

Mini Tower Preliminary Results

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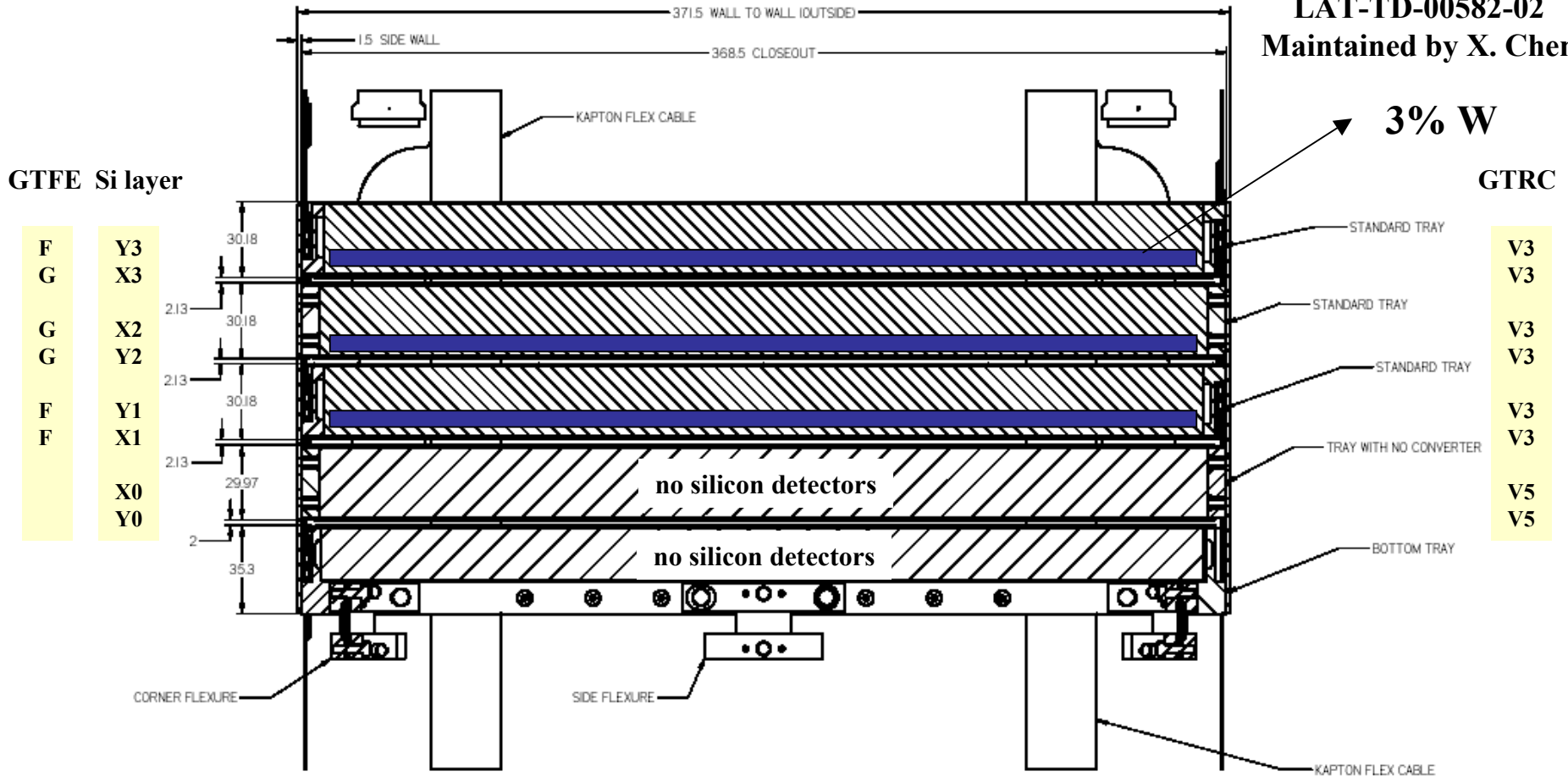
Ground Software Workshop

Minitower Test

- All results are **PRELIMINARY**
- These data are not intended for MC validation but to debug the data analysis chain and to study the experimental set-up

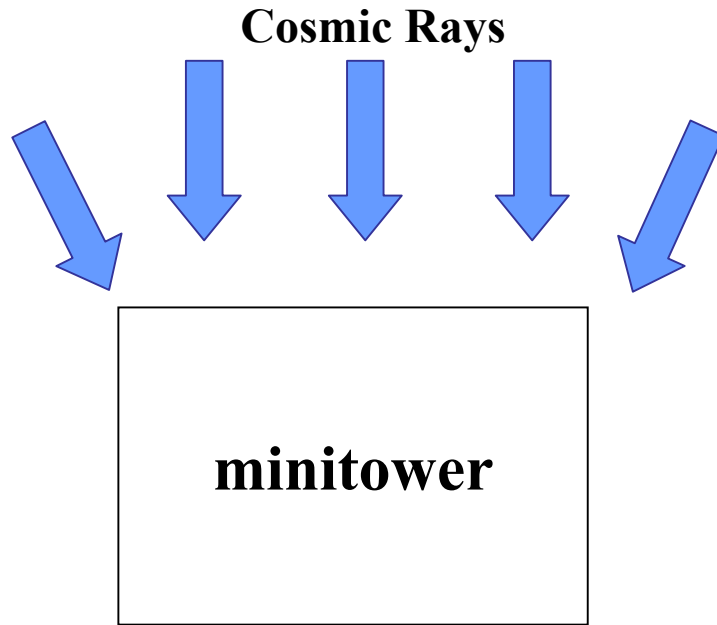
The Minitower Geometry

LAT-TD-00582-02
 Maintained by X. Chen

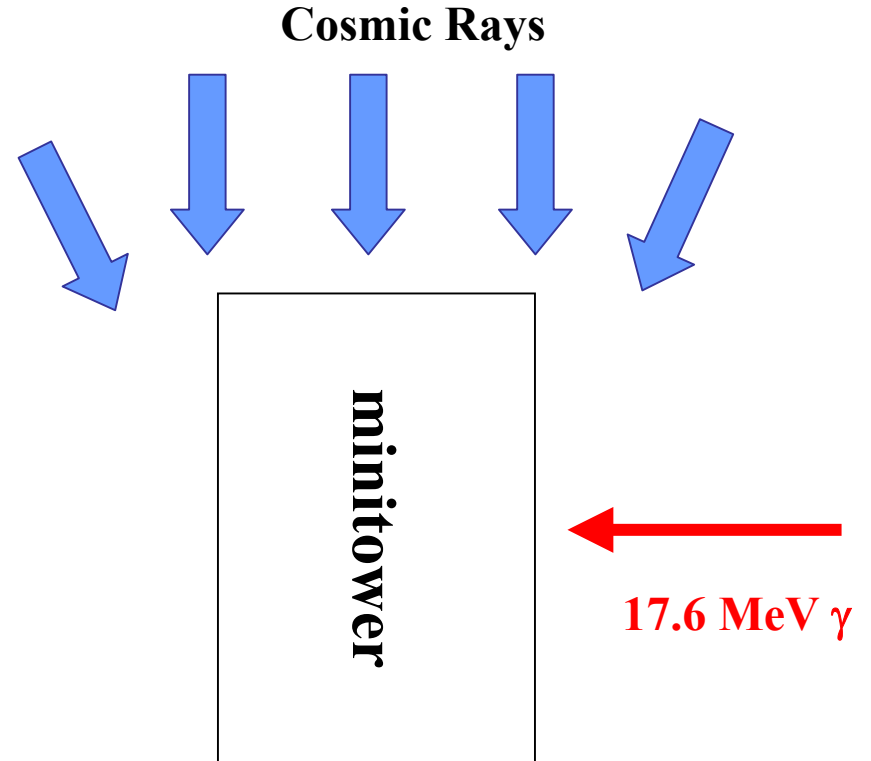


There are 8 layers instrumented with Front-End Electronics (MCMs) but only 6 layers instrumented with silicon detectors

Data Taking Configurations

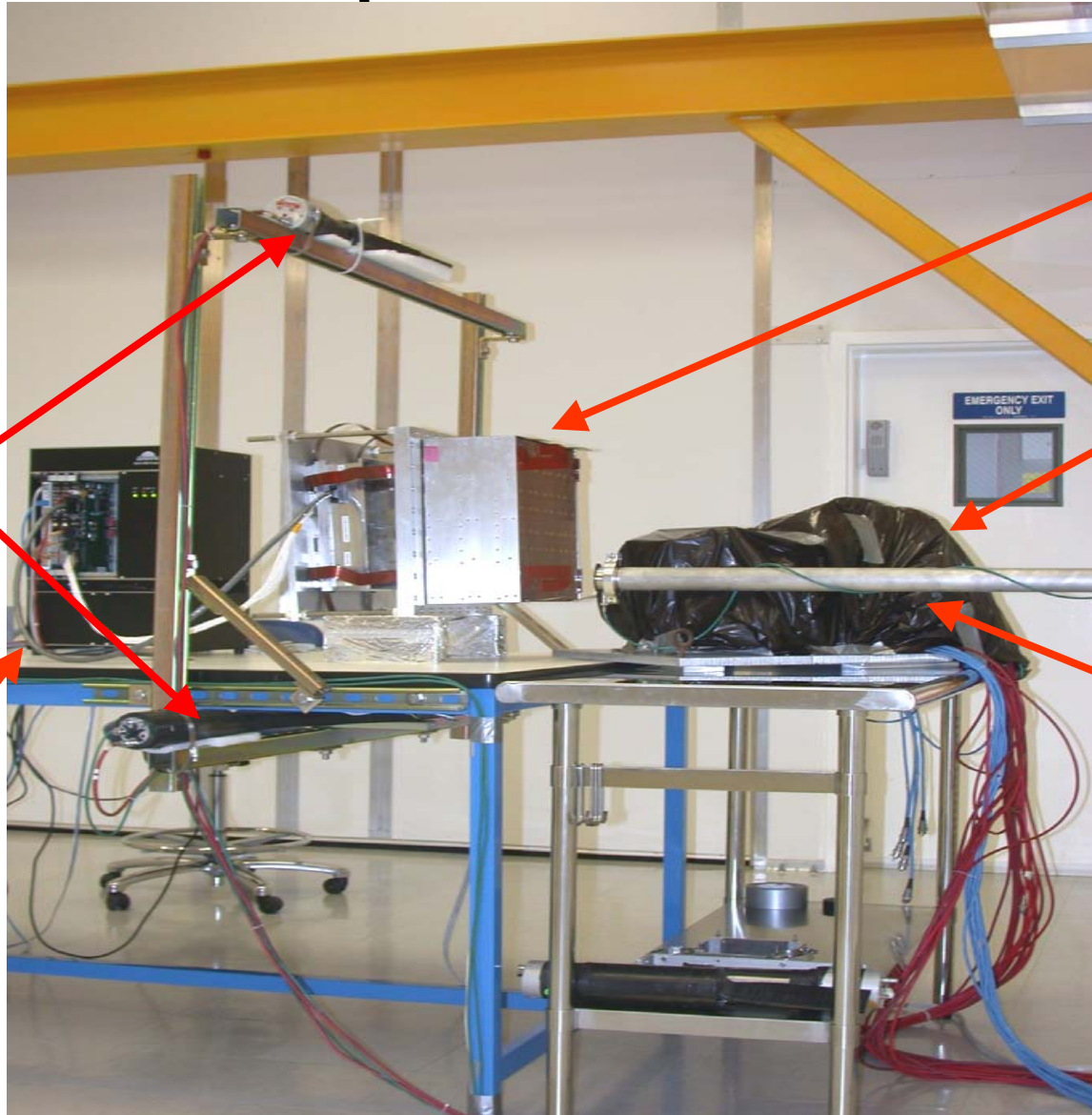


Vertical position
Expected CR trigger rate 13 Hz



Horizontal position
Expected CR trigger rate ~ 4 Hz
Expected γ trigger rate ~ 0.02 Hz

The Experimental Setup



Cosmic ray telescope

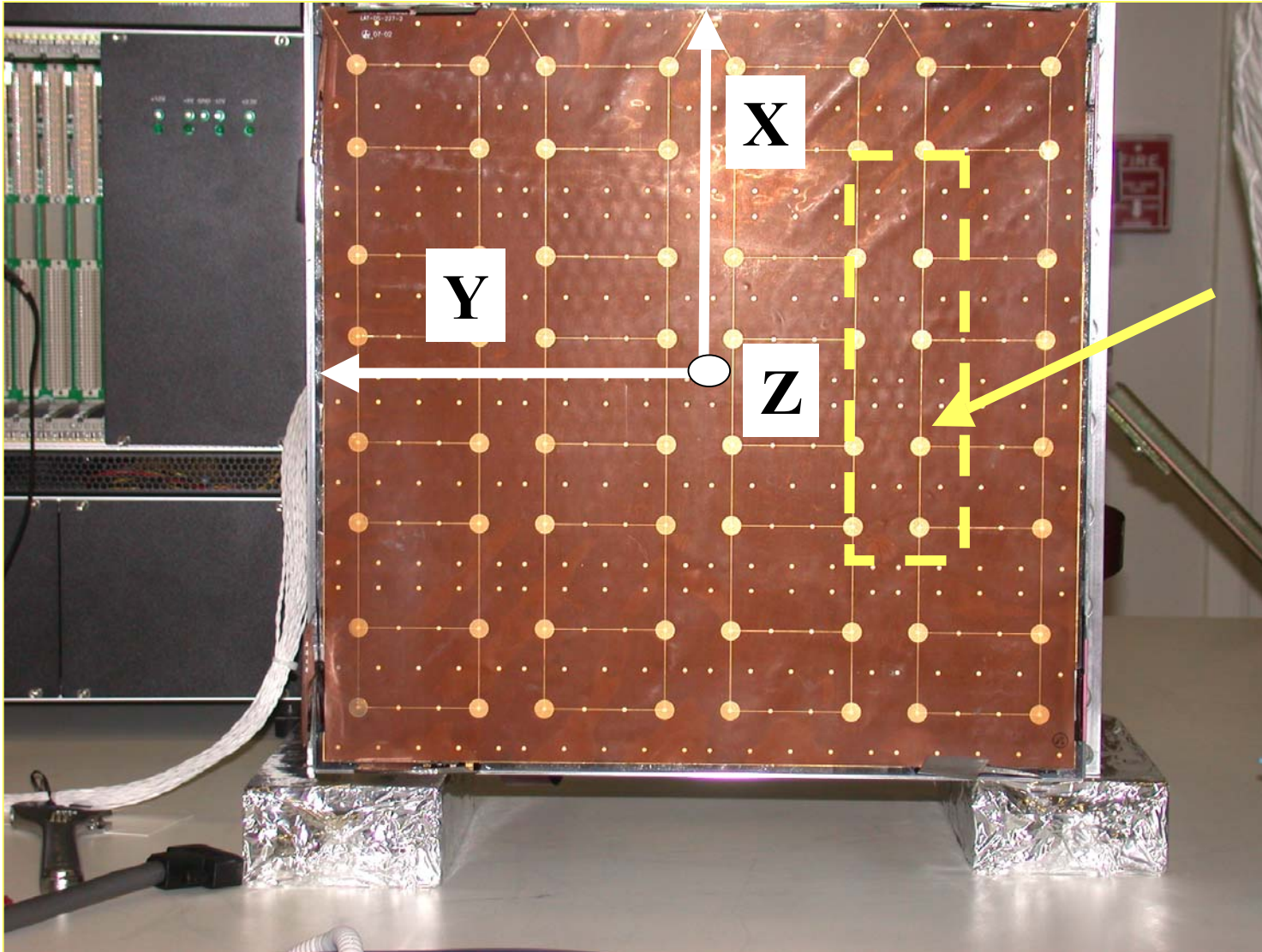
minitower

BGO crystals

VDG beam pipe

**EGSE
(VME crate)**

The Coordinate System



Based on position of disabled or dead channels in every layer, this region (~1/8 of minitower active area) is expected to have the highest trigger efficiency

Position VDG pipe at negative X and Y coordinates

Event rates – TKR trigger

Run ID	Run type	DATA Trigger rate (Hz)	MC Trigger rate (Hz)	DATA Reconstructed rate (Hz)	MC Reconstructed rate (Hz)
030613022805	Muons with vertical tracker	~ 0.94	~ 0.83	~0.88	~ 0.74
030604013515	Muons with horizontal tracker	~ 0.42	~ 0.38	~ 0.36	~ 0.33

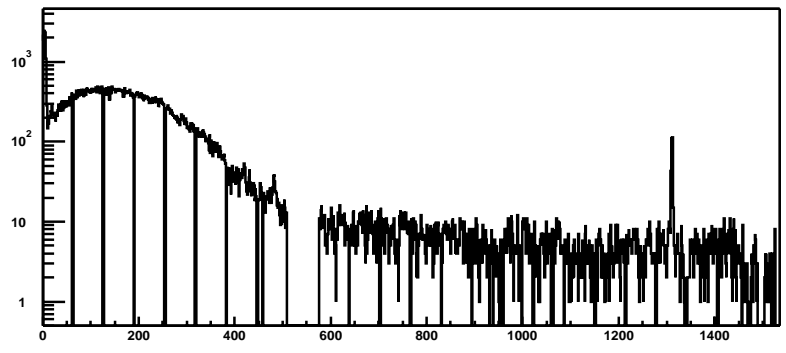
There is reasonable agreement between MC and DATA since we assume **about 20% uncertainty in the MC rates** due to the knowledge of the flux.

Y layers

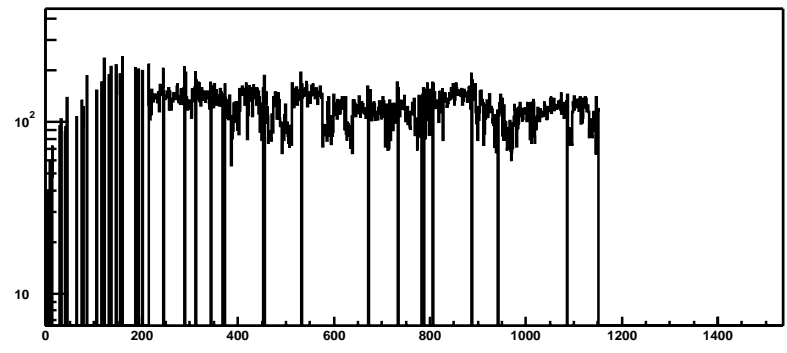
Strip Map

X layers

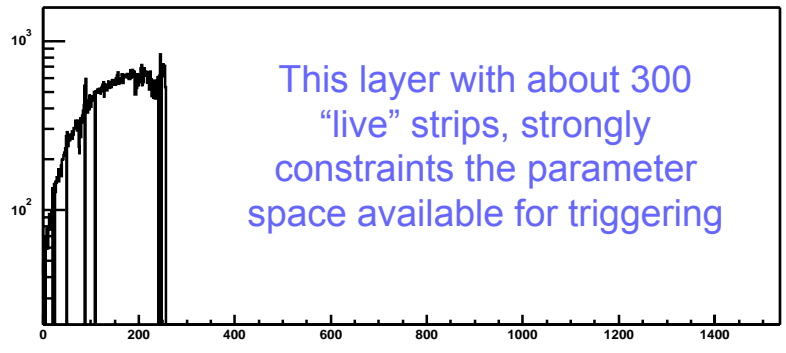
biLayer 3 view 1 plane 7



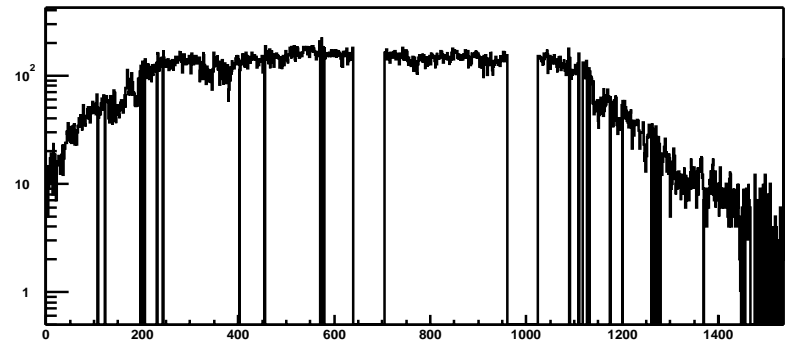
biLayer 3 view 0 plane 6



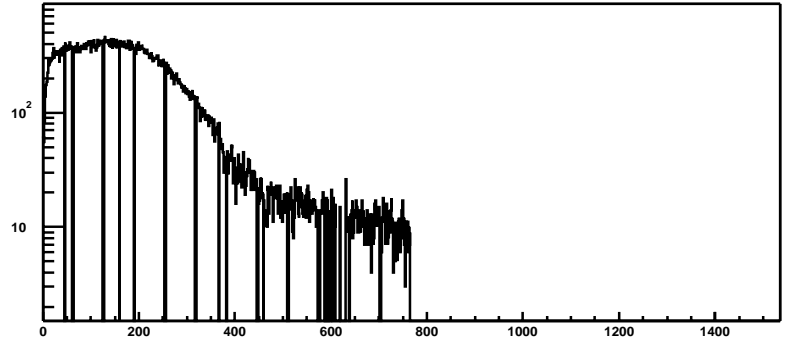
biLayer 2 view 1 plane 4



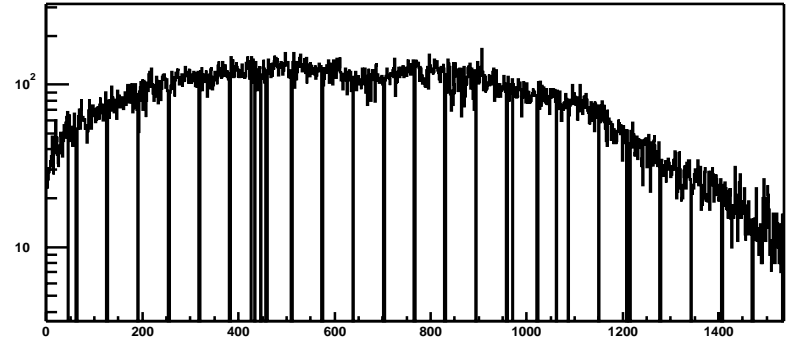
biLayer 2 view 0 plane 5



biLayer 1 view 1 plane 3



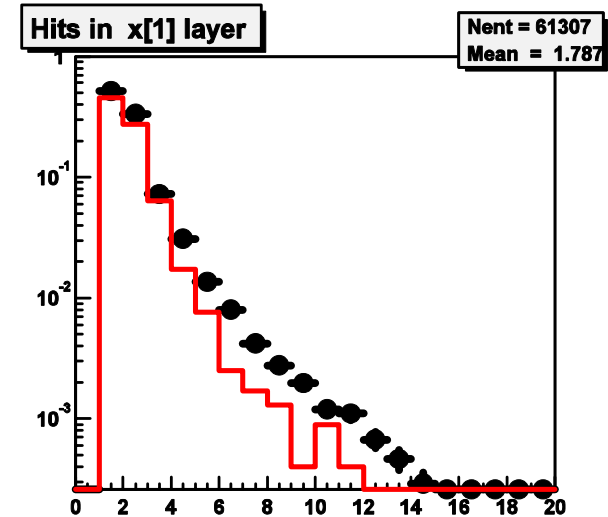
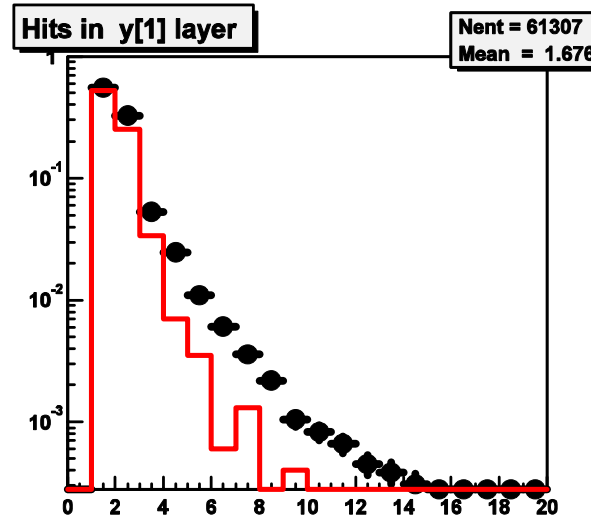
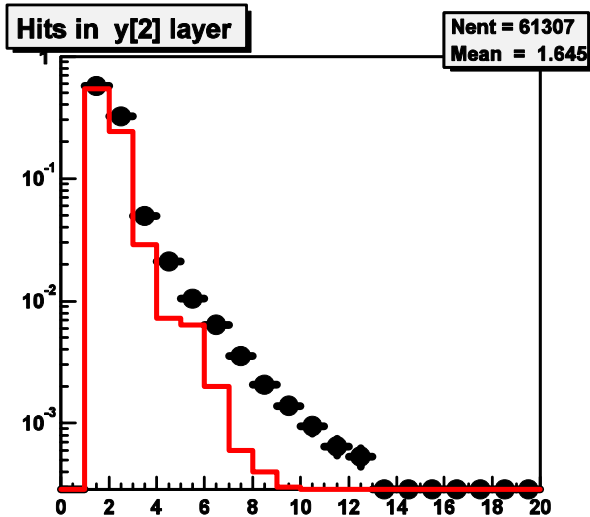
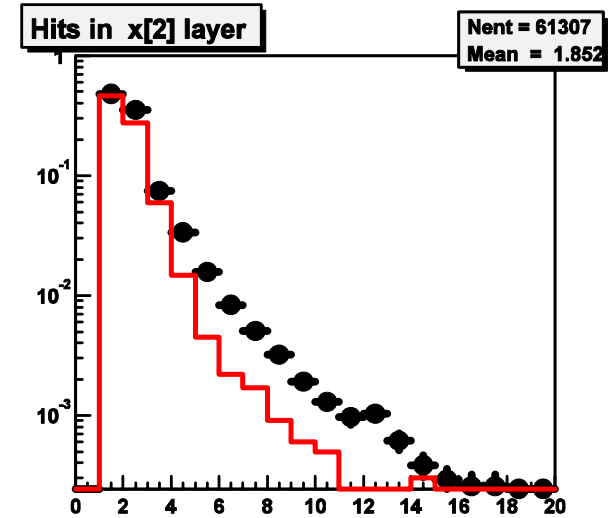
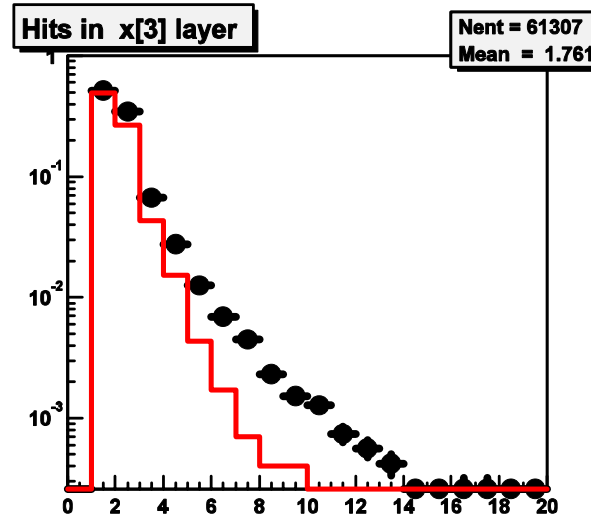
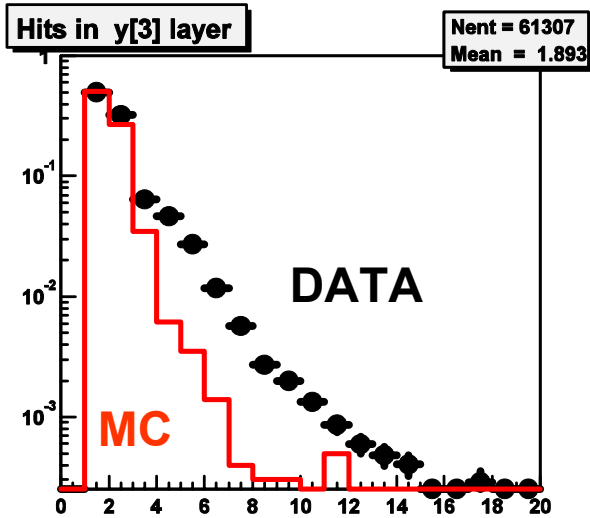
biLayer 1 view 0 plane 2



Muons with vertical tracker – TKR trigger only

Hit Multiplicity

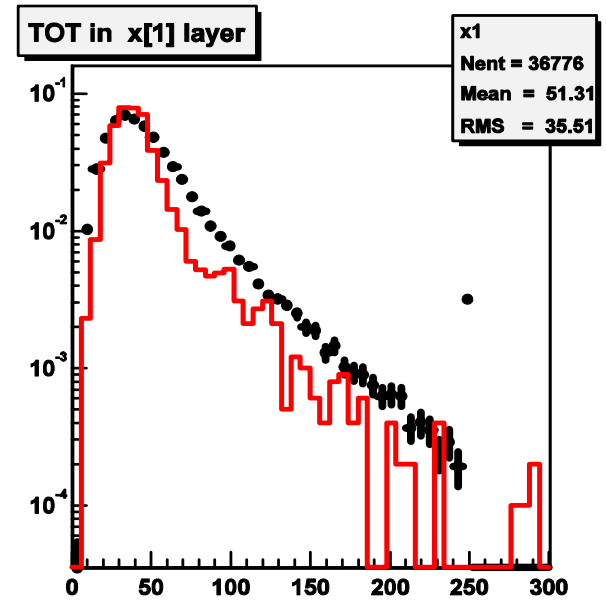
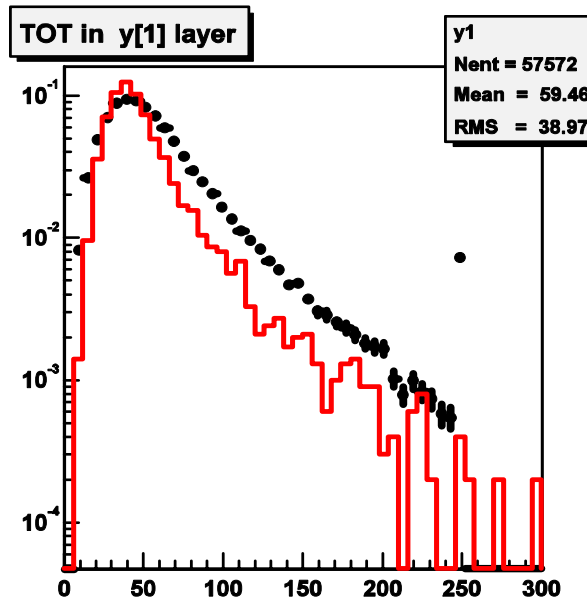
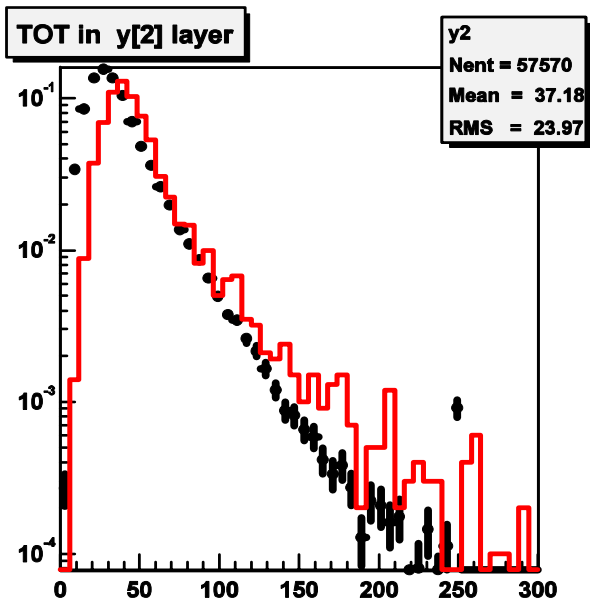
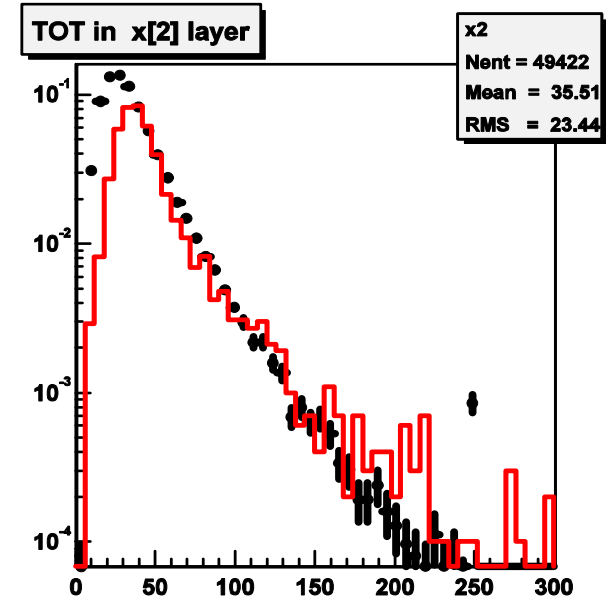
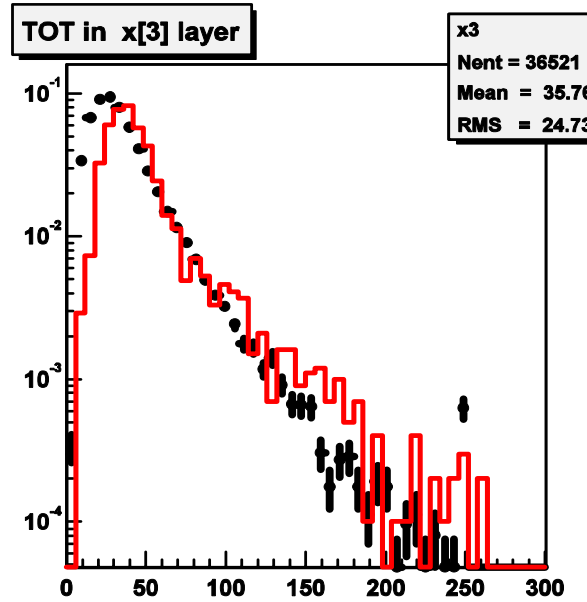
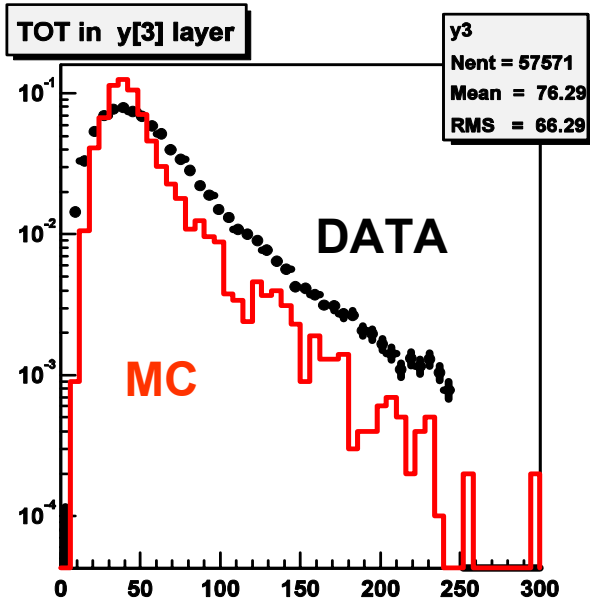
Normalized rates in Hz



Muons with vertical tracker – TKR trigger only

TOT in each layer

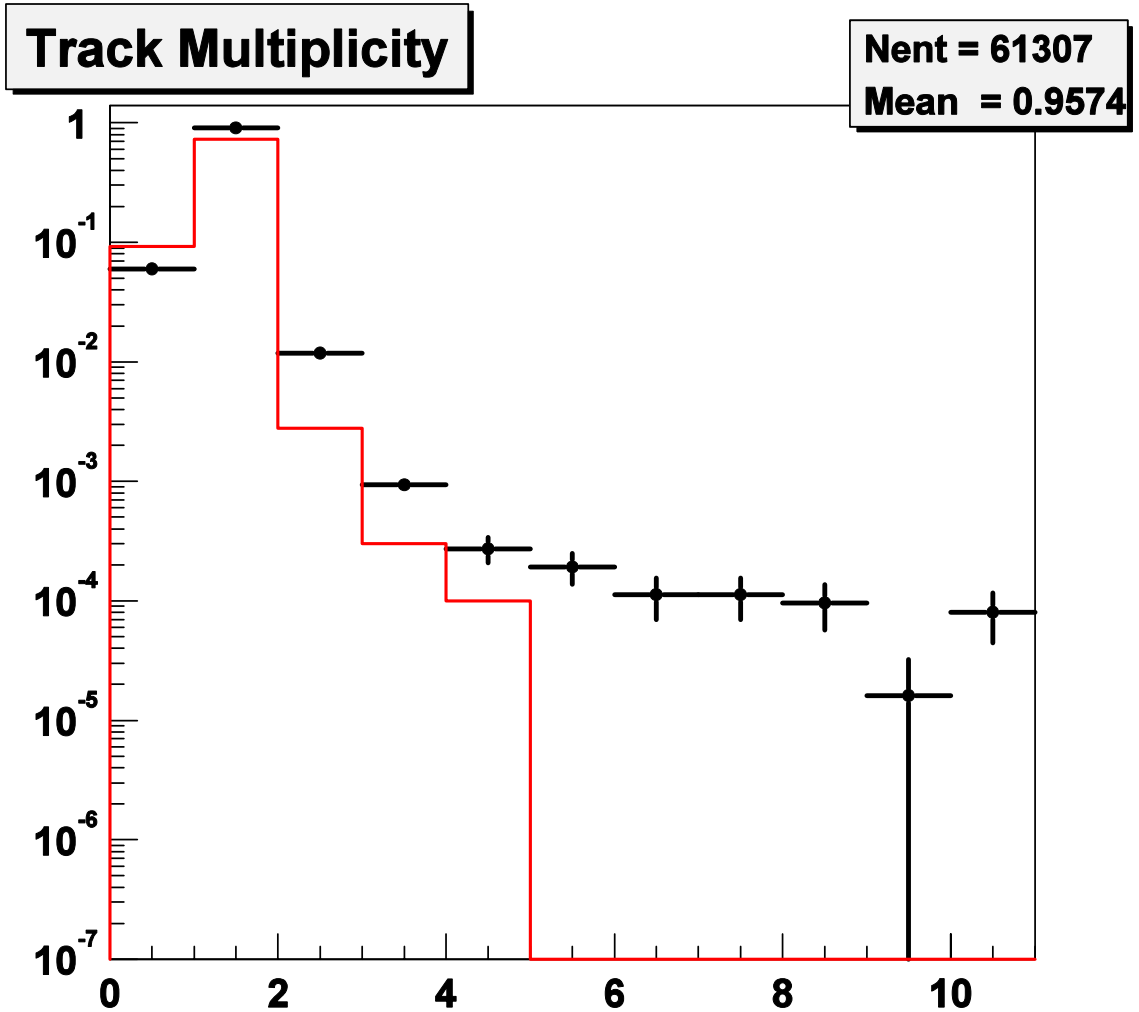
Normalized rates in Hz



Muons with vertical tracker – TKR trigger only

Track multiplicity

Normalized rates in Hz



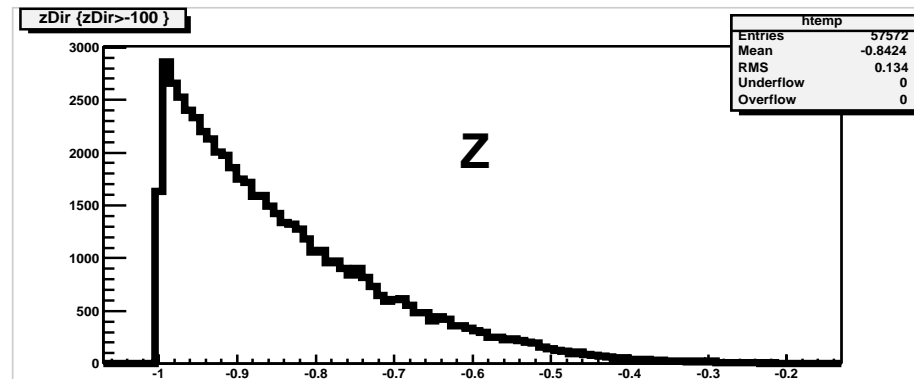
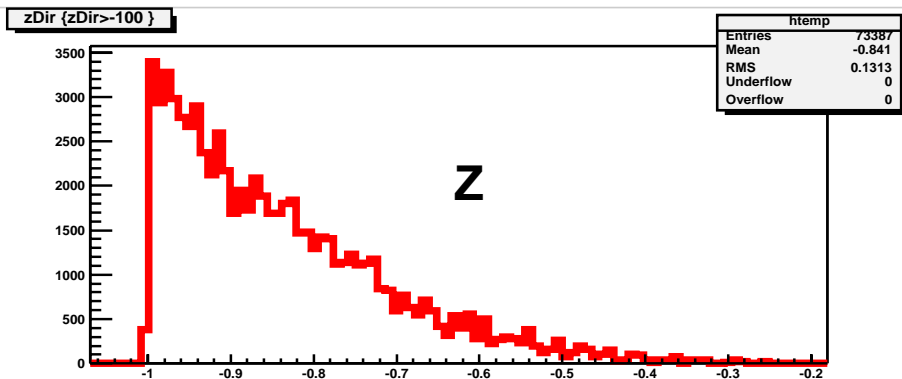
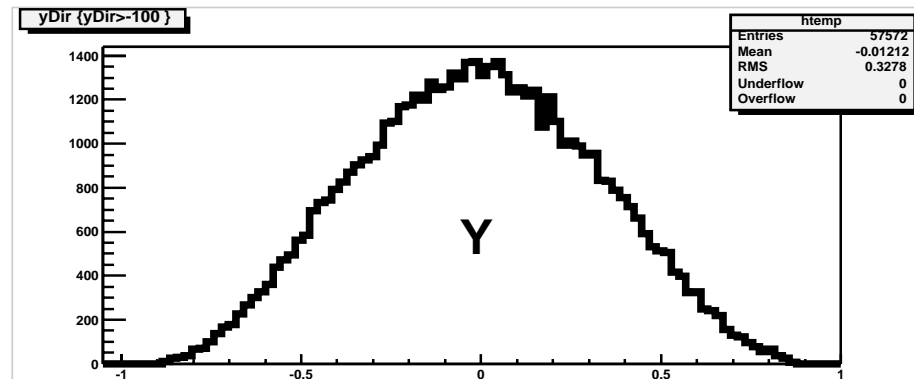
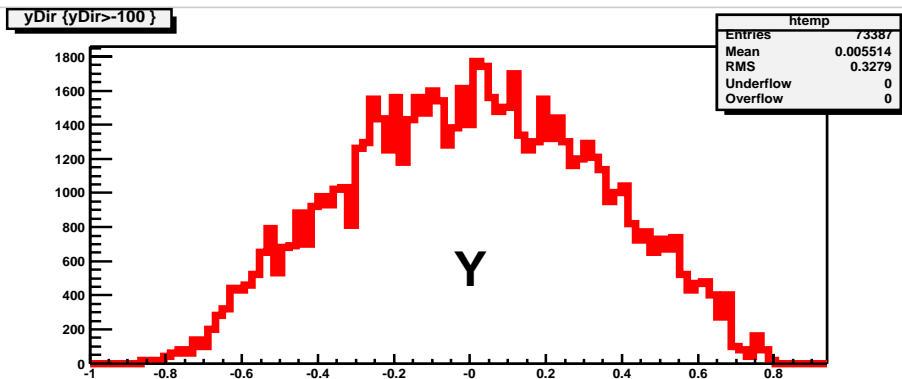
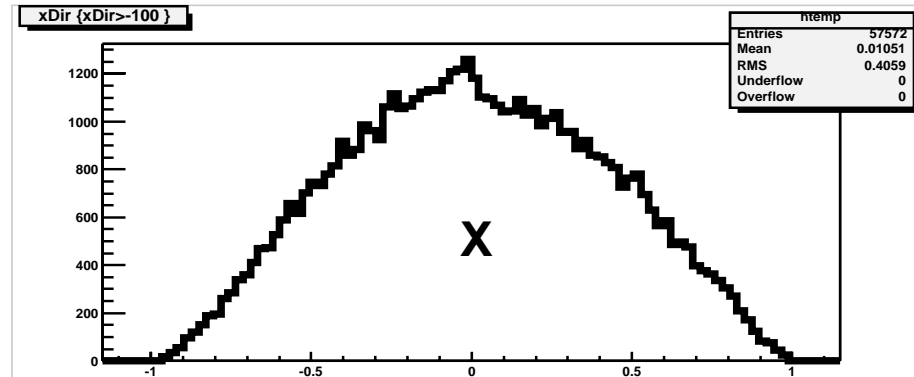
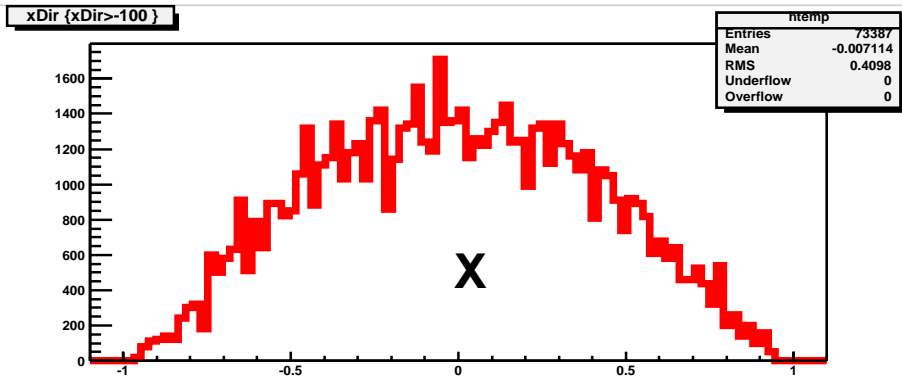
Dead Channel list
from DATA is used
as input for MC

Muons with vertical tracker

MC

Reconstructed direction

DATA



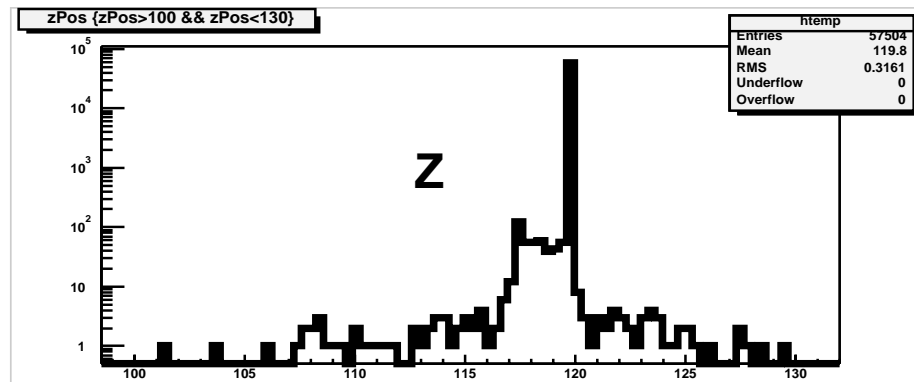
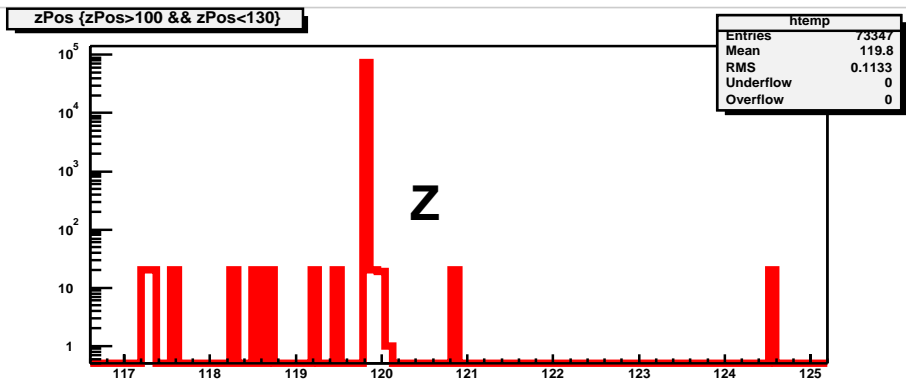
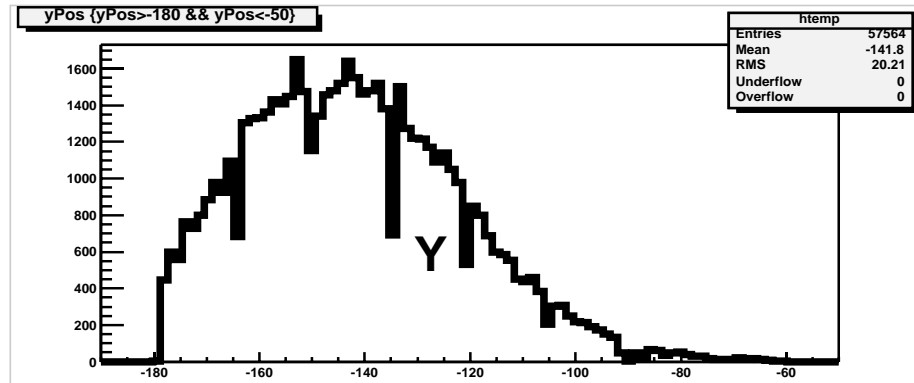
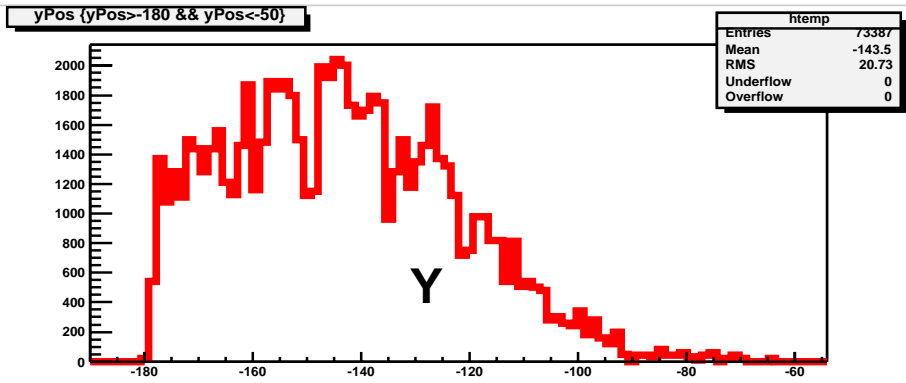
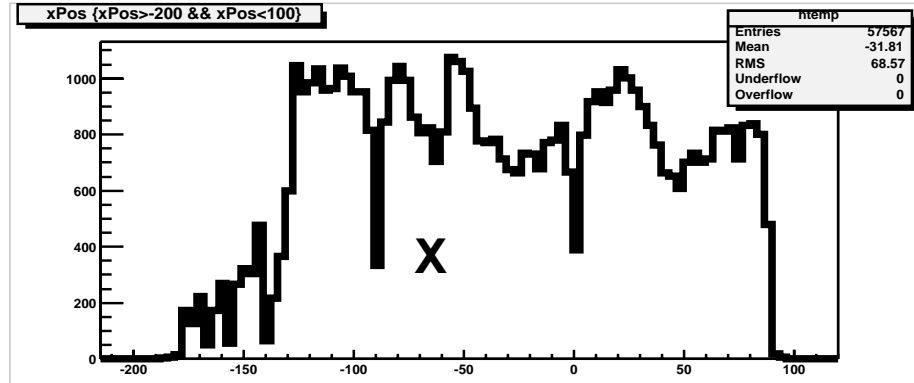
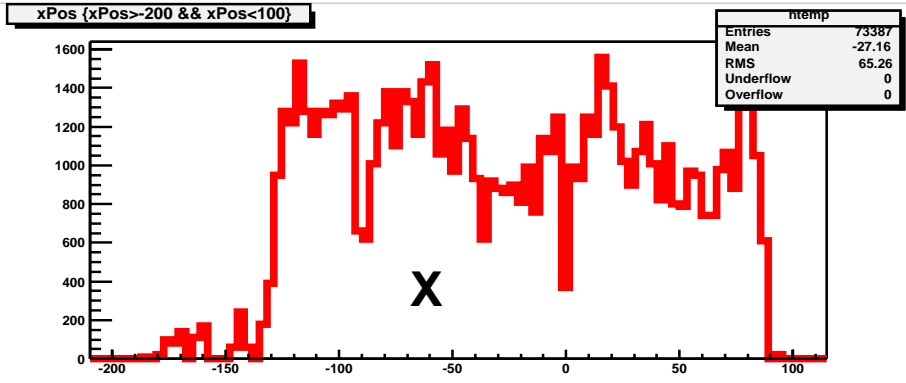
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Muons with vertical tracker

MC

Reconstructed direction

DATA



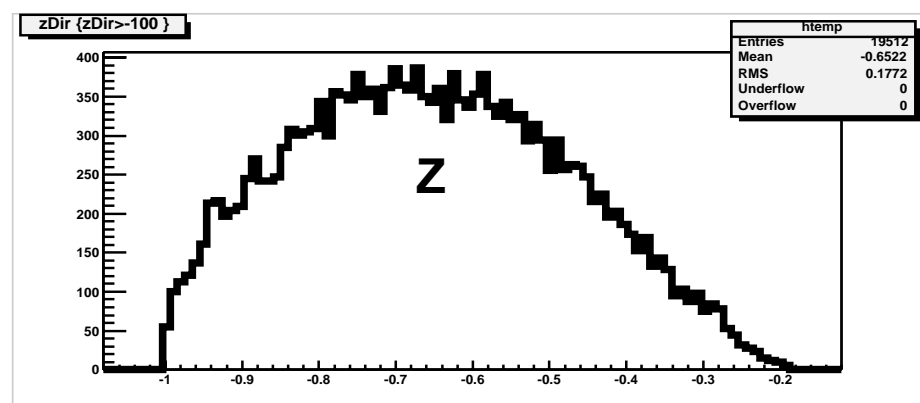
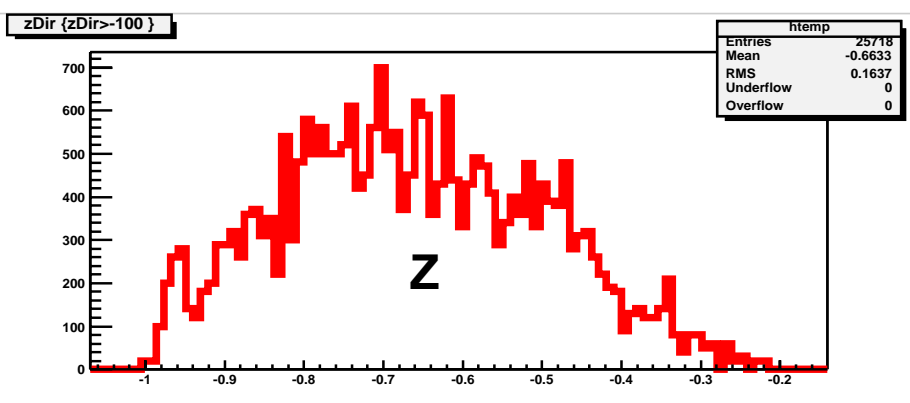
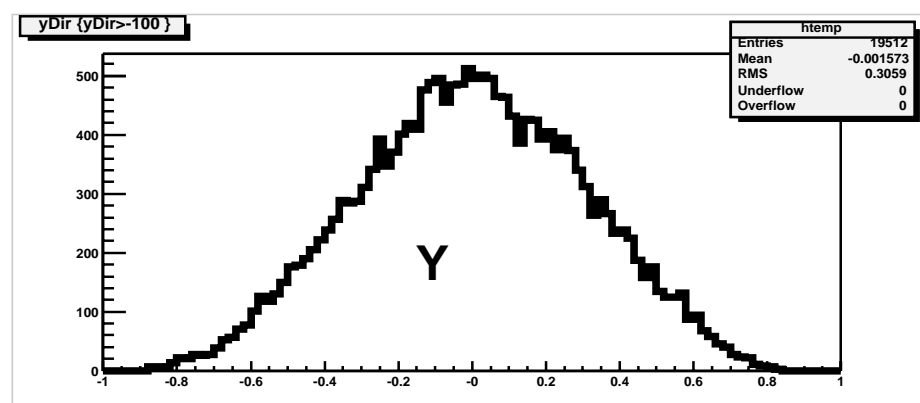
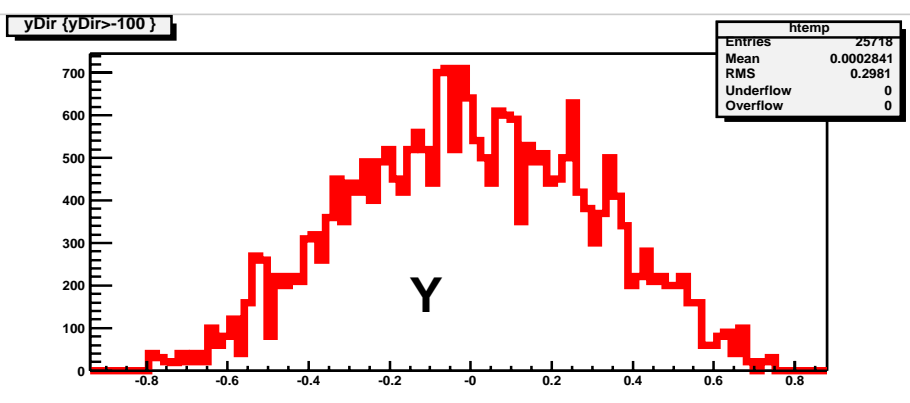
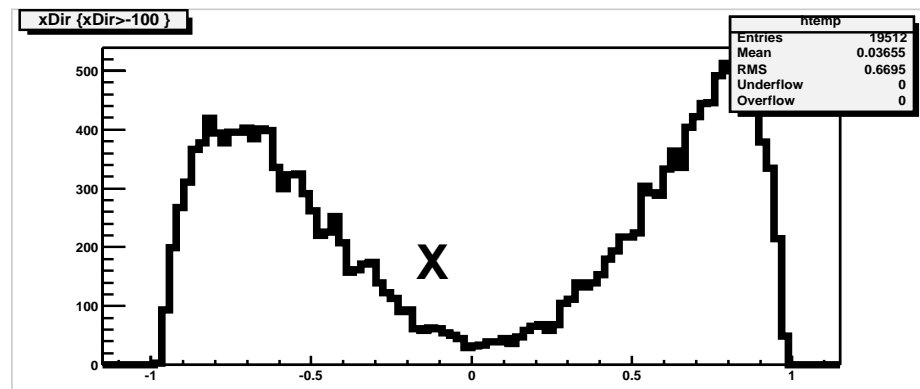
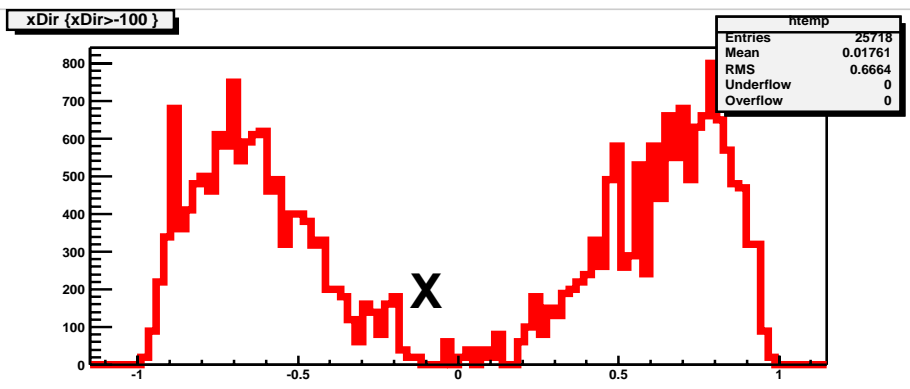
Dead Channel list
from DATA is used
as input for MC

Muons with horizontal tracker

MC

Reconstructed direction

DATA



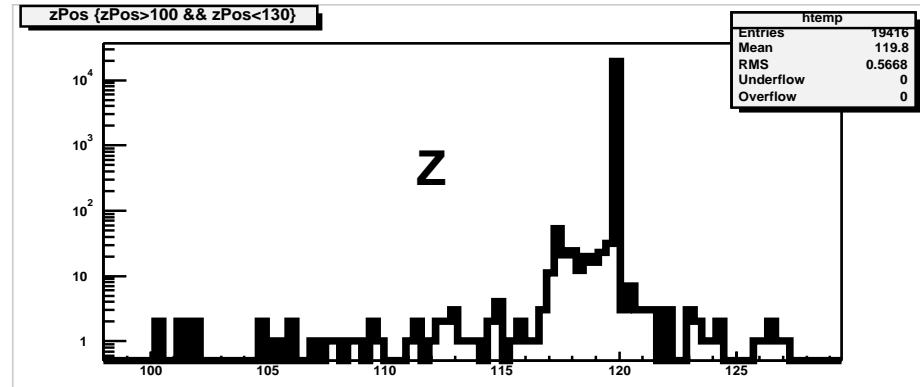
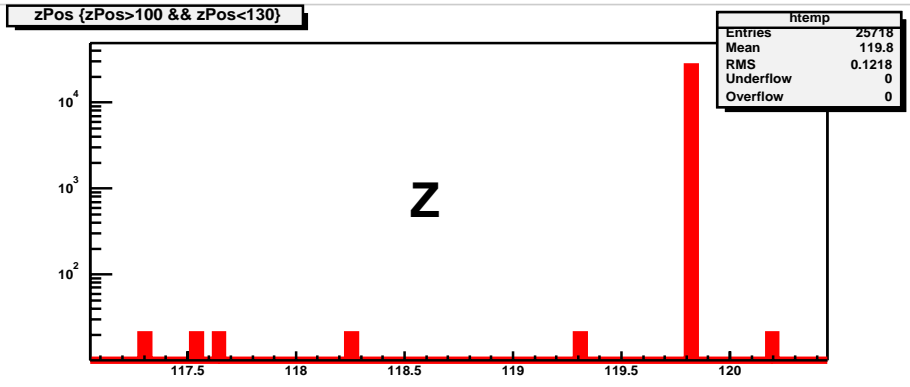
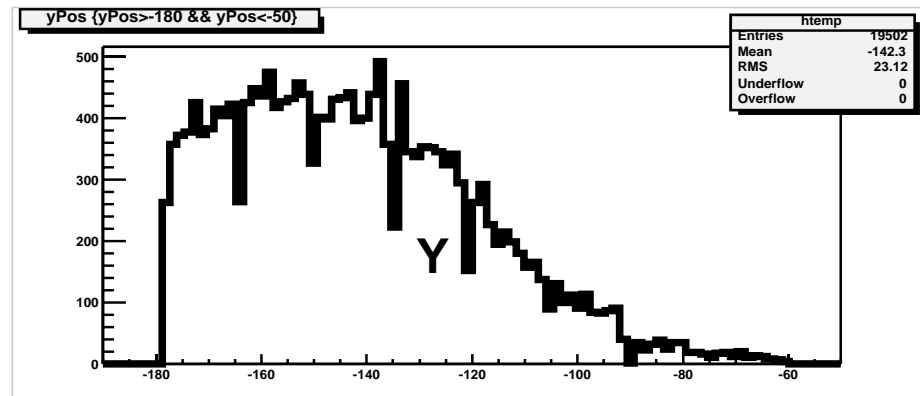
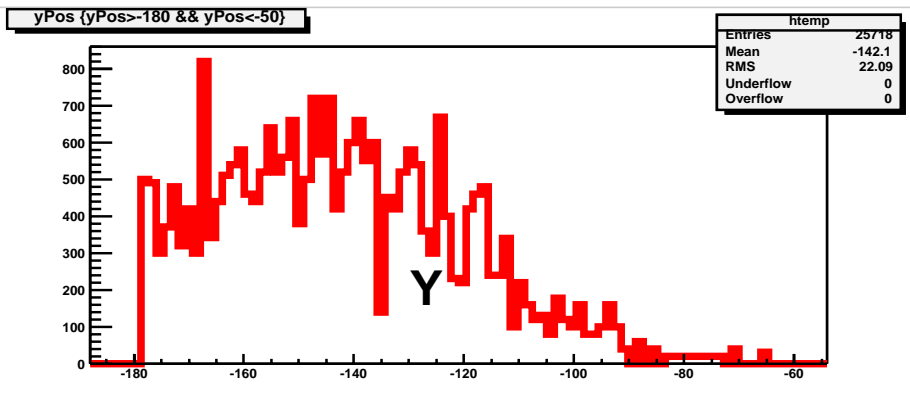
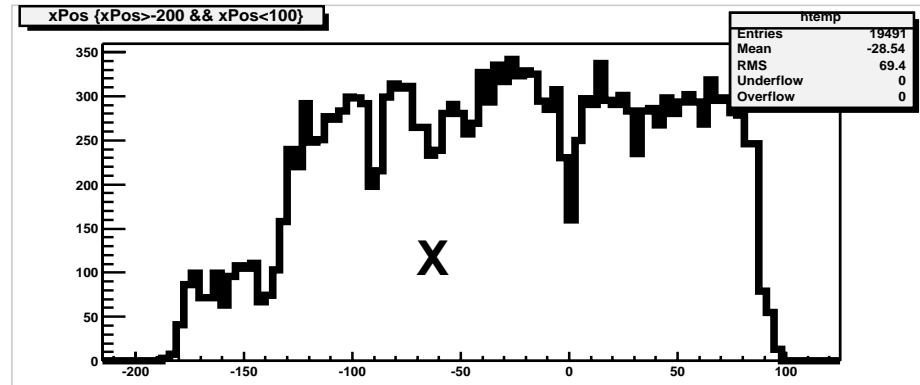
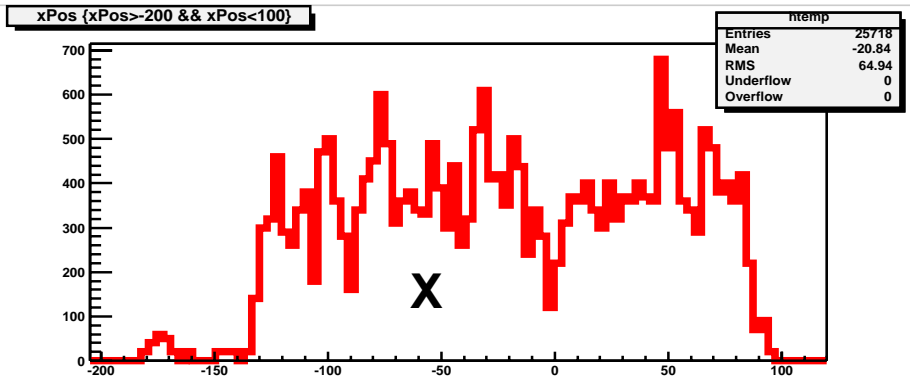
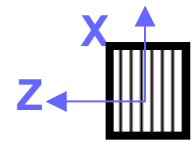
Dead Channel list
from DATA is used
as input for MC

Muons with horizontal tracker

MC

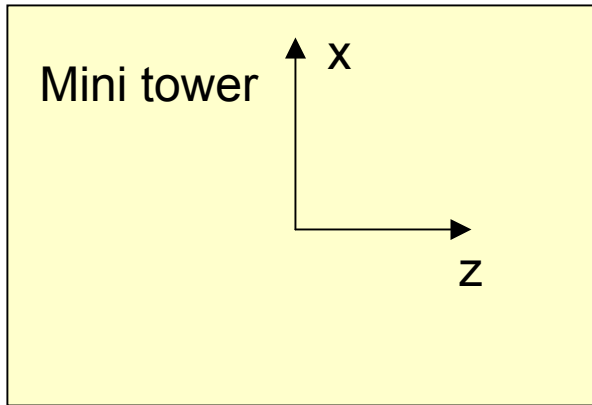
Reconstructed Position

DATA

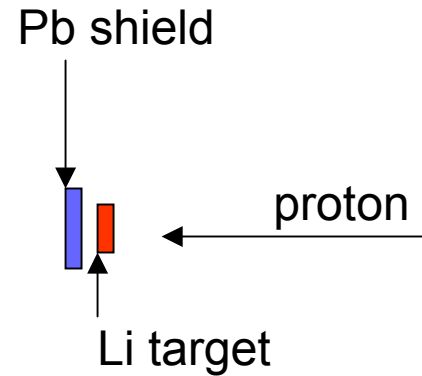


VDG DATA Taking Mode

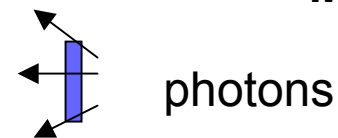
$P + Li \rightarrow Be \rightarrow Be + \text{gamma}$ (66% 17.6 MeV, 33% 14.6 MeV)



Experiment



MC Simulation

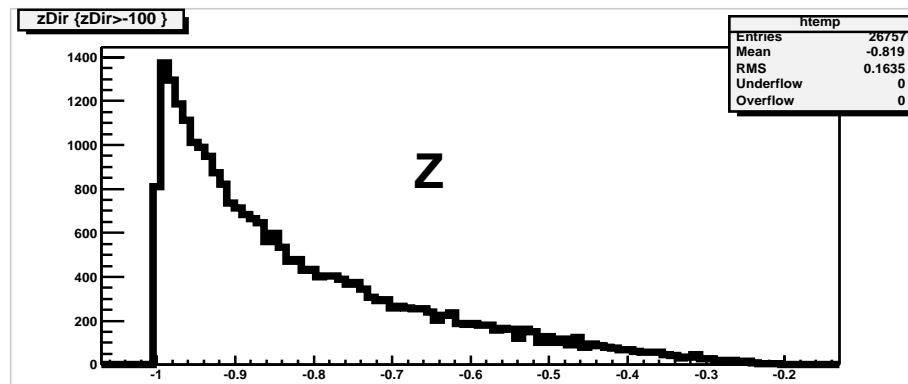
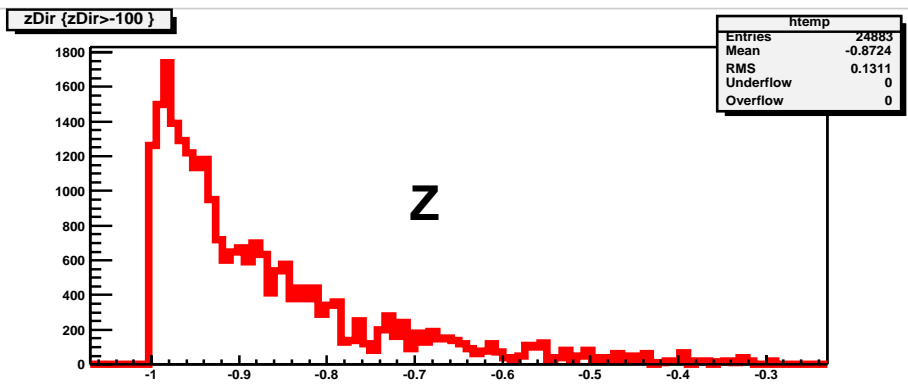
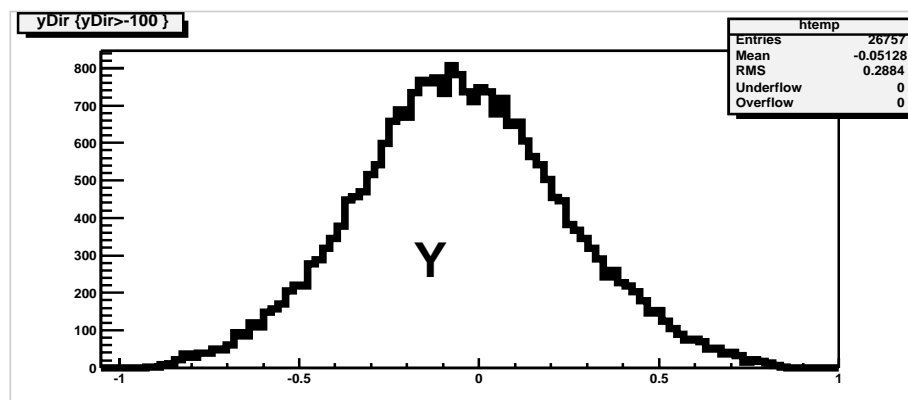
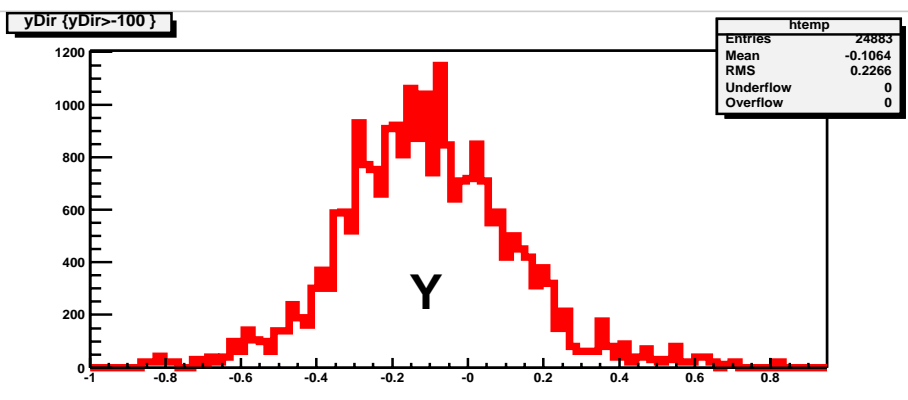
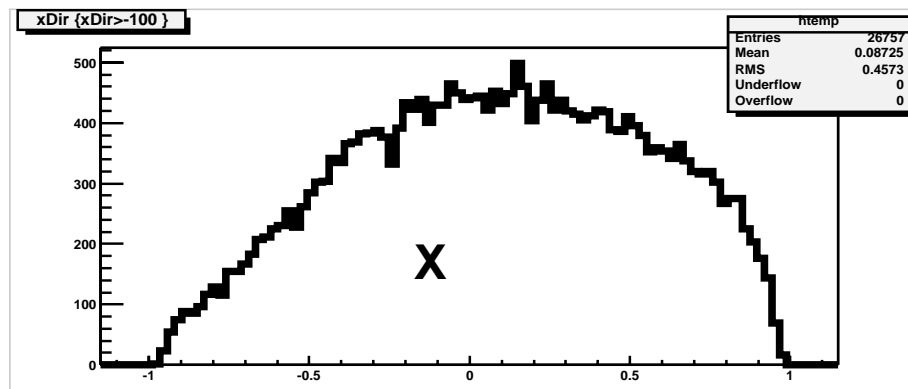
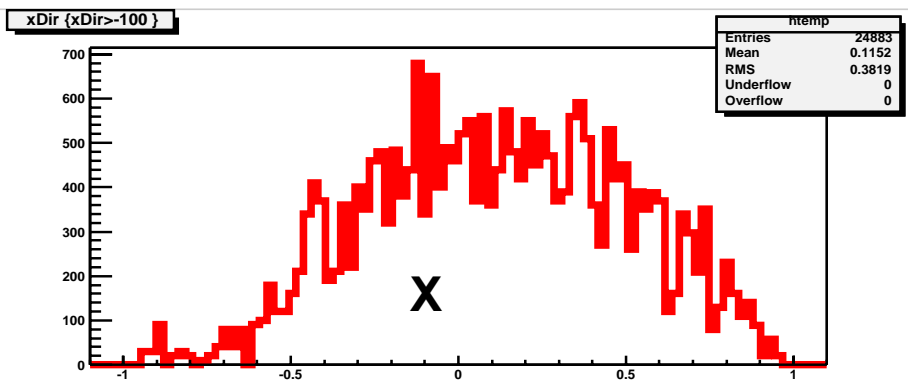


Only the Pb shield is implemented in the simulation

Photons + Muons with horizontal tracker

MC (photons only)

Reconstructed Direction DATA (photons + muons)

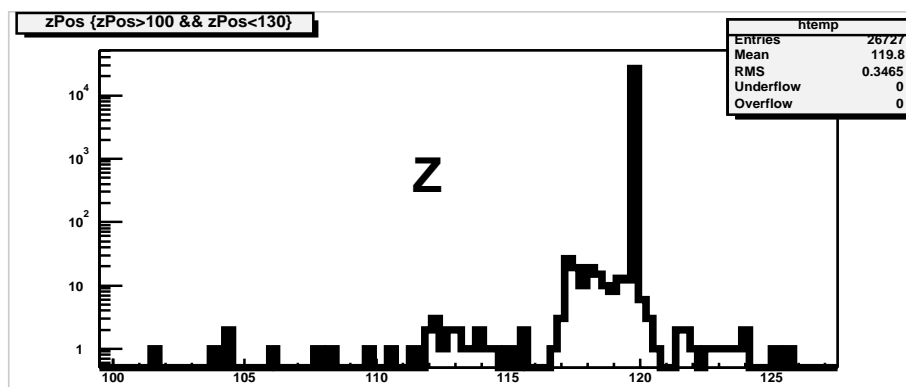
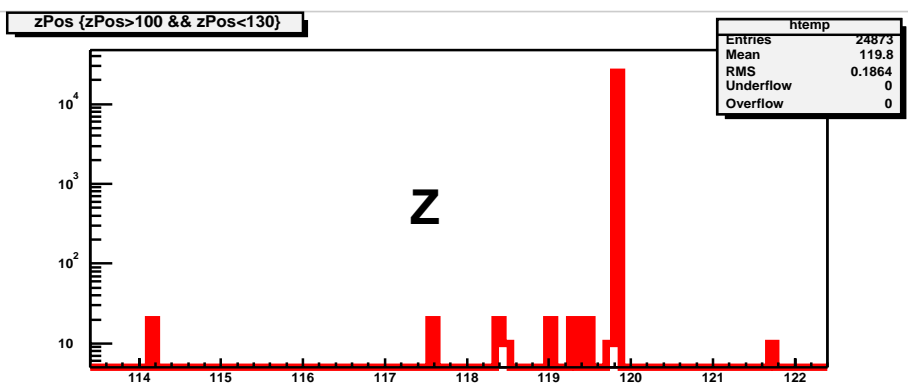
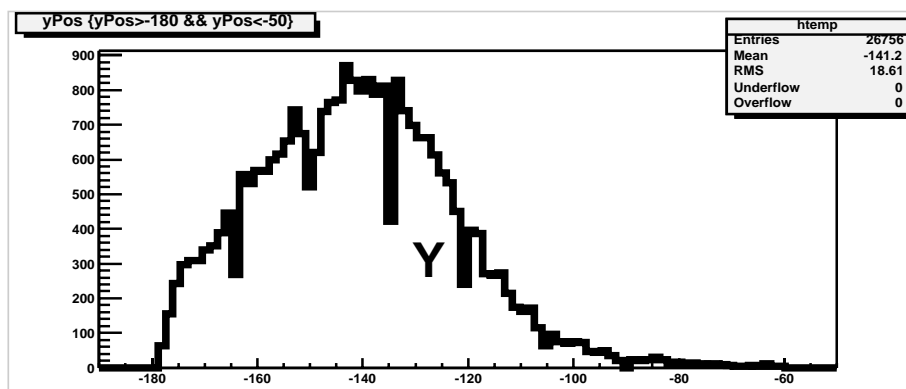
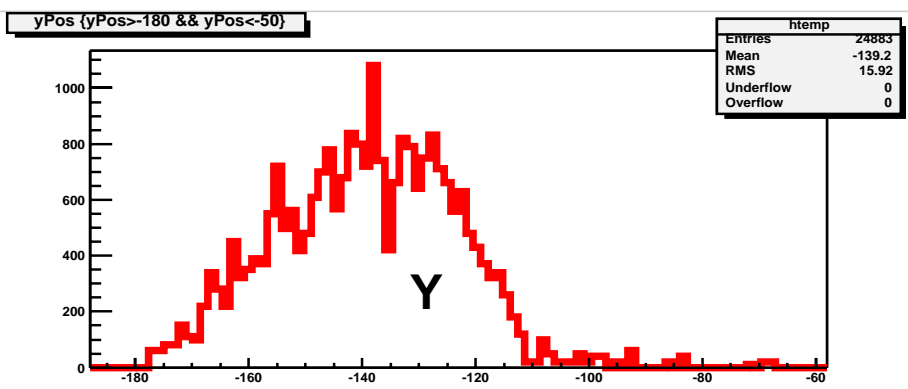
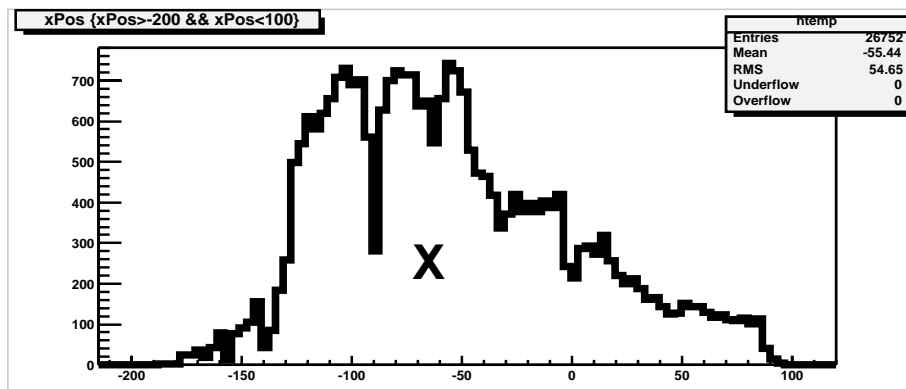
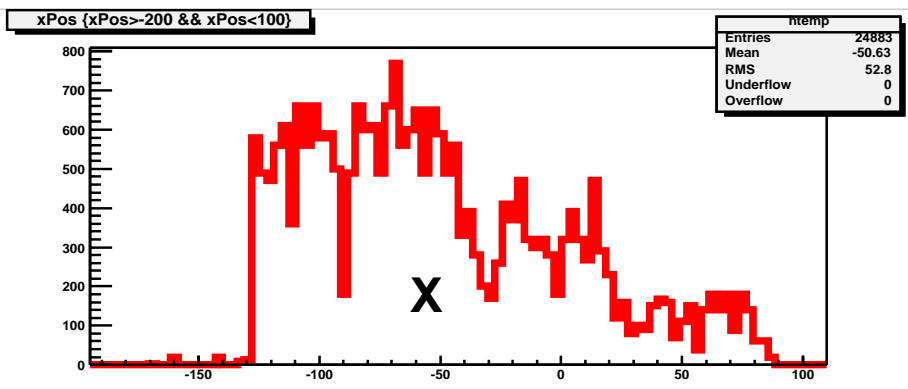


Photons + Muons with horizontal tracker

MC (photons only)

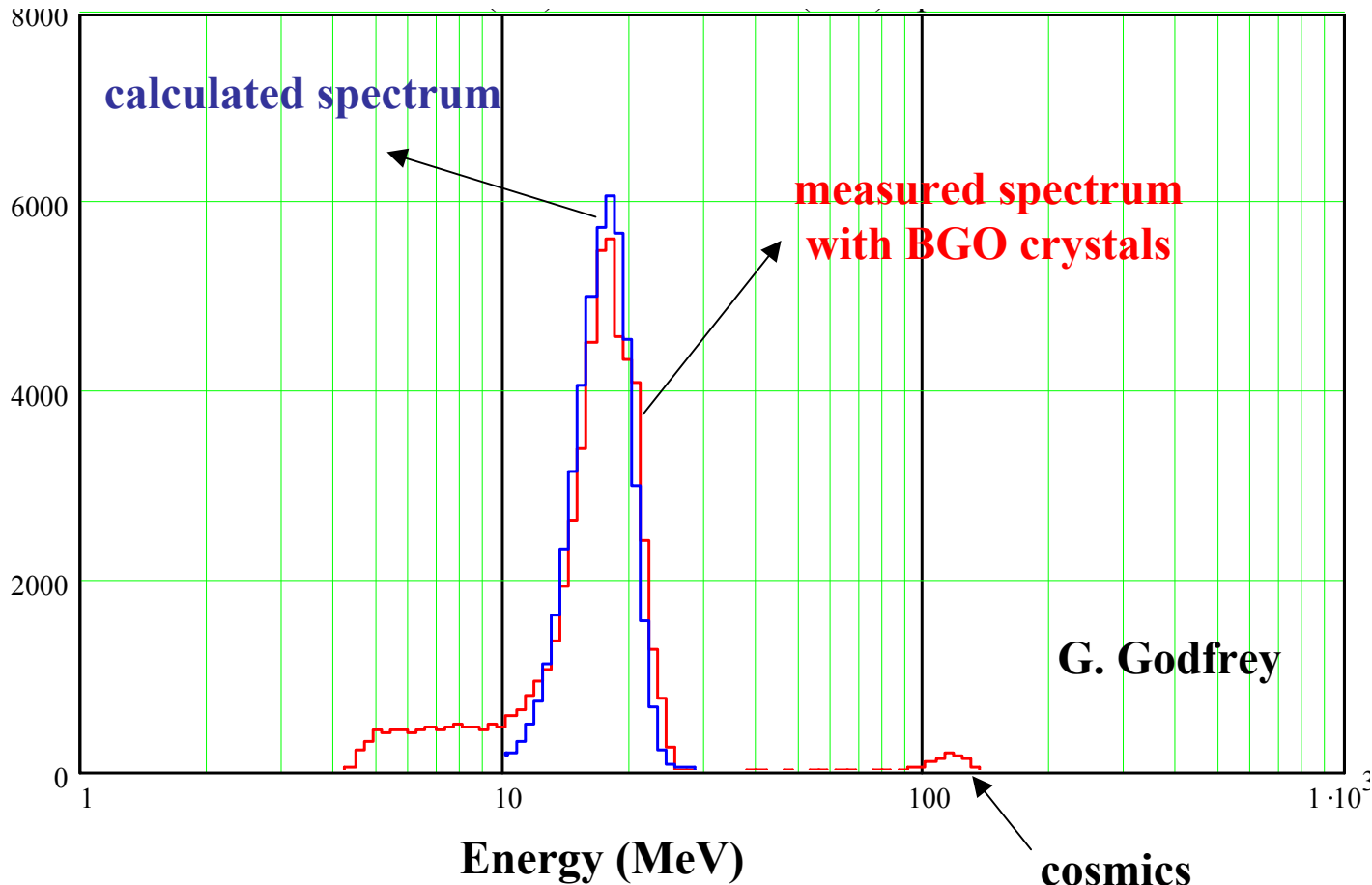
Reconstructed Position

DATA (photons + muons)



VDG Calibration

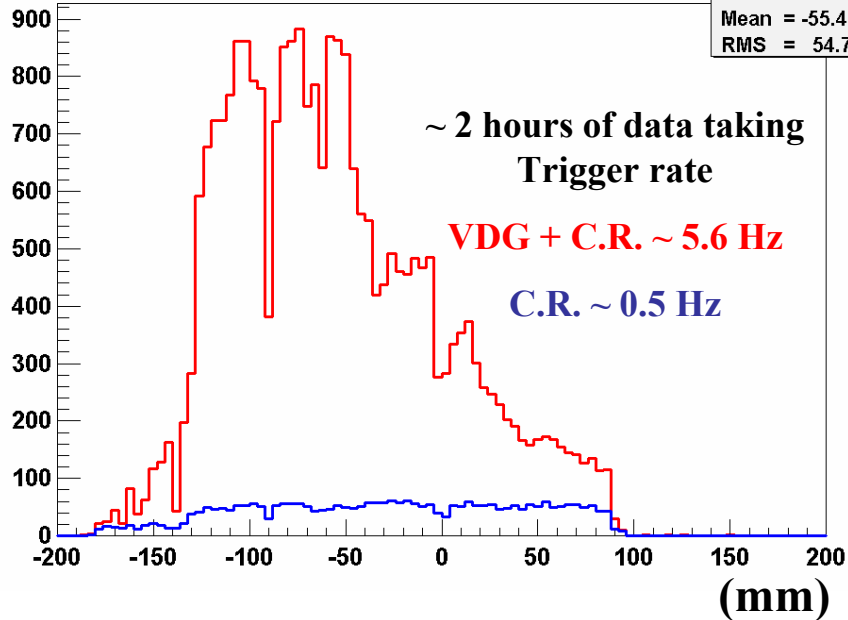
Minitower	: ebf0306040204959	46002 events	8158 s	Rate 5.6 Hz
BGO crystals	: VG13.dat	46907 events	6160 s	Rate 7.6 Hz



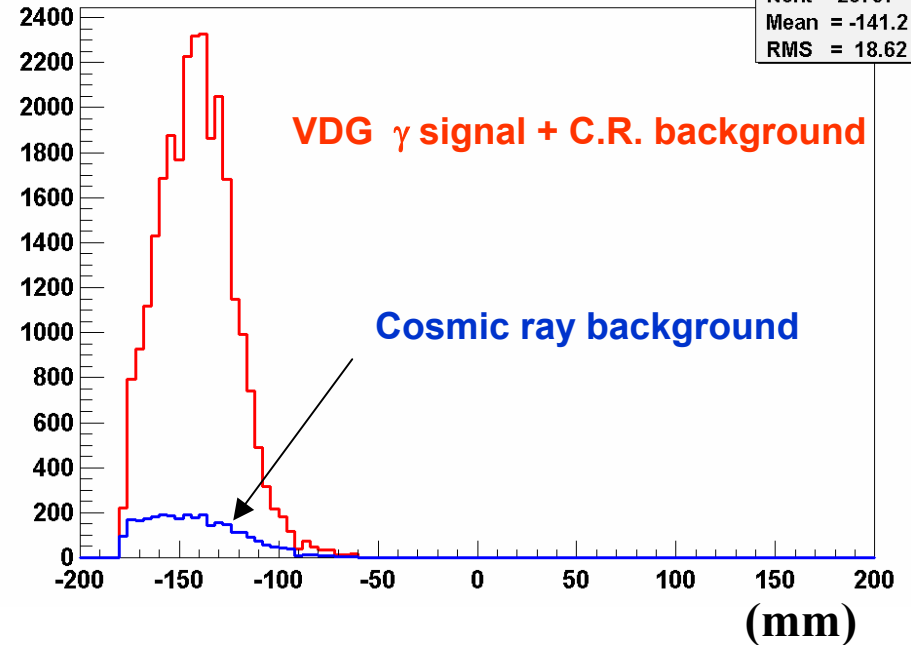
Used the BGO and estimate the photon rate in the minitower to be $5.7 \text{ Hz} \pm 30\%$ (preliminary)

Signal + Background (1)

Reconstructed X position



Reconstructed Y position



We understand the coordinate system of our set-up since both X and Y reconstructed positions are negative

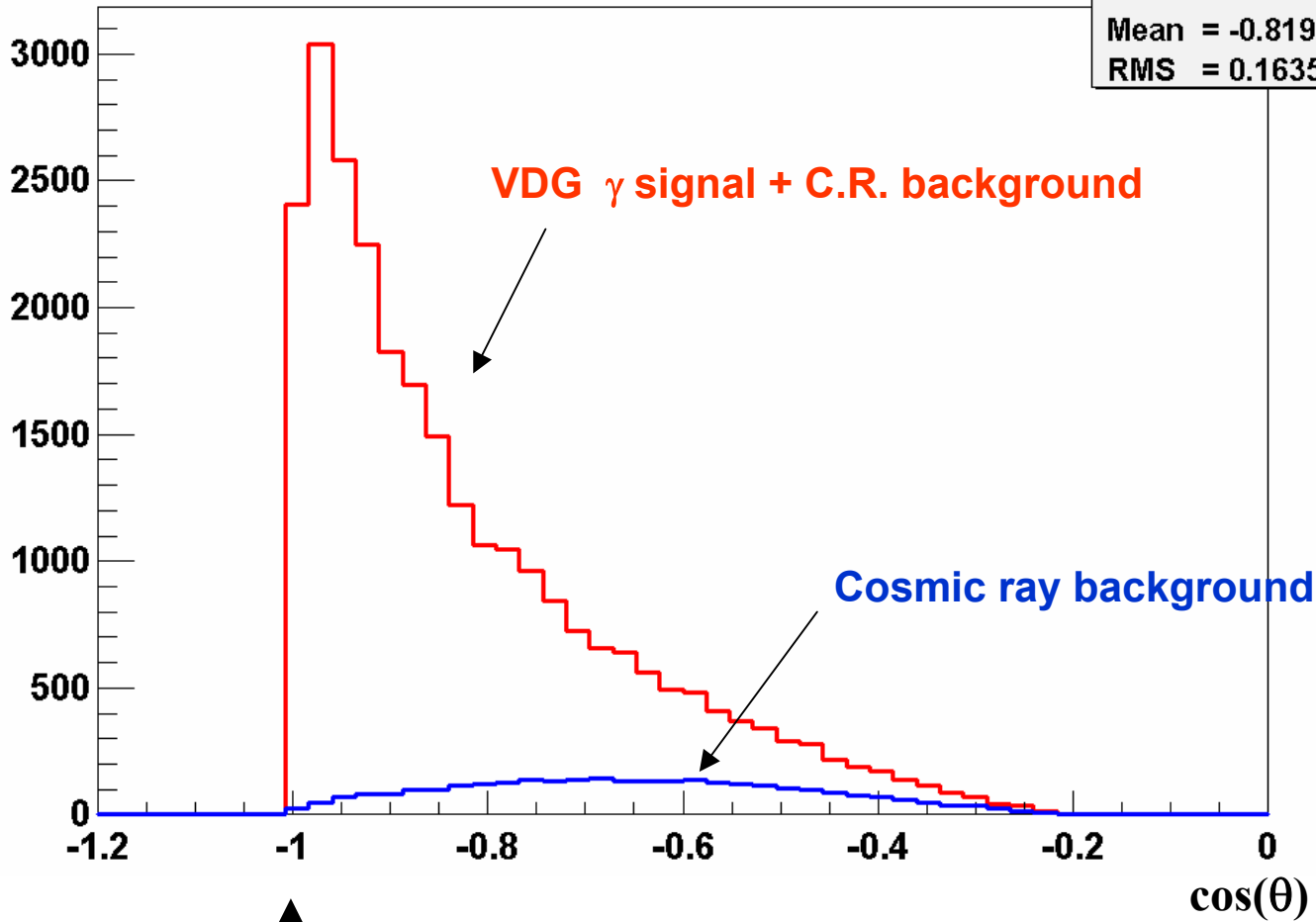
58% of triggered signal + background events were reconstructed
81% of triggered cosmic ray background events were reconstructed

The VDG provides valuable DATA to study reconstruction efficiencies of photons

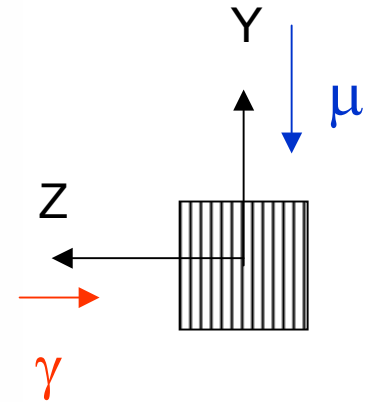
Signal + Background (2)

Reconstructed z direction

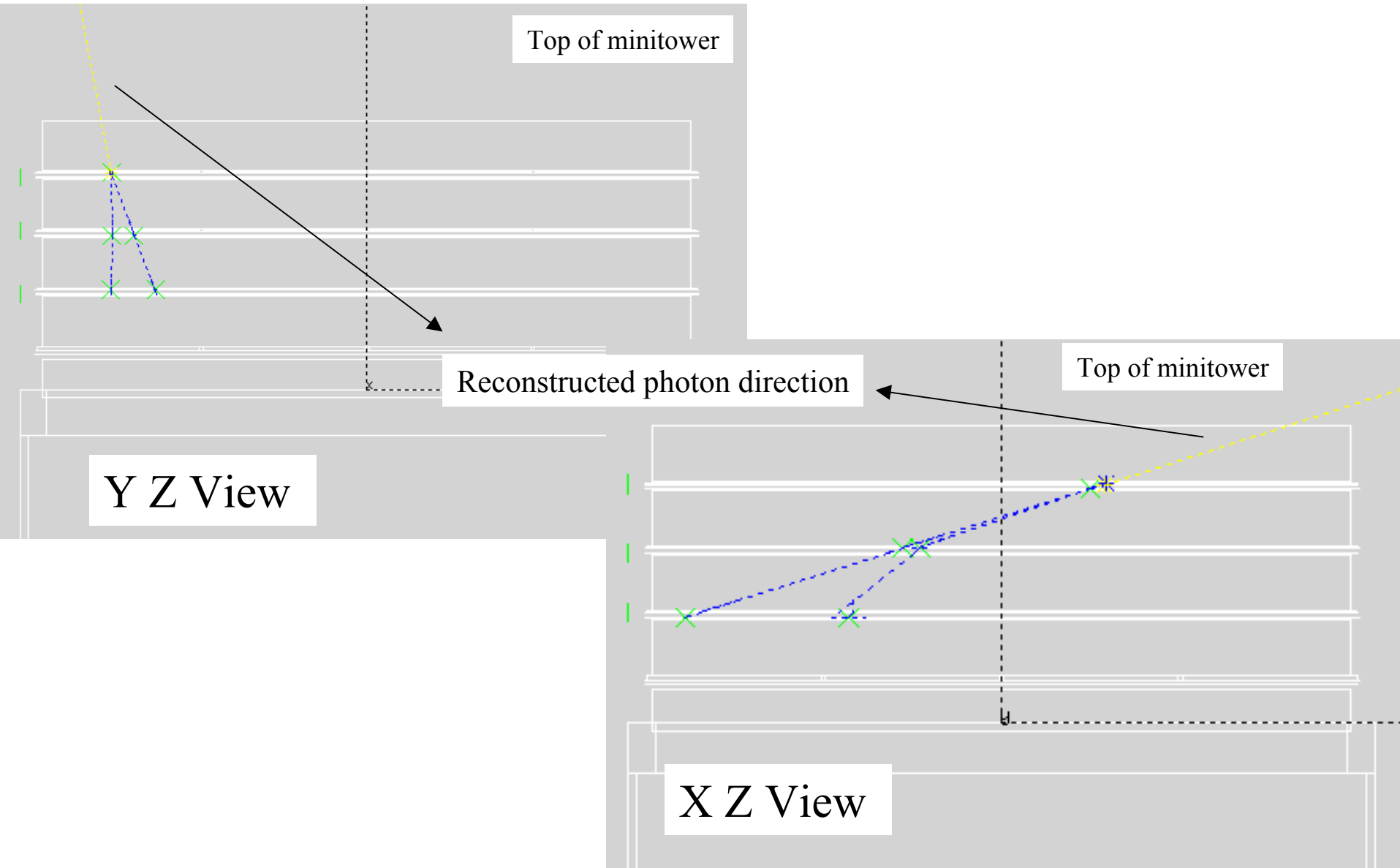
0
Nent = 26757
Mean = -0.819
RMS = 0.1635



↑ Photons impinging on top face of minitower



Photon candidate



Plans

- Continue to look at these data until the next hardware (TKR+CAL) is delivered (mid to end of August)
 - Analyzing the TKR data at different detector thresholds
 - Studying possible time effects
- The focus now is to develop all the online and offline infrastructure necessary for the next mini tower tests