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OBSERVATIONS AND ANALYSIS OF BE STAR CIRCUMSTELLAR ENVIRONMENTS WITH THE LONG BASELINE CHARA ARRAY INTERFEROMETER

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We present our approach in studying and determining the physical and geometrical properties of the circumstellar disks around Be stars. We use observational results on several Be stars obtained with the long baseline CHARA Array interferometer in the *K*-band. We were able to define for each case the envelope characteristics (projected shape and orientation) and to constrain the gas density and temperature profile interferometrically.

In order to investigate the large amount of gas ejected from the rapidly rotating Be stars, we have developed a simple model that uses the geometry of an axisymmetrical, flattened, expanding disk around the central star (Gies et al. 2007; Rivinius et al. 2001). The model generates synthetic infrared images of the circumstellar material using radially decreasing density and temperature profiles. The disk gas density and temperature distribution functions are given by the equations (1) and (2) shown below:

$$\rho(r,z) = \rho_0 * (r-r_0)^{-n} * \exp -(\frac{z}{2*H(r)})^2 \quad (1)$$

$$T(r) = T_0 * (\frac{r}{r_0})^{-q} . \quad (2)$$

The synthetic images are transformed to visibilities so that they can be directly compared to observational data. We show as an example results for the case of the Be star γ Cas in Figure 1. The visibility plot shows an allowed region for the predicted (u,v) plane, limited between the projected visibility along the major and the minor axes. We also use a uniform disk model to estimate the projected angular size of the envelope, and calculate the disk projected ellipticity on the sky. Using the derived value for the inclination angle and an accurate spectroscopic value of the projected rotational velocity $v \sin i$, we are able to give an estimate of the actual rotational velocity of the central star. Furthermore,

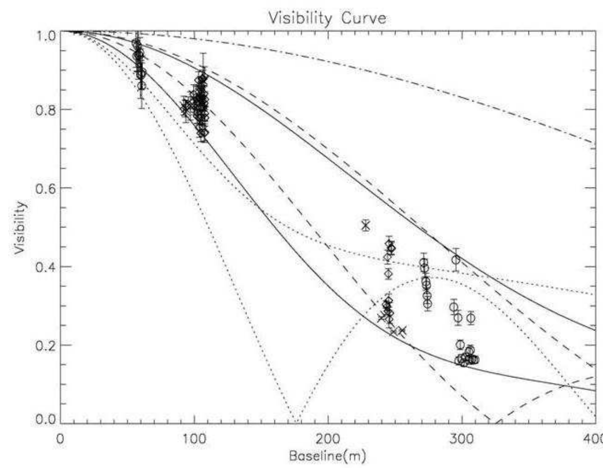

Fig. 1. Visibility as a function of baseline for the Be star γ Cas. Solid lines are the projected visibilities obtained with our model along the major (lower) and minor (upper) axis. The dashed lines are the best fit visibilities along the major and minor axes using a simple uniform disk model. The upper dotted line is a Gaussian profile fit of the data, and the lower dotted curve is for the ring model (ruled out). The dash-dotted line is the unresolved central star's visibility curve.

we have collected from the literature several magnitude measurements at longer wavelengths and we fit the IR excess flux and the overall spectral energy distribution to estimate a more precise temperature exponent q. The obtained values for the gas base density ρ_0 and the density exponent n are consistent with the IRAS measurements (Waters et al. 1987), and the position angles are comparable with those from Quirrenbach et al. (1997). The same approach is followed for each of the 21 Be stars in our survey, and first results about their geometrical and physical properties will be published in the near future.

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