

# Geometry and TOF Beam Characterization

Including "drift plots" for the 6-200 -ve polarity M0 optics data

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## Useful geometry numbers

- Corners  $A, B, C, D \Rightarrow$  TOF centre planes  $\hat{n} \cdot (\vec{r} - \vec{r}_0) = 0$
- $\hat{n}$  is the normal, obtained from  $\vec{AC} \times \vec{BD}$
- $\vec{r}_0$  is the centre of the detector, deduced from  $\vec{AC} + \vec{BD}$

Dihedral angle given by  $\cos \alpha = \hat{n}_1 \cdot \hat{n}_2$

TOF0 normal =  $(-0.467, -0.509, 99.998)$ ,  $\alpha = 0.396$  deg

TOF1 normal =  $(-0.927, -1.423, 99.986)$ ,  $\alpha = 0.974$  deg

Middles of the detector (from the survey recon)

TOF0  $\vec{r}_0 = (1.8, 2.6, 5293.8)$  mm

TOF1  $\vec{r}_0 = (30.2, -17.6, 12999.0)$  mm

Intersection with design orbit at  $z_{\text{design}} = \hat{n} \cdot \vec{r}_0 / \hat{n}_z$

TOF0  $z_{\text{design}} = 5293.7$  mm

TOF1  $z_{\text{design}} = 12999.0$  mm

## Error

$$\frac{\sigma_p}{p} = \frac{E^2}{m_0^2} \sqrt{\left(\frac{\sigma_t}{t}\right)^2 + \left(\frac{\sigma_s}{s}\right)^2} \quad (1)$$

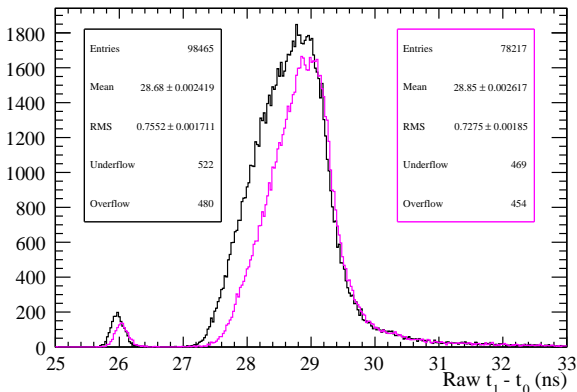
## Bias

$$\frac{\Delta p}{p} = \frac{E^2}{m_0^2} \left( \frac{\Delta s}{s} - \frac{\Delta t}{t} \right) \quad (2)$$

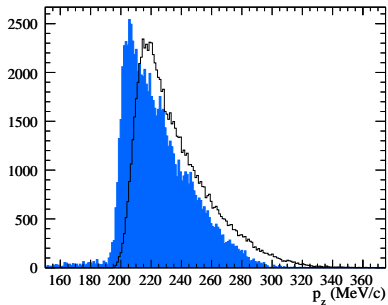
# Simulation/data comparison for 6–200 $e^-$ M0

Runs: 2175, 2176, 2187, 2190, 2200, 2204, 2205, 2210, 2211, 2223, 2238, 2239, 2241, 2243, 2244, 2245, 2253, 2254, 2255, 2266, 2272, 2274, 2275, 2276, 2303, 2498, 2499, 2500, 2501, 2502, 2521, 2525

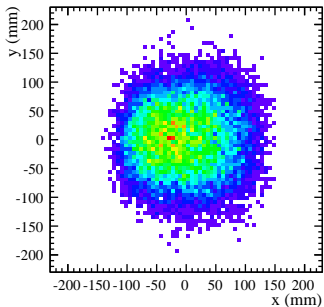
February and August calibrations



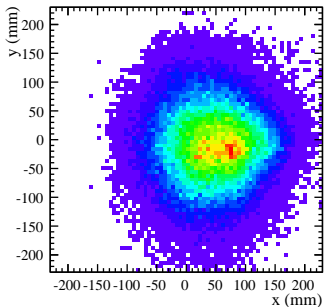
Simulation (blue) and data (black)

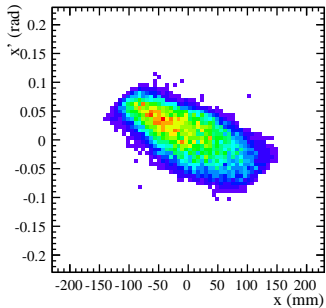
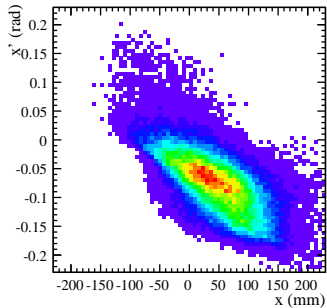
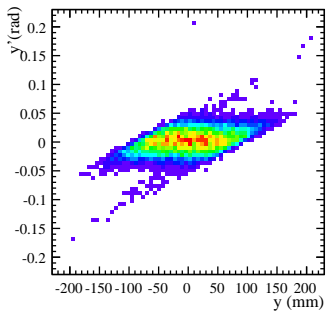
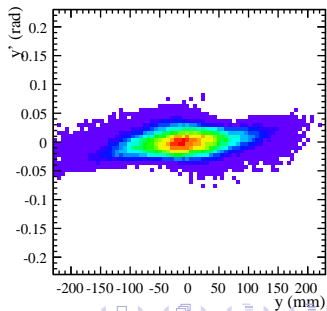


Simulation

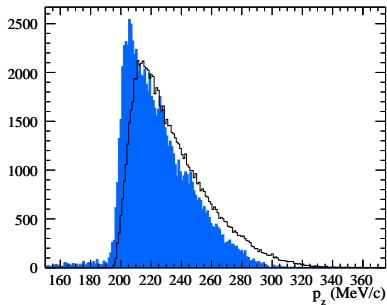


Data

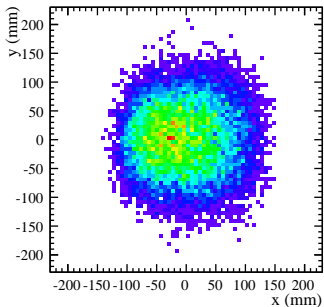


**Simulation****Data****Simulation****Data**

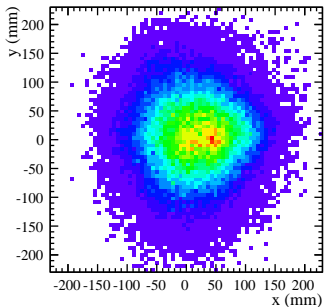
Simulation (blue) and data (black)

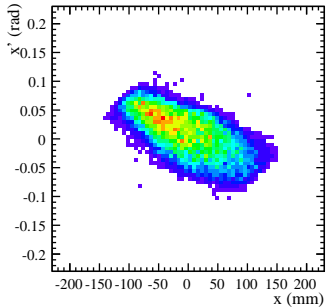
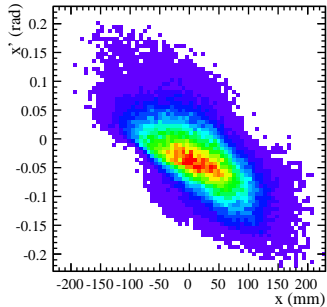
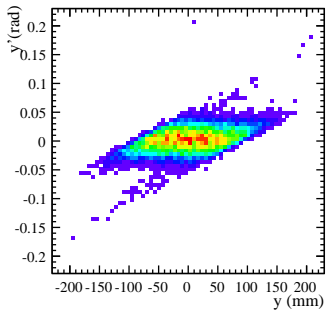
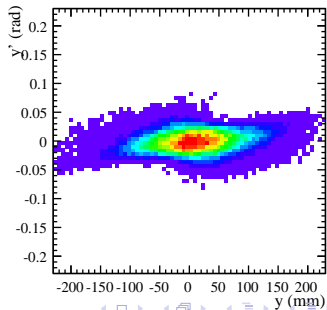


Simulation



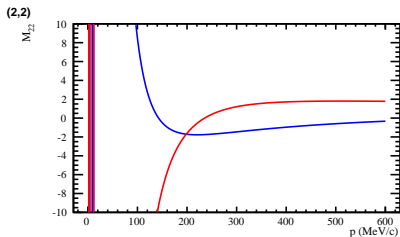
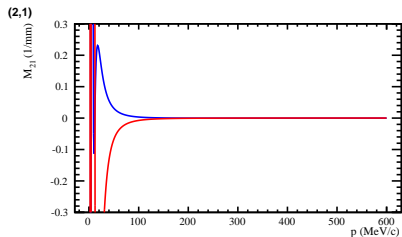
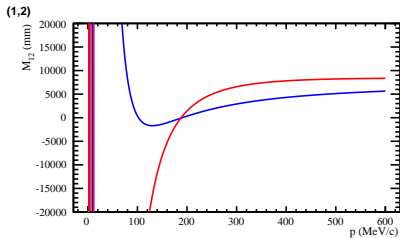
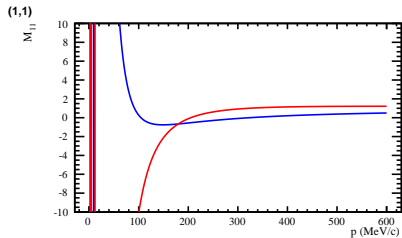
Data



**Simulation****Data****Simulation****Data**



# 6-200, -, M0 optics



$u$  is the position on TOF0

$v$  is the position on TOF1

$$x'_1 = A(p)u + B(p)v$$

