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THE INFRARED SPECTRUM OF CURIUM-244

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The Infrared Spectrum of Curium-244*

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Abstract

The spectrum of curium-244 has been observed on the high resolution Fourier-transform spectrometer at Laboratoire Aime Cotton. An electrodless lamp containing 50 μg of CmI_3 was run for 12 hours and 800,000 points were taken. A total of 1743 lines have been ascribed to curium and 87% of the lines have been assigned to transitions between known energy levels.

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The spectrum of several actinides have been recorded on the high resolution Fourier-transform spectrometer.[1-5] This spectrometer has gone through several modifications, the one used for this work is described by J. Connes et. al.[6]

We wish to report the spectrum of curium-244 (^{244}Cm) recorded on the Fourier-transform spectrometer between 3700-11800 cm^{-1}. The spectrometer was run for 12 hours and 800,000 points were recorded. The xenon line at 35079.84664 Å is the standard on which all of the calculations were based. The light source was a quartz electrodless lamp containing 50 μg of CmI_3. The lamp was 25 mm long and 6 mm inside diameter and was operated in a cavity at 2450 MHz with approximately 80 watts of input power.

The data were reduced using computer programs that locate the peak of a line and calculate the wavenumber and the intensity. The spectrometer was operated in air at atmospheric pressure and the lines have been corrected to vacuum. A strip chart recording was made of the final calculation (See Fig. 1, 2 and 3). Figure 1 is a tracing of the ^{244}Cm spectrum from 3770-11770 cm^{-1}. Figure 2 is a tracing of the line 9482.390 cm^{-1}; at this slower speed the reversal and isotope shift can be seen. Figure 3 is a tracing of the Cm line 4187.270 cm^{-1}. The width of the line at half maximum is 0.023 cm^{-1}. It is necessary to check the tracings against the tabulation since some background peaks get recorded and because there are strong oscillations around the intense peaks that are calculated.

After the tracings and listings were compared to verify the existance of lines, a line list was prepared. A search was made of this list for the presence of plutonium lines. The chemical separation of plutonium

from the curium was made 231 days before the spectrometer run. At that time no plutonium was detected. Plutonium-240 is the daughter of curium-244 (half-life of 17.6 years). A total of 116 lines of plutonium were found. These were the strongest lines in a list compiled by J. Blaise and M. Fred [5]. The plutonium lines observed in this experiment are listed in Table 1. In column 1 is the vacuum wavenumber of the Pu line, in column 2 is the intensity on a scale of 0-9, from the Blaise and Fred list. The curium list was also checked for impurities of Ca, Mg, Na, Mn, and Ti. No impurity was detected.

The final curium list contains 1837 entries of which 94 are double assignments and 33 are CmII. Table 2 is this list, in column 1 is the vacuum wavenumber of the line, column 2 is the intensity on a 0-9 scale, column 3 is the difference between the observed and calculated wavenumber, column 4 is the J value of the odd level, column 5 the J value of the even level, column 6 is the energy of the odd level, column 7 the energy of the even level and column 8 contains the isotope shift.

The sample contained about 3% ^{246}Cm. The values of the isotope shift are delta sigma (= sigma-246 minus sigma-244). In this sign convention a positive isotope shift of the line means that the upper level has a wider isotope shift than the lower level. An exception in columns 4-8 is the line 3922 which is a forbidden transition from a level of J=5 of the configuration f^8s^2 to the lowest level J=6 of the same configuration. Forbidden transitions of this type in the odd configurations do not occur in the region observed, the expected one would occur at 302.153 cm^{-1}.

From previous work on curium it was possible to calculate all the possible combinations that result in a transition in the region of

interest.[7] This calculation was compared to the observed list and when there was agreement within 0.02 cm^{-1} an assignment was made. Later a self-consistant set of values for the energy levels was obtained by starting with the two direct transitions to the ground level and building up the level scheme, using the known levels as a starting point. This new set of levels derived from the infrared data was then used to obtain a list of transitions. Lines which were different from the average by 0.01 cm^{-1} or more were not used in the average. A second requirement was that a level must consist of two or more lines. The root-mean-square deviation between observed and calculated for 840 lines was 1.8×10^{-3}.

Table 3 is a listing of the odd energy levels derived from the infrared data. In column 1 is the configuration, column 2 the J value and column 3 the energy value. Table 4 is a similar listing for the even levels.

A second computer program for finding peaks has become available, this one is better able to find weak lines. A check was then made of the predicted lines vs the new weak lines and the analysis was extended. There are 1602 lines classified and this 87% of the total.

Acknowledgments

We wish to acknowledge the help of T. Parsons for the chemical separation of the curium, the assistance of E. Worden in preparing the electrodless lamps, and the help of Mrs. J. Chevillard with the calculations.

One of us (J.G.C.) wishes to especially thank Professor P. Jacquinot for making his stay at Laboratoire Aimé Cotton such a pleasurable one and the Centre National de la Recherche Scientifique for the grant of chercheur associé.

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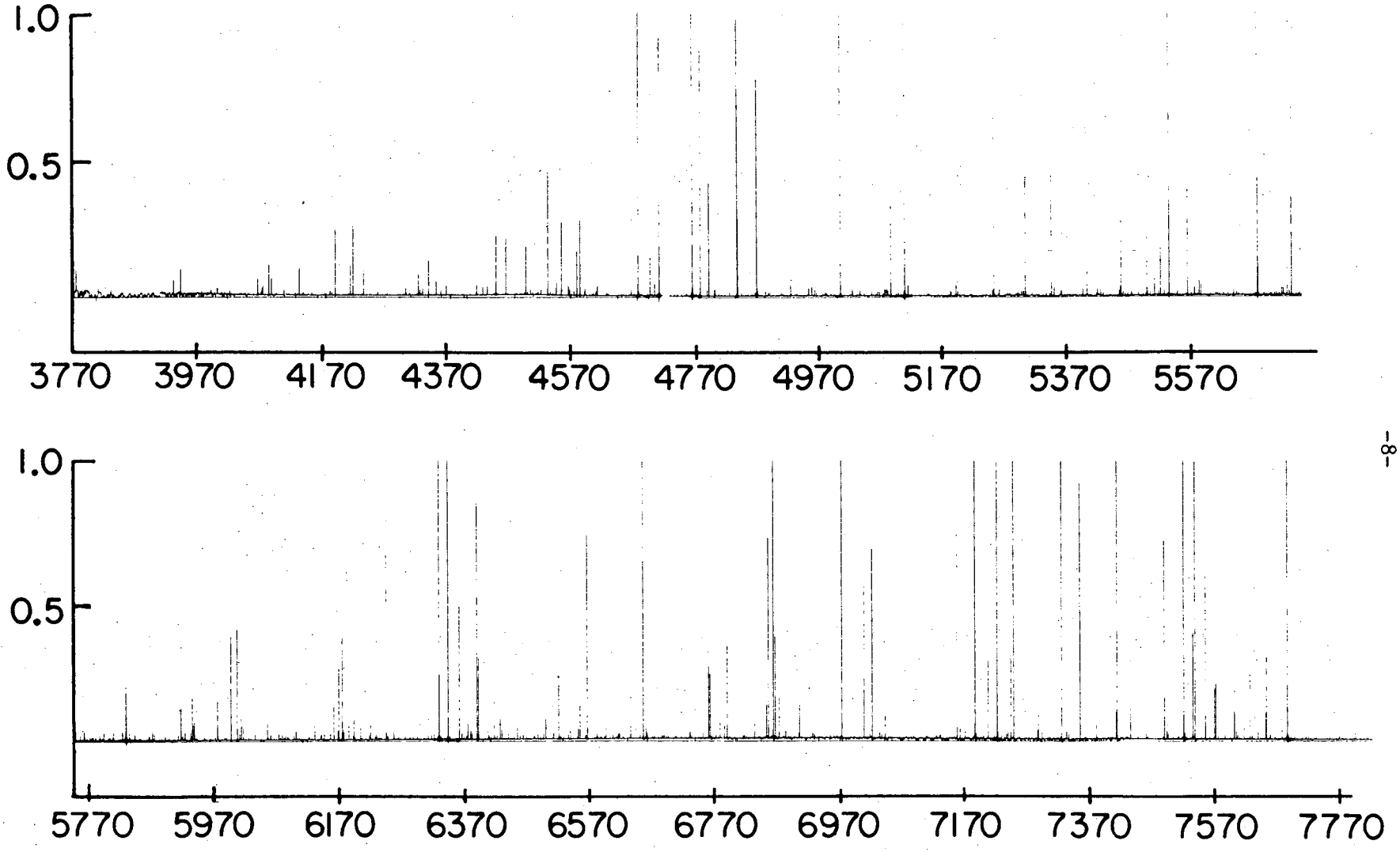
Figure Captions

Fig. 1. The curium-242 spectrum between 3770 and 11770 cm^{-1}.

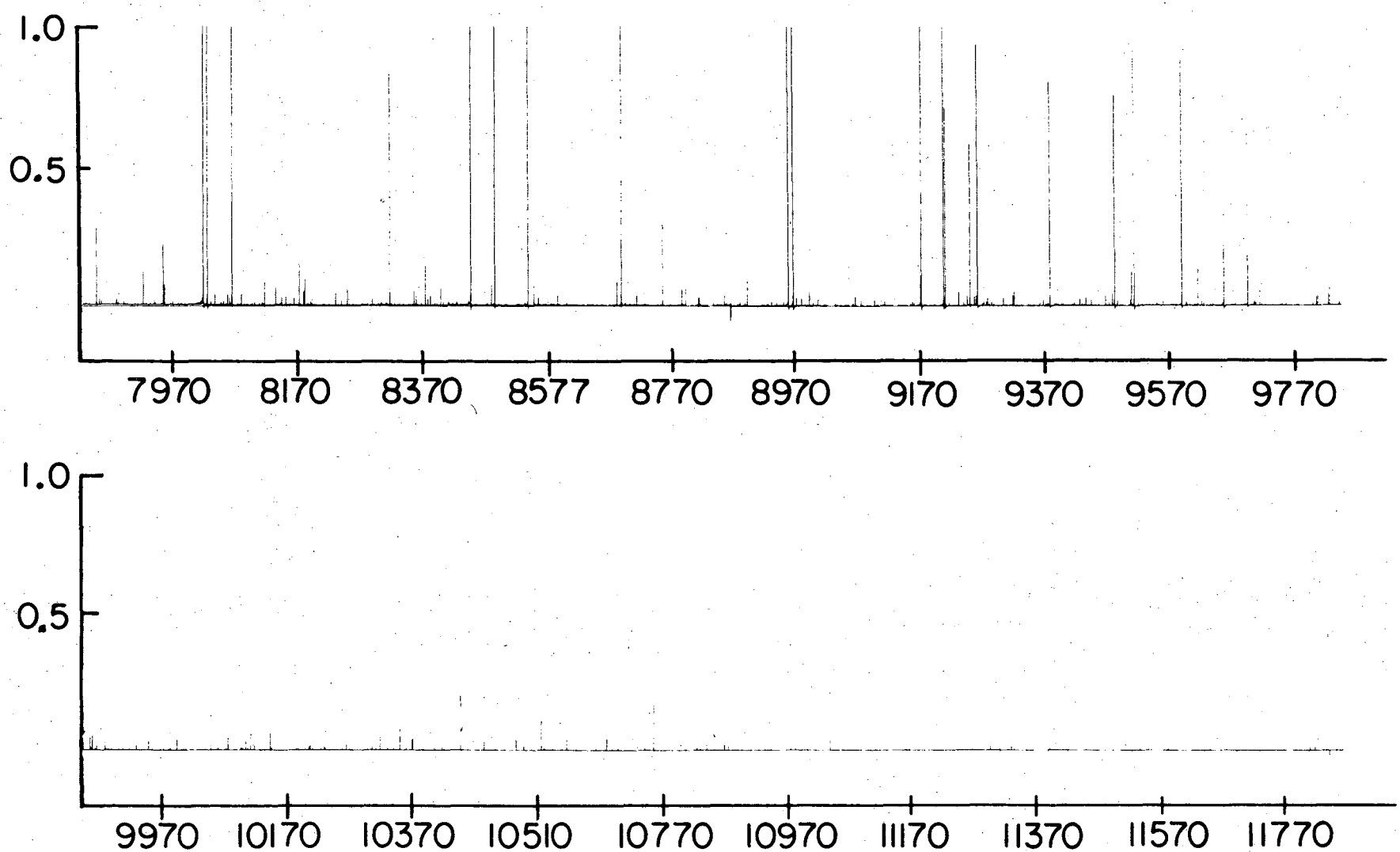
Fig. 2. The curium line at 9482.390 cm^{-1} illustrating the self-reversal and isotope shift of ^{246}Cm.

Fig. 3. The curium line at 4187.270 cm^{-1}.



XBL7410-4433

Fig. 1 (a)



XBL7410-4432

Fig. 1 (b)

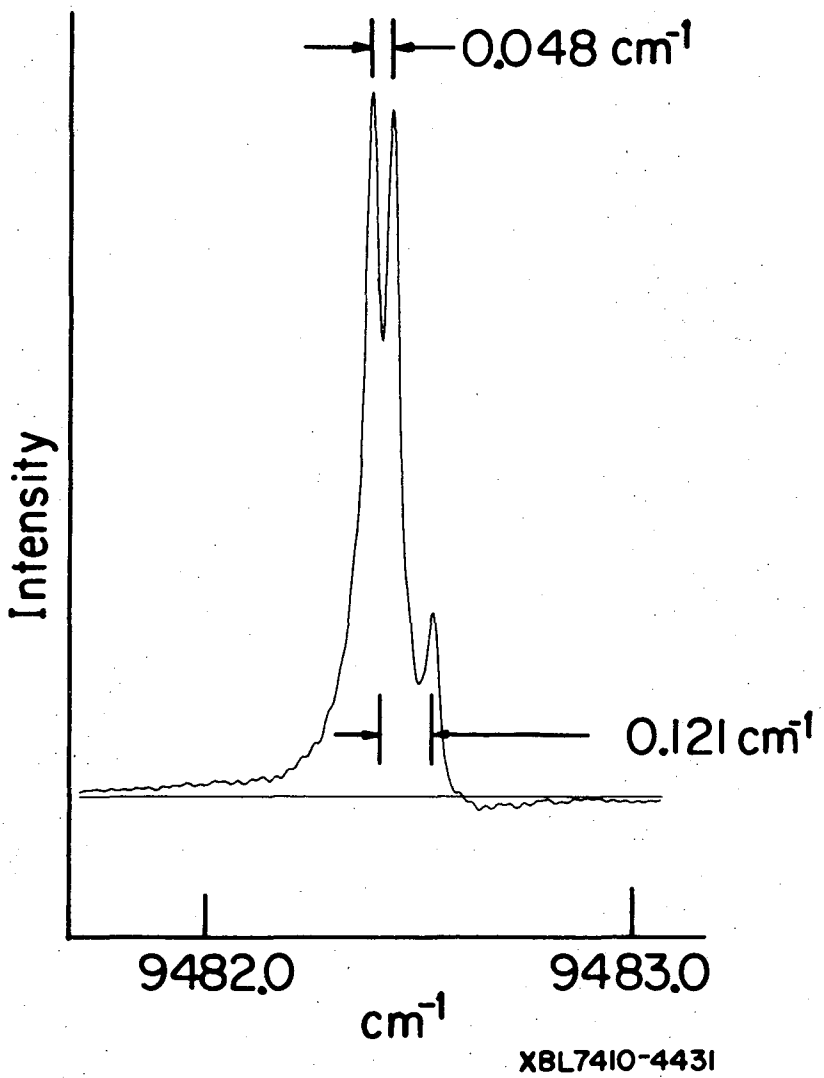


Fig. 2

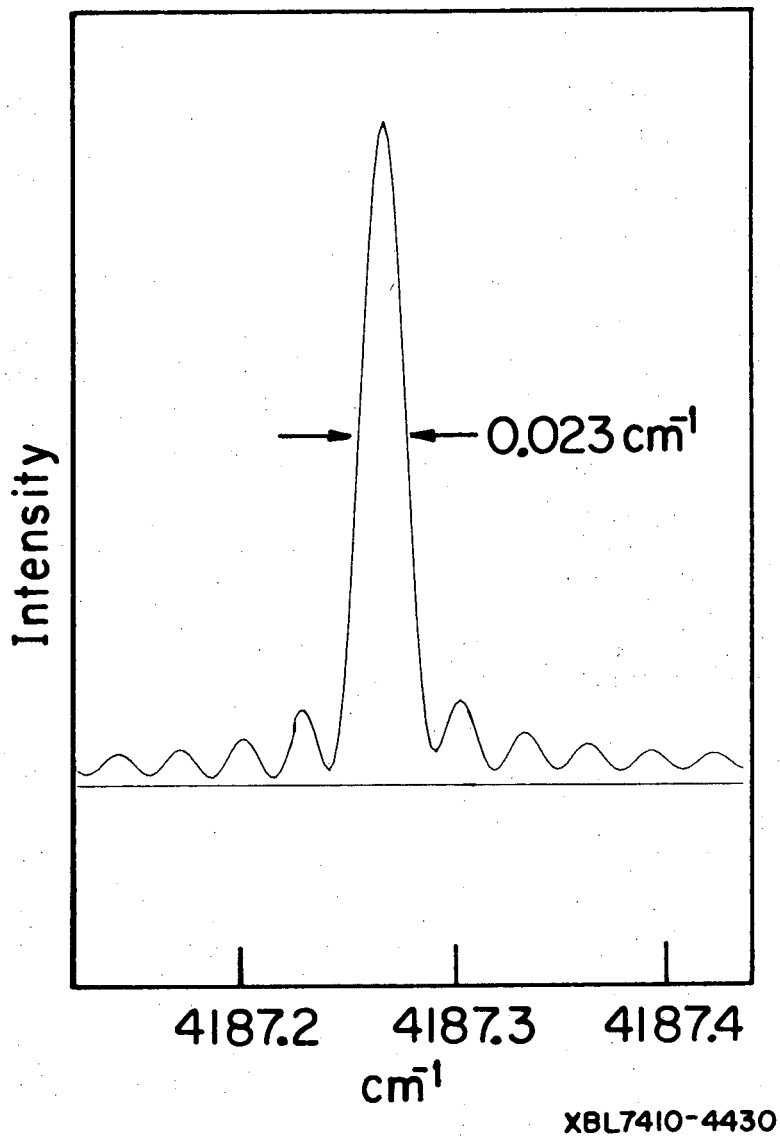


Fig. 3

Table 1. Plutonium line list.

Energy (wave no.)	Intensity (0-9)
4103.791	5
4109.003	6
4152.125	5
4311.667	5
4414.120	6
4416.753	5
4702.324	5
4705.948	4
4729.560	5
4732.351	7
4754.933	6
4794.471	5
4963.817	7
5097.662	6
5106.702	6
5138.867	5
5285.618	5
5292.907	6
5518.756	5
5730.826	6
5738.457	5
5777.604	6
5789.414	6
5899.997	5
5916.469	8
5975.163	7
5981.746	5
6043.390	5
6057.209	5
6073.907	5
6083.769	7
6187.900	6
6218.136	7
6227.066	6
6241.986	5
6300.549	5
6317.537	5
6335.776	5
6360.817	5
6373.923	6
6420.814	6
6427.572	5
6449.837	5
6482.062	6
6501.319	8

Table 1. (continued)

Energy (wave no.)	Intensity (0-9)
6505.759	5
6540.924	5
6564.454	6
6608.471	7
6612.827	5
6671.347	6
6689.320	6
6707.581	5
6772.670	6
6833.812	5
6897.470	5
6918.225	5
6929.463	6
6971.964	5
7020.055	5
7085.691	5
7126.472	6
7147.997	5
7171.788	7
7202.054	5
7289.567	7
7392.763	6
7434.355	5
7513.083	6
7534.759	5
7577.061	5
7660.545	7
7699.129	7
7751.307	6
7755.715	7
7833.199	5
7979.913	6
7983.092	6
8010.986	6
8047.865	6
8052.137	7
8063.826	6
8075.046	6
8110.270	6
8159.485	6
8173.573	8
8192.105	7
8231.966	8
8304.882	6
8334.082	6

Table 1. (continued)

Energy (wave no.)	Intensity (0-9)
8354.677	6
8356.014	6
8503.828	6
8791.076	6
8814.436	6
8927.942	6
8994.538	8
9008.349	7
9129.785	6
9258.305	7
9279.876	6
9376.016	6
9387.140	6
9434.502	6
9550.286	7
9577.058	6
9770.648	6
9845.069	6
9869.038	7
9920.654	5
9950.749	8
9974.361	7
10119.012	7
10486.928	8
10937.365	7
11124.733	7

Table 2. Curium line list.

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
3774.254	6	0	4.0	3.0	16516	20290	
3809.234	2	+1	6.0	5.0	23633	19824	
3829.338	2	0	7.0	7.0	20762	16932	
3922.316	1		6.0	5.0	* 1214	5136	EV-EV
3928.361	5	+1	5.0	5.0	9064	5136	
3939.755	6	0	4.0	3.0	15719	19658	
3973.452	1	+1	6.0	5.0	17047	21020	
3983.337	0	0	5.0	6.0	26790	22806	
3987.276	0	+2	4.0	4.0	27522	23535	
3987.545	1	+2	4.0	5.0	28989	25001	
3988.235	2	−1	6.0	6.0	23136	27124	
3993.784	1		7.0	7.0	26609	22615	
3997.922	3	+1	6.0	5.0	19059	23057	
4003.426	0	0	5.0	6.0	23299	19296	
4004.978	1						
4009.373	1	+3	5.0	5.0	21828	25838	
4014.615	0	0	5.0	4.0	24501	28515	
4018.057	2		7.0	7.0	27728	23710	
4019.721	0		5.0	4.0	23775	19755	
4027.493	0		3.0	2.0	22751	26779	
4027.493			6.0	6.0	24749	28777	
4027.939	0		4.0	3.0	20673	16645	
4034.104	0		6.0	6.0	23633	27667	
4036.162	1	−1	3.0	4.0	10484	14521	
4037.792	0	+1	3.0	4.0	20435	24472	
4040.762	0		6.0	6.0	25518	29559	
4041.213	1	0	6.0	5.0	26531	30573	
4042.563	0	+2	7.0	6.0	22907	18865	
4042.792	1		6.0	5.0	22129	26171	
4042.792		−5	6.0	5.0	30483	34526	
4046.930	1	+3	5.0	4.0	25057	21010	
4049.498	0						
4054.852	0		6.0	6.0	27888	23833	
4055.825	0	+2	6.0	5.0	29065	33121	
4061.956	6	+3	4.0	4.0	815	4877	
4063.822	1	+5	2.0	3.0	23560	27624	
4066.958	1	0	4.0	3.0	24357	20290	
4068.951	3	+1	6.0	5.0	22129	18060	
4070.657	3		7.0	7.0	26609	22538	
4070.657			2.0	2.0	33041	37112	
4074.360	0		6.0	6.0	29065	24991	
4079.997	6	−1	5.0	5.0	11641	15721	
4080.837	0	0	4.0	4.0	8958	4877	
4084.158	6	+1	5.0	4.0	20912	24996	
4090.343	0		6.0	7.0	17656	21746	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
4092.315	1	+3	5.0	6.0	19741	23833	
4094.329	0		5.0	4.0	16915	21010	
4099.992	0		5.0	5.0	23299	27399	
4105.016	2	+2	5.0	5.0	16915	21020	
4105.347	1	+1	4.0	5.0	15719	19824	
4106.515	3	+1	4.0	3.0	22341	26447	
4112.166	0	0	2.0	3.0	15546	19658	
4113.061	0		3.0	2.0	26103	30216	
4113.565	0		3.0	3.0	22334	26447	
4123.287	1	+1	5.0	6.0	23419	19296	
4127.107	0		7.0	6.0	31464	35591	
4129.734	6	+2	6.0	6.0	17656	21786	
4134.183	1		6.0	5.0	35053	39187	
4136.436	2	0	5.0	6.0	36943	22806	
4142.001	0		4.0	4.0	23146	27288	
4142.742	0	0	5.0	4.0	22640	26782	
4143.819	0	+2	3.0	4.0	21560	25704	
4144.293	0	+2	6.0	5.0	26428	30573	
4149.649	2	+2	4.0	5.0	21688	25838	
4155.324	0		6.0	7.0	24749	20593	
4166.314	0		3.0	4.0	28246	24079	
4168.734	0		4.0	4.0	24357	28526	
4170.788	1	+1	6.0	6.0	25518	21348	
4172.193	0		5.0	4.0	25057	29229	
4172.818	0	+1	3.0	3.0	24900	20727	
4177.865	1		6.0	7.0	27888	23710	
4179.231	2	+1	4.0	3.0	22268	26447	
4181.663	1		3.0	2.0	25844	30026	
4187.270	8	0	5.0	4.0	9064	4877	
4187.544	0		4.0	5.0	35768	31580	
4190.036	0		6.0	5.0	20197	24387	
4192.953	0		4.0	4.0	20673	16480	
4208.387	0	+1	4.0	5.0	22268	18060	
4210.309	0		6.0	5.0	23633	27843	
4211.450	6		4.0	3.0	16516	20727	
4215.522	0		4.5	4.5	10134	5919	
4216.062	8	−1	3.0	2.0	15924	20140	
4216.062			3.0	4.0	10484	14700	
4217.636	0		5.0	4.0	19089	23306	
4221.645	0	+4	2.0	2.0	22557	26779	
4223.240	0		4.0	4.0	24357	28580	
4229.889	0		4.0	5.0	27522	23292	
4231.143	0		6.0	5.0	27349	31580	
4233.116	6	+1	6.0	5.0	19059	23292	
4233.206	1		7.0	8.0	29921	25688	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
4237.472	0	0	5.0	5.0	22297	18060	
4238.573	0	−1	5.0	4.0	23299	27538	
4243.232	1	+2	5.0	4.0	25057	20813	
4245.534	0		4.0	4.0	24270	28515	
4253.207	0	−1	4.0	5.0	23146	27399	
4256.133	2	+1	3.0	4.0	15924	20180	
4262.934	0		6.0	5.0	23136	27399	
4263.232	0		7.0	7.0	26010	21746	
4271.466	1	+1	6.0	6.0	23136	18865	
4292.317	0	−3	6.0	5.0	27349	23057	
4296.376	0						
4297.659	0	0	4.0	4.0	16516	20813	
4300.525	3	0	6.0	6.0	17047	21348	
4301.521	1		1.0	2.0	25724	30026	
4305.820	0	+4	4.0	3.0	24357	28663	
4307.204	1		4.0	5.0	27522	23215	
4311.262	0		6.0	6.0	25518	29830	
4315.564	0		5.0	5.0	20912	25228	
4318.454	0	+1	6.0	6.0	19059	23377	
4320.644	0		5.0	4.0	24501	20180	
4320.865	6	+2	4.0	5.0	815	5136	
4321.136	0		5.0	6.0	20912	25233	
4323.338	2	+2	5.0	6.0	17463	21786	
4324.278	1		5.0	6.0	27131	22806	
4325.510	0	0	5.0	6.0	22799	27124	
4327.654	1	+3	4,0	5.0	20673	25001	
4327.894	3		5.0	6.0	22297	26625	
4337.368	0		4.0	4.0	16516	20853	
4337.610	6	+1	6.0	6.0	23633	19296	
4338.618	0		5.0	4.0	19741	24079	
4346.543	0	+2	5.0	4.0	24646	28992	
4349.685	5	+1	4.0	3.0	20673	25023	
4357.255	3		6.0	5.0	17656	22013	
4362.008	1		7.0	8.0	29921	25559	
4365.972	4	+1	3.0	3.0	15924	20290	
4367.016	0		4.0	3.0	23730	28097	
4374.505	0		6.0	5.0	20197	24572	
4374.735	0		5.0	4.0	34058	38433	
4391.221	0W						
4414.940	4	0	6.0	5.0	26428	22013	
4424.629	3	−1	5.0	5.0	23419	27843	
4431.869	2	+4	5.0	4.0	20912	16480	
4432.088	4	0	5.0	6.0	16915	21348	
4441.578	0	+1	4.0	4.0	22341	26782	
4443.750	0						

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
4445.215	2	+1	3.0	2.0	22334	26779	
4445.925	7	+1	2.0	1.0	15546	19992	
4448.629	1	+1	3.0	4.0	22334	26782	
4457.008	0	+2	4.0	3.0	26465	30922	
4461.653	7	+2	4.0	4.0	15719	20180	
4465.082	0	+1	4.0	5.0	27522	23057	
4472.269	0		2.0	3.0	22557	27030	
4475.845	0	+3	6.0	5.0	20197	15721	
4479.405	0		2.0	2.0	23377	27857	
4479.506	1	+1	5.0	6.0	23775	19296	
4485.209	0	+2	5.0	4.0	22297	26782	
4486.738	0		4.0	5.0	28635	33121	
4491.469	1	0	5.0	4.0	24501	28992	
4492.491	0		5.0	5.0	28880	24387	
4493.962	7	0	4.0	4.0	16516	21010	
4496.416	1		6.0	6.0	22129	26625	
4501.220	2	0	6.0	6.0	12534	17036	
4504.649	1	+1	4.0	5.0	16516	21020	
4506.370	0		4.0	4.0	25320	20813	
4510.442	0	0	7.0	6.0	27728	32239	
4513.260	1	0	5.0	5.0	21828	17315	
4518.019	2	+1	6.0	5.0	26531	22013	
4519.136	0		4.0	4.0	25529	21010	
4529.076	8		7.0	7.0	18009	22538	
4530.118	0		5.0	6.0	25878	21348	
4533.102	1	0	4.0	5.0	24357	19824	
4536.898	0		2.0	3.0	23561	28097	
4536.899	0	+7	2.0	3.0	23560	28097	
4537.899	0	−3	3.0	2.0	26103	21565	
4541.014	0		5.0	5.0	26554	22013	
4542.804	4	−3	6.0	6.0	27349	22806	
4547.942	0	−1	4.0	5.0	27763	23215	
4550.859	8	+2	5.0	5.0	17463	22013	
4561.761	0		5.0	4.0	25878	30439	
4561.797	3	+2	5.0	4.0	25878	30439	
4564.005	2		4.0	4.0	20673	25237	
4567.408	0						
4570.948	2		2.0	2.0	25455	30026	
4575.458	7	+1	3.0	4.0	320	4877	
4580.443	8	0	3.0	4.0	9458	4877	
4581.726	0		5.0	5.0	29153	24572	
4588.413	3	+2	3.0	3.0	20435	25023	
4595.126	0		3.0	4.0	25844	30439	
4600.210	0	+1	5.0	5.0	22799	27399	
4600.210		−12	7.0	6.0	26010	30610	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
4601.693	1	+1	4.0	4.0	24357	19755	
4605.949	2		7.0	7.0	18009	22615	
4605.949			4.0	5.0	35768	31162	
4607.416	2	−4	5.0	5.0	26554	31162	
4608.240	4	+1	7.0	6.0	24951	29559	
4623.197	1		3.0	3.0	22281	26905	
4624.206	0		4.0	3.0	28174	32798	
4624.995	1		2.0	3.0	21822	26447	
4625.867	0		6.0	7.0	23633	28259	
4627.321	0		6.0	5.0	24451	19824	
4635.392	1		4.0	3.0	27763	32698	
4641.901	0		4.0	5.0	28989	33630	
4646.247	0						
4648.170	0		5.0	4.0	22640	27288	
4651.227	0		6.0	7.0	19059	23710	
4655.158	0		4.0	5.0	26754	22099	
4658.959	1		4.0	3.0	21788	26447	
4662.218	2	+2	7.0	6.0	26010	21348	
4666.657	1						
4673.101	9	0	5.0	4.0	11641	16314	
4674.361	1		2.0	3.0	32299	27624	
4676.946	0		5.0	5.0	24501	19824	
4678.835	0		5.0	6.0	27485	22806	
4687.932			3.0	2.0	30536	25848	
4687.932	1		4.0	3.0	23146	27834	
4692.126	7	+1	1.0	1.0	15300	19992	
4695.015	1	+2	5.0	5.0	25878	30573	
4699.510	4	+1	6.0	7.0	17047	21747	
4702.453	0		5.0	6.0	20912	25615	
4706.579	9	0	4.0	3.0	10971	15677	
4710.244	0		7.0	7.0	20762	25472	
4714.887	0		3.0	3.0	26814	22099	
4720.081	1		2.0	3.0	23377	28097	
4729.560	0						
4731.645	0		5.0	4.0	19741	24472	
4733.491	1	+3	6.0	5.0	26428	31162	
4733.913	0		4.0	3.0	25529	30263	
4734.196	6		6.0	7.0	27349	22615	
4738.900	7	+1	6.0	6.0	17047	21786	
4739.108	6	0	5.0	5.0	22799	18060	
4740.433	0		5.0	4.0	23775	28515	
4741.086	0		4.0	5.0	26754	22013	
4743.901	7	0	2.0	3.0	15546	20290	
4744.278	1	−1	5.0	6.0	19089	23833	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
4744.474	0		4.0	4.0	36934	32189	
4745.540		+2	5.0	4.0	24501	19755	
4745.540	3	+1	6.0	6.0	26531	21786	
4750.508	6	0	4.0	5.0	10971	15721	
4750.707	1	0	5.0	4.0	23775	28526	
4753.262	1		3.0	2.0	25273	30026	
4757.416	1	+2	3.0	3.0	20435	15677	
4757.941	1						
4759.034	2	+3	4.0	3.0	21688	26447	
4759.924	1	+3	3.0	2.0	24900	20140	
4766.197	2		5.0	5.0	29153	24387	
4767.845	9	−1	3.0	2.0	10484	15252	
4768.535	0		5.0	6.0	26554	21786	
4774.239	1		6.0	6.0	19059	23833	
4774.239			3.0	4.0	28744	33518	
4779.338	1						
4780.748	9	−2	6.0	5.0	12534	17315	
4791.553	2A	+1	5.0	4.0	20912	25704	
4792.792	0		5.0	6.0	21828	17036	
4794.052	8		6.0	6.0	20197	24991	
4803.168	3	+1	3,0	3.0	15924	20727	
4803.332	0		4.0	4.0	29452	34255	
4804.023	3	+2	6.0	5.0	20197	25001	
4805.213	1	0	5.0	4.0	23775	28580	
4808.401	0		4.0	5.0	27763	22954	
4810.124	1	+1	5.0	4.0	17463	22273	
4813.349	0		6.0	5.0	22129	17315	
4813.490	1						
4815.157	0	−1	5.0	4.0	25878	30693	
4819.297	0	0	3.0	3.0	26103	30922	
4827.145	2	−1	5.0	6.0	22297	27124	
4839.255	8	−1	5.0	4.0	11641	16480	
4839.618	2						
4840.192	8	−2	1.0	2.0	15300	20140	
4846.572	1W						
4853.170	0	+3	7.0	6.0	20762	25615	
4854.934	0						
4857.188	2	+1	5.0	5.0	25878	21020	
4862.208		−3	7.0	7.0	26609	21747	
4862.208	0	+6	6.0	7.0	23633	28495	
4864.098	0B	0	5.0	5.0	23775	28639	
4867.876	1	+3	5.0	4.0	25878	21010	
4868.109	0	−8	6.0	6.0	30483	25615	
4870.464	9	+2	5.0	6.0	16915	21786	
4870.464			5.0	4.0	37187	32317	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
4871.568	3		7.0	7.0	27410	22538	
4872.933	1	+1	3.0	3.0	22751	27624	
4872.933			3.0	3.0	33148	38021	
4878.738	0	+1	7.0	6.0	24951	29830	
4878,738			3.0	4.0	41040	36162	
4884.504	2		2.0	1.0	22557	27442	
4887.211	0		3.0	3.0	21560	26447	
4889.377	2	+1	3.0	4.0	15924	20813	
4889.488	0		6.0	6.0	27349	32239	
4891.730	2	0	5.0	5.0	25057	29948	
4895.212	0	0	6.0	5.0	26531	31427	
4896.807	0	0	5.0	4.0	35336	30439	
4907.414	0		4.0	5.0	20673	25581	
4908.736	0	+2	4.0	5.0	23730	28639	
4910.494	0B	+9	5.0	6.0	23775	18865	
4910.494	0B	−7	4.0	4.0	25529	30439	
4910.494	0B		4.0	5.0	21688	26599	
4913.136	1	+2	5.0	4.0	26554	31468	
4914.584	0		3.0	3.0	21560	16645	
4918.606	0	+4	2.0	2.0	23560	28479	
4924.028	0		7.0	6.0	29921	34845	
4924.803	4	0	6.0	7.0	25518	20593	
4924.921	0	+1	6.0	5.0	24749	19824	
4925.561	1	+1	5.0	5.0	20912	25838	
4926.385	0		7.0	8.0	20762	25688	
4929.346	0	+1	5.0	5.0	26943	22013	
4932.016	0		3.0	2.0	22334	27266	
4934.465	0	−1	4.0	5.0	24357	29291	
4935.459	0		3.0	2.0	26814	31750	
4942.479	0		3.0	2.0	25273	30216	
4947.008	0	0	4.0	4.0	22341	27288	
4951.672	0		4.0	3.0	23146	28097	
4952.785	0	+1	4.0	5.0	22268	17315	
4953.820	3	+3	5.0	4.0	21828	26782	
4955.102	0						
4958.771	3		6.0	7.0	17656	22615	
4959.479	0		4.0	5.0	28174	23215	
4961.771	0		4.0	5.0	26465	31427	
4966.421	1	+1	6.0	5.0	17047	22013	
4976.171	1						
4979.430	0	+1	3.0	3.0	23683	28663	
4980.509	1						
4980.993	0	+1	4.0	3.0	26465	31446	
4981.871	1	+1	5.0	5.0	22297	17315	
4982.791	1	+1	5.0	5.0	24501	29484	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
4983.151	0	0	4.0	5.0	25836	20853	
4988.814	1W						
4990.581	0		5.0	4.0	19089	24079	
4990.639	0	+1	5.0	4.0	22297	27288	
4995.666	0		6.0	6.0	22129	27124	
4995.971	0		4.0	5.0	28634	33630	
4996.143	0	+2	4.0	3.0	20673	15677	
4998.288	0		6.0	5.0	26428	31427	
5004.645	9		8.0	8.0	22660	17656	
5008.810	0		3.0	3.0	35112	30103	
5011.158	0	+1	5.0	4.0	26943	31954	
5019.724	0	0	4.0	4.0	22268	27288	
5021.541	0	−1	4.0	5.0	24270	29291	
5022.860	0	0	4.0	4.0	25836	20813	
5023.870	3						
5024.468	2	+1	5.0	5.0	25878	20853	
5024.468			6.0	5.0	36605	31580	
5030.845	0	+2	6.0	5.0	20197	25228	
5035.744	1	+1	4.0	3.0	27763	32798	
5036.018	0		3.0	4.0	24900	29936	
5036.416	2	+3	6.0	6.0	20197	25233	
5038.559	0		5.0	5.0	25878	30916	
5038.559			4.0	4.0	33554	28515	
5042.763	1	−1	4.0	3.0	21688	16645	
5054.342	0		6.0	5.0	25518	30573	
5055.059	3						
5055.864	0	−5	5.0	5.0	26106	31162	
5057.985	0						
5058.214		−1	4.0	5.0	22341	27399	
5058.214	1	+1	5.0	6.0	24501	29559	
5061.534	0		2.0	1.0	28406	33467	
5062.975	0	+1	3.0	4.0	9458	14521	
5064.178	2	+2	5.0	4.0	25878	20813	
5067.082	4	+1	2.0	3.0	22557	27624	
5067.805	1		4.0	4.0	29452	34520	
5073.646			1.0	2.0	30922	25848	
5073.646	1	+4	4.0	5.0	29452	34526	
5075.351	3		7.0	7.0	31464	26388	
5076.383	2	+1	6.0	5.0	23136	18060	
5077.606	0	−1	3.0	3.0	25844	30922	
5079.584	2W	−16	3.0	4.0	21560	16480	
5080.741	2	+2	6.0	6.0	24749	29830	
5081.655	0	0	6.0	6.0	27888	22806	
5085.679	8	0	3.0	4.0	15924	21010	
5086.107	1	−2	4.0	5.0	23146	18060	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
5093.727	7	0	4.0	3.0	31411	36505	
5094.895	1	0	4.0	4.0	15719	20813	
5096.223	0		5.0	4.0	26106	21010	
5097.985	2	+2	5.0	5.0	16915	22013	
5100.349	0		3.0	3.0	25273	30373	
5101.789	0		2.0	2.0	23777	28479	
5101.842	0		5.0	5.0	22297	27399	
5107.783	9	0	2.0	2.0	10144	15252	
5107.783		0	6.0	6.0	30483	35591	
5107.783		+2	3.0	4.0	34337	29229	
5112.833	2W						
5113.243	6		7.0	7.0	27728	22615	
5117.023	0		3.0	3.0	25844	20727	
5117.358	0		4.0	5.0	28174	23057	
5118.853	2		1.0	2.0	10133	15252	
5120.360	0		3.0	2.0	28246	23125	
5125.303	0						
5130.585	1						
5130.929	0	−2	4.0	5.0	22268	27399	
5132.531	0		3.0	2.0	25273	20140	
5134.606	7	+2	4.0	5.0	15719	20853	
5134.606			4.0	3.0	31370	36505	
5139.198	2		2.0	2.0	30168	25029	
5142.837	1		4.0	3.0	21788	16645	
5144.767	6	0	7.0	6.0	13720	18865	
5149.644	0		3.0	3.0	23683	28833	
5155.295	0		4.0	5.0	23730	28886	
5155.700	0		6.0	6.0	24451	19296	
5161.431	1	−1	5.0	4.0	23419	28580	
5166.725	0		3.0	4.0	25273	30439	
5177.471	0						
5181.098	7	+1	2.0	3.0	15546	20727	
5182.456	2	+2	3.0	2.0	20435	15252	
5190.116	6						
5191.127	0		5.0	5.0	20912	15721	
5192.886	7	0	3.0	3.0	10484	15677	
5196.330	0	0	6.0	7.0	22129	16932	
5196.486	2						
5199.590	0		6.0	5.0	24749	29948	
5203.875	1		5.0	5.0	22640	27843	
5203.875	0	−3	3.0	4.0	22334	27538	
5205.322	0		5.0	6.0	24501	19296	
5206.912	0		5.0	6.0	26554	21348	
5213.712	1	0	4.0	5.0	24270	29484	
5216.396	0	+2	4.0	3.0	21688	26905	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
5216.512	0		5.0	4.0	23299	28515	
5232.960	0						
5233.282	0		6.0	5.0	27888	33121	
5239.324	1	+1	5.0	5.0	23299	18060	
5245.757	1	+2	3.0	4.0	21560	16314	
5249.213	1	+2	4.0	4.0	27522	22273	
5249.434	0		6.0	6.0	30483	25233	
5249.537	2	−1	3.0	2.0	26814	21565	
5251.451	8		7.0	8.0	22907	17656	
5252.555	0		6.0	5.0	23633	28886	
5252.817	0		5.0	4.0	26106	20853	
5255.647	0		5.0	4.0	19741	24996	
5259.069	1		5.0	5.0	20912	26171	
5259.069			4.0	5.0	38380	33121	
5260.233	2	+3	5.0	5.0	19741	25001	
5261.196	0		7.0	6.0	26609	21348	
5265.493	0		4.0	4.0	27522	32787	
5272.527	0		2.0	3.0	23561	28833	
5273.049	1		6.0	7.0	27888	22615	
5275.020	0						
5276.483	0	+1	4.0	3.0	27522	32798	
5277.203	1						
5283.602	0		4.0	3.0	22341	27624	
5287.111	0						
5288.660	1	+2	5.0	6.0	23775	29064	
5290.653	2	−1	3.0	3.0	22334	27624	
5291.197	0		4.0	4.0	15719	21010	
5295.757	2	+1	5.0	6.0	21828	27124	
5298.066	1	+2	6.0	5.0	17656	22954	
5298.138	0		4.0	4.0	23282	28580	
5298.210	0		6.0	5.0	17656	22954	
5298.438	2		4.0	3.0	26465	31763	
5299.482	2		2.0	2.0	22557	27857	
5301.887	8	+3	4.0	5.0	15719	21020	
5301.887			4.0	3.0	23327	28629	
5302.637	2	+4	5.0	5.0	24646	29948	
5312.981	1		3.0	2.0	32092	26779	
5320.126	0	+1	5.0	6.0	29153	23833	
5320.126			2.0	3.0	38119	32798	
5328.167	0		6.0	5.0	19059	24387	
5329.606	0		4.0	5.0	31167	25838	
5335.679	0		3.0	2.0	22334	16998	
5335.713	1	−3	6.0	5.0	27349	22013	
5341.309	1	+2	4.0	3.0	21688	27030	
5343.612	8	+1	4.0	4.0	10971	16314	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
5346.008	0		3.0	3.0	22751	28097	
5348.056	4	+1	5.0	4.0	21828	16480	
5357.252	0	+3	5.0	4.0	16915	22273	
5357.252			4.0	4.0	29830	24472	
5357.945	0		5.0	6.0	23419	28777	
5359.185	2	+2	5.0	5.0	23419	18060	
5359.838	2						
5364.984	0	+3	3.0	4.0	26103	31468	
5370.142	0	+2	5.0	6.0	22297	27667	
5373.934	0	+1	4.0	4.0	21688	16314	
5374.855	1						
5378.338	0	0	6.0	6.0	24451	29830	
5383.612	0		5.0	4.0	19089	24472	
5383.784	0	+3	6.0	5.0	20197	25581	
5392.985	0	+1	4.0	3.0	25529	30922	
5394.521	0	0	5.0	6.0	11641	17036	
5399.490	0	+2	5.0	4.0	26554	31954	
5400.651	6	+2	6.0	5.0	17656	23057	
5402.145	1		4.0	5.0	26255	20853	
5406.830	0		2.0	1.0	27562	22155	
5416.233	1	+1	7.0	7.0	26010	20593	
5417.738	4	+4	6.0	6.0	20197	25615	
5419.225	0	+2	6.0	6.0	22455	17036	
5419.859	0		2.0	3.0	30168	24748	
5420.118	0		3.0	4.0	25273	30693	
5422.551	4	+2	4.0	3.0	27522	22099	
5426.808	1		3.0	4.0	29506	24079	
5434.505	0		4.0	4.0	23146	28580	
5453.297	2	+1	6.0	6.0	24749	19296	
5453.847	1A	+1	5.0	4.0	23775	29229	
5455.115	3	+2	4.0	4.0	26465	21010	
5455.902	1						
5456.148	8	+1	5.0	4.0	9064	14521	
5459.250	2	+2	5.0	4.0	21828	27288	
5460.242	0		6.0	5.0	29065	34526	
5462.594	0		2.0	3.0	27562	22099	
5462.915	1	+4	2.0	1.0	25455	19992	
5466.876	1	−1	5.0	5.0	23419	28886	
5472.787	2						
5472.956	1	+3	3.0	3.0	24900	30373	
5474.009	1		4.0	4.0	21788	16314	
5483.743	0W						
5483.981	2		8.0	7.0	15110	20593	
5487.056	0		5.0	5.0	19741	25228	
5491.794	1		6.0	6.0	30483	24991	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
5495.918	0	+3	4.0	5.0	25320	19824	
5496.372	0		4.0	3.0	27763	33259	
5497.618	8	+1	4.0	5.0	16516	22013	
5498.484	2	+2	4.0	4.0	23730	29229	
5502.711	2	0	4.0	5.0	22341	27843	
5503.117	0		6.0	5.0	23136	28639	
5507.036	0		2.0	2.0	30536	25029	
5509.767	6	+1	4.0	4.0	10971	16480	
5516.439	2	0	5.0	5.0	23775	29291	
5517.085	0		4.0	3.0	23146	28663	
5517.750	0		5.0	5.0	32917	27399	
5519.152	7		3.0	2.0	33148	38667	
5522.673	1	−2	6.0	7.0	22455	16932	
5525.148	2	0	6.0	5.0	12534	18060	
5532.824	9	+1	2.0	3.0	10144	15677	
5537.085	0	+1	4.0	5.0	28989	34526	
5538.664	0		6.0	6.0	22129	27667	
5539.334	0	+3	3.0	4.0	24900	30439	
5544.672	0		5.0	4.0	26554	21010	
5545.483	1	0	3.0	4.0	23683	29229	
5546.051	0						
5546.341	2	0	5.0	5.0	22297	27843	
5549.012	0		5.0	5.0	25878	31427	
5554.224	0		3.0	3.0	25844	20290	
5558.530	1	+4	6.0	5.0	17656	23215	
5559.249	0		2.0	2.0	22557	16998	
5561.079	1	+4	4.0	5.0	23730	29291	
5562.334	1						
5562.581	8	+1	4.0	4.0	8958	14521	
5567.938	1		6.0	7.0	17047	22615	
5568.244	1						
5572.247	0						
5572.630	0						
5573.508	2A		6.0	5.0	23633	18060	
5573.508	2A	+2	5.0	4.0	23419	28992	
5573.856	3						
5575.426	0	− 1	4.0	5.0	22268	27843	
5577.715	0		4.0	5.0	28635	23057	
5579.071	0	0	4.0	4.0	24357	29936	
5579.593	1	+1	4.0	3.0	24357	29937	
5581.018	6	0	2.0	2.0	9671	15252	
5583.546	5	+1	4.0	3.0	16516	22099	
5584.274	0		1.0	2.0	25724	20140	
5589.931	1	+1	5.0	4.0	25878	31468	
5591.404	0		4.0	5.0	24357	29948	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
5594.252	0		5.0	5.0	17463	23057	
5595.241	0		5.0	6.0	26943	21348	
5598.703	1		8.0	7.0	22660	28259	
5602.051	0		4.0	3.0	25320	30922	
5602.623	0		6.0	7.0	27349	21746	
5607.255	2	+1	3.0	4.0	10484	4877	
5609.586	1W		4.0	3.0	25836	31446	
5611.707	7	0	4.0	5.0	26465	20853	
5613.409	1						
5619.502	2		2.0	1.0	21822	27442	
5626.612	2		7.0	7.0	20762	26388	
5634.904	0		5.0	4.0	26554	32189	
5635.844	4	+1	6.0	5.0	17656	23292	
5636.305	0		5.0	6.0	24501	18865	
5640.289	0		5.0	4.0	28880	34520	
5640.598	1	−1	3.0	2.0	15924	21565	
5640.842	2	+1	6.0	5.0	20197	25838	
5643.539	1	−3	6.0	5.0	25518	31162	
5644.878	0	+1	5.0	6.0	23419	29064	
5649.209	1	0	3.0	3.0	25273	30922	
5651.416	0	0	4,0	4.0	26465	20813	
5663.289	0	+1	4.0	3.0	27763	22099	
5666.667	0		4.0	3.0	24270	29937	
5670.765	1	−1	4.0	5.0	23730	18060	
5674.050	9	−1	5.0	5.0	11641	17315	+0.732
5674.782	6	+2	4.0	3.0	10971	16645	
5684.222	1W						
5684.860	0		2.0	2.0	30443	36128	
5687.300	1	+1	4.0	3.0	23146	28833	
5688.225	0		3.0	3.0	22334	16645	
5693.364	0		5.0	4.0	23299	28992	
5694.398	1	−1	6.0	5.0	25518	19824	
5695.282	0	+1	4.0	3.0	22341	16645	
5696.587	1	+2	4.0	5.0	28989	23292	
5701.134	1		7.0	7.0	18009	23710	
5704.130	1	+2	3.0	2.0	25844	20140	
5704.981	0		4.0	5.0	25529	19824	
5708.257	1		2.0	2.0	30737	25029	
5708.610	0	+1	5.0	5.0	23775	29484	
5709.017	0	−18	5.0	4.0	21828	27538	
5712.692	3		5.0	6.0	20912	26625	
5714.863	4		6.0	5.0	22129	27843	
5715.403	2	+1	5.0	5.0	23775	18060	
5716.729	1	+1	5.0	4.0	22799	28515	
5720.825	0						

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
5721.182	7	+1	6.0	6.0	17656	23377	
5724.460	2	−1	4.0	4.0	26465	32189	
5725.960	0		4.0	3.0	23730	29456	
5727.710	1B	+7	3.0	4.0	21560	27288	
5727.710	1B		3.0	2.0	22751	28479	
5728.052	9		8.0	7.0	22660	16932	
5735.329	1						
5739.950	0	−1	4.0	5.0	23146	28886	
5740.973	2	+1	5.0	4.0	26554	20813	
5744.742	1	+2	4.0	4.0	26754	21010	
5749.216	1	0	4.0	5.0	27763	22013	
5749.678	3	0	6.0	5.0	23136	28886	
5752.133	0	+3	5.0	5.0	17463	23215	
5756.927	3						
5761.155	0		5.0	6.0	25057	19296	
5763.037	3	+1	5.0	6.0	22799	17036	
5763.729	3	0	3.0	3.0	22334	28097	
5764.061	0	−3	3.0	4.0	22751	28515	
5764.384	0						
5767.734	0W						
5772.132	1	+3	6.0	5.0	27349	33121	
5773.573	0		4.0	4.0	25529	19755	
5773.904	0	+2	4.0	5.0	28989	23215	
5773.904			4.0	3.0	20673	26447	
5774.341	0		3.0	4.0	22751	28526	
5775.579	2		7.0	8.0	31464	25688	
5781.162	1						
5781.508	1	+1	5.0	4.0	22799	28580	
5787.685	2		2.0	3.0	30536	24748	
5792.451	1	+2	5.0	6.0	32917	27124	
5792.451			6.0	5.0	29065	34858	
5794.658	5	+1	3.0	2.0	9458	15252	
5802.076	0W		2.0	3.0	21822	27624	
5802.076			3.0	4.0	29794	35596	
5803.801	1		4.0	3.0	17280	23083	
5804.080	0	+2	6.0	7.0	22455	28259	
5804.472	2	+1	3.0	4.0	26814	21010	
5808.739	1						
5810.064	4	−1	5.0	4.0	23419	29229	
5818.777	0		5.0	6.0	26943	32762	
5821.016	1						
5823.819	6	+1	6.0	5.0	24749	30573	
5824.146	2	+2	7.0	6.0	18009	23833	
5824.219	1		2.0	1.0	22557	28381	
5829.447	7		5.0	5.0	17463	23292	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
5829.918	9	0	3.0	4.0	10484	16314	
5834.653	0		4.0	5.0	10971	5136	
5834.851	3	0	6.0	7.0	26428	20593	
5835.036	2		8.0	7.0	22660	28495	
5836.043	1		4.0	3.0	21788	27624	
5836.043			3.0	4.0	30860	36696	
5843.929	8	+1	5.0	4.0	17463	23307	-0.498
5850.507	0		6.0	5.0	23633	29484	
5852.841	1		5.0	4.0	25878	31730	
5861.255	0		5.0	5.0	29153	23292	
5863.408	1		7.0	6.0	20762	26625	
5865.720	3W						
5866.931	3W		4.0	4.0	31104	25237	
5869.652	0		7.0	6.0	22907	28777	
5870.008	0		5.0	4.0	20912	26782	
5870.579	0		4.0	3.0	25529	19658	
5871.099	0		4.0	3.0	8958	14829	
5871.408	6	+2	7.0	6.0	22907	17036	
5873.947	3	+4	5.0	6.0	19741	25615	
5873.947		+1	4.0	5.0	31712	25838	
5874.217	2						
5886.165	1	−7	5.0	4.0	22640	28526	
5886.165			5.0	4.0	26554	32441	
5890.895	0		5.0	6.0	16915	22806	
5891.157			4.0	5.0	28635	34526	
5891.157	2	+8	6.0	5.0	29183	23292	
5891.689	1						
5895.842	0		2.0	3.0	23561	29456	
5897.750	1	0	4.0	5.0	25529	31427	
5897.750			3.0	3.0	27758	33656	
5904.385	0	0	7.0	8.0	31464	25559	
5905.796	0	0	4.0	3.0	24357	30263	
5907.232	0	+1	6.0	5.0	17047	22954	
5912.197	2	0	5.0	5.0	19089	25001	
5916.778	1	−1	6.0	6.0	27264	21348	
5916.971	2	+1	4.0	3.0	25529	31446	
5916.971			3.0	4.0	32882	38799	
5918.847	0W						
5919.263	2		3.5	4.5	0	5919	
5921.867	0		2.0	2.0	22557	28479	
5922.315	0	+1	5.0	5.0	26943	21020	
5922.370	1	+1	3.0	4.0	26103	20180	
5922.830	2		4.0	3.0	32370	26447	
5923.561	1		2.0	2.0	25826	31750	
5926.868	0		5.0	5.0	24646	30573	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
5932.186	0		6.0	6.0	19059	24991	
5932.779	0		4.0	5.0	28989	23057	
5933.002	2	+2	5.0	4.0	26943	21010	
5933.002			3.0	3.0	32882	38815	
5934.515	7	+1	4.0	4.0	15719	9784	
5934.515			4.0	4.0	32865	38799	
5935.296	1						
5936.121	5	+1	4.0	3.0	21688	27624	
5937.930	6	+1	6.0	7.0	26531	20593	
5939.602	1	+2	4.0	5.0	31167	25228	
5941.044	1	+1	4.0	4.0	26754	20813	
5942.158	0	+1	6.0	5.0	19059	25001	
5942.280	0	0	7.0	6.0	27728	21786	
5953.736	2	+2	4.0	4.0	22268	16314	
5955.786	0	+2	3.0	4.0	26814	32770	
5963.165	0						
5964.173	0		5.0	6.0	24646	30610	
5964.921	0						
5967.037	0	+1	4.0	5.0	21688	15721	
5971.254	1		4.0	3.0	29503	23532	
5971.621	1		3.0	4.0	29506	23535	
5974.351	4		6.0	5.0	20197	26171	
5974.858	7	0	7.0	7.0	22907	16932	
5976.205	0		5.0	4.0	26790	20813	
5981.672	0	+2	7.0	7.0	27728	21747	
5985.839	1		3.0	2.0	24900	30886	
5988.920	2		2.0	3.0	30737	24748	
5990.875	0		2.0	3.0	25455	31446	
5991.714	0		7.0	7.0	31464	25472	
5996.072	8	−1	3.0	4.0	10484	16480	
5996.436	1						
6002.404	0		3.0	2.0	25077	31080	
6006.058	8	0	2.0	3.0	9671	15677	−0.276
6009.817	3	+1	6.0	5.0	17047	23057	
6010.966	1	+1	4.0	3.0	21688	15677	
6012.411	2	+2	4.0	5.0	25836	19824	
6012.584	6	+2	3.0	3.0	20435	26447	
6014.952	0	+1	5.0	5.0	21828	27843	
6015.212	5	+1	7.0	7.0	26609	20593	
6015.516	1	+1	4.0	4.0	26754	32770	
6016.008	0		4.0	3.0	24357	30373	
6019.401	0	+2	3.0	4.0	22334	16314	
6026.964	0		4.0	4.0	17280	23306	
6034.480	2		2.0	2.0	21822	27857	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
6038.796	0		5.0	5.0	16915	22954	
6043.876	0		5.0	5.0	26754	32798	
6047.008	0		5.0	4.0	24646	30693	
6053.011	0		5.0	6.0	35612	29559	
6053.727	3	+2	5.0	5.0	25878	19824	
6053.957	6		6.0	7.0	17656	23710	
6054.531	0	+1	5.0	6.0	23775	29830	
6055.154	1		4.0	5.0	21788	27843	
6057.803	0						
6059.163	2B						
6064.298	0	0	3.0	3.0	21560	27624	
6072.061	3	+1	5.0	4.0	17463	23535	
6073.225	0		5.0	6.0	28880	22806	
6074.827	1	+2	4.0	3.0	28174	22099	
6075.096	0		4.0	4.0	26255	20180	
6076.104	0						
6076.285	0	+1	5.0	4.0	25878	31954	
6077.536	2						
6079.023	0		2.0	3.0	23777	29456	
6081.003	1	+4	4.0	4.0	25836	19755	
6082.388	0		4.0	4.0	24357	30439	
6083.140	1	+1	4.0	4.0	23146	29229	
6086.279	0	+1	7.0	6.0	24951	18865	
6086.751	1	−1	3.0	4.0	26103	32189	
6086.954	2B	+2	5.0	5.0	22799	28886	
6088.171	1W		4.0	3.0	29452	35540	
6089.596	0	+2	5.0	5.0	26943	20853	
6096.443	0		5.0	5.0	29153	23057	
6097.052	2	+2	5.0	5.0	19741	25838	
6098.422	0		7.0	6.0	27446	21348	
6100.313	4	+3	6.0	6.0	23136	17036	
6103.086	1	0	4.0	3.0	24270	30373	
6105.573	0		2.0	3.0	22557	28663	
6105.952	1	0	3.0	3.0	22751	16645	
6108.920	1	+2	4.0	4.0	20673	26782	
6117.602	0		4.0	4.0	25836	31954	
6120.845	1		5.0	4.0	27131	21010	
6121.416	3	−1	6.0	5.0	24451	30573	
6122.317	0	+2	5.0	4.0	25878	19755	
6125.342	1W						
6129.303	0		5.0	4.0	26943	20813	
6130.425	5	+2	6.0	7.0	22129	28259	
6139.020	0		5.0	5.0	19089	25228	
6140.036	2	+3	3.0	4.0	15924	9784	
6140.251	1	0	5.0	6.0	23419	29559	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
6141.381	3	+2	5.0	5.0	16915	23057	
6145.005	0		2.0	3.0	21822	15677	
6145.438	3	−1	3.0	2.0	22334	28479	
6152.820	0		7.0	6.0	26609	32762	
6155.229	3	+1	4.0	5.0	21688	27843	
6161.089	7	+2	3.0	3.0	10484	16645	
6167.366	3		6.0	5.0	24749	30916	
6167.696	2	+3	6.0	5.0	17047	23215	
6168.980	8	+1	6.0	5.0	19059	25228	-0.276
6169.463	0		4.0	4.0	24270	30439	
6173.382	0	+2	5.0	5.0	23775	29948	
6174.550	8	+1	6.0	6.0	19059	25233	+0.184
6174.733	0		4.0	4.0	22341	28515	
6175.263	4	+1	3.0	3.0	15924	22099	
6176.913	4W						
6181.784	1W	−1	3.0	4.0	22334	28515	
6185.009	6	+2	4.0	4.0	22341	28526	
6192.016	0B						
6192.059	1	+1	3.0	4.0	22334	28526	
6193.346	6		4.5	5.5	10134	3911	
6194.764	1		2.0	1.0	30168	23973	
6198.169	0						
6203.763	5	+	6.0	7.0	23136	16932	
6205.684	1	+4	4.0	4.0	23730	29936	
6206.204	0	+3	4.0	3.0	23730	29937	
6211.948	1	+2	5.0	6.0	20912	27124	
6218.364	0	0	5.0	4.0	22297	28515	
6219.699	5	+2	3.0	3.0	9458	15677	
6222.775	1	0	6.0	6.0	25518	19296	
6228.640	2	+3	5.0	4.0	22297	28526	
6230.105	2	+1	6.0	6.0	26531	32762	
6230.105		−11	7.0	6.0	31464	25233	
6232.955	1	−1	5.0	4.0	26554	32787	
6236.050	1W						
6237.667	1A	+3	6.0	6.0	33362	27124	
6245.012	9	+2	6.0	5.0	17047	23292	
6246.120	0		5.0	5.0	22640	28886	
6246.565	3	+1	3.0	4.0	22334	28580	
6247.450	3	0	4.0	4.0	22268	28515	
6257.052	3	0	6.0	5.0	19059	25316	
6257.725	2	+2	4.0	4.0	22268	28526	
6263.252	0		5.0	6.0	23299	17036	
6264.729	2	−1	1.0	2.0	15300	21565	
6264.955	0		5.0	6.0	22799	29064	
6268.099	0						

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
6275.158	2		2.0	3.0	21822	28097	
6281.365	0		6.0	5.0	27349	33630	
6283.145	0	+2	5.0	4.0	22297	28580	
6283.274	2	+2	2.0	3.0	15546	9263	
6287.947	0B						
6287.952	1B						
6294.764	0						
6294.856	2	+3	4.0	5.0	15719	22013	
6297.376	0	+1	4.0	5.0	24357	18060	
6305.145	0	+3	4.0	4.0	26465	32770	
6306.332	1		2.0	3.0	30536	36842	
6309.122	0		4.0	3.0	21788	28097	
6312.229	2	0	4.0	4.0	22268	28580	
6312.229			2.0	2.0	36279	29967	
6318.302	2	+1	5.0	4.0	22799	16480	
6322.093	2	+1	4.0	3.0	22341	28663	
6328.688	1W	+3	6.0	5.0	27349	21020	
6330.065	9	0	6.0	6.0	12534	18865	
6330.348	7		6.0	6.0	17047	23377	
6333.184	2	+2	6.0	6.0	26428	32762	
6344.561	9	0	4.0	5.0	10971	17315	
6347.645	5	0	3.0	4.0	20435	26782	
6347.645		0	6.0	5.0	23136	29484	
6358.071	0		3.0	4.0	34314	40672	
6362.659	8	−1	7.0	6.0	20762	27124	
6363.122	0		6.0	7.0	17047	23710	
6366.193	0		6.0	5.0	27264	33630	
6366.759	2	+1	6.0	7.0	22129	28495	
6366.759		−1	4.0	5.0	26755	33121	
6366.759			3.0	4.0	29673	23306	
6369.958	0	0	5.0	5.0	25057	31427	
6375.438	2	0	5.0	4.0	20912	27288	
6376.574	5	+1	5.0	5.0	16915	23292	
6380.656	3	+2	7.0	6.0	27728	21348	
6380.853	2		3.0	2.0	29506	23125	
6383.114	2	+3	5.0	6.0	23419	17036	
6391.055	9	+1	5.0	4.0	16915	23307	
6391.055			4.0	5.0	32796	39187	
6393.172	8	+2	4.0	3.0	815	7208	
6393.870	1		6.0	6.0	29065	35459	
6403.825	0		7.0	7.0	26609	33013	
6407.402	0		6.0	5.0	22129	15721	
6409.197	4	+2	4.0	3.0	21688	28097	
6410.877	1	+1	5.0	4.0	25057	31468	

Table 2. (continued)

Energy (wave no.	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
6411.133	0		6.0	5.0	27264	20853	
6412.948	0		6.0	7.0	19059	25472	
6415.165	0	+1	4.0	5.0	23730	17315	
6418.449	7	0	5.0	5.0	11641	18060	
6419.341	0		3.0	3.0	23683	30103	
6423.053	2	+1	6.0	6.0	23136	29559	
6427.974	6		6.0	6.0	20197	26625	
6427.974			4.0	4.0	33758	40186	
6430.561	3		5.0	5.0	19741	26171	
6437.122	0	+1	3.0	4.0	22751	16314	
6441.223	6	+2	5.0	5.0	24501	18060	
6450.505	1		6.0	7.0	29065	22615	
6455.684	6	+1	4.0	3.0	15719	9263	
6460.114	2						
6464.448	2	0	4.0	3.0	26754	20290	
6464.962	2		6.0	5.0	24451	30916	
6469.945	1	0	3.0	3.0	20435	26905	
6477.014	0		3.0	2.0	25273	31750	
6484.455	0		5.0	4.0	22799	16314	
6488.270	2W						
6492.306	1	0	4.0	3.0	22341	28833	
6492.734	0		5.0	5.0	22799	29291	
6497.639	2						
6501.026	6	+2	2.0	3.0	10144	16645	
6512.134	0	+2	4.0	4.0	27522	21010	
6513.640	3	+1	3.0	2.0	10484	16998	
6521.917	7	0	6.0	5.0	19059	25581	
6524.179	2	0	3.0	3.0	26814	20290	
6525.910	1	0	5.0	6.0	19089	25615	
6529.600	2	+1	5.0	5.0	23419	29948	
6537.375	2	+2	3.0	3.0	21560	28097	
6540.462	3	+3	6.0	6.0	27888	21348	
6541.010	0		4.0	5.0	16516	23057	
6544.958	1	0	4.0	5.0	22341	28886	
6551.612	1W		4.0	3.0	28989	35540	
6553.193	4	+1	2.0	3.0	15546	22099	
6554.113	0		4.0	4.0	15719	22273	
6555.871	7	+1	6.0	6.0	19059	25615	
6559.219	0		2.0	1.0	21822	28381	
6564.870	1	+1	4.0	3.0	24357	30922	
6565.201	2		5.5	5.5	12913	6347	
6567.526	9	+1	4.0	3.0	16516	23083	
6579.748	0		5.0	6.0	28880	35459	
6582.106	0	+5	5.0	6.0	25878	19296	
6583.144	1						

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
6584.187	0	0	6.0	7.0	26428	33013	
6586.150	0	+1	5.0	5.0	24646	18060	
6588.589	1	0	5.0	4.0	22297	28886	
6589.311	0	0	5.0	4.0	22640	29229	
6589.827	1	0	6.0	5.0	26531	33121	
6590.767	0		4.0	3.0	22268	15677	
6594.857	1	-1	3.0	3.0	20435	27030	
6596.322	1		3.0	4.0	25844	32441	
6597.438	4	+4	6.0	6.0	23633	17036	
6604.447	0	0	6.0	5.0	26428	19824	
6610.809	0						
6614.350	1	+1	4.0	4.0	20673	27288	
6616.874	2	+1	5.0	4.0	17463	24079	
6617.674	2	0	4.0	5.0	22268	28886	
6619.188	4	+2	5.0	4.0	16915	23535	
6619.553	0		4.0	5.0	22341	15721	
6624.547	0						
6625.227	1	+2	5.0	4.0	20912	27538	
6625.227			5.0	5.0	32735	39360	
6634.702	0		4.0	4.0	34147	40782	
6636.654	1	0	4.0	3.0	23282	16645	
6636.981	7		8.0	7.0	15110	21747	
6640.967	0		4.0	5.0	26465	19824	
6642.622	0	+3	4.0	3.0	23730	30373	
6651.589	0	+1	4.0	4.0	22341	28992	
6651.945	2	0	4.0	3.0	24270	30922	
6651.945		-11	7.0	6.0	22907	29559	
6656.436	0		3.0	3.0	22334	15677	
6656.800	9	+1	5.0	5.0	9064	15721	
6660.437	1	+2	4.0	4.0	25529	32189	
6661.204	6	+2	3.0	3.0	15924	9263	
6664.030	0		5.0	4.0	26106	32770	
6664.363	0		5.0	4.0	23775	30439	
6667.433	0		3.0	4.0	26103	32770	
6670.795	1	-12	6.0	7.0	27264	20593	
6674.089	2	+2	3.0	2.0	26814	20140	
6681.068	0		3.0	2.0	28246	21565	
6681.405	0		5.0	4.0	26106	32787	
6684.906	0	+3	5.0	5.0	22799	29484	
6686.976	3	+2	5.0	4.0	21828	28515	
6686.976			4.0	4.0	30766	24079	
6687.733	0		5.0	5.0	26943	33630	
6689.193	0	0	6.0	5.0	24749	18060	
6689.193			5.0	4.0	16473	9784	
6689.621	2	+1	3.0	3.0	23683	30373	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
6692.902	2	+1	6.0	5.0	26428	33121	
6696.244	3W						
6697.251	0		5.0	4.0	21828	28526	
6708.438	0	+3	4.0	4.0	27522	20813	
6709.000	1	+5	4.0	4.0	23730	30439	
6709.507	1W		4.0	4.0	26465	19755	
6715.912	0		4.0	4.0	28989	22273	
6724.304	0		4.0	4.0	22268	28992	
6725.559	0		4.0	5.0	20673	27399	
6730.523	2	+2	5.0	5.0	26554	19824	
6731.753	6	+3	4.0	4.0	16516	9784	+0.126
6731.879	0		2.0	3.0	23377	16645	
6733.747	1	+1	6.0	5.0	22455	15721	
6739.332	0		5.0	6.0	23775	17036	
6749.016	0		5.0	5.0	19089	25838	
6751.756	2	+3	5.0	4.0	21828	28580	
6757.206	0		4.0	4.0	27763	34520	
6761.046	8	+1	6.0	6.0	12534	19296	
6762.547	0	0	5.0	4.0	26943	20180	
6763.233	7	+1	4.0	5.0	8958	15721	
6763.828	0		2.0	1.0	30737	23973	
6764.074	0	+3	5.0	4.0	11641	4877	
6765.647	1		4.0	3.0	24270	31036	
6772.753	2		6.0	7.0	30483	23710	
6772.753			4.0	3.0	35401	28629	
6776.208	0	+1	4.0	5.0	16516	23292	
6778.977	6	0	6.0	5.0	19059	25838	
6779.455	0						
6780.864	0		5.0	5.0	24646	31427	
6785.583	1						
6786.135	5	+1	6.0	6.0	17047	23833	
6790.339	0		4.0	4.0	23146	29936	
6790.689	8	+1	4.0	4.0	16516	23307	
6790.857	0		4.0	3.0	23146	29937	
6794.646	0	+2	4.0	3.0	27522	20727	
6801.671	0	+3	4.0	4.0	23282	16480	
6816.124	1		7.0	7.0	27410	20593	
6816.851	0						
6818.100	1		2.0	3.0	32299	39117	
6818.519	2	+3	5.0	4.0	23299	16480	
6821.783	1	+4	5.0	4.0	24646	31468	
6834.689	0		2.0	3.0	27562	20727	
6834.921	5	0	5.0	6.0	23775	30610	
6837.525	0		4.0	4.0	21688	28526	
6840.573	0		2.0	3.0	21822	28663	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
6840.573			2.0	2.0	36561	29721	
6840.833	0		5.0	5.0	26790	33630	
6842.992	0						
6849.620	0		3.0	2.0	24900	31750	
6853.075	2	–1	3.0	4.0	20435	27288	
6853.577	7	+1	2.0	2.0	10144	16998	
6855.157	1		1.0	1.0	15300	22155	
6856.730	9	+1	3.0	4.0	9458	16314	
6864.646	9		1.0	2.0	10133	16998	
6867.475	8	+1	3.0	2.0	15924	22792	
6868.877	0						
6873.719	7	0	7.0	7.0	13720	20593	-0.156
6880.004	1	0	2.0	3.0	22557	15677	
6884.183	3		5.0	6.0	19741	26625	
6888.144	0	–2	4.0	4.0	22341	29229	
6889.250	0		4.0	3.0	28989	22099	
6892.031	0		4.0	4.0	21688	28580	
6892.381	1	–1	5.0	4.0	25878	32770	
6897.232	0	+2	5.0	4.0	25057	31954	
6899.104	1		2.0	3.0	22557	29456	
6901.810	0						
6905.662	1W		4.0	3.0	28635	35540	
6905.662	0W	+8	7.0	6.0	20762	27667	
6905.662	0W		4.0	3.0	28635	35540	
6906.674	7	0	3.0	3.0	302	7208	
6915.061	0		2.0	3.0	23561	16645	
6917.696	0		5.0	6.0	16915	23833	
6917.753	0		5.0	4.0	23775	30693	
6924.502	0		5.0	5.0	17463	24387	
6925.742	0		3.0	4.0	25844	32770	
6927.225	2	–2	6.0	6.0	20197	27124	
6931.140	1	–1	5.0	5.0	20912	27843	
6938.379	0	+3	5.0	4.0	23419	16480	
6940.104	0						
6949.173	0		4.0	4.0	27763	20813	
6950.738	0		4.0	5.0	22341	29291	
6950.943	0		4.0	3.0	20673	27624	
6951.069	0		4.0	4.0	25836	32787	
6955.429	1	0	3.0	4.0	21560	28515	
6960.862	0		4.0	4.0	22268	29229	
6961.578	1W						
6962.056	0		4.0	3.0	25836	32798	
6962.393	0	+3	4.0	4.0	23730	30693	
6965.705	0	+3	3.0	4.0	21560	28526	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
6965.753	0	0	5.0	5.0	26790	19824	
6966.711	1	+4	5.0	4.0	24501	31468	
6974.260	9	+1	2.0	3.0	9671	16645	
6993.838	0		5.5	4.5	12913	5919	
7002.806	0		7.0	7.0	26010	33013	
7009.902	8	0	5.0	4.0	17463	24472	
7013.082	0	+1	5.0	6.0	25878	18865	
7018.820	4	0	4.0	4.0	16516	23535	
7020.582	1	+4	5.0	4.0	23419	30439	
7021.415	0		3.5	2.5	15457	8436	
7022.885	9	+1	3.0	4.0	9458	16480	
7025.529	0						
7032.379	0		2.0	1.0	32299	39331	
7034.814	2		6.0	5.0	27888	20853	
7035.383	0		4.0	3.0	27763	20727	
7037.945	2B	+1	3.0	3.0	23683	16645	
7014.496	0		5.0	4.0	19741	26782	
7043.536	6	+1	6.0	7.0	17656	24700	
7049.156	1		4.0	4.0	33554	40603	
7051.601	0						
7052.023	0	+1	6.0	5.0	29065	22013	
7074.151	0		3.0	3.0	22751	15677	
7077.560	1	+1	5.0	5.0	22799	15721	
7082.523	0		5.0	5.0	19089	26171	
7084.945	0	0	4.0	3.0	23730	16645	
7084.945			2.0	2.0	24665	31750	
7088.037	0		4.0	4.0	31167	24079	
7088.741	0						
7088.857	0		4.0	3.0	24357	31446	
7088.960	7	+1	4.0	5.0	10971	18060	
7091.828	1		4.0	4.0	27763	34854	
7099.061	0		6.0	5.0	26531	33630	
7108.973	2	+3	5.0	5.0	17463	24572	
7110.554	1	+1	4.0	4.0	24357	31468	
7112.485	0		6.0	5.0	19059	26171	
7117.032	0	0	7.0	6.0	27728	34845	
7118.853	1	+1	5.0	5.0	26943	19824	
7122.674	0		3.0	3.0	22334	29456	
7125.442	0		7.0	6.0	26609	33734	
7125.479	1B						
7125.582	0		2.0	2.0	25455	32581	
7131.386	6	+2	5.0	4.0	16915	9784	-0.151
7131.386			2.0	3.0	25826	32957	
7132.644	0		5.0	4.0	25057	32189	
7132.828	1	+5	6.0	6.0	26428	19296	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
7134.671	0		7.0	7.0	27728	20593	
7137.341	0		5.0	4.0	22799	29936	
7153.828	1	0	5.0	5.0	23419	30573	
7159.244	9	+2	3.0	3.0	15924	23083	
7164.000	4	+1	5.0	4.0	16915	24079	
7187.901	9	+3	3.0	3.0	9458	16645	
7189.671	2	0	3.0	3.0	20435	27624	
7201.305	1		3.0	2.0	15924	23125	
7201.924	1	–2	6.0	5.0	20197	27399	
7208.827	8	0	2.0	3.0	0	7208	–0.250
7218.970	1	0	3.0	2.0	302	7521	
7223.367	9	+1	5.0	6.0	11641	18865	
7224.456	3	+2	7.0	6.0	18009	25233	
7230.654	2		4.0	5.0	29503	22273	
7235.904	1	+3	6.0	6.0	26531	19296	
7238.480	2	+1	3.0	3.0	23683	30922	
7240.664	4						
7243.624	0		5.0	5.0	25878	33121	
7245.405	8	+1	2.0	2.0	15546	22792	
7249.903	9	+1	5.0	4.0	9064	16314	–0.237
7252.925	0		4.0	3.0	16516	9263	
7258.899	1	+1	5.0	6.0	26554	19296	
7261.962	0		5.0	6.0	22297	29559	
7273.974	0	+1	5.0	4.0	23419	30693	
7287.788	3	+2	7.0	6.0	24951	32239	
7289.423	7	+2	6.0	5.0	12534	19824	
7295.169	3		7.0	8.0	24951	17656	
7304.105	0		4.0	4.0	21688	28992	
7305.799	1W	+2	6.0	6.0	26428	33734	
7306.239	0		7.0	7.0	29921	22615	
7308.137	1	+4	5.0	4.0	24646	31954	
7313.183	0	0	7.0	6.0	26609	19296	
7313.183			4.5	3.5	15457	7313	
7318.933	0		6.0	7.0	29065	21746	
7326.811	9	0	2.0	2.0	9671	16998	+0.06
7334.916	3		6.0	6.0	17656	24991	
7338.251	2	+2	4.0	5.0	15719	23057	
7356.093	1						
7356.335	9	0	4.0	4.0	8958	16314	
7364.762	1	+1	4.0	3.0	15719	23083	
7382.406	6	+1	3.0	4.0	15924	23307	+0.16
7383.121	0		7.0	7.0	29921	22538	
7383.121			4.0	5.0	36867	29484	
7383.434	0	–2	5.0	6.0	19741	27124	
7400.388	0	+2	5.0	4.0	21828	29229	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
7404.516	1		3.0	3.0	31712	39117	
7406.897	0		3.0	3.0	29506	22099	
7408.598	1		4.0	5.0	28634	36043	
7414.835	6	+ 2	6.0	5.0	23136	15721	
7414.835			4.5	4.5	15559	8144	
7416.071	9	+14	5.0	4.0	9064	16480	
7421.795	1		2.0	2.0	27562	20140	
7424.420	1						
7430.337	0						
7430.484	1	0	6.0	6.0	22129	29559	
7430.484			4.0	3.0	33554	40985	
7431.446	0		4.0	5.0	23730	31162	
7432.255	1		3.0	4.0	28246	20813	
7436.628	0		6.0	5.0	23136	30573	
7437.546	7						
7446.919	0		4.0	3.0	28174	20727	
7449.298	1						
7453.063	0		5.0	4.0	24501	31954	
7462.856	2		7.0	7.0	18009	25472	
7465.152	2	+ 3	5.0	6.0	24501	17036	
7470.220	1	− 1	6.0	6.0	20197	27667	
7489.788	1	0	6.0	6.0	24749	32239	
7491.606	9	+ 1	1.0	2.0	15300	22792	
7495.477	3		4.0	4.0	17280	9784	
7496.079	0		6.0	6.0	27349	34945	
7497.129	0		5.0	6.0	26790	19296	
7497.416	4A	+ 1	7.0	7.0	20762	28259	
7505.408	2		8.0	7.0	15110	22615	
7514.711	1	− 1	3.0	4.0	25273	32787	
7522.490	9	0	4.0	4.0	8958	16480	
7523.852	0	0	2.0	3.0	21822	29346	
7524.534	2	+ 1	6.0	5.0	17047	24572	
7525.696	0		3.0	3.0	25273	32798	
7527.018	1W						
7532.465	0		5.0	6.0	22297	29830	
7536.148	2		5.0	6.0	19089	26625	
7537.173	8	+ 1	2.0	3.0	15546	23083	
7538.489	1	0	5.0	5.0	17463	25001	
7540.452	9	+ 2	3.0	2.0	9458	16998	
7547.047	0		4.0	4.0	23146	30693	
7550.186	0A	+ 1	7.0	8.0	18009	25559	
7557.029	8	+ 1	5.0	4.0	16915	24472	
7557.029			5.0	4.0	25793	33350	
7563.633	1	0	4.0	4.0	16516	24079	
7563.803	0	0	6.0	6.0	26428	18865	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
7569.861	0		2.0	1.0	27562	19992	
7571.093	0						
7571.709	7	+ 2	6.0	5.0	17656	25228	
7573.445	7	+ 2	4.0	5.0	15719	23292	
7577.279	1	+ 2	6.0	6.0	17656	25233	
7587.926	6	+ 2	4.0	4.0	15719	23307	
7592.834	0		5.0	6.0	24646	32239	
7595.865	0		4.0	3.0	22341	29937	
7596.432	0						
7596.908	0		4.0	4.0	24357	31954	
7602.916	0		3.0	3.0	22334	29937	
7605.777	3	+ 2	7.0	6.0	18009	25615	
7608.009	2		3.0	3.0	15924	23532	
7610.538	1	+ 1	3.0	4.0	15924	23535	
7613.440	0		5.0	4.0	20912	28526	
7621.613	0		3.0	3.0	22751	30373	
7624.496	1	+18	4.0	3.0	24270	16645	
7627.491	0		4.0	4.0	32865	25237	
7627.735	7	0	7.0	6.0	13720	21348	
7628.165	0		5.0	6.0	26106	33734	
7630.657	1						
7634.100	0		2.0	3.0	21822	29456	
7640.658	2	+ 5	5.0	4.0	22799	30439	
7647.229	0		5.0	6.0	26943	19296	
7651.606	0		5.0	5.0	23775	31427	
7652.704	6	+ 2	6.0	7.0	17047	24700	-0.1
7654.347	8	+ 1	5.0	6.0	11641	19296	
7658.136	0		5.0	5.0	19741	27399	
7658.389	0		2.0	2.0	22557	30216	
7659.781	2	+ 1	6.0	5.0	17656	25316	
7662.746	0	0	3.0	3.0	20435	28097	
7666.883	0	+ 2	6.0	6.0	26531	18865	
7667.944	1	+ 1	5.0	4.0	20912	28580	
7678.512	6A	+ 2	5.0	4.0	17463	9784	
7687.506	9	+ 2	4.0	3.0	8958	16645	
7692.525	1	− 1	5.0	4.0	23775	31468	
7693.464	2	0	5.0	4.0	19089	26782	
7702.678	0		6.0	6.0	27888	35591	
7711.554	1A	0	4.0	3.0	24357	16645	
7716.940	1		4.0	4.0	17280	24996	
7716.940			3.0	4.0	39447	31730	
7717.918	1	+ 1	6.0	6.0	29065	21348	
7717.918.			4.0	3.0	29064	36782	
7724.417	0		7.0	6.0	26010	33734	
7730.574	0	+ 2	5.0	6.0	21828	29559	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
7731.121	0		7.0	6.0	27728	35459	
7733.749	7	−1	7.0	7.0	20762	28495	
7741.453	0		5.0	5.0	25057	17315	
7744.165	0	+2	7.0	6.0	26609	18865	
7762.004	0		4.0	3.0	22341	30103	
7765.312	0		5.0	5.0	17463	25228	
7766.575	0		4.0	4.0	27522	19755	
7769.056	0		3.0	3.0	22334	30103	
7770.882	6	+1	5.0	6.0	17463	25233	
7773.906	0		5.0	5.0	22799	30573	
7776.136	0	+1	4.0	3.0	23146	30922	
7776.687	0		4.0	5.0	25836	18060	
7781.358	0		4.0	4.0	28635	20853	
7789.485	0		4.0	4.0	24270	16480	
7792.429	0		4.0	5.0	21688	29484	
7793.505	1	+1	6.0	5.0	23633	31427	
7796.491	1						
7796.716	3	+1	5.0	4.0	19741	27538	
7804.708	0						
7807.423	0		3.0	3.0	34255	26447	
7811.216	1	+1	5.0	6.0	22799	30610	
7815.677	2		6.0	7.0	17656	25472	
7815.677			1.0	1.0	32754	40570	
7816.057	1	+1	4.0	4.0	15719	23535	
7816.057			4.0	4.0	32370	40186	
7834.721	0	0	4.0	3.0	22268	30103	
7850.677	8	0	5.0	6.0	9064	1214	+0.279
7852.349.	0		4.0	4.0	20673	28526	
7858.412	2		4.0	3.0	16516	24374	
7876.571	0	+3	4.0	4.0	24357	16480	
7881.958	1		3.0	2.0	22334	30216	
7882.619	2B						
7882.625	1B						
7884.116	0		4.0	3.0	28174	20290	
7885.391	2						
7894.049	2	+1	5.0	4.0	22799	30693	
7896.317	0		3.0	3.0	21560	29456	
7911.958	0	+1	6.0	5.0	23633	15721	
7922.071	0		4.0	3.0	22341	30263	
7924.646	6	+1	5.0	6.0	17656	25581	
7926.126	0						
7926.431	0		5.0	6.0	19741	27667	
7929.123	1	+3	3.0	3.0	22334	30263	
7941.385	0		3.0	4.0	22751	30693	
7942.458	0						

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
7942.591	2						
7944.082	1		6.0	6.0	17047	29991	
7954.052	1	0	6.0	5.0	17047	25001	
7956.661	7	−1	4.0	4.0	16516	24472	
7958.600	6	+2	6.0	6.0	17656	25615	
7965.404	0		5.0	4.0	26554	34520	
7968.146	1	+2	4.0	5.0	28989	21020	
7971.323	2	+1	5.0	6.0	9064	17036	
7990.666	0		4.0	4.0	23730	31721	
8009.219	0	+2	4.0	5.0	23730	15721	
8012.709	0		6.0	6.0	24749	32762	
8015.172	1						
8016.646	1		4.0	3.0	17280	9263	
8016.646			1.0	1.0	36398	28381	
8018.576	2	+1	7.0	7.0	24951	16932	
8020.275	9R	+1	5.0	4.0	1764	9784	+0.116
8025.832	0	0	6.0	5.0	23136	31162	
8025.832			5.0	4.0	27780	19755	
8026.720	9	+1	7.0	7.0	13720	21747	
8032.283	2	0	4.0	3.0	22341	30373	
8038.555	4						
8048.748	1	+3	5.0	4.0	23419	31468	
8048.748			2.0	3.0	30443	38492	
8051.867	0						
8053.216	0		5.0	4.0	22640	30693	
8055.729	0		4.0	5.0	16516	24572	
8059.017	4	0	6.0	7.0	12534	20593	
8061.982	2	0	6.0	7.0	20197	28259	
8065.359	3		6.0	6.0	19059	27124	
8066.110	9	+1	7.0	6.0	13720	21786	
8078.209	0		5.0	6.0	26943	18865	
8080.800	1	−2	3.0	4.0	20435	28515	
8081.032	4	0	5.0	4.0	16915	24996	
8085.613	0		5.0	5.0	16915	25001	
8091.075	0		3.0	4.0	20435	28526	
8098.662	1	+3	4.0	4.0	22341	30439	
8102.631	0		5.0	5.0	19741	27843	
8114.132	1A	0	5.0	4.0	11641	19755	
8114.343	0		2.0	3.0	21822	29937	
8115.833	1		2.0	3.0	28406	20290	
8118.250	6	+1	5.0	5.0	17463	25581	
8132.809	0		5.0	5.0	29153	21020	
8135.785	6						
8142.292	0		5.0	4.0	22297	30439	
8144.306	0		3.5	4.5	0	8144	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
8145.437	3		2.0	3.0	24129	32275	
8145.581	2	+1	2.0	2.0	23398	15252	
8145.581		0	3.0	4.0	20435	28580	
8152.203	5	+1	5.0	6.0	17463	25615	
8165.343	3	+1	5.0	4.0	24646	16480	
8168.607	0		5.0	4.0	23299	31468	
8175.134	0		4.0	4.0	28989	20813	
8180.876	4W	+2	6.0	5.0	17047	25228	+0.16
8182.723	6	+1	5.0	5.0	11641	19824	
8182.723			6.0	5.0	17656	25838	
8186.445	0	+1	6.0	6.0	17047	25233	
8188.884	0						
8198.893	0		5.0	4.0	19089	27288	
8203.678	0		2.0	2.0	21822	30026	
8214.624	0		7.0	6.0	27728	35943	
8221.268	0		1.0	1.0	22660	30882	
8236.491	0		7.0	6.0	26609	34845	
8241.438	2						
8241.533	0	0	6.0	6.0	27349	35591	
8250.852	5	0	5.0	5.0	9064	17315	
8251.221	0		4.0	3.0	34698	26447	
8254.609	0		3.0	3.0	24900	16645	
8260.200	0		4.0	5.0	21688	29948	
8268.948	0		6.0	5.0	17047	25316	
8269.160	0		5.0	4.0	24501	32770	
8274.667	0		3.0	2.0	25273	16998	
8278.211	0		5.0	4.0	22799	14521	
8280.899	0		4.0	5.0	23146	31427	
8282.790	1						
8290.630	2	+2	6.0	5.0	23136	31427	
8300.120	0B	−1	4.0	3.0	23146	31446	
8302.103	0		7.0	6.0	20762	29064	
8308.302	0		2.0	2.0	23561	15252	
8310.310	0		6.0	6.0	24451	32762	
8312.439	1	+2	5.0	5.0	16915	25228	
8312.853	0		5.0	6.0	22297	30610	
8314.449	1		4.0	3.0	21788	30103	
8318.680	9		6.0	5.0	12534	20853	−0.159
8321.129	1						
8321.821	0		4.0	4.0	23146	31468	
8326.365	1W		6.0	6.0	27264	35591	
8331.498	0	+1	5.0	4.0	24646	16314	
8339.797	0		5.0	4.0	29153	20813	
8350.262	0		4.0	5.0	28174	19824	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
8352.054	0		4.0	4.0	22341	30693	
8357.285	5	0	4.0	5.0	8958	17315	
8357.644	0						
8359.822	1						
8360.871	4		4.0	4.0	15719	24079	
8360.871		+2	6.0	5.0	33362	25001	
8362.404	0						
8363.104	0		5.0	5.0	22799	31162	
8364.622	0		2.0	3.0	22557	30922	
8368.722	1	+2	4.0	5.0	26428	18060	
8372.354	0		2.0	2.0	23377	31750	
8375.310	7	+1	5.0	5.0	17463	25838	
8376.182	1		1.0	2.0	27752	36128	
8379.219	2		7.0	7.0	18009	26388	
8390.398	1		3.5	3.5	15457	7067	
8393.386	1		2.0	2.0	21822	30216	
8399.848	6						
8403.762	1		3.0	3.0	23089	31493	
8411.920	2						
8418.850	1W	0	4.0	4.0	28174	19755	
8424.769	0	−1	4.0	4.0	22268	30693	
8424.844	1		6.0	7.0	17047	25472	
8426.132	1						
8431.586	0	0	4.0	5.0	29452	21020	
8440.553	0		2.0	3.0	21822	30263	
8444.063	2	+2	6.0	5.0	22129	30573	
8447.719	9R	+2	4.0	3.0	815	9263	+0.116
8448.678	0		5.0	4.0	19089	27538	
8454.318	0	+6	4.0	4.0	28635	20180	
8456.983	1	+5	2.0	2.0	25455	16998	
8471.798	0		6.0	5.0	26531	18060	
8474.515	1		4.0	3.0	21788	30263	
8480.665	6	−1	4.0	4.0	16516	24996	
8482.594	0		6.0	6.0	25518	17036	
8485.960	9	+1	6.0	5.0	12534	21020	
8492.598	0						
8494.795	0	+1	5.0	5.0	26554	18060	
8507.281	0		4.0	3.0	16516	25036	
8522.460	0		2.0	2.0	22557	31080	
8528.437	0		4.0	3.0	24270	32798	
8533.812	1	0	5.0	5.0	17047	25581	
8535.098	0		5.0	4.0	23419	31954	
8539.028	9	+1	5.0	4.0	11641	20180	+0.1
8548.379	3A	0	3.0	4.0	15924	24472	
8548.752	0		4.0	5.0	24270	15721	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
8550.759	0		2.0	3.0	21822	30373	
8555.461	3	−26	4.0	4.0	20673	29229	
8557.658	0	+ 2	3.0	4.0	20435	28992	
8565.956	0		6.0	5.0	26531	35097	
8567.766	0		6.0	6.0	17047	25615	
8571.339	0		5.0	5.0	20912	29484	
8575.685	0						
8576.248	0		5.0	4.0	25057	16480	
8578.392	0		5.0	6.0	19089	27667	
8586.051	3	−1	6.0	7.0	25518	16932	
8592.448	0		6.0	6.0	27888	19296	
8598.866	0		4.0	4.0	29452	20853	
8600.594	1		8.0	7.0	15110	23710	
8618.082	0		4.0	5.0	20673	29291	
8627.219	0	+2	3.0	3.0	25273	16645	
8627.904	0		5.0	5.0	22799	31427	
8634.261	1						
8642.203	0		5.0	4.0	25878	34520	
8655.602	0		3.0	2.0	21560	30216	
8665.376	1	+1	5.0	5.0	16915	25581	
8670.028	0		6.0	5.0	24451	33121	
8677.467	0		5.0	6.0	25057	33734	
8687.642	9	+1	4.0	3.0	10971	19658	+0.1
8688.670	1	+1	6.0	5.0	20197	28886	
8694.458	0		3.0	3.0	22751	31446	
8696.684	0		2.0	1.0	0	8696	
8712.071	3	0	4.0	5.0	16516	25228	
8715.749	0		3.0	3.0	15924	7208	
8726.407	1		1.0	2.0	25724	16998	
8728.775	0						
8730.044	0		6.0	5.0	24451	15721	
8746.029	0		3.0	2.0	22334	31080	
8751.178	0		4.0	4.0	21688	30439	
8753.899	8	+1	4.0	4.0	15719	24472	
8754.595	0		5.0	5.0	19089	27843	
8784.555	6	−3	6.0	5.0	19059	27843	
8784.642	0	0	4.0	4.0	10971	19755	
8790.871	5	−1	6.0	5.0	17047	25838	
8794.215	1	+1	3.0	4.0	20435	29229	
8797.477	6	+1	7.0	6.0	20762	29559	
8800.137	0		4.0	5.0	16516	25316	
8809.535	0		2.0	3.0	25455	16645	
8811.273	3						
8811.919	0						
8813.034	3	+1	6.0	6.0	12534	21348	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
8818.274	0		7.0	7.0	13720	22538	
8821.108	0		4.0	5.0	22341	31162	
8827.198	5						
8835.470	1	0	7.0	6.0	26010	34845	
8839.389	0		4.0	4.0	25320	16480	
8839.433	0		5.0	4.0	19741	28580	
8846.266	0		3.0	2.0	25844	16998	
8848.623	0		7.0	7.0	31464	22615	
8852.967	0		4.0	5.0	15719	24572	
8853.234	3	+2	4.0	5.0	10971	19824	
8861.234	0						
8863.623	0		7.0	6.0	27728	18865	
8864.741	1	−1	5.0	5.0	22297	31162	
8879.358	0		3.0	4.0	21560	30439	
8880.202	0						
8881.667	0		6.0	5.0	24749	33630	
8883.128	0	+3	5.0	5.0	26943	18060	
8883.440	2	+1	4.0	3.0	25529	16645	
8888.606	0		2.0	3.0	22557	31446	
8891.314	1						
8893.825	0		4.0	5.0	22268	31162	
8895.147	6		7.0	7.0	13720	22615	
8913.084	0						
8922.436	0	+1	5.0	5.0	16915	25838	
8933.677	2						
8942.174	2						
8953.054	2		7.0	8.0	26609	17656	
8961.222	9R	+1	3.0	3.0	302	9263	+0.117
8968.889	9R	+3	4.0	4.0	815	9784	+0.121
8974.032	3	+3	7.0	6.0	26010	17036	
8981.948	2	+3	7.0	6.0	26609	35591	
8987.447	0		2.0	3.0	24665	15677	
8991.413	0	+4	5.0	5.0	26106	35097	
8994.979	0		5.0	4.0	23775	32770	
8995.251	0		5.0	5.0	9064	18060	
9000.533	1						
9006.474	0						
9011.722	0						
9018.385	0		1.0	2.0	15300	24318	
9021.689	0		3.0	3.0	20435	29456	
9027.645	2	+1	6.0	5.0	24749	15721	
9030.467	1		2.0	2.0	30443	39474	
9032.811	1						
9033.528	0						
9036.111	1	+1	5.0	5.0	20912	29948	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
9048.455	0	+2	4.0	4.0	25529	16480	
9049.392	4	0	3.0	2.0	34337	25287	
9057.021	0W						
9059.229	1	+2	6.0	6.0	26531	35591	
9059.229			2.0	1.0	21822	30882	
9063.648	0		2.0	2.0	21822	30886	
9065.009	1	0	4.0	5.0	16516	25581	
9067.976	3		7.0	6.0	20762	29830	
9067.976		+3	4.0	3.0	23730	32798	
9072.383	6	0	3.0	4.0	15924	24996	+0.270
9077.481	2	0	7.0	7.0	26010	16932	
9086.540	0	+1	7.0	6.0	13720	22806	
9098.999	2	0	3.0	3.0	15924	25023	
9101.482	0		6.0	5.0	23136	32237	
9104.576	1	+2	3.0	2.0	26103	16998	
9105.55	0		2.5	3.5	39369	30263	
9112.178	0		3.0	3.0	22334	31446	
9113.133	0		6.0	5.0	26428	17315	
9115.265	2	−3	7.0	6.0	18009	27124	
9115.674	0						
9128.396	0		6.0	6.0	23633	32762	
9129.540	0	+2	5.0	5.0	22297	31427	
9137.353	0						
9154.058	0		4.0	5.0	31167	22013	
9156.694	0		2.5	3.5	18230	9073	
9159.749	1		5.5	4.5	28079	18919	
9162.307	1W	+2	6.0	6.0	26428	35591	
9172.271	6	0	5.0	4.0	11641	20813	
9173.947	9	−1	3.0	3.0	10484	19658	+0.084
9177.845	0	+1	4.0	3.0	22268	31446	
9179.264	0		6.0	5.0	24451	33630	
9180.984	0						
9198.816	0	0	3.0	3.0	25844	16645	
9199.542	0	0	4.0	4.0	22268	31468	
9200.119	0		6.0	7.0	19059	28259	
9209.538	9	+1	4.0	4.0	10971	20180	+0.1
9211.233	3		4.5	5.5	15559	6347	
9211.983	3		5.0	4.0	11641	20853	
9212.016	9	0	6.0	7.0	12534	21747	
9217.992	1						
9231.595	1	+1	3.0	3.0	34255	25023	
9233.297	3	+1	5.0	6.0	24501	33734	
9233.660	0	+1	4.0	3.0	21688	30922	
9246.874	3						

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
9251.408	8	+1	6.0	6.0	12534	21786	
9253.331	0						
9254.504	0		5.0	4.0	23775	14521	
9261.074	2	+2	4.0	5.0	25836	35097	
9263.373	9R	−1	2.0	3.0	0	9263	+0.118
9270.949	1	0	3.0	4.0	10484	19755	
9271.038	0						
9271.820	0	+1	4.0	4.0	29452	20180	
9273.214	0						
9273.437	2						
9277.903	2	+1	4.0	4.0	15719	24996	
9278.605	0						
9278.752	0						
9279.345	3						
9282.486	1	+1	4.0	5.0	15719	25001	
9285.883	2						
9289.495	0	−1	6.0	5.0	27349	18060	
9304.804	3	+2	5.0	4.0	19089	9784	
9307.224	0						
9319.377	0	+1	4.0	3.0	10971	20290	
9319.755	3	−1	5.0	4.0	17463	26782	
9322.068	4	−1	4.0	5.0	16516	25838	
9325.869	0		3.0	2.0	21560	30886	
9327.674	0	0	7.0	7.0	29921	20593	
9333.353	0	+1	5.0	5.0	21828	31162	
9344.754	0	+1	5.0	6.0	24501	33846	
9363.192	1	+1	3.0	2.0	15924	25287	
9368.574	3	0	5.0	4.0	11641	21010	
9374.413	0		5.0	4.0	30651	40026	
9379.261	9	+1	5.0	5.0	11641	21020	+0.137
9389.649	0		5.5	5.5	15739	6347	
9390.593	0	+2	5.0	4.0	22799	32189	
9392.648	0B	0	6.0	6.0	26428	17036	
9397.937	0A	+1	5.0	4.0	29153	19755	
9400.499	0		6.0	6.0	27888	37288	
9414.721	0						
9426.703	3						
9430.246	0W		6.0	6.0	36554	27124	
9436.450	2	−3	6.0	7.0	19059	28495	
9436.895	0	+1	5.0	4.0	19089	28526	
9436.895			5.5	4.5	39466	30029	
9445.208	2						
9457.127	0	+1	3.0	3.0	26103	16645	
9468.088	3	−3	6.0	6.0	17656	27124	
9470.609	0		4.0	5.0	34698	25228	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
9473.628	1	−1	4.0	5.0	21688	31162	
9476.929	5	0	2.0	3.0	15546	25023	
9478.929	4	+1	6.0	5.0	12534	22013	
9482.390	9R	0	3.0	4.0	302	9784	+0.121
9484.677	0	−3	5.0	6.0	26106	35591	
9491.776	0W		2.0	1.0	35100	25608	
9493.056	0						
9495.726	0		6.0	6.0	26531	17036	
9496.099	0	−1	6.0	7.0	26428	16932	
9506.656	0						
9509.309	6	+2	4.0	5.0	15719	25228	
9513.878	9R		2.0	3.0	10144	19658	+0.1
9520.323	1						
9526.755	0W						
9533.135	1						
9535.610	0		3.0	3.0	22751	32287	
9538.251	1		3.5	4.5	15457	5919	
9543.642	0						
9553.671	0						
9560.303	1						
9563.345	0		5.0	4.0	25878	16314	
9573.012	0	+4	7.0	6.0	16609	17036	
9580.926	1	+2	7.0	6.0	26010	35591	
9590.172	8		8.0	7.0	15110	24700	−0.05
9596.981	1						
9597.381	1	+1	4.0	5.0	15719	25316	
9598.150	0	+2	5.0	5.0	21828	31427	
9599.177	0	−1	6.0	7.0	26531	16932	
9599.177			3.0	2.0	35904	26305	
9603.180	0						
9609.855	0		4.0	3.0	26255	16645	
9615.931	7						
9622.143	2	+3	3.0	4.0	26103	16480	
9625.090	2		4.0	3.0	17280	26905	
9627.520	0		5.0	5.0	26943	17315	
9636.193	0		4.0	3.0	39739	30103	
9639.871	1		4.5	4.5	15559	5919	
9655.775	1	0	3.0	2.0	10484	20140	
9657.557	8	−1	7.0	6.0	13720	23377	
9661.692	0	−3	5.0	6.0	17463	27124	
9673.492	0						
9676.461	2	+1	7.0	7.0	26609	16932	
9686.339	0						
9691.945	1						
9695.845	8	+1	3.0	4.0	10484	20180	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
9702.013	0	−1	5.0	5.0	32917	23215	
9702.013			2.0	2.0	36481	26779	
9704.211	0		3.0	3.0	36734	27030	
9706.333	2	−1	5.0	6.0	11641	21348	
9708.984	1						
9724.350	0						
9736.448	0						
9748.190	0						
9749.809	0						
9751.392	1	+1	6.0	5.0	20197	29948	
9751.392			2.0	2.0	21822	31574	
9756.572	0	0	4.0	3.0	10971	20727	
9757.306	0						
9757.646	0	+1	4.0	3.0	21688	31446	
9774.871	0		4.0	4.0	26255	16480	
9774.871			3.0	3.0	38438	28663	
9777.569	0W	+3	4.0	5.0	25320	35097	
9782.215	1	+1	3.0	4.0	34255	24472	
9782.215			4.0	3.0	28634	38417	
9787.076	2						
9788.296	0		3.0	4.0	26103	16314	
9793.451	0						
9793.716	0	+1	4.0	3.0	29452	19658	
9795.483	0						
9797.122	0		6.0	5.0	25518	15721	
9800.168	1	+1	5.0	6.0	9064	18865	
9805.683	1	0	3.0	3.0	10484	20290	
9807.712	3	+1	4.0	5.0	25529	15721	
9811.487	0		3.5	3.5	9012	18823	
9818.284	0		5.5	4.5	15737	5919	
9826.802	6	0	6.0	5.0	19059	28886	
9830.889	0						
9841.592	0		3.0	4.0	34314	24472	
9842.172	1		5.5	4.5	15737	25579	
9842.782	6	+1	4.0	4.0	10971	20812	
9847.644	4	+1	2.0	1.0	10144	19992	
9859.713	4		1.0	1.0	10133	19992	
9862.246	4	+1	4.0	5.0	15719	25581	−0.1
9864.177	0	−27	3.0	4.0	34337	24472	
9866.882	0	0	5.0	4.0	16915	26782	
9868.316	0		3.0	3.0	23089	32957	
9882.491	6	+1	4.0	5.0	10971	20853	
9886.653	0						
9903.294	0		7.0	6.0	27728	37631	
9909.810	0						

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
9910.798	0						
9931.452	2	−1	4.0	3.0	16516	26447	
9956.769	0	0	5.0	4.0	19741	9784	
9984.433	0	+2	4.0	4.0	26465	16480	
9985.246	0		6.0	5.0	23136	33121	
9985.759	1		4.5	3.5	18205	28191	
9987.118	1	−2	2.0	3.0	9671	19658	
9987.322	2	0	1.0	2.0	15300	25287	
9990.330	0		7.0	7.0	13720	23710	
9995.710	4	−2	2.0	2.0	10144	20140	
10006.780	6		1.0	2.0	10133	20140	
10014.951	0						
10039.084	2	0	4.0	4.0	10971	21010	
10039.084			4.0	3.0	30766	20727	
10040.704	0	+2	5.0	5.0	25057	35097	
10049.772	7	+2	4.0	5.0	10971	21020	
10061.467	0		4.5	4.5	18205	8744	
10061.616	1	+2	2.0	1.0	15546	25608	
10062.441	0						
10072.354	0		6.0	6.0	25518	35591	
10072.512	0		7.0	8.0	27728	17656	
10075.875	0						
10077.255	4	−3	6.0	6.0	17047	27124	
10080.445	2		6.0	7.0	12534	22615	
10096.384	0	+6	6.0	6.0	24749	34845	
10097.675	0						
10097.808	0						
10098.646	1						
10101.012	2	+1	6.0	6.0	23633	33734	
10105.427	2	−2	7.0	7.0	22907	33013	
10108.355	0	+21	5.0	5.0	35336	25228	
10113.344	6	0	7.0	6.0	13720	23833	
10113.344			4.0	3.0	23146	33259	
10119.305	2	0	4.0	5.0	15719	25838	
10140.052	0	+19	5.0	4.0	19089	29229	
10144.709	6	+1	5.0	6.0	11614	21786	
10145.406	0						
10145.621	1	+1	2.0	3.0	40114	20290	
10147.024	0	+1	4.0	3,0	31167	21020	
10147.024			1.0	2.0	10114	29967	
10187.282	1	+4	6.0	5.0	17656	27843	
10189.541	0						
10200.759	0	0	3.0	3.0	9458	19658	
10205.290	0W						
10208.818	3	−3	5.0	6.0	16915	27124	

Table 2. (continued

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
10208.818			2.0	3.0	34957	24748	
10212.470	0	+2	6.0	6.0	23633	33846	
10214.023	0		2.5	2.5	39369	29155	
10226.016			4.0	4.0	34698	24472	
10226.016	1		4.0	3.0	33758	23532	
10231.148	1	+1	5.0	6.0	9064	19296	
10232.849	1						
10260.041	1		1.0	2.0	27752	38012	
10271.837	1	0	6.0	6.0	12534	22806	
10300.423	0W						
10307.528	0						
10307.816	1	+1	1.0	1.0	15300	25608	
10314.306	0	+3	4.0	5.0	31167	20853	
10320.878	4	0	2.0	1.0	9671	19992	
10332.486	1W						
10352.234	4		8.0	7.0	22660	33013	
10352.234			3.0	4.0	29673	40026	
10362.315	0						
10372.230	3	+1	5.0	5.0	11641	22013	
10410.730	2	0	6.0	5.0	12534	22954	
10422.338	0						
10423.076	0						
10449.646	7		8.0	8.0	15110	25559	
10477.370	0		7.0	7.0	27410	16932	
10478.365	0						
10486.356	0	−2	7.0	7.0	18009	28495	
10486.356			5.5	5.5	35335	45821	
10487.151			3.5	2.5	41188	30701	
10487.151	0		3.0	4.0	39013	28526	
10522.323	4A	−1	6.0	5.0	12534	23057	
10522.323	4A		1.5	2.5	36178	25655	
10525.390	6	−1	3.0	4.0	10484	21010	
10550.155			5.5	5.5	37958	48509	
10550.155	2		5.5	4.5	41886	31336	
10578.451	6		8.0	8.0	15110	25688	
10578.451			4.0	4.0	35816	25237	
10580.972	0						
10582.817	2	+1	2.0	3.0	10144	20727	
10584.381	0						
10596.534	0W	+1	5.0	5.0	24501	35097	
10601.810	0						
10611.294	0						
10616.212	0						
10618.855	4	0	2.0	3.0	9671	20290	
10618.855			5.0	4.0	26790	37408	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
10650.621	1		3.0	4.0	20435	9784	
10650.621			3.0	4.0	35213	24563	
10665.479	0		4.5	5.5	17013	6347	
10680.201	0	0	6.0	5.0	12534	23215	
10680.201			3.5	3.5	37829	27149	
10682.586	4	0	3.0	2.0	9458	20140	
10690.934	1	+1	5.0	4.0	9064	19755	
10700.364	1	−1	4.0	3.0	8958	19658	
10707.173	0	+2	6.0	5.0	26428	15721	
10743.691	1	+2	4.0	5.0	26465	15721	
10757.518	6	0	6.0	5.0	12534	23292	
10759.524	0	+1	5.0	5.0	9064	19824	
10770.677	0	0	6.0	6.0	19059	29830	
10775.275	0						
10807.290	0						
10809.464	0						
10810.520	0						
10818.219	0						
10819.231	2		5.5	6.5	12913	2093	
10827.039	1	0	7.0	6.0	22907	33734	
10832.496	1	+2	3.0	3.0	9458	20290	
10842.856	5	0	6.0	6.0	12534	23377	
10842.856			4.0	4.0	38380	27538	
10854.819	0	0	3.0	2.0	15924	26779	
10854.819			2.0	3.0	27562	38417	
10858.231	0	−2	3.0	4.0	15924	26782	
10877.497	3						
109[illegible].098	0	−2	2.0	3.0	15546	26447	
1[illegible]9[illegible].740	2						
10928.599	0		4.0	4.0	23327	34255	
10938.497	0	+1	7.0	6.0	22907	33846	
10949.188	0						
10979.911	2	−1	7.0	7.0	13720	24700	
10987.256	0	0	4.0	4.0	31167	20180	
11042.740	3	+1	4.0	5.0	10971	22013	
11056.052	2	+1	2.0	3.0	9671	20727	
11063.185	0	−1	5.0	4.0	17465	28526	
11115.829	1	+1	5.0	4.0	9064	20180	
11115.829			5.0	5.0	26790	15674	
11115.829			7.0	6.0	36349	25233	
11122.376	0						
11163.153	0W		2.5	3.5	18230	7067	
11165.138	0	0	5.0	6.0	11641	22806	
11169.308	1						
11171.353	0		3.0	3.0	34255	23083	

Table 2. (continued)

Energy (wave no.)	Intensity (0-9)	Obs-calc	J_{odd}	J_{even}	Level Odd	Level Even	Isotope Shift
11175.563	0W		6.0	5.0	22455	33630	
11222.261	1	0	4.0	4.0	8958	20180	
11225.939	0						
11269.693	0	+3	3.0	3.0	9458	20727	
11293.624	1B						
11298.642	0	0	6.0	6.0	12534	23833	
11314.045	1						
11327.646	0	−4	4.0	5.0	16516	27843	
11332.101	2	+1	4.0	3.0	8958	20290	
11333.159	0						
11336.589	2						
11351.146	0W		6.0	5.0	25518	36869	
11355.901	0	+2	3.0	4.0	9458	20813	
11389.656	0	−1	6.0	5.0	23136	34526	
11406.470	0W		4.0	5.0	34698	23292	
11415.625	0	0	5.0	5.0	11641	23057	
11419.315	0						
11423.141	0	+4	5.0	5.0	17463	28886	
11464.251	0W	+3	6.0	5.0	23633	35097	
11509.155	0	+3	4.0	3.0	31167	19658	
11509.155			2.0	3.0	25273	36782	
11531.176	0						
11538.269	1						
11552.202	2	0	3.0	4.0	9458	21010	
11570.709	0						
11581.612	0	−5	4.0	3.0	16516	28097	
11584.061	2						
11604.528	0						
11650.819	1	0	5.0	5.0	11641	23292	
11665.299	2	−1	5.0	4.0	11641	23307	
11768.725	0						
11769.296	0	0	4.0	3.0	8958	20727	
11788.782	0	+1	5.0	5.0	9064	20853	
11808.262	0						
11839.385	0	0	7.0	8.0	13720	25559	
11855.504	0	−1	4.0	4.0	8958	20813	

Table 3. Odd energy levels of curium.

Config.	J	Level
FDS2	2	0.0
FDS2	3	302.153
FDS2	4	815.657
F7DS2	5	1764.269
F7DS2	6	3809.358
FDS2	4	8958.447
FDS2	5	9064.880
FDS2	3	9458.053
FDS2	2	9671.692
FDS2	1	10133.857
FD2S	2	10144.927
FD2S	3	10484.864
FD2S	4	10971.171
FD2S	5	11641.681
F7D2S	6	12534.982
F7D2S	7	13720.280
F7D2S	8	15110.016
F7D2S	1	15300.445
F7D2S	2	15546.646
F7D2S	4	15719.057
FD2S	3	15924.576
FD2S	4	16516.293
F7D2S	5	16915.927
FD2S	6	17047.490
	4	17280.018
F7D2S	5	17463.053
F8SP	6	17656.657
F8SP	7	18009.480
F7D2S	6	19059.385
	5	19089.345
	5	19741.312
F8SP	6	20197.521
	3	20435.164
	4	20673.891
F7D2S	7	20762.088
F8SP	5	20912.802
F7D2S	3	21560.537
F7D2S	4	21688.715
	4	21788.788
	2	21822.753
F7D2S	5	21828.992
F7D2S	6	22129.080
F7D2S	4	22268.516
F7D2S	5	22297.602
	3	22334.181

Table 3. (continued)

Config.	J	Level
F7D2S	4	22341.232
	6	22455.425
FD2S	2	22557.754
	5	22640.067
F8SP	8	22660.801
F7D2S	3	22751.903
F7D2S	5	22799.238
	7	22907.608
FD2S	6	23136.512
F7D2S	4	23146.239
	4	23282.605
	5	23299.453
	2	23377.830
FD2S	5	23419.313
FD2S	2	23561.018
F8SP	6	23633.636
FD2S	3	23683.895
F7D2S	4	23730.896
F8SP	5	23775.532
	4	24270.429
	4	24357.505
	6	24451.724
F8SP	5	24501.351
	5	24646.279
	2	24665.26
	6	24749.323
	3	24900.560
	7	24951.325
	5	25057.182
	3	25077.814
	3	25273.168
	4	25320.318
	2	25455.481
	6	25518.802
	4	25529.390
	1	25724.910
	4	25836.812
	3	25844.767
	5	25878.128
	7	26010.231
	3	26103.077
	5	26106.475
	4	26255.805
	6	26428.850
	4	26465.368

Table 3. (continued)

Config.	J	Level
	6	26531.928
	5	26554.924
	7	26609.210
	4	26754.995
	5	26790.156
	3	26814.726
	5	26943.255
	5	27131.099
	6	27264.794
	6	27349.626
	7	27410.121
	4	27522.387
	2	27562.433
	5	27586.156
	7	27728.669
	4	27763.126
	6	27888.474
	4	28174.663
	3	28246.242
	4	28635.020
	5	28880.044
	4	28989.085
	6	29065.932
	5	29153.749
	4	29452.527
	3	29506.733
	7	29921.673
	6	30483.365
	4	31167.964
	7	31464.050
	4	31712.308
	5	32917.197
	6	33362.412
FDSS	3	34255.170
FDSS	4	34698.971
FDSS	5	35336.719
FDSS	6	36554.991
FDSS	7	38633.652

Table 4. Even energy levels of curium.

Config.	J	Level
F8S2	6	1214.203
F8S2	4	4877.610
F8S2	5	5136.520
F8S2	3	7208.827
F8S2	2	7521.123
F7S2P	3	9263.374
F7S2P	4	9784.543
F8S2	4	14521.027
FDSP	2	15252.710
FDSP	3	15677.750
FS2P	5	15721.679
FDSP	4	16314.782
FS2P	4	16480.937
FS2P	3	16645.951
F8DS	7	16932.750
FS2P	2	16998.503
F8DS	6	17036.202
FDSP	5	17315.732
F8DS	8	17656.156
F8DS	5	18060.130
FDSP	6	18865.047
F8DS	6	19296.027
FDSP	3	19658.812
F8DS	4	19755.813
F8DS	5	19824.403
FDSP	1	19992.570
FDSP	2	20140.639
FDSP	4	20180.708
FDSP	3	20290.547
F8DS	7	20593.999
FDS	3	20727.743
FDS	4	20813.952
F8DS	5	20853.661
FDSP	4	21010.255
FDSP	5	21020.941
F8DS	6	21348.015
F8DS	2	21565.175
FDSP	7	21746.999
FDSP	6	21786.389
FDSP	5	22013.910

Table 4. (continued)

Config.	J	Level
F8DS	3	22099.838
	1	22155.602
F8DS	4	22273.176
	7	22538.553
FDSP	7	22615.426
FDSP	2	22792.050
F8DS	6	22806.819
	5	22954.721
F8DS	5	23057.306
FDSP	3	23083.818
	2	23125.882
F8DS	5	23215.183
FDSP	5	23292.500
FDSP	4	23306.981
FDSP	6	23377.838
FDSP	4	24472.955
	5	24572.023
FDSP	7	24700.192
	6	24991.572
FDSP	4	24996.959
F8DS	5	25001.542
FDSP	3	25023.575
FDSP	5	25228.364
FDSP	6	25233.934
FDSP	2	25287.767
	5	25316.437
	7	25472.332
FDSP	8	25559.665
FDSP	5	25581.302
FDSP	1	25608.260
F8DS	6	25616.255
	8	25688.469
F8DS	4	25704.354
FDSP	5	25838.362
	5	26171.870
	7	26388.698
FDSP	3	26447.746
	6	26625.494
FDSP	2	26779.395
FDSP	4	26782.809

Table 4. (continued)

Config.	J	Level
F8DS	3	26905.109
F8DS	3	27030.022
FDSP	6	27124.748
F8DS	4	27288.240
F8DS	5	27399.447
	1	27442.258
	4	27538.027
FDSP	3	27624.835
	6	27667.742
FDSP	5	27843.943
	2	27857.236
FDSP	3	28097.910
F8DS	7	28259.503
	1	28381.973
FDSP	2	28479.620
FDSP	7	28495.838
F8DS	4	28515.966
FDSP	4	28526.239
FDSP	4	28580.745
F8DS	5	28639.630
FDSP	3	28663.324
	6	28777.258
	3	28833.538
FDSP	5	28886.190
	4	28992.820
	6	29064.190
FDSP	4	29229.378
	5	29291.971
	3	29456.858
	5	29484.141
FDSP	6	29559.564
FDSP	6	29830.062
	4	29936.576
	3	29937.097
FDSP	5	29948.912
	2	30026.430
	3	30103.237
	2	30216.140
	3	30263.301
FDSP	3	30373.515
FDSP	4	30439.891
FDSP	5	30573.141
	6	30610.453
	4	30693.286
	2	30886.402

Table 4. (continued)

Config.	J	Level
	5	30916.688
FDSP	3	30922.374
	2	31080.214
FDSP	5	31162.344
	5	31427.140
FDSP	3	31446.360
FDSP	4	31468.058
	2	31750.181
	4	31954.412
FDSP	4	32189.829
	6	32239.111
	6	32762.032
	4	32770.510
	4	32787.880
	3	32798.869
F8SS	7	33013.037
	5	33121.755
F8SS	5	33630.991
F8SS	6	33734.647
	6	33846.104
	4	34520.332
	5	34526.169
	6	34845.701
F8SS	5	35097.884
	6	35459.791
	3	35540.695
F8SS	6	35591.155

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