

MORE *EINSTEIN* VIEWS OF WOLF-RAYET STARS

A.M.T.Pollock

Computer & Scientific Co. Ltd., Sheffield S11 7EY, England

1. The X-ray spectrum of HD 93162 WR25 WN7

HD 93162 is a star of special interest because of its unexplained and unusually high X-ray luminosity that is roughly 100 times greater than typical W-R values and rivalled only by HD 193793, although in contrast to WR140 it is not variable and despite the concentrated efforts of optical radial velocity observers shows no evidence of binarity. In addition to several *Einstein* X-ray IPC and HRI observations there was also one with the high-resolution SSS non-imaging 0.4-4. keV spectrometer on 1979 July 17. In the 6'-diameter aperture of this instrument the star's spectrum is diluted by a contribution from the Carina Nebula's diffuse emission, that from inspection of the IPC image should be roughly equal in intensity, and by an instrumental background of again roughly the same intensity. The SSS data were extracted and analysed via remote access over the network to the EXOSAT database system. The instrumental-background-subtracted spectrum was modelled with two components: (1) the diffuse component assumed, following Chlebowski et al's η Carinae work, to be a Raymond-Smith thermal plasma of fixed temperature $T = 7 \times 10^6$ K and X-ray absorbing column density $N_X = 2 \times 10^{21} \text{cm}^{-2}$ but unknown intensity; and (2) the stellar component, assumed to be a Raymond-Smith thermal plasma of unknown temperature and intensity with absorption constrained to be at least the interstellar value. The two best-fit components are of almost equal intensity and give a good fit to the data. For the W-R star, the following parameters apply:

$$\text{HD 93162} \quad L_X(0.4 - 4.0\text{keV}) = 4.2 \times 10^{33} \text{ergs s}^{-1} \quad T = 27 \times 10^6 \text{K}$$

This is a much higher temperature than those of the OB supergiants like δ Orionis but is something it shares with HD 193793, where the high luminosity is almost certainly caused by colliding winds in a binary system. Perhaps this is a further piece of evidence that HD 93162 is a WR+O binary system seen at low inclination.

2. An X-ray image of NGC 6321 including HD 152270 WR79 WC7+O5

HD 152270 lies in the core of the NGC 6321 cluster in a crowded field with 4 other hot stars brighter than 7^m with spectral types between O6 and B0.5, all potential X-ray sources. The nominal angular resolution of the *Einstein* IPC instrument, with which the cluster was observed on 1980 March 13, was $\sim 1'$ so that the images of all five stars overlap. The only sensible approach is to model the image by fitting the intensity of the background and all five sources simultaneously. A likelihood method was used with the relative source positions fixed at values determined by the known coordinates. The results were as follows:

		V	$L_X(0.2 - 4.0\text{keV}) 10^{32} \text{ergs s}^{-1}$
HD 152248	O8	6.11	27. \pm 5.
HD 152249	O9Ib	6.47	9. \pm 4.
HD 152270	WC7+O5	6.59	10. \pm 3.
HD 152234	B0.5Ia	5.45	< 5.
HD 152233	O6	6.59	16. \pm 4.

These are more accurate values than previously published: WR79 is twice as bright as previously published putting it among the brightest of the WC stars as common among the WR+O binaries.