FIRST MEASUREMENTS OF γ CASSIOPEAE'S HYDROGEN ENVELOPE

P. Granes
CERGA, Avenue Copernic, F-06130, Grasse, France

C. Thom
Institut Géographique National, 2 Av. Pasteur, F-94160
Saint Mandé, France

F. Vakili
CERGA, Observatoire de Calern, Caussols, F-06460
Saint Vallier de Thiey, France

1 - INTRODUCTION

In the framework of an interferometric program on Be stars, first announced during the IAU general assemblies at Patras, 1982, recently at New Delhi, 1985 and reported in the "Be Star Newsletter" n°6 and 13, we try to measure the angular diameter of the central star, hydrogen envelope and, if possible, its movement, of the brightest Be stars in the context of pulsating atmosphere or binary star hypothesis.

2 - OBSERVATIONS

The observations of γ Cas were made with the 2 Telescope Interferometer (I2T) at CERGA Observatory. The characteristics of this instrument are described by Koechlin and Rabbia (1985). For our observing run we used a high dispersion mode, with a 500 Å range centered on 6400 Å. Simultaneous interference fringes were recorded in the continuum and the Hα emission line, using a photon counting camera (Blazit et al. 1977) at the standard rate of 50 images per second to freeze atmospheric turbulence. Images were video-tape recorded during 30 minutes, for each baseline and the frame analysis was carried off-line by C.Thom fringe processor (1984). The baselines ranged from 8 to 25 meters, corresponding to a 17 to 4.5 milliarcsecond angular resolutions at 6563 Å.

Our previous interferometric survey on γ Cas (Vakili et al. 1984) had given a 0.9 marcs. upper limit for the angular diameter of the central star. Therefore, the central star taken in the continuum is a point-like source for the resolutions considered above, so the continuum was taken on two broad spectral channels on the red and blue sides of the Hα line: 87 Å centered on 6550 Å and 52 Å on 6620 Å respectively. The FWHM of Hα was estimated as 10 Å and the line width was chosen 20 Å for photon counting considerations. The ratio of the visibility in Hα and the mean visibility between the red and blue band in the continuum is taken as the absolute contrast.

3 - RESULTS

Since I2T measures the projected intensity of the envelope along N/S direction, we adopted a gaussian model for the projection of the limb darkening law in the Hα emissive region. The central star contributes to the fringe visibility curve in the Hα channel. To estimate this contribution, we need the ratio of the intensity through 20 Å centered on Hα to an equivalent spectral bandwidth in the neighbouring con-

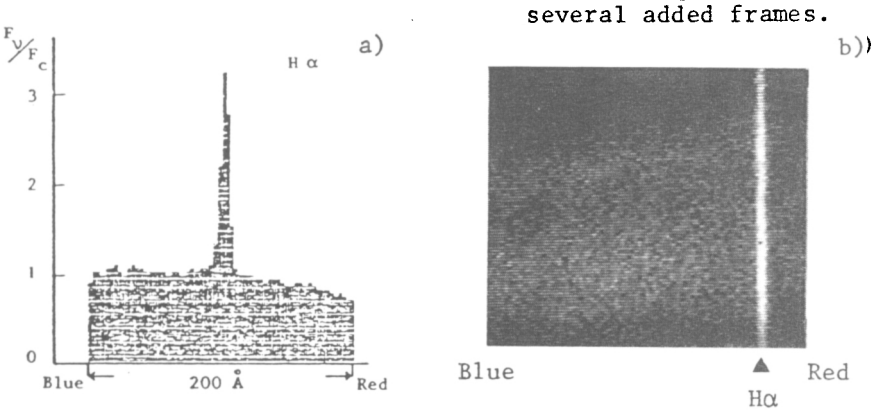
https://doi.org/10.1017/S0252921100116008 Published online by Cambridge University Press

tinuum. The Fourier spectrum of a gaussian is also a gaussian and the angular extent of the source is directly estimated from a least squares fit of the corrected visibility curve. For a gaussian model, we found an angular diameter of the envelope (without absorption) which corresponds to the equivalent uniform disk diameter of :

$$D_e = (6.0 \pm 0.7) \text{ marcs.}$$

For an absorption of 20% of the light of the star in the Hα channel, as given in a previous paper (Thom et al. 1986): $D_e = (5.2 \pm 0.7)$ marcs. At 220 pc, this result corresponds to $\approx 260\ R_\odot$ for the absolute dimension of the envelope (Schmidt-Kaler, 1964).
The phase visibility function was also analysed inside the emission line. From the fringe deviations across Hα, we found that the shell projection on the N/S direction is centered on the star, with a 0.3 marcs precision. We have observed, in the intensity spectrum, that the ratio of the flux at the top of the Hα line and the flux of the continuum taken on each side of the line profile was typically 3 during our campaign (figure 1).

Figure 1 a) Hα intensity spectrum. b) Hα on oblique fringes for several added frames.



4 – CONCLUSION

The envelope of γ Cas is presently shown as symmetrically dispersed around the star with an angular diameter of 6.0 marcs. The measured D_e/D_* ratio is greater than 6.6, which is consistent with the predicted values (3 to 15 expressed in R_*) for the Hα line formation region in the PM's model (Poeckert and Marlborough, 1978). However further observations are required to have more information on the optical thickness of the envelope and for this purpose observations in Hβ line are proposed.

REFERENCES

Blazit, A., Bonneau, D., Koechlin, L., Labeyrie, A., 1977, Ap.J. 214, L79.
Koechlin, L. and Rabbia, Y., 1985, Astron.Astrophys. 153, 91.
Poeckert, R. and Marlborough, J.M., 1978, Ap.J. 220, 940.
Schmidt-Kaler, Th., 1964, Veroff.Astr.Inst.Univ.Bonn, n°70.
Thom, C., 1984, Proc.Coll."Kilometric Optical Arrays in Space", ESA SP-226.
Thom, C., Granes, P., Vakili, F., 1986, Astron.Astrophys., in press.
Vakili, F., Granes, P., Bonneau, D., Noguchi, M., Hirata, R., 1984, Publ. Astron. Soc. Japan 36, 231.

https://doi.org/10.1017/S0252921100116008 Published online by Cambridge University Press