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1.

CCD PHOTOMETRY OF 154 BERTHA

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CCD photometry of 154 Bertha indicates a long rotation period. One possible solution is found to be 27.6 hours, with $(H,G)=(7.7,0.3)$. The measured lightcurve amplitude is about 0.15 mag.

Observations

The asteroid 154 Bertha has previously published photometry from only one apparition (Harris and Young, 1989). Their 1980 observations were insufficient to determine the photometric rotation period. Only a lower limit of 12 hours was established. This paper presents additional photometry of 154 Bertha, obtained on six nights in March-April 1997. The observations were made with the 0.41-m f/9 Cassegrain telescope at the Uppsala Astronomical Observatory, using Kron-Cousins BVRI-filters and a SBIG ST-6 CCD. The observations were made only in the V band, except for the first night, when the colors were also measured. Standard

stars having different colors were chosen from the catalog of Moffet and Barnes (1979) and were observed over a range of air masses during each night to determine the extinction corrections. As necessary, formulae from Bessel (1979) were used to convert between Johnson and Kron-Cousins magnitudes. Usually the atmospheric extinction was not found to vary during a night, and could be determined with an accuracy about 0.02 mag./airmass. The exception is the night of March 8, when the standard stars deviate by up to 0.15 mag from the mean extinction curve, for unknown reasons. A visual inspection showed no indications of clouds. There may have been a temporary problem with the cooling or the flat field correction of the CCD. Thus the data from this night should be given lower weight. The observational geometry for each of the six nights is presented in Table I.

Results

Standard corrections were applied to the measured asteroid magnitudes for helio-geocentric distances, as well to the observation times for light travel time. Thereafter a period search algorithm was

applied to the data to find possible lightcurve periods. Since the phase angle dependence of the brightness is unknown, one of two strategies can be tried. Either several G -values of the (H,G) -system (Bowell et al., 1989) can be examined, or observations from different nights are allowed to be shifted with varying amounts. The shifts can then be used to determine G , assuming that the shifts are caused mostly by varying phase angles. Unfortunately, it turned out that the observations were not sufficient to make an unambiguous and accurate determination of the lightcurve period of 154 Bertha. It can be established that $P > 13.8$ hours, and although the value 13.8 hours is actually possible, it demands a too high value of G to be realistic. A better possibility is $P=27.6$ hours and $G=0.3$ (Fig. 1), which give a mean absolute magnitude, H , of about 7.7. These values also fits very well to the previous observations by Harris and Young. There may also be other reasonable solutions. The colors of 154 Bertha measured are $(V-R)_c = 0.36 \pm 0.02$ and $(V-I)_c = 0.71 \pm 0.01$ (at phase angle 8.5

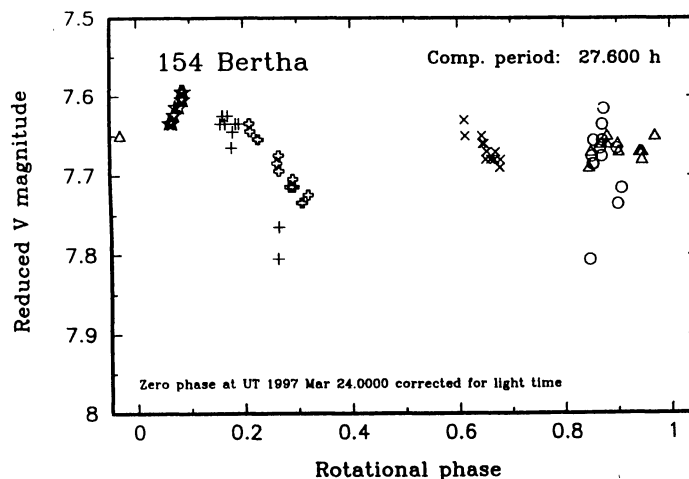


Table I. Observational geometry for photometry of 154 Bertha. Obs. time is the approximate Universal time at the start of the observations (and the time for which the parameters are calculated), r and d are the helio- and geocentric distance of the asteroid, respectively, a is the phase angle (in degrees) of the asteroid, and l and b are the ecliptic longitude and latitude (in degrees) of the asteroid, respectively.

Obs. time	r	d	a	l	b
1997 Mar 6.8	2.904	1.977	8.5	179.18	21.20
1997 Mar 8.8	2.903	1.970	8.1	179.39	21.15
1997 Mar 14.8	2.902	1.953	7.2	180.70	20.80
1997 Mar 17.8	2.901	1.948	6.9	181.37	20.58
1997 Apr 15.8	2.896	2.028	11.9	187.01	17.12
1997 Apr 20.8	2.896	2.063	13.2	187.61	16.36

Date	Magnitude shift	Reference
+ 1997 Mar 6.8	V -0.497	In preparation
○ 1997 Mar 8.8	V -0.483	In preparation
☆ 1997 Mar 14.8	V -0.453	In preparation
× 1997 Mar 17.8	V -0.442	In preparation
△ 1997 Apr 15.8	V -0.599	In preparation
◇ 1997 Apr 20.8	V -0.636	In preparation

Fig 1. The lightcurve of 154 Bertha obtained from the observations, using $G=0.3$ and $P=27.6$ hours. Reduced V magnitude corresponds to the magnitude the asteroid would have if observed at $r=d=1$ AU and $a=0$ deg.

degrees). Since the colors were only measured on one night, their phase dependencies are of course unknown.

References

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CLOSE APPROACHES OF MINOR PLANETS TO NAKED EYE STARS IN 1998

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A list is presented of approaches of minor planets brighter than magnitude 14 to naked eye stars. This may be helpful in finding some faint minor planets.

The accompanying table lists close approaches of minor planets to stars during 1998 where:

- The event takes place more than 30° from the Sun.
- The minor planet is brighter than visual magnitude 14.
- The star is brighter than magnitude 6.
- The minimum angular separation is smaller than $120''$.

This list can be helpful in locating some otherwise faint minor planets. By carefully drawing the star field around the predicted position down to the magnitude of the minor planet and comparing it to the situation some time later, one can detect the intruder by its apparent motion.

The information contained in the list is divided into 5 groups:

1. Date: gives the date and time in U.T. of the closest geocentric approach. All subsequent data pertain to this instant.

2. Closest approach: the two columns give the position of the minor planet with respect to the star:

- the minimum geocentric distance in seconds of arc
- the position angle in degrees, measured from north over east

3. Minor planet: gives information about the minor planet:

- number and name
- visual magnitude
- apparent motion in seconds of arc per hour
- parallax in seconds of arc

4. Star: the following data of the star are given:

- FK5 or PPM number
- visual magnitude
- right ascension for the equinox 2000.0
- declination (2000.0)

5. Sun and Moon:

- elongation of the Sun in degrees
- elongation of the Moon (degrees)
- illuminated fraction of the Moon in %

The *observed* minimum distance depends on the location of the observer on the Earth's surface but is always comprised between the minimum *geocentric* distance plus and minus the parallax. An occultation will be visible somewhere on the Earth when the parallax is greater than the geocentric separation.

The close approaches in this article were computed at the Scientific Computer Center of Agfa-Gevaert N.V., Mortsels, Belgium. The author would be pleased to receive reports from observers of these events.

Close approaches of minor planets to stars

[illegible]

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      "                                0
(Dist. < 120 ; El. Sun > 43
  Star < 6.0 ; Min. pl. < 14.0 )

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Date (U.T.)			Minim. dist.	Pos. ang.	Minor planet Name	Vis. App. Hor. mag. mot. par.			S t a r Designation			Vis. mag.	Right ascens. (2000.0)	Declination (2000.0)	Elongation Sun Moon		Ill. frac.
		h m	"	0			"/h	"			h m	0 '		0	0	%	
X 1997	dec 27	6 46.5	4.67	39	727 Nipponia	13.1	31.42	6.04	FK5 1123	5.6	4 28.54	+ 1 22.8	144	165	7		
	dec 28	17 18.7	9.29	37	111 Ate	12.4	25.94	4.61	PPM 157811	5.4	11 24.04	+ 1 24.5	105	94	1		
	dec 30	15 53.3	69.98	196	404 Arsinoe	13.6	27.93	4.28	FK5 159	3.7	4 19.79	+15 37.7	146	135	1		
1998	jan 2	0 56.7	19.02	178	178 Belisana	13.0	32.94	5.44	PPM 400073	5.5	5 29.27	+25 9.0	161	118	14		
	jan 3	14 55.3	74.95	13	100 Hekate	13.7	46.16	2.48	PPM 229579	5.8	14 58.89	-11 8.6	57	122	28		
	jan 6	0 9.9	109.07	3	654 Zelinda	13.0	48.46	4.28	FK5 1004	4.8	0 14.60	+20 12.4	86	22	55		
	jan 7	8 6.6	31.04	33	387 Aquitania	12.5	29.16	3.65	PPM 125951	4.9	8 57.59	+15 34.9	154	93	69		
	jan 8	18 49.1	17.67	157	385 Ilmatar	13.5	33.32	2.71	PPM 143079	5.9	0 2.40	+ 8 57.4	75	57	83		
	jan 10	18 58.7	99.09	147	410 Chloris	13.9	46.51	2.96	FK5 9	3.6	0 19.43	- 8 49.4	70	85	96		
	jan 12	6 50.7	85.78	160	202 Chryseos	13.7	46.90	2.20	FK5E 3791	5.8	22 24.45	-13 31.8	41	133	100		
	jan 13	22 57.9	108.28	360	654 Zelinda	13.1	52.91	4.14	PPM 89756	5.7	0 26.06	+20 8.8	80	114	98		
	jan 14	10 29.8	53.25	177	1639 Bower	13.7	38.36	6.78	PPM 98327	5.2	8 5.62	+27 31.8	172	19	97		
	jan 14	20 7.2	84.71	341	94 Aurora	12.1	21.19	4.27	PPM 70537	5.2	5 33.64	+34 43.5	148	56	95		
	jan 17	3 25.4	4.46	356	57 Mnemosyne	13.5	47.75	2.06	FK5S 3405	4.3	17 41.41	-12 52.5	32	98	82		
	jan 18	2 7.3	110.06	170	408 Fama	13.8	29.70	4.42	PPM 96740	5.8	6 55.31	+25 22.5	164	76	75		