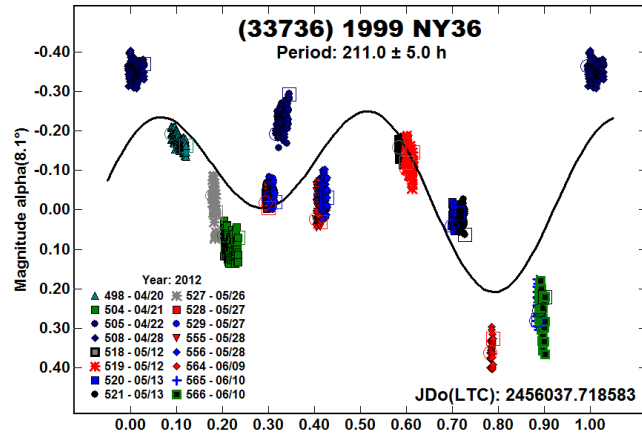
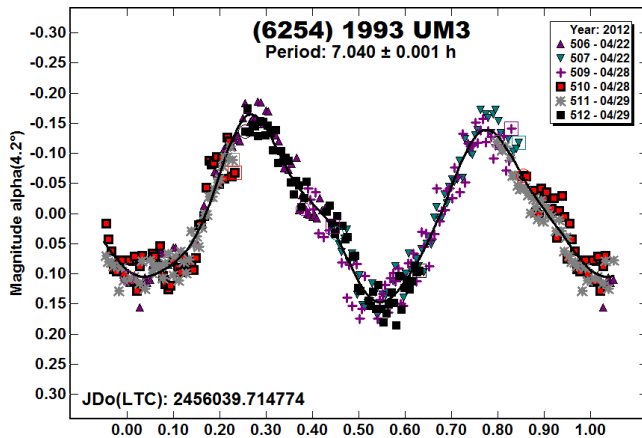




Combining these new results with those of Buchheim (2007) and Stephens (2009) provides much information about the rotational properties of 482 Petrina. It can be shown that the data presented in the 15.73 hour period lightcurve by Buchheim (2007) and in the 9.434 hour period lightcurve by Stephens (2009) are both consistent with a period of 11.794 hours. Buchheim's

interpretation was of three rotational cycles between alternate nights; four rotational cycles actually fit Buchheim's data better. His observed amplitude of 0.48 magnitudes can only be achieved with a bimodal lightcurve. On his lightcurve with assumed 15.73 hour period the two maxima were separated by 0.4 rotational cycles or 6.3 hours. This is much closer to the 5.90 hours expected for an 11.794 hour period than the 7.86 hours expected for a 15.73 hour period. Stephens' observations, although they span an interval of 11 days, still cover only part of an 11.794 hour cycle due to the very slow circulation of the observable part of the lightcurve. It seems that he observed the region of the narrow minimum and more closely spaced maxima. His 9.434 hour period follows from a reasonable assumption of equally spaced maxima. He assumed that he was observing alternate minima on successive nights whereas he was actually observing the same minimum. A symmetric lightcurve necessarily results from such an assumed alias period. And his published lightcurve is indeed nearly symmetric.

Buchheim (2007) found 0.48 magnitude amplitude at longitude 184 degrees. In this study near longitude 268 degrees, latitude +23 degrees, an amplitude near 0.10 magnitudes is found. This shows that the latter is at near polar aspect while the former is at near equatorial aspect. The lightcurve by Stephens near longitude 295 degrees, latitude +22 degrees, is almost identical to the segment from phase 0.50 through 1.00 and continuing to 0.10 of the lightcurve in this study, amplitude of this one segment being 0.06 magnitudes. This suggests that the two studies are at nearly identical aspect angles between the line of sight and polar axis with the rotational pole half way between them near longitude 280 degrees, latitude +23 degrees, or conversely near 100 degrees, -23 degrees, respectively.

An amplitude as large as 0.48 magnitudes is obtained only for a bimodal lightcurve. Combined with the results of this study we can state that the synodic rotation period is 11.794 ± 0.001 hours, with no possibility of an alias. The ratio $a/b \geq 10^{0.4\Delta M}$. For $\Delta M = 0.48$ in 2006 in near equatorial aspect, a/b for 482 Petrina is approximately 1.56. The ratio of minimum equatorial to polar radii b/c cannot be found from data obtained to date.

Caution should be given to all observers who obtain periods nearly commensurate, $1/3$, $2/5$, $1/2$, $3/5$, $2/3$, $1/1$, $4/3$, $3/2$, $5/3$, 2 , respectively, times the Earth's period. They are especially likely to infer an alias period in this circumstance. Either observations should be continued over a sufficiently long time interval, or collaboration should be obtained from observers at widely different longitudes, to obtain full phase coverage for all of these trial periods. If this is not feasible then the observer should acknowledge that the suggested period is not secure.

For 482 Petrina, when in this study the first observer encountered a nearly commensurate period he sought collaborators from widely spaced longitudes. This enabled the acquisition of a secure period. Indeed the authors of this paper have had several previous, and successful, collaborations for asteroids with periods nearly commensurate with Earth's. We strongly encourage other readers of this paper to follow our example.

The observing cadence by FP at Organ Mesa Observatory is such that a much larger number of data points were acquired there than at any of the other observatories. To make more legible the large number of data points in the segments of the lightcurve included by Organ Mesa observations, they have been binned in sets of three points with a maximum of five minutes between points.

The following table provides details of the individual sessions. Column headings refer to: Obs: Observer code: FP, Frederick Pilcher, 0.35 m f/10 S-C, SBIG STL-1001E CCD; AF, Andrea Fererro, 0.3m f/8 RC, SBIG ST9 CCD; JO, Julian Oey, 0.25 m f/11 S-C, SBIG ST-9XE CCD; Sess, session number; Date in calendar year 2012; UT of first and last data points of the session; Data Pts, number of data points in session.

Obs	Sess	Date	UT	Data Pts
FP	2022	May 26	4:54 - 11:05	309
FP	2023	May 27	4:47 - 11:03	261
FP	2026	May 30	4:38 - 11:03	215
FP	2027	Jun 1	4:48 - 8:45	143
FP	2028	Jun 2	5:38 - 10:56	243
FP	2029	Jun 3	4:39 - 11:00	165
FP	2034	Jun 8	4:01 - 11:07	257
FP	2035	Jun 9	3:54 - 11:11	311
FP	2036	Jun 10	3:48 - 11:05	365
FP	2043	Jun 14	4:41 - 11:02	208
AF	2044	Jun 4-5	21:36 - 2:41	146
FP	2047	Jun 19	3:12 - 11:05	240
FP	2048	Jun 20	3:06 - 6:08	144
JO	2051	Jun 15	10:36 - 15:45	54
JO	2052	Jun 17	11:40 - 13:24	18
JO	2053	Jun 18	10:07 - 13:55	41
JO	2054	Jun 20	11:30 - 15:56	38
AF	2055	Jun 20-21	21:38 - 2:27	125
FP	2057	Jun 26	3:11 - 10:50	298

References

- Behrend, R. (2002). Observatoire de Geneve web site. http://obswww.unige.ch/~behrend/page_cou.html
- Buchheim, R. K. (2007). "Lightcurves of 25 Phocaea, 468 Lina, 482 Petrina, 551 Ortrud, 741 Botolphia, 834 Burnhamia, 2839 Annette, and 3411 Debetencourt." *Minor Planet Bull.* **34**, 68-71.
- Stephens, R. D. (2009). "Asteroids Observed from GMARS and Santana Observatories." *Minor Planet Bull.* **36**, 59-62.
- Warner, B. D., Harris, A. W., and Pravec, P. (2012). "Asteroid Lightcurve Data file: Feb. 28, 2012."

Acknowledgments

The authors thank anonymous reviewers for helpful comments which greatly improved this paper.

