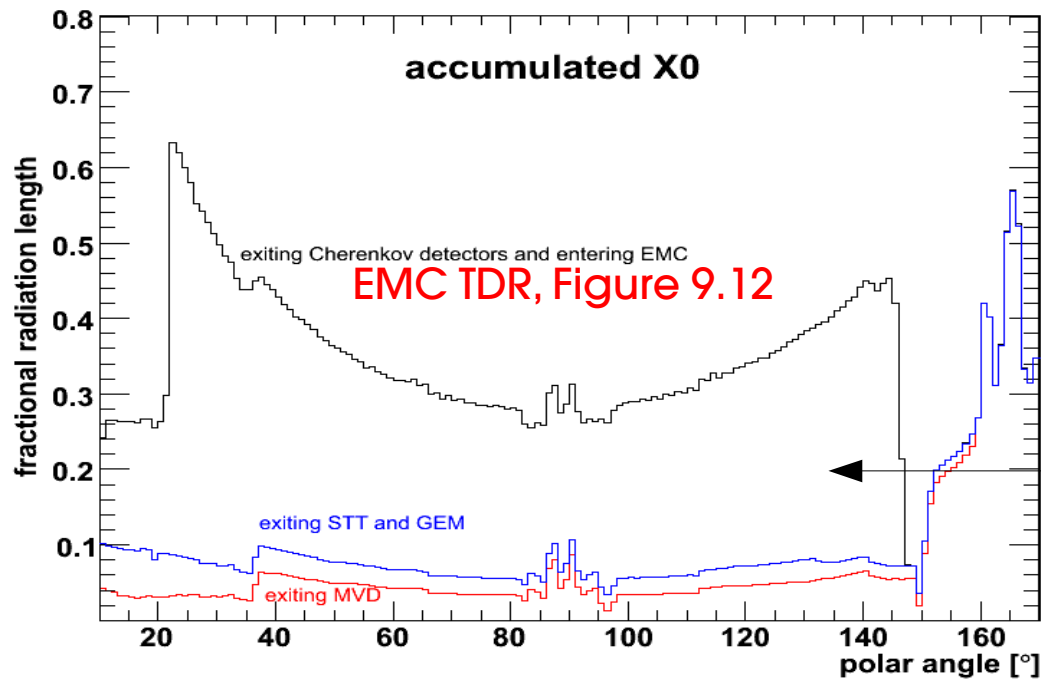


**Study of Preshowers in DIRC and the
possibility to detect them by TOF (SciTiI)
detector**

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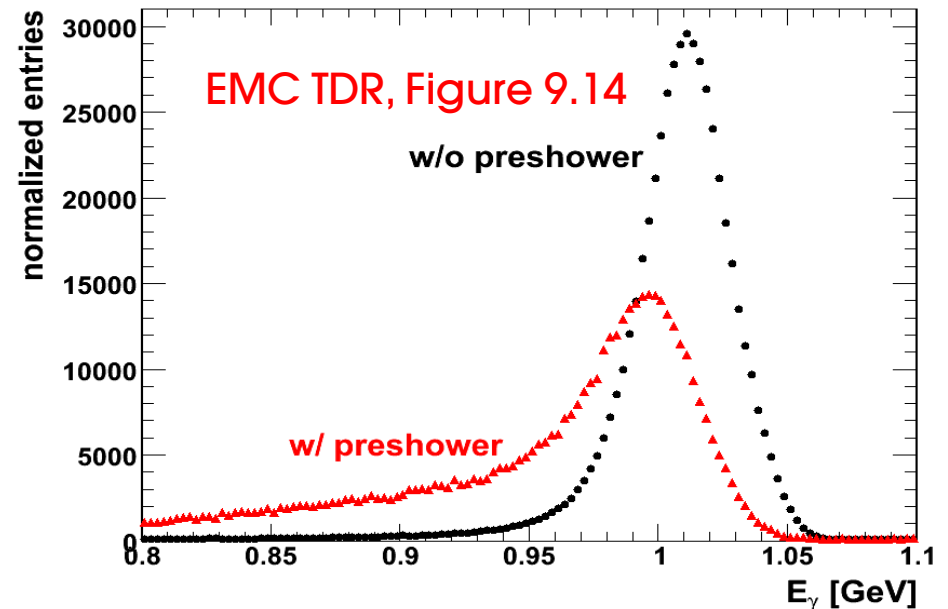
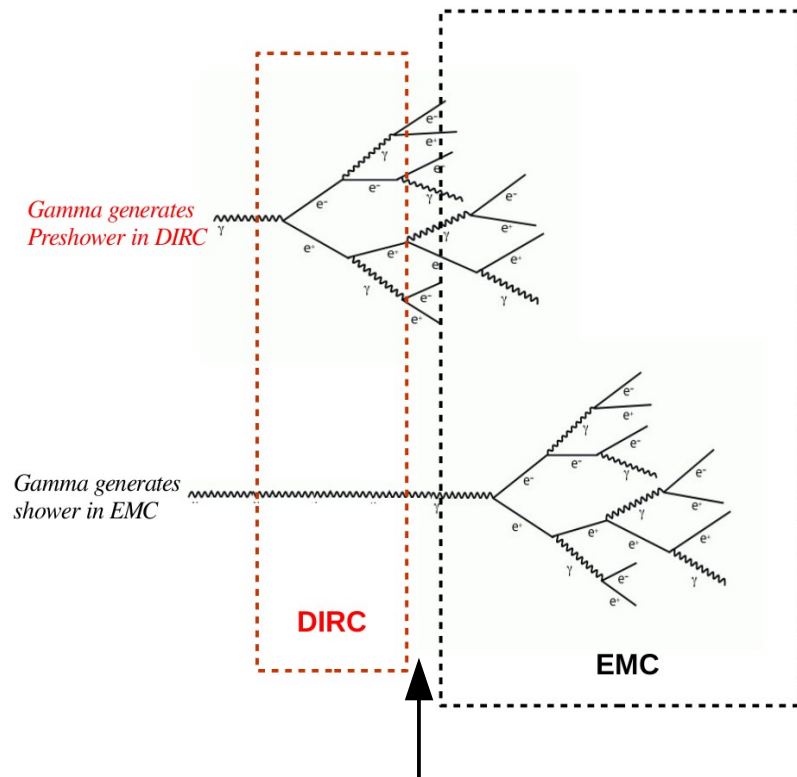
Introduction

- The presence of high material budget of other detectors in front of Electromagnetic Calorimeter (EMC) lead to the possibility for a high energetic photon to start EM shower before EMC. A EM shower started before EMC is called *Preshower*.



DIRC detector contributes most to the material budget in front of the EMC.

Preshower in DIRC



DIRC preshowers lead to a degradation of the energy resolution.

In Panda, we have a SciTil in between DIRC and EMC, which has low material budget, insensitive to gamma, but has a high efficiency to charged particles. In a study for BaBar experiment, it was shown that, by detecting preshower by DIRC itself, 50% of the converted gamma can be recovered. But in our case, separate detector would discover conversion with full efficiency and enhance the energy resolution.

Our strategy

- Study the Preshowers inside DIRC : as a first step, reproduce the results from EMC group (EMC TDR section 9.2.1).
- Develop a smart algorithm to compensate the energy resolution deterioration using SciTil.

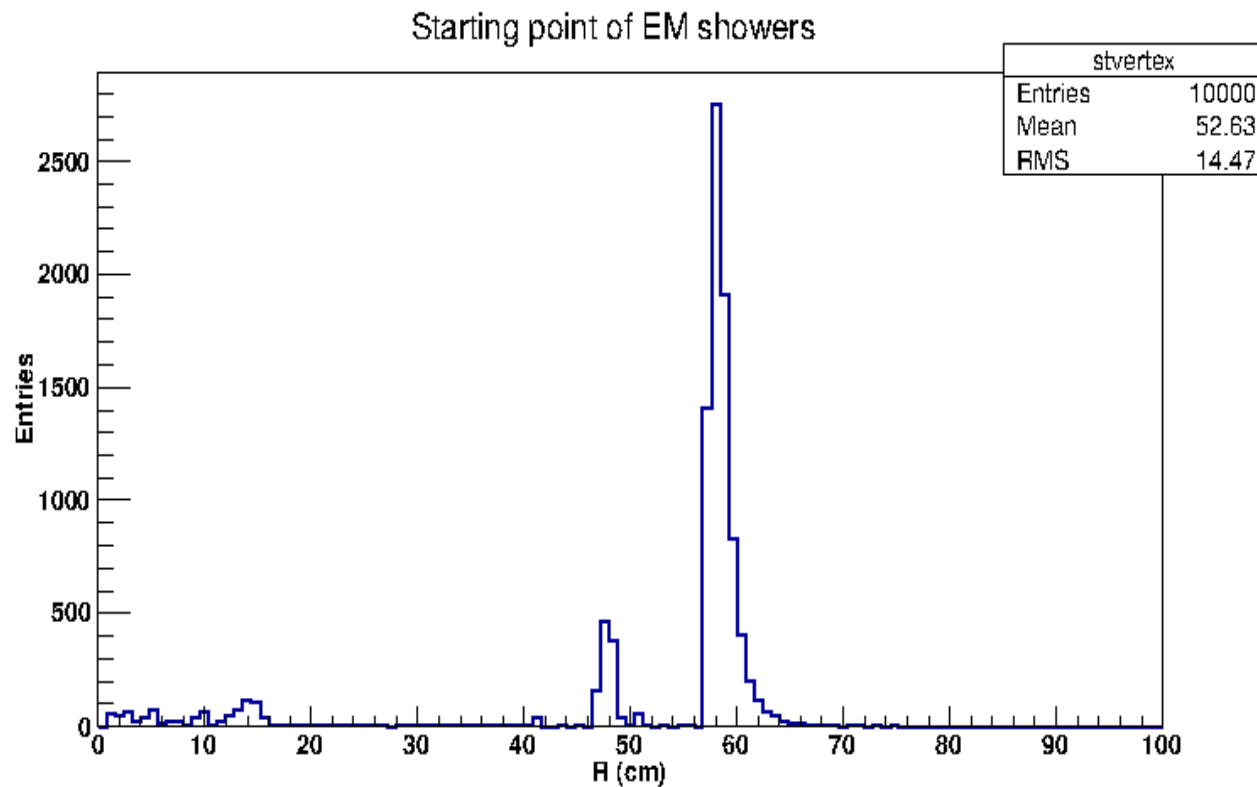
Our work

- Single photon MC events of energy 1 GeV are generated in pandaroot using box generator.

```
boxGen->SetPRange(1.0,1.0);  
boxGen->SetPhiRange(0., 360.);  
boxGen->SetThetaRange(22., 140.);  
boxGen->SetXYZ(0., 0., 0.);
```

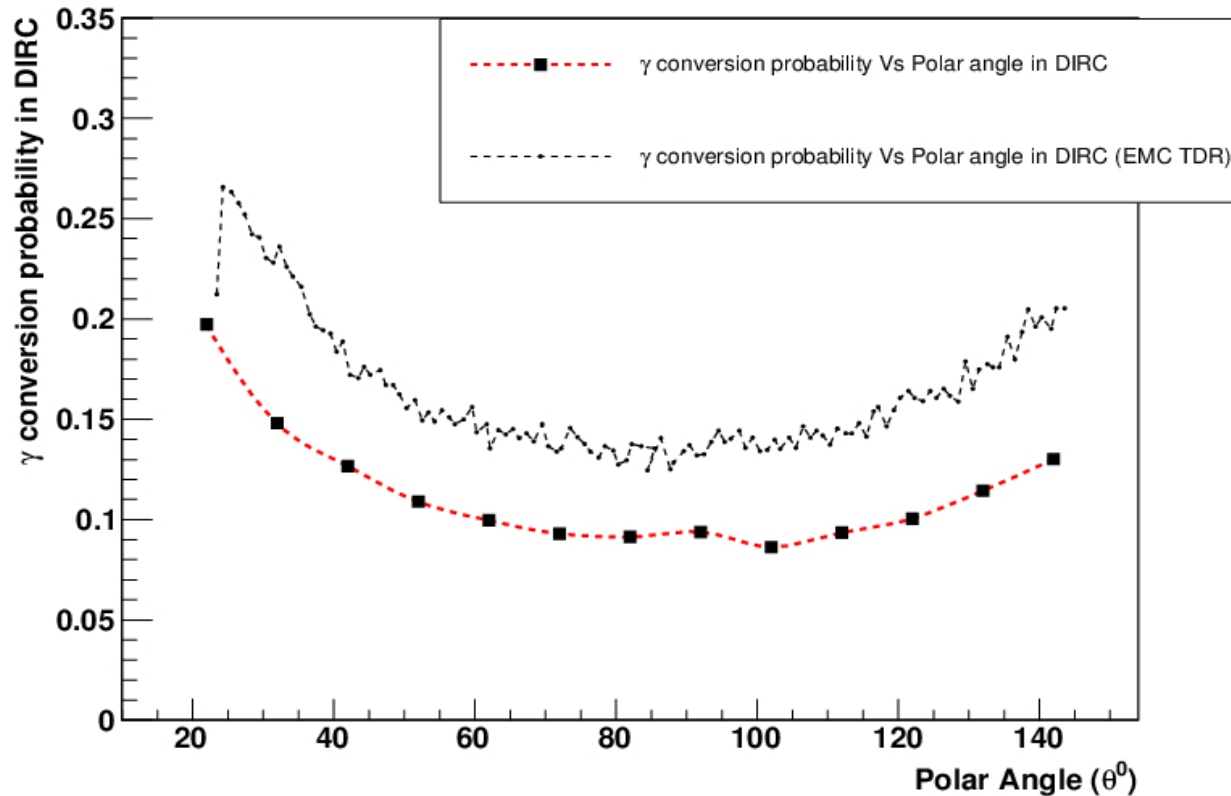
- For a gamma particle, the radial distance of the starting point of an EM shower (R) is estimated as,

R = Minimum of the radial distances of the starting vertices of the secondary particles.



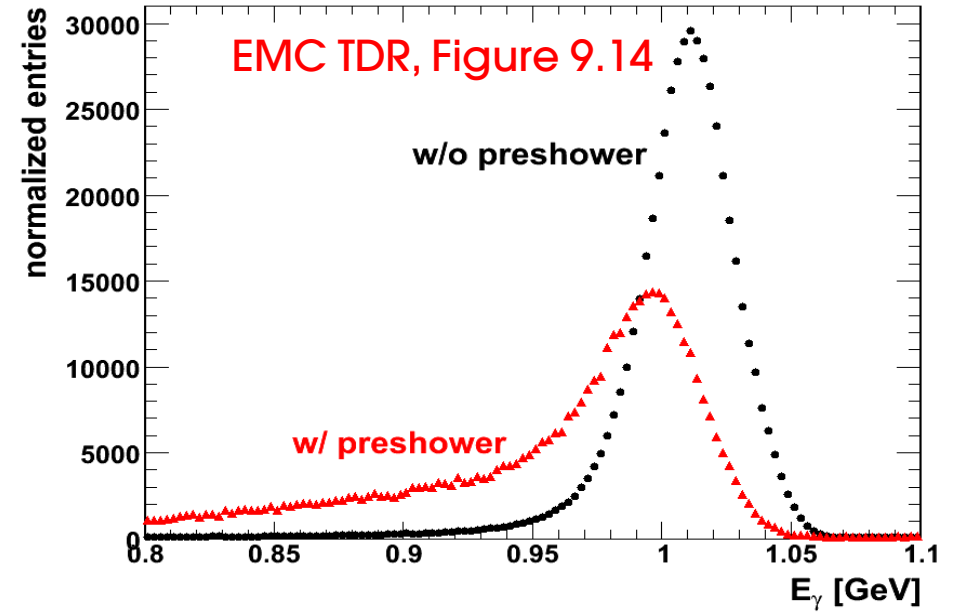
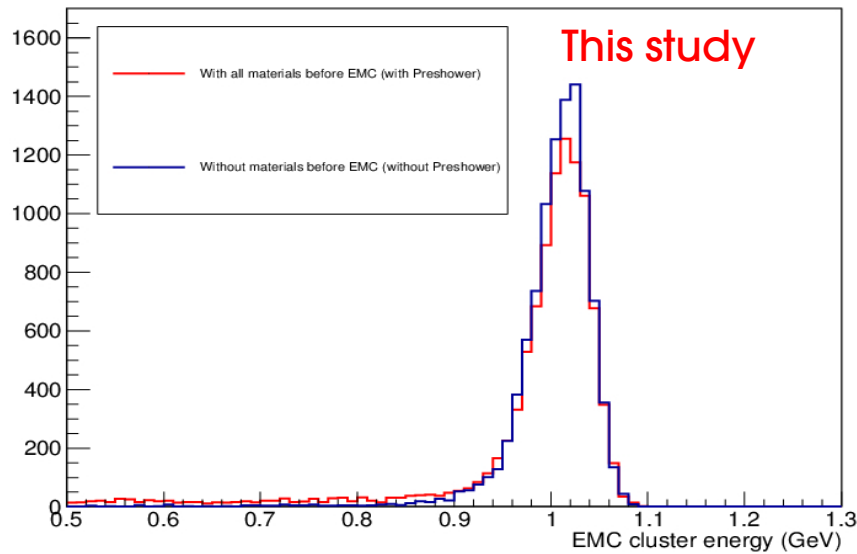
- Showers having $45 < R < 54$ cm are identified as Preshowers in DIRC .

- $\text{Gamma conversion probability in DIRC} = \frac{\text{No. of preshowers in DIRC}}{\text{No. of total generated gamma}}$



- A constant mismatching throughout the θ range is observed.
- According to EMC group (Dr. Bertram Kopf) the material budget of DIRC in terms of radiation length has been reduced by 30 %.
- We are not able to compare the geometries as the old geometry parameters are not provided.
- Expecting reply from EMC group (Dr. Bertram Kopf) .

EMC cluster energy



A discrepancy between old and new results is also found here. We are trying to understand the source of this.