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ANOTHER COMPONENT IN THE MULTIPLE SYSTEM η Mus

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The multiple star η Mus (HD 114911, HIP 64661, HR 4993) contains a bright ($V \sim$ 4.8-4.9, $B - V \approx -0.08$, $U - B \approx -0.34$) young B8V type eclipsing binary, about 58 arcsec from a 7.3 mag visual companion η Mus B (CD 67 1384B) and within ∼3 arcsec of a 10th mag (J) closer companion (η Mus C = DUN 131C). The sky location, HIPPARCOS distance 124 ± 9 pc and proper motions ($\mu_\alpha \cos\delta = -36.92$; $\mu_\delta = -10.63$ mas y^{-1}), make the system a likely member of the Lower Centaurus Crux concentration of the Sco-Cen OB2 Association (Nitschelm, 2004). This setting makes the system of interest for star formation studies and understanding gravitational binding within young associations.

Although included in several early programmes, the eclipsing binary nature only became clear after the HIPPARCOS light curve appeared (ESA, 1997). Buscombe and Morris (1961) had combined early spectroscopy with their own to produce a primary radial velocity curve and mass function, suggestive of a low secondary mass. The period used by Buscombe and Morris (1961) was apparently an alias of that found by HIPPARCOS, so promoting updated spectroscopic study, such as that published by Bakış et al. (2007).

Tokovinin's (1997) catalogue gave an estimate of the period for the wide pair at around 200000 y. But Bakış et al. (2007), noting the significant difference (∼ 12 km s^{-1}) in radial velocity between the A and B components then challenged the idea that the wide system is gravitationally bound. Hubrig et al. (2001), whilst examining η Mus for a possible X-ray source had discovered the additional pre-main sequence companion η Mus-C, separated by 2.71 arcsec at position angle 125 deg, with magnitude differences 5.25, 4.54 and 3.32 in the J, H and K-bands. If this star is bound to η Mus A it should have an orbital period in the order of 3000 y.

The classical EA light curve from HIPPARCOS suggests two fairly well separated stars at relatively low inclination, or perhaps third light. Curve-fitting experiments, that the present authors will present elsewhere, show an acceptable model for the HIPPARCOS data can be found without significant third light, however. This was also confirmed in fittings of the *uvby* photometry of the system by Hensberge et al. (2007).

New Component

Bakış et al. (2007) presented initial data taken with the HERCULES spectrograph of the Dept. Physics and Astronomy, UC (Hearnshaw et al. 2002). This has been added to our later data using essentially the same set-up. A slight difference between the γ velocity applying for May and September of 2006 was noticed and this prompted the present authors to further observations in 2010 and 2011. It has recently become apparent that the γ velocity of the main pair cycles in a rather eccentric orbit with the relatively short timescale shown in Fig. 1.

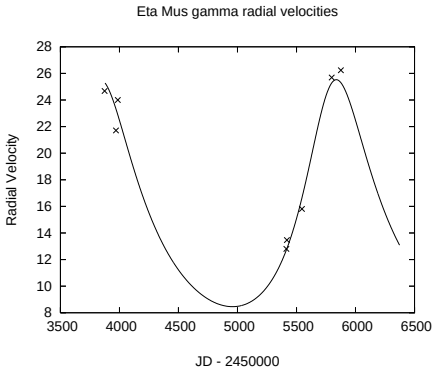

Figure 1. Preliminary model for the γ-velocity variation of η Mus

The $\sim$ y period orbit shown, which is plotted as y-velocity against time from the epoch JD 2453873 (2006 May 17), appears consistent with a small number of recent well-timed minima produced under the SBDSLR programme of the Variable Stars South (RASNZ); as well as photometry of the system, communicated privately by Dr H. Hensberge. Those data intermittently cover a timebase of $\sim$30y, although timing of the several minima they include is necessarily poor, relying only on model fitting to a small number of displaced points. The authors will provide more details of these analyses separately. More observations are clearly needed to substantiate this still very sketchily known inner system.

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