

LIGHTCURVES FOR 131 VALA, 374 BURGUNDIA, 734 BENDA AND 929 ALGUNDE

Lorenzo Franco
Balzaretto Observatory (A81), Rome, ITALY
lor_franco@libero.it

Alessandro Marchini
Astronomical Observatory, DSFTA - University of Siena (K54)
Via Roma 56, 53100 - Siena, ITALY

Giorgio Baj
M57 Observatory (K38), Saltrio, ITALY

Giulio Scarfi
Iota Scorpis Observatory (K78), La Spezia, ITALY

Paolo Bacci, Martina Maestriperieri
San Marcello Pistoiese (104), Pistoia, ITALY

Roberto Bacci
G. Pascoli Observatory (K63), Castelvecchio Pascoli, ITALY

Riccardo Papini, Fabio Salvaggio, Massimo Banfi
Wild Boar Remote Observatory (K49)
Spedaletto, Florence, ITALY

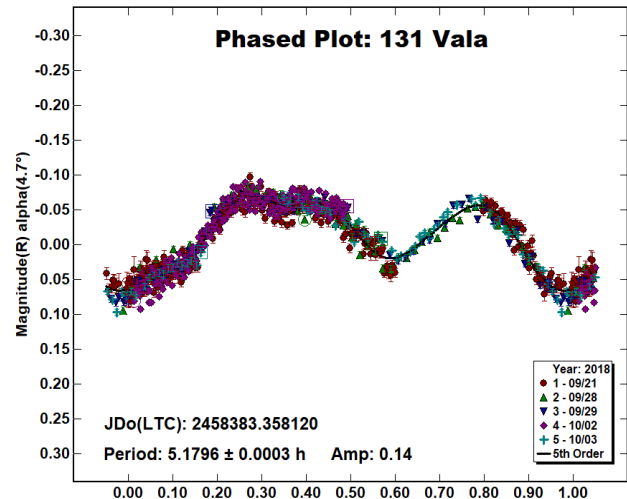
(Received: 2018 October 15)

Photometric observations of four main-belt asteroids were made in order to acquire lightcurves for shape/spin axis models. The synodic period and lightcurve amplitude were found for: 131 Vala: 5.1796 ± 0.0003 hr, 0.14 mag; 374 Burgundia: 6.9637 ± 0.0005 hr, 0.07 mag.; 734 Benda: 7.105 ± 0.001 hr, 0.25 mag; and 929 Algunde: 3.3104 ± 0.0003 hr, 0.11 mag.

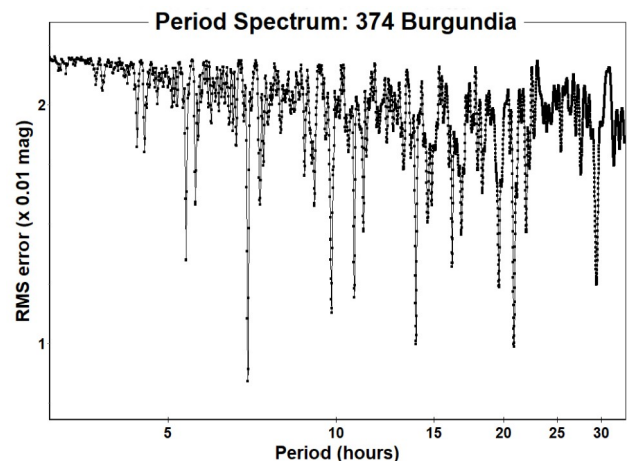
Collaborative observations of asteroids were made inside the UAI (Italian Amateur Astronomers Union) group. The targets were listed in the Shape/Spin Modeling Opportunities section from the most recent issues of the *Minor Planet Bulletin*. The CCD observations were made in 2018 August-October using the instrumentation described in the Table I. Lightcurve analysis was done at the Balzaretto Observatory with *MPO Canopus* (Warner, 2016). All the images were calibrated with dark and flat frames and converted to R magnitudes using solar colored field stars from CMC15 catalogue distributed with *MPO Canopus*. Table II shows the observing circumstances and results.

131 Vala is an X-type inner main-belt asteroid discovered on 1873 May 24 by C.H.F. Peters at Clinton. Observations were made over four nights. We found a synodic period of $P = 5.1796 \pm 0.0003$ hr and amplitude $A = 0.14 \pm 0.02$ mag. The period is close to the

previously published results in the asteroid lightcurve database (LCDB; Warner et al., 2009).



374 Burgundia is an S-type middle main-belt asteroid, discovered on 1893 September 18 by A. Charlois at Nice. Observations were made over seven nights. The period spectrum shows two stronger solutions near 6.9 and 13.8 hours with, respectively, a monomodal and bimodal lightcurve. The split-halves plot let us solve the ambiguity by showing that the two halves of the 13.8-hr solution were very symmetrical. This made the monomodal solution possible, but still not certain. Assuming a monomodal lightcurve, we found a synodic period of $P = 6.9637 \pm 0.0005$ hr and amplitude $A = 0.07 \pm 0.01$ mag. This period is close to that determined by Worman et al. (2004). The small amplitude and the monomodal solution could indicate a near polar aspect.

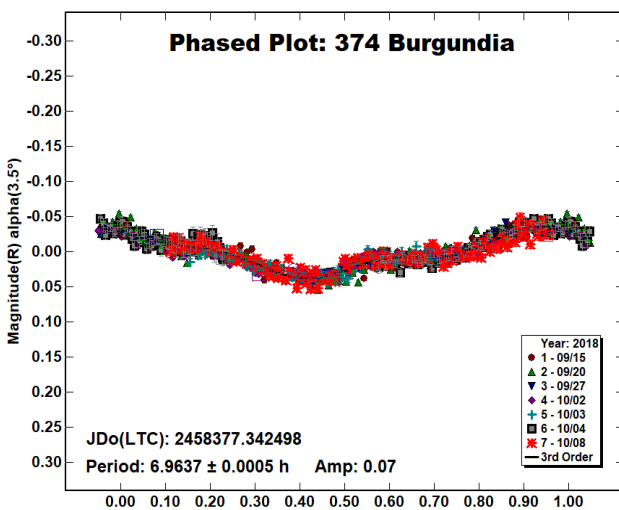
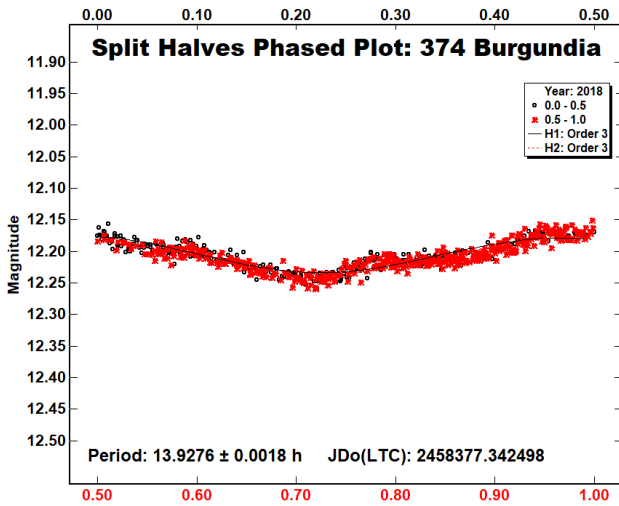


Observatory (MPC code)	Telescope	CCD	Filter	Observed Asteroids
Università Siena (K54)	0.30-m MCT f/5.6	SBIG STL-6303e (bin 2x2)	Rc	131, 374, 734, 929
M57 (K38)	0.30-m RCT f/5.5	SBIG STT-1603	C	131, 374
Iota Scorpis (K78)	0.40-m RCT f/8	SBIG STXL-6303e (bin 2x2)	Rc	374
GAMP(104)	0.60-m NRT f/4	Apogee Alta	C	131
G.Pascoli (K63)	0.40-m NRT f/3.2	QHY22 C 1318	C	131
WBRO (K49)	0.235-m SCT f/10	SBIG ST8-XME	C	734

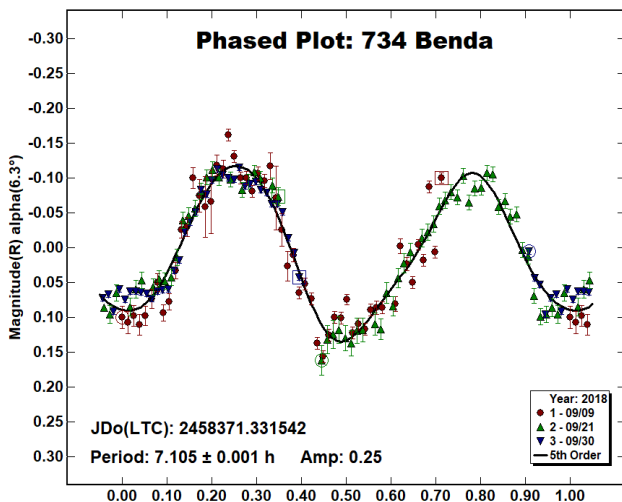
Table I. Observing Instrumentations. MCT: Maksutov-Cassegrain, NRT: Newtonian Reflector, RCT: Ritchey-Chretien, SCT: Schmidt-Cassegrain.

Number	Name	2018 mm/dd	Pts	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E	Amp	A.E.
131	Vala	09/21-10/03	722	4.7, 3.3	6	-6	5.1796	0.0003	0.14	0.02
374	Burgundia	09/15-10/08	678	3.5, 9.0	354	8	6.9637	0.0005	0.07	0.01
734	Benda	09/09-09/30	157	6.3, 1.7	3	0	7.105	0.001	0.25	0.04
929	Algunde	08/15-08/30	223	3.5, 8.8	323	6	3.3104	0.0003	0.11	0.04

Table II. Observing circumstances and results. Pts is the number of data points. The phase angle values are for the first and last date. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude and latitude at mid-date range (see Harris *et al.*, 1984).

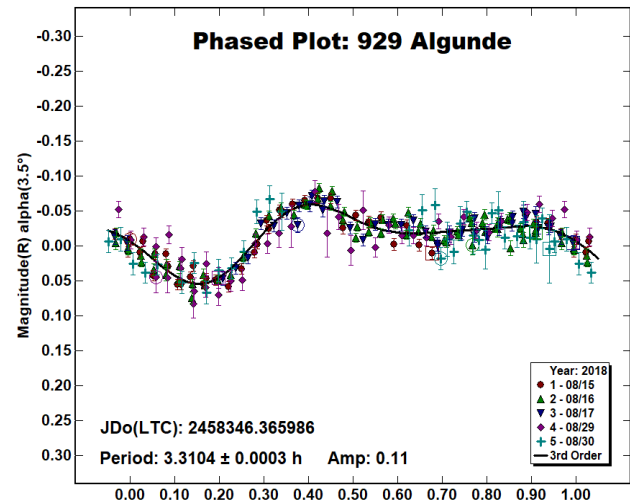


734 Benda is a C-type outer main-belt asteroid discovered on 1912 October 11 by J. Palisa Vienna. Observations were made over three nights.



We found a synodic period of $P = 7.105 \pm 0.001$ hr and amplitude $A = 0.25 \pm 0.04$ mag. The period is consistent with previously published results in the LCDB (Warner *et al.*, 2009).

929 Algunde is an S-type inner main-belt asteroid discovered on 1920 March 10 by K. Reinmuth at Heidelberg. Observations were made over five nights. We found a synodic period of $P = 3.3104 \pm 0.0003$ hr and amplitude $A = 0.11 \pm 0.04$ mag. The period is consistent with other results in the LCDB (Warner *et al.*, 2009).



References

DSFTA (2018), Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente – Astronomical Observatory.

<https://www.dsfta.unisi.it/en/research/labs-eng/astronomical-observatory>

Harris, A.W., Young, J.W., Scaltriti, F., Zappala, V. (1984). "Lightcurves and phase relations of the asteroids 82 Alkmene and 444 Gyptis." *Icarus* **57**, 251-258.

Warner, B.D., Harris, A.W., Pravec, P. (2009). "The asteroid lightcurve database." *Icarus* **202**, 134-146. Updated 2018 August. <http://www.minorplanet.info/lightcurvedatabase.html>

Warner, B.D. (2016). MPO Software, *MPO Canopus* v10.7.7.0. Bdw Publishing. <http://minorplanetobserver.com>

Worman, W.E., Fieber, S., Hulet, K. (2004). "Photometry of 374 Burgundia." *Minor Planet Bull.* **31**, 66-67.