

Update on Mistag in 5GeV Single γ Events

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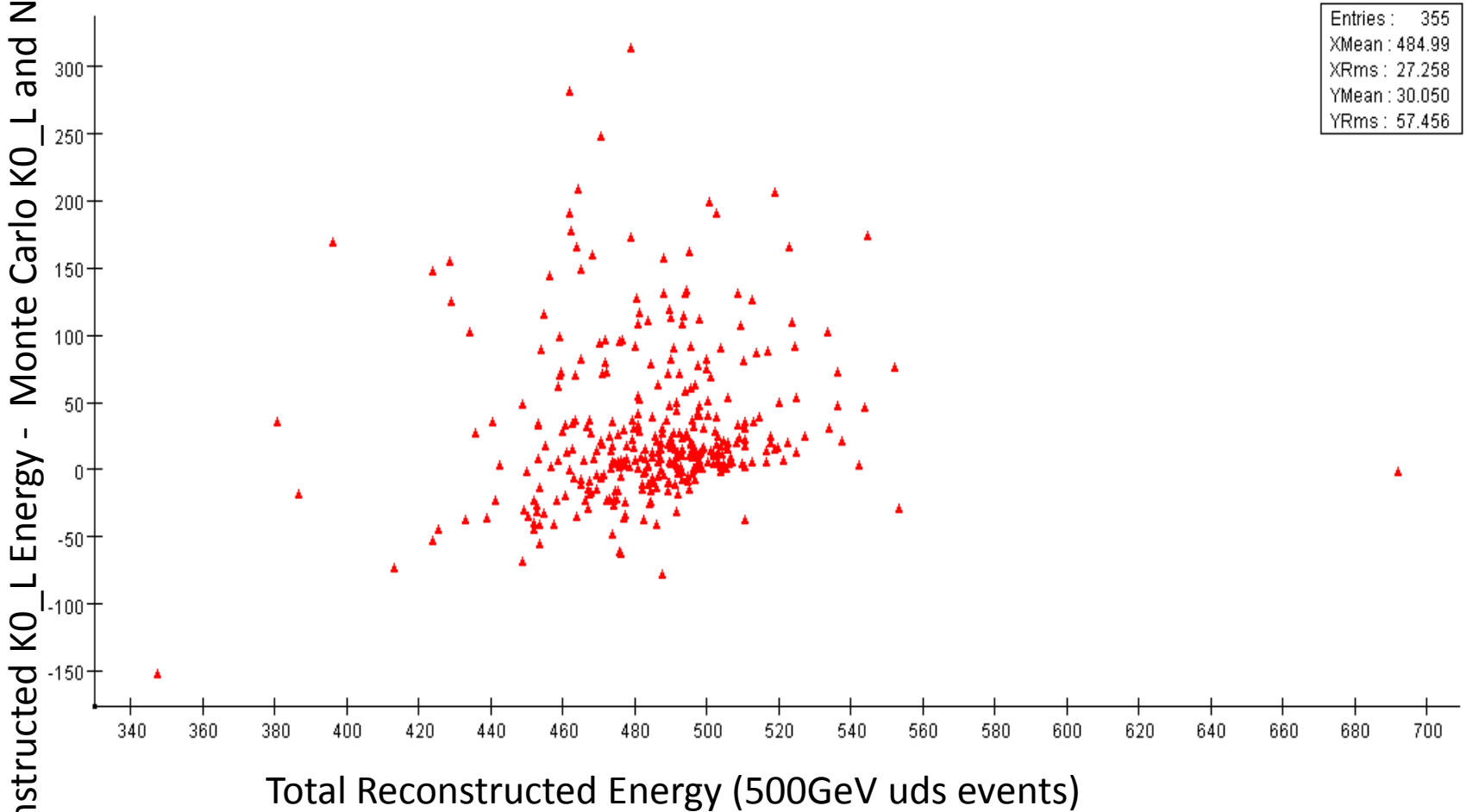
Last Time

- We found that more than 10% of 50GeV single photon events were being reconstructed incorrectly.

50 GeV γ (4350 events)	0 photons	1 photon	2 photons	3+ photons
0 KOL's	2	3502	52	0
1 KOL	272	485	4	0
2 KOL's	6	20	0	0
3+ KOL's	2	4	1	0

- We believe that this mis-identification of particles will affect the energy resolution.

Does this Affect Total Energy Resolution ?



The Current Study

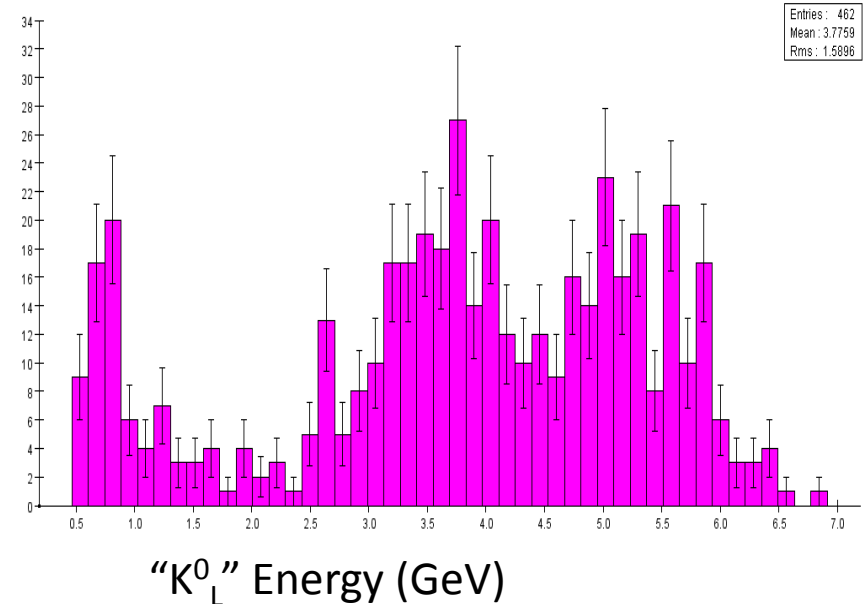
- We chose to study 5GeV single photon events, because 5GeV photons are more common in jets.
- Also, these showers rarely make it all the way to the HCAL, thus removing one possible reason why the particles would be reconstructed as K_L^0 's instead of photons.

5000 5GeV Single γ Events

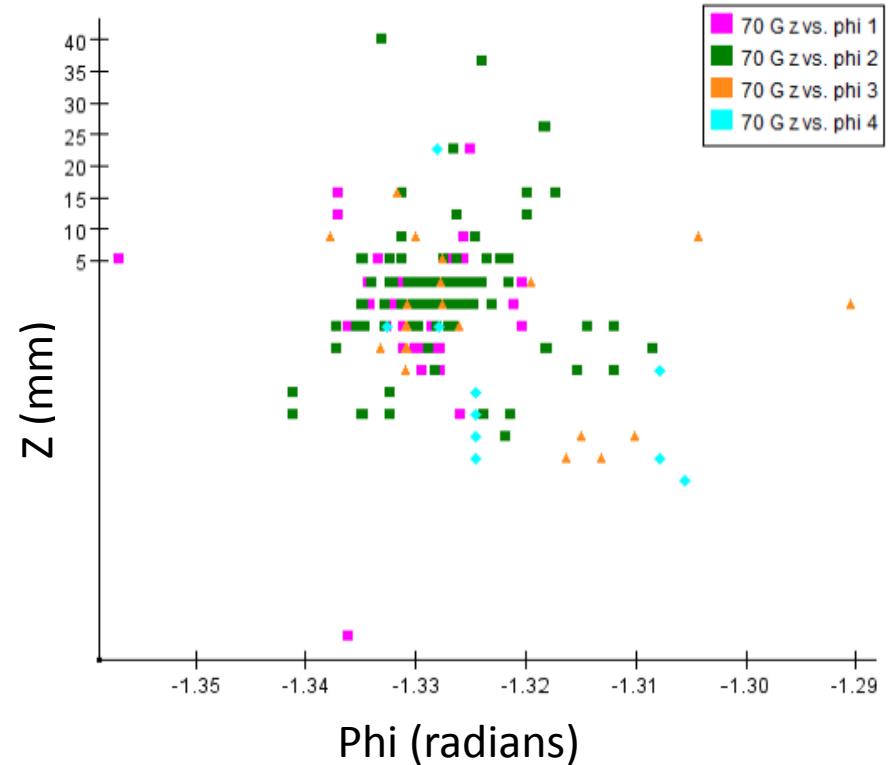
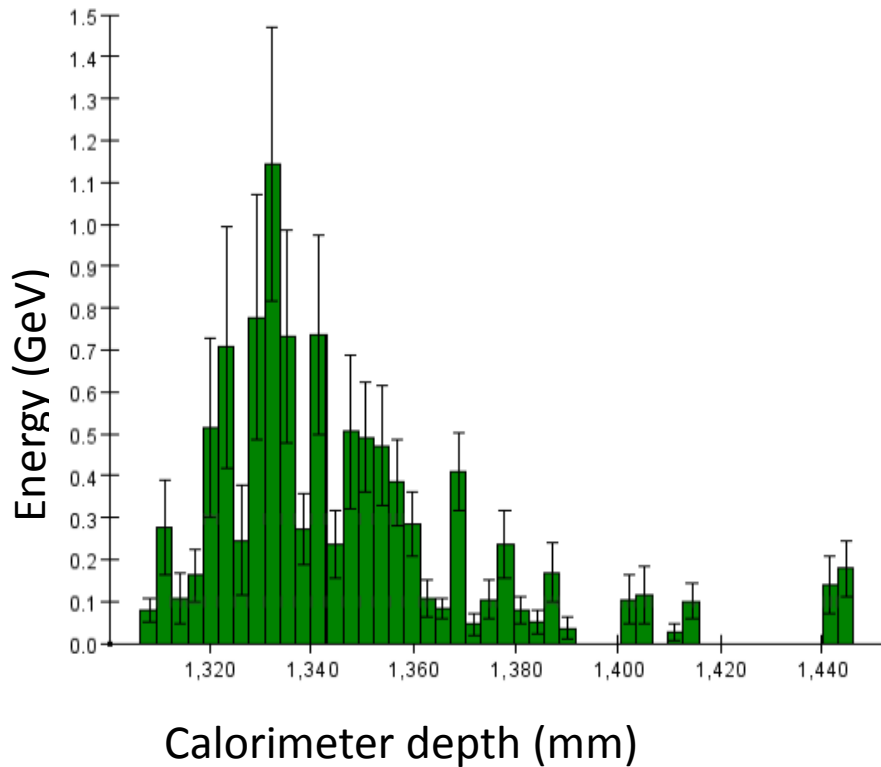
5 GeV γ (5000 events)	0 photons	1 photon	2 photons	3+ photons
0 K0L's	12	4165	391	10
1 K0L	145	221	14	4
2 K0L's	8	26	2	0
3+ K0L's	1	1	0	0

Outcomes of Interest:

- Only One Photon
- Only One K^0_L
- Two Photons (really $\gamma \rightarrow e+e^-$)
- One Photon and One K^0_L
 - Split transversely
 - Split longitudinally



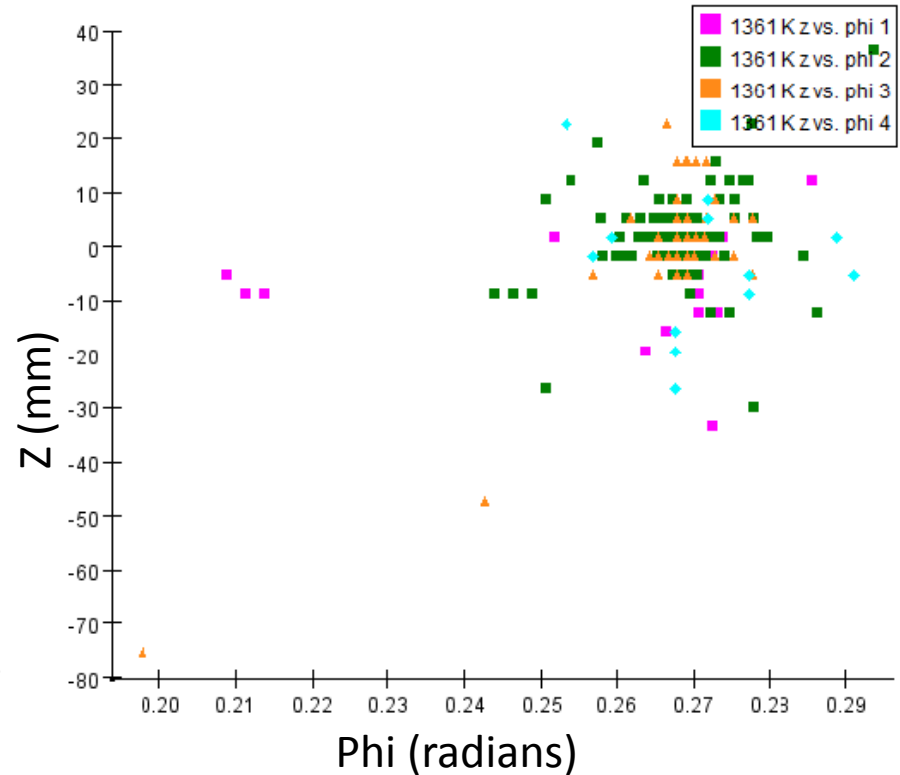
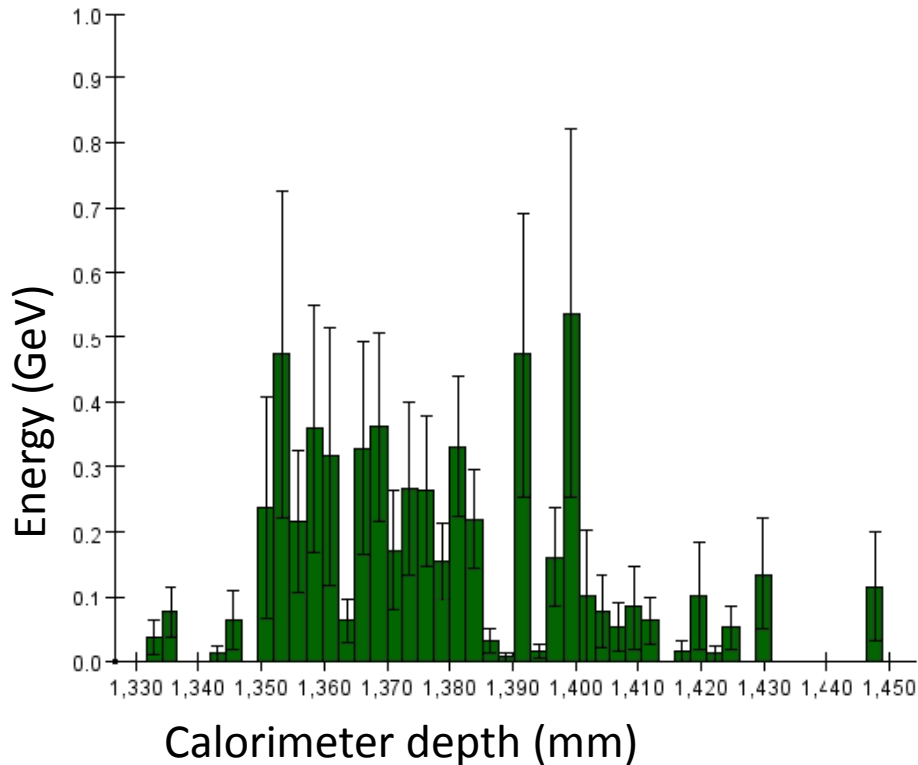
Only One Photon



First plot - energy deposited in the ECAL by the photon vs. the distance from the IP.

Second plot - the position of the photon.

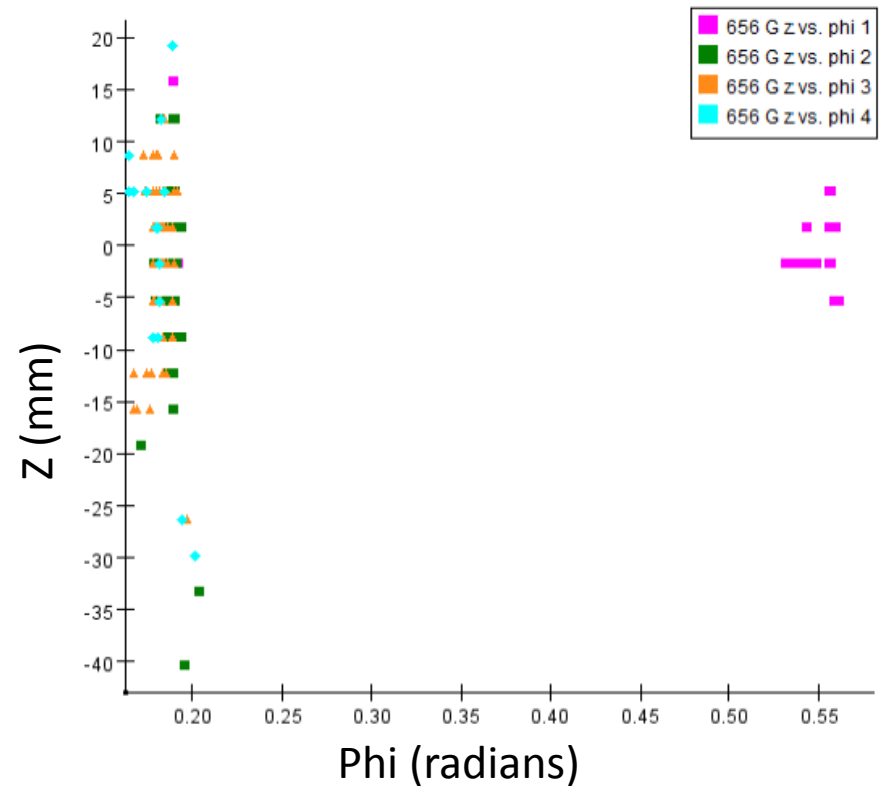
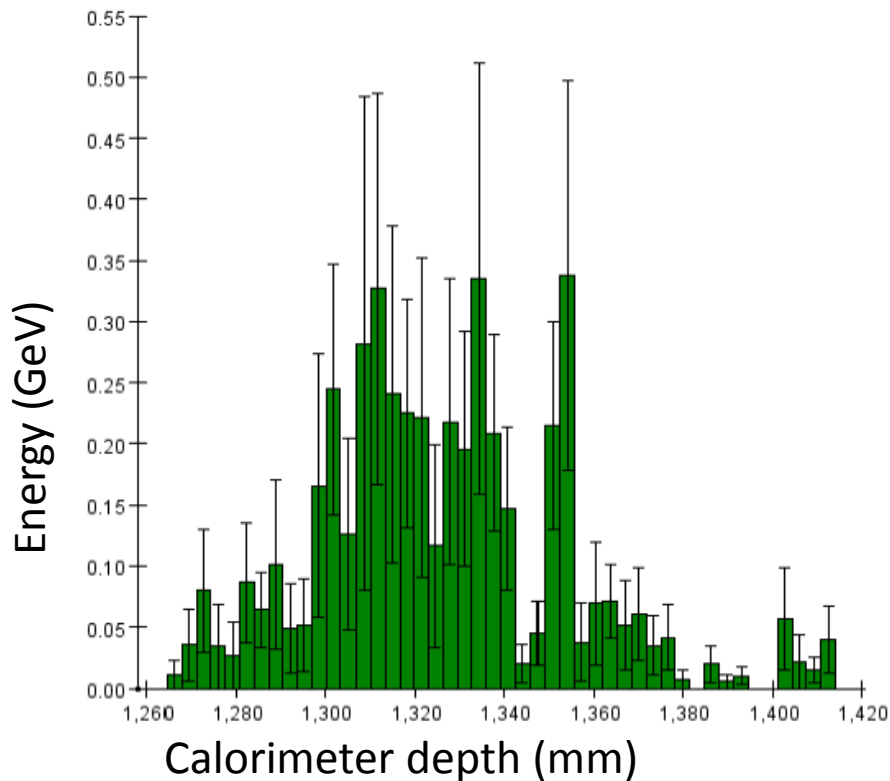
Only One K_L^0



First plot - energy deposited in the ECAL by the K_L^0 vs. the distance from the IP.

Second plot - the position of the K_L^0 .

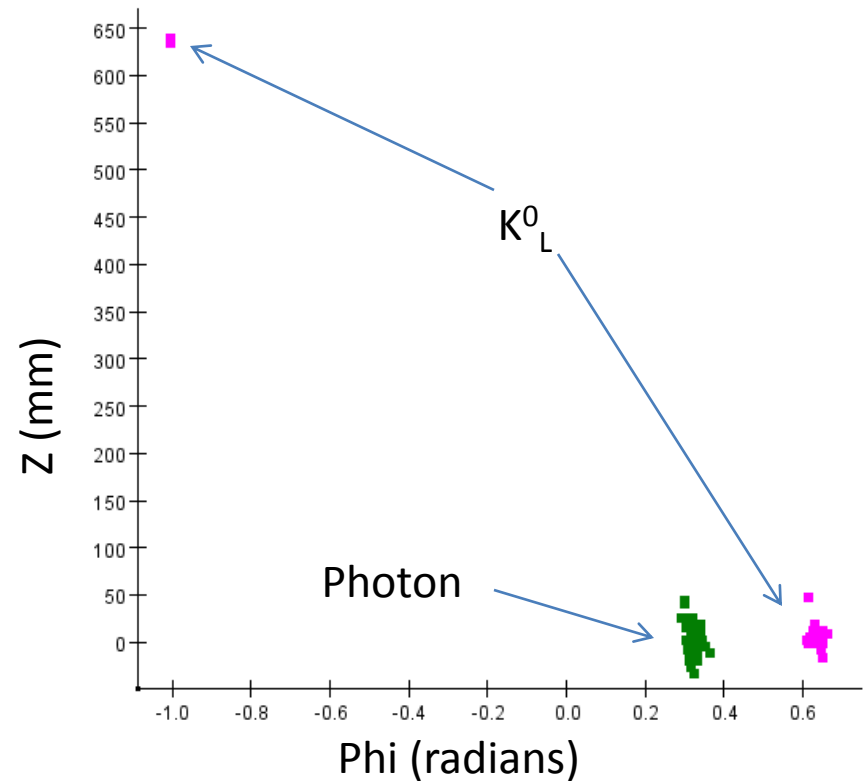
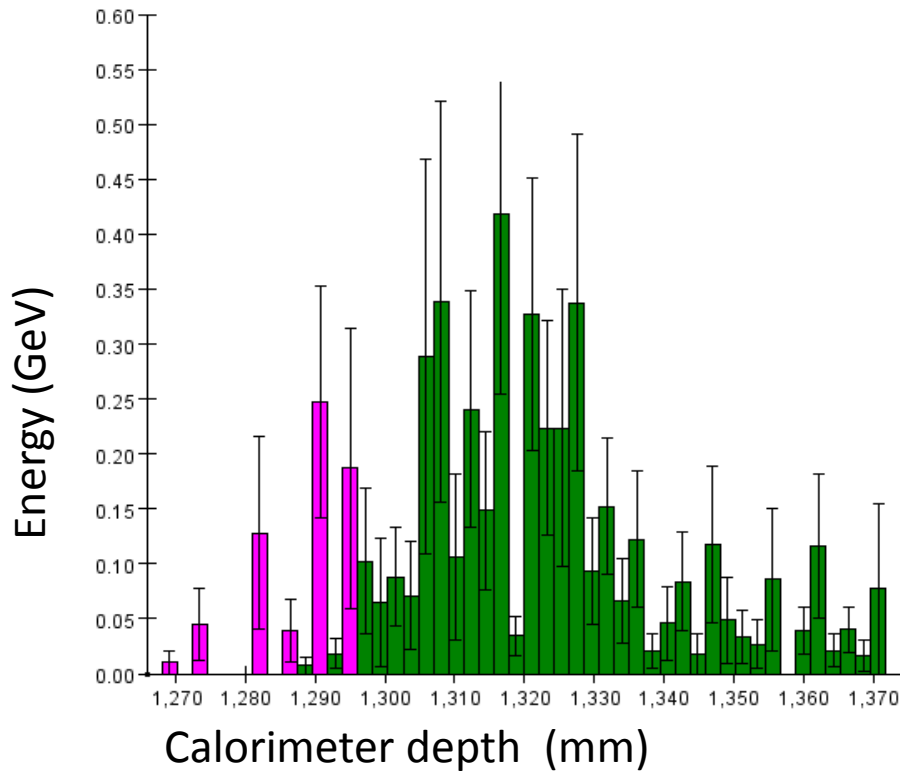
Two “Photons” ($\gamma \rightarrow e^+ e^-$)



First plot - energy deposited in the ECAL by the photons vs. the distance from the IP.

Second plot - the positions of the first and second photons.

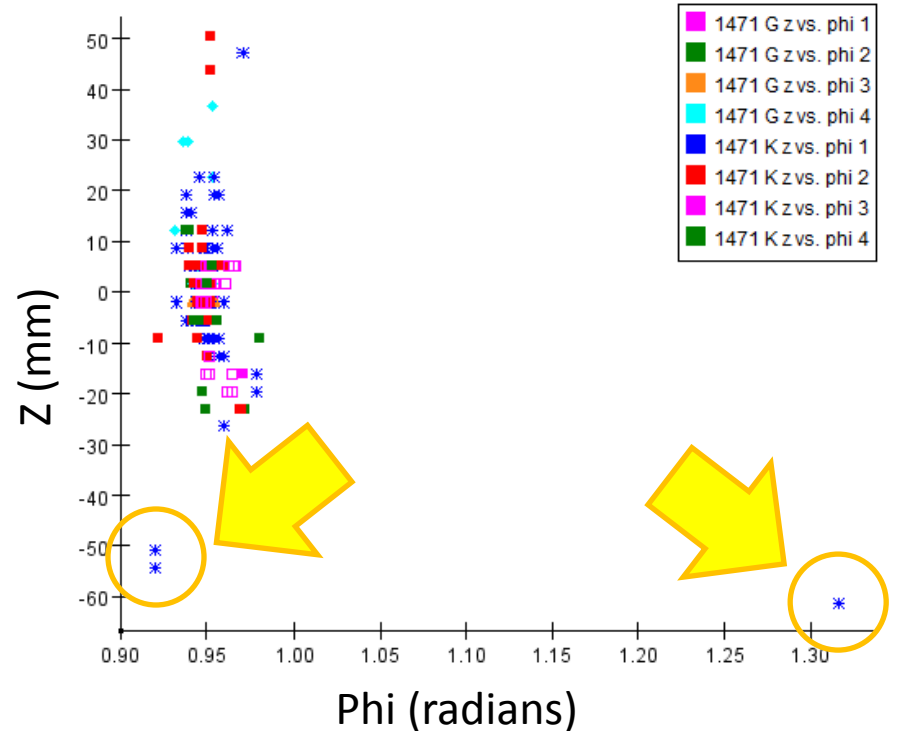
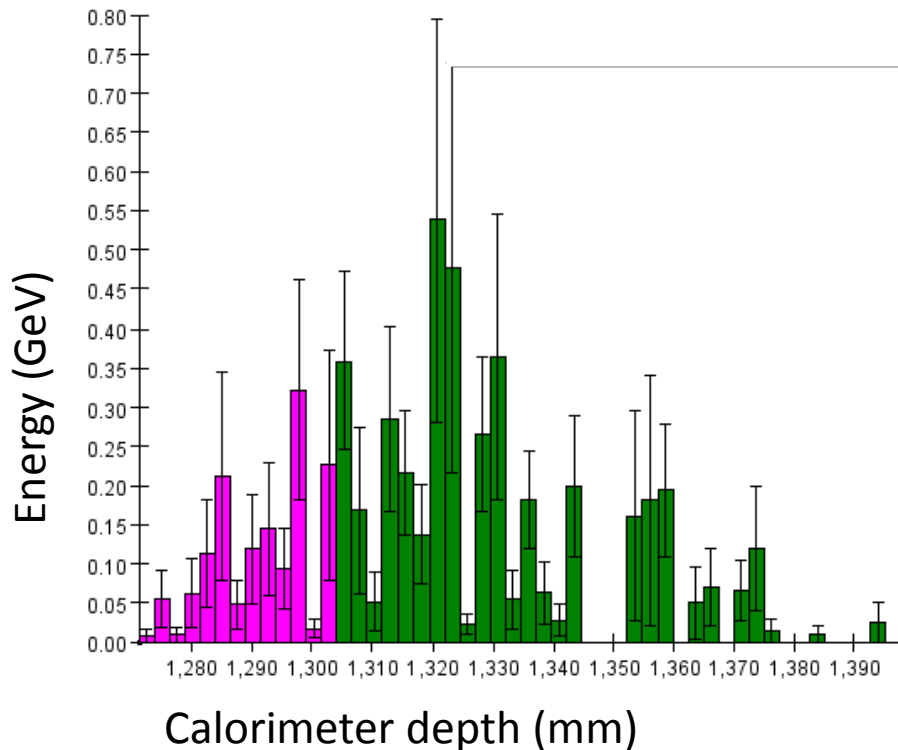
One Photon and One K_L^0



First plot - energy deposited in the ECAL by the photon and the K_L^0 vs. the distance from the IP.

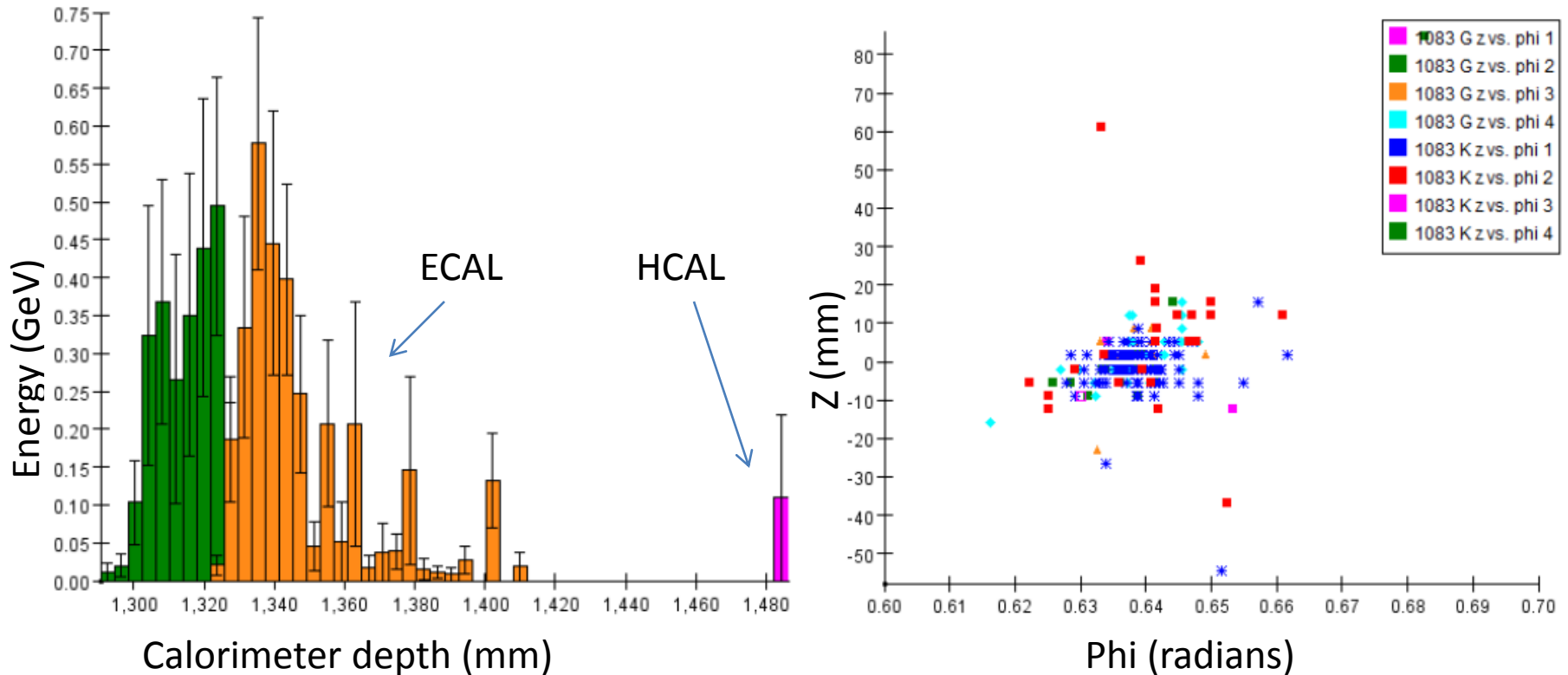
Second plot - the position of the photon and the K_L^0 . Notice the one hit really far from all of the others that is part of the K_L^0 .

Photon first, then K^0_L



The first plot shows the amount of energy deposited in the ECAL by the **photon** and the K^0_L vs. the distance from the IP. All of the hits on the Z vs. Phi plot (above right) are in roughly the same space, except for **a few of the dark blue ones** (which are in the beginning of what is called a K^0_L). Perhaps this spreading-out is what causes the algorithm to tag the second half of this shower as a K^0_L ?

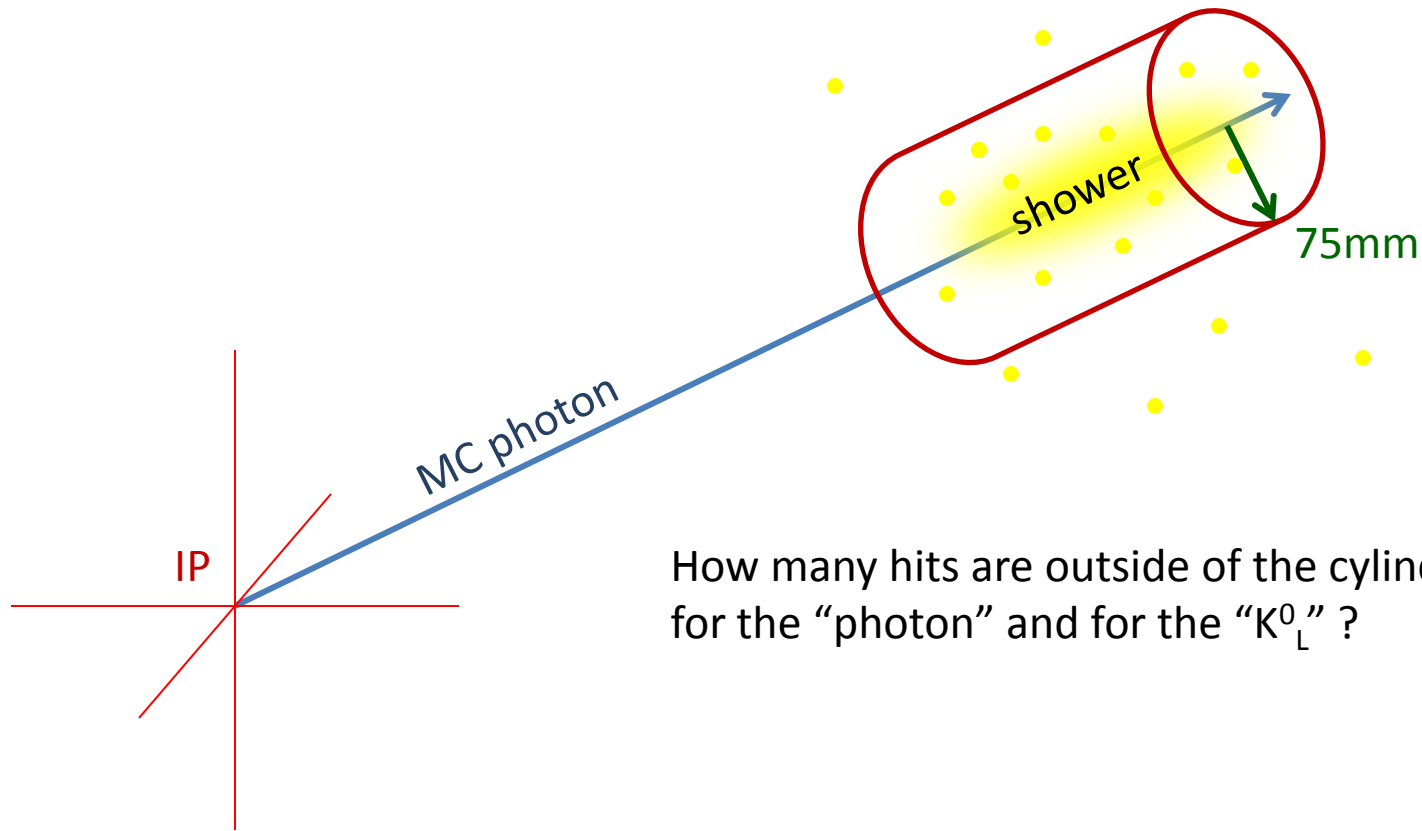
Photon first, then K^0_L (reaches HCAL)



First plot - energy deposited in the ECAL by the photon and the K^0_L vs. the distance from the IP. (There is some leakage into the HCAL in this event)

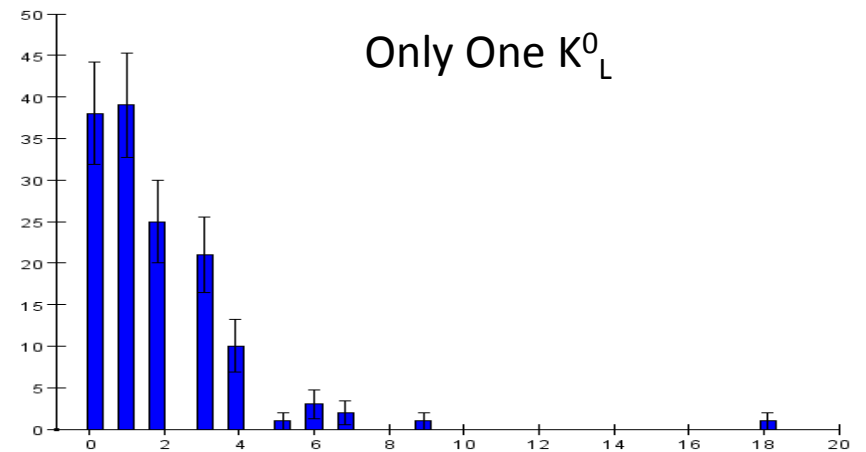
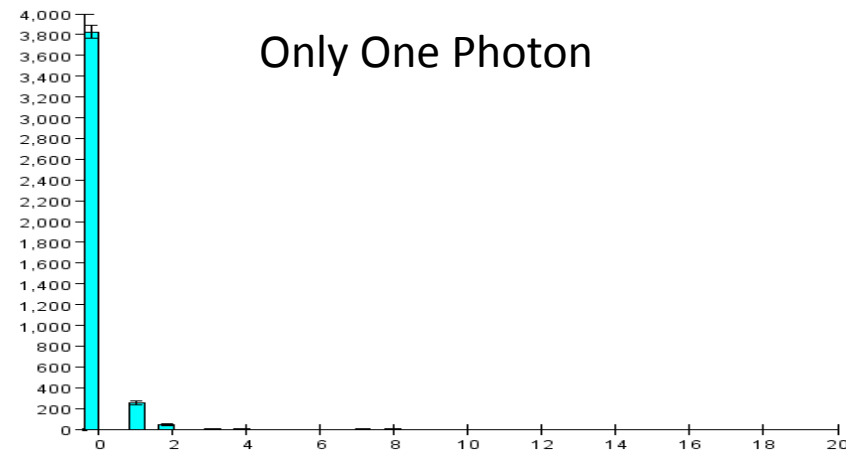
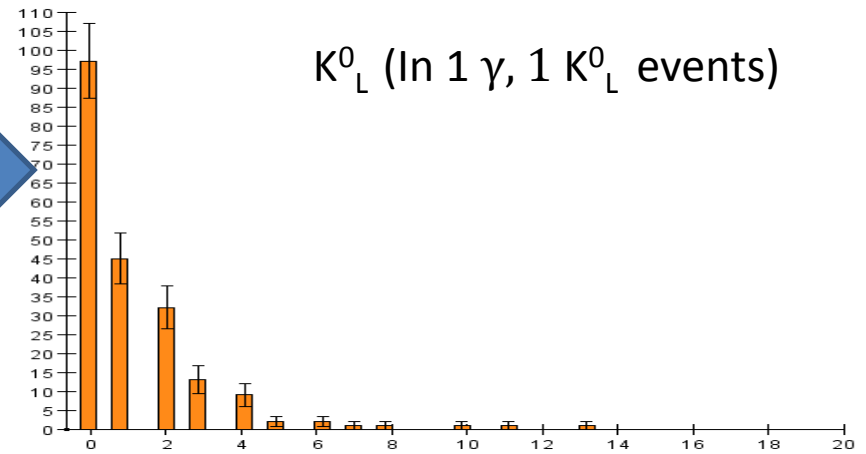
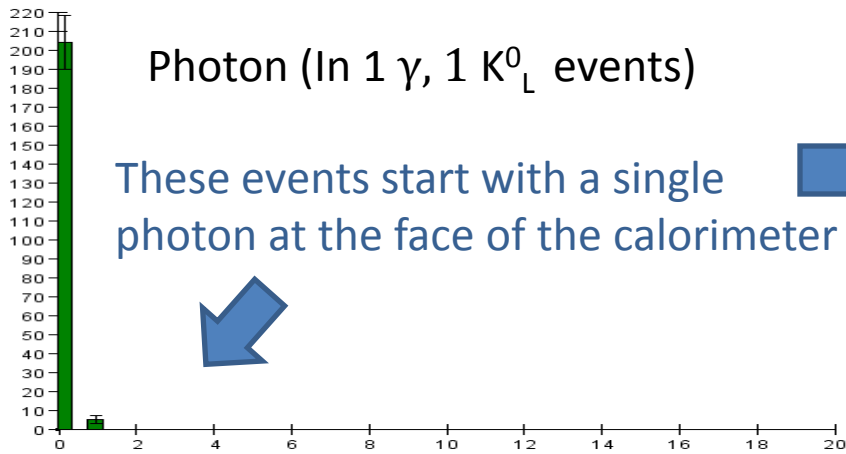
Second plot - the position of the photon and the K^0_L . (They are on top of each other.)

Testing the Hypothesis – One Photon AND One K^0_L events



How many hits are outside of the cylinder
for the “photon” and for the “ K^0_L ” ?

Hits outside the cylinder



of hits/event further than 75mm from the MC photon's direction

Result: The " K^0_L " contains more hits outside of the cylinder.
It is clear that the part of the shower tagged as a K^0_L is more spread out.