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THE LIGHT CURVE OF THE NEW CATACLYSMIC VARIABLE SDSS J015543.40 +002807.2

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SDSS J015543.40 +002807.2 was identified as a likely magnetic CV by Szkody et al. (2002) using colour and spectral criteria. The system was also proposed to be of high inclination and to have an orbital period of about 87 min. We present here the first light curve of the object. We observed SDSS J015543.40 +002807.2 with the Nordic Optical Telescope (2.56m) during one night of remote observations in the Nordic-Baltic Research Course "Astrophysics of Interacting Stars", Moletai, Lithuania, August 11-25, 2002, using StanCam and the V filter of NOT Optical Filters collection. We collected a time series of $\approx$ 101 min duration using 60 s exposures and 7 s readout time.

Our differential magnitudes are calculated in the sense of SDSS J015541.53 +002812.11 (which we use as a comparison star) minus the target. There were no significant variations in the comparison star during the sequence.

Table 1. The SDSS data for the object and comparison star (J2000, magnitudes)

Star	u	g	r	i	z
SDSS J015543.40 +002807.2	15.90	15.23	15.18	15.41	15.57
SDSS J015541.53 +002812.11	19.46	17.49	16.74	16.35	16.15

The shape of the light curve is quite similar to the light curve shapes of other AM Her type stars (see, for example, Sirk and Howell, 1998), but has an unusually deep and sharp minimum (about $5\overset{\mathrm{m}}{.}9$) of 408 ($\pm$ 67) seconds duration (0.08 phase), which is likely due to the total eclipse of the white dwarf and the accretion stream by the late-type secondary. The $\approx 1^{\mathrm{m}}$ minimum before the eclipse might be identified as the far-field accretion stream dip (Sirk and Howell, 1998) superposed on a hump of around 2445-4560 seconds (0.47-0.88 phase).

It is possible to estimate the mass of the secondary using the relation $M_{sec} = 3.18 \cdot 10^{-5}P$, where P is the orbital period in seconds (Warner, 1976). Then the secondary mass is about $0.17M_{\odot}$. Assuming a white dwarf mass in the range of $0.3M_{\odot} - 1.4M_{\odot}$ we can make an estimate of the inclination (Downes et al., 1986; Bailey, 1990) and the semi-major axis of the orbit. The depth of the eclipse also proves that SDSS J015543.40 +002807.2 belongs to the group of high inclination systems. We get $i \approx 78^{\circ}$ for the WD mass about $0.3M_{\odot}$ and $i \approx 90^{\circ}$ for the mass $0.83M_{\odot}$ (Chanan et al., 1976). We find from Kepler's third law that the semi-major axis varies from $3.3 \cdot 10^{10}$ cm (for a circular orbit at 90°) to $4.5 \cdot 10^{10}$ cm, if the semi-amplitude K is about 406 km/s (see Szkody et al., 2002). Then

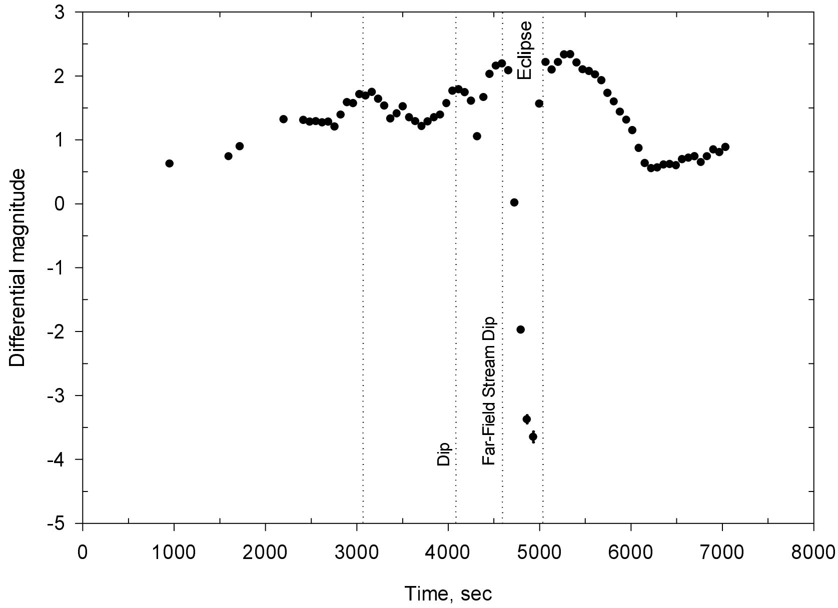

Figure 1. *V* filtered light curve of SDSS 015543.40 +002807.2. The zero point of the time scale corresponds to JD2452506.6157. Errors are less than the symbol size except for the two deep eclipse points. We also mark the possible interpretation of the curve features on the plot.

a very rough estimate of the bright stream size and/or the accretion region on the WD surface might be done assuming that the orbit is circular, and $i = 90°$. The maximum size of the bright stream in the orbital plane is determined by the time for the WD+bright region to pass into the secondary shadow, about $8.2 \cdot 10^9$ cm. This value is larger than typical WD radii ($\approx 7 - 8 \cdot 10^8$ cm) and has to include some light from the emitting stream as well.

The final conclusions about the object geometry and the model construction need to be done after further photometric observations throughout several cycles at different wavelengths are accomplished, as well as polarimetry which will establish the angle between the magnetic pole and rotation axis.

The paper is based on observations made with the Nordic Optical Telescope, operated on the island of La Palma jointly by Denmark, Finland, Iceland, Norway, and Sweden, in the Spanish Observatorio del Roque de los Muchachos of the Instituto de Astrofisica de Canarias.

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