

# 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  $100\pi$  mm-mrad, as would certainly hold for a pulse of  $10^{13}$   $p$ 's.

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

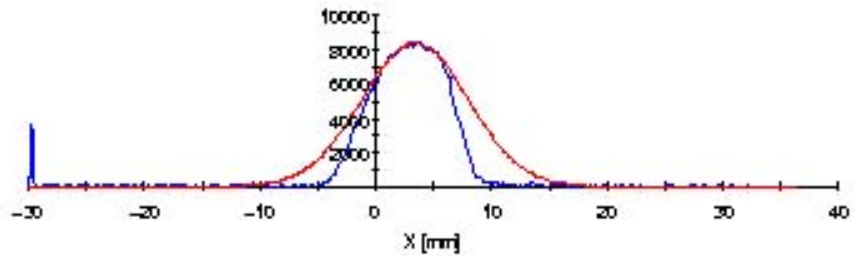
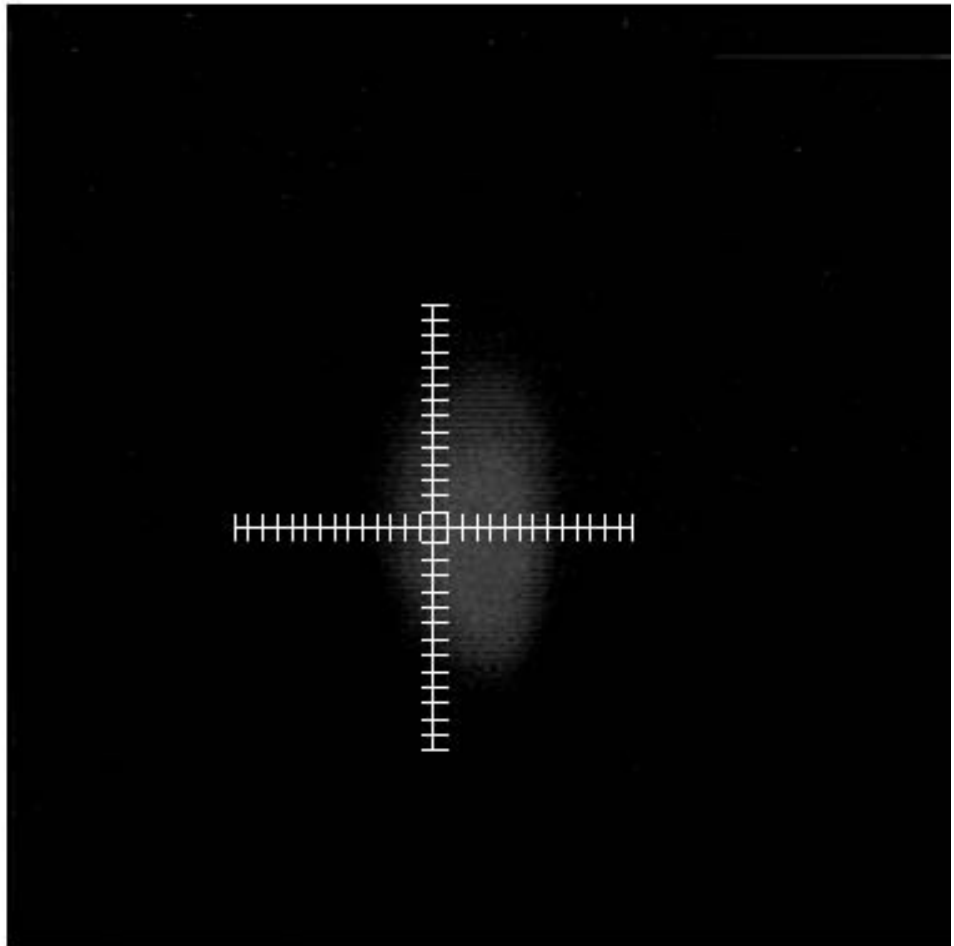
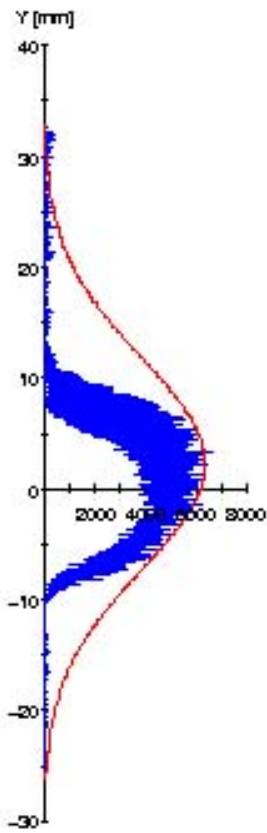
On the following pages are 3 spot-size profiles taken near the beginning, middle, and end of the study. These images can also be accessed on the Internet at <http://ad1.ags.bnl.gov/~kbrown/>

**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 deposition 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.

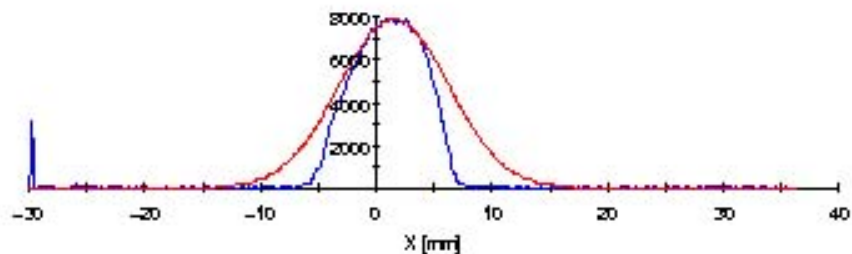
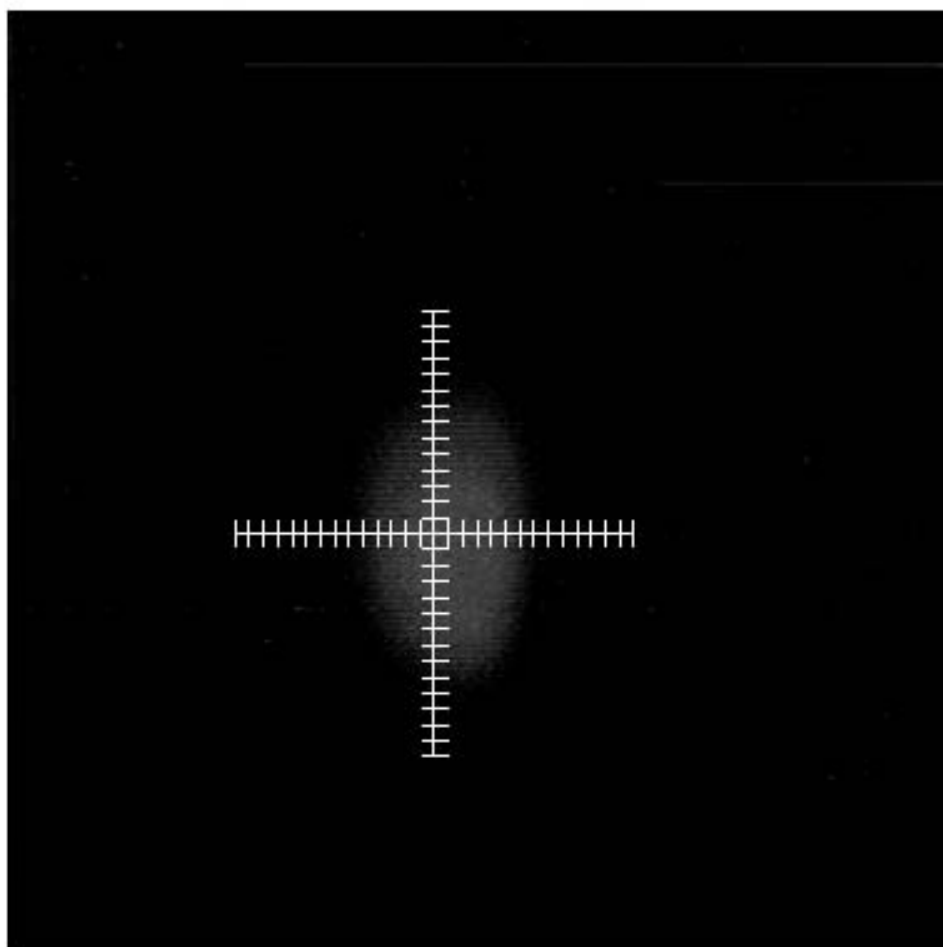
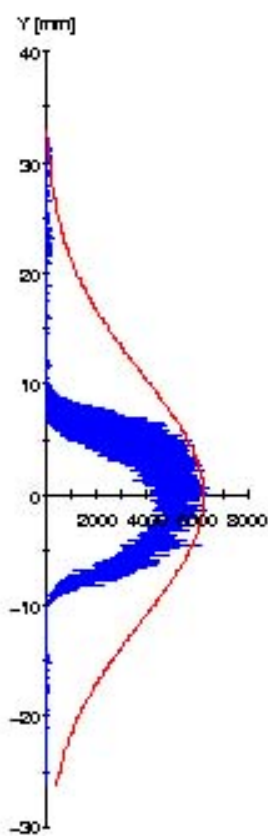
Hence, the priority now is to make a study of what magnets/power supplies will be needed to achieve this goal. In particular, if the radiography quads are indeed being commissioned for the U-line, a study should be made of their possible benefit in achieving a small spot size.

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%

