

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist
219	2010/10/07	177.0°		0h45m	+ 8°			2010/10/07	13.6		2010/09/30	0.870					
5142	2010/10/07	177.3°		0h45m	+ 7°			2010/10/07	13.7		2010/10/11	0.876					
36	2010/10/09	167.5°		0h47m	+18°			2010/10/10	10.4		2010/10/14	0.976					
1663	2010/10/09	169.3°		1h13m	- 3°			2010/10/08	13.7		2010/10/05	0.857					
66146	2010/10/09	143.8°		2h11m	-25°			2010/10/13	12.6		2010/10/17	0.177					
6425	2010/10/15	175.6°		1h12m	+12°			2010/10/15	13.8		2010/10/08	1.091					
296	2010/10/16	176.3°		1h31m	+ 5°			2010/10/16	13.9		2010/10/14	0.878					
1687	2010/10/16	176.0°		1h32m	+ 5°			2010/10/16	13.6		2010/10/18	1.640					
4349	2010/10/16	160.2°		1h49m	- 9°			2010/10/15	13.9		2010/10/12	1.020					
1080	2010/10/19	175.9°		1h32m	+14°			2010/10/20	13.5		2010/10/25	0.856					
725	2010/10/20	175.0°		1h46m	+ 5°			2010/10/20	13.6		2010/10/20	1.014					
137032	2010/10/20	125.0°		21h55m	+19°			2010/10/04	14.5		2010/10/01	0.083					
1383	2010/10/21	179.7°		1h42m	+10°			2010/10/21	14.5		2010/10/16	1.536					
175	2010/10/22	179.3°		1h46m	+11°			2010/10/22	11.5		2010/10/15	1.592					
3133	2010/10/26	178.9°		2h 4m	+14°			2010/10/26	13.7		2010/10/25	0.837					
902	2010/10/27	171.8°		1h55m	+20°			2010/10/27	14.2		2010/10/24	1.026					
2699	2010/10/27	164.6°		2h19m	- 2°			2010/10/26	14.5		2010/10/22	1.265					
319	2010/10/28	171.6°		2h21m	+ 5°			2010/10/28	13.4		2010/10/29	1.692					
645	2010/10/28	173.8°		2h 1m	+18°			2010/10/28	13.8		2010/10/31	1.873					
1253	2010/10/28	179.7°		2h 9m	+12°			2010/10/28	14.4		2010/10/27	1.494					
942	2010/10/29	169.9°		2h24m	+ 3°			2010/10/29	14.3		2010/10/27	1.624					
981	2010/10/29	179.4°		2h14m	+12°			2010/10/29	13.8		2010/10/22	1.624					
1550	2010/10/29	170.1°		2h23m	+ 3°			2010/10/28	13.0		2010/10/22	0.782					
2848	2010/11/01	178.7°		2h23m	+15°			2010/11/01	14.2		2010/10/30	1.578					
4298	2010/11/03	175.5°		2h39m	+10°			2010/11/03	14.4		2010/11/02	1.155					

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist
2360	2010/11/04	179.3°		2h39m	+15°			2010/11/04	14.5		2010/11/03	1.162					
3277	2010/11/04	169.7°		2h49m	+ 5°			2010/11/04	14.1		2010/10/31	1.330					
1133	2010/11/07	177.2°		2h50m	+13°			2010/11/06	13.4		2010/10/31	0.846					
144	2010/11/13	176.1°		3h19m	+14°			2010/11/13	10.0		2010/11/06	1.133					
846	2010/11/16	179.5°		3h27m	+19°			2010/11/16	13.4		2010/11/13	1.592					
1312	2010/11/20	146.0°		4h 6m	-13°			2010/11/17	14.5		2010/11/15	1.576					
5534	2010/11/20	167.8°		3h33m	+31°			2010/11/20	13.5		2010/11/19	0.864					
571	2010/11/23	170.7°		3h48m	+29°			2010/11/22	13.1		2010/11/16	0.889					
574	2010/11/23	166.8°		3h43m	+33°			2010/11/23	13.4		2010/11/20	0.739					
1196	2010/11/23	159.4°		4h 2m	- 0°			2010/11/20	13.4		2010/11/16	1.370					
4729	2010/11/23	179.1°		3h53m	+21°			2010/11/23	14.3		2010/11/16	0.910					
3838	2010/11/25	126.1°		0h17m	+14°			2010/11/11	14.4		2010/11/07	0.197					
37	2010/11/28	175.2°		4h12m	+25°			2010/11/28	9.6		2010/11/28	1.200					
1756	2010/11/28	172.9°		4h10m	+28°			2010/11/27	14.2		2010/11/22	1.042					
4082	2010/11/30	164.8°		4h 6m	+36°			2010/11/28	14.5		2010/11/22	0.857					
325	2010/12/04	166.6°		4h35m	+35°			2010/12/04	12.4		2010/12/02	1.745					
690	2010/12/07	179.4°		4h56m	+22°			2010/12/07	11.7		2010/12/01	1.845					
563	2010/12/13	178.6°		5h22m	+21°			2010/12/13	10.5		2010/12/09	1.117					
523	2010/12/17	179.4°		5h40m	+22°			2010/12/17	12.4		2010/12/17	1.469					
2301	2010/12/18	177.3°		5h46m	+26°			2010/12/18	13.9		2010/12/18	1.519					
675	2010/12/19	178.8°		5h48m	+22°			2010/12/19	10.3		2010/12/15	1.285					
6386	2010/12/20	169.8°		5h50m	+13°			2010/12/18	14.0		2010/12/06	0.795					
1115	2010/12/29	169.0°		6h39m	+34°			2010/12/29	12.9		2011/01/01	1.655					
554	2010/12/30	178.3°		6h39m	+24°			2010/12/30	10.8		2010/12/26	1.079					
3198	2010/12/31	166.0°		7h 6m	+36°			2011/01/01	14.2		2011/01/05	0.712					

PHOTOMETRIC OBSERVATIONS AND LIGHTCURVE ANALYSIS OF ASTEROIDS 397 VIENNA AND (5153) 1940 GO

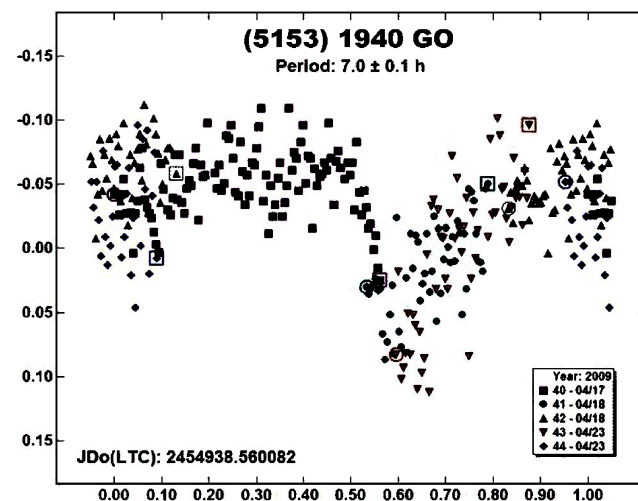
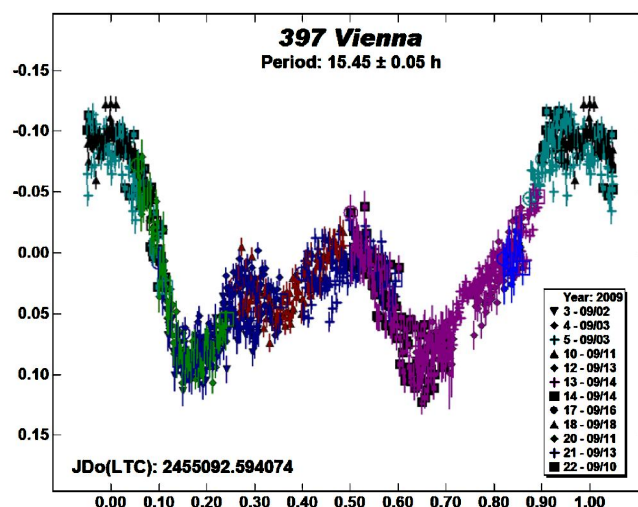
John C. Ruthroff
Shadowbox Observatory
12745 Crescent Drive
Carmel, IN 46032
john@theastroimager.com

(Received: 2009 October 11)

Photometric data were obtained from 2009 April through September for asteroids 397 Vienna and (5153) 1940 GO. For 397 Vienna, analysis of the data found a synodic period of 15.45 ± 0.05 h and lightcurve amplitude of 0.20 ± 0.05 mag. Due to limited measurements, no reliable period was determined for (5153) 1940 GO which displayed a lightcurve amplitude of less than 0.2 mag.

Main-belt asteroids 397 Vienna and 5153 (1940 GO) were observed from 2009 April through September. All observations were made with a 0.3-m Schmidt-Cassegrain (SCT) operating at f/6 on a German equatorial mount (GEM). The imager was an SBIG ST9 working at 1x1 binning which resulted in an image scale of 2.22 arc seconds/pixel. An SBIG AO-8 adaptive optics unit was employed. A Johnson V-band filter was used for all images of 397 Vienna. Observations of (5153) 1940 GO were unfiltered. The camera temperature was set to between -12°C and -16°C depending on ambient air temperature. Image acquisition and reduction were done with *CCDSofT*. All images were reduced with master dark, bias and sky-flat frames. An observing session began when the target reached approximately 40 degrees elevation. The GEM required that imaging be halted around target transit time in order to move the telescope to the other side of the pier. Other than this interruption, the camera took continuous exposures, pausing only to download each image. Exposures for 397 Vienna were 105 seconds while those for (5153) 1940GO were 120 seconds.

MPO Canopus v.9.5.0.10 was used for period analysis, which incorporates the Fourier algorithm (FALC) developed by Harris (Harris et al., 1989). A minimum of two comparison stars from the



2MASS catalog was used on each image. Observations from both asteroids were reduced using differential photometry.

397 Vienna. This asteroid was chosen for study for two reasons: 1) only one published lightcurve was found (Harris and Young, 1983) and so additional observations could confirm that the published lightcurve was accurate; and 2) a “first apparition”

lightcurve is needed to allow future study of Vienna's spin and shape using lightcurve inversion (Kassalainen et al., 2002). Observations made over 11 observing sessions from 2009 September 3 to 18 produced 1046 data points. The derived period of $15.45 \text{ h} \pm 0.05 \text{ h}$ is in good agreement with the period of 15.48 h reported by Harris and Young (1983). The phase angle bisectors at the middle of the observing run were longitude 338.4° and latitude 17.3° . The phase angle was 12.9° .

(5153) 1940 GO. This asteroid was chosen due to its favorable position in the sky and to its scant attention in the past. Only one published lightcurve was found, that being from Behrend (2009) with a period of 4.58 and $U = 1$ (see Warner et al., 2009, for the U definition). Data were collected during 5 observing sessions from 2009 April 17 to 23. A prolonged period of cloudy weather afterwards prevented gathering more observations. My data are not of sufficient quality or length to draw any reasonable conclusions. The accompanying plot shows a period of 7 hours, which is likely incorrect.

Acknowledgements

I thank Brian Warner for his continued advice and guidance on all things having to do with asteroid lightcurves. This paper makes

use of data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

References

- Behrend, R. (2009). Observatoire de Genève Web site. <http://obswww.unige.ch/~behrend/page1cou.html>
- Harris, A. W. and Young, J.W. (1983). "Asteroid Rotation." *Icarus* **54**, 59-109.
- Harris, A.W., Young, J.W., Bowell, E., Martin, L.J., Millis, R.L., Poutanen, M., Scaltriti, F., Zappala, V., Schober, H.J., Debehogne, H., and Zeigler, K. (1989). "Photoelectric Observations of Asteroids 3, 24, 60, 261 and 863." *Icarus*, **77**, 171-186.
- Kassalainen, M., Torppa, J., and Piironen, J. (2002). "Models of Twenty Asteroids from Photometric Data." *Icarus* **159**, 369-395.
- Warner, B.D., Harris, A.W., and Pravec, P. (2009). "The Asteroid Lightcurve Database." *Icarus* **202**, 134-146.

LIGHTCURVE ANALYSIS OF MINOR PLANETS 4820 FAY AND 6463 ISODA

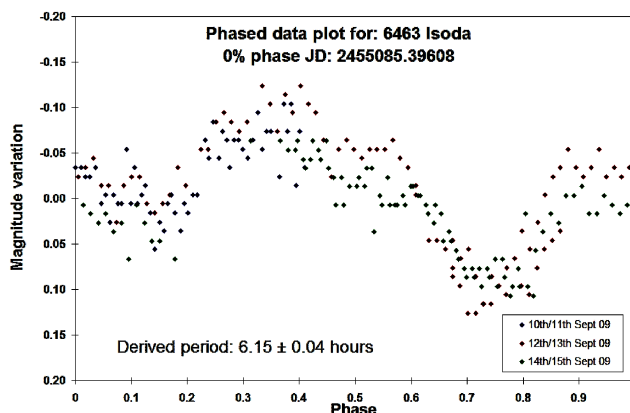
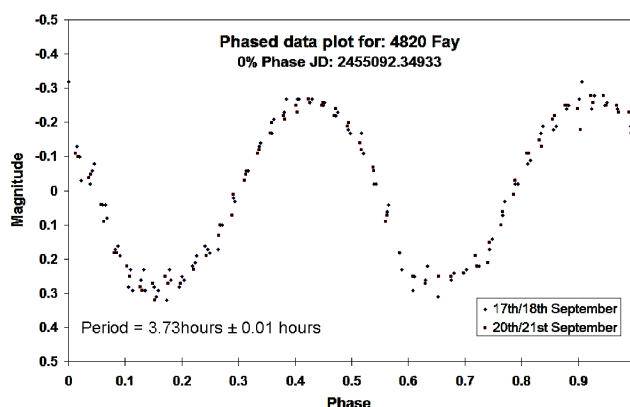
Darryl Sergison
Gothers Observatory
5 Gothers Road
St Dennis Cornwall UK
darryl_sergison@hotmail.com

(Received: 2009 September 20)

Observations during 2009 September yielded lightcurves for minor planets 4820 Fay and 6463 Isoda. For 4820 Fay, the synodic period was found to be $3.73 \pm 0.01 \text{ h}$; for 6463 Isoda, a period of $6.15 \pm 0.04 \text{ h}$ was determined.

Gothers Observatory is equipped with a Meade 0.25-m LX-200 Schmidt-Cassegrain with a Meade f/3.3 focal reducer. The detector is a QHY6 Pro CCD, binned at 1x1. The resulting optical train produces an image scale of $1.69 \times 1.63 \text{ arcsec/pixel}$. The camera was used with cooling set point cooling of -10°C . All observations were made unguided and unfiltered with exposures of 210 s. The typical FWHM of point sources was 4 to 4.5 arcsec for the reduced data sets. Automated computer control of the mount and CCD camera allows unsupervised imaging for extended durations of up to 8 hours. Image calibration and differential photometry were done using *Astrometrica* (Raab, 2009) with the Carlsberg Meridian Catalogue 14 (Evans et al., 2002) used for reference magnitudes. Period determination was performed using *Peranso* lightcurve analysis software (Vanmunster, 2009). Both targets were selected from the CALL lightcurve targets page (Warner, 2009).

4820 Fay This is a main-belt object that was at a favorable opposition in 2009 September. No previously reported lightcurve or rotational period could be found. The object was imaged 178 times over two nights. Its short period allowed four complete



cycles to be observed and so there is a high level of confidence in the reported solution. The lightcurve exhibits a typical bimodal curve with a synodic period of $3.73 \pm 0.01 \text{ h}$. Peak-to-peak magnitude variation (A) was found to be $0.53 \pm 0.02 \text{ mag}$.

6463 Isoda This is another main-belt object with no reported lightcurve or rotational period. The object was imaged 233 times over 3 nights. On two of the three nights, the total observing