
$3s^23p^4$	^1S	0	38546.3	0.5	60BOW
$3s3p^5$	$^3P^\circ$	2	134181.8	2	76SMI/SVE
		1	135658.3	2	76SMI/SVE
		0	136453.0	2	76SMI/SVE
$3s3p^5$	$^1P^\circ$	1	171139.5	2	76SMI/SVE
$3s^23p^3(^4S^\circ)3d$	$^3D^\circ$	3	189952	7	85SUG/COR2
		2	191203	7	85SUG/COR2
		1	191400	7	85SUG/COR2
$3s^23p^3(^2D^\circ)3d$	$^1D^\circ$	2	216387	9	85SUG/COR2
$3s^23p^3(^2D^\circ)3d$	$^3P^\circ$	2	225445	10	85SUG/COR2
		1	226082	10	85SUG/COR2
		0	227650	10	85SUG/COR2
$3s^23p^3(^2D^\circ)3d$	$^1F^\circ$	3	242475	12	85SUG/COR2
$3s^23p^3(^2D^\circ)3d$	$^3S^\circ$	1	249867	12	85SUG/COR2
$3s^23p^3(^2P^\circ)3d$	$^3P^\circ$	2	256032	13	85SUG/COR2
		1	257122	13	85SUG/COR2
		0	257809	13	85SUG/COR2
$3s^23p^3(^2D^\circ)3d$	$^1P^\circ$	1	260910	14	85SUG/COR2
$3s^23p^3(^2P^\circ)3d$	$^3D^\circ$	3	261623	14	85SUG/COR2
		2	262829	14	85SUG/COR2
		1	263658	14	85SUG/COR2
$3s^23p^3(^2P^\circ)3d$	$^1D^\circ$	2	273398	15	85SUG/COR2
$3s^23p^3(^2D^\circ)4s$	$^3D^\circ$	1	277792	15	85SUG/COR2
		2	277850	15	85SUG/COR2
		3	277986	15	85SUG/COR2
$3s^23p^3(^2P^\circ)3d$	$^1F^\circ$	3	279627	16	85SUG/COR2
$3s^23p^3(^2D^\circ)4s$	$^1D^\circ$	2	282371	16	85SUG/COR2
$3s^23p^3(^2P^\circ)4s$	$^3P^\circ$	0	293382	17	85SUG/COR2
		1	293471	17	85SUG/COR2
		2	293720	17	85SUG/COR2
$3s^23p^3(^2P^\circ)4s$	$^1P^\circ$	1	298132	18	85SUG/COR2
$3s^23p^3(^2P^\circ)3d$	$^1P^\circ$	1	298898	18	85SUG/COR2
$3s^23p^3(^4S^\circ)5s$	$^3S^\circ$	1	367888	30	85SUG/COR2
K V ($^4S^\circ_{3/2}$)	*Limit*	⋯	491330	150	99BIE/FRE

7.5. K V

P isoelectronic sequence

Ground state $1s^22s^22p^63s^23p^3\ ^4S^{\circ}_{3/2}$

Ionization energy [666 700(1300) cm^{-1}]
[82.66(16) eV]

Measurements of the K V spectrum were first reported in the region between 200 and 1050 Å by Ekefors [31EKE]. From these data Ram [33RAM] classified three transitions from $3s^23p^3$ to the $3s3p^4$ configuration. Bowen [34BOW] performed additional measurements between 250 and 650 Å and was able to extend the analysis to include more levels in the configurations identified by Ram as well as levels in $3s^23p^23d$ and $4s$. Tsien [39TSI] located $3s3p^4\ ^2S$ and ^2D. The connection between the doublet and quartet systems was not established until 1955, when Bowen [55BOW] measured the $^4S^{\circ}-^2D^{\circ}$ forbidden transition of the ground configuration in nebular spectra. More recent measurements by Smitt *et al.* [76SMI/SVE] produced more accurate wavelengths for the transitions between 580 and 772 Å. Sugar and Corliss [85SUG/COR2] incorporated all measurements along with identifications by Tsien [39TSI] and Ekberg and Svensson [70EKB/SVE] to produce improved energy level values for the $3p^2$ and $4s$ configurations. The energy level values retained in the Tables 12 and 13 are taken from the Sugar and Corliss compilation [85SUG/COR2]; however, calculations by Froese Fischer *et al.* [06FRO/TAC] and by Fawcett [86FAW2] indicate that the configuration designations for the $3s3p^4\ ^2P$ and $3s^23p^2(^3P)3d\ ^2P$ levels should be interchanged and we have done so.

The transition probabilities of allowed transitions of K V have been calculated by Huang [84HUA] using the multiconfiguration Dirac–Fock technique, Charro *et al.* [00CHA/MAR] with the relativistic quantum defect orbital formulation, Fawcett [86FAW2] using the relativistic Hartree–Fock, and Froese Fischer *et al.* [06FRO/TAC] with multiconfiguration Hartree–Fock. The following reported values are from the more extensive Froese Fischer *et al.* [06FRO/TAC] calculations, where available, and Fawcett [86FAW2] otherwise. The transition probabilities for forbidden lines in the ground state are from Mendoza and Zeippen [82MEN/ZEI]. Although lifetimes are not compiled here, it should be noted that Andersen *et al.* [75AND/PET] experimentally measured the lifetime of $3s3p^4\ ^4P_{3/2,5/2}$ to be 2.9(2) ns. The ionization energy cited above was determined by Lotz [67LOT] by fitting along the P I isoelectronic sequence.

References for K V

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85SUG/COR2	Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 26 (1985).
86FAW2	Fawcett, B. C., At. Data Nucl. Data Tables **35**, 185 (1986).
00CHA/MAR	Charro, E., Martín, I., and Serna, M. A., J. Phys. B **33**, 1753 (2000).
06FRO/TAC	Froese Fischer, C., Tachiev, G., and Irimia, A., At. Data Nucl. Data Tables **92**, 607 (2006).

TABLE 12. Observed spectral lines of K V

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
214.35	0.02	466525	100				31EKE	
282.36	0.02	354164	150				31EKE	
293.05	0.02	341239	100	3.54E+9	$3s^23p^3\ ^2P^{\circ}_{1/2}$	$3s^23p^2(^1S)4s\ ^2S_{1/2}$	31EKE	06FRO/TAC
293.33	0.02	340911	150	6.37E+9	$3s^23p^3\ ^2P^{\circ}_{3/2}$	$3s^23p^2(^1S)4s\ ^2S_{1/2}$	31EKE	06FRO/TAC
294.84	0.02	339172	300	4.78E+9	$3s^23p^3\ ^4S^{\circ}_{3/2}$	$3s^23p^2(^3P)4s\ ^4P_{5/2}$	31EKE	06FRO/TAC
296.17	0.02	337645	200	4.71E+9	$3s^23p^3\ ^4S^{\circ}_{3/2}$	$3s^23p^2(^3P)4s\ ^4P_{3/2}$	31EKE	06FRO/TAC
297.06	0.02	336628	200	4.68E+9	$3s^23p^3\ ^4S^{\circ}_{3/2}$	$3s^23p^2(^3P)4s\ ^4P_{1/2}$	31EKE	06FRO/TAC
300.25	0.02	333054	200	6.13E+9	$3s^23p^3\ ^2D^{\circ}_{3/2}$	$3s^23p^2(^1D)4s\ ^2D_{3/2}$	31EKE	06FRO/TAC
300.50	0.02	332775	200	6.46E+9	$3s^23p^3\ ^2D^{\circ}_{5/2}$	$3s^23p^2(^1D)4s\ ^2D_{5/2}$	31EKE	06FRO/TAC
311.24	0.02	321292	200	1.00E+10	$3s^23p^3\ ^2D^{\circ}_{5/2}$	$3s^23p^2(^3P)4s\ ^2P_{3/2}$	31EKE	06FRO/TAC
312.77	0.02	319724	250	1.16E+10	$3s^23p^3\ ^2D^{\circ}_{3/2}$	$3s^23p^2(^3P)4s\ ^2P_{1/2}$	31EKE	06FRO/TAC
315.18	0.02	317278	200	1.44E+9	$3s^23p^3\ ^2P^{\circ}_{1/2}$	$3s^23p^2(^1D)4s\ ^2D_{3/2}$	31EKE	06FRO/TAC
315.54	0.02	316920	150	1.77E+9	$3s^23p^3\ ^2P^{\circ}_{3/2}$	$3s^23p^2(^1D)4s\ ^2D_{5/2}$	31EKE	06FRO/TAC
327.03	0.02	305781	100	1.16E+9	$3s^23p^3\ ^2P^{\circ}_{1/2}$	$3s^23p^2(^3P)4s\ ^2P_{3/2}$	31EKE	06FRO/TAC

TABLE 12. Observed spectral lines of K V—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
327.38	0.02	305459	250	4.56E+9	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^3P)4s\ ^2P_{3/2}$	31EKE	06FRO/TAC
328.97		303976	100	3.40E+9	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s^23p^2(^3P)4s\ ^2P_{1/2}$	31EKE	06FRO/TAC
329.31	0.02	303668	50	1.08E+9	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^3P)4s\ ^2P_{1/2}$	31EKE	06FRO/TAC
349.50	0.02	286123	200				31EKE	
372.15	0.02	268709	500	5.23E+10	$3s^23p^3\ ^2D^\circ_{5/2}$	$3s^23p^2(^1D)3d\ ^2F_{7/2}$	31EKE	06FRO/TAC
372.46	0.02	268485	200	4.86E+10	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s^23p^2(^1D)3d\ ^2F_{5/2}$	31EKE	06FRO/TAC
372.77	0.02	268259	200	3.79E+9	$3s^23p^3\ ^2D^\circ_{5/2}$	$3s^23p^2(^1D)3d\ ^2F_{5/2}$	31EKE	06FRO/TAC
375.96	0.02	265986	300		$3s^23p^3\ ^2D^\circ_{5/2}$	$3s^23p^2(^1D)3d\ ^2P_{3/2}$	31EKE	
377.76	0.02	264718	250	4.0E+10	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s^23p^2(^1S)3d\ ^2D_{3/2}$	31EKE	86FAW2
378.22	0.02	264397	150	8.3E+9	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^1S)3d\ ^2D_{3/2}$	31EKE	86FAW2
379.12	0.02	263769	300	4.8E+10	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^1S)3d\ ^2D_{5/2}$	31EKE	86FAW2
383.32	0.02	260880	100	4.97E+8	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s3p^4\ ^2P_{1/2}$	31EKE	06FRO/TAC
387.80	0.02	257865	300	4.26E+10	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^4P_{5/2}$	31EKE	06FRO/TAC
389.07	0.02	257023	250	3.11E+10	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s^23p^2(^1D)3d\ ^2D_{3/2}$	31EKE	06FRO/TAC
389.43	0.02	256787	100	3.86E+9	$3s^23p^3\ ^2D^\circ_{5/2}$	$3s^23p^2(^1D)3d\ ^2D_{3/2}$	31EKE	06FRO/TAC
389.75	0.02	256575	100	2.29E+9	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s^23p^2(^1D)3d\ ^2D_{5/2}$	31EKE	06FRO/TAC
390.11	0.02	256338	250	3.11E+10	$3s^23p^3\ ^2D^\circ_{5/2}$	$3s^23p^2(^1D)3d\ ^2D_{5/2}$	31EKE	06FRO/TAC
395.40	0.02	252908	250	2.70E+10	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^1D)3d\ ^2S_{1/2}$	31EKE	06FRO/TAC
398.36	0.02	251029	200	2.91E+10	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s^23p^2(^1D)3d\ ^2P_{1/2}$	31EKE	06FRO/TAC
398.88	0.02	250702	200	6.86E+9	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^1D)3d\ ^2P_{1/2}$	31EKE	06FRO/TAC
399.75	0.02	250156	200	2.94E+10	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^1D)3d\ ^2P_{3/2}$	31EKE	06FRO/TAC
414.46	0.02	241275	150	8.87E+8	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s^23p^2(^1D)3d\ ^2D_{3/2}$	31EKE	06FRO/TAC
415.05	0.02	240935	250				31EKE	
415.79	0.02	240506	200	1.17E+9	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^1D)3d\ ^2D_{5/2}$	31EKE	06FRO/TAC
422.18	0.02	236866	400	2.65E+10	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s3p^4\ ^2P_{1/2}$	31EKE	06FRO/TAC
425.16	0.02	235206	300	2.67E+8	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^4P_{3/2}$	31EKE	06FRO/TAC
425.59	0.02	234968	500	5.95E+8	$3s^23p^3\ ^2D^\circ_{5/2}$	$3s^23p^2(^3P)3d\ ^4P_{3/2}$	31EKE	06FRO/TAC
438.02	0.02	228300	250				31EKE	
449.01	0.02	222711	150	7.58E+6	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^4D_{3/2}$	31EKE	06FRO/TAC
449.71	0.02	222366	200	7.18E+6	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^4D_{5/2}$	31EKE	06FRO/TAC
452.23		221128	100	1.29E+9	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s3p^4\ ^2P_{1/2}$	31EKE	06FRO/TAC
452.90	0.02	220799	200	1.57E+9	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s3p^4\ ^2P_{1/2}$	31EKE	06FRO/TAC
455.67	0.02	219457	250	2.99E+8	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s3p^4\ ^2P_{3/2}$	31EKE	06FRO/TAC
456.33	0.02	219140	400	1.34E+9	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s3p^4\ ^2P_{3/2}$	31EKE	06FRO/TAC
482.71	0.02	207164	200	8.97E+4	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^4F_{5/2}$	31EKE	06FRO/TAC
483.75	0.02	206718	200	3.56E+4	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^4F_{3/2}$	31EKE	06FRO/TAC
580.320	0.008	172319	500	1.64E+9	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^2P_{1/2}$	76SMI/SVE	06FRO/TAC
585.506	0.008	170792	300	1.60E+8	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^2P_{3/2}$	76SMI/SVE	06FRO/TAC
586.321	0.008	170555	500	1.50E+9	$3s^23p^3\ ^2D^\circ_{5/2}$	$3s^23p^2(^3P)3d\ ^2P_{3/2}$	76SMI/SVE	06FRO/TAC
602.257	0.008	166042	300	7.39E+8	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s3p^4\ ^2S_{1/2}$	76SMI/SVE	06FRO/TAC
603.429	0.008	165720	350	1.58E+9	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s3p^4\ ^2S_{1/2}$	76SMI/SVE	06FRO/TAC
638.681	0.008	156573	150	1.54E+8	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s^23p^2(^3P)3d\ ^2P_{1/2}$	76SMI/SVE	06FRO/TAC
639.994	0.008	156251	100	5.35E+7	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^2P_{1/2}$	76SMI/SVE	06FRO/TAC
644.964	0.008	155047	100	2.92E+7	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s^23p^2(^3P)3d\ ^2P_{3/2}$	76SMI/SVE	06FRO/TAC
646.308	0.008	154725	150	9.60E+7	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s^23p^2(^3P)3d\ ^2P_{3/2}$	76SMI/SVE	06FRO/TAC
686.373	0.008	145693	150	2.92E+7	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s3p^4\ ^2D_{5/2}$	76SMI/SVE	06FRO/TAC
686.968	0.008	145567	450	6.49E+8	$3s^23p^3\ ^2D^\circ_{3/2}$	$3s3p^4\ ^2D_{3/2}$	76SMI/SVE	06FRO/TAC
687.492	0.008	145456	450	6.20E+8	$3s^23p^3\ ^2D^\circ_{5/2}$	$3s3p^4\ ^2D_{5/2}$	76SMI/SVE	06FRO/TAC
688.091	0.008	145330	150	4.52E+7	$3s^23p^3\ ^2D^\circ_{5/2}$	$3s3p^4\ ^2D_{3/2}$	76SMI/SVE	06FRO/TAC
720.440	0.008	138804	400	3.92E+8	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s3p^4\ ^4P_{1/2}$	76SMI/SVE	06FRO/TAC
724.441	0.008	138037	450	3.87E+8	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s3p^4\ ^4P_{3/2}$	76SMI/SVE	06FRO/TAC
731.869	0.008	136636	500	3.80E+8	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s3p^4\ ^4P_{5/2}$	76SMI/SVE	06FRO/TAC
770.289	0.008	129821	200	5.86E+7	$3s^23p^3\ ^2P^\circ_{1/2}$	$3s3p^4\ ^2D_{3/2}$	76SMI/SVE	06FRO/TAC
771.454	0.008	129625	250	8.39E+7	$3s^23p^3\ ^2P^\circ_{3/2}$	$3s3p^4\ ^2D_{5/2}$	76SMI/SVE	06FRO/TAC
Air								
4122.63	0.05	24250		4.59E−3	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s^23p^3\ ^2D^\circ_{5/2}$	55BOW	82MEN/ZEI
4163.30	0.05	24013		8.84E−2	$3s^23p^3\ ^4S^\circ_{3/2}$	$3s^23p^3\ ^2D^\circ_{3/2}$	55BOW	82MEN/ZEI

TABLE 13. Energy levels of K v

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$3s^23p^3$	$^4S^{\circ}$	3/2	0.0	2.0	
$3s^23p^3$	$^2D^{\circ}$	3/2	24012.5	2.0	85SUG/COR2
		5/2	24249.6	2.0	85SUG/COR2
$3s^23p^3$	$^2P^{\circ}$	1/2	39758.1	2.0	85SUG/COR2
		3/2	40080.2	2.0	85SUG/COR2
$3s3p^4$	^4P	5/2	136636.5	2.0	85SUG/COR2
		3/2	138037.5	2.0	85SUG/COR2
		1/2	138804.1	2.0	85SUG/COR2
$3s3p^4$	^2D	3/2	169579.5	2.0	85SUG/COR2
		5/2	169705.8	2.0	85SUG/COR2
$3s^23p^2(^3P)3d$	^2P	3/2	194805.1	2.0	85SUG/COR2
		1/2	196331.2	2.0	85SUG/COR2
$3s3p^4$	^2S	1/2	205799.9	2.0	85SUG/COR2
$3s^23p^2(^3P)3d$	^4F	3/2	206720	10	85SUG/COR2
		5/2	207165	10	85SUG/COR2
$3s^23p^2(^3P)3d$	^4D	5/2	222366	10	85SUG/COR2
		3/2	222711	10	85SUG/COR2
$3s^23p^2(^3P)3d$	^4P	5/2	257865	10	85SUG/COR2
		3/2	259276	10	85SUG/COR2
		1/2	259726	10	85SUG/COR2
$3s3p^4$	^2P	3/2	259218	10	85SUG/COR2
		1/2	260882	10	85SUG/COR2
$3s^23p^2(^1D)3d$	^2D	5/2	280585	10	85SUG/COR2
		3/2	281035	10	85SUG/COR2
$3s^23p^2(^1D)3d$	^2P	3/2	290236	10	85SUG/COR2
		1/2	290784	10	85SUG/COR2
$3s^23p^2(^1D)3d$	^2F	5/2	292497	10	85SUG/COR2
		7/2	292960	10	85SUG/COR2
$3s^23p^2(^1D)3d$	^2S	1/2	292987	10	85SUG/COR2
$3s^23p^2(^1S)3d$	^2D	5/2	303850	10	85SUG/COR2
		3/2	304476	10	85SUG/COR2
$3s^23p^2(^3P)4s$	^4P	1/2	336628	10	85SUG/COR2
		3/2	337645	10	85SUG/COR2
		5/2	339172	10	85SUG/COR2
$3s^23p^2(^3P)4s$	^2P	1/2	343740	10	85SUG/COR2
		3/2	345540	10	85SUG/COR2
$3s^23p^2(^1D)4s$	^2D	5/2	357012	10	85SUG/COR2
		3/2	357050	10	85SUG/COR2
$3s^23p^2(^1S)4s$	^2S	1/2	380994	10	85SUG/COR2
K VI ($^3P_0$)	*Limit*	···	666700	1300	67LOT

7.6. K VI

Si isoelectronic sequence

Ground state $1s^2 2s^2 2p^6 3s^2 3p^2\ ^3P_0$

Ionization energy [803 400(1800) cm^{-1}]
[99.6(2) eV]

Measurements by Ekefors [31EKE] in the region between 200 and 1050 Å yielded the first observations of the K VI spectrum. From these data Ram [33RAM] and Whitford [34WHI] located most of the triplet levels and Robinson [37ROB] found two singlets. More recent measurements by Ekberg and Svensson [70EKB/SVE] and Smitt *et al.* [76SMI/SVE] produced more accurate wavelengths for the transitions between 375 and 725 Å. The $^3P_0-^3P_1$ forbidden ground-term transition was subsequently observed in a planetary nebula by Kelly and Lacy [95KEL/LAC]. Träbert *et al.* [88TRA/HEC] used beam-foil spectroscopy to measure transitions to the $3s3p^3\ ^5S^\circ_2$ level for several members of the silicon isoelectronic sequence and obtained a value for K VI by isoelectronic fitting. Sugar and Corliss [85SUG/COR2] used the Smitt *et al.* [76SMI/SVE] transitions to derive $3s^2 3p^2$ and $3s3p^3$ level values and the data from Ekberg and Svensson [70EKB/SVE] to obtain energies for the $3s^2 3p3d$ and $3s^2 3p4s$ configurations. The level values retained in Tables 14 and 15 are taken from the Sugar and Corliss compilation [85SUG/COR2] except for the $3s^2 3p^2\ ^3P_1$ level, which is more accurately known from the data by Kelly and Lacy [95KEL/LAC], and the $3s3p^3\ ^5S^\circ_2$ level from Träbert *et al.* [88TRA/HEC]. The leading percentages for the energy levels have been calculated by Biémont [89BIE].

The transition probabilities of allowed transitions of K VI have been calculated by Huang [85HUA] using the multiconfiguration Dirac–Fock technique, Charro *et al.* [97CHA/MAR] with the relativistic quantum defect orbital formulation, Fawcett [87FAW] using a relativistic Hartree–Fock approach, Froese Fischer *et al.* [06FRO/TAC] with multiconfiguration Hartree–Fock code, and Biémont [89BIE], whose semiempirical approach, based on the relativistic Hartree exchange method of Cowan [81COW], provided levels most consistent with the experimental observations. The values reported in Table 14 are from the Biémont calculations [89BIE]. The ionization energy cited above was determined by Biémont *et al.* [99BIE/FRE] using a semiempirical fit along the Si I isoelectronic sequence.

References for K VI

31EKE Ekefors, E., Z. Phys. **71**, 53 (1931).

33RAM Ram, M., Indian J. Phys. **8**, 151 (1933).

34WHI Whitford, A. E., Phys. Rev. **46**, 793 (1934).

37ROB Robinson, H. A., Phys. Rev. **52**, 724 (1937).

70EKB/SVE Ekberg, J. O., and Svensson, L. Å., Phys. Scr. **2**, 283 (1970).

76SMI/SVE Smitt, R., Svensson, L. Å., and Outred, M., Phys. Scr. **13**, 293 (1976).

81COW Cowan, R. D., *The Theory of Atomic Structure and Spectra* (University of California Press, Berkeley, CA, 1981).

85HUA Huang, K.-N., At. Data Nucl. Data Tables **32**, 503 (1985).

85SUG/COR2 Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 26 (1985).

86BIE Biémont, E., J. Opt. Soc. Am. B **3**, 163 (1986).

87FAW Fawcett, B. C., At. Data Nucl. Data Tables **36**, 129 (1987).

88TRA/HEC Träbert, E., Heckmann, P. H., Hutton, R., and Martinson, I., J. Opt. Soc. Am. **5**, 2173 (1988).

95KEL/LAC Kelly, D. M., and Lacy, J. H., Astrophys. J. **454**, L161 (1995).

97CHA/MAR Charro, E., Martín, I., and Lavín, C., Astron. Astrophys. Suppl. Ser. **124**, 397 (1997).

99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).

06FRO/TAC Froese Fischer, C., Tachiev, G., and Irimia, A., At. Data Nucl. Data Tables **92**, 607 (2006).

TABLE 14. Observed spectral lines of K VI

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
256.83	0.02	389361	3	3.75E+9	$3s^2 3p^2\ ^3P_1$	$3s^2 3p4s\ ^3P^\circ_2$	31EKE	89BIE
257.66	0.02	388113	2	4.78E+9	$3s^2 3p^2\ ^3P_0$	$3s^2 3p4s\ ^3P^\circ_1$	31EKE	89BIE
258.02	0.02	387570	4	1.10E+10	$3s^2 3p^2\ ^3P_2$	$3s^2 3p4s\ ^3P^\circ_2$	31EKE	89BIE
258.41	0.02	386980	1	3.46E+9	$3s^2 3p^2\ ^3P_1$	$3s^2 3p4s\ ^3P^\circ_1$	31EKE	89BIE
258.87	0.02	386290	3	1.46E+10	$3s^2 3p^2\ ^3P_1$	$3s^2 3p4s\ ^3P^\circ_0$	31EKE	89BIE
259.61	0.02	385195	2	6.11E+9	$3s^2 3p^2\ ^3P_2$	$3s^2 3p4s\ ^3P^\circ_1$	31EKE	89BIE
266.34	0.02	375454	4	2.18E+10	$3s^2 3p^2\ ^1D_2$	$3s^2 3p4s\ ^1P^\circ_1$	31EKE	86BIE
284.86	0.02	351050	0	3.34E+9	$3s^2 3p^2\ ^1S_0$	$3s^2 3p4s\ ^1P^\circ_1$	31EKE	89BIE
374.94	0.02	266709	5	3.38E+10	$3s^2 3p^2\ ^1D_2$	$3s^2 3p3d\ ^1F^\circ_3$	70EKB/SVE	89BIE
384.51	0.02	260069	2	1.47E+10	$3s^2 3p^2\ ^3P_0$	$3s^2 3p3d\ ^3D^\circ_1$	70EKB/SVE	89BIE
385.55	0.02	259372	4	2.04E+10	$3s^2 3p^2\ ^3P_1$	$3s^2 3p3d\ ^3D^\circ_2$	70EKB/SVE	89BIE

TABLE 14. Observed spectral lines of K VI—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
387.81	0.02	257859	6	3.16E+10	$3s^23p^2\ ^3P_2$	$3s^23p3d\ ^3D^\circ_3$	70EKB/SVE	89BIE
388.24	0.02	257572	3	1.15E+10	$3s^23p^2\ ^3P_2$	$3s^23p3d\ ^3D^\circ_2$	70EKB/SVE	89BIE
394.48	0.02	253498	3	1.00E+10	$3s^23p^2\ ^3P_0$	$3s^23p3d\ ^3P^\circ_1$	70EKB/SVE	89BIE
395.41	0.02	252904	3	2.08E+10	$3s^23p^2\ ^3P_1$	$3s^23p3d\ ^3P^\circ_0$	70EKB/SVE	89BIE
396.24	0.02	252371	1	2.99E+9	$3s^23p^2\ ^3P_1$	$3s^23p3d\ ^3P^\circ_1$	70EKB/SVE	89BIE
398.10	0.02	251191	3	7.71E+9	$3s^23p^2\ ^3P_1$	$3s^23p3d\ ^3P^\circ_2$	70EKB/SVE	89BIE
399.08	0.02	250579	2	7.84E+9	$3s^23p^2\ ^3P_2$	$3s^23p3d\ ^3P^\circ_1$	70EKB/SVE	89BIE
399.42	0.02	250364	2	2.59E+10	$3s^23p^2\ ^1S_0$	$3s^23p3d\ ^1P^\circ_1$	70EKB/SVE	89BIE
400.96	0.02	249400	4	1.12E+10	$3s^23p^2\ ^3P_2$	$3s^23p3d\ ^3P^\circ_2$	70EKB/SVE	89BIE
428.54	0.02	233352	1	2.23E+9	$3s^23p^2\ ^1D_2$	$3s^23p3d\ ^3P^\circ_2$	70EKB/SVE	89BIE
449.021	0.008	222706.7	0	9.86E+8	$3s^23p^2\ ^3P_1$	$3s3p^3\ ^1P^\circ_1$	76SMI/SVE	89BIE
452.667	0.008	220912.9	0	8.11E+8	$3s^23p^2\ ^3P_2$	$3s3p^3\ ^1P^\circ_1$	76SMI/SVE	89BIE
458.045	0.008	218319.2	2	2.81E+9	$3s^23p^2\ ^3P_0$	$3s3p^3\ ^3S^\circ_1$	76SMI/SVE	89BIE
460.440	0.008	217183.6	4	8.98E+9	$3s^23p^2\ ^3P_1$	$3s3p^3\ ^3S^\circ_1$	76SMI/SVE	89BIE
464.275	0.008	215389.6	5	1.35E+10	$3s^23p^2\ ^3P_2$	$3s3p^3\ ^3S^\circ_1$	76SMI/SVE	89BIE
488.132	0.008	204862.6	5	1.15E+10	$3s^23p^2\ ^1D_2$	$3s3p^3\ ^1P^\circ_1$	76SMI/SVE	89BIE
501.657	0.008	199339.4	0	6.12E+8	$3s^23p^2\ ^1D_2$	$3s3p^3\ ^3S^\circ_1$	76SMI/SVE	89BIE
571.564	0.008	174958.5	0	9.24E+7	$3s^23p^2\ ^1S_0$	$3s3p^3\ ^3S^\circ_1$	76SMI/SVE	89BIE
611.864	0.008	163435.0	4	3.67E+8	$3s^23p^2\ ^3P_0$	$3s3p^3\ ^3P^\circ_1$	76SMI/SVE	89BIE
616.122	0.008	162305.5	4*	2.24E+8	$3s^23p^2\ ^3P_1$	$3s3p^3\ ^3P^\circ_2$	76SMI/SVE	89BIE
616.122	0.008	162305.5	4*	3.46E+8	$3s^23p^2\ ^3P_1$	$3s3p^3\ ^3P^\circ_1$	76SMI/SVE	89BIE
616.189	0.008	162287.9	3	1.11E+9	$3s^23p^2\ ^3P_1$	$3s3p^3\ ^3P^\circ_0$	76SMI/SVE	89BIE
623.012	0.008	160510.6	9*	8.34E+8	$3s^23p^2\ ^3P_2$	$3s3p^3\ ^3P^\circ_2$	76SMI/SVE	89BIE
623.012	0.008	160510.6	9*	3.82E+8	$3s^23p^2\ ^3P_2$	$3s3p^3\ ^3P^\circ_1$	76SMI/SVE	89BIE
625.410	0.008	159895.1	8	1.53E+9	$3s^23p^2\ ^1D_2$	$3s3p^3\ ^1D^\circ_2$	76SMI/SVE	89BIE
710.526	0.008	140740.8	7	2.21E+8	$3s^23p^2\ ^3P_0$	$3s3p^3\ ^3D^\circ_1$	76SMI/SVE	89BIE
716.016	0.008	139661.7	9	2.90E+8	$3s^23p^2\ ^3P_1$	$3s3p^3\ ^3D^\circ_2$	76SMI/SVE	89BIE
716.289	0.008	139608.5	5	1.20E+8	$3s^23p^2\ ^3P_1$	$3s3p^3\ ^3D^\circ_1$	76SMI/SVE	89BIE
724.278	0.008	138068.5	10	3.27E+8	$3s^23p^2\ ^3P_2$	$3s3p^3\ ^3D^\circ_3$	76SMI/SVE	89BIE
725.328	0.008	137868.7	4	5.02E+7	$3s^23p^2\ ^3P_2$	$3s3p^3\ ^3D^\circ_2$	76SMI/SVE	89BIE
88299.	2.	1132.52			$3s^23p^2\ ^3P_0$	$3s^23p^2\ ^3P_1$	95KEL/LAC	

TABLE 15. Energy levels of K VI

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
$3s^23p^2$	^3P	0	0.0	2	95%	85SUG/COR2
		1	1132.52	0.03	96%	95KEL/LAC
		2	2927.2	2	95%	85SUG/COR2
$3s^23p^2$	^1D	2	18977.8	2	95%	85SUG/COR2
$3s^23p^2$	^1S	0	43358.8	2	94%	85SUG/COR2
$3s3p^3$	$^5S^\circ$	2	[100480.]	100	99%	88TRA/HEC
$3s3p^3$	$^3D^\circ$	1	140741.3	2	85% + 12% $3s^23p3d\ ^3D^\circ_1$	85SUG/COR2
		2	140795.4	2	85% + 12% $3s^23p3d\ ^3D^\circ_2$	85SUG/COR2
		3	140995.7	2	86% + 12% $3s^23p3d\ ^3D^\circ_3$	85SUG/COR2
$3s3p^3$	$^3P^\circ$	0	163421.3	2	86% + 11% $3s^23p3d\ ^3P^\circ_0$	85SUG/COR2
		1	163435.0	2	86% + 12% $3s^23p3d\ ^3P^\circ_1$	85SUG/COR2
		2	163438		85% + 12% $3s^23p3d\ ^3P^\circ_2$	85SUG/COR2
$3s3p^3$	$^1D^\circ$	2	178872.9	2	52% + 43% $3s^23p3d\ ^1D^\circ_2$	85SUG/COR2
$3s3p^3$	$^3S^\circ$	1	218317.3	2	85% + 9% $3s3p^3\ ^1P^\circ_1$	85SUG/COR2
$3s3p^3$	$^1P^\circ$	1	223840.1	2	76% + 11% $3s^23p3d\ ^1P^\circ_1$	85SUG/COR2

TABLE 15. Energy levels of K VI—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
$3s^23p3d$	$^3P^\circ$	2	252327	13	72% + 10% $3s3p^3$ $^3P^\circ_2$	85SUG/COR2
		1	253503	13	82% + 11% $3s3p^3$ $^3P^\circ_1$	85SUG/COR2
		0	254037	13	84% + 11% $3s3p^3$ $^3P^\circ_0$	85SUG/COR2
$3s^23p3d$	$^3D^\circ$	1	260069	14	82% + 12% $3s3p^3$ $^3D^\circ_1$	85SUG/COR2
		2	260503	14	82% + 12% $3s3p^3$ $^3D^\circ_2$	85SUG/COR2
		3	260786	14	84% + 12% $3s3p^3$ $^3D^\circ_3$	85SUG/COR2
$3s^23p3d$	$^1F^\circ$	3	285687	16	96%	85SUG/COR2
$3s^23p3d$	$^1P^\circ$	1	293723	17	84% + 10% $3s3p^3$ $^1P^\circ_1$	85SUG/COR2
$3s^23p4s$	$^3P^\circ$	0	387423	30	100%	85SUG/COR2
		1	388116	30	94%	85SUG/COR2
		2	390496	30	100%	85SUG/COR2
$3s^23p4s$	$^1P^\circ$	1	394420	30	94%	85SUG/COR2
K VII ($^2P^\circ_{1/2}$)	*Limit*	⋯	803400	1800		99BIE/FRE

7.7. K VII

Al isoelectronic sequence

Ground state $1s^22s^22p^63s^23p$ $^2P^\circ_{1/2}$

Ionization energy 948 200(900) cm^{-1}
117.56(10) eV

Ekefors [31EKE] was the first to report K VII spectral lines, which he observed in the region between 200 and 1050 Å. From the Ekefors data Whitford [34WHI] located levels in the $3s^23p$, $3s3p^2$, $3p^3$, and $3s3p4s$ configurations. Levels in $3s^23d$, $3s^24d$, and $3s3p3d$ were identified by Phillips [39PHI]. More recent measurements by Ekberg and Svensson [70EKB/SVE] and Smitt *et al.* [76SMI/SVE] produced more accurate wavelengths for the transitions between 375 and 725 Å and Edlén and Bodén [76EDL/BOD] improved the values between 125 and 225 Å. Sugar and Corliss [85SUG/COR2] used the material available before 1985 to compile the energy levels. Subsequent research by Levashov *et al.* [90LEV/RYA] and Churilov and Levashov [93CHU/LEV] using laser-produced plasmas produced a much more extensive set of transitions. A complete reoptimization of the energy levels was given by Churilov and Levashov [93CHU/LEV]. The ground state splitting was observed by Feuchtgruber *et al.* [97FEU/LUT] in observations of the planetary nebula. The level values retained in Tables 16 and 17 below are mostly taken from Churilov and Levashov [93CHU/LEV]. However, the ground state splitting is from Feuchtgruber *et al.* [97FEU/LUT], the values of Smitt *et al.* [76SMI/SVE] are more accurate for the $3s3p^2$ configuration, and several of the configurations observed by Ekberg and Svensson [70EKB/SVE] were not reported by Churilov and Levashov [93CHU/LEV] or Levashov *et al.* [90LEV/RYA]. The level values for the $3s3p4s$ ^4P configuration are those measured by Ekberg and Svensson [70EKB/SVE], adjusted to include the measurement of the connection between the doublet system and quartet system by Churilov and Levashov [93CHU/LEV]. That connection was also predicted using isoelectronic fitting by Jupén and Curtis [96JUP/CUR] and by Träbert *et al.* [88TRA/HEC], whose values are within 40 cm^{-1} of the [93CHU/LEV] measurement.

The transition probabilities of allowed transitions of K VII have been calculated by Huang [86HUA] using the multiconfiguration Dirac–Fock technique and Froese Fischer *et al.* [06FRO/TAC], whose multiconfiguration Hartree–Fock approach provided levels more consistent with the experimental observations. The values reported in Table 16 are from the Froese Fischer *et al.* [06FRO/TAC] calculations, with the exception of the forbidden $3s^23p$ $^2P^\circ_{1/2}$–$3s^23p$ $^2P^\circ_{1/2}$ transition. The ionization energy cited above was determined by Ekberg and Svensson [70EKB/SVE] using the nf ^2F series.

References for K VII

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86HUA	Huang, K.-N., At. Data Nucl. Data Tables **34**, 1 (1986).
87FAW	Fawcett, B. C., At. Data Nucl. Data Tables

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86BIE Biémont, E., J. Opt. Soc. Am. B **3**, 163 (1989).

90LEV/RYA Levashov, V. E., Ryabtsev, A. N., and Churilov, S. S., Opt. Spectrosc. **69**, 20 (1990).

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97CHA/MAR Charro, E., Martín, I., and Lavín, C., Astron. Astrophys. Suppl. Ser. **124**, 397 (1997).

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06FRO/TAC Froese Fischer, C., Tachiev, G., and Irimia, A., At. Data Nucl. Data Tables **92**, 607 (2006).

TABLE 16. Observed spectral lines of K VII

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
126.654	0.005	789553	0		$3s^23p\ ^2P^\circ_{1/2}$	$3s^26d\ ^2D_{3/2}$	76EDL/BOD	
127.156	0.005	786436	1		$3s^23p\ ^2P^\circ_{3/2}$	$3s^26d\ ^2D_{5/2}$	76EDL/BOD	
133.084	0.02	751405	00		$3s^23p\ ^2P^\circ_{3/2}$	$3s^26s\ ^2S_{1/2}$	76EDL/BOD	
139.480	0.005	716949	2		$3s^23p\ ^2P^\circ_{1/2}$	$3s^25d\ ^2D_{3/2}$	76EDL/BOD	
140.084	0.005	713857	1		$3s^23p\ ^2P^\circ_{3/2}$	$3s^25d\ ^2D_{5/2}$	76EDL/BOD	
152.889	0.005	654069	2		$3s^23p\ ^2P^\circ_{1/2}$	$3s^25s\ ^2S_{1/2}$	76EDL/BOD	
153.624	0.005	650940	3		$3s^23p\ ^2P^\circ_{3/2}$	$3s^25s\ ^2S_{1/2}$	76EDL/BOD	
175.205	0.005	570760	4		$3s^23p\ ^2P^\circ_{1/2}$	$3s^24d\ ^2D_{3/2}$	76EDL/BOD	
176.120	0.005	567794	5		$3s^23p\ ^2P^\circ_{3/2}$	$3s^24d\ ^2D_{5/2}$	76EDL/BOD	
176.181	0.005	567598	2		$3s^23p\ ^2P^\circ_{3/2}$	$3s^24d\ ^2D_{3/2}$	76EDL/BOD	
207.568	0.005	481770	2		$3s^23d\ ^2D_{3/2,5/2}$	$3s^25f\ ^2F^\circ_{5/2,7/2}$	76EDL/BOD	
218.990	0.005	456641	1		$3s3p^2\ ^2D_{3/2}$	$3s^24f\ ^2F^\circ_{5/2}$	76EDL/BOD	
219.071	0.005	456473	2				76EDL/BOD	
220.629	0.005	453250	3	9.16E+9	$3s3p^2\ ^4P_{3/2}$	$3s3p4s\ ^4P^\circ_{5/2}$	76EDL/BOD	06FRO/TAC
221.035	0.005	452417	3	1.26E+10	$3s3p^2\ ^4P_{1/2}$	$3s3p4s\ ^4P^\circ_{3/2}$	76EDL/BOD	06FRO/TAC
221.479	0.005	451510	5	2.13E+10	$3s3p^2\ ^4P_{5/2}$	$3s3p4s\ ^4P^\circ_{5/2}$	76EDL/BOD	06FRO/TAC
221.564	0.005	451337	1	5.00E+9	$3s3p^2\ ^4P_{1/2}$	$3s3p4s\ ^4P^\circ_{1/2}$	76EDL/BOD	06FRO/TAC
221.595	0.005	451274	1	4.02E+9	$3s3p^2\ ^4P_{3/2}$	$3s3p4s\ ^4P^\circ_{3/2}$	76EDL/BOD	06FRO/TAC
222.121	0.005	450205	3	2.50E+10	$3s3p^2\ ^4P_{3/2}$	$3s3p4s\ ^4P^\circ_{1/2}$	76EDL/BOD	06FRO/TAC
222.449	0.005	449541	2	1.36E+10	$3s3p^2\ ^4P_{5/2}$	$3s3p4s\ ^4P^\circ_{3/2}$	76EDL/BOD	06FRO/TAC
227.625	0.005	439319	5	1.03E+10	$3s^23p\ ^2P^\circ_{1/2}$	$3s^24s\ ^2S_{1/2}$	76EDL/BOD	06FRO/TAC
229.258	0.005	436190	6	2.10E+10	$3s^23p\ ^2P^\circ_{3/2}$	$3s^24s\ ^2S_{1/2}$	76EDL/BOD	06FRO/TAC
279.433	0.02	357868	0		$3s^23d\ ^2D_{3/2}$	$3s^24f\ ^2F^\circ_{5/2}$	70EKB/SVE	
279.521	0.02	357755	0		$3s^23d\ ^2D_{5/2}$	$3s^24f\ ^2F^\circ_{7/2}$	70EKB/SVE	
352.465	0.010	283716	4		$3p^3\ ^2D^\circ_{5/2}$	$3p^2(^3P)3d\ ^2F_{7/2}$	93CHU/LEV	
352.874	0.010	283387	3		$3p^3\ ^2D^\circ_{3/2}$	$3p^2(^3P)3d\ ^2F_{5/2}$	93CHU/LEV	
356.643	0.010	280392	4	1.64E+10	$3s3p^2\ ^2D_{3/2}$	$3s3p(^1P^\circ)3d\ ^2F^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
357.704	0.010	279561	6	1.76E+10	$3s3p^2\ ^2D_{5/2}$	$3s3p(^1P^\circ)3d\ ^2F^\circ_{7/2}$	90LEV/RYA	06FRO/TAC
363.418	0.010	275165	2		$3p^3\ ^2P^\circ_{1/2}$	$3p^2(^3P)3d\ ^2D_{3/2}$	93CHU/LEV	
364.891	0.010	274054	4		$3p^3\ ^2P^\circ_{3/2}$	$3p^2(^3P)3d\ ^2D_{5/2}$	93CHU/LEV	
375.124	0.010	266579	2		$3s3p(^3P^\circ)3d\ ^2F^\circ_{5/2}$	$3s3d^2\ ^2F_{5/2}$	93CHU/LEV	
378.538	0.010	264174	2		$3s3p(^3P^\circ)3d\ ^2F^\circ_{7/2}$	$3s3d^2\ ^2F_{7/2}$	93CHU/LEV	
391.129	0.010	255670	1		$3s3p3d\ ^4F^\circ_{5/2}$	$3s3d^2\ ^4F_{5/2}$	93CHU/LEV	
392.403	0.010	254840	2		$3s3p3d\ ^4F^\circ_{7/2}$	$3s3d^2\ ^4F_{7/2}$	93CHU/LEV	
394.162	0.010	253703	2		$3s3p3d\ ^4F^\circ_{9/2}$	$3s3d^2\ ^4F_{9/2}$	93CHU/LEV	
397.691	0.02	251452	0	4.94E+9	$3s3p^2\ ^4P_{1/2}$	$3s3p3d\ ^4D^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
398.354	0.02	251033	1	1.46E+10	$3s3p^2\ ^4P_{1/2}$	$3s3p3d\ ^4D^\circ_{1/2}$	70EKB/SVE	06FRO/TAC
398.943	0.02	250662	4	1.79E+10	$3s^23p\ ^2P^\circ_{1/2}$	$3s^23d\ ^2D^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
399.495	0.02	250316	1	1.34E+10	$3s3p^2\ ^4P_{3/2}$	$3s3p3d\ ^4D^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
400.147	0.02	249908	2	6.93E+9	$3s3p^2\ ^4P_{3/2}$	$3s3p3d\ ^4D^\circ_{1/2}$	70EKB/SVE	06FRO/TAC

TABLE 16. Observed spectral lines of K VII—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
400.979	0.010	249390	7*	5.88E+9	$3s3p^2\ ^4P_{1/2}$	$3s3p3d\ ^4P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
401.553	0.02	249003	3	2.17E+10	$3s3p^2\ ^4P_{5/2}$	$3s3p3d\ ^4D^\circ_{7/2}$	70EKB/SVE	06FRO/TAC
401.790	0.02	248886	2	1.03E+10	$3s3p^2\ ^4P_{5/2}$	$3s3p3d\ ^4D^\circ_{5/2}$	70EKB/SVE	06FRO/TAC
402.132	0.02	248675	2	9.49E+9	$3s3p^2\ ^4P_{1/2}$	$3s3p3d\ ^4P^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
402.291	0.02	248576	0	2.88E+9	$3s3p^2\ ^4P_{5/2}$	$3s3p3d\ ^4D^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
402.695	0.010	248327	2		$3p^3\ ^2D^\circ_{3/2}$	$3p^2(^1D)3d\ ^2D_{3/2}$	93CHU/LEV	
402.818	0.010	248241	2	7.38E+9	$3s3p^2\ ^4P_{3/2}$	$3s3p3d\ ^4P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
403.800	0.02	247647	6	2.11E+10	$3s^23p\ ^2P^\circ_{3/2}$	$3s^23d\ ^2D_{5/2}$	70EKB/SVE	06FRO/TAC
403.991	0.02	247530	3*	3.71E+9	$3s^23p\ ^2P^\circ_{3/2}$	$3s^23d\ ^2D_{3/2}$	70EKB/SVE	06FRO/TAC
403.991	0.02	247530	3*		$3s3p^2\ ^4P_{3/2}$	$3s3p3d\ ^4P^\circ_{3/2}$	70EKB/SVE	
405.345	0.02	246703	2	7.88E+9	$3s3p^2\ ^4P_{3/2}$	$3s3p3d\ ^4P^\circ_{5/2}$	70EKB/SVE	06FRO/TAC
406.850	0.02	245791	0	3.84E+9	$3s3p^2\ ^4P_{5/2}$	$3s3p3d\ ^4P^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
408.210	0.02	244972	1	5.03E+9	$3s3p^2\ ^4P_{5/2}$	$3s3p3d\ ^4P^\circ_{5/2}$	70EKB/SVE	06FRO/TAC
408.498	0.010	244799	5	7.94E+9	$3s3p^2\ ^2D_{5/2}$	$3s3p(^3P^\circ)3d\ ^2F^\circ_{7/2}$	90LEV/RYA	06FRO/TAC
409.030	0.010	244481	5	2.34E+10	$3s3p^2\ ^2P_{1/2}$	$3s3p(^1P^\circ)3d\ ^2D^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
410.120	0.010	243831	2		$3p^3\ ^4S^\circ_{3/2}$	$3p^23d\ ^4P_{1/2}$	93CHU/LEV	
410.792	0.010	243432	4		$3p^3\ ^4S^\circ_{3/2}$	$3p^23d\ ^4P_{3/2}$	93CHU/LEV	
411.538	0.010	242991	60	3.09E+10	$3s3p^2\ ^2P_{3/2}$	$3s3p(^1P^\circ)3d\ ^2D^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
411.871	0.010	242794	4		$3p^3\ ^4S^\circ_{3/2}$	$3p^23d\ ^4P_{5/2}$	93CHU/LEV	
412.28		242554	2	7.25E+9	$3s3p^2\ ^2P_{3/2}$	$3s3p(^1P^\circ)3d\ ^2D^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
412.395	0.010	242486	5	7.17E+9	$3s3p^2\ ^2D_{3/2}$	$3s3p(^3P^\circ)3d\ ^2F^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
412.681	0.010	242318	0	6.93E+8	$3s3p^2\ ^2D_{5/2}$	$3s3p(^3P^\circ)3d\ ^2F^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
416.250	0.010	240240	1	4.39E+9	$3s3p^2\ ^2P_{1/2}$	$3s3p(^1P^\circ)3d\ ^2P^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
416.444	0.010	240128	2	8.80E+9	$3s3p^2\ ^2P_{1/2}$	$3s3p(^1P^\circ)3d\ ^2P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
419.621	0.010	238310	1	9.58E+9	$3s3p^2\ ^2P_{3/2}$	$3s3p(^1P^\circ)3d\ ^2P^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
419.811	0.010	238202	2*	4.99E+9	$3s3p^2\ ^2P_{3/2}$	$3s3p(^1P^\circ)3d\ ^2P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
419.811	0.010	238202	2*	1.60E+10	$3s3p^2\ ^2S_{1/2}$	$3s3p(^3P^\circ)3d\ ^2P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
421.454	0.010	237274	8	1.84E+10	$3s3p^2\ ^2S_{1/2}$	$3s3p(^3P^\circ)3d\ ^2P^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
444.880	0.010	224780	2	5.85E+9	$3s3p^2\ ^2P_{1/2}$	$3s3p(^3P^\circ)3d\ ^2P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
445.620	0.010	224406	10	1.52E+10	$3s3p^2\ ^2D_{3/2}$	$3s3p(^3P^\circ)3d\ ^2D^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
446.005	0.010	224213	10	1.55E+10	$3s3p^2\ ^2D_{5/2}$	$3s3p(^3P^\circ)3d\ ^2D^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
446.624	0.010	223902	5		$3s3p3d\ ^4D^\circ_{5/2}$	$3s3d^2\ ^4F_{7/2}$	93CHU/LEV	
446.699	0.010	223864	5		$3s3p3d\ ^4D^\circ_{7/2}$	$3s3d^2\ ^4F_{9/2}$	93CHU/LEV	
450.607	0.010	221923	4	5.16E+9	$3s3p^2\ ^2P_{3/2}$	$3s3p(^3P^\circ)3d\ ^2P^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
456.220	0.010	219192	2		$3p^3\ ^2D^\circ_{5/2}$	$3p^2(^3P)3d\ ^2P_{3/2}$	93CHU/LEV	
475.688	0.010	210222	1		$3p^3\ ^2P^\circ_{3/2}$	$3p^2(^1D)3d\ ^2D_{5/2}$	93CHU/LEV	
476.283	0.010	209959	1		$3s3p(^1P^\circ)3d\ ^2D^\circ_{3/2}$	$3s3d^2\ ^2F_{5/2}$	93CHU/LEV	
477.103	0.010	209598	3		$3s3p(^1P^\circ)3d\ ^2D^\circ_{5/2}$	$3s3d^2\ ^2F_{7/2}$	93CHU/LEV	
479.770	0.008	208433.2	1	3.10E+9	$3s^23p\ ^2P^\circ_{1/2}$	$3s3p^2\ ^2P_{3/2}$	76SMI/SVE	06FRO/TAC
484.254	0.008	206503.2	3	1.08E+10	$3s^23p\ ^2P^\circ_{1/2}$	$3s3p^2\ ^2P_{1/2}$	76SMI/SVE	06FRO/TAC
486.506	0.010	205547	2		$3s3p(^3P^\circ)3d\ ^2D^\circ_{5/2}$	$3p^2(^3P)3d\ ^2F_{7/2}$	93CHU/LEV	
487.097	0.008	205297.9	5	1.47E+10	$3s^23p\ ^2P^\circ_{3/2}$	$3s3p^2\ ^2P_{3/2}$	76SMI/SVE	06FRO/TAC
491.718	0.008	203368.6	2	6.77E+9	$3s^23p\ ^2P^\circ_{3/2}$	$3s3p^2\ ^2P_{1/2}$	76SMI/SVE	06FRO/TAC
498.399	0.010	200642	6	8.09E+9	$3s^23d\ ^2D_{5/2}$	$3s3p(^1P^\circ)3d\ ^2D^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
499.191	0.010	200324	4	8.35E+9	$3s^23d\ ^2D_{3/2}$	$3s3p(^1P^\circ)3d\ ^2D^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
509.591	0.010	196236	3		$3s3p(^1P^\circ)3d\ ^2F^\circ_{7/2}$	$3s3d^2\ ^2G_{9/2}$	93CHU/LEV	
510.291	0.010	195967	8*	1.20E+10	$3s^23d\ ^2D_{5/2}$	$3s3p(^1P^\circ)3d\ ^2P^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
510.291	0.010	195967	8*	1.25E+10	$3s^23d\ ^2D_{3/2}$	$3s3p(^1P^\circ)3d\ ^2P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
511.362	0.010	195556	3		$3s3p(^1P^\circ)3d\ ^2F^\circ_{5/2}$	$3s3d^2\ ^2G_{7/2}$	93CHU/LEV	
517.794	0.02	193127	1	2.69E+9	$3s3p^2\ ^4P_{1/2}$	$3p^3\ ^4S^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
517.909	0.008	193084.1	3	2.99E+9	$3s^23p\ ^2P^\circ_{1/2}$	$3s3p^2\ ^2S_{1/2}$	76SMI/SVE	06FRO/TAC
520.857	0.02	191991	2	5.29E+9	$3s3p^2\ ^4P_{3/2}$	$3p^3\ ^4S^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
525.612	0.02	190254	3	7.74E+9	$3s3p^2\ ^4P_{5/2}$	$3p^3\ ^4S^\circ_{3/2}$	70EKB/SVE	06FRO/TAC
526.452	0.008	189950.8	4	3.02E+9	$3s^23p\ ^2P^\circ_{3/2}$	$3s3p^2\ ^2S_{1/2}$	76SMI/SVE	06FRO/TAC
531.675	0.010	188085	1		$3s3p3d\ ^4P^\circ_{5/2}$	$3p^23d\ ^4P_{5/2}$	93CHU/LEV	
534.543	0.010	187076	1				93CHU/LEV	
537.078	0.010	186193	1		$3s3p3d\ ^4F^\circ_{5/2}$	$3p^23d\ ^4D_{5/2}$	93CHU/LEV	

TABLE 16. Observed spectral lines of K VII—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
537.661	0.010	185991	2		$3s3p3d\ ^4F^\circ_{5/2}$	$3p^23d\ ^4D_{3/2}$	93CHU/LEV	
539.736	0.010	185276	3		$3s3p3d\ ^4F^\circ_{7/2}$	$3p^23d\ ^4D_{5/2}$	93CHU/LEV	
540.673	0.010	184955	1		$3s3p(^3P^\circ)3d\ ^2F^\circ_{7/2}$	$3p^2(^3P)3d\ ^2F_{7/2}$	93CHU/LEV	
541.125	0.010	184800	4		$3s3p3d\ ^4D^\circ_{5/2}$	$3p^23d\ ^4P_{3/2}$	93CHU/LEV	
541.315	0.010	184735	4		$3s3p3d\ ^4F^\circ_{9/2}$	$3p^23d\ ^4D_{7/2}$	93CHU/LEV	
542.289	0.010	184404	1				93CHU/LEV	
543.421	0.010	184019	4		$3s3p3d\ ^4D^\circ_{7/2}$	$3p^23d\ ^4P_{5/2}$	93CHU/LEV	
544.831	0.010	183543	5	4.94E+9	$3s3p^2\ ^2D_{3/2}$	$3p^3\ ^2P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
545.228	0.010	183410	6	4.23E+9	$3s3p^2\ ^2D_{5/2}$	$3p^3\ ^2P^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
550.601	0.010	181620	6	7.84E+9	$3s^23d\ ^2D_{3/2}$	$3s3p(^1P^\circ)3d\ ^2F^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
550.968	0.010	181499	0	5.00E+8	$3s^23d\ ^2D_{5/2}$	$3s3p(^1P^\circ)3d\ ^2F^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
553.013	0.010	180828	7	8.19E+9	$3s^23d\ ^2D_{5/2}$	$3s3p(^1P^\circ)3d\ ^2F^\circ_{7/2}$	90LEV/RYA	06FRO/TAC
557.678	0.010	179315	1		$3s3p(^3P^\circ)3d\ ^2P^\circ_{1/2}$	$3p^2(^3P)3d\ ^2D_{3/2}$	93CHU/LEV	
558.208	0.010	179145	2		$3s3p(^3P^\circ)3d\ ^2P^\circ_{3/2}$	$3p^2(^3P)3d\ ^2D_{5/2}$	93CHU/LEV	
559.538	0.010	178719	1		$3s3p(^3P^\circ)3d\ ^2F^\circ_{5/2}$	$3p^2(^1S)3d\ ^2D_{3/2}$	93CHU/LEV	
560.801	0.010	178316	1		$3s3p(^1P^\circ)3d\ ^2F^\circ_{5/2}$	$3p^2(^3P)3d\ ^2D_{3/2}$	93CHU/LEV	
562.146	0.010	177890	1		$3s3p(^1P^\circ)3d\ ^2F^\circ_{7/2}$	$3p^2(^3P)3d\ ^2D_{5/2}$	93CHU/LEV	
572.487	0.010	174676	5		$3s3p3d\ ^4F^\circ_{9/2}$	$3p^23d\ ^4F_{9/2}$	93CHU/LEV	
575.181	0.010	173858	1		$3s3p3d\ ^4F^\circ_{7/2}$	$3p^23d\ ^4F_{5/2}$	93CHU/LEV	
576.225	0.010	173543	2		$3s3p3d\ ^4F^\circ_{9/2}$	$3p^23d\ ^4F_{7/2}$	93CHU/LEV	
590.302	0.010	169405	1		$3s3p(^3P^\circ)3d\ ^2D^\circ_{5/2}$	$3p^2(^1D)3d\ ^2D_{5/2}$	93CHU/LEV	
629.103	0.010	158956	2		$3s3p3d\ ^4P^\circ_{5/2}$	$3p^23d\ ^4D_{7/2}$	93CHU/LEV	
635.106	0.010	157454	1		$3s3p3d\ ^4P^\circ_{3/2}$	$3p^23d\ ^4D_{5/2}$	93CHU/LEV	
658.398	0.008	151883.8	5	5.75E+8	$3s^23p\ ^2P^\circ_{1/2}$	$3s3p^2\ ^2D_{3/2}$	76SMI/SVE	06FRO/TAC
671.512	0.008	148917.7	6	6.09E+8	$3s^23p\ ^2P^\circ_{3/2}$	$3s3p^2\ ^2D_{5/2}$	76SMI/SVE	06FRO/TAC
672.269	0.008	148750.0	0	7.50E+7	$3s^23p\ ^2P^\circ_{3/2}$	$3s3p^2\ ^2D_{3/2}$	76SMI/SVE	06FRO/TAC
684.584	0.010	146074	3	5.79E+8	$3s^23d\ ^2D_{5/2}$	$3s3p(^3P^\circ)3d\ ^2F^\circ_{7/2}$	90LEV/RYA	06FRO/TAC
684.711	0.010	146047	4	8.89E+8	$3s3p^2\ ^2D_{5/2}$	$3p^3\ ^2D^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
685.376	0.010	145905	3	7.92E+8	$3s3p^2\ ^2D_{3/2}$	$3p^3\ ^2D^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
690.445	0.010	144834	2		$3s3p3d\ ^4D^\circ_{7/2}$	$3p^23d\ ^4F_{9/2}$	93CHU/LEV	
695.198	0.010	143843	2		$3s3p3d\ ^4D^\circ_{5/2}$	$3p^23d\ ^4F_{7/2}$	93CHU/LEV	
695.909	0.010	143697	2*	4.82E+8	$3s^23d\ ^2D_{3/2}$	$3s3p(^3P^\circ)3d\ ^2F^\circ_{5/2}$	90LEV/RYA	06FRO/TAC
698.060	0.010	143254	1		$3s3p3d\ ^4D^\circ_{3/2}$	$3p^23d\ ^4F_{5/2}$	93CHU/LEV	
702.351	0.010	142379	3	4.18E+8	$3s3p^2\ ^2S_{1/2}$	$3p^3\ ^2P^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
775.676	0.010	128920	2	7.06E+8	$3s3p^2\ ^2P_{1/2}$	$3p^3\ ^2P^\circ_{1/2}$	90LEV/RYA	06FRO/TAC
787.251	0.010	127024	2	7.36E+8	$3s3p^2\ ^2P_{3/2}$	$3p^3\ ^2P^\circ_{3/2}$	90LEV/RYA	06FRO/TAC
31905.3	1.5	3134.28		3.14E−1	$3s^23p\ ^2P^\circ_{1/2}$	$3s^23p\ ^2P^\circ_{3/2}$	97FEU/LUT	86HUA

TABLE 17. Energy levels of K VII

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$3s^23p$	$^2P^\circ$	1/2	0.00	4	
		3/2	3134.28	0.14	97FEU/LUT
$3s3p^2$	^4P	1/2	114889	4	93CHU/LEV
		3/2	116027	4	93CHU/LEV
		5/2	117764	4	93CHU/LEV
$3s3p^2$	^2D	3/2	151883.9	2	76SMI/SVE
		5/2	152051.7	2	76SMI/SVE
$3s3p^2$	^2S	1/2	193084.5	2	76SMI/SVE
$3s3p^2$	^2P	1/2	206502.9	2	76SMI/SVE
		3/2	208432.5	2	76SMI/SVE

TABLE 17. Energy levels of K VII—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$3s^23d$	^2D	3/2	250664	4	93CHU/LEV
		5/2	250787	4	93CHU/LEV
$3p^3$	$^2D^\circ$	3/2	297788	4	93CHU/LEV
		5/2	298098	4	93CHU/LEV
$3p^3$	$^4S^\circ$	3/2	308021	4	93CHU/LEV
$3p^3$	$^2P^\circ$	1/2	335425	4	93CHU/LEV
		3/2	335460	4	93CHU/LEV
3s3p3d	$^4F^\circ$	5/2	334828	4	93CHU/LEV
		7/2	335745	4	93CHU/LEV
		9/2	336960	4	93CHU/LEV
3s3p3d	$^4P^\circ$	5/2	362740	4	93CHU/LEV
		3/2	363567	4	93CHU/LEV
		1/2	364292	4	93CHU/LEV
3s3p3d	$^4D^\circ$	1/2	365933	4	93CHU/LEV
		3/2	366356	4	93CHU/LEV
		5/2	366662	4	93CHU/LEV
		7/2	366800	4	93CHU/LEV
$3s3p(^3P^\circ)3d$	$^2D^\circ$	5/2	376266	4	93CHU/LEV
		3/2	376289	4	93CHU/LEV
$3s3p(^3P^\circ)3d$	$^2F^\circ$	5/2	394367	4	93CHU/LEV
		7/2	396853	4	93CHU/LEV
$3s3p(^3P^\circ)3d$	$^2P^\circ$	3/2	430356	4	93CHU/LEV
		1/2	431284	4	93CHU/LEV
$3s3p(^1P^\circ)3d$	$^2F^\circ$	7/2	431613	4	93CHU/LEV
		5/2	432279	4	93CHU/LEV
$3s3p(^1P^\circ)3d$	$^2P^\circ$	1/2	446656	4	93CHU/LEV
		3/2	446745	4	93CHU/LEV
$3s3p(^1P^\circ)3d$	$^2D^\circ$	3/2	450988	4	93CHU/LEV
		5/2	451426	4	93CHU/LEV
$3s^24s$	^2S	1/2	439322	6	70EKB/SVE
$3p^23d$	^4F	5/2	509610	4	93CHU/LEV
		7/2	510506	4	93CHU/LEV
		9/2	511643	4	93CHU/LEV
$3p^2(^3P)3d$	^2P	3/2	517290	4	93CHU/LEV
$3p^23d$	^4D	3/2	520819	4	93CHU/LEV
		5/2	521021	4	93CHU/LEV
		7/2	521696	4	93CHU/LEV
$3p^2(^1D)3d$	^2D	5/2	545671	4	93CHU/LEV
		3/2	546115	4	93CHU/LEV
$3p^23d$	^4P	5/2	550817	4	93CHU/LEV
		3/2	551458	4	93CHU/LEV
		1/2	551852	4	93CHU/LEV
3s3p4s	$^4P^\circ$	1/2	566231	4	70EKB/SVE, 93CHU/LEV
		3/2	567308	4	70EKB/SVE, 93CHU/LEV
		5/2	569280	4	70EKB/SVE, 93CHU/LEV

TABLE 17. Energy levels of K VII—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$3s^24d$	^2D	3/2	570738	6	70EKB/SVE
		5/2	570922	6	70EKB/SVE
$3p^2(^1S)3d$	^2D	3/2	573086	4	93CHU/LEV
		5/2	574915	4	93CHU/LEV
$3p^2(^3P)3d$	^2F	5/2	581175	4	93CHU/LEV
		7/2	581812	4	93CHU/LEV
$3s3d^2$	^4F	5/2	590498	4	93CHU/LEV
		7/2	590585	4	93CHU/LEV
		9/2	590663	4	93CHU/LEV
$3p^2(^3P)3d$	^2D	5/2	609506	4	93CHU/LEV
		3/2	610595	4	93CHU/LEV
$3s^24f$	$^2F^\circ$	5/2	608532	6	70EKB/SVE
		7/2	608536	6	70EKB/SVE
$3s3d^2$	^2G	7/2	627835	4	93CHU/LEV
		9/2	627849	4	93CHU/LEV
$3s3d^2$	^2F	5/2	660947	4	93CHU/LEV
		7/2	661024	4	93CHU/LEV
$3s^25s$	^2S	1/2	654074	6	70EKB/SVE
$3s^25d$	^2D	3/2	716949	6	70EKB/SVE
		5/2	716986	6	70EKB/SVE
$3s^25f$	$^2F^\circ$	5/2	732500	6	70EKB/SVE
		7/2	732500	6	70EKB/SVE
$3s^26s$	^2S	1/2	754539	6	70EKB/SVE
$3s^26d$	^2D	3/2	789578	6	70EKB/SVE
		5/2	789600	6	70EKB/SVE
K VIII ($^1S_0$)	*Limit*	⋯	948200	900	70EKB/SVE

7.8. K VIII

Mg isoelectronic sequence

Ground state $1s^22s^22p^63s^2\ ^1S_0$

Ionization energy 1 249 100(400) cm^{-1}
154.87(5) eV

Ekefors [31EKE] first reported K VIII transitions in his observations in the region between 200 and 1050 Å. From the Ekefors data Whitford [34WHI] located the ^3P levels in the $3s3p$ and $3p^2$ configurations. Levels in $3s3d$, $3s4s$, $3s4d$, and $3s4f$ were identified by Parker and Phillips [40PAR/PHI]. Fawcett [70FAW2] made the first observations of transitions involving the $3p3d$ configuration and located the $3p^2\ ^1D_2$ level. Ekberg [71EKB] analyzed all the data available then to produce an optimized set of levels for $3sns$ up to $n=6$, $3snp$ up to $n=7$, $3snd$ up to $n=7$, and $3snf$ up to $n=7$, in addition to $3p^2$, $3p4s$, and $3p4p$. In 1976 Edlén and Bodén [76EDL/BOD] published a list of more accurate K VIII wavelengths, observed in the course of a detailed study of K IX. More recently Levashov [89LEV] measured three intercombination lines using a laser-produced plasma. This allowed the singlet and triplet levels to be connected. Levashov also observed many previously unreported lines involving the $3p3d$ and $3d^2$ configurations. Churilov *et al.* [89CHU/LEV] performed a more extensive analysis of the $3d^2-3p3d$ transitions. Where available, the level values retained in Tables 18 and 19 are taken from [89CHU/LEV]. Those with two references (e.g., 76EDL/BOD, 89CHU/LEV) were obtained by combining wavelength measurements from the first reference with levels from the second source. The leading percentages were calculated by Das *et al.* [04DAS/DEB].

The transition probabilities of allowed transitions of K VIII have been calculated by Fawcett [83FAW], using a semi-empirical relativistic Hartree–Fock technique. Utilizing a relativistic Hartree–Fock approach and incorporating core polarization effects Biémont *et al.* [02BIE/DUM] obtained 54 transition probabilities involving $n=3$ levels. A comparative study by Das *et al.* [04DAS/DEB] included the CIV method developed by Hibbert [75HIB]. Froese Fischer *et al.*

[06FRO/TAC], whose values are retained in Table 18, produced a comprehensive set of transition probabilities and good agreement with experimental energy levels by optimizing their multi-configuration Hartree–Fock levels. The ionization energy given above was determined here by combining the value obtained by Ekberg [71EKB] using the $3snf\ ^3F$ series with the measurement of the intersystem interval by Levashov [89LEV].

References for K VIII

31EKE Ekefors, E., Z. Phys. **71**, 53 (1931).

34WHI Whitford, A. E., Phys. Rev. **46**, 793 (1934).

40PAR/PHI Parker, W. L., and Phillips, L. W., Phys. Rev. **57**, 140 (1940).

70FAW2 Fawcett, B. C., J. Phys. B **3**, 1732 (1970).

71EKB Ekberg, J. O., Phys. Scr. **4**, 101 (1971).

75HIB Hibbert, A., Comput. Phys. Commun. **9**, 141 (1975).

76EDL/BOD Edlén, B., and Bodén, E., Phys. Scr. **14**, 31 (1976).

83FAW Fawcett, B. C., At. Data Nucl. Data Tables **28**, 579 (1983).

89CHU/LEV Churilov, S. S., Levashov, V. E., and Wyart, J.-F., Phys. Scr. **40**, 625 (1989).

89LEV Levashov, V. E., Opt. Spectrosc. **66**, 449 (1989).

02BIE/DUM Biémont, E., Dumont, P.-D., Garnir, H. P., Palmeri, P., and Quinet, P., Eur. Phys. J. D **20**, 199 (2002).

04DAS/DEB Das, R., Deb, N. C., Roy, K., and Msezane, A. Z., Astron. Astrophys. **416**, 375 (2004).

06FRO/TAC Froese Fischer, C., Tachiev, G., and Irimia, A., At. Data Nucl. Data Tables **92**, 607 (2006).

TABLE 18. Observed spectral lines of K VIII

λ (Å)	Unc. (Å)	σ (cm⁻¹)	Int.	Line code	A_{ki} (s⁻¹)	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum									
91.917	0.005	1087938	0			$3s^2\ ^1S_0$	$3s7p\ ^1P^\circ_1$	76EDL/BOD	
97.793	0.005	1022568	1			$3s^2\ ^1S_0$	$3s6p\ ^1P^\circ_1$	76EDL/BOD	
103.086	0.005	970064	0			$3s3p\ ^3P^\circ_1$	$3s7d\ ^3D_{1,2}$	76EDL/BOD	
103.351	0.005	967577	0			$3s3p\ ^3P^\circ_2$	$3s7d\ ^3D_{2,3}$	76EDL/BOD	
109.303	0.005	914888	0			$3s3p\ ^3P^\circ_0$	$3s6d\ ^3D_1$	76EDL/BOD	
109.434	0.005	913793	1			$3s3p\ ^3P^\circ_1$	$3s6d\ ^3D_2$	76EDL/BOD	
109.535	0.005	912950	3			$3s^2\ ^1S_0$	$3s5p\ ^1P^\circ_1$	76EDL/BOD	
109.711	0.005	911486	2			$3s3p\ ^3P^\circ_2$	$3s6d\ ^3D_3$	76EDL/BOD	
113.858	0.005	878287	0			$3s3p\ ^3P^\circ_1$	$3s6s\ ^3S_1$	76EDL/BOD	
114.173	0.005	875864	0			$3s3p\ ^3P^\circ_2$	$3s6s\ ^3S_1$	76EDL/BOD	
121.885	0.005	820446	1			$3s3p\ ^3P^\circ_0$	$3s5d\ ^3D_1$	76EDL/BOD	
122.054	0.005	819309	3			$3s3p\ ^3P^\circ_1$	$3s5d\ ^3D_2$	76EDL/BOD	
122.413	0.005	816907	4			$3s3p\ ^3P^\circ_2$	$3s5d\ ^3D_3$	76EDL/BOD	
132.105	0.005	756974	0			$3s3p\ ^3P^\circ_0$	$3s5s\ ^3S_1$	76EDL/BOD	
132.519	0.005	754609	0			$3s3p\ ^1P^\circ_1$	$3s5d\ ^1D_2$	76EDL/BOD	
132.715	0.005	753494	2			$3s3p\ ^3P^\circ_2$	$3s5s\ ^3S_1$	76EDL/BOD	
135.889	0.005	735895	1	h		$3s3d\ ^3D_{1,2,3}$	$3s7f\ ^3F^\circ_{2,3,4}$	76EDL/BOD	
136.979	0.005	730039	0		2.35E+9	$3s3p\ ^3P^\circ_1$	$3p4p\ ^3S_1$	76EDL/BOD	06FRO/TAC
137.118	0.005	729299	1		2.00E+9	$3s3p\ ^3P^\circ_1$	$3p4p\ ^3P_2$	76EDL/BOD	06FRO/TAC
137.248	0.005	728608	2		4.38E+9	$3s3p\ ^3P^\circ_0$	$3p4p\ ^3P_1$	76EDL/BOD	06FRO/TAC
137.424	0.005	727675	3		1.29E+10	$3s3p\ ^3P^\circ_2$	$3p4p\ ^3S_1$	76EDL/BOD	06FRO/TAC
137.458	0.005	727495	1		6.42E+9	$3s3p\ ^3P^\circ_1$	$3p4p\ ^3P_1$	76EDL/BOD	06FRO/TAC
137.563	0.005	726940	4		9.90E+9	$3s3p\ ^3P^\circ_2$	$3p4p\ ^3P_2$	76EDL/BOD	06FRO/TAC
137.601	0.005	726739	2		1.22E+10	$3s3p\ ^3P^\circ_1$	$3p4p\ ^3P_0$	76EDL/BOD	06FRO/TAC
137.906	0.005	725132	0		1.42E+9	$3s3p\ ^3P^\circ_2$	$3p4p\ ^3P_1$	76EDL/BOD	06FRO/TAC
138.632	0.005	721334	5	b		$3s3p\ ^3P^\circ_{0,1,2}$	$3p4p\ ^3D_{1,2,3}$	76EDL/BOD	
138.842	0.005	720243	1		2.63E+9	$3s3p\ ^3P^\circ_1$	$3p4p\ ^3D_1$	76EDL/BOD	06FRO/TAC
139.101	0.005	718902	1		1.63E+9	$3s3p\ ^3P^\circ_2$	$3p4p\ ^3D_2$	76EDL/BOD	06FRO/TAC
142.751	0.02	700520	0	h		$3s3p\ ^1P^\circ_1$	$3s5s\ ^1S_0$	71EKB	
143.805	0.005	695386	6		2.31E+10	$3s^2\ ^1S_0$	$3s4p\ ^1P^\circ_1$	76EDL/BOD	06FRO/TAC
146.352	0.005	683284	2	h		$3s3d\ ^3D_{1,2}$	$3s6f\ ^3F^\circ_{2,3}$	76EDL/BOD	
146.382	0.005	683144	2	h		$3s3d\ ^3D_3$	$3s6f\ ^3F^\circ_4$	76EDL/BOD	
155.701	0.005	642257	4		1.41E+10	$3s3p\ ^3P^\circ_0$	$3s4d\ ^3D_1$	76EDL/BOD	06FRO/TAC
155.951	0.005	641227	5		1.91E+10	$3s3p\ ^3P^\circ_1$	$3s4d\ ^3D_2$	76EDL/BOD	06FRO/TAC
155.976	0.005	641124	3		1.07E+10	$3s3p\ ^3P^\circ_1$	$3s4d\ ^3D_1$	76EDL/BOD	06FRO/TAC

TABLE 18. Observed spectral lines of K VIII—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
156.495	0.005	638998	6		2.55E+10	3s3p $^3P^\circ_2$	3s4d $^3D_3$	76EDL/BOD	06FRO/TAC
156.533	0.005	638843	3		6.45E+9	3s3p $^3P^\circ_2$	3s4d $^3D_2$	76EDL/BOD	06FRO/TAC
167.896	0.005	595607	3			3s3d $^3D_{1,2}$	3s5f $^3F^\circ_{2,3}$	76EDL/BOD	
167.934	0.005	595472	3			3s3d $^3D_3$	3s5f $^3F^\circ_4$	76EDL/BOD	
172.028	0.005	581301	2		9.32E+9	3s3p $^1P^\circ_1$	3s4d $^1D_2$	76EDL/BOD	06FRO/TAC
182.643	0.005	547516	2			3s3d $^1D_2$	3s5f $^1F^\circ_3$	76EDL/BOD	
196.461	0.005	509007	2		1.45E+10	3p^2 $^1D_2$	3s4f $^1F^\circ_3$	76EDL/BOD	06FRO/TAC
198.538	0.005	503682	3		5.20E+9	3s3p $^3P^\circ_0$	3s4s $^3S_1$	76EDL/BOD	06FRO/TAC
198.978	0.005	502568	5		1.56E+10	3s3p $^3P^\circ_1$	3s4s $^3S_1$	76EDL/BOD	06FRO/TAC
199.922	0.005	500195	6		2.63E+10	3s3p $^3P^\circ_2$	3s4s $^3S_1$	76EDL/BOD	06FRO/TAC
203.137	0.005	492279	0		7.09E+9	3p^2 $^3P_1$	3p4s $^3P^\circ_2$	76EDL/BOD	06FRO/TAC
203.701	0.005	490916	1		9.24E+9	3p^2 $^3P_0$	3p4s $^3P^\circ_1$	76EDL/BOD	06FRO/TAC
204.201	0.005	489714	1		2.06E+10	3p^2 $^3P_2$	3p4s $^3P^\circ_2$	76EDL/BOD	06FRO/TAC
204.260	0.005	489572	1		6.87E+9	3p^2 $^3P_1$	3p4s $^3P^\circ_1$	76EDL/BOD	06FRO/TAC
204.644	0.005	488653	2		2.85E+10	3p^2 $^3P_1$	3p4s $^3P^\circ_0$	76EDL/BOD	06FRO/TAC
205.344	0.005	486988	2		9.94E+9	3p^2 $^3P_2$	3p4s $^3P^\circ_1$	76EDL/BOD	06FRO/TAC
221.281	0.005	451914	4		2.91E+10	3s3p $^1P^\circ_1$	3s4s $^1S_0$	76EDL/BOD	06FRO/TAC
230.656	0.005	433546	2		6.37E+10	3s3d $^3D_1$	3s4f $^3F^\circ_2$	76EDL/BOD	06FRO/TAC
230.694	0.005	433475	3		6.74E+10	3s3d $^3D_2$	3s4f $^3F^\circ_3$	76EDL/BOD	06FRO/TAC
230.750	0.005	433369	4		7.59E+10	3s3d $^3D_3$	3s4f $^3F^\circ_4$	76EDL/BOD	06FRO/TAC
256.222	0.02	390287	0		5.60E+10	3s3d $^1D_2$	3s4f $^1F^\circ_3$	71EKB	06FRO/TAC
362.275	0.010	276033	6		1.51E+10	3p^2 $^1D_2$	3p3d $^1F^\circ_3$	89LEV	06FRO/TAC
373.581	0.010	267680	2		6.25E+8	3p^2 $^3P_2$	3p3d $^1F^\circ_3$	89LEV	06FRO/TAC
405.813	0.010	246419	3		1.47E+10	3p3d $^1D^\circ_2$	3d^2 $^1D_2$	89CHU/LEV	06FRO/TAC
416.642	0.010	240014	5		6.53E+9	3s3p $^3P^\circ_0$	3s3d $^3D_1$	89LEV	06FRO/TAC
418.456	0.02	238974	2	h	8.70E+9	3s3p $^3P^\circ_1$	3s3d $^3D_2$	71EKB	06FRO/TAC
418.582	0.02	238902	1	h	4.83E+9	3s3p $^3P^\circ_1$	3s3d $^3D_1$	71EKB	06FRO/TAC
420.859	0.010	235709	6	b	6.81E+8	3p3d $^3F^\circ_4$	3d^2 $^3F_3$	89CHU/LEV	06FRO/TAC
422.414	0.02	236735	4	h	1.13E+10	3s3p $^3P^\circ_2$	3s3d $^3D_3$	71EKB	06FRO/TAC
422.643	0.02	236606	1	h	2.82E+9	3s3p $^3P^\circ_2$	3s3d $^3D_2$	71EKB	06FRO/TAC
423.738	0.010	235995	3		7.96E+9	3p3d $^3F^\circ_4$	3d^2 $^3F_4$	89CHU/LEV	06FRO/TAC
427.851	0.010	233726	3		2.95E+9	3p^2 $^3P_0$	3p3d $^3D^\circ_1$	89LEV	06FRO/TAC
429.461	0.010	232850	6		7.19E+9	3p^2 $^3P_1$	3p3d $^3D^\circ_2$	89LEV	06FRO/TAC
430.349	0.010	232370	5		9.23E+9	3p^2 $^3P_1$	3p3d $^3D^\circ_1$	89LEV	06FRO/TAC
432.142	0.010	231405	5		9.32E+9	3p^2 $^3P_0$	3p3d $^3P^\circ_1$	89LEV	06FRO/TAC
432.640	0.010	231139	3		9.52E+9	3p^2 $^3P_1$	3p3d $^3P^\circ_0$	89LEV	06FRO/TAC
433.978	0.010	230426	7		1.53E+10	3p^2 $^3P_2$	3p3d $^3D^\circ_3$	89LEV	06FRO/TAC
434.267	0.010	230273	5		7.80E+9	3p^2 $^3P_2$	3p3d $^3D^\circ_2$	89LEV	06FRO/TAC
435.166	0.010	229797	2		2.37E+9	3p^2 $^3P_2$	3p3d $^3D^\circ_1$	89LEV	06FRO/TAC
436.426	0.010	229134	6		7.23E+9	3p^2 $^3P_1$	3p3d $^3P^\circ_2$	89LEV	06FRO/TAC
439.022	0.010	227779	7	b	1.27E+10	3p^2 $^1S_0$	3p3d $^1P^\circ_1$	89LEV	06FRO/TAC
439.615	0.010	227472	2		1.78E+9	3p^2 $^3P_2$	3p3d $^3P^\circ_1$	89LEV	06FRO/TAC
440.107	0.010	227217	3		8.88E+10	3p3d $^3P^\circ_2$	3d^2 $^3P_2$	89CHU/LEV	06FRO/TAC
440.207	0.010	227166	2		1.10E+10	3p3d $^3P^\circ_2$	3d^2 $^3P_1$	89CHU/LEV	06FRO/TAC
441.382	0.010	226561	10*		2.04E+10	3s3p $^1P^\circ_1$	3s3d $^1D_2$	89LEV	06FRO/TAC
441.382	0.010	226561	10*		2.85E+9	3p^2 $^3P_2$	3p3d $^3P^\circ_2$	89LEV	06FRO/TAC
441.857	0.010	226318	1		2.75E+9	3p3d $^3P^\circ_1$	3d^2 $^3P_2$	89CHU/LEV	06FRO/TAC
442.124	0.010	226181	2		2.36E+10	3p3d $^3P^\circ_1$	3d^2 $^3P_0$	89CHU/LEV	06FRO/TAC
444.137	0.010	225156	1		5.63E+9	3p3d $^3P^\circ_0$	3d^2 $^3P_1$	89CHU/LEV	06FRO/TAC
446.43	0.020	223999	1		1.55E+9	3p3d $^3D^\circ_1$	3d^2 $^3P_2$	89CHU/LEV	06FRO/TAC
447.399	0.010	223514	2		4.88E+9	3p3d $^3D^\circ_2$	3d^2 $^3P_2$	89CHU/LEV	06FRO/TAC
447.713	0.010	223357	3		5.25E+9	3p3d $^3D^\circ_3$	3d^2 $^3P_2$	89CHU/LEV	06FRO/TAC
457.652	0.010	218507	2		2.72E+10	3p3d $^1P^\circ_1$	3d^2 $^1S_0$	89CHU/LEV	06FRO/TAC
474.818	0.010	210607	7		8.23E+9	3p^2 $^1D_2$	3p3d $^1D^\circ_2$	89LEV	06FRO/TAC
489.916	0.010	204117	3		5.64E+9	3p3d $^3D^\circ_1$	3d^2 $^3F_2$	89CHU/LEV	06FRO/TAC
490.737	0.010	203775	5*	b	6.95E+9	3p3d $^3D^\circ_2$	3d^2 $^3F_3$	89CHU/LEV	06FRO/TAC
490.737	0.010	203775	5*	b	9.07E+9	3p3d $^3D^\circ_3$	3d^2 $^3F_4$	89CHU/LEV	06FRO/TAC

TABLE 18. Observed spectral lines of K VIII—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
519.382	0.02	192537	10		9.03E+9	$3s^2\ ^1S_0$	$3s3p\ ^1P^\circ_1$	71EKB	06FRO/TAC
554.198	0.010	180441	6		8.22E+9	$3p3d\ ^1F^\circ_3$	$3d^2\ ^1G_4$	89CHU/LEV	06FRO/TAC
557.016	0.02	179528	2*	b	1.96E+9	$3s3p\ ^3P^\circ_1$	$3p^2\ ^3P_2$	71EKB	06FRO/TAC
561.595	0.02	178064	2*	b	2.67E+9	$3s3p\ ^3P^\circ_0$	$3p^2\ ^3P_1$	71EKB	06FRO/TAC
564.480	0.02	177154	5		5.70E+9	$3s3p\ ^3P^\circ_2$	$3p^2\ ^3P_2$	71EKB	06FRO/TAC
565.132	0.02	176950	0		1.96E+9	$3s3p\ ^3P^\circ_1$	$3p^2\ ^3P_1$	71EKB	06FRO/TAC
569.506	0.02	175591	1		7.64E+9	$3s3p\ ^3P^\circ_1$	$3p^2\ ^3P_0$	71EKB	06FRO/TAC
572.820	0.02	174575	2		3.12E+9	$3s3p\ ^3P^\circ_2$	$3p^2\ ^3P_1$	71EKB	06FRO/TAC
581.388	0.010	172002	3		3.03E+9	$3p3d\ ^1P^\circ_1$	$3d^2\ ^1D_2$	89CHU/LEV	06FRO/TAC
584.223	0.010	171168	3		8.16E+7	$3s3p\ ^3P^\circ_1$	$3p^2\ ^1D_2$	89LEV	06FRO/TAC
584.855	0.010	170983	2		4.90E+8	$3s3d\ ^3D_2$	$3p3d\ ^3D^\circ_3$	89LEV	06FRO/TAC
585.310	0.010	170850	10*	b	3.21E+9	$3s3d\ ^3D_3$	$3p3d\ ^3D^\circ_3$	89LEV	06FRO/TAC
585.393	0.010	170825	10*	b	3.10E+9	$3s3d\ ^3D_2$	$3p3d\ ^3D^\circ_2$	89LEV	06FRO/TAC
586.774	0.010	170423	5		3.77E+9	$3s3d\ ^3D_1$	$3p3d\ ^3D^\circ_1$	89LEV	06FRO/TAC
591.053	0.010	169190	3		4.02E+9	$3s3d\ ^3D_1$	$3p3d\ ^3P^\circ_0$	89LEV	06FRO/TAC
592.420	0.010	168799	4		1.73E+8	$3s3p\ ^3P^\circ_2$	$3p^2\ ^1D_2$	89LEV	06FRO/TAC
595.161	0.010	168022	5		3.82E+9	$3s3d\ ^3D_2$	$3p3d\ ^3P^\circ_1$	89LEV	06FRO/TAC
598.871	0.010	166981	6		3.75E+9	$3s3d\ ^3D_3$	$3p3d\ ^3P^\circ_2$	89LEV	06FRO/TAC
601.245	0.010	166322	4		4.96E+9	$3s3d\ ^1D_2$	$3p3d\ ^1P^\circ_1$	89LEV	06FRO/TAC
605.680	0.010	165104	10		7.74E+9	$3s3p\ ^1P^\circ_1$	$3p^2\ ^1S_0$	89LEV	06FRO/TAC
635.625	0.010	157325	8		5.88E+9	$3s3d\ ^1D_2$	$3p3d\ ^1F^\circ_3$	89LEV	06FRO/TAC
721.354	0.010	138628	6		1.80E+9	$3s3d\ ^3D_3$	$3p3d\ ^3F^\circ_4$	89LEV	06FRO/TAC
729.97	0.010	136992	5	b	1.50E+9	$3s3d\ ^3D_2$	$3p3d\ ^3F^\circ_3$	89LEV	06FRO/TAC
730.66	0.010	136863	2		2.30E+8	$3s3d\ ^3D_3$	$3p3d\ ^3F^\circ_3$	89LEV	06FRO/TAC
737.33	0.010	135624	4	b	1.33E+9	$3s3d\ ^3D_1$	$3p3d\ ^3F^\circ_2$	89LEV	06FRO/TAC
737.71	0.010	135555	2		2.82E+8	$3s3d\ ^3D_2$	$3p3d\ ^3F^\circ_2$	89LEV	06FRO/TAC
927.170	0.010	107855	8		5.75E+8	$3s3p\ ^1P^\circ_1$	$3p^2\ ^1D_2$	89LEV	06FRO/TAC

TABLE 19. Energy levels of K VIII

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
$3s^2$	^1S	0	0	40	100%	
3s3p	$^3P^\circ$	0	128097	40	100%	89CHU/LEV
		1	129209	40	100%	89CHU/LEV
		2	131582	40	100%	89CHU/LEV
3s3p	$^1P^\circ$	1	192537	40	96%	89CHU/LEV
$3p^2$	^1D	2	300317	40	74% + 24% 3s3d $^1D_2$	89CHU/LEV
$3p^2$	^3P	0	304820	40	99%	89CHU/LEV
		1	306179	40	99%	89CHU/LEV
		2	308756	40	98%	89CHU/LEV
$3p^2$	^1S	0	357590	40	93%	89CHU/LEV
3s3d	^3D	1	368127	40	100%	89CHU/LEV
		2	368206	40	100%	89CHU/LEV
		3	368337	40	100%	89CHU/LEV
3s3d	^1D	2	419030	40	74% + 24% $3p^2$ $^1D_2$	89CHU/LEV
3p3d	$^3F^\circ$	2	503756	40	97%	89LEV
		3	505184	40	100%	89CHU/LEV
		4	506945	40	100%	89CHU/LEV
3p3d	$^1D^\circ$	2	510993	40	97%	89CHU/LEV

TABLE 19. Energy levels of K VIII—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
3p3d	$^3P^\circ$	2	535330	40	86% + 13% 3p3d $^3D^\circ_2$	89CHU/LEV
		1	536211	40	82% + 17% 3p3d $^3D^\circ_1$	89CHU/LEV
		0	537314	40	99%	89CHU/LEV
3p3d	$^3D^\circ$	1	538541	40	83% + 17% 3p3d $^3P^\circ_1$	89CHU/LEV
		2	539020	40	86% + 13% 3p3d $^3P^\circ_2$	89CHU/LEV
		3	539175	40	100%	89CHU/LEV
3p3d	$^1F^\circ$	3	576421	40	98%	89CHU/LEV
3p3d	$^1P^\circ$	1	585418	40	95%	89CHU/LEV
3s4s	^3S	1	631861	40		89CHU/LEV
3s4s	^1S	0	644451	40		89CHU/LEV
3s4p	$^1P^\circ$	1	695386	50		76EDL/BOD, 89CHU/LEV
$3d^2$	^3F	2	742660	40	100%	89CHU/LEV
		3	742797	40	100%	89CHU/LEV
		4	742952	40	100%	89CHU/LEV
$3d^2$	^1G	4	756866	40	97%	89CHU/LEV
$3d^2$	^1D	2	757420	40	83%	89CHU/LEV
$3d^2$	^3P	0	762399	40	99%	89CHU/LEV
		1	762470	40	99%	89CHU/LEV
		2	762534	40	99%	89CHU/LEV
3s4d	^3D	1	770344	50		76EDL/BOD, 89CHU/LEV
		2	770430	50		76EDL/BOD, 89CHU/LEV
		3	770580	50		76EDL/BOD, 89CHU/LEV
3s4d	^1D	2	773838	50		76EDL/BOD, 89CHU/LEV
3p4s	$^3P^\circ$	0	794832	50		76EDL/BOD, 89CHU/LEV
		1	795744	50		76EDL/BOD, 89CHU/LEV
		2	798464	50		76EDL/BOD, 89CHU/LEV
3s4f	$^3F^\circ$	2	801673	50		76EDL/BOD, 89CHU/LEV
		3	801681	50		76EDL/BOD, 89CHU/LEV
		4	801707	50		76EDL/BOD, 89CHU/LEV
$3d^2$	^1S	0	803924	40	92%	89CHU/LEV
3s4f	$^1F^\circ$	3	809317	40		71EKB, 89CHU/LEV
3p4p	^3D	1	849452	50		76EDL/BOD, 89CHU/LEV
		2	850484	50		76EDL/BOD, 89CHU/LEV
		3	852919	50		71EKB, 89LEV
3p4p	^3P	0	855948	50		76EDL/BOD, 89CHU/LEV
		1	856708	50		76EDL/BOD, 89CHU/LEV
		2	858515	50		76EDL/BOD, 89CHU/LEV
3p4p	^3S	1	859252	50		76EDL/BOD, 89CHU/LEV
3s5s	^3S	1	885074	50		76EDL/BOD, 89CHU/LEV
3s5s	^1S	0	893057	50		76EDL/BOD, 89CHU/LEV
3s5p	$^1P^\circ$	1	912950	50		76EDL/BOD, 89CHU/LEV
3s5d	^1D	2	947146	50		76EDL/BOD, 89CHU/LEV

TABLE 19. Energy levels of K VIII—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
3s5d	^{3}D	3	948489	50		76EDL/BOD, 89CHU/LEV
		2	948518	50		76EDL/BOD, 89CHU/LEV
		1	948543	50		76EDL/BOD, 89CHU/LEV
3s5f	^{3}F°	2,3,4	963810	50		76EDL/BOD, 89CHU/LEV
3s5f	^{1}F°	3	966546	50		76EDL/BOD, 89CHU/LEV
3s6s	^{3}S	1	1007471	50		76EDL/BOD, 89CHU/LEV
3s6p	^{1}P°	1	1022568	50		76EDL/BOD, 89CHU/LEV
3s6d	^{3}D	1	1042985	50		76EDL/BOD, 89CHU/LEV
		2	1043002	50		76EDL/BOD, 89CHU/LEV
		3	1043068	50		76EDL/BOD, 89CHU/LEV
3s6f	^{3}F°	2,3,4	1051486	50		76EDL/BOD, 89CHU/LEV
3s7p	^{1}P°	1	1087938	60		76EDL/BOD, 89CHU/LEV
3s7d	^{3}D	1,2,3	1099273	50		76EDL/BOD, 89CHU/LEV
3s7f	^{3}F°	2,3,4	1104101	50		76EDL/BOD, 89CHU/LEV
K IX ($^2S_{1/2}$)	*Limit*	···	1249100	400		71EKB, 89CHU/LEV

7.9. K IX

Na isoelectronic sequence

Ground state $1s^22s^22p^63s\ ^2S_{1/2}$

Ionization energy 1 418 063(20) cm^{-1}
175.819(3) eV

The analysis of the K IX spectrum started with Whitford's [34WHI] identification of the $3s-3p$ resonance doublet in the line list published by Ekefors [31EKE]. Additional measurements by Edlén [36EDL2] and Kruger and Phillips [39KRU/PHI] enabled the discovery of np levels for $n=3,4$, nd levels for $n=3,4,5$ and nf levels for $n=4,5$. The spectrum was remeasured by Edlén and Bodén [76EDL/BOD], who also performed a complete reanalysis and produced an optimized set of energy levels. At nearly the same time Cohen and Behring [76COH/BEH] also remeasured the spectrum and reported experimental energy levels. Subsequently Reader *et al.* [87REA/KAU] measured transitions in 17 heavier members of the sodium isoelectronic sequence, incorporated previous observations in other members, and derived fitted values for the wavelengths of 7 spectral lines of K IX. In Tables 20 and 21 we retain the experimental wavelengths of Edlén and Bodén [76EDL/BOD] and Cohen and Behring [76COH/BEH] and the energy levels obtained from them. A wavelength of 423.05(5) Å for the $2p^53s3p\ ^4D^\circ_{7/2}-2p^53s3d\ ^4F_{9/2}$ has been determined by Jupén *et al.* [88JUP/ENG] by interpolation along the isoelectronic sequence.

The transition probabilities of allowed transitions of K IX have been calculated by Johnson *et al.* [96JOH/LIU], using third-order many-body perturbation theory, Siegel *et al.* [98SIE/MIG], with the core polarization model, and Froese Fischer *et al.* [06FRO/TAC], using the multiconfiguration Dirac-Hartree-Fock method. The results of Johnson *et al.* [96JOH/LIU] and Froese Fischer *et al.* [06FRO/TAC] were nearly identical, with the latter providing values for several additional transitions. The transition probabilities of Siegel *et al.* [98SIE/MIG] also agree very well with the others and are given here where there are no Froese Fischer *et al.* [06FRO/TAC] values. The ionization energy cited above was determined by Edlén [78EDL] using the nf series.

References for K IX

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TABLE 20. Observed spectral lines of K IX

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
76.913	0.005	1300170	0		$2p^63s\ ^2S_{1/2}$	$2p^69p\ ^2P^\circ_{1/2,3/2}$	76EDL/BOD	
78.902	0.005	1267395	0		$2p^63s\ ^2S_{1/2}$	$2p^68p\ ^2P^\circ_{1/2,3/2}$	76EDL/BOD	
82.036	0.005	1218977	1		$2p^63s\ ^2S_{1/2}$	$2p^67p\ ^2P^\circ_{1/2,3/2}$	76EDL/BOD	
85.732	0.010	1166425	0		$2p^63p\ ^2P^\circ_{3/2}$	$2p^610d\ ^2D_{5/2}$	76COH/BEH	
87.064	0.010	1148580	1		$2p^63p\ ^2P^\circ_{1/2}$	$2p^69d\ ^2D_{3/2}$	76COH/BEH	
87.345	0.010	1144885	1		$2p^63p\ ^2P^\circ_{3/2}$	$2p^69d\ ^2D_{5/2}$	76COH/BEH	
87.508	0.005	1142753	2		$2p^63s\ ^2S_{1/2}$	$2p^66p\ ^2P^\circ_{3/2}$	76EDL/BOD	
87.534	0.005	1142413	1		$2p^63s\ ^2S_{1/2}$	$2p^66p\ ^2P^\circ_{1/2}$	76EDL/BOD	
89.396	0.005	1118618	0		$2p^63p\ ^2P^\circ_{1/2}$	$2p^68d\ ^2D_{3/2}$	76EDL/BOD	
89.697	0.005	1114864	1		$2p^63p\ ^2P^\circ_{3/2}$	$2p^68d\ ^2D_{5/2}$	76EDL/BOD	
93.069	0.005	1074472	1		$2p^63p\ ^2P^\circ_{1/2}$	$2p^67d\ ^2D_{3/2}$	76EDL/BOD	
93.395	0.005	1070721	2		$2p^63p\ ^2P^\circ_{3/2}$	$2p^67d\ ^2D_{5/2}$	76EDL/BOD	
95.069	0.010	1051868	1		$2p^63p\ ^2P^\circ_{1/2}$	$2p^67s\ ^2S_{1/2}$	76COH/BEH	
95.399	0.005	1048229	0		$2p^63p\ ^2P^\circ_{3/2}$	$2p^67s\ ^2S_{1/2}$	76EDL/BOD	
98.796	0.005	1012187	5		$2p^63s\ ^2S_{1/2}$	$2p^65p\ ^2P^\circ_{3/2}$	76EDL/BOD	
98.866	0.005	1011470	4		$2p^63s\ ^2S_{1/2}$	$2p^65p\ ^2P^\circ_{1/2}$	76EDL/BOD	
99.394	0.005	1006097	3		$2p^63p\ ^2P^\circ_{1/2}$	$2p^66d\ ^2D_{3/2}$	76EDL/BOD	
99.761	0.005	1002396	4		$2p^63p\ ^2P^\circ_{3/2}$	$2p^66d\ ^2D_{5/2}$	76EDL/BOD	
103.163	0.005	969340	0		$2p^63p\ ^2P^\circ_{1/2}$	$2p^66s\ ^2S_{1/2}$	76EDL/BOD	
103.561	0.005	965614	1		$2p^63p\ ^2P^\circ_{3/2}$	$2p^66s\ ^2S_{1/2}$	76EDL/BOD	
107.183	0.005	932984	0		$2p^63d\ ^2D_{3/2,5/2}$	$2p^69f\ ^2F^\circ_{5/2,7/2}$	76EDL/BOD	
110.652	0.010	903734	0		$2p^63d\ ^2D_{3/2,5/2}$	$2p^68f\ ^2F^\circ_{5/2,7/2}$	76EDL/BOD	
112.120	0.005	891902	4	6.82E+10	$2p^63p\ ^2P^\circ_{1/2}$	$2p^65d\ ^2D_{3/2}$	76EDL/BOD	98SIE/MIG
112.586	0.005	888210	5	2.07E+10	$2p^63p\ ^2P^\circ_{3/2}$	$2p^65d\ ^2D_{5/2}$	76EDL/BOD	98SIE/MIG
112.594	0.010	888147	20	2.30E+9	$2p^63p\ ^2P^\circ_{3/2}$	$2p^65d\ ^2D_{3/2}$	76COH/BEH	98SIE/MIG
116.109	0.005	861260	0		$2p^63d\ ^2D_{3/2}$	$2p^67f\ ^2F^\circ_{5/2}$	76EDL/BOD	
116.139	0.005	861037	1		$2p^63d\ ^2D_{5/2}$	$2p^67f\ ^2F^\circ_{7/2}$	76EDL/BOD	
121.091	0.005	825825	2	7.05E+9	$2p^63p\ ^2P^\circ_{1/2}$	$2p^65s\ ^2S_{1/2}$	76EDL/BOD	98SIE/MIG
121.645	0.005	822064	3	1.43E+10	$2p^63p\ ^2P^\circ_{3/2}$	$2p^65s\ ^2S_{1/2}$	76EDL/BOD	98SIE/MIG
125.697	0.005	795564	2		$2p^63d\ ^2D_{3/2}$	$2p^66f\ ^2F^\circ_{5/2}$	76EDL/BOD	
125.735	0.005	795323	3		$2p^63d\ ^2D_{5/2}$	$2p^66f\ ^2F^\circ_{7/2}$	76EDL/BOD	
131.633	0.005	759688	8	1.84E+10	$2p^63s\ ^2S_{1/2}$	$2p^64p\ ^2P^\circ_{3/2}$	76EDL/BOD	06FRO/TAC
131.880	0.005	758265	7	1.90E+10	$2p^63s\ ^2S_{1/2}$	$2p^64p\ ^2P^\circ_{1/2}$	76EDL/BOD	06FRO/TAC
145.659	0.005	686535	4		$2p^63d\ ^2D_{3/2}$	$2p^65f\ ^2F^\circ_{5/2}$	76EDL/BOD	
145.712	0.005	686285	5		$2p^63d\ ^2D_{5/2}$	$2p^65f\ ^2F^\circ_{7/2}$	76EDL/BOD	
147.120	0.005	679717	7	2.56E+10	$2p^63p\ ^2P^\circ_{1/2}$	$2p^64d\ ^2D_{3/2}$	76EDL/BOD	06FRO/TAC
147.912	0.005	676078	8	3.09E+10	$2p^63p\ ^2P^\circ_{3/2}$	$2p^64d\ ^2D_{5/2}$	76EDL/BOD	06FRO/TAC
147.941	0.005	675945	4	5.15E+9	$2p^63p\ ^2P^\circ_{3/2}$	$2p^64d\ ^2D_{3/2}$	76EDL/BOD	06FRO/TAC
156.963	0.005	637093	1	3.94E+9	$2p^63d\ ^2D_{5/2}$	$2p^65p\ ^2P^\circ_{3/2}$	76EDL/BOD	98SIE/MIG
157.071	0.005	636655	0	4.43E+9	$2p^63d\ ^2D_{3/2}$	$2p^65p\ ^2P^\circ_{1/2}$	76EDL/BOD	98SIE/MIG
184.590	0.005	541741	5	1.65E+10	$2p^63p\ ^2P^\circ_{1/2}$	$2p^64s\ ^2S_{1/2}$	76EDL/BOD	06FRO/TAC
185.881	0.005	537979	6	3.30E+10	$2p^63p\ ^2P^\circ_{3/2}$	$2p^64s\ ^2S_{1/2}$	76EDL/BOD	06FRO/TAC
205.769	0.005	485982	6	9.27E+10	$2p^63d\ ^2D_{3/2}$	$2p^64f\ ^2F^\circ_{5/2}$	76EDL/BOD	06FRO/TAC
205.860	0.005	485767	7	9.93E+10	$2p^63d\ ^2D_{5/2}$	$2p^64f\ ^2F^\circ_{7/2}$	76EDL/BOD	06FRO/TAC
260.042	0.02	384553	50	1.03E+10	$2p^63d\ ^2D_{5/2}$	$2p^64p\ ^2P^\circ_{3/2}$	76COH/BEH	06FRO/TAC
260.822	0.02	383403	25	1.16E+10	$2p^63d\ ^2D_{3/2}$	$2p^64p\ ^2P^\circ_{1/2}$	76COH/BEH	06FRO/TAC
459.317	0.005	217714.6	4	7.40E+9	$2p^63p\ ^2P^\circ_{1/2}$	$2p^63d\ ^2D_{3/2}$	76EDL/BOD	06FRO/TAC
466.835	0.005	214208.4	5	8.46E+9	$2p^63p\ ^2P^\circ_{3/2}$	$2p^63d\ ^2D_{5/2}$	76EDL/BOD	06FRO/TAC
467.391	0.005	213953.6	2	1.41E+9	$2p^63p\ ^2P^\circ_{3/2}$	$2p^63d\ ^2D_{3/2}$	76EDL/BOD	06FRO/TAC
621.452	0.005	160913.5	6	3.09E+9	$2p^63s\ ^2S_{1/2}$	$2p^63p\ ^2P^\circ_{3/2}$	76EDL/BOD	06FRO/TAC

TABLE 20. Observed spectral lines of K IX—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
636.325	0.005	157152.4	5	2.87E+9	$2p^63s\ ^2S_{1/2}$	$2p^63p\ ^2P^\circ_{1/2}$	76EDL/BOD	06FRO/TAC

TABLE 21. Energy levels of K IX

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$2p^63s$	^2S	1/2	0	1.2	
$2p^63p$	$^2P^\circ$	1/2	157152.4	1.2	76EDL/BOD
		3/2	160913.5	1.3	76EDL/BOD
$2p^63d$	^2D	3/2	374867	2	76EDL/BOD
		5/2	375122	2	76EDL/BOD
$2p^64s$	^2S	1/2	698893	14	76EDL/BOD
$2p^64p$	$^2P^\circ$	1/2	758262	30	76EDL/BOD
		3/2	759685	30	76EDL/BOD
$2p^64d$	^2D	3/2	836869	30	76EDL/BOD
		5/2	837003	30	76EDL/BOD
$2p^64f$	$^2F^\circ$	5/2	860849	20	76EDL/BOD
		7/2	860889	20	76EDL/BOD
$2p^65s$	^2S	1/2	982977	30	76EDL/BOD
$2p^65p$	$^2P^\circ$	1/2	1011520	50	76EDL/BOD
		3/2	1012210	50	76EDL/BOD
$2p^65d$	^2D	3/2	1049050	40	76EDL/BOD
		5/2	1049130	40	76EDL/BOD
$2p^65f$	$^2F^\circ$	5/2	1061400	30	76EDL/BOD
		7/2	1061410	30	76EDL/BOD
$2p^66s$	^2S	1/2	1126510	50	76EDL/BOD
$2p^66p$	$^2P^\circ$	1/2	1142410	70	76EDL/BOD
		3/2	1142750	70	76EDL/BOD
$2p^66d$	^2D	3/2	1163250	50	76EDL/BOD
		5/2	1163310	50	76EDL/BOD
$2p^66f$	$^2F^\circ$	5/2	1170430	30	76EDL/BOD
		7/2	1170440	30	76EDL/BOD
$2p^67s$	^2S	1/2	1209140	50	76EDL/BOD
$2p^67p$	$^2P^\circ$	1/2,3/2	1218980	70	76EDL/BOD
$2p^67d$	^2D	3/2	1231620	60	76EDL/BOD
		5/2	1231640	60	76EDL/BOD
$2p^67f$	$^2F^\circ$	5/2	1236130	40	76EDL/BOD
		7/2	1236160	40	76EDL/BOD
$2p^68p$	$^2P^\circ$	1/2,3/2	1267390	80	76EDL/BOD
$2p^68d$	^2D	3/2	1275770	60	76EDL/BOD
		5/2	1275780	60	76EDL/BOD
$2p^68f$	$^2F^\circ$	5/2,7/2	1278860	40	76COH/BEH
$2p^69p$	$^2P^\circ$	1/2,3/2	1300170	80	76EDL/BOD

TABLE 21. Energy levels of K IX—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$2p^69d$	^2D	3/2	1305730	70	76COH/BEH
		5/2	1305800	70	76COH/BEH
$2p^69f$	$^2F^\circ$	5/2,7/2	1308000	40	76EDL/BOD
$2p^610d$	^2D	5/2	1327340	70	76COH/BEH
K X ($^1S_0$)	*Limit*	⋯	1418063	20	78EDL

7.10. K X

Ne isoelectronic sequence

Ground state $1s^22s^22p^6\ ^1S_0$

Ionization energy [4 062 400(600) cm^{-1}]
[503.67(7) eV]

The foundation of the analysis of the K X spectrum is the research by Edlén and Tyrén [36EDL/TYR], who identified transitions from the ground state to $J=1$ levels of the $2s^22p^53s, 3d, 4s$, and $4d$ configurations, as well as $2s2p^63p$. Improved values for the doublet at 41 Å were reported by Edlén and Bodén [76EDL/BOD]. Fawcett *et al.* [79FAW/BRO] observed 13 transitions in the 114–168 Å region, which were classified as being from $2s^22p^53s$, $3p$, and $3d$ to $2s^22p^54s$, $4p$, $4d$, $4f$, and $5f$. Due to lack of consistency with established values for the lower levels, the designations of Fawcett *et al.* [79FAW/BRO] have been omitted in Tables 22 and 23. Transitions between the $2s^22p^53s$, $3p$, and $3d$ levels were observed by Gayazov *et al.* [87GAY/KRA], including some intercombination lines, which made it possible to tie those levels with greater accuracy. Nilsen and Scofield [94NIL/SCO] used isoelectronic fitting to predict wavelengths for two transitions not observed experimentally. The level values retained in Table 23 are taken primarily from Gayazov *et al.* [87GAY/KRA], adjusted to agree with the separation between the ground state and $2s^22p^53s\ 3/2[3/2]^\circ_1$ measured by Edlén and Bodén [76EDL/BOD]. The levels enclosed in square brackets were obtained by Gayazov *et al.* [87GAY/KRA] using isoelectronic fitting. For those levels not reported by Gayazov *et al.* [87GAY/KRA] the values given by Edlén and Tyrén [36EDL/TYR] are used. As mentioned in Fawcett *et al.* [79FAW/BRO], theoretical calculations indicate that jK coupling is purer than LS for this ion so we utilize jK coupling in these tables. The uncertainties given for the Gayazov *et al.* [87GAY/KRA] levels are relative to the other excited states. The uncertainty with respect to the ground state is much larger. Uncertainties were not reported in Edlén and Tyrén [36EDL/TYR]. However, a detailed analysis of the uncertainties of measurements using the same experimental apparatus for other spectra is given in the summary of Tyrén's thesis [40TYR], but no uncertainty estimate was given for weak lines.

Transition probabilities for K X have been calculated by Biémont and Hansen [87BIE/HAN] and by Loginov [89LOG] using the relativistic Hartree–Fock method. Their values agree to within 5%. Hibbert *et al.* [93HIB/LED] incorporated variationally optimized orbitals and a modified Breit–Pauli Hamiltonian to produce level values in close agreement with experiment and transition probabilities which agree with the results of Biémont and Hansen [87BIE/HAN] and Loginov [89LOG] results to within 10% for most transitions. The results of Hibbert *et al.* [93HIB/LED] are retained in Table 22. The ionization energy cited above was determined by Biémont *et al.* [99BIE/FRE] using a semi-empirical fit along the Ne I isoelectronic sequence.

References for K X

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76EDL/BOD Edlén, B., and Bodén, E., Phys. Scr. **14**, 31 (1976).

78EDL Edlén, B., Phys. Scr. **17**, 565 (1978).

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TABLE 22. Observed spectral lines of K X

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
29.588		3379749	0		$2s^22p^6\ ^1S_0$	$2s^22p^54d\ 1/2[3/2]^\circ_1$	36EDL/TYR	
29.794		3356380	0		$2s^22p^6\ ^1S_0$	$2s^22p^54d\ 3/2[3/2]^\circ_1$	36EDL/TYR	
30.887		3237608	0	6.34E+11	$2s^22p^6\ ^1S_0$	$2s2p^63p\ ^1P^\circ_1$	36EDL/TYR	93HIB/LED
30.937		3232375	00		$2s^22p^6\ ^1S_0$	$2s^22p^54s\ 1/2[1/2]^\circ_1$	36EDL/TYR	
31.062		3219368	00	1.60E+10	$2s^22p^6\ ^1S_0$	$2s2p^63p\ ^3P^\circ_1$	36EDL/TYR	93HIB/LED
31.200		3205128	00		$2s^22p^6\ ^1S_0$	$2s^22p^54s\ 3/2[3/2]^\circ_1$	36EDL/TYR	
35.307	0.004	2832300	4	3.51E+12	$2s^22p^6\ ^1S_0$	$2s^22p^53d\ 1/2[3/2]^\circ_1$	36EDL/TYR	93HIB/LED
35.779	0.004	2794936	2	3.13E+11	$2s^22p^6\ ^1S_0$	$2s^22p^53d\ 3/2[3/2]^\circ_1$	36EDL/TYR	93HIB/LED
36.229	0.004	2760220	1	1.04E+10	$2s^22p^6\ ^1S_0$	$2s^22p^53d\ 3/2[1/2]^\circ_1$	36EDL/TYR	93HIB/LED
41.151	0.005	2430074	2	2.08E+11	$2s^22p^6\ ^1S_0$	$2s^22p^53s\ 1/2[1/2]^\circ_1$	76EDL/BOD	93HIB/LED
41.548	0.005	2406855	2	1.08E+11	$2s^22p^6\ ^1S_0$	$2s^22p^53s\ 3/2[3/2]^\circ_1$	76EDL/BOD	93HIB/LED
114.76	0.01	871384					79FAW/BRO	
127.35	0.01	785238					79FAW/BRO	
127.56	0.01	783945					79FAW/BRO	
128.93	0.01	775615					79FAW/BRO	
164.77	0.01	606907					79FAW/BRO	
165.54	0.01	604084					79FAW/BRO	
166.48	0.01	600673					79FAW/BRO	
166.90	0.01	599161					79FAW/BRO	
167.62	0.01	596588					79FAW/BRO	
167.76	0.01	596090					79FAW/BRO	
168.79	0.01	592452					79FAW/BRO	
[383.58]	0.1	[260702]		3.38E+9	$2s^22p^53s\ 3/2[3/2]^\circ_1$	$2s^22p^53p\ 3/2[1/2]_0$	94NIL/SCO	93HIB/LED
414.54	0.02	241231	3	1.81E+9	$2s^22p^53p\ 1/2[1/2]_1$	$2s^22p^53d\ 1/2[3/2]^\circ_1$	87GAY/KRA	93HIB/LED
421.70	0.02	237135	4	7.68E+9	$2s^22p^53s\ 1/2[1/2]^\circ_1$	$2s^22p^53p\ 3/2[1/2]_0$	87GAY/KRA	93HIB/LED
436.81	0.02	228932	6	3.58E+9	$2s^22p^53p\ 3/2[1/2]_1$	$2s^22p^53d\ 3/2[3/2]^\circ_2$	87GAY/KRA	93HIB/LED
438.04	0.02	228290	5	3.34E+9	$2s^22p^53p\ 3/2[3/2]_1$	$2s^22p^53d\ 3/2[3/2]^\circ_1$	87GAY/KRA	93HIB/LED
446.75	0.02	223839	3	4.81E+9	$2s^22p^53p\ 3/2[1/2]_1$	$2s^22p^53d\ 3/2[1/2]^\circ_1$	87GAY/KRA	93HIB/LED
451.89	0.02	221293	3	5.39E+9	$2s^22p^53p\ 3/2[1/2]_1$	$2s^22p^53d\ 3/2[1/2]^\circ_0$	87GAY/KRA	93HIB/LED
464.68	0.02	215202	13	6.01E+9	$2s^22p^53p\ 1/2[3/2]_1$	$2s^22p^53d\ 1/2[5/2]^\circ_2$	87GAY/KRA	93HIB/LED
469.68	0.02	212911	11	9.87E+8	$2s^22p^53p\ 3/2[5/2]_3$	$2s^22p^53d\ 3/2[7/2]^\circ_3$	87GAY/KRA	93HIB/LED
470.75	0.02	212427	13	6.41E+9	$2s^22p^53p\ 3/2[5/2]_2$	$2s^22p^53d\ 3/2[7/2]^\circ_3$	87GAY/KRA	93HIB/LED
472.66	0.02	211569	11	4.46E+9	$2s^22p^53p\ 3/2[3/2]_1$	$2s^22p^53d\ 3/2[5/2]^\circ_2$	87GAY/KRA	93HIB/LED
474.38	0.02	210801	13	6.54E+9	$2s^22p^53p\ 1/2[3/2]_2$	$2s^22p^53d\ 3/2[5/2]^\circ_3$	87GAY/KRA	93HIB/LED
475.91	0.02	210124	5	5.30E+9	$2s^22p^53p\ 1/2[1/2]_1$	$2s^22p^53d\ 1/2[3/2]^\circ_2$	87GAY/KRA	93HIB/LED
476.94	0.02	209670	13	5.43E+9	$2s^22p^53p\ 3/2[3/2]_2$	$2s^22p^53d\ 1/2[5/2]^\circ_3$	87GAY/KRA	93HIB/LED
477.10	0.02	209600	8	3.18E+9	$2s^22p^53p\ 1/2[1/2]_0$	$2s^22p^53d\ 3/2[3/2]^\circ_1$	87GAY/KRA	93HIB/LED
477.54	0.02	209407	14	6.46E+9	$2s^22p^53p\ 3/2[5/2]_3$	$2s^22p^53d\ 3/2[7/2]^\circ_4$	87GAY/KRA	93HIB/LED
481.55	0.02	207663	7	8.87E+8	$2s^22p^53p\ 1/2[3/2]_2$	$2s^22p^53d\ 1/2[5/2]^\circ_2$	87GAY/KRA	93HIB/LED
521.62	0.03	191710	2	6.10E+8	$2s^22p^53s\ 3/2[3/2]^\circ_2$	$2s^22p^53p\ 1/2[1/2]_1$	87GAY/KRA	93HIB/LED
560.74	0.03	178336	1	2.89E+9	$2s^22p^53s\ 3/2[3/2]^\circ_1$	$2s^22p^53p\ 1/2[1/2]_0$	87GAY/KRA	93HIB/LED
594.36	0.03	168248	1	1.34E+9	$2s^22p^53s\ 1/2[1/2]^\circ_0$	$2s^22p^53p\ 1/2[1/2]_1$	87GAY/KRA	93HIB/LED
[603.36]	0.1	[165739]		1.12E+9	$2s^22p^53s\ 3/2[3/2]^\circ_1$	$2s^22p^53p\ 3/2[3/2]_2$	94NIL/SCO	93HIB/LED
606.57	0.03	164861	1	1.75E+9	$2s^22p^53p\ 3/2[1/2]_0$	$2s^22p^53d\ 1/2[3/2]^\circ_1$	87GAY/KRA	93HIB/LED
622.12	0.03	160741	3	1.19E+9	$2s^22p^53s\ 1/2[1/2]^\circ_1$	$2s^22p^53p\ 1/2[1/2]_1$	87GAY/KRA	93HIB/LED
624.09	0.03	160233	8	1.12E+9	$2s^22p^53s\ 3/2[3/2]^\circ_2$	$2s^22p^53p\ 3/2[5/2]_2$	87GAY/KRA	93HIB/LED
625.19	0.03	159951	3	2.47E+9	$2s^22p^53s\ 1/2[1/2]^\circ_1$	$2s^22p^53p\ 1/2[3/2]_2$	87GAY/KRA	93HIB/LED
625.31	0.03	159921	4	1.26E+9	$2s^22p^53s\ 1/2[1/2]^\circ_0$	$2s^22p^53p\ 1/2[3/2]_1$	87GAY/KRA	93HIB/LED
626.02	0.03	159739	11	2.68E+9	$2s^22p^53s\ 3/2[3/2]^\circ_2$	$2s^22p^53p\ 3/2[5/2]_3$	87GAY/KRA	93HIB/LED
626.39	0.03	159645	11	2.16E+9	$2s^22p^53s\ 3/2[3/2]^\circ_1$	$2s^22p^53p\ 3/2[3/2]_1$	87GAY/KRA	93HIB/LED
655.55	0.03	152544	8	1.36E+9	$2s^22p^53s\ 3/2[3/2]^\circ_1$	$2s^22p^53p\ 3/2[5/2]_2$	87GAY/KRA	93HIB/LED
656.19	0.03	152395	3	1.19E+9	$2s^22p^53s\ 1/2[1/2]^\circ_1$	$2s^22p^53p\ 1/2[3/2]_1$	87GAY/KRA	93HIB/LED

TABLE 23. Energy levels of K x

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$2s^22p^6$	^1S	0	0	300	
$2s^22p^53s$	$3/2[3/2]^\circ$	2	2399168	20	87GAY/KRA
		1	2406855	20	76EDL/BOD, 87GAY/KRA
$2s^22p^53s$	$1/2[1/2]^\circ$	0	2422630	20	87GAY/KRA
		1	2430137	20	87GAY/KRA
$2s^22p^53p$	3/2[1/2]	1	[2536246]		87GAY/KRA
		0	2667264	20	87GAY/KRA
$2s^22p^53p$	3/2[5/2]	3	2558910	20	87GAY/KRA
		2	2559399	20	87GAY/KRA
$2s^22p^53p$	3/2[3/2]	1	2566499	20	87GAY/KRA
		2	[2572660]		87GAY/KRA
$2s^22p^53p$	1/2[3/2]	1	2582550	20	87GAY/KRA
		2	2590088	20	87GAY/KRA
$2s^22p^53p$	1/2[1/2]	0	2585190	20	87GAY/KRA
		1	2590878	20	87GAY/KRA
$2s^22p^53d$	$3/2[1/2]^\circ$	0	[2757539]		87GAY/KRA
		1	[2760084]		87GAY/KRA
$2s^22p^53d$	$3/2[3/2]^\circ$	2	[2765178]		87GAY/KRA
		1	2794790	20	87GAY/KRA
$2s^22p^53d$	$3/2[7/2]^\circ$	4	2768317	20	87GAY/KRA
		3	2771824	20	87GAY/KRA
$2s^22p^53d$	$3/2[5/2]^\circ$	2	2778069	20	87GAY/KRA
		3	2800889	20	87GAY/KRA
$2s^22p^53d$	$1/2[5/2]^\circ$	2	2797752	20	87GAY/KRA
		3	[2782330]		87GAY/KRA
$2s^22p^53d$	$1/2[3/2]^\circ$	2	2801002	20	87GAY/KRA
		1	2832117	20	87GAY/KRA
$2s^22p^54s$	$3/2[3/2]^\circ$	1	3205100		36EDL/TYR
$2s2p^63p$	$^3P^\circ$	1	3219400		36EDL/TYR
$2s^22p^54s$	$1/2[1/2]^\circ$	1	3232400		36EDL/TYR
$2s2p^63p$	$^1P^\circ$	1	3237600		36EDL/TYR
$2s^22p^54d$	$3/2[3/2]^\circ$	1	3356400		36EDL/TYR
$2s^22p^54d$	$1/2[3/2]^\circ$	1	3379700		36EDL/TYR
K XI ($^2P^\circ_{3/2}$)	*Limit*	⋯	4062400	600	99BIE/FRE

7.11. K XI

F isoelectronic sequence

Ground state $1s^22s^22p^5\ ^2P^\circ_{3/2}$

Ionization energy [4 562 000(6000) cm^{-1}]
[565.6(7) eV]

The analysis of the K XI spectrum began with the research of Edlén and Tyrén [36EDL/TYR], who classified ten transitions in the 30–40 Å region as being from the ground configuration to levels of the $2s^22p^43s$ and $3d$ configurations. Feldman *et al.* [73FEL/DOS] contributed a more extensive set of measurements in the same wavelength range. The $2s^22p^5$ to $2s2p^6$ resonance doublet at 155 Å was first identified by Fawcett *et al.* [67FAW/BRO] and subsequently measured to greater accuracy by Edlén and Bodén [76EDL/BOD] and Kaufman *et al.* [82KAU/SUG]. The splitting of the ground term doublet was measured by Prior [87PRI] in a metastable ion beam. Jupén and Träbert [01JUP/TRA] remeasured the K XI spectrum, obtaining values for several previously unobserved levels of the $2s^22p^43p$, $3d$, and $4f$ configurations. In K XI the uncertainty of the separation of the ground state and the $2s^22p^4nl$ states is about 1000 cm^{-1}; however, the relative uncertainties of these higher states (which are listed in Tables 24 and 25) are significantly smaller. The uncertainties given for the $2s^22p^5\ {}^2P^\circ_{3/2}$ and $2s2p^6\ {}^2S_{1/2}$ levels are with respect to the ground state.

The transition probabilities of allowed transitions of K XI have been calculated by Blackford and Hibbert [94BLA/HIB], using a modified Breit–Pauli Hamiltonian. Karpuškienė and Bogandovich [03KAR/BOG] used a configuration interaction technique, resulting in probabilities within 10% of the values of Blackford and Hibbert [94BLA/HIB], but for a more limited set of transitions. They also compared their configuration interaction results with those obtained using a Hartree–Fock plus Breit–Pauli method and those of [94BLA/HIB]. The transition probability of the forbidden ground state transition was measured by Träbert *et al.* [01TRA/BEI]. The ionization energy cited above was determined by Biémont *et al.* [99BIE/FRE] using a semiempirical fit along the F I isoelectronic sequence.

References for K XI

36EDL/TYR Edlén, B., and Tyrén, F., Z. Phys. **101**, 206 (1936).

67FAW/BRO Fawcett, B. C., Bromage, G. E., and Peacock, N. J., Proc. Phys. Soc. **91**, 970 (1967).

73FEL/DOS Feldman, U., Doschek, G. A., Cowan, R. D., and Cohen, L., J. Opt. Soc. Am. **63**, 1445 (1973).

76EDL/BOD Edlén, B., and Bodén, E., Phys. Scr. **14**, 31 (1976).

82KAU/SUG Kaufman, V., Sugar, J., and Cooper, D., Phys. Scr. **25**, 623 (1982).

87PRI Prior, M. H., J. Opt. Soc. Am. B **4**, 144 (1987).

94BLA/HIB Blackford, H. M. S., and Hibbert, A., At. Data Nucl. Data Tables **58**, 101 (1994).

99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).

01JUP/TRA Jupén, C., and Träbert, E., J. Phys. B **34**, 3053 (2001).

01TRA/BEI Träbert, E., Beiersdorfer, P., Brown, G. V., Chen, H., Pinnington, E. H., and Thorn, D. B., Phys. Rev. A **64**, 034501 (2001).

03KAR/BOG Karpuškienė, R., and Bogandovich, P., J. Phys. B **36**, 2145 (2003).

TABLE 24. Observed spectral lines of K XI

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
31.457	0.010	3179000	1	4.96E+10	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^1S)3d\ {}^2D_{3/2}$	73FEL/DOS	94BLA/HIB
31.483	0.010	3176200	10	4.72E+11	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^1S)3d\ {}^2D_{5/2}$	73FEL/DOS	94BLA/HIB
31.688	0.010	3155800	9	1.17E+12	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^1S)3d\ {}^2D_{3/2}$	73FEL/DOS	94BLA/HIB
32.099	0.010	3115400	10	3.48E+11	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^1D)3d\ {}^2D_{3/2}$	73FEL/DOS	94BLA/HIB
32.178	0.010	3107700	20	3.10E+12	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^1D)3d\ {}^2D_{5/2}$	73FEL/DOS	94BLA/HIB
32.278	0.010	3098100	8	8.76E+10	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^1D)3d\ {}^2F_{5/2}$	73FEL/DOS	94BLA/HIB
32.318	0.010	3094300	10	2.30E+12	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^1D)3d\ {}^2S_{1/2}$	73FEL/DOS	94BLA/HIB
32.341	0.010	3092000	18	2.80E+12	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^1D)3d\ {}^2D_{3/2}$	73FEL/DOS	94BLA/HIB
32.421	0.010	3084400	8	4.30E+11	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^1D)3d\ {}^2P_{3/2}$	73FEL/DOS	94BLA/HIB
32.563	0.010	3071000	6	7.47E+11	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^1D)3d\ {}^2S_{1/2}$	73FEL/DOS	94BLA/HIB
32.808	0.010	3048000	20	1.35E+12	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^3P)3d\ {}^2D_{5/2}$	73FEL/DOS	94BLA/HIB
32.956	0.010	3034300	10*	1.39E+11	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^3P)3d\ {}^2F_{5/2}$	73FEL/DOS	94BLA/HIB
32.956	0.010	3034300	10*	5.11E+11	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^3P)3d\ {}^2D_{3/2}$	73FEL/DOS	94BLA/HIB
33.012	0.010	3029200	10	9.90E+10	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^3P)3d\ {}^4P_{5/2}$	73FEL/DOS	94BLA/HIB
33.028	0.010	3027700	2	1.49E+11	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^3P)3d\ {}^2P_{1/2}$	73FEL/DOS	94BLA/HIB
33.087	0.010	3022400	10	2.04E+10	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^3P)3d\ {}^2P_{3/2}$	73FEL/DOS	94BLA/HIB
33.107	0.010	3020500	8	1.08E+11	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^3P)3d\ {}^4F_{5/2}$	73FEL/DOS	94BLA/HIB
33.134	0.010	3018000	3	8.99E+10	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^3P)3d\ {}^4P_{1/2}$	73FEL/DOS	94BLA/HIB
33.211	0.010	3011000	6	3.45E+11	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^3P)3d\ {}^2D_{3/2}$	73FEL/DOS	94BLA/HIB
33.285	0.010	3004400	6	8.24E+10	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^3P)3d\ {}^2P_{1/2}$	73FEL/DOS	94BLA/HIB
33.34	0.010	2999400	4	2.06E+9	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^3P)3d\ {}^4P_{3/2}$	73FEL/DOS	94BLA/HIB
35.563	0.010	2811900	4	9.00E+10	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^1S)3s\ {}^2S_{1/2}$	73FEL/DOS	94BLA/HIB
35.865	0.010	2788200	4	9.81E+10	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^1S)3s\ {}^2S_{1/2}$	73FEL/DOS	94BLA/HIB
36.660	0.010	2727800	20	1.92E+11	$2s^22p^5\ {}^2P^\circ_{3/2}$	$2s^22p^4({}^1D)3s\ {}^2D_{5/2}$	73FEL/DOS	94BLA/HIB
36.968	0.010	2705000	10	1.98E+11	$2s^22p^5\ {}^2P^\circ_{1/2}$	$2s^22p^4({}^1D)3s\ {}^2D_{3/2}$	73FEL/DOS	94BLA/HIB

TABLE 24. Observed spectral lines of K XI—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
37.236	0.010	2685600	6	2.04E+11	$2s^22p^5\ ^2P^\circ_{3/2}$	$2s^22p^4(^3P)3s\ ^2P_{1/2}$	73FEL/DOS	94BLA/HIB
37.431	0.010	2671600	20	3.75E+11	$2s^22p^5\ ^2P^\circ_{3/2}$	$2s^22p^4(^3P)3s\ ^2P_{3/2}$	73FEL/DOS	94BLA/HIB
37.564	0.010	2662100	10	3.04E+11	$2s^22p^5\ ^2P^\circ_{1/2}$	$2s^22p^4(^3P)3s\ ^2P_{1/2}$	73FEL/DOS	94BLA/HIB
37.692	0.010	2653100	10	8.14E+10	$2s^22p^5\ ^2P^\circ_{3/2}$	$2s^22p^4(^3P)3s\ ^4P_{3/2}$	73FEL/DOS	94BLA/HIB
37.766	0.010	2647900	5	4.31E+10	$2s^22p^5\ ^2P^\circ_{1/2}$	$2s^22p^4(^3P)3s\ ^2P_{3/2}$	73FEL/DOS	94BLA/HIB
37.871	0.010	2640500	5	3.40E+9	$2s^22p^5\ ^2P^\circ_{3/2}$	$2s^22p^4(^3P)3s\ ^4P_{5/2}$	73FEL/DOS	94BLA/HIB
37.891	0.010	2639100	1	6.68E+9	$2s^22p^5\ ^2P^\circ_{1/2}$	$2s^22p^4(^3P)3s\ ^4P_{1/2}$	73FEL/DOS	94BLA/HIB
38.030	0.010	2629500	3	5.12E+9	$2s^22p^5\ ^2P^\circ_{1/2}$	$2s^22p^4(^3P)3s\ ^4P_{3/2}$	73FEL/DOS	94BLA/HIB
38.112	0.010	2623800	2		$2s2p^6\ ^2S_{1/2}$	$2s2p^5(^3P^\circ)3s\ ^2P^\circ_{1/2}$	73FEL/DOS	
38.317	0.010	2609800	6		$2s2p^6\ ^2S_{1/2}$	$2s2p^5(^3P^\circ)3s\ ^2P^\circ_{3/2}$	73FEL/DOS	
135.08	0.10	740300	20		$2s^22p^4(^3P)3d\ ^4D_{7/2}$	$2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{9/2}$	01JUP/TRA	
135.38	0.10	738700	10		$2s^22p^4(^3P)3d\ ^4D_{5/2}$	$2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{7/2}$	01JUP/TRA	
138.27	0.10	723200	37		$2s^22p^4(^3P)3d\ ^4P_{9/2}$	$2s^22p^4(^3P_2)4f\ ^2[5]^\circ_{11/2}$	01JUP/TRA	
139.40	0.10	717400	10		$2s^22p^4(^3P)3d\ ^4P_{7/2}$	$2s^22p^4(^3P_2)4f\ ^2[5]^\circ_{9/2}$	01JUP/TRA	
152.462	0.005	655910	560	3.68E+10	$2s^22p^5\ ^2P^\circ_{3/2}$	$2s2p^6\ ^2S_{1/2}$	82KAU/SUG	94BLA/HIB
158.135	0.005	632370	450	1.62E+10	$2s^22p^5\ ^2P^\circ_{1/2}$	$2s2p^6\ ^2S_{1/2}$	82KAU/SUG	94BLA/HIB
491.85	0.10	203310	18	4.84E+9	$2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$	$2s^22p^4(^3P)3d\ ^4F_{7/2}$	01JUP/TRA	94BLA/HIB
493.36	0.10	202690	16	2.37E+9	$2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$	$2s^22p^4(^3P)3d\ ^4D_{7/2}$	01JUP/TRA	94BLA/HIB
495.66	0.10	201750	73	5.05E+9	$2s^22p^4(^3P)3p\ ^4D^\circ_{7/2}$	$2s^22p^4(^3P)3d\ ^4F_{9/2}$	01JUP/TRA	94BLA/HIB
498.09	0.10	200770	12	4.75E+9	$2s^22p^4(^1D)3p\ ^2F^\circ_{5/2}$	$2s^22p^4(^1D)3d\ ^2G_{7/2}$	01JUP/TRA	94BLA/HIB
499.24	0.10	200300	8	3.52E+9	$2s^22p^4(^1D)3p\ ^2D^\circ_{5/2}$	$2s^22p^4(^1D)3d\ ^2F_{7/2}$	01JUP/TRA	94BLA/HIB
499.92	0.10	200030	14	4.98E+9	$2s^22p^4(^3P)3p\ ^2D^\circ_{5/2}$	$2s^22p^4(^3P)3d\ ^2F_{7/2}$	01JUP/TRA	94BLA/HIB
507.65	0.10	196990	20		$2s^22p^4(^3P)3p\ ^2F^\circ_{7/2}$	$2s^22p^4(^3P)3d\ ^2G_{9/2}$	01JUP/TRA	
581.83	0.10	171870	7	2.58E+9	$2s^22p^4(^1D)3s\ ^2D_{5/2}$	$2s^22p^4(^1D)3p\ ^2D^\circ_{5/2}$	01JUP/TRA	94BLA/HIB
592.70	0.10	168720	6	2.71E+9	$2s^22p^4(^1D)3s\ ^2D_{3/2}$	$2s^22p^4(^1D)3p\ ^2D^\circ_{3/2}$	01JUP/TRA	94BLA/HIB
614.17	0.10	162820	27	2.55E+9	$2s^22p^4(^3P)3s\ ^4P_{5/2}$	$2s^22p^4(^3P)3p\ ^4D^\circ_{7/2}$	01JUP/TRA	94BLA/HIB
644.74	0.10	155100	5	1.98E+9	$2s^22p^4(^3P)3s\ ^4P_{3/2}$	$2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$	01JUP/TRA	94BLA/HIB
651.74	0.10	153440	11*	1.96E+9	$2s^22p^4(^3P)3s\ ^2P_{3/2}$	$2s^22p^4(^3P)3p\ ^2D^\circ_{5/2}$	01JUP/TRA	
651.74	0.10	153440	11*	2.12E+9	$2s^22p^4(^1D)3s\ ^2D_{5/2}$	$2s^22p^4(^1D)3p\ ^2F^\circ_{7/2}$	01JUP/TRA	94BLA/HIB
671.75	0.10	148860	4	1.65E+9	$2s^22p^4(^1D)3s\ ^2D_{3/2}$	$2s^22p^4(^1D)3p\ ^2F^\circ_{5/2}$	01JUP/TRA	94BLA/HIB
690.95	0.10	144730	6	1.53E+9	$2s^22p^4(^3P)3s\ ^4P_{5/2}$	$2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$	01JUP/TRA	94BLA/HIB
Air								
4255.1	0.9	23495		2.25E+2	$2s^22p^5\ ^2P^\circ_{3/2}$	$2s^22p^5\ ^2P^\circ_{1/2}$	87PRI	01TRA/BEI

TABLE 25. Energy levels of K XI

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
$2s^22p^5$	$^2P^\circ$	3/2	0	1000		
		1/2	23495	5		87PRI
$2s2p^6$	^2S	1/2	655901	20	100%	82KAU/SUG
$2s^22p^4(^3P)3s$	^4P	5/2	2640500	250	100%	73FEL/DOS
		3/2	2653000	250	80%+19% $2s^22p^4(^3P)3s\ ^2P_{3/2}$	73FEL/DOS
		1/2	2662600	250	97%	73FEL/DOS
$2s^22p^4(^3P)3s$	^2P	3/2	2671500	250	78%+20% $2s^22p^4(^3P)3s\ ^4P_{3/2}$	73FEL/DOS
		1/2	2685600	250	98%	73FEL/DOS
$2s^22p^4(^1D)3s$	^2D	5/2	2727800	250	98%	73FEL/DOS
		3/2	2728500	250	96%	73FEL/DOS
$2s^22p^4(^3P)3p$	$^4P^\circ$	5/2	2785200	250	91%+8% $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$	01JUP/TRA
$2s^22p^4(^3P)3p$	$^4D^\circ$	7/2	2803300	250	97%	01JUP/TRA
		5/2	2808160	250	91%+8% $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$	01JUP/TRA
$2s^22p^4(^1S)3s$	^2S	1/2	2811800	250	96%	73FEL/DOS

TABLE 25. Energy levels of K XI—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
$2s^22p^4(^3P)3p$	$^2D°$	5/2	2824960	250	55% + 39% $2s^22p^4(^3P)3p$ $^4D°_{5/2}$	01JUP/TRA
$2s^22p^4(^1D)3p$	$^2F°$	5/2	2877500	250	95%	01JUP/TRA
		7/2	2881200	250	97%	01JUP/TRA
$2s^22p^4(^1D)3p$	$^2D°$	3/2	2897360	250	96%	01JUP/TRA
		5/2	2899630	250	96%	01JUP/TRA
$2s^22p^4(^3P)3d$	^4D	7/2	2987900	300	90% + 7% $2s^22p^4(^3P)3d$ $^4F_{7/2}$	01JUP/TRA
		5/2	2989520	300	89% + 5% $2s^22p^4(^3P)3d$ $^4F_{5/2}$	01JUP/TRA
		3/2	(2992800)		87% + 7% $2s^22p^4(^3P)3d$ $^4F_{3/2}$	01JUP/TRA
		1/2	(2996100)		89% + 5% $2s^22p^4(^3P)3d$ $^4P_{1/2}$	01JUP/TRA
$2s^22p^4(^3P)3d$	^4F	9/2	3005000	300	97%	01JUP/TRA
		7/2	3011500	300	57% + 38% $2s^22p^4(^3P)3d$ $^2F_{7/2}$	01JUP/TRA
		5/2	3020500	300	77% + 11% $2s^22p^4(^3P)3d$ $^2F_{5/2}$	73FEL/DOS
		3/2	3024900	300	77% + 15% $2s^22p^4(^3P)3d$ $^4P_{3/2}$	01JUP/TRA
$2s^22p^4(^3P)3d$	^4P	1/2	3018000	300	93% + 4% $2s^22p^4(^3P)3d$ $^4D_{1/2}$	73FEL/DOS
		3/2	3022300	300	72% + 17% $2s^22p^4(^3P)3d$ $^4F_{3/2}$	73FEL/DOS
		5/2	3029200	300	61% + 12% $2s^22p^4(^3P)3d$ $^2F_{5/2}$	73FEL/DOS
$2s^22p^4(^3P)3d$	^2F	7/2	3025000	300	57% + 34% $2s^22p^4(^3P)3d$ $^4F_{7/2}$	01JUP/TRA
		5/2	3034300	300	51% + 16% $2s^22p^4(^1D)3d$ $^2D_{5/2}$	73FEL/DOS
$2s^22p^4(^3P)3d$	^2P	1/2	3027800	300	69% + 23% $2s^22p^4(^1D)3d$ $^2P_{1/2}$	73FEL/DOS
		3/2	(3047300)		59% + 19% $2s^22p^4(^1D)3d$ $^2P_{3/2}$	01JUP/TRA
$2s^22p^4(^3P)3d$	^2D	3/2	3034400	300	51% + 18% $2s^22p^4(^3P)3d$ $^2P_{3/2}$	73FEL/DOS
		5/2	3048000	300	66% + 16% $2s^22p^4(^3P)3d$ $^2F_{5/2}$	73FEL/DOS
$2s^22p^4(^1D)3d$	^2G	9/2	3078200	300	97%	01JUP/TRA
		7/2	3078300	300	96%	01JUP/TRA
$2s^22p^4(^1D)3d$	^2S	1/2	3094300	300	95%	73FEL/DOS
$2s^22p^4(^1D)3d$	^2F	5/2	3098100	300	86% + 13% $2s^22p^4(^1D)3d$ $^2D_{5/2}$	73FEL/DOS
		7/2	3099900	300	97%	01JUP/TRA
$2s^22p^4(^1D)3d$	^2D	5/2	3107700	300	71% + 16% $2s^22p^4(^3P)3d$ $^2D_{5/2}$	73FEL/DOS
		3/2	3115400	300	77% + 22% $2s^22p^4(^3P)3d$ $^2D_{3/2}$	73FEL/DOS
$2s^22p^4(^1D)3d$	^2P	3/2	3107900	300	77% + 20% $2s^22p^4(^3P)3d$ $^2P_{3/2}$	73FEL/DOS
		1/2	(3115100)		72% + 25% $2s^22p^4(^3P)3d$ $^2P_{1/2}$	01JUP/TRA
$2s^22p^4(^1S)3d$	^2D	5/2	3176300	300	95%	73FEL/DOS
		3/2	3179100	300	93%	73FEL/DOS
$2s2p^5(^3P°)3s$	$^2P°$	3/2	3265800	250		73FEL/DOS
		1/2	3279800	250		73FEL/DOS
$2s^22p^4(^3P_2)4f$	$^2[4]°$	7/2	3728200	500		01JUP/TRA
		9/2	3728200	500		01JUP/TRA
$2s^22p^4(^3P_2)4f$	$^2[5]°$	11/2	3728300	500		01JUP/TRA
		9/2	3728800	500		01JUP/TRA
K XII ($^3P_2$)	*Limit*	—	4562000	6000		99BIE/FRE

7.12. K XII

O isoelectronic sequence

Ground state $1s^22s^22p^4\ ^3P_2$

Ionization energy [5 090 000(7 000) cm^{-1}]
[631.1(9) eV]

In their seminal study of the K XII spectrum, Deutchman and House [67DEU/HOU] identified seven transitions in the 140–180 Å region as being from the ground configuration to levels of the $2s2p^5$ configuration. Fawcett *et al.* [74FAW/GAL] located the $2s2p^5\ ^1P^\circ_1 - 2p^6\ ^1S_0$ transition. These transitions were subsequently measured to greater accuracy by Kaufman *et al.* [82KAU/SUG], who also observed several intercombination lines (as seen in Table 26). Doschek *et al.* [73DOS/FEL] observed transitions to the $2s^22p^33s$ levels in the 34 Å region and Fawcett and Hayes [75FAW/HAY] measured spectral lines near 30 Å to locate the $2s^22p^33d$ levels. Additional analysis of the Fawcett and Hayes [75FAW/HAY] data was reported by Bromage and Fawcett [77BRO/FAW]. The forbidden line at 5277 Å, measured by Prior [87PRI] in a metastable ion beam, established the $2s^22p^4\ ^3P_2 - ^3P_1$ separation. Observations by Feldman *et al.* [00FEL/CUR, 04FEL/LAN] have improved the values for the $2s^22p^4\ ^1D_2$ level and the $2s^22p^4\ ^3P_1 - ^1S_0$ separation. In this spectrum the uncertainty of the separation of the ground state and the higher states is given in Table 27; however, both Kaufman *et al.* [82KAU/SUG] and Doschek *et al.* [73DOS/FEL] indicate that their uncertainties for fine structure splittings is about a factor of 3 smaller.

The transition probabilities of allowed transitions of K XII have been calculated by Fawcett [86FAW], using relativistic Hartree–Fock calculations with scaling factors interpolated along the isoelectronic sequence, and also by Tachiev and Froese Fischer [02TAC/FRO] with an *ab initio* multiconfiguration Hartree–Fock technique. A less complete set has been reported by Landi [05LAN]. The values agree to within 20%, although the values of Fawcett [86FAW] are consistently higher than those of Tachiev and Froese Fischer [02TAC/FRO] and the results of Landi [05LAN] lie between them. In Table 26 we have retained the probabilities of Fawcett [86FAW] where available, due to the better agreement with the measured energy levels. However, absent experimental transition rates with which to compare the sets of data it is difficult to ascertain which calculation produces the most accurate transition probabilities. The probabilities for the forbidden ground state transitions were calculated by Galavís *et al.* [97GAL/MEN]. The ionization energy cited was determined by Biémont *et al.* [99BIE/FRE] using a semi-empirical fit along the O I isoelectronic sequence.

References for K XII

67DEU/HOU Deutchman, W. A., and House, L. L., Astrophys. J. **149**, 451 (1967).

73DOS/FEL Doschek, G. A., Feldman, U., and Cohen, L., J. Opt. Soc. Am. **63**, 1463 (1973).

74FAW/GAL Fawcett, B. C., Galanti, M., and Peacock, N. J., J. Phys. B **7**, 1149 (1974).

75FAW/HAY Fawcett, B. C., and Hayes, R. W., Mon. Not. R. Astron. Soc. **170**, 185 (1975).

77BRO/FAW Bromage, G. E., and Fawcett, B. C., Mon. Not. R. Astron. Soc. **178**, 591 (1977).

82KAU/SUG Kaufman, V., Sugar, J., and Cooper, D., Phys. Scr. **25**, 623 (1982).

86FAW Fawcett, B. C., At. Data Nucl. Data Tables **34**, 215 (1986).

87PRI Prior, M. H., J. Opt. Soc. Am. B **4**, 144 (1987).

97GAL/MEN Galavís, M. E., Mendoza, C., and Zeippen, C. J., Astron. Astrophys. Suppl. Ser. **123**, 159 (1997).

99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).

00FEL/CUR Feldman, U., Curdt, W., Landi, E., and Wilhelm, K., Astrophys. J. **544**, 508 (2000).

02TAC/FRO Tachiev, G. I., and Froese Fischer, C., Astron. Astrophys. **385**, 716 (2002).

04FEL/LAN Feldman, U., Landi, E., and Curdt, W., Astrophys. J. **607**, 1039 (2004).

05LAN Landi, E., Astron. Astrophys. **434**, 365 (2005).

TABLE 26. Observed spectral lines of K XII

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line Code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum									
29.168	0.010	3428400	4		1.18E+12	$2s^22p^4\ ^3P_2$	$2s^22p^3(^2P^\circ)3d\ ^3D^\circ_3$	75FAW/HAY	86FAW
29.342	0.010	3408100	4		2.00E+12	$2s^22p^4\ ^3P_1$	$2s^22p^3(^2P^\circ)3d\ ^3D^\circ_1$	75FAW/HAY	86FAW
29.367	0.010	3405200	4		1.31E+10	$2s^22p^4\ ^3P_2$	$2s^22p^3(^2P^\circ 3d\ ^3P^\circ_2$	75FAW/HAY	02TAC/FRO
29.43	0.010	3397900	3*		2.17E+12	$2s^22p^4\ ^3P_0$	$2s^22p^3(^2P^\circ)3d\ ^3D^\circ_1$	75FAW/HAY	86FAW
29.53	0.010	3386400	2*	b	1.90E+11	$2s^22p^4\ ^3P_1$	$2s^22p^3(^2P^\circ)3d\ ^3P^\circ_2$	75FAW/HAY	86FAW
29.53	0.010	3386400	2*	b	8.24E+11	$2s^22p^4\ ^3P_0$	$2s^22p^3(^2P^\circ)3d\ ^3P^\circ_1$	75FAW/HAY	86FAW
29.559	0.010	3383100	3		3.07E+12	$2s^22p^4\ ^3P_2$	$2s^22p^3(^2D^\circ)3d\ ^3S^\circ_1$	75FAW/HAY	86FAW
29.667	0.010	3370700	5*	b	5.53E+12	$2s^22p^4\ ^1D_2$	$2s^22p^3(^2P^\circ)3d\ ^1F^\circ_3$	75FAW/HAY	86FAW
29.667	0.010	3370700	5*	b	3.85E+12	$2s^22p^4\ ^3P_2$	$2s^22p^3(^2D^\circ)3d\ ^3P^\circ_2$	75FAW/HAY	86FAW

TABLE 26. Observed spectral lines of K XII—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line Code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
29.735	0.010	3363000	7*	b	5.50E+12	$2s^22p^4\ ^1D_2$	$2s^22p^3(^2P^\circ)3d\ ^1F^\circ_3$	75FAW/HAY	86FAW
29.735	0.010	3363000	7*	b	3.25E+12	$2s^22p^4\ ^3P_2$	$2s^22p^3(^2D^\circ)3d\ ^3D^\circ_3$	75FAW/HAY	86FAW
29.921	0.010	3342100	5		2.32E+12	$2s^22p^4\ ^3P_1$	$2s^22p^3(^2D^\circ)3d\ ^3D^\circ_2$	75FAW/HAY	86FAW
29.986	0.010	3334900	4		3.49E+11	$2s^22p^4\ ^3P_0$	$2s^22p^3(^2D^\circ)3d\ ^3D^\circ_1$	75FAW/HAY	86FAW
30.151	0.010	3316600	2		2.01E+12	$2s^22p^4\ ^1D_2$	$2s^22p^3(^2D^\circ)3d\ ^1F^\circ_3$	75FAW/HAY	86FAW
30.202	0.010	3311000	2		5.23E+12	$2s^22p^4\ ^1S_0$	$2s^22p^3(^2P^\circ)3d\ ^1P^\circ_1$	77BRO/FAW	86FAW
30.351	0.010	3294800	3		1.23E+12	$2s^22p^4\ ^1D_2$	$2s^22p^3(^2D^\circ)3d\ ^1D^\circ_2$	75FAW/HAY	86FAW
30.571	0.010	3271100	7		1.40E+12	$2s^22p^4\ ^3P_2$	$2s^22p^3(^4S^\circ)3d\ ^3D^\circ_3$	75FAW/HAY	86FAW
30.800	0.010	3246800	3		8.62E+11	$2s^22p^4\ ^3P_1$	$2s^22p^3(^4S^\circ)3d\ ^3D^\circ_2$	75FAW/HAY	86FAW
33.237	0.010	3008700	8		2.55E+11	$2s^22p^4\ ^3P_2$	$2s^22p^3(^4S^\circ)3s\ ^3D^\circ_3$	73DOS/FEL	86FAW
33.276	0.010	3005200	0		1.35E+11	$2s^22p^4\ ^3P_2$	$2s^22p^3(^4S^\circ)3s\ ^3D^\circ_2$	73DOS/FEL	86FAW
33.486	0.010	2986300	8		1.23E+11	$2s^22p^4\ ^3P_1$	$2s^22p^3(^4S^\circ)3s\ ^3D^\circ_2$	73DOS/FEL	86FAW
33.547	0.010	2980900	3		9.29E+10	$2s^22p^4\ ^3P_0$	$2s^22p^3(^4S^\circ)3s\ ^3D^\circ_1$	73DOS/FEL	86FAW
33.957	0.010	2944900	4		6.21E+11	$2s^22p^4\ ^1D_2$	$2s^22p^3(^4S^\circ)3s\ ^1D^\circ_2$	73DOS/FEL	86FAW
34.126	0.010	2930300	5		5.35E+11	$2s^22p^4\ ^3P_2$	$2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$	73DOS/FEL	86FAW
34.200	0.010	2924000	2		3.16E+11	$2s^22p^4\ ^1S_0$	$2s^22p^3(^4S^\circ)3s\ ^1P^\circ_1$	73DOS/FEL	86FAW
34.349	0.010	2911300	3		2.66E+11	$2s^22p^4\ ^3P_1$	$2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$	73DOS/FEL	86FAW
34.393	0.010	2907600	0		9.40E+10	$2s^22p^4\ ^3P_0$	$2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$	73DOS/FEL	86FAW
126.650	0.010	789580	3		1.59E+9	$2s^22p^4\ ^3P_2$	$2s2p^5\ ^1P^\circ_1$	82KAU/SUG	02TAC/FRO
140.862	0.010	709920	8000		8.44E+10	$2s^22p^4\ ^1D_2$	$2s2p^5\ ^1P^\circ_1$	82KAU/SUG	86FAW
159.603	0.010	626560	70		6.63E+9	$2s^22p^4\ ^1S_0$	$2s2p^5\ ^1P^\circ_1$	82KAU/SUG	86FAW
169.726	0.010	589180	300		1.22E+10	$2s^22p^4\ ^3P_2$	$2s2p^5\ ^3P^\circ_1$	82KAU/SUG	86FAW
172.584	0.010	579430	300		2.75E+10	$2s^22p^4\ ^3P_1$	$2s2p^5\ ^3P^\circ_0$	82KAU/SUG	86FAW
174.412	0.010	573360	600		1.96E+10	$2s^22p^4\ ^3P_2$	$2s2p^5\ ^3P^\circ_2$	82KAU/SUG	86FAW
175.373	0.010	570210	200		6.58E+9	$2s^22p^4\ ^3P_1$	$2s2p^5\ ^3P^\circ_1$	82KAU/SUG	86FAW
176.691	0.010	565960	200		8.40E+9	$2s^22p^4\ ^3P_0$	$2s2p^5\ ^3P^\circ_1$	82KAU/SUG	86FAW
180.370	0.010	554420	200		6.03E+9	$2s^22p^4\ ^3P_1$	$2s2p^5\ ^3P^\circ_2$	82KAU/SUG	86FAW
182.752	0.010	547190	30		7.75E+10	$2s2p^5\ ^1P^\circ_1$	$2p^6\ ^1S_0$	82KAU/SUG	86FAW
202.545	0.010	493720	40		2.47E+8	$2s^22p^4\ ^1D_2$	$2s2p^5\ ^3P^\circ_2$	82KAU/SUG	02TAC/FRO
694.82	0.02	143922			4.56E+3	$2s^22p^4\ ^3P_1$	$2s^22p^4\ ^1S_0$	04FEL/LAN	97GAL/MEN
1256.484	0.025	79587			4.14E+2	$2s^22p^4\ ^3P_2$	$2s^22p^4\ ^1D_2$	00FEL/CUR	97GAL/MEN
Air									
5277.2	1.8	18944			1.50E+2	$2s^22p^4\ ^3P_2$	$2s^22p^4\ ^3P_1$	87PRI	97GAL/MEN

TABLE 27. Energy levels of K XII

Configuration	Term	*J*	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$2s^22p^4$	^3P	2	0	50	
		1	18944	6	87PRI
		0	23207	20	82KAU/SUG
$2s^22p^4$	^1D	2	79587	2	00FEL/CUR
$2s^22p^4$	^1S	0	162886	6	04FEL/LAN
$2s2p^5$	$^3P^\circ$	2	573363	20	82KAU/SUG
		1	589176	20	82KAU/SUG
		0	598382	20	82KAU/SUG
$2s2p^5$	$^1P^\circ$	1	789574	50	82KAU/SUG
$2p^6$	^1S	0	1336760	50	82KAU/SUG
$2s^22p^3(^4S^\circ)3s$	$^3S^\circ$	1	2930400	900	73DOS/FEL
$2s^22p^3(^2D^\circ)3s$	$^3D^\circ$	1	3004100	900	73DOS/FEL
		2	3005200	900	73DOS/FEL
		3	3008700	900	73DOS/FEL

TABLE 27. Energy levels of K XII—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$2s^22p^3(^2D^\circ)3s$	$^1D^\circ$	2	3024600	900	73DOS/FEL
$2s^22p^3(^2P^\circ)3s$	$^1P^\circ$	1	3087000	900	73DOS/FEL
$2s^22p^3(^4S^\circ)3d$	$^3D^\circ$	2	3265700	1000	75FAW/HAY
		3	3271100	1000	75FAW/HAY
$2s^22p^3(^2D^\circ)3d$	$^3D^\circ$	1	3358100	1000	75FAW/HAY
		2	3361100	1000	75FAW/HAY
$2s^22p^3(^2D^\circ)3d$	$^3P^\circ$	2	3370700	1000	75FAW/HAY
$2s^22p^3(^2D^\circ)3d$	$^1D^\circ$	2	3374400	1000	75FAW/HAY
$2s^22p^3(^2D^\circ)3d$	$^3S^\circ$	1	3383100	1000	75FAW/HAY
$2s^22p^3(^2D^\circ)3d$	$^1F^\circ$	3	3396300	1000	75FAW/HAY
$2s^22p^3(^2P^\circ)3d$	$^3P^\circ$	2	3405200	1000	75FAW/HAY
		1	3410000	1000	75FAW/HAY
$2s^22p^3(^2P^\circ)3d$	$^1D^\circ$	2	3416600	1000	75FAW/HAY
$2s^22p^3(^2P^\circ)3d$	$^3D^\circ$	1	3427000	1000	75FAW/HAY
		2	3427000	1000	75FAW/HAY
		3	3428400	1000	75FAW/HAY
$2s^22p^3(^2P^\circ)3d$	$^1F^\circ$	3	3442700	1000	75FAW/HAY
$2s^22p^3(^2P^\circ)3d$	$^1P^\circ$	1	3474100	1000	75FAW/HAY
K XIII ($^4S^\circ_{3/2}$)	*Limit*	···	5090000	7000	99BIE/FRE

7.13. K XIII

N isoelectronic sequence

Ground state $1s^22s^22p^3\ ^4S^\circ_{3/2}$

Ionization energy [5 764 500(4 000) cm^{-1}]
[714.7(5) eV]

K XIII transitions of the type $2s^22p^3-2s2p^4$ were first observed in 1967 by Deutchman and House [67DEU/HOU] and Fawcett *et al.* [67FAW/BRO]. Boiko *et al.* [70BOI/VOI] measured several additional lines. The $2p^33d$ terms are taken from Fawcett and Hayes [75FAW/HAY], who measured spectral lines near 28 Å to locate them. Fawcett and Hayes [75FAW/HAY] also reported the first observations of transitions to $2p^5$ levels in the 160–170 Å region. The allowed transitions above 100 Å were subsequently measured to greater accuracy by Kaufman *et al.* [82KAU/SUG2]. Although not retained in Tables 28 and 29, it should be noted that Edlén [84EDL] performed an extensive comparison of theoretical and experimental level values for the nitrogen isoelectronic sequence and obtained semi-empirical values through isoelectronic fitting. Forbidden transitions within the $2s^22p^3$ complex of levels have been reported by Mohan *et al.* [03MOH/LAN] and by Feldman *et al.* [00FEL/CUR, 04FEL/LAN]. These allow the connection of the doublet and quartet systems and improve the values of the ground term splittings. The $2s2p^4$ level values have been calculated by combining the results of Kaufman *et al.* [82KAU/SUG2] and the revised values for the $2s^22p^3$ levels. The leading percentages are taken from Sugar and Corliss [85SUG/COR3].

The transition probabilities of allowed transitions of K XIII have been calculated by Merkelis *et al.* [97MER/VIL], using second order many-body perturbation theory with relativistic corrections. The transition probabilities of the forbidden ground state transitions were calculated by Merkelis *et al.* [99MER/MAR]. The ionization energy cited was determined by Biémont *et al.* [99BIE/FRE] using a semi-empirical fit along the N I isoelectronic sequence.

References for K XIII

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Not. R. Astron. Soc. **179**, 683 (1977).
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84EDL Edlén, B., Phys. Scr. **30**, 135 (1984).
85SUG/COR3 Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 40 (1985).
97MER/VIL Merkelis, G., Vilkas, M. J., Kisielius, R., Gaigalas, G., and Martinson, I., Phys. Scr. **56**, 41 (1997).
99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).
99MER/MAR Merkelis, G., Martinson, I., Kisielius, R., and Vilkas, M. J., Phys. Scr. **59**, 122 (1999).
00FEL/CUR Feldman, U., Curdt, W., Landi, E., and Wilhelm, K., Astrophys. J. **544**, 508 (2000).
03MOH/LAN Mohan, A., Landi, E., and Dwivedi, B. N., Astrophys. J. **582**, 1162 (2003).
04FEL/LAN Feldman, U., Landi, E., and Curdt, W., Astrophys. J. **607**, 1039 (2004).

TABLE 28. Observed spectral lines of K XIII

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line Code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum									
27.337	0.010	3658000	8	b		$2s^22p^3\ ^4S^\circ_{3/2}$	$2s^22p^2(^3P)3d\ ^4P_{3/2}$	75FAW/HAY	
27.384	0.010	3651800	8			$2s^22p^3\ ^4S^\circ_{3/2}$	$2s^22p^2(^3P)3d\ ^4P_{5/2}$	75FAW/HAY	
27.44	0.010	3644300	2	b		$2s^22p^3\ ^2D^\circ_{5/2}$	$2s^22p^2(^1D)3d\ ^2P_{3/2}$	75FAW/HAY	
27.507	0.010	3635400	3			$2s^22p^3\ ^2D^\circ_{3/2}$	$2s^22p^2(^1D)3d\ ^2F_{5/2}$	75FAW/HAY	
27.53	0.010	3632400	3	b		$2s^22p^3\ ^2D^\circ_{5/2}$	$2s^22p^2(^1D)3d\ ^2F_{5/2}$	75FAW/HAY	
27.586	0.010	3625000	9			$2s^22p^3\ ^2D^\circ_{5/2}$	$2s^22p^2(^1D)3d\ ^2F_{7/2}$	75FAW/HAY	
27.835	0.010	3592600	2*	b		$2s^22p^3\ ^2D^\circ_{3/2}$	$2s^22p^2(^3P)3d\ ^2D_{5/2}$	75FAW/HAY	
27.835	0.010	3592600	2*	b		$2s^22p^3\ ^2D^\circ_{5/2}$	$2s^22p^2(^3P)3d\ ^2D_{5/2}$	75FAW/HAY	
28.012	0.010	3569900	4			$2s^22p^3\ ^2P^\circ_{3/2}$	$2s^22p^2(^1D)3d\ ^2F_{5/2}$	75FAW/HAY	
28.160	0.010	3551100	4			$2s^22p^3\ ^2D^\circ_{5/2}$	$2s^22p^2(^3P)3d\ ^2F_{7/2}$	75FAW/HAY	
28.327	0.010	3530200	5			$2s^22p^3\ ^2P^\circ_{1/2}$	$2s^22p^2(^3P)3d\ ^2D_{3/2}$	75FAW/HAY	
28.958	0.010	3453300	2			$2s^22p^3\ ^2P^\circ_{3/2}$	$2s^22p^2(^3P)3d\ ^2P_{3/2}$	75FAW/HAY	
138.500	0.010	722020	200		3.46E+10	$2s^22p^3\ ^2D^\circ_{3/2}$	$2s2p^4\ ^2P_{1/2}$	82KAU/SUG2	97MER/VIL
142.681	0.010	700860	200		9.75E+9	$2s^22p^3\ ^2D^\circ_{3/2}$	$2s2p^4\ ^2P_{3/2}$	82KAU/SUG2	97MER/VIL
143.741	0.010	695700	2000		5.16E+10	$2s^22p^3\ ^2D^\circ_{5/2}$	$2s2p^4\ ^2P_{3/2}$	82KAU/SUG2	97MER/VIL
149.447	0.010	669130	30		1.04E+10	$2s^22p^3\ ^2D^\circ_{3/2}$	$2s2p^4\ ^2S_{1/2}$	82KAU/SUG2	97MER/VIL
151.073	0.010	661930	6		5.41E+9	$2s^22p^3\ ^2P^\circ_{1/2}$	$2s2p^4\ ^2P_{1/2}$	82KAU/SUG2	97MER/VIL
152.793	0.010	654480	100		3.13E+10	$2s^22p^3\ ^2P^\circ_{3/2}$	$2s2p^4\ ^2P_{1/2}$	82KAU/SUG2	97MER/VIL
156.067	0.010	640750	5		3.38E+9	$2s^22p^3\ ^2P^\circ_{1/2}$	$2s2p^4\ ^2P_{3/2}$	82KAU/SUG2	97MER/VIL
157.902	0.010	633300	40		8.43E+9	$2s^22p^3\ ^2P^\circ_{3/2}$	$2s2p^4\ ^2P_{3/2}$	82KAU/SUG2	97MER/VIL
161.302	0.010	619960	20		2.61E+10	$2s2p^4\ ^2D_{3/2}$	$2p^5\ ^2P^\circ_{1/2}$	82KAU/SUG2	97MER/VIL
164.193	0.010	609040	40		1.67E+10	$2s^22p^3\ ^2P^\circ_{1/2}$	$2s2p^4\ ^2S_{1/2}$	82KAU/SUG2	97MER/VIL
166.214	0.010	601630	20		1.02E+10	$2s^22p^3\ ^2P^\circ_{3/2}$	$2s2p^4\ ^2S_{1/2}$	82KAU/SUG2	97MER/VIL
168.165	0.010	594650	5		4.34E+9	$2s2p^4\ ^2D_{3/2}$	$2p^5\ ^2P^\circ_{3/2}$	82KAU/SUG2	97MER/VIL
168.471	0.010	593570	40		2.35E+10	$2s2p^4\ ^2D_{5/2}$	$2p^5\ ^2P^\circ_{3/2}$	82KAU/SUG2	97MER/VIL
178.205	0.010	561150	200		1.70E+10	$2s^22p^3\ ^2D_{3/2}$	$2s2p^4\ ^2D_{3/2}$	82KAU/SUG2	97MER/VIL
179.514	0.010	557060	500		1.52E+10	$2s^22p^3\ ^2D^\circ_{5/2}$	$2s2p^4\ ^2D_{5/2}$	82KAU/SUG2	97MER/VIL
179.855	0.010	556000	3		7.78E+8	$2s^22p^3\ ^2D^\circ_{5/2}$	$2s2p^4\ ^2D_{3/2}$	82KAU/SUG2	97MER/VIL
198.524	0.010	503720	20		7.94E+9	$2s^22p^3\ ^4S^\circ_{3/2}$	$2s2p^4\ ^4P_{1/2}$	82KAU/SUG2	97MER/VIL
199.567	0.010	501080	10*		1.85E+9	$2s^22p^3\ ^2P^\circ_{1/2}$	$2s2p^4\ ^2D_{3/2}$	82KAU/SUG2	97MER/VIL
201.505	0.010	496270	500*		7.52E+9	$2s^22p^3\ ^4S^\circ_{3/2}$	$2s2p^4\ ^4P_{3/2}$	82KAU/SUG2	97MER/VIL
202.104	0.010	494800	500*		3.05E+9	$2s^22p^3\ ^2P^\circ_{3/2}$	$2s2p^4\ ^2D_{5/2}$	82KAU/SUG2	97MER/VIL
208.106	0.010	480520	200		6.80E+9	$2s^22p^3\ ^4S^\circ_{3/2}$	$2s2p^4\ ^4P_{5/2}$	82KAU/SUG2	97MER/VIL
219.793	0.010	454970	15		1.63E+10	$2s2p^4\ ^2P_{3/2}$	$2p^5\ ^2P^\circ_{3/2}$	82KAU/SUG2	97MER/VIL
594.91	0.020	168093			1.82E+3	$2s^22p^3\ ^4S^\circ_{3/2}$	$2s^22p^3\ ^2P^\circ_{3/2}$	04FEL/LAN	99MER/MAR
622.58	0.020	160622			8.93E+2	$2s^22p^3\ ^4S^\circ_{3/2}$	$2s^22p^3\ ^2P^\circ_{1/2}$	04FEL/LAN	99MER/MAR
945.880	0.020	105722	98		5.92E+0	$2s^22p^3\ ^4S^\circ_{3/2}$	$2s^22p^3\ ^2D^\circ_{5/2}$	00FEL/CUR	99MER/MAR
994.442	0.020	100559	180		2.19E+2	$2s^22p^3\ ^4S^\circ_{3/2}$	$2s^22p^3\ ^2D^\circ_{3/2}$	00FEL/CUR	99MER/MAR

TABLE 29. Energy levels of K XIII

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
$2s^22p^3$	$^4S°$	3/2	0	4	99%	
$2s^22p^3$	$^2D°$	3/2	100559	4	91% + 8% $2s^22p^3$ $^2P_{3/2}$	00FEL/CUR
		5/2	105722	4	100%	00FEL/CUR
$2s^22p^3$	$^2P°$	1/2	160622	4	98%	04FEL/LAN
		3/2	168093	4	89% + 9% $2s^22p^3$ $^2D°_{3/2}$	04FEL/LAN
$2s(^2S)2p^4(^3P)$	^4P	5/2	480524	20	100%	82KAU/SUG2, 04FEL/LAN
		3/2	496266	20	100%	82KAU/SUG2, 04FEL/LAN
		1/2	503717	20	99%	82KAU/SUG2, 04FEL/LAN
$2s(^2S)2p^4(^1D)$	^2D	3/2	661714	30	99%	82KAU/SUG2, 04FEL/LAN
		5/2	662835	30	100%	82KAU/SUG2, 04FEL/LAN
$2s(^2S)2p^4(^1S)$	^2S	1/2	769694	40	91% + 9% $2s(^2S)2p^4(^3P)$ $^2P_{1/2}$	82KAU/SUG2, 04FEL/LAN
$2s(^2S)2p^4(^3P)$	^2P	3/2	801402	50	99%	82KAU/SUG2, 04FEL/LAN
		1/2	822569	50	91%	82KAU/SUG2, 04FEL/LAN
$2p^5$	$^2P°$	3/2	1256384	30	98%	82KAU/SUG2, 04FEL/LAN
		1/2	1281669	40	98% + 8% $2s(^2S)2p^4(^1S)$ $^2S_{1/2}$	82KAU/SUG2, 04FEL/LAN
$2s^22p^2(^3P)3d$	^2P	3/2	3621400	1000		75FAW/HAY
$2s^22p^2(^3P)3d$	^4P	5/2	3651800	1000		75FAW/HAY
		3/2	3658000	1000		75FAW/HAY
$2s^22p^2(^3P)3d$	^2F	7/2	3656900	1000		75FAW/HAY
$2s^22p^2(^3P)3d$	^2D	3/2	3690800	1000		75FAW/HAY
		5/2	3698300	1000		75FAW/HAY
$2s^22p^2(^1D)3d$	^2F	7/2	3730700	1000		75FAW/HAY
		5/2	3738000	1000		75FAW/HAY
$2s^22p^2(^1D)3d$	^2D	5/2	3736000	1000		75FAW/HAY
$2s^22p^2(^1D)3d$	^2P	3/2	3750000	1000		75FAW/HAY
K XIV ($^3P_0$)	*Limit*	···	5764500	4000		99BIE/FRE

7.14. K XIV

C isoelectronic sequence

Ground state $1s^22s^22p^2\ ^3P_0$

Ionization energy [6 341 600(2 600) cm^{-1}]
[786.3(3) eV]

The first observations of the K XIV spectrum were made by Boiko *et al.* [70BOI/VOI], who measured five transitions of the type $2s^22p^2-2s2p^3$ in a laser-produced plasma. In a study of the region between 140 and 230 Å, Fawcett and Hayes [75FAW/HAY] reported two more of these spectral lines and four members of the $2s2p^3-2p^4$ transition array. By also observing lines near 25 Å they identified transitions to the $2s^22p3d$ configuration. Their results were included in a more extensive study of the isoelectronic sequence by Bromage and Fawcett [77BRO/FAW2]. In a further study Fawcett *et al.* [80FAW/RID] were able to record five additional lines in the region between 180 and 290 Å, albeit with reduced accuracy. The $2s^22p^2-2s2p^3$ transitions were subsequently measured to greater accuracy by Sugar *et al.* [82SUG/KAU], who also reanalyzed the energy levels. Edlén [85EDL] used isoelectronic fitting to predict the $2p^4\ ^3P_0$ and $2s2p^3\ ^5S°_2$ level values listed in Tables 30 and 31. Feldman *et al.* [04FEL/LAN] observed the forbidden transition between the $2s^22p^2\ ^3P_2$ and $^1D_2$ levels in the solar spectrum, providing a more accurate determination of the splitting between them. With the exception of those taken from Edlén [85EDL] and Feldman *et al.* [04FEL/LAN], the energy level values below 1255000 cm^{-1} listed in Table 31 are from Sugar *et al.* [82SUG/KAU]. Higher levels are obtained by combining the low-lying levels from Sugar *et al.* [82SUG/KAU] with transition energies for lines measured by Bromage and Fawcett [77BRO/FAW2] or Fawcett and Hayes [75FAW/HAY]. According to Sugar and Corliss [85SUG/COR3] the purity of the levels is 93% or better in *LS* coupling, so the leading percentages are not included here.

The oscillator strengths of allowed transitions of K XIV have been calculated by Zhang and Sampson [96ZHA/SAM], using the multiconfiguration Dirac–Fock method and Fawcett [87FAW3], with a relativistic Hartree–Fock approach. Aggarwal *et al.* [03AGG/KEE] used the GRASP code of Dyall *et al.* [89DYA/GRA] to calculate oscillator strengths; however, few experimentally observed spectral lines were included in the reported results. For consistency we have retained the Fawcett values, which were available for almost all of the transitions. The transition probability of the forbidden $^3P_2-^1D_2$ ground configuration transition was calculated by Vilkas *et al.* [96VIL/MAR], using second-order many-body perturbation theory. The ionization energy cited above was determined by Biémont *et al.* [99BIE/FRE] using a semiempirical fit along the C I isoelectronic sequence.

References for K XIV

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85SUG/COR3 Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 40 (1985).
87FAW3 Fawcett, B. C., At. Data Nucl. Data Tables **37**, 367 (1987).
89DYA/GRA Dyall, K. G., Grant, I. P., Johnson, C. T., Parpia, F. A., and Plummer, E. P., Comput. Phys. Commun. **55**, 425 (1989).
96VIL/MAR Vilkas, M. J., Martinson, I., Merkelis, G., Gaigalas, G., and Kisielius, R., Phys. Scr. **54**, 281 (1996).
96ZHA/SAM Zhang, H. L., and Sampson, D. H., At. Data Nucl. Data Tables **63**, 275 (1996).
99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).
03AGG/KEE Aggarwal, K. M., Keenan, F. P., and Msezane, A. Z., Astron. Astrophys. **401**, 377 (2003).
04FEL/LAN Feldman, U., Landi, E., and Curdt, W., Astrophys. J. **607**, 1039 (2004).

TABLE 30. Observed spectral lines of K XIV

λ (Å)	Unc. (Å)	σ (cm⁻¹)	Int.	Line Code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum									
25.700	0.010	3891100	4		3.60E+12	$2s^22p^2\ ^3P_2$	$2s^22p3d\ ^3P^\circ_2$	75FAW/HAY	87FAW3
25.750	0.010	3883500	5		5.68E+12	$2s^22p^2\ ^3P_2$	$2s^22p3d\ ^3D^\circ_3$	75FAW/HAY	87FAW3
25.818	0.010	3873300			1.80E+10	$2s^22p^2\ ^3P_2$	$2s^22p3d\ ^3D^\circ_2$	77BRO/FAW2	87FAW3
25.909	0.010	3859700	7		7.61E+12	$2s^22p^2\ ^1D_2$	$2s^22p3d\ ^1F^\circ_3$	75FAW/HAY	87FAW3
26.018	0.010	3843500			3.60E+11	$2s^22p^2\ ^3P_2$	$2s^22p3d\ ^3F^\circ_3$	77BRO/FAW2	87FAW3
26.284	0.010	3804600			3.67E+11	$2s^22p^2\ ^1D_2$	$2s^22p3d\ ^3D^\circ_2$	77BRO/FAW2	87FAW3
26.465	0.010	3778600			4.43E+12	$2s^22p^2\ ^1S_0$	$2s^22p3d\ ^1P^\circ_1$	77BRO/FAW2	87FAW3
26.591	0.010	3760700			3.09E+11	$2s^22p^2\ ^1D_2$	$2s^22p3d\ ^3F^\circ_2$	77BRO/FAW2	87FAW3
26.816	0.010	3729100	2			$2s(^2S)2p^3(^2D^\circ)\ ^3D^\circ_3$	$2s(^2S)2p^2(^4P)3d\ ^3F_4$	75FAW/HAY	
147.556	0.010	677710	15		6.02E+9	$2s^22p^2\ ^3P_0$	$2s(^2S)2p^3(^4S^\circ)\ ^3S^\circ_1$	82SUG/KAU	87FAW3
150.495	0.010	664470	60		1.77E+10	$2s^22p^2\ ^3P_1$	$2s(^2S)2p^3(^4S^\circ)\ ^3S^\circ_1$	82SUG/KAU	87FAW3
151.713	0.010	659140	250		3.65E+10	$2s^22p^2\ ^1D_2$	$2s(^2S)2p^3(^2P^\circ)\ ^1P^\circ_1$	82SUG/KAU	87FAW3
153.970	0.010	649480	300		3.27E+10	$2s^22p^2\ ^3P_2$	$2s(^2S)2p^3(^4S^\circ)\ ^3S^\circ_1$	82SUG/KAU	87FAW3
154.265	0.010	648240	1		8.41E+8	$2s^22p^2\ ^3P_2$	$2s(^2S)2p^3(^2D^\circ)\ ^1D^\circ_2$	82SUG/KAU	87FAW3
168.961	0.010	591850	8		1.61E+10	$2s(^2S)2p^3(^2D^\circ)\ ^3D^\circ_2$	$2p^4\ ^3P_1$	82SUG/KAU	87FAW3
169.165	0.010	591140	4		7.69E+9	$2s(^2S)2p^3(^2D^\circ)\ ^3D^\circ_1$	$2p^4\ ^3P_1$	82SUG/KAU	87FAW3
172.252	0.010	580540	500		2.81E+10	$2s^22p^2\ ^1D_2$	$2s(^2S)2p^3(^2D^\circ)\ ^1D^\circ_2$	82SUG/KAU	87FAW3
173.580	0.010	576100	15		9.37E+9	$2s^22p^2\ ^1S_0$	$2s(^2S)2p^3(^2P^\circ)\ ^1P^\circ_1$	82SUG/KAU	87FAW3
175.024	0.010	571350	8		5.79E+9	$2s(^2S)2p^3(^2D^\circ)\ ^3D^\circ_2$	$2p^4\ ^3P_2$	82SUG/KAU	87FAW3
175.723	0.010	569080	400		2.00E+10	$2s(^2S)2p^3(^2D^\circ)\ ^3D^\circ_3$	$2p^4\ ^3P_2$	82SUG/KAU	87FAW3
185.883	0.010	537970	150*		3.02E+9	$2s^22p^2\ ^3P_0$	$2s(^2S)2p^3(^2P^\circ)\ ^3P^\circ_1$	82SUG/KAU	87FAW3
189.85	0.05	526730		b	1.33E+9	$2s^22p^2\ ^3P_1$	$2s(^2S)2p^3(^2P^\circ)\ ^3P^\circ_2$	80FAW/RID	87FAW3
190.551	0.010	524790	7		4.41E+9	$2s^22p^2\ ^3P_1$	$2s(^2S)2p^3(^2P^\circ)\ ^3P^\circ_1$	82SUG/KAU	87FAW3
190.779	0.010	524170	5		1.06E+10	$2s^22p^2\ ^3P_1$	$2s(^2S)2p^3(^2P^\circ)\ ^3P^\circ_0$	82SUG/KAU	87FAW3
192.85	0.05	518540			9.15E+9	$2s(^2S)2p^3(^2P^\circ)\ ^3P^\circ_1$	$2p^4\ ^3P_0$	80FAW/RID	87FAW3
195.422	0.010	511710	40		8.63E+9	$2s^22p^2\ ^3P_2$	$2s(^2S)2p^3(^2P^\circ)\ ^3P^\circ_2$	82SUG/KAU	87FAW3
195.79	0.05	510750			5.68E+9	$2s(^2S)2p^3(^2P^\circ)\ ^3P^\circ_2$	$2p^4\ ^3P_1$	80FAW/RID	87FAW3
196.151	0.010	509810	8		2.95E+9	$2s^22p^2\ ^3P_2$	$2s(^2S)2p^3(^2P^\circ)\ ^3P^\circ_1$	82SUG/KAU	87FAW3

TABLE 30. Observed spectral lines of K XIV—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line Code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
200.097	0.010	499760	2		4.36E+10	2s(^{2}S)2p^3(^{2}P°) ^{1}P°$_1$	2p^4 ^{1}S$_0$	82SUG/KAU	87FAW3
204.014	0.010	490160	3		3.37E+9	2s(^{2}S)2p^3(^{2}P°) ^{3}P°$_2$	2p^4 ^{3}P$_2$	82SUG/KAU	87FAW3
217.615	0.010	459530	3		3.38E+9	2s^{2}2p^2 ^{3}P$_0$	2s(^{2}S)2p^3(^{2}D°) ^{3}D°$_1$	82SUG/KAU	87FAW3
224.457	0.010	445520	6		4.00E+9	2s^{2}2p^2 ^{3}P$_1$	2s(^{2}S)2p^3(^{2}D°) ^{3}D°$_2$	82SUG/KAU	87FAW3
231.066	0.010	432780	3		3.69E+9	2s^{2}2p^2 ^{3}P$_2$	2s(^{2}S)2p^3(^{2}D°) ^{3}D°$_3$	82SUG/KAU	87FAW3
231.297	0.010	432340	6		1.84E+10	2s(^{2}S)2p^3(^{2}D°) ^{1}D°$_2$	2p^4 ^{1}D$_2$	82SUG/KAU	87FAW3
283.57	0.05	352650			4.15E+9	2s(^{2}S)2p^3(^{4}S°) ^{3}S°$_1$	2p^4 ^{3}P$_2$	80FAW/RID	87FAW3
1477.19	0.02	67696			4.60E+2	2s^{2}2p^2 ^{3}P$_2$	2s^{2}2p^2 ^{1}D$_2$	04FEL/LAN	96VIL/MAR

TABLE 31. Energy levels of K XIV

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
2s^{2}2p^2	^{3}P	0	0	20	
		1	13235	20	82SUG/KAU
		2	28225	20	82SUG/KAU
2s^{2}2p^2	^{1}D	2	95921	20	04FEL/LAN
2s^{2}2p^2	^{1}S	0	178914	50	82SUG/KAU
2s(^{2}S)2p^3(^{4}S°)	^{5}S°	2	[250650]	50	85EDL
2s(^{2}S)2p^3(^{2}D°)	^{3}D°	2	458754	50	82SUG/KAU
		1	459498	50	82SUG/KAU
		3	461002	50	82SUG/KAU
2s(^{2}S)2p^3(^{2}P°)	^{3}P°	0	537402	50	82SUG/KAU
		1	538032	50	82SUG/KAU
		2	539938	50	82SUG/KAU
2s(^{2}S)2p^3(^{2}D°)	^{1}D°	2	676460	50	82SUG/KAU
2s(^{2}S)2p^3(^{4}S°)	^{3}S°	1	677710	50	82SUG/KAU
2s(^{2}S)2p^3(^{2}P°)	^{1}P°	1	755050	50	82SUG/KAU
2p^4	^{3}P	2	1030090	50	82SUG/KAU
		1	1050620	50	82SUG/KAU
		0	[1056100]	50	85EDL
2p^4	^{1}D	2	1108800	50	82SUG/KAU
2p^4	^{1}S	0	1254810	50	82SUG/KAU
2s^{2}2p3d	^{3}F°	2	3856600	1600	77BRO/FAW2
		3	3871700	1600	77BRO/FAW2
2s^{2}2p3d	^{3}D°	2	3901000	1600	77BRO/FAW2
		3	3911700	1600	75FAW/HAY
2s^{2}2p3d	^{3}P°	2	3919300	1600	75FAW/HAY
2s^{2}2p3d	^{1}F°	3	3955600	1600	75FAW/HAY
2s^{2}2p3d	^{1}P°	1	3957500	1600	77BRO/FAW2
2s2p^2(^{4}P)3d	^{3}F	4	4190100	1600	75FAW/HAY
K XV (^{2}P°$_{1/2}$)	*Limit*	···	6341600	2600	99BIE/FRE

7.15. K XV

B isoelectronic sequence

Ground state $1s^2 2s^2 2p\ ^2P^{\circ}_{1/2}$

Ionization energy [6 943 800(2 000) cm^{-1}]
[860.9(2) eV]

The first identified K XV spectral line was reported by Boiko *et al.* [70BOI/VOI], who measured the $2s^2 2p\ ^2P^{\circ}_{3/2}$–$2s2p^2\ ^2P_{3/2}$ transition in a laser-produced plasma. In a study of transitions between 160 and 200 Å Fawcett and Hayes [75FAW/HAY] reported seven more lines between the $2s2p^2$ and the $2s^2 2p$ and $2p^3$ configurations which are listed in Table 32. By also observing lines between 23 and 26 Å they measured transitions to the $2s^2 3d$, $2s2p3p$, and $2s2p3d$ configurations which are listed in Table 32. In a further study Fawcett *et al.* [80FAW/RID] were able to record eight additional $2s2p^2$–$2p^3$ lines in the region between 180 and 260 Å, albeit with reduced accuracy. The transitions between 160 and 240 Å were subsequently measured to greater accuracy by Sugar *et al.* [82SUG/KAU2], who reanalyzed the energy levels and estimated the location of the $2s2p^2\ ^4P_{5/2}$ level by isoelectronic fitting to within $\pm 100\ cm^{-1}$. Thus the relative positions of the doublet and quartet level systems are known to that accuracy (indicated by $+x$ in Table 33). Prior [87PRI] observed the forbidden transition between the ground state doublet levels in an ion beam, providing a more accurate determination of the splitting between them. The leading percentages for the energy levels are taken from Sugar and Corliss [85SUG/COR3].

The oscillator strengths of allowed transitions of K XV between 160 and 260 Å have been calculated by Zhang and Sampson [94ZHA/SAM], using the multiconfiguration Dirac–Fock method and Galvís *et al.* [98GAL/MEN], who utilized the SUPERSTRUCTURE code, as described in their earlier paper [98GAL/MEN]. The results agree to within 10% and we retain the results of Galvís *et al.* [98GAL/MEN] in Table 32. Oscillator strengths for transitions between the $2s^2 2p$ and $2s^2 3d$ levels are taken from the relativistic quantum defect orbital calculations of Lavín *et al.* [92LAV/MAR]. The transition probability of the forbidden ground state transition has been the subject of several theoretical papers [01CHA/LOP, 03KOC, 83FRO, 05TUP/VOL, 06VOL/GLA]. It was also measured experimentally in an electron beam ion trap by Träbert *et al.* [01TRA/BEI] with an estimated uncertainty of ±2%. The ionization energy cited above was determined by Biémont *et al.* [99BIE/FRE] using a semiempirical fit along the B I isoelectronic sequence.

References for K XV

70BOI/VOI Boiko, V. A., Voinov, Yu. P., Gribkov, V. A., and Sklizkov, G. V., Opt. Spectrosc. **29**, 545 (1970).

75FAW/HAY Fawcett, B. C., and Hayes, R. W., Mon. Not. R. Astron. Soc. **170**, 185 (1975).

80FAW/RID Fawcett, B. C., Ridgeley, A., and Hatter, A. T., J. Opt. Soc. Am. **70**, 1349 (1980).

82SUG/KAU2 Sugar, J., Kaufman, V., and Cooper, D., Phys. Scr. **26**, 293 (1982).

83FRO Froese Fischer, C., J. Phys. B **16**, 157 (1983).

85SUG/COR3 Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 40 (1985).

87PRI Prior, M. H., J. Opt. Soc. Am. B **4**, 144 (1987).

92LAV/MAR Lavín, C., Martin, I., and Vallejo, M. J., Int. J. Quant. Chem. **26**, 455 (1992).

94ZHA/SAM Zhang, H. L., and Sampson, D. H., At. Data Nucl. Data Tables **56**, 41 (1994).

97GAL/MEN Galavís, M. E., Mendoza, C., and Zeippen, C. J., Astron. Astrophys. Suppl. Ser. **123**, 159 (1997).

98GAL/MEN Galavís, M. E., Mendoza, C., and Zeippen, C. J., Astron. Astrophys. Suppl. Ser. **131**, 499 (1998).

99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).

01CHA/LOP Charro, E., López-Ferrero, S., and Martín, I., J. Phys. B **34**, 4243 (2001).

01TRA/BEI Träbert, E., Beiersdorfer, P., Brown, G. V., Chen, H., Pinnington, E. H., and Thorn, D. B., Phys. Rev. A **64**, 034501 (2001).

03KOC Koc, K., J. Phys. B **36**, L93 (2003).

05TUP/VOL Tupitsyn, I. I., Volotka, A. V., Glazov, D. A., Plunien, G., Crespo López-Urrutia, J. R., Lapierre, A., and Ullrich, J., Phys. Rev. A **72**, 062503 (2005).

06VOL/GLA Volotka, A. V., Glazov, D. A., Plunien, G., Shabaev, V. M., and Tupitsyn, I. I., Eur. Phys. J D **38**, 293 (2006).

TABLE 32. Observed spectral lines of K XV

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line Code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum									
23.146	0.010	4320400	1			$2s^2 2p\ ^2P^{\circ}_{1/2}$	$2s2p(^3P)3p\ ^2D_{3/2}$	75FAW/HAY	
23.180	0.010	4314100	2			$2s^2 2p\ ^2P^{\circ}_{3/2}$	$2s2p(^3P)3p\ ^2D_{5/2}$	75FAW/HAY	
23.588	0.010	4239400	1			$2s^2 2p\ ^2P^{\circ}_{1/2}$	$2s2p(^3P)3p\ ^2P_{1/2}$	75FAW/HAY	
23.633	0.010	4231400	1			$2s^2 2p\ ^2P^{\circ}_{3/2}$	$2s2p(^3P)3p\ ^2P_{3/2}$	75FAW/HAY	
23.981	0.010	4170000	3			$2s2p^2\ ^2D_{5/2}$	$2s2p(^1P)3d\ ^2F^{\circ}_{7/2}$	75FAW/HAY	

TABLE 32. Observed spectral lines of K XV—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line Code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
24.13	0.010	4144200	6			2s2p^2 ^{4}P$_{5/2}$	2s2p(^{3}P)3d ^{4}P°$_{5/2}$	75FAW/HAY	
24.20	0.010	4132200	8*		3.51E+12	2s^{2}2p ^{2}P°$_{1/2}$	2s^{2}3d ^{2}D$_{3/2}$	75FAW/HAY	92LAV/MAR
24.20	0.010	4132200	8*			2s2p^2 ^{4}P$_{5/2}$	2s2p(^{3}P)3d ^{4}D°$_{7/2}$	75FAW/HAY	
24.328	0.010	4110500	8		4.19E+12	2s^{2}2p ^{2}P°$_{3/2}$	2s^{2}3d ^{2}D$_{5/2}$	75FAW/HAY	92LAV/MAR
24.77	0.010	4037100	2			2s2p^2 ^{2}P$_{3/2}$	2s2p(^{1}P)3d ^{2}D°$_{5/2}$	75FAW/HAY	
24.889	0.010	4017800	3			2s2p^2 ^{2}D$_{5/2}$	2s2p(^{3}P)3d ^{2}F°$_{7/2}$	75FAW/HAY	
24.946	0.010	4008700	2			2s2p^2 ^{2}D$_{3/2}$	2s2p(^{3}P)3d ^{2}F°$_{5/2}$	75FAW/HAY	
25.265	0.010	3958000	2			2s2p^2 ^{2}D$_{5/2}$	2s2p(^{3}P)3d ^{2}D°$_{5/2}$	75FAW/HAY	
166.925	0.010	599070	15		4.25E+9	2s^{2}2p ^{2}P°$_{1/2}$	2s2p^2 ^{2}P$_{3/2}$	82SUG/KAU2	98GAL/MEN
169.989	0.010	588270	3		7.07E+9	2s^{2}2p ^{2}P°$_{1/2}$	2s2p^2 ^{2}P$_{1/2}$	82SUG/KAU2	98GAL/MEN
175.406	0.010	570110	200*	b	2.37E+10	2s^{2}2p ^{2}P°$_{3/2}$	2s2p^2 ^{2}P$_{3/2}$	82SUG/KAU2	98GAL/MEN
178.807	0.010	559260	20		1.74E+10	2s^{2}2p ^{2}P°$_{3/2}$	2s2p^2 ^{2}P$_{1/2}$	82SUG/KAU2	98GAL/MEN
180.878	0.010	552860	20		1.62E+10	2s^{2}2p ^{2}P°$_{1/2}$	2s2p^2 ^{2}S$_{1/2}$	82SUG/KAU2	98GAL/MEN
184.58	0.05	541770		b	2.08E+9	2s2p^2 ^{2}D$_{3/2}$	2p^3 ^{2}P°$_{3/2}$	80FAW/RID	98GAL/MEN
185.123	0.010	540180	15		9.39E+9	2s2p^2 ^{2}D$_{5/2}$	2p^3 ^{2}P°$_{3/2}$	82SUG/KAU2	98GAL/MEN
186.799	0.010	535340	3		1.36E+10	2s2p^2 ^{2}D$_{3/2}$	2p^3 ^{2}P°$_{1/2}$	82SUG/KAU2	98GAL/MEN
189.766	0.010	526960	1		4.79E+9	2s2p^2 ^{4}P$_{1/2}$	2p^3 ^{4}S°$_{3/2}$	82SUG/KAU2	98GAL/MEN
193.930	0.010	515650	3		8.91E+9	2s2p^2 ^{4}P$_{3/2}$	2p^3 ^{4}S°$_{3/2}$	82SUG/KAU2	98GAL/MEN
199.567	0.010	501080	10*	b	1.23E+10	2s2p^2 ^{4}P$_{5/2}$	2p^3 ^{4}S°$_{3/2}$	82SUG/KAU2	98GAL/MEN
230.71	0.05	433440		b	9.01E+8	2s2p^2 ^{2}D$_{3/2}$	2p^3 ^{2}D°$_{5/2}$	80FAW/RID	98GAL/MEN
231.00	0.05	432900		b	3.26E+9	2s2p^2 ^{2}S$_{1/2}$	2p^3 ^{2}P°$_{3/2}$	80FAW/RID	98GAL/MEN
231.54	0.05	431890			7.18E+9	2s2p^2 ^{2}D$_{5/2}$	2p^3 ^{2}D°$_{5/2}$	80FAW/RID	98GAL/MEN
232.34	0.05	430400			5.61E+9	2s2p^2 ^{2}D$_{3/2}$	2p^3 ^{2}D°$_{3/2}$	80FAW/RID	98GAL/MEN
233.22	0.05	428780			1.74E+9	2s2p^2 ^{2}D$_{5/2}$	2p^3 ^{2}D°$_{3/2}$	80FAW/RID	98GAL/MEN
240.083	0.010	416520	3		3.41E+9	2s^{2}2p ^{2}P°$_{3/2}$	2s2p^2 ^{2}D$_{5/2}$	82SUG/KAU2	98GAL/MEN
255.76	0.05	390990			7.45E+9	2s2p^2 ^{2}P$_{1/2}$	2p^3 ^{2}P°$_{1/2}$	80FAW/RID	98GAL/MEN
258.62	0.05	386670			7.83E+9	2s2p^2 ^{2}P$_{3/2}$	2p^3 ^{2}P°$_{3/2}$	80FAW/RID	98GAL/MEN
Air									
3445.3	1.3	29017			2.24E+2	2s2p^2 ^{2}P$_{1/2}$	2s2p^2 ^{2}P$_{3/2}$	87PRI	01TRA/BEI

TABLE 33. Energy levels of K XV

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
2s^{2}2p	^{2}P°	1/2	0	60		
		3/2	29017	11		87PRI
2s2p^2	^{4}P	1/2	248320+x	60	100%	82SUG/KAU2
		3/2	259630+x	60	100%	82SUG/KAU2
		5/2	274200+x	60	99%	82SUG/KAU2
2s2p^2	^{2}D	3/2	443960	100	99%	80FAW/RID
		5/2	445510	60	99%	82SUG/KAU2
2s2p^2	^{2}S	1/2	552860	60	75%+25% 2s2p^2 ^{2}P$_{1/2}$	82SUG/KAU2
2s2p^2	^{2}P	1/2	588260	60	75%+25% 2s2p^2 ^{2}S$_{1/2}$	82SUG/KAU2
		3/2	599080	60	99%	82SUG/KAU2
2p^3	^{4}S°	3/2	775280+x	60		82SUG/KAU2
2p^3	^{2}D°	3/2	874320	100		80FAW/RID
		5/2	877400	100		80FAW/RID
2p^3	^{2}P°	1/2	979270	100		80FAW/RID
		3/2	985690	60		82SUG/KAU2
2s^{2}3d	^{2}D	3/2	4132200	1700		75FAW/HAY
		5/2	4139500	1700		75FAW/HAY

TABLE 33. Energy levels of K XV—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Leading percentages	Reference
$2s2p(^3P^\circ)3p$	^2P	1/2	4239400	1700		75FAW/HAY
		3/2	4260400	1700		75FAW/HAY
$2s2p(^3P^\circ)3p$	^2D	3/2	4320400	1700		75FAW/HAY
		5/2	4343100	1700		75FAW/HAY
$2s2p(^3P^\circ)3d$	$^2D^\circ$	5/2	4403600	1700		75FAW/HAY
$2s2p(^3P^\circ)3d$	$^4D^\circ$	7/2	4406400+x	1700		75FAW/HAY
$2s2p(^3P^\circ)3d$	$^4P^\circ$	5/2	4418400+x	1700		75FAW/HAY
$2s2p(^3P^\circ)3d$	$^2F^\circ$	5/2	4452600	1700		75FAW/HAY
		7/2	4463300	1700		75FAW/HAY
$2s2p(^1P^\circ)3d$	$^2F^\circ$	7/2	4615500	1700		75FAW/HAY
$2s2p(^1P^\circ)3d$	$^2D^\circ$	5/2	4636200	1700		75FAW/HAY
K XVI ($^1S_0$)	*Limit*	···	6943800	2000		99BIE/FRE

7.16. K XVI

Be isoelectronic sequence

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

Ionization energy [7 805 000(3 000) cm^{-1}]
[967.7(4) eV]

The first measurements of K XVI spectral lines were reported by Fawcett and Hayes [75FAW/HAY], who discovered the $2s^2\ ^1S_0$–$2s2p\ ^1P^\circ_1$ resonance transition at 206 Å. They also observed transitions involving the $2s2p$, $2p^2$, $2s3d$, $2p3p$, and $2p3d$ configurations in the region between 21 and 24 Å which are listed in Table 34. In a further study, Fawcett *et al.* [80FAW/RID] were able to record several $2s2p$ to $2p^2$ lines with wavelengths between 250 and 275 Å using a laser-induced plasma. No intercombination lines have been reported, but the relative position of the singlet and triplet systems has been calculated by Edlén [83EDL] using isoelectronic fitting. Based on isoelectronic comparisons Edlén [85EDL2] later suggested improved values for the ^3P splittings in the $2p^2$ configuration.

The oscillator strengths of the allowed $n=2-3$ transitions of K XVI have been calculated by Fawcett [84FAW], using the relativistic Dirac–Fock method. The transition probability of the resonance transition is taken from Jönsson *et al.* [98JON/FRO], who used the multiconfiguration Dirac–Fock method. The other $n=2-2$ transition probabilities are taken from Zhang and Sampson [92ZHA/SAM], also utilizing the multiconfiguration Dirac–Fock approach. Relativistic many-body calculations by Safronova *et al.* [99SAF/JOH] for the $2s^2\ ^1S_0$–$2s2p\ ^1P^\circ_1$ and $2s2p\ ^1P^\circ_1$–$2p^2\ ^1S_0$ transitions agree with the results of Zhang and Sampson [92ZHA/SAM] and Jönsson *et al.* [98JON/FRO] to within 5%. Träbert *et al.* [01TRA/BEI] measured the lifetime of the $2s2p\ ^3P^\circ_2$ level, which decays predominantly through the M1 transition to $2s2p\ ^3P^\circ_1$, with an estimated uncertainty of ±7%. The wavelength of this transition has not been measured experimentally so a Ritz value is provided in Table 34. The ionization energy given in Table 35 was determined by Biémont *et al.* [99BIE/FRE] using a semiempirical fit along the Be I isoelectronic sequence.

References for K XVI

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83EDL Edlén, B., Phys. Scr. **28**, 51 (1983).

84FAW Fawcett, B. C., At. Data Nucl. Data Tables **30**, 1 (1984).

85EDL2 Edlén, B., Phys. Scr. **32**, 86 (1985).

92ZHA/SAM Zhang, H. L., and Sampson, D. H., At. Data Nucl. Data Tables **52**, 143 (1992).

98JON/FRO Jönsson, P., Froese Fischer, C., and Träbert, E., J. Phys. B **31**, 3497 (1998).

99BIE/FRE Biémont, E., Frémat, Y., and Quinet, P., At. Data Nucl. Data Tables **71**, 117 (1999).

99SAF/JOH Safronova, U. I., Johnson, W. R., Safronova, M. S., and Derevianko, A., Phys. Scr. **59**, 286 (1999).

01TRA/BEI Träbert, E., Beiersdorfer, P., Brown, G. V., Chen, H., Pinnington, E. H., and Thorn, D. B., Phys. Rev. A **64**, 034501 (2001).

TABLE 34. Observed spectral lines of K XVI

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	Line Code	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum									
21.737	0.010	4600500	3		1.4E+12	2s2p $^3P^\circ_2$	2p3p $^3D_3$	75FAW/HAY	84FAW
21.911	0.010	4563900	1		2.1E+12	$2s^2$ $^1S_0$	2s3p $^1P^\circ_1$	75FAW/HAY	84FAW
22.813	0.010	4383500	3		3.0E+12	2s2p $^3P^\circ_1$	2s3d $^3D_2$	75FAW/HAY	84FAW
22.921	0.010	4362800	5		7.6E+12	2s2p $^3P^\circ_2$	2s3d $^3D_3$	75FAW/HAY	84FAW
23.27	0.010	4297400	2		5.2E+12	$2p^2$ $^3P_1$	2p3d $^3D^\circ_2$	75FAW/HAY	84FAW
23.315	0.010	4289100	4		6.8E+12	$2p^2$ $^3P_2$	2p3d $^3D^\circ_3$	75FAW/HAY	84FAW
23.399	0.010	4273700	5		9.5E+12	$2p^2$ $^1D_2$	2p3d $^1F^\circ_3$	75FAW/HAY	84FAW
23.84	0.010	4194600	3	b	4.3E+12	2s2p $^1P^\circ_1$	2s3d $^1D_2$	75FAW/HAY	84FAW
206.27	0.010	484800			1.02E+10	$2s^2$ $^1S_0$	2s2p $^1P^\circ_1$	75FAW/HAY	98JON/FRO
213.42	0.05	468560			4.54E+8	2s2p $^3P^\circ_2$	$2p^2$ $^1D_2$	80FAW/RID	92ZHA/SAM
235.87	0.05	423960			2.45E+9	2s2p $^3P^\circ_1$	$2p^2$ $^3P_2$	80FAW/RID	92ZHA/SAM
239.26	0.05	417960			1.72E+10	2s2p $^1P^\circ_1$	$2p^2$ $^1S_0$	80FAW/RID	92ZHA/SAM
240.01	0.05	416650			3.08E+9	2s2p $^3P^\circ_0$	$2p^2$ $^3P_1$	80FAW/RID	92ZHA/SAM
245.31	0.05	407650			2.15E+9	2s2p $^3P^\circ_1$	$2p^2$ $^3P_1$	80FAW/RID	92ZHA/SAM
248.52	0.05	402380			5.94E+9	2s2p $^3P^\circ_2$	$2p^2$ $^3P_2$	80FAW/RID	92ZHA/SAM
253.68	0.05	394200			7.80E+9	2s2p $^3P^\circ_1$	$2p^2$ $^3P_0$	80FAW/RID	92ZHA/SAM
259.01	0.05	386080			3.03E+9	2s2p $^3P^\circ_2$	$2p^2$ $^3P_1$	80FAW/RID	92ZHA/SAM
[396.01]	0.02	[252518]			4.42E+6	$2s^2$ $^1S_0$	2s2p $^3P^\circ_1$	83EDL	98JON/FRO
Air									
4635.	(*Ritz*)	21570			1.31E+2	2s2p $^3P^\circ_1$	2s2p $^3P^\circ_2$		01TRA/BEI

TABLE 35. Energy levels of K XVI

Configuration	Term	*J*	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$2s^2$	^1S	0	0	80	
2s2p	$^3P^\circ$	0	243520	80	80FAW/RID, 83EDL
		1	[252518]	15	83EDL
		2	274090	80	80FAW/RID, 83EDL
2s2p	$^1P^\circ$	1	484800	30	75FAW/HAY
$2p^2$	^3P	0	646720	80	80FAW/RID, 85EDL2
		1	660200	80	80FAW/RID, 85EDL2
		2	676500	80	80FAW/RID, 85EDL2
$2p^2$	^1D	2	742650	90	80FAW/RID
$2p^2$	^1S	0	902760	90	80FAW/RID
2s3p	$^1P^\circ$	1	4563900	2000	75FAW/HAY
2s3d	^3D	2	4636000	2000	75FAW/HAY
		3	4636900	2000	75FAW/HAY
2s3d	^1D	2	4679000	2000	75FAW/HAY
2p3p	^3D	3	4874500	2000	75FAW/HAY
2p3d	$^3D^\circ$	2	4958000	2000	75FAW/HAY
		3	4965600	2000	75FAW/HAY
2p3d	$^1F^\circ$	3	5016300	2000	75FAW/HAY
K XVII ($^1S_{1/2}$)	*Limit*	···	7805000	3000	99BIE/FRE

7.17. K XVII

Li isoelectronic sequence

Ground state $1s^22s\ ^2S_{1/2}$

Ionization energy [8 344 200(1000) cm^{-1}]
[1034.5(1) eV]

In 1972 the first measurements of the K XVII spectrum lines were reported by two groups; Goldsmith *et al.* [72GOL/FEL], who observed the $1s^22p-1s^23d$ transitions in the spectrum of a vacuum spark in the region at 22 Å; and Purcell and Widing [72PUR/WID], who discovered the $1s^22s\ ^2S_{1/2}-1s^22p\ ^2P^\circ_{3/2}$ resonance transition at 327 Å in a solar flare. Later solar observations by Widing and Purcell [76WID/PUR] included the $1s^22s\ ^2S_{1/2}-1s^22p\ ^2P^\circ_{1/2}$ line listed in Table 36. Measurements of satellites around the He-like transitions between 3 and 4 Å [74AGL/BOI, 88AGL/PAN, 78BOI/YAF, 78BOI/PIK, 74FEL/DOS] established levels in the $1s2s2p$, $1s2p^2$, $1s2s3p$, and $1s2s3d$ configurations. Mazzoni [87MAZ] contributed the classification of the line at 3.067 Å. Further observations in the region between 14 and 23 Å and around 64 Å, using laser-induced plasmas [78BOI/YAF, 89BRO/EKB, 76AGL/BOI, 81FAW/RID] enabled the location of the $1s^23s$, $4s$, $3p$, $4p$, $3d$, $4d$, $5d$, and $4f$ configurations. Edlén [79EDL, 83EDL] used isoelectronic fitting and theoretical calculations to enhance the understanding of the level structure and predict additional levels. The polarization formulas applied by Edlén in 1979 [79EDL] were given in his 1978 paper [78EDL]. Sugar and Corliss [85SUG/COR3] drew together all the data available up to 1985 to produce a compilation of energy levels. Level values in Table 37 are taken from Sugar and Corliss [85SUG/COR3] except for those calculated from lines remeasured by Brown *et al.* [89BRO/EKB].

There are three main sources for oscillator strengths of K XVII spectral lines. Johnson *et al.* [96JOH/LIU] reported values for the $1s^22s-1s^22p$ and $1s^22p-1s^23s$ transitions obtained from third-order many-body perturbation theory. Zhang *et al.* [90ZHA/SAM] calculated those plus $1s^22s-1s^23p$ and $1s^22p-1s^23d$, $4d$, and $5d$ with a Dirac–Fock–Slater approach. Martín *et al.* [93MAR/KAR] obtained values for the $1s^23d-1s^24f$ transitions using the relativistic quantum defect orbital method and, in addition, provided an extensive comparison of results for various techniques for Li-like ions. The $1s^22p-1s2s3d$ transition probability listed in Table 36 was calculated by Aglitskii *et al.* [88AGL/PAN] in their report of the experimental observation of that spectral line. Although multiplet transition probabilities are not included in this compilation, it should be noted that oscillator strengths have been published by Yan *et al.* [98YAN/TAM] for $1s^22s-1s^22p$ and by Hu andWang [04HU/WAN] for the $1s^22p-1s^2nd$ (n=3–9) multiplets. The ionization energy cited was reported by Edlén [79EDL] from an isoelectronic fit of the Li I isoelectronic sequence. An ionization potential of 8344198 cm^{-1} for ^{39}K XVII has been calculated by Chung [92CHU], including relativistic and QED contributions. However, due to the lack of accurate experimental data for comparison, the uncertainty of the calculation is unknown.

References for K XVII

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83EDL	Edlén, B., Phys. Scr. **28**, 51 (1983).
84FAW	Fawcett, B. C., At. Data Nucl. Data Tables **30**, 1 (1984).
85SUG/COR3	Sugar, J., and Corliss, C., J. Phys. Chem. Ref. Data **14**, 40 (1985).
87MAZ	Mazzoni, M., Solar Phys. **108**, 221 (1987).
88AGL/PAN	Aglitskii, E. V., Panin, P. N., Safronova, U. I., Ulitin, S. A., Vainshtein, L. A., Mikhailov, Y. A., Rode, A. V., Skliskov, G. V., Cornille, M., Dubau, J., Loulergue, M., Faucher, P., and Bely-Dubau, F., J. Phys. Coll. C1 **49**, 267 (1988).
89BRO/EKB	Brown, C. M., Ekberg, J. O., Seely, J. F., and Feldman, U., J. Opt. Soc. Am. B **6**, 1650 (1989).
90ZHA/SAM	Zhang, H. L., Sampson, A. H., and Fontes, C. J., At. Data Nucl. Data Tables **44**, 31 (1990).
92CHU	Chung, K. T., Phys. Rev. A **45**, 7766 (1992).
93MAR/KAR	Martín, I., Karwowski, J., Diercksen, G. H. F., and Barrientos, C., Astron. Astro-

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04HU/WAN Hu, M.-H., and Wang, Z.-W., Chin. Phys. **13**, 1246 (2004).

TABLE 36. Observed spectral lines of K XVII

λ (Å)	Unc. (Å)	σ (cm^{-1})	Int.	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum								
3.0429	0.0005	32863000	13*		1s^{2}2s $^2S_{1/2}$	1s2s(^{1}S)3p $^2P^\circ_{1/2,3/2}$	78BOI/PIK	
3.0608	0.0019	32671000	*	1.25E+13	1s^{2}2p $^2P^\circ_{1/2}$	1s2p3p $^2D_{3/2}$	88AGL/PAN	88AGL/PAN
3.0608	0.0019	32671000	*	1.05E+13	1s^{2}2p $^2P^\circ_{1/2}$	1s2s3d $^2D_{3/2}$	88AGL/PAN	88AGL/PAN
3.0608	0.0019	32671000	*	3.12E+13	1s^{2}2p $^2P^\circ_{3/2}$	1s2p3p $^2D_{5/2}$	88AGL/PAN	88AGL/PAN
3.0670	0.0005	32605000	9		1s^{2}2p $^2P^\circ_{1/2,3/2}$	1s2p(^{3}P)3p $^2P_{1/2,3/2}$	78BOI/PIK	
3.0740	0.0005	32531000	5		1s^{2}2p $^2P^\circ_{1/2,3/2}$	1s2s3d $^2D_{3/2}$	78BOI/PIK	
3.5357	0.0005	28283000	*		1s^{2}3p $^2P^\circ_{1/2,3/2}$	1s2p3p $^2P_{1/2,3/2}$	74AGL/BOI	
3.5411	0.0005	28240000			1s^{2}2p $^2P^\circ_{1/2}$	1s2p^2 $^2S_{1/2}$	74AGL/BOI	
3.5456	0.0005	28204000			1s^{2}2p $^2P^\circ_{3/2}$	1s2p^2 $^2S_{1/2}$	74AGL/BOI	
3.5484	0.0010	28182000	*		1s^{2}2s $^2S_{1/2}$	1s(^{2}S)2s2p(^{1}P) $^2P^\circ_{1/2,3/2}$	74AGL/BOI	
3.5614	0.0010	28079000	*		1s^{2}2s $^2S_{1/2}$	1s(^{2}S)2s2p(^{3}P) $^2P^\circ_{1/2,3/2}$	74AGL/BOI	
3.5614	0.0010	28079000	*		1s^{2}2p $^2P^\circ_{3/2}$	1s(^{2}S)2p^2(^{3}P) $^2P_{1/2,3/2}$	74AGL/BOI	
3.5657	0.0005	28045000			1s^{2}2p $^2P^\circ_{1/2}$	1s(^{2}S)2p^2(^{1}D) $^2D_{3/2}$	74AGL/BOI	
3.5695	0.0005	28015000			1s^{2}2p $^2P^\circ_{3/2}$	1s(^{2}S)2p^2(^{1}D) $^2D_{5/2}$	74AGL/BOI	
3.5880	0.0015	27871000	*		1s^{2}2p $^2P^\circ_{1/2,3/2}$	1s(^{2}S)2p^2(^{3}P) $^4P_{1/2,3/2,5/2}$	74AGL/BOI	
3.5880	0.0015	27871000	*		1s^{2}2s $^2S_{1/2}$	1s(^{2}S)2s2p(^{3}P) $^4P^\circ_{1/2,3/2,5/2}$	74AGL/BOI	
14.715	0.003	6795800		7.01E+11	1s^{2}2p $^2P^\circ_{1/2}$	1s^{2}5d $^2D_{3/2}$	76AGL/BOI	
14.776	0.003	6767700	*		1s^{2}2p $^2P^\circ_{3/2}$	1s^{2}5d $^2D_{3/2,5/2}$	76AGL/BOI	90ZHA/SAM
15.755	0.003	6347200	*		1s^{2}2s $^2S_{1/2}$	1s^{2}4p $^2P^\circ_{1/2,3/2}$	76AGL/BOI	
16.427	0.003	6087500		1.52E+12	1s^{2}2p $^2P^\circ_{1/2}$	1s^{2}4d $^2D_{3/2}$	76AGL/BOI	90ZHA/SAM
16.497	0.003	6061700		1.81E+12	1s^{2}2p $^2P^\circ_{3/2}$	1s^{2}4d $^2D_{5/2}$	76AGL/BOI	90ZHA/SAM
20.889	0.010	4787200	2	1.84E+12	1s^{2}2s $^2S_{1/2}$	1s^{2}3p $^2P^\circ_{3/2}$	89BRO/EKB	90ZHA/SAM
20.931	0.010	4777600	1	1.87E+12	1s^{2}2s $^2S_{1/2}$	1s^{2}3p $^2P^\circ_{1/2}$	89BRO/EKB	90ZHA/SAM
22.020	0.005	4541300	2	4.53E+12	1s^{2}2p $^2P^\circ_{1/2}$	1s^{2}3d $^2D_{3/2}$	72GOL/FEL	90ZHA/SAM
22.163	0.005	4512000	3	5.41E+12	1s^{2}2p $^2P^\circ_{3/2}$	1s^{2}3d $^2D_{5/2}$	72GOL/FEL	90ZHA/SAM
22.573	0.010	4430100	1	2.43E+11	1s^{2}2p $^2P^\circ_{1/2}$	1s^{2}3s $^2S_{1/2}$	89BRO/EKB	96JOH/LIU
22.741	0.010	4397300	1	4.99E+11	1s^{2}2p $^2P^\circ_{3/2}$	1s^{2}3s $^2S^\circ_{1/2}$	89BRO/EKB	96JOH/LIU
63.168	0.010	1583100	1		1s^{2}3p $^2P^\circ_{1/2}$	1s^{2}4d $^2D_{3/2}$	89BRO/EKB	
63.509	0.010	1574600	1		1s^{2}3p $^2P^\circ_{3/2}$	1s^{2}4d $^2D_{5/2}$	89BRO/EKB	
64.643	0.010	1547000	3	1.08E+9	1s^{2}3d $^2D_{3/2}$	1s^{2}4f $^2F^\circ_{5/2}$	89BRO/EKB	93MAR/KAR
64.747	0.010	1544500	4	1.16E+12	1s^{2}3d $^2D_{5/2}$	1s^{2}4f $^2F^\circ_{7/2}$	89BRO/EKB	93MAR/KAR
326.78	0.02	306020		1.73E+9	1s^{2}2s $^2S_{1/2}$	1s^{2}2p $^2P^\circ_{3/2}$	76WID/PUR	96JOH/LIU
365.63	0.02	273500		1.22E+9	1s^{2}2s $^2S_{1/2}$	1s^{2}2p $^2P^\circ_{1/2}$	76WID/PUR	96JOH/LIU

TABLE 37. Energy levels of K XVII

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
1s^{2}2s	^{2}S	1/2	0	20	
1s^{2}2p	^{2}P°	1/2	273500	20	76WID/PUR
		3/2	306020	20	76WID/PUR
1s^{2}3s	^{2}S	1/2	4703500	2000	89BRO/EKB
1s^{2}3p	^{2}P°	1/2	4777600	2000	89BRO/EKB
		3/2	4784900	2000	89BRO/EKB
1s^{2}3d	^{2}D	3/2	4814800	1000	72GOL/FEL
		5/2	4818000	1000	72GOL/FEL
1s^{2}4p	^{2}P°	1/2,3/2	6347200	1200	76AGL/BOI

TABLE 37. Energy levels of K XVII—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$1s^24d$	^2D	3/2	6361000	1100	76AGL/BOI
		5/2	6367700	1100	76AGL/BOI
$1s^24f$	$^2F^\circ$	5/2	6364500	2000	89BRO/EKB
		7/2	6364000	2000	89BRO/EKB
$1s^25d$	^2D	3/2	7069300	2000	76AGL/BOI
		5/2	7073800	2000	76AGL/BOI
K XVIII ($^1S_0$)	*Limit*	—	8344200	1000	79EDL
$1s(^2S)2s2p(^3P^\circ)$	$^4P^\circ$	1/2,3/2,5/2	27871000	4000	74AGL/BOI
$1s(^2S)2s2p(^3P^\circ)$	$^2P^\circ$	1/2,3/2	28079000	4000	74AGL/BOI
$1s(^2S)2p^2(^3P)$	^4P	1/2,3/2,5/2	28160000	4000	74AGL/BOI
$1s(^2S)2s2p(^1P^\circ)$	$^2P^\circ$	1/2,3/2	28182000	4000	74AGL/BOI
$1s(^2S)2p^2(^1D)$	^2D	3/2	28318000	4000	74AGL/BOI
		5/2	28321000	4000	74AGL/BOI
$1s(^2S)2p^2(^3P)$	^2P	1/2,3/2	28384000	4000	74AGL/BOI
$1s(^2S)2p^2(^1S)$	^2S	1/2	28511000	4000	74AGL/BOI
$1s2s(^1S)3p$	$^2P^\circ$	1/2,3/2	32863000	10000	78BOI/PIK
1s2p3p	^2D	3/2	32945000	20000	88AGL/PAN
		5/2	32977000	20000	88AGL/PAN
1s2s3d	^2D	3/2	32945000	20000	88AGL/PAN
$1s2p(^3P^\circ)3p$	^2P	1/2,3/2	33060000	10000	74AGL/BOI

7.18. K XVIII

He isoelectronic sequence

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

Ionization energy (37 189 176(1) cm^{-1})
(4610.8697(1) eV)

Measurements of the K XVIII spectrum were first reported by Cohen *et al.* [68COH/FEL] using a vacuum spark source. Lines from the $1s2p$ and $1s3p$ levels to the ground state have also been observed in laser-induced plasmas [74AGL/BOI, 77AGL/ZHE, 78BOI/YAF, 78BOI/PIK]. In addition, the $1s^2\ ^1S_0 - 1s3p\ ^1P^\circ_1$ transition has been observed in a solar flare by Seely and Feldman [85SEE/FEL]. The most accurate experimental wavelengths to date have been obtained by Beiersdorfer *et al.* [86BEI/BIT, 89BEI/BIT] in tokamak plasmas. The forbidden $1s^2\ ^1S_0 - 1s2s\ ^1S_0$ transition has not been experimentally observed, but the Ritz wavelength (3.54851 Å) is included in Table 38.

In Table 39 we retain the theoretical values for the K XVIII energy levels, which are reported to have a smaller uncertainty than the experimental values. The levels are taken from the theoretical calculations of Plante *et al.* [94PLA/JOH], whose relativistic all-order many-body calculations include terms of higher order in $Z\alpha$ than those of the unified theory of Drake [88DRA]. Both Drake [88DRA] and Plante *et al.* [94PLA/JOH] calculated the energy level values for the $n=1$ and $n=2$ levels of helium-like potassium. Vainshtein and Safronova [85VAI/SAF] utilized perturbation theory in their calculations and extended the levels to include $n=3$–5. Although the absolute level uncertainty given by Vainshtein and Safronova [85VAI/SAF] was about 3000 cm^{-1}, the fine structure splittings are estimated to be accurate to within 8 cm^{-1}.

Johnson *et al.* [95JOH/PLA] used a relativistic, iterative technique to compute the $1s^2 - 1s2p$ and $1s^2 - 1s2s\ ^3S_1$ transition probabilities cited. Johnson *et al.* [95JOH/PLA] also presents a detailed comparison of several methods of calculating transition probabilities for He-like ions. In an investigation of two-photon transition rates Drake [86DRA] observed that the two-photon rate for the $1s^2 - 1s2s\ ^3S_1$ line was several orders of magnitude lower than that for the single-photon $M1$ transition. The $1s^2 - 1s2s\ ^1S_0$ decay, however, is dominated by the simultaneous emission of two $E1$ photons. The $1s^2 - 1s3p$ transition rates retained here were obtained by Safronova *et al.* [95SAF/SAF] using a Z-dependent expansion. The ionization potential listed was calculated by Plante *et al.* [94PLA/JOH].

References for K XVIII

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TABLE 38. Observed spectral lines of K XVIII

λ (Å)	Unc. (Å)	σ (cm^{-1})	A_{ki} (s^{-1})	Lower level	Upper level	λ Ref.	A_{ki} Ref.
Vacuum							
3.00860	0.00011	33238100	3.72E+13	$1s^2\ ^1S_0$	$1s3p\ ^1P^\circ_1$	85SEE/FEL	95SAF/SAF
3.0110	0.0005	33212000	9.10E+11	$1s^2\ ^1S_0$	$1s3p\ ^3P^\circ_1$	78BOI/PIK	95SAF/SAF
3.53195	0.00012	28313000	1.33E+14	$1s^2\ ^1S_0$	$1s2p\ ^1P^\circ_1$	89BEI/BIT	95JOH/PLA
3.54595	0.00005	28201200	4.91E+8	$1s^2\ ^1S_0$	$1s2p\ ^3P^\circ_2$	86BEI/BIT	95JOH/PLA
(3.54851)		28180900	5.91E+8	$1s^2\ ^1S_0$	$1s2s\ ^1S_0$		86DRA
3.54950	0.00005	28173000	2.98E+12	$1s^2\ ^1S_0$	$1s2p\ ^3P^\circ_1$	86BEI/BIT	95JOH/PLA
3.57040	0.00005	28008100	8.34E+6	$1s^2\ ^1S_0$	$1s2s\ ^3S_1$	86BEI/BIT	95JOH/PLA

TABLE 39. Energy levels of K XVIII

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
$1s^2$	^1S	0	0	1	
1s2s	^3S	1	(28005899)	1	94PLA/JOH
1s2p	$^3P^\circ$	0	(28166731)	1	94PLA/JOH
		1	(28173110)	1	94PLA/JOH
		2	(28201500)	1	94PLA/JOH
1s2s	^1S	0	(28180867)	1	94PLA/JOH
1s2p	$^1P^\circ$	1	(28314166)	1	94PLA/JOH
1s3s	^3S	1	(33151400)	3000	85VAI/SAF
1s3p	$^3P^\circ$	0	(33195600)	3000	85VAI/SAF
		1	(33197559)	3000	85VAI/SAF
		2	(33205986)	3000	85VAI/SAF
1s3s	^1S	0	(33197700)	3000	85VAI/SAF
1s3d	^3D	1	(33230648)	3000	85VAI/SAF
		2	(33230700)	3000	85VAI/SAF
		3	(33234084)	3000	85VAI/SAF

TABLE 39. Energy levels of K XVIII—Continued

Configuration	Term	J	Energy (cm^{-1})	Unc. (cm^{-1})	Reference
1s3d	^1D	2	(33235300)	3000	85VAI/SAF
1s3p	$^1P^\circ$	1	(33236700)	3000	85VAI/SAF
1s4s	^3S	1	(34928800)	3000	85VAI/SAF
1s4p	$^3P^\circ$	0	(34947500)	3000	85VAI/SAF
		1	(34948325)	3000	85VAI/SAF
		2	(34951879)	3000	85VAI/SAF
1s4s	^1S	0	(34948300)	3000	85VAI/SAF
1s4d	^3D	1	(34962178)	3000	85VAI/SAF
		2	(34962200)	3000	85VAI/SAF
		3	(34963624)	3000	85VAI/SAF
1s4d	^1D	2	(34964200)	3000	85VAI/SAF
1s4p	$^1P^\circ$	1	(34964700)	3000	85VAI/SAF
1s5s	^3S	1	(35746600)	3000	85VAI/SAF
1s5p	$^3P^\circ$	0	(35756100)	3000	85VAI/SAF
		1	(35756522)	3000	85VAI/SAF
		2	(35758341)	3000	85VAI/SAF
1s5s	^1S	0	(35756500)	3000	85VAI/SAF
1s5d	^3D	1	(35763589)	3000	85VAI/SAF
		2	(35763600)	3000	85VAI/SAF
		3	(35764329)	3000	85VAI/SAF
1s5d	^1D	2	(35764600)	3000	85VAI/SAF
1s5p	$^1P^\circ$	1	(35764900)	3000	85VAI/SAF
K XIX ($^2S_{1/2}$)	*Limit*	⋯	(37188598)	20	88DRA

7.19. K XIX

H isoelectronic sequence

Ground state $1s\ ^2S_{1/2}$

Ionization energy (39 795 784(7) cm^{-1})
(4934.0479(9) eV)

No experimental measurements of the K XIX spectrum have been made; however Erickson [77ERI] calculated energy levels of ^{39}K for ns levels with $n=1-13$, np levels with $n=2-13$, nd levels with $n=3-5$, nf levels with $n=4-5$, plus the levels with $J=n-1/2$ for $n=6-13$. Level separations between levels with $n=1$ and 2 have since been calculated by Mohr [83MOH] and Johnson and Soff [85JOH/SOF] with smaller reported uncertainties. The energies of Johnson and Soff [85JOH/SOF] for these levels are reported here. For levels with $n\geq 3$ the values given here were obtained by first correcting the binding energies of Erickson [77ERI] for the latest CODATA internationally recommended value of the Rydberg constant, $R=109737.31568525(73)$ cm^{-1}. The resulting values were then subtracted from the ionization energy of Johnson and Soff [85JOH/SOF]. All wavelengths listed in Table 40 are computed using the differences of the levels, with only transitions involving levels with $n\leq 7$ tabulated here. Uncertainties in the wavelengths are calculated from those given in Erickson [77ERI] and Johnson and Soff [85JOH/SOF] for the energy levels; however, this is not a rigorous method as errors in the level value calculations are not statistically independent. The ionization energy given in Table 41 is taken from Johnson and Soff [85JOH/SOF]. It should be noted that although Erickson's reported uncertainty for the ionization potential is ± 50 cm^{-1}, his value differs from the result of Johnson and Soff [85JOH/SOF] by over 150 cm^{-1}. It is likely that the values for other levels of Erickson [77ERI] levels may also have errors larger than those reported.

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.

References for K XIX

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98PAL Pal'chikov, V. G., Phys. Scr. **57** 581 (1998).

TABLE 40. Spectral lines of ^{39}K XIX

λ (Å)	Unc. (Å)	σ (cm^{-1})	A_{ki} (s^{-1})	Lower Level	Upper Level	λ Ref.	A_{ki} Ref.
(2.5650678)	0.0000005	(38985324.)	1.60E+12	1s $^2S_{1/2}$	7p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(2.5844957)	0.0000005	(38692268.)	2.55E+12	1s $^2S_{1/2}$	6p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(2.6171799)	0.0000005	(38209066.)	4.47E+12	1s $^2S_{1/2}$	5p $^2P^{\circ}_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(2.6173914)	0.0000005	(38205978.)	4.45E+12	1s $^2S_{1/2}$	5p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(2.6798049)	0.0000005	(37316150.)	8.88E+12	1s $^2S_{1/2}$	4p $^2P^{\circ}_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(2.6802382)	0.0000005	(37310116.)	8.83E+12	1s $^2S_{1/2}$	4p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(2.8258877)	0.0000006	(35387110.)	2.18E+13	1s $^2S_{1/2}$	3p $^2P^{\circ}_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(2.8270309)	0.0000006	(35372800.)	2.17E+13	1s $^2S_{1/2}$	3p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(3.3466905)	0.0000008	(29880265.)	8.13E+13	1s $^2S_{1/2}$	2p $^2P^{\circ}_{3/2}$	85JOH/SOF	04JIT/BUN
(3.3521068)	0.0000008	(29831985.)	8.19E+13	1s $^2S_{1/2}$	2p $^2P^{\circ}_{1/2}$	85JOH/SOF	04JIT/BUN
(10.924930)	0.000005	(9153377.)	2.01E+10	2p $^2P^{\circ}_{1/2}$	7s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(10.926811)	0.000007	(9151801.)	2.36E+11	2s $^2S_{1/2}$	7p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(10.982859)	0.000002	(9105097.)	4.18E+10	2p $^2P^{\circ}_{3/2}$	7s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(11.286245)	0.000005	(8860343.)	3.23E+10	2p $^2P^{\circ}_{1/2}$	6s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(11.288282)	0.000008	(8858744.)	3.76E+11	2s $^2S_{1/2}$	6p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(11.348080)	0.000003	(8812063.)	6.70E+10	2p $^2P^{\circ}_{3/2}$	6s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(11.937341)	0.000006	(8377075.)	1.04E+12	2p $^2P^{\circ}_{1/2}$	5d $^2D_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(11.939526)	0.000009	(8375542.)	6.46E+11	2s $^2S_{1/2}$	5p $^2P^{\circ}_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(11.941589)	0.000006	(8374095.)	5.66E+10	2p $^2P^{\circ}_{1/2}$	5s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(11.943930)	0.000009	(8372454.)	6.51E+11	2s $^2S_{1/2}$	5p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(12.005066)	0.000003	(8329817.)	1.23E+12	2p $^2P^{\circ}_{3/2}$	5d $^2D_{5/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(12.006539)	0.000003	(8328795.)	2.04E+11	2p $^2P^{\circ}_{3/2}$	5d $^2D_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(12.010836)	0.000003	(8325815.)	1.17E+11	2p $^2P^{\circ}_{3/2}$	5s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(13.361562)	0.000007	(7484155.)	2.27E+12	2p $^2P^{\circ}_{1/2}$	4d $^2D_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(13.36429)	0.00001	(7482627.)	1.26E+12	2s $^2S_{1/2}$	4p $^2P^{\circ}_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(13.371968)	0.000007	(7478331.)	1.13E+11	2p $^2P^{\circ}_{1/2}$	4s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(13.37506)	0.00001	(7476602.)	1.27E+12	2s $^2S_{1/2}$	4p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(13.444709)	0.000004	(7437870.)	2.69E+12	2p $^2P^{\circ}_{3/2}$	4d $^2D_{5/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(13.448316)	0.000004	(7435875.)	4.47E+11	2p $^2P^{\circ}_{3/2}$	4d $^2D_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(13.458858)	0.000004	(7430051.)	2.35E+11	2p $^2P^{\circ}_{3/2}$	4s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(18.00148)	0.00001	(5555099.)	7.08E+12	2p $^2P^{\circ}_{1/2}$	3d $^2D_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(18.00635)	0.00002	(5553596.)	2.91E+12	2s $^2S_{1/2}$	3p $^2P^{\circ}_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(18.04635)	0.00001	(5541286.)	2.78E+11	2p $^2P^{\circ}_{1/2}$	3s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(18.05290)	0.00002	(5539276.)	2.97E+12	2s $^2S_{1/2}$	3p $^2P^{\circ}_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(18.143726)	0.000007	(5511547.)	8.42E+12	2p $^2P^{\circ}_{3/2}$	3d $^2D_{5/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(18.15930)	0.00001	(5506819.)	1.40E+12	2p $^2P^{\circ}_{3/2}$	3d $^2D_{3/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(18.204968)	0.000007	(5493006.)	5.78E+11	2p $^2P^{\circ}_{3/2}$	3s $^2S_{1/2}$	77ERI, 85JOH/SOF	04JIT/BUN
(27.681186)	0.000008	(3612562.)	1.37E+10	3p $^2P^{\circ}_{1/2}$	7s $^2S_{1/2}$	77ERI	04JIT/BUN
(27.68508)	0.00002	(3612054.)	7.92E+10	3s $^2S_{1/2}$	7p $^2P^{\circ}_{1/2}$	77ERI	04JIT/BUN
(27.791269)	0.000006	(3598252.4)	2.83E+10	3p $^2P^{\circ}_{3/2}$	7s $^2S_{1/2}$	77ERI	04JIT/BUN
(27.7913634)	0.0000003	(3598240.2)	6.40E+9	3d $^2D_{3/2}$	7p $^2P^{\circ}_{1/2}$	77ERI	04JIT/BUN
(30.124768)	0.000009	(3319528.)	2.22E+10	3p $^2P^{\circ}_{1/2}$	6s $^2S_{1/2}$	77ERI	04JIT/BUN
(30.12958)	0.00002	(3318997.)	1.26E+11	3s $^2S_{1/2}$	6p $^2P^{\circ}_{1/2}$	77ERI	04JIT/BUN
(30.255190)	0.000007	(3305218.)	4.59E+10	3p $^2P^{\circ}_{3/2}$	6s $^2S_{1/2}$	77ERI	04JIT/BUN
(30.255503)	0.000002	(3305183.9)	1.08E+10	3d $^2D_{3/2}$	6p $^2P^{\circ}_{1/2}$	77ERI	04JIT/BUN
(35.25770)	0.00001	(2836260.)	3.71E+11	3p $^2P^{\circ}_{1/2}$	5d $^2D_{3/2}$	77ERI	04JIT/BUN
(35.26348)	0.00002	(2835795.)	2.12E+11	3s $^2S_{1/2}$	5p $^2P^{\circ}_{3/2}$	77ERI	04JIT/BUN
(35.29478)	0.00001	(2833280.)	3.97E+10	3p $^2P^{\circ}_{1/2}$	5s $^2S_{1/2}$	77ERI	04JIT/BUN
(35.30193)	0.00002	(2832706.)	2.16E+11	3s $^2S_{1/2}$	5p $^2P^{\circ}_{1/2}$	77ERI	04JIT/BUN
(35.4233648)	0.0000005	(2822995.52)	5.55E+11	3d $^2D_{3/2}$	5f $^2F^{\circ}_{5/2}$	77ERI	04JIT/BUN

TABLE 40. Spectral lines of ^{39}K XIX—Continued

λ (Å)	Unc. (Å)	σ (cm^{-1})	A_{ki} (s^{-1})	Lower Level	Upper Level	λ Ref.	A_{ki} Ref.
(35.42366)	0.00001	(2822972.2)	4.43E+11	3p $^2P^\circ_{3/2}$	5d $^2D_{5/2}$	77ERI	04JIT/BUN
(35.436095)	0.000002	(2821981.4)	1.96E+9	3d $^2D_{3/2}$	5p $^2P^\circ_{3/2}$	77ERI	04JIT/BUN
(35.43648)	0.00001	(2821950.6)	7.38E+10	3p $^2P^\circ_{3/2}$	5d $^2D_{3/2}$	77ERI	04JIT/BUN
(35.47395)	0.00001	(2818970.3)	8.21E+10	3p $^2P^\circ_{3/2}$	5s $^2S_{1/2}$	77ERI	04JIT/BUN
(35.474918)	0.000004	(2818893.1)	2.06E+10	3d $^2D_{3/2}$	5p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(35.4763684)	0.0000005	(2818777.81)	5.92E+11	3d $^2D_{5/2}$	5f $^2F^\circ_{7/2}$	77ERI	04JIT/BUN
(35.4827852)	0.0000005	(2818268.05)	3.94E+10	3d $^2D_{5/2}$	5f $^2F^\circ_{5/2}$	77ERI	04JIT/BUN
(35.495558)	0.000002	(2817253.9)	1.79E+10	3d $^2D_{5/2}$	5p $^2P^\circ_{3/2}$	77ERI	04JIT/BUN
(51.45780)	0.00003	(1943339.9)	7.65E+11	3p $^2P^\circ_{1/2}$	4d $^2D_{3/2}$	77ERI	04JIT/BUN
(51.46999)	0.00005	(1942880.)	3.96E+11	3s $^2S_{1/2}$	4p $^2P^\circ_{3/2}$	77ERI	04JIT/BUN
(51.61248)	0.00003	(1937516.)	8.06E+10	3p $^2P^\circ_{1/2}$	4s $^2S_{1/2}$	77ERI	04JIT/BUN
(51.63035)	0.00005	(1936845.)	4.04E+11	3s $^2S_{1/2}$	4p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(51.785377)	0.000001	(1931047.05)	1.68E+12	3d $^2D_{3/2}$	4f $^2F^\circ_{5/2}$	77ERI	04JIT/BUN
(51.78596)	0.00002	(1931025.5)	9.17E+11	3p $^2P^\circ_{3/2}$	4d $^2D_{5/2}$	77ERI	04JIT/BUN
(51.838554)	0.000008	(1929066.2)	4.55E+9	3d $^2D_{3/2}$	4p $^2P^\circ_{3/2}$	77ERI	04JIT/BUN
(51.83952)	0.00002	(1929030.3)	1.53E+11	3p $^2P^\circ_{3/2}$	4d $^2D_{3/2}$	77ERI	04JIT/BUN
(51.885655)	0.000001	(1927314.99)	1.80E+12	3d $^2D_{5/2}$	4f $^2F^\circ_{7/2}$	77ERI	04JIT/BUN
(51.912466)	0.000001	(1926319.58)	1.20E+11	3d $^2D_{5/2}$	4f $^2F^\circ_{5/2}$	77ERI	04JIT/BUN
(51.965904)	0.000008	(1924338.7)	4.16E+10	3d $^2D_{5/2}$	4p $^2P^\circ_{3/2}$	77ERI	04JIT/BUN
(51.99650)	0.00003	(1923206.4)	1.67E+11	3p $^2P^\circ_{3/2}$	4s $^2S_{1/2}$	77ERI	04JIT/BUN
(52.00122)	0.00002	(1923031.9)	4.80E+10	3d $^2D_{3/2}$	4p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(59.69274)	0.00002	(1675245.7)	9.52E+9	4p $^2P^\circ_{1/2}$	7s $^2S_{1/2}$	77ERI	04JIT/BUN
(59.70119)	0.00003	(1675008.6)	3.72E+10	4s $^2S_{1/2}$	7p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(59.90853)	0.00001	(1669211.4)	1.96E+10	4p $^2P^\circ_{3/2}$	7s $^2S_{1/2}$	77ERI	04JIT/BUN
(59.909487)	0.000004	(1669184.7)	7.39E+9	4d $^2D_{3/2}$	7p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(72.34784)	0.00003	(1382211.3)	1.57E+10	4p $^2P^\circ_{1/2}$	6s $^2S_{1/2}$	77ERI	04JIT/BUN
(72.36140)	0.00004	(1381952.3)	5.86E+10	4s $^2S_{1/2}$	6p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(72.66507)	0.00002	(1376177.0)	3.24E+10	4p $^2P^\circ_{3/2}$	6s $^2S_{1/2}$	77ERI	04JIT/BUN
(72.66764)	0.00001	(1376128.4)	1.29E+10	4d $^2D_{3/2}$	6p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(111.24164)	0.00007	(898943.9)	1.61E+11	4p $^2P^\circ_{1/2}$	5d $^2D_{3/2}$	77ERI	04JIT/BUN
(111.26567)	0.00010	(898749.8)	9.48E+10	4s $^2S_{1/2}$	5p $^2P^\circ_{3/2}$	77ERI	04JIT/BUN
(111.61168)	0.00009	(895963.6)	2.83E+10	4p $^2P^\circ_{1/2}$	5s $^2S_{1/2}$	77ERI	04JIT/BUN
(111.64932)	0.00010	(895661.5)	9.70E+10	4s $^2S_{1/2}$	5p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(111.86432)	0.00001	(893940.08)	3.15E+11	4d $^2D_{3/2}$	5f $^2F^\circ_{5/2}$	77ERI	04JIT/BUN
(111.86543)	0.00004	(893931.2)	1.93E+11	4p $^2P^\circ_{3/2}$	5d $^2D_{5/2}$	77ERI	04JIT/BUN
(111.99137)	0.00001	(892925.9)	2.47E+9	4d $^2D_{3/2}$	5p $^2P^\circ_{3/2}$	77ERI	04JIT/BUN
(111.99342)	0.00004	(892909.6)	3.24E+10	4p $^2P^\circ_{3/2}$	5d $^2D_{3/2}$	77ERI	04JIT/BUN
(112.050183)	0.000004	(892457.27)	5.35E+11	4f $^2F^\circ_{5/2}$	5g $^2G_{7/2}$	77ERI	04JIT/BUN
(112.05051)	0.00001	(892454.64)	3.37E+11	4d $^2D_{5/2}$	5f $^2F^\circ_{7/2}$	77ERI	04JIT/BUN
(112.113868)	0.000008	(891950.32)	3.14E+8	4f $^2F^\circ_{5/2}$	5d $^2D_{5/2}$	77ERI	04JIT/BUN
(112.11455)	0.00001	(891944.88)	2.25E+10	4d $^2D_{5/2}$	5f $^2F^\circ_{5/2}$	77ERI	04JIT/BUN
(112.136859)	0.000004	(891767.44)	5.55E+11	4f $^2F^\circ_{7/2}$	5g $^2G_{9/2}$	77ERI	04JIT/BUN
(112.175298)	0.000004	(891461.86)	1.98E+10	4f $^2F^\circ_{7/2}$	5g $^2G_{7/2}$	77ERI	04JIT/BUN
(112.239126)	0.000008	(890954.91)	6.34E+9	4f $^2F^\circ_{7/2}$	5d $^2D_{5/2}$	77ERI	04JIT/BUN
(112.24217)	0.00003	(890930.7)	2.25E+10	4d $^2D_{5/2}$	5p $^2P^\circ_{3/2}$	77ERI	04JIT/BUN
(112.242424)	0.000008	(890928.73)	6.72E+9	4f $^2F^\circ_{5/2}$	5d $^2D_{3/2}$	77ERI	04JIT/BUN
(112.36848)	0.00006	(889929.3)	5.85E+10	4p $^2P^\circ_{3/2}$	5s $^2S_{1/2}$	77ERI	04JIT/BUN
(112.38005)	0.00004	(889837.6)	2.59E+10	4d $^2D_{3/2}$	5p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(128.30638)	0.00005	(779384.5)	7.08E+9	5p $^2P^\circ_{1/2}$	7s $^2S_{1/2}$	77ERI	04JIT/BUN
(128.32939)	0.00007	(779244.7)	2.09E+10	5s $^2S_{1/2}$	7p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(128.81681)	0.00003	(776296.2)	1.46E+10	5p $^2P^\circ_{3/2}$	7s $^2S_{1/2}$	77ERI	04JIT/BUN
(128.82209)	0.00002	(776264.4)	7.24E+9	5d $^2D_{3/2}$	7p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(205.61320)	0.00008	(486350.1)	1.17E+10	5p $^2P^\circ_{1/2}$	6s $^2S_{1/2}$	77ERI	04JIT/BUN
(205.68159)	0.00008	(486188.4)	3.19E+10	5s $^2S_{1/2}$	6p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN
(206.92718)	0.00013	(483261.8)	2.43E+10	5p $^2P^\circ_{3/2}$	6s $^2S_{1/2}$	77ERI	04JIT/BUN
(206.95019)	0.00009	(483208.1)	1.31E+10	5d $^2D_{3/2}$	6p $^2P^\circ_{1/2}$	77ERI	04JIT/BUN

TABLE 41. Energy levels of ^{39}K XIX

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
1s	^2S	1/2	(0.)	7.	85JOH/SOF
2s	^2S	1/2	(29833524.)	7.	85JOH/SOF
2p	$^2P^\circ$	1/2	(29831985.)	7.	85JOH/SOF
		3/2	(29880265.)	7.	85JOH/SOF
3s	^2S	1/2	(35373271.)	2.	77ERI, 85JOH/SOF
3p	$^2P^\circ$	1/2	(35372800.)	1.	77ERI, 85JOH/SOF
		3/2	(35387109.6)	0.8	77ERI, 85JOH/SOF
3d	^2D	3/2	(35387084.44)	0.04	77ERI, 85JOH/SOF
		5/2	(35391811.91)	0.04	77ERI, 85JOH/SOF
4s	^2S	1/2	(37310316.0)	0.8	77ERI, 85JOH/SOF
4p	$^2P^\circ$	1/2	(37310116.3)	0.6	77ERI, 85JOH/SOF
		3/2	(37316150.6)	0.3	77ERI, 85JOH/SOF
4d	^2D	3/2	(37316139.88)	0.08	77ERI, 85JOH/SOF
		5/2	(37318135.08)	0.08	77ERI, 85JOH/SOF
4f	$^2F^\circ$	5/2	(37318131.49)	0.03	77ERI, 85JOH/SOF
		7/2	(37319216.90)	0.03	77ERI, 85JOH/SOF
5s	^2S	1/2	(38206079.9)	0.4	77ERI, 85JOH/SOF
5p	$^2P^\circ$	1/2	(38205977.5)	0.3	77ERI, 85JOH/SOF
		3/2	(38209065.8)	0.2	77ERI, 85JOH/SOF
5d	^2D	3/2	(38209060.22)	0.05	77ERI, 85JOH/SOF
		5/2	(38210081.81)	0.05	77ERI, 85JOH/SOF
5f	$^2F^\circ$	5/2	(38210079.96)	0.03	77ERI, 85JOH/SOF
		7/2	(38210589.72)	0.03	77ERI, 85JOH/SOF
5g	^2G	7/2	(38210588.758)	0.006	77ERI, 85JOH/SOF
		9/2	(38210894.345)	0.006	77ERI, 85JOH/SOF
6s	^2S	1/2	(38692327.6)	0.2	77ERI, 85JOH/SOF
6p	$^2P^\circ$	1/2	(38692268.3)	0.2	77ERI, 85JOH/SOF
6h	$^2H^\circ$	11/2	(38695230.538)	0.002	77ERI, 85JOH/SOF
7s	^2S	1/2	(38985362.0)	0.1	77ERI, 85JOH/SOF
7p	$^2P^\circ$	1/2	(38985324.6)	0.1	77ERI, 85JOH/SOF
7i	^2I	13/2	(38987242.5261)	0.0006	77ERI, 85JOH/SOF
8s	^2S	1/2	(39175472.3)	0.1	77ERI, 85JOH/SOF
8p	$^2P^\circ$	1/2	(39175447.29)	0.09	77ERI, 85JOH/SOF
8k	$^2K^\circ$	15/2	(39176758.4814)	0.0002	77ERI, 85JOH/SOF
9s	^2S	1/2	(39305767.27)	0.07	77ERI, 85JOH/SOF
9p	$^2P^\circ$	1/2	(39305749.70)	0.06	77ERI, 85JOH/SOF
9l	^2L	17/2	(39306684.9669)	0.0001	77ERI, 85JOH/SOF
10s	^2S	1/2	(39398940.73)	0.05	77ERI, 85JOH/SOF
10p	$^2P^\circ$	1/2	(39398927.92)	0.04	77ERI, 85JOH/SOF

TABLE 41. Energy levels of ^{39}K XIX—Continued

Configuration	Term	J	Energy (cm^{-1})	Uncertainty (cm^{-1})	Reference
10m	$^2M^\circ$	19/2	(39399618.10755)	0.00006	77ERI, 85JOH/SOF
11s	^2S	1/2	(39467862.70)	0.04	77ERI, 85JOH/SOF
11p	$^2P^\circ$	1/2	(39467853.08)	0.03	77ERI, 85JOH/SOF
11n	^2N	21/2	(39468376.77400)	0.00003	77ERI, 85JOH/SOF
12s	^2S	1/2	(39520273.33)	0.03	77ERI, 85JOH/SOF
12p	$^2P^\circ$	1/2	(39520265.92)	0.03	77ERI, 85JOH/SOF
12o	$^2O^\circ$	23/2	(39520672.61136)	0.00002	77ERI, 85JOH/SOF
13s	^2S	1/2	(39561054.37)	0.02	77ERI, 85JOH/SOF
13p	$^2P^\circ$	1/2	(39561048.54)	0.02	77ERI, 85JOH/SOF
13q	^2Q	25/2	(39561370.61100)	0.00001	77ERI, 85JOH/SOF
	Limit	⋯	(39795781.)		85JOH/SOF

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