EMC Full Simulation studies Studies

EMC Meeting

16/03/2010

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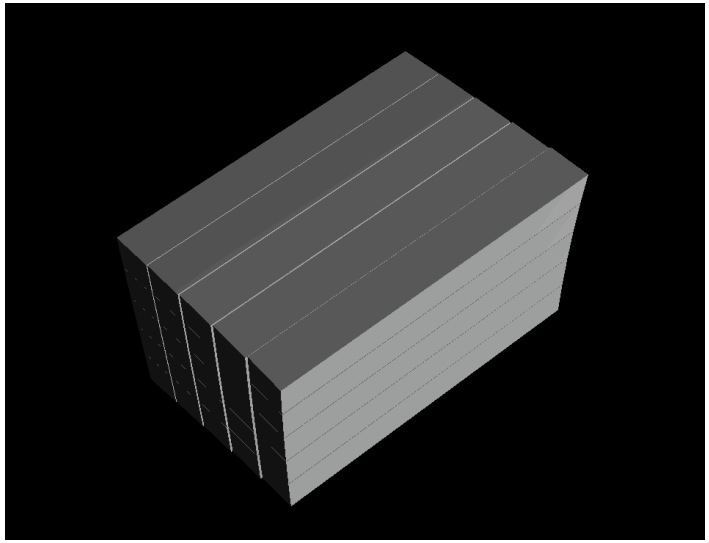
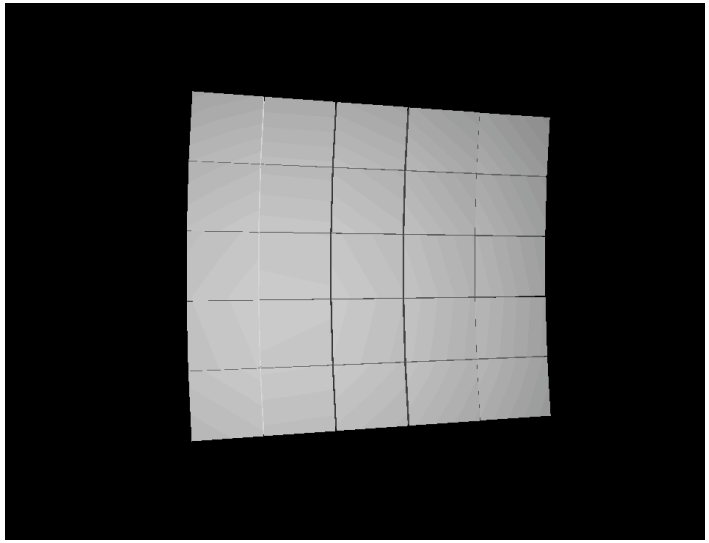
*Work supported by FONDAZIONE CASSA RISPARMIO PERUGIA

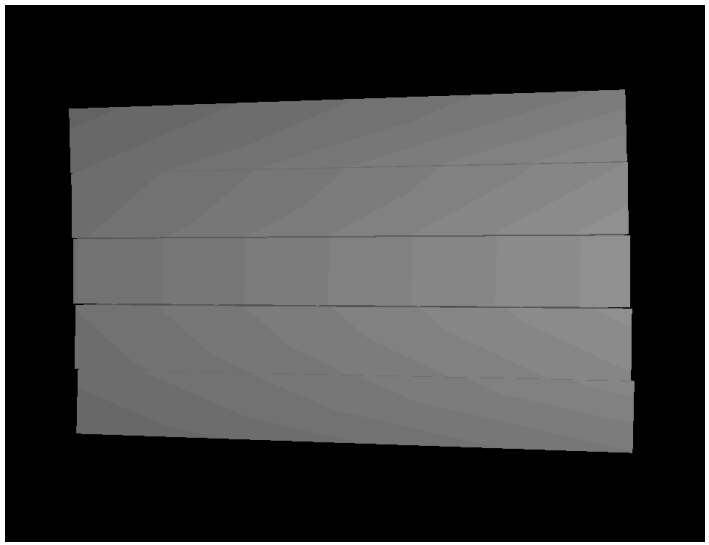
Outline

- TB module geometry
- Background studies

TB Module geometry

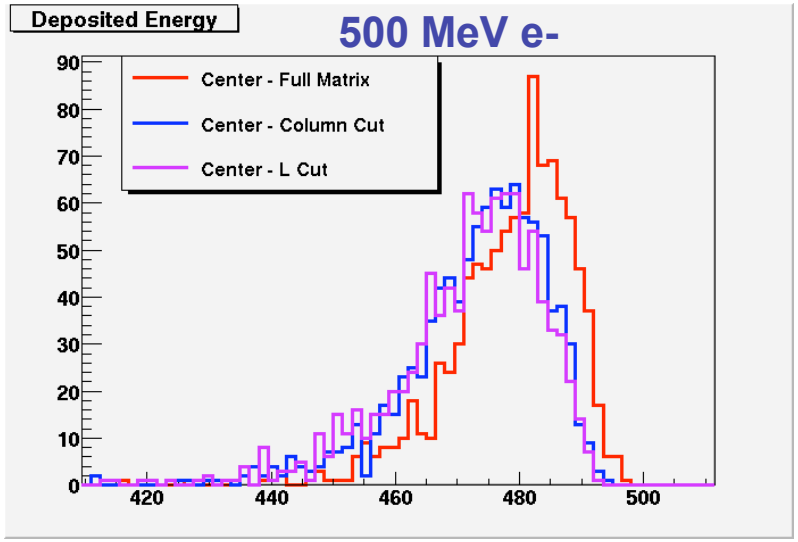


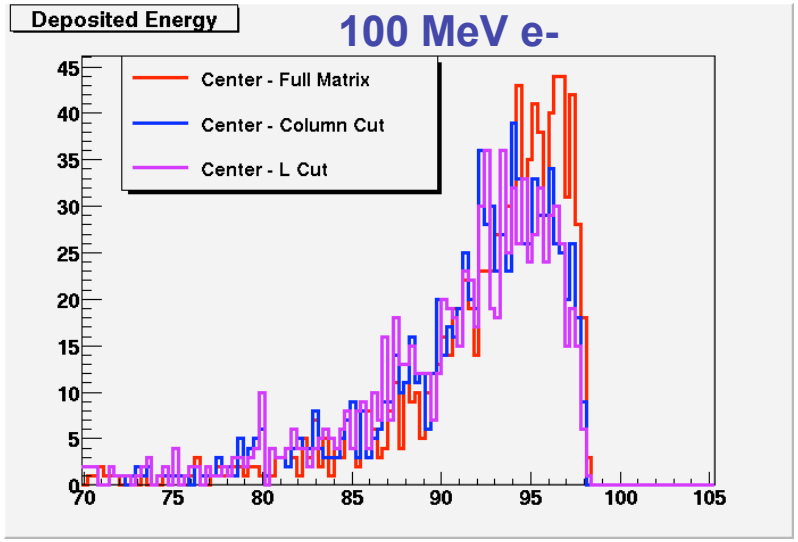




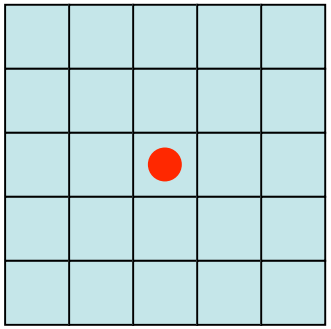
- TB Module geometry modeled according to CAD design.
- To be added:
  - CsI Crystals
  - Support Box
  - Upstream detectors
- Some preliminary studies already possible

Deposited Energy

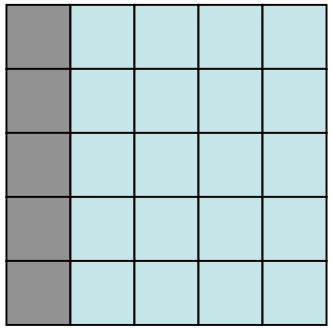




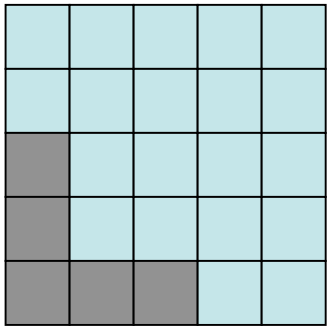
Beam at Center



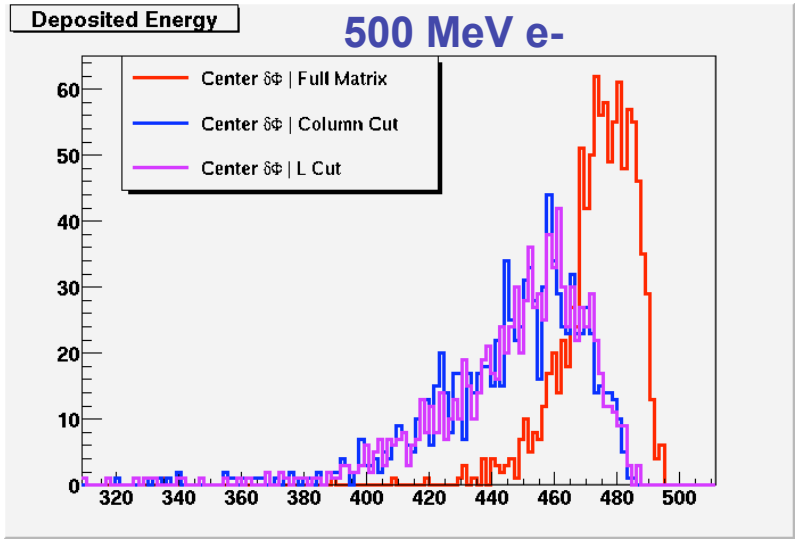
Column Cut



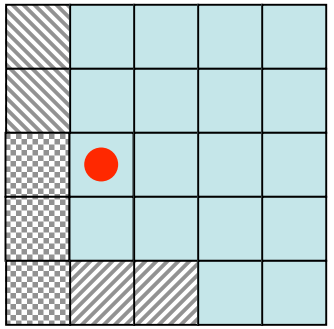
L Cut

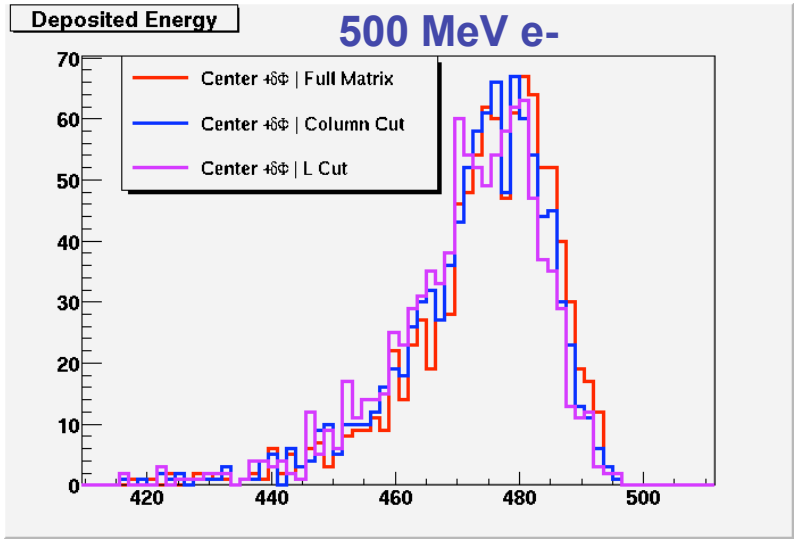


Deposited Energy

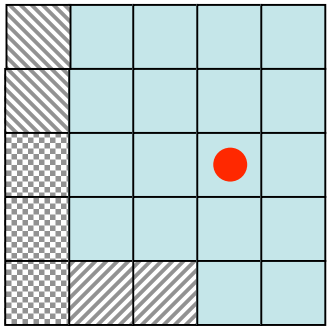


Beam at Center - δϕ

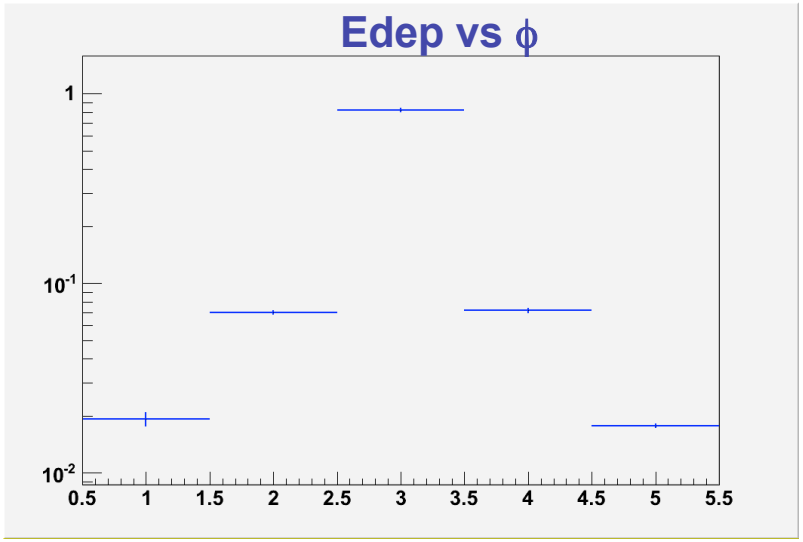


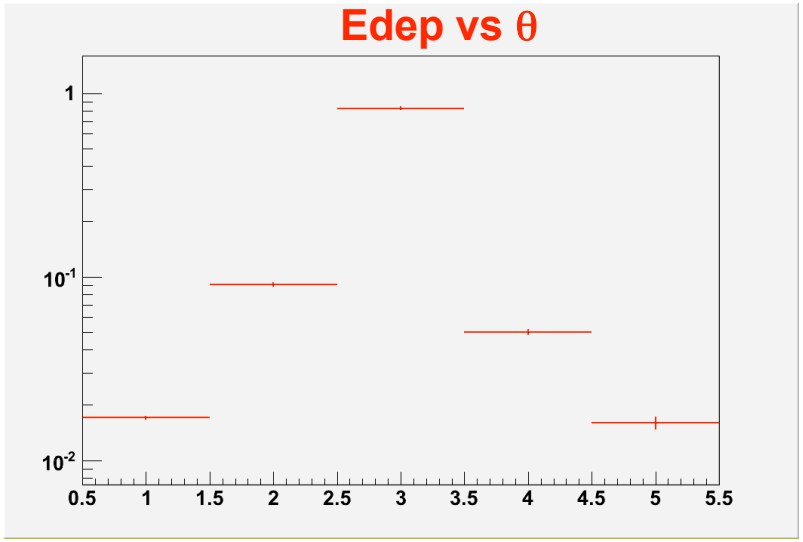


Beam at Center + δϕ



Fraction of energy deposit vs Crystal position



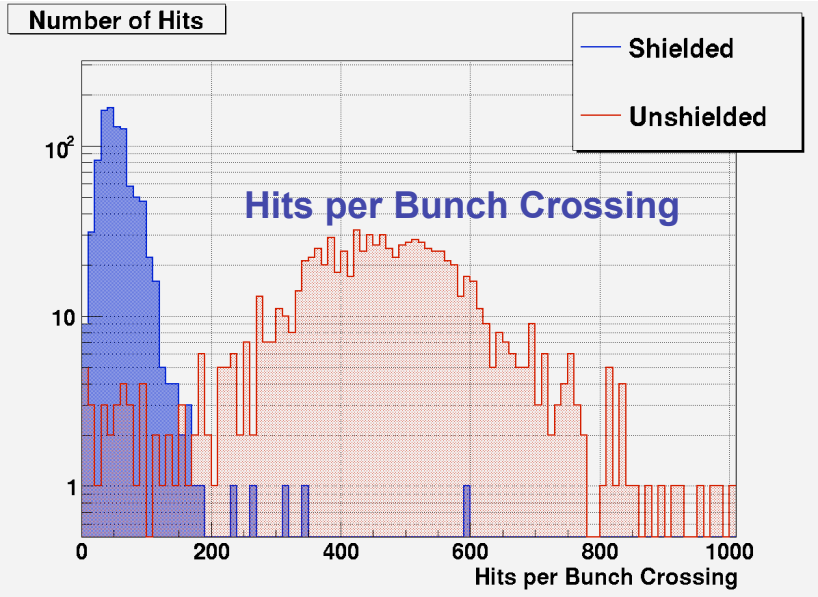


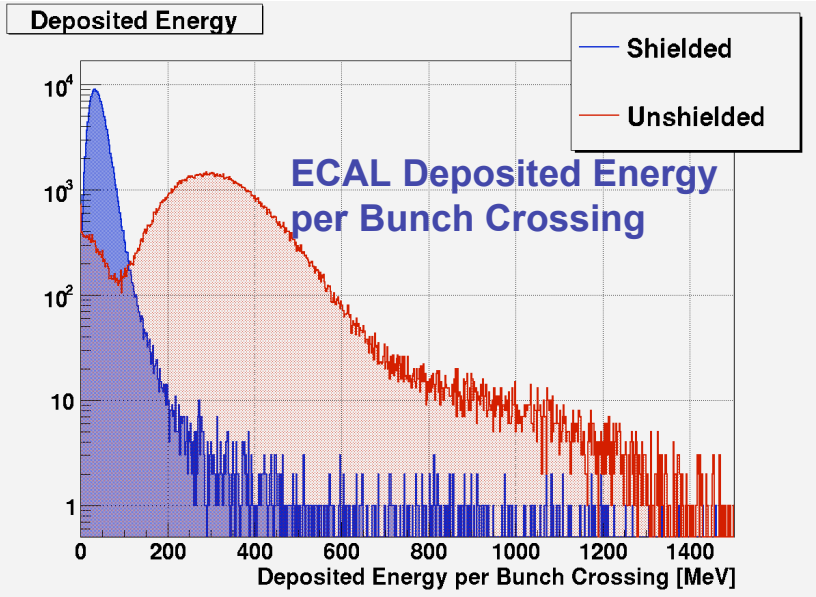
- 500 MeV e- at matrtix center
- Average Edep vs Crystal position
- ~2% Energy deposit in the external Rows or Columns

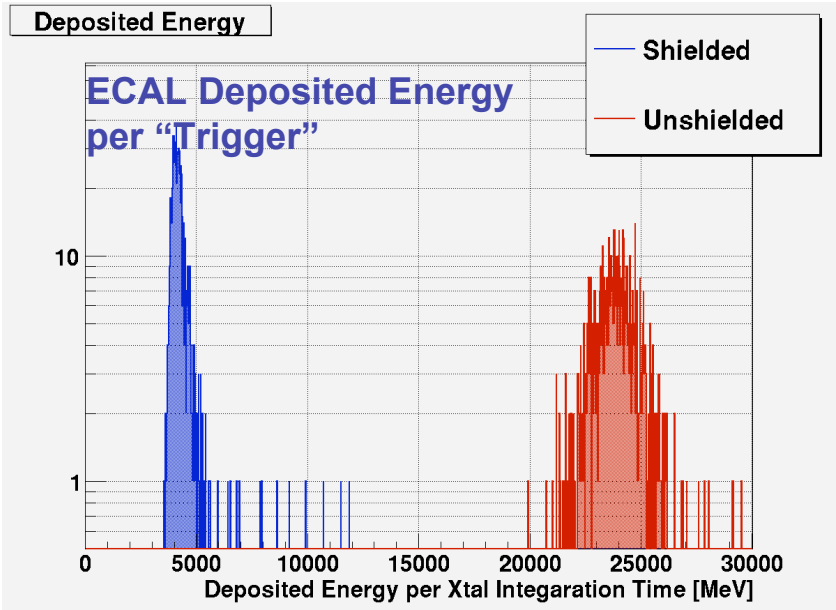
Background Studies

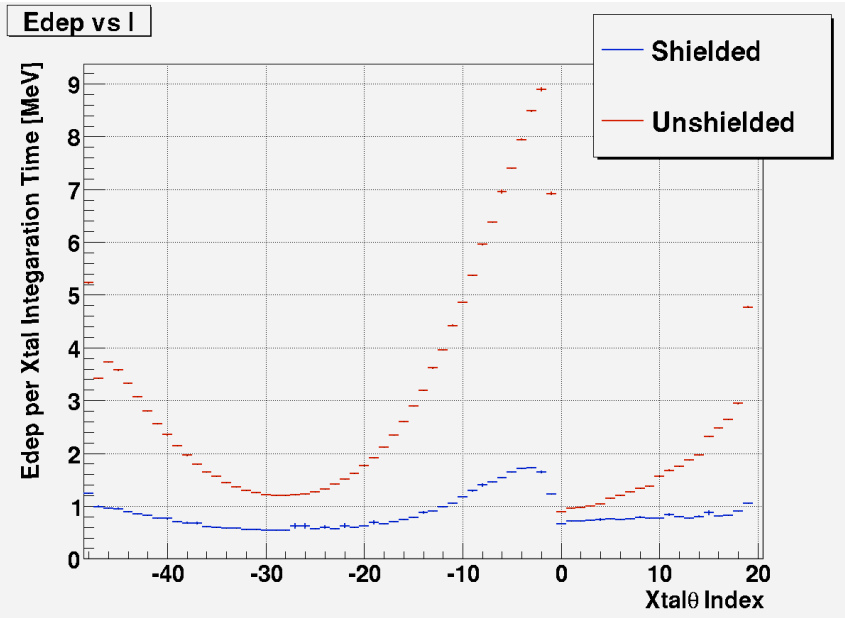
- Data:
  - 0.929 ms of Radiative Bhabha background (Full Simulation)
    - Shielded - Unshielded comparison
    - Delta_Emin comparison
  - 1 Bunch crossing every 4.644 ns
- Deposited energy
  - Bunch crossing
  - Crystal integration time
    - 1 us CsI
    - 0.2us LSO
    - Energy deposit scaled as $\left(1-e^{-\Delta t/\tau}\right)/\left(1-e^{-gate/\tau}\right)$
  - Clustering
- Particles Flux

Shielded - Unshielded

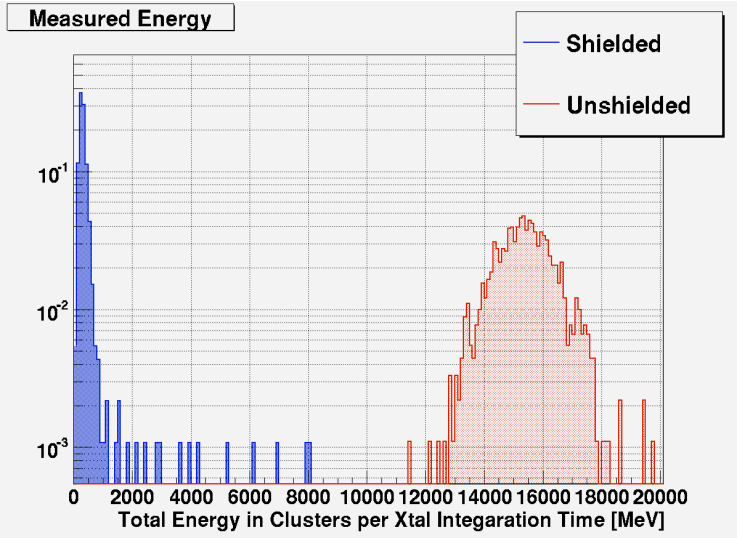


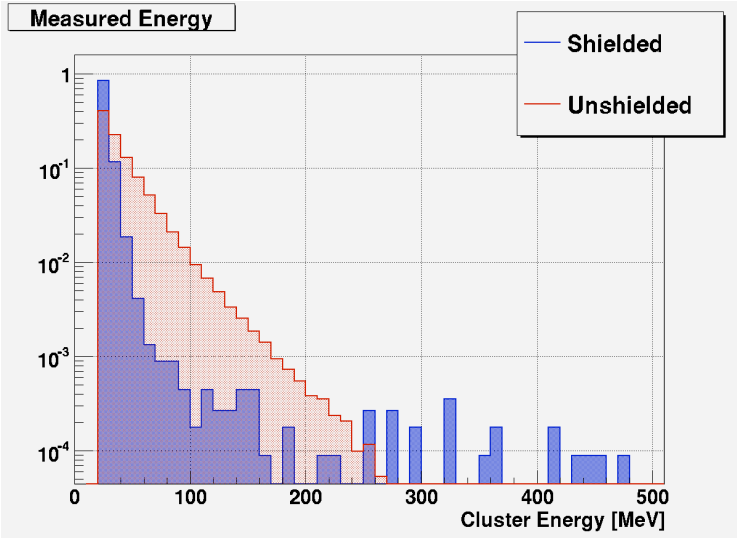


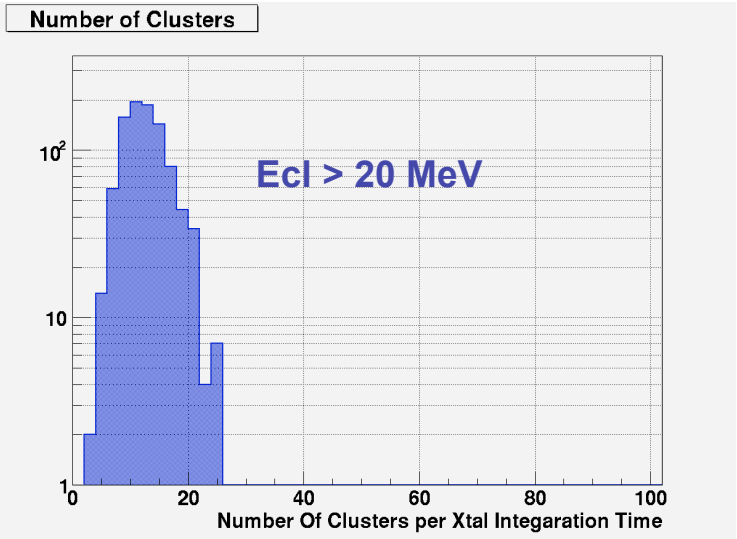


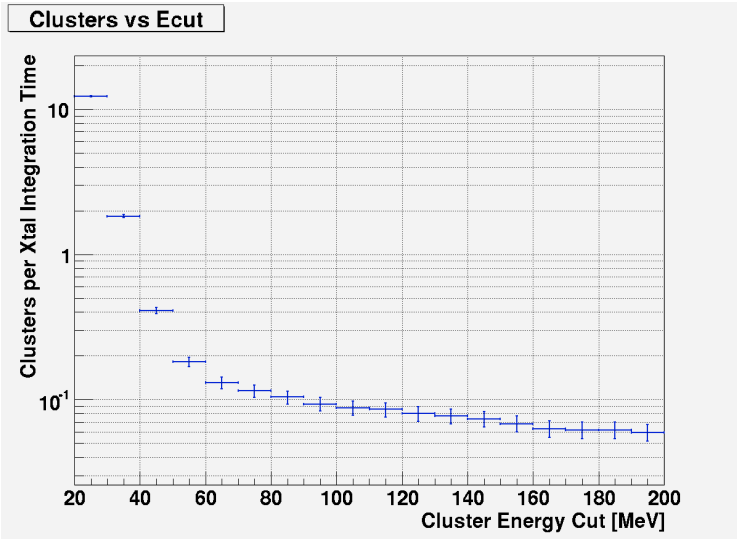


Clusters

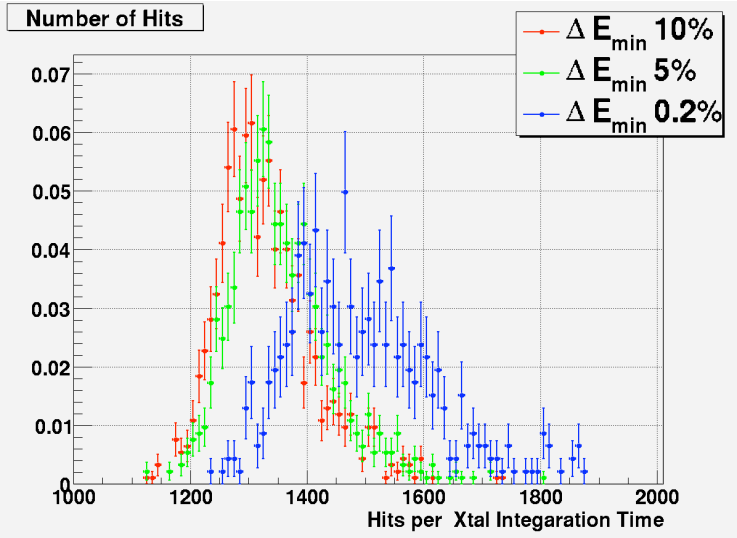

Measured Energy
Shielded
Unshielded
10^{-1}
10^{-2}
10^{-3}
0 2000 4000 6000 8000 10000 12000 14000 16000 18000 20000
Total Energy in Clusters per Xtal Integaration Time [MeV]

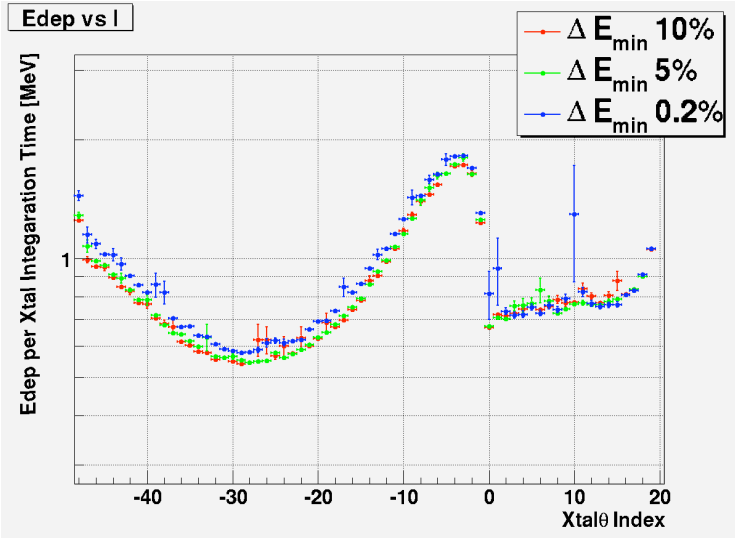

Measured Energy
Shielded
Unshielded
1
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0 100 200 300 400 500
Cluster Energy [MeV]

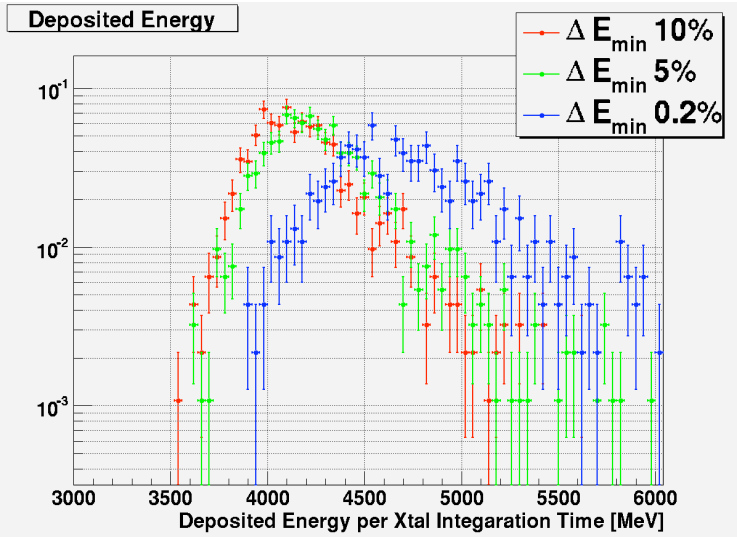

Number of Clusters
10^2
10
1
Ecl > 20 MeV
0 20 40 60 80 100
Number Of Clusters per Xtal Integaration Time


Clusters vs Ecut
Clusters per Xtal Integration Time
10
1
10^{-1}
20 40 60 80 100 120 140 160 180 200
Cluster Energy Cut [MeV]

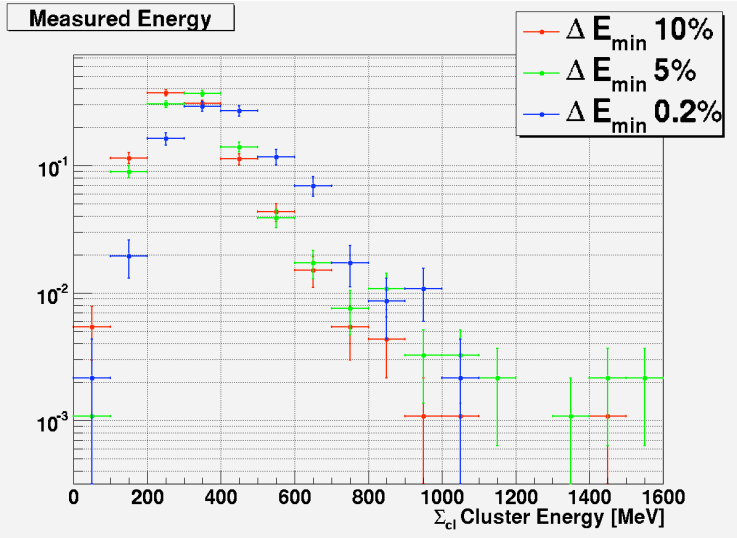
Delat Emin : Crystal Integration time

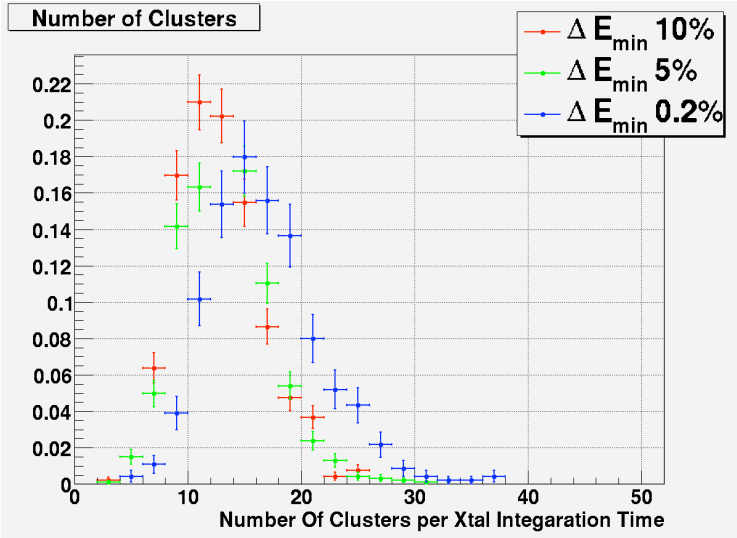




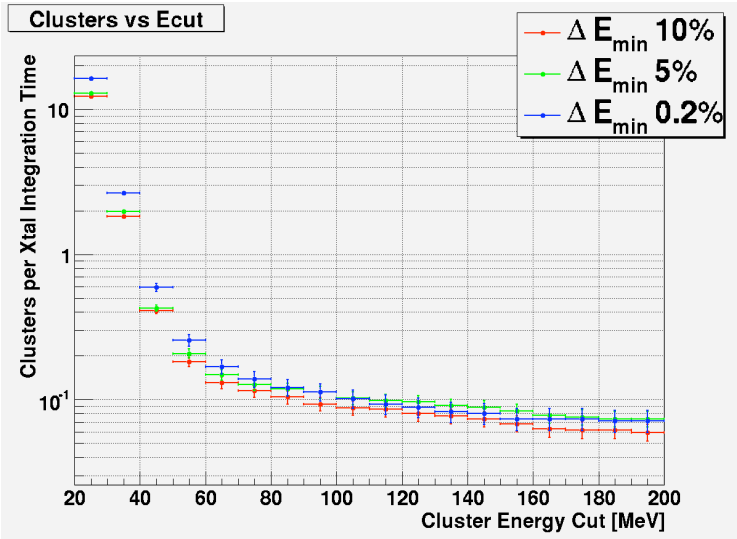


Delta Emin : Clusters

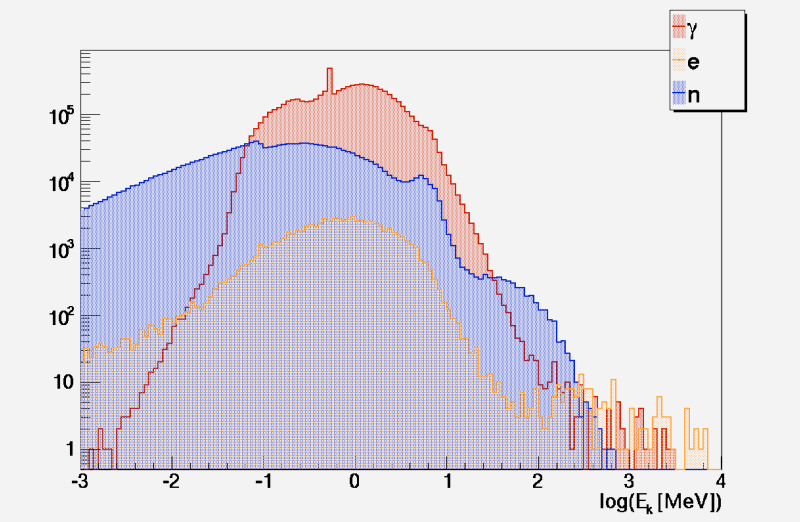




- There is a significant difference between the 10% and 0.2% cuts
- Need to check what happens at lower cut energies

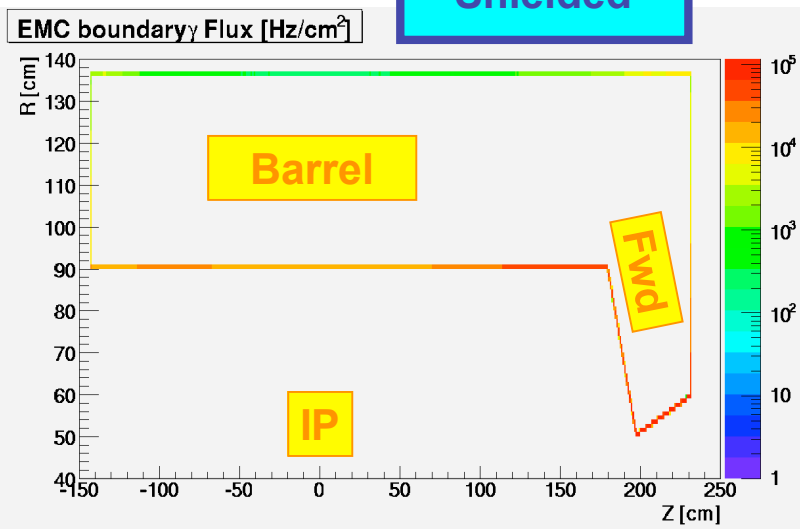


Particles Flux

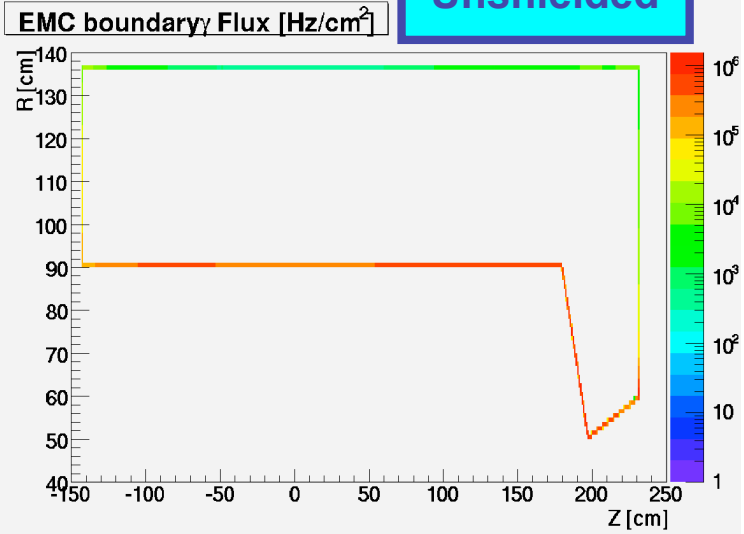


The simulation tool records infos for all the particles crossing the EMC (and other detectors) volume boundary

Shielded

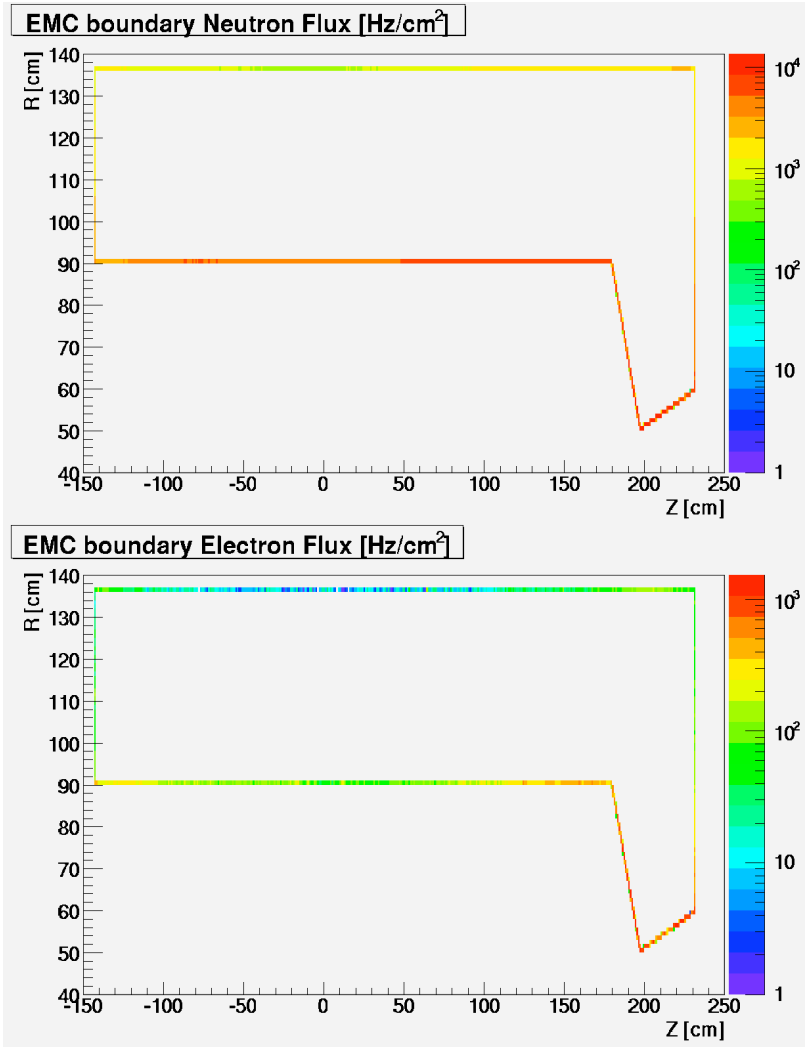


Unshielded

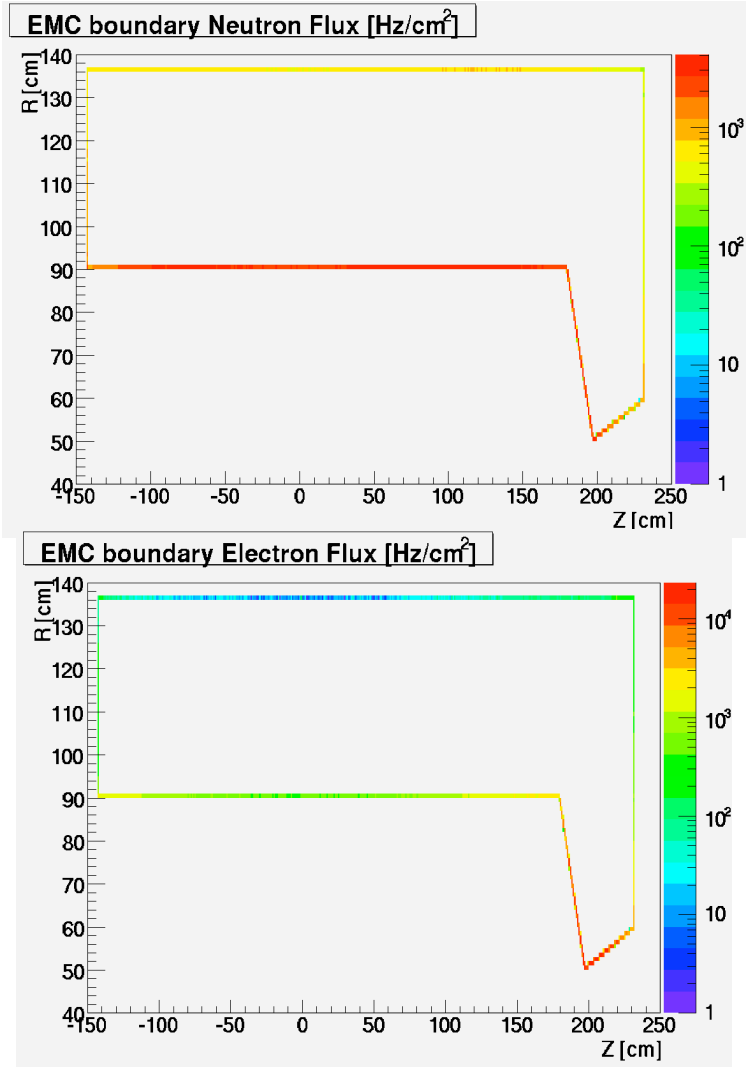


Particles Flux

Shielded



Unshielded



Full Sim - Fast Sim comparison

- Agreement with Chih-hisiang to directly compare Full and Fats simulations
  - Define the same timing windows and energy threshold
  - Use exactly the same set of data

- My analysis still not ready
  - Quick look at fast Sim results may hint that FullSim has larger number of clusters (see Chih-hisiang presentation)

Conclusions

- TB module geometry desciption under way
  - Included within the SuperB Full Sim package (Bruno) in order to have a direct check of ECAL simulation with the TB

- Background
  - Unshielded configuration
    - seems to have too much EM paricles in the EMC
  - Shielded configuration
    - Need to check effects with Physics analysis
    - Cross check with Fast Sim under way
    - Need to lower the cut on the Delta_:Emin parameter