Energy Estimator Studies

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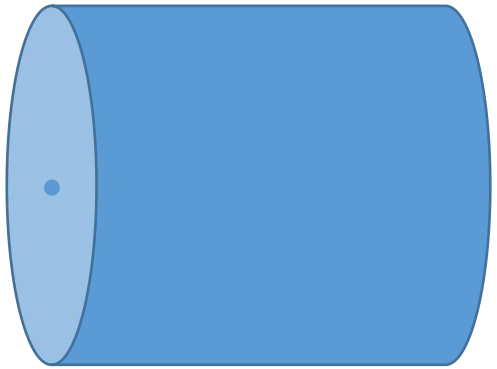
Outline

- The energy measurement of Pion in Ecal at the hit level and cluste level
- The energy measurement of Pion in Ecal+Hcal at hit level

Calorimeter model

- The electromagnetic calorimeter is Si - W(tungsten)sandwiching and high granularity
- The structure of hadron calorimeter use materials such as Iron and air



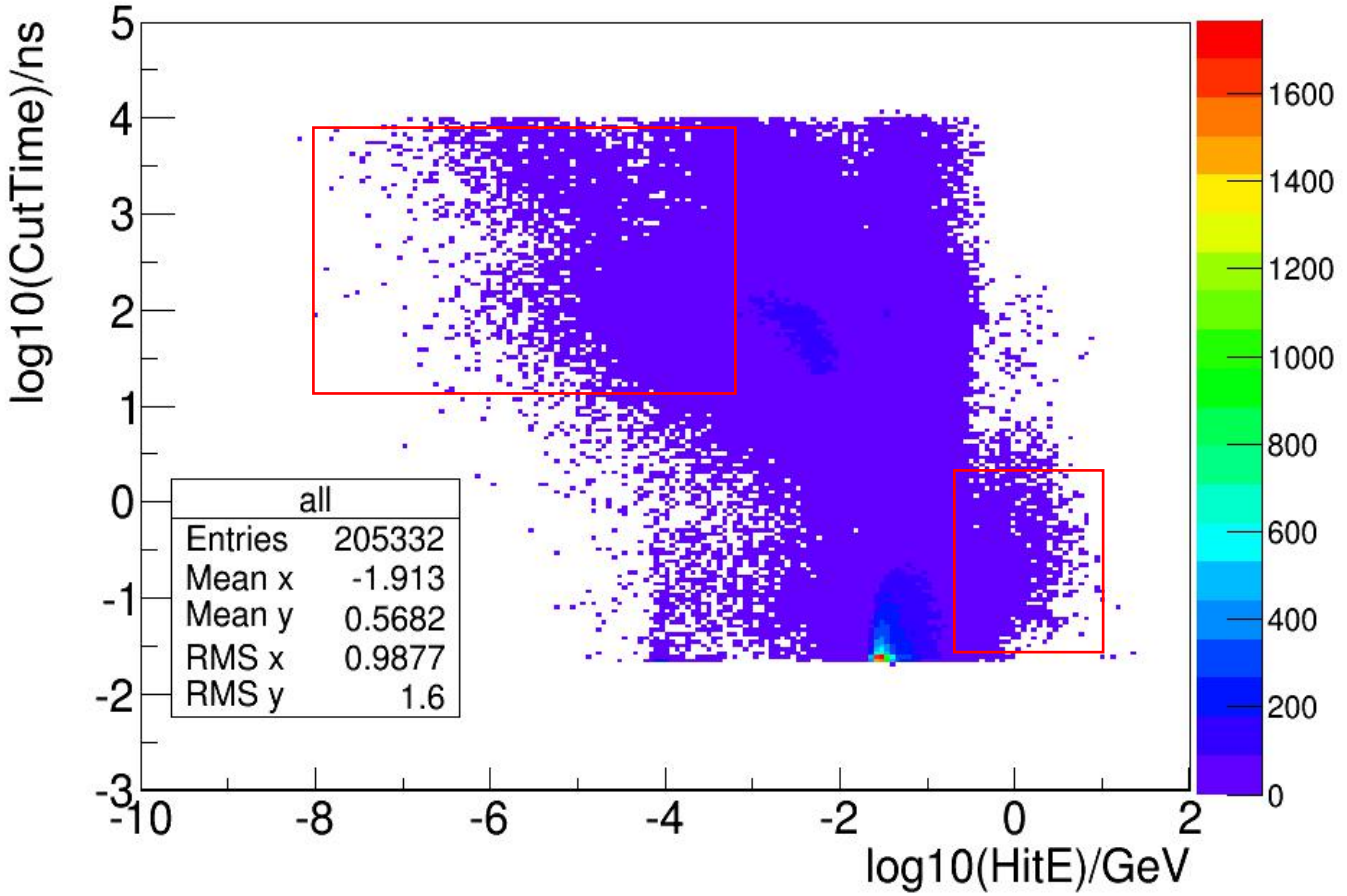
- The structure of Ecal

Si:0.3;(Cu:0.5,W:10,Cu:0.3,PCB:1.2,Si:0.3,Air:0.5)*240

- The structure of Ecal+Hcal
  Si:0.5;(Cu:0.5,W:0,Cu:0.5,Si:0.5,PCB:1.2,Air:0.5)*20;(Cu:0.5,W:0,Cu:0.5,Si:0.5,PCB:1.2,Air:0.5)*10;(Iron:0,RPC1:1.2,PCB:1.2,Air:0.5)*40

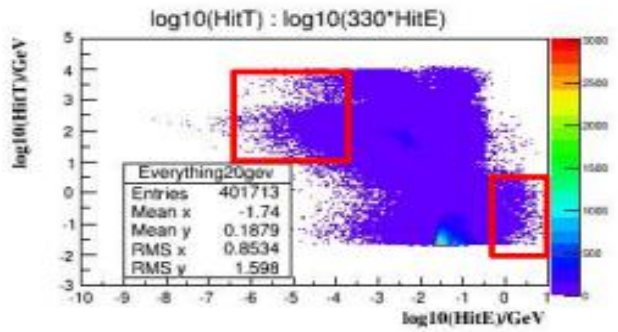
ZeroThickReset 1.4*20,2.8*10,25*40

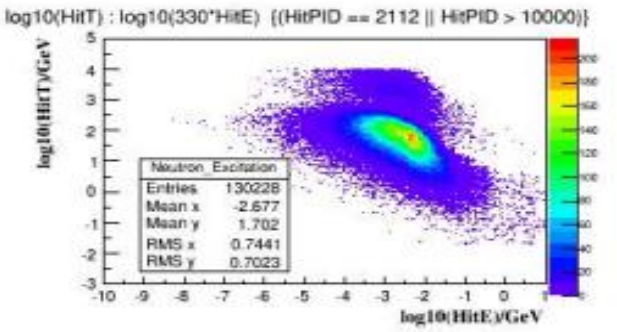
optimize the energy measurement of Pion

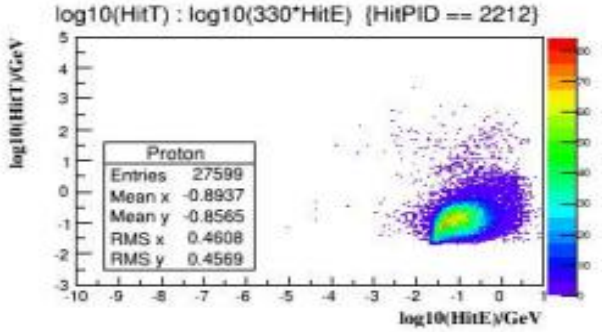


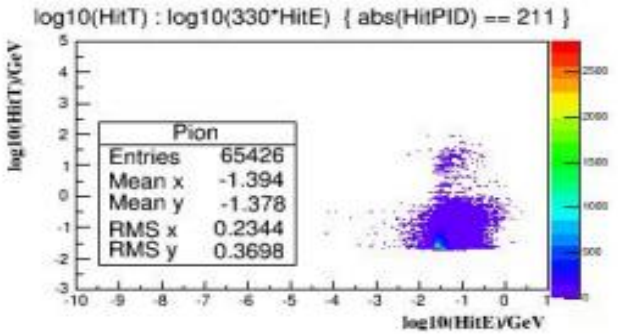
It is showed that 10 GeV pion events, to deal with the hits that high-energy fast component on the right and low-energy slow component on the left

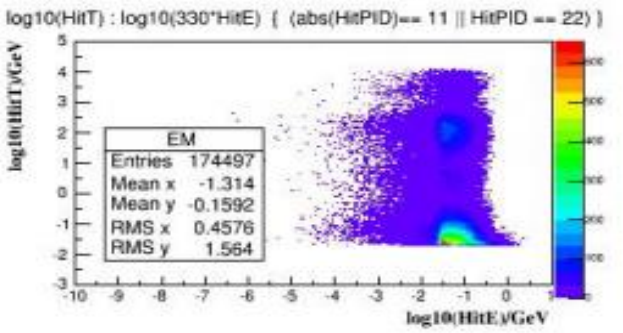
Hit come from what particles

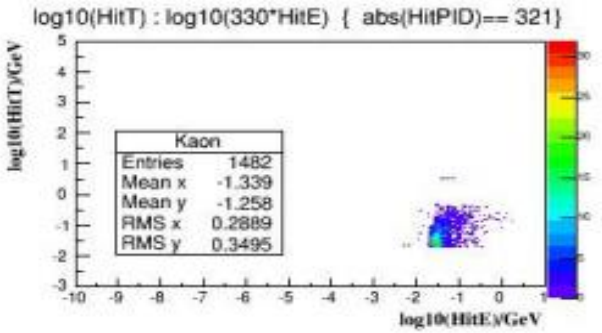


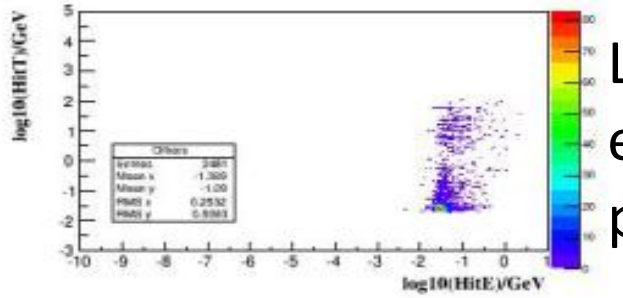








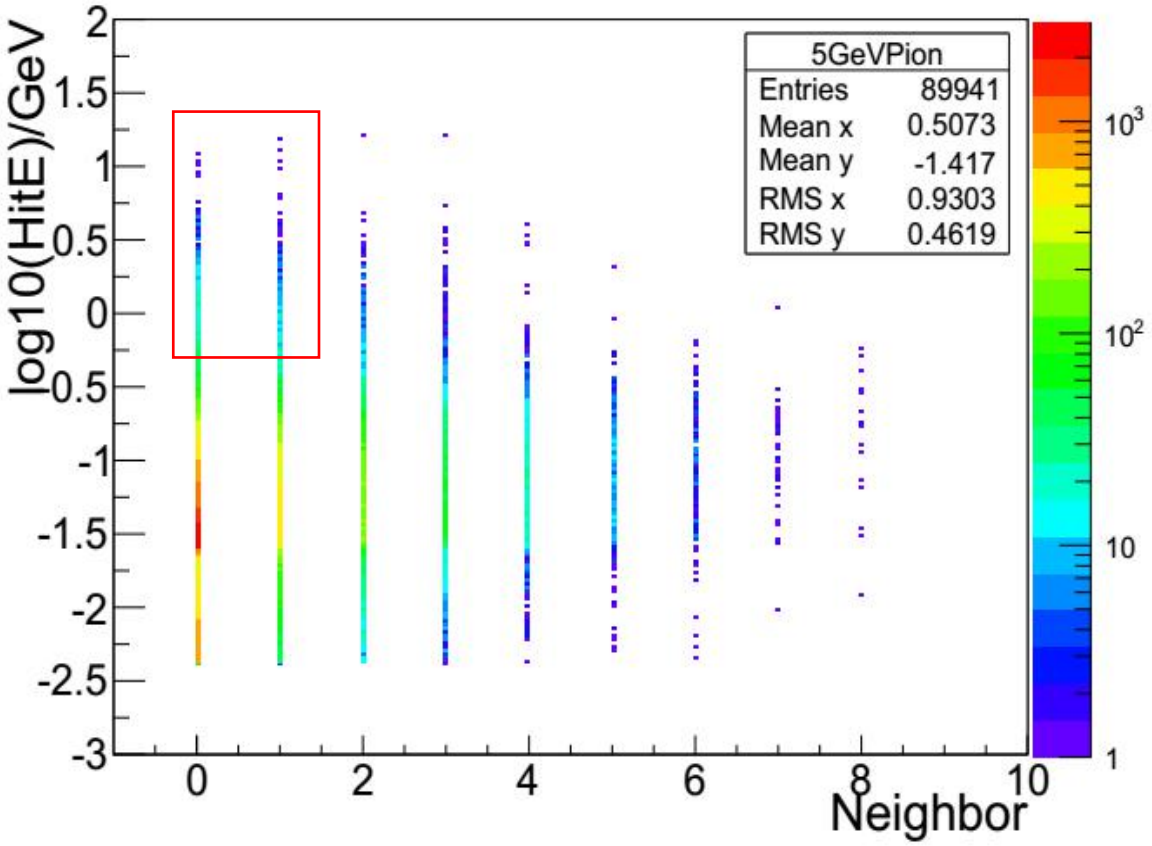




Low energy hit mainly come from neutron,high energy hit mainly come from neutron and proton and EM

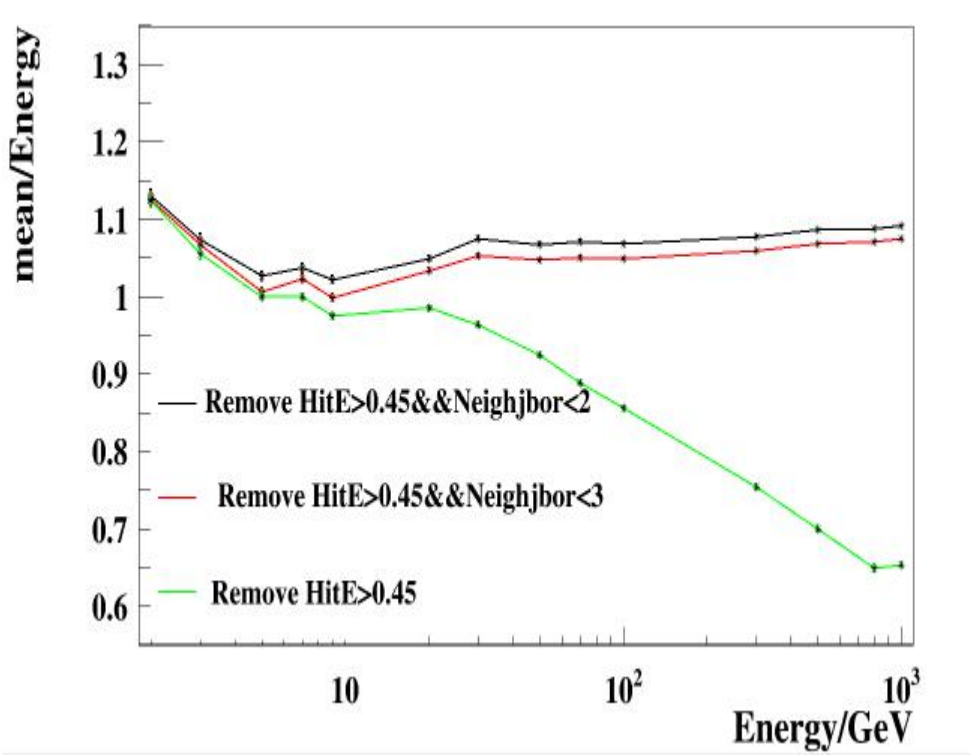
The number of Hit from different particles

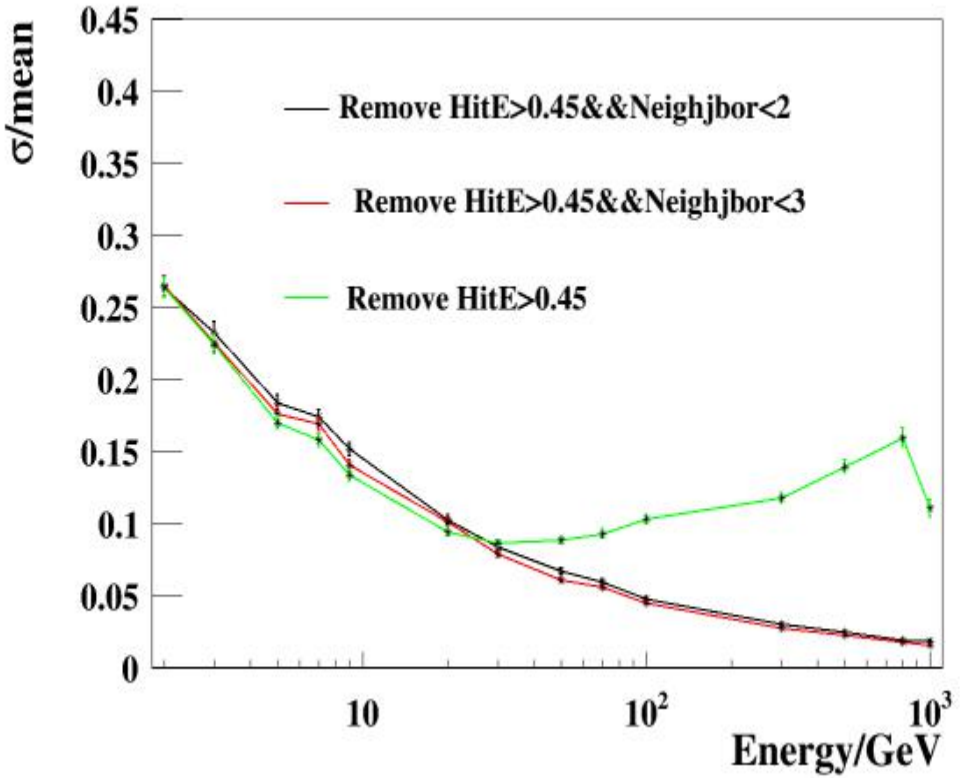
	Neutron_Excitation	Proton	Pion	EM	Kaon	others
HitE>0	130228	27599	65426	174497	1482	2481
HitE>0.45	277	3352	167	972	15	23
HitE>0.45&& Neighbor<2	227	2408	85	12	11	16
HitE>0.45&& Neighbor<1	165	1556	33	5	5	9



Through the table we can know high-energy hit is mainly produced by the hadron hit, may be related to high energy nuclear reactions

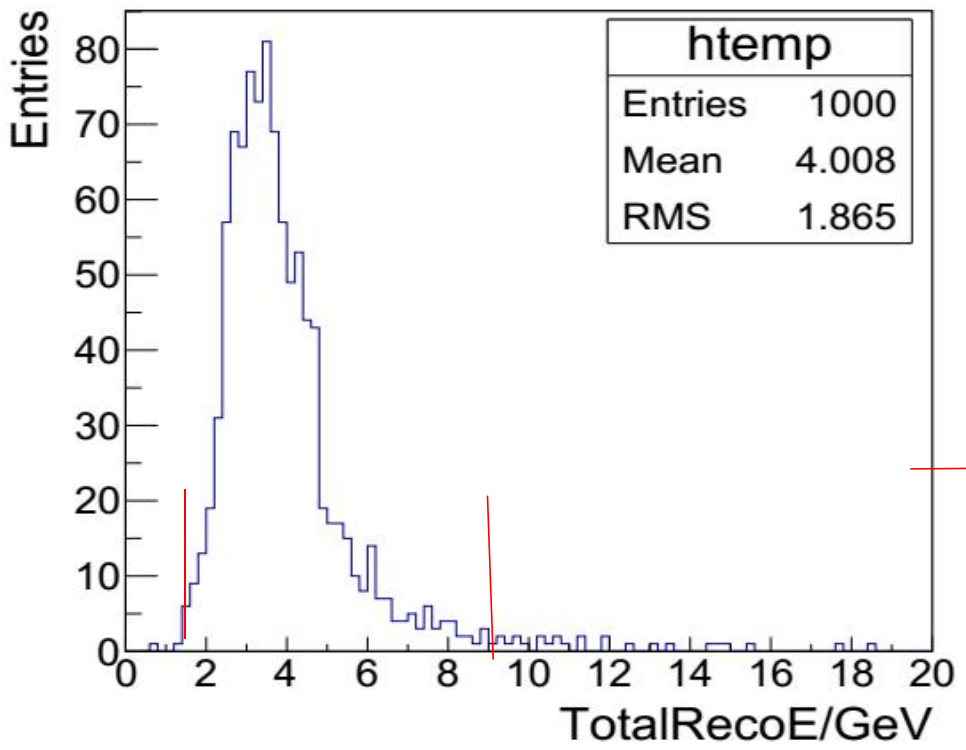
Use the Neighbor variables

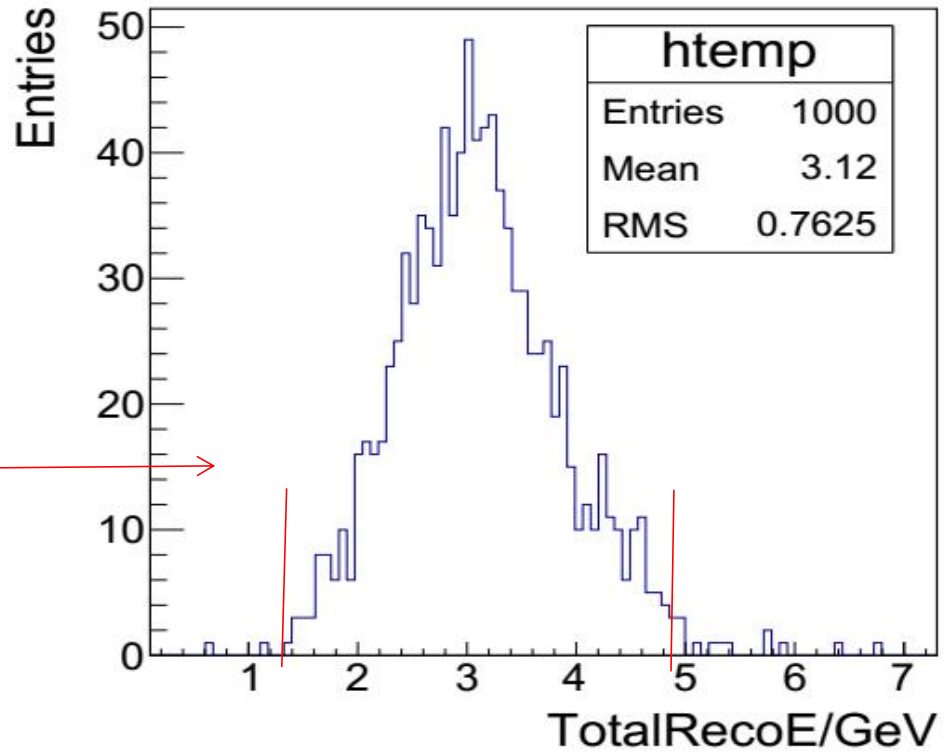




To remove all the high energy hits,the energy measurement is bad

The change of energy distribution

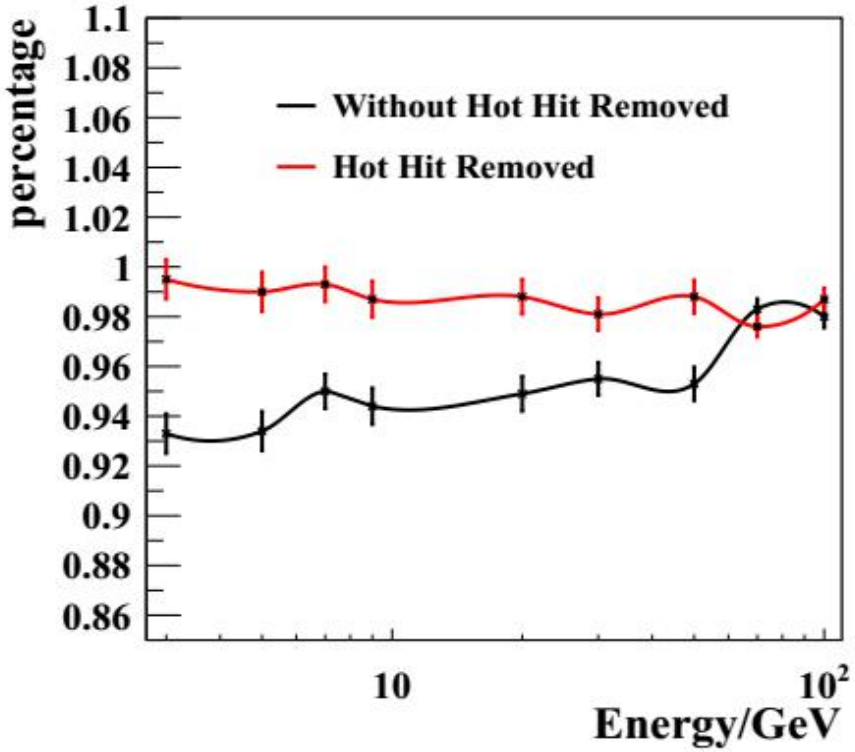




3 sigma

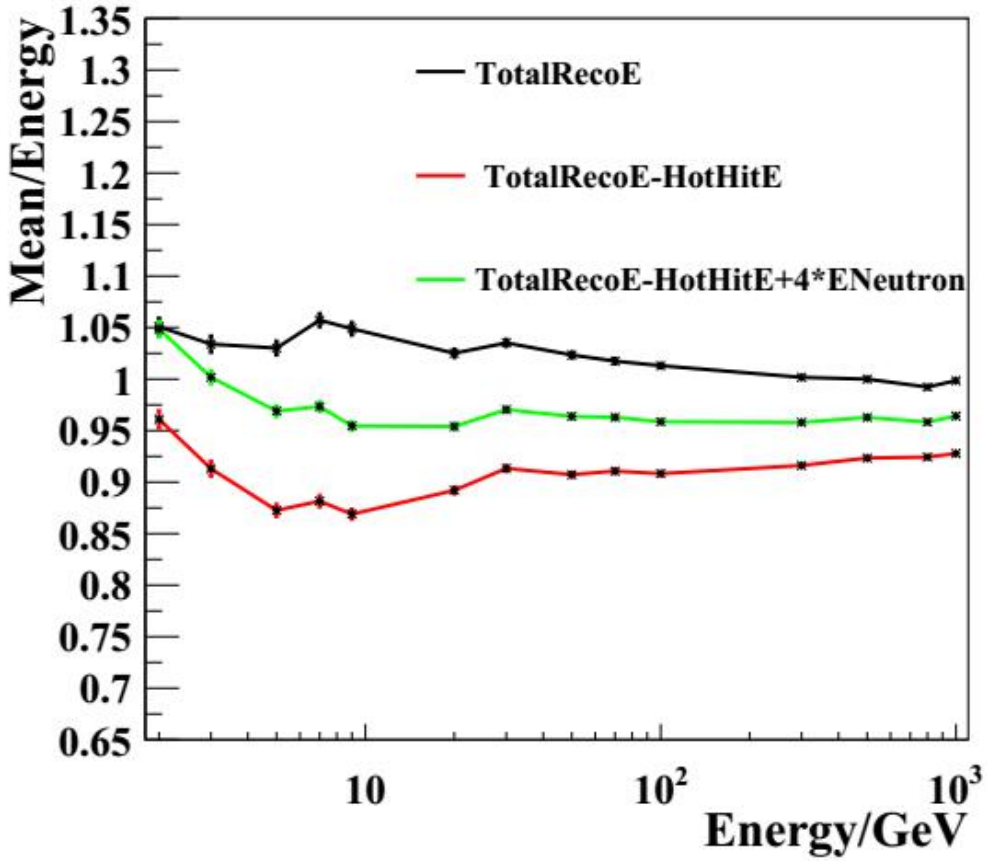
This is 3 gev Pion events,with the hothit removed,the long tail disappears

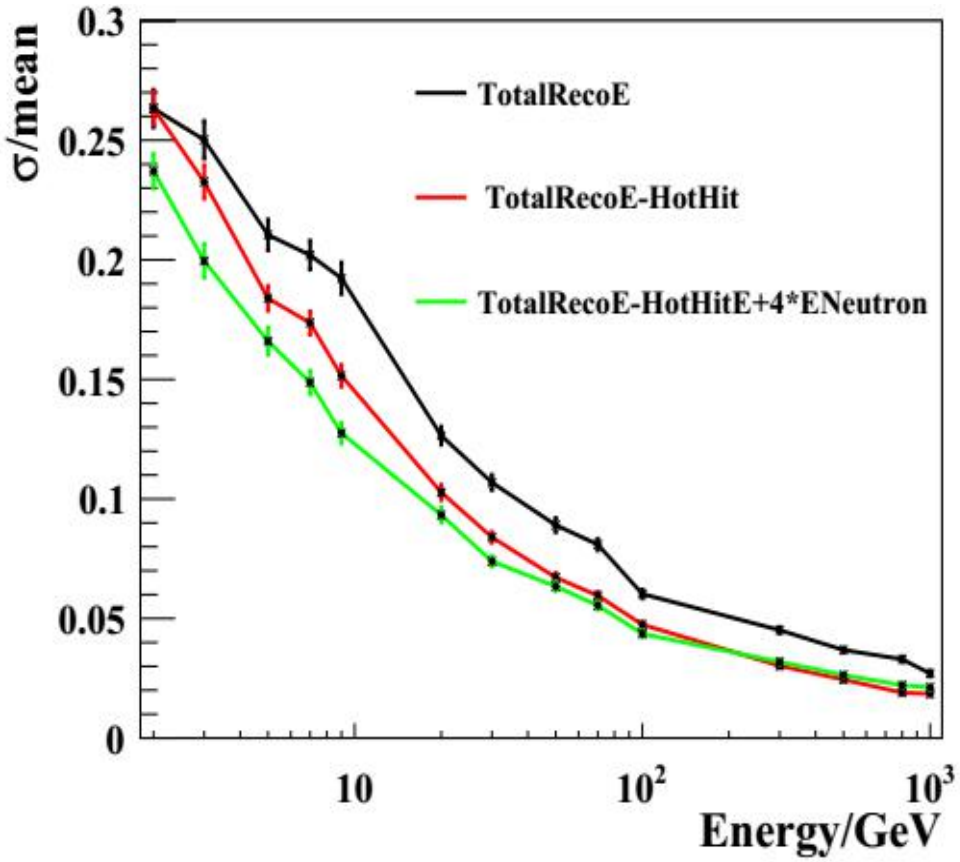
The percentage of particles in a certain area



With the hothit removed,the energy distribution has changed,the percentage of particles that energy in the range mean-3*sigma to mean+3*sigma has improved with hothit removed

Energy linearity and resolution

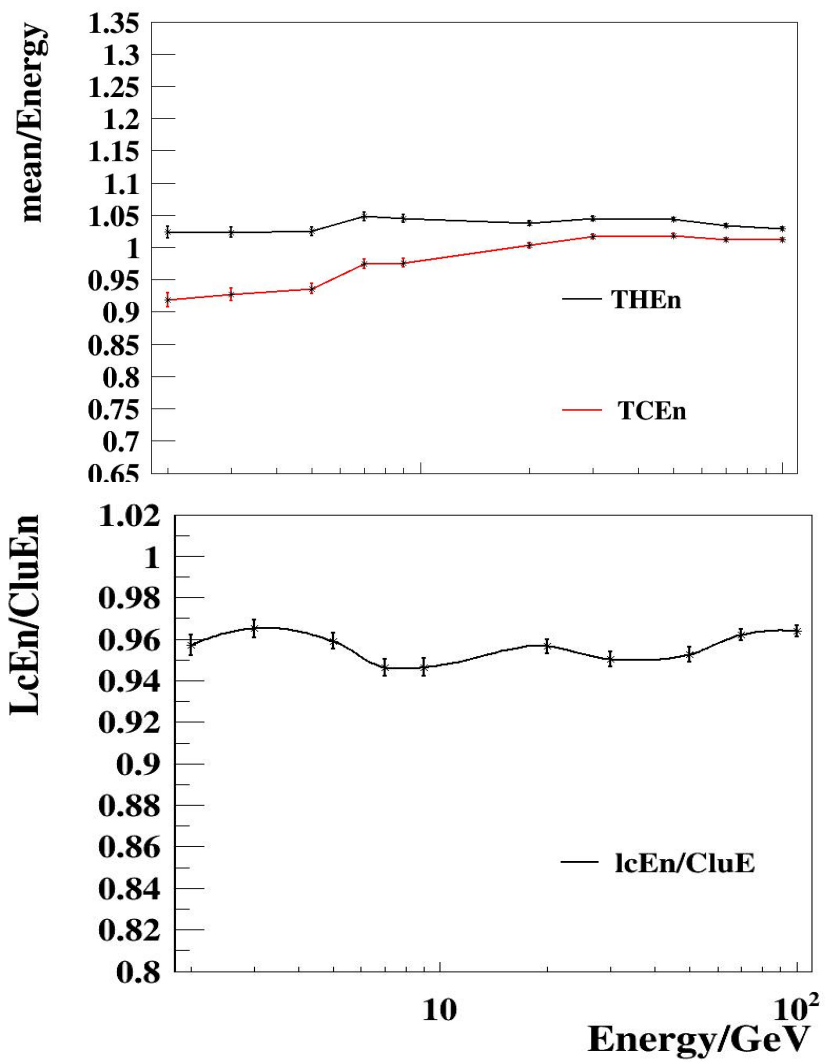


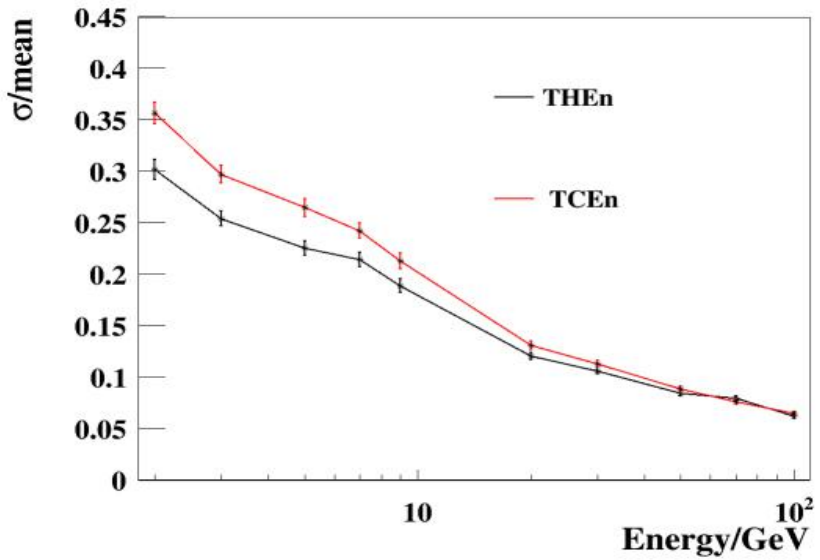


With the hothit removed and increase the weight of low energy neutrons can make energy resolution to be better 15% to 30% in the range 1-1000 GeV

N0_Netron selection is log10（HitE/330)<-4.2,HiT>1,Neighbor==0
HotHitE:HitE>0.45,Neighbor<2

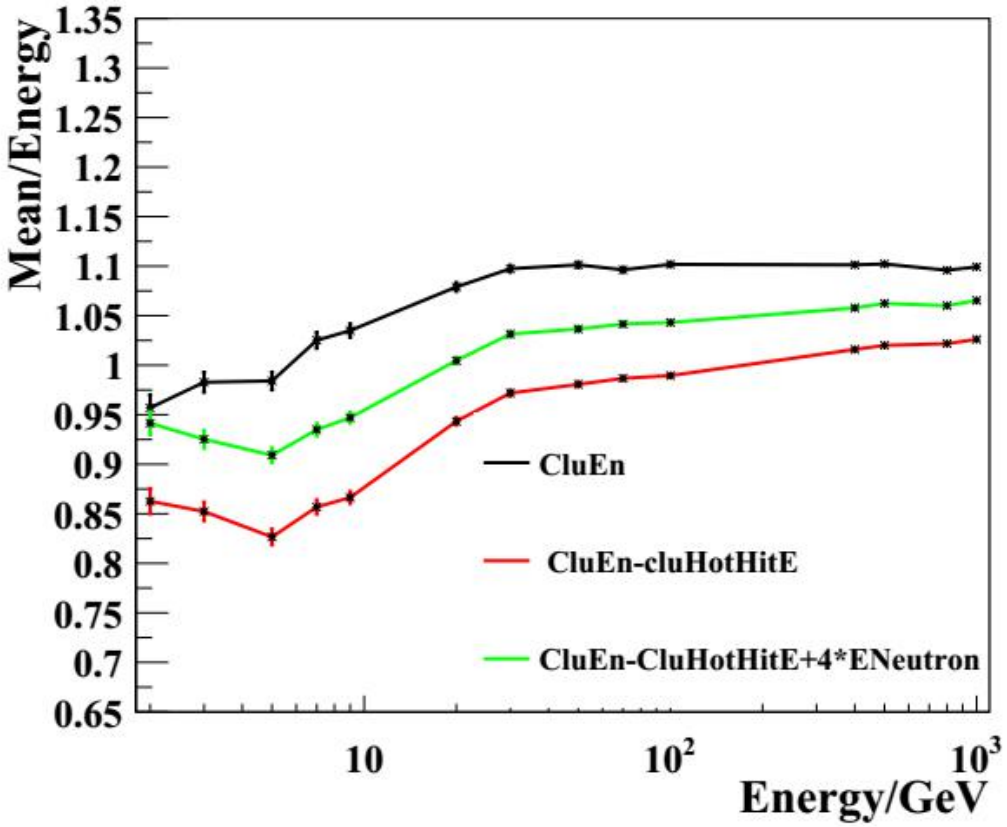
Energy measurement in arbor17

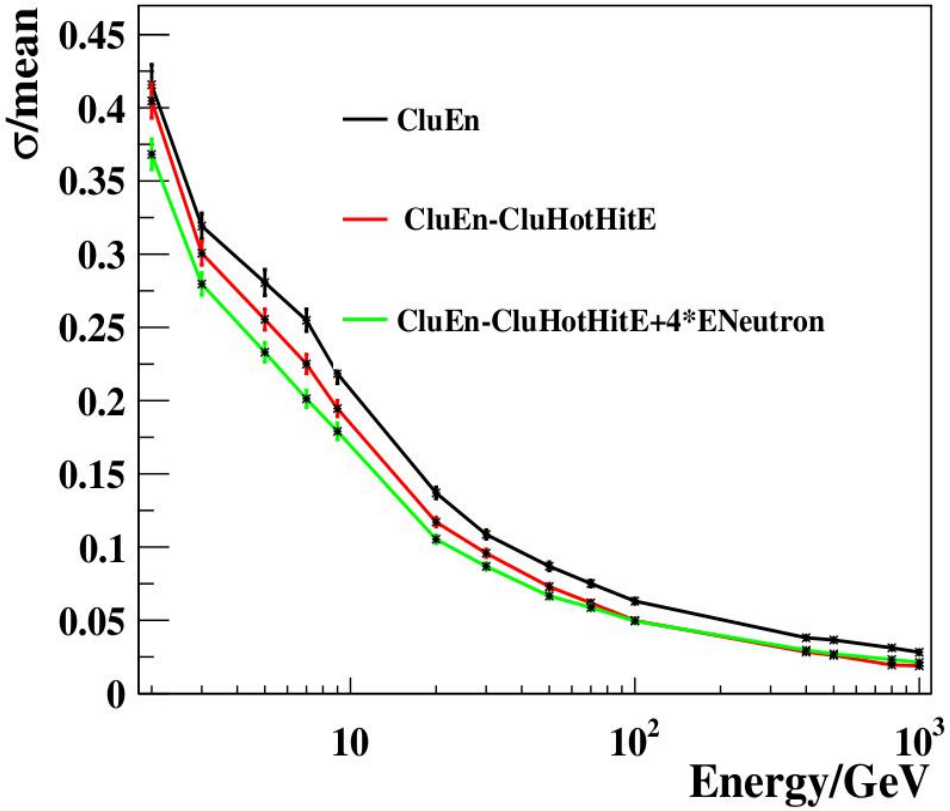




In cluste level,the energy measurement get worse, it loses some hits compared to the hit level

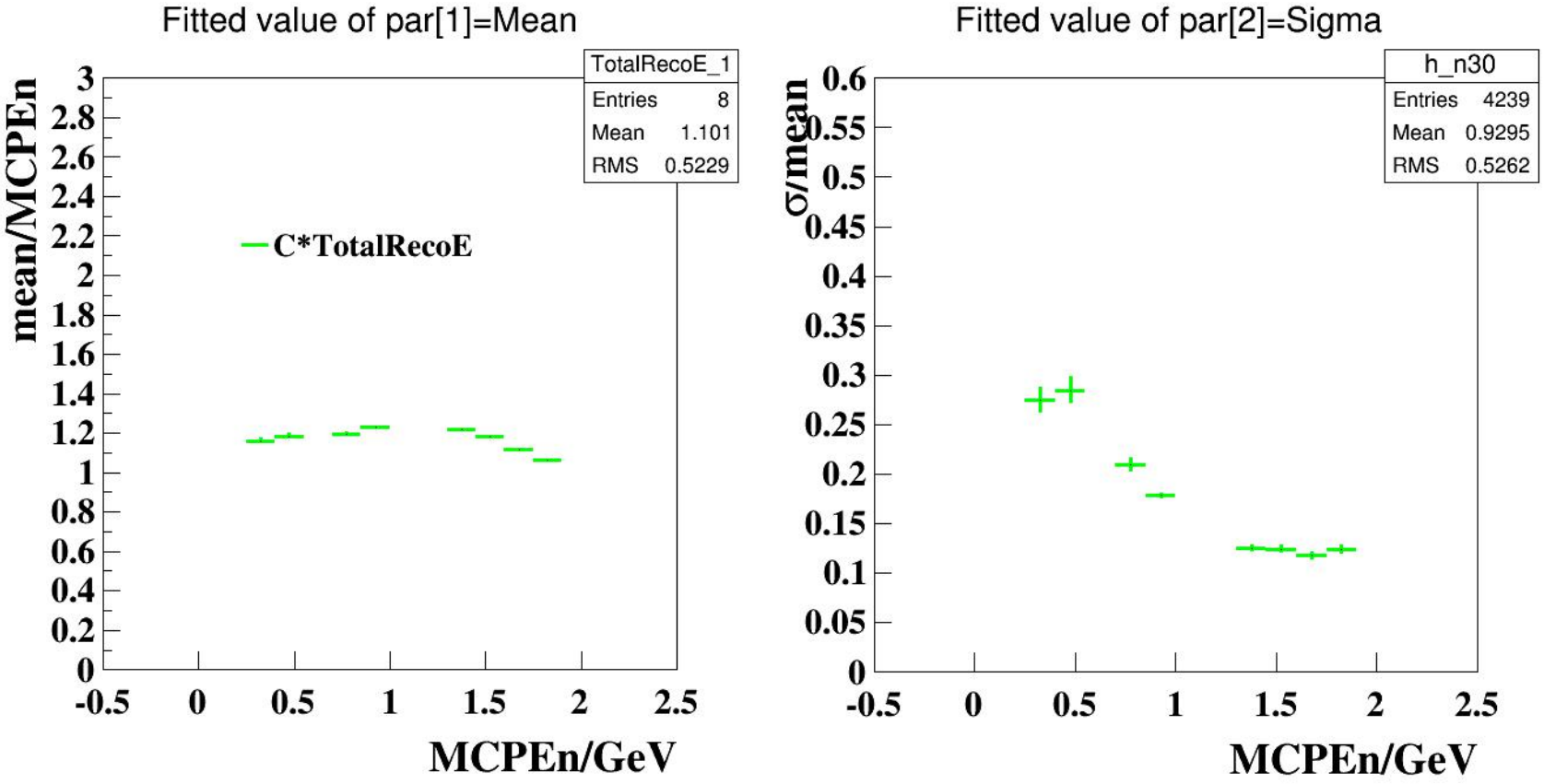
Energy linearity and resolution





In cluste level with hothit removed and increase the weight of low energy neutron make energy resolution to be better 10% to 30% in the range 1-1000GeV

Energy linearity and resolution



The energy of electromagnetic part is addition of the hit energy , the energy of hadron part is to count the hits