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HIGH-FIELD POLAR AR UMa IN FAINT LUMINOSITY STATE

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AR UMa was classified as a polar based on the Einstein Slew Survey by Remillard et al. (1994). Like other polars, AR UMa switches between “high” (up 13^m) and “low” (16^m) luminosity states (Wenzel, 1993). The detailed spectral, photometric and polarimetric investigations were introduced by Schmidt et al. (1996). This object has one of the largest magnetic field: about 230 MGs. Beside this, there is an anticorrelation between the luminosity and the degree of polarization.

Our observations of this object were obtained on March 16, 1999 using the 2.6-m Shain Telescope of the Crimean Astrophysical Observatory, altogether 424 points of photometry and circular polarization data with a 4 sec exposure time in the wide R filter ($\lambda \approx 0.5\text{--}0.75$ micron). Unfortunately, we had not measured any comparison star, but the brightness of AR UMa was about 16^m.5. Our observations spanned a time interval of about 1.56 hours, i.e. only about 80 percent of the 1.932 hour orbital period. The orbital variations are well pronounced in the photometric phase curve (Figure 1a). The phase zero corresponds to the crossing the mean velocity by the radial velocity of the high velocity emission line component. This crossing corresponds to the inferior conjunction of the secondary star (Schmidt et al., 1996, [1]).

Thus the elements are:

$$\text{HJD} = 2450096.9085 + 0.0805 \times E. \quad (1)$$

Large dispersion of the data may be explained by poor quantum statistics, rather than real oscillations. The mean circular polarization is significantly positive (5.82 ± 0.45 per cent), what corresponds to results for a faint state obtained by previous investigators. The phase curve of circular polarization, which was binned into 16 intervals (Figure 1b), also demonstrates orbital variations. Beside this, the accuracy estimates obtained from the quantum statistics are smaller than real deviations (Shakhovskoy et al., 1998). This argues for a presence of polarization variations within time bins.

AR UMa is a very interesting star, and, during high states of luminosity, its brightness may increase up to 13^m–14^m, which makes this polar a very perspective object for further investigations.

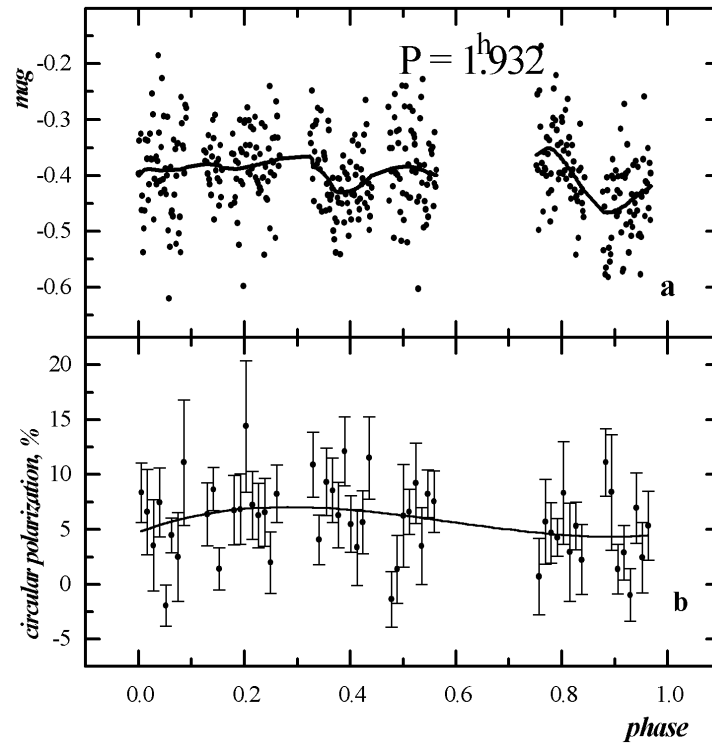


Figure 1. Photometric (a) and circular polarization (b) phase curve of AR UMa, 2.5-m Shain Telescope, CrAO, JD 2451254

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