

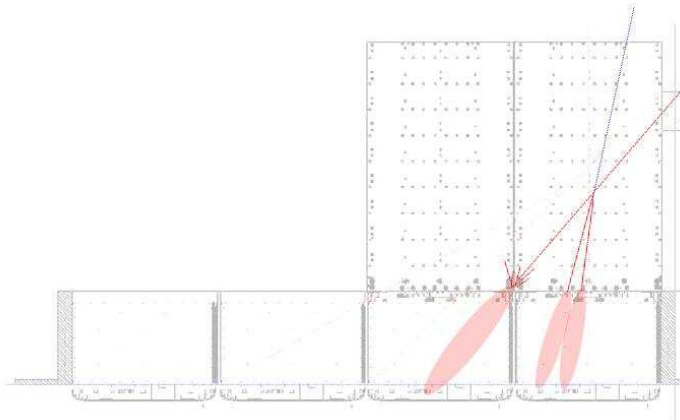
GLAST CERN 2006 Beamtest



Tkr Hits for MIPs

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Runs

- Cosmic rays : 3300000645 (Pisa)
- 5GeV Muon Beam Self-Trigger : 700000752 (PS)
- Many MC with different parameters

CUTS

- × 1Hit per plane for Tkr Top & Bottom Layers
- × TkrNumTracks==1 & TkrTotalHits[3]>=36 hits
- × $\Delta_{time} \geq 1ms$
- × Abs(dataVtxZDir)>0.999 for run 752)
- × Abs(dataVtxZDir)>0.95 for run 645)
- × CalNumHit[tower]==8 for run 645

Summary Tables

Absolute differences		TkrTotalHits		TkrTotalCluster		Tkr1TopToT		Cluster Size	
RED	BLACK	Mean	RMS	Mean	RMS	Mean	RMS	Mean	RMS
Cosmic Mu 645	MC cosmic mu	-1.7	-0.5	0	-1	-3.5	0	-0.07	-0.1
MC Mu 0deg	MC Mu 5deg.	0.	0.3	-1.	0.	0.	0.	0.	0.04
MC mu 752	MC - TOT low threshold	0.	0.4	-0.6	0.	0.	1.5	n/a	n/a
MC data 752	MC High Noise	-1.5	-0.1	3.8	0.9	-8.7	-3.	n/a	n/a
Mu data 752	MC mu 752	-6.	-0.7	-0.6	-0.2	-8.	-2.5	-0.15	-0.2
Mu data 752	Cosmic mu 645	-1.3	0.4	-1.1	0.2	0.3	1.8	-0.01	0.01
MC mu 752	MC BariAlg	0.	0.	-0.6	0.1	0.	0.	0.01	0.02
MC mu 752	MC mu no-bt06	1.	0.	1.3	0.5	0.	-0.7	0	-0.02
Proton 1423	MC-184	-6.5	-1.7	-1.3	-0.6	-9.	-9	-0.14	-0.21

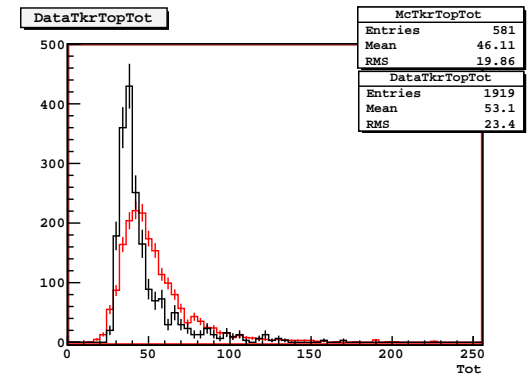
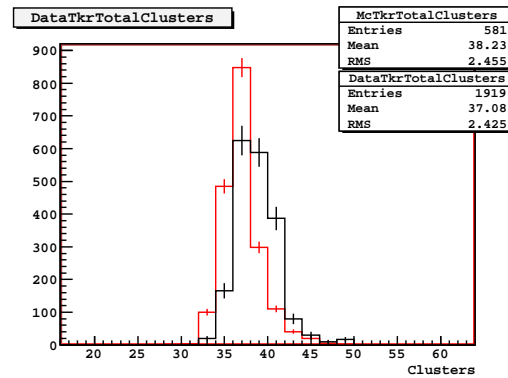
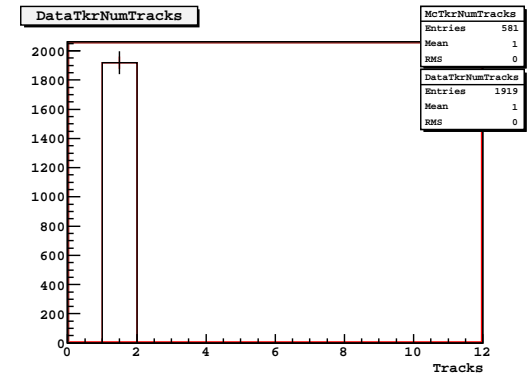
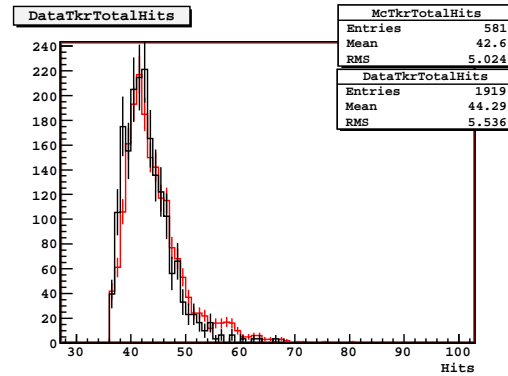
Relative differences		TkrTotalHits		TkrTotalCluster		Tkr1TopToT		Cluster Size		Comments
RED	BLACK	Mean	RMS	Mean	RMS	Mean	RMS	Mean	RMS	
Cosmic Mu 645	MC cosmic mu	-4%	-10%	3%	0%	-13%	15%	-6%	-24%	good but not perfect
MC Mu 0deg	MC Mu 5deg.	0%	7%	-3%	0%	0%	0%	0%	4%	would expect bigger diff.
MC mu 752	MC - TOT low threshold	0%	0.4%	-0.6%	0%	0%	1.5%	n/a	n/a	no impact
MC data 752	MC High Noise	-3%	-2%	10%	45 %	-16%	-14%	n/a	n/a	+hits but ++clusters
Mu data 752	MC mu 752	-15%	-13%	-1.5%	-10%	-15%	-12%	-13%	-48%	big differences
Mu data 752	Cosmic mu 645	-3%	8%	-3%	9 %	0.5%	8.3%	-1%	2%	muons are muons
MC mu 752	MC BariAlg	0%	0%	-1.5%	5%	0%	0%.	1%	10%	!!!shift on maximum
MC mu 752	MC mu no-bt06	2%	0%	3%	27 %	0%	-4%	0%	-9%	!!!shift on maximum
Proton 1423	MC-184	-14%	-29%	-3%	-26%	-17 %	-32%	-12%	-50%	bigger diff. than for mu

Conclusions

- $\Delta_{Hit}(cosmics) < \Delta_{Hit}(PSmu) < \Delta_{Hit}(protons)$
- additional hits are close to the track (see Cluster Dist. to Track for protons)
- pb also seen for EM showers from γ and high energy electrons
- one guess : problem in the MC for low energy electrons physics ?
 - more very low energy electrons can create bigger clusters
 - if they have more energy they create new clusters
 - effect is bigger for protons b/c they create more Δ_{rays} with high energy
 - do not know what to say about *raw ToT*

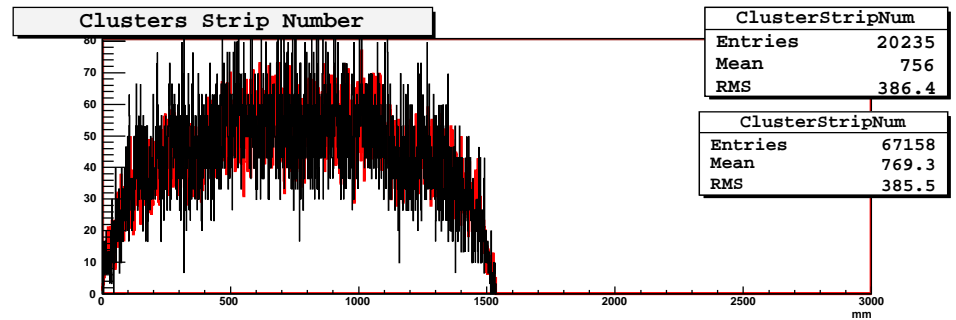
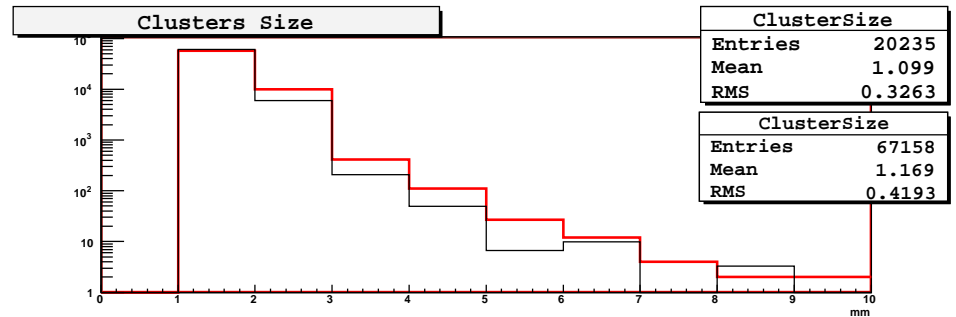
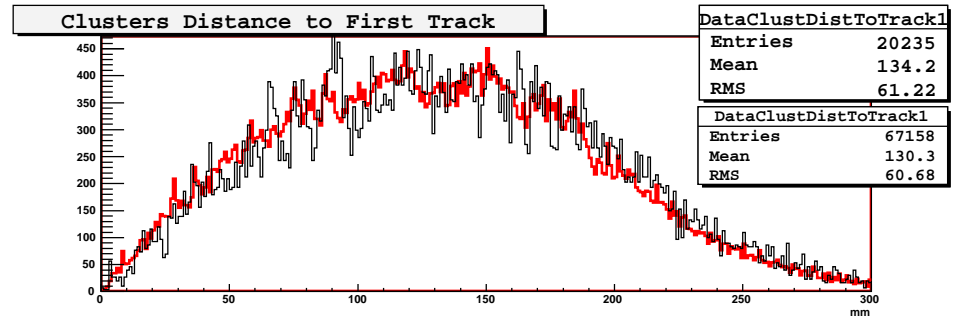
Cosmic Muons : 330000645 (1)

- TotalHits : very good
- TotalClusters : slightly more clusters in MC !
- TopToT : +10% on mean and RMS for Data



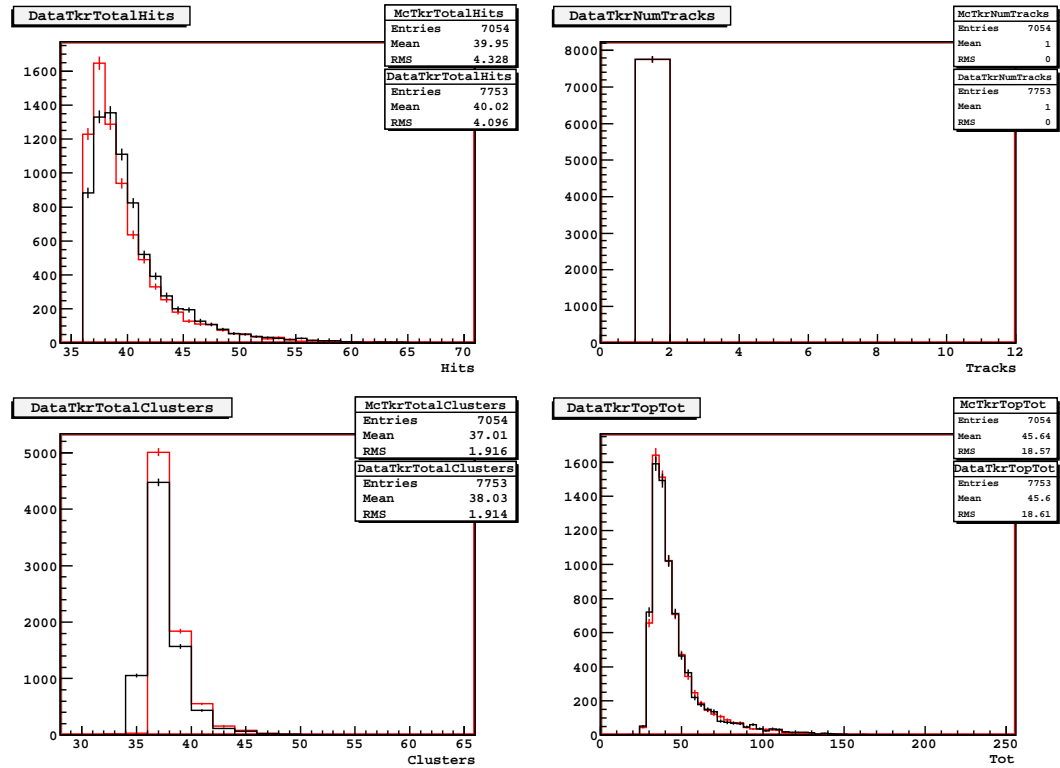
Cosmic Muons : 330000645 (2)

- Clust. Dist. to Track : perfect
- Cluster Size : slightly bigger in Data
- Strip Numbers : perfect



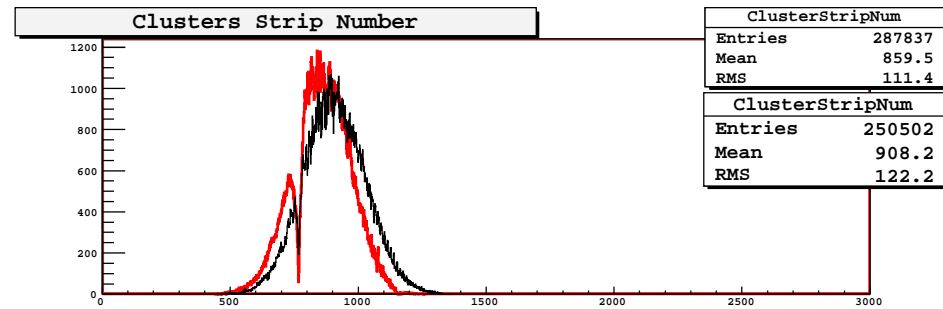
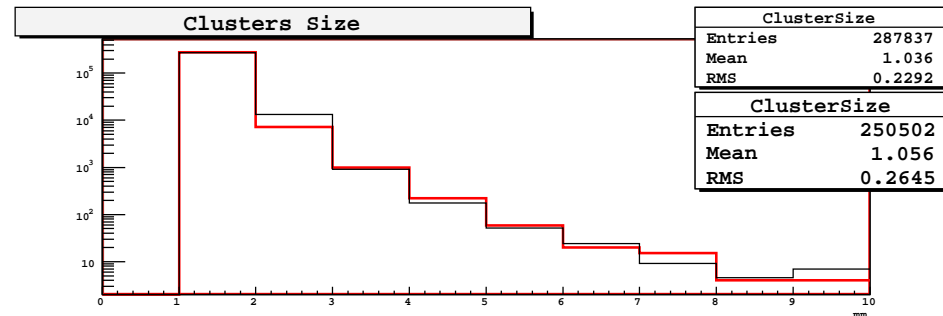
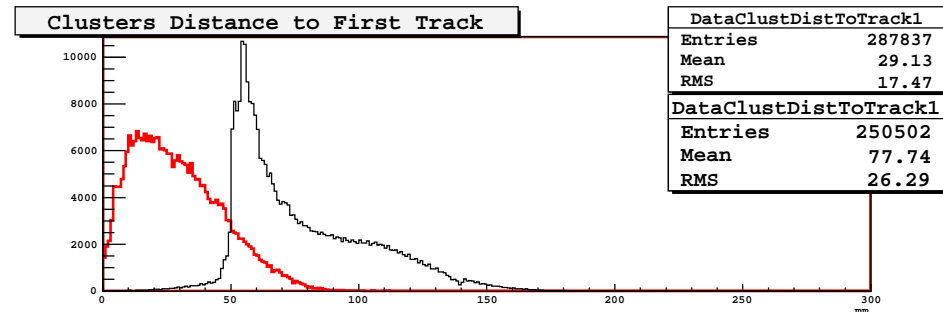
MC Muons : 0deg vs 5deg (1)

- TotalHits : very slight shift at 5degs
- TotalClusters : same
- TopToT : same



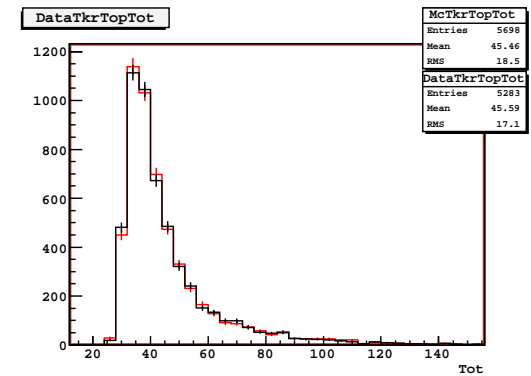
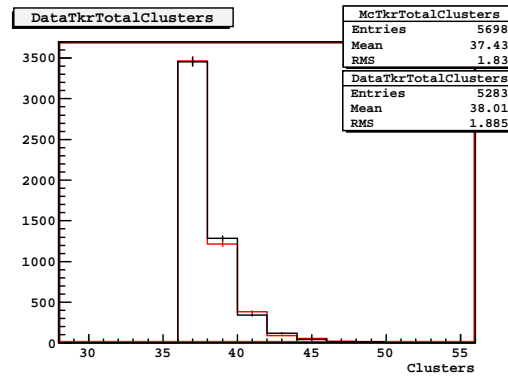
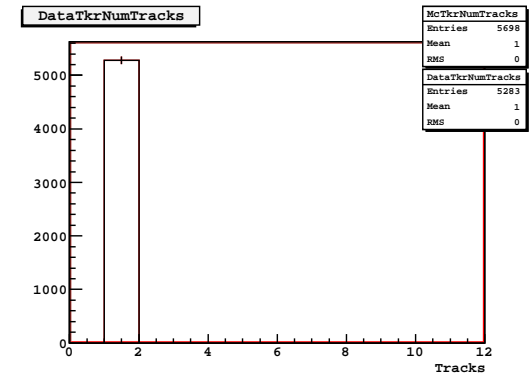
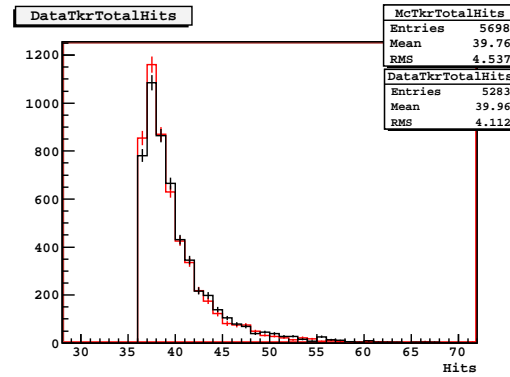
MC Muons : 0deg vs 5deg (2)

- Clust. Dist. to Track : very different !?
- Cluster Size : slightly bigger
- Strip Numbers : slight shift at 5deg



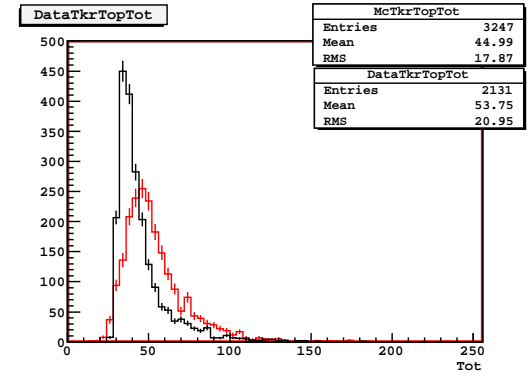
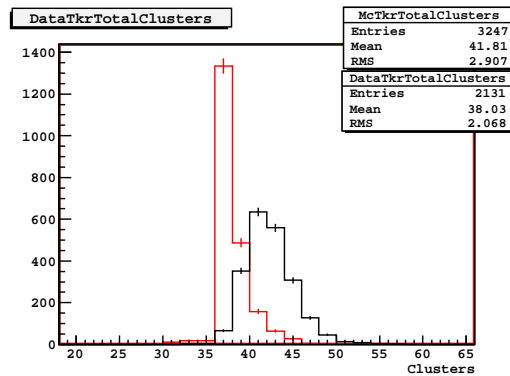
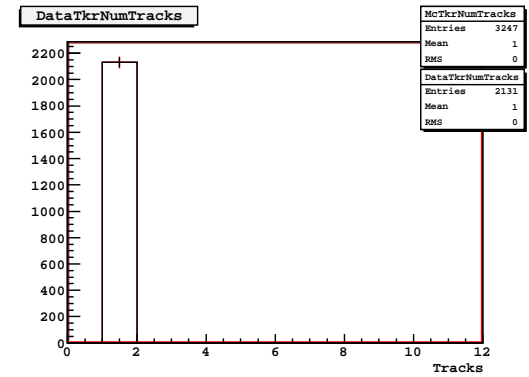
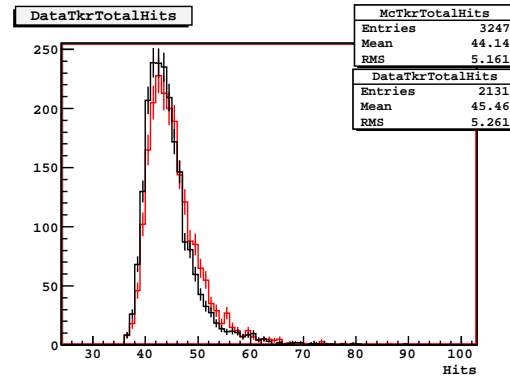
MC Muons ToT Low threshold

- TotalHits : same
- TotalClusters : same
- TopToT : same



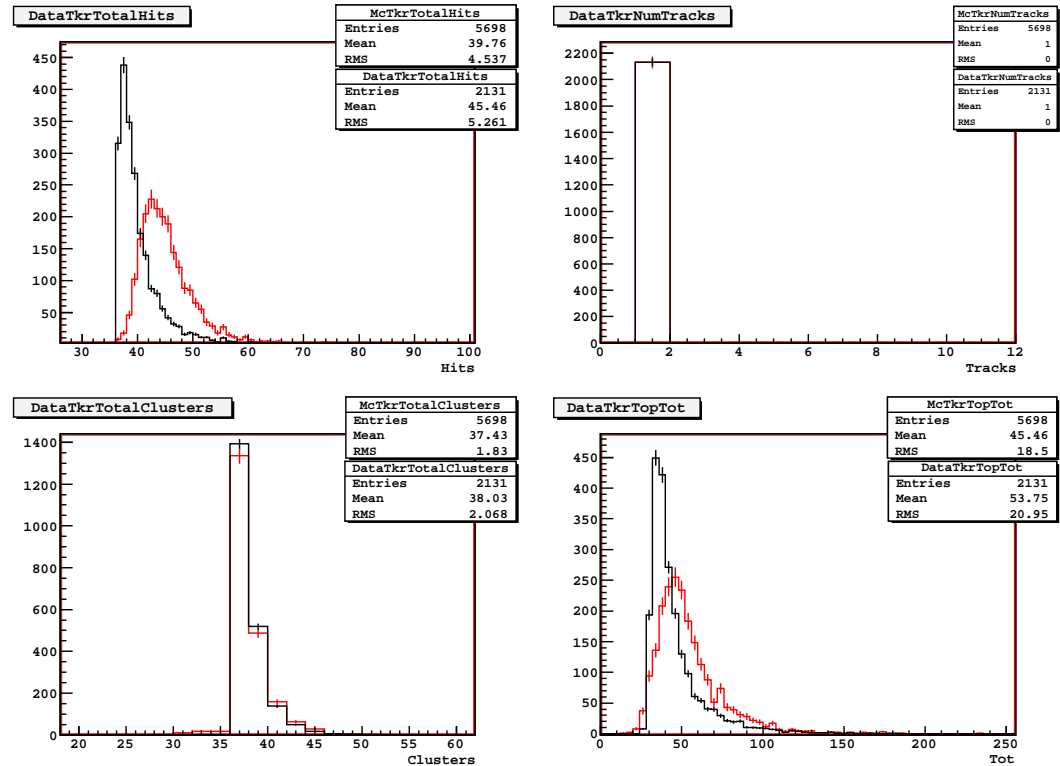
PS Muon 752 vs MC Muons High Noise

- TotalHits : good agreement !
- TotalClusters : many more clusters in MC
- TopToT : 8 dacs shift for data



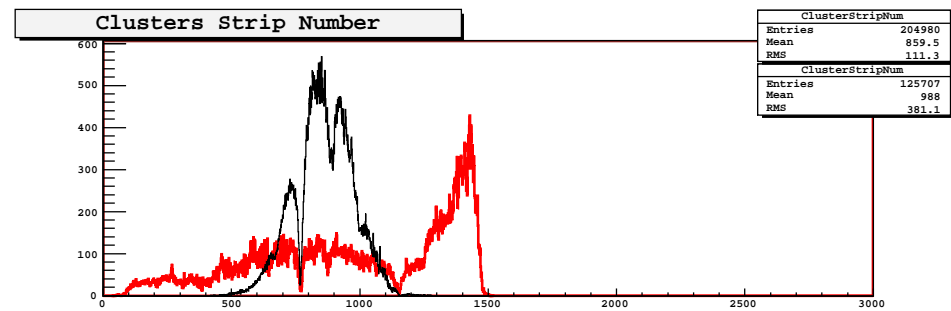
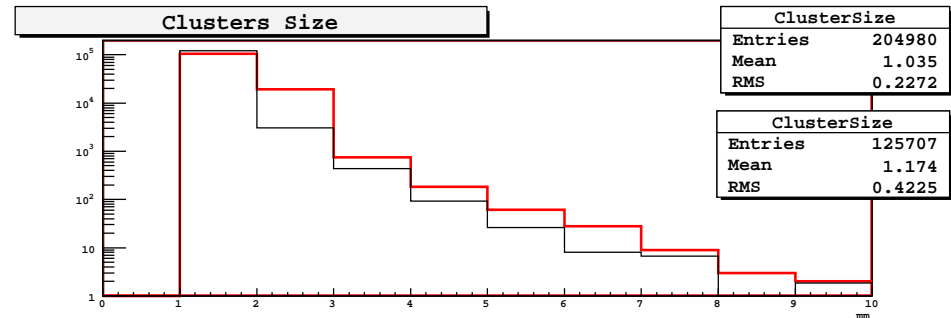
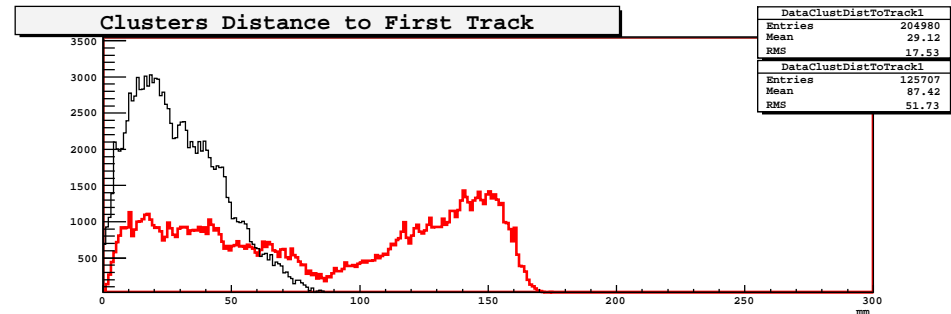
PS Muon 752 vs MC Muon beam (1)

- TotalHits : 6hits shift on mean, and 0.7 on RMS
- TotalClusters : good agreement
- TopToT : 8dacs shift on mean and 3dacs on RMS



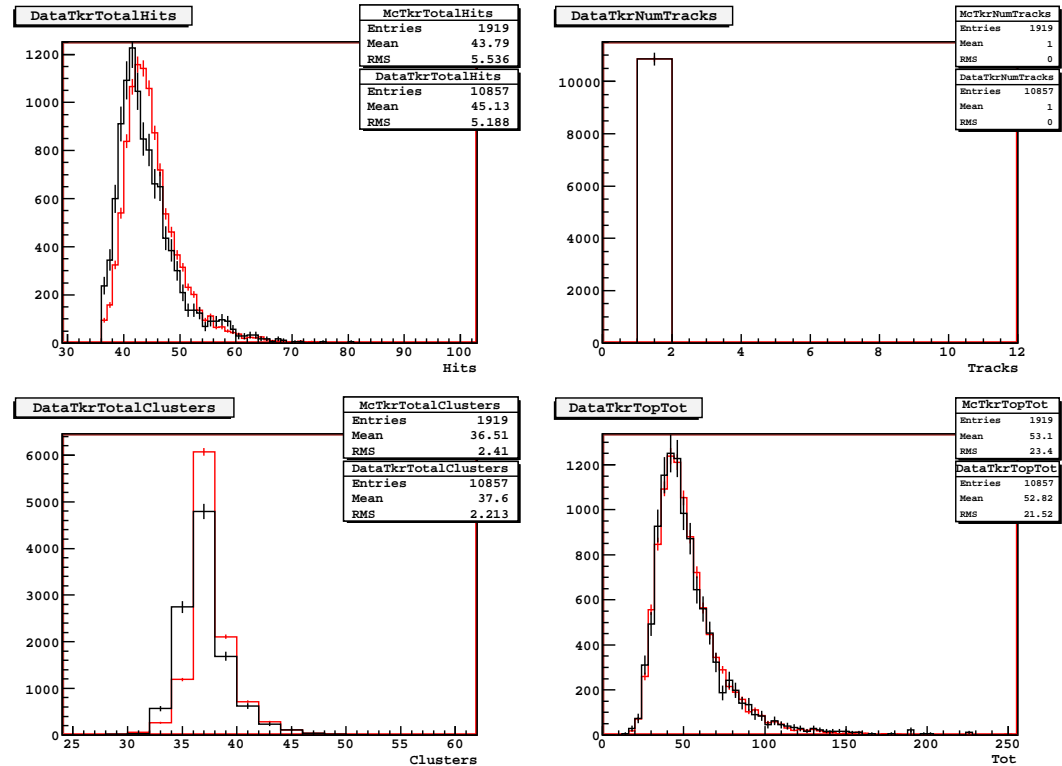
PS Muon 752 vs MC Muon beam (2)

- Clust. Dist. to Track : very different, 2 bumps in data
- Cluster Size : MC clusters 15% smaller
- Strip Numbers : peak in right side of tower 3 in data



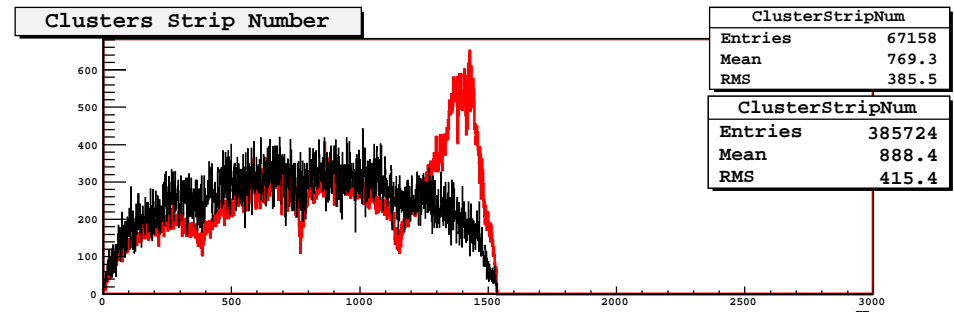
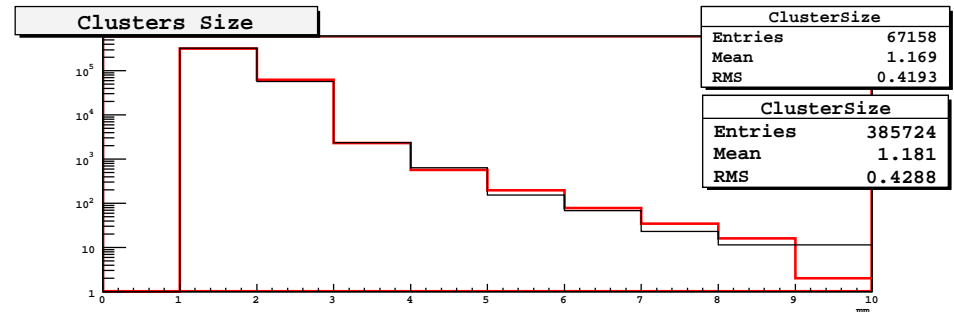
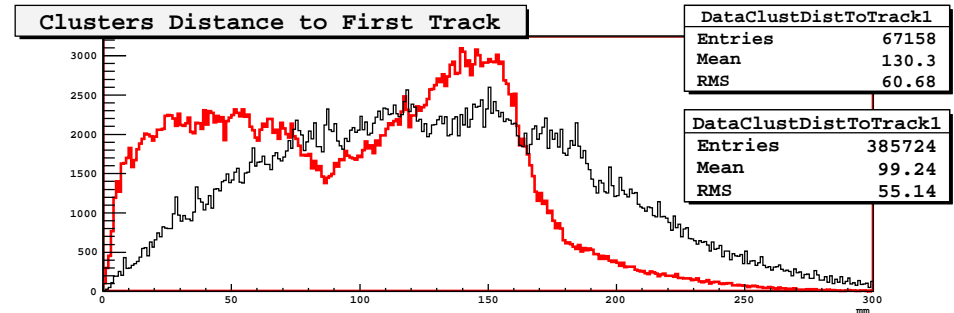
PS Muon 752 vs Cosmic Muons 645 (1)

- TotalHits : 1hit shift for muon from the beam
- TotalClusters : 1cluster shift for muon from the beam
- TopToT : same distributions



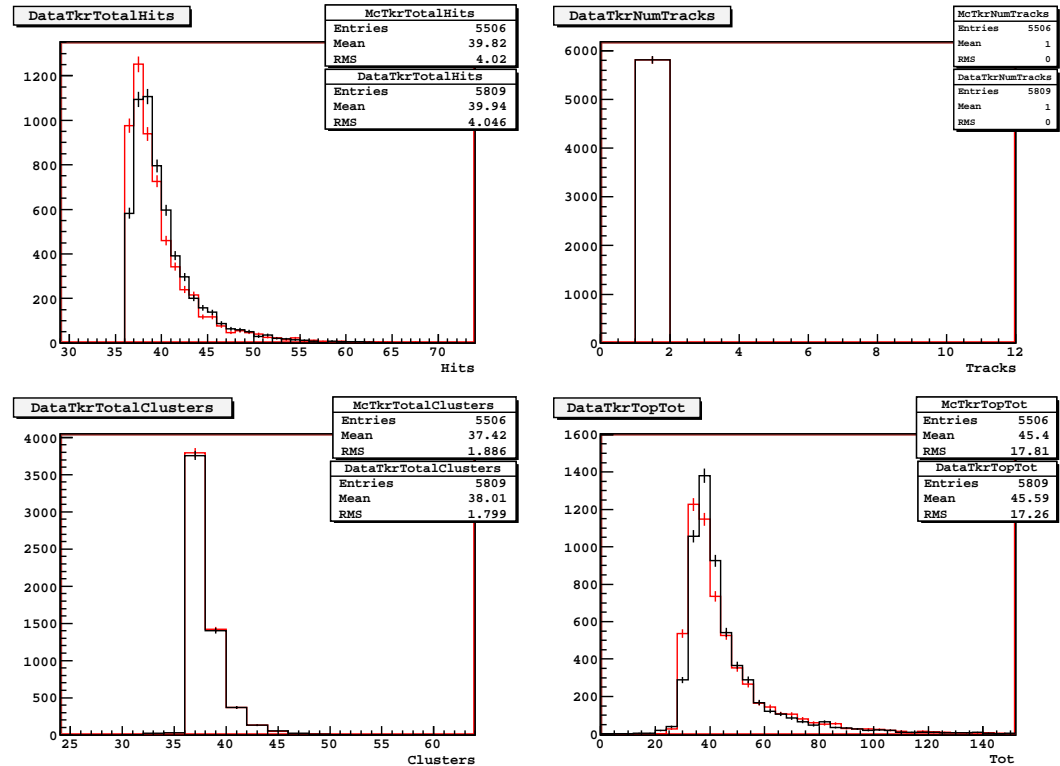
PS Muon 752 vs Cosmic Muons 645 (2)

- Clust. Dist. to Track : 1 bump for cosmic, 2 for accelerator muons
- Cluster Size : same distributions
- Strip Numbers : flat for cosmic but 1 bump right of tower 3 for accelerator muons



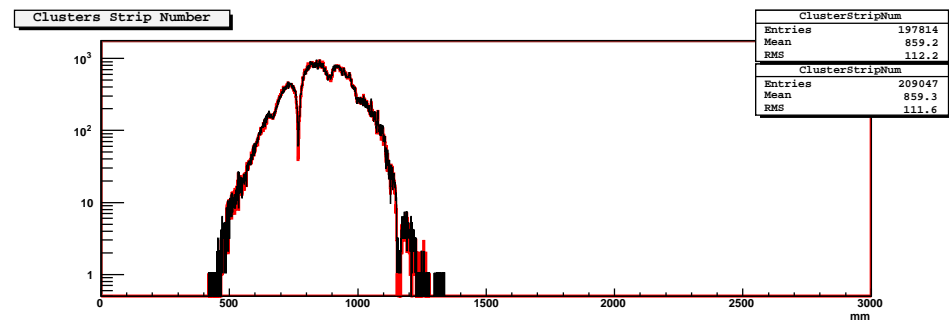
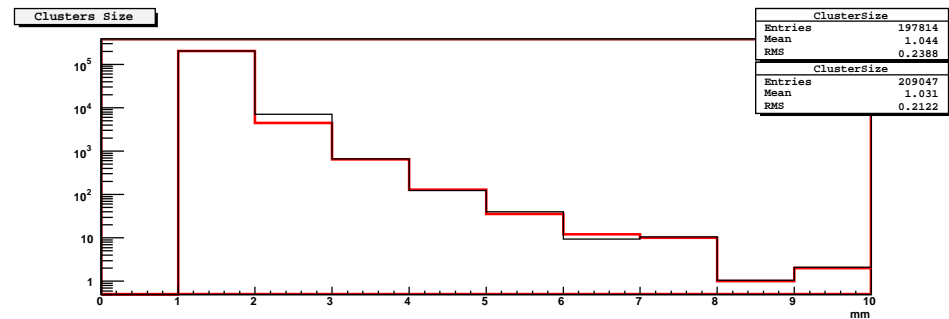
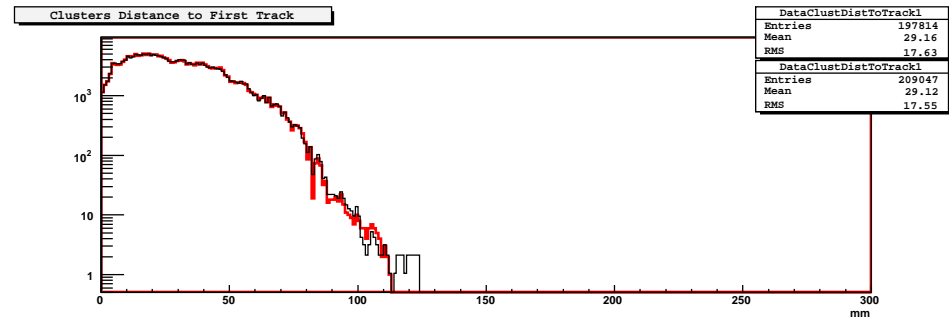
MC Muon Beam vs MC BariAlg (1)

- TotalHits : 1hit shift for max of distribution
- TotalClusters : same distributions
- TopToT : 2dacs shift for BariAlg on the position of the maximum



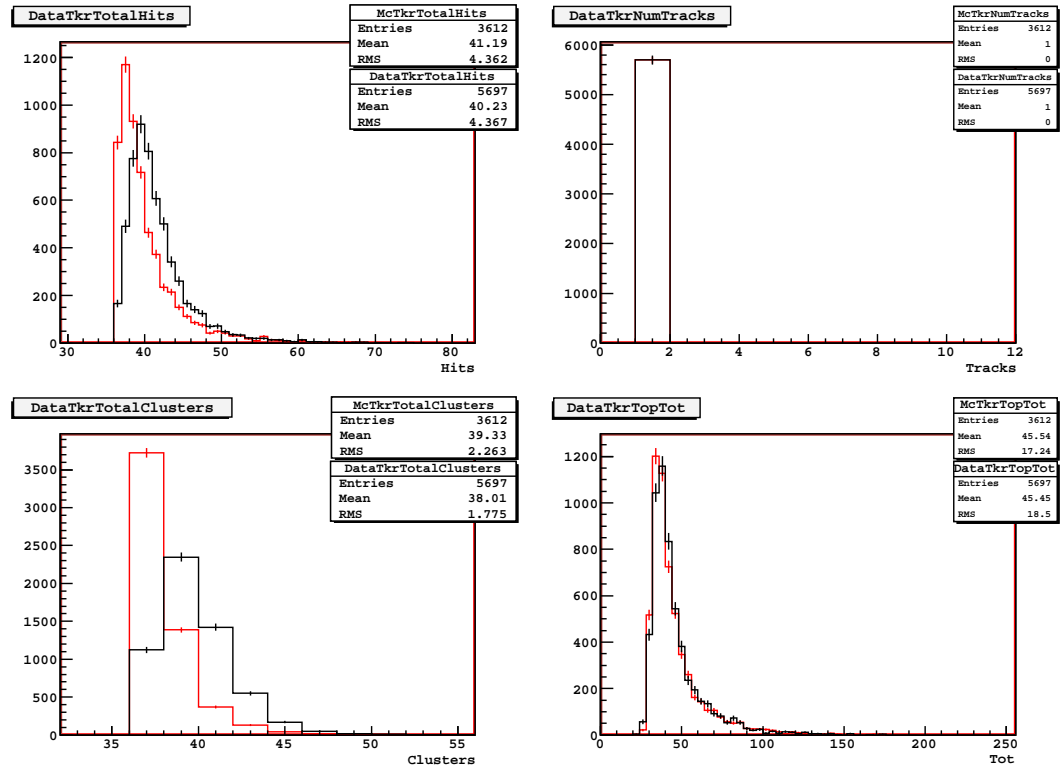
MC Muon Beam vs MC BariAlg (2)

- Clust. Dist. to Track : same distributions
- Cluster Size : same distributions
- Strip Numbers : same distributions



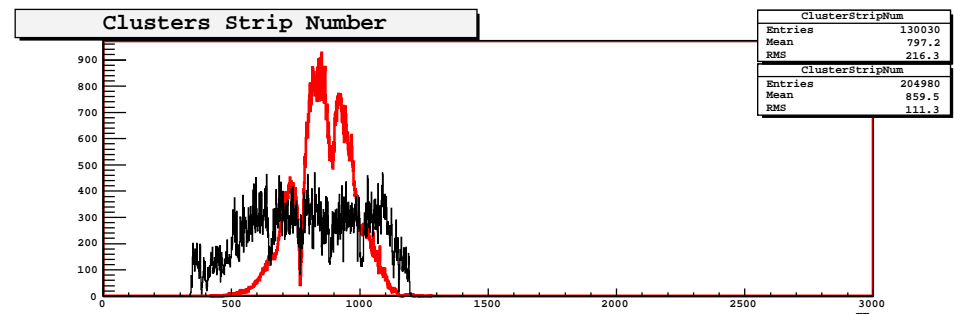
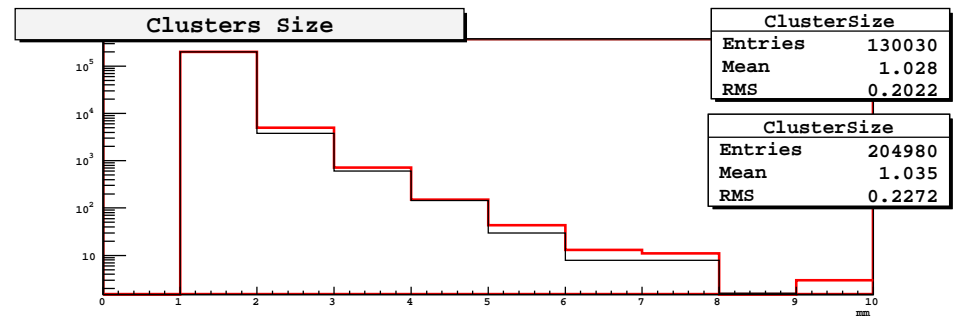
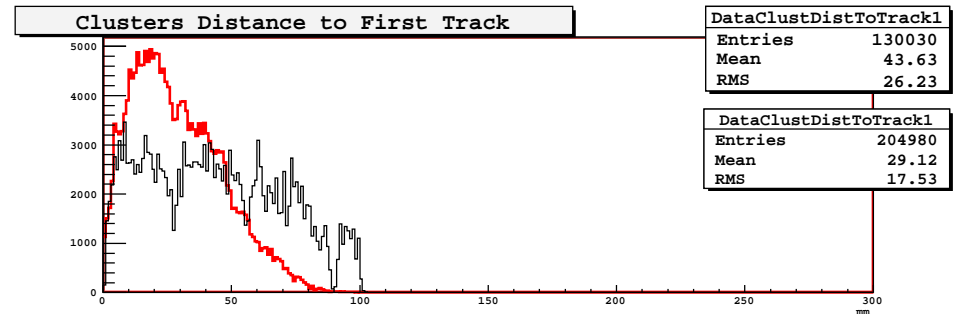
MC Muon Beam with and w/o bt06(1)

- TotalHits : 1hit shift for 'nobt06'
- TotalClusters : 1hit shift for 'nobt06'
- TopToT : very slight shift for 'nobt06'



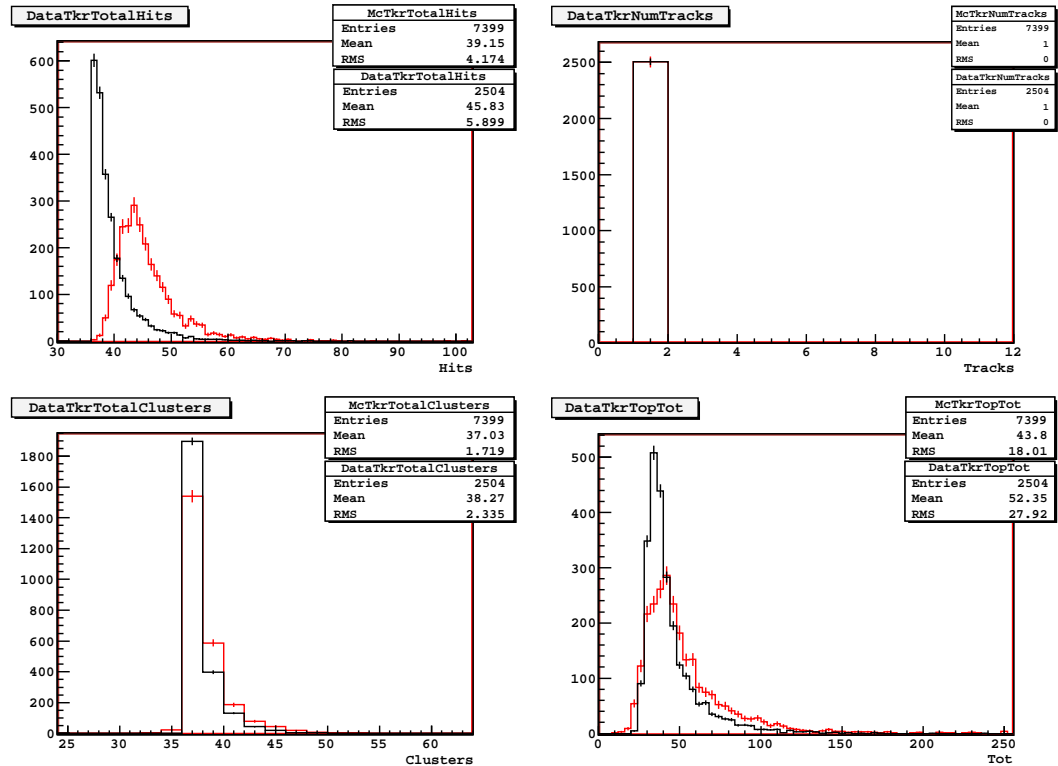
MC Muon Beam with and w/o bt06 (2)

- Clust. Dist. to Track : narrower and peaked with 'bt06'
- Cluster Size : very slightly more clusters for 'bt06'
- Strip Numbers : peaked for 'bt06'



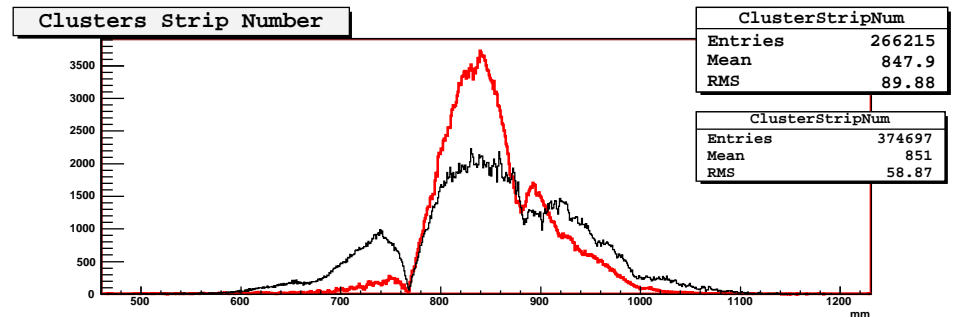
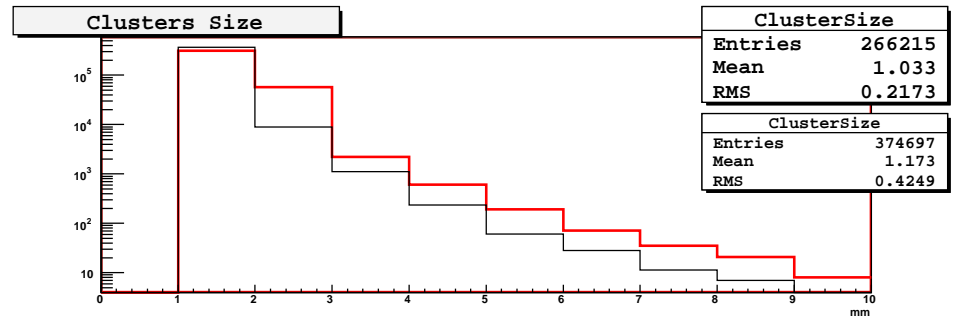
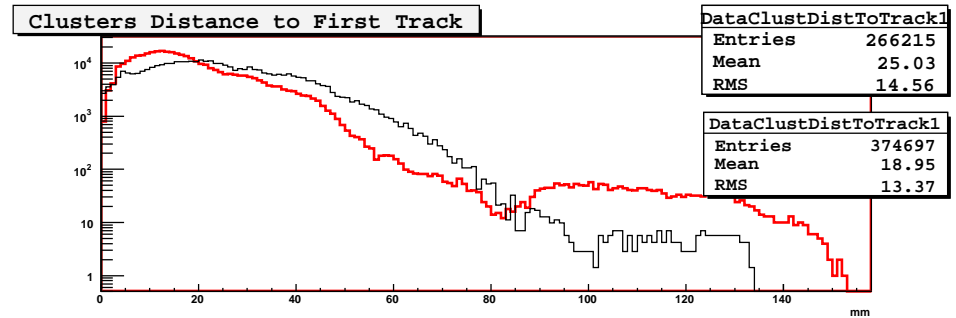
Proton Beam 1423 vs MC 184 (1)

- TotalHits : 6.5 hits on mean and 1.8 hits on RMS for data
- TotalClusters : 1.2 cluster on mean and 0.8 on RMS for data
- TopToT : 8.5 dacs on mean and 9 dacs on RMS for data



Proton Beam 1423 vs MC 184 (2)

- Clust. Dist. to Track : 2 peaks in data, 1st peak is thinner
- Cluster Size : MC clusters are smaller by 15%
- Strip Numbers : peak in data is thinner and higher



Proton Beam 1423 vs MC 184

- Nb of Clusters : 36 in MC and data
- Tkr1RMS : smaller in data
- Tkr1KalThetaMS : smaller in data
- Tkr1KalEne : bigger in data

