THE FeII λ5317 LINE PROFILE OF NINE Be STARS(*)

D. BALLEREAU, J. CHAUVILLE
Observatoire de Paris-Meudon - 92195 Meudon Cedex, France

and

J. ZOREC
Institut d'Astrophysique - 98bis, Bd. Arago, 75014 Paris, France

Abstract. Our aim is to analyse the FeII λ5317 emission line of nine Be stars recorded in 1990, to deduce some constraints on the modeling of their envelope and to compare them to the results obtained in 1985 and 1987 by other authors.

1. Introduction and observations

Be stars are known to present emission lines on the first Balmer terms of their spectrum, episodically or permanently. Some early (<B5) Be stars show in addition FeII emission lines, when the emission on Balmer lines reaches a threshold of strength. These lines are produced by a moving circumstellar gas supposed to be more or less concentrated in the equatorial plane.

The FeII line profiles displayed in Figure 1 (α Col, HR2142, β^1 Mon, κ CMa, NV Pup, *o* Pup, PP Car, 48 Lib and χ Oph) were observed in Feb. 1990 at the La Silla Observatory (T1.52m, ECHELEC spectrograph, R = 32000, S/N $\simeq$ 200). The Hγ line of seven of nine of the program stars were also recorded.

2. Discussion and conclusions

Two of our sample stars (β^1 Mon and 48 Lib) present a shell reversal. The one of 48 Lib has two components, which are explained by Hubert et al. (1989) by the presence of two layers with different RVs. Seven stars display Class 1 profiles, one a Class 2 profile (κ CMa) and one an intermediate Class profile (χ Oph), according to the classification of Hanuschik (1987). We measured the widths of each emission line at three levels (base, half-height, peaks) and found that a clear linear correlation exists between them and V sin i, which confirms the results of Hanuschik (1987), Slettebak et al. (1992) and Dachs et al. (1992). If we take into account the peak separations for FeII and Hγ, the regression lines are respectively represented by ΔV_{peaks}^{FeII} = V sin i - 7 and $\Delta V_{peaks}^{H\gamma}$ = 0.95 V sin i - 63 ; the plot of the peak separations of Hγ versus FeII's ones leads to a regression line $\Delta V_{peaks}^{H\gamma} = \Delta V_{peaks}^{FeII}$ - 67 , which indicates that the FeII emitting region is inside the Hγ one.

If we use the relation ΔV_{peaks} = 2 V sin i r^{-j} (Huang 1972), r being the outer radius of the FeII and Hγ emitting disks (case of a keplerian movement

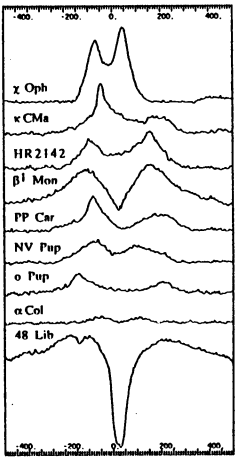
L. A. Balona et al. (eds.), Pulsation, Rotation and Mass Loss in Early-Type Stars, 263–264.

https://doi.org/10.1017/S0074180900215003 Published online by Cambridge University Press

with j = 1/2), we obtain the r values given in the Figure 1, for the epochs 1985, 1987 and 1990. We note that the FeII emitting disk of six stars vary in a monotonic way, while two show an extremum.

In conclusion, we may emphasize the following points :

- the width parameters of the FeII emission lines are correlated with the V sin i of the central star
- for several stars, the total width of the FeII emission lines is larger than 2 V sin i, which implies additional broadening phenomena
- the FeII disk is closer to the star than the Hγ disk by a factor of 0.75
- an increase of the equivalent width of FeII emission lines is not always correlated with an increase of the outer radius of the disk
- the long term modeling constraints obtained from different sets of spectroscopic data are sometimes in contradiction.



star	r_{FeII}/r_* 1985(a)	r_{FeII}/r_* 1987(b)	r_{FeII}/r_* 1990(c)	$r_{H\gamma}/r_*$ 1990(c)
α Col	3.7	5.1	5.1	-
HR2142	9.5	8.4	7.8	9.1
β¹ Mon	3.8	4.3	5.2	5.5
NV Pup	6.7	6.6	6.9	-
o Pup	3.1	4.2	3.3	5.0
PP Car	4.6	3.4	3.3	3.7
48 Lib	-	8.9	5.0	5.9
χ Oph	8.2	7.5	6.3	1 4

Remarks :
(a)... from Hanuschik (1987)
(b)... from Dachs et al. (1992)
(c)... this work

Fig. 1. Intensity tracings of the FeII λ5317 lines of our sample stars. The intensity of the emission decreases from the top to the bottom. The Table gives the outer radii of the FeII emitting disks at three epochs (with the Hγ emitting disk in 1990).

(*)*Observations obtained at the ESO (La Silla, Chile)*

References

Dachs, J., Hummel, W., Hanuschik, R.W.: 1992, *Astron. Astrophys. Suppl.* **95**, 437
Hanuschik, R.W.: 1987, *Astron. Astrophys.* **173**, 299
Huang, S.-S.: 1972, *Astrophys. J.* **171**, 549
Hubert, A.-M., Hubert, H., Floquet, M. et al.: 1989, in P. Delache, S. Laloe, C. Magnan and J. Tran Thanh Van, ed(s)., *Modeling the Stellar Environment : How and Why ?*, Editions Frontières, 263
Slettebak, A., Collins II, G.W., Truax, R.: 1992, *Astrophys. J. Suppl.* **81**, 335

https://doi.org/10.1017/S0074180900215003 Published online by Cambridge University Press