

RICH GEMC SIMULATIONS

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Aerogel Optical Surface

HERMES R. De Leo, NIMA 457 (2001) 52

Forward scattering probability $\sim 15\%$ with and average angle ~ 1.6 mrad

AMS P. Aguayo, NIMA 560 (2006) 291

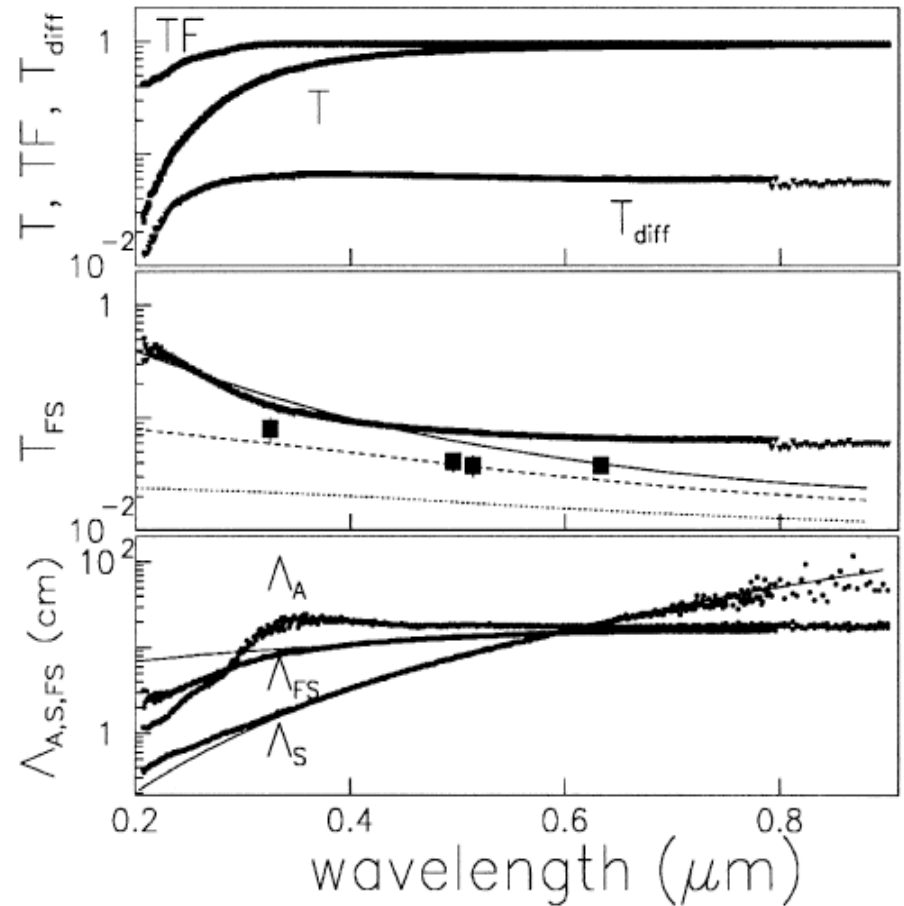
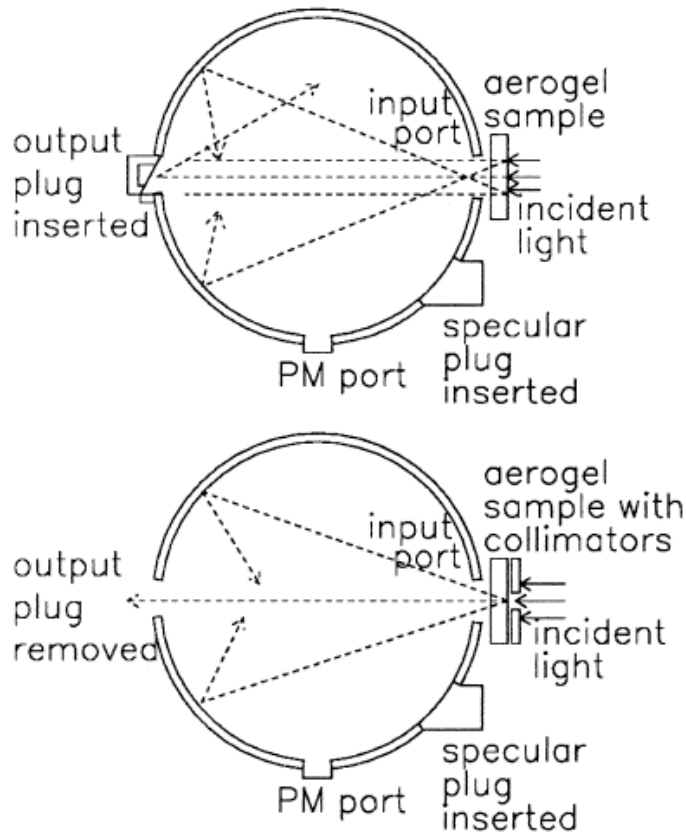
$$P(\theta) = (\sin \theta / \delta\theta^2) \exp(-\sin^2 \theta / 2\delta\theta^2).$$

Radiator	P_{col}	$\delta\theta$ (mrad)	C ($\mu\text{m}^4 \text{cm}^{-1}$)	R
<i>2002 run</i>				
MECy01.103	0.33 ± 0.02	20 ± 3	0.0089 ± 0.0002	1.13 ± 0.01
MECy02.103	0.28 ± 0.02	24 ± 2	0.0079 ± 0.0001	0.96 ± 0.01
MECy02.105	0.20 ± 0.02	25 ± 3	0.0095 ± 0.0002	0.96 ± 0.01
CINy02.103	0.15 ± 0.01	24 ± 3	0.0059 ± 0.0001	0.98 ± 0.01
<i>2003 run</i>				
MECy03.103	0.14 ± 0.01	23 ± 2	0.0058 ± 0.0001	0.98 ± 0.01
CINy02.103	0.14 ± 0.01	17 ± 2	0.0052 ± 0.0001	1.03 ± 0.01
CINy03.105	0.19 ± 0.01	14 ± 2	0.0055 ± 0.0001	1.00 ± 0.02

Aerogel Optical Surface

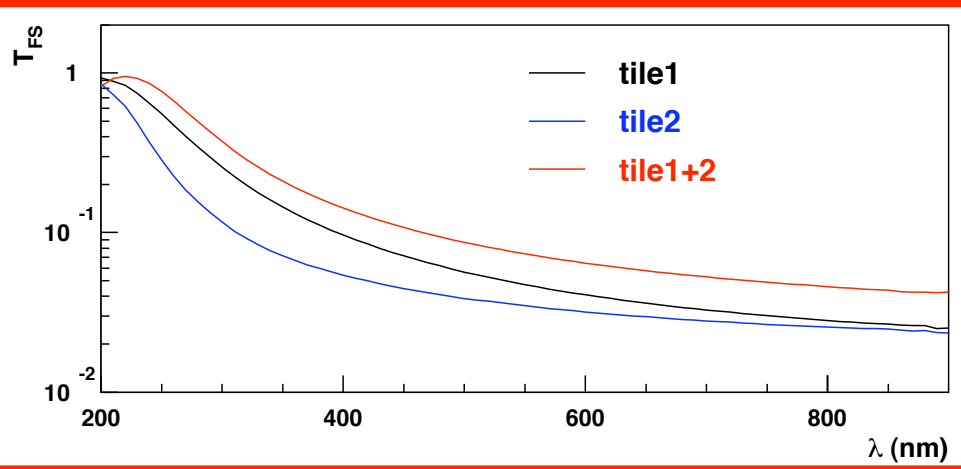
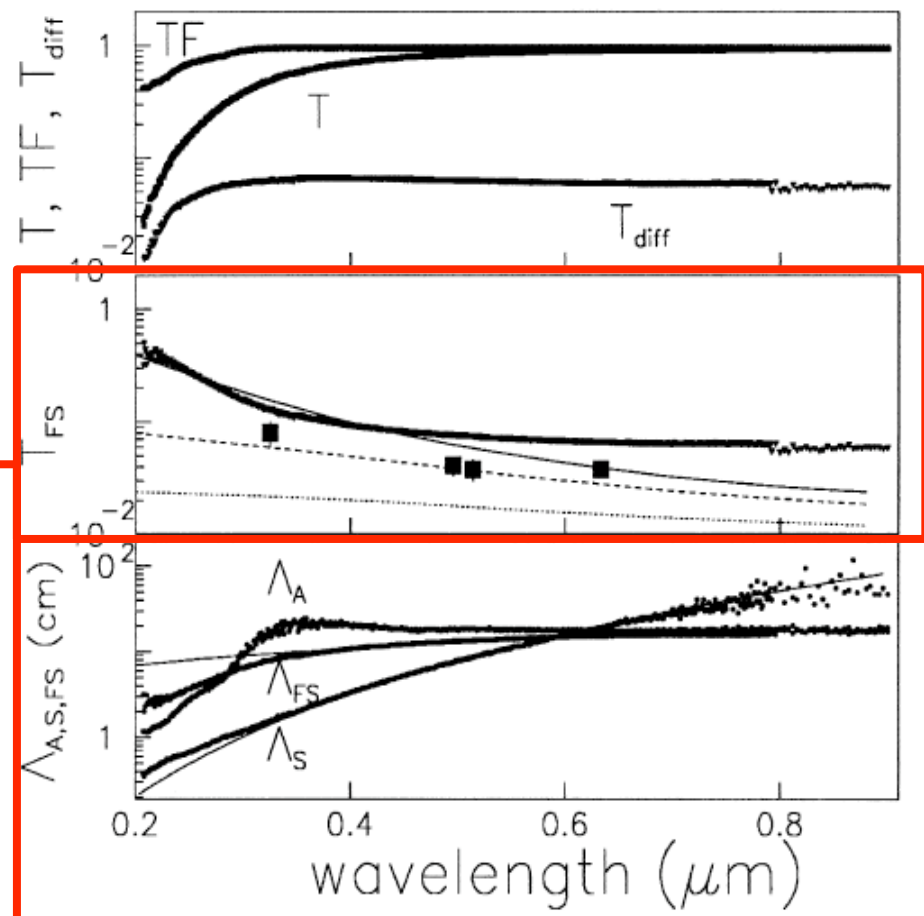
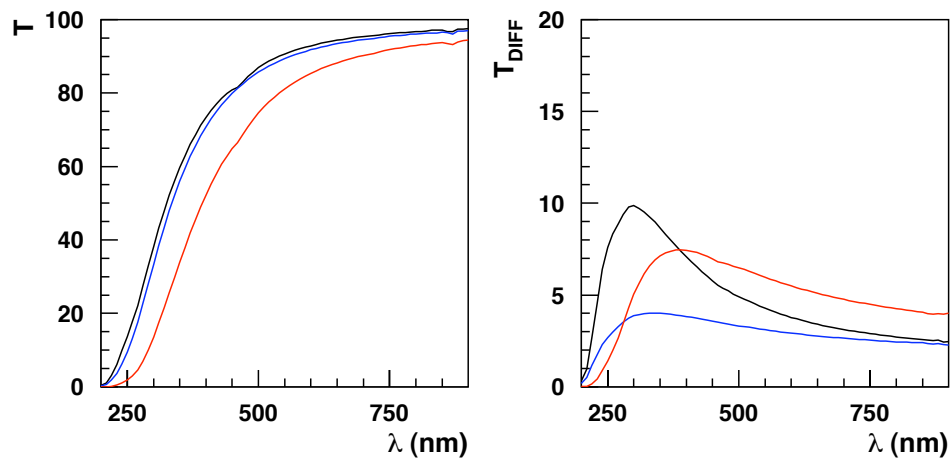
The roughness of aerogel surface causes forward scattering of light

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



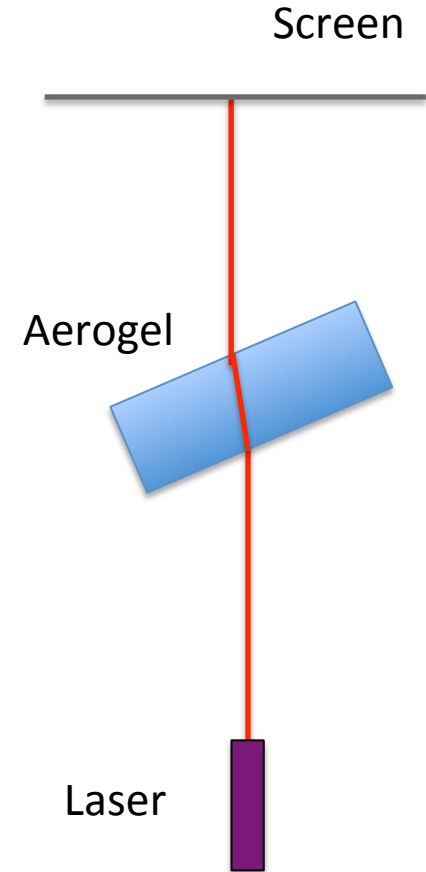
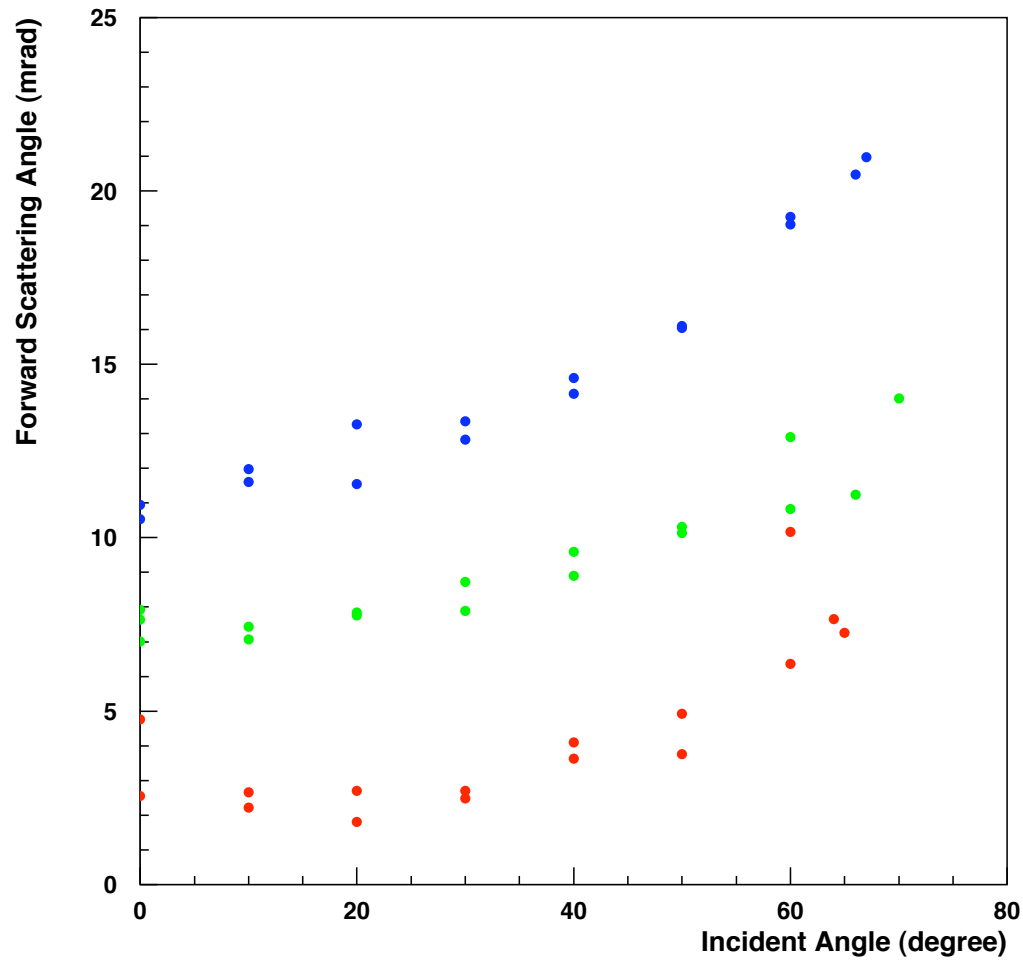
Aerogel Optical Surface

Aerogel used in CERN test-beam



Light Scattering on Aerogel Surface

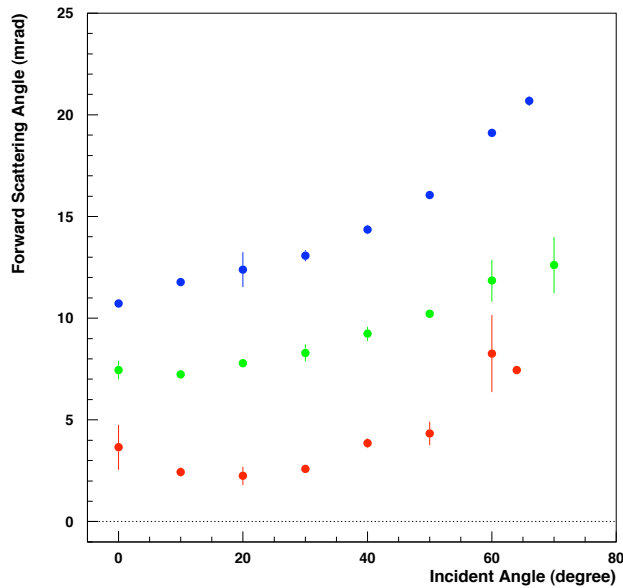
Broadening of a 638 nm laser beam transmitted through aerogel



The GEANT4 model does not account for wavelength dependence

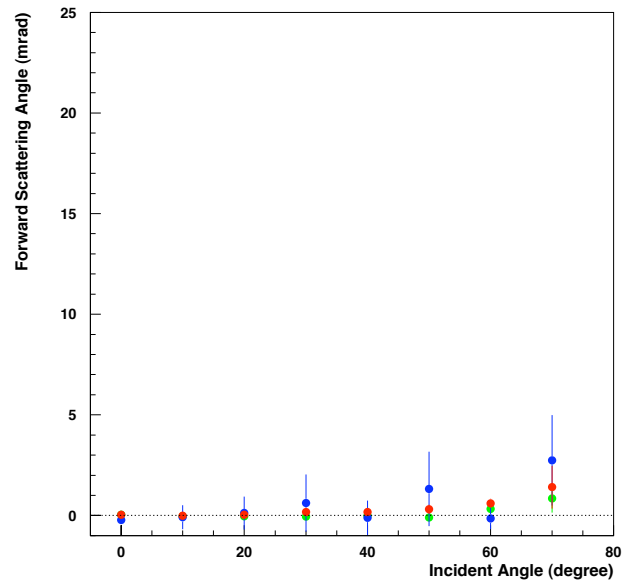
Forward Scattering

Novobirsk



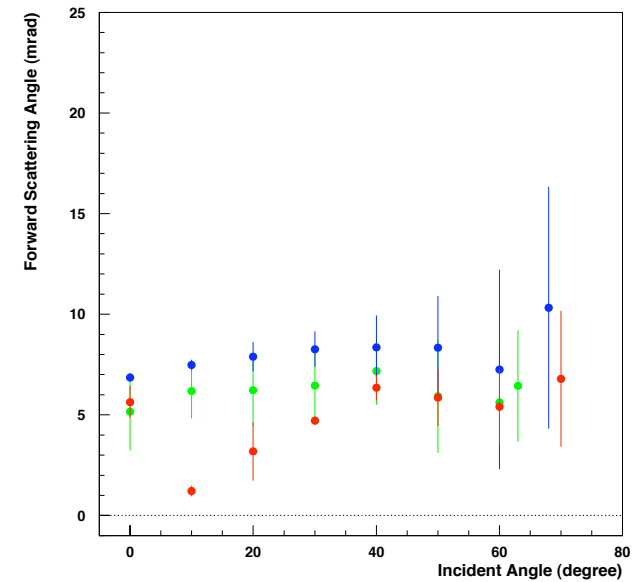
N=1.05
2 cm thickness

Matsushita



N=1.05
1 cm thickness

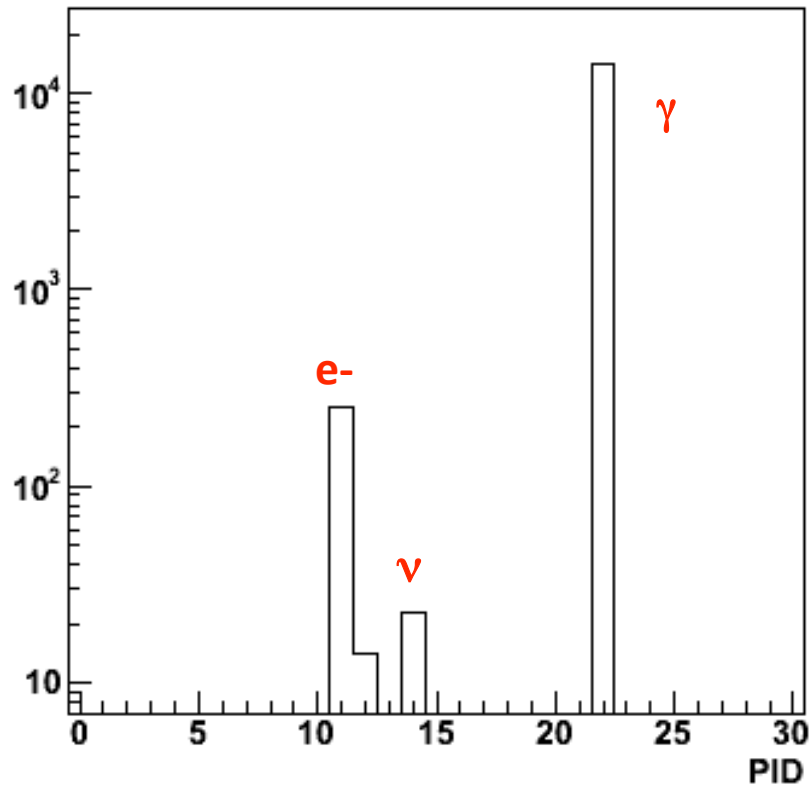
Aspen



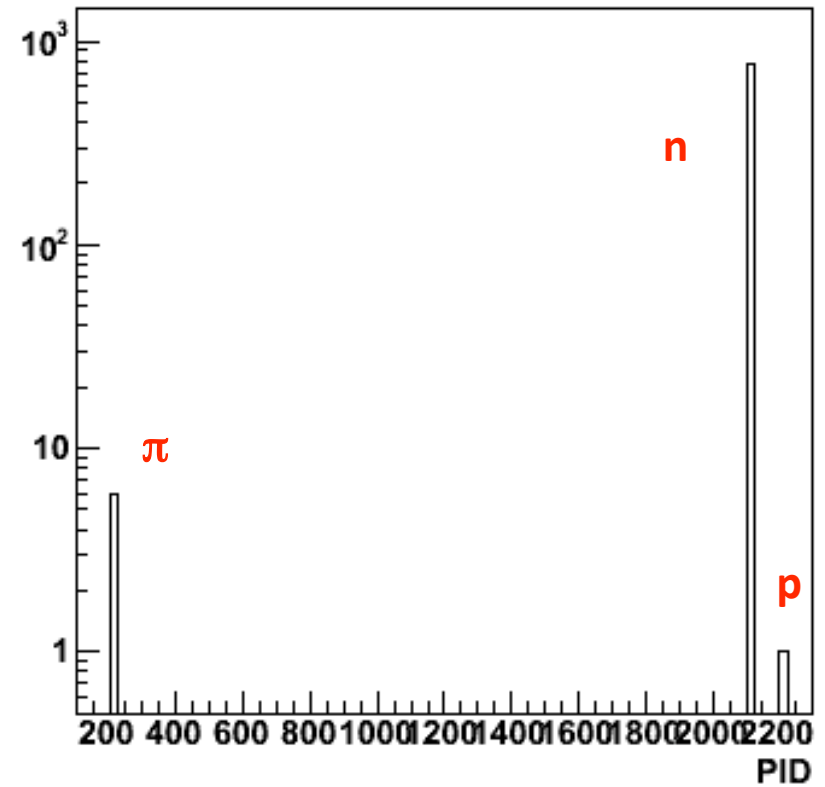
N=1.01
1.7 cm thickness
Scratched surface

Background PID

$\text{abs(pid)} \{ \text{abs(pid)} < 1e2 \}$

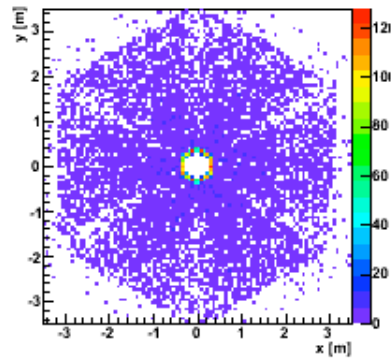


$\text{abs(pid)} \{ \text{abs(pid)} > 1e2 \&\& \text{abs(pid)} < 1e8 \}$

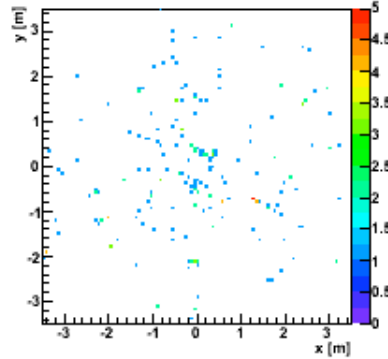


Particle Flux ($\text{sec}^{-1} \text{cm}^{-2}$)

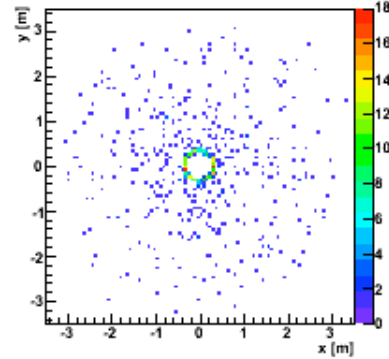
y/1000.:x/1000. {abs(pid)==22}



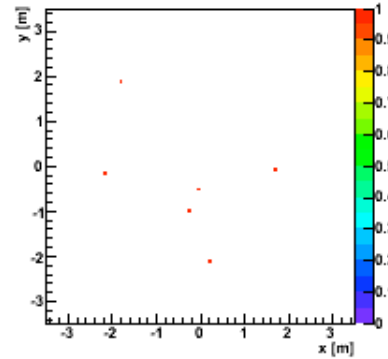
y/1000.:x/1000. {abs(pid)==11}



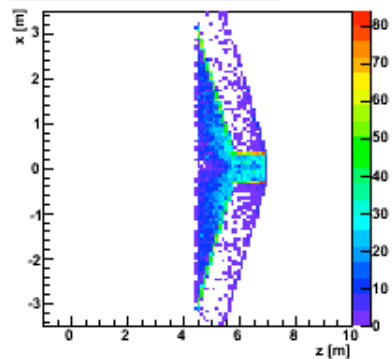
y/1000.:x/1000. {abs(pid)==2112}



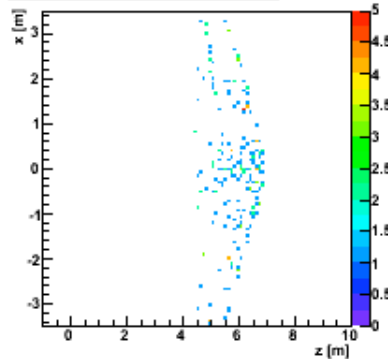
y/1000.:x/1000. {abs(pid)==211}



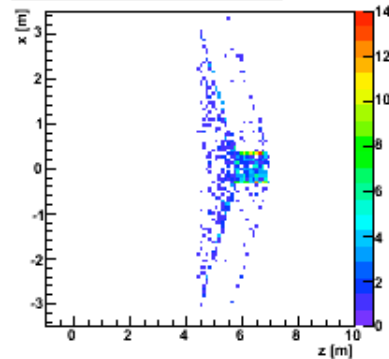
x/1000.:z/1000. {abs(pid)==22}



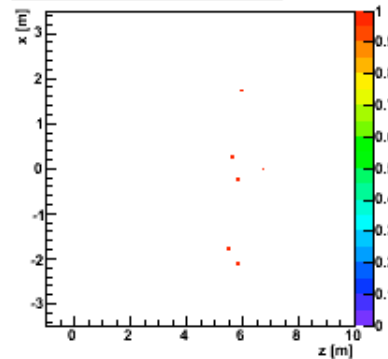
x/1000.:z/1000. {abs(pid)==11}



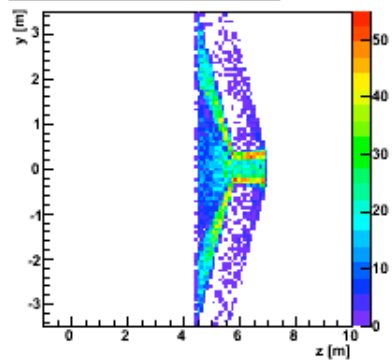
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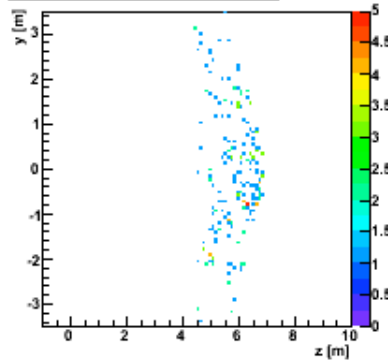
x/1000.:z/1000. {abs(pid)==211}



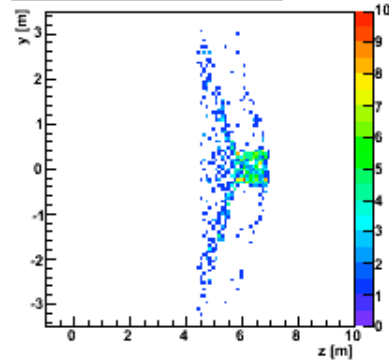
y/1000.:z/1000. {abs(pid)==22}



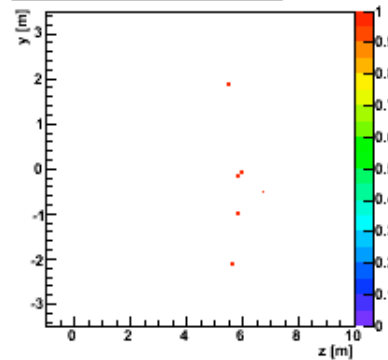
y/1000.:z/1000. {abs(pid)==11}



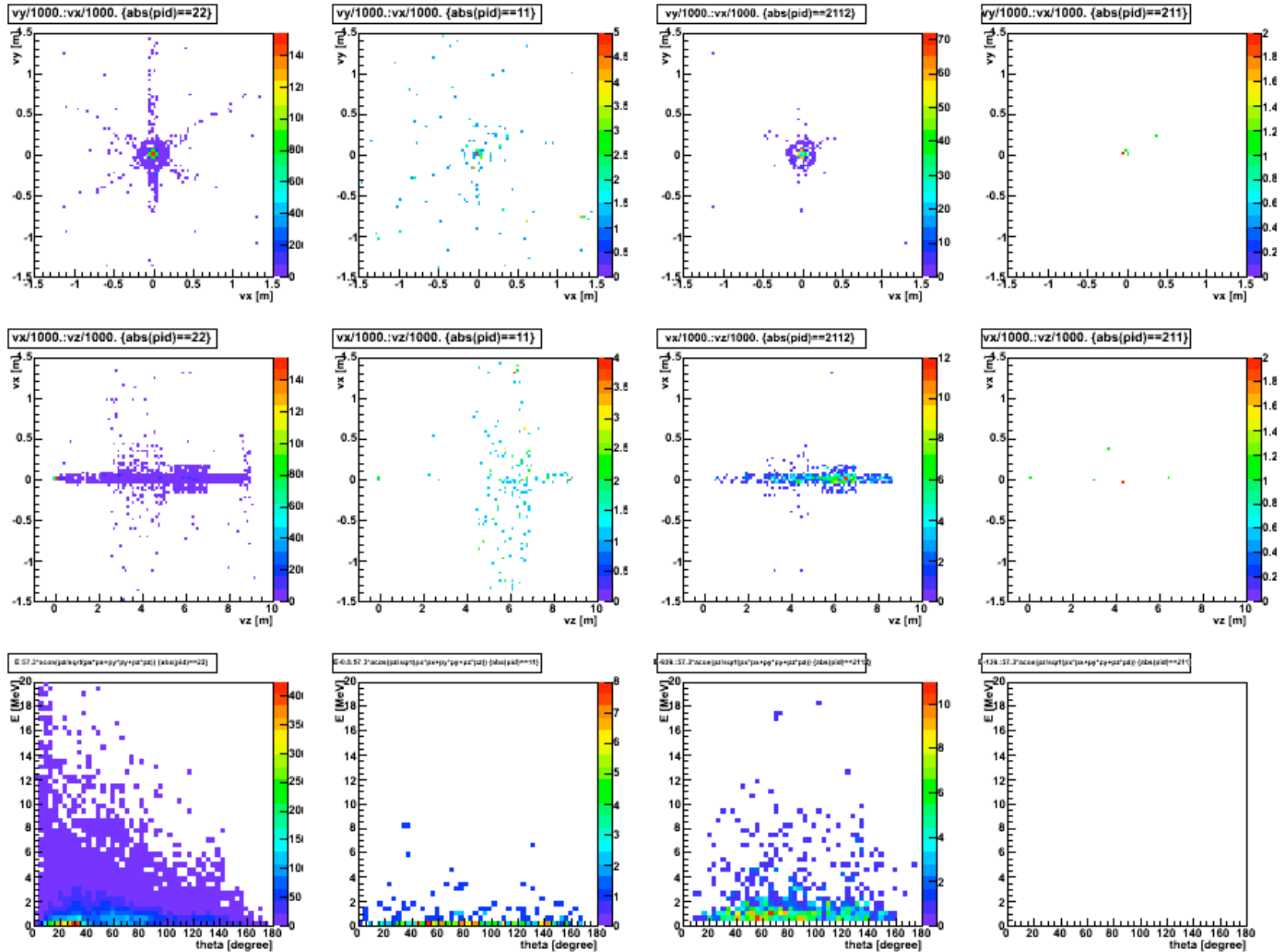
y/1000.:z/1000. {abs(pid)==2112}



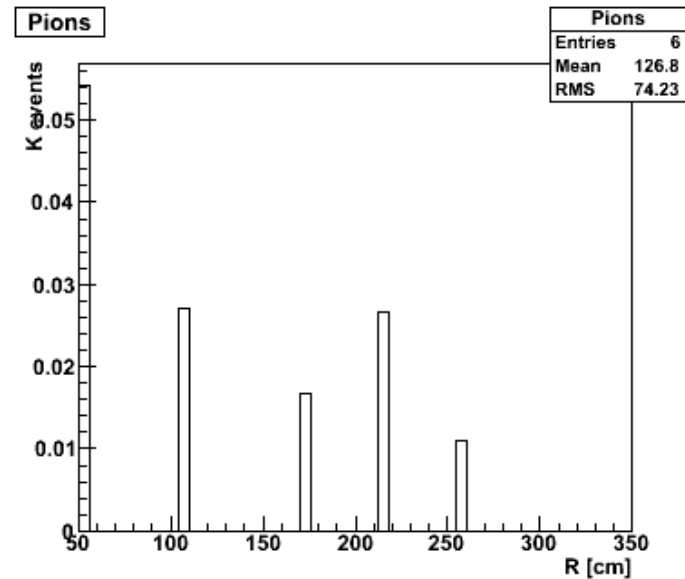
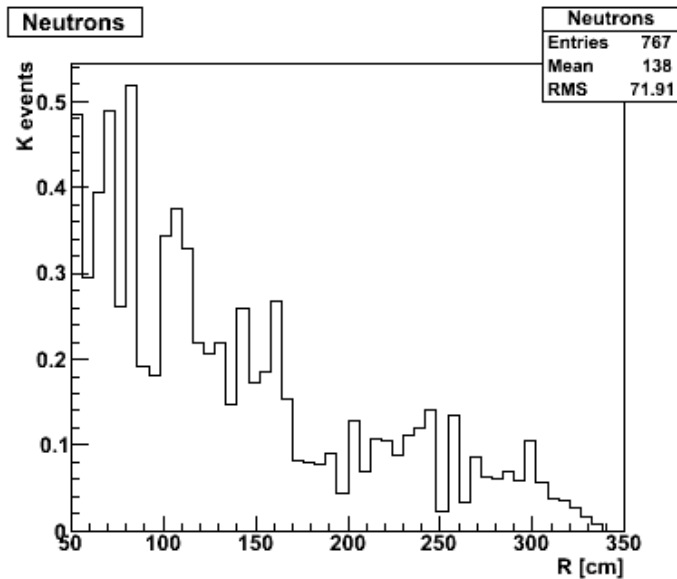
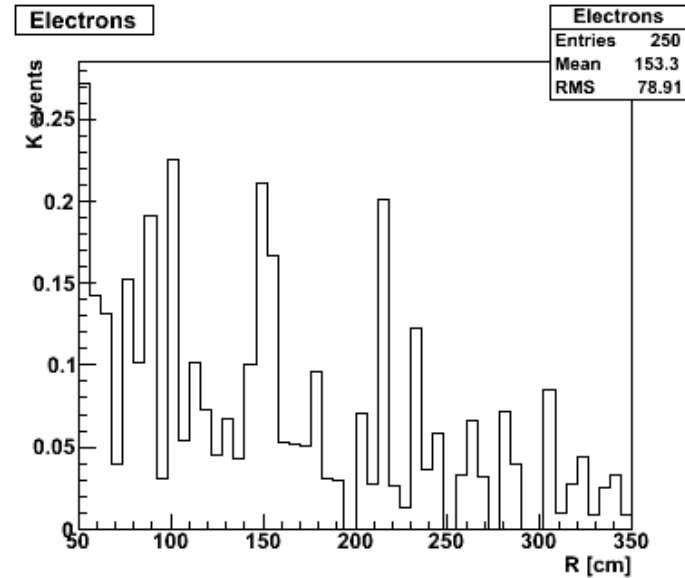
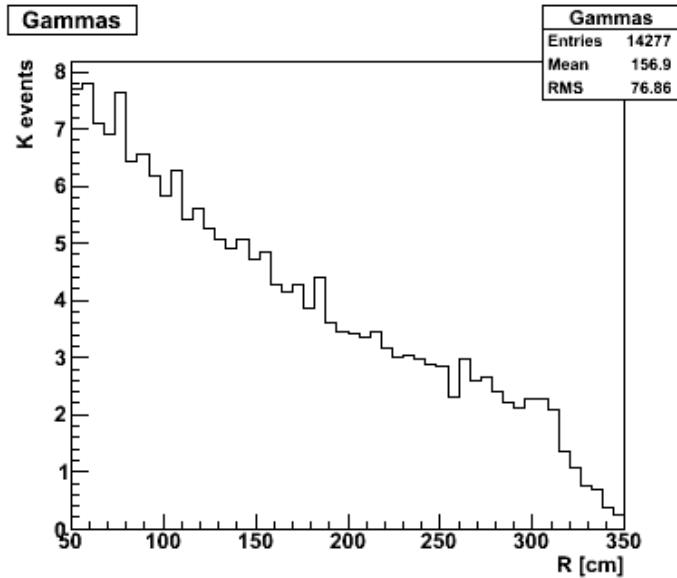
y/1000.:z/1000. {abs(pid)==211}



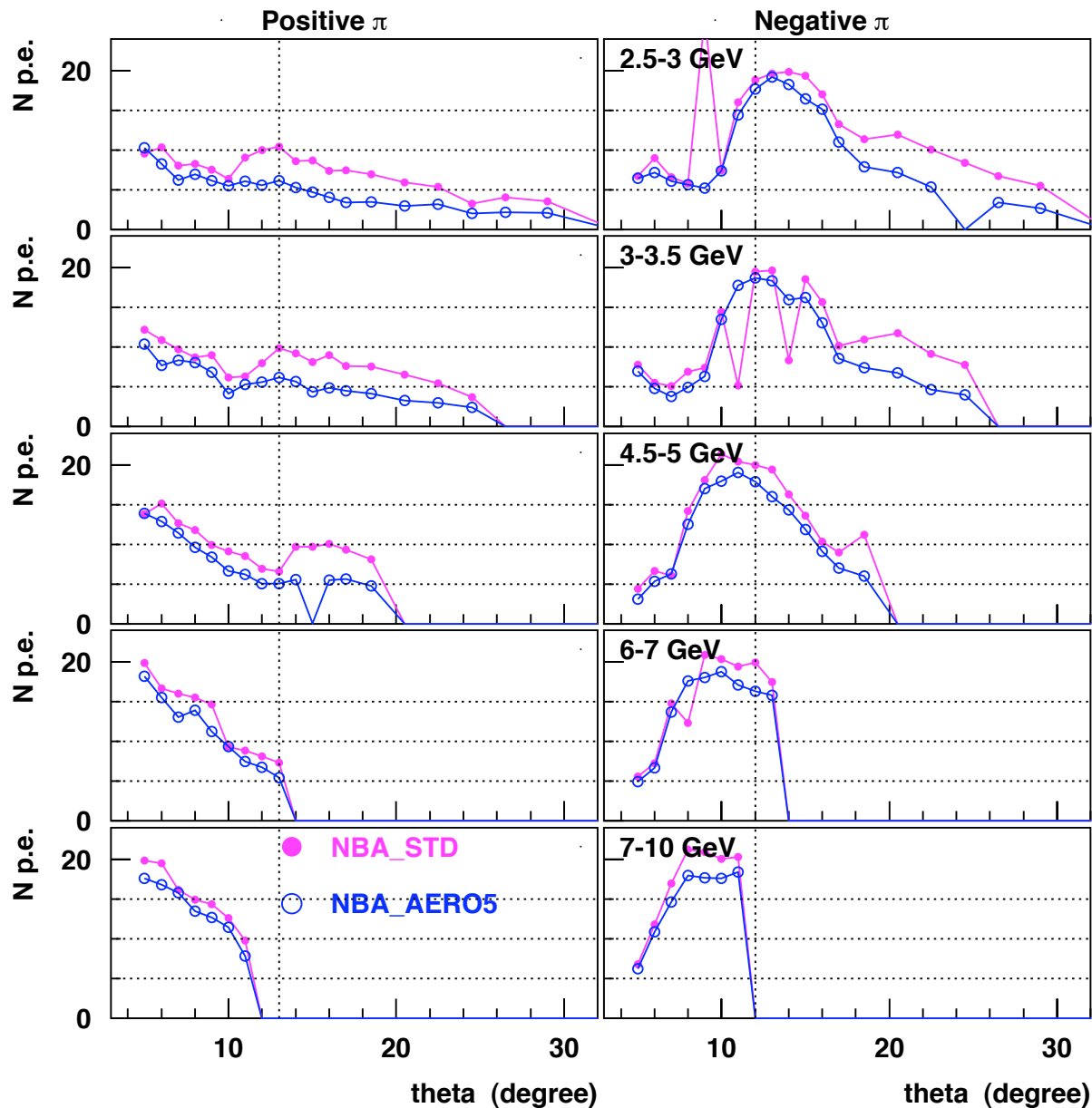
Background Energy and Vertex



Particle Flux ($\text{sec}^{-1} \text{cm}^{-2}$)



Photon Yield at CLAS12



Photon Yield at CLAS12

