# TRIPLE SYSTEM $\epsilon$ Vol AND QUADRUPLE SYSTEM $\eta$ Mus: THE MASS RATIO IN CLOSE BINARY SYSTEMS

MEDICI, A.; HUBRIG, S.

Astrophysikalisches Institut Potsdam, An der Sternwarte 16, D-14482 Potsdam, Germany

In the course of our spectroscopic study aimed at searching the line Hg II $\lambda$ 3984 in a sample of 28 spectroscopic binaries with late B primaries, 11 new double-lined spectroscopic binaries were discovered, 10 of which were previously known as single-lined systems: 3 Si stars (HD 35008, HD 61512, and HD 130081), one He-weak star (HD 139160), 5 stars with normal late B primary (HD 68520, HD 87191, HD 102010, HD 114911, and HD 162515) and two stars with HgMn anomaly (HD 75642 and HD 87751) (Hubrig & Mathys 1996). The observations were carried out at the European Southern Observatory for five nights spanning from March 16 to March 20. We used the 1.5 m telescope and the Boller & Chivens spectrograph, equipped with a Ford Aerospace chip. Spectra were recorded at a resolution of approximately 1 Å over the wavelength range 3700–4600 Å.

In two stars with known orbital parameters, HD 68520 (= $\varepsilon$ Vol, spectral type B5, V = 4.3) and HD 114911 (= $\eta$ Mus, spectral type B8, V = 4.8), the lines issued from both components in binary systems are clearly separated in some phases. In this paper we report about the mass ratios of these systems.

## HD 68520 ($\varepsilon$ Volantis)

This star is listed in the Eighth Catalogue of the Orbital Elements of Spectroscopic Binary Systems (Batten et al. 1989) as a single-lined system. The orbital parameters for the primary component were calculated by Sanford (1914) using the method of Lehmann-Filhes. One of his spectrograms gives evidence of a secondary's spectrum which yielded the mass ratio $\mathcal{M}_1/\mathcal{M}_2 = 1.23$. From our observations we obtain $\mathcal{M}_1/\mathcal{M}_2 = 1.30$.

The catalogue of multiple stars (Tokovinin 1997) indicates $\varepsilon$ Vol to have one visual companion which is $2\overset{\mathrm{m}}{.}9$ fainter and separated by $6\overset{''}{.}1$ at position angle 24°. From the spectral type of the primary Tokovinin estimates the mass of the primary $\mathcal{M}_1 = 5.76$ M$_\odot$. Assuming a minimum secondary mass for the single-lined system, he obtains $\mathcal{M}_2 = 3.26$ M$_\odot$ for the secondary. Adopting these values the mass ratio for this system will be 1.77.

## HD 114911 ($\eta$ Muscæ)

This star is also listed in the Eighth Catalogue of the Orbital Elements of Spectroscopic Binary Systems (Batten et al. 1989) as a single-lined system. The orbital parameters for the primary component were calculated by Buscombe & Morris (1961). Our observations yield a ratio $\mathcal{M}_1/\mathcal{M}_2 = 1.14$.

In the catalogue of multiple stars (Tokovinin 1997) $\eta$ Mus is mentioned as a triple star with a visual companion with common proper motion at the distance of 60.′′00 and position angle of 332°. This companion is 3.$^{\mathrm{m}}$4 fainter than $\eta$ Mus. From the spectral type of the primary Tokovinin estimates the mass of the primary $\mathcal{M}_1 = 4.48$ M$_\odot$. Assuming a minimum secondary mass for the single-lined system, he obtains $\mathcal{M}_2 = 2.63$ M$_\odot$ for the secondary. Adopting these values the mass ratio will be 1.70.

In fact, the triple system $\eta$ Mus is a quadruple system. In March 1999 we have observed $\eta$ Mus with the ESO adaptive optics system ADONIS at the 3.6-m telescope on La Silla. Our observations revealed an additional faint companion separated by 2.′′71 at position angle 125° (Hubrig & Mignant 2000). The magnitude differences in the K, H and J bands are 4.$^{\mathrm{m}}$32, 4.$^{\mathrm{m}}$54 and 5.$^{\mathrm{m}}$25, respectively.

References:

Batten A. H., Fletcher J. M., MacCarthy D. G., 1989, Eighth Catalogue of the Orbital Elements of Spectroscopic Binary Systems, Publ. Dominion Astrophys. Obs., **17**
Buscombe W., Morris P. M., 1961, MNRAS, **123**, 183
Hubrig S., Mathys G., 1996, A&AS, **120**, 457
Hubrig S., Mignant D. L., 2000, in prep.
Sanford R. L., 1914, Lick O. Bull., **8**, 127
Tokovinin A. A., 1997, A&AS, **124**, 75