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The Palomar–Leiden Survey of Faint Minor Planets: Conclusion

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The results are given of a revision and small extension of the Palomar–Leiden Survey of minor planets. The majority of the class 4 orbits in the original Survey have been rederived using positions measured from the second plate of each blink pair, and in some cases the orbits could be raised to class 1 quality by the identification of observations in the second month. By using the concept of "*e*-assumed orbits," meaningful—if not always accurate—orbits are given for the cases that previously had to be rejected. The extension to the Survey consists of 170 new objects found in the field used for photometric calibration purposes. The total number of orbits in the Survey is 2403, and a tabulation is given of the 1198 orbits that supplement or amend those in the original Survey. A listing is included of the identifications of Palomar–Leiden objects with minor planets observed at other oppositions.

INTRODUCTION

The Palomar–Leiden Survey of faint minor planets, published almost a decade and a half ago (van Houten *et al.*, 1970; hereinafter called PLS I), had as its principal objective a statistical discussion of the orbits of faint minor planets. The orbits were ascribed to four quality classes depending on the available observations. Class 1 orbits were based on at least two positions in each observing month (September and October 1960). Class 2 orbits involved only a single position in one or the other of the months. Class 3 and 4 orbits were obtained from positions in one month only and were defined according as to whether the arc of observation was greater than or less than 7 days. PLS I consisted of 1965 orbits, including 129 entries that were rejected for reasons specified there.

During the first Tucson colloquium on minor planets in 1971 considerable interest was shown in the individual orbits in the Survey. For that reason an attempt has been made to improve the quality of the orbits, mainly by examining the Survey plates for further positions. It has been possible to transfer to an improved quality class some 120 of the orbits in PLS I, and for the majority of the orbits remaining in class 4 the opportunity was taken of using positions measured on the second plate of a blink pair. No systematic search for additional minor planets has been made in the original Survey fields, but there is a considerable increase in the number of fourth-class orbits on account of the acquisition of additional positions (from the September 1960 plates) of objects for which there had previously not been enough observations to permit an orbit determination. Furthermore, the plates containing Selected Area (SA) 68, which had been used for the photometric calibration, were also searched for

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minor planets. The minor planets on the SA 68 plates and the images of PLS I objects on additional nights were found in Leiden using a blink microscope lent by the Lunar and Planetary Laboratory. The number of orbits has in fact been increased by 441, including 170 (designated with P-L numbers in the 3000s) determinations for objects found in the SA 68 field.

The total number of orbits in PLS II is 2403, and almost exactly half of the orbits represent new computations. More than 700 of the new orbits were computed by the late P. Herget. After Herget's death, B. G. Marsden obtained orbits for some 450 more objects. A number of orbits were derived at the Leiden Observatory by means of a computer program written by Herget, and a few orbits were computed by C. M. Bardwell, then at the Cincinnati Observatory.

e-ASSUMED ORBITS

In view of the low accuracy of the fourth-class orbits (and to some extent third-class orbits), two selection rules were applied for their acceptance in PLS I. These were that the orbital eccentricity e should not exceed 0.30 and that the semimajor axis a should not be smaller than 2.0 AU, except for objects of Hungaria type and the obvious Apollo-type object 6743 P-L. Similar rules have been adopted in PLS II, but the limits were changed slightly. The upper limit for e was generally increased to 0.35, since about 1% of the class 1 orbits have $e > 0.30$. The general lower limit of a was shifted to a more realistic 2.1 AU, and objects that seemed to be at and beyond the 2 : 1 Kirkwood gap (3.3 AU) were subjected to careful scrutiny. The relaxation of the eccentricity limit has meant that five of the previously rejected class 3 orbits can be accepted without change. These are 7620, 9086, 9528, 9552, and 9593 P-L: the reliability of the second of these orbits has in fact been demonstrated by the identification of observations of the same object in 1980.

The total number of orbits rejected according to the new limits was 91, while for 13 further objects no orbit could be determined at all; one orbit was excluded because of its very high inclination i. For these 105 objects, orbits have therefore been derived by more devious means, generally by fixing e (and sometimes a instead or in addition) at reasonable values. The philosophy for this procedure is that, if the residuals from such an orbit are acceptable, the orbit should be closer to the truth than one determined by more direct means that gives values of e and a outside their acceptable ranges. While this is undoubtedly true, it is difficult to judge the reliability of these "e-assumed orbits" statistically. Some insight may, nevertheless, be obtained from the following examples of choices between accepting the straightforward class 4 orbits and orbits with assumed eccentricity.

First, for 2223 P-L four different orbits were available:

ω	Ω	i	e	a	Computer
110°46	221°89	1°37	0.2747	2.0968	Herget
119.18	218.75	1.66	0.2663	2.2272	Bardwell
115.50	220.07	1.52	0.2692	2.1629	Marsden (e assumed)
112.14	221.26	1.42	0.2730	2.1193	Marsden

The orbit computed by Herget, derived according to his method (Herget, 1965) and the quasi-least-squares differential correction described in PLS I, used all six available observations (covering a 4-day arc), and a is just below the acceptable minimum. Bardwell used the same method without the differential correction, and this forces the first and last observations to have exactly zero residuals; on the other hand, he rejected one of the observations and obtained a result that is certainly acceptable. The e-assumed orbit incorporated all six observations but was designed to give a in the range expected of normal minor planets. Although certainly not true of all e-assumed orbits, a full least-squares differential correction then succeeded in this case and gave a value of a that is just technically in the acceptable range. One concludes that the orbit of 2223 P-L is basically determinate but that it may be influenced by a rather poor position; the e-assumed orbit is undoubtedly a good approximation to the

truth, although in this case the complete least-squares solution has been adopted.

In the case of 4540 P-L satisfactory orbits could be derived for eccentricities covering the range 0.00–0.35, small values of e being associated with large values of i and vice versa. On the other hand, the semimajor axis varied only slightly among the orbits. It is probable that the eccentricity is in fact larger than the value (0.01) eventually adopted, but it is clear that, except for a, which must be in the range 3.0–3.2 AU, nothing can really be said about the orbital elements of this object.

For 6339 P-L the eccentricity of the adopted e-assumed orbit (0.24) is essentially the smallest that gives acceptable residuals. Larger values, up to $e = 0.40$ and more, also represent the observations satisfactorily. It is possible that the omission of one of the observations would lead to a general solution with an acceptable eccentricity, but the orbit of 6339 P-L is obviously not particularly determinate.

The conclusion is that, while in some cases the adopted e-assumed orbits may be good approximations to the truth, in many others they are merely wild guesses. There is no way to remedy this situation, but the alternative of giving general results with meaninglessly high eccentricities seems somehow less satisfactory. While the genuine fourth-class orbits can be discussed statistically in a reasonably appropriate way, as is shown in the next section, many of the individual cases must clearly be suspect and in that sense differ from the e-assumed cases only because the general solutions just happened to give values of e and a in the acceptable ranges.

COMPARISON WITH THE PLS I CLASS 4 ORBITS

Although it can be expected that, on the whole, the addition of a second position from a blink pair has increased the accuracy of the fourth-class orbits, it is desirable to put this qualification on a quantitative basis. To do this, the new class 4 orbital elements were compared with those given in PLS I. Since the accuracy of the old orbits had already been discussed, it was hoped that the accuracy of the new orbits could be derived from the differences. For this comparison 370 orbits were available.

It soon turned out, however, that there is a systematic difference between the semimajor axes of the old and the new orbits. Closer inspection showed that this difference is limited to orbits with $a < 2.6$ AU in PLS I. The average value of this difference is as much as 0.121 AU, in the sense that the old values are smaller than the new. Accordingly, for the purpose of determining the accuracy of the new orbits, the comparison was restricted to the cases that originally had $a > 2.6$ AU. No further systematic differences were found, and the following average differences were derived:

$$|\overline{\Delta a}| = 0.070 \text{ AU}$$

$$|\overline{\Delta e}| = 0.040$$

$$|\overline{\Delta i}| = 1^{\circ}.35.$$

Compared with the corresponding values (derived by comparison of first-class orbits with effective fourth-class orbits determined from the September observations alone) in PLS I ($|\overline{\Delta a}| = 0.071$ AU, $|\overline{\Delta e}| = 0.035$, $|\overline{\Delta i}| = 0^{\circ}.76$), this gives the impression that the new class 4 orbits are of very good quality. As indicated in the previous section, this is certainly unrealistic. The accuracy of the class 4 orbits in PLS I was probably overestimated, since it was based on measurements of bright images that have smaller positional errors than faint ones. Moreover, the two sets of data are not completely independent.

On the other hand, in 19 cases it was possible eventually to identify further observations that allowed new class 4 orbits to be extended to class 1. The sample is small, but the resulting differences between the new class 4 and the corresponding new class 1 orbits are:

$$|\overline{\Delta a}| = 0.040 \text{ AU}$$

$$|\overline{\Delta e}| = 0.027$$

$$|\overline{\Delta i}| = 0^{\circ}.70.$$

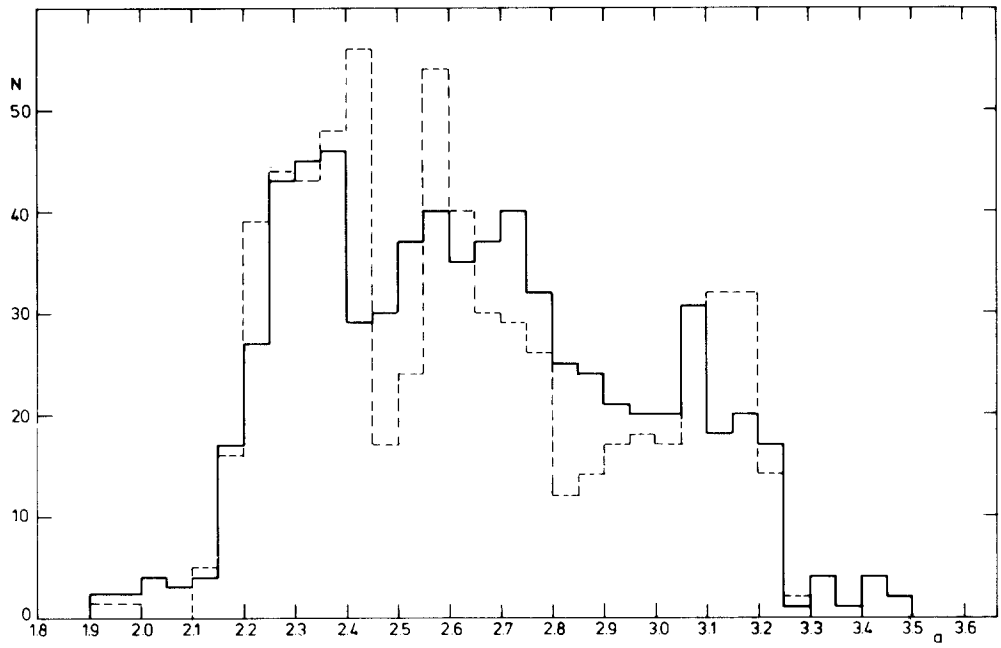

FIG. 1. Frequency distribution of the semimajor axes of the class 4 orbits (solid line) and class 1 orbits (broken line, and scaled to the same number).

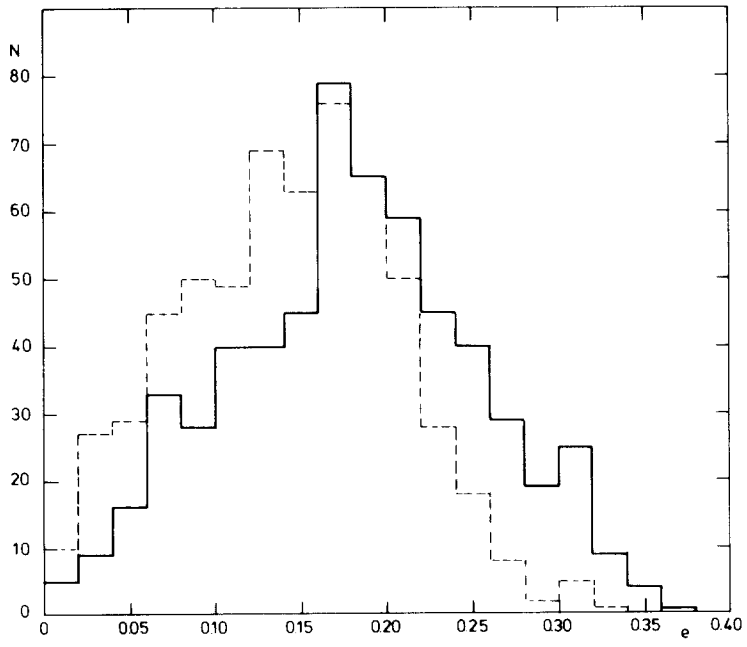

FIG. 2. Frequency distribution of the eccentricities of the class 4 orbits (solid line) and class 1 orbits (broken line, and scaled to the same number).

DISTRIBUTION FUNCTION OF SEMIMAJOR AXES AND ECCENTRICITIES OF CLASS 4 ORBITS

The Figs. 1 and 2 show the distributions of the semimajor axes and eccentricities of the final PLS II orbits of classes 1 and 4, the results of class 1 being shown with a broken line and those of class 4 with a solid line. Only representative samples of the class 4 orbits have been plotted (681 in the case of the semimajor axes and 590 for the eccentricities), and the class 1 entries have been scaled to correspond to the selected number of class 4 orbits.

In the plot of semimajor axes (Fig. 1), the 3 : 1 Kirkwood gap is clearly visible (around 2.5 AU), although in the class 4 distribution it is much more shallow than in that of class 1. The distribution function for the eccentricities (Fig. 2) is rather similar for the two quality classes, each having a maximum near $e = 0.17$.

ORBITS OF QUALITY CLASS 2

A class 2 orbit, which involves observations over an arc of from 4 to 9 days in one of the observing months and just a single observation in the other, is in effect a case where it is not clear whether the orbit has essentially the accuracy of a class 1 orbit or whether it should really be treated as of only class 3 or 4. Even if the residuals are satisfactorily small, one can never be absolutely sure that the observation and/or its identification are correct. Statistically, the distribution of semimajor axes is found to be more nearly similar to that of the class 1 orbits than to that of class 4. In particular, the 3 : 1 Kirkwood gap is essentially in its right place. It can thus tentatively be concluded that the additional position generally really does belong to the object to which it has been assigned. In fact, the number of class 2 orbits in PLS II is less than in PLS I, for it was possible to promote almost 50 of the earlier orbits to class 1.

On the other hand, the large residuals shown in PLS I indicate that the month-to-month linkages of observations of 2202, 2207, 4864, and 6692 P-L were incorrect. Further investigation has also revealed incorrect linkages for 2785 and 6794 P-L (the latter in fact originally was a class 1 orbit). Accordingly, these orbits have now been relegated to class 4 status.

SPECIAL ORBITS

Orbits for nine new Trojans (2804, 4292, 4322, 4534, 6375, 6889, 9602, 9612, and 9616 P-L) are listed in this paper. Four of these were suspected to be Trojans in PLS I, but it was not then possible to give Trojan-like orbits. Unfortunately, all but one of the new Trojans have *e*-assumed orbits. While this is regrettable, it does provide a good illustration of the occasional great usefulness of this method of orbit computation. One more Trojan, 2706 P-L, which had a class 4 orbit in PLS I, now has a class 1 orbit.

Three new Hilda-type objects (2864, 6240, and 7617 P-L) were found, two of them again with *e*-assumed orbits (7617 P-L had a rejected orbit in PLS I). Three earlier class 4 Hilda orbits (2709, 4710, and 6847 P-L) have been somewhat improved, but they remain class 4.

Four new Hungarias (3006, 3509, 6310, and 6378 P-L) were found (two again with *e*-assumed orbits), as was the known Hungaria object 3566 P-L = (1235) Schorria. Two of the earlier class 4 Hungaria orbits (2112 and 4761 P-L) have been somewhat improved, and three more (7071, 7072, and 7082 P-L, the first of which has recently been identified at other oppositions and numbered) have been improved to class 1 quality.

The orbit of one more fast-moving object, 5025 P-L, was obtained. At the time of observation this object was evidently some 0.7 AU from Earth. If the elements are reliable, this object would have its perihelion in the vicinity of the orbit of Mercury and its aphelion between the orbits of Jupiter and Saturn!

TABLE I

ORBITAL ELEMENTS

P–L	g	M	ω	Ω	i	e	a	N	Q	P–L	g	M	ω	Ω	i	e	a	N	Q
2026	15.4	25°.07	4°.76	334°.73	6°.21	0.0864	2.7343	7	1	2166N	17.4	358°.27	169°.18	201°.64	4°.54	0.2379	2.3646	3	X
2030	17.3	23.91	107.29	223.59	4.29	0.2074	2.1489	7	1	2167N	17.5	358.04	178.01	192.42	5.11	0.2452	2.2523	3	X
2045	18.0	346.86	23.27	3.70	6.76	0.2130	2.2393	7	1	2171	17.0	317.68	188.06	233.75	4.19	0.1209	2.6481	8	4
2046	17.0	349.09	95.23	289.04	2.91	0.1621	2.6028	8	1	2173N	16.4	264.29	255.60	230.19	7.09	0.1898	2.6199	8	4
2047	17.3	41.00	314.26	4.43	6.65	0.0972	2.2037	8	1	2174	17.1	56.05	309.49	325.44	5.19	0.3324	2.5727	5	4
2054	15.7	174.96	327.86	226.90	4.75	0.1458	2.3186	7	1	2175	16.4	83.00	284.17	352.46	4.49	0.0836	2.6143	6	1
2067	16.1	76.62	292.29	336.93	3.30	0.2197	2.7386	6	1	2176	18.7	343.18	72.35	325.42	2.49	0.2866	2.5835	7	2
2092	15.1	29.70	7.28	323.92	5.17	0.1230	2.6491	6	1	2177	16.4	312.66	194.84	248.02	1.27	0.2541	2.9965	7	1
2097	15.0	36.67	134.00	194.95	7.63	0.0487	3.0373	9	1	2178N	17.7	42.81	314.87	349.63	6.28	0.2239	2.4088	7	1
2098	14.1	10.22	156.96	192.01	11.87	0.2611	2.6285	9	1	2179	16.0	255.55	132.42	0.78	17.46	0.1713	2.7543	7	4
2099	15.5	203.29	331.13	199.01	5.73	0.1151	2.2696	8	1	2180N	15.8	208.00	319.63	203.28	7.97	0.0421	3.0615	10	1
2100	15.3	94.11	72.53	193.16	16.75	0.0739	2.8569	9	1	2181	16.7	313.64	80.64	1.77	9.34	0.2683	3.0265	7	4
2102	16.8	48.22	323.84	335.80	3.93	0.1865	2.3050	10	1	2183	16.9	115.58	55.02	194.84	5.91	0.0390	2.4170	8	4
2105	17.4	21.82	353.91	342.38	7.26	0.1679	2.2461	9	1	2186	16.5	114.38	242.45	358.87	13.01	0.1360	2.5547	8	1
2107	16.7	97.13	11.75	243.56	4.93	0.1466	2.2674	6	1	2187	15.7	218.22	213.60	309.63	5.27	0.1860	2.7056	9	2
2108	19.5	6.13	4.94	344.04	2.62	0.3848	2.3192	6	1	2190	15.5	243.94	292.36	207.69	4.56	0.1446	3.1328	9	1
2111N	15.1	149.70	227.83	348.33	10.69	0.0950	3.1383	9	2	2192	16.5	3.51	167.93	197.04	7.01	0.1438	3.0049	6	4
2112	17.2	241.59	134.15	4.41	24.79	0.1305	1.9027	6	4	2193N	15.9	301.50	253.22	195.73	12.54	0.1829	2.8567	6	4
2113	17.0	344.38	164.24	222.58	3.50	0.0892	2.6601	8	2	2194	16.0	324.26	56.35	359.71	16.28	0.1360	2.7844	8	4
2115	16.0	54.61	70.01	221.33	4.64	0.2166	3.2093	6	4	2198	16.0	210.00	167.51	358.73	17.15	0.1384	2.6193	7	4
2116	16.7	345.76	162.19	225.68	6.73	0.1410	2.7246	6	1	2201	15.6	51.54	298.28	10.30	4.45	0.1068	3.1891	6	1
2117	16.6	3.00	93.84	270.89	1.21	0.0774	2.7103	7	1	2202	16.7	181.26	211.43	334.93	5.36	0.0386	2.3875	6	4
2118N	16.1	282.66	266.61	205.82	6.33	0.2268	2.7696	7	4	2203	17.3	48.08	103.20	212.20	5.15	0.0361	2.2945	7	4
2119	17.4	14.22	137.20	211.49	6.31	0.1398	2.3600	7	1	2205	17.2	8.69	160.67	188.62	3.56	0.3002	2.3553	5	4
2120	17.3	54.27	85.91	214.79	6.50	0.1298	2.2772	6	1	2207	16.0	78.46	307.55	333.53	5.89	0.0679	2.3980	5	4
2123	15.4	65.90	310.12	346.83	8.78	0.0738	3.1743	12	1	2208	17.2	316.04	210.70	225.39	4.52	0.2563	2.6188	11	1
2125	16.6	10.91	9.44	342.42	6.17	0.1836	2.4242	6	1	2210	17.8	319.59	175.94	254.21	1.35	0.2513	2.4846	6	4
2126	14.5	279.45	114.02	341.50	7.22	0.0459	2.4647	6	1	2211N	17.0	83.10	304.32	319.79	4.07	0.2069	2.3796	7	2
2127	16.6	18.66	27.09	315.61	2.56	0.1707	3.0461	6	1	2212N	18.0	337.03	206.22	193.74	3.02	0.1644	2.2078	8	4
2128	18.5	6.86	58.13	297.99	1.59	0.2177	2.4149	9	1	2213N	18.2	333.91	173.95	238.52	3.08	0.2569	2.5951	8	1
2132	16.7	39.89	320.21	356.45	11.80	0.1503	2.5274	7	4	2214N	18.0	14.19	40.87	306.91	2.61	0.1554	2.5371	7	4
2133	15.6	303.90	90.30	356.22	14.08	0.1884	2.5784	12	1	2215N	16.0	329.00	165.14	245.85	4.33	0.1431	3.2324	10	1
2134	16.2	324.19	83.00	335.59	3.05	0.1732	2.6998	7	1	2216N	16.8	357.37	165.49	208.75	10.44	0.1633	2.9727	6	4
2135	18.9	18.08	7.87	332.01	2.20	0.1890	2.1144	9	1	2217N	17.1	12.26	357.91	355.62	14.99	0.1217	2.6646	6	4
2137	17.4	290.73	250.88	209.71	8.30	0.1938	2.3767	6	4	2218N	16.8	303.02	88.45	355.63	13.18	0.1672	2.6877	6	4
2140	14.2	7.96	1.87	354.81	10.31	0.2176	2.7618	11	1	2219N	16.1	197.25	345.33	196.06	1.57	0.3051	2.2953	7	4
2141	17.6	30.02	114.18	208.26	3.04	0.2167	2.6348	8	4	2220N	15.8	356.42	11.87	1.47	14.08	0.1490	3.1992	7	2
2142	14.4	314.54	242.04	193.36	7.39	0.2130	2.7957	8	1	2221N	18.0	49.20	71.96	236.47	3.57	0.1223	2.1802	8	2
2143	18.7	12.35	346.56	351.50	6.85	0.3797	2.6207	6	4	2222N	17.4	351.03	105.08	276.02	2.19	0.1902	2.6802	7	4
2144	17.6	347.15	68.15	324.98	3.47	0.3149	2.5186	7	4	2223N	19.5	17.71	112.14	221.26	1.42	0.2730	2.1193	6	4
2145	15.4	338.89	196.54	207.45	9.23	0.2503	2.5244	7	4	2224N	18.0	317.02	109.21	309.34	1.69	0.0844	2.1843	9	1
2146	17.0	9.99	140.44	199.76	8.22	0.4172	2.6744	7	4	2225N	17.4	305.42	101.59	331.03	6.66	0.0961	2.3905	7	4
2147	16.2	339.62	45.00	359.37	9.49	0.2595	2.7413	8	4	2226N	16.8	6.61	128.49	232.66	1.77	0.0572	2.6715	8	4
2149	15.2	175.29	348.31	208.11	8.93	0.0223	3.1483	6	X	2227N	18.3	349.51	47.69	336.42	3.62	0.2019	2.4433	9	1
2150	17.5	17.58	131.28	208.45	6.68	0.2490	2.7638	8	4	2228N	17.0	68.56	29.14	244.46	4.47	0.2338	2.4195	11	1
2152N	14.6	205.31	189.09	349.75	12.48	0.3499	3.0301	3	4	2230N	17.6	31.78	119.47	203.08	6.84	0.1816	2.5499	7	4
2156	15.6	16.24	152.56	194.00	11.25	0.1803	3.1080	8	4	2231N	17.0	298.06	202.00	249.14	1.26	0.1953	2.6617	3	4
2157	14.3	309.87	240.76	193.56	21.15	0.1357	3.2116	8	4	2232N	17.1	295.45	262.88	190.41	10.70	0.1797	2.5078	8	4
2160	16.6	18.92	119.15	222.45	4.45	0.1808	2.3008	8	4	2233N	18.5	31.94	79.50	240.94	4.23	0.1964	2.3704	8	2
2163N	18.8	19.67	4.03	324.95	1.41	0.3125	2.2934	3	4	2234N	18.6	347.87	20.46	3.44	7.01	0.1444	2.2817	11	1

P-L	g	M	ω	Ω	i	e	a	N	Q
2235N	18.1	307°.03	85°.06	0°.05	3°.97	0.2194	2.3066	8	4
2236N	18.4	358.27	151.39	219.02	1.77	0.1459	2.2280	8	X
2237N	18.5	10.44	344.83	2.83	4.74	0.2937	2.8814	7	2
2238N	17.4	27.58	121.34	209.30	2.20	0.1494	2.6952	7	4
2503	14.8	312.93	57.21	7.70	15.06	0.1064	2.5520	7	1
2507	16.7	297.21	80.46	2.08	5.77	0.1215	2.2780	10	1
2512	16.0	58.65	318.35	348.86	1.45	0.0252	2.6185	10	1
2513	16.3	325.09	68.69	354.13	1.74	0.2315	3.1140	7	1
2535	14.0	16.66	208.24	136.92	2.16	0.1540	3.1437	7	1
2537	16.4	14.28	316.92	26.70	5.22	0.2038	2.3786	8	1
2539N	15.5	274.47	120.36	0.96	6.61	0.2439	3.1191	8	X
2544	16.2	4.07	353.00	9.09	11.61	0.1141	2.9681	9	1
2551	14.8	42.58	290.53	25.64	1.75	0.0996	2.8460	8	1
2582	16.9	323.97	25.21	30.22	3.32	0.1499	2.4190	7	1
2585	16.7	329.16	40.99	10.61	9.69	0.1978	2.7635	10	1
2602	15.9	313.99	11.16	62.24	2.86	0.1975	3.0894	8	1
2606	16.5	21.52	130.26	203.74	2.00	0.1887	2.3725	7	1
2609	18.1	55.57	260.06	33.21	3.17	0.1584	2.2580	8	4
2616N	16.3	208.17	137.90	26.88	5.18	0.1256	2.4566	8	4
2619N	15.9	262.05	109.82	11.38	8.36	0.1170	3.1580	7	4
2628N	17.7	92.17	271.09	4.75	1.46	0.0072	2.3861	8	X
2634	16.9	358.35	180.82	187.67	8.45	0.2744	3.0242	10	1
2639N	16.4	60.49	237.77	58.31	2.00	0.1299	3.0978	5	4
2640N	18.5	6.03	162.30	193.44	1.77	0.1990	2.2915	3	4
2641N	18.1	318.23	69.12	3.04	3.19	0.2464	2.5854	7	2
2644N	17.1	125.10	236.24	356.16	2.62	0.1212	2.3384	6	4
2647	16.5	334.30	28.04	16.65	1.50	0.1779	2.3920	10	1
2652N	17.3	346.19	227.49	159.70	0.95	0.2067	3.0175	6	4
2653	16.0	46.79	307.53	356.84	4.75	0.1681	3.2474	7	X
2654	16.6	327.45	274.81	135.23	1.44	0.1550	3.0080	6	4
2659	17.4	14.22	177.27	163.79	3.50	0.2283	2.2587	6	2
2661	15.2	263.60	126.17	9.71	16.11	0.3086	3.1479	5	4
2662N	17.2	339.87	11.17	16.92	6.77	0.0644	2.2515	5	4
2664	16.2	314.73	54.67	5.06	8.31	0.0806	3.0882	7	2
2666	17.5	344.14	227.81	169.39	5.26	0.3325	2.6873	8	4
2667	18.7	351.22	12.92	5.96	2.24	0.2114	2.3165	8	4
2668N	17.0	133.33	111.03	113.75	1.44	0.1070	2.2827	8	4
2670	17.5	327.51	233.45	188.41	14.28	0.2761	2.6829	6	X
2672	17.6	4.47	344.01	13.98	14.97	0.2049	2.6288	10	1
2674	16.4	81.46	216.44	60.42	1.75	0.0724	2.5975	8	1
2676	17.1	326.45	98.06	310.90	0.57	0.1168	2.5818	7	1
2677	17.7	329.00	8.83	33.10	3.72	0.0789	2.4079	8	4
2678	16.5	231.27	29.01	116.82	2.14	0.1307	2.4100	6	1
2682	16.2	17.95	189.49	152.20	1.70	0.1728	3.2387	6	1
2683	15.1	26.98	135.05	180.80	14.08	0.3054	2.7584	7	4
2684	17.0	303.72	246.75	183.24	6.60	0.0647	2.5795	8	4
2686N	16.6	12.43	20.44	330.60	1.39	0.1588	3.2556	9	4
2687	18.7	359.34	181.47	185.01	5.69	0.3043	2.5188	8	4
2689	16.3	305.41	40.59	26.10	4.58	0.0512	2.7881	9	2
2690	17.1	293.93	70.29	25.80	4.72	0.2038	2.5859	6	1
2691	15.9	132°.66	190°.69	32°.66	2°.84	0.1538	2.3828	6	1
2693	16.8	349.71	206.50	177.05	9.58	0.2384	2.9498	7	4
2695	15.7	288.97	121.52	330.25	1.09	0.1061	3.0944	5	1
2697	18.7	5.89	209.07	146.88	2.70	0.2089	2.3121	8	4
2698	17.1	78.63	274.84	5.75	7.73	0.0717	2.2499	6	1
2699	15.7	302.95	201.26	242.13	0.34	0.1640	3.2877	7	1
2701	16.9	358.00	190.51	178.25	12.15	0.2757	2.4761	6	4
2703	17.4	288.34	265.46	184.72	6.54	0.1002	2.3022	6	1
2704	15.4	111.97	53.33	187.30	22.00	0.1705	3.1525	9	2
2705	15.9	282.89	276.36	183.01	12.00	0.1196	3.1015	8	4
2706	13.8	327.25	307.46	99.56	1.21	0.0646	5.1324	7	1
2707	17.0	341.86	14.10	16.51	6.69	0.1191	2.7688	8	4
2709	15.7	329.29	253.71	164.13	3.42	0.2450	3.9886	8	4
2713N	16.3	347.74	192.78	191.26	11.08	0.1133	2.9904	7	4
2715	17.2	32.86	146.18	180.33	3.57	0.1184	2.5964	6	4
2716	17.8	23.47	170.91	159.40	2.62	0.2090	2.3544	6	1
2717	16.7	163.20	46.50	152.44	3.92	0.2065	2.1022	9	2
2718N	19.0	359.49	10.01	357.52	2.20	0.2610	2.5453	10	1
2719	16.5	31.25	219.28	104.36	2.01	0.1786	3.0634	8	4
2720	17.4	342.47	248.01	141.81	3.04	0.1236	2.7032	4	2
2722	15.5	102.77	67.88	181.31	14.98	0.1575	2.6806	9	2
2723N	17.2	172.52	17.24	177.58	3.88	0.0450	2.2611	6	4
2724	18.2	353.98	206.48	168.85	5.90	0.2245	2.3176	8	4
2726	15.7	320.70	244.75	177.53	13.50	0.1810	2.5670	7	4
2727	16.5	153.07	188.22	20.83	4.96	0.1471	2.3322	7	1
2728	15.1	235.23	145.63	13.02	16.32	0.3192	2.9247	7	4
2729N	16.2	96.34	51.78	198.03	4.23	0.2143	2.5456	10	1
2730	17.5	50.48	251.99	48.40	0.87	0.1710	2.5130	6	4
2732	16.0	160.52	180.42	25.19	5.60	0.0848	2.7477	8	4
2734	17.6	13.10	236.70	107.05	2.02	0.2747	3.0911	6	4
2735	18.6	21.47	317.06	10.92	2.04	0.2797	2.3416	8	4
2737	17.3	8.71	301.12	55.09	3.78	0.1073	2.4792	8	1
2738	16.0	236.87	310.42	186.46	15.28	0.0397	3.0413	6	4
2742	17.4	318.26	304.67	123.96	2.54	0.2076	2.6267	8	4
2744N	16.1	55.44	117.63	180.76	19.48	0.1270	3.0551	6	4
2745	17.7	40.39	125.10	187.89	5.23	0.1658	2.3159	8	4
2747	16.7	284.28	74.87	30.94	5.82	0.1894	2.5328	8	1
2748	17.0	333.98	235.01	170.77	7.44	0.1921	2.5843	8	4
2749	17.8	349.01	238.55	144.55	3.36	0.1977	2.3279	8	4
2750	18.1	24.40	175.53	158.58	4.03	0.1477	2.2232	9	2
2752	15.1	11.55	169.70	184.10	8.79	0.1465	3.0780	8	4
2753N	16.3	77.54	102.11	175.56	12.00	0.1167	2.5988	8	4
2755	16.0	14.33	320.15	30.59	5.43	0.1281	3.2361	7	2
2756	15.5	179.80	166.93	22.88	11.66	0.0849	2.9461	6	X
2758	18.4	13.91	329.02	13.66	2.72	0.2775	2.7193	6	4
2759	17.8	4.03	185.89	175.75	0.98	0.1968	2.4357	8	2
2761	17.2	8.83	177.07	174.38	5.36	0.2490	2.3671	7	4
2763	16.1	286.91	350.94	97.72	2.09	0.0525	2.9488	5	1
2764	16.4	135.08	38.54	179.85	6.65	0.2534	2.2939	8	4
2765	16.5	338.69	25.38	14.80	1.23	0.1872	2.6961	7	1

TABLE I—*Continued*

P-L	g	M	ω	Ω	i	e	a	N	Q	P-L	g	M	ω	Ω	i	e	a	N	Q
2766	18.0	42°.95	254°.02	46°.13	2°.26	0.2510	2.3480	8	4	2844N	17.3	12°.41	183°.94	163°.97	1°.73	0.1861	2.8161	8	4
2767	13.3	153.91	124.22	82.21	2.81	0.2720	2.9613	7	2	2845N	16.8	344.49	356.29	30.54	2.82	0.1217	3.1124	8	4
2769	16.5	83.34	88.76	185.00	12.15	0.1095	2.5389	5	2	2846N	17.1	226.92	333.27	171.00	3.10	0.0536	2.3394	8	4
2773	18.8	23.50	298.75	26.92	1.87	0.2736	2.2944	7	4	2847N	17.1	29.22	326.43	11.90	7.85	0.0392	2.5658	6	4
2774	17.2	327.65	3.07	48.93	2.82	0.1576	2.4667	6	1	2848N	16.6	359.38	350.50	20.58	1.04	0.1341	3.1188	6	X
2782	15.8	165.78	85.48	117.47	3.87	0.0485	3.0407	7	4	2849N	18.4	19.77	333.47	1.25	1.39	0.2187	2.3689	8	2
2784	15.4	87.87	138.88	125.11	2.85	0.1668	3.2402	7	4	2850N	14.6	148.73	349.94	219.09	1.51	0.2461	3.2251	7	X
2785	16.5	15.26	260.09	91.51	2.23	0.0694	2.6202	3	4	2851N	16.0	48.20	117.78	187.74	23.86	0.1629	3.1582	6	4
2787N	15.0	95.27	84.80	171.66	4.14	0.1670	2.5111	3	4	2852N	18.6	12.10	271.60	75.13	2.27	0.2171	2.3963	8	4
2788N	15.3	79.23	151.60	118.69	2.41	0.1843	3.1462	3	X	2853N	16.5	352.22	358.05	18.01	10.63	0.0266	2.9790	8	X
2789N	14.0	358.80	281.10	90.28	2.60	0.1112	3.1440	3	X	2854N	16.2	266.26	123.61	1.69	4.95	0.2123	2.7826	8	4
2792N	15.4	177.93	173.26	18.94	10.87	0.2860	2.4093	3	X	2855N	16.8	340.59	221.30	170.90	6.79	0.1127	2.8080	6	4
2794N	14.0	177.84	163.89	29.55	2.55	0.1256	2.9329	3	X	2856N	14.9	245.69	123.67	24.44	6.77	0.2453	3.1915	6	X
2795N	14.3	247.11	124.25	23.03	9.75	0.2625	2.5610	3	4	2857N	16.4	76.38	88.06	173.07	5.41	0.2498	2.5291	8	1
2797N	15.9	177.95	145.70	46.04	3.24	0.2105	2.3100	3	X	2858N	18.5	12.24	185.74	161.05	2.69	0.1746	2.2494	7	4
2798N	16.8	359.36	323.24	46.10	5.35	0.1818	3.1718	3	X	2860N	15.9	184.94	359.20	186.52	18.94	0.2364	2.5092	6	4
2799	16.3	15.91	156.60	185.66	27.12	0.2325	3.0398	7	4	2861N	15.4	235.43	333.05	176.03	0.63	0.1598	3.0104	8	4
2801	17.1	348.77	209.67	175.02	6.05	0.1806	2.5365	8	4	2862N	17.3	312.43	14.58	43.23	2.01	0.0457	2.5761	6	4
2803N	17.4	272.79	279.42	185.35	3.50	0.0970	2.3754	7	4	2863N	16.0	204.36	353.65	173.32	5.90	0.0990	2.7721	8	4
2804N	13.3	346.74	195.62	191.09	24.46	0.0208	5.2128	6	X	2864N	16.5	345.28	34.16	2.86	7.91	0.3159	3.9174	6	4
2805	16.8	9.86	166.68	188.73	10.36	0.1478	3.0698	6	4	3001N	16.0	343.22	161.90	225.95	11.60	0.1917	2.6592	7	4
2807N	16.6	2.01	176.26	190.24	9.52	0.1747	3.0092	8	4	3002N	13.0	26.74	35.79	296.41	9.84	0.0966	3.0029	8	4
2808	16.3	255.90	309.91	179.91	2.02	0.1539	2.4215	11	1	3003N	16.0	327.92	93.80	322.71	14.34	0.2376	3.0996	7	4
2809	16.6	19.00	171.12	173.17	1.63	0.1307	2.8858	6	4	3004N	16.6	352.53	54.22	321.24	11.17	0.1860	2.6923	7	4
2810	17.2	18.68	161.91	184.93	3.20	0.0728	2.3446	8	4	3005N	15.1	97.73	338.03	280.57	9.39	0.0755	3.0185	8	4
2811	17.7	12.40	187.44	158.03	1.45	0.2773	3.0997	6	4	3006N	18.2	246.37	145.97	341.84	20.64	0.0821	1.9399	3	4
2812	19.2	6.71	337.08	19.15	5.54	0.1981	2.1674	5	4	3007N	17.0	12.33	130.35	217.99	13.73	0.0937	2.6036	8	4
2813N	17.2	249.96	346.20	138.96	1.92	0.0542	2.3953	6	4	3008N	17.0	328.93	111.98	297.00	9.02	0.1803	2.5656	7	4
2814	15.8	75.90	271.56	3.94	6.28	0.1424	3.1192	6	2	3009N	15.7	320.78	104.89	308.13	9.29	0.1105	3.0751	8	4
2816N	16.5	48.65	276.71	13.21	8.19	0.2699	3.1367	8	4	3010N	14.7	23.88	108.06	226.66	11.83	0.1026	2.9456	10	4
2817	19.1	18.47	315.78	20.11	2.96	0.2320	2.3073	8	4	3011N	16.4	311.94	96.56	333.29	14.16	0.1693	2.5864	11	4
2818	16.5	146.69	169.24	43.42	4.70	0.1382	2.3919	4	2	3012N	15.9	343.16	91.17	296.01	9.17	0.1322	2.9582	10	4
2819	16.3	29.02	158.28	176.44	1.76	0.0477	2.8997	7	4	3013N	14.2	139.17	271.27	307.31	12.72	0.1364	3.0263	8	4
2822N	18.1	312.16	58.11	13.11	6.47	0.1837	2.2997	6	4	3014N	18.4	2.08	68.87	291.10	7.25	0.3032	2.5912	9	4
2823	18.9	16.12	156.80	184.04	4.33	0.1889	2.1700	5	4	3015N	13.9	248.29	203.60	284.41	9.91	0.1029	3.0140	13	4
2824	16.6	162.40	188.26	11.44	8.03	0.1634	2.5405	6	X	3016N	15.0	336.01	160.74	232.60	11.23	0.0929	2.6640	15	4
2826	16.5	241.94	125.76	14.41	13.75	0.1739	2.5105	8	4	3017N	16.2	268.95	170.13	317.05	13.05	0.2685	2.7668	5	4
2828	16.0	22.47	151.32	178.89	11.51	0.2114	2.4788	9	4	3018N	14.8	97.48	313.41	288.03	11.04	0.2662	2.6423	7	4
2829	15.9	198.20	6.13	165.90	3.65	0.1400	2.4711	5	1	3019N	17.1	7.43	25.04	327.34	11.90	0.2538	2.6938	11	4
2830	16.1	300.94	306.91	142.83	2.78	0.2248	3.0111	9	1	3020N	14.9	20.07	53.16	287.16	8.69	0.1149	2.9917	16	4
2831	16.2	45.50	266.26	50.29	2.71	0.0804	3.0961	8	4	3021N	14.1	144.06	279.09	300.13	12.05	0.0731	3.1844	8	4
2834	17.7	322.79	74.14	355.41	4.54	0.2849	2.5823	6	1	3022N	15.9	37.08	36.94	280.23	9.83	0.1533	2.9801	8	4
2836	17.6	350.06	236.27	145.06	2.60	0.2446	2.6890	7	4	3023N	15.5	249.44	257.36	235.47	10.51	0.1707	2.5764	16	4
2837N	16.4	209.51	325.05	197.52	2.99	0.0851	2.5359	10	1	3024N	14.5	182.24	255.18	290.86	11.11	0.1735	2.6210	9	4
2838N	15.9	275.87	96.39	29.01	2.44	0.3086	2.8285	6	4	3025N	15.6	72.48	328.29	309.53	11.66	0.1503	2.6426	9	4
2839N	17.1	59.73	296.37	352.80	2.47	0.1687	2.7316	8	4	3026N	15.0	27.59	355.40	334.50	13.39	0.1421	3.1636	15	4
2840N	16.2	190.44	34.08	148.53	4.18	0.2178	2.2384	8	4	3027N	15.0	43.82	21.50	287.42	6.33	0.1377	2.4874	13	4
2841N	18.7	47.68	292.30	6.53	2.72	0.1921	2.1271	7	4	3028N	15.8	45.39	24.52	286.97	7.65	0.1015	2.7808	16	4
2842N	18.4	10.47	330.37	19.70	3.22	0.1859	2.4470	6	4	3029N	17.5	359.27	111.87	253.16	5.80	0.3304	2.2878	22	1
2843N	16.5	297.74	254.38	188.76	16.89	0.1188	2.8639	6	4	3030N	15.7	311.39	176.43	257.19	10.07	0.1849	3.1592	10	4

P–L	g	M	ω	Ω	i	e	a	N	Q
3031N	15.2	343°.04	83°.76	306°.44	11°.30	0.1417	3.0843	8	4
3033N	15.6	356.30	111.66	258.72	7.62	0.1020	3.0851	11	4
3034N	14.6	8.83	118.26	236.46	9.58	0.1015	3.0064	16	4
3035N	17.2	350.32	73.94	305.61	8.22	0.1636	2.7638	9	4
3036N	17.1	328.96	104.99	301.56	6.08	0.1533	2.2437	17	2
3037N	14.1	281.35	158.82	298.04	8.44	0.0982	3.1989	18	1
3038N	16.9	51.56	21.49	274.78	7.20	0.1762	2.2783	16	1
3039N	15.8	336.01	157.69	246.10	7.06	0.2308	2.8451	16	4
3040N	15.6	13.88	56.17	288.31	8.06	0.2181	2.6396	15	1
3041N	17.3	16.54	86.31	246.98	8.59	0.3148	2.9748	10	4
3042N	15.2	345.29	115.30	274.40	6.43	0.2315	2.7853	18	1
3043N	18.2	21.65	50.97	284.42	6.44	0.1640	2.2182	13	4
3044N	17.7	350.44	82.35	296.06	7.79	0.1147	2.2259	7	4
3045N	14.6	44.64	335.19	332.59	12.72	0.1611	2.6447	18	1
3046N	17.4	28.73	10.85	317.37	7.98	0.1429	2.4941	12	4
3047N	14.1	125.46	255.75	333.36	13.36	0.1675	3.0457	14	2
3048N	15.5	11.63	135.11	213.90	17.18	0.1849	3.1922	14	4
3049N	16.2	38.70	58.20	255.97	6.47	0.1551	2.3878	15	4
3050N	15.0	344.56	71.49	315.58	8.62	0.1229	3.0267	16	1
3051N	14.7	45.16	77.50	227.87	12.24	0.1695	2.6048	15	1
3052N	14.9	31.41	6.78	323.95	9.92	0.0835	2.9861	15	1
3053N	17.1	38.57	46.92	266.62	7.65	0.1697	2.2430	11	1
3054N	15.6	350.09	148.12	229.77	8.97	0.1537	2.8212	7	4
3055N	16.9	358.75	12.21	355.56	30.74	0.1377	2.5187	7	4
3056N	17.0	100.70	315.14	295.55	7.19	0.1296	2.3895	5	4
3057N	16.2	351.43	41.41	337.22	9.84	0.2285	2.8898	4	4
3058N	17.6	45.40	345.86	322.73	7.56	0.1234	2.5662	4	4
3059N	17.8	13.34	53.26	291.08	4.16	0.1849	2.2527	4	4
3060N	16.9	18.76	102.44	231.59	5.42	0.2204	2.2283	4	4
3061N	16.5	64.77	22.98	263.44	5.77	0.1288	2.4946	7	4
3062N	16.8	350.79	106.69	268.79	5.22	0.0607	2.1891	7	4
3063N	13.7	233.90	203.03	291.45	6.90	0.0175	3.3424	7	4
3064N	16.8	358.37	42.15	324.80	6.59	0.1276	2.2914	4	4
3065N	16.2	48.24	40.47	262.69	5.56	0.1473	2.7132	6	4
3066N	14.2	262.15	266.81	207.69	14.84	0.1021	2.7502	4	4
3067N	17.2	31.43	80.89	243.59	5.78	0.1344	2.4888	5	4
3068N	15.9	31.62	51.19	281.84	5.81	0.0247	2.5494	6	4
3069N	16.2	63.54	336.75	314.60	5.68	0.1004	2.3921	4	4
3070N	18.0	335.30	114.97	285.65	5.58	0.1731	2.3582	7	4
3071N	15.6	54.13	17.02	282.98	5.33	0.1180	2.3885	5	4
3072N	13.1	169.16	229.16	328.29	13.08	0.1246	2.5969	15	1
3073N	16.5	68.09	66.94	217.08	13.17	0.1261	2.5315	11	4
3074N	13.6	208.83	305.83	220.96	11.33	0.1913	2.9113	4	4
3075N	16.5	359.30	56.93	311.30	7.79	0.2438	3.0956	13	1
3076N	14.9	275.75	250.70	238.14	8.55	0.3373	2.8240	5	4
3077N	16.1	303.43	100.23	346.31	13.68	0.2113	2.6490	4	4
3078N	15.9	203.21	233.71	295.73	5.38	0.1505	2.3463	4	4
3079N	17.4	7.80	54.09	295.15	4.31	0.3144	2.6011	4	4
3080N	16.0	347.34	55.99	329.26	6.89	0.2112	2.4028	4	4
3081N	14.0	4.51	132.22	228.72	9.95	0.1439	3.0490	9	2
3082N	15.7	347°.32	72°.31	309°.90	8°.60	0.0547	2.6461	15	1
3083N	15.1	92.53	346.56	272.56	6.71	0.1420	2.4270	10	1
3084N	16.1	251.57	260.58	231.10	6.69	0.1655	2.4218	4	4
3085N	16.1	358.86	131.17	237.52	7.41	0.1824	3.2172	3	X
3086N	14.0	58.55	55.38	246.05	9.20	0.0825	2.9902	10	1
3087N	13.7	17.77	85.53	261.70	8.33	0.0956	3.0664	19	1
3088N	9.2	122.39	256.86	329.37	12.99	0.2768	2.6769	14	1
3089N	16.9	8.10	16.37	338.49	13.92	0.2020	2.6018	8	1
3090N	14.3	318.03	200.02	231.15	14.18	0.2230	3.1776	15	1
3091N	15.1	279.02	174.76	287.45	9.72	0.1012	2.9426	13	1
3092N	16.0	47.81	0.70	295.05	7.40	0.2411	2.6460	10	1
3093N	14.6	123.88	294.80	300.39	12.32	0.0726	2.8744	5	4
3094N	16.1	71.31	43.87	234.34	12.95	0.1295	2.5958	7	4
3095N	17.2	43.42	336.60	321.89	13.67	0.2436	2.8608	5	4
3096N	16.5	324.73	82.03	322.27	10.41	0.0390	2.5844	9	4
3097N	15.5	52.04	353.41	294.67	7.05	0.2272	2.8263	5	4
3098N	15.6	256.50	208.91	270.34	6.34	0.1050	2.3558	7	4
3099N	17.0	320.31	66.62	349.41	28.34	0.1231	2.6454	5	4
3100N	15.0	176.04	247.29	300.21	9.73	0.0930	2.9449	5	4
3101N	17.2	31.35	38.91	283.57	6.19	0.1311	2.2804	3	4
3102N	9.5	136.41	331.40	240.57	9.99	0.2397	2.7042	3	4
3103N	16.4	351.12	131.94	242.75	9.20	0.1114	3.1068	3	4
3104N	16.9	339.50	86.69	306.67	7.14	0.1823	2.6395	4	4
3105N	16.4	312.05	196.46	227.07	10.12	0.1325	2.5496	4	4
3106N	15.1	33.71	85.56	240.86	9.13	0.1141	2.9914	12	1
3107N	15.6	5.15	144.57	214.91	12.78	0.1715	2.6256	6	1
3108N	13.6	118.59	0.87	234.79	14.09	0.1225	2.6064	9	4
3109N	15.2	63.06	353.87	293.54	11.16	0.1455	3.0252	5	4
3110N	15.2	33.82	45.91	281.64	10.91	0.0655	2.9385	5	4
3111N	16.6	344.77	87.84	295.61	9.46	0.0941	2.9826	6	4
3112N	17.3	25.50	76.58	246.29	10.06	0.2501	2.8740	5	4
3113N	18.1	41.76	44.34	258.01	8.75	0.2183	2.2652	4	4
3114N	14.8	205.71	308.29	217.75	15.76	0.1079	3.2086	4	4
3115N	16.7	7.14	72.26	280.76	7.43	0.1764	2.6756	7	4
3116N	15.6	57.20	9.84	272.92	11.94	0.2314	3.2951	4	4
3117N	18.7	20.22	52.69	279.15	4.86	0.2368	2.1420	8	4
3118N	16.0	256.71	208.76	292.54	8.15	0.3033	2.5192	5	4
3119N	15.9	93.43	280.93	339.20	11.04	0.1037	2.3023	4	4
3120N	15.6	276.59	242.57	232.42	15.34	0.2422	2.7332	3	X
3121N	16.3	67.13	341.23	285.45	5.84	0.2618	2.3747	3	X
3503N	15.5	52.68	55.05	244.74	11.39	0.1525	2.6388	11	2
3504N	16.4	359.12	38.93	330.95	11.52	0.1949	2.6648	10	1
3507N	16.6	62.96	41.75	242.40	11.80	0.1885	2.3369	11	3
3509N	16.7	117.67	241.43	4.57	27.04	0.0726	1.9638	11	3
3512N	14.8	221.95	224.97	292.06	10.62	0.1145	2.9874	8	3
3513N	14.8	338.65	87.34	307.62	9.21	0.0714	2.5765	9	3
3514N	15.9	352.96	94.44	284.02	8.68	0.0902	2.6438	9	3
3515N	15.5	323.21	146.89	279.32	10.14	0.2173	3.1244	6	3
3516N	13.4	191.46	229.00	314.82	10.27	0.1797	2.6107	12	3
3517N	16.3	8.14	14.98	340.87	8.53	0.1855	2.3015	11	3

TABLE I—*Continued*

P–L	g	M	ω	Ω	i	e	a	N	Q	P–L	g	M	ω	Ω	i	e	a	N	Q
3518N	15.2	317°.85	140°.18	279°.26	7°.54	0.0811	2.9157	10	3	4094	17.1	21°.87	88°.67	243°.74	3°.16	0.1826	2.6944	7	4
3519N	17.2	3.57	109.85	252.35	6.90	0.1777	2.1950	10	3	4111	16.8	322.50	64.68	354.90	4.30	0.2103	2.7064	8	1
3520N	14.5	348.50	141.01	243.52	9.50	0.1240	3.0116	11	3	4116	16.1	16.21	108.30	226.87	1.18	0.2432	2.1969	11	1
3521N	15.4	50.63	30.36	272.91	9.50	0.1501	2.6056	9	3	4118N	19.5	33.66	12.19	301.79	1.06	0.2019	2.1867	7	4
3522N	16.4	4.36	61.67	300.95	6.63	0.1618	2.2407	9	3	4131N	17.4	17.78	139.47	205.55	11.00	0.0741	2.4905	7	4
3523N	14.5	16.08	22.73	330.62	9.01	0.0399	2.5918	10	3	4132N	14.8	205.30	186.44	347.07	7.78	0.3390	2.9582	5	4
3524N	14.2	128.94	253.58	345.72	14.00	0.0441	2.5697	10	3	4133N	18.0	35.02	328.17	352.02	6.50	0.1279	2.3710	8	2
3525N	11.0	345.22	86.49	303.32	8.98	0.1054	3.0216	9	3	4134N	17.6	238.17	142.86	350.83	5.58	0.0717	2.2043	7	4
3526N	13.2	351.32	45.43	336.72	11.55	0.0923	3.1114	9	3	4135N	18.4	357.33	153.52	214.54	2.50	0.2093	2.6511	5	4
3527N	16.2	140.35	316.87	269.24	7.60	0.0651	2.2355	8	3	4136N	18.3	345.32	118.26	264.44	0.57	0.1059	2.2506	5	4
3528N	15.9	105.13	30.38	232.57	14.21	0.0252	2.6996	6	3	4137N	18.1	50.50	304.51	355.67	1.51	0.1491	2.4065	7	4
3529N	15.6	39.61	88.84	222.62	16.96	0.2116	3.1049	6	3	4138N	17.6	263.52	119.31	353.43	6.11	0.0981	2.2234	7	4
3534N	15.6	51.24	306.02	0.38	25.46	0.1165	2.7694	7	1	4142N	18.0	351.70	161.37	216.85	4.54	0.2303	2.5674	6	4
3535N	14.3	100.14	271.33	338.84	12.27	0.1757	2.4213	9	1	4143N	17.9	43.53	76.55	234.62	3.54	0.1174	2.3646	7	4
3536N	16.0	331.35	59.48	348.41	11.44	0.1781	2.4478	6	2	4144N	17.7	314.37	232.46	200.05	2.45	0.2241	2.4725	7	4
3537N	13.1	66.03	347.75	302.90	7.04	0.1162	2.6664	7	3	4145N	16.4	229.83	166.32	344.32	3.83	0.2057	2.5711	5	4
3538N	15.9	3.08	68.75	291.53	4.20	0.2458	2.2555	7	1	4146N	17.2	67.62	96.97	187.66	16.42	0.1144	2.6812	6	4
3539N	16.3	261.96	175.93	300.35	6.33	0.0765	2.2866	4	3	4147N	16.7	92.71	55.64	195.66	6.73	0.1770	2.5176	5	4
3540N	15.0	357.75	94.50	279.40	7.70	0.1717	2.7654	4	3	4148N	17.9	357.48	31.97	334.59	2.99	0.0917	2.6195	4	4
3541N	14.3	18.56	28.23	308.54	8.58	0.2899	3.1274	3	3	4154N	16.7	13.38	352.85	358.03	6.29	0.0608	2.7790	7	4
3542N	15.2	11.35	118.86	233.25	13.08	0.2240	3.0334	4	3	4155N	18.5	322.48	99.92	310.91	1.55	0.1069	2.2606	5	4
3543N	16.5	347.73	149.79	238.15	11.98	0.1679	2.6735	4	3	4156N	16.8	336.91	124.44	268.66	2.22	0.0779	3.1522	7	4
3544N	16.5	36.42	52.34	269.00	5.75	0.1327	2.4217	5	3	4162N	16.8	212.14	269.33	247.09	2.62	0.0916	2.5661	8	4
3546N	14.0	92.68	260.58	352.66	15.00	0.2512	2.6538	3	4	4164	15.6	359.40	11.66	354.27	22.28	0.2061	3.0428	3	X
3547N	10.9	295.05	94.70	348.46	15.81	0.0842	3.2218	6	1	4165N	19.5	3.04	146.30	210.71	4.88	0.2528	2.1684	3	X
3548N	16.8	41.06	48.47	264.14	5.38	0.1594	2.2830	4	3	4166	15.7	19.13	139.88	204.69	9.24	0.0042	3.0483	8	1
3549N	17.8	0.66	142.83	220.24	11.74	0.3481	2.5403	7	1	4170	17.6	24.96	94.53	236.22	4.87	0.1433	2.4538	6	1
3550N	16.0	17.48	34.44	306.44	4.28	0.1975	2.3078	3	4	4173	15.5	107.66	248.70	356.21	24.40	0.1289	3.0946	4	4
3552N	14.5	296.48	231.13	212.25	18.72	0.0923	2.9926	3	4	4174	16.4	319.80	81.90	344.03	10.06	0.2280	3.2267	7	4
3553N	14.9	201.99	230.44	303.60	6.71	0.1041	2.6542	3	4	4176	18.0	33.14	48.36	265.29	3.66	0.2175	2.4522	7	4
3555N	16.3	334.20	70.41	328.00	5.92	0.0461	2.3194	3	4	4177	16.3	113.49	267.11	335.36	7.12	0.0872	2.4483	6	1
3557N	15.8	285.57	146.50	311.89	4.60	0.1211	2.2750	3	4	4179	15.8	55.45	353.86	301.53	3.79	0.1336	3.1323	6	1
3558N	16.1	39.54	54.17	259.04	4.67	0.1870	2.3418	3	4	4180	16.4	192.58	200.57	331.91	2.15	0.0725	2.3115	12	1
3559N	15.3	27.38	108.98	229.10	8.92	0.0822	2.6775	3	4	4181	15.6	125.61	228.95	352.76	7.96	0.2110	2.6080	8	4
3560N	13.1	348.17	32.58	353.29	14.70	0.0933	3.1921	3	X	4182N	17.8	20.91	349.87	348.00	7.98	0.1079	2.4578	6	4
3562N	17.5	19.89	48.77	291.25	8.14	0.1727	2.2996	4	3	4183	17.8	347.96	102.16	282.29	3.05	0.2550	2.6055	6	1
3563N	15.7	319.91	92.95	341.45	15.53	0.2372	3.1854	4	3	4185	16.0	37.18	22.91	291.05	4.81	0.1696	3.0507	7	4
3564N	16.3	43.00	12.02	298.54	5.70	0.1598	2.4247	6	3	4187	18.4	10.81	139.24	207.06	4.68	0.2103	2.4840	7	4
3566N	16.7	316.29	54.69	12.09	21.79	0.1551	1.8021	4	4	4188	17.4	61.87	285.36	353.17	12.72	0.2147	2.6167	7	4
3567N	16.2	245.40	167.60	319.91	7.09	0.0314	2.2782	4	4	4190	17.0	20.05	111.16	225.17	5.73	0.1598	2.3669	6	1
4031	15.9	314.63	86.65	341.63	5.11	0.1822	2.3693	8	1	4191	17.0	1.86	25.22	336.78	8.19	0.2086	2.9496	4	4
4050	14.8	289.78	239.82	203.51	9.57	0.0659	2.9852	8	1	4192	15.1	35.98	328.00	348.56	13.06	0.1614	3.1600	7	4
4056	17.6	350.02	72.50	308.09	1.18	0.2185	2.4079	10	1	4193	17.2	321.28	89.23	328.47	2.68	0.1793	2.5816	8	1
4057	15.4	288.47	102.52	340.30	5.52	0.0344	2.8539	8	1	4194	16.8	32.66	119.32	194.94	8.45	0.2138	2.9833	8	4
4064	16.5	25.99	2.07	324.89	2.56	0.1943	2.9753	7	1	4195	19.0	344.73	167.71	218.17	1.64	0.2007	2.2088	7	4
4066	17.3	330.66	46.43	359.05	4.33	0.1766	2.2288	12	1	4197	17.2	336.57	132.22	264.84	2.42	0.1689	2.8756	7	4
4070	15.9	247.91	190.43	300.41	3.02	0.1168	2.5590	9	1	4198	19.1	11.47	352.73	349.85	5.81	0.2628	2.2271	8	4
4072	16.0	87.98	17.95	235.59	2.59	0.2247	2.3451	10	1	4203	15.2	57.48	307.59	357.04	17.51	0.0338	3.5361	5	1
4074	16.5	93.89	15.99	238.91	0.60	0.1459	2.4041	11	1	4205	17.0	344.91	48.95	336.11	6.49	0.1564	2.2507	7	4
4092	15.9	110.95	273.78	337.23	5.96	0.0357	3.0959	3	4	4206	15.6	36.64	322.05	350.32	12.21	0.1882	2.3548	7	4

P–L	g	M	ω	Ω	i	e	a	N	Q
4207	16.0	213°.40	165°.23	347°.20	4°.83	0.0199	3.1959	5	4
4208	16.1	123.73	36.92	190.75	12.72	0.1503	2.7685	11	4
4209	16.0	26.72	11.16	318.66	4.62	0.1419	3.1179	7	1
4211	17.6	18.26	140.81	195.90	4.04	0.1857	2.6016	11	4
4213	15.9	68.02	301.20	348.32	8.18	0.0699	2.9816	7	1
4215	17.6	276.66	186.27	272.14	1.78	0.0937	2.2119	6	1
4216	17.2	350.01	22.44	357.35	16.75	0.1787	3.0045	5	4
4219	17.4	15.17	139.07	205.48	6.09	0.1369	2.7808	5	4
4220	17.4	346.56	78.06	306.05	3.95	0.1645	2.6958	7	4
4221	17.4	24.79	350.66	333.17	5.98	0.2527	2.9321	7	4
4223	17.7	33.40	347.29	329.32	2.48	0.1842	2.4555	5	1
4224	16.5	26.83	91.82	227.93	5.97	0.2662	3.1847	7	4
4226N	17.6	18.50	75.16	270.00	1.56	0.0264	2.3689	5	X
4230	17.1	44.16	94.70	199.76	12.26	0.2624	2.6503	6	1
4232	19.1	31.88	356.02	307.59	1.08	0.3199	2.2197	7	4
4233	17.0	335.73	116.99	284.41	1.38	0.2053	2.8282	7	4
4234N	15.1	171.73	204.09	348.03	5.82	0.1631	3.1207	5	4
4238	16.7	307.85	241.37	201.83	12.74	0.2399	2.6667	7	1
4244	17.4	61.54	69.55	213.20	5.45	0.1909	2.4535	7	4
4245	19.4	11.62	359.84	343.58	2.24	0.2555	2.2294	7	4
4246	15.5	268.29	266.58	205.44	4.05	0.1272	3.1958	6	1
4249	17.3	14.28	141.48	199.79	9.46	0.2461	3.0750	7	4
4250	16.1	317.42	81.53	342.41	7.89	0.1665	2.7060	7	4
4252	18.4	51.44	338.24	318.15	3.04	0.1689	2.1053	6	2
4253	16.5	285.87	117.95	355.24	9.10	0.2852	2.7715	7	4
4261	16.7	352.66	166.65	207.90	3.27	0.0961	2.7795	4	4
4262	17.6	3.09	158.06	203.03	3.58	0.1172	2.4616	7	4
4263	16.3	324.31	47.98	2.75	10.53	0.1222	3.0713	6	1
4264	17.4	319.52	70.79	352.72	2.03	0.1985	2.7367	9	4
4265	17.6	332.27	50.36	356.64	1.55	0.2100	2.7206	11	4
4266	17.3	292.58	112.72	333.11	1.38	0.1159	2.5530	5	2
4267	18.4	1.02	8.09	354.80	3.85	0.2307	2.5366	6	4
4268	18.7	22.52	353.66	323.78	3.41	0.3561	2.6893	7	4
4270	16.6	317.14	178.58	238.78	1.96	0.0996	2.7457	7	1
4273	16.6	129.23	342.75	235.61	0.85	0.2561	2.3509	6	4
4274	17.1	199.92	248.64	280.58	2.15	0.0760	2.2988	5	2
4279	17.1	298.52	247.35	203.27	8.31	0.2034	2.6445	7	4
4280N	18.2	5.09	24.35	334.50	1.50	0.1126	2.3453	7	4
4281	17.3	354.72	10.30	3.02	2.92	0.1785	2.9098	13	4
4283	16.6	358.76	169.68	198.75	14.42	0.1590	3.1074	7	X
4285	15.9	328.44	54.68	349.46	9.07	0.0753	2.9879	5	2
4286	16.4	304.81	215.65	229.66	2.01	0.2152	3.2021	7	4
4287N	17.5	317.60	72.92	347.74	0.82	0.1424	2.5967	3	4
4288	17.0	160.92	10.29	190.42	5.69	0.1392	2.2422	7	1
4289	17.5	318.80	62.24	353.39	4.45	0.1042	2.3273	6	1
4292N	13.9	350.50	38.46	339.14	2.83	0.0268	5.1537	5	X
4293N	18.6	332.59	203.05	200.88	1.96	0.1762	2.3099	7	4
4294N	16.3	302.61	91.82	359.89	13.67	0.2492	3.2269	5	4
4297N	16.3	281.62	94.90	355.58	1.18	0.0451	2.9842	8	4
4302	15.2	180.75	311.00	232.86	3.99	0.0751	3.1383	8	1
4303	16.6	308°.03	228°.27	194°.08	22°.10	0.0683	2.8463	6	4
4304	17.4	26.62	76.61	248.20	2.56	0.1941	2.4445	7	1
4305	17.0	341.52	45.65	347.47	6.86	0.2093	3.0733	7	4
4306	17.9	321.42	147.01	268.78	1.35	0.1558	2.5744	7	4
4307	18.0	339.04	46.28	350.32	10.92	0.1998	2.5603	5	4
4308	18.9	349.63	186.20	195.86	5.03	0.2666	2.5829	7	4
4310	16.5	353.93	11.06	1.95	8.89	0.1374	3.0526	10	1
4315	15.8	106.07	46.28	211.33	1.44	0.0254	2.8680	6	1
4316	18.1	328.23	218.83	199.27	5.18	0.2604	2.5336	6	1
4318	17.8	358.46	142.63	225.48	4.24	0.2028	2.6886	5	2
4320	16.5	332.26	38.65	2.51	14.54	0.1166	3.0447	7	1
4321	17.7	47.42	86.57	200.53	7.91	0.2723	2.3749	8	1
4322	13.7	359.54	25.51	341.04	6.30	0.0360	5.1013	7	X
4323	19.1	344.84	82.18	304.62	3.76	0.1969	2.2635	7	4
4324	16.0	151.41	222.66	345.06	11.65	0.1448	2.6591	7	4
4326	18.3	20.94	51.81	277.13	2.51	0.2520	2.6209	6	4
4327	15.8	278.34	271.97	195.24	16.86	0.1769	3.1460	7	4
4328	16.6	193.31	304.57	233.85	1.49	0.2752	2.3270	6	4
4329N	19.0	341.16	63.15	330.76	1.45	0.2125	2.4217	7	4
4330	19.0	10.32	40.33	309.55	2.10	0.1834	2.2315	6	4
4331	19.7	2.95	23.50	334.83	1.89	0.2039	2.2252	7	4
4332	17.1	43.54	70.26	229.98	2.66	0.2350	2.8859	7	4
4333	17.1	312.98	70.48	359.62	14.18	0.1691	2.6784	6	4
4337	20.0	9.98	156.71	187.19	7.41	0.3034	2.3973	6	4
4504N	17.8	15.49	335.24	1.85	9.97	0.2397	3.0874	8	4
4505N	15.6	119.01	28.00	198.21	2.16	0.2076	3.0713	8	4
4507N	18.4	357.99	352.97	14.10	0.88	0.1107	2.2794	6	4
4508N	18.7	330.84	41.43	11.87	3.50	0.2689	2.3610	6	4
4509N	16.4	292.44	278.60	174.14	4.18	0.1813	3.1948	7	4
4510N	17.7	315.77	249.95	173.07	5.04	0.1679	2.5901	8	4
4511N	18.8	330.01	239.91	164.79	5.59	0.1734	2.2601	7	4
4512N	18.5	46.57	129.57	177.98	5.91	0.0938	2.1552	5	X
4513N	18.6	336.73	353.78	40.86	3.34	0.1623	2.2554	7	4
4514N	16.2	246.65	337.30	146.76	2.92	0.0587	2.8498	5	4
4515N	15.1	245.86	325.14	170.49	12.34	0.1800	3.1246	7	4
4516N	18.9	10.48	156.35	190.03	2.13	0.2206	2.3772	5	4
4517	15.1	22.20	322.15	9.55	6.85	0.1760	2.2988	8	1
4518N	18.6	37.04	198.92	119.00	1.90	0.0958	2.2698	7	4
4520N	20.6	346.57	26.08	3.86	5.51	0.3395	2.1866	6	X
4527N	16.3	171.22	128.12	61.52	3.75	0.3225	2.3032	5	4
4531N	18.9	353.11	343.49	30.88	2.87	0.2043	2.4195	5	4
4532N	18.8	11.14	329.14	17.07	6.65	0.2000	2.3271	5	4
4533N	17.4	353.64	197.30	175.23	11.81	0.1704	2.7780	7	4
4534N	13.9	359.55	192.80	173.50	3.33	0.0995	5.2190	6	X
4540N	15.7	178.99	9.80	177.01	17.15	0.0100	3.0694	5	X
4546	17.8	333.67	32.92	9.32	4.28	0.2050	2.3671	6	1
4549N	19.9	14.57	318.74	20.83	4.66	0.2262	2.1533	5	4
4551N	17.1	0.66	230.60	132.18	2.79	0.0619	2.8259	7	4
4554N	18.0	359.02	355.74	9.65	11.18	0.2094	2.7848	6	X
4558N	16.6	323.29	38.95	15.26	3.69	0.1750	3.1240	5	4

TABLE I—*Continued*

P-L	g	M	ω	Ω	i	e	a	N	Q	P-L	g	M	ω	Ω	i	e	a	N	Q
4560N	16.6	192°.16	354°.28	181°.55	16°.04	0.1248	2.4299	6	4	4736	17.0	8°.44	334°.94	15°.16	6°.53	0.1876	3.0151	8	4
4561N	16.1	117.13	77.35	161.02	5.90	0.0732	3.0391	7	4	4737	17.6	323.84	47.05	6.95	11.82	0.1828	2.7542	8	4
4562N	18.0	355.98	7.58	2.27	3.21	0.1583	2.6177	6	X	4738	16.8	29.56	322.44	6.90	2.07	0.0715	2.5839	8	4
4563N	16.2	58.57	282.97	14.40	14.50	0.0914	3.1553	5	4	4739	17.7	353.97	11.44	359.50	5.91	0.1249	2.3539	7	1
4564N	15.6	171.53	15.03	177.10	1.27	0.0644	3.1973	5	X	4740	17.1	24.62	351.21	334.97	1.14	0.2095	3.2095	7	4
4565N	16.1	9.88	348.73	7.96	9.98	0.0079	3.1288	8	X	4741	17.4	351.23	21.68	352.27	2.20	0.0968	2.3643	6	1
4566N	17.9	330.41	281.62	135.56	2.00	0.3052	3.0098	7	4	4743N	15.7	263.30	307.20	172.83	0.16	0.1773	3.1919	8	4
4622	16.5	36.40	132.48	178.85	13.59	0.1848	2.5923	7	1	4744N	19.0	337.69	35.42	356.53	1.36	0.1333	2.1379	7	4
4627	17.8	359.45	325.23	39.16	2.02	0.1974	2.3809	7	1	4745	17.5	40.47	307.01	5.28	3.31	0.1245	2.4058	8	4
4632	16.1	152.14	14.43	190.61	5.32	0.1151	2.3190	6	4	4746	15.8	180.50	178.82	4.91	15.77	0.2278	2.6087	8	X
4644	16.0	249.67	286.99	186.95	4.97	0.0045	2.7428	8	1	4747	18.4	339.38	19.49	9.40	5.16	0.1205	2.1697	8	4
4653	14.9	102.40	251.75	1.18	21.46	0.0722	3.2346	10	1	4748	16.7	60.57	123.26	166.28	4.96	0.1208	2.5998	7	4
4660	17.1	28.55	311.97	9.05	5.75	0.1790	2.4555	10	1	4749	16.9	274.89	33.45	68.36	1.36	0.1182	2.5473	8	4
4681	15.3	166.83	197.97	357.13	10.22	0.0442	3.0033	8	1	4750	15.4	279.91	293.39	187.05	1.05	0.3210	2.8279	7	4
4689	18.7	2.83	166.47	191.21	3.18	0.1939	2.4670	11	4	4752	16.8	45.96	317.59	350.78	2.99	0.1074	2.8237	8	4
4690	17.3	26.39	312.56	8.80	10.67	0.2101	2.9187	10	4	4754	17.9	356.13	240.60	127.44	1.92	0.1471	2.6709	7	4
4694	16.1	341.64	23.83	0.66	18.39	0.0807	2.7299	8	4	4755	17.4	339.12	211.95	180.14	11.13	0.1624	2.5497	8	4
4695	16.6	173.21	185.03	3.54	6.33	0.0429	2.3330	7	1	4756	16.6	104.51	62.11	176.05	5.79	0.2045	2.3611	5	1
4696	17.9	27.44	154.53	176.74	2.06	0.0572	2.1445	6	4	4757	15.5	181.65	3.11	179.49	7.57	0.0631	3.0886	6	4
4697	18.2	334.75	29.54	10.88	6.42	0.2144	2.5385	10	4	4758	15.9	312.42	56.06	9.68	5.01	0.1502	3.0906	7	1
4699	18.3	31.36	131.84	187.45	3.35	0.1610	2.3199	13	4	4759N	18.7	14.15	125.34	211.51	0.34	0.2869	2.6994	6	4
4700	15.1	145.43	218.36	346.85	3.24	0.2450	2.5782	16	4	4760N	16.6	100.06	57.70	175.65	13.56	0.2978	2.4400	6	4
4701	17.3	108.42	215.29	31.25	3.46	0.0635	2.3406	8	4	4761	18.4	307.16	60.15	4.57	18.00	0.0931	1.8852	3	4
4702	18.7	25.02	241.82	72.29	0.90	0.3111	2.4958	8	4	4762	16.3	4.37	188.61	169.47	9.61	0.0915	3.0962	8	2
4703	16.4	42.91	295.28	9.64	3.62	0.1616	3.0431	13	4	4763	17.1	4.80	185.72	170.62	8.17	0.1668	2.9220	7	4
4704	16.6	318.96	67.14	341.92	3.70	0.0603	2.7032	12	4	4767	19.0	315.02	232.49	202.80	1.40	0.2655	2.1945	8	4
4705N	16.5	10.34	167.21	184.20	11.60	0.0474	2.9414	7	X	4768	17.8	1.58	182.57	178.14	3.80	0.2414	2.8405	8	4
4706	17.6	180.75	170.15	11.26	5.53	0.0346	2.2269	8	4	4769	17.8	330.49	221.83	182.08	10.28	0.1595	2.5956	6	4
4707	18.2	311.52	283.72	151.71	2.11	0.2420	2.4800	8	4	4770	15.8	87.41	246.62	18.39	9.35	0.0960	3.0818	8	2
4708	17.4	59.65	281.58	11.97	4.34	0.0871	2.4340	9	2	4771	17.5	12.46	190.41	156.31	2.81	0.1403	2.7530	8	4
4709	19.2	2.69	185.58	170.44	5.75	0.3059	2.5655	9	4	4773	18.0	3.75	125.13	233.63	0.80	0.1613	2.6736	8	4
4710	15.6	339.43	15.98	18.83	5.62	0.2217	3.9750	8	4	4774	15.6	217.04	318.15	195.28	2.47	0.0895	2.8599	4	4
4712	17.1	218.31	323.91	187.39	1.62	0.1039	2.3589	12	4	4775	16.4	247.52	125.68	2.97	6.02	0.1150	2.8092	8	4
4713	17.1	1.01	145.27	215.62	0.82	0.2607	3.0537	14	4	4777	17.5	15.97	186.55	151.90	4.19	0.2050	2.7547	7	4
4715	16.8	104.22	95.80	148.44	2.92	0.1300	2.3938	9	2	4779	18.3	3.32	353.42	5.23	1.79	0.1900	2.5637	8	4
4717	17.8	6.34	348.96	3.29	4.42	0.2282	2.8970	10	4	4782	15.9	177.78	356.42	189.88	6.83	0.3254	2.3426	8	X
4718	17.5	34.88	307.92	6.97	3.64	0.1653	2.6357	9	4	4783	15.7	176.10	350.31	197.18	1.86	0.2245	2.4536	8	X
4719	18.8	343.56	224.96	162.44	1.09	0.2078	2.3369	9	4	4785	15.7	271.66	310.34	172.11	1.93	0.2653	3.1534	8	4
4720	17.7	335.48	21.38	9.00	16.39	0.0773	2.5395	5	4	4786	18.2	4.07	215.22	142.29	1.72	0.1574	2.4691	8	4
4721	16.3	204.77	148.46	10.91	2.40	0.0230	2.7483	9	2	4787	17.5	305.33	60.70	15.51	6.67	0.1733	2.4598	8	4
4723	17.0	325.66	223.75	184.78	10.35	0.1475	2.7299	9	4	4788	17.9	28.81	95.54	178.47	10.96	0.5587	2.6117	5	1
4724	16.8	2.68	354.45	4.53	9.66	0.1777	2.9169	9	4	4789	18.2	44.48	264.20	23.46	1.23	0.3011	2.3060	8	4
4725	18.5	348.26	25.95	358.51	4.63	0.2849	2.7198	8	4	4790	17.2	350.69	19.01	356.02	2.23	0.0561	2.7260	8	4
4726	17.5	14.62	131.90	207.41	1.46	0.2216	2.3683	8	1	4791	18.5	20.94	323.91	7.42	1.19	0.2093	2.3738	8	4
4727	15.6	78.12	90.67	190.65	8.29	0.0386	3.1902	9	2	4793	16.9	131.09	134.38	88.41	1.80	0.1269	2.3529	7	4
4728	16.6	1.37	173.33	187.94	5.69	0.1914	3.1925	6	1	4794	15.4	270.10	107.35	15.08	11.71	0.2603	3.1308	7	4
4729	17.4	61.42	123.48	158.17	3.10	0.1756	2.3771	8	4	4795	17.8	315.89	269.76	168.13	7.64	0.2958	2.7022	7	4
4730	16.7	41.87	287.08	26.28	4.77	0.0859	2.6635	6	1	4797	16.7	47.99	120.65	184.03	8.56	0.1256	2.7624	5	2
4732	17.0	61.12	275.51	5.62	11.00	0.1883	2.5260	8	4	4798	17.6	52.74	280.30	12.63	3.02	0.1764	2.3181	5	1
4733	17.8	28.77	156.71	168.23	5.48	0.1340	2.3513	7	4	4799N	16.8	323.54	40.99	8.87	14.63	0.1221	2.6872	10	1

P-L	g	M	ω	Ω	i	e	a	N	Q
4800	17.6	34°.81	155°.89	155°.29	2°.45	0.2122	2.4013	7	1
4802	16.0	18.19	331.19	10.27	19.78	0.1056	3.2422	5	4
4803	18.7	359.06	342.17	22.63	1.42	0.1963	2.3263	8	4
4805N	16.6	136.77	196.64	21.04	2.29	0.1497	2.3889	8	4
4806	16.6	270.98	301.41	157.05	2.26	0.0436	2.6053	7	4
4807N	18.1	354.35	224.45	146.71	1.66	0.1268	2.4811	8	4
4808N	17.8	4.57	207.54	150.79	3.24	0.0701	2.3599	7	4
4810	15.7	278.25	96.48	5.55	12.09	0.1296	3.0954	7	1
4811	18.7	338.94	15.26	18.33	1.86	0.1772	2.1631	8	4
4814	16.4	330.29	267.63	131.50	2.87	0.0834	2.9484	6	1
4816	19.2	6.38	209.93	142.68	1.22	0.2301	2.2455	8	4
4817	16.9	310.71	241.32	182.00	7.20	0.1015	2.4204	6	1
4819	15.7	54.77	123.56	169.96	9.16	0.1589	3.4759	7	4
4821	17.1	340.82	248.90	139.26	3.27	0.1172	2.6560	8	2
4823	15.8	165.69	42.73	154.61	1.47	0.0966	2.9996	6	4
4824	16.0	204.29	345.43	179.17	3.21	0.0801	2.7326	8	4
4826	16.2	35.97	121.56	202.31	1.40	0.0777	2.9515	11	1
4827	18.2	13.25	104.06	235.42	0.25	0.2889	2.7225	7	4
4828	18.0	5.96	347.35	6.84	3.89	0.2538	2.9076	6	4
4829	16.6	61.50	277.68	6.79	8.88	0.1742	2.7267	6	1
4830	16.9	28.84	320.06	15.25	3.50	0.0130	2.5372	7	X
4832	19.2	16.31	169.11	165.77	4.70	0.2528	2.1666	7	4
4834N	19.4	0.68	348.12	13.40	5.77	0.3335	2.5409	5	X
4835	17.5	1.98	204.15	157.45	2.57	0.1761	2.8904	6	4
4837N	14.8	178.92	178.35	8.68	0.37	0.1204	3.2193	8	X
4839	17.0	50.97	126.68	165.56	2.18	0.2041	2.3466	8	1
4840N	16.2	52.76	233.74	69.05	2.39	0.0936	3.0445	6	4
4842	15.8	177.89	11.19	175.86	1.97	0.3036	2.3037	6	X
4843	17.3	305.34	38.69	35.77	2.92	0.1478	2.5804	7	4
4844	17.0	153.24	57.05	149.74	3.26	0.0975	2.2365	5	4
4847	18.4	359.83	350.07	14.04	6.93	0.2418	2.5867	7	4
4848	16.8	92.89	83.10	173.05	2.68	0.1438	2.3823	6	1
4849	17.2	310.62	60.78	2.17	0.96	0.0893	2.4234	8	2
4850	16.8	321.46	231.14	185.92	13.30	0.1600	2.5938	6	1
4851	15.4	90.26	248.09	13.58	9.03	0.1201	3.0129	6	1
4852	17.9	340.74	240.37	159.19	5.06	0.2911	2.8575	7	4
4854	17.5	330.89	255.08	147.96	3.99	0.1463	2.6134	7	4
4855	16.9	59.96	253.44	14.47	16.95	0.3129	2.4914	6	4
4856	15.6	35.53	297.64	22.15	8.11	0.1270	3.1214	8	1
4857	17.9	59.84	241.41	38.91	3.09	0.2189	2.3610	7	4
4860N	17.0	38.88	166.02	132.54	1.53	0.2911	3.0998	7	4
4862	16.3	247.16	329.00	165.76	5.82	0.1708	2.5490	7	4
4864	17.4	54.59	123.12	175.27	5.26	0.1194	2.3888	3	4
4866N	16.9	12.02	334.80	15.30	10.37	0.1055	2.7275	7	4
4868N	15.9	286.01	84.60	20.84	1.97	0.2170	3.0618	6	4
4877	17.0	52.32	287.92	16.27	8.92	0.0893	2.4573	4	2
4879N	16.3	358.73	309.18	57.35	3.26	0.0364	2.5941	3	X
4881	18.2	17.40	190.54	146.42	3.18	0.2162	2.5007	7	4
4883	17.9	315.59	216.41	211.37	2.37	0.2119	2.5951	13	4
4884	15.8	14.88	157.84	189.03	8.36	0.0431	2.9919	14	4
4886	17.3	311°.41	244°.00	177°.41	8°.20	0.1025	2.5205	7	4
4887N	18.4	338.12	204.07	202.03	1.93	0.3126	2.7591	3	4
4888N	18.2	16.20	151.07	186.94	2.92	0.2250	2.5961	6	4
4889	17.3	322.60	244.70	184.14	16.63	0.2879	3.0897	6	4
4890	17.8	332.47	48.87	3.82	3.85	0.2774	2.8603	8	4
4891	15.8	169.13	15.80	177.73	5.52	0.1370	2.7064	6	4
4892	15.6	125.32	60.34	171.52	12.60	0.0851	2.9922	7	4
4893	15.6	285.40	57.56	25.50	2.26	0.0287	2.8792	6	1
4898	16.4	310.42	42.41	15.53	8.98	0.0694	2.9928	7	4
4899	18.1	11.74	171.12	174.95	2.91	0.2047	2.5835	8	4
4901	18.6	343.33	239.06	151.90	2.15	0.2643	2.7162	8	4
4902	16.7	191.74	158.69	16.73	4.71	0.2535	2.2655	7	4
4903	15.4	164.89	177.12	14.31	8.37	0.3152	2.6686	8	4
4904N	17.6	69.24	106.79	164.71	5.78	0.1913	2.4469	3	4
4905	17.6	267.45	115.76	352.34	1.99	0.1058	2.4013	8	4
4906	19.2	13.02	155.59	187.62	1.01	0.2075	2.3086	7	4
4907	17.6	15.74	334.33	4.73	12.38	0.2256	2.9877	6	4
4908	16.2	168.52	31.75	162.52	6.04	0.0944	2.8375	6	4
4909	18.2	338.22	358.46	34.40	2.11	0.1761	2.4736	7	4
4910	17.2	63.92	268.96	6.26	6.14	0.2148	2.4515	6	4
4911	18.0	20.59	144.82	186.49	3.52	0.2284	2.5635	6	4
4917	16.3	152.42	186.64	19.30	2.21	0.0708	2.5128	7	1
4918	16.5	79.29	93.54	174.72	13.38	0.1258	2.6410	6	1
5008	17.0	289.61	83.86	358.84	7.33	0.0254	2.3707	11	1
5012	14.5	173.91	343.45	212.73	13.55	0.1215	3.0911	3	X
5017	14.7	354.89	167.90	208.97	16.14	0.0357	3.1812	3	X
5019	18.0	350.61	13.29	8.50	2.37	0.1899	2.2952	3	X
5020	16.7	334.75	173.32	228.38	6.13	0.1367	2.3758	4	3
5021	16.0	49.11	88.99	210.85	9.74	0.1745	2.3535	6	3
5023	17.0	59.18	74.93	220.18	6.58	0.1218	2.3564	5	1
5025N	16.9	346.53	149.93	355.91	6.20	0.8954	4.2006	3	4
5031	17.9	4.11	143.72	217.65	3.60	0.1711	2.3104	5	1
5033	17.8	350.03	9.91	11.87	4.22	0.1544	2.1996	3	X
5034	16.8	323.56	214.23	210.94	10.66	0.2551	2.5897	6	1
5036N	17.1	0.34	103.37	262.97	3.78	0.2480	2.5545	5	1
5037N	18.0	355.92	160.21	212.20	12.31	0.2696	2.5815	3	3
5038N	18.0	349.57	13.88	10.49	10.89	0.2253	2.2635	3	4
5039N	17.9	11.55	337.56	14.84	6.02	0.1493	2.3515	3	4
5040N	16.4	334.61	206.02	206.86	21.15	0.2807	3.1504	3	4
5041N	16.5	19.14	123.57	224.89	8.49	0.0397	2.3720	3	4
5557	15.1	154.37	217.75	349.37	1.19	0.1510	3.1107	7	1
5560	14.9	354.51	284.18	88.35	2.90	0.0600	3.1987	3	X
5585	16.6	346.55	4.36	20.16	1.69	0.0468	2.9141	5	1
6004N	16.3	201.09	242.45	278.38	0.60	0.0617	2.6506	5	4
6005N	17.3	322.16	63.53	344.06	1.33	0.1203	2.6541	7	4
6006N	19.0	348.76	173.24	203.58	5.48	0.1771	2.1907	7	4
6007N	15.5	217.00	313.65	206.28	7.11	0.2467	2.7786	8	4
6008N	17.7	27.18	123.46	201.66	8.78	0.1604	2.6138	7	4
6009N	17.1	258.85	218.64	257.49	2.56	0.1375	2.5089	7	4
6010N	18.8	31.77	337.07	335.77	3.88	0.2062	2.3524	8	4

TABLE I—*Continued*

P–L	g	M	ω	Ω	i	e	a	N	Q	P–L	g	M	ω	Ω	i	e	a	N	Q
6011N	19.1	18°.35	88°.71	241°.76	2°.88	0.2458	2.3787	6	4	6227	17.8	11°.26	36°.66	304°.05	3°.01	0.2737	2.7020	8	4
6012N	15.4	242.51	264.26	238.43	3.90	0.2617	3.0819	6	4	6228	18.2	350.33	181.96	191.90	7.48	0.1569	2.3146	8	4
6013N	19.5	341.83	194.40	193.67	5.84	0.1861	2.2623	6	4	6230	16.9	50.63	12.41	279.69	3.09	0.1843	2.3419	8	4
6014N	16.8	184.84	348.60	191.01	8.05	0.1908	2.4267	6	4	6231	17.5	337.19	83.46	320.70	4.83	0.3006	3.0550	8	4
6015N	18.4	330.33	201.86	208.72	4.62	0.2604	2.6157	6	4	6233	18.4	338.44	50.90	341.19	6.08	0.1771	2.1924	7	4
6017N	18.6	9.83	356.44	350.70	10.47	0.1844	2.4335	7	4	6234N	16.5	251.21	161.18	336.10	2.49	0.2966	2.4045	8	X
6018N	17.8	346.65	174.30	206.84	6.30	0.1837	2.8264	8	4	6235	18.1	320.15	173.26	240.40	2.72	0.1490	2.5219	8	4
6019N	20.4	356.46	40.71	325.72	0.55	0.2344	2.2087	6	X	6236N	15.9	290.58	90.35	348.84	15.12	0.0752	3.1267	8	4
6021N	17.4	113.61	234.67	358.96	20.15	0.1465	2.1599	8	X	6237	15.2	195.42	331.01	201.15	8.38	0.3126	2.6516	8	4
6022N	16.2	349.20	193.04	181.63	0.52	0.0822	3.2417	6	4	6238	17.4	253.48	274.61	200.96	6.73	0.0779	2.3097	7	4
6023N	18.4	2.46	149.49	208.44	4.17	0.1598	2.4944	7	4	6239N	16.3	77.29	17.60	238.09	1.48	0.2375	3.0916	8	4
6024N	15.0	211.16	303.07	220.14	4.32	0.2289	3.1231	6	4	6240N	16.6	338.07	134.03	270.18	0.74	0.3338	3.9287	8	X
6025N	18.9	339.89	43.80	340.30	4.58	0.0898	2.1744	8	X	6241	17.2	345.67	184.72	199.73	10.32	0.2302	3.0909	7	4
6026N	17.2	59.11	93.68	195.65	8.96	0.1227	2.7428	6	4	6243	16.5	186.39	215.74	319.99	2.84	0.0751	2.3525	6	1
6027N	17.8	64.45	266.43	12.01	1.74	0.1700	2.3059	8	4	6244	18.8	14.91	332.52	356.54	7.25	0.3389	2.2099	8	X
6035	15.1	44.66	297.93	359.49	11.30	0.1944	2.6507	6	1	6246	14.4	281.69	130.42	313.43	4.35	0.0324	3.1833	4	4
6053	15.6	47.51	80.86	211.79	3.31	0.1998	2.6065	9	1	6248	16.2	84.13	257.02	354.98	5.55	0.2166	2.8081	8	4
6112	17.5	15.48	48.72	284.83	1.20	0.2456	2.5476	3	4	6249	17.1	50.87	119.68	185.32	5.05	0.0512	2.3127	8	4
6129	18.7	347.05	183.65	196.74	0.58	0.1830	2.2050	6	X	6251	17.6	28.61	326.44	344.50	2.81	0.2781	2.8796	8	4
6133	16.8	353.26	125.72	246.04	2.77	0.2159	2.3794	11	1	6252	17.5	35.63	332.79	338.93	3.00	0.1709	2.5705	8	4
6182N	16.5	179.33	282.61	257.64	1.92	0.1341	2.3819	3	X	6253	16.2	116.74	32.24	192.77	8.34	0.2175	2.7327	8	4
6183N	18.7	330.81	216.96	193.87	3.69	0.2829	2.2284	3	4	6254	16.7	89.76	346.09	285.15	3.56	0.0100	2.7451	6	4
6185N	18.1	344.78	35.52	352.56	6.17	0.2916	2.9307	8	4	6256	16.1	89.04	253.36	358.17	13.88	0.1834	2.8598	8	4
6187	17.2	68.67	70.17	198.40	7.24	0.1989	2.3645	8	4	6257	17.4	308.06	108.39	330.26	3.28	0.2362	2.7094	8	4
6191	16.4	25.62	99.11	224.48	4.54	0.1800	3.1421	6	1	6259	17.9	25.32	83.15	238.50	3.38	0.2287	2.6694	8	4
6192	16.5	359.38	171.86	188.47	6.06	0.1375	2.9573	8	4	6261	15.7	99.04	241.13	348.06	2.76	0.3281	2.7711	8	4
6194	18.3	40.68	342.11	321.34	4.10	0.1856	2.3079	8	4	6262	18.3	2.63	156.70	200.57	5.42	0.1545	2.3778	8	4
6195	17.6	3.92	0.62	353.65	12.48	0.2042	2.6207	8	4	6263N	18.6	22.22	130.69	199.94	3.68	0.1523	2.2887	8	4
6197	16.2	305.66	76.10	341.02	2.12	0.0322	2.7653	8	4	6264	17.3	33.90	311.33	356.75	2.37	0.2300	2.6698	7	4
6198	15.5	352.92	18.34	355.97	9.88	0.3147	2.5282	8	4	6265N	15.9	143.90	205.05	356.66	11.69	0.3196	2.4047	7	4
6201	19.2	358.46	117.45	245.26	2.26	0.1866	2.1563	8	4	6266	17.2	9.50	13.65	333.00	1.60	0.1975	2.5219	8	4
6203	17.2	95.48	345.56	265.57	3.58	0.1312	2.2790	8	4	6267	15.8	205.96	169.62	355.22	6.20	0.2384	2.6063	8	4
6204	17.4	347.66	181.89	195.58	10.34	0.1574	2.6455	7	4	6268	17.9	357.89	175.99	188.08	1.18	0.2067	2.7377	8	4
6205	18.9	335.85	197.94	197.10	2.07	0.1870	2.2100	8	4	6269	15.6	118.42	39.67	193.60	6.44	0.1050	3.1329	8	4
6206	17.0	308.24	90.34	351.54	8.38	0.2782	2.7938	8	X	6270N	17.7	346.39	197.71	185.09	10.97	0.2228	2.8529	8	4
6208	17.5	43.64	318.35	349.24	14.11	0.1172	2.4300	8	4	6271	15.1	146.72	236.80	326.54	1.26	0.2279	3.2316	6	X
6209	17.1	191.23	298.53	234.14	4.07	0.1500	2.2948	8	4	6272	15.9	275.15	124.96	333.11	5.22	0.0944	3.1898	8	4
6211	17.9	337.60	179.32	215.56	4.51	0.2075	2.7194	8	4	6273	18.1	350.07	45.57	333.00	4.58	0.2452	3.0369	8	4
6212	17.5	34.58	322.26	350.06	10.79	0.1797	2.5861	8	4	6274	15.9	103.47	33.17	205.10	4.22	0.1948	2.5656	7	1
6213	17.4	296.31	211.19	231.19	2.46	0.1623	2.3548	8	4	6275	15.2	201.53	183.56	342.44	1.83	0.1720	2.8660	8	4
6215	18.8	326.56	66.99	340.54	6.26	0.1709	2.1861	8	4	6277	15.9	263.43	261.66	215.51	5.78	0.1656	3.1218	8	4
6216N	17.3	70.82	305.31	335.90	6.48	0.0838	2.3263	7	4	6279	17.3	312.87	65.78	352.58	7.33	0.1029	2.3087	6	1
6218	16.9	341.27	53.60	339.57	8.52	0.2510	3.0494	4	4	6281	18.1	308.86	67.25	2.91	0.40	0.1761	2.3970	8	4
6219	18.3	10.81	64.36	278.16	1.26	0.2362	2.3318	10	1	6283N	17.7	3.97	10.81	345.07	3.15	0.1732	2.6499	8	4
6220	17.2	307.96	115.44	324.98	2.09	0.2582	2.7350	8	4	6284	16.4	83.93	57.58	183.73	6.56	0.3272	2.7620	8	4
6221N	17.1	359.47	11.13	349.87	4.61	0.0456	2.4091	8	X	6287	15.2	261.14	127.59	354.28	16.93	0.1854	3.2225	8	4
6222	18.2	19.05	102.24	230.86	1.46	0.1757	2.3447	8	4	6288	17.5	342.11	118.89	268.74	2.55	0.1681	2.7381	8	4
6223	17.6	273.91	145.81	303.49	1.82	0.0221	2.1715	6	4	6290	17.4	112.30	28.74	204.58	4.02	0.1707	2.2022	8	4
6225	18.9	356.54	110.85	255.49	1.65	0.2363	2.4406	8	4	6291	18.2	43.15	9.17	287.26	1.04	0.2296	2.4365	8	4
6226	16.7	323.69	63.69	354.44	20.65	0.2318	3.1921	7	4	6292	15.6	209.71	163.06	0.54	18.08	0.2537	2.5338	8	4

P–L	g	M	ω	Ω	i	e	a	N	Q	P–L	g	M	ω	Ω	i	e	a	N	Q
6293	15.3	128°.00	327°.16	249°.11	0°.96	0.2369	2.5285	8	4	6356N	16.2	201°.44	153°.06	10°.51	3°.03	0.0765	2.8062	8	4
6294	17.6	287.41	242.83	203.00	2.56	0.1010	2.3965	6	4	6358	17.6	343.98	174.81	210.31	4.22	0.1888	2.7686	8	4
6295	18.0	347.13	38.82	345.13	5.84	0.2461	2.9974	7	4	6359	16.6	352.17	14.81	357.72	9.78	0.1303	3.2278	6	4
6296	16.0	292.53	120.51	333.94	7.18	0.2108	3.3427	6	4	6360	16.9	206.42	266.20	254.04	3.25	0.1108	2.2690	6	4
6297N	15.9	179.81	181.22	0.69	26.49	0.1361	2.7360	8	4	6361	16.5	22.15	108.09	226.84	4.71	0.1085	3.1767	5	4
6298N	19.3	330.39	237.86	179.35	0.60	0.3246	2.2877	3	X	6362	18.1	35.04	105.47	211.21	5.76	0.1270	2.2391	8	4
6300	17.8	294.43	114.27	329.01	1.24	0.1428	2.3534	8	4	6363	18.4	28.51	322.56	351.99	2.64	0.2409	2.6270	8	4
6301	19.2	320.09	60.28	354.87	1.46	0.1614	2.1795	8	4	6365	19.2	359.51	14.54	346.77	6.47	0.2187	2.3223	8	4
6302	16.7	257.17	128.00	358.55	2.17	0.2132	2.5872	8	X	6366	16.6	80.85	254.79	352.80	9.12	0.2815	2.8629	7	4
6304	18.5	3.23	354.72	2.52	2.59	0.1173	2.2661	8	X	6367	17.8	335.07	43.49	349.82	9.26	0.1276	2.6317	8	4
6306	16.7	301.50	190.30	248.14	2.99	0.1589	2.7084	3	4	6368	18.2	328.17	69.78	330.80	4.03	0.1046	2.3664	7	4
6307	16.6	327.23	59.53	354.50	10.19	0.2339	2.9741	8	4	6369	16.7	55.48	344.00	313.94	3.41	0.0880	3.0452	6	4
6310N	18.3	273.68	95.22	1.86	18.72	0.0778	1.9335	8	X	6370N	17.4	54.14	97.99	199.68	10.30	0.1033	2.5952	7	4
6311	17.5	266.31	121.28	342.24	6.86	0.0600	2.2477	7	4	6371	17.0	127.52	224.42	355.25	6.52	0.1835	2.2754	7	X
6313	17.8	344.74	80.48	303.91	1.87	0.1783	2.6391	8	4	6373	19.3	348.61	43.65	336.26	3.42	0.2145	2.2694	8	4
6314	18.3	327.34	54.32	357.19	2.02	0.2192	2.3743	8	4	6374	19.6	0.61	108.30	251.91	0.03	0.2649	2.4426	7	4
6315	17.4	10.52	347.08	0.12	4.16	0.1592	2.9649	8	4	6375	13.9	28.31	97.05	231.73	2.19	0.1111	5.2571	5	X
6316	17.8	5.49	4.11	349.37	1.73	0.1895	2.4601	10	1	6376N	16.0	158.61	199.50	354.24	6.19	0.2684	2.6635	8	4
6317	16.3	344.58	133.25	246.95	1.02	0.0747	2.8634	9	2	6377	18.0	332.28	159.72	238.34	3.63	0.1339	2.5192	7	4
6318	17.6	315.36	77.27	348.02	8.27	0.1865	2.6411	8	4	6378N	18.7	57.08	90.23	181.08	14.39	0.2910	1.9085	8	X
6321	17.6	311.36	241.92	178.90	0.96	0.1106	2.3851	6	4	6379N	19.8	21.91	56.48	270.28	1.13	0.2353	2.1609	6	X
6322	18.0	322.27	58.65	354.48	3.96	0.1620	2.3131	8	4	6380	17.7	306.03	104.45	329.66	3.53	0.1749	2.6779	6	4
6323	16.7	7.59	359.53	353.01	4.86	0.1246	2.7380	7	1	6381	16.1	299.09	243.84	182.13	10.15	0.0538	2.5612	7	1
6324	19.2	7.75	76.43	273.10	1.83	0.2299	2.2719	8	4	6385N	15.4	205.35	344.78	181.08	7.91	0.3015	2.5921	8	4
6325	18.7	8.56	32.41	315.90	1.11	0.2174	2.4378	7	4	6386N	16.5	179.22	8.78	172.48	1.18	0.1242	2.4009	3	X
6326N	15.2	289.70	208.89	236.70	1.14	0.1129	3.1448	11	1	6387N	17.7	331.83	226.99	178.08	3.29	0.2279	2.4540	8	4
6327	18.0	357.66	106.57	259.31	0.45	0.2443	2.8199	8	4	6388	17.6	23.28	135.68	183.02	7.74	0.2677	3.0509	6	4
6329	15.2	219.26	311.23	200.89	8.50	0.1256	3.1167	8	4	6389N	15.7	147.95	201.05	3.12	3.35	0.1666	2.8337	6	4
6330	18.2	336.92	49.66	344.57	7.46	0.1477	2.5368	8	4	6504N	16.8	261.50	88.35	26.52	3.65	0.1558	2.4416	6	4
6331	19.4	1.79	3.38	355.28	8.43	0.2883	2.3899	6	4	6505N	16.4	197.36	356.13	170.51	7.57	0.0797	2.7698	8	4
6332N	16.2	171.09	347.64	200.74	4.23	0.2704	2.3438	8	4	6506N	16.4	76.20	85.16	161.39	10.98	0.3130	2.9674	8	4
6333	17.5	312.87	195.82	233.97	3.12	0.1972	2.5696	8	4	6507N	17.2	342.58	219.29	167.34	9.72	0.1822	2.9837	6	4
6334	18.9	30.49	56.05	261.80	0.73	0.1901	2.2202	7	4	6508N	19.1	25.96	299.26	29.05	6.12	0.1072	2.2216	6	4
6336	17.7	358.56	169.29	194.60	1.01	0.0278	2.3671	5	X	6509N	17.1	47.65	117.26	170.79	1.07	0.2401	3.0217	6	X
6337	17.1	5.77	163.74	191.85	1.77	0.0871	2.8237	8	4	6510N	17.8	349.30	12.54	2.40	13.86	0.1582	2.8235	6	4
6338	17.6	344.81	191.05	186.63	5.46	0.0035	2.3314	8	4	6516	17.2	351.29	1.40	12.88	6.46	0.2429	2.2244	8	1
6339N	17.0	298.56	102.14	349.66	4.26	0.2421	2.9019	8	X	6517N	17.3	359.58	356.71	4.70	10.84	0.1459	3.0819	5	4
6340	17.6	346.07	53.76	328.37	3.62	0.1484	2.6398	8	4	6565	14.4	322.93	303.93	98.79	3.06	0.0742	2.8744	6	1
6341	18.2	17.50	144.72	188.10	4.32	0.2466	2.6651	8	4	6606	16.1	226.59	108.24	28.66	6.67	0.0431	2.3278	8	1
6342	16.6	56.44	291.06	355.95	15.99	0.1917	2.9100	8	4	6613	17.3	8.07	295.67	49.62	1.92	0.2202	2.4090	8	1
6344	22.6	348.99	232.62	184.27	4.65	0.6411	2.6186	4	4	6638	16.8	35.32	265.41	40.72	3.78	0.2048	2.6682	6	1
6345	17.8	336.92	193.80	198.59	7.72	0.1351	2.6377	7	4	6651	18.0	33.90	288.04	26.58	2.29	0.1521	2.3630	8	4
6347N	20.1	345.54	194.66	191.52	0.74	0.2620	2.2033	6	4	6672	17.1	14.38	176.49	159.98	7.30	0.1904	2.6999	8	4
6348	17.5	343.06	25.81	3.08	3.76	0.2321	3.0982	8	4	6674	16.8	34.27	152.89	148.78	4.83	0.2591	2.8208	8	4
6349	17.3	319.20	175.73	239.57	2.78	0.1366	2.7687	5	4	6675	17.3	311.49	64.41	10.66	5.33	0.2668	2.5366	8	1
6350	17.1	287.07	246.63	216.13	4.50	0.2338	2.5962	7	4	6679	16.1	155.37	197.71	356.37	7.52	0.2570	2.3929	8	4
6351	17.6	344.10	180.96	203.53	3.18	0.1643	2.7221	8	4	6681	16.8	154.76	196.37	2.94	8.19	0.1023	2.3393	7	4
6352	18.0	5.83	155.56	196.97	0.78	0.2154	2.6250	8	4	6682	15.8	63.13	80.85	179.86	4.72	0.3019	3.0984	8	4
6353	16.6	260.92	104.46	6.42	2.23	0.0909	2.8793	6	4	6684	18.1	60.21	266.53	11.13	3.63	0.1899	2.2806	8	4
6355	19.1	339.15	122.99	272.05	1.04	0.2223	2.2814	6	4	6685	16.1	106.27	83.97	161.99	2.72	0.0580	2.8953	8	4

TABLE I—*Continued*

P–L	g	M	ω	Ω	i	e	a	N	Q	P–L	g	M	ω	Ω	i	e	a	N	Q
6687	18.7	30°.94	149°.80	156°.51	4°.72	0.2648	2.3286	6	4	6753	16.7	305°.95	4°.73	55°.45	2°.92	0.0675	2.7222	8	4
6689N	19.9	339.68	222.07	177.46	0.58	0.3232	2.2216	6	X	6756	19.3	4.46	181.87	170.75	2.16	0.2435	2.2680	8	4
6690	17.1	38.31	167.92	124.12	1.66	0.2956	2.9049	8	4	6757	19.0	8.29	171.28	174.48	8.47	0.2478	2.2170	7	X
6691	16.1	209.88	138.35	15.06	6.18	0.0959	2.3908	6	1	6758	17.9	338.56	233.34	160.54	5.41	0.2266	2.3296	8	4
6692	17.9	31.48	279.98	40.82	3.42	0.0904	2.2616	4	4	6760	18.3	3.55	194.41	159.88	3.27	0.2249	2.5202	8	4
6694	16.2	187.65	359.35	175.12	7.41	0.2700	2.2690	8	4	6762	17.4	59.75	249.43	31.93	4.47	0.1712	2.4179	7	4
6696	18.4	352.35	226.12	144.71	3.08	0.2206	2.3851	8	4	6764	15.4	178.86	19.66	162.04	2.82	0.0282	3.0160	8	X
6697	17.0	303.14	23.26	48.90	3.83	0.1637	2.7566	8	4	6765	18.7	348.68	359.95	16.63	3.16	0.1722	2.3305	6	4
6698	17.5	33.27	297.83	16.60	6.16	0.1473	2.3707	5	2	6766	13.5	78.98	102.53	171.18	13.60	0.0662	3.1404	7	1
6699	17.8	35.91	126.08	173.75	4.86	0.2640	2.3839	8	X	6768	18.7	358.18	310.13	52.49	2.76	0.2282	2.2922	8	4
6701	15.9	78.16	75.83	179.36	22.96	0.2243	3.0105	8	4	6770	18.6	339.25	233.40	156.65	1.93	0.1751	2.2688	8	4
6702	18.0	10.13	338.45	6.29	6.82	0.1689	2.2594	8	4	6772N	17.4	308.44	261.05	162.35	1.53	0.1133	2.4787	7	4
6703	16.0	163.24	22.69	169.82	5.08	0.1095	2.6371	8	4	6776	16.9	285.25	28.73	59.88	1.45	0.1162	2.7049	6	4
6705	16.9	278.62	75.81	22.70	7.21	0.1653	2.3458	6	1	6777	16.8	329.56	254.60	161.92	9.52	0.3126	3.2004	7	4
6707	16.1	0.63	216.07	141.97	2.88	0.0159	3.0262	8	4	6778	16.3	359.57	198.78	161.77	9.48	0.2255	2.6867	8	4
6708	16.8	190.63	141.88	27.89	2.48	0.0647	2.4276	8	4	6780	14.8	184.92	6.74	170.82	18.73	0.2602	3.0651	6	4
6709	18.1	352.90	325.49	44.77	3.17	0.2311	2.3835	6	1	6781	16.6	313.87	39.34	24.60	6.02	0.1839	3.1209	8	4
6710N	17.5	343.57	219.71	163.81	2.65	0.1869	2.6305	7	4	6782	17.1	89.23	124.20	132.61	2.83	0.1260	2.2330	6	1
6712	16.7	352.50	189.41	180.84	12.94	0.1678	2.5747	7	1	6784	15.8	334.80	16.92	12.15	10.30	0.0678	3.0031	5	2
6713	16.9	67.67	279.39	4.99	4.81	0.0685	2.7182	8	4	6785	17.4	41.40	274.91	25.21	3.42	0.2065	2.5285	8	4
6714	16.1	316.95	44.68	3.20	20.92	0.0720	3.1610	8	4	6786	16.4	330.37	3.14	32.71	1.82	0.0863	3.1783	7	4
6715	18.0	331.98	18.29	15.73	8.14	0.1181	2.3272	7	4	6788	16.7	350.77	307.71	65.28	3.00	0.1613	2.9851	7	4
6716	16.0	233.48	113.49	12.82	13.07	0.0202	2.8294	8	4	6794	17.2	194.69	38.41	127.48	3.13	0.0117	2.2840	3	4
6717	16.9	100.13	166.20	74.61	2.54	0.1664	2.4393	6	4	6795	19.7	357.02	191.41	173.69	5.00	0.1992	2.1652	6	X
6718N	17.7	331.34	241.10	173.24	5.82	0.3238	3.2115	6	4	6796	17.5	98.52	240.11	15.70	4.85	0.0582	2.2484	6	4
6721	17.8	45.97	283.23	20.74	2.63	0.1052	2.5565	6	4	6798	18.0	356.57	352.52	13.24	6.99	0.2053	2.4091	6	1
6723N	17.5	26.34	300.33	16.59	5.34	0.2348	2.6989	7	4	6799	17.5	321.44	293.07	122.60	2.21	0.1923	2.5261	8	4
6724	17.7	13.94	332.04	1.72	9.89	0.2896	3.1805	8	4	6801	16.8	20.52	196.64	132.05	3.38	0.2073	2.4688	8	4
6726	16.1	352.25	247.78	118.80	3.10	0.0073	2.9295	8	4	6802	18.2	11.54	326.37	18.73	3.30	0.1500	2.4794	8	4
6727	17.0	343.87	214.25	170.41	14.27	0.2201	2.4374	8	4	6803	17.0	46.21	278.65	16.54	9.02	0.1941	2.6965	8	4
6729	15.7	102.66	239.80	4.42	18.16	0.1134	3.0658	7	4	6805	17.8	12.55	276.53	60.73	3.02	0.2761	2.5892	8	1
6730	16.4	29.85	143.81	182.12	1.61	0.0676	3.0479	7	4	6807	18.0	342.96	222.64	165.87	7.40	0.2364	2.7372	6	4
6731	17.8	335.43	326.30	71.69	2.58	0.2286	2.5847	8	4	6808	15.8	78.34	241.15	25.58	5.23	0.1361	3.1153	8	4
6733	17.6	29.53	139.81	169.36	9.10	0.2677	2.6637	8	4	6810	17.7	30.31	180.88	134.42	4.28	0.2003	2.4645	8	4
6734	17.3	283.81	324.42	127.82	1.56	0.1428	2.4091	8	4	6813	17.0	45.92	252.11	51.26	4.18	0.1213	2.7877	8	4
6735	15.6	328.22	30.04	12.30	5.12	0.1534	3.1381	6	1	6814	15.8	58.05	277.08	21.26	2.40	0.0521	3.0786	8	4
6737	16.8	51.28	282.27	11.72	4.02	0.1465	2.8144	8	4	6815	19.2	334.41	28.52	20.99	4.76	0.3159	2.4026	8	X
6738N	17.4	354.48	202.98	164.64	4.80	0.1729	3.0161	4	X	6817	16.8	64.88	194.84	82.62	3.42	0.1619	2.3169	7	4
6739	17.7	21.03	161.32	171.51	6.37	0.1252	2.2892	6	1	6820	16.1	120.37	59.76	166.12	7.29	0.1720	2.7134	8	4
6740	16.3	6.61	327.10	24.08	5.50	0.0919	3.2271	8	4	6822	18.1	13.96	191.19	147.38	5.78	0.2139	2.6314	8	4
6741	16.2	187.59	104.54	67.73	3.18	0.0613	2.6733	8	4	6823	17.8	5.13	210.87	142.87	2.01	0.1823	2.5822	8	4
6743	18.1	305.75	106.09	10.49	7.90	0.5237	1.6805	8	4	6824	18.0	358.09	199.12	165.75	6.56	0.3436	2.7443	8	4
6744	17.6	325.34	239.15	173.26	6.55	0.2163	2.5587	6	1	6825N	18.1	27.99	279.86	35.88	3.98	0.2371	2.2528	6	1
6746	15.9	74.64	75.78	173.75	17.72	0.3106	2.8986	8	4	6826	15.8	3.53	310.83	45.04	5.63	0.1235	2.9297	7	1
6747	17.8	41.06	286.87	8.64	14.89	0.2410	2.5229	6	4	6831N	15.6	76.93	268.00	356.47	6.56	0.1496	3.1572	8	4
6748	17.9	15.16	317.24	26.16	5.32	0.0240	2.2237	8	4	6832	16.5	110.31	192.68	34.07	1.95	0.2242	2.4463	8	4
6749	18.6	18.37	165.62	166.03	4.75	0.2071	2.3648	6	4	6833N	16.2	155.99	203.88	353.32	2.10	0.1466	2.8748	7	4
6750	16.5	154.92	179.50	16.89	4.00	0.2305	2.3648	6	4	6834	16.0	44.37	276.28	29.62	2.19	0.0944	3.1968	8	4
6751	16.8	205.82	344.18	175.10	7.52	0.1090	2.3967	6	4	6835	16.4	93.14	199.12	58.18	2.89	0.0666	2.9251	8	4
6752	15.8	274.51	32.73	74.03	3.04	0.1928	3.0660	8	4	6836	17.2	10.94	332.02	13.24	7.36	0.1074	2.7017	8	4

P-L	g	M	ω	Ω	i	e	a	N	Q
6837	17.0	348°.88	285°.73	86°.43	3°.19	0.0907	2.8518	8	4
6839	17.3	60.64	170.20	107.90	3.30	0.1839	2.5795	8	4
6840	17.6	1.80	253.75	103.09	2.62	0.1347	2.5228	8	4
6841	17.7	292.21	78.16	7.41	4.43	0.1546	2.3599	8	4
6843	17.0	250.64	19.09	99.22	2.03	0.0859	2.5576	8	4
6845	16.9	14.73	270.07	67.70	3.90	0.1835	3.1631	8	4
6847	15.7	345.56	224.53	159.61	10.27	0.2400	3.9639	8	4
6848	18.6	348.71	0.98	15.77	7.08	0.1769	2.2930	8	4
6849	17.2	40.16	289.32	18.77	6.91	0.1453	2.8167	8	4
6850	16.6	116.73	122.32	115.13	3.32	0.0651	2.8587	8	4
6851N	17.9	42.19	164.46	134.46	3.32	0.2107	2.6033	8	4
6852	17.5	332.62	277.49	130.36	3.22	0.2956	2.9297	6	4
6853N	14.8	179.24	186.97	352.44	2.34	0.1763	3.2269	8	X
6854	17.9	44.12	284.39	23.19	6.22	0.0742	2.1861	8	4
6855	17.7	310.82	290.14	144.92	3.41	0.2597	2.6096	7	4
6856	19.0	16.09	166.79	164.17	7.14	0.2618	2.3480	5	4
6857	17.7	277.21	91.32	1.72	1.41	0.0911	2.3809	6	4
6858	15.4	151.23	30.92	171.69	17.88	0.1137	2.9708	7	4
6859	16.7	343.45	254.91	122.41	3.73	0.0472	2.9650	8	4
6860	16.6	33.37	173.88	144.28	5.65	0.1100	3.1352	6	4
6862	18.8	26.21	149.58	172.21	4.36	0.1988	2.2922	6	4
6863	18.5	314.44	6.61	58.54	2.20	0.2182	2.2401	7	4
6864	16.4	129.57	53.39	159.05	6.47	0.2244	2.4488	8	4
6865	18.4	333.49	30.43	5.98	13.60	0.1686	2.4443	6	4
6867	18.7	347.60	219.24	158.06	6.92	0.1559	2.1886	8	4
6869N	17.7	51.48	106.22	175.58	11.86	0.2480	2.4822	6	4
6871	17.1	130.02	86.01	129.79	2.25	0.1662	2.2947	8	4
6872N	16.8	63.21	262.08	23.19	1.40	0.1032	2.7396	8	4
6873	17.3	207.07	92.68	62.80	3.51	0.0751	2.2583	6	4
6874N	16.2	212.04	154.19	0.95	17.40	0.1300	2.7565	4	X
6876	16.0	251.76	337.66	150.23	3.79	0.1996	2.9230	7	4
6877N	17.7	55.21	116.34	169.83	3.37	0.1801	2.5993	7	4
6878N	19.1	30.59	157.62	154.63	1.54	0.2293	2.3355	3	X
6879	17.8	357.23	345.84	18.77	6.37	0.2543	3.0879	5	4
6880	18.2	307.06	19.12	52.72	2.07	0.1810	2.4525	5	4
6881	19.1	5.59	194.13	157.31	4.55	0.2025	2.3260	6	4
6882	18.4	339.67	26.83	8.27	4.31	0.2507	2.6471	5	4
6883	18.3	320.88	253.35	162.82	5.73	0.1897	2.4145	6	4
6884N	19.7	331.07	359.74	52.02	2.50	0.3048	2.1554	3	4
6885N	18.4	344.13	221.51	165.35	6.02	0.2703	2.7196	7	4
6887	16.6	117.59	202.00	30.48	2.39	0.1024	2.7546	8	4
6889	13.9	359.56	285.77	73.53	2.87	0.0012	5.2103	6	X
6890	18.4	356.36	187.82	178.43	16.69	0.1941	2.6430	6	X
7061	16.6	337.50	178.67	213.08	5.54	0.1275	2.4331	7	1
7069	15.9	314.69	214.38	207.23	11.55	0.1305	2.5166	4	2
7071	16.7	22.86	135.80	199.39	21.10	0.1025	1.9167	20	1
7072	16.1	237.40	298.19	196.47	21.19	0.0784	1.9481	6	1
7081	17.7	285.15	105.63	348.55	4.97	0.1136	2.2099	10	1
7082	16.6	334.97	198.38	194.96	22.13	0.0967	1.9529	7	1
7501N	16.9	78.26	247.23	11.82	26.83	0.2263	2.3595	3	3
7502N	17.1	352°.25	345°.35	27°.64	11°.73	0.1561	2.4522	3	3
7562	16.0	332.79	15.89	20.86	12.51	0.1481	2.9210	5	1
7574	16.5	347.11	348.43	34.61	7.06	0.2606	3.0847	6	1
7583	17.5	325.13	330.10	99.81	2.76	0.3495	2.7598	3	4
7586	17.5	350.74	214.01	160.82	5.30	0.1780	2.4182	3	X
7590	17.6	335.41	10.77	35.00	6.99	0.2869	2.6486	3	3
7591	15.7	48.17	219.04	60.60	3.98	0.3165	3.2599	4	3
7614	17.3	35.65	187.09	123.94	3.35	0.1972	2.3498	4	3
7617	16.0	341.65	327.60	70.09	3.87	0.2971	3.9364	3	X
7635	18.1	322.05	21.95	35.91	5.10	0.1965	2.2413	4	3
7639	15.6	206.96	72.51	92.29	4.40	0.1809	2.6009	4	3
7645N	16.0	161.15	40.11	158.41	6.49	0.0611	2.4462	4	3
7646	16.7	340.22	257.98	126.42	3.77	0.0709	2.6437	4	3
7648	15.9	0.97	336.13	26.63	9.05	0.0874	2.8765	3	X
9002N	15.0	138.34	13.01	199.76	13.91	0.1106	2.5669	3	3
9003N	16.3	16.76	122.01	213.07	5.71	0.2197	2.2973	3	3
9061	17.0	350.00	62.32	311.77	3.07	0.1982	2.7469	4	X
9074	16.5	314.15	171.86	246.38	0.74	0.1432	2.6870	7	1
9085	17.4	23.06	322.40	3.85	4.01	0.1960	2.2165	6	1
9097	15.6	179.07	181.47	359.35	7.05	0.1284	2.5849	5	1
9099	15.2	32.61	133.36	185.49	12.48	0.0938	3.1550	4	3
9100N	16.3	352.97	29.04	337.43	2.90	0.0811	2.7590	3	X
9103	14.3	356.13	172.27	191.77	3.12	0.1809	2.2243	4	3
9104	15.6	27.38	139.91	183.31	13.00	0.1374	3.0868	5	1
9508	14.2	262.52	15.28	94.53	2.34	0.1570	3.3767	4	3
9511	14.4	354.44	202.83	159.41	0.78	0.0331	3.2193	4	X
9513	15.4	352.99	245.53	118.77	2.94	0.1096	3.1357	4	X
9514	15.7	171.61	135.67	48.71	2.48	0.0137	2.7812	3	X
9520	16.3	221.06	87.36	55.17	3.35	0.0978	2.3698	3	3
9529	15.9	354.16	211.66	152.18	2.67	0.0698	2.7624	3	X
9531	16.0	43.70	269.08	30.43	6.55	0.1486	2.4058	4	3
9532	16.3	351.01	332.85	37.41	3.11	0.1861	2.6370	4	3
9541	15.7	351.49	204.11	163.64	2.05	0.0837	2.8109	4	X
9542	15.5	352.07	302.64	62.55	3.02	0.0310	2.9471	5	2
9547	15.8	2.63	164.22	189.62	7.57	0.2128	2.4787	4	3
9548	16.3	354.33	206.22	160.35	3.92	0.2366	3.1970	4	X
9554	14.8	329.05	266.56	127.75	5.07	0.0987	3.4441	4	3
9563	17.4	2.27	260.72	94.01	3.39	0.1823	2.3730	4	3
9568	16.5	349.49	343.21	34.61	7.58	0.2978	2.3784	3	X
9573	16.7	327.40	357.29	53.38	5.53	0.2369	2.6277	3	4
9574	14.8	333.53	24.42	20.50	13.61	0.2699	2.9904	3	4
9586	14.9	173.93	47.61	134.38	6.16	0.1278	3.1335	3	X
9596	14.7	179.89	1.12	176.14	12.22	0.0916	2.9829	3	X
9599	14.9	180.36	355.58	181.31	11.67	0.1351	2.9539	3	X
9602N	13.3	357.85	209.83	146.43	7.04	0.0484	5.1555	3	X
9612N	12.4	175.95	138.57	41.07	3.19	0.0253	5.0803	3	X
9616N	13.2	37.53	128.10	178.73	10.26	0.1553	5.1616	3	3
9618N	16.7	333.10	322.84	69.33	2.22	0.1315	2.6870	4	2

New computations confirm the general correctness of the two previously known Apollo-type objects, 6344 and 6743 P-L (both still of class 4). A class 2 Amor-type orbit in PLS I, that of 4788 P-L, has now been promoted to class 1, and at $e = 0.56$, this is by far the most eccentric class 1 orbit in PLS II.

In a study of orbits in the 2 : 1 Kirkwood gap, Franklin *et al.* (1975) concluded that most, if not all, of the 21 PLS I orbits (all then of class 3 or 4) that appeared to be librating were spurious. This is borne out in PLS II, which in ten instances shows "former librators" with improved general orbits that are far from the gap. In three cases (2691, 2834, and 5557 P-L) these improved orbits are of class 1. On the other hand, 2699 P-L has a class 1 orbit of only moderate eccentricity right in the gap. The class 3 orbit for 7591 P-L also remains in the gap.

The highest orbital inclination among the class 1 orbits is still the 26°.4 (for 2104 P-L) mentioned in PLS I. Two third-class (the Hungaria 3509 P-L and the Phocaea 7501 P-L) and four fourth-class orbits have higher inclinations, the largest value being 30°.7 in the case of 3055 P-L. Since the SA 68 field is further from the ecliptic than the older fields, it is to be expected that it would produce a greater proportion of high-inclination orbits. The median inclination of the SA 68 objects is 9°.2, just twice the median inclination for the Survey as a whole.

No proper elements have been obtained for the new orbits, so little can be said about the occurrence of family members among the new class 1 orbits.

TABULATION

PLS II contains a total of 2403 orbits, and the number of the orbits in each quality class Q is as follows:

Q	No.
1	1124
2	132
3	183
4	859
X	105

Quality class X refers to the e-assumed orbits, 96 of which might otherwise be ascribed to class 4, the remainder to class 3. It should be noted that 2510 P-L = (1694) and 6549 P-L = (1630) were accidentally listed under both designations in PLS I. 5029 P-L should also be eliminated, because it is identical with 2128 P-L, which now therefore has a class 1 orbit. The orbit of 6303 P-L is erroneously given as class 4, instead of class 1, in PLS I.

Table I lists 1198 orbital elements that supplement or amend the orbits in PLS I. The standard angular elements ω, Ω, and i are referred to the mean equinox of 1950.0, and the mean anomaly M corresponds to the epoch JED 2437200.5 = 23.0 Sept 1960 ET. The absolute magnitudes g were calculated using the same phase function adopted for PLS I, $1.03\,T(\alpha) + 0.039\,|\alpha| - 0.05$, where $T(\alpha)$ represents the opposition effect (as a function of the phase angle α) tabulated by Gehrels (1967). They are thus not exactly equivalent to standard B(1,0) values. The column N shows the number of observations utilized in the computation. The 441 orbits for which there were no corresponding entries in PLS I are indicated with a letter N after the planet number.

Thirteen of the objects for which orbits are given in Table I have been identified with long-numbered minor planets or with minor planets observed at other oppositions (some of which have therefore recently been permanently numbered). Better orbits for these objects are obviously available elsewhere. These P-L objects with identifications (numbers in parentheses denoting numbered minor planets) are as follows:

2221 P-L = 1979 MW7	3042 P-L = 1981 ER3	3071 P-L = (2799)
3072 P-L = (1106)	3088 P-L = (516)	3102 P-L = (156)
3516 P-L = (2546)	3525 P-L = (1112)	3537 P-L = (2412)
3547 P-L = (973)	3566 P-L = (1235)	4805 P-L = 1981 EP22
7071 P-L = (2495)		

Likewise, many of the objects for which orbits were published only in PLS I have subsequently been permanently numbered or identified at other oppositions. These are:

2005 P-L = (2125)
2006 P-L = (1979)
2007 P-L = (1964)
2008 P-L = (1868)
2009 P-L = (2798)
2010 P-L = (2823)
2011 P-L = 1965 SX
2015 P-L = (2154)
2017 P-L = 1980 TT6
2159 P-L = (958)
2509 P-L = (2339)
2517 P-L = (1808)
2519 P-L = (2214)
2520 P-L = (1776)
2521 P-L = (1965)
2522 P-L = (1809)
2523 P-L = (2041)
2524 P-L = (2317)
2525 P-L = 1977 QG1
2526 P-L = (2018)
2528 P-L = (2224)
2529 P-L = (2176)
2533 P-L = 1976 SQ1
2540 P-L = 1978 QV1
2552 P-L = (1966)
2563 P-L = 1978 WA6
2578 P-L = 1931 BC
2580 P-L = (2818)
2605 P-L = (2782)
2630 P-L = 1979 TP2
4006 P-L = (2934)
4007 P-L = (1777)
4008 P-L = A923 RD
4010 P-L = (1795)
4011 P-L = (1923)
4017 P-L = 1978 TG6
4021 P-L = (2662)
4023 P-L = (1924)
4081 P-L = 1980 PF1
4097 P-L = (2054)
4113 P-L = 1981 EQ25
4120 P-L = 1982 RC1
4196 P-L = (1810)
4260 P-L = 1974 RK1
4506 P-L = (1778)
4519 P-L = (2256)
4576 P-L = (1811)
4578 P-L = (2435)
4579 P-L = 1980 FJ3
4583 P-L = 1982 CB
4585 P-L = (2800)
4596 P-L = (1869)
4633 P-L = (2042)
4645 P-L = (1812)
5550 P-L = 1983 AP
6036 P-L = (2095)
6066 P-L = (2436)
6073 P-L = 1981 ER19
6081 P-L = 1977 EC8
6090 P-L = (2200)
6091 P-L = 1982 VO
6116 P-L = (1779)
6512 P-L = (2247)
6521 P-L = (2318)
6525 P-L = (2921)
6534 P-L = (1912)
6542 P-L = (2155)
6545 P-L = (2471)
6546 P-L = (2225)
6547 P-L = 1979 SW9
6548 P-L = 1983 AX
6550 P-L = 1983 CC1
6551 P-L = (2177)
6553 P-L = (1846)
6554 P-L = (2930)
6558 P-L = (2876)
6559 P-L = (2003)
6560 P-L = 1969 FE
6561 P-L = (2663)
6562 P-L = 1971 SW
6567 P-L = (2289)
6578 P-L = (2462)
6591 P-L = 1979 GB
6611 P-L = 1976 QJ1
6816 P-L = (2413)
7588 P-L = (2082)
7589 P-L = (1813)
7631 P-L = (2319)
7633 P-L = 1977 DR3
9086 P-L = 1980 RM1
9503 P-L = (1976)
9597 P-L = (2210)

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REFERENCES

FRANKLIN, F. A., B. G. MARSDEN, J. G. WILLIAMS, AND C. M. BARDWELL (1975). Minor planets and comets in libration about the 2:1 resonance with Jupiter. *Astron. J.* **80,** 729–746.

GEHRELS, T. (1967). Minor planets: II. Photographic magnitudes. *Astron. J.* **72,** 1288–1291.

HERGET, P. (1965). The computation of preliminary orbits. *Astron. J.* **70,** 1–3.

VAN HOUTEN, C. J., I. VAN HOUTEN-GROENEVELD, P. HERGET, AND T. GEHRELS (1970). The Palomar–Leiden Survey of faint minor planets. *Astron. Astrophys. Suppl. Ser.* **2,** 339–448.