

# RICH GEMC SIMULATIONS

Contalbrigo Marco, Aram Movsisyan  
Luciano Pappalardo, Luca Barion & Paolo Lenisa  
INFN Ferrara

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Rich Meeting, 01 February 2013

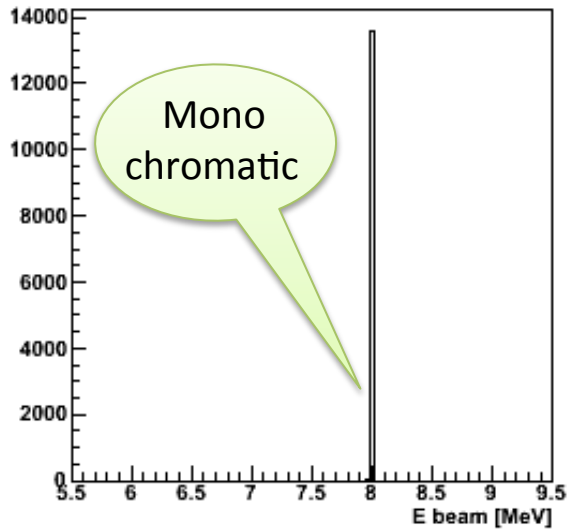
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# Simulation Optimization

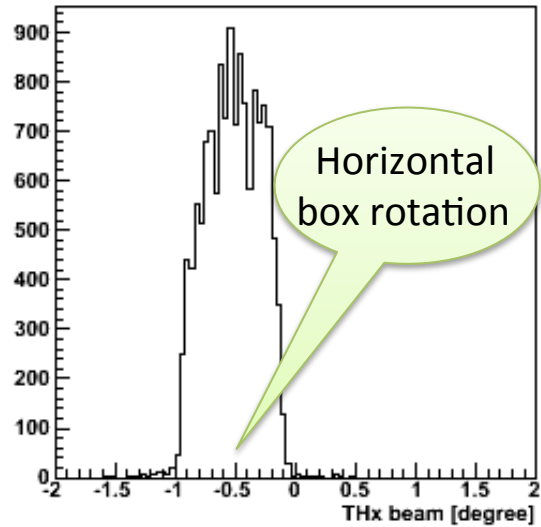
- ✓ Geometry
  - ✓ beam trajectory taken from GEMs
  - ✓ box 0.5 degrees rotation with respect to the beam
- ✓ Aerogel optical properties
  - ✓ measured transmission
  - ✓ refractive index
  - ✓ measured dispersion (direct light data with filters)
- ✓ MA-PMTs digitalization
  - ✓ dead area
  - ✓ double hits → take the OR
  - ✓ PMTs global efficiency
  - ✓ cross-talk
  - ✓ gain

# Beam Tracks

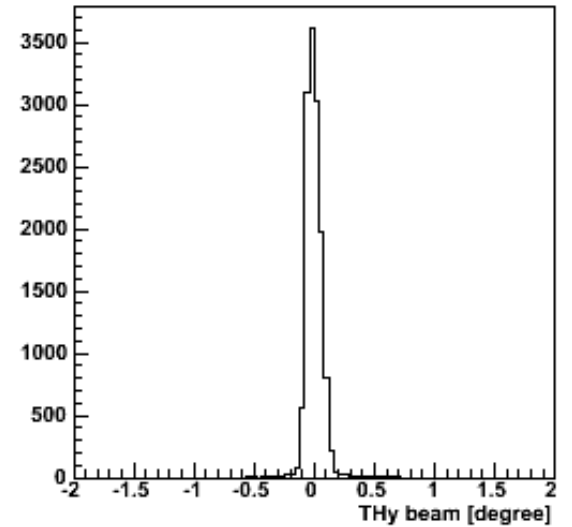
ebeam/1000.



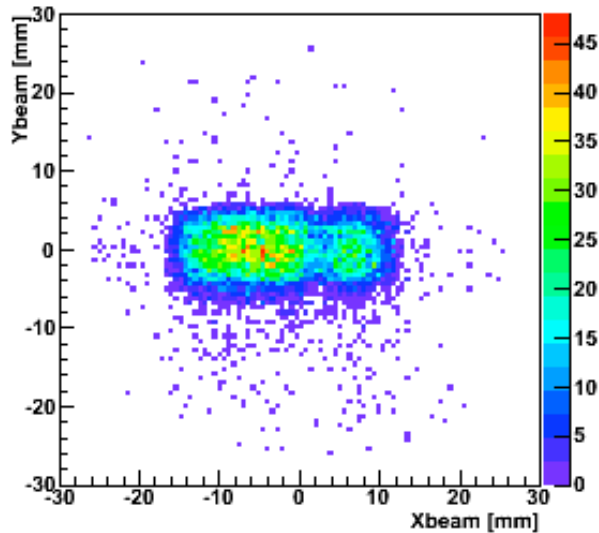
thxgen



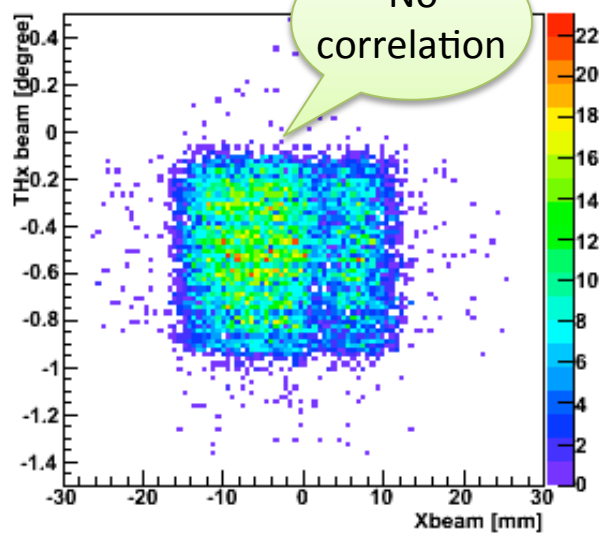
thygen



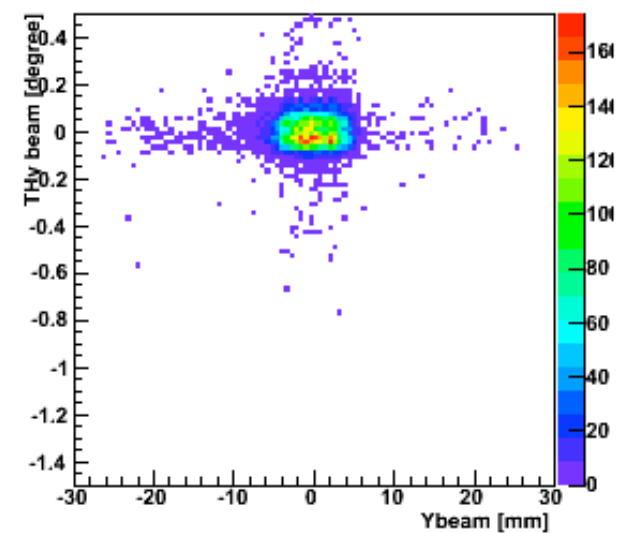
ybeam:xbeam



thxgen:xbeam

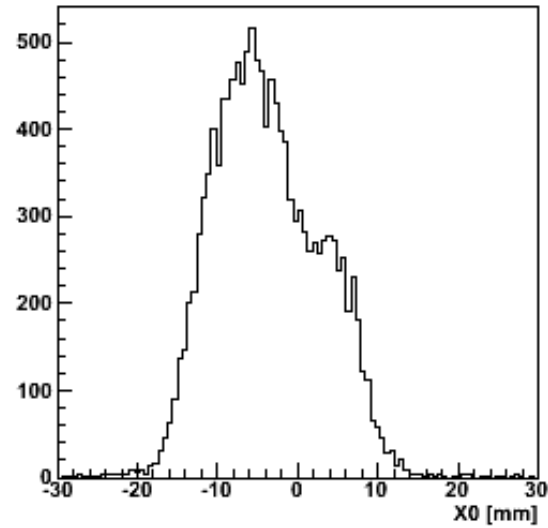


thygen:ybeam

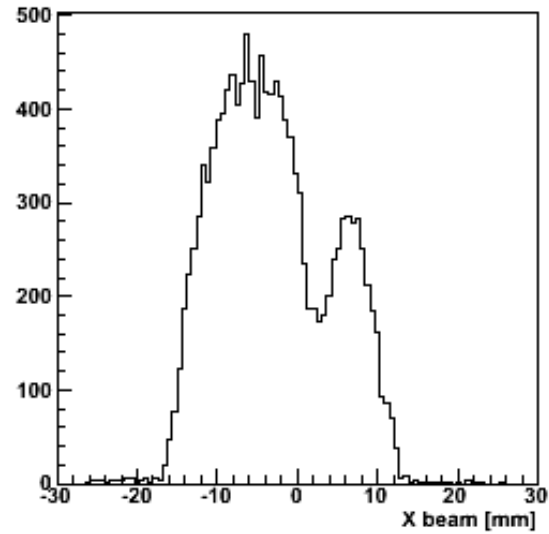


# Beam Profile

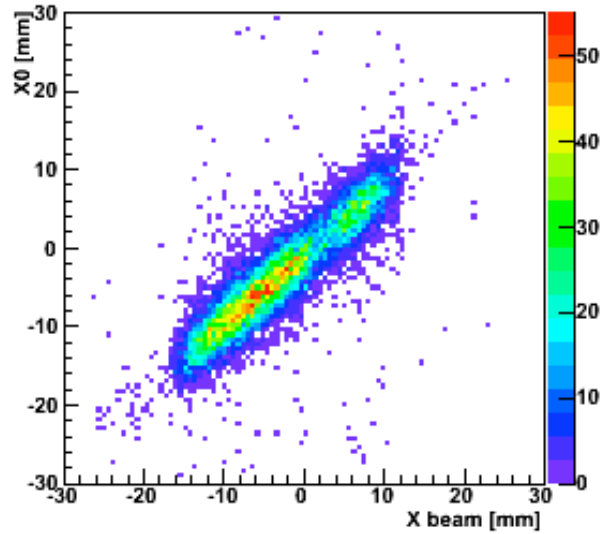
x0 {abs(r)<500.}



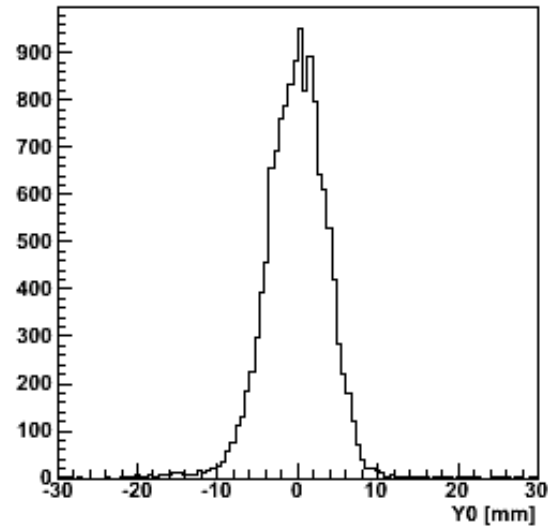
xbeam {abs(r)<500.}



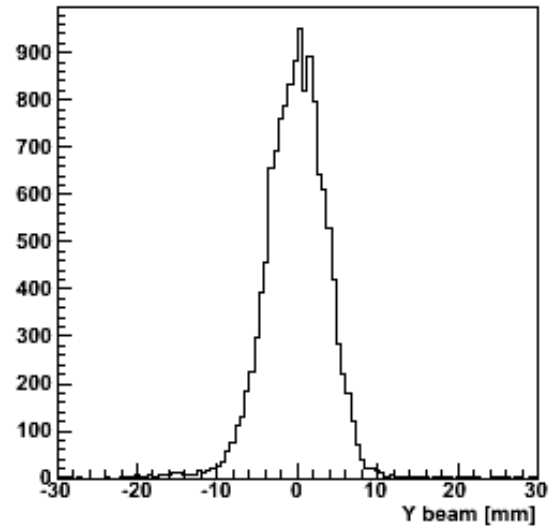
x0:xbeam {abs(r)<500}



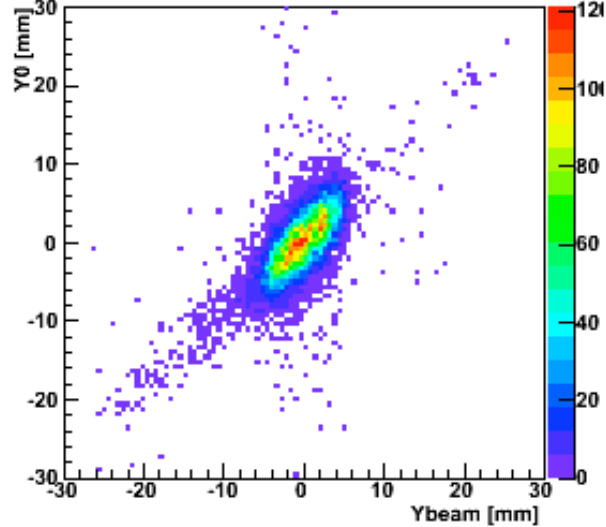
y0 {abs(r)<500.}



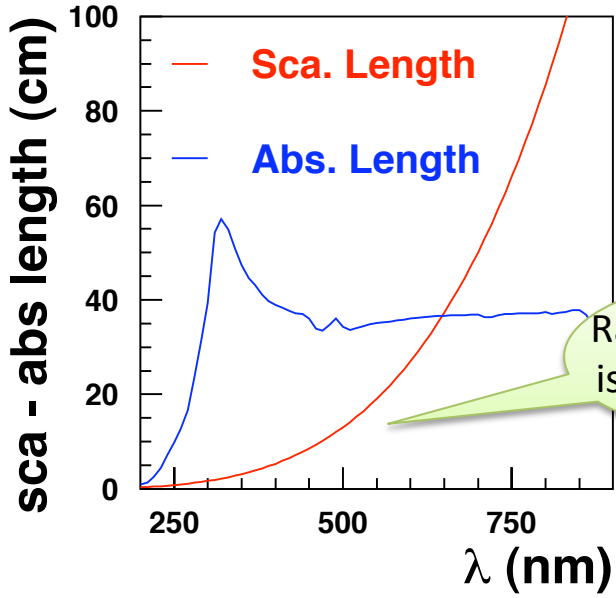
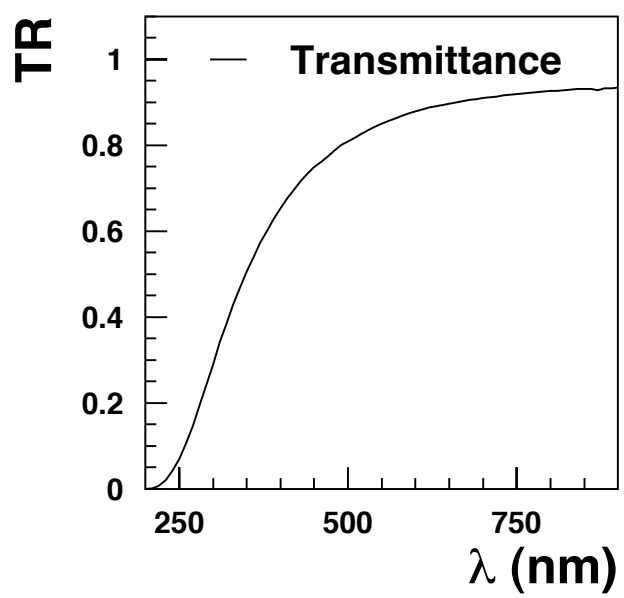
y0 {abs(r)<500.}



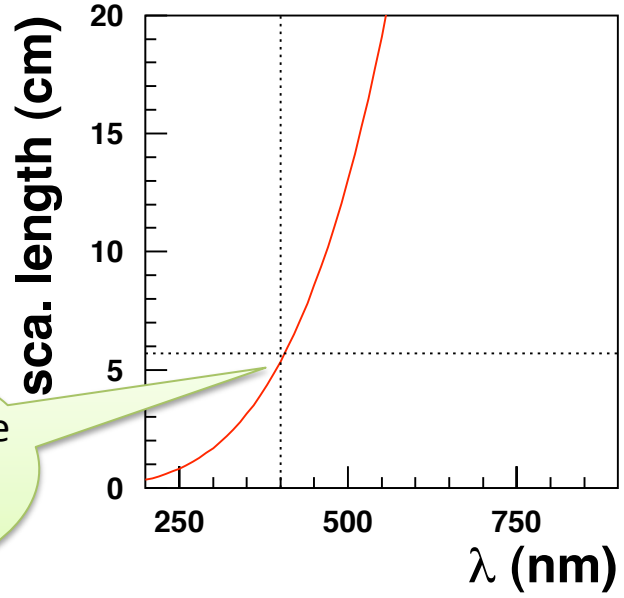
y0:ybeam {abs(r)<500}



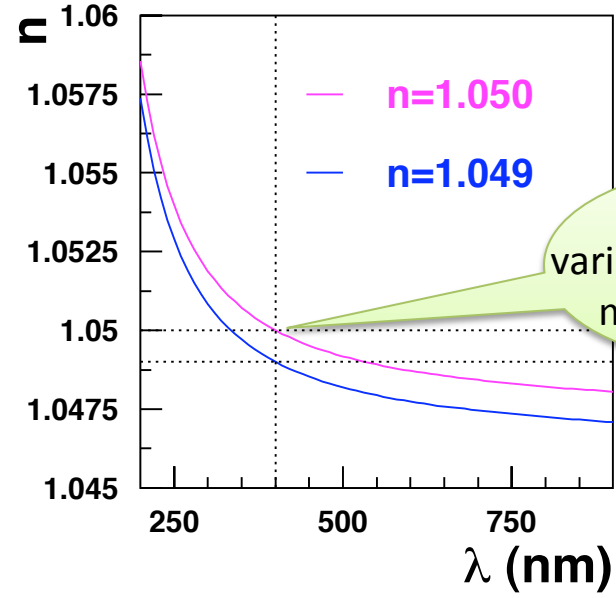
# Aerogel Characterization



Rayleigh scattering is the major effect



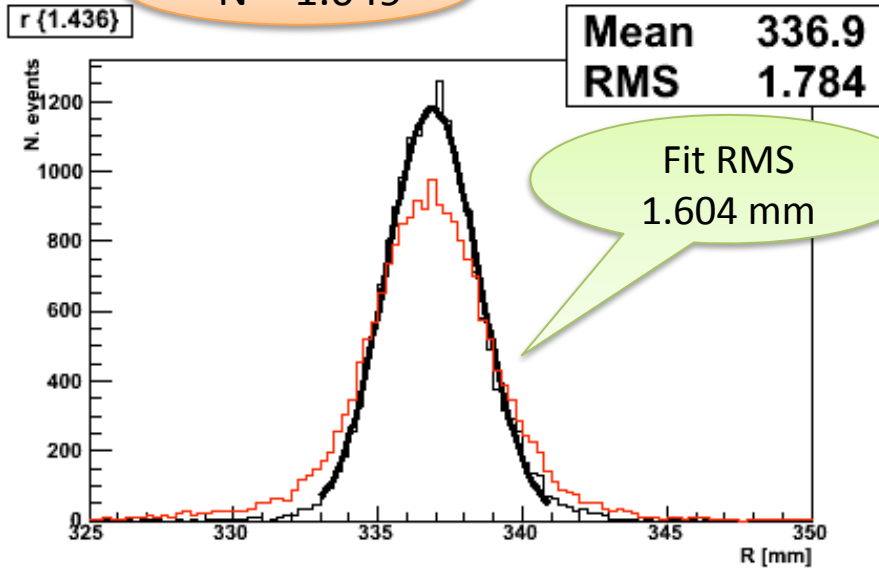
Goal transmittance assumed for CLAS12 !!!



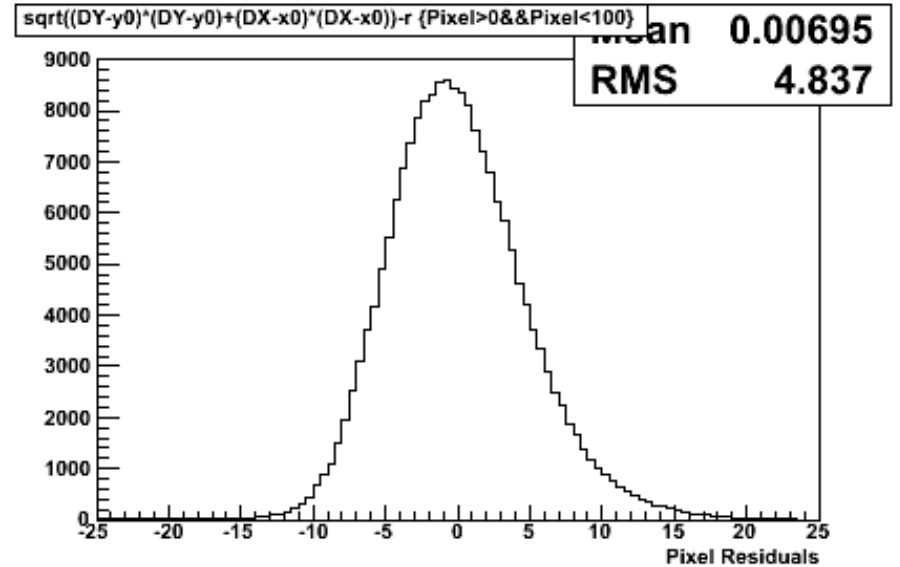
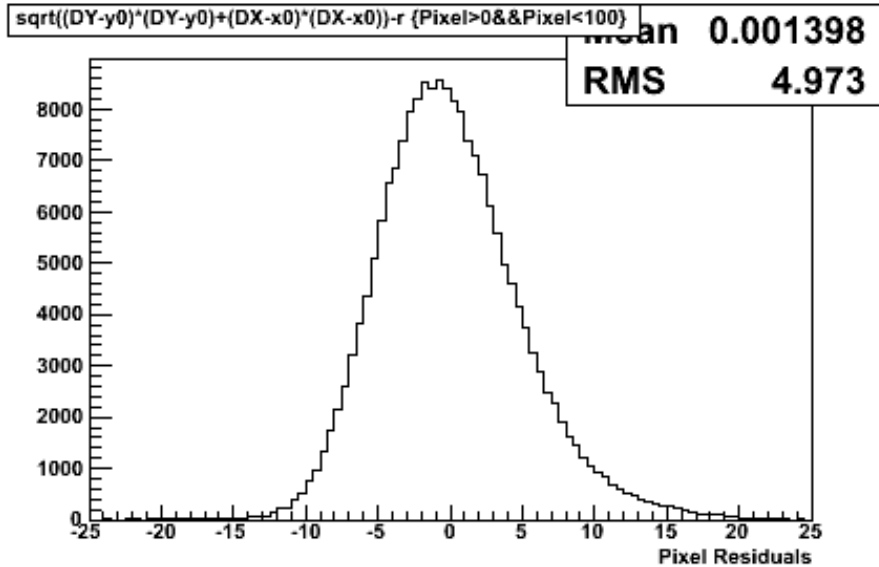
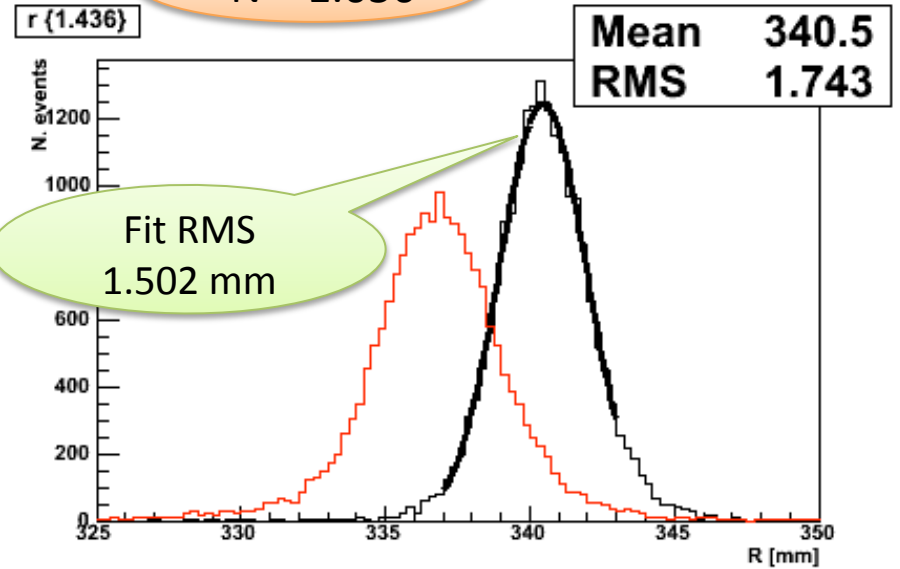
Ref. index variation to match the measured radius

# Beam Profile

N = 1.049

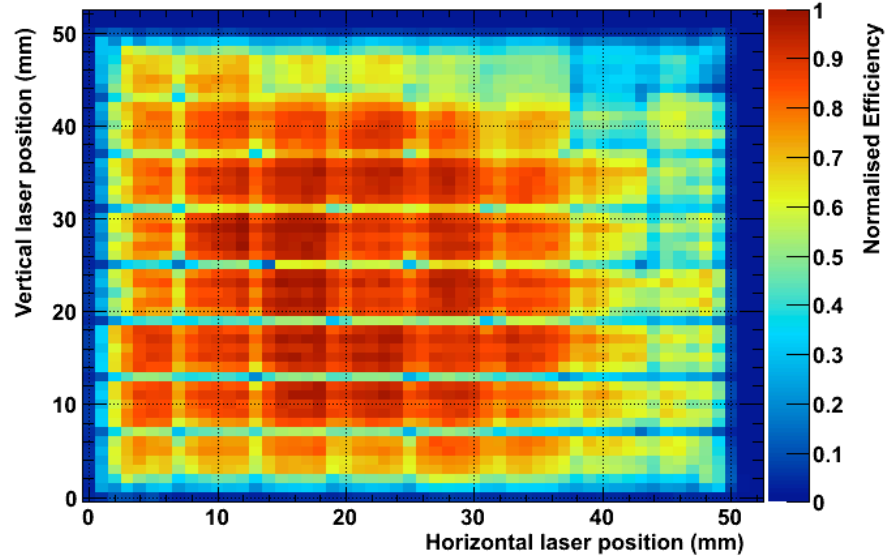


N = 1.050

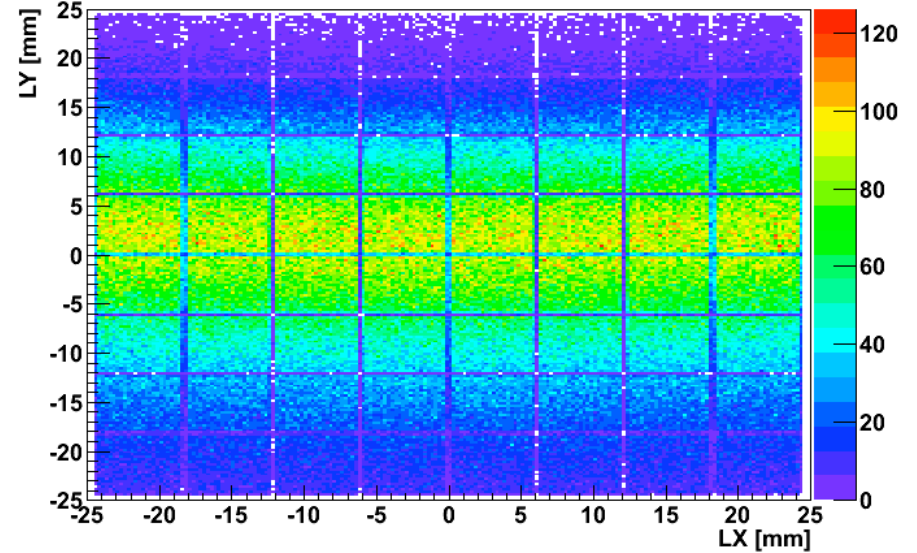


# Pixelization

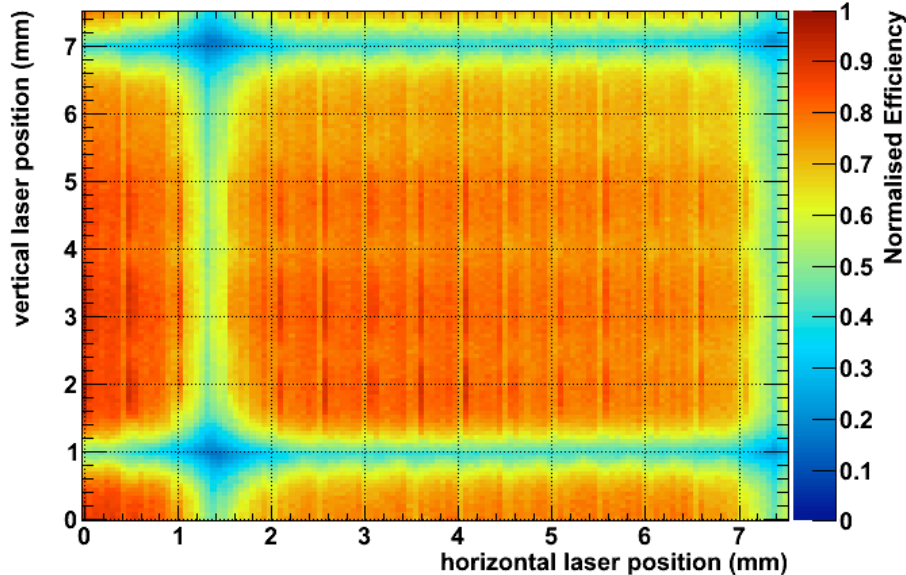
H8500 SN DA0269 - Global Efficiency Map



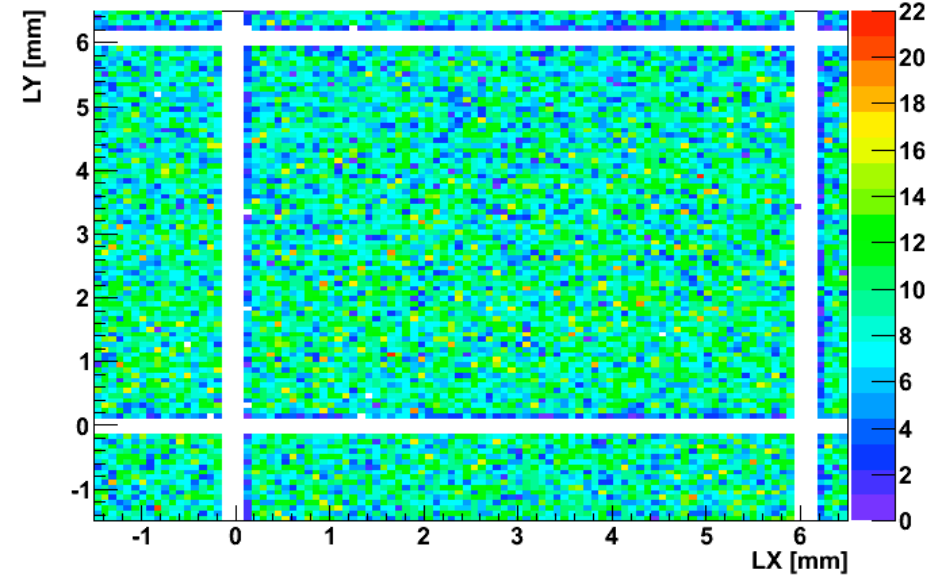
LY:LX {Pixel>0}



H8500 - Global Efficiency Map

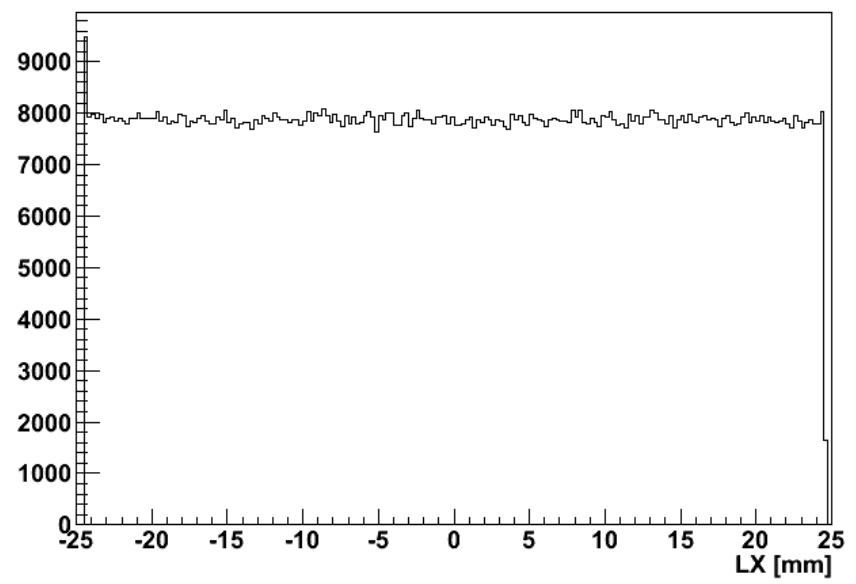


LY:LX {Pixel>0}

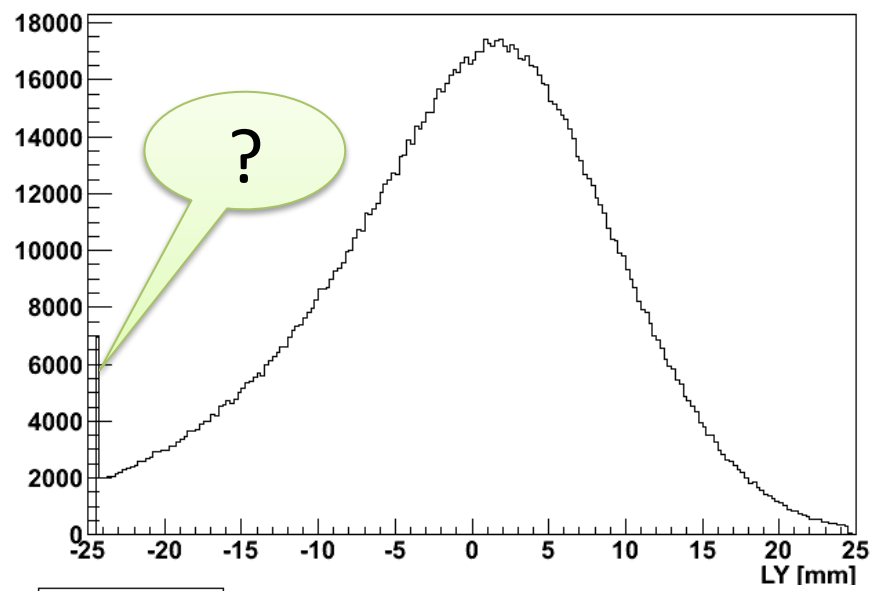


# Pixelization

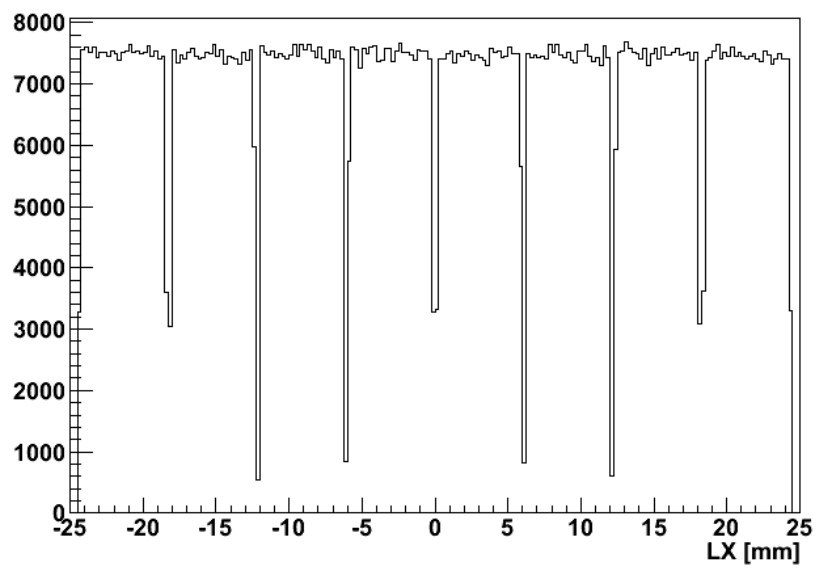
LX



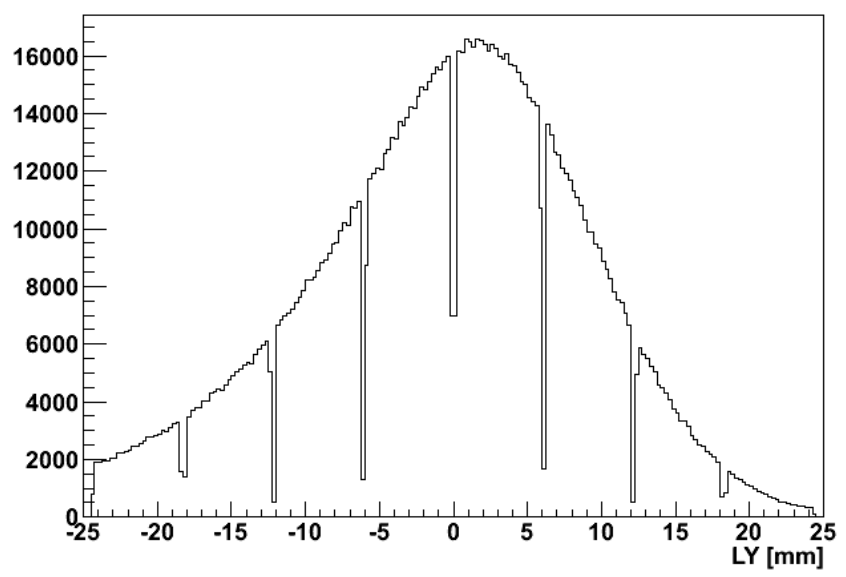
LY



LX {Pixel>0}



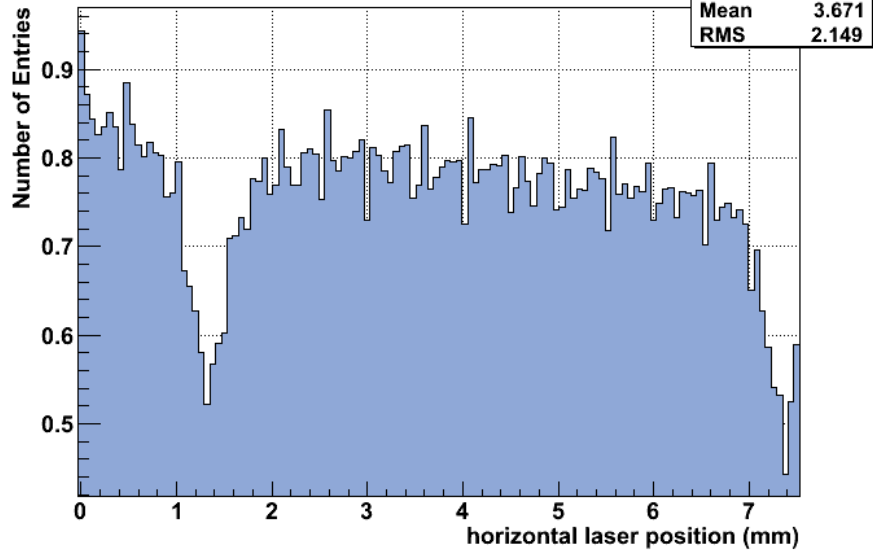
LY {Pixel>0}



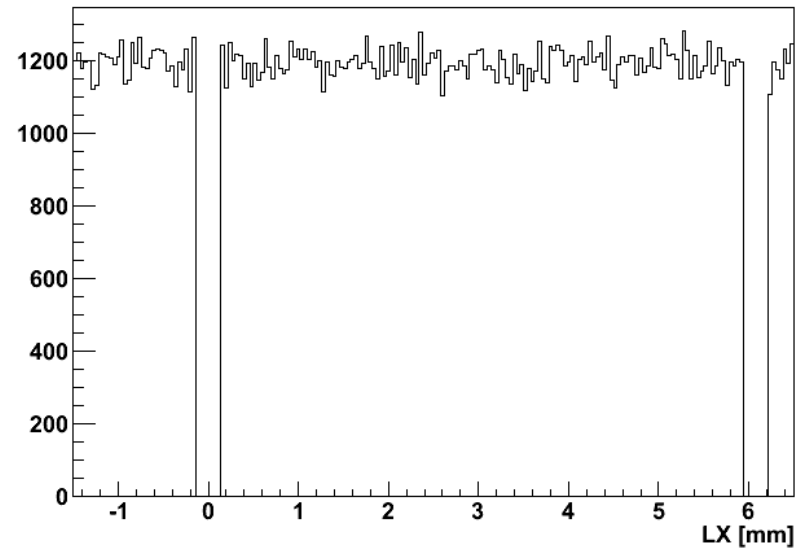


# Pixelization

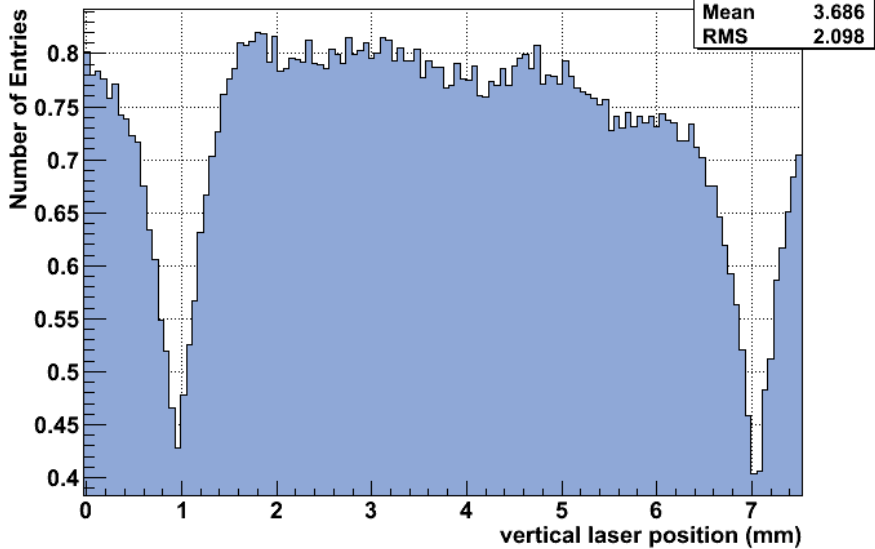
ProjectionX of biny=62



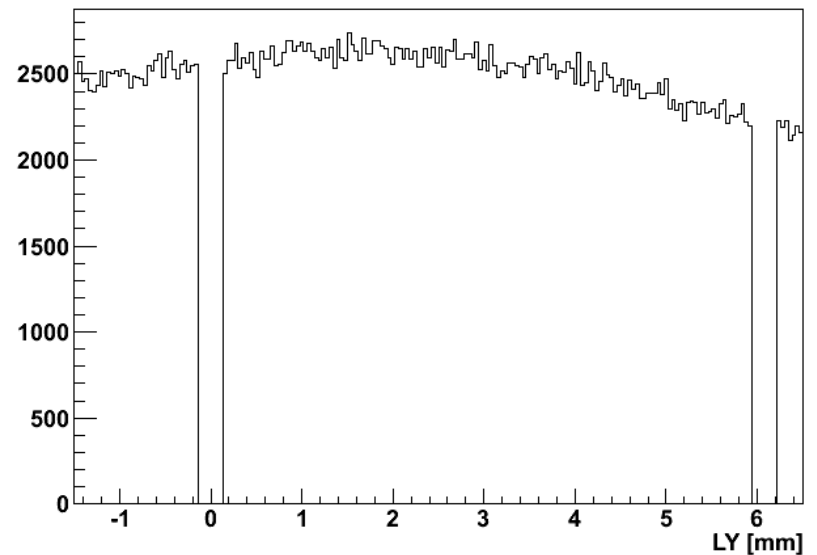
LX {Pixel>0}



ProjectionY of binx=72



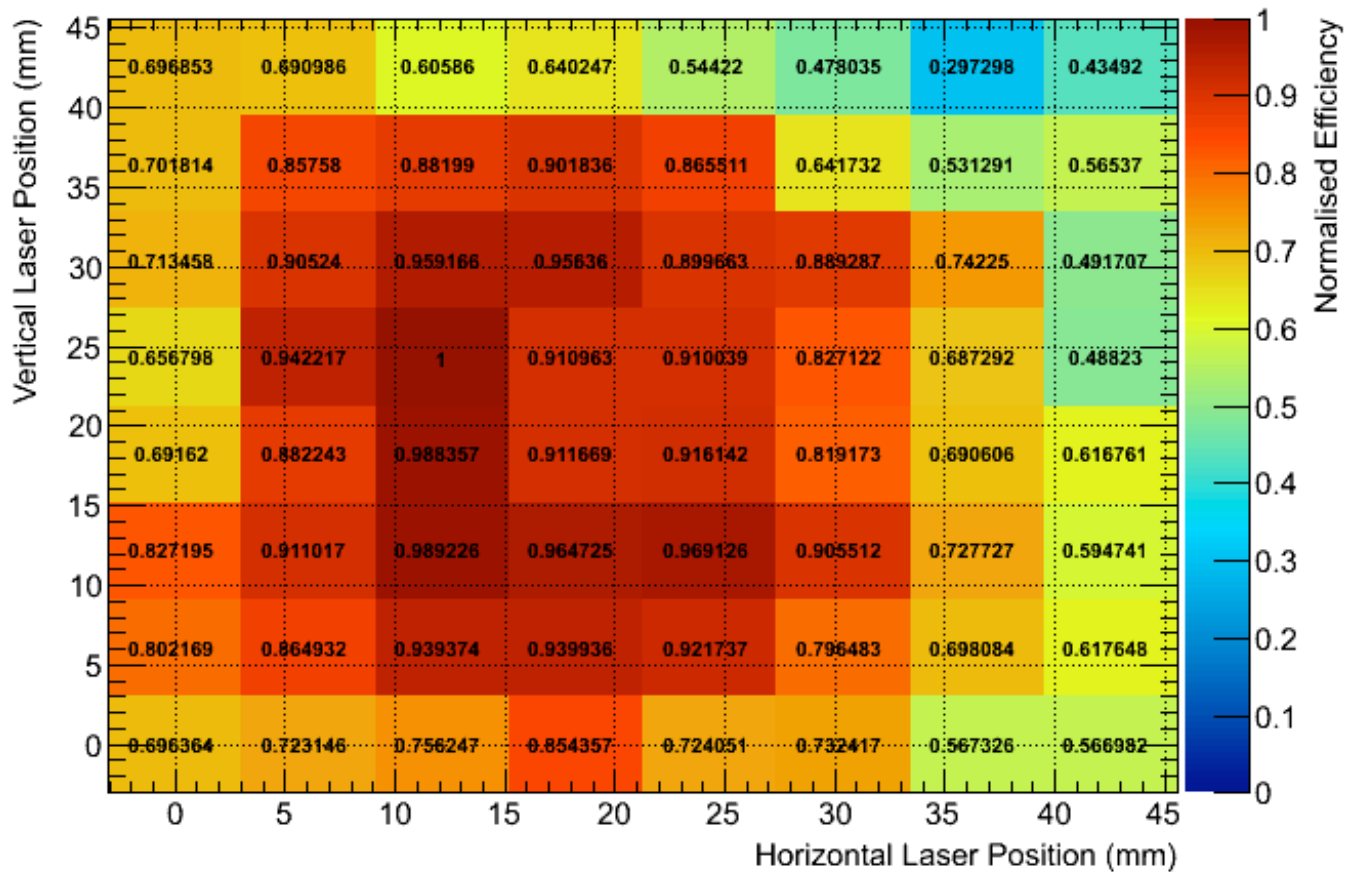
LY {Pixel>0}



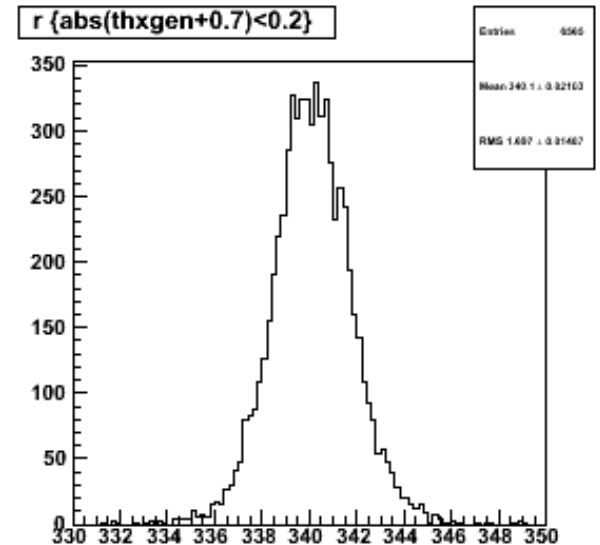
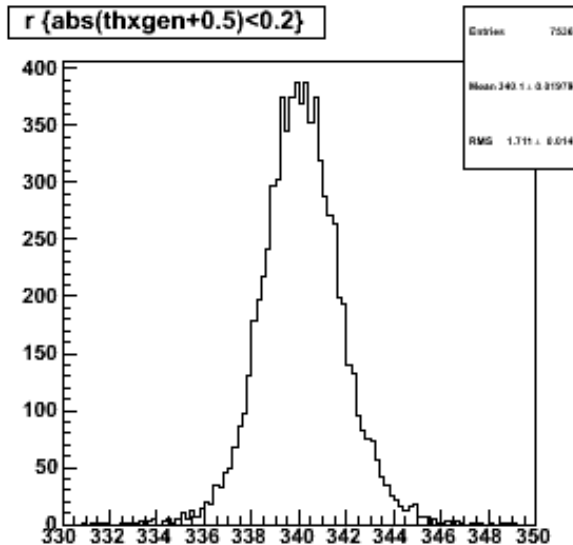
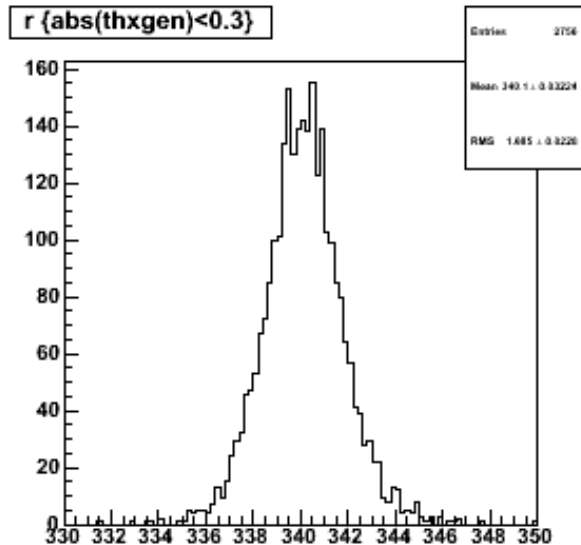
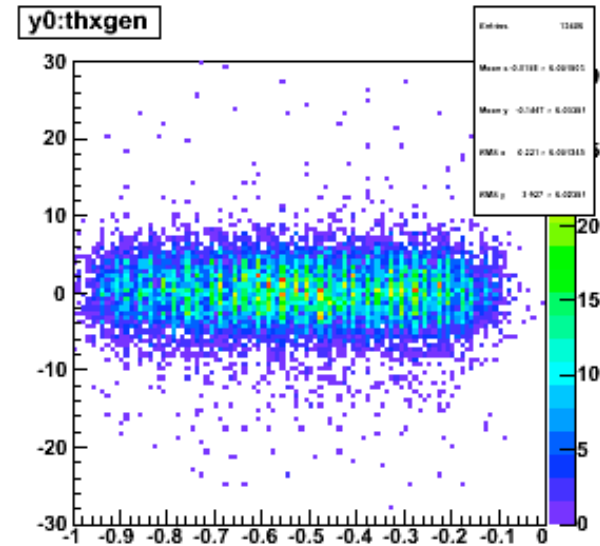
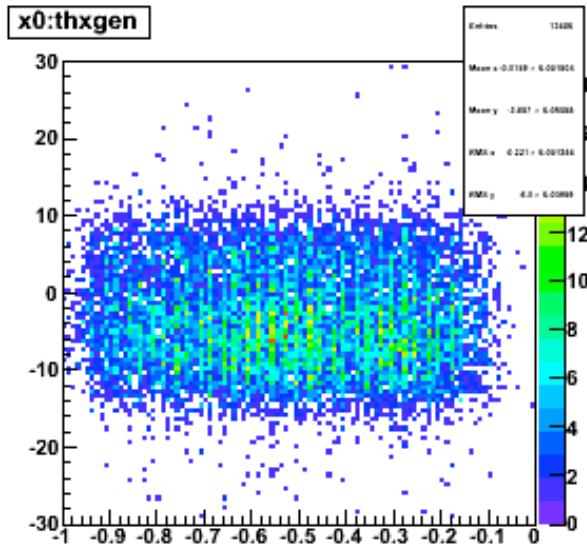
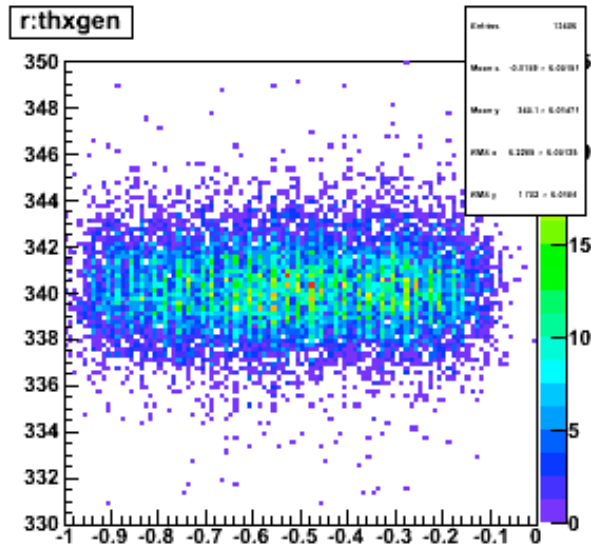
# Gain Spread

Not accounted for so far

H8500 SN DA0269 - Global Efficiency Map



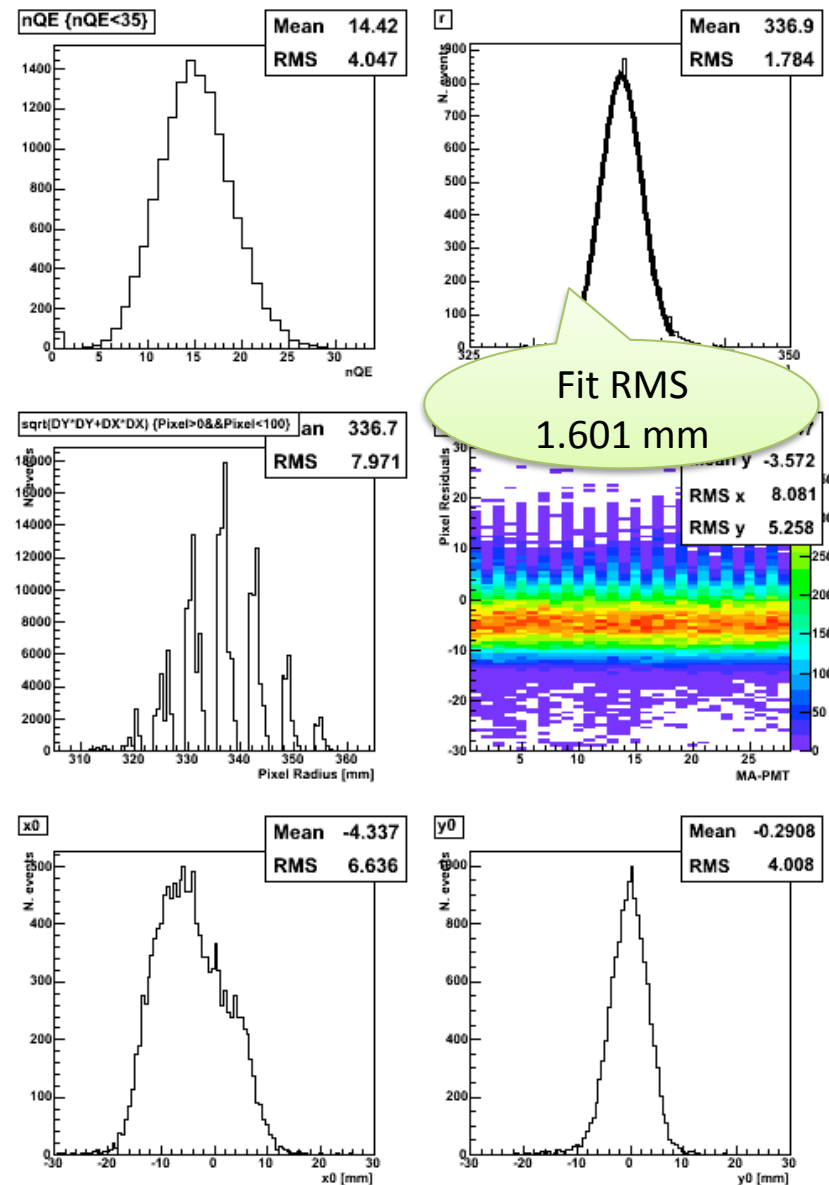
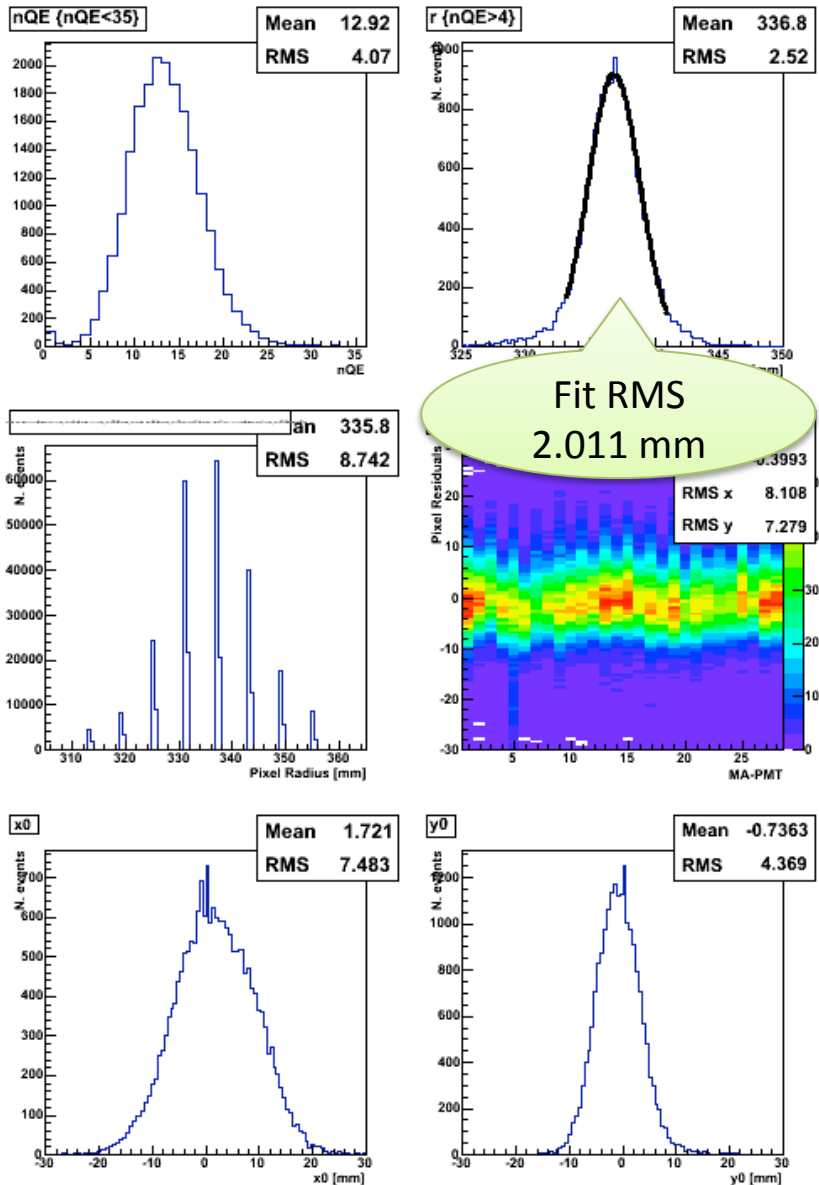
# DATA vs MC with Beam Spread



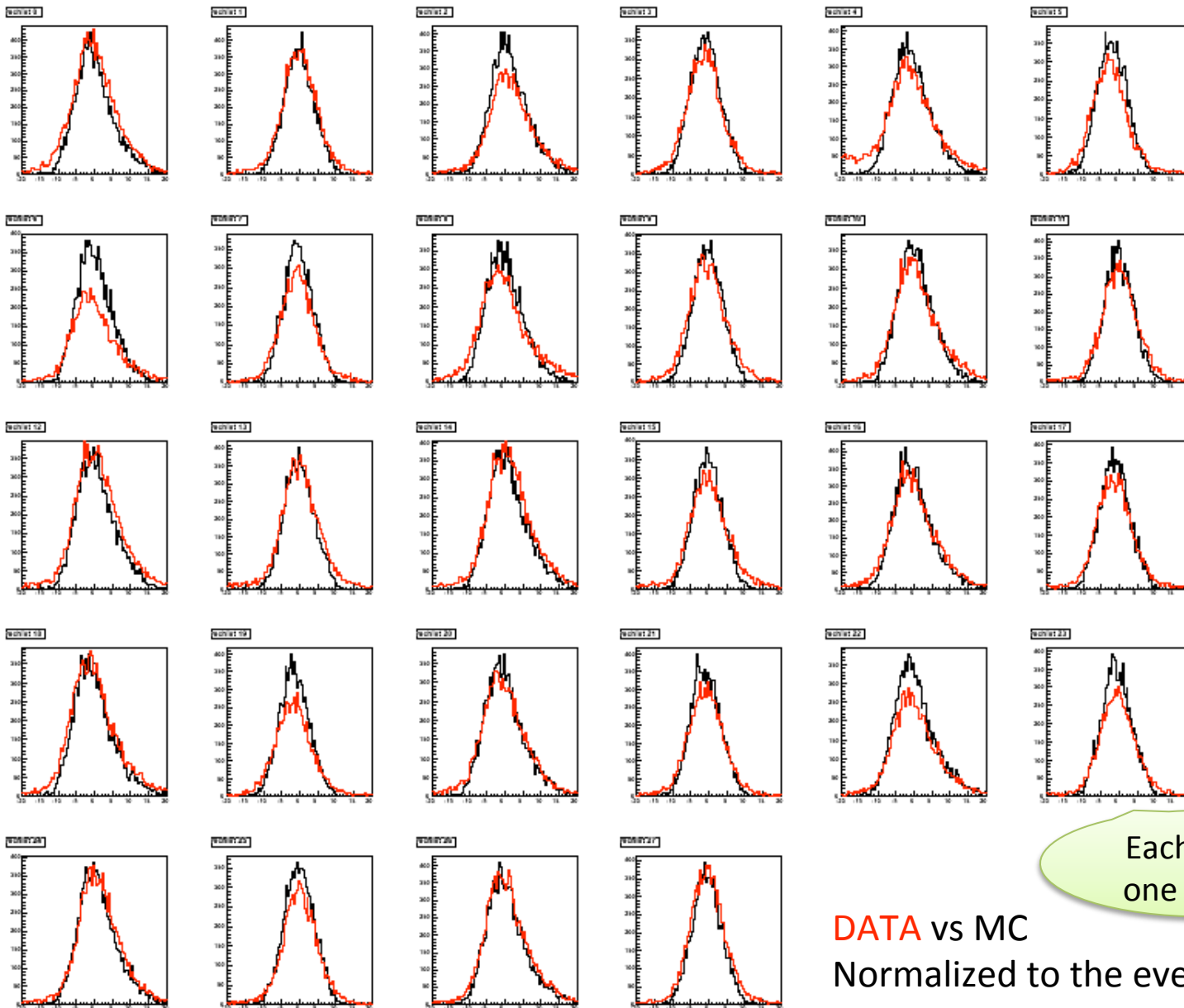
# DATA vs MC with Beam Spread

DATA (Run 1051)

MC (Aram GEM values)



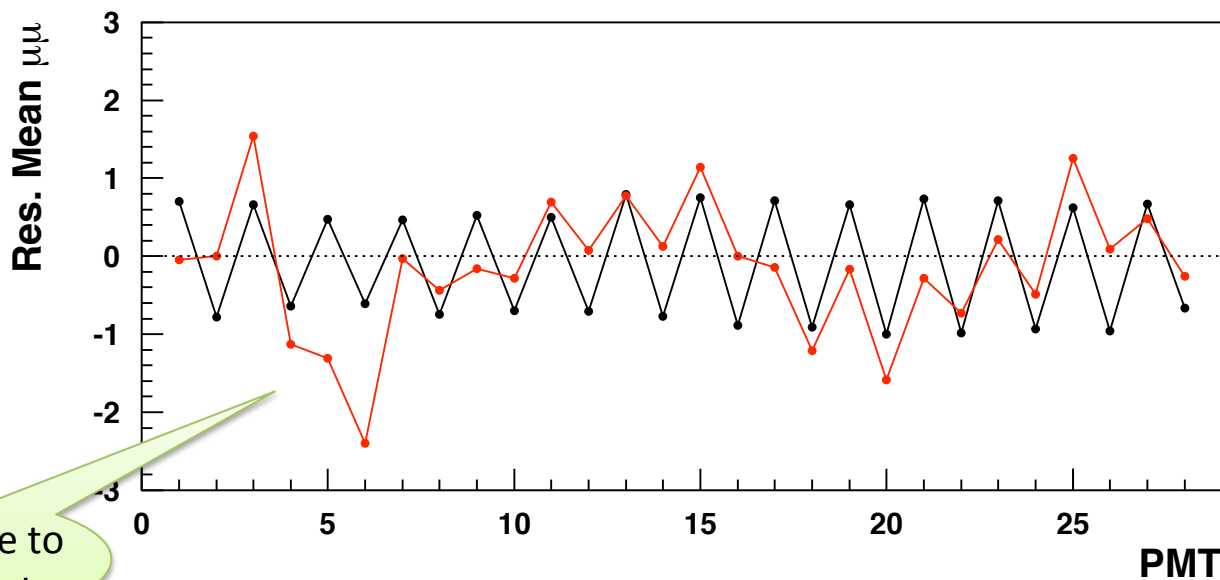
# Pixel Residual Distributions



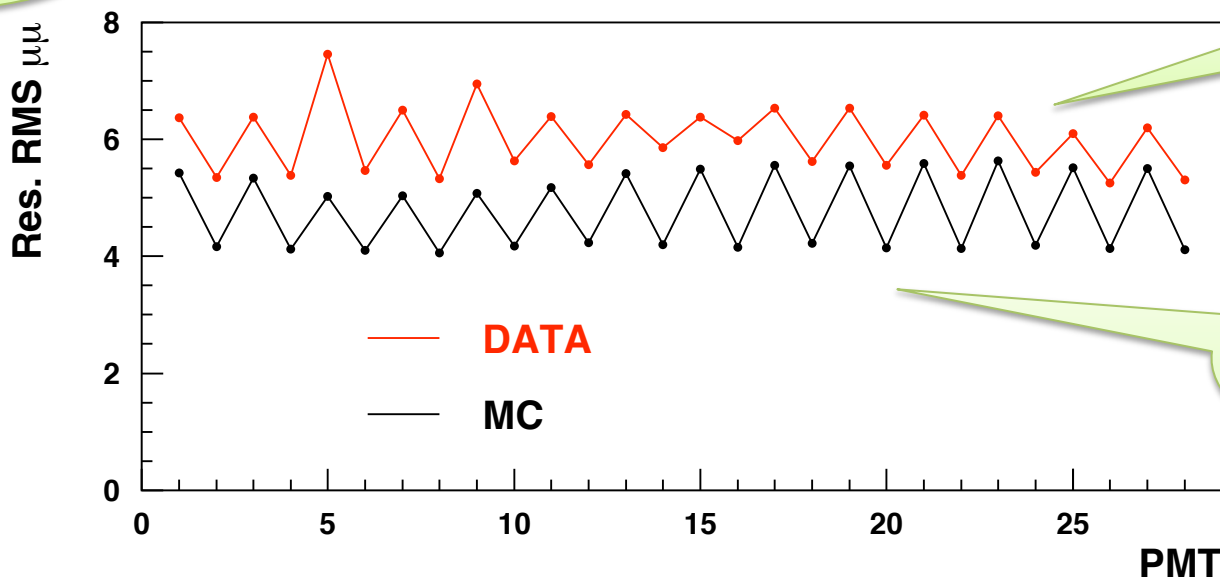
Each panel is  
one MA-PMT

DATA vs MC  
Normalized to the event number

# Pixel Residuals



Mismatch due to misalignment

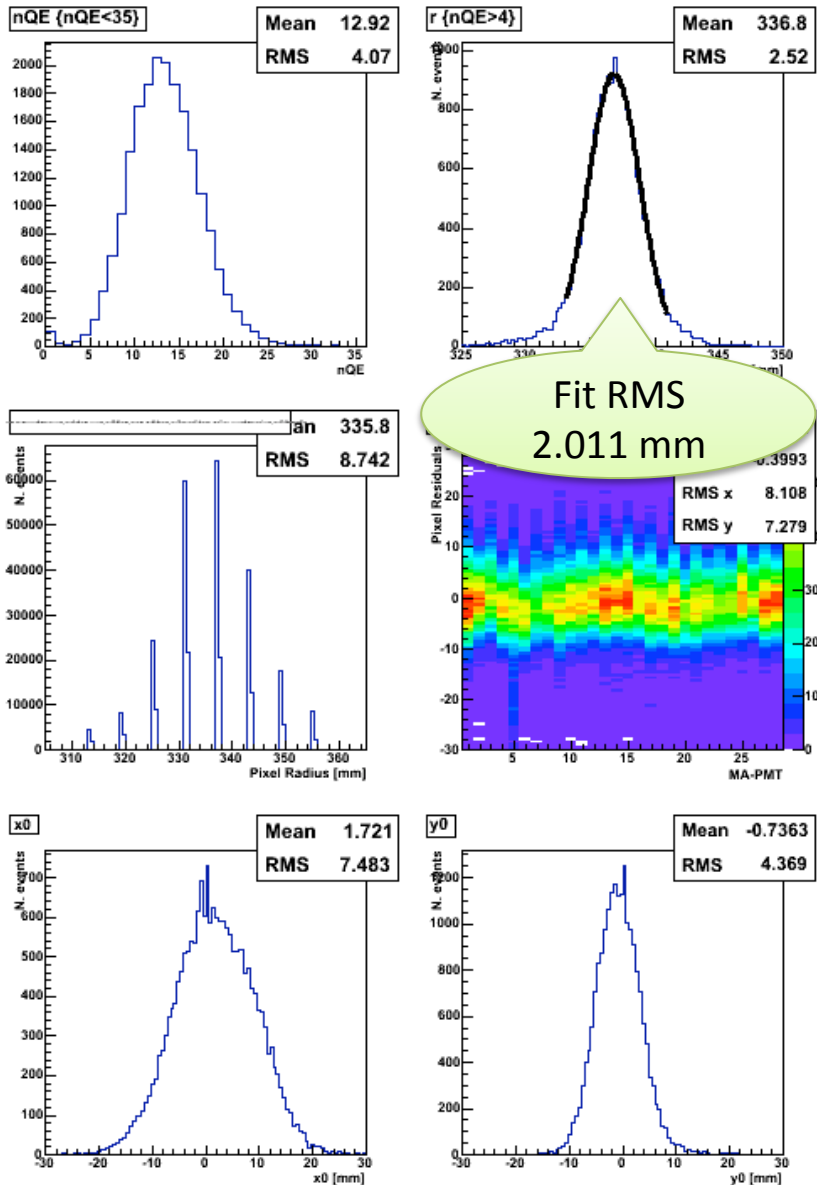


About 1mm offset in DATA

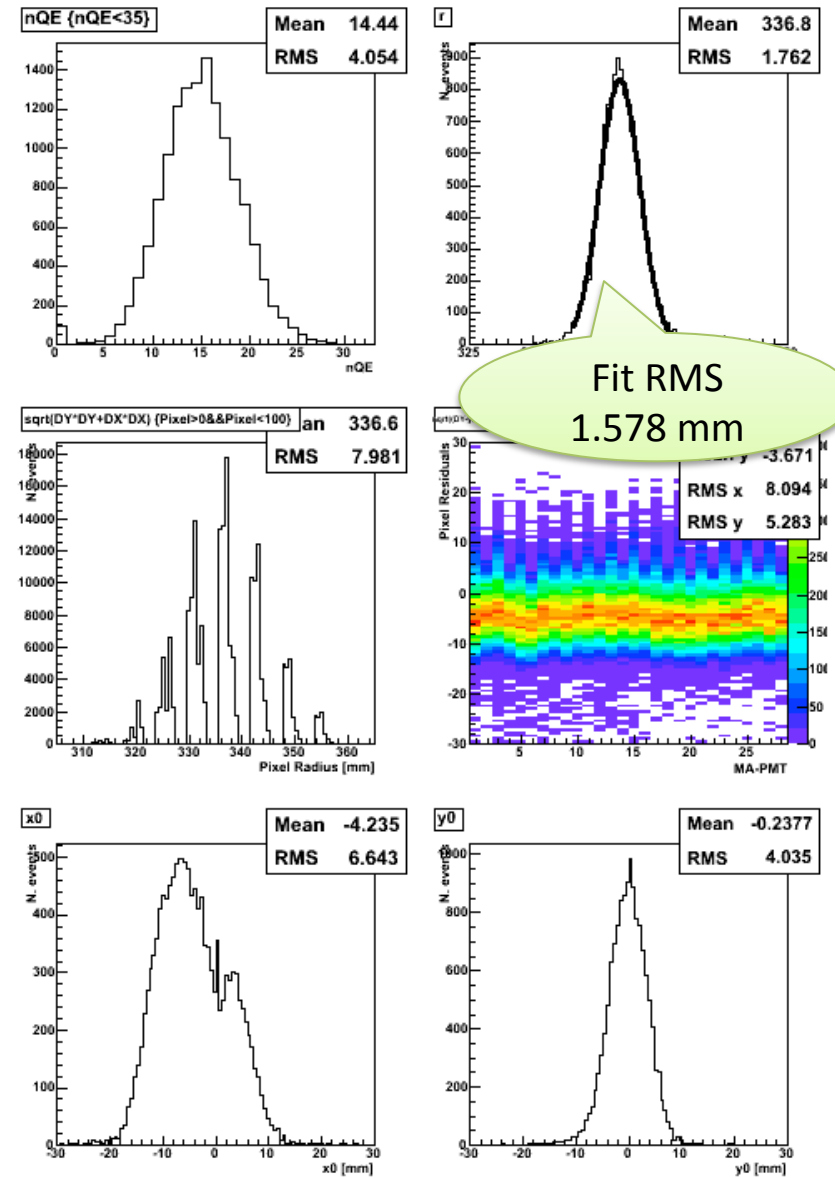
Zig-zag due to UV & not-UV glass window

# DATA vs MC with Misalignment

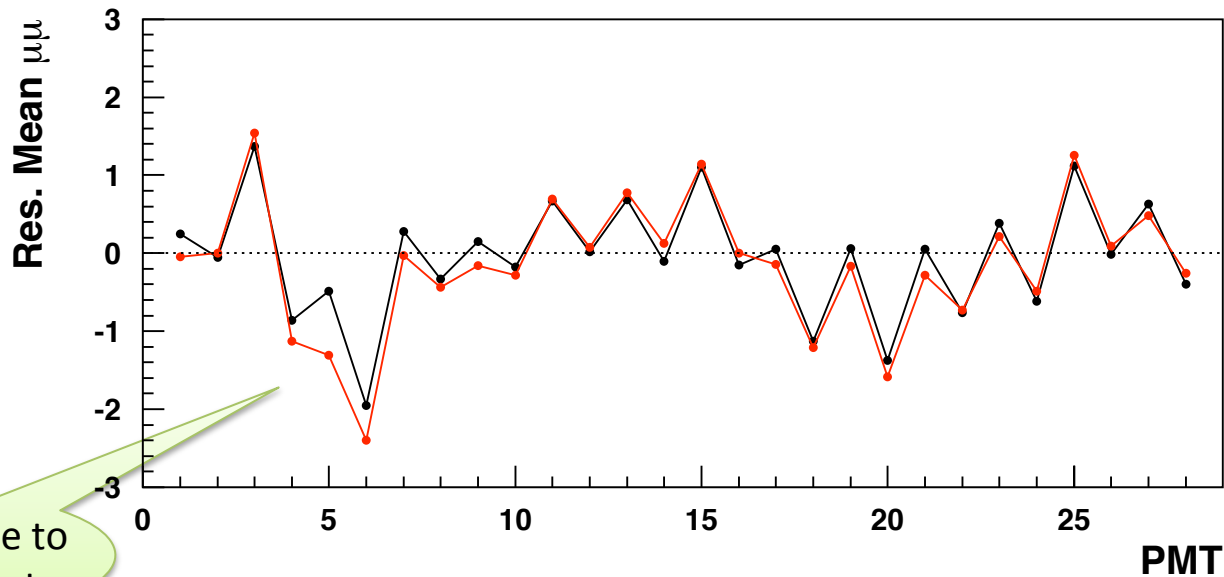
DATA (Run 1051)



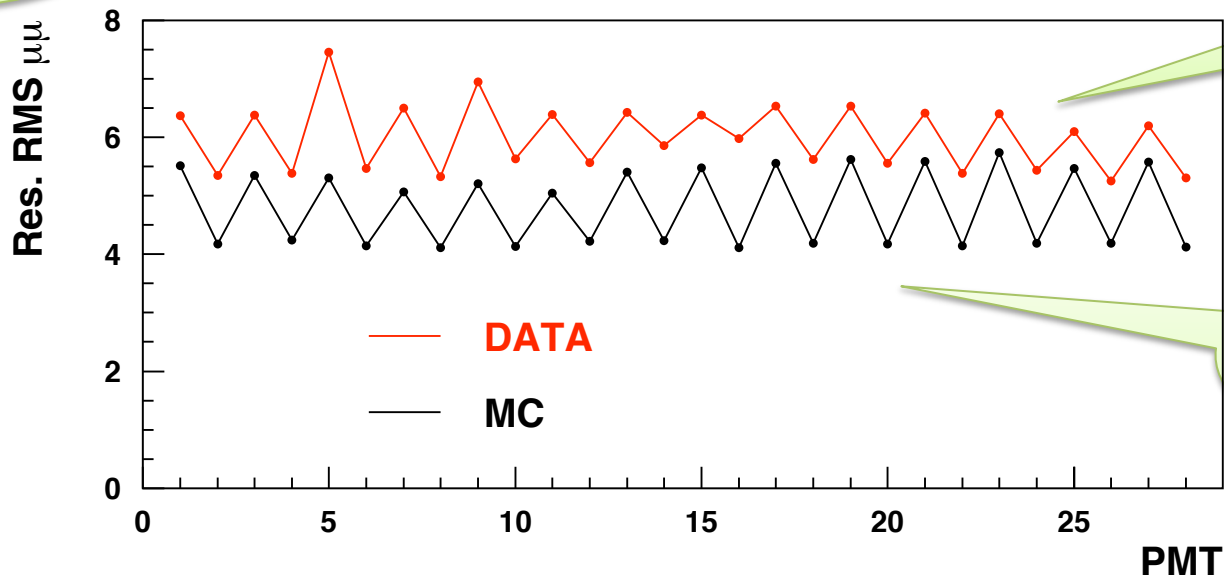
MC (Aram GEM values)



# Pixel Residuals



Mismatch due to misalignment



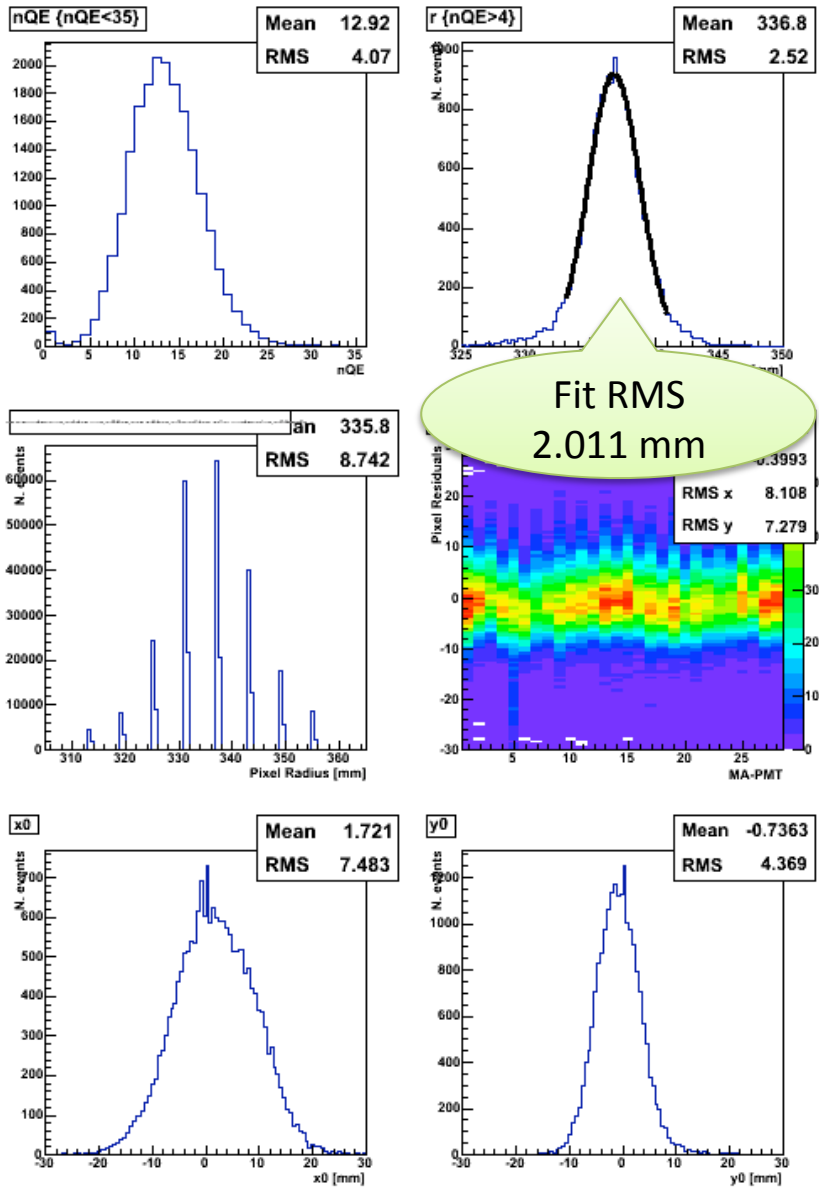
About 1mm offset in DATA

Zig-zag due to UV & not-UV glass window

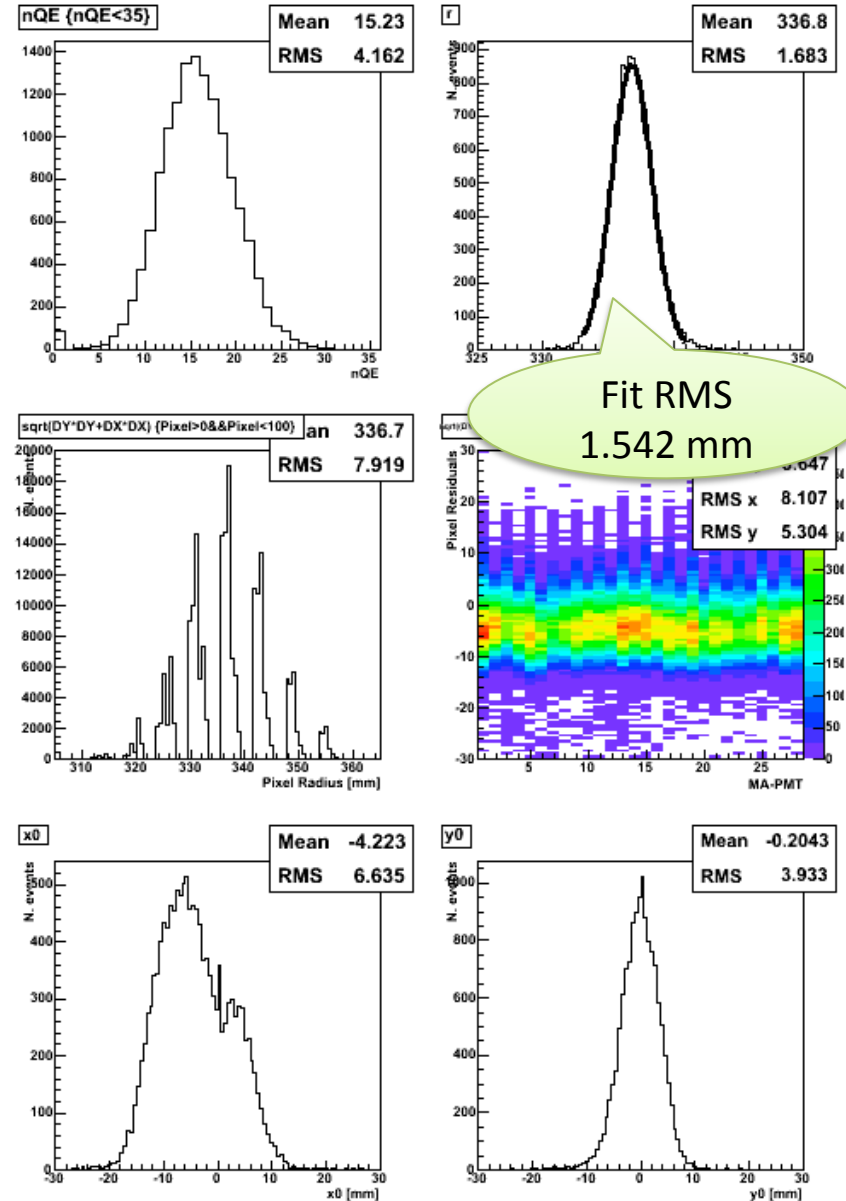


# DATA vs MC with Misalignment+Eff

DATA (Run 1051)

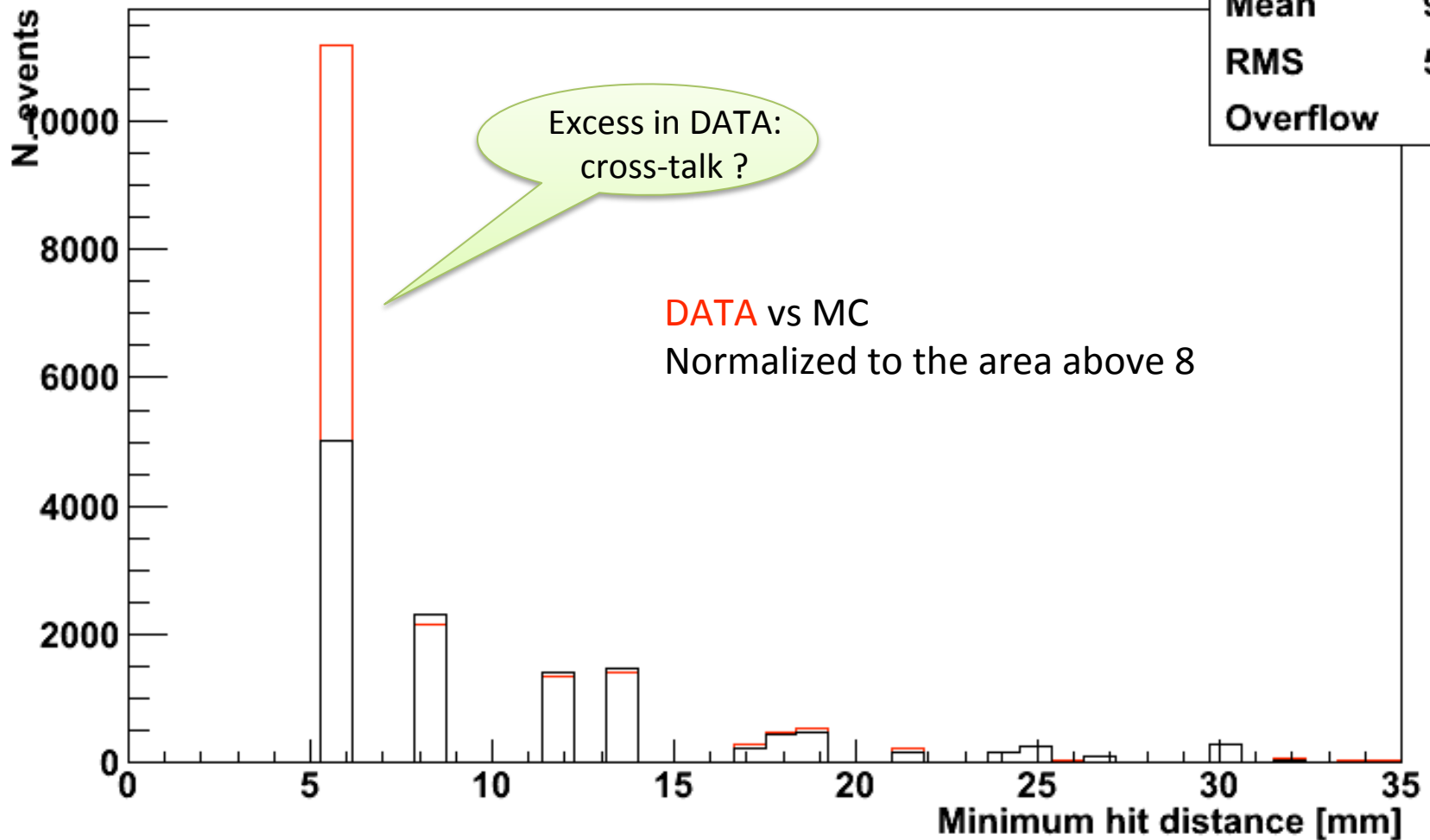


MC (Aram GEM values)



# Minimum Hit Distance

mindist data



Entries	19991
Mean	9.488
RMS	5.874
Overflow	1362