Autoradiographic beam profile studies performed for the 2004 BLIP irradiation

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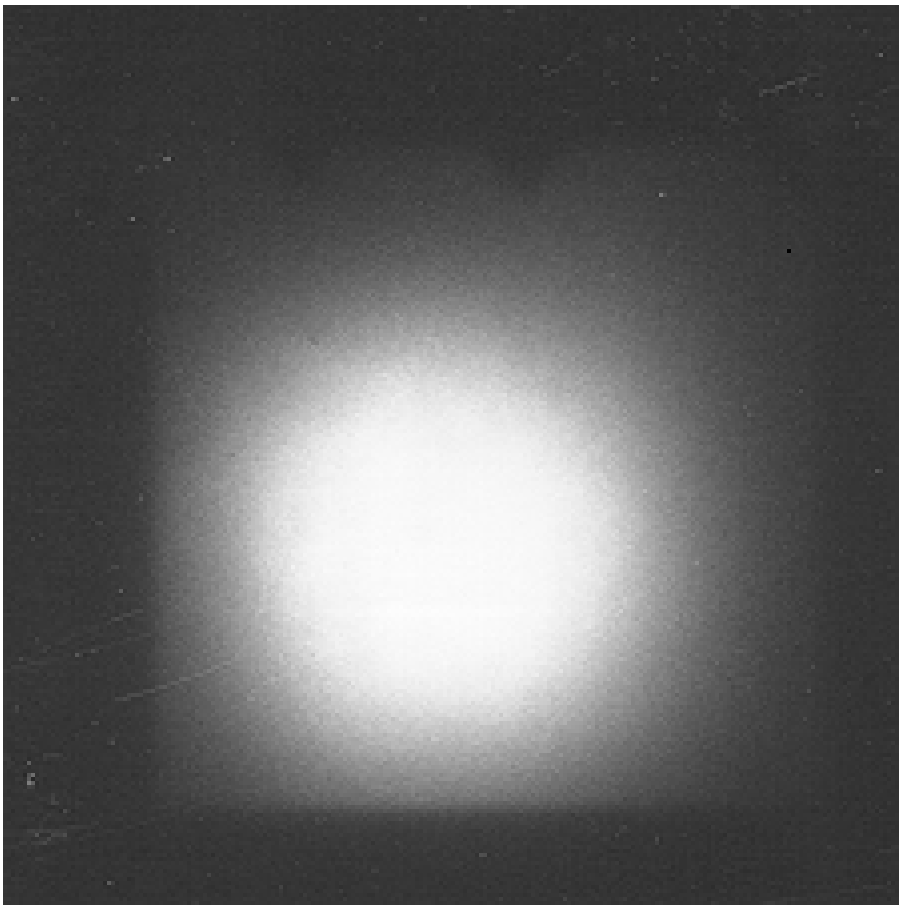

Fig.1 Two minute exposure on Polapan 57 film. The center is saturated but the edges of the foil become visible. Note also the faint outline of the two notches at the top and the chamfer at the right upper corner. These are used to identify the foil and its orientation. The unsaturated fringes of the beam spot are used to define the position of the beam center with respect to the edges of the foil (see Fig. 2).

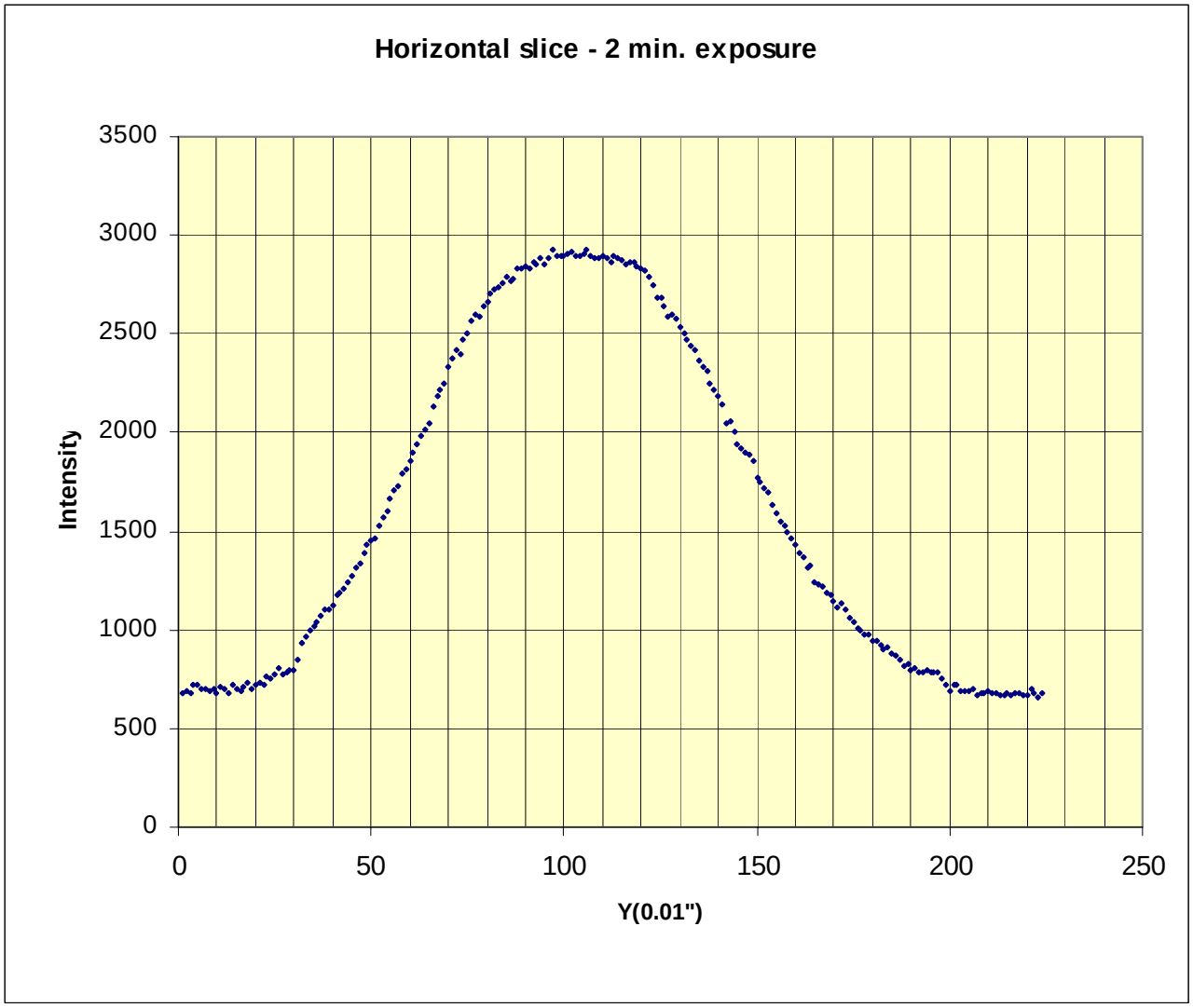

Fig. 2 One of several horizontal slices obtained from the scanned picture shown in fig.1 by adding 13 consecutive rows of pixels. The changes in slope around channels 32 and 197 indicate the edges of the foil. The known width of the foil is 42 mm, which should correspond to 165.35 channels since each channel is 0.01" wide. We see that there is good agreement. The position of the beam is determined from the intersections of the slopes with several horizontal lines, and averaging the results. The procedure is repeated for a few additional horizontal slices. The identical procedure is applied to vertical slices.

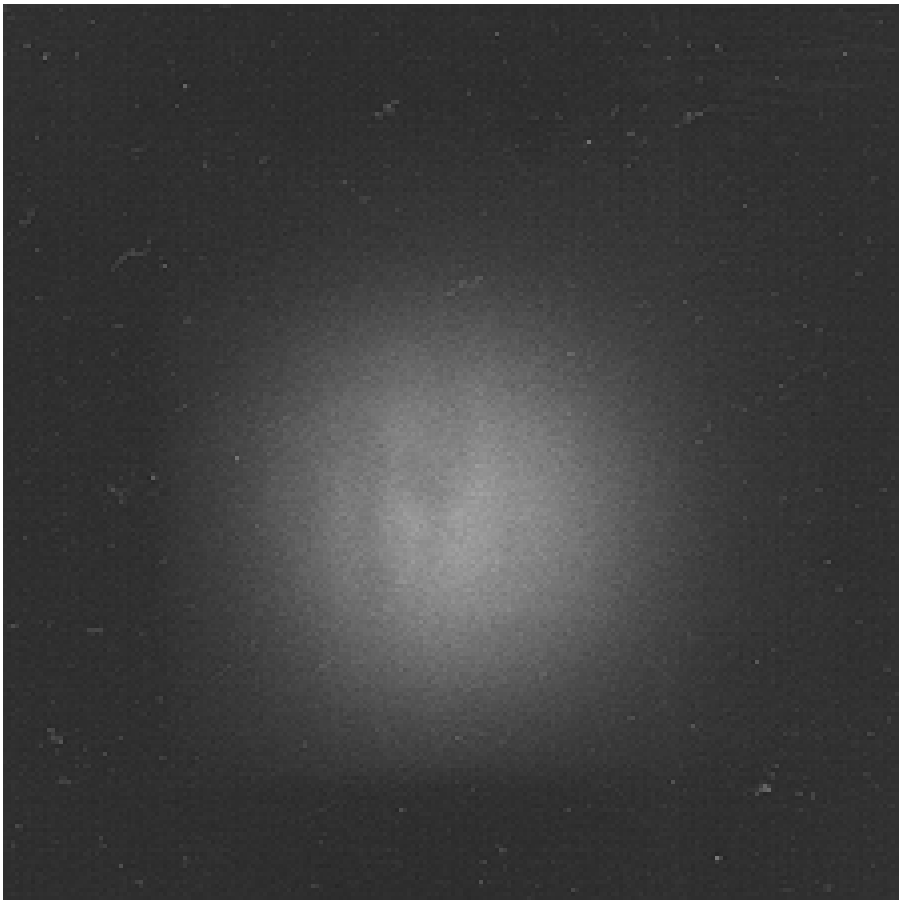

Fig. 3 30 second exposure on Polapan 57 film. This exposure is not saturated and the response of the film is assumed to be linear. This assumption is based on previous experience with this film where response calibrations were carried out. It seems unnecessary to repeat these calibrations, especially considering the fact that good Gaussian fits were obtained. Note the faint shadows in the brighter regions of the image. Visual inspection of the nickel foil indicates that material flaked off at these locations. When doing the Gaussian least square fits to horizontal slices points corresponding to these areas were excluded. For vertical slices these areas could be largely avoided.

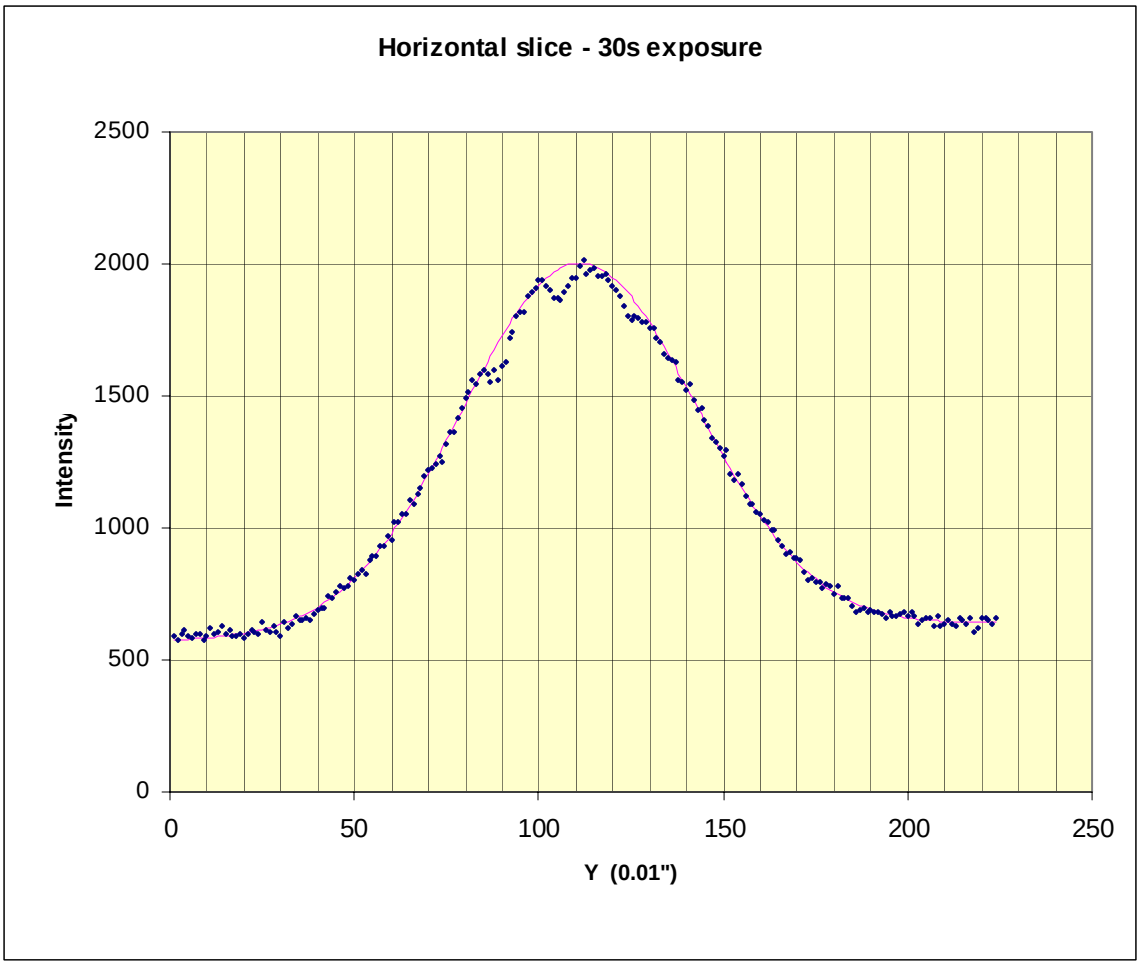

Fig. 4 Example of a least square Gaussian + straight base line fit to a horizontal slice obtained by adding 13 consecutive rows of pixels of the scanned picture shown in fig. 3. Points corresponding to the regions with intensity defects due to flaking were not included in the fitting calculation (see fig. 3 caption). A few different horizontal profiles were thus obtained, giving consistent values of sigma.

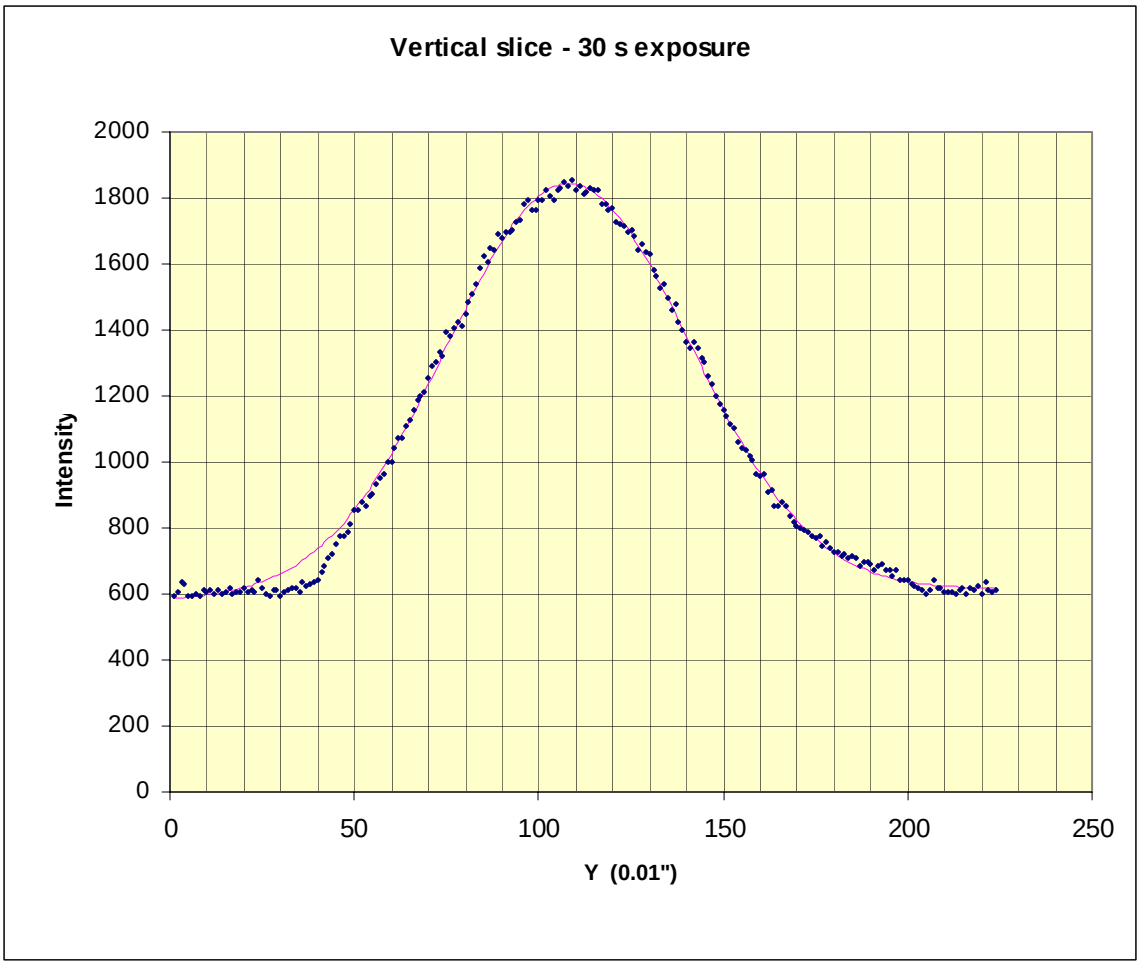

Fig. 5 Example of a least square Gaussian + straight base line fit to a vertical slice obtained by adding 13 consecutive columns of pixels of the scanned picture shown in fig. 3. Points corresponding to the one region with intensity defects due to flaking were not included in the fitting calculation (see fig. 3 caption). A few different vertical profiles were thus obtained, giving consistent values of sigma.

Table 1. Results of autoradiographic beam profile measurements for the 2004 BLIP irradiation, using the "downstream" nickel foil.

Horizontal position looking at the surface where the beam enters the foil	Vertical position	Horizontal rms width (σ)	Vertical rms width (σ)
2.9 ± 0.5 mm left of center	4.5 ± 0.5 mm below center	8.1 ± 0.3 mm	8.4 ± 0.3 mm

Fig. 6 The nickel foil in the third "basket" of samples that was inserted into the 100-200 MeV proton beam at the BLIP Facility of the BNL linac.