

Fundamental parameters of BE UMa revised

Shimanskii V., Borisov N., Pozdnyakova S., Bikmaev I., Vlasyuk V., Sakhbullin N., Spiridonova O.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

We have determined a complete set of parameters for the young pre-cataclysmic variable BE UMa from a comprehensive photometric and spectroscopic analysis using model atmospheres. Our precise photometry and spectroscopy were acquired with the 6-m telescope and Zeiss-1000 telescope of the Special Astrophysical Observatory and the 1.5-m Russian-Turkish telescope at a wide range of orbital phases, including times of primary eclipses. We performed a detailed identification of emission lines of ten elements. At phases of minimum brightness, the spectra reveal absorption lines and molecular bands formed in the secondary's atmosphere, whose effective temperature was determined to be $T_{\text{eff}}(2) = 4750 \pm 150$ K. We have studied the radial-velocity curves of the cool star using lines of various elements. All the curves exhibit the previously predicted distortions due to reflection effects in the close binary. The derived component-mass ratio is $q = 0.43 \pm 0.09$, and the component masses are $M_1 = 0.59 \pm 0.07 M_{\odot}$ and $M_2 = 0.25 \pm 0.08 M_{\odot}$. We analyzed the light curves using model atmospheres for irradiated stars; all the parameters of BE UMa were refined. We demonstrate the validity of our modeling of the binary's spectra at phases of brightness maximum, which provides a good description of the observed intensities of most lines of heavy elements. The abundances of helium and several light elements (C, N, O, Ne, Mg) in the atmosphere of the cool star are probably higher than the solar values. We conclude that the physical characteristics of the primary are in good agreement with evolutionary tracks for planetary-nebula nuclei, and that the secondary is overluminous by a factor of 30 compared to main-sequence stars of the same mass. © 2008 Pleiades Publishing, Ltd.

<http://dx.doi.org/10.1134/S1063772908070056>
