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Extended analysis of the Eu III spectrum⋆

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ABSTRACT

Aims. We create an Eu III new atomic data set for interpreting the spectra of chemically peculiar stars by an extended analysis of the doubly-ionized europium.
Methods. We classified Eu III spectral lines from a laboratory wavelength list with the support of energy and transition probability predictions in the Racah-Slater approach, using the Cowan codes and generalized least-squares fit (GLS) studies along the sequence of doubly-ionized lanthanides.
Results. More than thirty new levels and ninety classified lines are established in Eu III. Improved prediction of the Eu III spectrum was achieved by using scaling factors for ab initio energy integrals, as well as effective configuration interaction parameters supplied by GLS studies. Transition probabilities, oscillator strengths, and Landé g-factors are calculated for the lines in the region 2000–9995 Å.

Key words. atomic data – stars: atmospheres – stars: chemically peculiar – stars: variables: general

1. Introduction

The spectra of doubly-charged lanthanide ions are of current interest for modelling stellar atmospheres. Their importance in stellar spectra and the relevant advances in laboratory studies have been reviewed recently (Wahlgren 2002; Biémont & Quinet 2003). The spectrum of doubly-charged europium Eu III is especially important among the third spectra of the rare-earth elements (REE), since europium shows prominent overabundances in the atmospheres of hot magnetic chemically peculiar stars (CP2) where Eu^{2+} is its dominant ionization stage (Ryabchikova et al. 1999). The ground configuration of Eu III is $4f^7$. For this ion, Sugar & Spector (1974) published a list of 890 observed lines but only one third of them were classified. These lines were transitions involving nine levels of $4f^7$ and ninety-six levels of the $4f^6(^7F)5d$, $4f^6(^7F)6s$ and $4f^6(^7F)6p$ sub-configurations built on the lowest term ^7F of the $4f^6$ core. Several levels with low J values, assumed to give rise to weak transitions, were missing in these sub-configurations.

First estimates of the oscillator strengths in Eu III spectrum were made by Ryabchikova et al. (1999) from the spectra of some CP2 stars. Using europium abundances obtained from Eu II transition at 6645.11 Å and assuming local thermodynamic equilibrium (LTE), they were able to derive "astrophysical" oscillator strengths for four Eu III lines. Later, Mashonkina et al. (2002) calculated oscillator strengths and transition probabilities for the $4f^7 - (4f^6 5d + 4f^6 6s)$ transitions in Eu III using the Cowan (1981) code. Relativistic Hartree-Fock (HFR) energies were modified by a fitting to the experimental ones but transition integrals were kept at their HFR values in the calculations. These calculations led to transition probabilities lower than the astrophysical transition probabilities by about two orders of magnitude. However, in a comparison with the lifetime measurements of the 5d ^8P term levels (Zhang et al. 2000; Den Hartog et al. 2002), it was concluded that the calculated absolute transition probabilities could be overestimated by a factor of 3. Later, calculations of the Eu III spectrum were performed by Quinet & Biémont (2003). In addition to the approach by Mashonkina et al. (2002), the core polarisation effects were included in the calculations leading to a modification of ab initio transition integrals. As a result, about 10% deviation of calculated lifetimes for the 5d ^8P term levels from the most accurate measurements (Den Hartog et al. 2002) was achieved. Calculated by Quinet & Biémont (2003), oscillator strengths for about 900 lines can be found in the DREAM data base created at Mons University (Biémont et al. 1999).

We present here the results of new calculations of the Eu III spectrum. Improved predictions of the energy levels and relative transition probabilities were performed using scaling factors for HFR integrals and a set of effective parameters accounting for the interactions with the far lying configurations obtained from the generalized least-squares fit (GLS) studies along the sequence of doubly-ionized lanthanides. An absolute scale of transition probabilities was established by scaling of transition integrals by the factors extrapolated from the lanthanide ion spectra where lifetime measurements are available. Starting from the known levels and unclassified lines of Sugar & Spector (1974) and based on our calculations of transition probabilities, new energy levels of Eu III were determined.

2. Results and discussion

As mentioned above, a limited number of levels are known in the ground $4f^7$ configuration and the $4f^6(^7F)5d$, $4f^6(^7F)6s$,

⋆ Table 5 is also available in electronic form at the CDS via anonymous ftp to cdsarc.u-strasbg.fr (130.79.128.5) or via http://cdsweb.u-strasbg.fr/cgi-bin/qcat?J/A+A/483/339

Table 1. Additional new classifications for Eu III.

Wavelength[a] (Å)	Int.[a]	g_uA[b] s^{-1}	Wavenumber[a] cm^{-1}	Upper level E cm^{-1}	Upper level Parity, J	Lower level E cm^{-1}	Lower level Parity, J	$\log(g_lf)$[c]
2173.592	10	5.287(8)	45 992.37	83 009	(o) 1.5	37 017	(e) 2.5	–0.425
2173.592	10	2.677(7)	45 992.37	82 954	(o) 4.5	36 962	(e) 5.5	–1.723
2184.972	2	1.951(8)	45 752.85	85 114	(o) 1.5	39 361	(e) 1.5	–0.854
2211.603	3	2.223(8)	45 201.97	84 563	(o) 0.5	39 361	(e) 1.5	–0.787
2223.127	10	3.772(8)	44 967.70	81 985	(o) 3.5	37 017	(e) 2.5	–0.552
2235.168	10	4.360(8)	44 725.48	82 954	(o) 4.5	38 229	(e) 3.5	–0.485
2236.321	3	2.148(6)	44 702.42	83 928	(o) 5.5	39 225	e) 4.5	–2.79
2269.453	5	2.091(8)	44 049.86	81 067	(o) 2.5	37 017	(e) 2.5	–0.790
2282.657	4	3.318(6)	43 795.08	83 928	(o) 5.5	40 133	(e) 5.5	–2.584
2337.443	3	2.283(6)	42 768.68	83 928	(o) 5.5	41 159	(e) 4.5	–2.727
2342.966	5	5.180(7)	42 667.88	74 847	(e) 6.5	32 179	(o) 5.5	–1.372
2350.382	10	3.958(7)	42 533.26	74 847	(e) 6.5	32 314	(o) 6.5	–1.486
2363.758	20	5.183(7)	42 292.59	74 246	(e) 5.5	31 954	(o) 4.5	–1.361
2376.423	10	5.027(7)	42 067.21	74 246	(e) 5.5	32 179	(o) 5.5	–1.370
2383.617	10	4.738(6)	41 940.25	83 928	(o) 5.5	41 987	(e) 5.5	–2.39
2389.107	20	6.415(6)	41 843.89	83 928	(o) 5.5	42 084	(e) 4.5	–2.259
2394.658	10	1.485(8)	41 746.89	80 253	(o) 1.5	38 506	(e) 0.5	–0.894
2407.300	20	5.566(7)	41 527.67	73 481	(e) 4.5	31 954	(o) 4.5	–1.313
2408.318	20	8.947(7)	41 510.13	73 583	(e) 7.5	32 073	(o) 8.5	–1.105
2420.435	2	1.817(7)	41 302.34	73 481	(e) 4.5	32 179	(o) 5.5	–1.795
2422.002	30	1.452(8)	41 275.62	73 583	(e) 7.5	32 307	(o) 7.5	–0.891
2426.733	5	7.473(4)	41 195.16	86 933	(o) 1.5	45 738	(e) 0.5	–4.178
2428.284	2	1.359(8)	41 168.84	86 933	(o) 1.5	45 765	(e) 1.5	–0.920
2433.646	10	1.301(6)	41 078.14	83 928	(o) 5.5	42 850	(e) 6.5	–2.936
2436.394	20	1.545(7)	41 031.82	73 339	(e) 6.5	32 314	(o) 6.5	–1.862
2436.772	10	7.519(6)	43 025.46	73 339	(e) 6.5	32 314	(o) 6.5	–2.174
2440.669	50	1.585(8)	40 959.95	73 033	(e) 8.5	32 073	(o) 8.5	–0.850
2441.710	3	1.424(8)	40 942.33	82 101	(o) 4.5	41 159	(e) 4.5	–0.895
2442.416	2	5.323(7)	40 930.67	79 437	(o) 1.5	38 506	(e) 0.5	–1.323
2454.726	2	3.102(6)	40 725.42	73 033	(e) 8.5	32 307	(o) 7.5	–2.555
2470.198	7	1.720(8)	40 470.34	86 208	(o) 0.5	45 738	(e) 0.5	–0.801
2476.447	20	6.721(7)	40 368.24	72 547	(e) 5.5	32 179	(o) 5.5	–1.208
2477.988	5	6.848(6)	40 343.14	72 416	(e) 7.5	32 073	(o) 8.5	–2.196
2484.735	2	1.065(7)	40 233.60	72 547	(e) 5.5	32 314	(o) 6.5	–2.005
2490.495	10	3.346(8)	40 140.55	87 820	(o) 2.5	47 680	(e) 1.5	–0.510
2492.481	10	2.174(7)	40 108.57	72 416	(e) 7.5	32 307	(o) 7.5	–1.691
2492.878	1	8.152(6)	40 102.19	72 416	(e) 7.5	32 314	(o) 6.5	–2.117
2505.507	2	4.984(7)	39 900.06	81 059	(o) 0.5	41 159	(e) 4.5	–1.329
2511.474	1	7.602(6)	39 805.27	71 984	(e) 6.5	32 179	(o) 5.5	–2.140
2519.596	2	6.734(6)	39 676.97	71 984	(e) 6.5	32 307	(o) 7.5	–2.190
2519.996	5	8.974(6)	39 670.66	71 984	(e) 6.5	32 314	(o) 6.5	–2.066
2560.474	5	1.819(8)	39 043.56	90 155	(o) 5.5	51 111	(e) 4.5	–0.745
2562.179	1	9.954(7)	39 017.58	85 114	(o) 1.5	46 096	(e) 0.5	–1.009
2562.993	5	1.495(8)	39 005.19	85 114	(o) 1.5	46 108	(e) 2.5	–0.831
2574.907	5	2.672(7)	38 824.72	84 563	(o) 0.5	45 738	(e) 0.5	–1.574
2575.689	2	3.870(5)	38 812.93	67 013	(e) 2.5	28 200	(o) 3.5	–3.413
2576.660	5	1.254(8)	38 798.31	84 563	(o) 0.5	45 765	(e) 1.5	–0.904
2585.671	1	1.108(8)	38 663.11	87 820	(o) 2.5	49 157	(e) 1.5	–0.956
2594.711	10	1.068(8)	38 528.41	87 820	(o) 2.5	49 292	(e) 3.5	–0.972
2594.711	10	3.874(7)	38 528.41	86 208	(o) 0.5	47 680	(e) 1.5	–1.410
2594.758	20	5.528(8)	38 527.72	89 639	(o) 4.5	51 111	(e) 4.5	–0.251
2600.950	2	7.038(6)	38 436.00	70 615	(e) 5.5	32 179	(o) 5.5	–2.147
2604.442	10	9.814(6)	38 384.47	67 013	(e) 2.5	28 628	(o) 2.5	–2.002

Table 1. continued.

Wavelength[a] (Å)	Int.[a]	g_uA^b s^{-1}	Wavenumber[a] cm^{-1}	Upper level E cm^{-1}	Parity, J	Lower level E cm^{-1}	Parity, J	$\log(g_lf)^c$
2610.092	30	4.020(7)	38 301.38	70 615	(e) 5.5	32 314	(o) 6.5	–1.387
2613.747	2	4.390(7)	38 247.84	85 928	(o) 2.5	47 680	(e) 1.5	–1.350
2616.259	20	5.186(7)	38 211.11	70 284	(e) 7.5	32 073	(o) 8.5	–1.273
2623.327	20	3.918(7)	38 108.16	70 416	(e) 6.5	32 307	(o) 7.5	–1.392
2623.762	5	1.197(7)	38 101.85	70 416	(e) 6.5	32 314	(o) 6.5	–1.907
2632.417	2	1.654(7)	37 976.57	70 284	(e) 7.5	32 307	(o) 7.5	–1.766
2634.329	2	1.693(8)	37 949.02	86 208	(o) 0.5	48 259	(e) 0.5	–0.754
2634.909	4	3.515(8)	37 940.67	85 114	(o) 1.5	47 173	(e) 2.5	–0.437
2645.218	20	5.720(7)	37 792.81	69 866	(e) 7.5	32 073	(o) 8.5	–1.220
2646.416	1	1.927(8)	37 775.71	86 933	(o) 1.5	49 157	(e) 1.5	–0.695
2661.736	5	1.495(7)	37 558.29	69 866	(e) 7.5	32 307	(o) 7.5	–1.800
2674.444	4	5.194(8)	37 379.83	86 208	(o) 0.5	48 828	(e) 1.5	–0.253
2697.894	2	2.090(7)	37 054.96	88 166	(o) 4.5	51 111	(e) 4.5	–1.640
2698.194	5	8.164(7)	37 050.84	86 208	(o) 0.5	49 157	(e) 1.5	–1.051
2743.943	10	3.377(7)	36 433.12	68 506	(e) 8.5	32 073	(o) 8.5	–1.417
2755.124	20	6.153(8)	36 285.28	85 114	(o) 1.5	48 828	(e) 1.5	–0.154
2761.724	10	2.503(7)	36 198.58	68 506	(e) 8.5	32 307	(o) 7.5	–1.543
2792.514	20	1.165(7)	35 799.46	70 615	(e) 5.5	34 816	(o) 4.5	–1.867
2793.995	5	5.516(6)	35 780.49	84 938	(o) 2.5	49 157	(e) 1.5	–2.191
2797.512	2	5.510(6)	35 735.51	67 915	(e) 6.5	32 179	(o) 5.5	–2.189
2807.589	1	4.802(6)	35 607.26	67 915	(e) 6.5	32 307	(o) 7.5	–2.245
2808.091	10	3.090(7)	35 600.89	67 915	(e) 6.5	32 314	(o) 6.5	–1.437
2808.353	2	6.626(6)	35 597.58	67 905	(e) 7.5	32 307	(o) 7.5	–2.105
2808.857	5	2.277(7)	35 591.19	67 905	(e) 7.5	32 314	(o) 6.5	–1.569
2814.141	3	1.275(7)	35 524.36	67 478	(e) 4.5	31 954	(o) 4.5	–1.819
2821.780	3	1.960(7)	35 428.19	67 607	(e) 5.5	32 179	(o) 5.5	–1.633
2831.456	3	5.857(6)	35 307.13	67 261	(e) 5.5	31 954	(o) 4.5	–2.152
2832.106	1	4.191(6)	35 299.03	67 478	(e) 4.5	32 179	(o) 5.5	–2.298
2832.545	2	4.494(6)	35 293.56	67 607	(e) 5.5	32 314	(o) 6.5	–2.270
2848.551	5	1.289(7)	35 095.25	67 274	(e) 6.5	32 179	(o) 5.5	–1.805
2858.999	5	1.044(7)	34 967.00	67 274	(e) 6.5	32 307	(o) 7.5	–1.893
2860.619	3	1.437(6)	34 947.21	67 261	(e) 5.5	32 314	(o) 6.5	–2.755
2889.854	2	3.714(7)	34 593.68	85 705	(o) 3.5	51 111	(e) 4.5	–1.330
2956.347	4	6.533(6)	33 815.64	66 123	(e) 7.5	32 307	(o) 7.5	–2.071
2956.902	10	1.997(7)	33 809.30	66 123	(e) 7.5	32 314	(o) 6.5	–1.586
3000.500	3	4.759(6)	33 318.06	65 497	(e) 5.5	32 179	(o) 5.5	–2.186
3012.675	1	2.938(5)	33 183.43	65 497	(e) 5.5	32 314	(o) 6.5	–3.393
3032.839	40	1.634(7)	32 962.81	83 928	(o) 5.5	50 965	(e) 6.5	–1.646
7005.747	1	4.967(5)	14 280.06	49 086	(e) 5.5	34 816	(o) 4.5	–2.449
7750.594	2	7.669(5)	12 898.69	47 714	(e) 4.5	34 816	(o) 4.5	–2.166

[a] Experimental wavelengths, wavenumbers and intensities are from Sugar & Spector (1974).
[b] Weighted emission transition probabilities g_uA are noted as $m(n)$ for $m \times 10^n$.
[c] The last column refers to absorption oscillator strengths.

and $4f^6(^7F)6p$ sub-configurations built on the lowest term ^7F of the $4f^6$ core in the Eu III spectrum. In the parametric Racah-Slater approach the configurations $4f^N$ (N = 6 and 7) are described at the first order of perturbation theory by $F^k(4f, 4f)$ Slater integrals (k = 0, 2, 4, 6) to which effective parameters are added for considering the second-order configuration interaction effects, usually the $\alpha L(L + 1) + \beta G(G2) + \gamma G(R7)$ correction, accounting for double excitations (Rajnak & Wybourne 1963). The spin-dependent interactions are limited to the spin-orbit operator. The $F^k(4f, nl)$ and $G^k(4f, nl)$ Slater integrals are added in the $4f^6nl$ configurations. Second-order configuration interactions for the 4f–nl space in the Cowan code (Cowan 1981) are treated using $F^k(4f, nl)$ and $G^k(4f, nl)$ Slater integrals of illegal ranks as parameters. The most important interactions are expected with the levels of the doubly-excited group $4f^5(5d^2, 5d6s, 6s^2)$. According to Brewer (1971), they should be located above $102\,000 \pm 6000$ cm^{-1} and therefore their influence can be treated in effective configuration interaction parameter approach. But direct application of the parametric Racah-Slater method could not be provided for a reliable interpretation of the high-lying new energy levels in Eu III since the electrostatic energy parameters could only be determined from nine levels of three terms in the $4f^7$ configuration and only from one parent term ^7F in the $4f^6nl$ configurations. However, the predictions of the $4f^N$ high levels could be improved with the support of semi-empirical regularities within the Ln III period (Ln is a common name for all lanthanides), i.e. the N-dependence of radial integrals along the period, similar to Shadmi's

Table 2. Newly found energy levels of Eu III.

J	E_{exp} (cm^{-1})	Leading comp.[a]	E_{calc} (cm^{-1})	g_{calc}
$4f^7$				
4.5	34816.06	95% ^{6}D	34 783	1.548
5.5	83928.16	45% $^4_4$G	83 892	1.220
$4f^6(^7F)5d$				
2.5	37017.43	71% (^{7}F) ^{8}D	37 078	1.993
0.5	38506.60	68% (^{7}F) ^{8}G	38 477	0.023
1.5	39361.13	48% (^{7}F) ^{6}P	39 391	2.554
0.5	45738.36	43% (^{7}F) ^{6}D	45 827	1.504
1.5	45764.77	45% (^{7}F) ^{6}F	45 763	1.367
1.5	47680.44	49% (^{7}F) ^{6}D	47 540	1.451
1.5	49157.86	79% (^{7}F) ^{6}G	49 107	0.146
4.5	51111.47	69% (^{7}F) ^{6}G	51 186	1.311
7.5	64084.42?	81% (^{5}L) ^{6}L	64 066	1.020
5.5	64809.92?	51% (^{5}L) ^{6}K	64 667	0.921
4.5	64998.99?	19% (^{5}L) ^{4}I	64 982	1.006
5.5	65497.59	16% ($^5_6$D)^{6}F	65 294	1.060
7.5	66123.43	26% (^{5}L) ^{6}K	66 292	1.226
2.5	67013.00	10% ($^5_6$D)^{6}S	66 978	1.221
5.5	67261.35	11% (^{5}L) ^{6}I	67 298	1.071
6.5	67274.79	13% (^{5}L) ^{6}K	67 309	1.105
4.5	67478.58	22% (^{5}L) ^{6}I	67 514	1.055
5.5	67607.72	28% (^{5}L) ^{6}I	67 729	1.105
7.5	67905.35	14% (^{5}L) ^{6}I	67 898	1.168
6.5	67915.04	44% (^{5}L) ^{6}I	67 904	1.189
4.5	68392.15?	22% ($^5_6$H)^{6}I	68 558	0.845
8.5	68506.39	30% (^{5}L) ^{6}I	68 554	1.235
7.5	69866.09	22% (^{5}L) ^{6}I	69 907	1.224
7.5	70284.41	34% ($^5_6$H)^{6}H	70 361	1.235
6.5	70415.96	15% ($^5_6$F)^{6}H	70 371	1.205
5.5	70615.54	24% ($^5_6$H)^{6}H	70 652	1.199
6.5	71984.79	30% ($^5_6$I)^{6}K	71 861	1.042
7.5	72416.38	37% ($^5_6$I)^{6}K	72 324	1.143
5.5	72547.76	28% ($^5_6$I)^{6}I	72 504	1.052
8.5	73033.22	59% ($^5_6$I)^{6}I	73 166	1.250
6.5	73339.60	13% ($^5_6$F)^{6}G	73 347	1.168
4.5	73481.89	25% ($^5_6$I)^{6}I	73 429	0.845
7.5	73583.41	32% ($^5_6$I)^{6}I	73 474	1.257
5.5	74246.78	35% (^{5}K) ^{6}K	74 235	0.945
6.5	74847.41	36% (^{5}K) ^{6}L	74 944	1.052
$4f^6(^7F)6p$				
1.5	85114.01	32% (^{7}F) ^{8}F	85 120	1.431
0.5	86208.70	80% (^{7}F) ^{6}F	86 198	–0.445

[a] A subscript figure on the left side of the term designation stands for a seniority number.
? Level with ambiguous correspondence between E_{exp} and E_{calc}.

simultaneous treatment of several iron-group elements of the same ionic charge (Shadmi et al. 1968). This GLS fit method had already been applied to the $4f^{N-1}5d$ and $4f^{N-1}6s$ configurations in the second, third, and fourth spectra (Wyart & Bauche-Arnoult 1981). Previous works for the opposite parity had also shown its relevance for the $4f^{N-1}6p$ (Wyart 1978) and $4f^N$ (Wyart 1977) configurations. More recently, the first analysis of Dy III (Spector et al. 1997) and an extension in the Er III analysis (Wyart et al. 1997) brought additional levels, so we updated the GLS studies for $4f^N$ and $4f^{N-1}6p$. Detailed theoretical results will be reported in another publication.

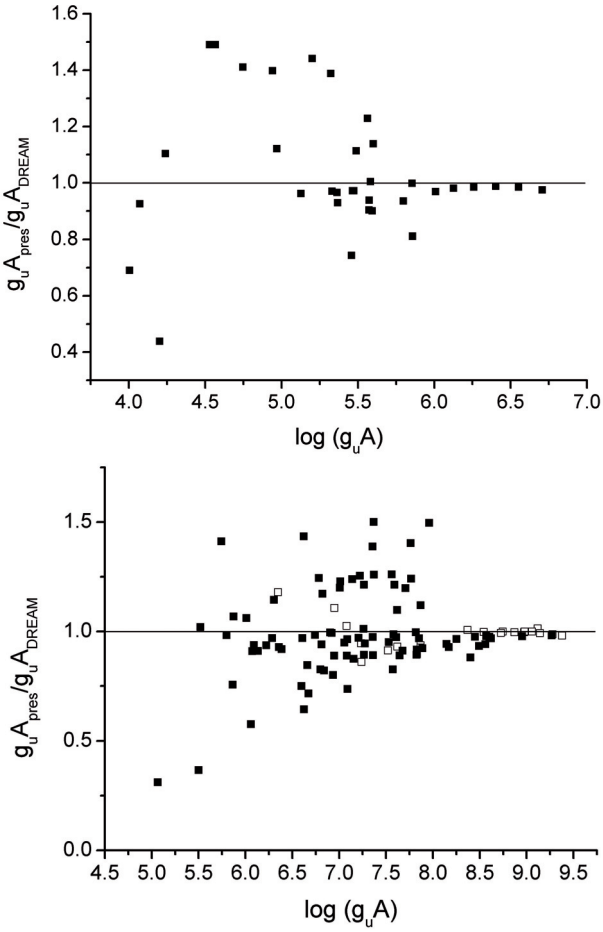

Fig. 1. *Upper panel*: comparison of the ratios of transition probabilities calculated in this work and taken from the DREAM database for all 34 lines of the $4f^7$–$4f^6$5d transitions listed in DREAM in the region 4600–9660 Å. The *lower panel* shows the same, but for the $4f^6$5d–$4f^6$6p (filled squares) and $4f^6$6s–$4f^6$6p (hollow squares) lines in the regions 2000–2100 Å and 3000–3100 Å.

Introduction of an extended set of effective parameters (α, β, and γ in the $4f^N$ configurations and F^1(4f, 5d) in $4f^6$5d) with values predicted from GLS studies, as well as GLS scaling factors for electrostatic parameters resulted in more accurate predictions of the Eu III spectrum than in previous calculations by Mashonkina et al. (2002). With these calculations, it was possible to extend the analysis of Eu III spectrum using the list of unclassified lines from the publication by Sugar & Spector (1974).

A total of ninety-three new classifications, extending those of Sugar & Spector (1974), are collected in Table 1. The general agreement between line intensities and gA transition probabilities supports the classifications. The present calculations helped to derive new levels given in Table 2. Among those levels are

- two levels that make the sub-configuration $4f^6(^7F)6p$ now complete;
- eight out of the nine levels of $4f^6(^7F)5d$ that were still missing (the level $4f^6(^7F)5d\ ^6F_{1/2}$ should be found from only one transition near 2501 Å where several lines are present);
- twenty seven levels of $4f^6$5d belonging to parent terms other than ^{7}F of the $4f^6$ sub-configuration with energies in the range 64 800–75 000 cm^{-1} decaying to two or three levels of the terms $4f^7\ ^6$I and ^{6}P;
- the level $4f^7\ ^6D_{9/2}$ determined from its three most probable transitions in the scheme of known levels;

Table 3. Classified lines of the level newly found at 83928.16 cm^{-1} and from the level at 83959.93 cm^{-1}.

		83928.16 cm^{-1} J = 5.5 (odd)				83959.93 cm^{-1} J = 5.5 (odd)			
Lower level (even)									
E (cm^{-1})	J	λ(Å)[a]	Int[a]	σ (cm^{-1})	g_uA[b]	λ(Å)[a]	Int[a]	σ (cm^{-1})	g_uA[b]
39 225	4.5	2236.321	3	44 702.42	2.148(6)	2234.732	2	44 734.20	3.173(8)
40 133	5.5	2282.657	4	43 795.08	3.318(6)	2281.002	8	43 826.85	7.283(8)
41 159	4.5	2337.443	3	42 768.68	2.283(6)	2335.710[c]	0	42 800.41	7.147(7)
41 987	5.5	2383.617	10	41 940.25	4.738(6)	2381.813	10	41 972.02	3.047(8)
42 084	4.5	2389.107	20	41 843.89	6.415(6)	2387.294	20	41 875.67	1.149(9)
42 850	6.5	2433.646	10	41 078.14	1.301(6)	2431.765	10	41 109.91	2.660(8)
50 965	6.5	3032.839	40	32 962.81	1.634(7)	3029.918	50	32 994.59	2.384(9)

[a] Wavelengths (in Å) and intensities in arbitrary units are from Sugar & Spector (1974).
[b] Weighted emission transition probabilities g_uA in s^{-1} are noted as $m(n)$ for $m \times 10^n$.
[c] The unobserved line at expected wavelength 23 35.710 Å is 0.051 Å above the closest measured line by Sugar & Spector (1974).

– the level 4f^7 $^4_4$G, where the subscript is a seniority number, whose identification needs some discussion.

A search from unclassified lines (Sugar & Spector 1974) had led to a new level at 83 928.16 cm^{-1} with unambiguous J-value of 11/2 based on transitions to some sextets and octets of the 4f^6(^{7}F)5d configuration. In its vicinity, only a 4f^6($^7F_6$)6p ^{8}D$_{11/2}$ was predicted, but had already been found by Sugar & Spector (1974) at a well-established value of 83 959.93 cm^{-1} with three first components in LS coupling 76% ^{8}D, 10% ^{6}F, and 8% ^{8}F. Therefore, the unique plausible identification of the new level at 83 928.16 cm^{-1}, was some high-lying term of the ground configuration 4f^7. However a study of the 4f^7 configuration, in which parameters were either fitted from ten known levels or fixed to values derived from GLS studies, shows that the high-lying terms of 4f^7 comprise mostly doublets and a few quartets and should not decay to the sextets and octets of the 4f^6(^{7}F)5d configuration. The 25th to 27th levels with J = 11/2 in Eu III 4f^7 are predicted at 79 512, 83 769 and 85 412 cm^{-1} which indicates that the Eu III level at 83 928 cm^{-1} is quite likely the 26th one. It must be 4f^7 $^4_4$G with three main LS components 44% $^4_4$G, 22% $^4_2$G, and 8% ^{2}H. Comparison of the classified lines for the two levels at 83 928 cm^{-1} and 83 959 cm^{-1} listed in Table 3 suggests that both levels have the same trends in branching ratios and that the level at 83 928 cm^{-1} borrows its radiative properties from its neighbour. Such a mixing behaviour, in the absence of a common LS term in the eigenfunctions, can only come from higher order CI effects, and it is usual, in these cases, that the parametric method fails to reproduce it adequately. Indeed, the present calculations of 4f^7 + 4f^{6}6p and 4f^{6}5d + 4f^{6}6s by means of the Cowan codes (Cowan 1981) lead to a configuration-sharing that underestimates the transition probabilities for the level at 83 928 cm^{-1}. Consequently the theoretical radiative data for this level should not be considered as reliable for diagnostic purposes.

Table 4 lists energy parameters of known configurations in Eu III obtained from the fitting with all known levels except for the questioned ones. In a comparison with Mashonkina et al. (2002), parameter γ, with a fixed value taken from GLS studies, was added to the set of effective parameters of the f^N shells, along with electrostatic direct interaction parameter of illegal rank F^1(4f, 5d) in the 4f^{6}5d configuration. Parametric calculations of the 4f^{6}6p configuration were not published by Mashonkina et al. (2002), but reported by Quinet & Biémont (2003) using only electrostatic Slater and spin-orbit parameters.

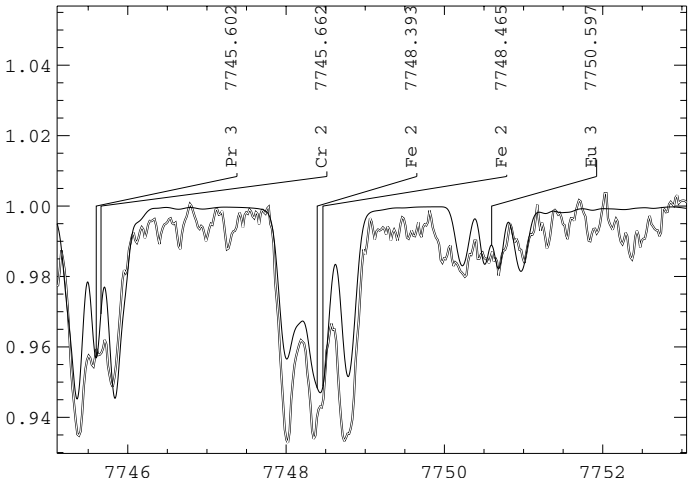

Fig. 2. Comparison between the observed spectrum of HD 144897 in the region of Eu III λ 7750.59 Å line (double line) and synthesized spectrum with the atomic parameters derived in the present work (full line).

In our present calculations of the 4f^{6}6p configuration, the same set of effective parameters as in 4f^{6}5d was used. An increased number of known terms in the 4f^7 and 4f^6 shells permitted all F^k(4f, 4f) (k = 2, 4, 6) parameters to be fitted in the 4f^7 and 4f^{6}5d configurations. In the 4f^{6}6p and 4f^{6}6s configurations where the levels of only the ^{7}F parent term are known, these parameters were fixed at Hartree-Fock ratios to the same parameters respectively in 4f^7 and 4f^{6}5d. The effective parameters α, β, and γ were fixed at the predetermined values, whereas F^1(4f, nl) were free at the fitting and converged to the well-defined values. In result, 48 even levels were fitted with 11 parameters and 97 odd levels with 15 parameters with the average deviations 26 and 72 cm^{-1}, respectively.

An analysis of the data for lanthanide atoms and first ions (Komarovskii 1991) has shown that ab initio calculations usually overestimate the transition probabilities by two or more times as was also the case in the calculations by Mashonkina et al. (2002), where HFR values were adopted for the dipole matrix elements. Substantial improvement in the calculations can be achieved by taking the core polarisation effects into account. But this technique does not work for transitions 4f^N–4f^{N-1}5d because of a collapse of the 4f orbital inside the 5s^{2}5p^6 closed

Table 4. Fitted (FIT) and Hartree-Fock (HFR) energy parameters (cm^{-1}) of the $4f^7$+$4f^6$6p and $4f^6$5d+$4f^6$6s configurations of Eu III and their ratios.

Parameter	FIT	HFR	FIT/HFR	Par. status[c]
$E_{av}(4f^7)$	77216(37)	96402	–19186[b]	
$F^2(4f, 4f)$	77906(199)	104872	0.743	r1
$F^4(4f, 4f)$	54316(286)	65418	0.830	r2
$F^6(4f, 4f)$	37152(127)	46956	0.791	r3
α	30			f
β	–823			f
γ	1268			f
$\zeta(4f)$	1035(27)	1294	0.800	
$E_{av}(4f^6 6p)$	145577(33)	148447	–2870[b]	
$F^2(4f, 4f)$	84201(215)	113345	0.743	r1
$F^4(4f, 4f)$	59056(311)	71126	0.830	r2
$F^6(4f, 4f)$	40488(139)	51172	0.791	r3
α	30			f
β	–823			f
γ	1268			f
$\zeta(4f)$	1311(4)	1411	0.929	
$\zeta(6p)$	2882(9)	2345	1.229	
$F^1(4f, 6p)$	250(57)			
$F^2(4f, 6p)$	5712(87)	7533	0.758	
$G^2(4f, 6p)$	1752(21)	1901	0.922	r4
$G^4(4f, 6p)$	1576(19)	1710	0.922	r4
$R^2(4f4f, 4f6p)$	–3605	–4241	0.85	f
$R^4(4f4f, 4f6p)$	–2250	–2647	0.85	f
σ[a]	26			
$E_{av}(4f^6 5d)$	104592(99)	106581	–1989[b]	
$F^2(4f, 4f)$	84147(438)	112625	0.747	r5
$F^4(4f, 4f)$	62970(689)	70639	0.891	r6
$F^6(4f, 4f)$	40477(602)	50813	0.796	r7
α	30			f
β	–823			f
γ	1268			f
$\zeta(4f)$	1320(10)	1405	0.940	
$\zeta(5d)$	909(19)	983	0.924	
$F^1(4f, 5d)$	1294(167)			
$F^2(4f, 5d)$	19382(122)	25828	0.750	
$F^4(4f, 5d)$	11440(270)	12422	0.921	
$G^1(4f, 5d)$	8299(79)	11893	0.698	
$G^3(4f, 5d)$	7288(223)	9535	0.764	
$G^5(4f, 5d)$	5092(199)	7239	0.703	
$E_{av}(4f^6 6s)$	111319(110)	114213	–2894[b]	
$F^2(4f, 4f)$	84659(440)	113265	0.747	r5
$F^4(4f, 4f)$	63255(693)	71072	0.891	r6
$F^6(4f, 4f)$	40732(606)	51133	0.796	r7
α	30			f
β	–823			f
γ	1268			f
$\zeta(4f)$	1316(16)	1410	0.933	
$G^3(4f, 6s)$	2091(47)	2770	0.755	
$R^2(4f5d, 4f6s)$	–239	–281	0.85	f
$R^2(4f5d, 6s4f)$	1819	2141	0.85	f
σ[a]	72			

[a] σ – an average deviation of the fitting. [b] The differences FIT-HFR are given for the average energies of the configurations. [c] r1 – r7 parameters are related to the corresponding HFR ratios; f – fixed parameter.

subshells (Biémont et al. 2001). Therefore, Quinet & Biémont (2003) calculated $4f^6$6p–$4f^6$(5d + 6s) transition probabilities accounting for core polarisation, while a scaling of HFR dipole matrix element was applied for $4f^7$–$4f^6$5d bringing into agreement calculated and measured lifetimes (Zhang et al. 2000) for the $4f^6(^7F)^8P$ levels. In the present work, we corrected the HFR values of the transition integrals calculated by means of the RCN code by Cowan (1981) using scaling factors as an effective treatment of core polarisation effects for all transitions. The chosen scaling factors are 0.55 for the 4f–5d transitions and 0.86 for the 6s–6p and 5d-6p transitions. The first scaling factor agrees with the Eu III experimental lifetimes measured by Zhang et al. (2000) and Den Hartog et al. (2002) (same as Quinet & Biémont 2003), while the second one fits measured values of the lifetimes for the 5d–6p transitions in the second spectra of several lanthanides, for example, in Nd III (Zhang et al. 2002a; calculations by Ryabchikova et al. 2006) and in Dy III (Zhang et al. 2002b; calculations by the present authors).

The results of our calculations for the known levels are presented in Table 5, which can be found after the references. For each transition between 2000–9000 Å, we give wavelength calculated from the experimental level energies (Ritz wavelength); weighted transition probability g_uA (higher than 10^5 s^{-1} for 2000–3360 Å and higher than 10^4 s^{-1} for 3360–9000 Å region) and logarithm of the oscillator strength $\log(g_l f)$ (where g_u and g_l are the statistic weights of the upper and lower levels, respectively); cancellation factor CF; energy of the lower level with its parity, g-factor Landé, level designation and J-value; the same for the upper level. A comparison of the results of our calculations for transition probabilities with those by Quinet & Biémont (2003) is shown in Fig. 1.

In the upper panel, the ratios of transition probabilities calculated in this work ($g_u A_{pres}$) and by Quinet & Biémont (2003) ($g_u A_{DREAM}$) for all 34 lines of the $4f^7$–$4f^6$5d transitions listed in DREAM for the region 4600–9660 Å are given as a function of their transition probabilities. The same quantities are shown in Fig. 1 (lower panel) but for the $4f^6$5d–$4f^6$6p and $4f^6$6s–$4f^6$6p lines, taken from the regions 2000–2100 Å and 3000–3100 Å. Very good agreement for the strong lines of the $4f^6$5d–$4f^6$6p and $4f^6$6s–$4f^6$6p transitions implies that core polarisation approach and a scaling of the transition integrals are equivalent in the calculation of the transition probabilities. Good agreement for the strong lines in the $4f^7$–$4f^6$5d case is expected due to using the same approach in treating the transition integrals in both calculations. Substantial differences in calculations are revealed for weak lines of all transition arrays. It should be noted that all lines with different $g_u A$ values in our calculations and those in Quinet & Biémont's (2003) have small cancellation factors CF < 0.2 (for a definition of CF see Cowan 1981, p. 432), and therefore the results of calculations depend critically on the accuracy of calculated composition of the levels in intermediate coupling. We hope that by using a larger set of energy parameters and having a larger number of levels for the fitting, our values for the transition probabilities for weak lines are more reliable. Calculated Landé g-factors listed in Table 5 are in good agreement with calculations by Quinet & Biémont (2004). More than a 5% difference exists only for two levels: 38 050.11 cm^{-1} $4f^6$5d J = 0.5 (19%) and 84 510.34 cm^{-1} $4f^6$6p J = 1.5 (12%). It is interesting to note that the g-factor of the first level is very sensitive to the calculation scheme. It has the value 2.568 in this work but 2.072 and 1.774 respectively in the calculations by Quinet & Biémont (2004) and Mashonkina et al. (2002). It has to be noted further that in these two publications an even level at 39574.00 cm^{-1} is listed by mistake. Indeed, it was a value calculated by Mashonkina et al. (2002). This level was found only in this work with the value 39 361.13 cm^{-1} (Table 2).

3. Astrophysical applications

Table 5 contains 1150 transitions only between experimentally known levels of Eu III. These data are very important for the abundance study of the rare-earth elements and, in particular, non-equilibrium line formation in the atmospheres of the chemically peculiar (Ap) stars (see Mashonkina et al. 2002, 2005). One of the newly classified Eu III lines, λ 7750.59 Å, has already been identified and used in Eu abundance determination in Ap star HD 144897 (Ryabchikova et al. 2006), supporting +5 dex Eu overabundance in its atmosphere. This line, together with four other strongest Eu III lines in the red spectral region at 6666.347, 6976.028, 7221.838, and 8379.183 Å, are the indicators of the Eu anomalies. Moreover, spectroscopic observations of the sharp-lined stars with strong magnetic fields help a lot in justifying the spectral line classification via the comparison of the resolved Zeeman patterns. Figure 2 shows a comparison between the observed and synthesized spectra for HD 144897 whose surface magnetic field is 8.8 kG. (For details of the observations and calculations see Ryabchikova et al. 2006.) Although Eu III λ 7750.59 Å is weak, a fairly good agreement between the observed and calculated spectral features supports the line classification and the calculated atomic parameters.

For some applications, such as a search for new levels, a full account of the line opacities in model atmosphere calculations, or non-LTE calculations (Mashonkina et al. 2002), an extended list of transitions including predicted levels can be a big help. Therefore we made a list of 23 827 lines in the region 2000–9995 Å available with transition probabilities for all transitions from the levels below 91 000 cm^{-1} on the websites http//das101.isan.troitsk.ru/files/spectra/Eu_III and http://molat.obspm.fr.

4. Conclusions

Recommended scaling factors of HFR integrals and average values of the two-body effective parameters derived by means of GLS techniques applied to the Ln III spectra are shown to be useful in the calculation of the Eu III spectrum. These new calculations support extensions of the Eu III analysis including two levels of $4f^7\ {}^6D$ and ${}^4_4G$ terms and more than ninety classified lines. The accidental perturbation shown in the two levels at 83 928 and 83 959 cm^{-1} should be a warning to users of theoretical g_uA values that low levels of excited configurations can be strongly perturbed by upper unknown levels of lower configurations. However, most of the oscillator strengths reported here should be useful for modelling astrophysical plasmas. For further extensions in this very complex spectrum, a much longer line list than the present one (Sugar & Spector 1974) would be needed.

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Table 5. Spectrum of Eu III.

Wavelength	$g_u A$	$\log(g_l f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.[a]	J	E cm^{-1}	g	Design.[a]	J
2001.084	2.185E+06	–2.879	–0.220	0.00 (o)	1.997	4f7 8S	3.5	49956.73 (e)	1.491	4f65d(7F)6D	4.5
2001.859	2.434E+07	–1.834	–0.040	38229.07 (e)	1.790	4f65d(7F)8D	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2002.260	3.555E+06	–2.669	–0.010	37017.43 (e)	1.993	4f65d(7F)8D	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2002.526	1.667E+06	–2.999	0.510	33856.22 (e)	–0.377	4f65d(7F)8H	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2002.713	3.288E+05	–3.703	–0.010	37017.43 (e)	1.993	4f65d(7F)8D	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2003.662	1.656E+07	–2.002	–0.070	38067.33 (e)	1.351	4f65d(7F)8H	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2003.808	4.175E+06	–2.601	–0.030	39289.69 (e)	1.385	4f65d(7F)8H	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2006.193	6.545E+07	–1.403	–0.270	35108.86 (e)	1.050	4f65d(7F)8H	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2007.471	4.139E+07	–1.602	–0.140	36962.29 (e)	1.298	4f65d(7F)8H	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2010.088	7.369E+07	–1.350	–0.230	35972.13 (e)	1.211	4f65d(7F)8H	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2013.740	1.602E+07	–2.012	0.830	38067.33 (e)	1.351	4f65d(7F)8H	6.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2013.992	6.627E+06	–2.395	0.070	40518.43 (e)	1.509	4f65d(7F)8F	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2018.258	7.689E+07	–1.328	0.650	35108.86 (e)	1.050	4f65d(7F)8H	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2018.419	1.229E+06	–3.123	0.030	39225.71 (e)	1.686	4f65d(7F)8D	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2019.232	1.776E+08	–0.964	0.640	35972.13 (e)	1.211	4f65d(7F)8H	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2019.304	5.510E+06	–2.471	0.080	40133.12 (e)	1.626	4f65d(7F)8D	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2024.354	1.872E+07	–1.939	0.700	34394.41 (e)	0.693	4f65d(7F)8H	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2026.932	2.801E+08	–0.763	0.690	36962.29 (e)	1.298	4f65d(7F)8H	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2027.291	4.701E+06	–2.536	–0.040	35627.36 (e)	2.575	4f65d(7F)8D	1.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2028.051	4.081E+05	–3.597	–0.150	0.00 (o)	1.997	4f7 8S	3.5	49292.56 (e)	1.475	4f65d(7F)6D	3.5
2033.797	1.919E+06	–2.924	0.790	33856.22 (e)	–0.377	4f65d(7F)8H	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2035.146	1.157E+05	–4.144	0.000	40518.43 (e)	1.509	4f65d(7F)8F	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2035.318	2.265E+06	–2.852	0.010	39636.88 (e)	1.492	4f65d(7F)8G	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2038.272	3.609E+08	–0.647	0.540	40133.12 (e)	1.626	4f65d(7F)8D	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2040.348	8.827E+06	–2.258	–0.140	41159.52 (e)	1.470	4f65d(7F)8G	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2040.811	2.263E+07	–1.850	0.140	39769.05 (e)	2.081	4f65d(7F)8P	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2041.244	3.690E+08	–0.638	0.790	38067.33 (e)	1.351	4f65d(7F)8H	6.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2042.631	6.279E+06	–2.404	–0.010	39225.71 (e)	1.686	4f65d(7F)8D	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2042.841	1.100E+05	–4.161	0.000	35627.36 (e)	2.575	4f65d(7F)8D	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2043.880	8.295E+05	–3.283	0.000	37017.43 (e)	1.993	4f65d(7F)8D	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2045.027	2.530E+05	–3.800	0.000	38050.11 (e)	2.639	4f65d(7F)8F	0.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2045.046	1.143E+06	–3.143	0.010	35627.36 (e)	2.575	4f65d(7F)8D	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2048.246	9.437E+05	–3.227	0.010	39014.36 (e)	1.333	4f65d(7F)8G	1.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2049.844	5.836E+07	–1.435	0.230	40870.60 (e)	1.883	4f65d(7F)8P	3.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2051.294	6.660E+07	–1.375	0.090	39225.71 (e)	1.686	4f65d(7F)8D	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2052.066	7.298E+05	–3.336	0.000	38229.07 (e)	1.790	4f65d(7F)8D	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2053.250	1.585E+07	–1.998	–0.050	37017.43 (e)	1.993	4f65d(7F)8D	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2054.063	1.477E+08	–1.030	0.580	35972.13 (e)	1.211	4f65d(7F)8H	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2054.075	3.367E+07	–1.671	0.630	35108.86 (e)	1.050	4f65d(7F)8H	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2056.241	3.161E+05	–3.699	0.000	38316.66 (e)	1.616	4f65d(7F)8F	1.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2056.315	4.032E+06	–2.592	0.710	34394.41 (e)	0.693	4f65d(7F)8H	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2057.514	3.885E+07	–1.608	0.120	39579.66 (e)	1.518	4f65d(7F)8F	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2057.725	1.376E+07	–2.059	0.080	41573.22 (e)	1.511	4f65d(7F)8F	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2059.879	5.510E+05	–3.454	0.000	38229.07 (e)	1.790	4f65d(7F)8D	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2060.447	4.155E+08	–0.578	0.590	36962.29 (e)	1.298	4f65d(7F)8H	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2062.062	1.357E+06	–3.063	0.010	41159.52 (e)	1.470	4f65d(7F)8G	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2062.905	1.371E+07	–2.057	–0.170	39361.13 (e)	2.554	4f65d(7F)6P	1.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2064.307	1.380E+06	–3.055	0.020	38506.60 (e)	0.023	4f65d(7F)8G	0.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2064.583	3.993E+08	–0.594	1.000	39289.69 (e)	1.385	4f65d(7F)8H	7.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2066.233	6.452E+06	–2.384	0.040	40371.65 (e)	1.468	4f65d(7F)8G	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2072.250	1.201E+07	–2.112	0.070	39579.66 (e)	1.518	4f65d(7F)8F	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2072.521	8.574E+06	–2.258	0.060	40518.43 (e)	1.509	4f65d(7F)8F	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2073.394	8.932E+08	–0.240	0.650	38067.33 (e)	1.351	4f65d(7F)8H	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2074.712	4.551E+06	–2.532	0.030	39636.88 (e)	1.492	4f65d(7F)8G	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2075.442	1.223E+07	–2.102	–0.090	41987.90 (e)	1.466	4f65d(7F)8G	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2075.811	4.807E+05	–3.508	0.010	38050.11 (e)	2.639	4f65d(7F)8F	0.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2076.198	4.743E+07	–1.512	–0.130	35627.36 (e)	2.575	4f65d(7F)8D	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2077.637	5.094E+07	–1.483	0.120	38828.56 (e)	1.543	4f65d(7F)8F	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2078.125	1.130E+07	–2.136	0.060	38828.56 (e)	1.543	4f65d(7F)8F	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2079.603	1.396E+08	–1.043	0.410	42084.25 (e)	1.768	4f65d(7F)8P	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2079.812	4.198E+06	–2.565	0.040	41573.22 (e)	1.511	4f65d(7F)8F	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2080.419	2.343E+07	–1.819	–0.230	39769.05 (e)	2.081	4f65d(7F)8P	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2081.225	3.948E+06	–2.589	0.020	40133.12 (e)	1.626	4f65d(7F)8D	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2083.200	3.294E+05	–3.669	0.240	35972.13 (e)	1.211	4f65d(7F)8H	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2086.105	3.282E+05	–3.668	0.000	37017.43 (e)	1.993	4f65d(7F)8D	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2086.183	7.974E+06	–2.284	0.080	39014.36 (e)	1.333	4f65d(7F)8G	1.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2087.365	5.164E+06	–2.473	0.050	38316.66 (e)	1.616	4f65d(7F)8F	1.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2087.766	1.832E+07	–1.922	–0.220	40870.60 (e)	1.883	4f65d(7F)8P	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2088.947	3.736E+07	–1.612	–0.190	40897.66 (e)	2.045	4f65d(7F)6P	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2089.385	7.459E+05	–3.311	0.220	35108.86 (e)	1.050	4f65d(7F)8H	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2090.219	3.101E+08	–0.691	–0.600	40133.12 (e)	1.626	4f65d(7F)8D	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2091.613	6.721E+07	–1.356	–0.310	40371.65 (e)	1.468	4f65d(7F)8G	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2093.504	1.847E+09	0.083	0.750	39289.69 (e)	1.385	4f65d(7F)8H	7.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2094.930	6.874E+06	–2.343	0.020	39225.71 (e)	1.686	4f65d(7F)8D	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2095.123	1.678E+06	–2.959	–0.330	0.00 (o)	1.997	4f7 8S	3.5	47714.74 (e)	1.452	4f65d(7F)6F	4.5
2095.678	2.004E+06	–2.880	0.030	38506.60 (e)	0.023	4f65d(7F)8G	0.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2095.804	1.644E+06	–2.964	0.010	38229.07 (e)	1.790	4f65d(7F)8D	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2097.914	1.026E+07	–2.169	0.080	41987.90 (e)	1.466	4f65d(7F)8G	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2098.056	2.327E+07	–1.814	0.050	40518.43 (e)	1.509	4f65d(7F)8F	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2099.154	9.286E+06	–2.211	–0.010	37017.43 (e)	1.993	4f65d(7F)8D	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2099.661	3.632E+07	–1.621	0.090	38316.66 (e)	1.616	4f65d(7F)8F	1.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2099.939	9.085E+07	–1.222	–0.310	41573.22 (e)	1.511	4f65d(7F)8F	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2100.442	1.014E+07	–2.173	0.070	41159.52 (e)	1.470	4f65d(7F)8G	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5

Table 5. continued.

Wavelength	g_uA	$\log(g_i f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2100.583	1.022E+06	–3.170	0.200	34394.41 (e)	0.693	4f65d(7F)8H	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2101.392	1.938E+07	–1.891	0.280	39361.13 (e)	2.554	4f65d(7F)6P	1.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2102.165	8.292E+06	–2.260	–0.190	42084.25 (e)	1.768	4f65d(7F)8P	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2103.073	2.511E+08	–0.777	–0.470	39225.71 (e)	1.686	4f65d(7F)8D	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2103.512	1.215E+07	–2.094	0.530	36962.29 (e)	1.298	4f65d(7F)8H	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2104.736	1.812E+07	–1.920	0.050	42658.20 (e)	1.520	4f65d(7F)8F	6.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2104.910	9.651E+05	–3.192	0.010	37017.43 (e)	1.993	4f65d(7F)8D	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2105.658	4.401E+07	–1.533	–0.230	38229.07 (e)	1.790	4f65d(7F)8D	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2106.844	6.060E+06	–2.394	0.040	40371.65 (e)	1.468	4f65d(7F)8G	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2107.197	5.769E+07	–1.416	–0.120	40518.43 (e)	1.509	4f65d(7F)8F	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2109.830	6.742E+07	–1.345	0.230	35627.36 (e)	2.575	4f65d(7F)8D	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2110.587	2.919E+06	–2.710	0.000	39579.66 (e)	1.518	4f65d(7F)8F	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2113.140	1.445E+08	–1.015	–0.350	39636.88 (e)	1.492	4f65d(7F)8G	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2113.645	3.528E+06	–2.627	0.020	39636.88 (e)	1.492	4f65d(7F)8G	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2114.562	2.671E+07	–1.747	0.510	35972.13 (e)	1.211	4f65d(7F)8H	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2115.694	2.121E+07	–1.846	0.030	38229.07 (e)	1.790	4f65d(7F)8D	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2117.478	9.330E+05	–3.202	–0.240	33856.22 (e)	–0.377	4f65d(7F)8H	1.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2118.228	1.199E+05	–4.093	0.000	39014.36 (e)	1.333	4f65d(7F)8G	1.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2118.395	1.549E+08	–0.982	0.740	41987.90 (e)	1.466	4f65d(7F)8G	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2118.852	4.523E+06	–2.517	–0.010	39579.66 (e)	1.518	4f65d(7F)8F	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2119.061	7.107E+06	–2.321	–0.010	39769.05 (e)	2.081	4f65d(7F)8P	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2119.569	4.284E+06	–2.540	0.080	39769.05 (e)	2.081	4f65d(7F)8P	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2122.099	1.452E+08	–1.008	–0.250	42530.91 (e)	1.746	4f65d(7F)6P	3.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2122.483	4.209E+06	–2.547	–0.010	38828.56 (e)	1.543	4f65d(7F)8F	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2124.099	2.515E+07	–1.770	–0.110	38050.11 (e)	2.639	4f65d(7F)8F	0.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2124.440	1.325E+08	–1.046	0.290	39225.71 (e)	1.686	4f65d(7F)8D	4.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2124.694	4.312E+09	0.464	1.000	40659.41 (e)	1.409	4f65d(7F)8H	8.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2126.674	9.968E+07	–1.170	–0.260	41159.52 (e)	1.470	4f65d(7F)8G	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2127.094	4.112E+06	–2.555	0.400	36962.29 (e)	1.298	4f65d(7F)8H	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2127.305	3.789E+07	–1.590	0.510	35108.86 (e)	1.050	4f65d(7F)8H	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2127.780	8.140E+06	–2.258	0.360	35972.13 (e)	1.211	4f65d(7F)8H	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2128.533	1.239E+06	–3.074	0.520	36962.29 (e)	1.298	4f65d(7F)8H	5.5	83928.16 (o)	1.220	4f7 4G4	5.5
2129.236	2.797E+06	–2.721	0.140	40870.60 (e)	1.883	4f65d(7F)8P	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2130.464	2.787E+07	–1.722	0.260	40897.66 (e)	2.045	4f65d(7F)6P	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2130.890	1.217E+08	–1.082	–0.450	39014.36 (e)	1.333	4f65d(7F)8G	1.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2131.150	2.089E+08	–0.845	0.800	40133.12 (e)	1.626	4f65d(7F)8D	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2132.590	1.501E+07	–1.990	0.040	38828.56 (e)	1.543	4f65d(7F)8F	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2132.603	1.112E+07	–2.120	0.350	35108.86 (e)	1.050	4f65d(7F)8H	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2133.909	8.941E+06	–2.213	–0.320	39361.13 (e)	2.554	4f65d(7F)6P	1.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2136.066	2.260E+08	–0.811	0.560	41159.52 (e)	1.470	4f65d(7F)8G	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2136.199	2.001E+07	–1.864	0.120	38316.66 (e)	1.616	4f65d(7F)8F	1.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2136.381	3.318E+05	–3.646	–0.220	0.00 (o)	1.997	4f7 8S	3.5	46793.38 (e)	1.433	4f65d(7F)6F	3.5
2137.927	3.638E+07	–1.602	–0.160	37017.43 (e)	1.993	4f65d(7F)8D	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2140.225	3.418E+07	–1.628	0.220	38229.07 (e)	1.790	4f65d(7F)8D	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2141.897	1.267E+07	–2.059	–0.380	34394.41 (e)	0.693	4f65d(7F)8H	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2142.066	5.830E+05	–3.397	0.100	42084.25 (e)	1.768	4f65d(7F)8P	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2142.255	4.018E+07	–1.558	0.550	34394.41 (e)	0.693	4f65d(7F)8H	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2144.006	7.644E+07	–1.276	0.420	40133.12 (e)	1.626	4f65d(7F)8D	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2144.247	3.159E+07	–1.663	0.160	38316.66 (e)	1.616	4f65d(7F)8F	1.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2144.906	7.319E+07	–1.297	0.460	38506.60 (e)	0.023	4f65d(7F)8G	0.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2145.559	1.844E+05	–3.895	0.000	41573.22 (e)	1.511	4f65d(7F)8F	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2146.483	1.248E+08	–1.065	–0.260	40371.65 (e)	1.468	4f65d(7F)8G	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2146.760	1.217E+08	–1.075	0.410	39361.13 (e)	2.554	4f65d(7F)6P	1.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2148.922	4.715E+08	–0.487	–0.310	42658.20 (e)	1.520	4f65d(7F)8F	6.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2149.262	7.206E+07	–1.302	0.360	38050.11 (e)	2.639	4f65d(7F)8F	0.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2150.814	1.174E+08	–1.088	0.470	39225.71 (e)	1.686	4f65d(7F)8D	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2151.702	1.796E+07	–1.905	0.150	38050.11 (e)	2.639	4f65d(7F)8F	0.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2153.270	3.355E+07	–1.633	–0.050	40518.43 (e)	1.509	4f65d(7F)8F	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2153.593	2.222E+08	–0.811	0.780	38067.33 (e)	1.351	4f65d(7F)8H	6.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2153.962	3.182E+08	–0.654	–0.590	38229.07 (e)	1.790	4f65d(7F)8D	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2154.618	1.006E+07	–2.154	–0.460	33856.22 (e)	–0.377	4f65d(7F)8H	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2155.032	1.429E+08	–1.002	0.330	40371.65 (e)	1.468	4f65d(7F)8G	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2155.118	1.716E+07	–1.923	–0.010	41573.22 (e)	1.511	4f65d(7F)8F	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2156.883	7.757E+07	–1.267	–0.110	39579.66 (e)	1.518	4f65d(7F)8F	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2157.823	4.092E+08	–0.544	0.480	42850.07 (e)	1.452	4f65d(7F)8G	6.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2159.277	2.841E+07	–1.702	0.630	33856.22 (e)	–0.377	4f65d(7F)8H	1.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2159.549	6.660E+07	–1.332	–0.150	39636.88 (e)	1.492	4f65d(7F)8G	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2159.802	3.721E+08	–0.585	0.750	36962.29 (e)	1.298	4f65d(7F)8H	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2159.827	8.892E+07	–1.207	0.170	38828.56 (e)	1.543	4f65d(7F)8F	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2161.286	4.170E+08	–0.533	–0.820	39225.71 (e)	1.686	4f65d(7F)8D	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2161.651	1.014E+08	–1.149	0.270	38316.66 (e)	1.616	4f65d(7F)8F	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2161.873	4.512E+07	–1.500	0.050	40518.43 (e)	1.509	4f65d(7F)8F	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2162.768	4.287E+07	–1.522	0.220	42530.91 (e)	1.746	4f65d(7F)6P	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2164.119	1.424E+06	–3.001	–0.010	38316.66 (e)	1.616	4f65d(7F)8F	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2164.828	3.552E+07	–1.602	–0.070	41987.90 (e)	1.466	4f65d(7F)8G	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2165.734	6.252E+07	–1.358	0.160	39769.05 (e)	2.081	4f65d(7F)8P	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2166.217	2.243E+08	–0.800	–0.860	40133.12 (e)	1.626	4f65d(7F)8D	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2167.120	4.422E+08	–0.507	0.750	35972.13 (e)	1.211	4f65d(7F)8H	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2167.320	8.630E+07	–1.216	0.200	39579.66 (e)	1.518	4f65d(7F)8F	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2168.054	1.502E+07	–1.976	0.070	38828.56 (e)	1.543	4f65d(7F)8F	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2168.533	5.444E+07	–1.416	0.310	39014.36 (e)	1.333	4f65d(7F)8G	1.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2169.354	1.037E+07	–2.135	–0.050	42084.25 (e)	1.768	4f65d(7F)8P	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2169.730	1.732E+06	–2.913	0.010	40870.60 (e)	1.883	4f65d(7F)8P	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5

Table 5. continued.

Wavelength	g_uA	$\log(g_l f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2170.013	2.790E+07	–1.706	0.090	39636.88 (e)	1.492	4f65d(7F)8G	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2170.566	2.881E+07	–1.692	0.120	38506.60 (e)	0.023	4f65d(7F)8G	0.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2171.005	3.250E+08	–0.639	0.550	40897.66 (e)	2.045	4f65d(7F)6P	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2171.538	1.036E+07	–2.135	–0.250	40897.66 (e)	2.045	4f65d(7F)6P	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2172.618	3.035E+07	–1.668	0.460	35972.13 (e)	1.211	4f65d(7F)8H	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2173.055	3.263E+06	–2.636	–0.030	38506.60 (e)	0.023	4f65d(7F)8G	0.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2173.594	2.677E+07	–1.723	0.510	36962.29 (e)	1.298	4f65d(7F)8H	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2173.605	5.287E+08	–0.425	0.990	37017.43 (e)	1.993	4f65d(7F)8D	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2174.560	3.410E+08	–0.616	0.300	41987.90 (e)	1.466	4f65d(7F)8G	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2175.198	3.130E+07	–1.653	–0.460	35108.86 (e)	1.050	4f65d(7F)8H	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2175.567	4.381E+08	–0.507	0.780	35108.86 (e)	1.050	4f65d(7F)8H	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2176.257	9.633E+05	–3.165	0.000	39769.05 (e)	2.081	4f65d(7F)8P	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2177.954	8.675E+07	–1.210	–0.100	39579.66 (e)	1.518	4f65d(7F)8F	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2178.318	1.779E+07	–1.898	0.580	38067.33 (e)	1.351	4f65d(7F)8H	6.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2178.466	3.131E+07	–1.652	0.120	40870.60 (e)	1.883	4f65d(7F)8P	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2179.128	5.755E+07	–1.387	0.330	42084.25 (e)	1.768	4f65d(7F)8P	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2179.827	5.089E+06	–2.440	0.800	38067.33 (e)	1.351	4f65d(7F)8H	6.5	83928.16 (o)	1.220	4f7 4G4	5.5
2179.906	2.739E+07	–1.709	–0.510	34394.41 (e)	0.693	4f65d(7F)8H	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2182.151	2.407E+07	–1.765	–0.030	38828.56 (e)	1.543	4f65d(7F)8F	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2183.423	3.009E+07	–1.667	–0.050	41159.52 (e)	1.470	4f65d(7F)8G	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2183.529	1.362E+07	–2.011	–0.590	33856.22 (e)	–0.377	4f65d(7F)8H	1.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2184.458	7.666E+07	–1.261	–0.110	40518.43 (e)	1.509	4f65d(7F)8F	4.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2184.676	3.693E+08	–0.578	0.820	34394.41 (e)	0.693	4f65d(7F)8H	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2184.922	2.722E+05	–3.709	–0.020	43885.27 (e)	0.842	4f65d(7F)6H	3.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2184.971	1.951E+08	–0.854	0.810	39361.13 (e)	2.554	4f65d(7F)6P	1.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2188.372	3.793E+07	–1.565	–0.150	38828.56 (e)	1.543	4f65d(7F)8F	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2190.589	7.935E+08	–0.243	0.670	42530.91 (e)	1.746	4f65d(7F)6P	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2192.238	6.360E+05	–3.337	–0.050	44553.80 (e)	1.083	4f65d(7F)6H	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2192.270	7.795E+07	–1.250	0.100	41159.52 (e)	1.470	4f65d(7F)8G	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2193.213	2.402E+08	–0.761	0.860	33856.22 (e)	–0.377	4f65d(7F)8H	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2193.391	4.722E+07	–1.467	0.470	39361.13 (e)	2.554	4f65d(7F)6P	1.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2194.384	1.613E+07	–1.934	–0.030	40371.65 (e)	1.468	4f65d(7F)8G	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2194.765	2.565E+06	–2.733	0.010	39014.36 (e)	1.333	4f65d(7F)8G	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2194.805	7.696E+08	–0.254	0.980	38229.07 (e)	1.790	4f65d(7F)8D	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2196.171	3.118E+08	–0.644	0.140	43658.96 (e)	1.444	4f65d(7F)8G	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2197.310	1.912E+07	–1.859	–0.170	39014.36 (e)	1.333	4f65d(7F)8G	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2198.221	1.120E+07	-2.091	0.020	39636.88 (e)	1.492	4f65d(7F)8G	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2198.657	1.083E+07	–2.105	–0.020	41573.22 (e)	1.511	4f65d(7F)8F	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2199.034	1.721E+06	–2.905	0.000	38316.66 (e)	1.616	4f65d(7F)8F	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2200.021	1.784E+08	–0.886	0.460	35627.36 (e)	2.575	4f65d(7F)8D	1.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2201.236	4.266E+08	–0.507	0.950	39225.71 (e)	1.686	4f65d(7F)8D	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2203.959	1.282E+07	–2.030	–0.050	39579.66 (e)	1.518	4f65d(7F)8F	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2204.010	3.517E+05	–3.591	–0.040	43395.75 (e)	0.309	4f65d(7F)6H	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2204.539	9.951E+07	–1.138	0.790	40133.12 (e)	1.626	4f65d(7F)8D	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2204.629	8.560E+06	–2.206	0.030	39769.05 (e)	2.081	4f65d(7F)8P	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2205.188	2.254E+05	–3.784	0.000	40371.65 (e)	1.468	4f65d(7F)8G	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2206.739	3.532E+08	–0.589	0.340	42658.20 (e)	1.520	4f65d(7F)8F	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2206.743	1.873E+07	–1.864	–0.080	39636.88 (e)	1.492	4f65d(7F)8G	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2207.301	9.478E+06	–2.159	–0.200	42530.91 (e)	1.746	4f65d(7F)6P	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2211.604	2.223E+08	–0.787	–0.970	39361.13 (e)	2.554	4f65d(7F)6P	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2211.843	1.488E+09	0.037	0.990	39289.69 (e)	1.385	4f65d(7F)8H	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2212.343	2.964E+08	–0.663	0.290	41573.22 (e)	1.511	4f65d(7F)8F	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2212.352	4.175E+07	–1.514	0.090	40518.43 (e)	1.509	4f65d(7F)8F	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2212.632	1.668E+09	0.087	0.980	38067.33 (e)	1.351	4f65d(7F)8H	6.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2213.201	1.560E+06	–2.941	0.010	39769.05 (e)	2.081	4f65d(7F)8P	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2214.188	6.538E+07	–1.317	–0.850	39361.13 (e)	2.554	4f65d(7F)6P	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2214.662	1.512E+09	0.046	0.970	36962.29 (e)	1.298	4f65d(7F)8H	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2215.345	4.843E+08	–0.448	1.000	33856.22 (e)	–0.377	4f65d(7F)8H	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
2216.126	7.882E+07	–1.236	0.050	42850.07 (e)	1.452	4f65d(7F)8G	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2216.198	2.892E+07	–1.672	0.040	40371.65 (e)	1.468	4f65d(7F)8G	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2217.226	1.246E+09	–0.037	0.980	35972.13 (e)	1.211	4f65d(7F)8H	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2217.324	9.468E+06	–2.155	–0.090	44553.80 (e)	1.083	4f65d(7F)6H	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2218.528	7.329E+07	–1.267	0.070	39579.66 (e)	1.518	4f65d(7F)8F	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2218.686	1.230E+05	–4.043	0.000	40870.60 (e)	1.883	4f65d(7F)8P	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2218.896	6.193E+07	–1.339	–0.130	41987.90 (e)	1.466	4f65d(7F)8G	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2218.969	1.231E+08	–1.042	0.360	42658.20 (e)	1.520	4f65d(7F)8F	6.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2219.330	9.587E+08	–0.150	0.990	35108.86 (e)	1.050	4f65d(7F)8H	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2219.421	6.938E+08	–0.290	1.000	34394.41 (e)	0.693	4f65d(7F)8H	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2220.020	2.684E+08	–0.703	–0.800	40897.66 (e)	2.045	4f65d(7F)6P	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2221.349	5.890E+07	–1.361	0.080	39636.88 (e)	1.492	4f65d(7F)8G	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2223.127	3.772E+08	–0.552	–0.470	37017.43 (e)	1.993	4f65d(7F)8D	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2223.433	1.479E+07	–1.960	–0.010	40518.43 (e)	1.509	4f65d(7F)8F	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2223.536	2.757E+07	–1.690	0.110	38050.11 (e)	2.639	4f65d(7F)8F	0.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2224.081	1.933E+08	–0.844	0.320	38828.56 (e)	1.543	4f65d(7F)8F	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2227.796	6.763E+06	–2.298	–0.030	39636.88 (e)	1.492	4f65d(7F)8G	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2227.893	7.544E+06	–2.251	0.020	39769.05 (e)	2.081	4f65d(7F)8P	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2228.058	1.045E+07	–2.108	–0.110	43885.27 (e)	0.842	4f65d(7F)6H	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2228.436	1.197E+06	–3.050	0.030	42084.25 (e)	1.768	4f65d(7F)8P	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2228.460	2.259E+08	–0.773	–0.970	42850.07 (e)	1.452	4f65d(7F)8G	6.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2229.395	1.170E+07	–2.058	–0.120	45313.75 (e)	1.213	4f65d(7F)6H	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2229.732	2.855E+07	–1.672	–0.130	40870.60 (e)	1.883	4f65d(7F)8P	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2231.078	1.261E+08	–1.026	0.510	40897.66 (e)	2.045	4f65d(7F)6P	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2232.835	1.579E+06	–2.927	0.000	41987.90 (e)	1.466	4f65d(7F)8G	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5

Table 5. continued.

Wavelength	g_uA	$\log(g_i f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2233.313	1.698E+07	–1.897	0.040	39014.36 (e)	1.333	4f65d(7F)8G	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2234.731	3.173E+08	–0.622	–0.410	39225.71 (e)	1.686	4f65d(7F)8D	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2235.164	4.360E+08	–0.485	–0.460	38229.07 (e)	1.790	4f65d(7F)8D	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2236.000	2.799E+08	–0.678	–0.200	41573.22 (e)	1.511	4f65d(7F)8F	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2236.319	2.148E+06	–2.791	–0.230	39225.71 (e)	1.686	4f65d(7F)8D	4.5	83928.16 (o)	1.220	4f7 4G4	5.5
2236.799	1.138E+08	–1.069	0.440	38316.66 (e)	1.616	4f65d(7F)8F	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2237.651	3.322E+07	–1.603	–0.230	42084.25 (e)	1.768	4f65d(7F)8P	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2240.140	2.751E+08	–0.682	–0.880	35627.36 (e)	2.575	4f65d(7F)8D	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2240.988	3.576E+07	–1.570	0.280	40870.60 (e)	1.883	4f65d(7F)8P	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2243.129	1.962E+07	–1.829	–0.080	40371.65 (e)	1.468	4f65d(7F)8G	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2244.195	2.750E+07	–1.682	–0.060	41159.52 (e)	1.470	4f65d(7F)8G	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2245.177	1.078E+07	–2.087	0.460	35627.36 (e)	2.575	4f65d(7F)8D	1.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2250.276	6.732E+06	–2.291	–0.140	43395.75 (e)	0.309	4f65d(7F)6H	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2250.751	4.364E+07	–1.479	0.170	39361.13 (e)	2.554	4f65d(7F)6P	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2250.849	3.030E+08	–0.638	–0.680	42530.91 (e)	1.746	4f65d(7F)6P	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2252.410	6.713E+08	–0.292	–0.610	42658.20 (e)	1.520	4f65d(7F)8F	6.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2253.908	1.319E+08	–0.996	–0.580	40133.12 (e)	1.626	4f65d(7F)8D	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2255.344	4.564E+07	–1.457	–0.150	45313.75 (e)	1.213	4f65d(7F)6H	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2255.598	1.633E+08	–0.904	0.130	41159.52 (e)	1.470	4f65d(7F)8G	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2256.935	1.201E+08	–1.037	0.090	41987.90 (e)	1.466	4f65d(7F)8G	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2257.596	2.602E+06	–2.700	–0.170	43885.27 (e)	0.842	4f65d(7F)6H	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2258.223	7.188E+07	–1.260	0.070	40371.65 (e)	1.468	4f65d(7F)8G	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2260.251	1.150E+08	–1.055	0.440	42530.91 (e)	1.746	4f65d(7F)6P	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2260.907	1.026E+08	–1.104	–0.550	40897.66 (e)	2.045	4f65d(7F)6P	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2261.761	4.091E+07	–1.502	–0.140	44553.80 (e)	1.083	4f65d(7F)6H	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2261.856	1.620E+07	–1.905	0.270	42084.25 (e)	1.768	4f65d(7F)8P	4.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2261.881	4.750E+08	–0.439	0.460	39579.66 (e)	1.518	4f65d(7F)8F	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2262.191	4.913E+06	–2.423	0.000	42850.07 (e)	1.452	4f65d(7F)8G	6.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2262.717	9.172E+07	–1.153	0.200	38828.56 (e)	1.543	4f65d(7F)8F	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2265.736	1.059E+09	–0.089	0.740	40518.43 (e)	1.509	4f65d(7F)8F	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2268.529	6.268E+06	–2.316	0.100	40870.60 (e)	1.883	4f65d(7F)8P	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2269.385	8.621E+08	–0.173	–0.880	43658.96 (e)	1.444	4f65d(7F)8G	7.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2269.453	2.091E+08	–0.790	–0.700	37017.43 (e)	1.993	4f65d(7F)8D	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2269.855	1.468E+07	–1.944	0.220	37017.43 (e)	1.993	4f65d(7F)8D	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2269.923	1.039E+08	–1.095	–0.870	40897.66 (e)	2.045	4f65d(7F)6P	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2270.860	7.597E+06	–2.230	–0.040	39225.71 (e)	1.686	4f65d(7F)8D	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2271.408	1.982E+08	–0.812	0.960	35627.36 (e)	2.575	4f65d(7F)8D	1.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2271.616	1.488E+08	–0.939	–0.310	39769.05 (e)	2.081	4f65d(7F)8P	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2271.809	8.962E+07	–1.157	–0.260	46150.85 (e)	1.294	4f65d(7F)6H	6.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2272.274	3.612E+05	–3.554	0.000	39014.36 (e)	1.333	4f65d(7F)8G	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2275.350	3.315E+07	–1.588	–0.150	43885.27 (e)	0.842	4f65d(7F)6H	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2276.853	1.244E+09	–0.015	0.910	41573.22 (e)	1.511	4f65d(7F)8F	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2278.614	3.972E+06	–2.509	0.030	38229.07 (e)	1.790	4f65d(7F)8D	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2279.030	3.442E+06	–2.571	0.170	45313.75 (e)	1.213	4f65d(7F)6H	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2281.004	7.283E+08	–0.243	–0.520	40133.12 (e)	1.626	4f65d(7F)8D	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2281.889	2.178E+07	–1.767	–0.950	35627.36 (e)	2.575	4f65d(7F)8D	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2282.659	3.318E+06	–2.584	–0.240	40133.12 (e)	1.626	4f65d(7F)8D	5.5	83928.16 (o)	1.220	4f7 4G4	5.5
2283.967	1.216E+08	–1.022	–0.530	40870.60 (e)	1.883	4f65d(7F)8P	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2284.693	1.802E+07	–1.850	0.040	38229.07 (e)	1.790	4f65d(7F)8D	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2285.380	4.890E+07	–1.417	0.180	40897.66 (e)	2.045	4f65d(7F)6P	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2286.111	1.096E+08	–1.065	–0.130	39225.71 (e)	1.686	4f65d(7F)8D	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2290.328	6.386E+07	–1.298	–0.330	39361.13 (e)	2.554	4f65d(7F)6P	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2291.617	7.339E+08	–0.239	0.980	42658.20 (e)	1.520	4f65d(7F)8F	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2291.775	6.677E+06	–2.279	0.160	42084.25 (e)	1.768	4f65d(7F)8P	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2292.205	3.369E+07	–1.576	0.470	40897.66 (e)	2.045	4f65d(7F)6P	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2292.206	2.256E+07	–1.749	–0.200	44553.80 (e)	1.083	4f65d(7F)6H	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2295.552	1.910E+06	–2.821	–0.200	43395.75 (e)	0.309	4f65d(7F)6H	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2296.148	2.159E+07	–1.768	–0.200	43395.75 (e)	0.309	4f65d(7F)6H	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2298.564	2.100E+08	–0.778	0.140	41987.90 (e)	1.466	4f65d(7F)8G	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2299.145	2.886E+07	–1.641	0.020	41159.52 (e)	1.470	4f65d(7F)8G	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2301.238	4.754E+07	–1.423	0.230	40518.43 (e)	1.509	4f65d(7F)8F	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2301.742	7.996E+08	–0.196	0.530	42850.07 (e)	1.452	4f65d(7F)8G	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2302.922	4.460E+05	–3.450	0.070	40518.43 (e)	1.509	4f65d(7F)8F	4.5	83928.16 (o)	1.220	4f7 4G4	5.5
2303.120	6.265E+06	–2.301	0.190	44553.80 (e)	1.083	4f65d(7F)6H	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2303.156	1.488E+06	–2.927	0.000	40371.65 (e)	1.468	4f65d(7F)8G	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2303.577	6.634E+07	–1.277	0.460	42530.91 (e)	1.746	4f65d(7F)6P	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2303.668	2.565E+07	–1.690	–0.320	42084.25 (e)	1.768	4f65d(7F)8P	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2304.375	1.321E+09	0.025	0.990	43658.96 (e)	1.444	4f65d(7F)8G	7.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2304.768	1.070E+08	–1.070	0.230	39579.66 (e)	1.518	4f65d(7F)8F	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2304.891	2.166E+07	–1.763	0.050	39636.88 (e)	1.492	4f65d(7F)8G	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2305.856	8.686E+06	–2.158	0.840	35627.36 (e)	2.575	4f65d(7F)8D	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
2311.937	4.194E+08	–0.474	0.740	39769.05 (e)	2.081	4f65d(7F)8P	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2312.168	3.337E+07	–1.571	0.110	37017.43 (e)	1.993	4f65d(7F)8D	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2315.487	8.015E+07	–1.190	–0.490	42530.91 (e)	1.746	4f65d(7F)6P	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2316.432	1.432E+08	–0.939	0.270	38828.56 (e)	1.543	4f65d(7F)8F	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2317.535	1.424E+07	–1.939	–0.700	37017.43 (e)	1.993	4f65d(7F)8D	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2318.657	1.023E+08	–1.082	0.740	40133.12 (e)	1.626	4f65d(7F)8D	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2321.651	3.083E+07	–1.602	–0.260	43885.27 (e)	0.842	4f65d(7F)6H	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2323.372	8.486E+07	–1.162	0.340	46150.85 (e)	1.294	4f65d(7F)6H	6.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2327.628	7.795E+06	–2.198	0.080	42530.91 (e)	1.746	4f65d(7F)6P	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2329.552	6.731E+07	–1.261	0.180	41573.22 (e)	1.511	4f65d(7F)8F	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2329.941	1.429E+08	–0.935	0.710	40870.60 (e)	1.883	4f65d(7F)8P	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2331.411	7.981E+07	–1.187	–0.300	40897.66 (e)	2.045	4f65d(7F)6P	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5

Table 5. continued.

Wavelength	$g_u A$	$\log(g_l f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2331.584	4.028E+07	–1.482	0.430	39225.71 (e)	1.686	4f65d(7F)8D	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2331.656	5.592E+06	–2.340	0.160	43885.27 (e)	0.842	4f65d(7F)6H	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2332.859	1.557E+08	–0.895	–0.430	45313.75 (e)	1.213	4f65d(7F)6H	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2333.236	8.430E+06	–2.161	0.010	46793.38 (e)	1.433	4f65d(7F)6F	3.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2333.649	2.571E+07	–1.677	–0.060	38229.07 (e)	1.790	4f65d(7F)8D	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2334.073	3.392E+05	–3.556	0.010	38229.07 (e)	1.790	4f65d(7F)8D	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2334.559	2.346E+08	–0.715	0.620	40133.12 (e)	1.626	4f65d(7F)8D	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2335.710	7.417E+07	–1.217	–0.490	41159.52 (e)	1.470	4f65d(7F)8G	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2337.445	2.283E+06	–2.727	–0.430	41159.52 (e)	1.470	4f65d(7F)8G	4.5	83928.16 (o)	1.220	4f7 4G4	5.5
2337.949	1.795E+08	–0.831	0.380	39225.71 (e)	1.686	4f65d(7F)8D	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2338.430	1.157E+08	–1.024	–0.270	38316.66 (e)	1.616	4f65d(7F)8F	1.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2339.567	1.635E+07	–1.873	0.040	40518.43 (e)	1.509	4f65d(7F)8F	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2342.967	5.180E+07	–1.372	–0.720	32179.55 (o)	1.037	4f7 6I	5.5	74847.41 (e)	1.052	4f65d(5K)6K	6.5
2344.165	1.196E+08	–1.005	0.360	45313.75 (e)	1.213	4f65d(7F)6H	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2344.241	1.507E+06	–2.905	0.000	46108.79 (e)	1.405	4f65d(7F)6F	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2347.637	1.577E+08	–0.885	–0.480	40371.65 (e)	1.468	4f65d(7F)8G	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2349.109	1.703E+07	–1.851	0.310	42084.25 (e)	1.768	4f65d(7F)8P	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2350.381	3.958E+07	–1.486	0.300	32314.14 (o)	1.159	4f7 6I	6.5	74847.41 (e)	1.052	4f65d(5K)6K	6.5
2350.421	2.789E+07	–1.636	–0.380	43395.75 (e)	0.309	4f65d(7F)6H	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2350.512	3.193E+07	–1.579	–0.590	0.00 (o)	1.997	4f7 8S	3.5	42530.91 (e)	1.746	4f65d(7F)6P	3.5
2352.284	2.847E+08	–0.626	–0.920	41987.90 (e)	1.466	4f65d(7F)8G	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2355.531	1.074E+05	–4.047	0.000	47714.74 (e)	1.452	4f65d(7F)6F	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2355.758	1.229E+08	–0.991	0.170	40518.43 (e)	1.509	4f65d(7F)8F	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2356.672	1.975E+06	–2.783	0.100	37017.43 (e)	1.993	4f65d(7F)8D	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2357.353	1.912E+07	–1.797	0.310	42530.91 (e)	1.746	4f65d(7F)6P	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2357.465	3.210E+07	–1.573	0.050	39579.66 (e)	1.518	4f65d(7F)8F	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2358.268	2.180E+08	–0.739	–0.530	44553.80 (e)	1.083	4f65d(7F)6H	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2358.509	1.744E+08	–0.837	0.340	41573.22 (e)	1.511	4f65d(7F)8F	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2360.278	2.257E+05	–3.724	0.020	41573.22 (e)	1.511	4f65d(7F)8F	5.5	83928.16 (o)	1.220	4f7 4G4	5.5
2360.651	1.740E+08	–0.838	–0.350	39636.88 (e)	1.492	4f65d(7F)8G	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2362.821	4.298E+06	–2.444	0.230	43395.75 (e)	0.309	4f65d(7F)6H	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2363.759	5.183E+07	–1.361	–0.750	31954.21 (o)	0.833	4f7 6I	4.5	74246.78 (e)	0.945	4f65d(5K)6K	5.5
2366.773	3.251E+06	–2.564	0.010	38828.56 (e)	1.543	4f65d(7F)8F	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2367.210	7.585E+06	–2.196	–0.020	38828.56 (e)	1.543	4f65d(7F)8F	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2368.042	2.224E+08	–0.729	0.390	39769.05 (e)	2.081	4f65d(7F)8P	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2368.591	1.200E+08	–0.994	0.380	44553.80 (e)	1.083	4f65d(7F)6H	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2368.750	6.762E+07	–1.246	–0.280	38050.11 (e)	2.639	4f65d(7F)8F	0.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2373.902	1.537E+07	–1.886	0.040	40897.66 (e)	2.045	4f65d(7F)6P	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2374.028	8.104E+06	–2.164	–0.060	42530.91 (e)	1.746	4f65d(7F)6P	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2374.084	1.760E+09	0.174	0.940	47069.87 (e)	1.349	4f65d(7F)6H	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2375.206	3.465E+08	–0.533	–0.820	41159.52 (e)	1.470	4f65d(7F)8G	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2375.461	2.670E+08	–0.647	-1.000	0.00 (o)	1.997	4f7 8S	3.5	42084.25 (e)	1.768	4f65d(7F)8P	4.5
2375.473	5.936E+08	–0.299	0.870	40870.60 (e)	1.883	4f65d(7F)8P	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2376.422	5.027E+07	–1.370	0.370	32179.55 (o)	1.037	4f7 6I	5.5	74246.78 (e)	0.945	4f65d(5K)6K	5.5
2377.230	2.626E+08	–0.653	0.880	39014.36 (e)	1.333	4f65d(7F)8G	1.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2377.790	2.288E+08	–0.711	–0.640	43885.27 (e)	0.842	4f65d(7F)6H	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2381.813	3.047E+08	–0.586	–0.800	41987.90 (e)	1.466	4f65d(7F)8G	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2382.000	2.165E+07	–1.733	–0.710	40133.12 (e)	1.626	4f65d(7F)8D	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2382.492	1.449E+08	–0.908	–0.120	46793.38 (e)	1.433	4f65d(7F)6F	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2383.617	4.738E+06	–2.393	–0.490	41987.90 (e)	1.466	4f65d(7F)8G	5.5	83928.16 (o)	1.220	4f7 4G4	5.5
2383.807	5.716E+07	–1.313	0.300	38316.66 (e)	1.616	4f65d(7F)8F	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2384.050	1.772E+05	–3.821	0.000	32314.14 (o)	1.159	4f7 6I	6.5	74246.78 (e)	0.945	4f65d(5K)6K	5.5
2384.517	1.103E+08	–1.026	–0.070	47714.74 (e)	1.452	4f65d(7F)6F	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2384.519	4.505E+06	–2.414	–0.200	38229.07 (e)	1.790	4f65d(7F)8D	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2387.293	1.149E+09	–0.007	0.990	42084.25 (e)	1.768	4f65d(7F)8P	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2389.106	6.415E+06	–2.259	0.690	42084.25 (e)	1.768	4f65d(7F)8P	4.5	83928.16 (o)	1.220	4f7 4G4	5.5
2389.511	1.279E+07	–1.962	–0.070	38316.66 (e)	1.616	4f65d(7F)8F	1.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2389.685	2.202E+07	–1.723	–0.650	39225.71 (e)	1.686	4f65d(7F)8D	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2389.982	3.668E+07	–1.503	0.040	42658.20 (e)	1.520	4f65d(7F)8F	6.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2390.481	1.221E+08	–0.979	0.470	43885.27 (e)	0.842	4f65d(7F)6H	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2391.104	1.356E+09	0.067	0.910	46150.85 (e)	1.294	4f65d(7F)6H	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2391.896	4.496E+08	–0.414	–0.760	41159.52 (e)	1.470	4f65d(7F)8G	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2394.654	1.485E+08	–0.894	0.920	38506.60 (e)	0.023	4f65d(7F)8G	0.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2395.289	2.984E+07	–1.588	0.670	31745.99 (o)	0.455	4f7 6I	3.5	73481.89 (e)	0.845	4f65d(5I)6I2	4.5
2395.616	2.910E+08	–0.602	–0.740	40371.65 (e)	1.468	4f65d(7F)8G	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2395.728	3.839E+06	–2.480	–0.140	44553.80 (e)	1.083	4f65d(7F)6H	4.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2395.767	4.604E+06	–2.401	–0.180	45313.75 (e)	1.213	4f65d(7F)6H	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2396.302	1.673E+08	–0.841	0.750	43395.75 (e)	0.309	4f65d(7F)6H	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2396.651	1.407E+08	–0.916	–0.190	46108.79 (e)	1.405	4f65d(7F)6F	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2396.998	1.318E+06	–2.944	0.000	39361.13 (e)	2.554	4f65d(7F)6P	1.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2398.786	1.256E+08	–0.965	–0.180	41573.22 (e)	1.511	4f65d(7F)8F	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2400.494	6.521E+06	–2.249	–0.030	47993.76 (e)	1.612	4f66s(7F)8F	3.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2400.997	7.638E+08	–0.179	–0.830	42850.07 (e)	1.452	4f65d(7F)8G	6.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2402.336	4.194E+08	–0.440	–0.720	40371.65 (e)	1.468	4f65d(7F)8G	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2403.424	2.508E+06	–2.662	–0.140	43885.27 (e)	0.842	4f65d(7F)6H	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2403.739	1.178E+08	–0.992	0.960	38050.11 (e)	2.639	4f65d(7F)8F	0.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2404.073	2.690E+08	–0.633	–0.510	40518.43 (e)	1.509	4f65d(7F)8F	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2404.264	5.742E+06	–2.303	–0.020	47173.34 (e)	1.703	4f66s(7F)8F	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2405.468	4.337E+06	–2.423	–0.300	46150.85 (e)	1.294	4f65d(7F)6H	6.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2406.433	8.698E+07	–1.121	0.540	43395.75 (e)	0.309	4f65d(7F)6H	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2407.300	5.566E+07	–1.313	–0.440	31954.21 (o)	0.833	4f7 6I	4.5	73481.89 (e)	0.845	4f65d(5I)6I2	4.5
2408.319	8.947E+07	–1.105	0.410	32073.30 (o)	1.292	4f7 6I	8.5	73583.41 (e)	1.257	4f65d(5I)6I2	7.5
2409.625	1.755E+08	–0.816	0.230	39579.66 (e)	1.518	4f65d(7F)8F	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5

Table 5. continued.

Wavelength	g_uA	$\log(g_i f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2410.077	2.572E+08	–0.650	–0.760	39579.66 (e)	1.518	4f65d(7F)8F	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2410.840	6.800E+07	–1.228	–0.080	40518.43 (e)	1.509	4f65d(7F)8F	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2412.025	1.013E+09	–0.052	0.900	45313.75 (e)	1.213	4f65d(7F)6H	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2412.953	3.183E+08	–0.556	0.640	39636.88 (e)	1.492	4f65d(7F)8G	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2413.267	1.762E+08	–0.813	0.340	38828.56 (e)	1.543	4f65d(7F)8F	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2413.407	1.947E+08	–0.770	–0.660	39636.88 (e)	1.492	4f65d(7F)8G	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2415.479	4.831E+06	–2.375	–0.050	38050.11 (e)	2.639	4f65d(7F)8F	0.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2415.810	1.071E+06	–3.029	0.000	41573.22 (e)	1.511	4f65d(7F)8F	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2416.296	1.035E+08	–1.042	–0.180	46793.38 (e)	1.433	4f65d(7F)6F	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2419.113	1.585E+08	–0.858	–0.850	38828.56 (e)	1.543	4f65d(7F)8F	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2419.245	1.058E+08	–1.033	0.450	38316.66 (e)	1.616	4f65d(7F)8F	1.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2420.435	1.817E+07	–1.795	0.170	32179.55 (o)	1.037	4f7 6I	5.5	73481.89 (e)	0.845	4f65d(5I)6I2	4.5
2420.471	2.461E+08	–0.665	0.260	42658.20 (e)	1.520	4f65d(7F)8F	6.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2420.472	4.865E+06	–2.369	–0.020	46519.26 (e)	1.977	4f66s(7F)8F	1.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2420.676	6.104E+07	–1.271	0.140	39769.05 (e)	2.081	4f65d(7F)8P	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2421.133	1.479E+06	–2.887	0.020	39769.05 (e)	2.081	4f65d(7F)8P	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2422.001	1.452E+08	–0.891	–0.840	32307.78 (o)	1.238	4f7 6I	7.5	73583.41 (e)	1.257	4f65d(5I)6I2	7.5
2422.334	1.061E+06	–3.030	0.110	42658.20 (e)	1.520	4f65d(7F)8F	6.5	83928.16 (o)	1.220	4f7 4G4	5.5
2422.375	2.055E+06	–2.740	0.060	32314.14 (o)	1.159	4f7 6I	6.5	73583.41 (e)	1.257	4f65d(5I)6I2	7.5
2422.896	4.088E+08	–0.443	–0.500	41987.90 (e)	1.466	4f65d(7F)8G	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2423.812	7.436E+05	–3.183	–0.150	43395.75 (e)	0.309	4f65d(7F)6H	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2424.140	1.013E+08	–1.050	0.550	39014.36 (e)	1.333	4f65d(7F)8G	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2424.609	9.178E+06	–2.092	–0.190	40870.60 (e)	1.883	4f65d(7F)8P	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2424.689	1.343E+07	–1.926	–0.060	48925.15 (e)	1.571	4f66s(7F)8F	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2428.289	1.359E+08	–0.920	–0.360	45764.77 (e)	1.367	4f65d(7F)6F	1.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2428.568	1.663E+07	–1.832	–0.370	42084.25 (e)	1.768	4f65d(7F)8P	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2428.834	3.381E+05	–3.525	–0.810	0.00 (o)	1.997	4f7 8S	3.5	41159.52 (e)	1.470	4f65d(7F)8G	4.5
2429.319	8.792E+08	–0.108	0.930	44553.80 (e)	1.083	4f65d(7F)6H	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2430.039	1.093E+08	–1.015	–0.630	39014.36 (e)	1.333	4f65d(7F)8G	1.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2430.417	3.373E+07	–1.525	0.230	38506.60 (e)	0.023	4f65d(7F)8G	0.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2431.138	7.270E+07	–1.192	–0.590	38316.66 (e)	1.616	4f65d(7F)8F	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2431.489	5.711E+08	–0.295	0.960	43395.75 (e)	0.309	4f65d(7F)6H	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2431.492	2.446E+08	–0.664	–0.580	40870.60 (e)	1.883	4f65d(7F)8P	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2431.769	2.660E+08	–0.626	–0.580	42850.07 (e)	1.452	4f65d(7F)8G	6.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2433.094	2.008E+07	–1.749	0.040	40897.66 (e)	2.045	4f65d(7F)6P	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2433.649	1.301E+06	–2.936	–0.150	42850.07 (e)	1.452	4f65d(7F)8G	6.5	83928.16 (o)	1.220	4f7 4G4	5.5
2434.194	3.754E+08	–0.473	–0.280	49086.13 (e)	1.440	4f65d(7F)6F	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2435.129	7.151E+08	–0.195	0.930	43885.27 (e)	0.842	4f65d(7F)6H	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2435.985	2.905E+07	–1.586	0.030	47714.74 (e)	1.452	4f65d(7F)6F	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2436.394	1.545E+07	–1.862	0.250	32307.78 (o)	1.238	4f7 6I	7.5	73339.60 (e)	1.168	4f65d(5F)6G2	6.5
2436.645	5.754E+07	–1.289	0.070	46793.38 (e)	1.433	4f65d(7F)6F	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2436.772	7.519E+06	–2.174	–0.180	32314.14 (o)	1.159	4f7 6I	6.5	73339.60 (e)	1.168	4f65d(5F)6G2	6.5
2440.171	6.854E+07	–1.212	–0.270	45313.75 (e)	1.213	4f65d(7F)6H	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2440.265	2.097E+08	–0.727	–0.290	41987.90 (e)	1.466	4f65d(7F)8G	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2440.671	1.585E+08	–0.850	–0.800	32073.30 (o)	1.292	4f7 6I	8.5	73033.22 (e)	1.250	4f65d(5I)6I2	8.5
2441.719	1.424E+08	–0.895	–0.260	41159.52 (e)	1.470	4f65d(7F)8G	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2442.351	3.573E+07	–1.496	–0.470	38050.11 (e)	2.639	4f65d(7F)8F	0.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
2442.421	5.323E+07	–1.323	–0.490	38506.60 (e)	0.023	4f65d(7F)8G	0.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2442.687	4.539E+07	–1.390	–0.260	44553.80 (e)	1.083	4f65d(7F)6H	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2444.387	4.959E+07	–1.353	–0.770	0.00 (o)	1.997	4f7 8S	3.5	40897.66 (e)	2.045	4f65d(7F)6P	2.5
2444.698	3.450E+06	–2.509	–0.010	39361.13 (e)	2.554	4f65d(7F)6P	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2444.816	9.356E+07	–1.075	–0.360	46150.85 (e)	1.294	4f65d(7F)6H	6.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2446.005	1.676E+08	–0.823	-1.000	0.00 (o)	1.997	4f7 8S	3.5	40870.60 (e)	1.883	4f65d(7F)8P	3.5
2446.019	2.074E+08	–0.730	–0.550	42084.25 (e)	1.768	4f65d(7F)8P	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2448.010	3.878E+06	–2.458	–0.020	46096.40 (e)	3.917	4f66s(7F)8F	0.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2448.076	9.034E+07	–1.090	–0.180	46108.79 (e)	1.405	4f65d(7F)6F	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2448.570	4.404E+08	–0.399	–0.360	43658.96 (e)	1.444	4f65d(7F)8G	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2448.701	8.006E+07	–1.143	–0.110	41159.52 (e)	1.470	4f65d(7F)8G	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2448.753	7.471E+07	–1.172	0.130	46108.79 (e)	1.405	4f65d(7F)6F	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2452.662	1.825E+07	–1.784	0.060	47993.76 (e)	1.612	4f66s(7F)8F	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2452.927	1.738E+07	–1.803	–0.260	43885.27 (e)	0.842	4f65d(7F)6H	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2453.077	2.428E+05	–3.657	0.020	31954.21 (o)	0.833	4f7 6I	4.5	72707.00 (e)	1.249	4f65d(5F)6G2	5.5
2454.725	3.102E+06	–2.555	0.060	32307.78 (o)	1.238	4f7 6I	7.5	73033.22 (e)	1.250	4f65d(5I)6I2	8.5
2455.413	1.191E+07	–1.968	0.040	48925.15 (e)	1.571	4f66s(7F)8F	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2456.523	1.384E+07	–1.902	0.020	40371.65 (e)	1.468	4f65d(7F)8G	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2456.993	3.558E+07	–1.492	–0.110	40371.65 (e)	1.468	4f65d(7F)8G	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2458.361	6.444E+07	–1.235	0.680	38316.66 (e)	1.616	4f65d(7F)8F	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
2459.423	2.040E+07	–1.733	0.080	47173.34 (e)	1.703	4f66s(7F)8F	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2459.869	1.437E+08	–0.883	–0.900	47069.87 (e)	1.349	4f65d(7F)6H	7.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2461.297	1.081E+06	–3.008	0.000	39636.88 (e)	1.492	4f65d(7F)8G	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2461.787	9.445E+07	–1.067	0.560	38828.56 (e)	1.543	4f65d(7F)8F	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2462.910	1.030E+08	–1.029	–0.280	42658.20 (e)	1.520	4f65d(7F)8F	6.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2463.899	6.751E+07	–1.212	0.370	39579.66 (e)	1.518	4f65d(7F)8F	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2465.161	2.905E+07	–1.574	0.030	49086.13 (e)	1.440	4f65d(7F)6F	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2465.889	1.343E+07	–1.913	0.050	40518.43 (e)	1.509	4f65d(7F)8F	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2466.646	1.016E+07	–2.033	–0.030	41573.22 (e)	1.511	4f65d(7F)8F	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2466.718	1.430E+07	–1.883	0.310	32179.55 (o)	1.037	4f7 6I	5.5	72707.00 (e)	1.249	4f65d(5F)6G2	5.5
2467.267	3.564E+05	–3.488	0.770	0.00 (o)	1.997	4f7 8S	3.5	40518.43 (e)	1.509	4f65d(7F)8F	4.5
2467.378	4.116E+06	–2.425	–0.020	39636.88 (e)	1.492	4f65d(7F)8G	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2469.333	7.527E+07	–1.163	–0.270	39769.05 (e)	2.081	4f65d(7F)8P	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2469.898	9.937E+06	–2.042	–0.110	38506.60 (e)	0.023	4f65d(7F)8G	0.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
2470.198	1.720E+08	–0.801	–0.830	45738.36 (e)	1.504	4f65d(7F)6D	0.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2471.336	7.888E+07	–1.140	–0.070	47714.74 (e)	1.452	4f65d(7F)6F	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5

Table 5. continued.

Wavelength	$g_u A$	$\log(g_l f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2471.812	7.843E+07	–1.143	0.300	45764.77 (e)	1.367	4f65d(7F)6F	1.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2473.048	5.214E+06	–2.320	0.010	42530.91 (e)	1.746	4f65d(7F)6P	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2473.103	2.208E+06	–2.694	–0.020	39014.36 (e)	1.333	4f65d(7F)8G	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2473.626	1.884E+07	–1.762	0.120	46519.26 (e)	1.977	4f66s(7F)8F	1.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2474.609	7.218E+06	–2.178	–0.010	42850.07 (e)	1.452	4f65d(7F)8G	6.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2474.937	1.848E+07	–1.769	–0.200	32314.14 (o)	1.159	4f7 6I	6.5	72707.00 (e)	1.249	4f65d(5F)6G2	5.5
2475.454	9.013E+06	–2.083	0.160	39769.05 (e)	2.081	4f65d(7F)8P	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2475.650	2.495E+06	–2.639	–0.300	43395.75 (e)	0.309	4f65d(7F)6H	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2476.238	1.370E+06	–2.901	–0.910	0.00 (o)	1.997	4f7 8S	3.5	40371.65 (e)	1.468	4f65d(7F)8G	3.5
2476.449	6.721E+07	–1.208	–0.500	32179.55 (o)	1.037	4f7 6I	5.5	72547.76 (e)	1.052	4f65d(5I)6I2	5.5
2477.775	4.823E+08	–0.357	0.600	49292.56 (e)	1.475	4f65d(7F)6D	3.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2477.991	6.848E+06	–2.196	0.290	32073.30 (o)	1.292	4f7 6I	8.5	72416.38 (e)	1.143	4f65d(5I)6K2	7.5
2481.984	1.386E+07	–1.892	0.080	39361.13 (e)	2.554	4f65d(7F)6P	1.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2483.289	4.189E+08	–0.416	0.570	48496.43 (e)	1.465	4f65d(7F)6D	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2484.027	3.912E+07	–1.440	0.160	47714.74 (e)	1.452	4f65d(7F)6F	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2484.733	1.065E+07	–2.005	–0.110	32314.14 (o)	1.159	4f7 6I	6.5	72547.76 (e)	1.052	4f65d(5I)6I2	5.5
2485.014	3.526E+06	–2.486	0.010	49925.96 (e)	1.548	4f66s(7F)8F	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2486.917	3.663E+08	–0.473	0.600	49956.73 (e)	1.491	4f65d(7F)6D	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2487.017	7.775E+07	–1.142	–0.550	40870.60 (e)	1.883	4f65d(7F)8P	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2487.500	1.193E+07	–1.956	0.370	40870.60 (e)	1.883	4f65d(7F)8P	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2488.502	4.256E+07	–1.403	–0.090	47993.76 (e)	1.612	4f66s(7F)8F	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2488.692	3.712E+05	–3.462	0.000	40897.66 (e)	2.045	4f65d(7F)6P	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2488.906	2.080E+08	–0.713	–0.330	45313.75 (e)	1.213	4f65d(7F)6H	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2489.071	6.018E+07	–1.253	–0.170	45764.77 (e)	1.367	4f65d(7F)6F	1.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2489.819	2.523E+06	–2.629	0.000	46793.38 (e)	1.433	4f65d(7F)6F	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2490.496	3.346E+08	–0.510	0.630	47680.44 (e)	1.451	4f65d(7F)6D	1.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2491.075	2.436E+08	–0.643	–0.240	46150.85 (e)	1.294	4f65d(7F)6H	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2492.146	2.784E+07	–1.586	0.060	41987.90 (e)	1.466	4f65d(7F)8G	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2492.249	1.133E+07	–1.976	0.080	46096.40 (e)	3.917	4f66s(7F)8F	0.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2492.479	2.174E+07	–1.691	0.320	32307.78 (o)	1.238	4f7 6I	7.5	72416.38 (e)	1.143	4f65d(5I)6K2	7.5
2492.874	8.152E+06	–2.117	–0.170	32314.14 (o)	1.159	4f7 6I	6.5	72416.38 (e)	1.143	4f65d(5I)6K2	7.5
2493.486	7.117E+07	–1.175	0.370	49086.13 (e)	1.440	4f65d(7F)6F	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2493.837	8.778E+07	–1.085	–0.370	44553.80 (e)	1.083	4f65d(7F)6H	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2494.504	3.896E+05	–3.439	–0.020	39361.13 (e)	2.554	4f65d(7F)6P	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2498.147	6.716E+06	–2.202	0.340	42084.25 (e)	1.768	4f65d(7F)8P	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2501.031	1.664E+08	–0.805	–0.160	47069.87 (e)	1.349	4f65d(7F)6H	7.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2501.279	2.027E+07	–1.722	0.200	39014.36 (e)	1.333	4f65d(7F)8G	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
2501.328	2.817E+06	–2.576	0.010	46793.38 (e)	1.433	4f65d(7F)6F	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2505.456	2.915E+07	–1.561	0.390	42084.25 (e)	1.768	4f65d(7F)8P	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2505.513	4.984E+07	–1.329	0.170	41159.52 (e)	1.470	4f65d(7F)8G	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2506.031	1.568E+07	–1.829	–0.360	43885.27 (e)	0.842	4f65d(7F)6H	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2510.022	3.874E+06	–2.437	0.020	48925.15 (e)	1.571	4f66s(7F)8F	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2510.090	2.329E+06	–2.658	–0.010	47993.76 (e)	1.612	4f66s(7F)8F	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2510.576	3.193E+07	–1.519	0.070	46108.79 (e)	1.405	4f65d(7F)6F	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2511.476	7.602E+06	–2.140	–0.190	32179.55 (o)	1.037	4f7 6I	5.5	71984.79 (e)	1.042	4f65d(5I)6K2	6.5
2511.788	2.562E+07	–1.616	0.150	39636.88 (e)	1.492	4f65d(7F)8G	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2512.954	4.405E+07	–1.380	0.240	40371.65 (e)	1.468	4f65d(7F)8G	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2513.607	8.232E+07	–1.108	–0.110	47173.34 (e)	1.703	4f66s(7F)8F	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2513.761	8.397E+07	–1.099	–1.000	0.00 (o)	1.997	4f7 8S	3.5	39769.05 (e)	2.081	4f65d(7F)8P	2.5
2514.321	1.340E+07	–1.896	–0.060	47173.34 (e)	1.703	4f66s(7F)8F	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2517.296	4.928E+07	–1.329	0.290	49925.96 (e)	1.548	4f66s(7F)8F	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2518.804	1.608E+07	–1.815	–0.130	46519.26 (e)	1.977	4f66s(7F)8F	1.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2519.248	6.524E+07	–1.211	0.050	49956.73 (e)	1.491	4f65d(7F)6D	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2519.593	6.734E+06	–2.190	0.230	32307.78 (o)	1.238	4f7 6I	7.5	71984.79 (e)	1.042	4f65d(5I)6K2	6.5
2519.997	8.974E+06	–2.066	0.130	32314.14 (o)	1.159	4f7 6I	6.5	71984.79 (e)	1.042	4f65d(5I)6K2	6.5
2520.157	1.121E+07	–1.972	–0.320	39769.05 (e)	2.081	4f65d(7F)8P	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2522.144	7.629E+06	–2.139	–0.970	0.00 (o)	1.997	4f7 8S	3.5	39636.88 (e)	1.492	4f65d(7F)8G	2.5
2523.172	6.022E+05	–3.240	0.070	39361.13 (e)	2.554	4f65d(7F)6P	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
2523.615	9.284E+05	–3.052	–0.340	43395.75 (e)	0.309	4f65d(7F)6H	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2524.728	1.480E+05	–3.848	0.000	46108.79 (e)	1.405	4f65d(7F)6F	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2525.791	8.767E+05	–3.077	0.840	0.00 (o)	1.997	4f7 8S	3.5	39579.66 (e)	1.518	4f65d(7F)8F	3.5
2526.347	2.236E+05	–3.669	0.000	42530.91 (e)	1.746	4f65d(7F)6P	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2533.393	8.342E+05	–3.099	0.000	49292.56 (e)	1.475	4f65d(7F)6D	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2533.822	3.040E+06	–2.533	0.010	42530.91 (e)	1.746	4f65d(7F)6P	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2535.332	1.116E+05	–3.969	0.090	34816.06 (o)	1.548	4f7 6D	4.5	74246.78 (e)	0.945	4f65d(5K)6K	5.5
2536.727	1.043E+08	–0.997	–0.140	46519.26 (e)	1.977	4f66s(7F)8F	1.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2538.878	2.855E+07	–1.557	0.140	45738.36 (e)	1.504	4f65d(7F)6D	0.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2540.151	4.132E+06	–2.398	0.020	40897.66 (e)	2.045	4f65d(7F)6P	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2540.582	3.800E+07	–1.434	–0.210	45764.77 (e)	1.367	4f65d(7F)6F	1.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2542.177	1.455E+07	–1.855	–0.020	48496.43 (e)	1.465	4f65d(7F)6D	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2544.875	5.583E+06	–2.266	–0.560	40870.60 (e)	1.883	4f65d(7F)8P	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2545.157	7.521E+05	–3.137	–0.190	28200.06 (o)	1.691	4f7 6P	3.5	67478.58 (e)	1.055	4f65d(5L)6I	4.5
2546.629	1.534E+05	–3.826	–0.010	40897.66 (e)	2.045	4f65d(7F)6P	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2546.805	9.773E+06	–2.025	–0.030	47680.44 (e)	1.451	4f65d(7F)6D	1.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2546.840	7.602E+07	–1.131	0.080	49925.96 (e)	1.548	4f66s(7F)8F	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2547.570	9.991E+06	–2.012	–0.010	48925.15 (e)	1.571	4f66s(7F)8F	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2548.299	4.244E+08	–0.383	0.650	47714.74 (e)	1.452	4f65d(7F)6F	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2548.583	1.818E+06	–2.754	–0.820	0.00 (o)	1.997	4f7 8S	3.5	39225.71 (e)	1.686	4f65d(7F)8D	4.5
2549.420	2.341E+08	–0.639	0.670	50426.33 (e)	1.215	4f65d(7F)6G	3.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2550.922	5.533E+08	–0.267	0.910	50965.29 (e)	1.534	4f66s(7F)8F	6.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2551.972	1.100E+05	–3.969	0.000	45764.77 (e)	1.367	4f65d(7F)6F	1.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2552.012	1.029E+05	–3.996	0.000	45313.75 (e)	1.213	4f65d(7F)6H	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2553.992	2.946E+07	–1.538	0.020	49610.81 (e)	1.315	4f66s(7F)6F	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5

Table 5. continued.

Wavelength	g_uA	$\log(g_i f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2554.497	2.603E+08	–0.593	0.490	46793.38 (e)	1.433	4f65d(7F)6F	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2558.065	5.557E+08	–0.260	0.760	49086.13 (e)	1.440	4f65d(7F)6F	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2560.356	2.334E+08	–0.638	–0.500	47714.74 (e)	1.452	4f65d(7F)6F	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2560.474	1.819E+08	–0.745	0.870	51111.47 (e)	1.311	4f65d(7F)6G	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2561.059	7.568E+07	–1.128	0.050	48925.15 (e)	1.571	4f66s(7F)8F	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2562.177	9.954E+07	–1.009	0.200	46096.40 (e)	3.917	4f66s(7F)8F	0.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2562.991	1.495E+08	–0.831	–0.430	46108.79 (e)	1.405	4f65d(7F)6F	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2563.856	5.484E+07	–1.267	0.040	48828.91 (e)	1.086	4f66s(7F)6F	1.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2564.963	1.527E+06	–2.822	–0.350	42084.25 (e)	1.768	4f65d(7F)8P	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2566.554	1.267E+07	–1.903	–0.020	47993.76 (e)	1.612	4f66s(7F)8F	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2569.149	1.659E+08	–0.783	–0.360	46793.38 (e)	1.433	4f65d(7F)6F	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2571.650	3.829E+07	–1.425	–0.070	49292.56 (e)	1.475	4f65d(7F)6D	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2571.665	1.929E+08	–0.715	–0.610	49086.13 (e)	1.440	4f65d(7F)6F	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2573.377	2.336E+08	–0.636	0.590	49905.64 (e)	0.970	4f65d(7F)6G	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2574.319	4.931E+07	–1.311	0.030	50805.58 (e)	1.399	4f66s(7F)6F	3.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2574.583	7.943E+07	–1.101	–0.240	46108.79 (e)	1.405	4f65d(7F)6F	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2574.653	6.002E+05	–3.225	0.860	0.00 (o)	1.997	4f7 8S	3.5	38828.56 (e)	1.543	4f65d(7F)8F	2.5
2574.907	2.672E+07	–1.574	–0.180	45738.36 (e)	1.504	4f65d(7F)6D	0.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2575.689	3.870E+05	–3.413	0.010	28200.06 (o)	1.691	4f7 6P	3.5	67013.00 (e)	1.221	4f65d(5D)6S3	2.5
2576.660	1.254E+08	–0.904	–0.540	45764.77 (e)	1.367	4f65d(7F)6F	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2576.766	1.238E+08	–0.914	–0.200	49956.73 (e)	1.491	4f65d(7F)6D	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2578.410	1.342E+06	–2.871	0.010	45738.36 (e)	1.504	4f65d(7F)6D	0.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2578.786	1.482E+07	–1.830	0.010	47993.76 (e)	1.612	4f66s(7F)8F	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2579.543	1.932E+06	–2.715	0.000	47173.34 (e)	1.703	4f66s(7F)8F	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2580.168	2.441E+07	–1.613	–0.140	45764.77 (e)	1.367	4f65d(7F)6F	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2584.104	9.991E+05	–2.998	–0.010	46793.38 (e)	1.433	4f65d(7F)6F	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2584.949	5.707E+07	–1.243	0.070	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2585.489	6.794E+05	–3.166	–0.160	34816.06 (o)	1.548	4f7 6D	4.5	73481.89 (e)	0.845	4f65d(5I)6I2	4.5
2585.671	1.108E+08	–0.956	0.760	49157.86 (e)	0.146	4f65d(7F)6G	1.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2585.790	1.861E+05	–3.728	0.010	31954.21 (o)	0.833	4f7 6I	4.5	70615.54 (e)	1.199	4f65d(5H)6H1	5.5
2586.804	1.412E+05	–3.847	–0.010	45313.75 (e)	1.213	4f65d(7F)6H	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2590.251	7.242E+06	–2.137	–0.070	46519.26 (e)	1.977	4f66s(7F)8F	1.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2592.094	8.794E+05	–3.051	–0.010	47714.74 (e)	1.452	4f65d(7F)6F	4.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2593.963	6.308E+05	–3.196	0.040	40897.66 (e)	2.045	4f65d(7F)6P	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2594.175	9.703E+06	–2.009	0.070	42530.91 (e)	1.746	4f65d(7F)6P	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2594.485	2.635E+07	–1.575	–0.030	47173.34 (e)	1.703	4f66s(7F)8F	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2594.486	2.542E+06	–2.589	–0.020	46108.79 (e)	1.405	4f65d(7F)6F	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2594.700	1.117E+06	–2.948	–0.040	42530.91 (e)	1.746	4f65d(7F)6P	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2594.711	1.068E+08	–0.972	–0.180	49292.56 (e)	1.475	4f65d(7F)6D	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2594.721	3.874E+07	–1.410	–0.160	47680.44 (e)	1.451	4f65d(7F)6D	1.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2594.760	5.528E+08	–0.251	0.660	51111.47 (e)	1.311	4f65d(7F)6G	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2596.338	5.592E+08	–0.246	0.870	51650.77 (e)	1.352	4f65d(7F)6G	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2598.876	1.315E+08	–0.875	–0.610	46096.40 (e)	3.917	4f66s(7F)8F	0.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2600.111	6.299E+07	–1.199	–0.140	48496.43 (e)	1.465	4f65d(7F)6D	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2600.875	6.870E+07	–1.161	–0.150	48496.43 (e)	1.465	4f65d(7F)6D	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2600.951	7.038E+06	–2.147	–0.100	32179.55 (o)	1.037	4f7 6I	5.5	70615.54 (e)	1.199	4f65d(5H)6H1	5.5
2602.092	1.353E+08	–0.862	–0.220	46519.26 (e)	1.977	4f66s(7F)8F	1.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2602.444	1.089E+08	–0.956	–0.310	46096.40 (e)	3.917	4f66s(7F)8F	0.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2603.284	1.120E+08	–0.942	0.470	46108.79 (e)	1.405	4f65d(7F)6F	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2603.333	1.518E+05	–3.810	–0.010	44553.80 (e)	1.083	4f65d(7F)6H	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2604.443	9.814E+06	–2.002	0.280	28628.54 (o)	1.857	4f7 6P	2.5	67013.00 (e)	1.221	4f65d(5D)6S3	2.5
2607.741	1.449E+05	–3.829	0.000	46150.85 (e)	1.294	4f65d(7F)6H	6.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2608.340	3.584E+08	–0.434	0.410	50426.33 (e)	1.215	4f65d(7F)6G	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2609.719	1.090E+07	–1.953	0.010	51848.18 (e)	1.433	4f66s(7F)6F	4.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2610.091	4.020E+07	–1.387	–0.380	32314.14 (o)	1.159	4f7 6I	6.5	70615.54 (e)	1.199	4f65d(5H)6H1	5.5
2613.746	4.390E+07	–1.350	–0.140	47680.44 (e)	1.451	4f65d(7F)6D	1.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2614.248	5.392E+08	–0.257	0.510	49925.96 (e)	1.548	4f66s(7F)8F	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2614.528	2.121E+05	–3.661	0.010	32179.55 (o)	1.037	4f7 6I	5.5	70415.96 (e)	1.205	4f65d(5F)6H2	6.5
2615.030	9.187E+05	–3.028	–0.480	0.00 (o)	1.997	4f7 8S	3.5	38229.07 (e)	1.790	4f65d(7F)8D	3.5
2616.113	2.638E+09	0.433	0.930	50965.29 (e)	1.534	4f66s(7F)8F	6.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2616.259	5.186E+07	–1.273	–0.490	32073.30 (o)	1.292	4f7 6I	8.5	70284.41 (e)	1.236	4f65d(5H)6H1	7.5
2616.323	3.343E+08	–0.462	0.180	49610.81 (e)	1.315	4f66s(7F)6F	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2616.354	6.121E+08	–0.206	–0.610	49956.73 (e)	1.491	4f65d(7F)6D	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2620.792	1.435E+08	–0.829	0.450	46793.38 (e)	1.433	4f65d(7F)6F	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2623.326	3.918E+07	–1.392	0.330	32307.78 (o)	1.238	4f7 6I	7.5	70415.96 (e)	1.205	4f65d(5F)6H2	6.5
2623.571	2.196E+08	–0.644	0.220	48828.91 (e)	1.086	4f66s(7F)6F	1.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2623.764	1.197E+07	–1.907	0.150	32314.14 (o)	1.159	4f7 6I	6.5	70415.96 (e)	1.205	4f65d(5F)6H2	6.5
2623.899	1.285E+05	–3.876	–0.010	43885.27 (e)	0.842	4f65d(7F)6H	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2626.980	7.857E+08	–0.090	0.660	52099.87 (e)	1.382	4f65d(7F)6G	6.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2627.764	2.255E+08	–0.632	–0.520	46519.26 (e)	1.977	4f66s(7F)8F	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2628.454	2.063E+09	0.330	0.910	49925.96 (e)	1.548	4f66s(7F)8F	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2629.433	6.023E+08	–0.205	0.540	48925.15 (e)	1.571	4f66s(7F)8F	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2629.950	5.263E+06	–2.263	–0.060	45764.77 (e)	1.367	4f65d(7F)6F	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2630.582	1.463E+07	–1.823	0.100	49956.73 (e)	1.491	4f65d(7F)6D	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2631.412	1.290E+08	–0.873	0.550	46519.26 (e)	1.977	4f66s(7F)8F	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2631.462	1.264E+08	–0.880	0.390	47714.74 (e)	1.452	4f65d(7F)6F	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2631.598	4.492E+08	–0.330	0.460	51650.77 (e)	1.352	4f65d(7F)6G	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2632.414	1.654E+07	–1.766	–0.250	32307.78 (o)	1.238	4f7 6I	7.5	70284.41 (e)	1.236	4f65d(5H)6H1	7.5
2632.854	1.541E+05	–3.797	0.010	32314.14 (o)	1.159	4f7 6I	6.5	70284.41 (e)	1.236	4f65d(5H)6H1	7.5
2633.900	1.251E+05	–3.882	0.000	49086.13 (e)	1.440	4f65d(7F)6F	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2634.325	1.693E+08	–0.754	0.370	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2634.409	8.110E+08	–0.075	0.290	50805.58 (e)	1.399	4f66s(7F)6F	3.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2634.908	3.515E+08	–0.437	–0.570	47173.34 (e)	1.703	4f66s(7F)8F	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5

Table 5. continued.

Wavelength	$g_u A$	$\log(g_l f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2635.334	8.153E+05	–3.070	0.000	45313.75 (e)	1.213	4f65d(7F)6H	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2635.335	5.215E+08	–0.265	0.570	47993.76 (e)	1.612	4f66s(7F)8F	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2636.669	3.842E+08	–0.399	0.540	49905.64 (e)	0.970	4f65d(7F)6G	2.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2638.367	3.963E+05	–3.383	–0.030	34816.06 (o)	1.548	4f7 6D	4.5	72707.00 (e)	1.249	4f65d(5F)6G2	5.5
2641.418	2.475E+06	–2.585	0.010	46793.38 (e)	1.433	4f65d(7F)6F	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2642.272	1.368E+09	0.156	0.800	48925.15 (e)	1.571	4f66s(7F)8F	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2644.080	1.896E+05	–3.700	0.000	46150.85 (e)	1.294	4f65d(7F)6H	6.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2645.219	5.720E+07	–1.220	–0.430	32073.30 (o)	1.292	4f7 6I	8.5	69866.09 (e)	1.224	4f65d(5L)6I	7.5
2645.346	1.265E+09	0.123	0.380	51848.18 (e)	1.433	4f66s(7F)6F	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2646.418	1.927E+08	–0.695	0.680	49157.86 (e)	0.146	4f65d(7F)6G	1.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2647.153	1.962E+07	–1.684	0.090	47714.74 (e)	1.452	4f65d(7F)6F	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2647.162	3.392E+08	–0.448	0.490	47173.34 (e)	1.703	4f66s(7F)8F	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2648.911	2.600E+07	–1.560	0.120	50426.33 (e)	1.215	4f65d(7F)6G	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2649.502	3.382E+05	–3.448	0.140	34816.06 (o)	1.548	4f7 6D	4.5	72547.76 (e)	1.052	4f65d(5I)6I2	5.5
2650.932	7.964E+08	–0.076	0.700	47993.76 (e)	1.612	4f66s(7F)8F	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2653.563	7.267E+07	–1.111	0.300	49086.13 (e)	1.440	4f65d(7F)6F	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2653.970	4.077E+05	–3.365	0.000	46108.79 (e)	1.405	4f65d(7F)6F	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2655.092	3.287E+08	–0.463	–0.530	49292.56 (e)	1.475	4f65d(7F)6D	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2655.818	2.282E+08	–0.616	0.250	51111.47 (e)	1.311	4f65d(7F)6G	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2655.896	5.459E+05	–3.237	–0.010	45313.75 (e)	1.213	4f65d(7F)6H	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2657.189	1.433E+06	–2.819	0.120	42530.91 (e)	1.746	4f65d(7F)6P	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2661.735	1.495E+07	–1.800	–0.080	32307.78 (o)	1.238	4f7 6I	7.5	69866.09 (e)	1.224	4f65d(5L)6I	7.5
2662.186	2.913E+06	–2.510	0.090	32314.14 (o)	1.159	4f7 6I	6.5	69866.09 (e)	1.224	4f65d(5L)6I	7.5
2662.462	2.668E+06	–2.546	0.020	44553.80 (e)	1.083	4f65d(7F)6H	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2663.902	7.547E+07	–1.094	–0.830	51650.77 (e)	1.352	4f65d(7F)6G	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2666.858	2.676E+09	0.456	0.990	47993.76 (e)	1.612	4f66s(7F)8F	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2668.184	3.386E+06	–2.446	0.010	49292.56 (e)	1.475	4f65d(7F)6D	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2668.207	2.026E+09	0.335	0.980	47173.34 (e)	1.703	4f66s(7F)8F	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2670.605	6.033E+07	–1.193	0.430	47680.44 (e)	1.451	4f65d(7F)6D	1.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2670.727	1.637E+08	–0.761	–0.490	48496.43 (e)	1.465	4f65d(7F)6D	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2670.765	5.194E+05	–3.254	–0.010	44553.80 (e)	1.083	4f65d(7F)6H	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2671.795	3.356E+08	–0.443	0.260	47069.87 (e)	1.349	4f65d(7F)6H	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2673.385	1.802E+08	–0.711	0.210	50426.33 (e)	1.215	4f65d(7F)6G	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2674.448	5.194E+08	–0.253	–0.980	48828.91 (e)	1.086	4f66s(7F)6F	1.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2675.802	1.558E+07	–1.778	–0.010	50805.58 (e)	1.399	4f66s(7F)6F	3.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2676.086	3.249E+09	0.543	1.000	48925.15 (e)	1.571	4f66s(7F)8F	4.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2677.513	4.762E+07	–1.290	0.150	47173.34 (e)	1.703	4f66s(7F)8F	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2677.726	5.641E+07	–1.215	–0.050	49610.81 (e)	1.315	4f66s(7F)6F	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2678.537	1.115E+09	0.081	–0.940	49610.81 (e)	1.315	4f66s(7F)6F	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2682.242	1.104E+07	–1.922	–0.260	45738.36 (e)	1.504	4f65d(7F)6D	0.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2683.193	5.757E+06	–2.209	–0.030	47680.44 (e)	1.451	4f65d(7F)6D	1.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2683.211	1.364E+09	0.168	0.970	46519.26 (e)	1.977	4f66s(7F)8F	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2684.144	1.506E+06	–2.788	–0.050	45764.77 (e)	1.367	4f65d(7F)6F	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2686.747	3.235E+05	–3.459	0.000	48496.43 (e)	1.465	4f65d(7F)6D	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2687.668	3.882E+07	–1.372	0.210	49086.13 (e)	1.440	4f65d(7F)6F	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2687.738	3.561E+09	0.587	0.970	52960.08 (e)	1.450	4f66s(7F)6F	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
2688.674	1.557E+05	–3.771	0.010	43885.27 (e)	0.842	4f65d(7F)6H	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2689.238	3.130E+06	–2.468	0.050	43885.27 (e)	0.842	4f65d(7F)6H	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2693.502	3.962E+09	0.635	1.000	49925.96 (e)	1.548	4f66s(7F)8F	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2694.663	6.062E+07	–1.180	–0.060	48828.91 (e)	1.086	4f66s(7F)6F	1.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2694.804	2.313E+08	–0.597	0.300	46150.85 (e)	1.294	4f65d(7F)6H	6.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2696.169	4.708E+08	–0.290	–0.910	52099.87 (e)	1.382	4f65d(7F)6G	6.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2697.891	2.090E+07	–1.640	0.040	51111.47 (e)	1.311	4f65d(7F)6G	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2698.193	8.164E+07	–1.051	0.290	49157.86 (e)	0.146	4f65d(7F)6G	1.5	86208.70 (o)	–0.445	4f66p(7F)6F	0.5
2699.042	1.077E+07	–1.932	0.050	49905.64 (e)	0.970	4f65d(7F)6G	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2699.866	2.719E+07	–1.529	0.040	49905.64 (e)	0.970	4f65d(7F)6G	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
2700.777	1.472E+09	0.205	–0.890	50805.58 (e)	1.399	4f66s(7F)6F	3.5	87820.98 (o)	1.338	4f66p(7F)6F	2.5
2702.302	8.947E+06	–2.009	–0.010	50965.29 (e)	1.534	4f66s(7F)8F	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2703.100	2.134E+06	–2.630	–0.020	46793.38 (e)	1.433	4f65d(7F)6F	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2705.950	5.413E+07	–1.226	0.130	47993.76 (e)	1.612	4f66s(7F)8F	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2707.330	8.546E+06	–2.026	–0.070	47714.74 (e)	1.452	4f65d(7F)6F	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2708.260	8.449E+08	–0.032	0.960	46096.40 (e)	3.917	4f66s(7F)8F	0.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2708.837	1.864E+09	0.312	–0.970	51848.18 (e)	1.433	4f66s(7F)6F	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
2709.169	3.587E+05	–3.402	–0.010	46108.79 (e)	1.405	4f65d(7F)6F	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2710.499	3.577E+05	–3.408	0.000	47680.44 (e)	1.451	4f65d(7F)6D	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2712.577	3.351E+07	–1.433	0.060	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2713.023	5.560E+07	–1.210	–0.390	51111.47 (e)	1.311	4f65d(7F)6G	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2714.069	5.566E+05	–3.211	0.000	49925.96 (e)	1.548	4f66s(7F)8F	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2714.381	1.717E+06	–2.725	0.010	47680.44 (e)	1.451	4f65d(7F)6D	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2716.338	4.988E+06	–2.263	0.010	49956.73 (e)	1.491	4f65d(7F)6D	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2717.465	1.404E+08	–0.807	0.320	45313.75 (e)	1.213	4f65d(7F)6H	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2718.067	2.891E+07	–1.494	0.040	48925.15 (e)	1.571	4f66s(7F)8F	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2718.771	1.008E+07	–1.953	0.130	49157.86 (e)	0.146	4f65d(7F)6G	1.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2719.711	1.718E+06	–2.720	0.090	43395.75 (e)	0.309	4f65d(7F)6H	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2720.663	5.091E+09	0.753	1.000	50965.29 (e)	1.534	4f66s(7F)8F	6.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2725.542	1.979E+09	0.344	–0.950	52960.08 (e)	1.450	4f66s(7F)6F	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
2727.944	4.367E+08	–0.312	0.230	47993.76 (e)	1.612	4f66s(7F)8F	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2728.768	3.332E+06	–2.434	0.010	49292.56 (e)	1.475	4f65d(7F)6D	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2730.120	3.752E+06	–2.381	–0.010	48496.43 (e)	1.465	4f65d(7F)6D	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2731.160	5.197E+08	–0.235	0.460	47173.34 (e)	1.703	4f66s(7F)8F	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2734.811	2.662E+08	–0.525	0.110	48925.15 (e)	1.571	4f66s(7F)8F	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2737.528	2.417E+06	–2.563	0.010	50426.33 (e)	1.215	4f65d(7F)6G	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2737.739	1.267E+06	–2.845	0.000	51650.77 (e)	1.352	4f65d(7F)6G	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5

Table 5. continued.

Wavelength	g_uA	$\log(g_i f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2738.489	7.353E+07	–1.081	0.340	44553.80 (e)	1.083	4f65d(7F)6H	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2739.646	3.745E+08	–0.375	0.720	46519.26 (e)	1.977	4f66s(7F)8F	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2743.277	3.364E+05	–3.424	0.000	48496.43 (e)	1.465	4f65d(7F)6D	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2743.946	3.377E+07	–1.417	–0.210	32073.30 (o)	1.292	4f7 6I	8.5	68506.39 (e)	1.235	4f65d(5L)6I	8.5
2745.494	4.134E+05	–3.335	0.000	49292.56 (e)	1.475	4f65d(7F)6D	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2746.908	1.474E+07	–1.774	–0.140	49086.13 (e)	1.440	4f65d(7F)6F	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2749.757	1.623E+08	–0.735	0.060	49925.96 (e)	1.548	4f66s(7F)8F	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2751.448	6.918E+07	–1.102	–0.300	50426.33 (e)	1.215	4f65d(7F)6G	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2752.621	1.508E+09	0.234	0.850	51848.18 (e)	1.433	4f66s(7F)6F	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2752.681	9.556E+08	0.038	0.770	49610.81 (e)	1.315	4f66s(7F)6F	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2753.322	1.270E+08	–0.839	–0.290	51650.77 (e)	1.352	4f65d(7F)6G	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2753.744	2.503E+08	–0.546	–0.930	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2755.138	6.153E+08	–0.154	–0.910	48828.91 (e)	1.086	4f66s(7F)6F	1.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2756.421	3.081E+07	–1.453	0.350	43885.27 (e)	0.842	4f65d(7F)6H	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2757.751	9.190E+08	0.020	0.860	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2760.208	1.869E+09	0.330	0.940	52960.08 (e)	1.450	4f66s(7F)6F	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
2761.721	2.503E+07	–1.543	0.320	32307.78 (o)	1.238	4f7 6I	7.5	68506.39 (e)	1.235	4f65d(5L)6I	8.5
2762.579	4.699E+05	–3.274	0.000	49292.56 (e)	1.475	4f65d(7F)6D	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2764.575	2.655E+06	–2.515	0.010	46793.38 (e)	1.433	4f65d(7F)6F	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2765.884	7.011E+05	–3.099	–0.010	48496.43 (e)	1.465	4f65d(7F)6D	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2766.257	1.309E+09	0.175	0.790	50805.58 (e)	1.399	4f66s(7F)6F	3.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2768.374	1.782E+09	0.311	0.890	51848.18 (e)	1.433	4f66s(7F)6F	4.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2768.538	1.283E+09	0.170	0.820	48828.91 (e)	1.086	4f66s(7F)6F	1.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2769.531	1.004E+06	–2.941	–0.020	47680.44 (e)	1.451	4f65d(7F)6D	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2769.703	1.598E+09	0.267	0.830	49610.81 (e)	1.315	4f66s(7F)6F	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2771.105	1.101E+08	–0.896	0.050	50965.29 (e)	1.534	4f66s(7F)8F	6.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2773.766	8.480E+06	–2.009	0.330	43395.75 (e)	0.309	4f65d(7F)6H	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2775.212	6.780E+07	–1.108	0.210	49905.64 (e)	0.970	4f65d(7F)6G	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2775.885	9.532E+06	–1.962	–0.050	48496.43 (e)	1.465	4f65d(7F)6D	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2780.344	3.204E+07	–1.431	–0.280	49157.86 (e)	0.146	4f65d(7F)6G	1.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2780.471	1.602E+09	0.267	0.820	50805.58 (e)	1.399	4f66s(7F)6F	3.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2786.531	5.742E+06	–2.174	0.030	46108.79 (e)	1.405	4f65d(7F)6F	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2787.805	5.379E+07	–1.203	0.210	52099.87 (e)	1.382	4f65d(7F)6G	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2789.652	1.631E+07	–1.720	0.020	47173.34 (e)	1.703	4f66s(7F)8F	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2789.873	1.241E+06	–2.837	0.000	51111.47 (e)	1.311	4f65d(7F)6G	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
2789.975	3.316E+06	–2.410	0.070	32073.30 (o)	1.292	4f7 6I	8.5	67905.35 (e)	1.168	4f65d(5L)6I	7.5
2792.513	1.165E+07	–1.867	–0.460	34816.06 (o)	1.548	4f7 6D	4.5	70615.54 (e)	1.199	4f65d(5H)6H1	5.5
2793.782	4.034E+06	–2.326	0.000	47993.76 (e)	1.612	4f66s(7F)8F	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2793.991	5.516E+06	–2.191	–0.050	49157.86 (e)	0.146	4f65d(7F)6G	1.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2796.505	1.885E+07	–1.660	–0.090	49956.73 (e)	1.491	4f65d(7F)6D	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2797.514	5.510E+06	–2.189	0.180	32179.55 (o)	1.037	4f7 6I	5.5	67915.04 (e)	1.189	4f65d(5L)6I	6.5
2797.617	6.351E+07	–1.127	–0.230	48828.91 (e)	1.086	4f66s(7F)6F	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2797.741	5.833E+05	–3.164	0.060	31745.99 (o)	0.455	4f7 6I	3.5	67478.58 (e)	1.055	4f65d(5L)6I	4.5
2799.087	2.552E+06	–2.523	0.000	48925.15 (e)	1.571	4f66s(7F)8F	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2801.753	8.732E+06	–1.987	–0.010	48828.91 (e)	1.086	4f66s(7F)6F	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2803.947	2.777E+06	–2.486	0.130	31954.21 (o)	0.833	4f7 6I	4.5	67607.72 (e)	1.105	4f65d(5L)6I	5.5
2804.331	4.660E+07	–1.258	–0.110	51111.47 (e)	1.311	4f65d(7F)6G	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2804.550	1.681E+07	–1.707	–0.070	49292.56 (e)	1.475	4f65d(7F)6D	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2807.351	2.115E+06	–2.602	–0.060	52099.87 (e)	1.382	4f65d(7F)6G	6.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
2807.589	4.802E+06	–2.245	–0.140	32307.78 (o)	1.238	4f7 6I	7.5	67915.04 (e)	1.189	4f65d(5L)6I	6.5
2808.091	3.090E+07	–1.437	–0.250	32314.14 (o)	1.159	4f7 6I	6.5	67915.04 (e)	1.189	4f65d(5L)6I	6.5
2808.353	6.626E+06	–2.105	–0.060	32307.78 (o)	1.238	4f7 6I	7.5	67905.35 (e)	1.168	4f65d(5L)6I	7.5
2808.855	2.277E+07	–1.569	0.290	32314.14 (o)	1.159	4f7 6I	6.5	67905.35 (e)	1.168	4f65d(5L)6I	7.5
2811.798	1.409E+07	–1.777	–0.010	49925.96 (e)	1.548	4f66s(7F)8F	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2813.413	9.235E+06	–1.959	0.060	47714.74 (e)	1.452	4f65d(7F)6F	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2814.141	1.275E+07	–1.819	–0.200	31954.21 (o)	0.833	4f7 6I	4.5	67478.58 (e)	1.055	4f65d(5L)6I	4.5
2814.233	7.522E+06	–2.054	–0.060	49956.73 (e)	1.491	4f65d(7F)6D	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2815.818	8.281E+07	–1.004	–0.140	49610.81 (e)	1.315	4f66s(7F)6F	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2815.917	4.427E+06	–2.276	–0.010	50426.33 (e)	1.215	4f65d(7F)6G	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2821.782	1.960E+07	–1.633	–0.220	32179.55 (o)	1.037	4f7 6I	5.5	67607.72 (e)	1.105	4f65d(5L)6I	5.5
2823.611	3.225E+06	–2.415	–0.080	49157.86 (e)	0.146	4f65d(7F)6G	1.5	84563.08 (o)	3.448	4f66p(7F)8F	0.5
2823.977	2.331E+07	–1.550	0.180	49086.13 (e)	1.440	4f65d(7F)6F	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2824.781	7.396E+06	–2.052	0.120	51650.77 (e)	1.352	4f65d(7F)6G	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2827.824	2.427E+07	–1.537	–0.110	49157.86 (e)	0.146	4f65d(7F)6G	1.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2828.183	4.509E+06	–2.271	–0.040	49292.56 (e)	1.475	4f65d(7F)6D	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2829.696	6.389E+05	–3.118	–0.040	47680.44 (e)	1.451	4f65d(7F)6D	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2829.816	1.498E+06	–2.742	0.000	49610.81 (e)	1.315	4f66s(7F)6F	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2830.683	1.433E+07	–1.764	–0.020	50965.29 (e)	1.534	4f66s(7F)8F	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2831.349	2.062E+06	–2.604	0.010	46793.38 (e)	1.433	4f65d(7F)6F	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2831.455	5.857E+06	–2.152	0.170	31954.21 (o)	0.833	4f7 6I	4.5	67261.35 (e)	1.071	4f65d(5L)6I	5.5
2831.826	7.009E+06	–2.074	–0.040	45764.77 (e)	1.367	4f65d(7F)6F	1.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2832.106	4.191E+06	–2.298	–0.070	32179.55 (o)	1.037	4f7 6I	5.5	67478.58 (e)	1.055	4f65d(5L)6I	4.5
2832.543	4.494E+06	–2.270	–0.080	32314.14 (o)	1.159	4f7 6I	6.5	67607.72 (e)	1.105	4f65d(5L)6I	5.5
2833.590	2.201E+06	–2.581	–0.050	48496.43 (e)	1.465	4f65d(7F)6D	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2833.732	2.511E+07	–1.516	–0.060	50426.33 (e)	1.215	4f65d(7F)6G	3.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2836.859	1.317E+07	–1.797	0.040	47714.74 (e)	1.452	4f65d(7F)6F	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2839.398	1.104E+05	–3.877	0.000	49905.64 (e)	0.970	4f65d(7F)6G	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
2839.559	9.015E+08	0.038	0.410	52960.08 (e)	1.450	4f66s(7F)6F	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
2840.740	1.244E+06	–2.821	0.000	46793.38 (e)	1.433	4f65d(7F)6F	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2842.449	1.144E+07	–1.856	0.140	51111.47 (e)	1.311	4f65d(7F)6G	4.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2846.324	1.894E+08	–0.640	0.180	50805.58 (e)	1.399	4f66s(7F)6F	3.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
2847.409	4.339E+07	–1.276	0.140	51650.77 (e)	1.352	4f65d(7F)6G	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2848.438	4.218E+08	–0.290	0.270	51848.18 (e)	1.433	4f66s(7F)6F	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5

Table 5. continued.

Wavelength	$g_u A$	$\log(g_l f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2848.552	1.289E+07	–1.805	–0.290	32179.55 (o)	1.037	4f7 6I	5.5	67274.79 (e)	1.105	4f65d(5L)6K	6.5
2849.643	2.161E+06	–2.580	–0.030	32179.55 (o)	1.037	4f7 6I	5.5	67261.35 (e)	1.071	4f65d(5L)6I	5.5
2851.936	1.245E+07	–1.815	0.130	50426.33 (e)	1.215	4f65d(7F)6G	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2853.468	6.558E+06	–2.096	0.020	48925.15 (e)	1.571	4f66s(7F)8F	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2853.633	1.820E+07	–1.655	–0.040	49905.64 (e)	0.970	4f65d(7F)6G	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2853.878	7.528E+07	–1.034	–0.160	49610.81 (e)	1.315	4f66s(7F)6F	2.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2856.058	2.760E+06	–2.470	0.190	48925.15 (e)	1.571	4f66s(7F)8F	4.5	83928.16 (o)	1.220	4f7 4G4	5.5
2856.326	6.439E+05	–3.103	0.000	52960.08 (e)	1.450	4f66s(7F)6F	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
2858.999	1.044E+07	–1.893	–0.250	32307.78 (o)	1.238	4f7 6I	7.5	67274.79 (e)	1.105	4f65d(5L)6K	6.5
2859.501	6.470E+06	–2.101	0.010	47993.76 (e)	1.612	4f66s(7F)8F	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2859.519	5.471E+05	–3.174	–0.010	32314.14 (o)	1.159	4f7 6I	6.5	67274.79 (e)	1.105	4f65d(5L)6K	6.5
2859.695	7.332E+05	–3.045	0.000	46108.79 (e)	1.405	4f65d(7F)6F	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2860.333	1.893E+05	–3.633	0.000	46108.79 (e)	1.405	4f65d(7F)6F	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2860.549	1.535E+06	–2.724	–0.010	48828.91 (e)	1.086	4f66s(7F)6F	1.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2860.618	1.437E+06	–2.755	0.020	32314.14 (o)	1.159	4f7 6I	6.5	67261.35 (e)	1.071	4f65d(5L)6I	5.5
2861.089	5.004E+07	–1.211	0.200	52099.87 (e)	1.382	4f65d(7F)6G	6.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2863.511	9.095E+05	–2.952	0.000	51848.18 (e)	1.433	4f66s(7F)6F	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2864.527	2.018E+07	–1.602	0.050	49610.81 (e)	1.315	4f66s(7F)6F	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2866.640	1.001E+07	–1.904	0.040	49086.13 (e)	1.440	4f65d(7F)6F	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2871.747	2.205E+06	–2.564	0.000	47173.34 (e)	1.703	4f66s(7F)8F	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2876.861	1.434E+06	–2.750	0.060	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2882.343	3.662E+06	–2.346	0.050	49956.73 (e)	1.491	4f65d(7F)6D	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2883.131	2.779E+08	–0.462	–0.300	50805.58 (e)	1.399	4f66s(7F)6F	3.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2886.716	2.119E+07	–1.576	0.090	51650.77 (e)	1.352	4f65d(7F)6G	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2888.934	3.525E+07	–1.357	0.130	49905.64 (e)	0.970	4f65d(7F)6G	2.5	84510.34 (o)	0.538	4f66p(7F)6G	1.5
2889.857	3.714E+07	–1.330	0.110	51111.47 (e)	1.311	4f65d(7F)6G	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2892.603	4.522E+08	–0.246	0.190	49925.96 (e)	1.548	4f66s(7F)8F	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2896.424	6.453E+06	–2.088	–0.050	45738.36 (e)	1.504	4f65d(7F)6D	0.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2896.688	2.984E+07	–1.422	0.090	50426.33 (e)	1.215	4f65d(7F)6G	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2898.642	5.545E+06	–2.155	0.060	45764.77 (e)	1.367	4f65d(7F)6F	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2899.011	1.138E+06	–2.848	0.020	49292.56 (e)	1.475	4f65d(7F)6D	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2903.266	4.382E+08	–0.257	–0.390	51848.18 (e)	1.433	4f66s(7F)6F	4.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2907.215	2.956E+07	–1.425	–0.150	47714.74 (e)	1.452	4f65d(7F)6F	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2908.793	4.738E+06	–2.219	0.030	51111.47 (e)	1.311	4f65d(7F)6G	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2912.634	5.286E+08	–0.172	0.210	48925.15 (e)	1.571	4f66s(7F)8F	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2916.818	8.417E+07	–0.968	0.290	46793.38 (e)	1.433	4f65d(7F)6F	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2917.117	9.053E+07	–0.936	–0.320	47714.74 (e)	1.452	4f65d(7F)6F	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2917.482	1.230E+07	–1.803	–0.070	46793.38 (e)	1.433	4f65d(7F)6F	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2924.644	1.970E+07	–1.597	–0.140	52099.87 (e)	1.382	4f65d(7F)6G	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
2924.778	1.504E+07	–1.714	0.480	48828.91 (e)	1.086	4f66s(7F)6F	1.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2926.016	4.120E+07	–1.274	0.290	49610.81 (e)	1.315	4f66s(7F)6F	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2926.359	5.241E+07	–1.168	–0.250	49086.13 (e)	1.440	4f65d(7F)6F	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
2926.786	4.284E+06	–2.259	0.010	46096.40 (e)	3.917	4f66s(7F)8F	0.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2927.848	6.024E+07	–1.110	0.260	46108.79 (e)	1.405	4f65d(7F)6F	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2928.875	4.478E+07	–1.241	0.080	50805.58 (e)	1.399	4f66s(7F)6F	3.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
2930.998	4.911E+08	–0.199	0.250	47993.76 (e)	1.612	4f66s(7F)8F	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
2933.307	4.117E+08	–0.274	–0.440	52960.08 (e)	1.450	4f66s(7F)6F	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
2935.988	5.888E+06	–2.120	0.080	32073.30 (o)	1.292	4f7 6I	8.5	66123.43 (e)	1.226	4f65d(5L)6K	7.5
2936.458	2.973E+06	–2.414	–0.020	46108.79 (e)	1.405	4f65d(7F)6F	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2937.382	3.030E+07	–1.406	0.020	49925.96 (e)	1.548	4f66s(7F)8F	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2937.770	4.026E+07	–1.283	0.030	48925.15 (e)	1.571	4f66s(7F)8F	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2940.040	8.924E+06	–1.941	–0.080	49956.73 (e)	1.491	4f65d(7F)6D	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
2940.126	1.294E+06	–2.774	–0.070	49925.96 (e)	1.548	4f66s(7F)8F	5.5	83928.16 (o)	1.220	4f7 4G4	5.5
2941.063	3.234E+07	–1.377	0.030	47993.76 (e)	1.612	4f66s(7F)8F	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2948.908	1.799E+07	–1.627	0.220	45738.36 (e)	1.504	4f65d(7F)6D	0.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2949.518	1.766E+07	–1.637	–0.030	47173.34 (e)	1.703	4f66s(7F)8F	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2950.196	4.083E+08	–0.273	0.330	47173.34 (e)	1.703	4f66s(7F)8F	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2951.207	3.227E+07	–1.375	0.240	45764.77 (e)	1.367	4f65d(7F)6F	1.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2951.486	6.563E+05	–3.069	0.020	49905.64 (e)	0.970	4f65d(7F)6G	2.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2951.733	5.140E+07	–1.169	–0.240	49086.13 (e)	1.440	4f65d(7F)6F	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2952.742	5.754E+07	–1.124	0.110	51848.18 (e)	1.433	4f66s(7F)6F	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
2954.658	5.400E+07	–1.152	0.160	50805.58 (e)	1.399	4f66s(7F)6F	3.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2955.166	1.727E+07	–1.644	–0.110	51650.77 (e)	1.352	4f65d(7F)6G	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2956.347	6.533E+06	–2.071	–0.100	32307.78 (o)	1.238	4f7 6I	7.5	66123.43 (e)	1.226	4f65d(5L)6K	7.5
2956.903	1.997E+07	–1.586	–0.350	32314.14 (o)	1.159	4f7 6I	6.5	66123.43 (e)	1.226	4f65d(5L)6K	7.5
2957.715	4.354E+07	–1.243	0.140	52960.08 (e)	1.450	4f66s(7F)6F	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
2963.475	9.201E+06	–1.916	–0.050	46519.26 (e)	1.977	4f66s(7F)8F	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
2966.597	1.075E+06	–2.846	–0.020	45738.36 (e)	1.504	4f65d(7F)6D	0.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2968.924	1.251E+05	–3.782	0.000	45764.77 (e)	1.367	4f65d(7F)6F	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
2969.836	3.198E+05	–3.379	0.000	49292.56 (e)	1.475	4f65d(7F)6D	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
2972.295	3.062E+08	–0.392	0.460	46519.26 (e)	1.977	4f66s(7F)8F	1.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2972.513	4.021E+07	–1.274	0.090	51848.18 (e)	1.433	4f66s(7F)6F	4.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
2980.344	2.348E+06	–2.498	0.080	31954.21 (o)	0.833	4f7 6I	4.5	65497.59 (e)	1.060	4f65d(5L)4I	5.5
2980.386	1.999E+07	–1.574	–0.140	46096.40 (e)	3.917	4f66s(7F)8F	0.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
2981.615	7.337E+06	–2.007	–0.080	51111.47 (e)	1.311	4f65d(7F)6G	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
2982.292	1.495E+09	0.300	–0.990	50965.29 (e)	1.534	4f66s(7F)8F	6.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
2985.211	7.178E+06	–2.023	0.040	48496.43 (e)	1.465	4f65d(7F)6D	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
2993.253	6.370E+06	–2.065	0.170	49610.81 (e)	1.315	4f66s(7F)6F	2.5	83009.54 (o)	2.640	4f66p(7F)8D	1.5
2994.319	1.387E+07	–1.733	–0.100	47680.44 (e)	1.451	4f65d(7F)6D	1.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
2996.720	2.338E+07	–1.501	0.210	46793.38 (e)	1.433	4f65d(7F)6F	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
2997.569	2.250E+06	–2.515	–0.060	50426.33 (e)	1.215	4f65d(7F)6G	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
2998.099	2.562E+07	–1.460	0.230	47714.74 (e)	1.452	4f65d(7F)6F	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
2998.456	1.839E+08	–0.606	0.540	46096.40 (e)	3.917	4f66s(7F)8F	0.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5

Table 5. continued.

Wavelength	g_uA	$\log(g_i f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
2999.571	1.531E+07	–1.684	0.160	46108.79 (e)	1.405	4f65d(7F)6F	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3000.116	1.308E+09	0.247	–0.890	49925.96 (e)	1.548	4f66s(7F)8F	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
3000.147	1.702E+07	–1.638	0.050	52960.08 (e)	1.450	4f66s(7F)6F	5.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
3000.502	4.759E+06	–2.186	0.110	32179.55 (o)	1.037	4f7 6I	5.5	65497.59 (e)	1.060	4f65d(5L)4I	5.5
3002.889	2.427E+06	–2.489	0.020	49956.73 (e)	1.491	4f65d(7F)6D	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
3007.231	8.492E+05	–2.936	0.020	45738.36 (e)	1.504	4f65d(7F)6D	0.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
3009.622	5.096E+06	–2.160	0.100	45764.77 (e)	1.367	4f65d(7F)6F	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
3012.673	2.938E+05	–3.393	0.010	32314.14 (o)	1.159	4f7 6I	6.5	65497.59 (e)	1.060	4f65d(5L)4I	5.5
3013.286	1.139E+09	0.191	–0.870	48925.15 (e)	1.571	4f66s(7F)8F	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3018.440	2.336E+08	–0.495	–0.950	46519.26 (e)	1.977	4f66s(7F)8F	1.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
3022.073	5.546E+08	–0.119	–0.940	47173.34 (e)	1.703	4f66s(7F)8F	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
3022.686	9.372E+08	0.109	–0.930	47993.76 (e)	1.612	4f66s(7F)8F	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
3023.399	9.465E+08	0.113	–0.870	47993.76 (e)	1.612	4f66s(7F)8F	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
3023.925	1.380E+09	0.277	0.930	48925.15 (e)	1.571	4f66s(7F)8F	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3026.792	1.886E+09	0.414	0.940	49925.96 (e)	1.548	4f66s(7F)8F	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
3027.978	2.291E+07	–1.497	0.230	49086.13 (e)	1.440	4f65d(7F)6F	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3029.614	4.052E+07	–1.259	0.150	49956.73 (e)	1.491	4f65d(7F)6D	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
3029.913	2.384E+09	0.517	0.960	50965.29 (e)	1.534	4f66s(7F)8F	6.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
3031.246	7.406E+08	0.009	–0.890	47173.34 (e)	1.703	4f66s(7F)8F	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3032.049	1.200E+07	–1.783	0.100	50805.58 (e)	1.399	4f66s(7F)6F	3.5	83776.98 (o)	1.871	4f66p(7F)8D	2.5
3032.833	1.634E+07	–1.646	0.940	50965.29 (e)	1.534	4f66s(7F)8F	6.5	83928.16 (o)	1.220	4f7 4G4	5.5
3036.975	5.294E+08	–0.135	–0.930	46519.26 (e)	1.977	4f66s(7F)8F	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3039.973	3.483E+08	–0.316	–0.960	46096.40 (e)	3.917	4f66s(7F)8F	0.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
3043.397	3.642E+06	–2.294	–0.120	51111.47 (e)	1.311	4f65d(7F)6G	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
3044.553	1.831E+07	–1.592	–0.250	51650.77 (e)	1.352	4f65d(7F)6G	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
3047.031	1.183E+06	–2.788	0.010	49292.56 (e)	1.475	4f65d(7F)6D	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3048.602	8.873E+06	–1.908	0.070	51848.18 (e)	1.433	4f66s(7F)6F	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
3048.669	3.335E+05	–3.337	0.060	34816.06 (o)	1.548	4f7 6D	4.5	67607.72 (e)	1.105	4f65d(5L)6I	5.5
3057.910	3.792E+07	–1.279	0.170	49292.56 (e)	1.475	4f65d(7F)6D	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3069.122	8.481E+06	–1.925	–0.140	47680.44 (e)	1.451	4f65d(7F)6D	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
3069.338	2.272E+07	–1.498	–0.160	48496.43 (e)	1.465	4f65d(7F)6D	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
3073.354	6.275E+05	–3.048	–0.010	50426.33 (e)	1.215	4f65d(7F)6G	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
3074.152	2.217E+06	–2.502	0.030	52960.08 (e)	1.450	4f66s(7F)6F	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
3079.574	7.372E+07	–0.980	0.490	46519.26 (e)	1.977	4f66s(7F)8F	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
3086.772	7.100E+07	–0.993	–0.220	52099.87 (e)	1.382	4f65d(7F)6G	6.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
3087.971	3.297E+07	–1.324	–0.160	49610.81 (e)	1.315	4f66s(7F)6F	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3094.199	1.418E+07	–1.690	–0.150	51650.77 (e)	1.352	4f65d(7F)6G	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
3096.707	1.729E+07	–1.604	0.060	50965.29 (e)	1.534	4f66s(7F)8F	6.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
3098.546	7.362E+07	–0.975	0.340	47173.34 (e)	1.703	4f66s(7F)8F	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3100.994	4.168E+07	–1.220	0.250	48828.91 (e)	1.086	4f66s(7F)6F	1.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
3107.015	3.652E+07	–1.277	0.110	49925.96 (e)	1.548	4f66s(7F)8F	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3108.579	6.669E+07	–1.015	0.310	47993.76 (e)	1.612	4f66s(7F)8F	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3109.610	2.054E+07	–1.528	–0.110	50805.58 (e)	1.399	4f66s(7F)6F	3.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
3110.793	9.182E+06	–1.873	–0.120	51111.47 (e)	1.311	4f65d(7F)6G	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
3111.034	5.487E+07	–1.099	0.190	48925.15 (e)	1.571	4f66s(7F)8F	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
3113.222	6.597E+06	–2.018	–0.060	51848.18 (e)	1.433	4f66s(7F)6F	4.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
3116.305	1.260E+05	–3.736	0.050	51848.18 (e)	1.433	4f66s(7F)6F	4.5	83928.16 (o)	1.220	4f7 4G4	5.5
3116.353	1.072E+06	–2.809	–0.030	49905.64 (e)	0.970	4f65d(7F)6G	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3121.324	7.903E+05	–2.943	0.000	49956.73 (e)	1.491	4f65d(7F)6D	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3124.684	3.539E+07	–1.286	0.410	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
3128.115	1.417E+06	–2.686	0.010	47680.44 (e)	1.451	4f65d(7F)6D	1.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
3137.817	6.545E+07	–1.015	–0.310	52099.87 (e)	1.382	4f65d(7F)6G	6.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
3139.482	1.234E+06	–2.737	–0.010	51111.47 (e)	1.311	4f65d(7F)6G	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
3140.949	2.978E+05	–3.355	–0.060	52099.87 (e)	1.382	4f65d(7F)6G	6.5	83928.16 (o)	1.220	4f7 4G4	5.5
3146.244	5.483E+05	–3.094	0.000	49292.56 (e)	1.475	4f65d(7F)6D	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
3147.017	6.869E+05	–2.997	–0.010	49292.56 (e)	1.475	4f65d(7F)6D	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
3147.986	1.869E+06	–2.561	0.010	48496.43 (e)	1.465	4f65d(7F)6D	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
3148.026	1.217E+06	–2.747	–0.020	47680.44 (e)	1.451	4f65d(7F)6D	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3156.098	9.682E+06	–1.837	–0.110	50426.33 (e)	1.215	4f65d(7F)6G	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3157.940	1.597E+06	–2.627	–0.020	48496.43 (e)	1.465	4f65d(7F)6D	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3163.889	9.581E+06	–1.841	–0.040	51650.77 (e)	1.352	4f65d(7F)6G	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
3167.771	1.093E+06	–2.781	0.010	50426.33 (e)	1.215	4f65d(7F)6G	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3170.999	1.237E+09	0.272	0.890	52960.08 (e)	1.450	4f66s(7F)6F	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
3178.076	2.314E+08	–0.452	0.620	49610.81 (e)	1.315	4f66s(7F)6F	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
3178.865	4.004E+08	–0.214	0.830	49610.81 (e)	1.315	4f66s(7F)6F	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
3181.293	1.805E+08	–0.562	0.760	48828.91 (e)	1.086	4f66s(7F)6F	1.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
3183.781	8.614E+08	0.117	0.850	51848.18 (e)	1.433	4f66s(7F)6F	4.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
3185.853	1.147E+08	–0.759	0.770	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
3191.460	2.386E+08	–0.438	0.890	48828.91 (e)	1.086	4f66s(7F)6F	1.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3193.571	7.410E+06	–1.944	–0.050	51650.77 (e)	1.352	4f65d(7F)6G	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
3193.820	1.748E+05	–3.577	0.000	47680.44 (e)	1.451	4f65d(7F)6D	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
3194.345	5.965E+08	–0.042	0.800	50805.58 (e)	1.399	4f66s(7F)6F	3.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3206.304	2.564E+08	–0.405	–0.550	50805.58 (e)	1.399	4f66s(7F)6F	3.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3206.509	1.024E+08	–0.803	0.900	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3208.146	2.668E+06	–2.388	0.040	49905.64 (e)	0.970	4f65d(7F)6G	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
3208.949	3.471E+06	–2.273	0.050	49905.64 (e)	0.970	4f65d(7F)6G	2.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
3209.508	2.870E+07	–1.353	0.190	52099.87 (e)	1.382	4f65d(7F)6G	6.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
3213.839	2.562E+08	–0.402	–0.580	51848.18 (e)	1.433	4f66s(7F)6F	4.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
3214.221	4.392E+06	–2.173	–0.060	49956.73 (e)	1.491	4f65d(7F)6D	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
3224.891	2.354E+08	–0.434	–0.680	52960.08 (e)	1.450	4f66s(7F)6F	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
3225.332	2.535E+05	–3.404	0.010	49157.86 (e)	0.146	4f65d(7F)6G	1.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3225.876	8.592E+05	–2.871	–0.010	51111.47 (e)	1.311	4f65d(7F)6G	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3228.199	1.287E+06	–2.695	–0.550	52960.08 (e)	1.450	4f66s(7F)6F	5.5	83928.16 (o)	1.220	4f7 4G4	5.5

Table 5. continued.

Wavelength	g_uA	$\log(g_l f)$	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.	J	E cm^{-1}	g	Design.	J
3231.051	8.156E+05	–2.899	–0.010	48496.43 (e)	1.465	4f65d(7F)6D	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3238.073	6.290E+05	–3.003	–0.010	51111.47 (e)	1.311	4f65d(7F)6G	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3239.410	2.395E+06	–2.429	–0.030	49292.56 (e)	1.475	4f65d(7F)6D	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3244.721	5.821E+07	–1.036	0.430	48828.91 (e)	1.086	4f66s(7F)6F	1.5	79639.31 (o)	3.416	4f66p(7F)6D	0.5
3254.033	2.302E+07	–1.438	0.370	48259.62 (e)	–0.591	4f66s(7F)6F	0.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
3258.350	1.794E+05	–3.539	0.050	34816.06 (o)	1.548	4f7 6D	4.5	65497.59 (e)	1.060	4f65d(5L)4I	5.5
3262.472	8.015E+07	–0.890	0.250	49610.81 (e)	1.315	4f66s(7F)6F	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
3266.149	8.227E+06	–1.880	0.050	48828.91 (e)	1.086	4f66s(7F)6F	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3273.165	2.122E+06	–2.465	0.010	49610.81 (e)	1.315	4f66s(7F)6F	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3283.010	1.847E+07	–1.524	0.130	51650.77 (e)	1.352	4f65d(7F)6G	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3294.168	1.367E+06	–2.655	0.020	49905.64 (e)	0.970	4f65d(7F)6G	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
3300.664	8.374E+05	–2.863	0.000	52960.08 (e)	1.450	4f66s(7F)6F	5.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
3301.634	7.109E+05	–2.936	0.020	49157.86 (e)	0.146	4f65d(7F)6G	1.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3303.555	8.427E+07	–0.862	0.160	50805.58 (e)	1.399	4f66s(7F)6F	3.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
3304.407	1.297E+05	–3.675	0.000	50805.58 (e)	1.399	4f66s(7F)6F	3.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
3304.432	2.640E+05	–3.365	0.000	51848.18 (e)	1.433	4f66s(7F)6F	4.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
3305.070	4.321E+05	–3.153	0.000	49905.64 (e)	0.970	4f65d(7F)6G	2.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3315.471	2.752E+06	–2.343	–0.040	48828.91 (e)	1.086	4f66s(7F)6F	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
3317.231	7.082E+07	–0.933	–0.120	51848.18 (e)	1.433	4f66s(7F)6F	4.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
3332.980	4.251E+07	–1.150	–0.090	52960.08 (e)	1.450	4f66s(7F)6F	5.5	82954.63 (o)	1.628	4f66p(7F)8D	4.5
3338.159	1.038E+07	–1.759	0.090	51111.47 (e)	1.311	4f65d(7F)6G	4.5	81059.48 (o)	1.360	4f66p(7F)8G	3.5
3351.774	8.997E+05	–2.816	–0.010	49610.81 (e)	1.315	4f66s(7F)6F	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3352.041	2.578E+06	–2.364	0.070	49157.86 (e)	0.146	4f65d(7F)6G	1.5	78981.86 (o)	–1.085	4f66p(7F)8G	0.5
3362.963	6.589E+06	–1.948	0.070	50426.33 (e)	1.215	4f65d(7F)6G	3.5	80153.48 (o)	1.265	4f66p(7F)8G	2.5
3385.238	3.950E+06	–2.171	0.050	49905.64 (e)	0.970	4f65d(7F)6G	2.5	79437.18 (o)	0.980	4f66p(7F)8G	1.5
3430.517	1.531E+04	–4.568	0.000	52960.08 (e)	1.450	4f66s(7F)6F	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
4054.425	6.572E+05	–2.797	–0.150	65497.59 (e)	1.060	4f65d(5L)4I	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
4336.216	5.123E+05	–2.834	0.040	66123.43 (e)	1.226	4f65d(5L)6K	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
4363.411	2.016E+04	–4.242	0.010	28200.06 (o)	1.691	4f7 6P	3.5	51111.47 (e)	1.311	4f65d(7F)6G	4.5
4366.790	1.150E+05	–3.481	–0.050	67261.35 (e)	1.071	4f65d(5L)6I	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
4369.354	1.042E+05	–3.523	0.020	67274.79 (e)	1.105	4f65d(5L)6K	6.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
4467.458	1.326E+05	–3.400	–0.060	67261.35 (e)	1.071	4f65d(5L)6I	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
4495.142	1.842E+04	–4.253	0.000	67915.04 (e)	1.189	4f65d(5L)6I	6.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
4497.918	2.833E+04	–4.070	0.030	28200.06 (o)	1.691	4f7 6P	3.5	50426.33 (e)	1.215	4f65d(7F)6G	3.5
4511.250	3.227E+04	–4.005	0.040	67478.58 (e)	1.055	4f65d(5L)6I	4.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
4537.694	3.599E+04	–3.949	0.020	67607.72 (e)	1.105	4f65d(5L)6I	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
4564.151	3.384E+04	–3.975	–0.010	67274.79 (e)	1.105	4f65d(5L)6K	6.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
4586.336	1.469E+04	–4.342	0.010	28628.54 (o)	1.857	4f7 6P	2.5	50426.33 (e)	1.215	4f65d(7F)6G	3.5
4595.004	7.153E+05	–2.637	0.080	28200.06 (o)	1.691	4f7 6P	3.5	49956.73 (e)	1.491	4f65d(7F)6D	4.5
4598.433	1.194E+05	–3.423	–0.070	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
4698.574	1.608E+04	–4.274	0.040	28628.54 (o)	1.857	4f7 6P	2.5	49905.64 (e)	0.970	4f65d(7F)6G	2.5
4699.066	5.047E+04	–3.776	0.060	67478.58 (e)	1.055	4f65d(5L)6I	4.5	88753.45 (o)	1.416	4f66p(7F)6F	3.5
4699.440	1.908E+05	–3.200	0.050	67905.35 (e)	1.168	4f65d(5L)6I	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
4739.696	3.650E+05	–2.902	0.060	28200.06 (o)	1.691	4f7 6P	3.5	49292.56 (e)	1.475	4f65d(7F)6D	3.5
4779.258	1.318E+05	–3.338	–0.020	66123.43 (e)	1.226	4f65d(5L)6K	7.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
4782.184	1.128E+04	–4.411	–0.010	67261.35 (e)	1.071	4f65d(5L)6I	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
4829.930	1.339E+04	–4.328	0.000	67261.35 (e)	1.071	4f65d(5L)6I	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
4833.067	2.921E+05	–2.989	–0.040	67274.79 (e)	1.105	4f65d(5L)6K	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
4837.978	3.736E+05	–2.878	0.070	28628.54 (o)	1.857	4f7 6P	2.5	49292.56 (e)	1.475	4f65d(7F)6D	3.5
4925.614	8.724E+04	–3.491	0.040	28200.06 (o)	1.691	4f7 6P	3.5	48496.43 (e)	1.465	4f65d(7F)6D	2.5
5015.702	7.682E+04	–3.540	0.040	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
5018.546	4.671E+04	–3.755	–0.030	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	86933.53 (o)	1.108	4f66p(7F)6F	1.5
5031.844	3.975E+05	–2.818	0.150	28628.54 (o)	1.857	4f7 6P	2.5	48496.43 (e)	1.465	4f65d(7F)6D	2.5
5057.644	1.831E+04	–4.152	0.000	67274.79 (e)	1.105	4f65d(5L)6K	6.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
5064.682	1.278E+04	–4.310	–0.010	70415.96 (e)	1.205	4f65d(5F)6H2	6.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
5116.413	2.554E+04	–3.997	0.000	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
5122.920	6.258E+05	–2.610	0.210	28200.06 (o)	1.691	4f7 6P	3.5	47714.74 (e)	1.452	4f65d(7F)6F	4.5
5127.107	3.273E+04	–3.887	0.010	67261.35 (e)	1.071	4f65d(5L)6I	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
5176.568	8.541E+05	–2.463	–0.190	69866.09 (e)	1.224	4f65d(5L)6I	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
5205.864	1.418E+04	–4.239	0.000	68506.39 (e)	1.235	4f65d(5L)6I	8.5	87710.15 (o)	1.463	4f66p(7F)8G	7.5
5224.304	5.744E+04	–3.629	–0.010	67905.35 (e)	1.168	4f65d(5L)6I	7.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
5247.360	1.469E+05	–3.215	0.100	28628.54 (o)	1.857	4f7 6P	2.5	47680.44 (e)	1.451	4f65d(7F)6D	1.5
5255.158	8.214E+04	–3.467	0.020	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	89639.17 (o)	1.453	4f66p(7F)6F	4.5
5259.681	1.037E+05	–3.364	0.020	67274.79 (e)	1.105	4f65d(5L)6K	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
5285.257	4.593E+04	–3.718	–0.020	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	85928.29 (o)	1.495	4f66p(7F)6D	2.5
5291.180	6.866E+05	–2.537	–0.600	70284.41 (e)	1.236	4f65d(5H)6H1	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
5328.279	1.301E+04	–4.259	0.010	70415.96 (e)	1.205	4f65d(5F)6H2	6.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
5348.364	2.264E+04	–4.014	0.020	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
5376.780	3.074E+05	–2.877	0.130	28200.06 (o)	1.691	4f7 6P	3.5	46793.38 (e)	1.433	4f65d(7F)6F	3.5
5385.566	5.764E+04	–3.599	–0.070	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
5414.926	2.016E+04	–4.061	0.010	65497.59 (e)	1.060	4f65d(5L)4I	5.5	83959.93 (o)	1.599	4f66p(7F)8D	5.5
5444.121	1.541E+05	–3.155	0.020	66123.43 (e)	1.226	4f65d(5L)6K	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
5484.983	1.295E+04	–4.232	–0.010	67478.58 (e)	1.055	4f65d(5L)6I	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
5487.379	1.107E+04	–4.299	0.000	67261.35 (e)	1.071	4f65d(5L)6I	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
5503.611	3.920E+05	–2.756	0.190	28628.54 (o)	1.857	4f7 6P	2.5	46793.38 (e)	1.433	4f65d(7F)6F	3.5
5509.927	1.922E+04	–4.060	–0.370	34816.06 (o)	1.548	4f7 6D	4.5	52960.08 (e)	1.450	4f66s(7F)6F	5.5
5523.019	1.613E+04	–4.134	–0.010	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	85114.02 (o)	1.431	4f66p(7F)8F	1.5
5577.127	1.931E+04	–4.047	–0.010	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	84938.40 (o)	1.135	4f66p(7F)6G	2.5
5582.318	9.301E+04	–3.364	0.090	28200.06 (o)	1.691	4f7 6P	3.5	46108.79 (e)	1.405	4f65d(7F)6F	2.5
5698.426	3.850E+05	–2.729	0.250	70415.96 (e)	1.205	4f65d(5F)6H2	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
5719.155	3.809E+05	–2.735	0.320	28628.54 (o)	1.857	4f7 6P	2.5	46108.79 (e)	1.405	4f65d(7F)6F	2.5
5729.715	8.858E+04	–3.362	–0.050	72707.00 (e)	1.249	4f65d(5F)6G2	5.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
5763.997	2.500E+04	–3.903	–0.010	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5

Table 5. continued.

Wavelength	g_uA	log($g_i f$)	CF	Lower level				Upper levell			
Å	s^{-1}			E cm^{-1}	g	Design.[a]	J	E cm^{-1}	g	Design.[a]	J
5820.721	1.842E+05	–3.026	0.080	69866.09 (e)	1.224	4f65d(5L)6I	7.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
5833.972	1.537E+05	–3.110	0.160	28628.54 (o)	1.857	4f7 6P	2.5	45764.77 (e)	1.367	4f65d(7F)6F	1.5
5938.463	6.846E+04	–3.445	–0.100	34816.06 (o)	1.548	4f7 6D	4.5	51650.77 (e)	1.352	4f65d(7F)6G	5.5
5945.270	1.626E+04	–4.064	–0.010	73339.60 (e)	1.168	4f65d(5F)6G2	6.5	90155.04 (o)	1.461	4f66p(7F)6F	5.5
5964.171	2.691E+04	–3.848	0.080	72416.38 (e)	1.143	4f65d(5I)6K2	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
5966.031	1.178E+05	–3.197	0.190	70284.41 (e)	1.236	4f65d(5H)6H1	7.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
6029.179	3.589E+04	–3.708	0.010	67905.35 (e)	1.168	4f65d(5L)6I	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
6086.303	1.202E+04	–4.173	0.020	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
6135.000	2.135E+04	–3.924	0.020	34816.06 (o)	1.548	4f7 6D	4.5	51111.47 (e)	1.311	4f65d(7F)6G	4.5
6192.326	2.402E+05	–2.857	–0.090	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
6258.044	2.209E+04	–3.894	0.090	71984.79 (e)	1.042	4f65d(5I)6K2	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
6258.636	4.593E+04	–3.567	–0.010	67274.79 (e)	1.105	4f65d(5L)6K	6.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
6301.005	1.140E+05	–3.171	–0.060	70415.96 (e)	1.205	4f65d(5F)6H2	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
6311.813	1.465E+04	–4.058	0.010	73339.60 (e)	1.168	4f65d(5F)6G2	6.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
6404.268	1.287E+04	–4.110	0.030	34816.06 (o)	1.548	4f7 6D	4.5	50426.33 (e)	1.215	4f65d(7F)6G	3.5
6410.492	8.704E+05	–2.277	0.590	73583.41 (e)	1.257	4f65d(5I)6I2	7.5	89178.53 (o)	1.468	4f66p(7F)8F	6.5
6466.745	8.366E+04	–3.282	0.050	72707.00 (e)	1.249	4f65d(5F)6G2	5.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
6554.363	1.251E+04	–4.097	–0.010	72707.00 (e)	1.249	4f65d(5F)6G2	5.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
6602.903	7.009E+05	–2.329	0.140	34816.06 (o)	1.548	4f7 6D	4.5	49956.73 (e)	1.491	4f65d(7F)6D	4.5
6666.351	5.080E+06	–1.469	0.360	32073.30 (o)	1.292	4f7 6I	8.5	47069.87 (e)	1.349	4f65d(7F)6H	7.5
6677.233	1.256E+04	–4.078	–0.010	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	81985.13 (o)	1.669	4f66p(7F)8D	3.5
6725.632	4.791E+04	–3.486	0.050	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
6772.240	2.135E+05	–2.836	–0.220	32307.78 (o)	1.238	4f7 6I	7.5	47069.87 (e)	1.349	4f65d(7F)6H	7.5
6807.990	1.113E+04	–4.114	–0.040	73481.89 (e)	0.845	4f65d(5I)6I2	4.5	88166.46 (o)	1.524	4f66p(7F)6D	4.5
6837.743	2.307E+05	–2.788	–0.100	69866.09 (e)	1.224	4f65d(5L)6I	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
6837.964	7.824E+04	–3.261	0.030	73339.60 (e)	1.168	4f65d(5F)6G2	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
6905.841	1.349E+05	–3.006	0.070	34816.06 (o)	1.548	4f7 6D	4.5	49292.56 (e)	1.475	4f65d(7F)6D	3.5
6976.029	7.199E+05	–2.279	0.170	28200.06 (o)	1.691	4f7 6P	3.5	42530.91 (e)	1.746	4f65d(7F)6P	3.5
7005.743	4.967E+05	–2.449	0.330	34816.06 (o)	1.548	4f7 6D	4.5	49086.13 (e)	1.440	4f65d(7F)6F	5.5
7039.145	1.890E+05	–2.847	–0.270	70284.41 (e)	1.236	4f65d(5H)6H1	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
7113.308	1.124E+04	–4.071	–0.010	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	81067.28 (o)	1.743	4f66p(7F)6D	2.5
7113.910	1.701E+05	–2.891	–0.060	72707.00 (e)	1.249	4f65d(5F)6G2	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
7191.036	3.732E+05	–2.545	–0.180	28628.54 (o)	1.857	4f7 6P	2.5	42530.91 (e)	1.746	4f65d(7F)6P	3.5
7200.451	3.683E+04	–3.543	–0.030	28200.06 (o)	1.691	4f7 6P	3.5	42084.25 (e)	1.768	4f65d(7F)8P	4.5
7207.183	1.435E+04	–3.948	–0.020	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
7221.842	3.556E+06	–1.559	0.340	32307.78 (o)	1.238	4f7 6I	7.5	46150.85 (e)	1.294	4f65d(7F)6H	6.5
7225.162	2.966E+05	–2.638	–0.230	32314.14 (o)	1.159	4f7 6I	6.5	46150.85 (e)	1.294	4f65d(7F)6H	6.5
7425.750	5.741E+04	–3.328	–0.170	73481.89 (e)	0.845	4f65d(5I)6I2	4.5	86944.83 (o)	1.518	4f66p(7F)6D	3.5
7428.525	2.359E+05	–2.716	–0.160	73583.41 (e)	1.257	4f65d(5I)6I2	7.5	87041.33 (o)	1.458	4f66p(7F)8G	6.5
7529.065	2.464E+04	–3.682	0.050	73481.89 (e)	0.845	4f65d(5I)6I2	4.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
7550.462	1.001E+04	–4.069	0.020	67013.00 (e)	1.221	4f65d(5D)6S3	2.5	80253.58 (o)	1.946	4f66p(7F)6D	1.5
7611.615	2.907E+05	–2.600	–0.240	32179.55 (o)	1.037	4f7 6I	5.5	45313.75 (e)	1.213	4f65d(7F)6H	5.5
7624.277	1.329E+04	–3.930	–0.090	74847.41 (e)	1.052	4f65d(5K)6K	6.5	87959.80 (o)	1.455	4f66p(7F)6G	5.5
7690.421	2.520E+06	–1.655	0.330	32314.14 (o)	1.159	4f7 6I	6.5	45313.75 (e)	1.213	4f65d(7F)6H	5.5
7724.381	2.839E+04	–3.594	–0.020	73339.60 (e)	1.168	4f65d(5F)6G2	6.5	86282.06 (o)	1.460	4f66p(7F)8G	5.5
7750.597	7.669E+05	–2.166	0.380	34816.06 (o)	1.548	4f7 6D	4.5	47714.74 (e)	1.452	4f65d(7F)6F	4.5
7790.674	6.647E+04	–3.221	0.050	70415.96 (e)	1.205	4f65d(5F)6H2	6.5	83248.29 (o)	1.427	4f66p(7F)8G	5.5
7826.906	4.293E+04	–3.407	0.020	72707.00 (e)	1.249	4f65d(5F)6G2	5.5	85479.93 (o)	1.487	4f66p(7F)8F	4.5
7873.338	2.863E+05	–2.574	0.170	28200.06 (o)	1.691	4f7 6P	3.5	40897.66 (e)	2.045	4f65d(7F)6P	2.5
7890.152	1.586E+05	–2.828	–0.130	28200.06 (o)	1.691	4f7 6P	3.5	40870.60 (e)	1.883	4f65d(7F)8P	3.5
7934.584	2.299E+05	–2.663	–0.240	31954.21 (o)	0.833	4f7 6I	4.5	44553.80 (e)	1.083	4f65d(7F)6H	4.5
7989.291	1.569E+04	–3.824	–0.060	74246.78 (e)	0.945	4f65d(5K)6K	5.5	86760.09 (o)	1.413	4f66p(7F)6G	4.5
8079.077	1.812E+06	–1.754	0.320	32179.55 (o)	1.037	4f7 6I	5.5	44553.80 (e)	1.083	4f65d(7F)6H	4.5
8148.304	1.009E+04	–4.004	0.020	28628.54 (o)	1.857	4f7 6P	2.5	40897.66 (e)	2.045	4f65d(7F)6P	2.5
8166.313	3.369E+04	–3.478	0.070	28628.54 (o)	1.857	4f7 6P	2.5	40870.60 (e)	1.883	4f65d(7F)8P	3.5
8178.901	1.219E+05	–2.916	0.300	73481.89 (e)	0.845	4f65d(5I)6I2	4.5	85705.11 (o)	1.347	4f66p(7F)6G	3.5
8235.458	1.338E+05	–2.866	–0.250	31745.99 (o)	0.455	4f7 6I	3.5	43885.27 (e)	0.842	4f65d(7F)6H	3.5
8282.466	1.125E+04	–3.942	0.060	72416.38 (e)	1.143	4f65d(5I)6K2	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
8346.818	1.472E+05	–2.819	0.200	34816.06 (o)	1.548	4f7 6D	4.5	46793.38 (e)	1.433	4f65d(7F)6F	3.5
8379.183	1.335E+06	–1.852	0.320	31954.21 (o)	0.833	4f7 6I	4.5	43885.27 (e)	0.842	4f65d(7F)6H	3.5
8581.513	1.018E+06	–1.945	0.320	31745.99 (o)	0.455	4f7 6I	3.5	43395.75 (e)	0.309	4f65d(7F)6H	2.5
8628.990	2.325E+05	–2.590	–0.170	32073.30 (o)	1.292	4f7 6I	8.5	43658.96 (e)	1.444	4f65d(7F)8G	7.5
8641.423	2.097E+05	–2.625	–0.280	28200.06 (o)	1.691	4f7 6P	3.5	39769.05 (e)	2.081	4f65d(7F)8P	2.5
8703.623	2.222E+04	–3.595	–0.050	70615.54 (e)	1.199	4f65d(5H)6H1	5.5	82101.85 (o)	1.404	4f66p(7F)8G	4.5
8741.289	1.734E+04	–3.700	–0.160	28200.06 (o)	1.691	4f7 6P	3.5	39636.88 (e)	1.492	4f65d(7F)8G	2.5
8807.240	1.176E+04	–3.874	0.120	32307.78 (o)	1.238	4f7 6I	7.5	43658.96 (e)	1.444	4f65d(7F)8G	7.5
8959.183	1.610E+04	–3.716	–0.100	73481.89 (e)	0.845	4f65d(5I)6I2	4.5	84640.55 (o)	1.587	4f66p(7F)8F	3.5
9168.977	2.015E+05	–2.602	0.240	73583.41 (e)	1.257	4f65d(5I)6I2	7.5	84486.77 (o)	1.439	4f66p(7F)6G	6.5
9314.859	1.947E+05	–2.606	0.380	28628.54 (o)	1.857	4f7 6P	2.5	39361.13 (e)	2.554	4f65d(7F)6P	1.5
9483.004	5.576E+04	–3.125	–0.150	32307.78 (o)	1.238	4f7 6I	7.5	42850.07 (e)	1.452	4f65d(7F)8G	6.5
9658.797	1.586E+04	–3.650	–0.170	32307.78 (o)	1.238	4f7 6I	7.5	42658.20 (e)	1.520	4f65d(7F)8F	6.5

[a] A figure behind the term designation stands for a seniority number.