

No pion contamination

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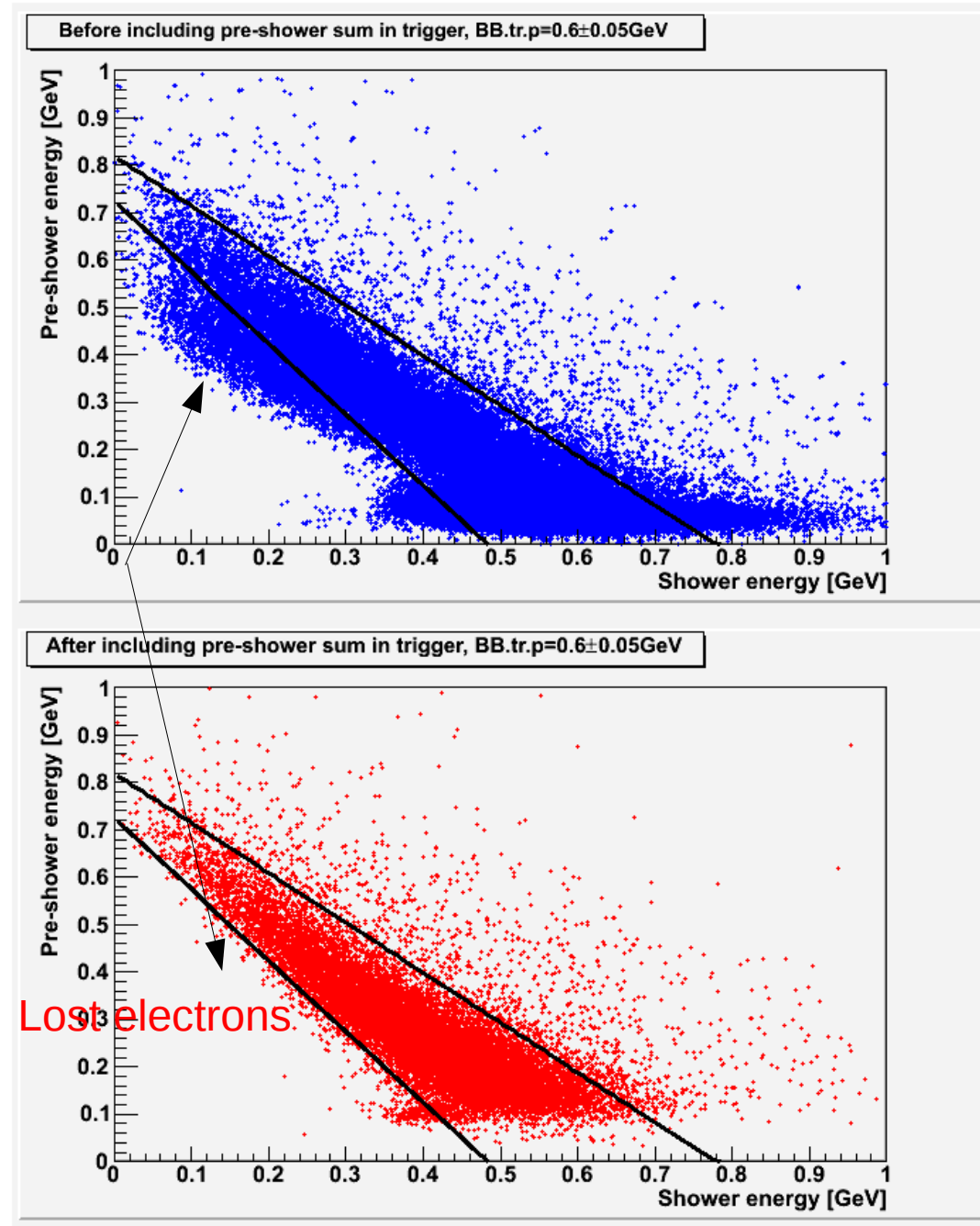
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Including pre-shower sum in trigger

This plot is produced with **good_electron** cut minus pre-shower energy cut > 0.2 GeV and **eoverp** cut ($E_{\text{calo_total}}/P$).

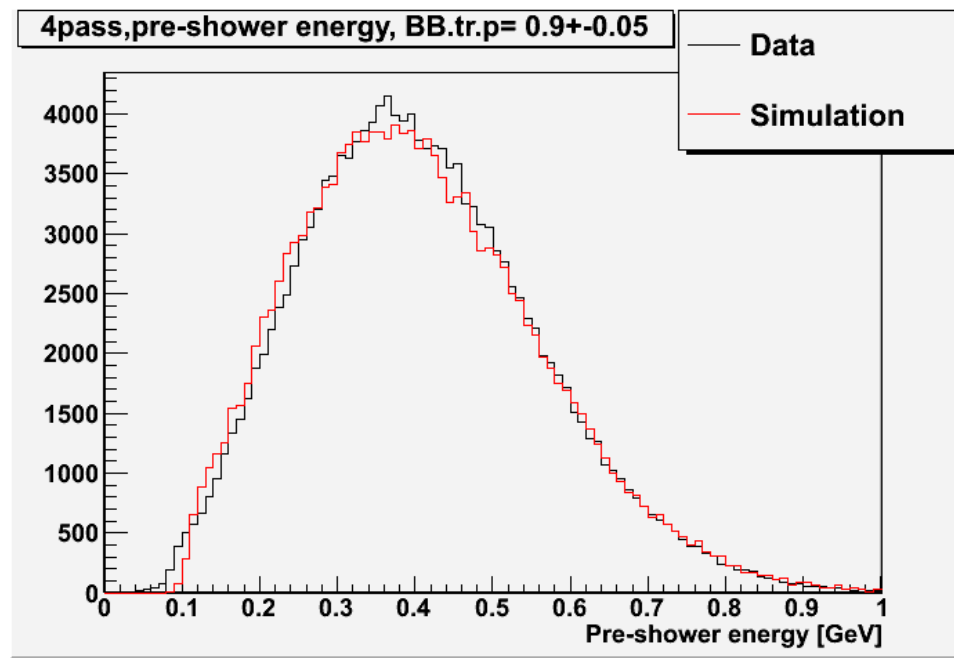
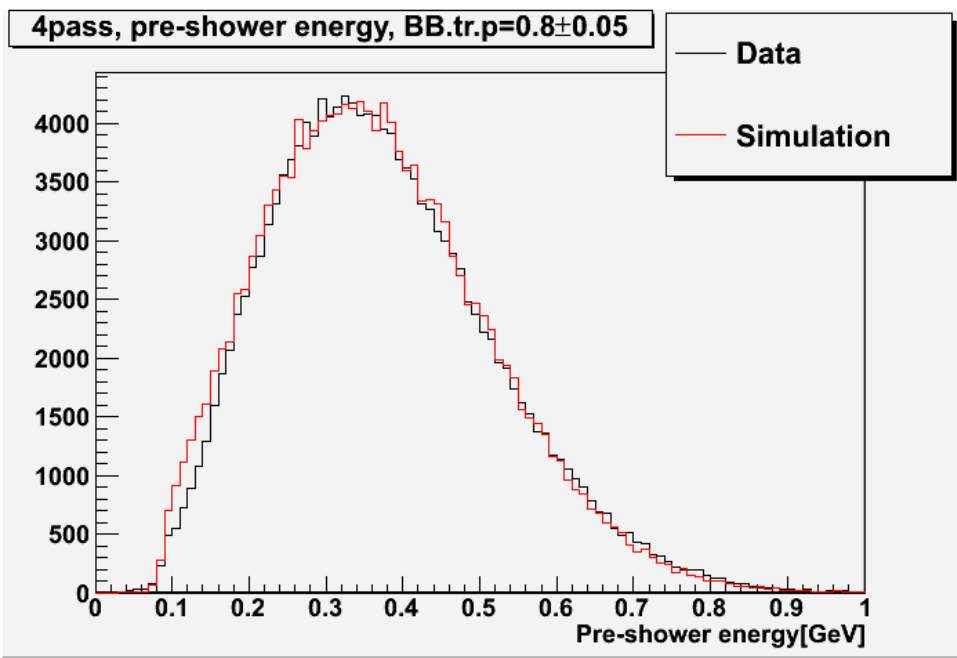
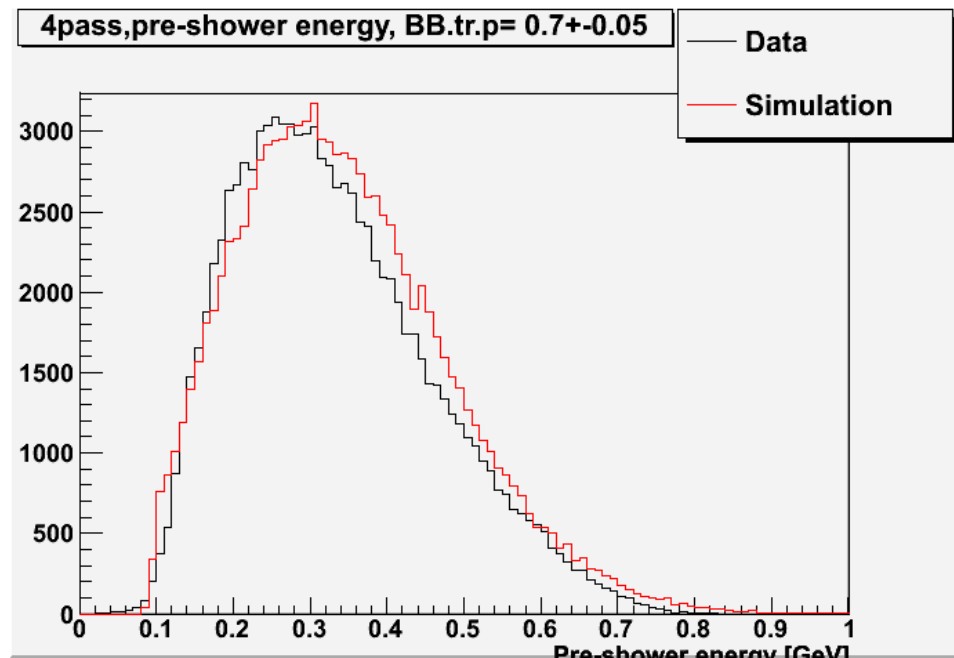
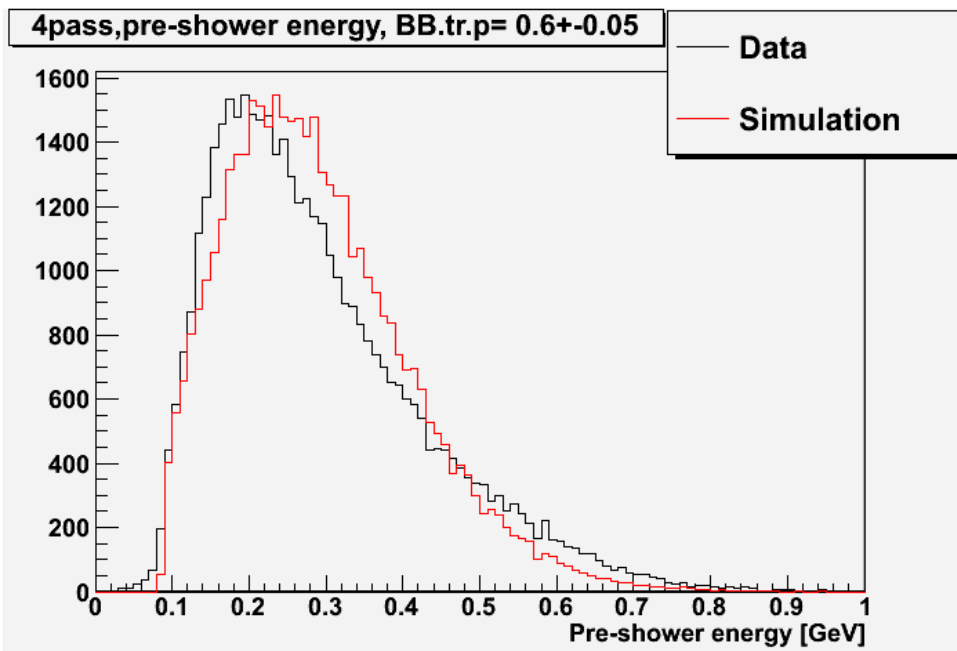
Top plot is pre-shower energy vs shower energy for track momentum 0.6 ± 0.05 GeV, bottom plot is the same but after including pre-shower sum into trigger.

After including pre-shower sum into trigger about 25% of electrons at this momentum bin were lost due to thresholds in calorimeter being too high. The energy threshold on total shower was about 0.72 GeV when most of the energy of the particle were deposited in the pre-shower, see the red plot. This threshold decreased as there was more energy deposited in the shower, see the red plot. The consequence of this is an energy spectrum of pre-shower that looks peaked near low energy. This problem does not exist before including pre-shower in trigger logic (see blue plot). In my simulation I did not have total shower energy cut as high as 0.72 GeV, I had a cut of $E_{\text{ps}} + E_{\text{sh}} > 0.5$ GeV and it caused disagreement between simulation and data. After applying an identical high threshold cut disagreement between simulation and data almost disappeared (see next page). Unfortunately this confused me into thinking that there is pion contamination at low energy since the effect of pion contamination would have a similar energy distribution in the pre-shower.



Data and Simulation

These plots are produced with `good_electron` cut, plus momentum cut indicated in the title.



Conclusion

Inclusion of pre-shower sum into total calorimeter trigger causes energy distribution shape change in pre-shower and shower for electron energy range 0.6-1.0 GeV.

The changed energy distribution shapes can be confused as being produced by negative pion contamination: number of pions increase at lower pre-shower energy.

After including the equivalent energy cut in simulation, agreement between simulation and data is archived.

Simulation confirms that there is no significant pion contamination after **good_electron** cut.