

A first orbital solution for the very massive 30 Dor main-sequence WN6h+O binary R145

O. Schnurr(1,2), A.F.J. Moffat(1), A. Villar-Sbaffi(1), N. St-Louis(1), N.I. Morrell(3)

(1) Universite de Montreal, Canada

(2) University of Sheffield, UK

(3) Las Campanas Observatory, Chile

We report the results of a spectroscopic and polarimetric study of the massive, hydrogen-rich WN6h stars R144 (HD 38282 = BAT99-118 = Brey 89) and R145 (HDE 269928 = BAT99-119 = Brey 90) in the LMC. Both stars have been suspected to be binaries by previous studies (R144: Schnurr et al. 2008b; R145: Moffat 1989). We have combined radial-velocity (RV) data from these two studies with previously unpublished polarimetric data. For R145, we were able to establish, for the first time, an orbital period of 158.8 days, along with the full set of orbital parameters, including the inclination angle i , which was found to be $i = (38 \pm 9)$ deg. By applying a modified version of the shift-and-add method developed by Demers et al. (2002), we were able to isolate the spectral signature of the very faint-line companion star. With the RV amplitudes of both components in R145, we were thus able to estimate their absolute masses. We find minimum masses $M_{WR} \sin^3(i) = (116 \pm 33) M_{\odot}$ and $M_O \sin^3(i) = (48 \pm 20) M_{\odot}$ for the WR and the O component, respectively. Thus, if the low inclination angle were correct, resulting absolute masses of the components would be at least 300 and 125 M_{\odot} , respectively. However, such high masses are not supported by brightness considerations when R145 is compared to systems with known, very high masses such as NGC3603-A1 or WR20a. An inclination angle close to 90 degrees would remedy the situation, but is excluded by the currently available data. More and better data are thus required to firmly establish the nature of this puzzling, yet potentially very massive and important system. As to R144, however, the combined data sets are not sufficient to find any periodicity.

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Email: o.schnurr@sheffield.ac.uk