

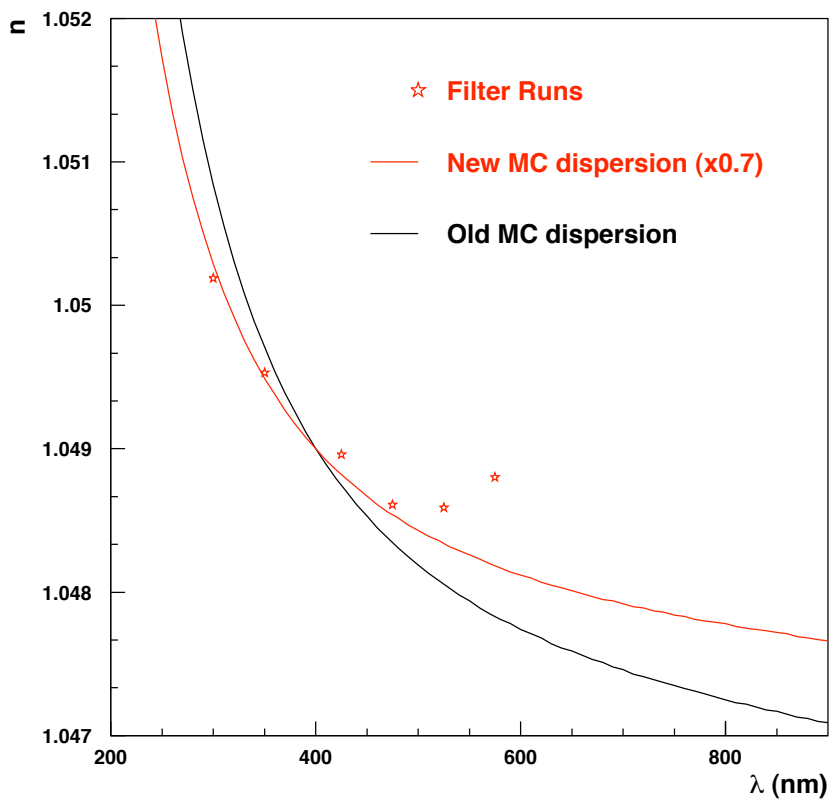
RICH GEMC SIMULATIONS

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Luciano Pappalardo, Luca Barion & Paolo Lenisa
INFN Ferrara

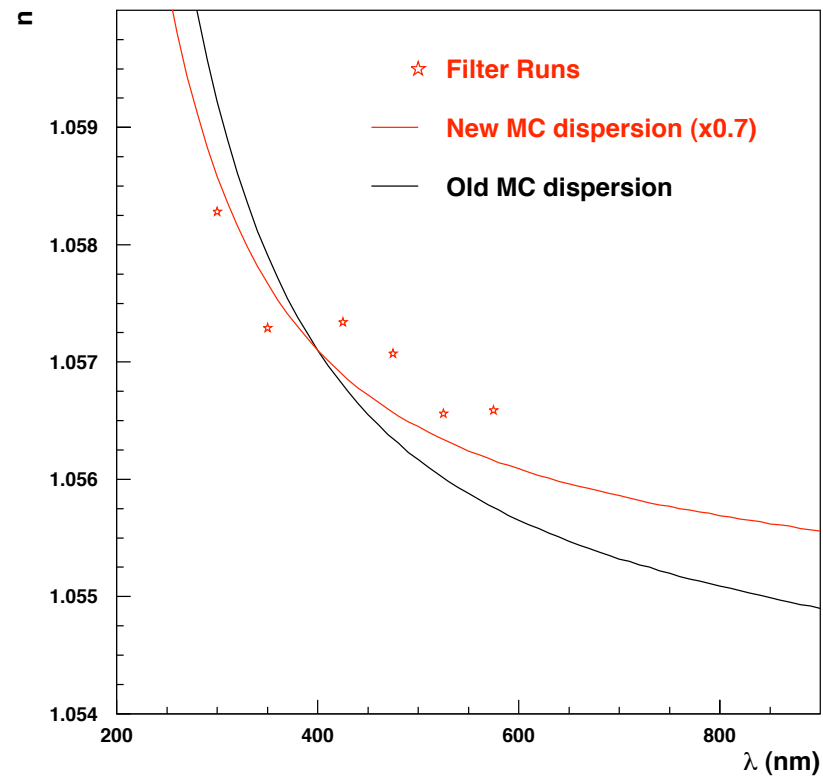
Rich Meeting, 5 May 2013

Aerogel Dispersion

n=1.05



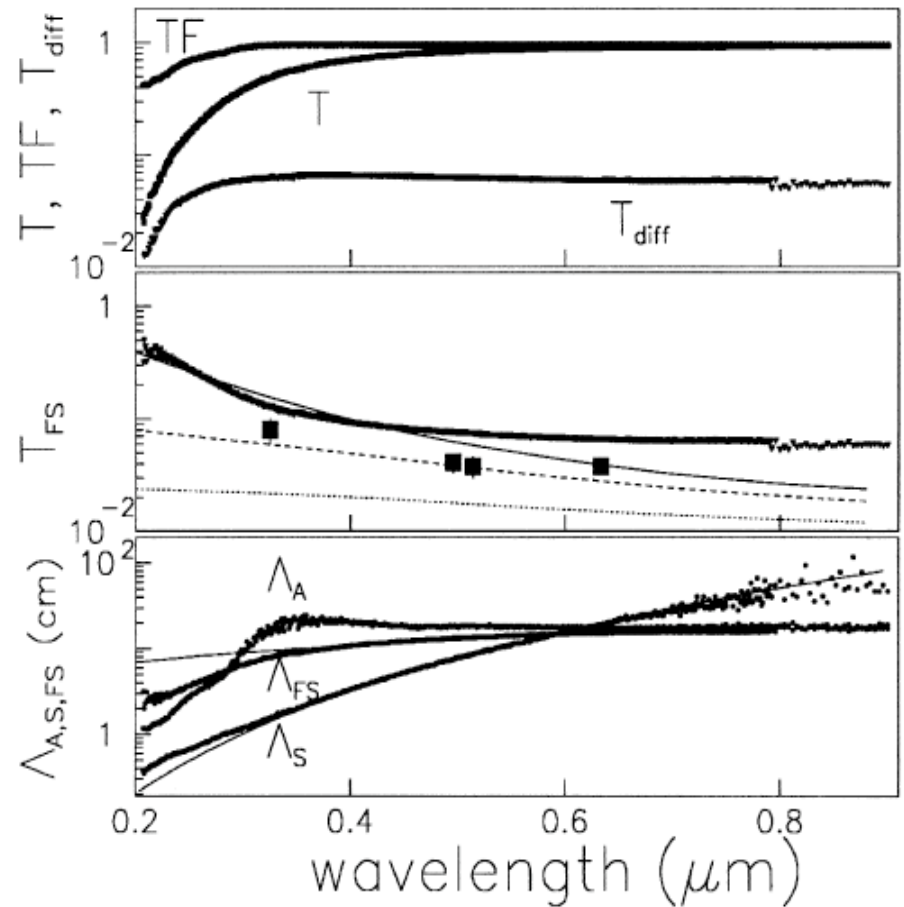
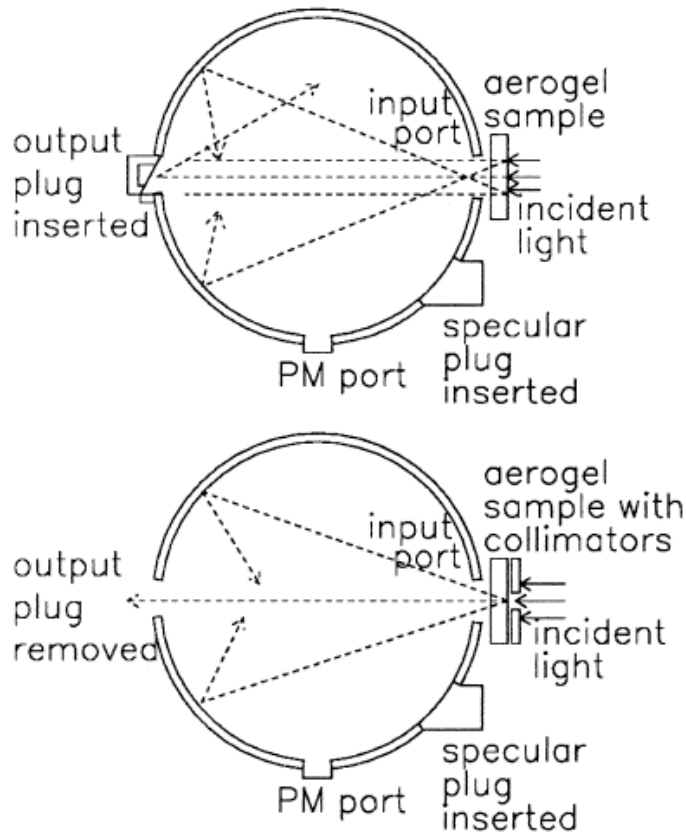
n=1.06



Aerogel Optical Surface

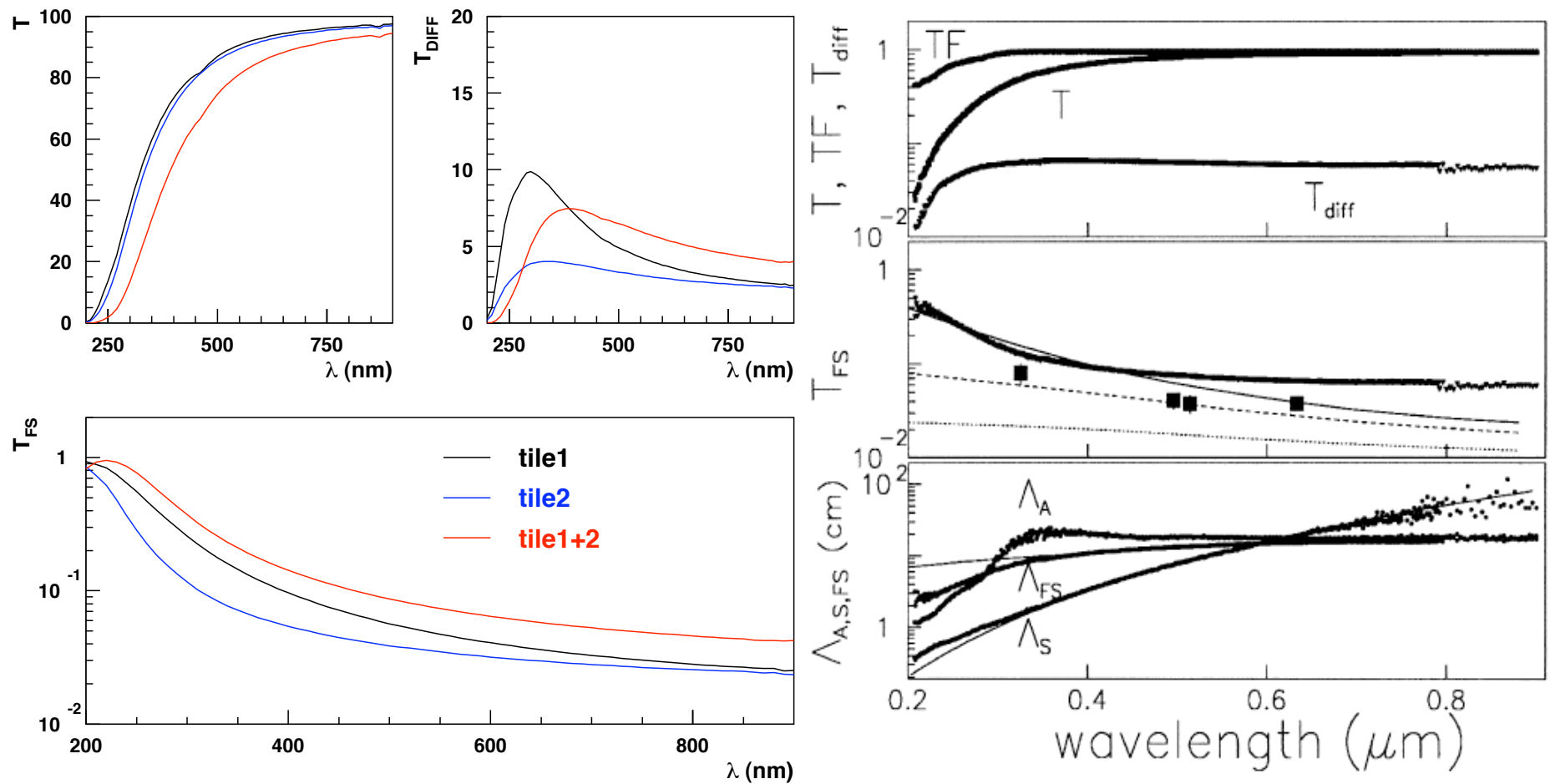
The roughness of aerogel surface causes forward scattering of light

Can be measured by spectrophotometer or looking to the spot of laser beams



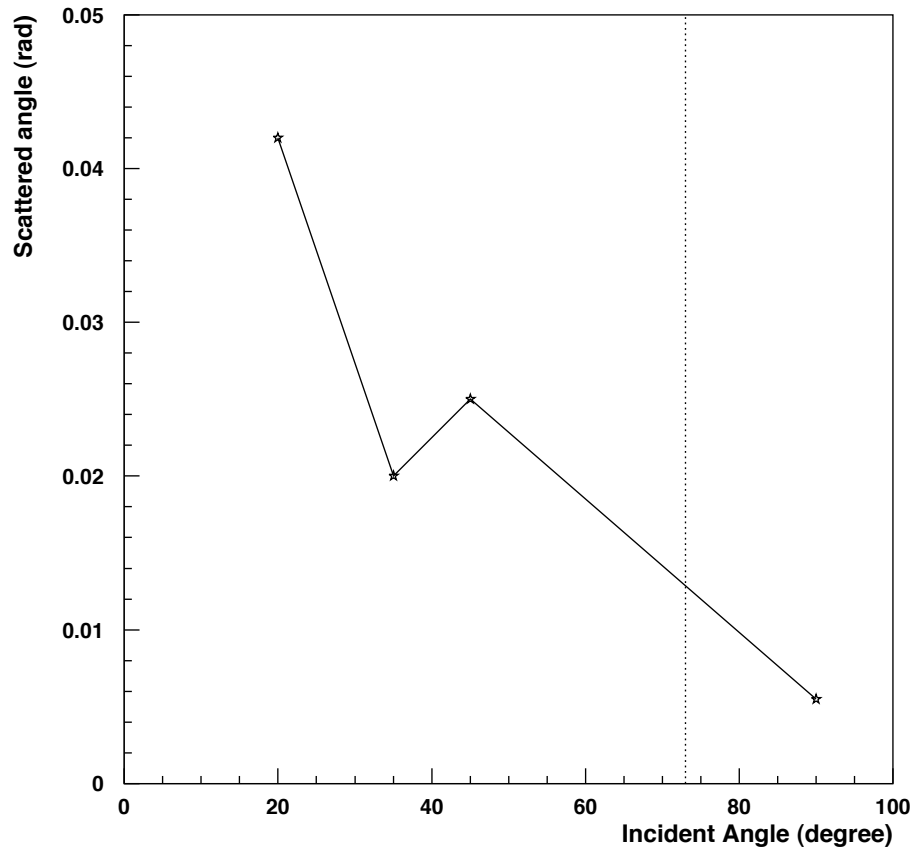
Aerogel Optical Surface

Aerogel used in CERN test-beam



Light Scattering on Aerogel Surface

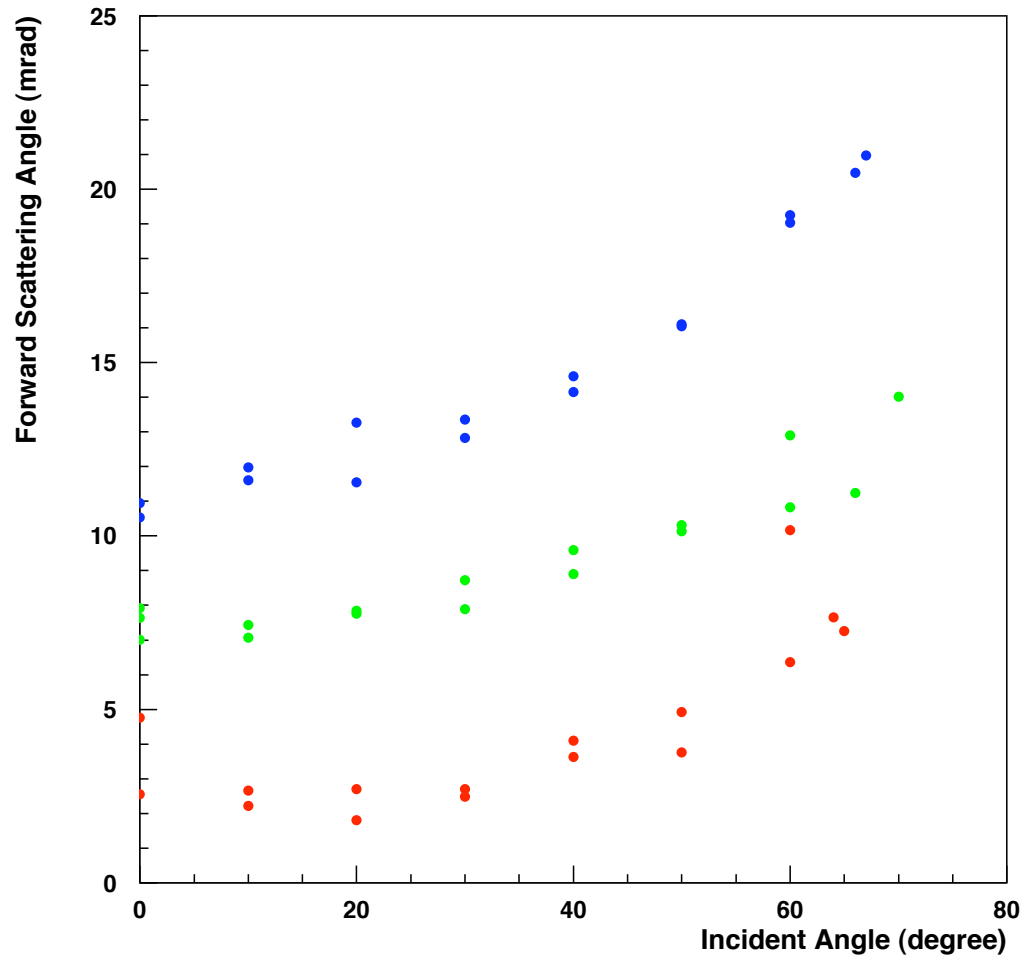
Broadening of a 638 nm laser beam after reflection on aerogel surface



The GEANT4 model does not account for wavelength dependence

Light Scattering on Aerogel Surface

Broadening of a 638 nm laser beam transmitted through aerogel

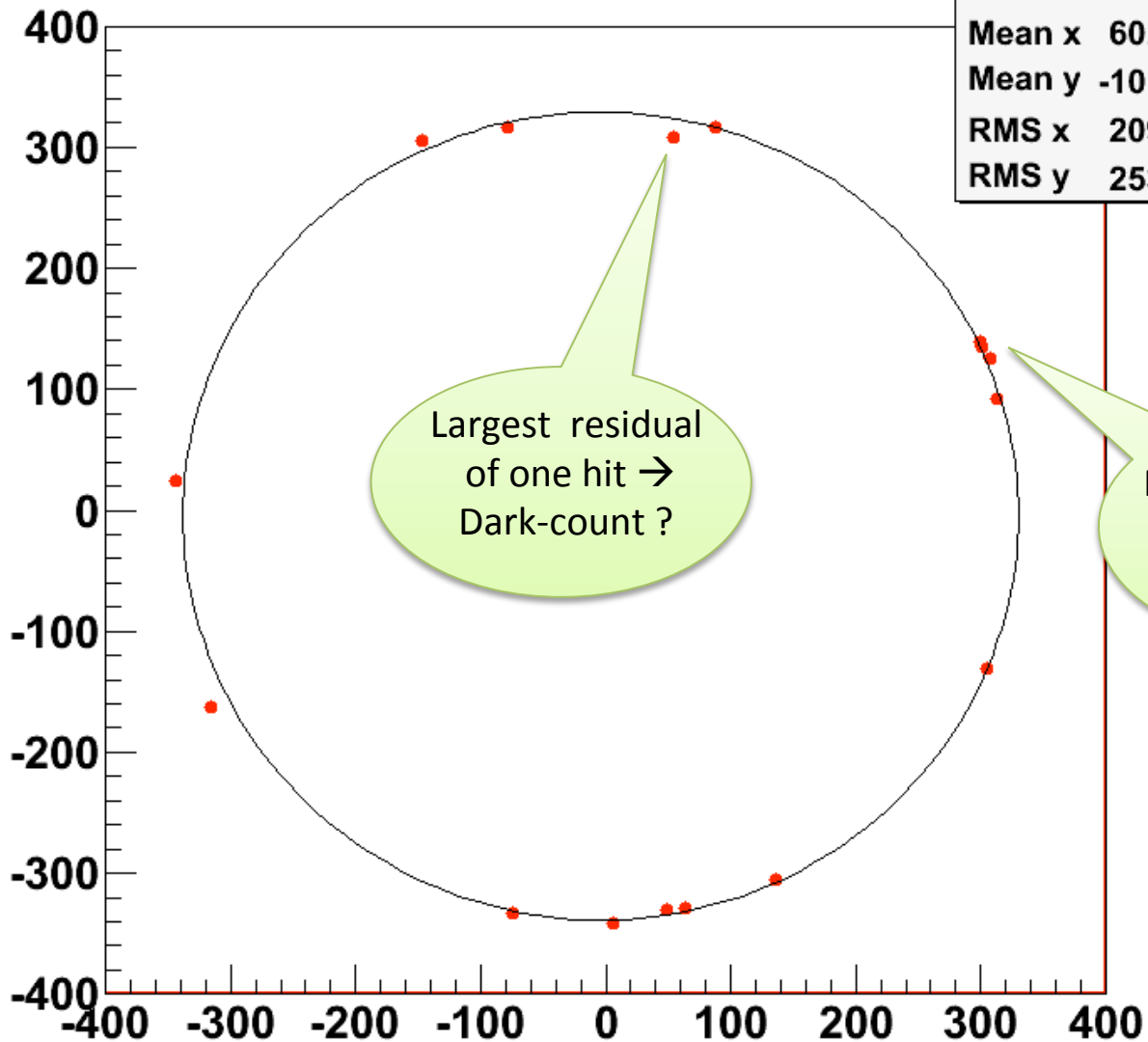


The GEANT4 model does not account for wavelength dependence

PMTs Hit Pattern

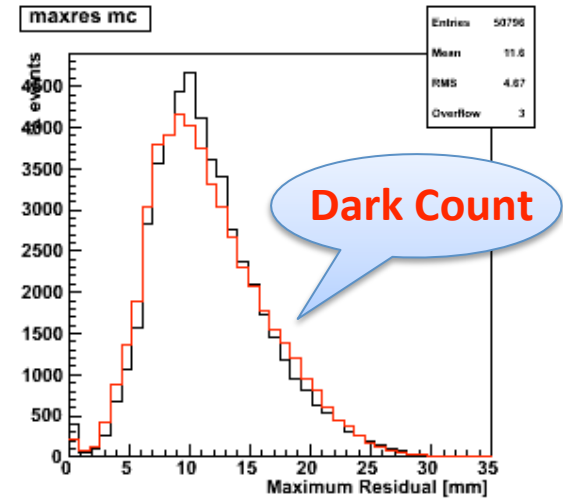
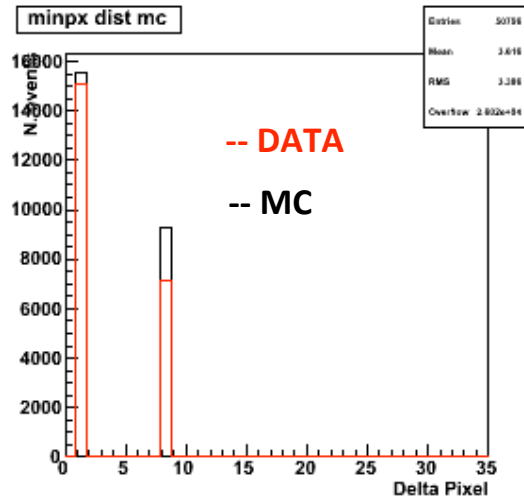
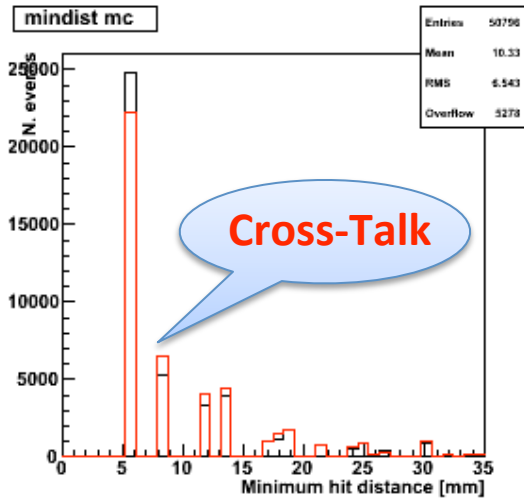
yy:xx {adc>thr&&event==5}

h1	
Entries	16
Mean x	60.67
Mean y	-10.74
RMS x	209.2
RMS y	253.5

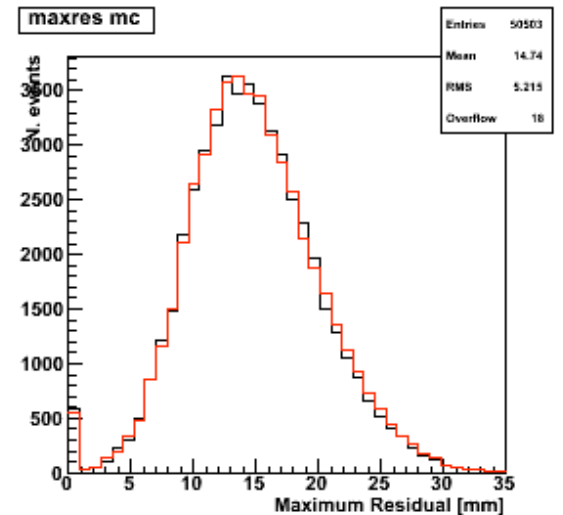
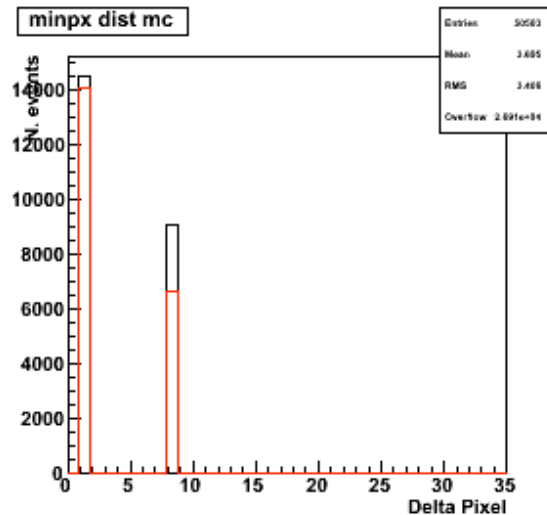
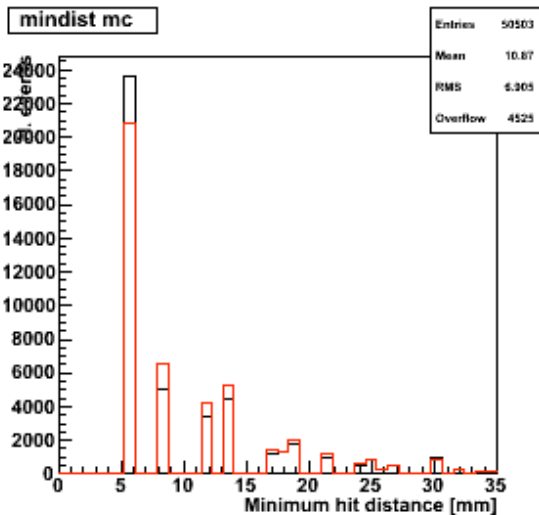


PMTs Digitalization

Run 1050-1054



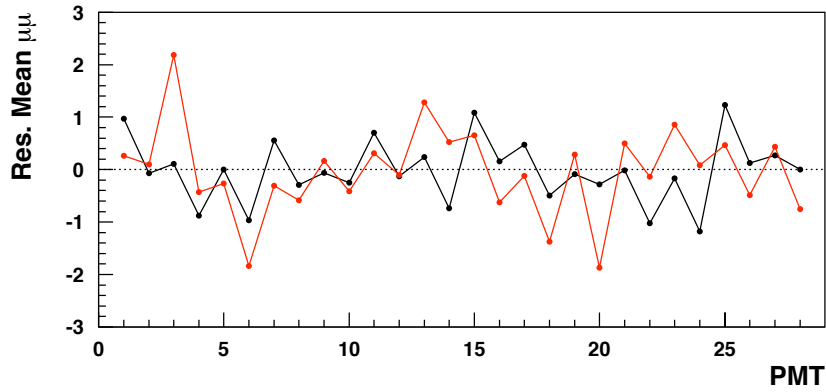
Run 820-828



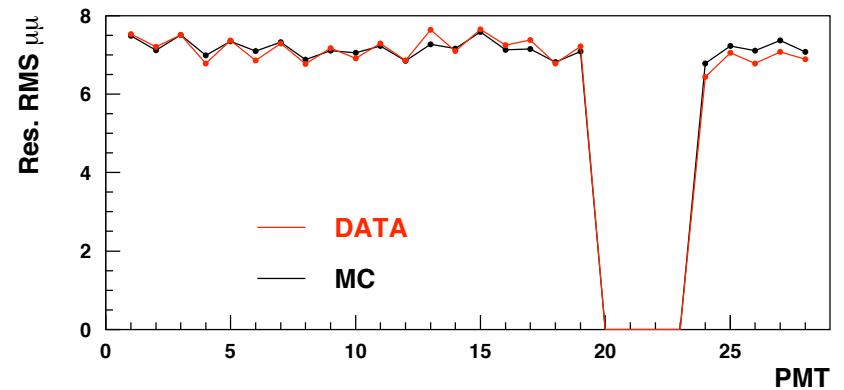
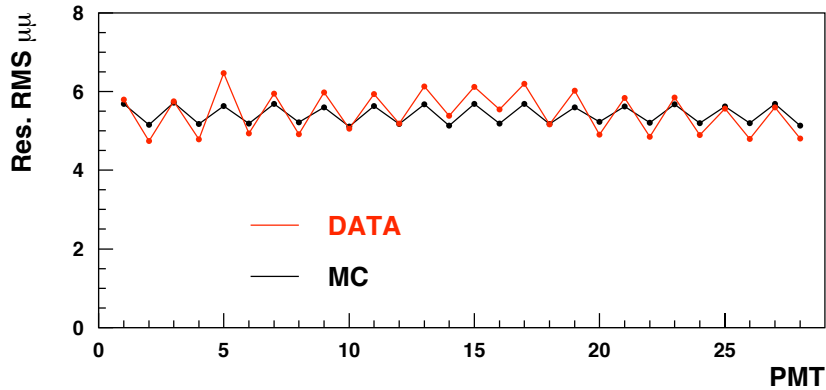
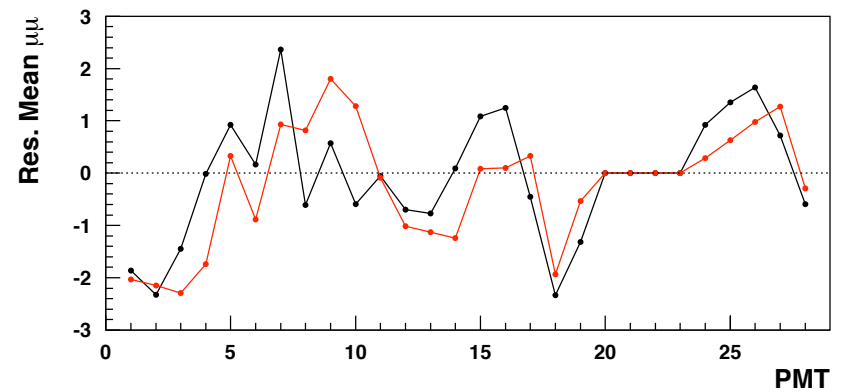
Hit residuals

$$\text{Residual} = R_{\text{HIT}} - \langle R \rangle_{\text{Event}}$$

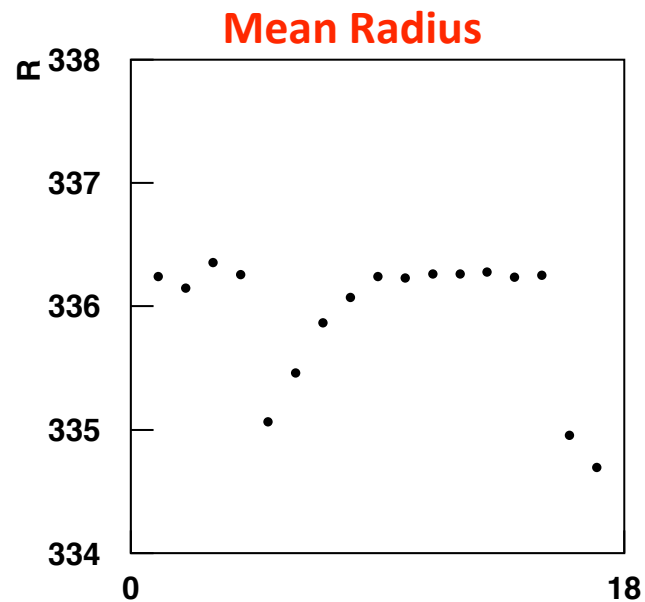
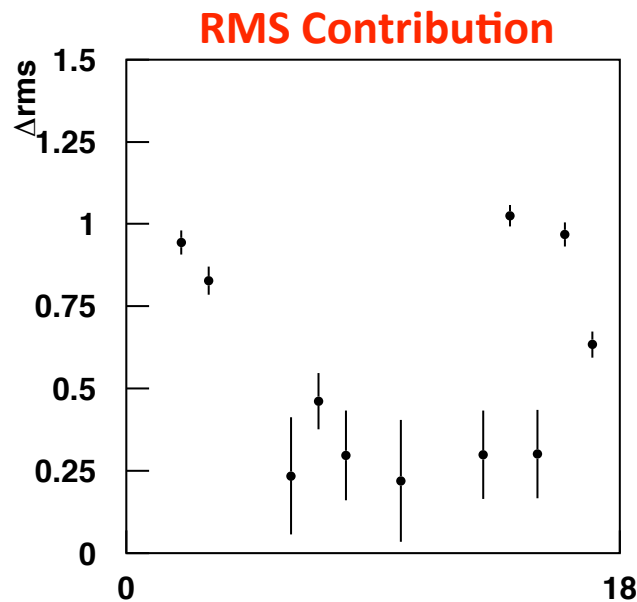
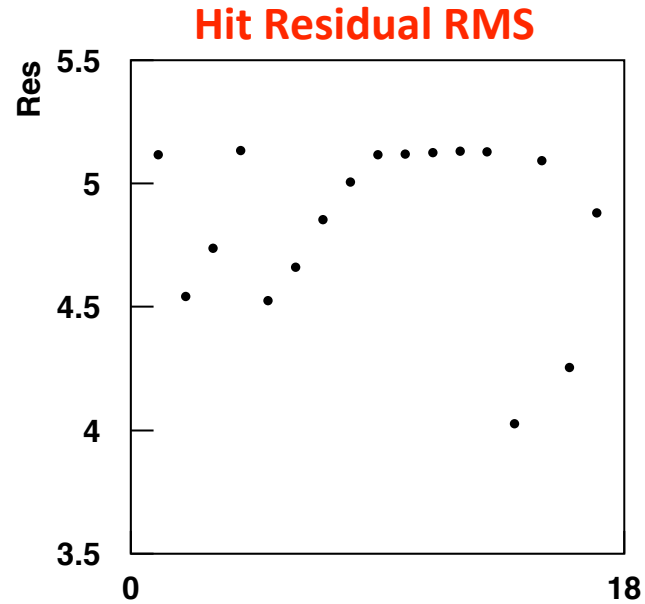
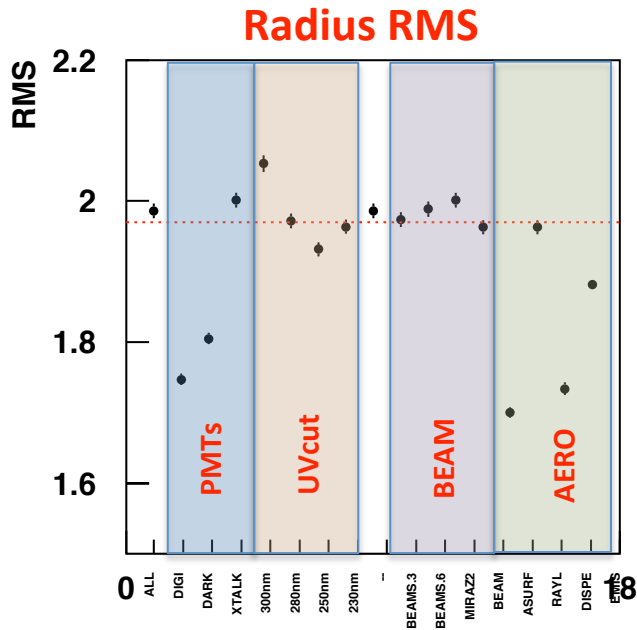
Direct Light



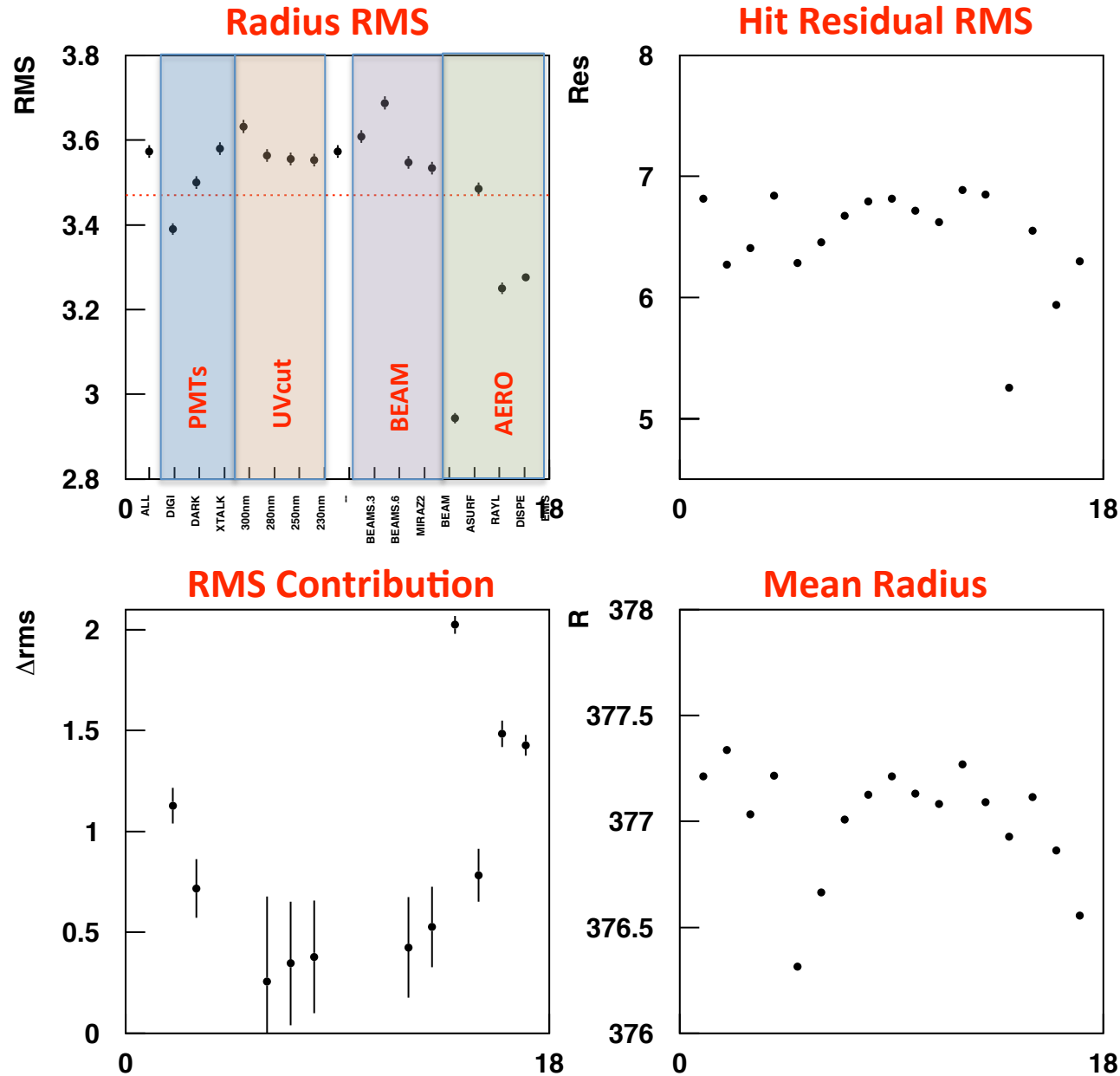
Reflected Light



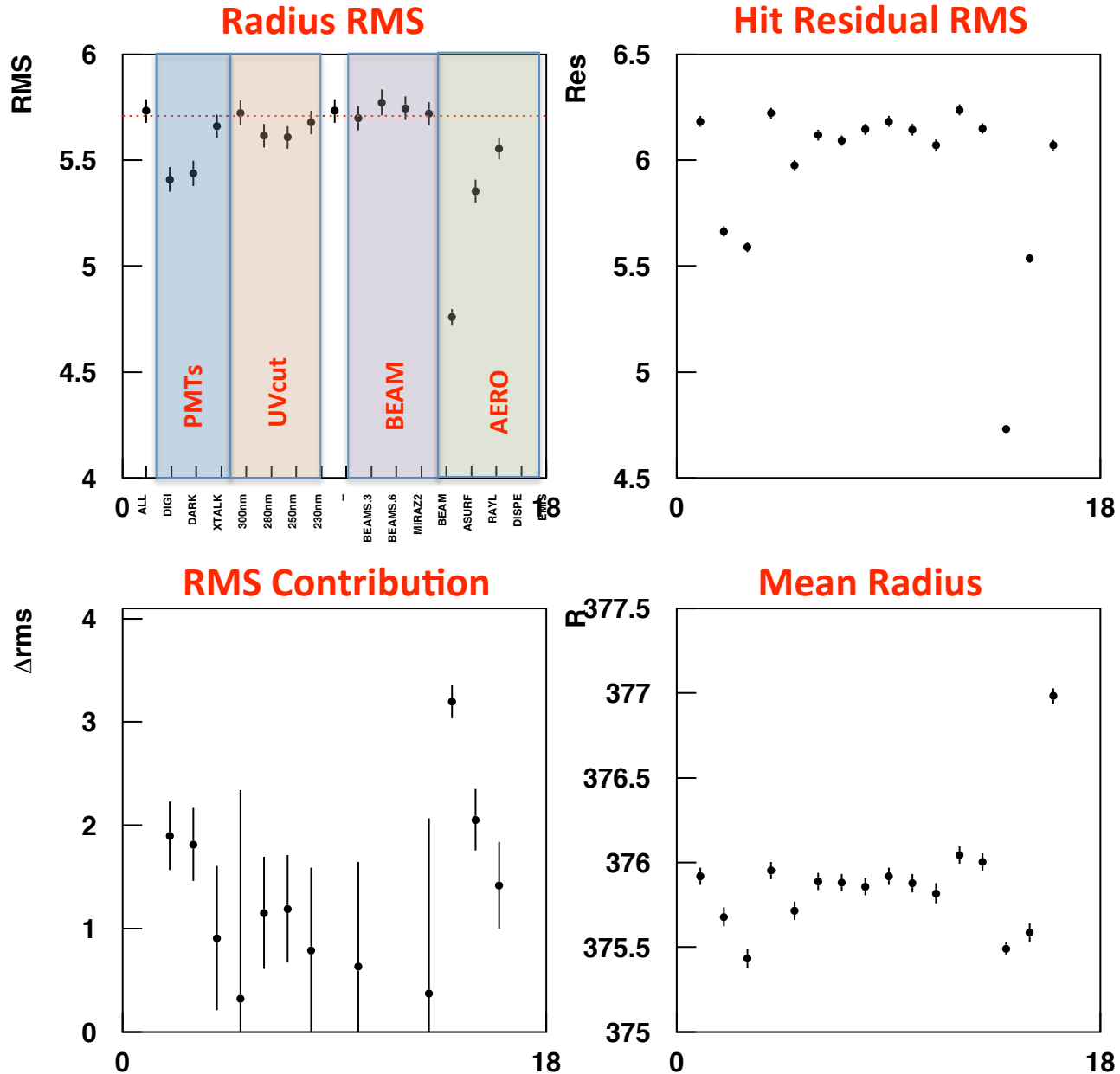
Direct Light (n=1.05)



Reflected Light (n=1.05)

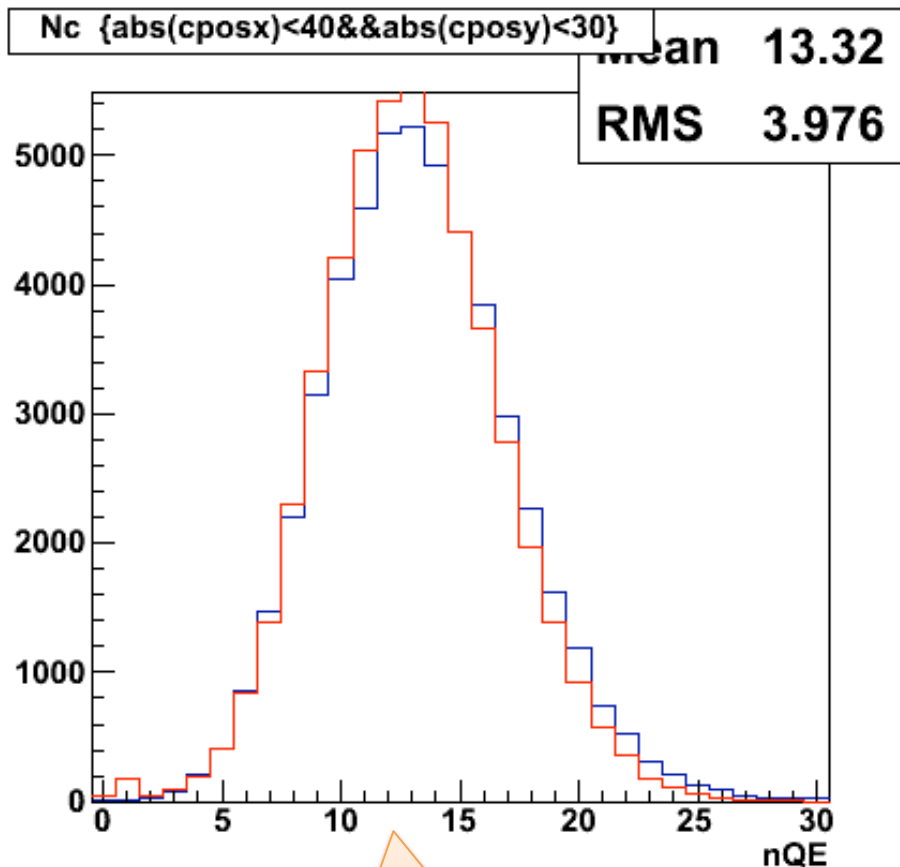


With Adsorbers (n=1.05)



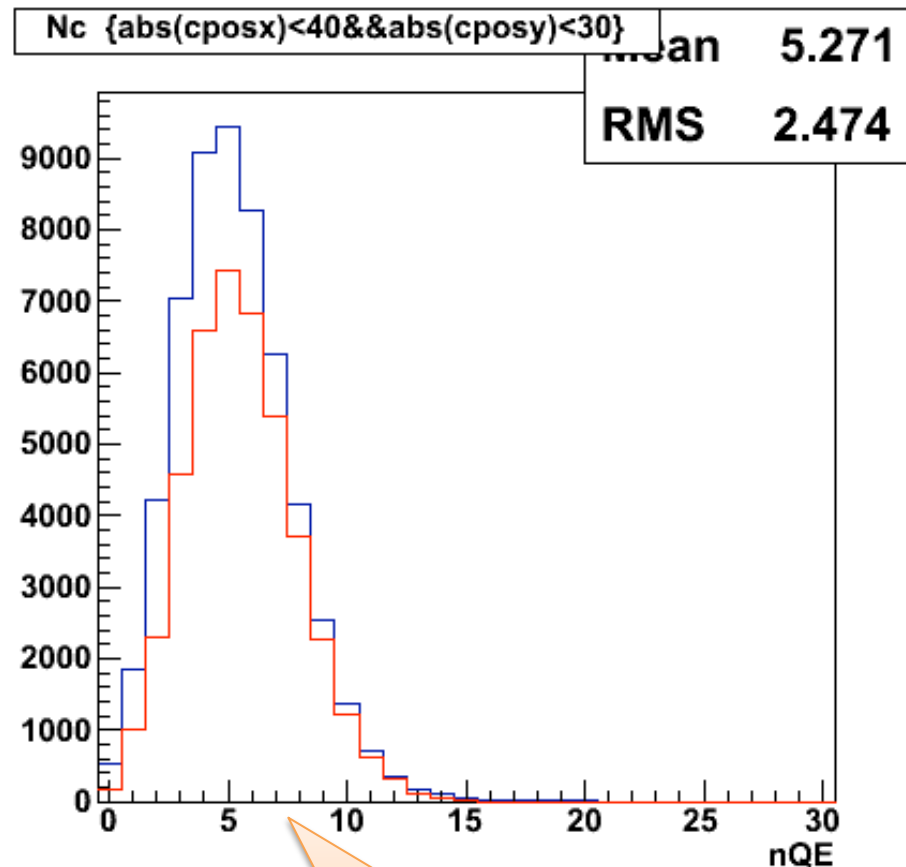
Number of Photo-electrons

Direct Light



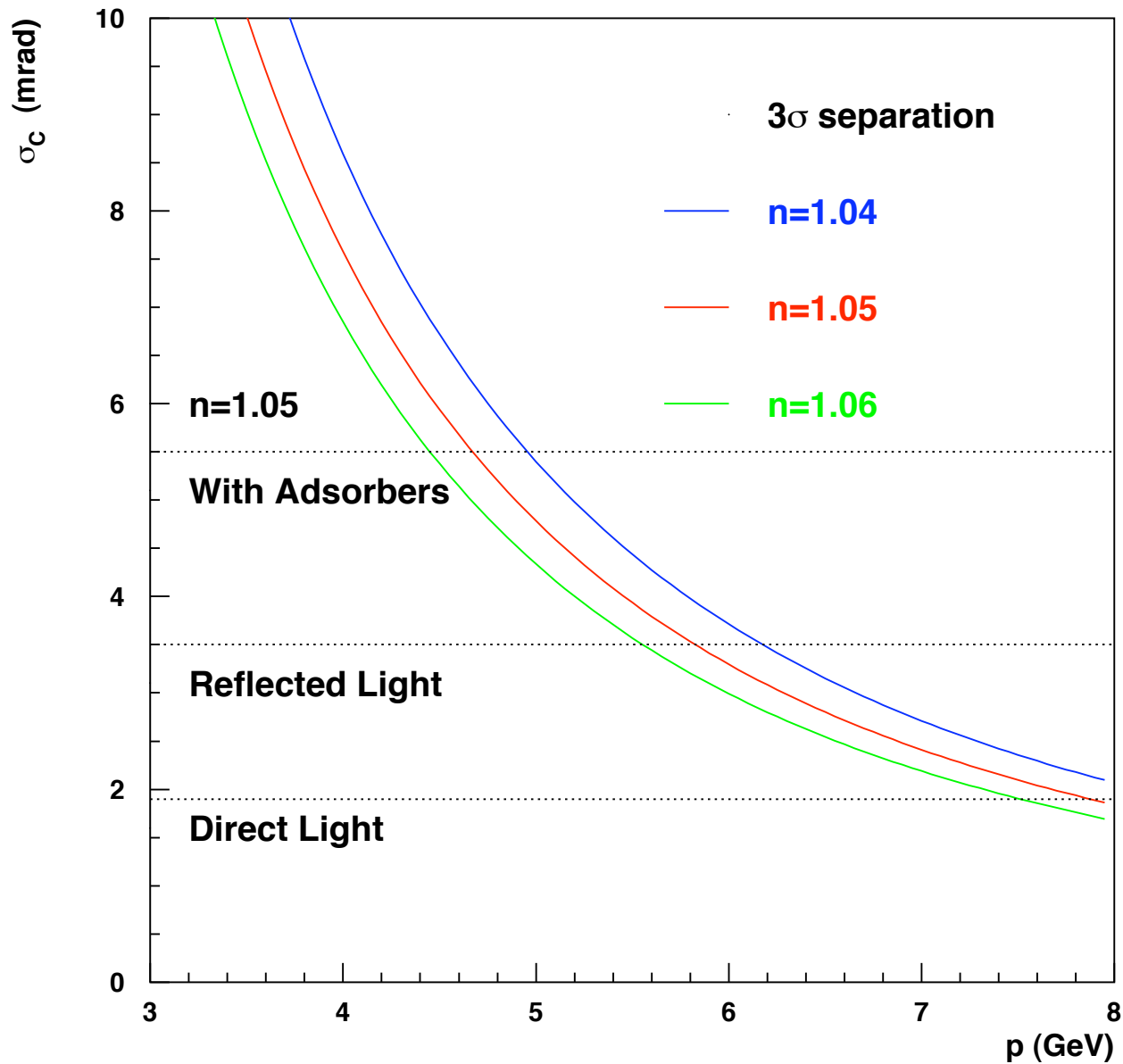
~ 7-10 in old CLAS12 simulations

Reflected Light



~ 3-6 in old CLAS12 simulations

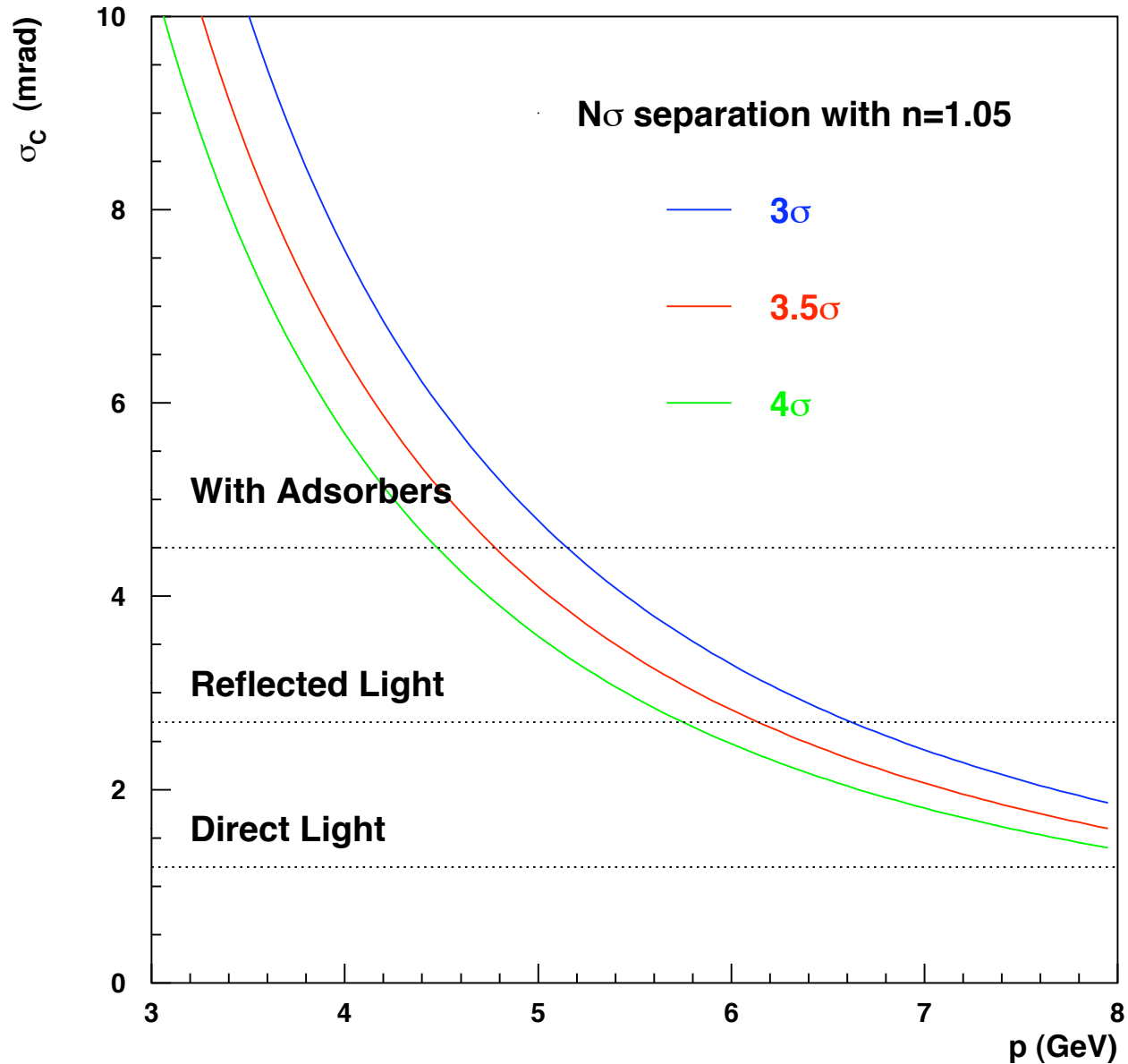
3-sigma Separation



Potential RMS Improvements

- Not-UV window (~ 0.2)
- Ring center from GEM after alignment (~ 0.2)
- Reduced dark count with precise timing (~ 0.2)
- 50% Improvement in aerogel optical surface ($\sim 0.15-0.5$)

Projected Separation



Material Budget

Component	Weight (g)	Area (cm ²)	Number	Areal density (g cm ⁻²)
H8500	125	5.7 x 5.7	1	3.84
Socket	??			
Coaxial cable	63	70 x 4	1 - 15	0.22 – 3.37
MAROC Front-End	24	7 x 5.2	1	0.66
MAROC Backplane16	64	21 x 5.2	1/16	0.04
MAROC Controller	88	17.5 x 10.5		0.48