Progress on back-scattering

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2. Trying to explain bad agreement Data/MC
3. Plot of distance between electron and photon
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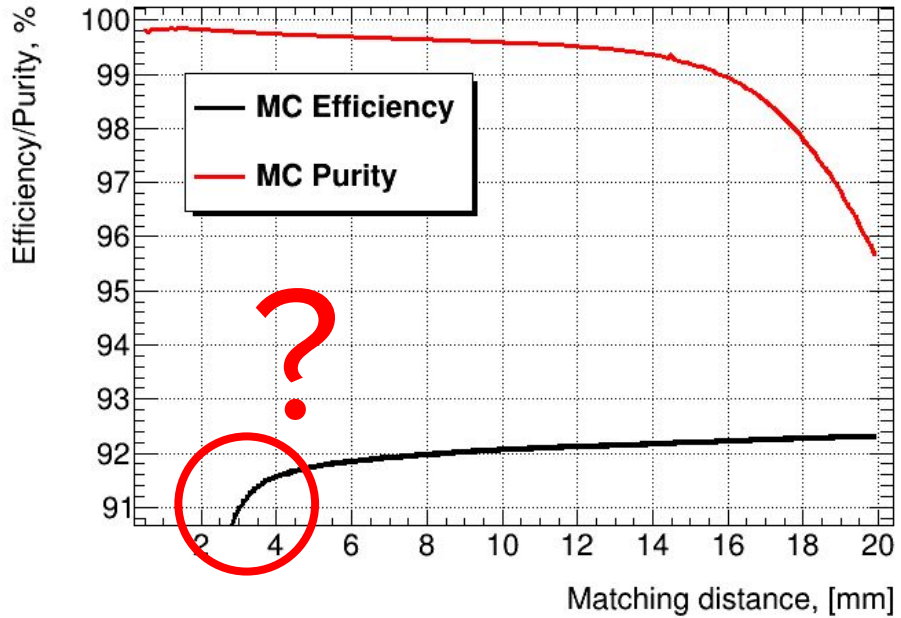
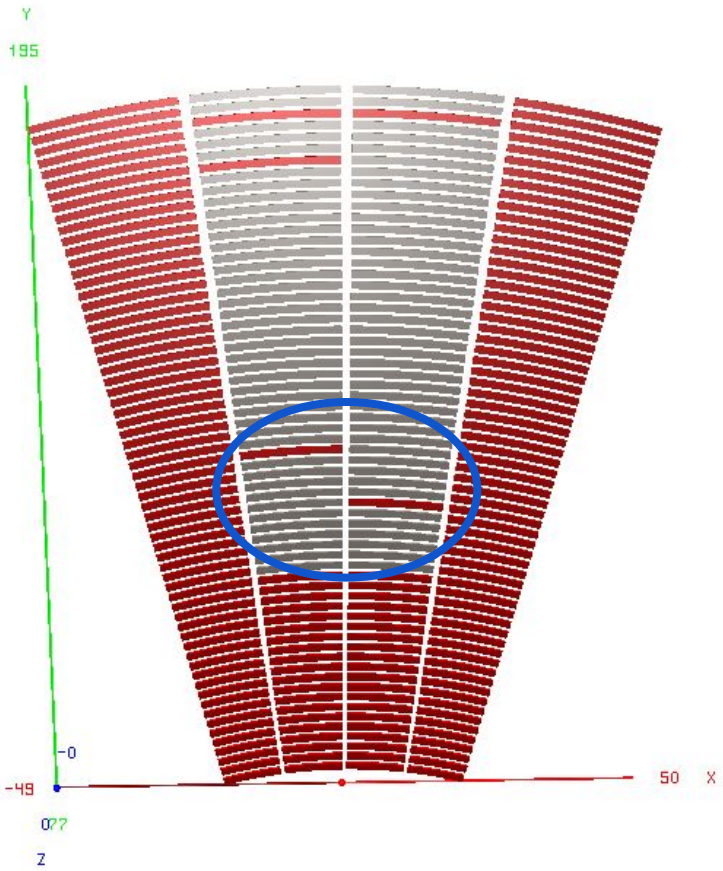
Why electron identification efficiency is 91 %?



Electron identification		
	Efficiency, %	Purity, %
MC w/ back-scattering	90.966 ± 0.018	99.803 ± 0.003
MC w/o back-scattering	90.941 ± 0.018	$99.8\,3 \pm 0.003$
Difference	0.026 ± 0.018	-0.01 ± 0.003

Table 3: Back scattering effect on electron identification algorithm.

Why electron identification efficiency is 91 %?

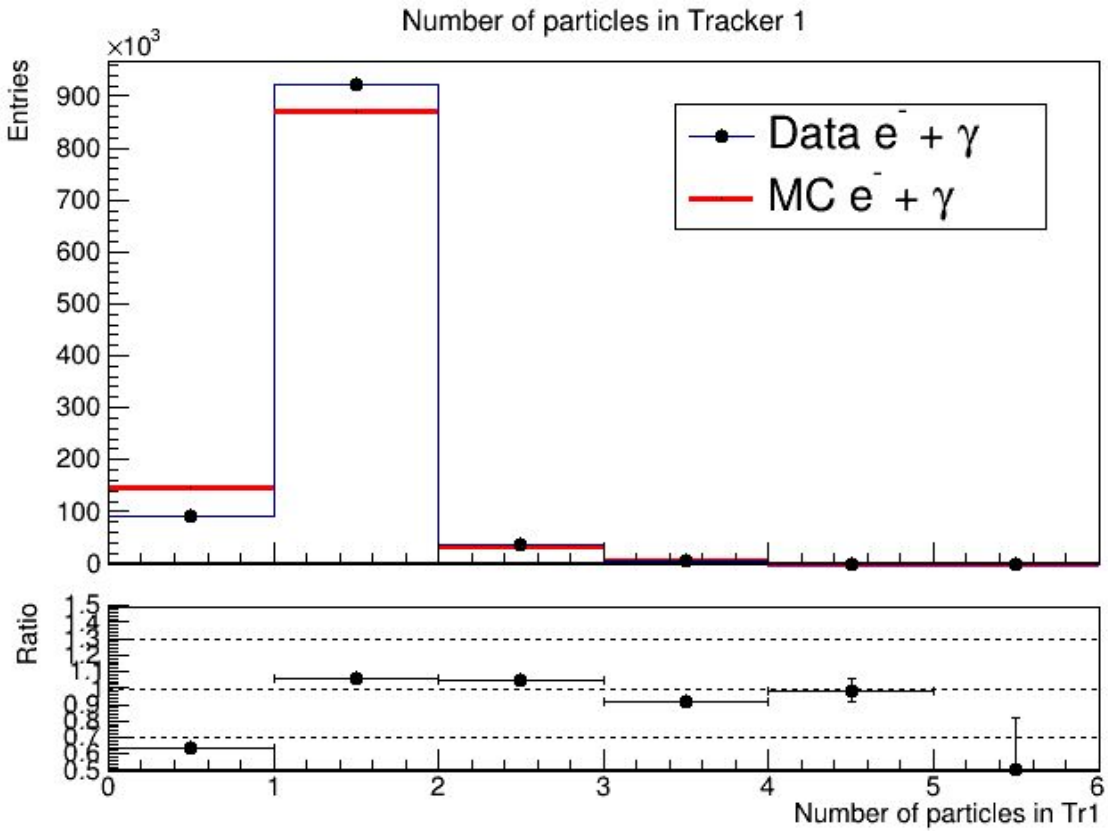


Number of events, %		
Particle	Tracker 1	Tracker 2
Primary e^-	$92.32 \pm 0.02\%$	$99.37 \pm 0.01\%$
Pre-showered e^-	$3.41 \pm 0.01\%$	$5.52 \pm 0.01\%$
Pre-showered e^+	$2.64 \pm 0.01\%$	$3.24 \pm 0.01\%$
Back-scattered e^-	$1.1 \pm 0.01\%$	$1.68 \pm 0.01\%$
Back-scattered γ	$0.547 \pm 0.004\%$	$0.89 \pm 0.01\%$
Pre-showered γ	$0.76 \pm 0.01\%$	$0.88 \pm 0.01\%$
Back-scattered e^+	$0.155 \pm 0.002\%$	$0.282 \pm 0.003\%$
Back-scattered Hadrons	$0.015 \pm 0.001\%$	$0.025 \pm 0.001\%$
Total pre-showered	$5.38 \pm 0.01\%$	$7.83 \pm 0.02\%$
Total back-scattered	$1.78 \pm 0.01\%$	$2.81 \pm 0.01\%$

Table 2: Fraction of event with certain particle detected in each tracker.

Recalculate MC taking into account all bad pads?

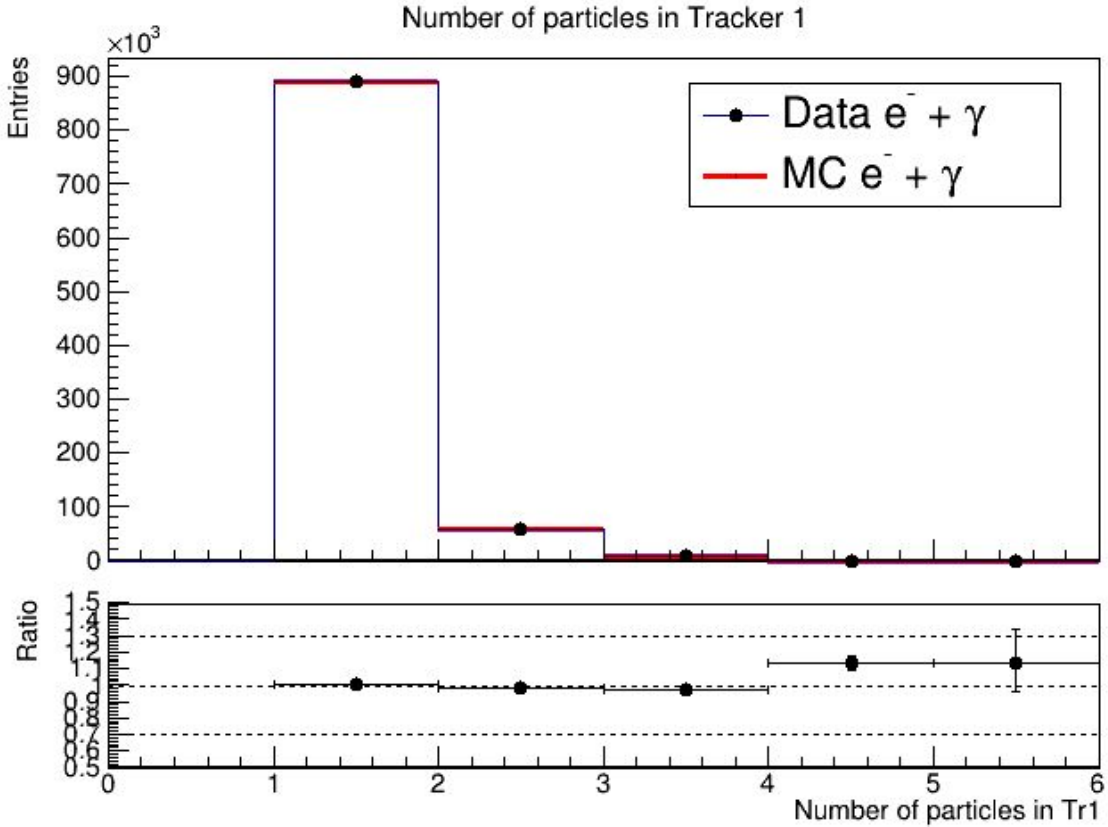
Control plots: N particles for trackers



- MC doesn't simulate trackers inefficiency

- MC doesn't simulate trigger!
- Trigger rejects data events with particles that don't reach the LumiCal
- ~10% of events don't reach the LumiCal based on MC

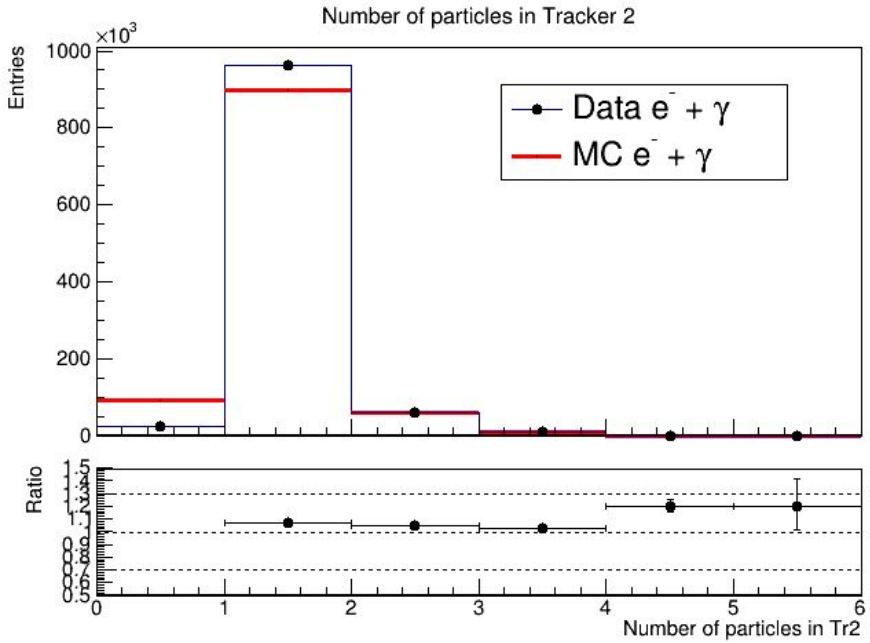
Control plots: N particles for trackers

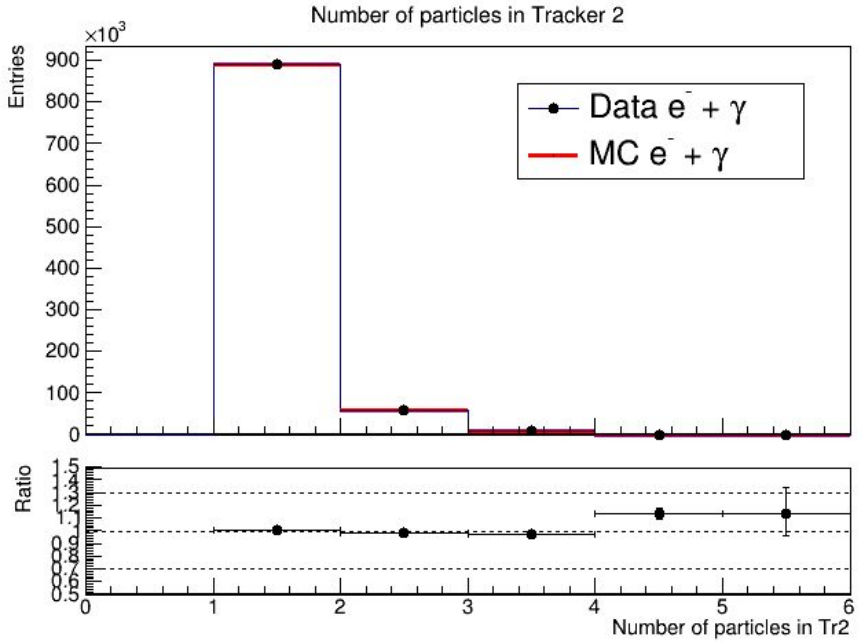


Plot only for events with:
tr1_n_clusters > 0 and tr2_n_clusters > 0

- 100 % agreement for 1, 2 clusters
- 10% underestimate of 4, 5 clusters events
- Electronic noise? Cross-talk? Env. background? etc.

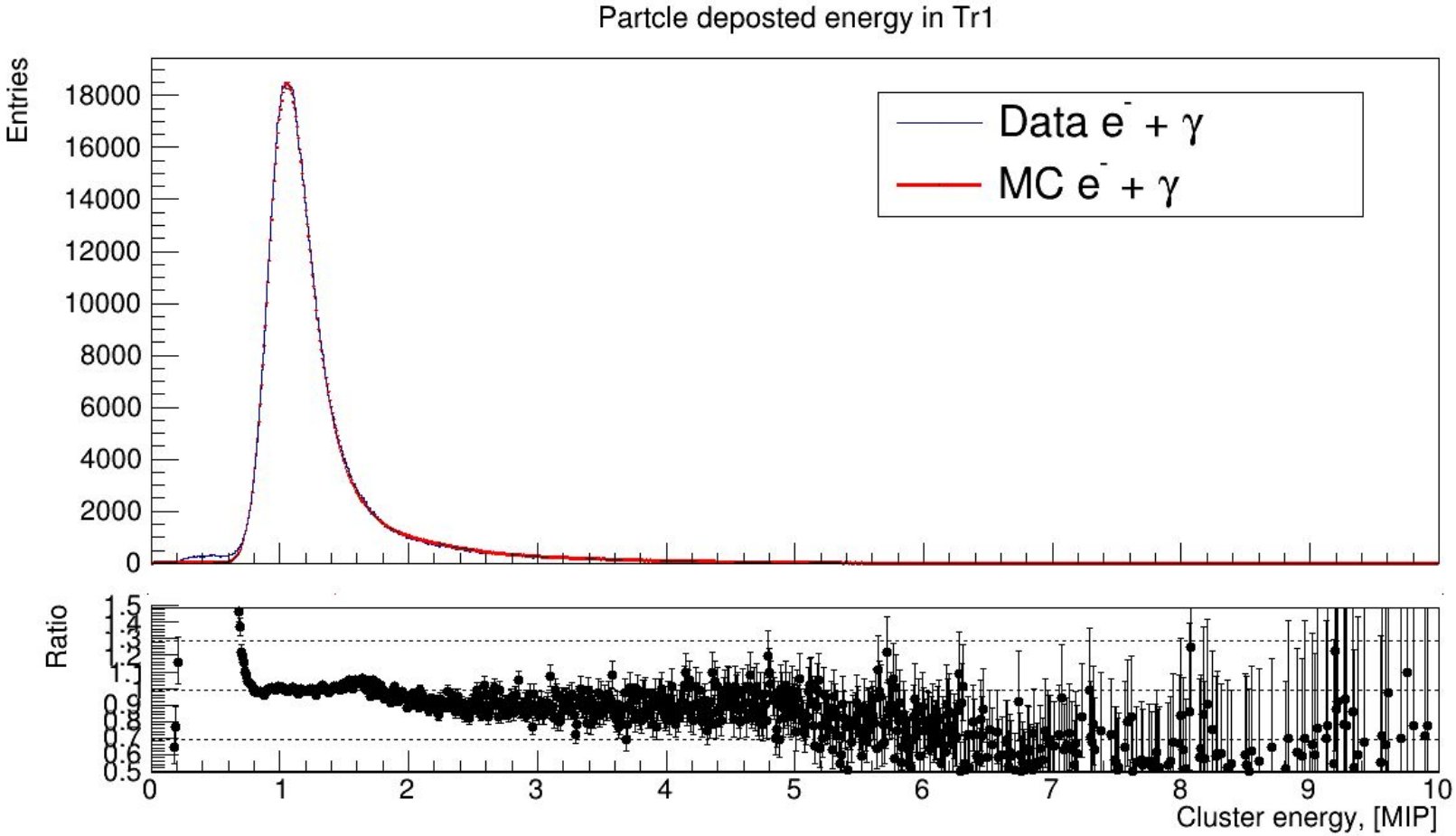
Control plots: N particles for trackers



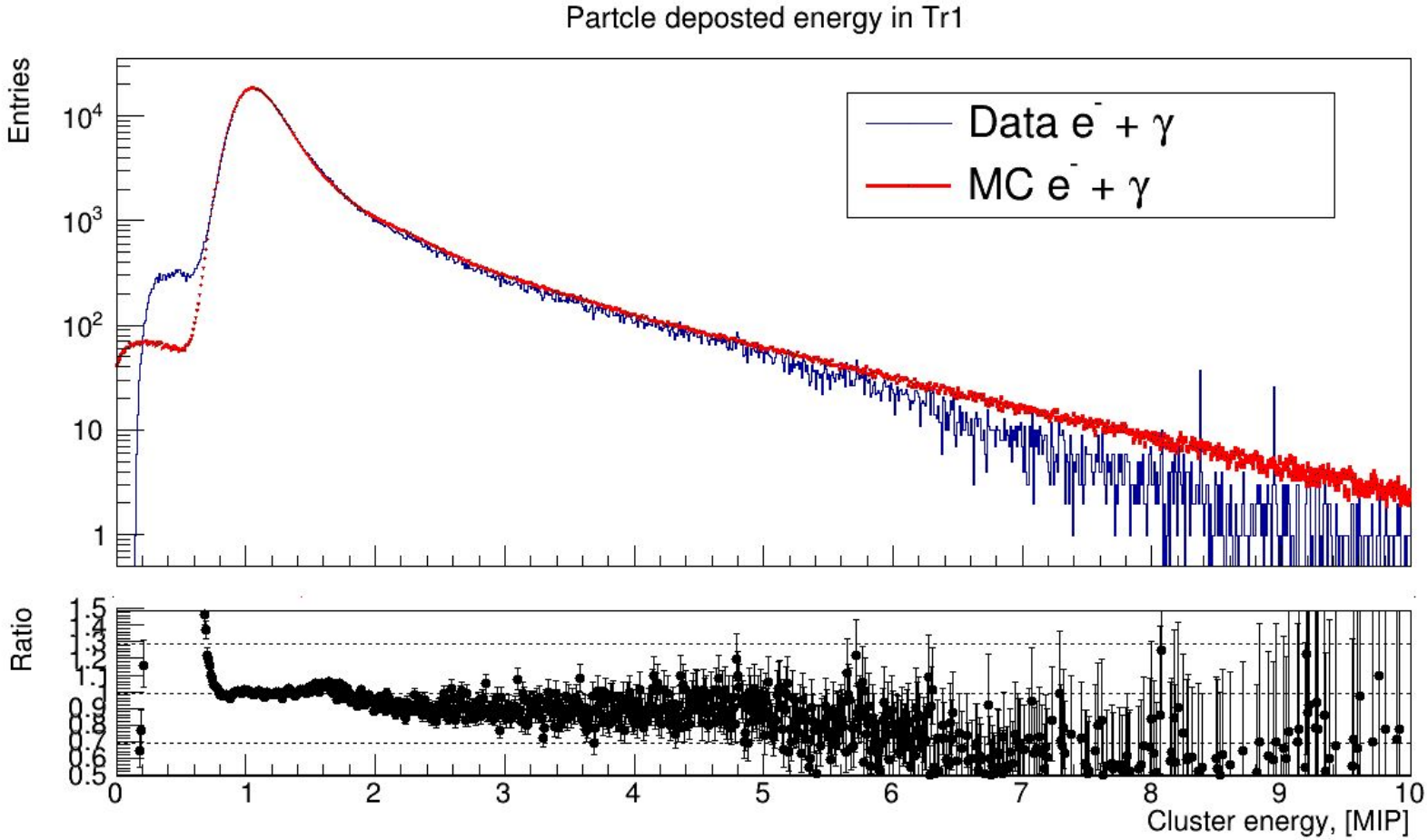


The same holds for tracker 2

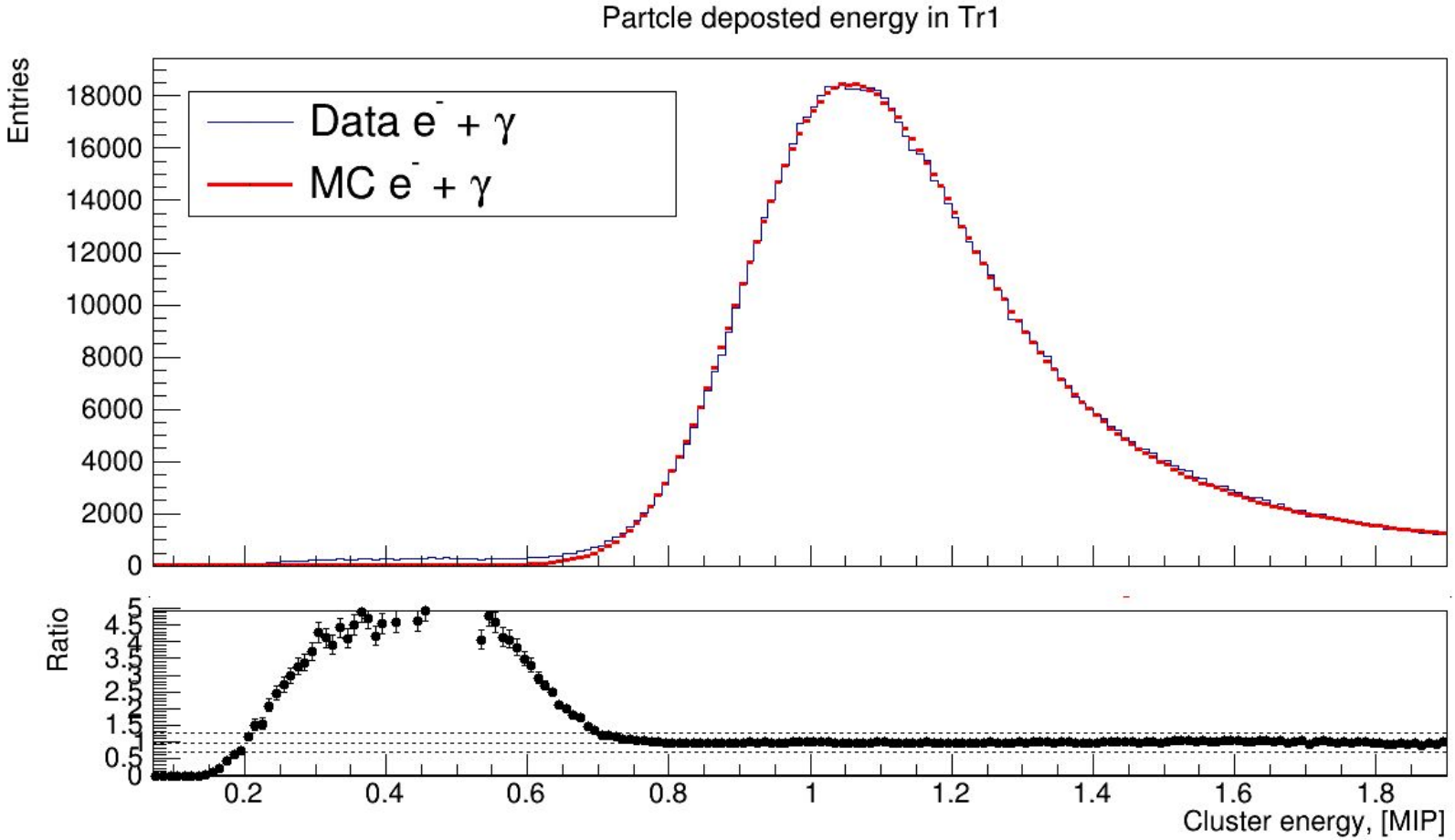
Control plots: energy distribution in tracker 1



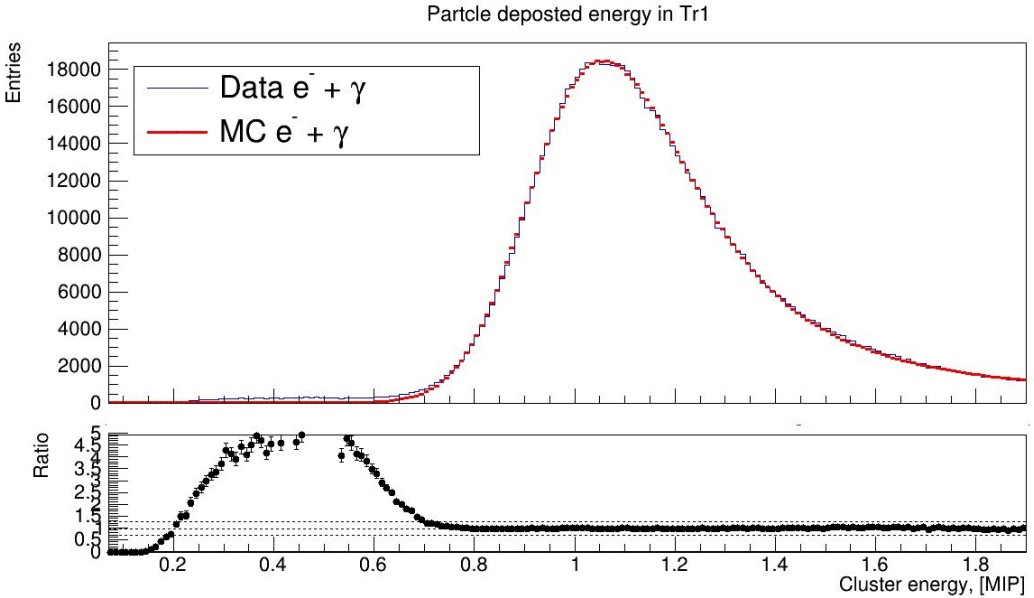
Control plots: energy distribution in tracker 1



Control plots: energy distribution in tracker 1



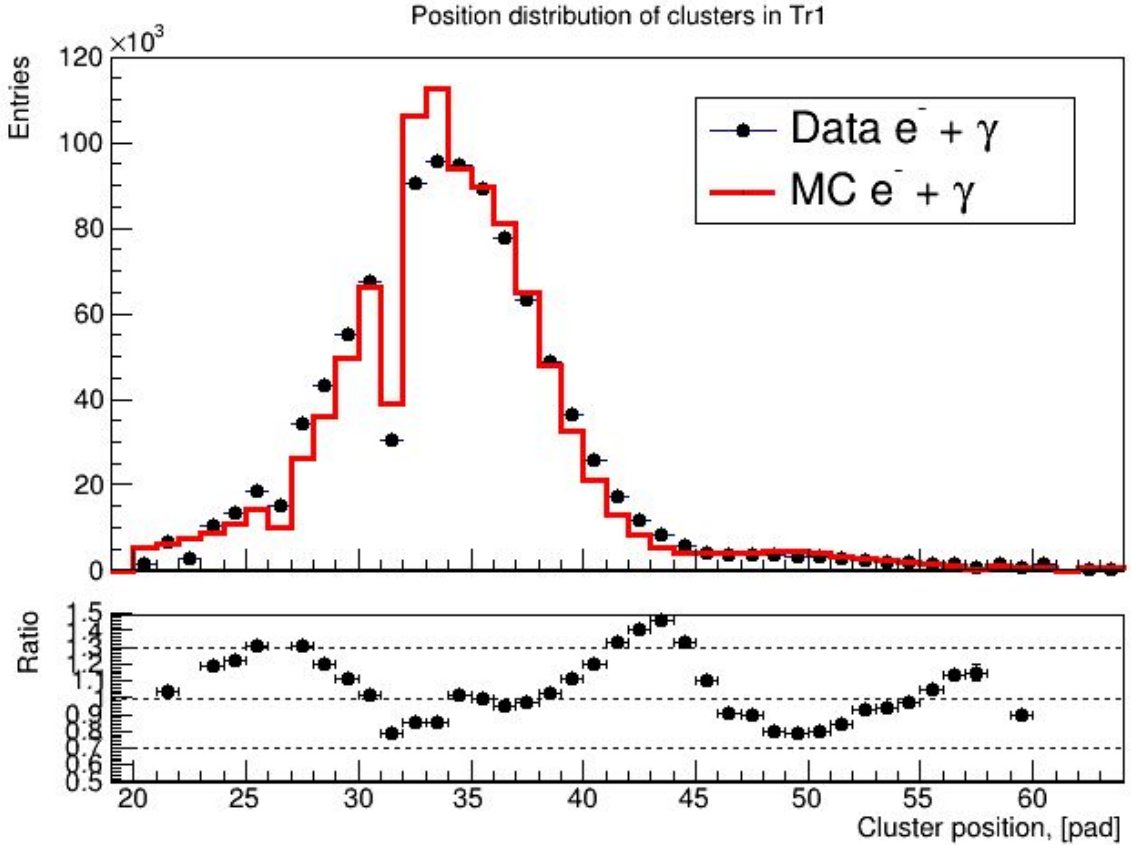
Control plots: energy distribution in tracker 1



- Is NOT charge sharing.
- Is NOT trackers noise. Noise included in the MC with 0.6 factor to match peak shape.
- Is NOT ZS. Data exceeds MC.

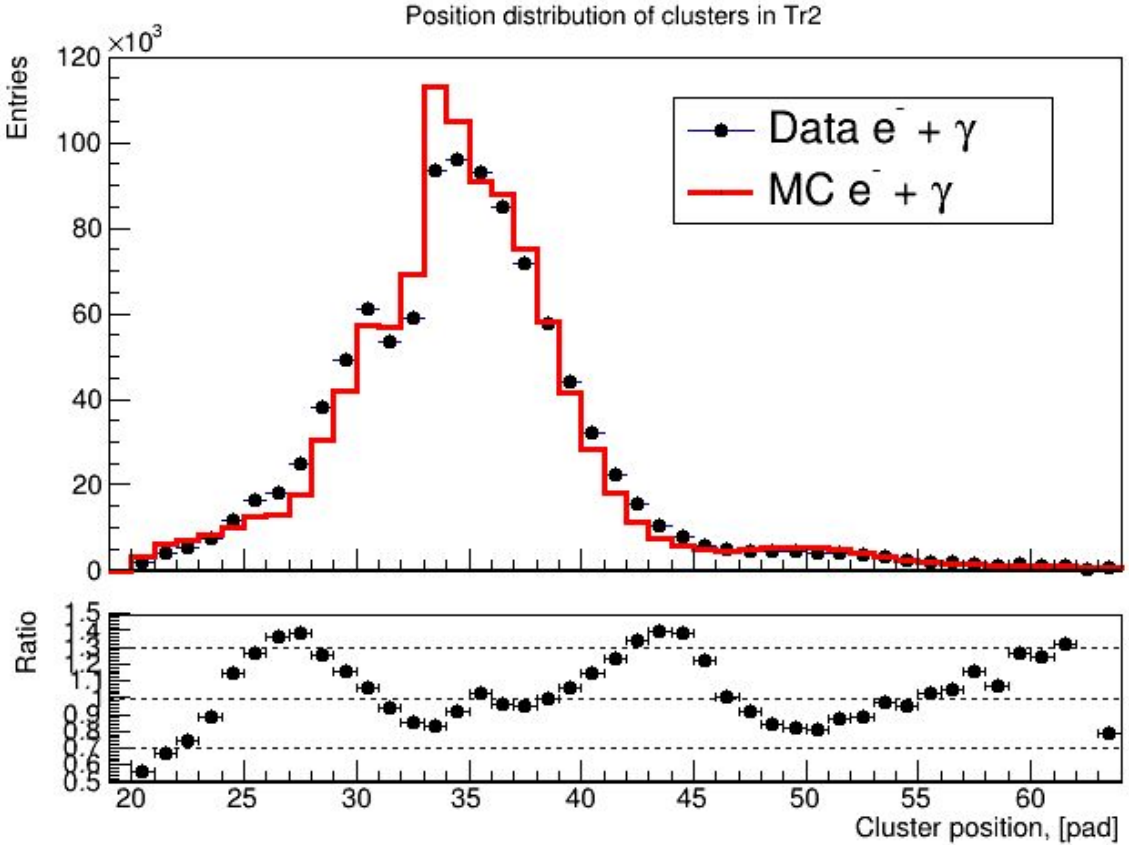
- Another ideas?

Control plots: position distribution in tracker 1



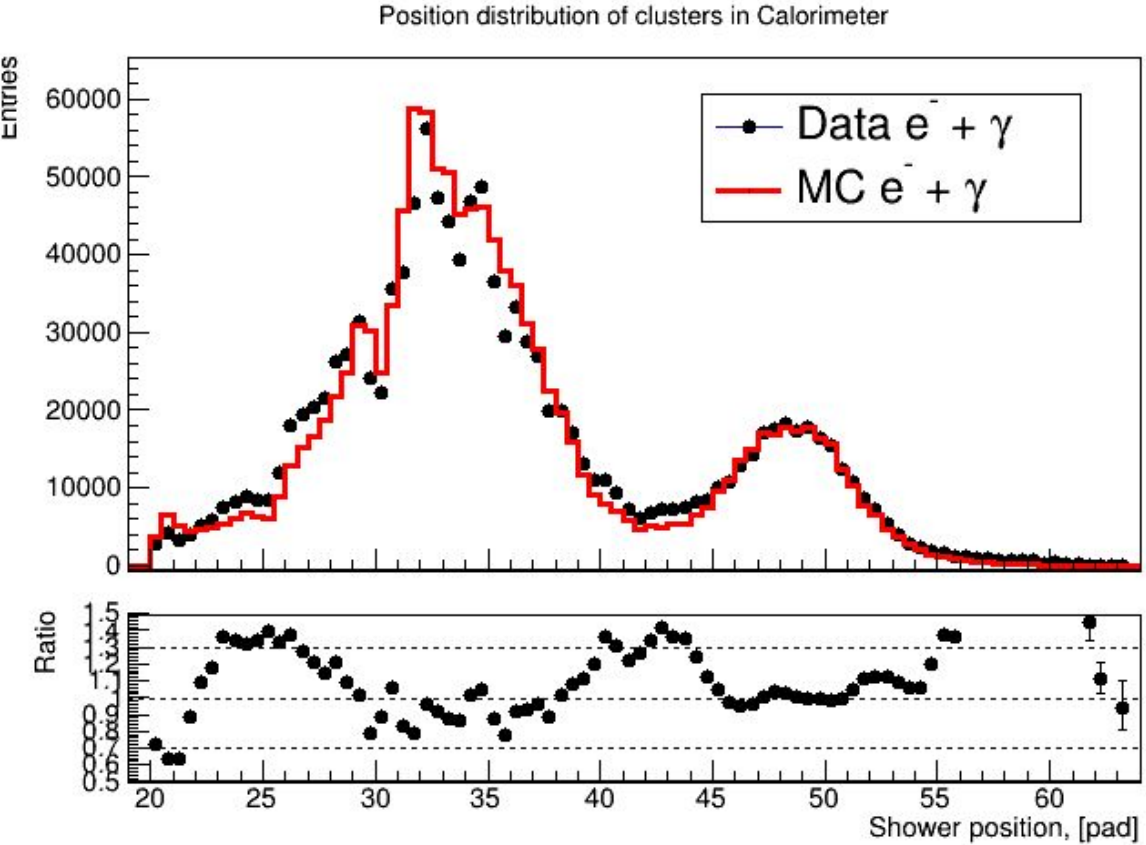
- Have no idea why the ratio so wiggly...
- 26 and 31 bad pads are clearly visible

Control plots: position distribution in tracker 2

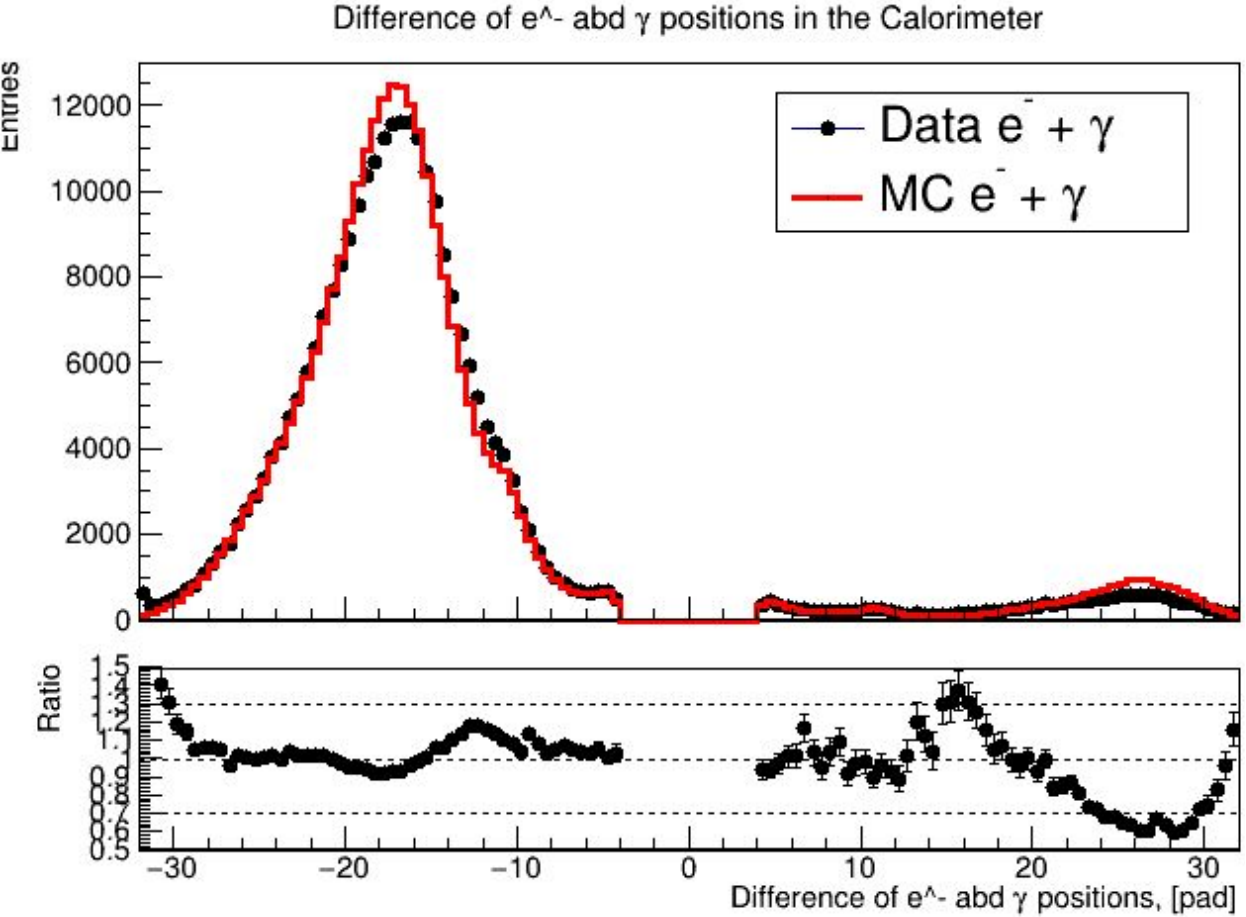


- Wiggles in Tr2 seem to be synchronised with wiggles in Tr1
- Wrong position + misalignment simulation?
- Beam shape/ angular spread?

Control plots: position distribution in the calorimeter



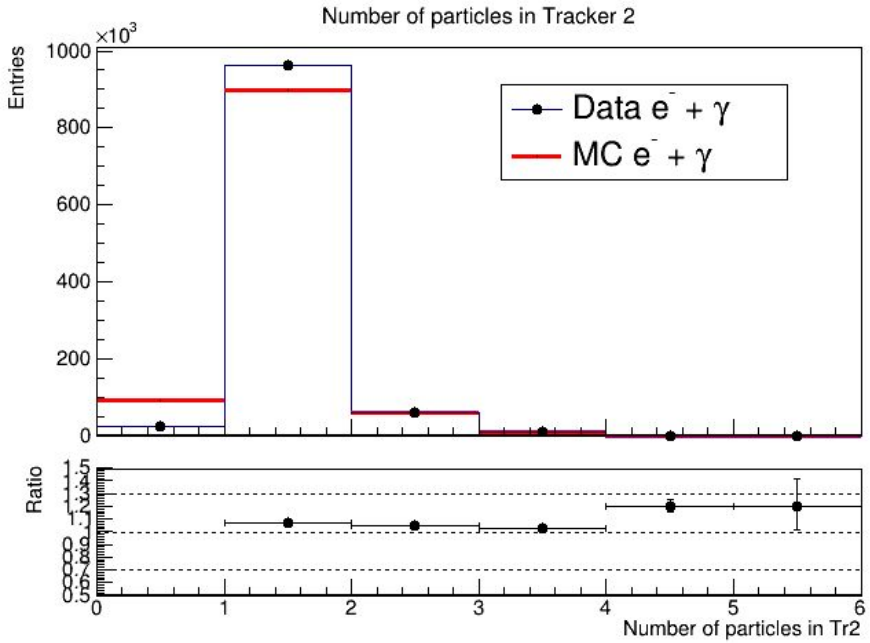
Control plots: Distance between e^- and photon in cal

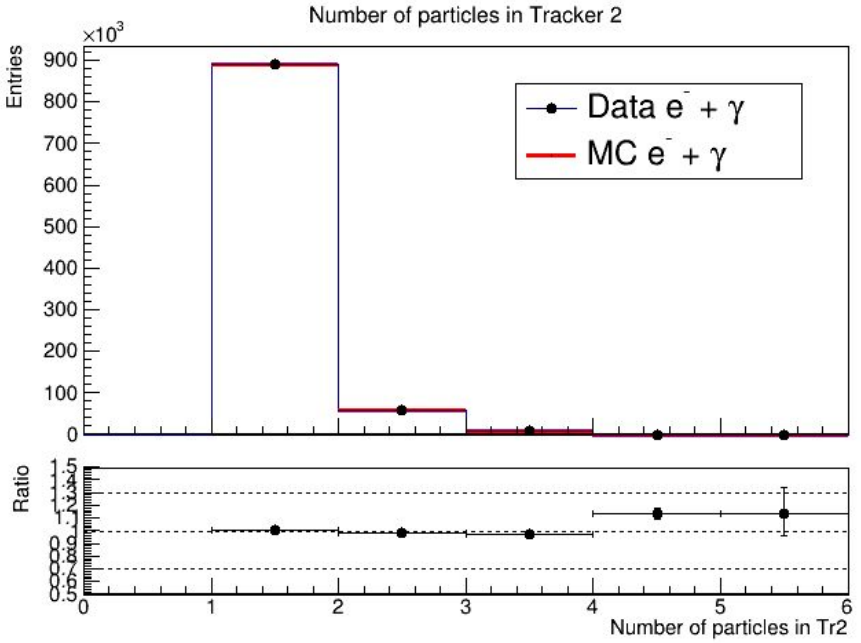


- Electron is 17 pads (3 cm) lower in average from a photon
- Sometimes photon has higher energy than an electron

Control plots: N particles for trackers

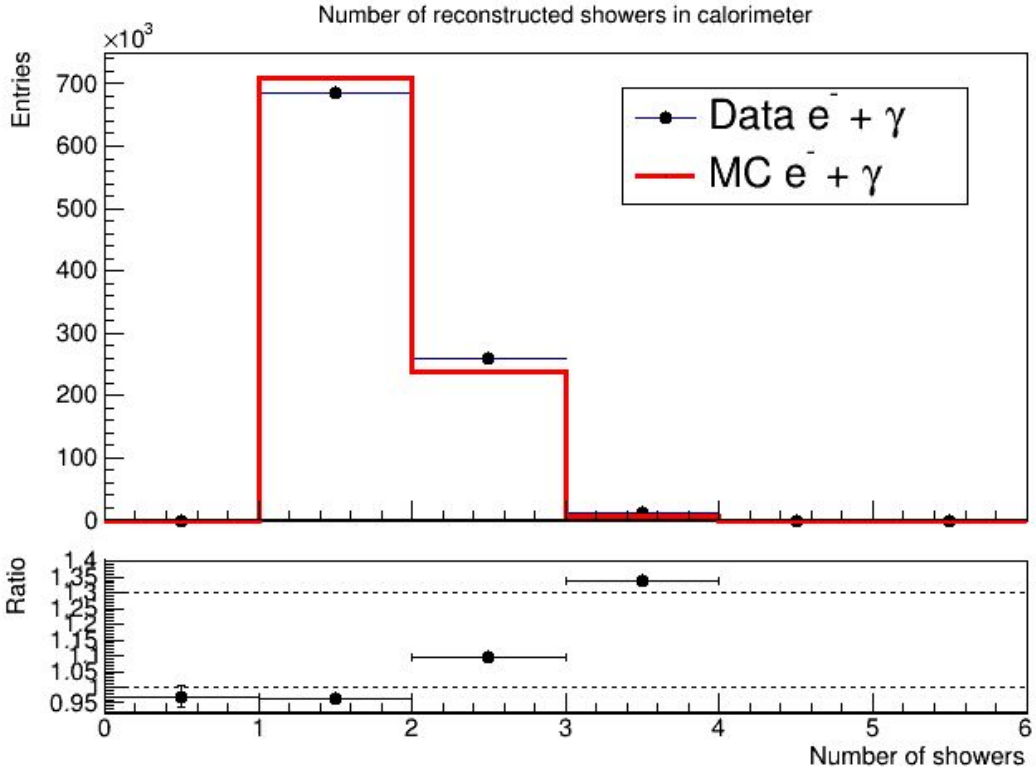
tr1_n_clusters > 0 and tr2_n_clusters > 0





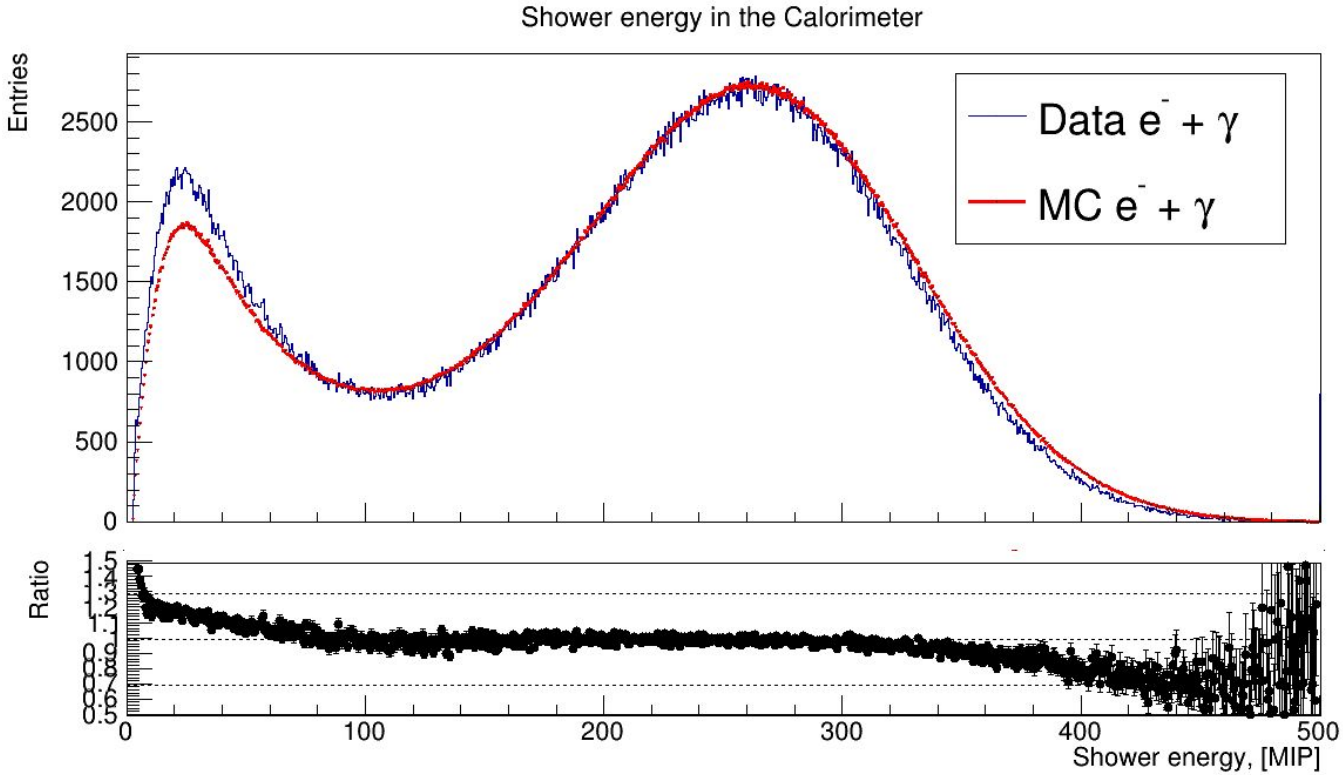
The same holds for tracker 2

Control plots: N particles for the calorimeter



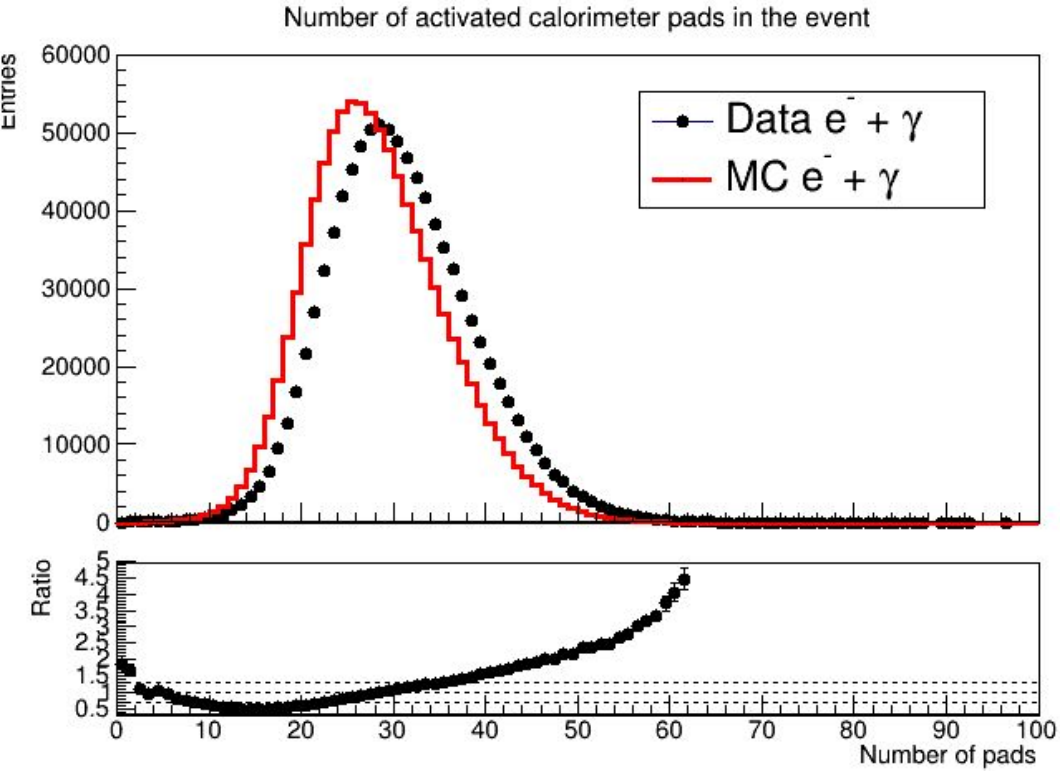
Data overestimates N clusters in the calorimeter

Control plots: Energy of the showers for the calorimeter



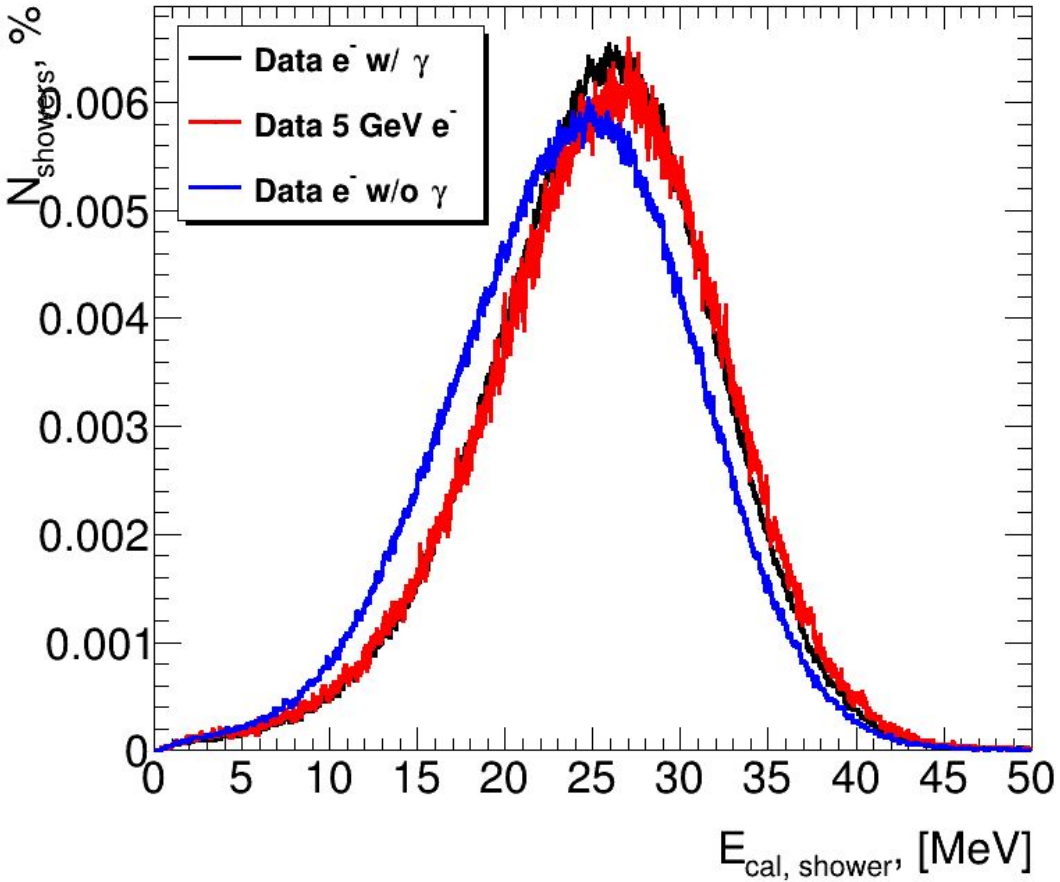
Data shows more low energy showers

Control plots: Number of pads in the calorimeter

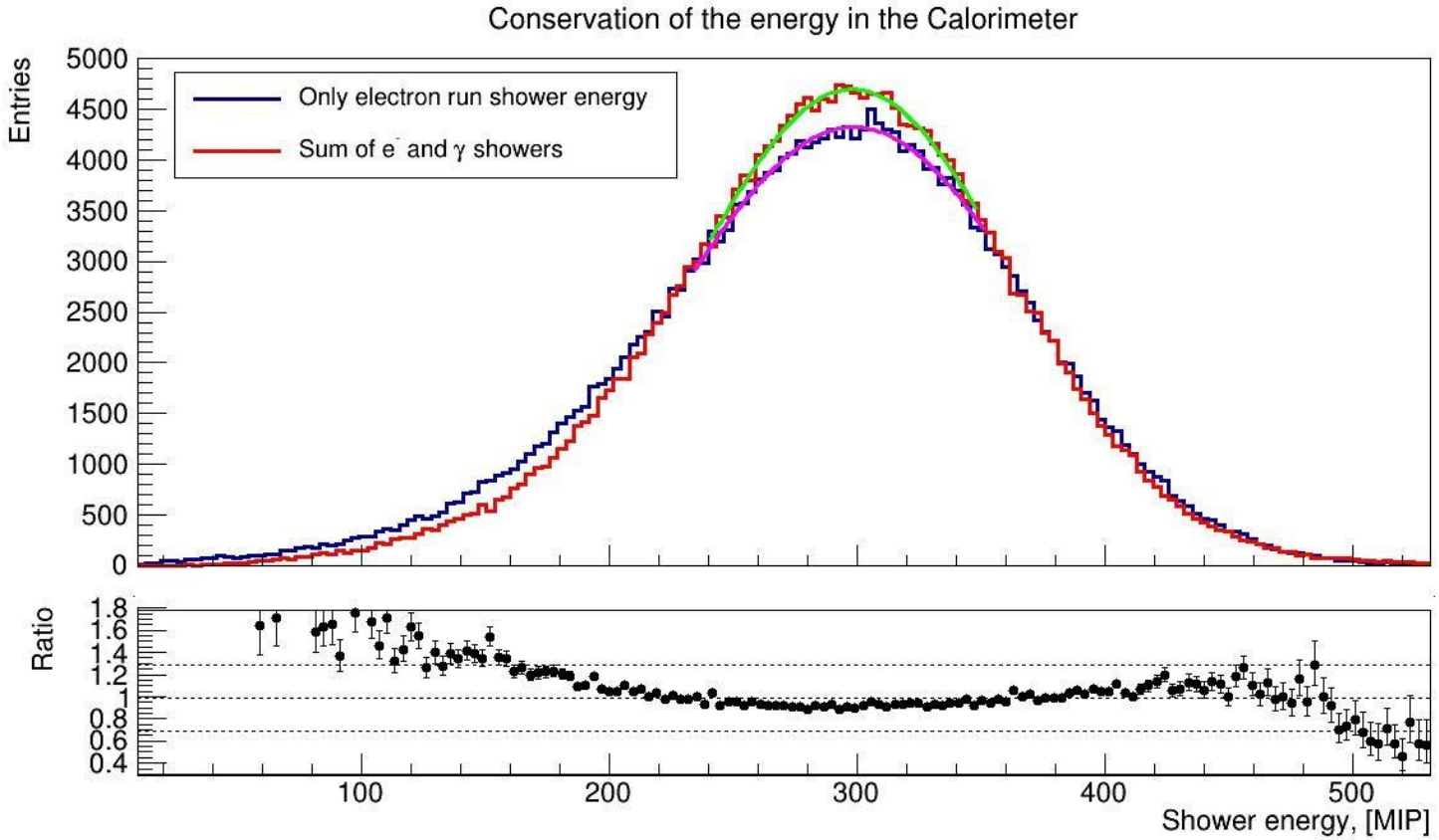


- Electronic noise? Cross-talk? Env. background? etc.

Control plots: Sum of the energies check



Control plots: Sum of the energies check



Only electron mean:
298.5 +- 0.44 MIP

Sum mean:
298.033 +- 0.35 MIP

Relative difference:
~0.15 %

Summary

1. Work on the paper draft is ongoing. Huge thanks to Wolfgang, Aharon for trying to decode my writings.
2. Data/MC position agreement is very wiggly
3. Energy of the showers and N activated pads in the calorimeter in disagreement
4. Energy sum check looks good

TODO

1. Recalculate MC without bad pads in the tracker (at all)?
2. Back-scattering tracks from secondary hits in the trackers for data and MC
3. Anything else?