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First Results from the FEB U-Line Spot-Size Study

Participants: K. Brown, A. Carroll, J. Hastings, K. McDonald and N. Tsoupas.

Summary: The smallest spot seen at the FEB U-line focus in the neutrino blockhouse had $\sigma_x \approx \sigma_y \approx 4$ mm. There were about 10^{12} 24-GeV protons in the pulse. The emittance was believed to be "large", *i.e.*, about 100π mm-mrad, as would certainly hold for a pulse of 10^{13} p's.

This result was not unexpected. Nick Tsoupas' transport calculation for $100pi$ mm-mrad indicated $\sigma_x = \sigma_y \approx 2.5$ mm.

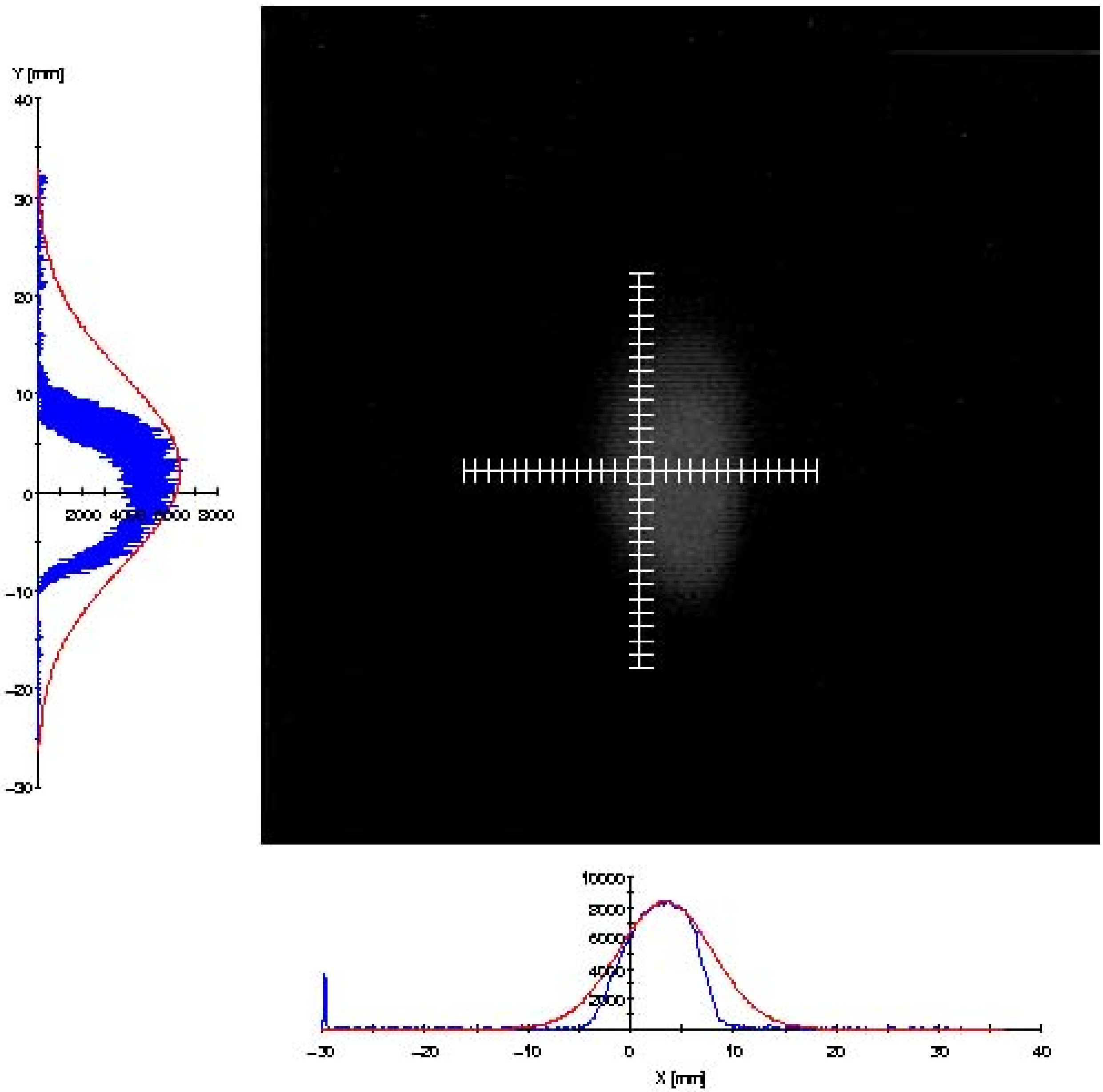
On the following pages are 3 spot-size profiles taken near the beginning, middle, and end of the study. These images can also be accessed on the Internet at http://ad1.ags.bnl.gov/˜kbrown/

Implication: We need more quads to get to $\sigma_x = \sigma_y \approx 1$ mm, so that a pulse of 10^{13} protons causes the same local energy depostion as the baseline muon collider proton beam. Beam tests of liquid targets in the present conditions would not tell us all we need to know.

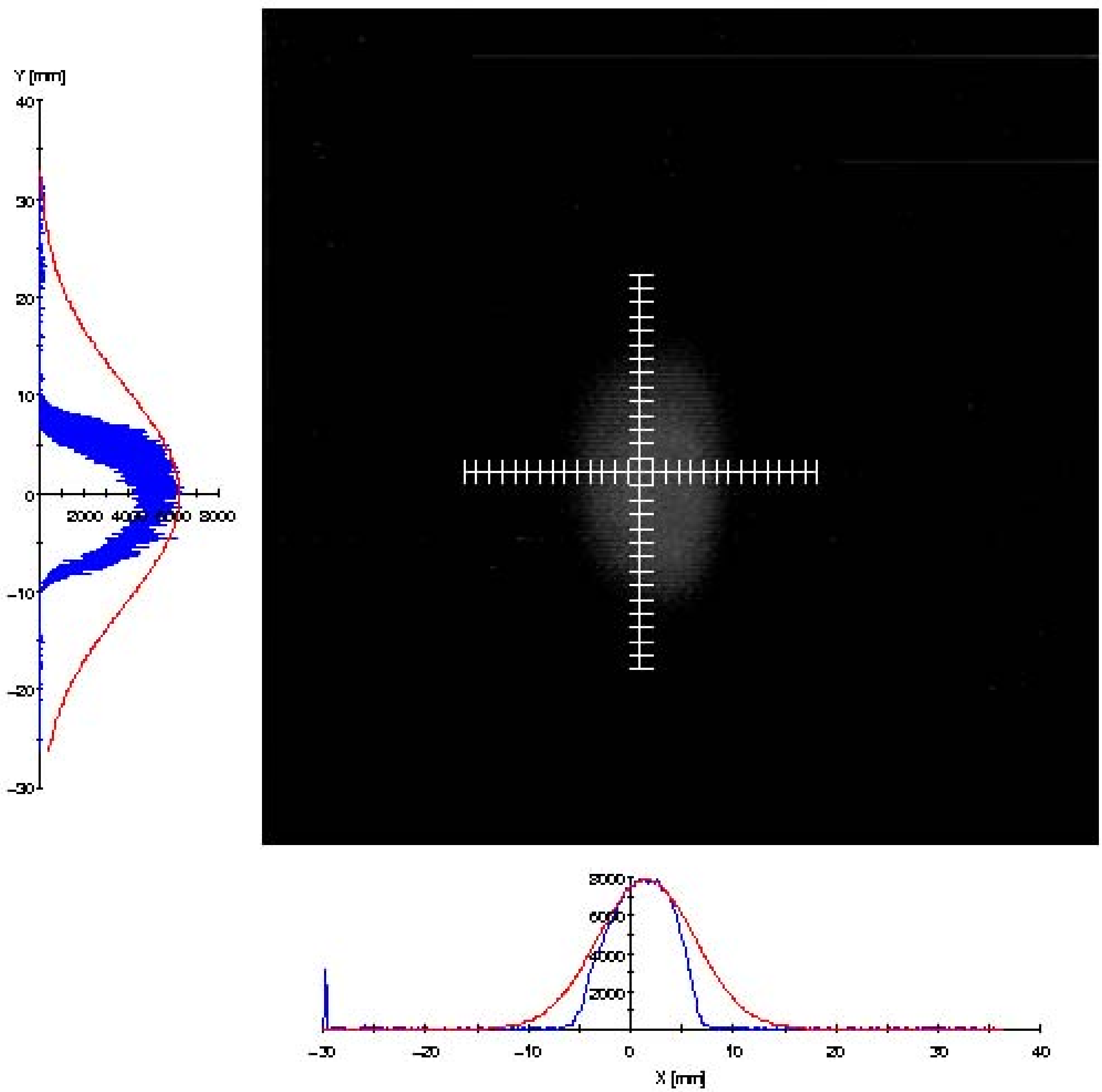
Hence, the priority now is to make a study of what magnets/power supplies will be needed to achieve this goal. In particular, if the radiography quads are indeed being commissioned for the U-line, a study should be made of their possible benefit in achieving a small spot size.

Thanks to the participants listed above, and to AGS operators. The measurement was heroic in that the shift started at 7 am Tuesday, Nov. 17, 1998. The profiles were collected at 3-7 am Wed. morning. Kevin was still going strong I returned to Princeton at 5:30 am.

-- uf730 Wed Nov 18 05:14:12 1998 --
Framegrabber = seb-fg1
Signal Range = 0 100
Centroid = 2.33263 0.844168 mm
Center = 3.41341 2.24381 mm
Sigma = 4.60076 9.5821 mm
Ellipse = 9.61202 4.59755 mm
Theta = -1.53149
Intensity = 565389
Attenuation = 0%



-- uf730 Wed Nov 18 06:29:21 1998 --
Framegrabber = seb-fg1
Signal Range = 0 106
Centroid = 0.758593 -0.00924321 mm
Center = 1.56206 -0.228696 mm
Sigma = 4.74986 11.213 mm
Ellipse = 29.5473 4.42446 mm
Theta = 1.19092
Intensity = 527376
Attenuation = 0%



-- uf730 Wed Nov 18 06:42:53 1998 --

Framegrabber = seb-fg1

Signal Range = 0 157

Centroid = 7.07032 3.39971 mm

Center = 2.58813 -0.144885 mm

Sigma = 4.01048 10.8851 mm

!!Failed 2D Gauss Fit!!

Intensity = 1152191

Attenuation = 0%