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INSTRUMENT SCIENCE REPORT

CAL/FOS-011

TITLE: Scattered Light Background Perpendicular to the
Dispersion - Preliminary Version (FOS Calibration #19)

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ABSTRACT

An analysis of the scattered light perpendicular to the direction of spectral dispersion was done for all FOS dispersers using data taken during the thermal vacuum calibration in July 1984 and during ambient calibration in August 1984. The intensity of the scattered light is less than 0.5% of the intensity of the spectrum at positions 1500 microns above or below the spectrum on the photocathode.

A spectrum that is not completely understood appeared on both tubes when the blank aperture and grating L65 were in place.

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I. DATA ACQUISITION

Perpendicular scattered light data were obtained during the July 1984 thermal vacuum calibration using an Argon Lamp and during the August 1984 ambient calibration using tungsten and deuterium lamps.

For each grating, a 3.2mm by 25.6mm area was scanned with all 512 channels using a vertical (y) stepsize of 200 microns.

II. DATA REDUCTION

The raw data were ^{average} corrected for non-linearities and dead diodes. The ~~dark~~ light level for the August data (0.65 counts/sec on the red side, and 0.07 counts/sec on the blue side), as measured using the blank aperture, was subtracted. The dark count for the July 1984 data taken during thermal vacuum testing is negligible. At each vertical position, the sum of the counts for all channels at each y-position was normalized to the sum of the total number of counts for all vertical positions. Normalization to the vertical position with the greatest counts is not appropriate because of the use of paired apertures and apertures with a height greater than the diode array. The results are shown in the upper plots of Figures 1 to 14. The second plot in Figures 1 to 14 shows the counts/sec in each channel at the y-position with maximum counts. The bottom plot shows the scattered light background from the first y-position.

(< 0.002 cts/s on
both sides)

III. ANALYSIS

The scattered light perpendicular to the direction of dispersion has the following relative intensity measured at 1500 microns from the spectrum.

<u>TUBE</u>	<u>DISPERSER</u>	<u>SCATTERED LIGHT</u>
Blue	H13	0.001
Blue	H19	0.002
Blue	H27	0.002
Blue	H40	0.001
Blue	H57	0.002
Blue	L15	0.002
Blue	L65	0.001
Blue	Prism	0.001
Red	H27	0.005
Red	H40	0.002
Red	H57	0.002
Red	H78	0.004
Red	L65	0.002
Red	Prism	0.001

Most of the counts in the background are due to perpendicular scattered light, since the background in the bottom plots show shapes similar to the spectra in the middle plots.

Some scattered light, which is not due to scattering perpendicular to the order, is evident in the plots for the red tube prism, H27, and H57 (Figures 9, 11, and 14).

Figures 15 and 16 show the puzzling results for the blank apertures. These figures represent the same treatment of the data as Figures 1-14, except that the dark count rate has not been subtracted. The spectrum in the middle plot is from the third y-position on the blue tube and from the second y-step on the red side. A similar spectral pattern appears in those same y-positions for L65 used with an open aperture. The small excess light at these steps is discernible on Figures 7 and 13. One possible explanation is that stray light from the room is getting onto the grating and causing a dispersed L65 spectrum that is offset in both x and y. In that case, the spike near sample 90 on the middle plot of Figure 15 is still unexplained, since the zero order must be the signal near sample 300. Images constructed from the y-scans show this spike as a much sharper feature than the other stray light features on both tubes. Future versions of this report will include reproductions of the images.

FIGURE CAPTIONS

Figures 1-16

Top Plot

Ratio of the counts at each vertical photocathode y-position to the sum of the counts from all positions versus vertical photocathode y-position.

Center Plot

The spectrum at the y- position of the photocathode with maximum counts versus photocathode horizontal sample x-position (50 micron x-steps).

Bottom Plot

The background counts from the first (lowest) y-position on the photocathode versus x-position as in the middle plot.

Figure 1

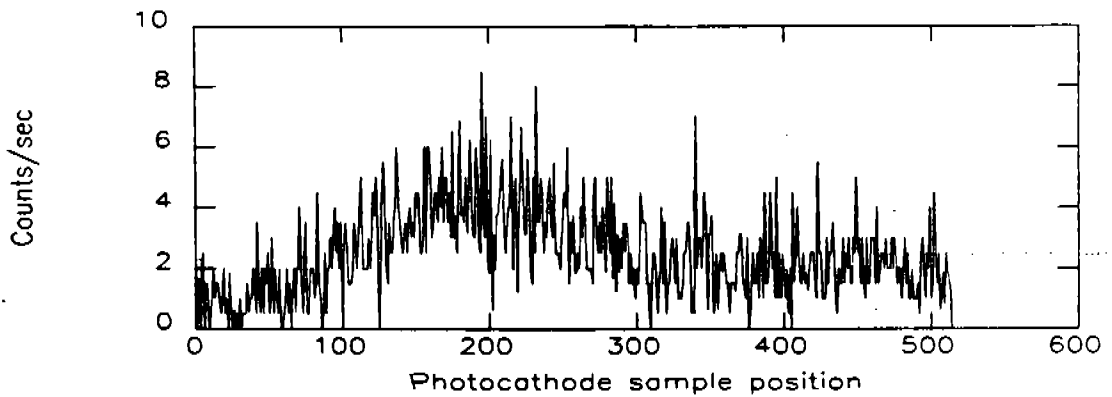
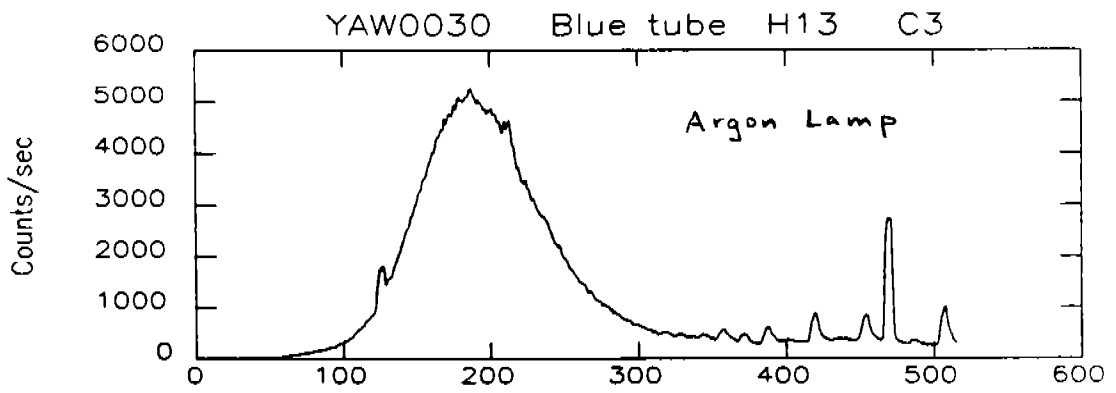
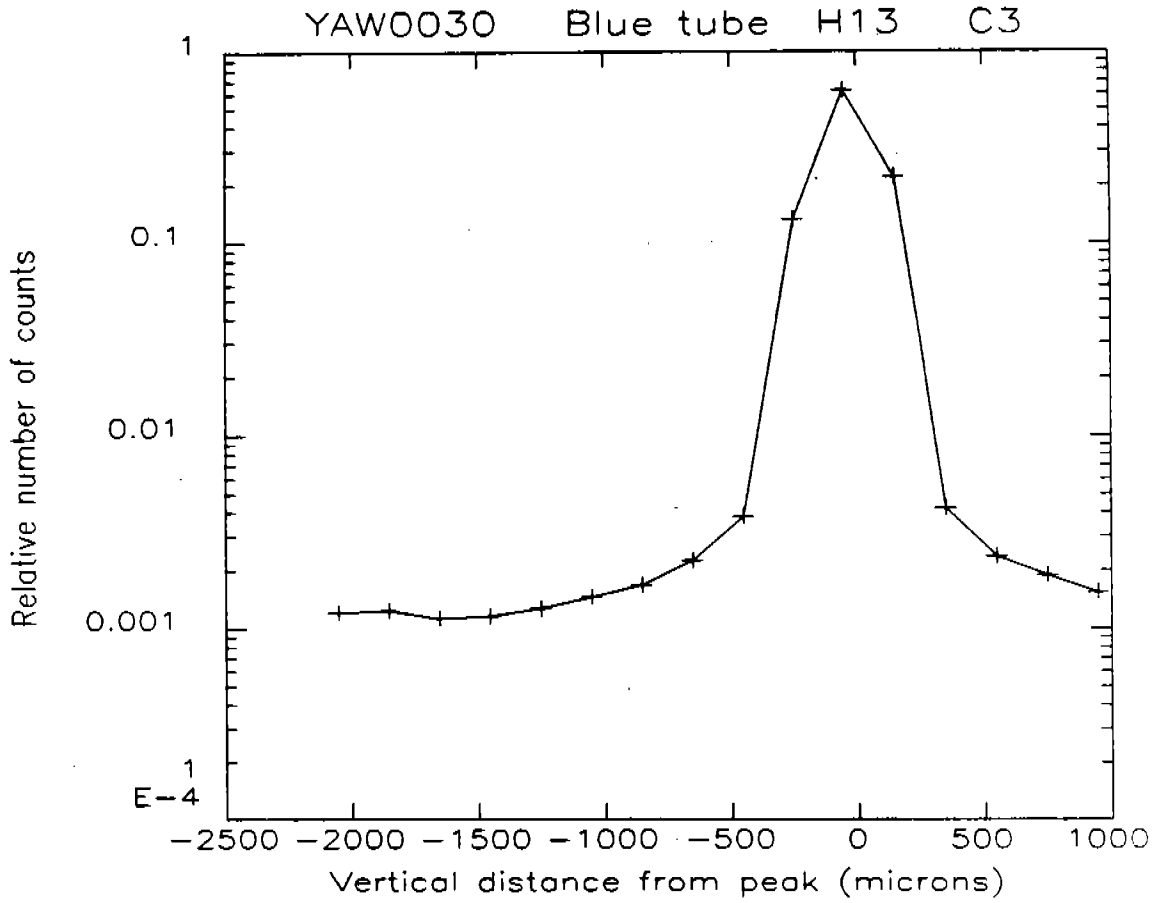


Figure 2

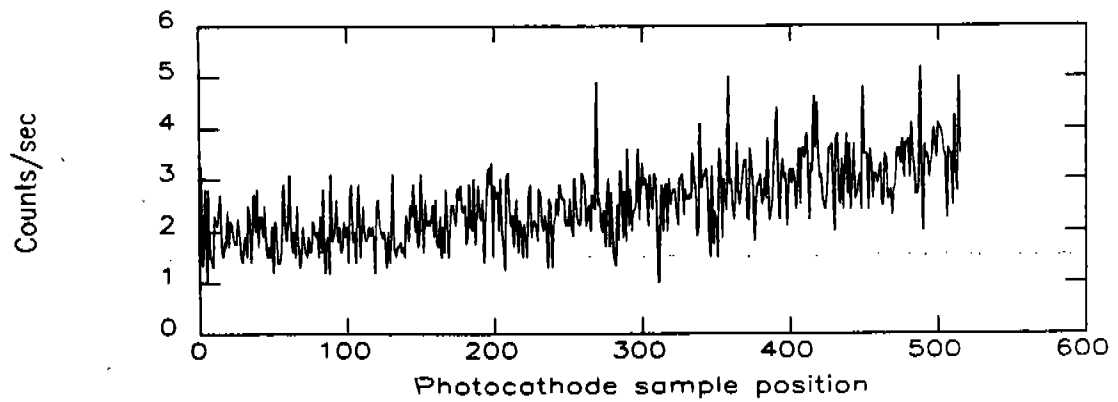
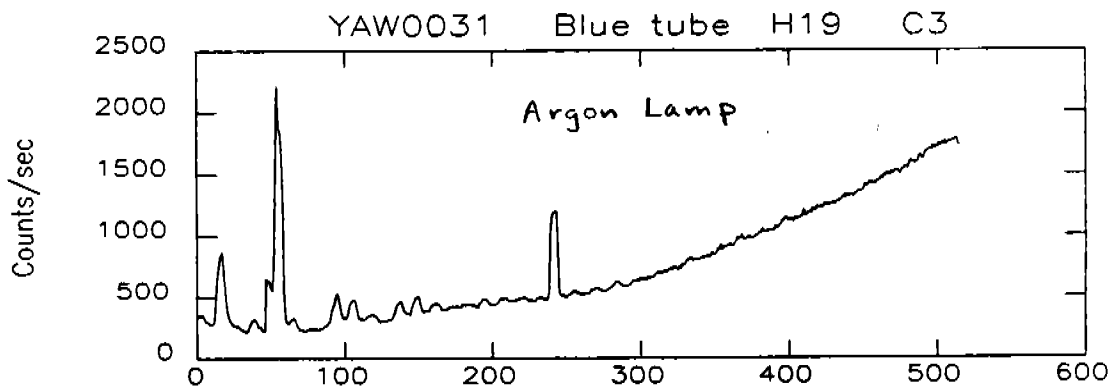
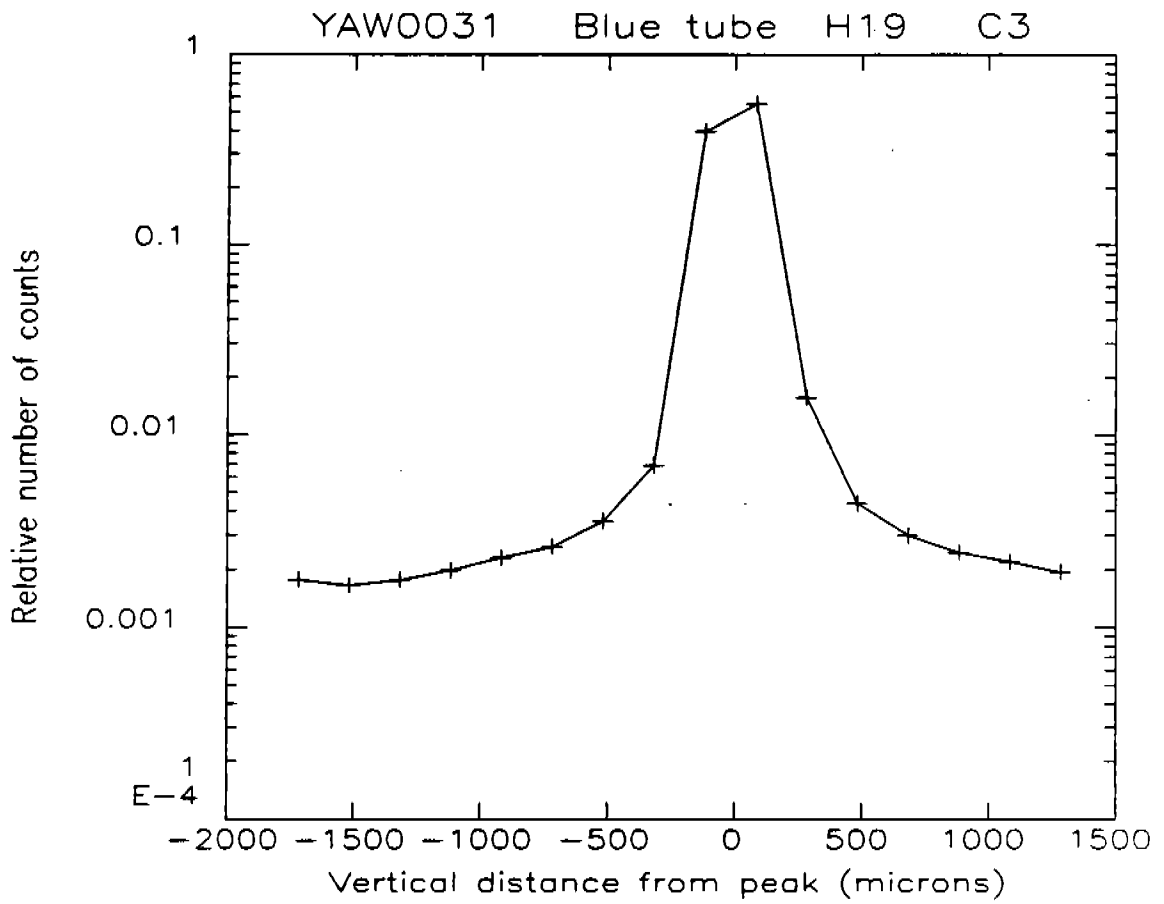


Figure 3

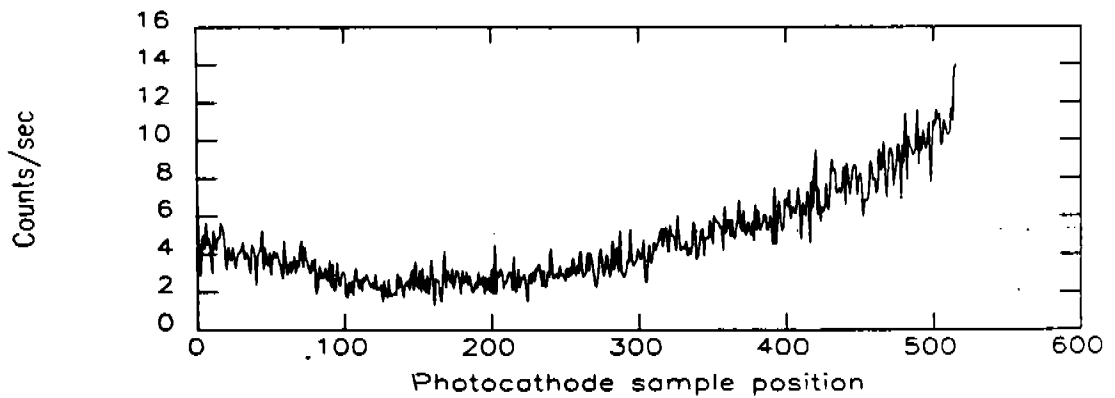
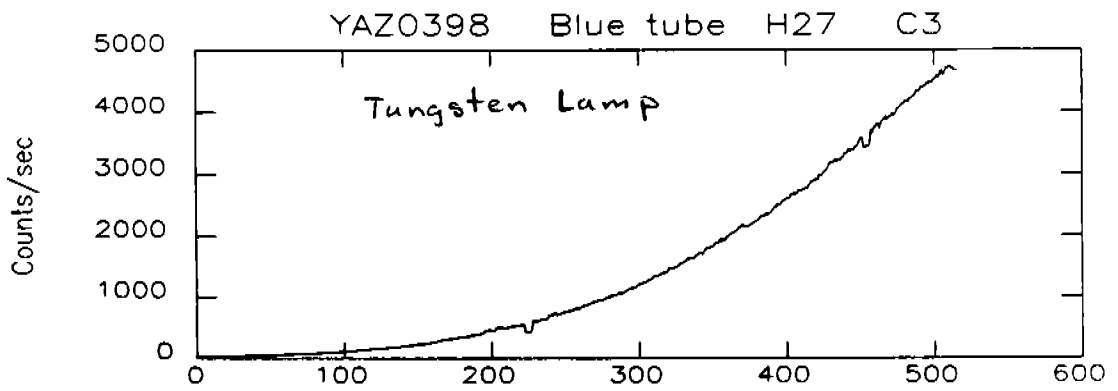
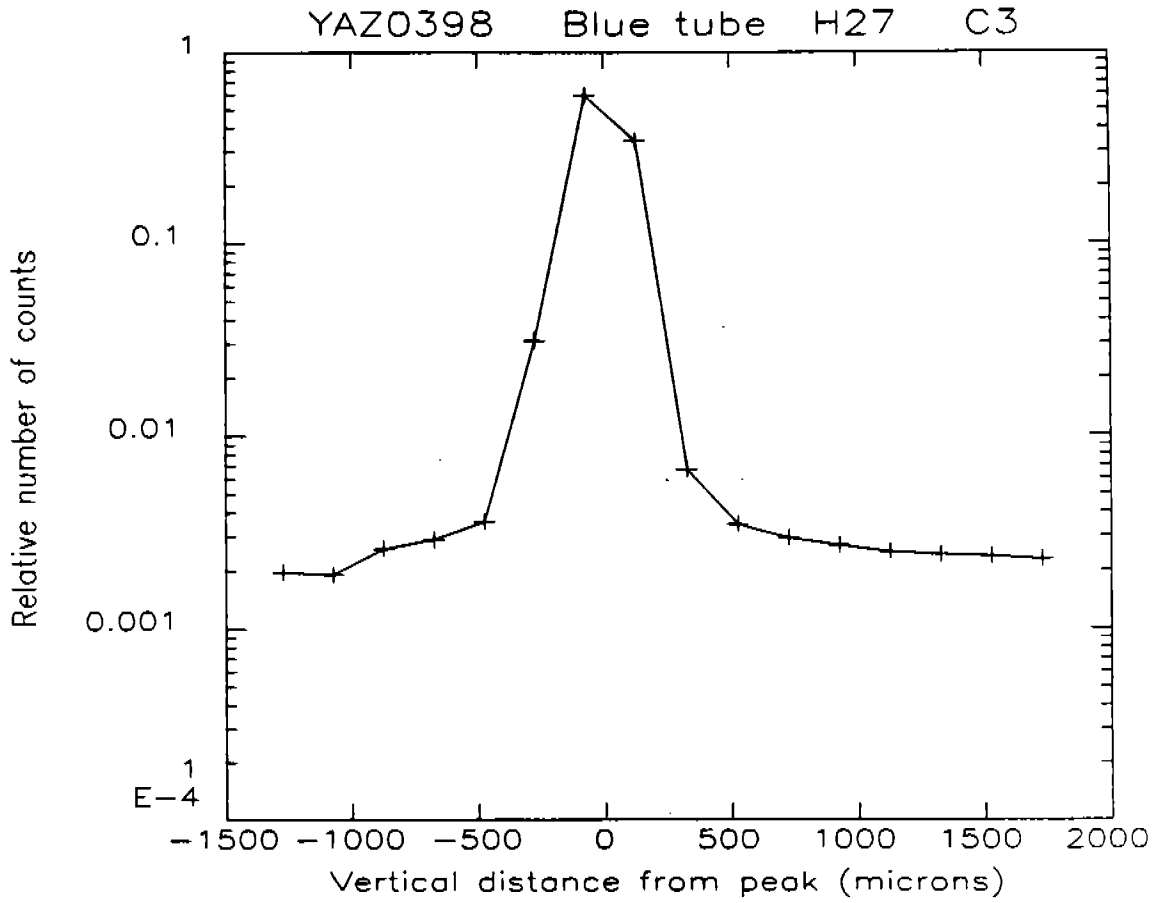


Figure 4

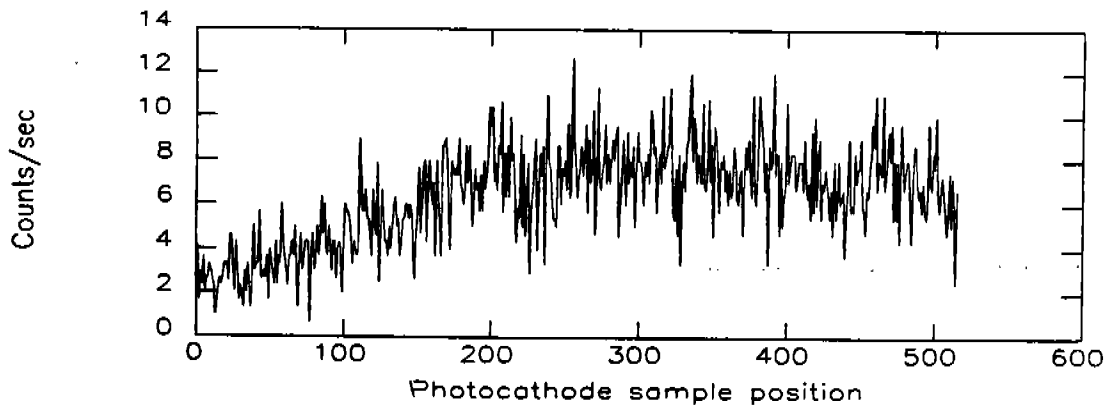
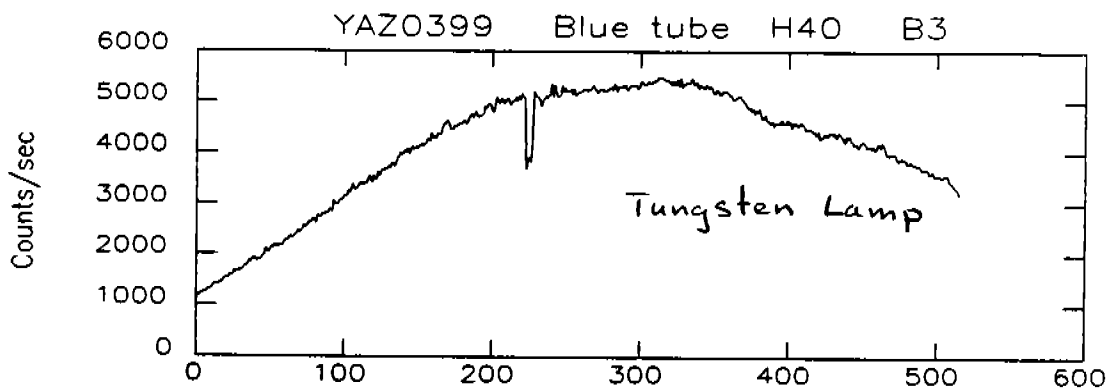
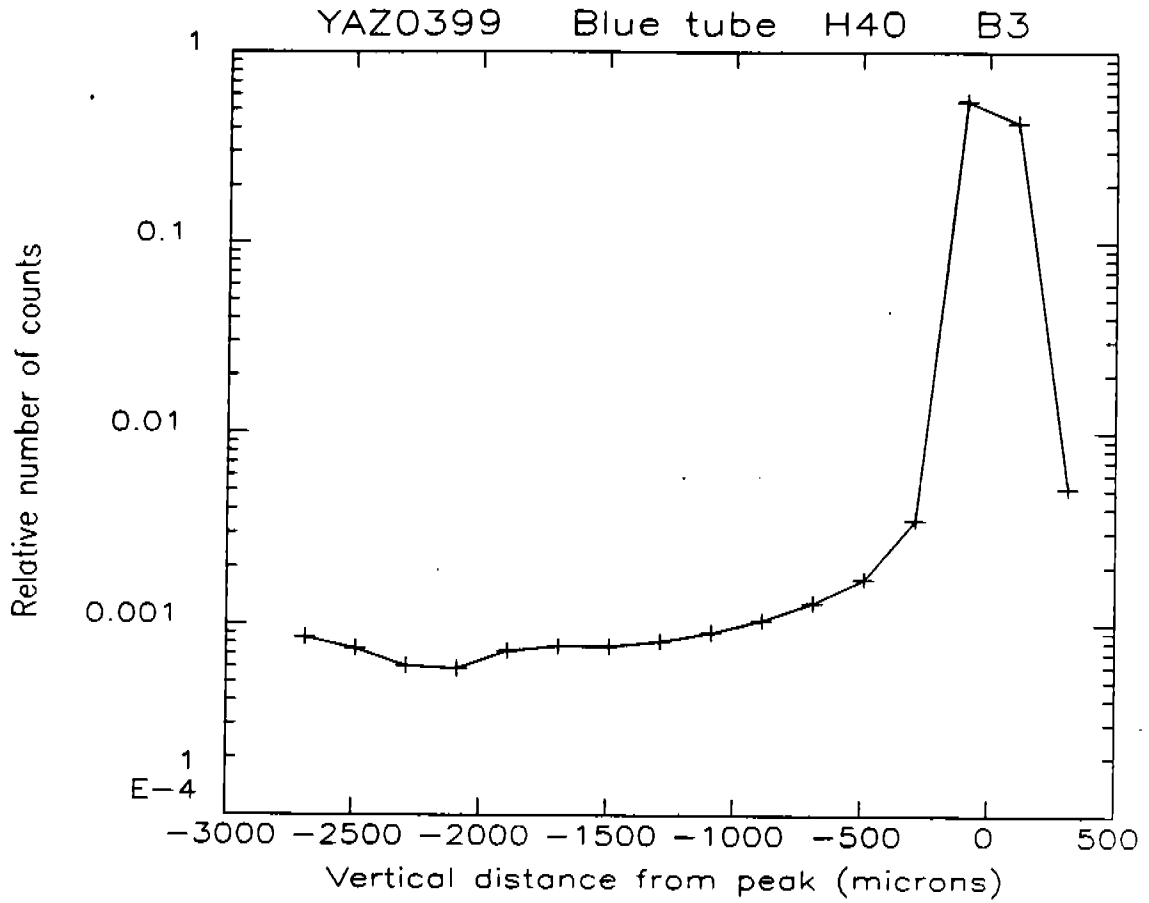


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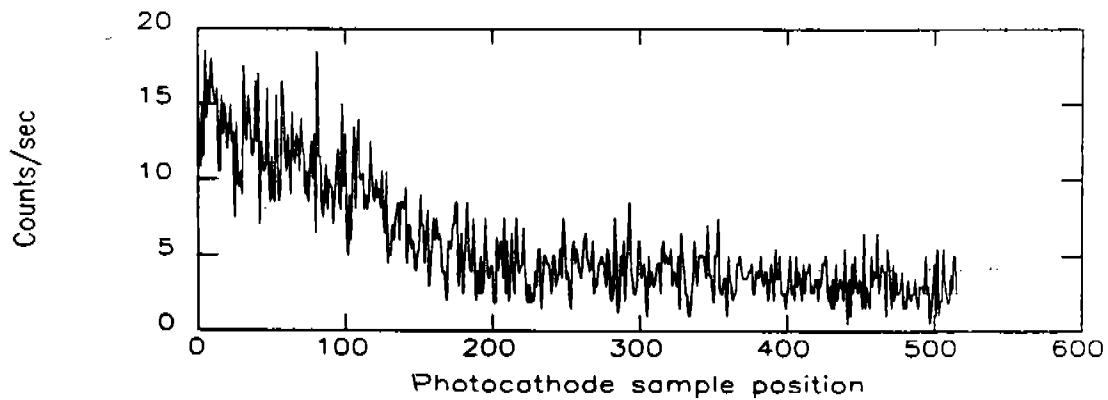
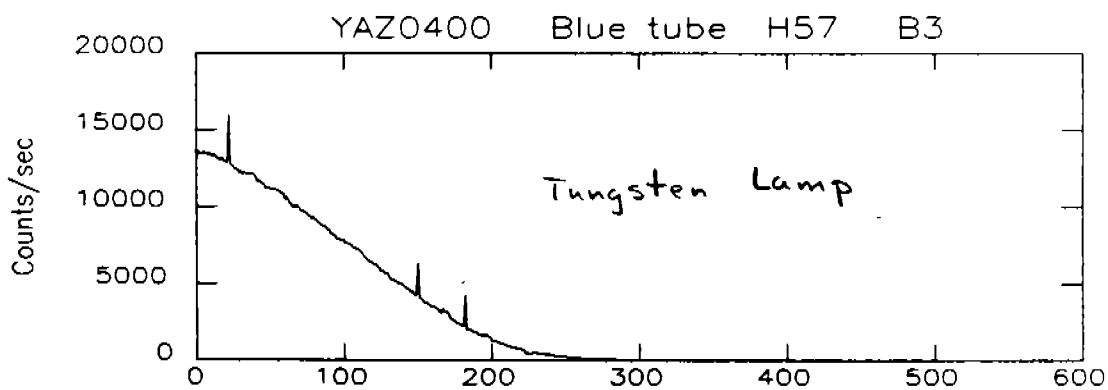
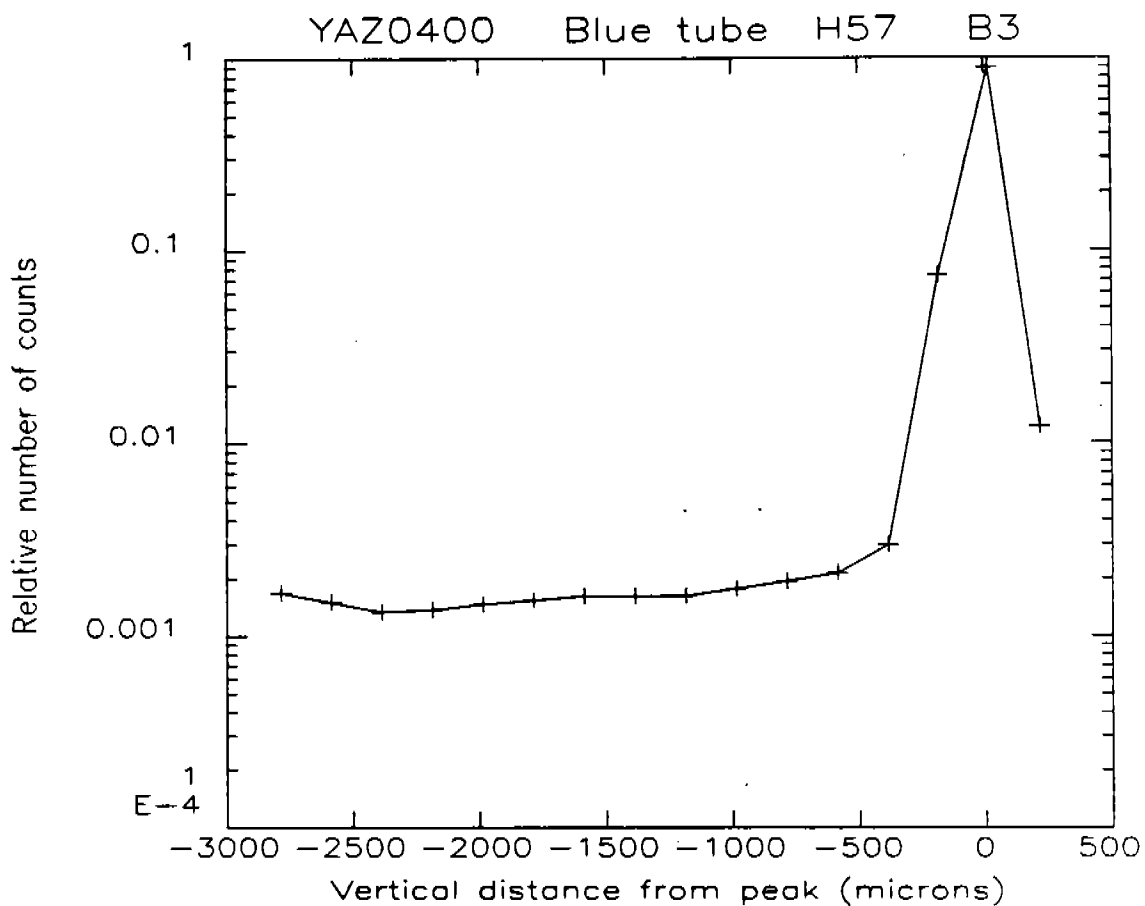


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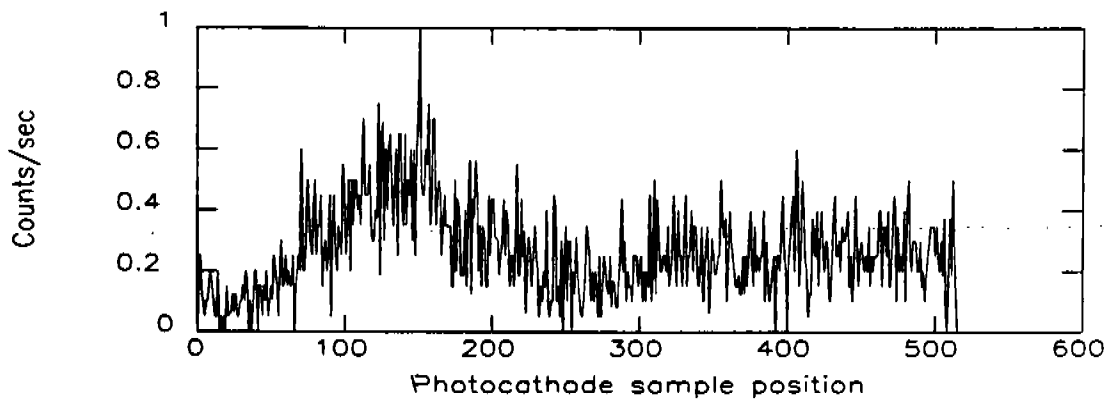
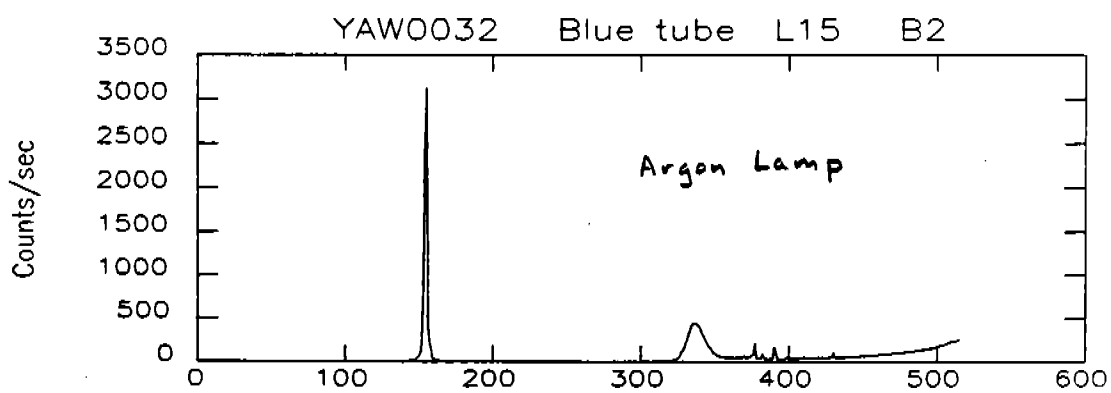
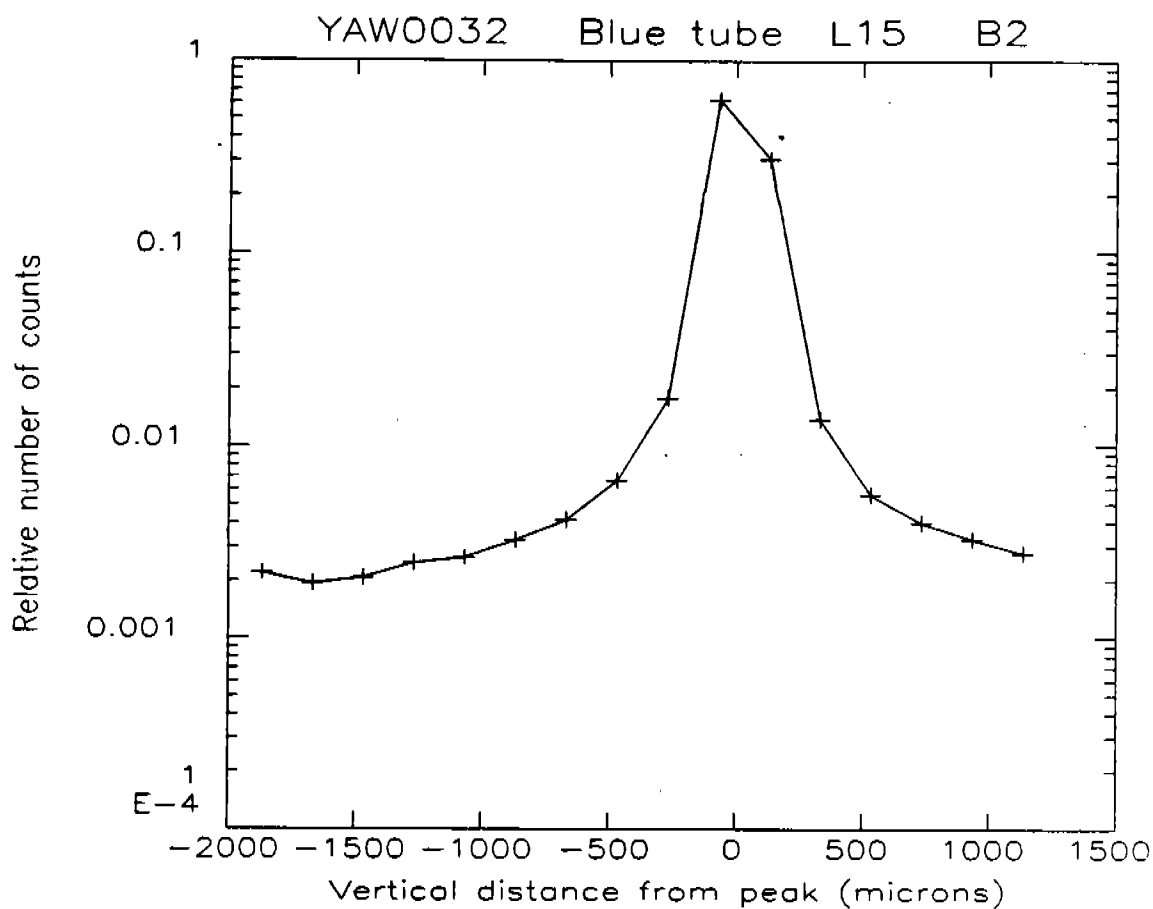


Figure 7

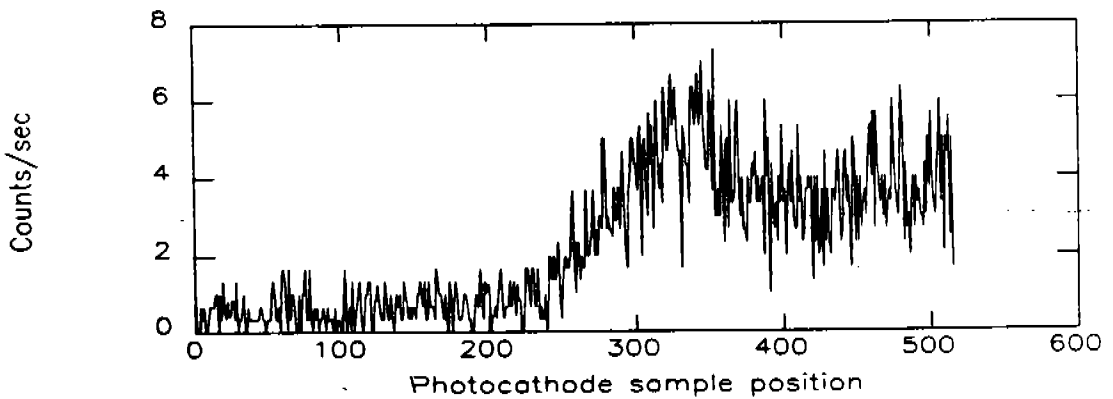
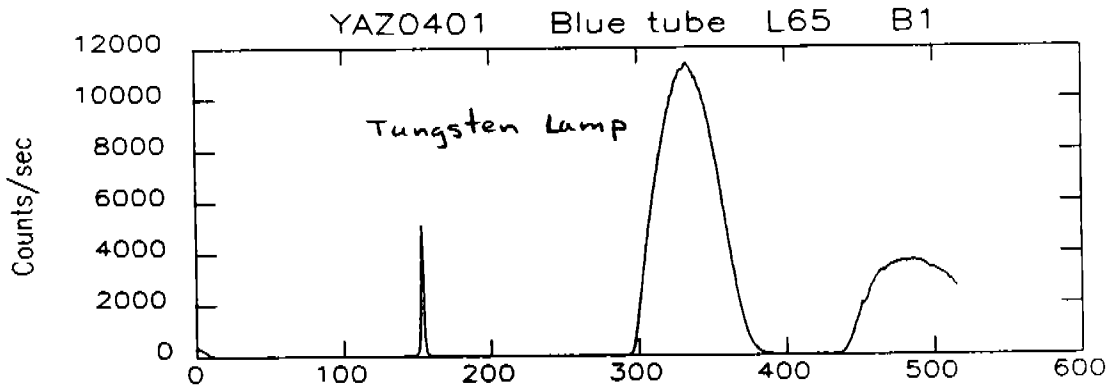
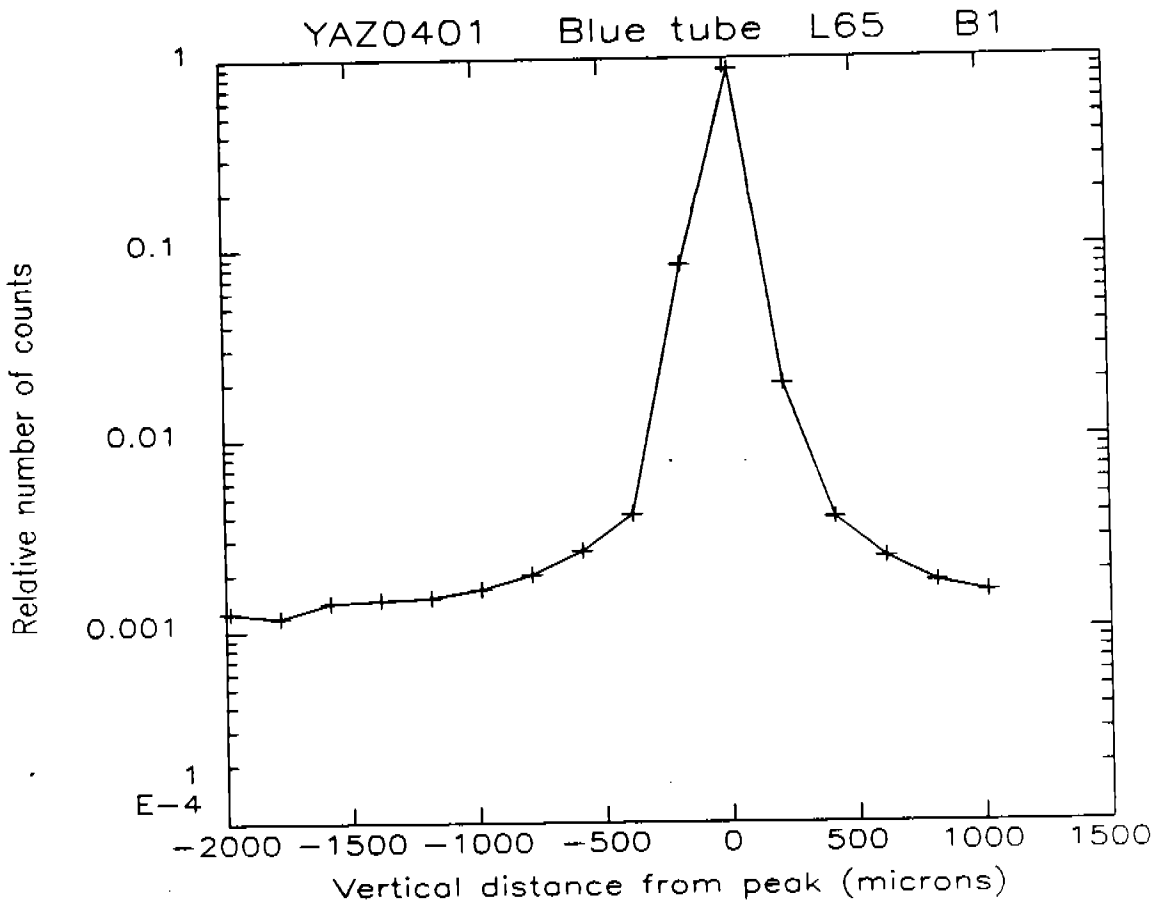


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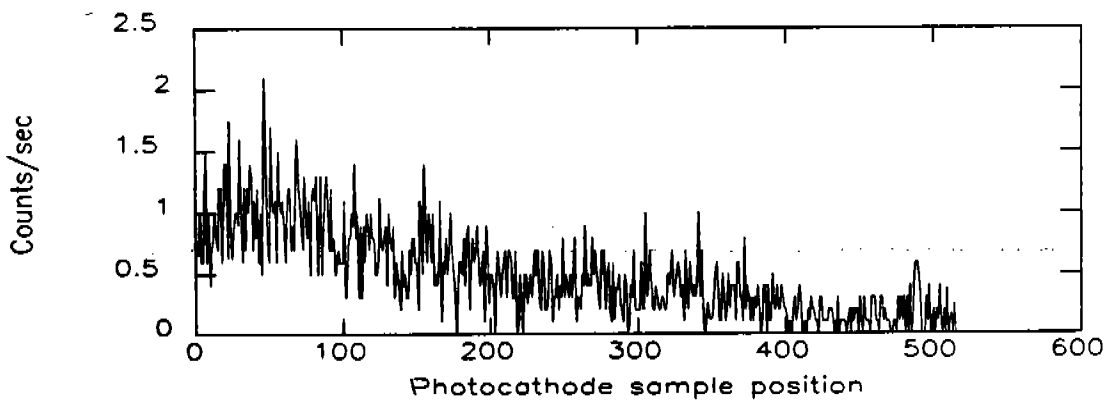
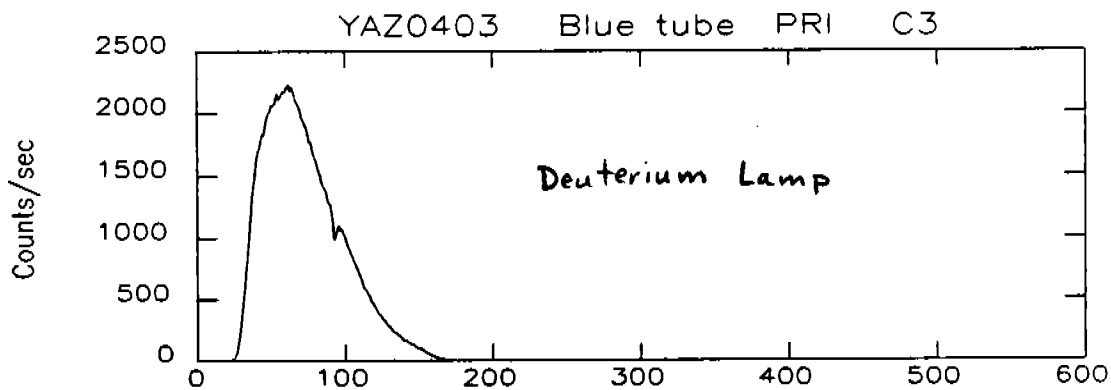
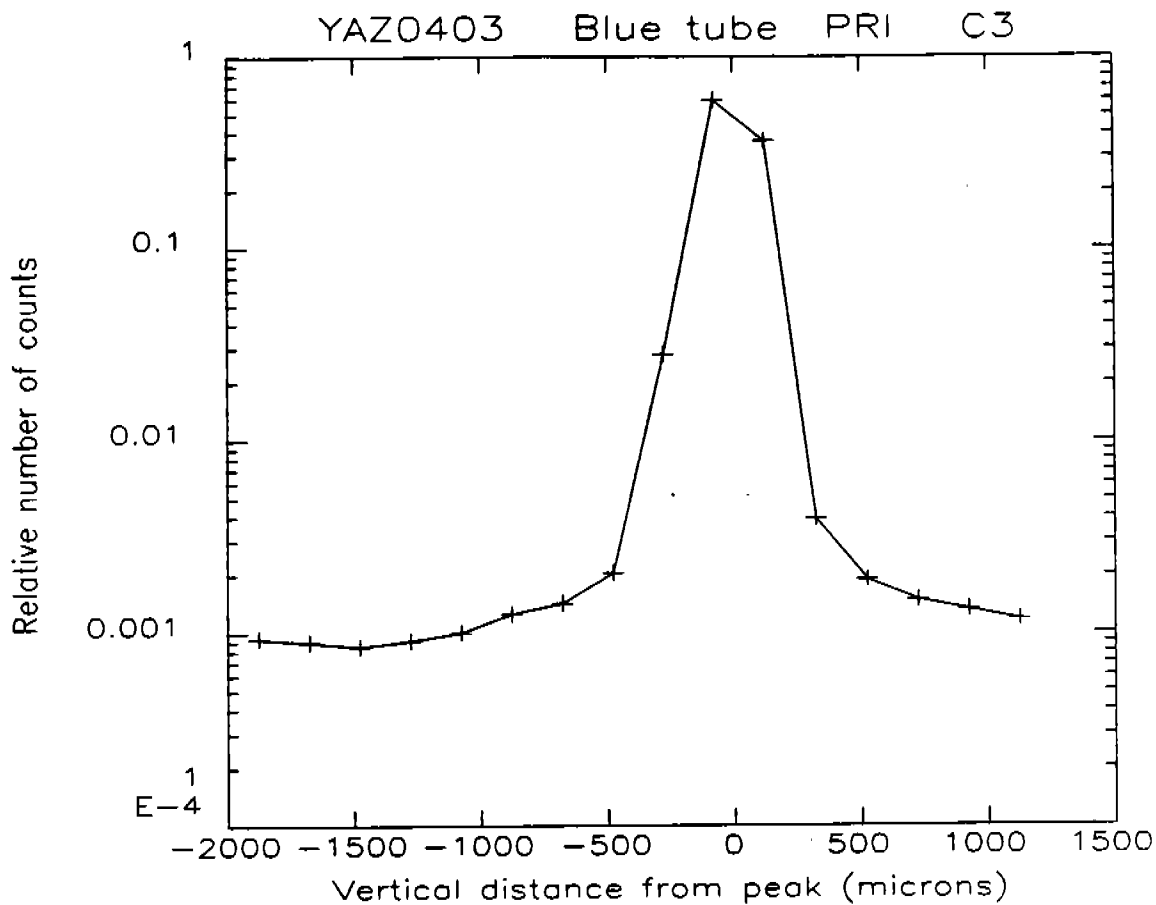


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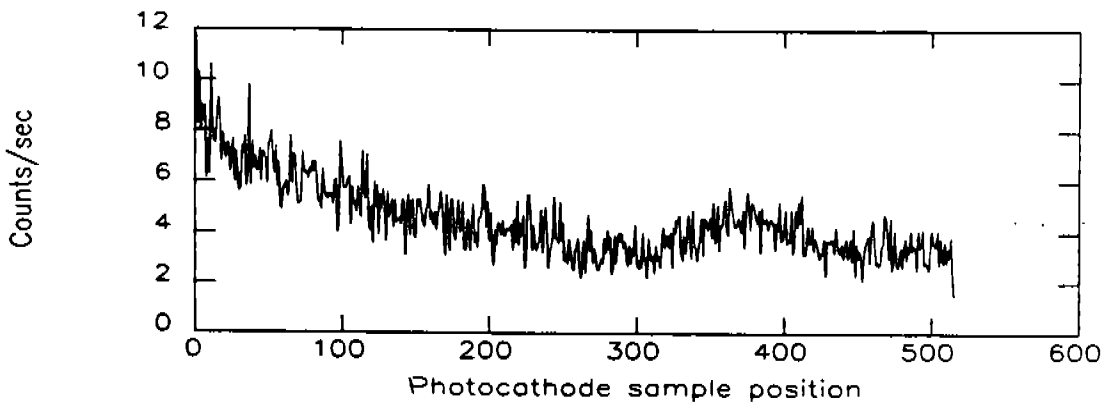
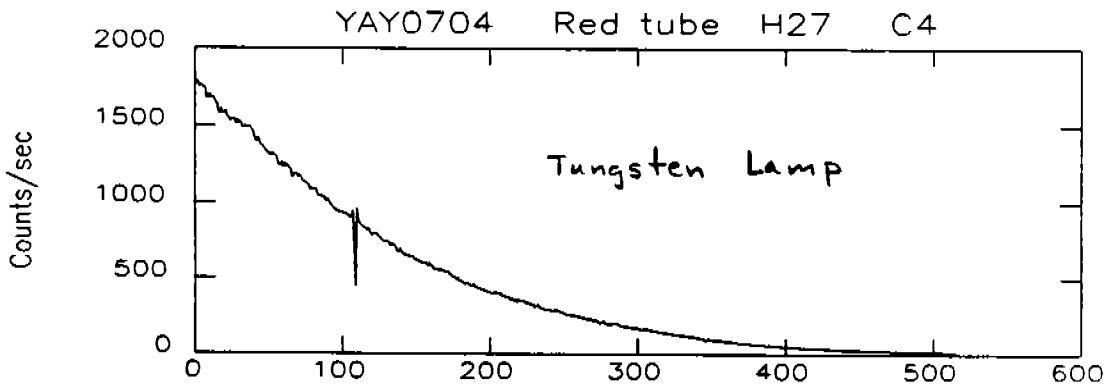
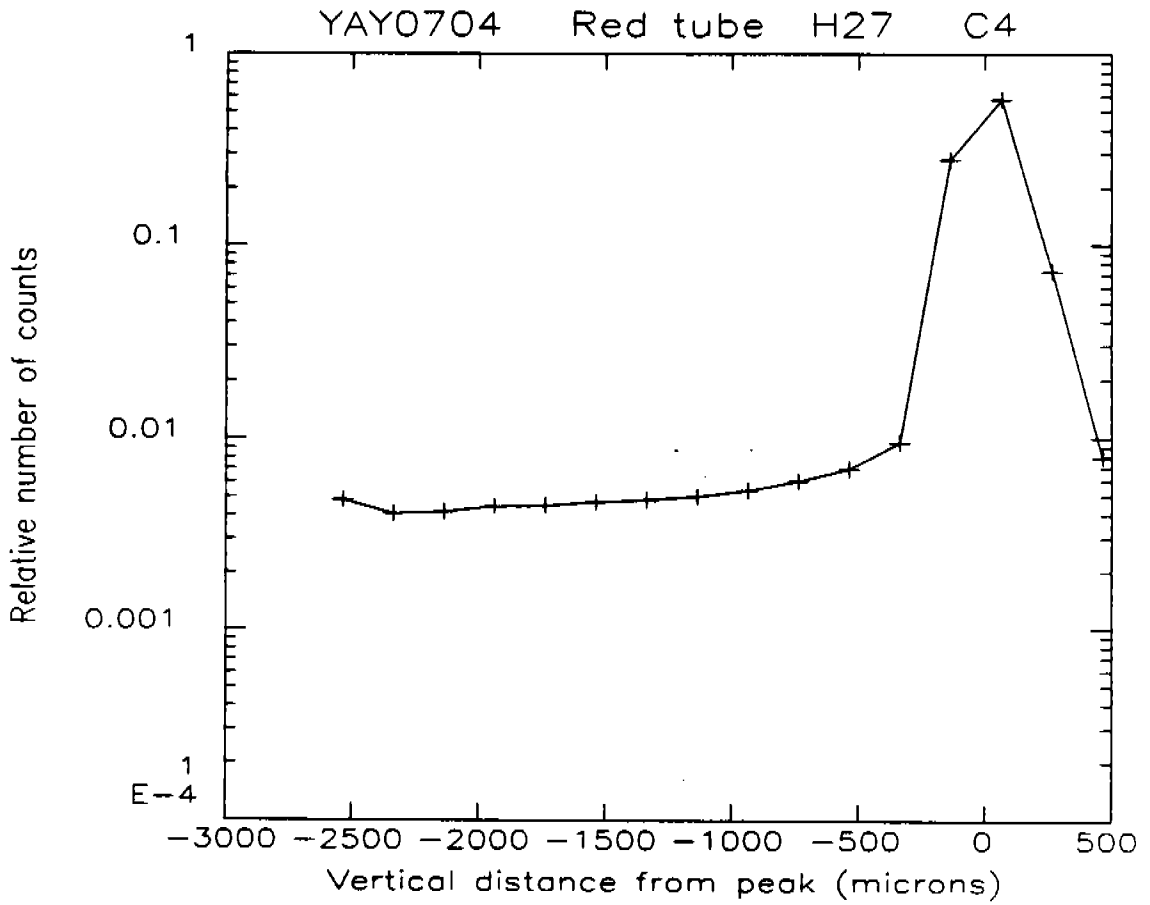


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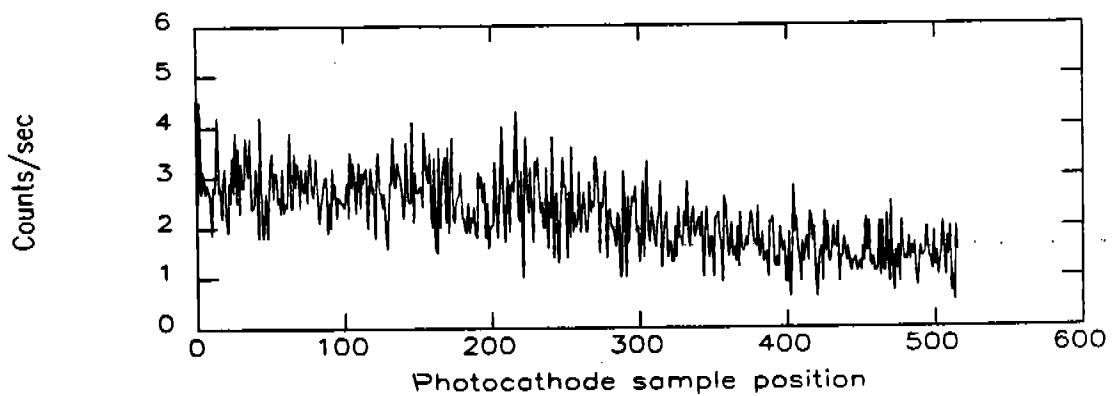
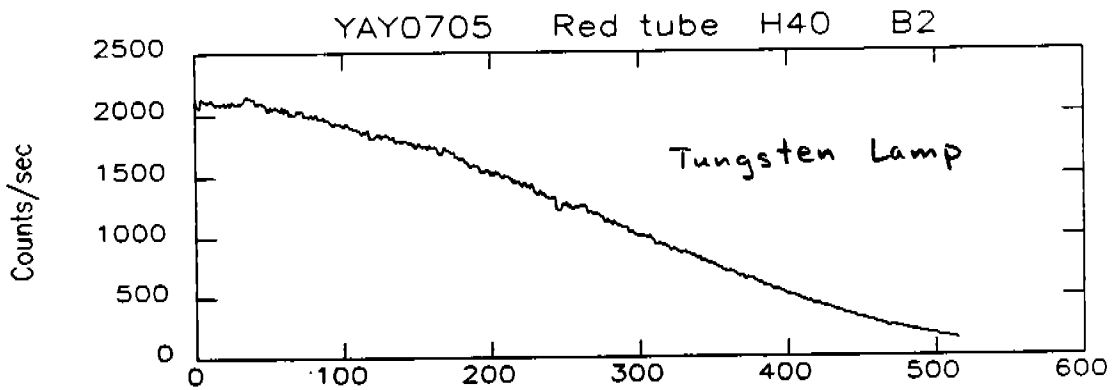
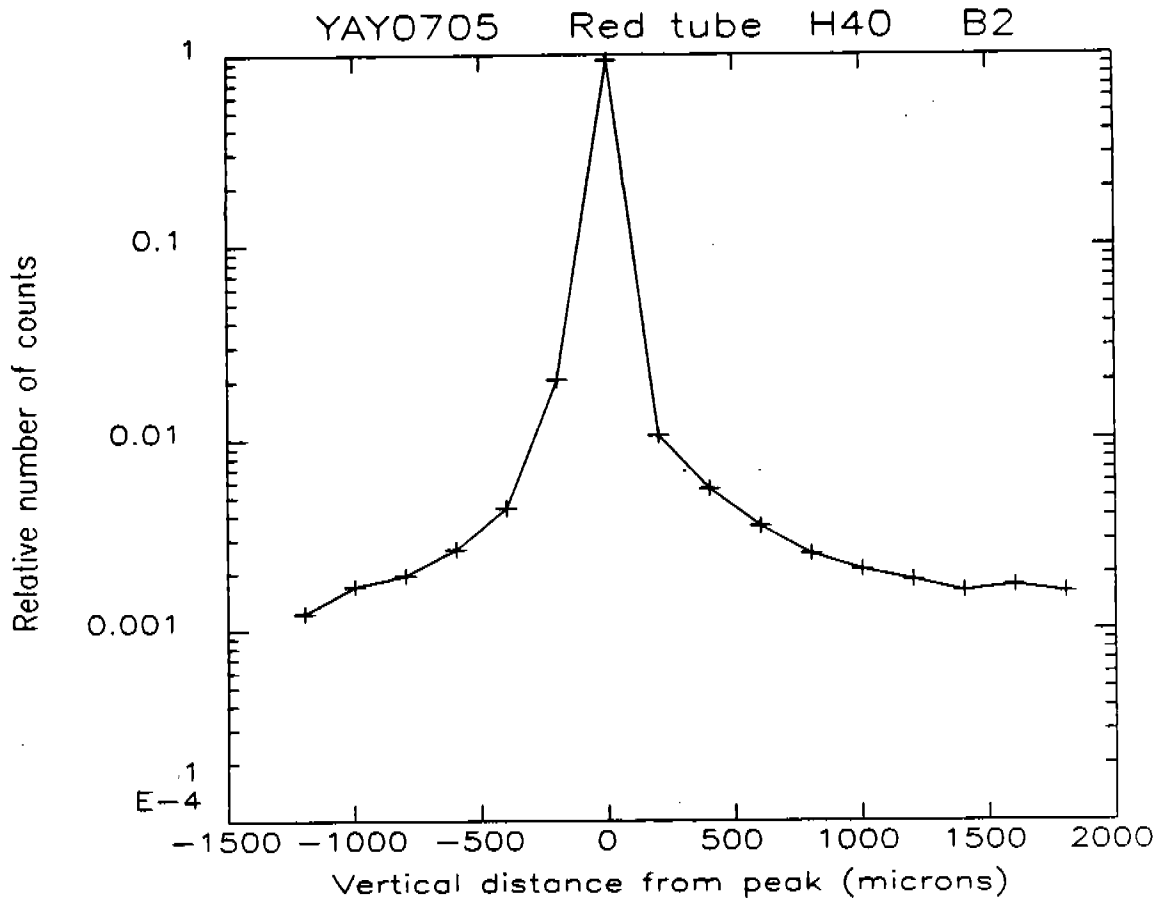


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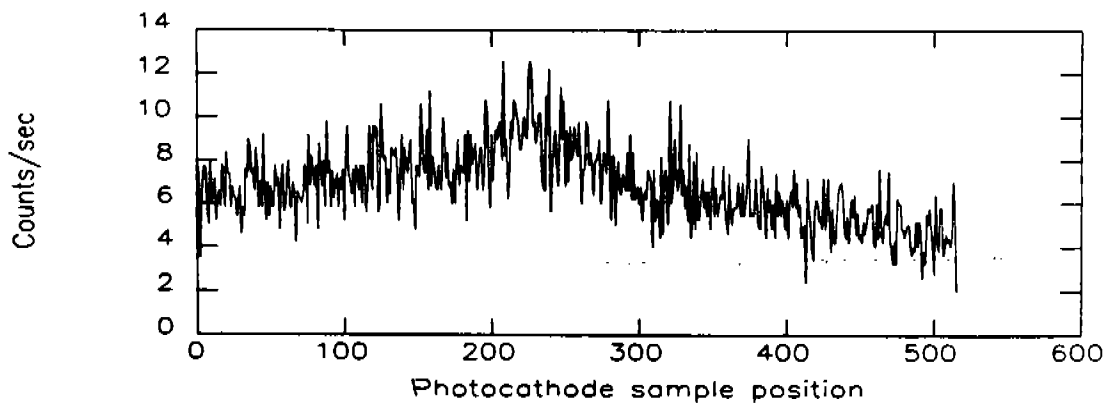
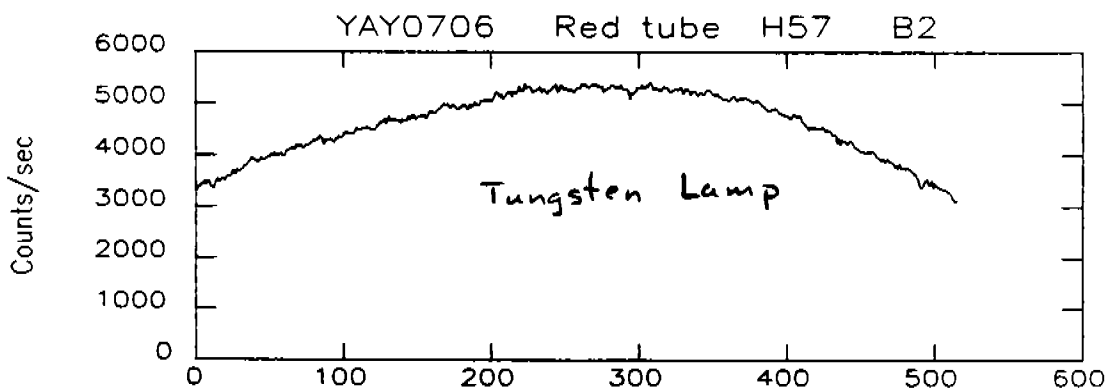
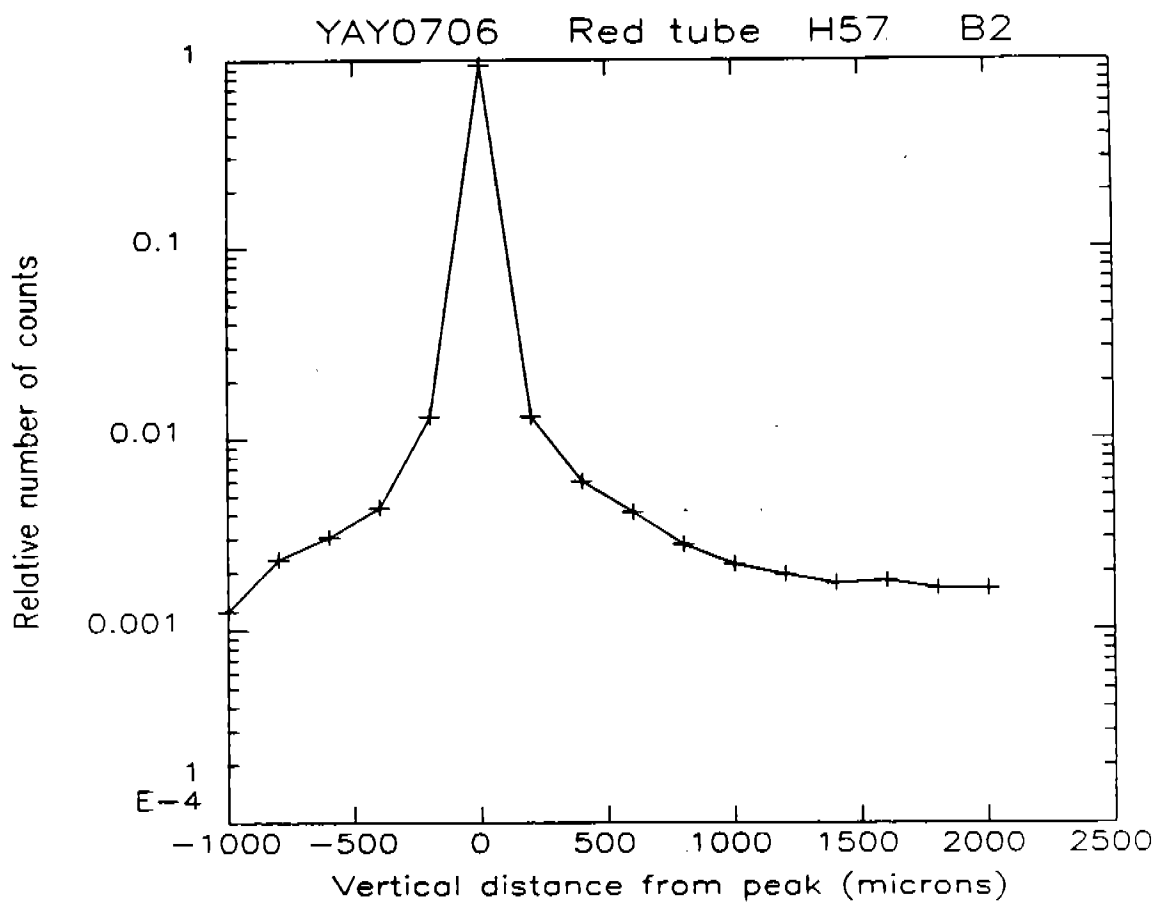


Figure 12

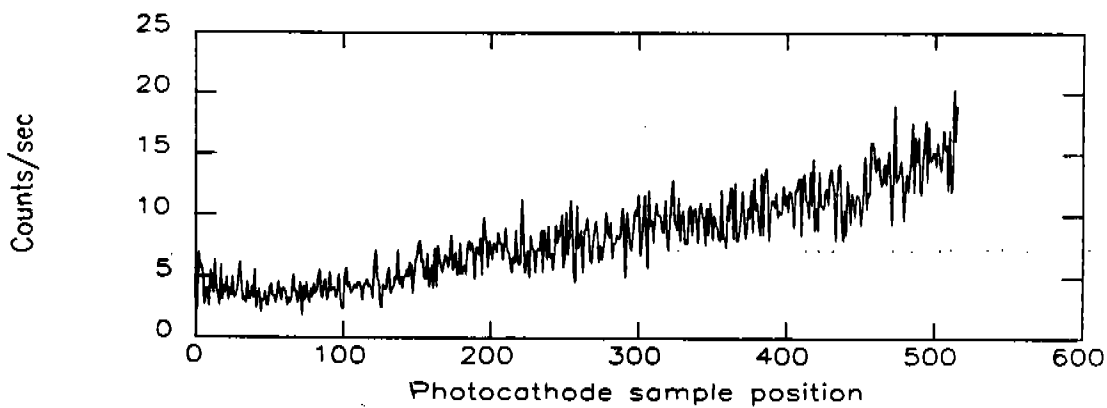
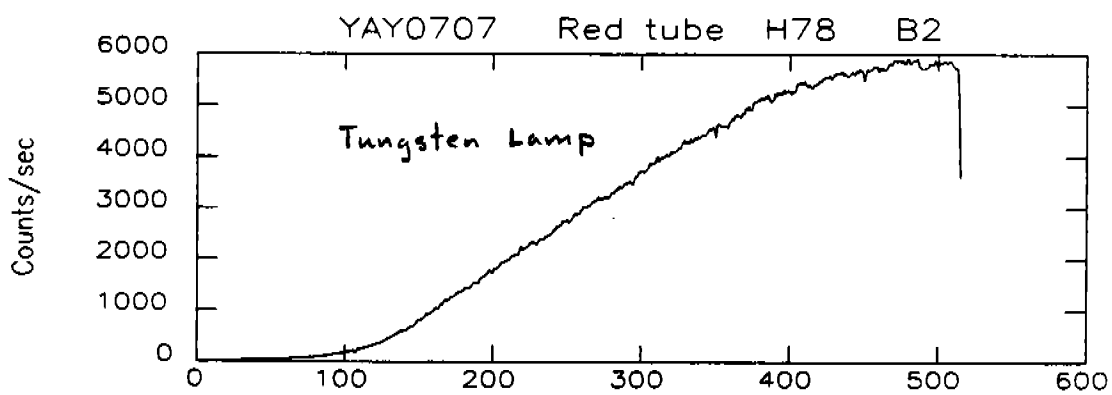
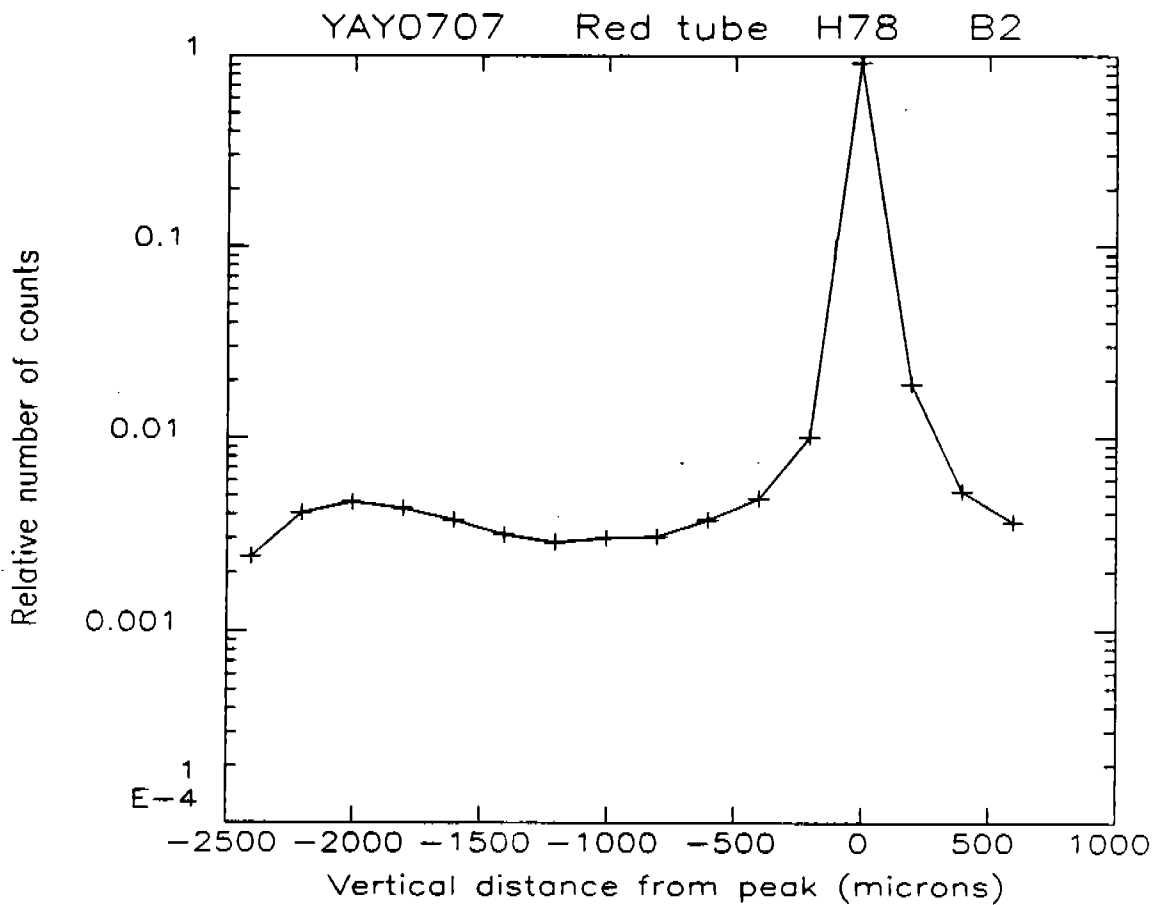


Figure 13

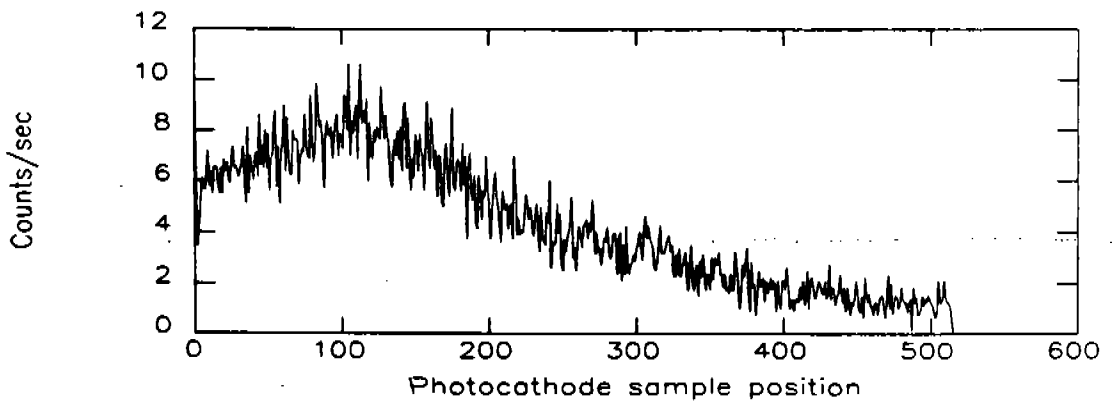
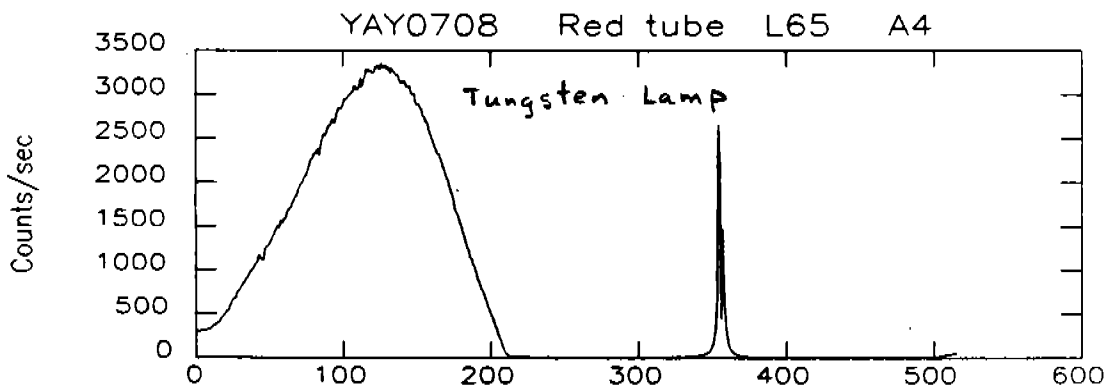
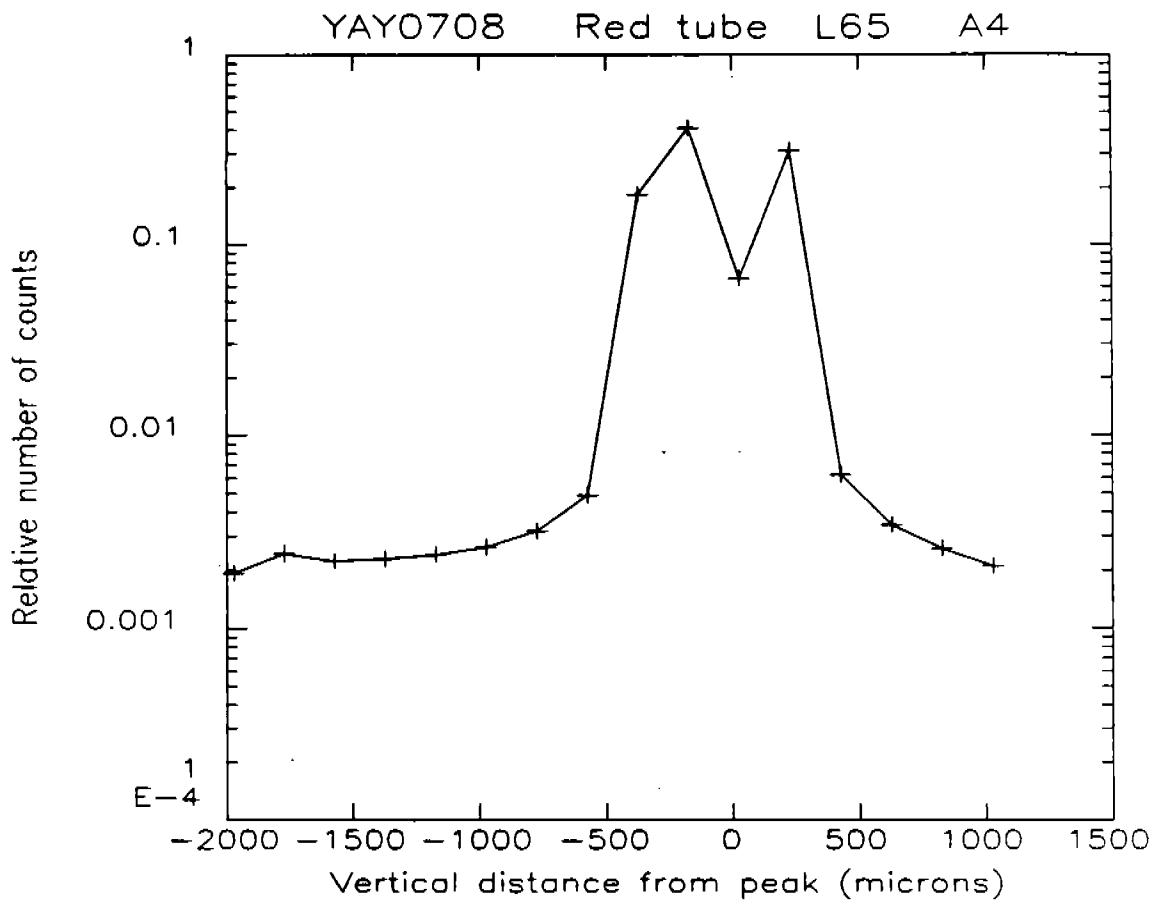


Figure 14

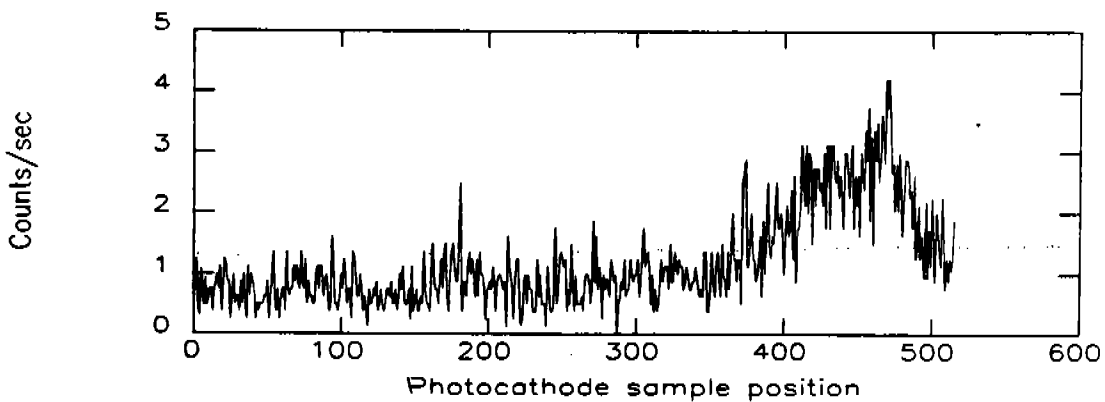
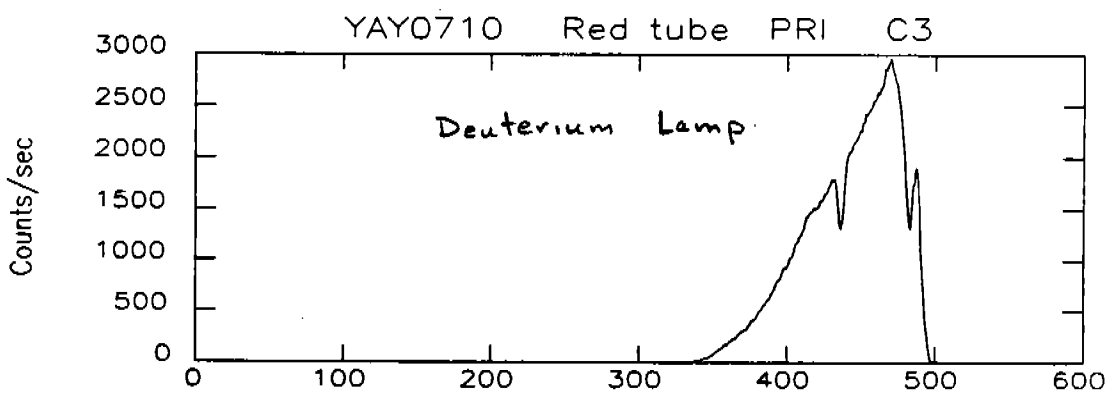
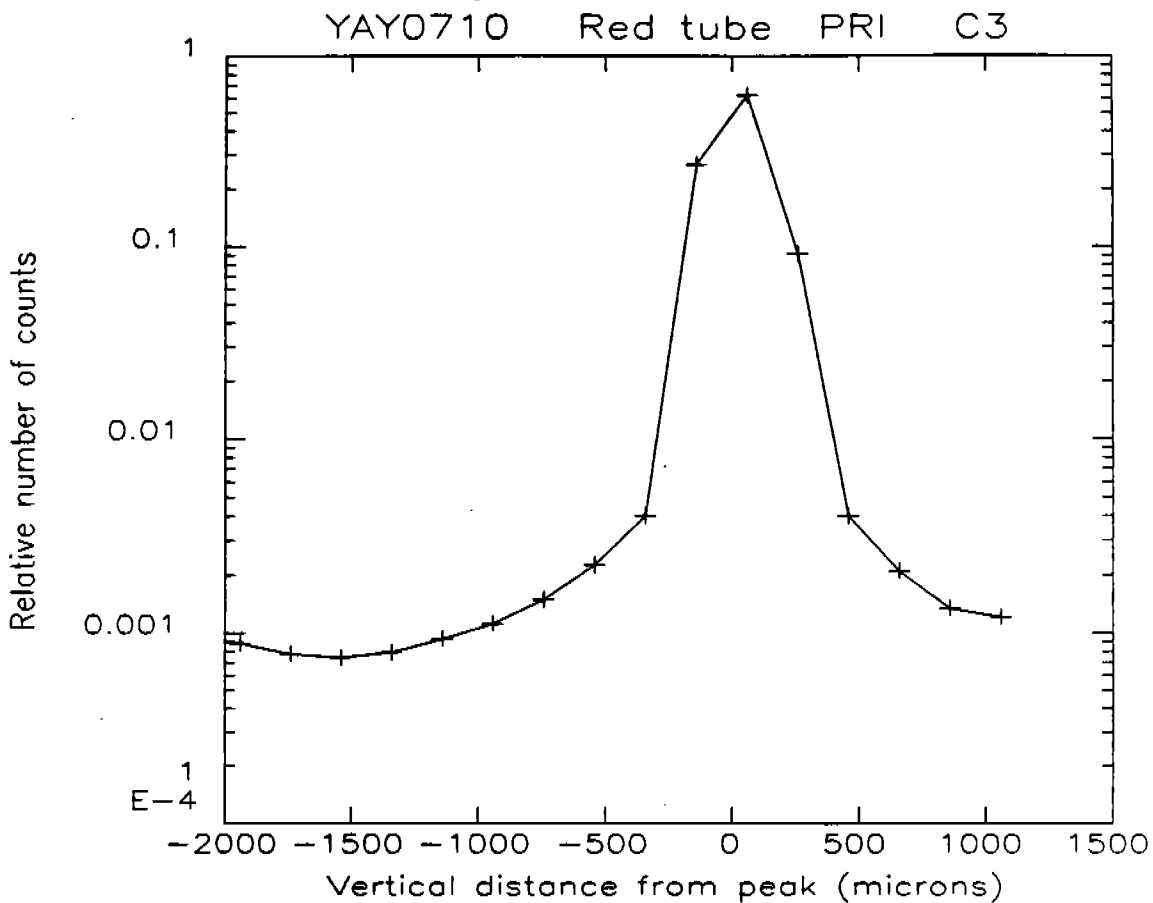


Figure 15

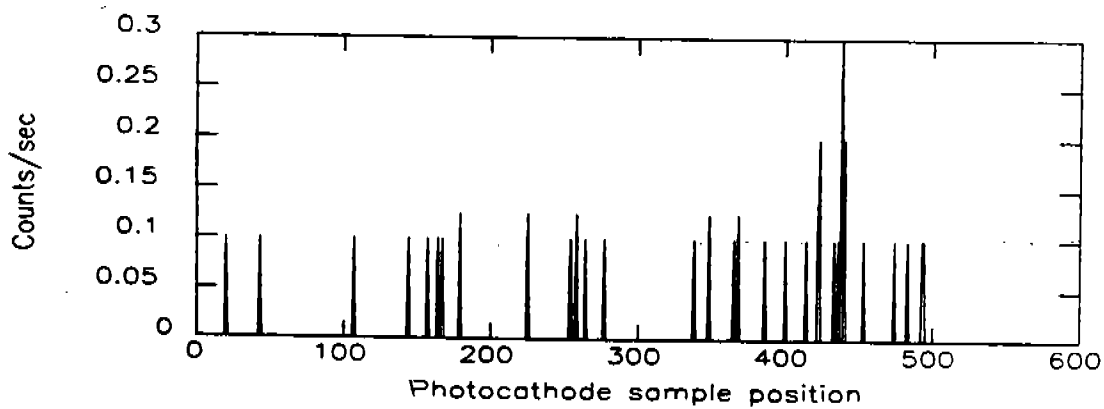
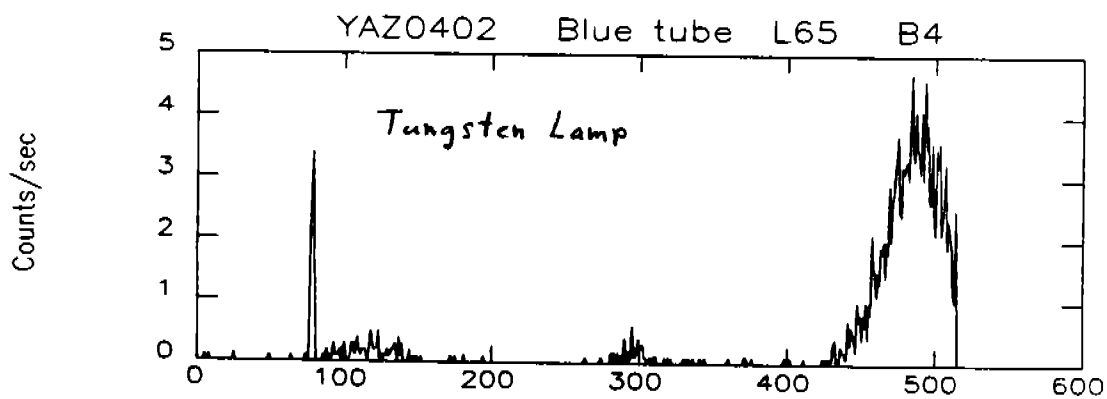
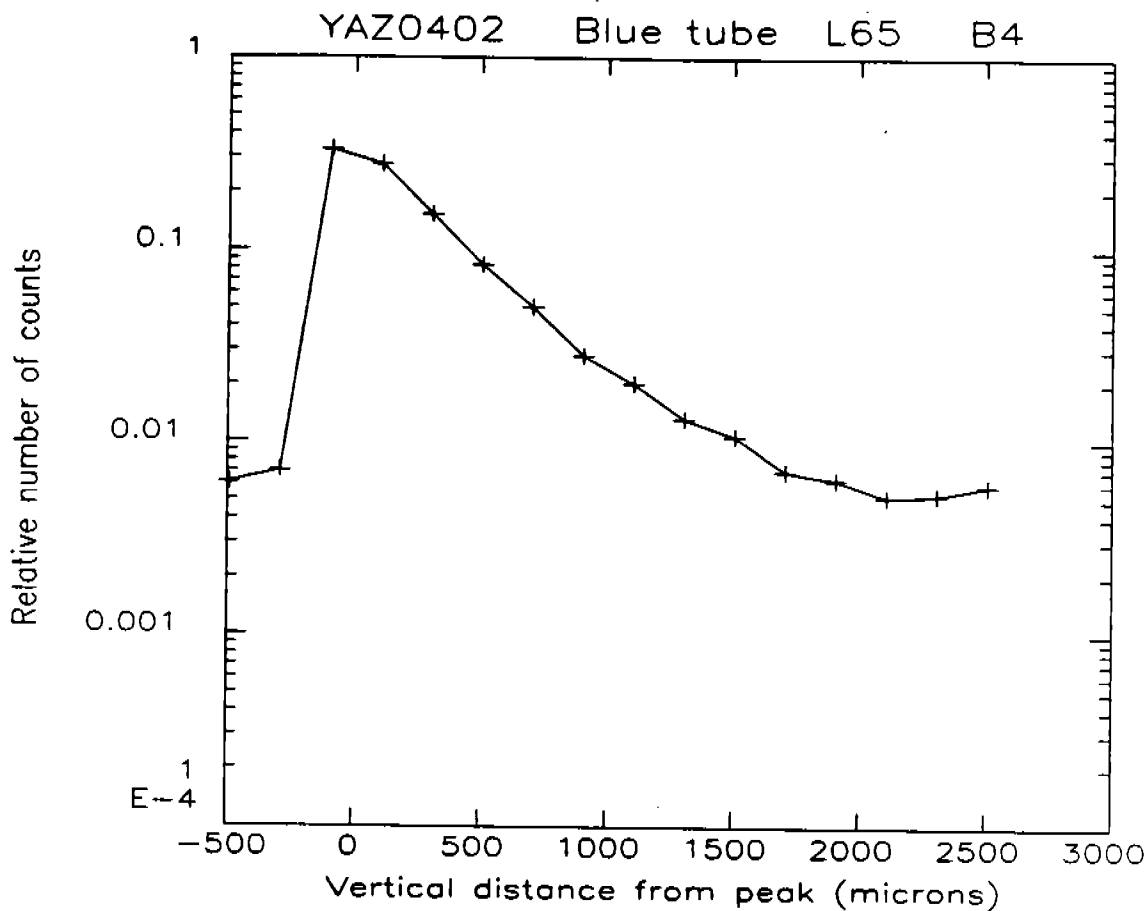


Figure 16

