Forward Scattering
Preliminary tests

L. Barion, G.Battaglia, M. Contalbrigo, P. Lenisa,
A. Movsisyan, L. Pappalardo
INFN Ferrara

RICH Meeting
29.05.2015

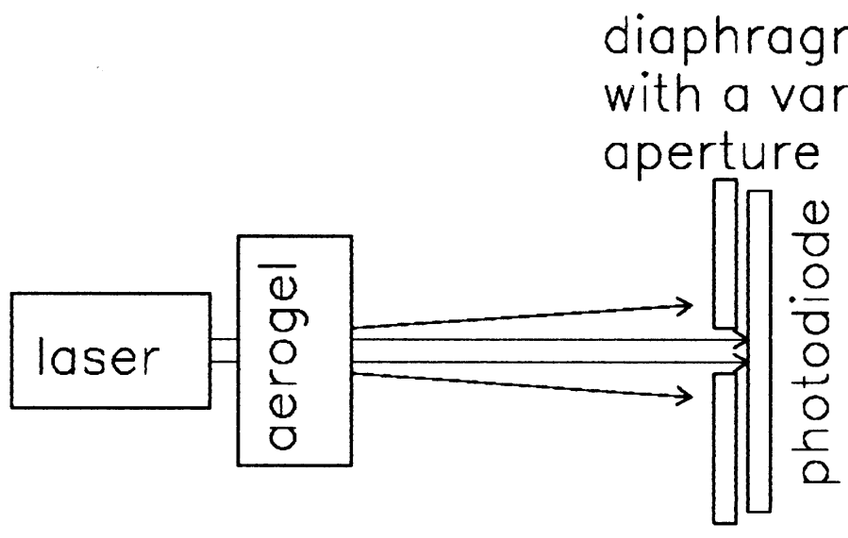
Introduction

Analysis based on publication from 2001:

R.De Leo et al., "Chromatic aberration and forward scattering of light in silica aerogel", NIM A457 (2001) 52-63

Description of the setup:

In an inhomogeneous medium, the intensity of the light scattered at small angels depends on microscopic density fluctuations which cause local variations of the dielectric properties of the material. The anisotropy in the dielectric constant of the medium causes a light scattering which is strongly forward peaked, and contributes in to the angular dispersion of the light.

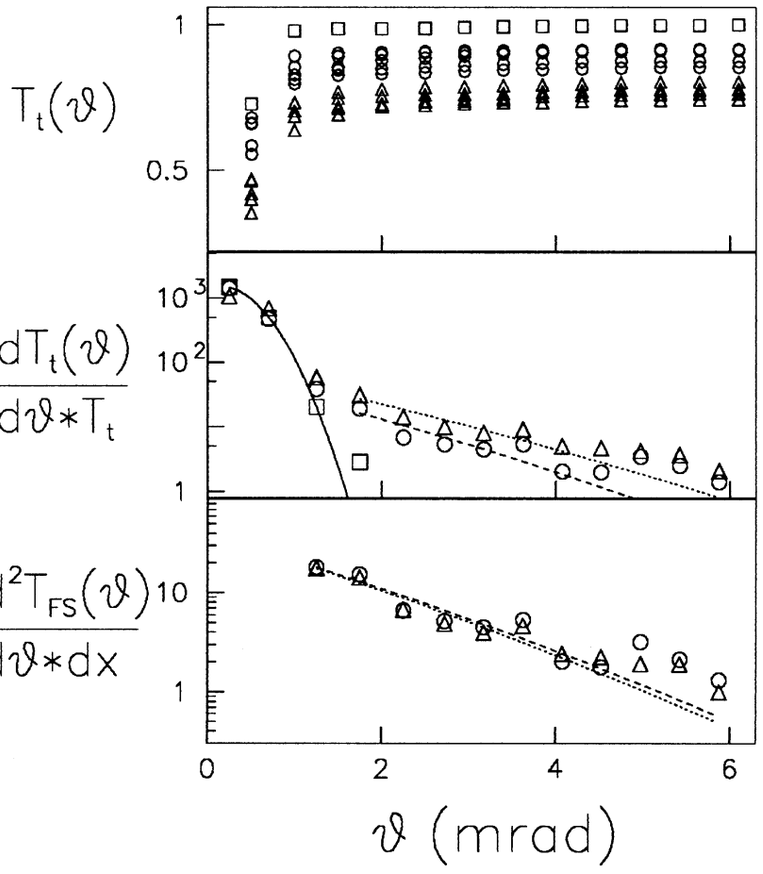


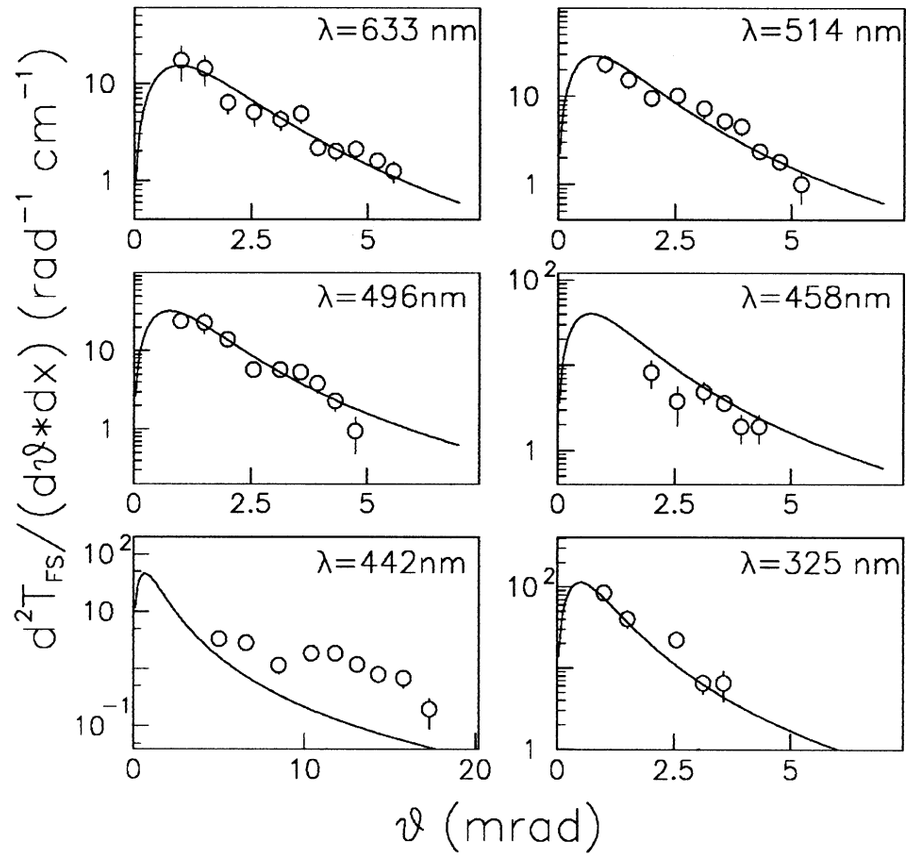
Analysis based on publication from 2001:

R.De Leo et al., "Chromatic aberration and forward scattering of light in silica aerogel", NIM A457 (2001) 52-63

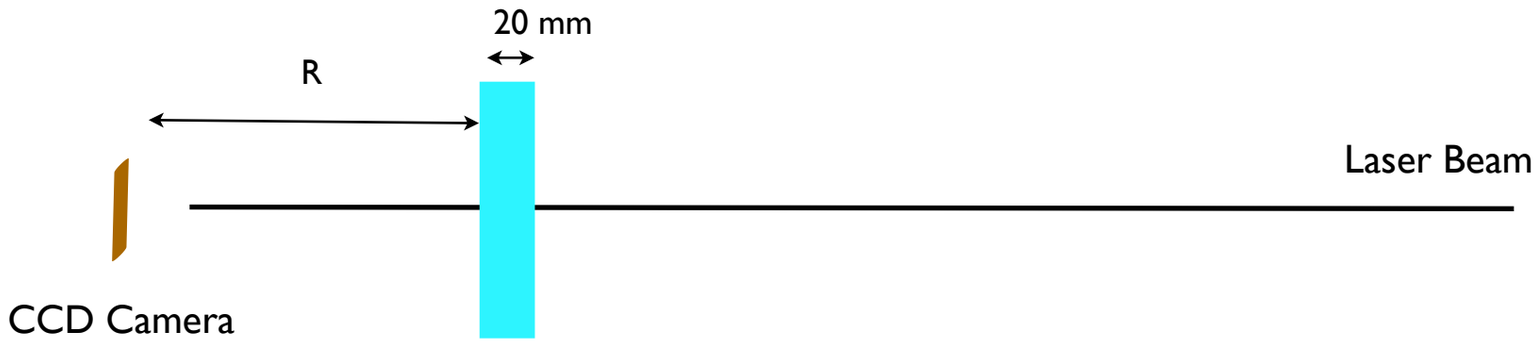
Results from the reference:

$$\frac{\mathrm{d}T_{\mathrm{FS},t}(\theta)}{\mathrm{d}\theta} = \frac{\mathrm{d}T_t(\theta)}{\mathrm{d}\theta}\frac{1}{T_t} - f_{\mathrm{B}}\frac{\mathrm{d}T_0}{\mathrm{d}\theta} \qquad \frac{\mathrm{d}^2T_{\mathrm{FS}}}{\mathrm{d}\theta\,\mathrm{d}x} = \frac{(1+\cos^2\theta)}{\lambda^4}(\sin\theta)\,wf.$$

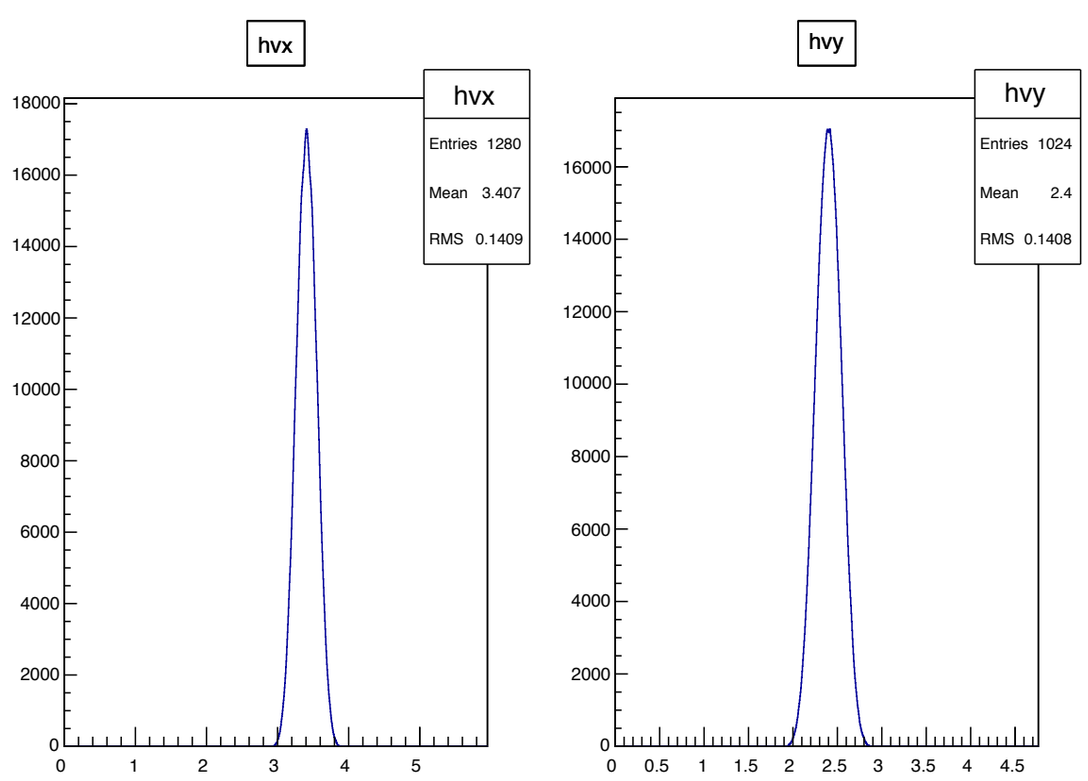




Description of the setup:

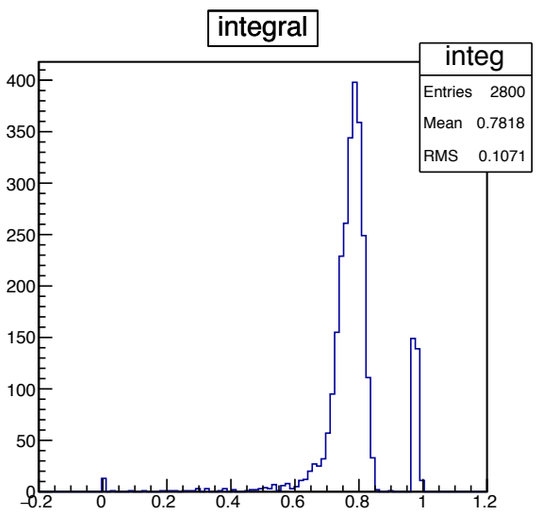


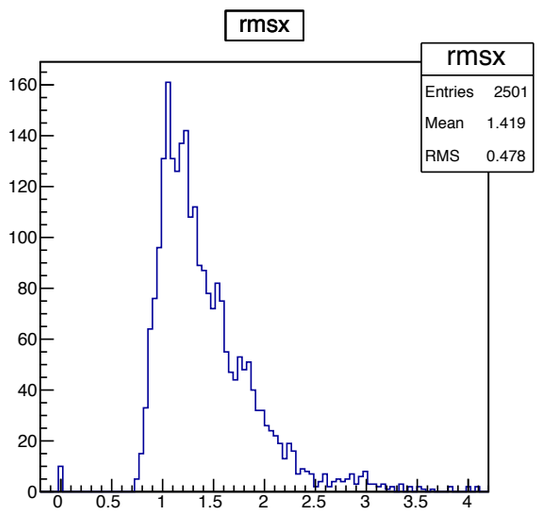
Measurements without aerogel: X, Y profiles

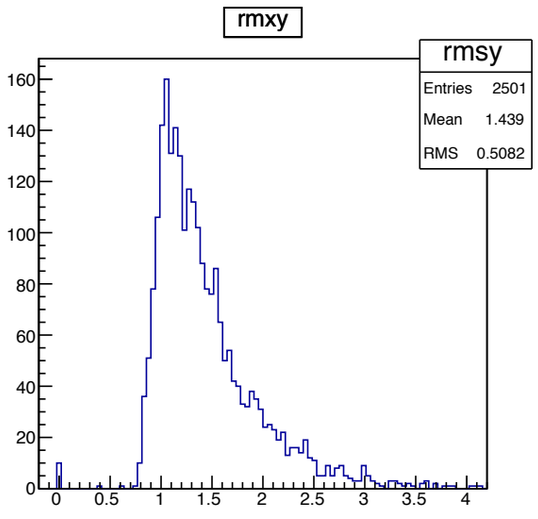


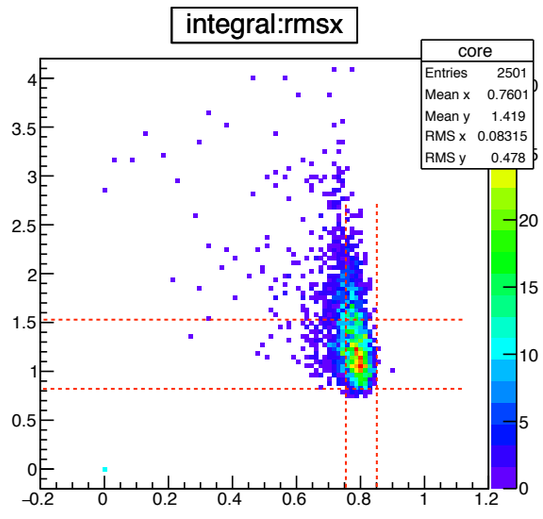
Nov105 398m3

Face 1

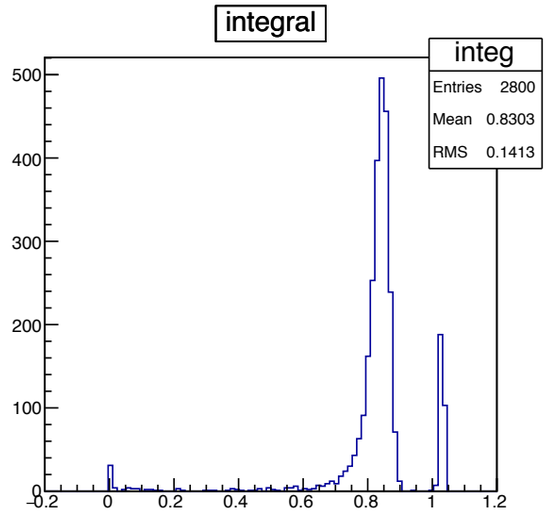


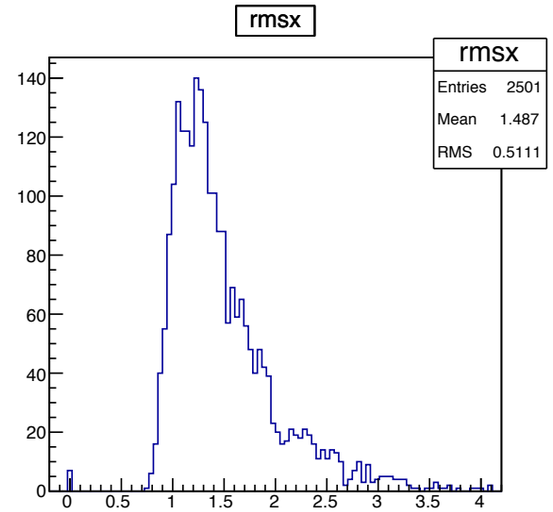


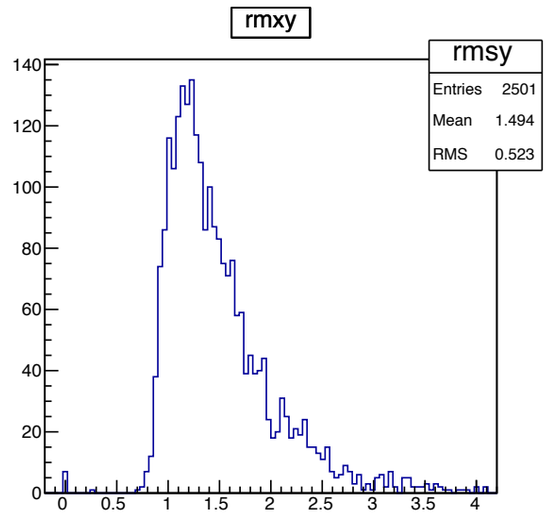


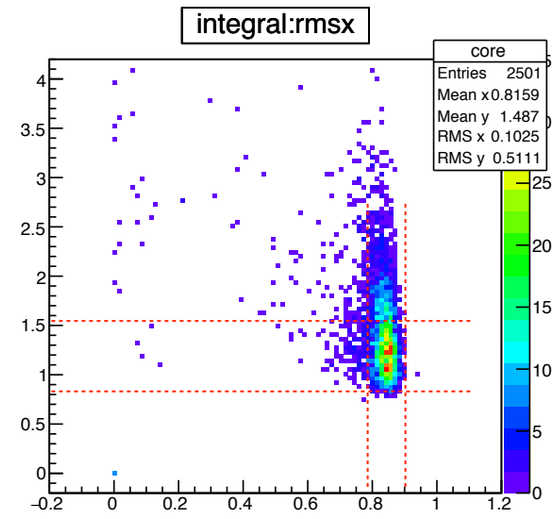


Face 2



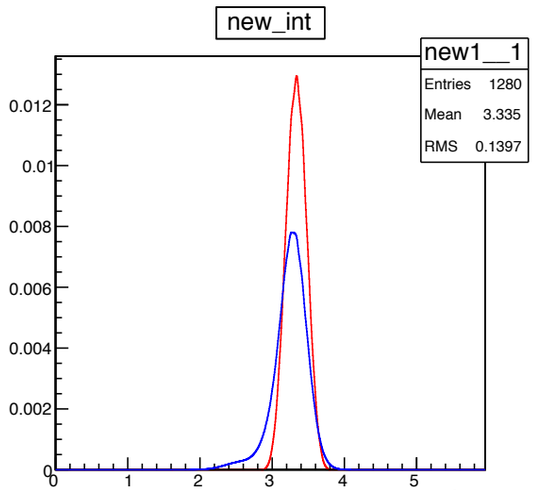


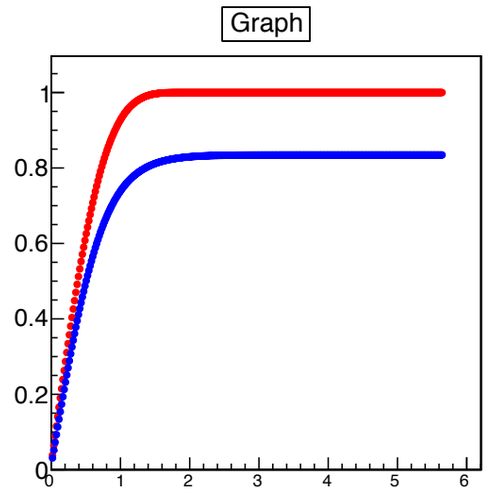


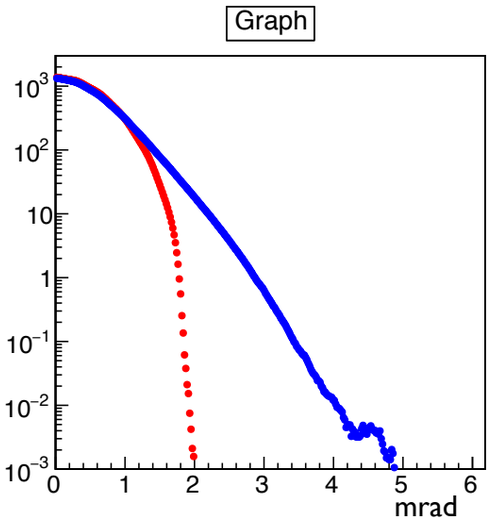


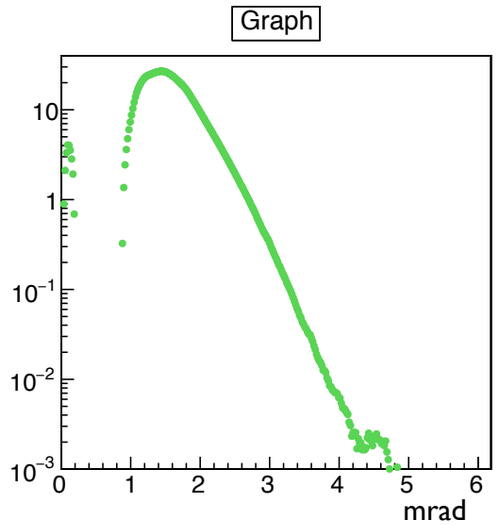
Nov105 398m3

Face 1

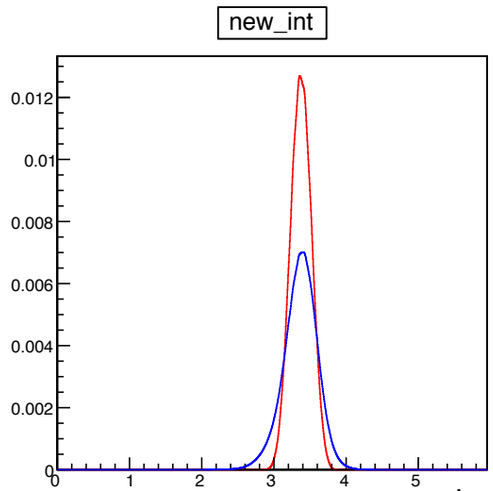


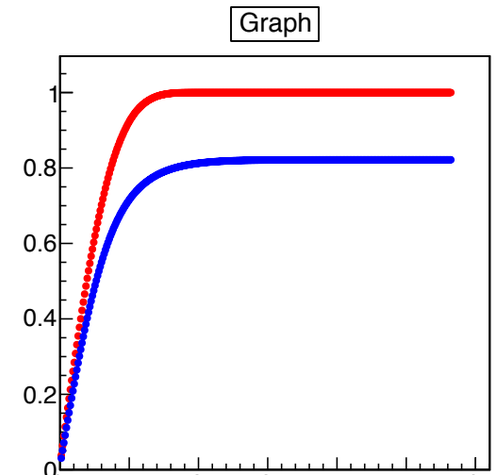


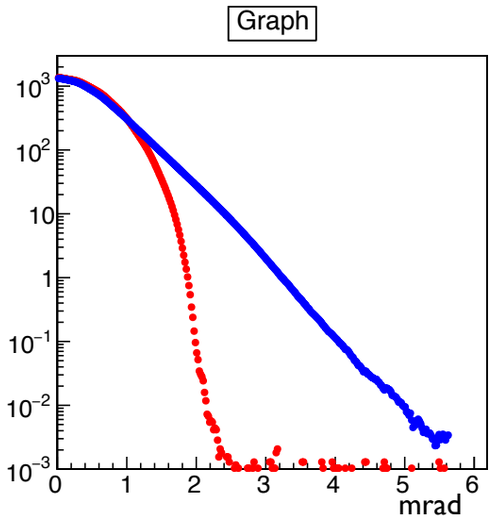


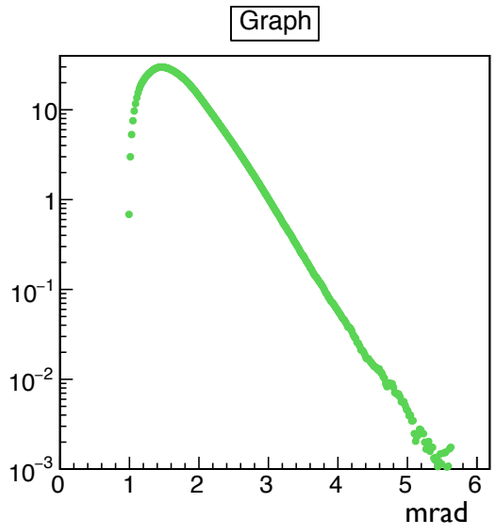


Face 2





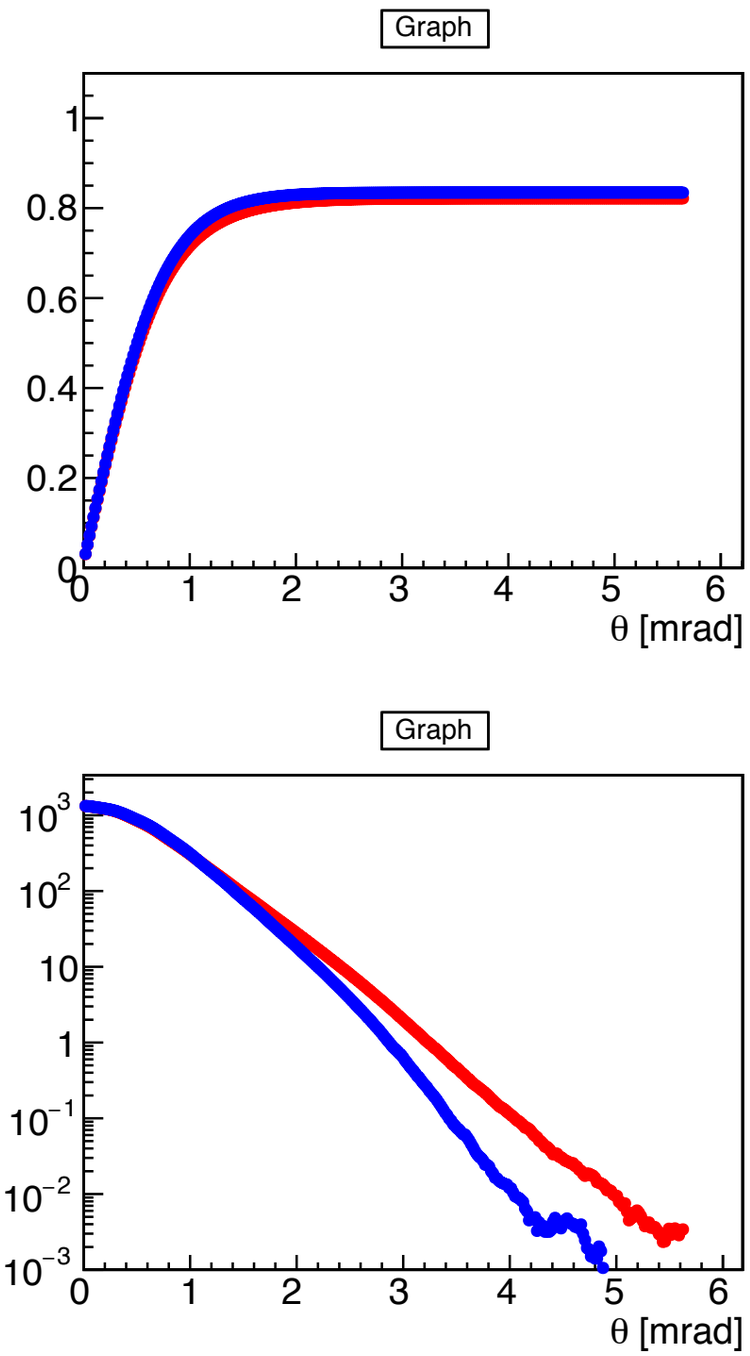


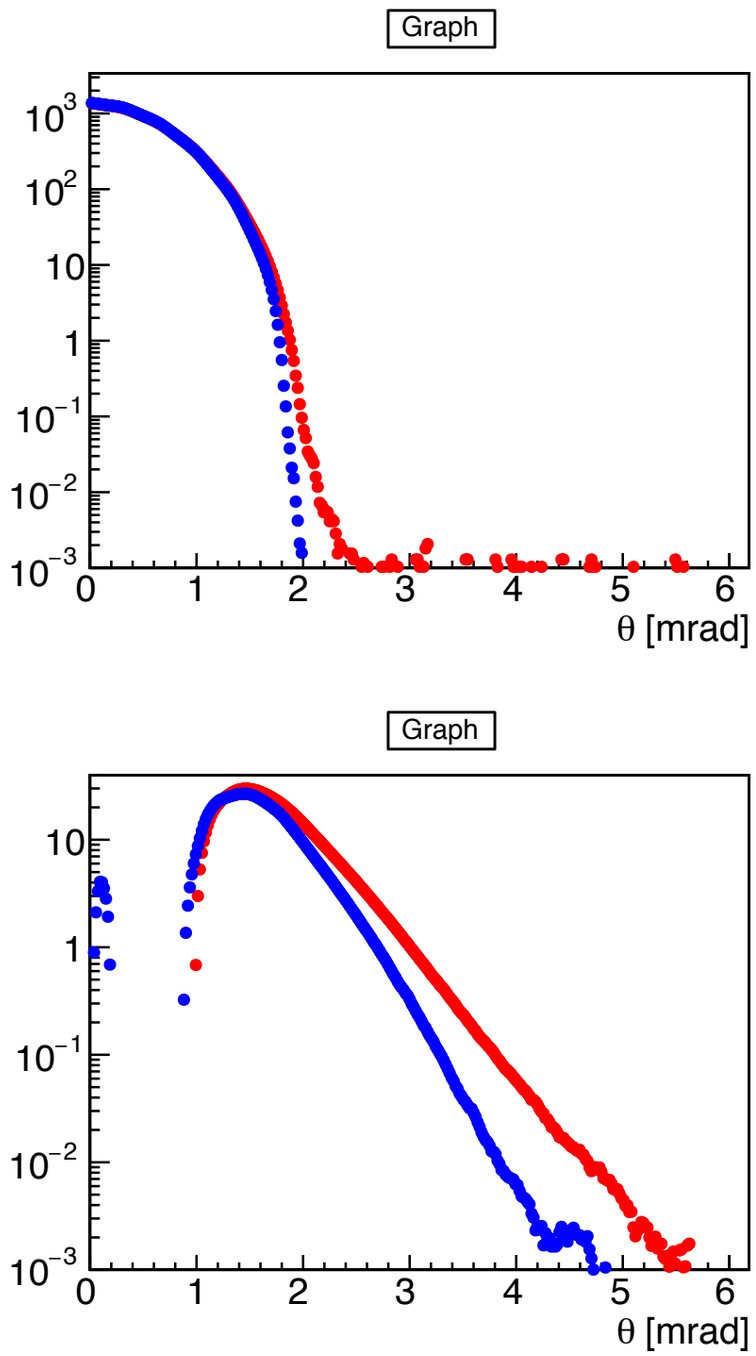


$$\frac{\mathrm{d}T_{\mathrm{FS},t}(\theta)}{\mathrm{d}\theta} = \frac{\mathrm{d}T_t(\theta)}{\mathrm{d}\theta}\frac{1}{T_t} - f_{\mathrm{B}}\frac{\mathrm{d}T_0}{\mathrm{d}\theta}$$

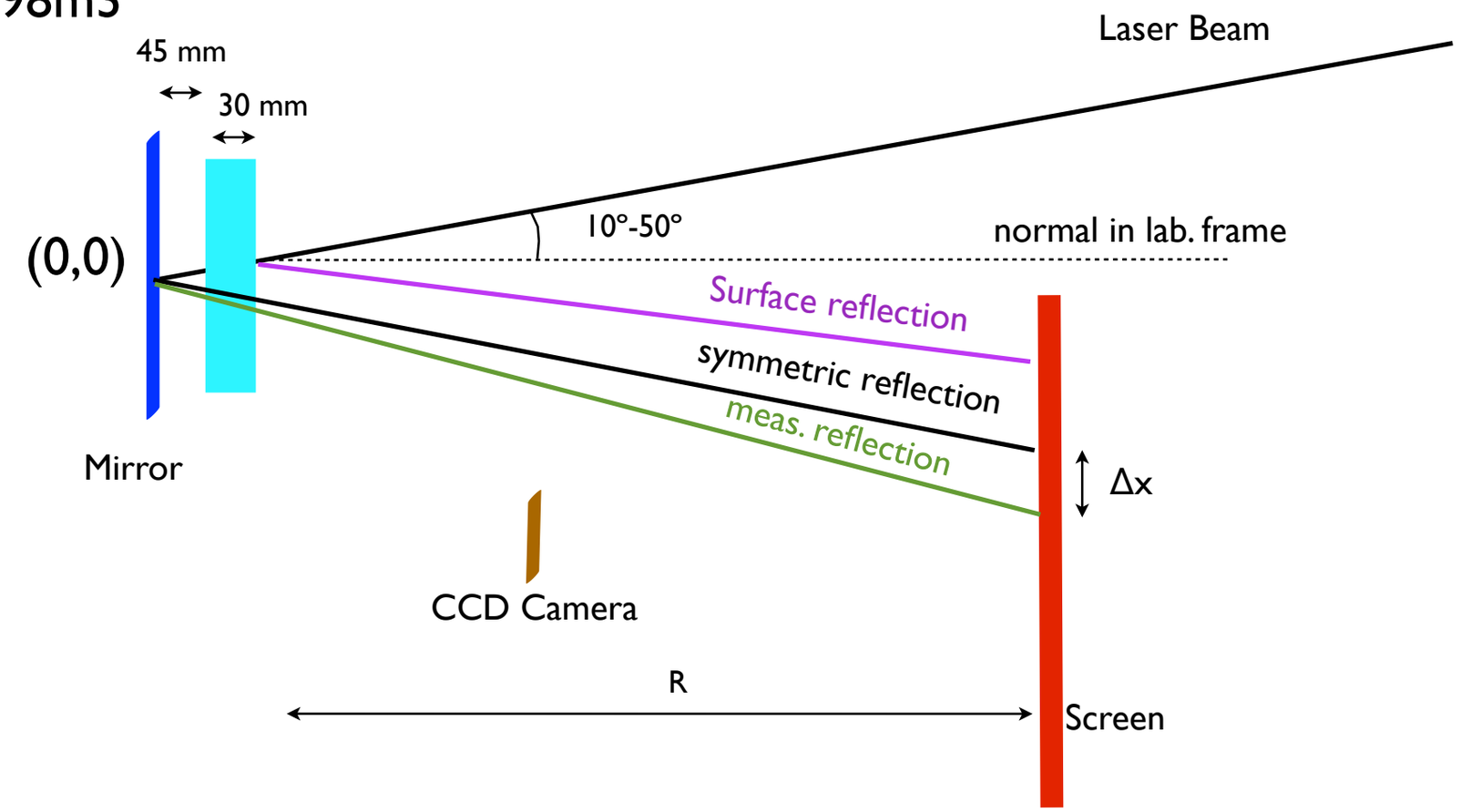
Comparison of two surfaces

Nov105 398m3





Nov105 398m3

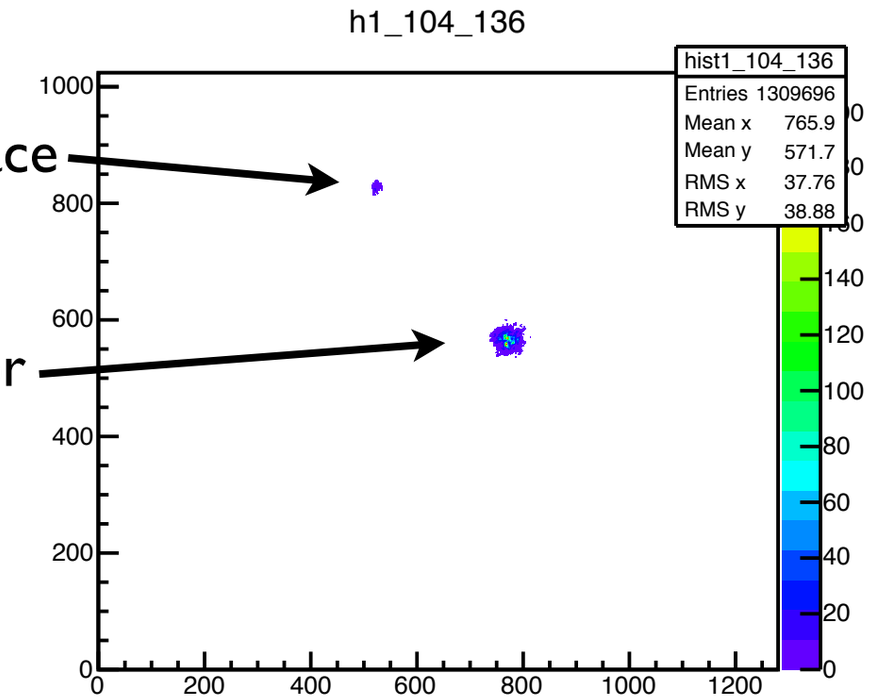


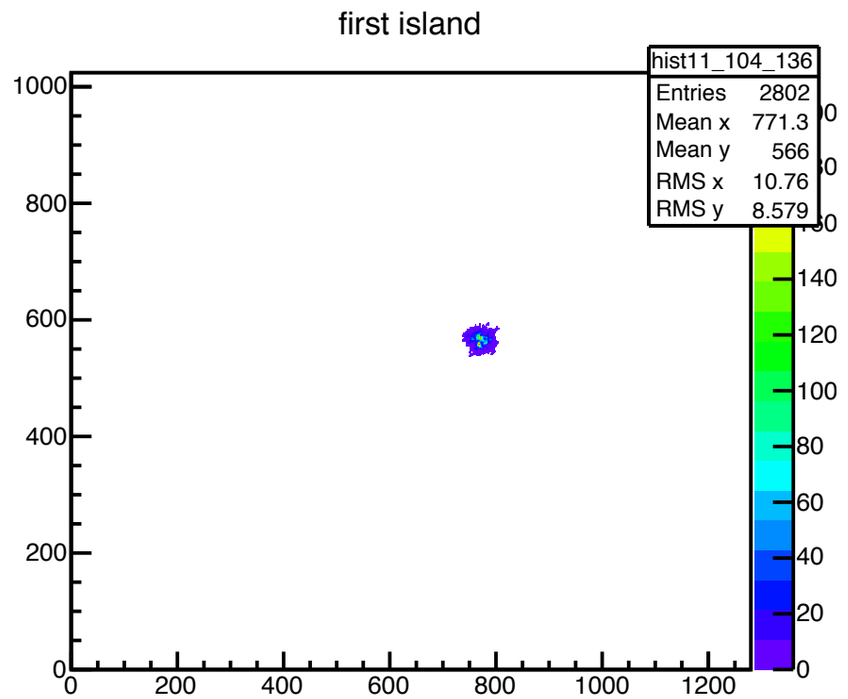
$$\Delta(\theta_X) = \frac{\Delta x \, Scale \, \cos(\Theta)}{R}$$

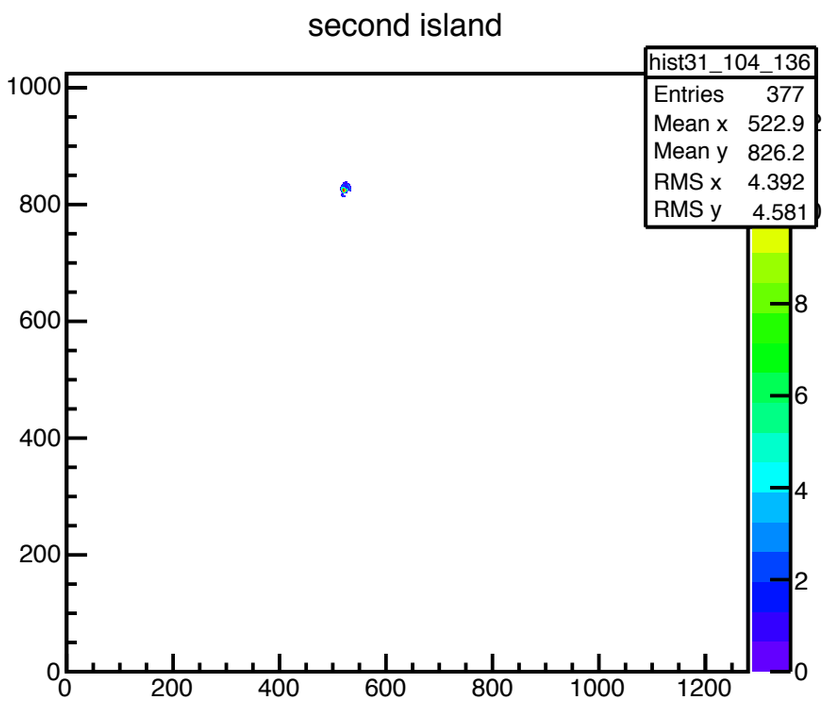
Nov105 398m3

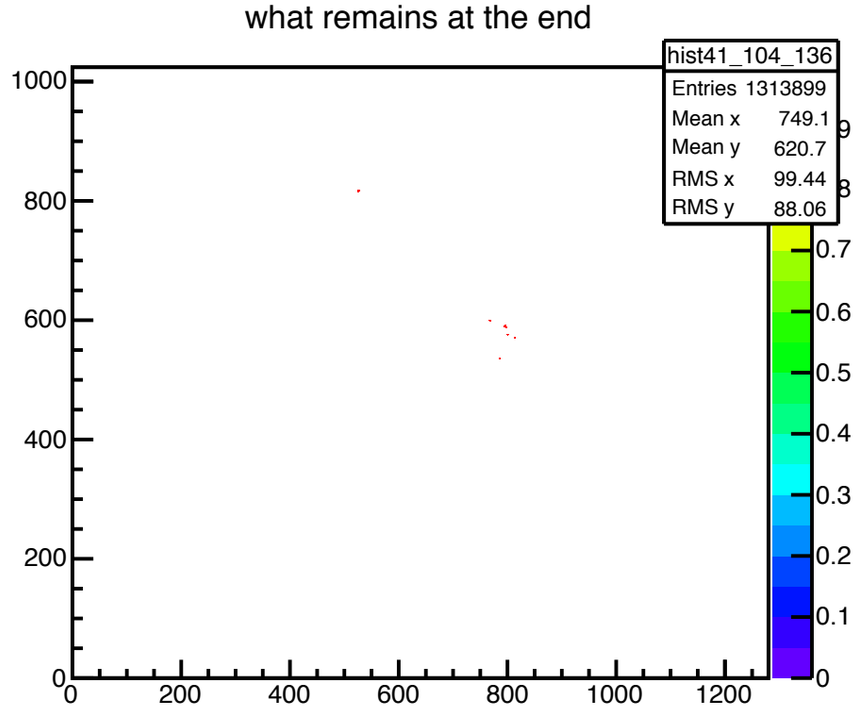
Reflection from Surface

Reflection from Mirror

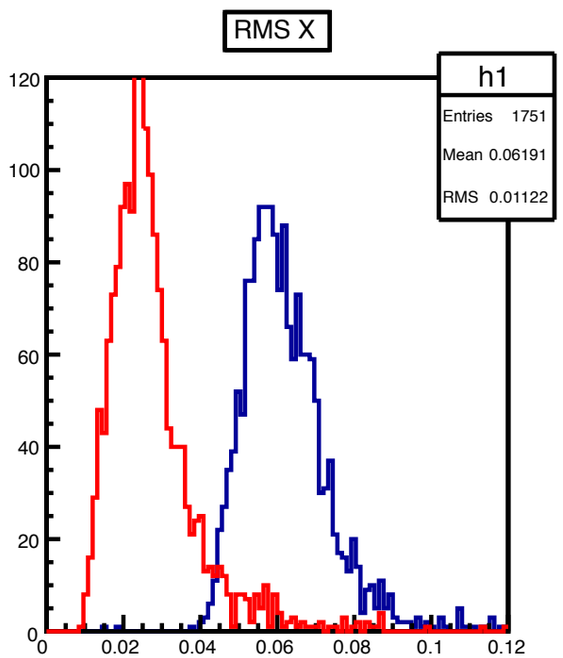


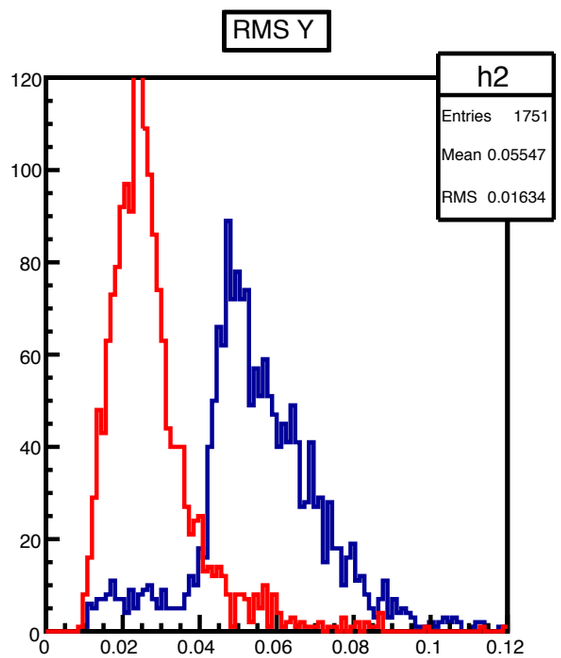


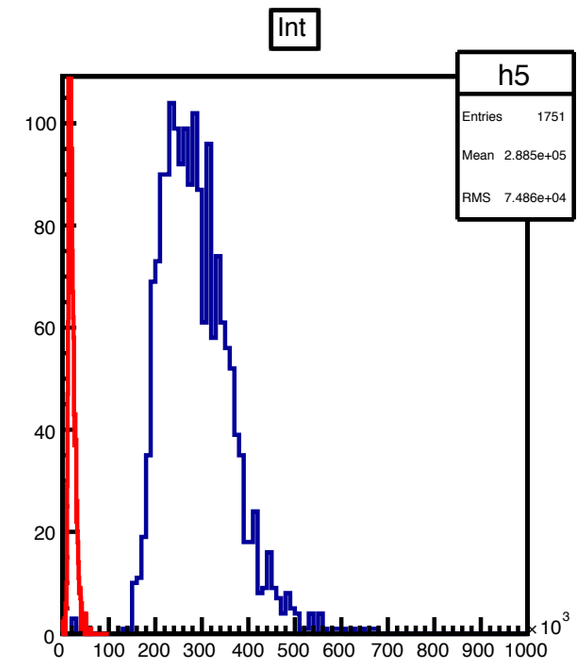




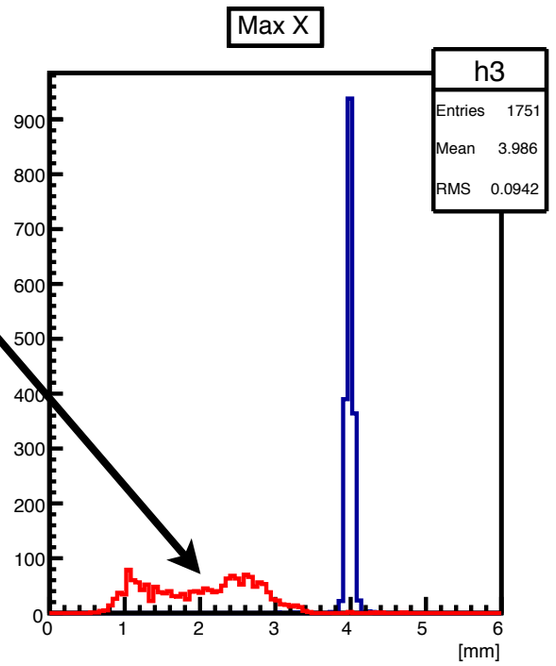
Nov105 398m3

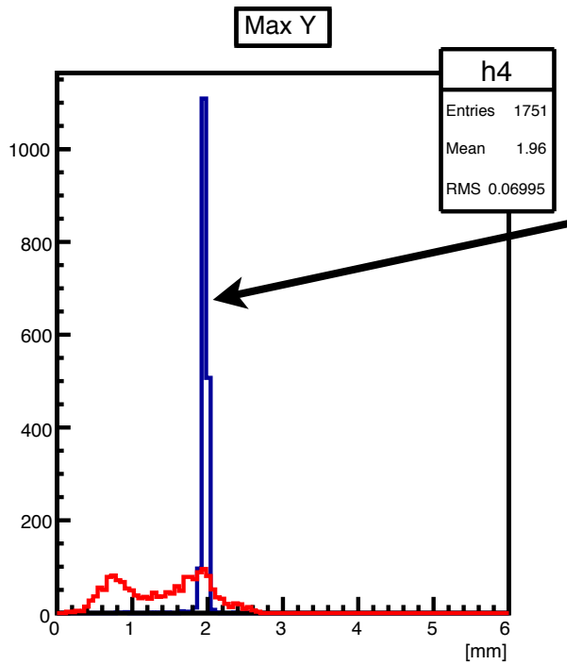






Reflection from Surface

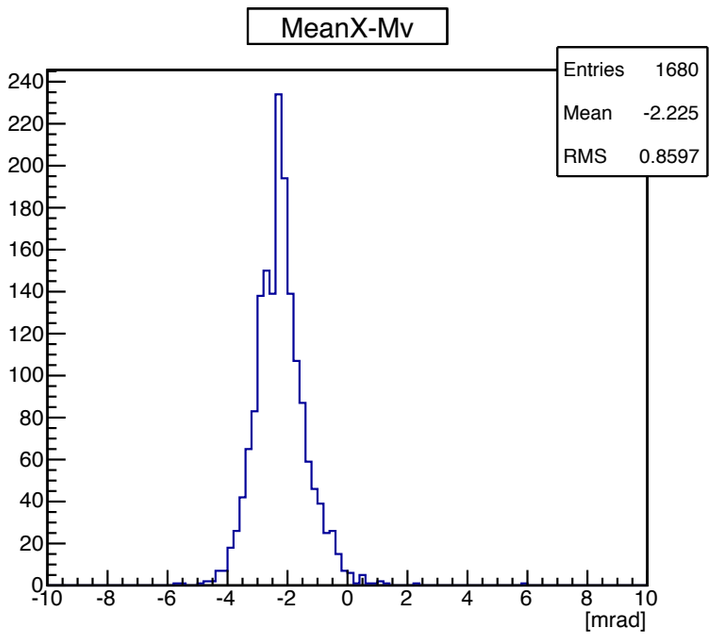


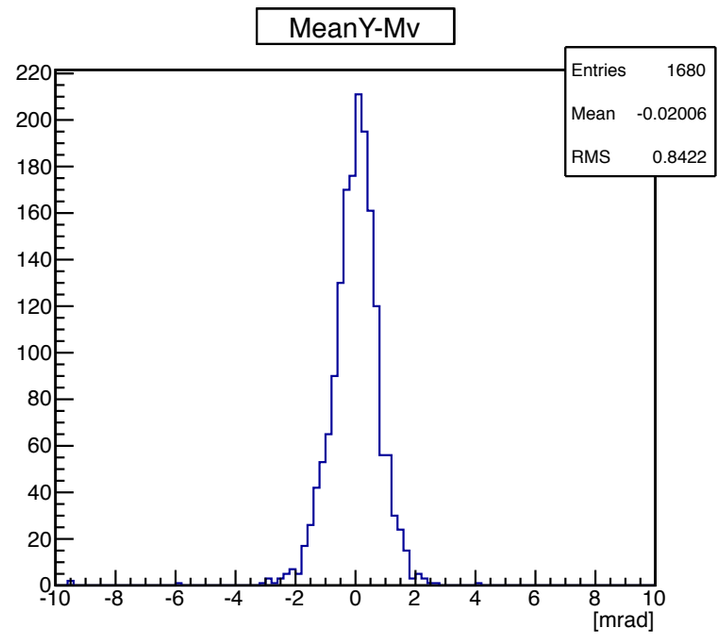


Reflection from Mirror

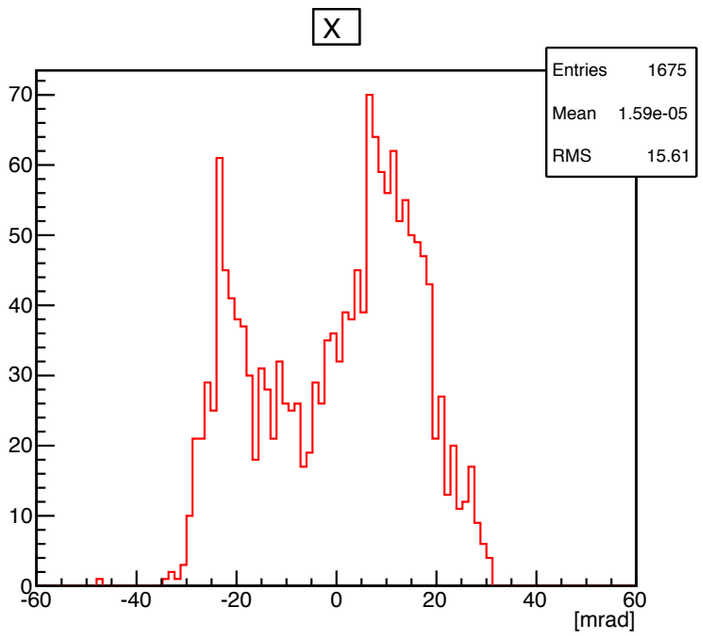
Nov105 398m3

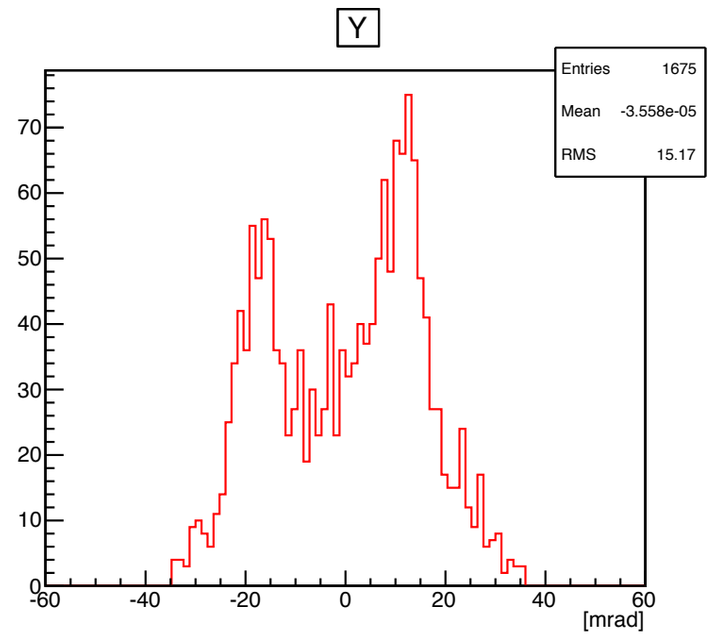
Reflection from Mirror





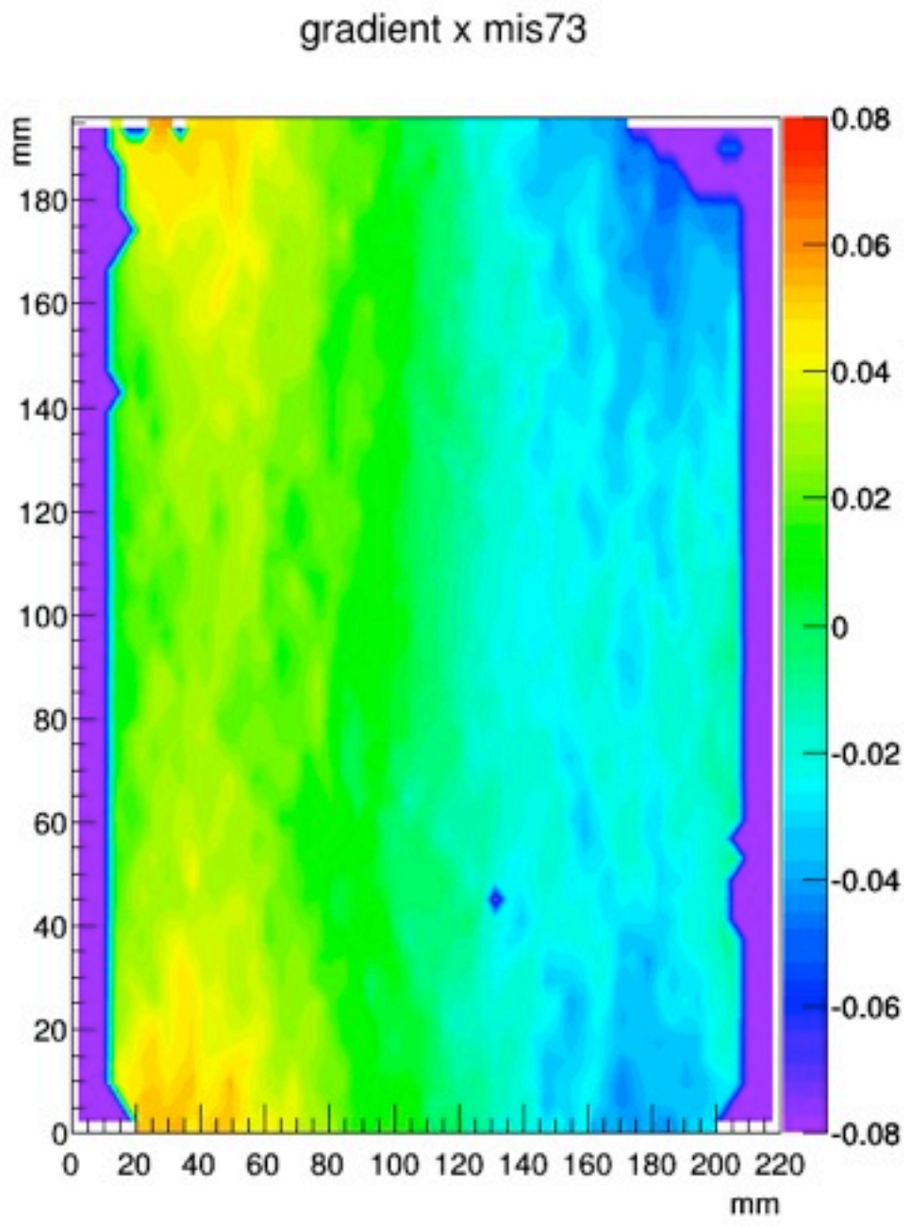
Reflection from Surface

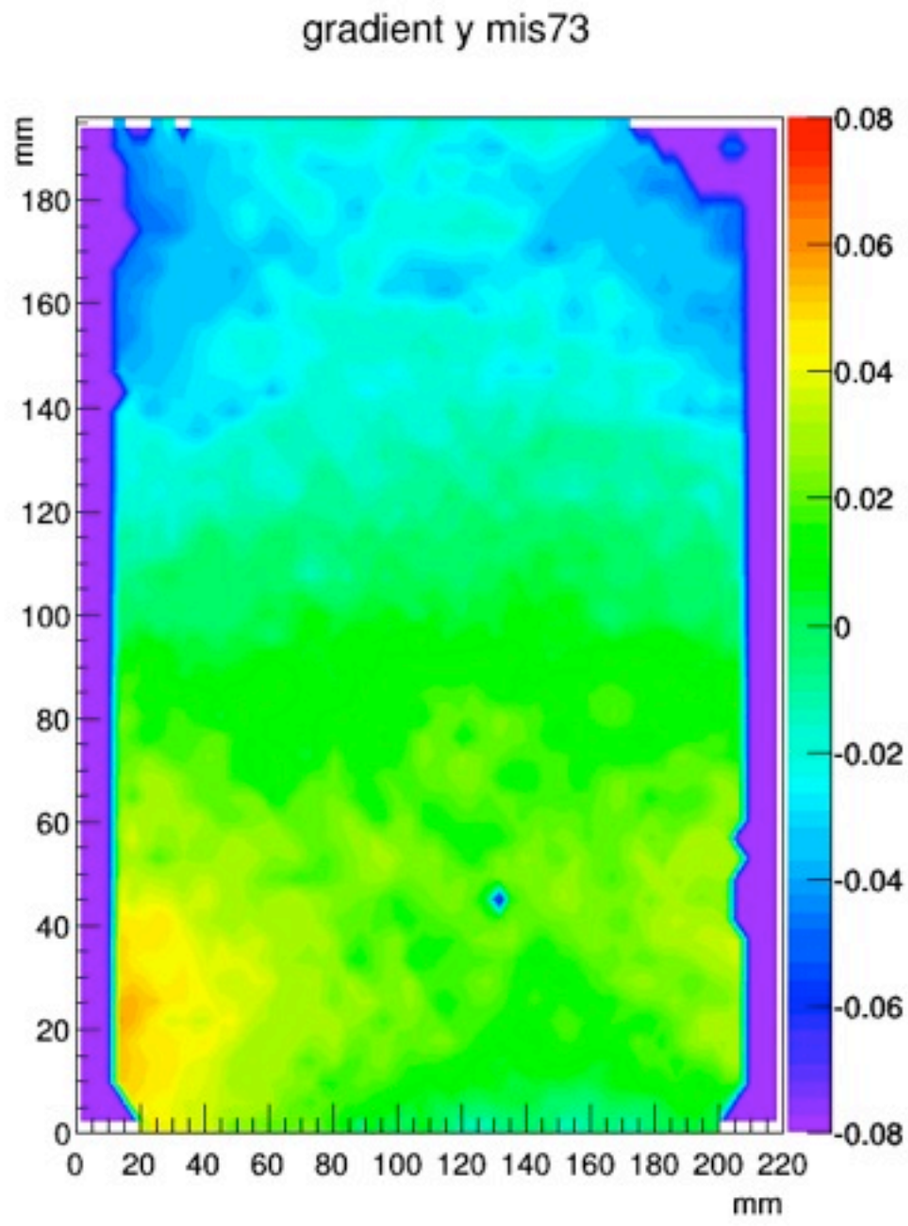




Complete scan of the surface with reflection

Nov105 398m3





Complete scan of the surface with reflection

Nov105 398m3

Surface map obtained from the integration of measured gradients.