MC studies of the Electromagnetic Calorimeter with projective geometry for the MPD/NICA

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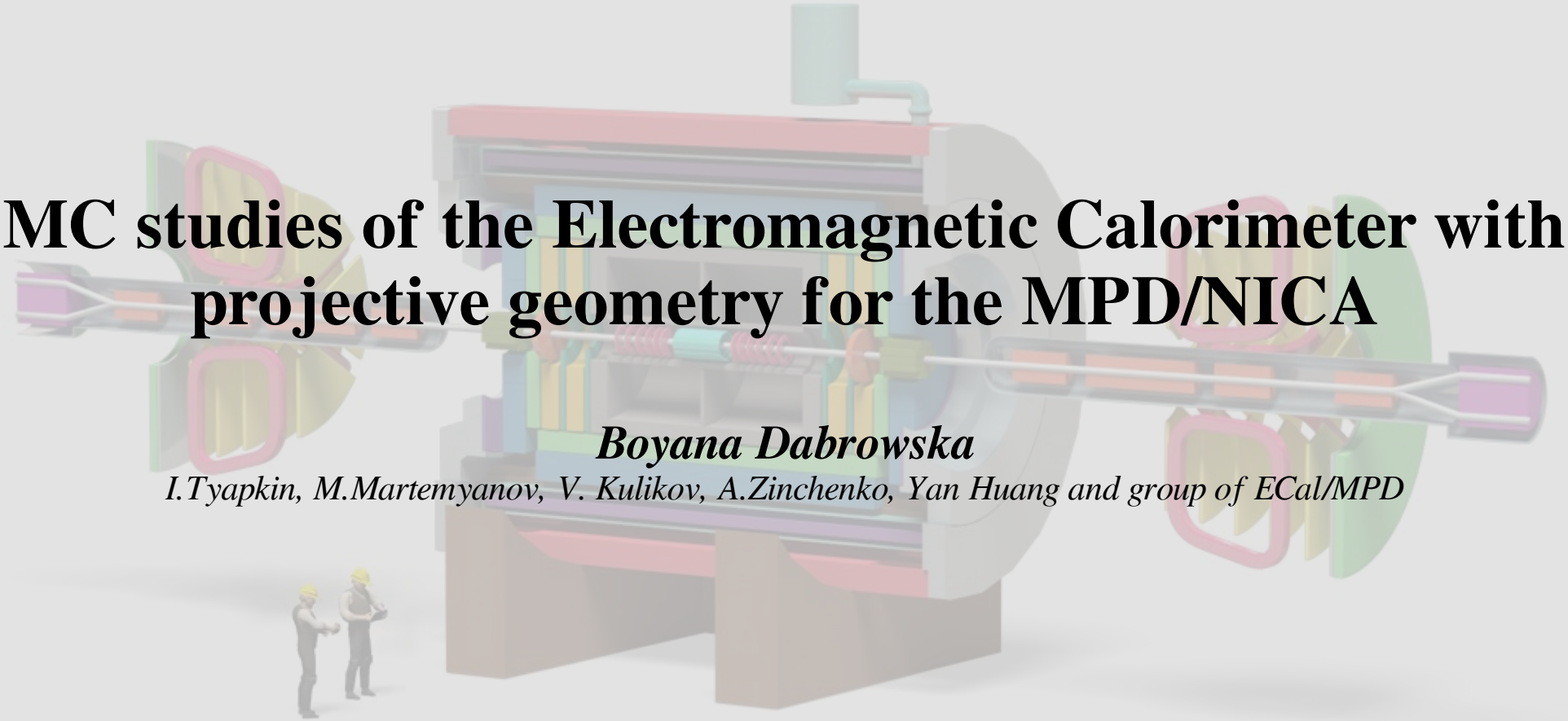


Two types of digitizers and cluster methods in MpdRoot:

I type *- Classes made by Maxim Martemyanov (from group of ITEF);*
II type *- Classes made by Alexander Zinchenko (JINR);*

Digitizer

I type: Use special function which relates point to the corresponding module by minimal angle between module axis and direction to the point and merges all points in active element to hit.

II type: Use GeoManager class.

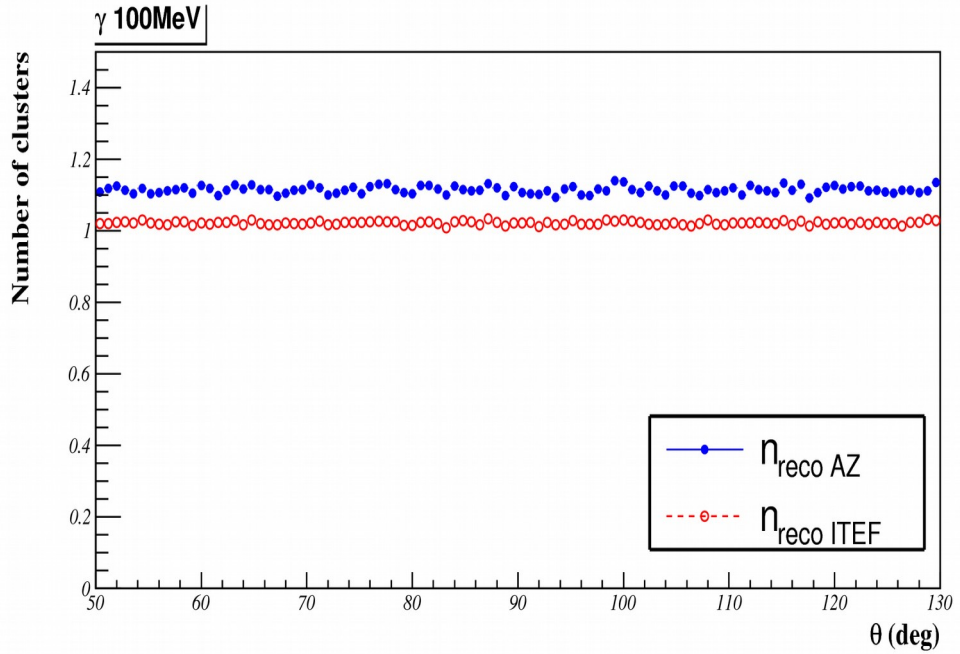
Cluster method

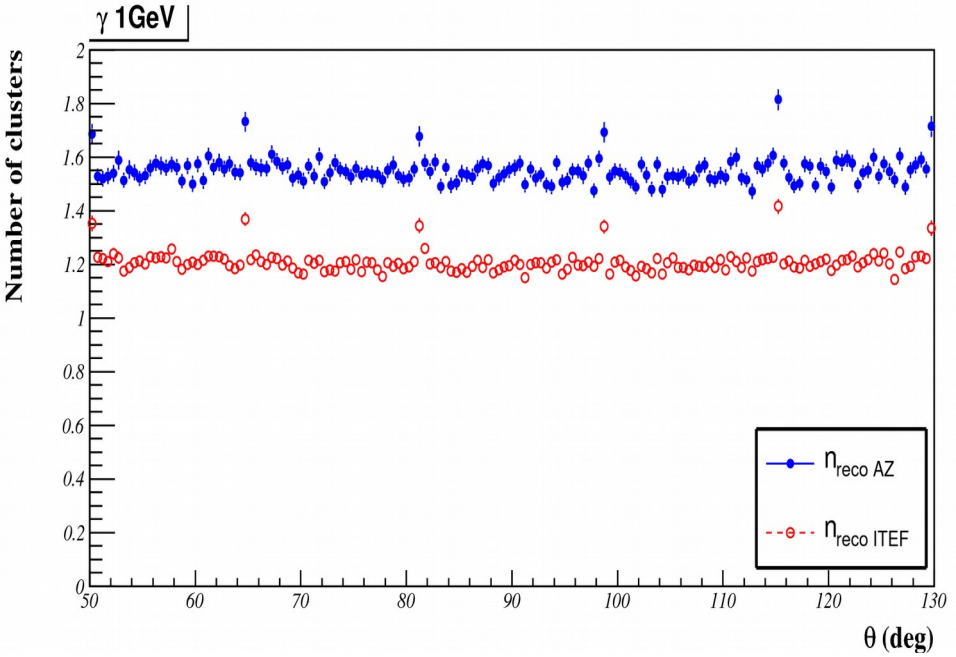
I type: Algorithm is merging hits into cluster around hit with maximal energy. It's based on a module frame and it used nRow and nLine;

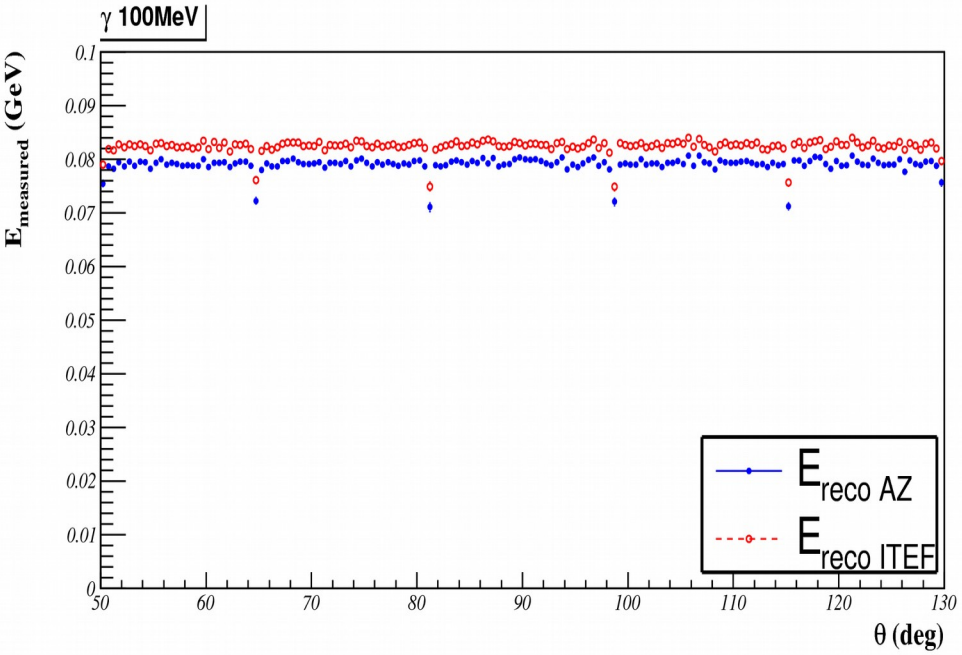
II type: Also algorithm merges hits into cluster around hit with maximal energy, but we have digits alongside each other.

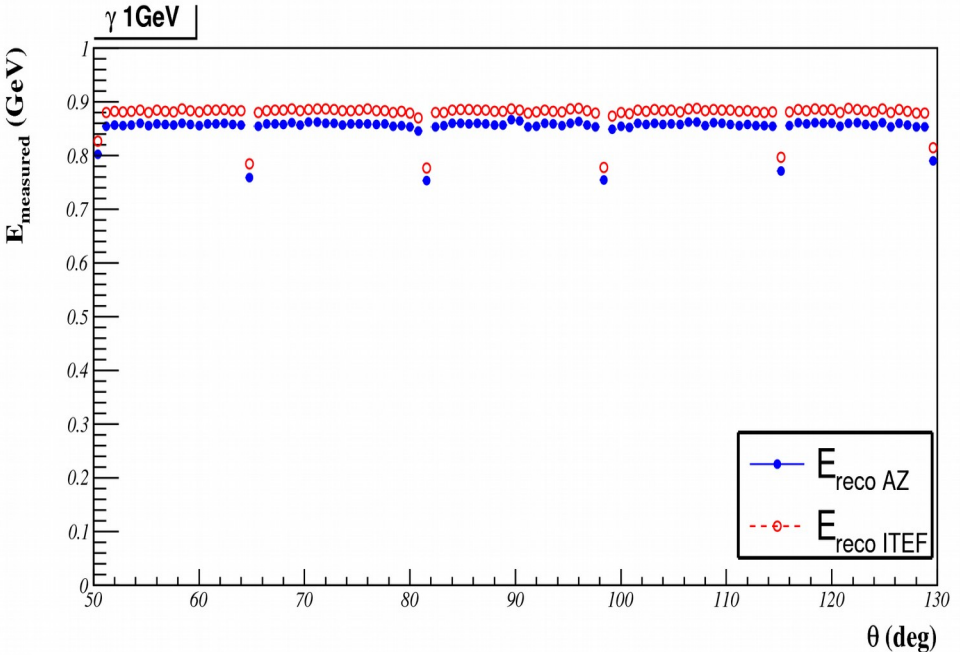
ECal parameters checked with these two methods:

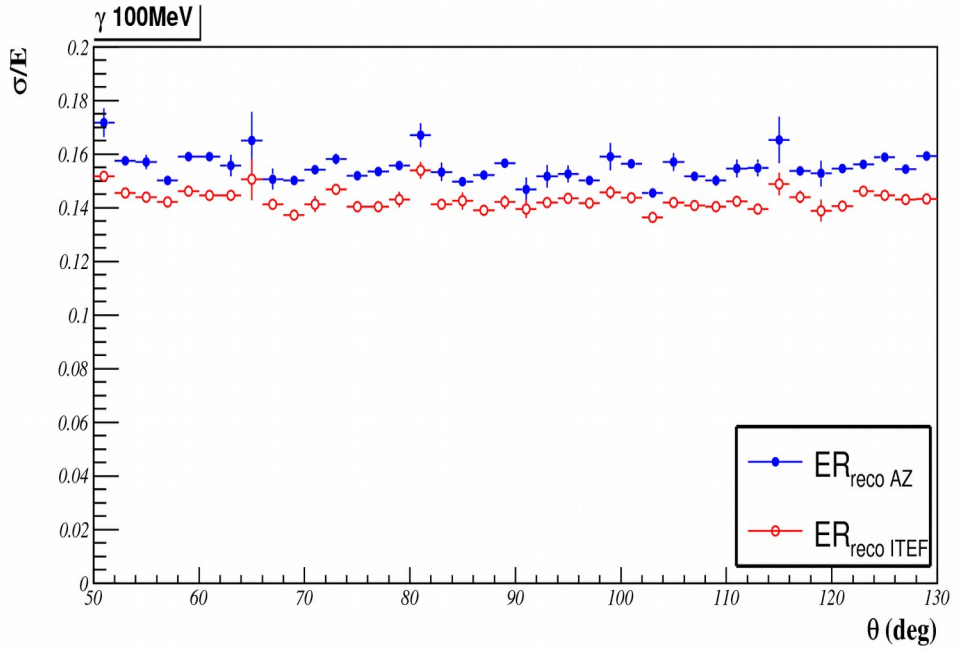
1. BOX Generator, only ECal;
2. Photons with different energy;
3. Events 100 000, with magnetic field 0.5T, Threshold > 10MeV;
4. Hit fall in azimuth angle 89.2 degree and in polar angle range 50 ÷ 130 degrees.

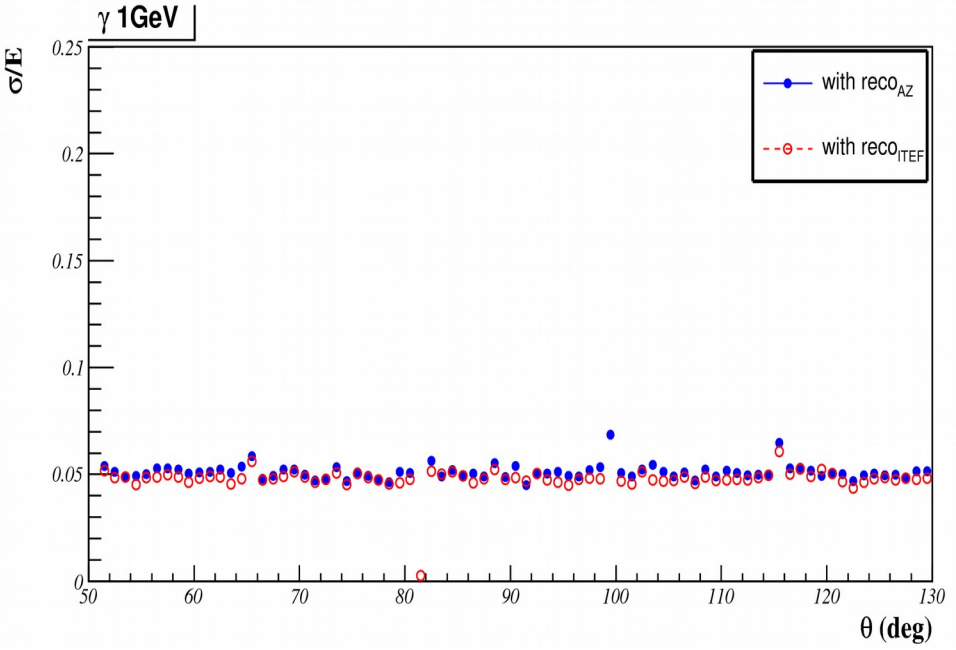

γ 100MeV
Number of clusters
θ (deg)
n reco AZ
n reco ITEF


γ 1GeV
Number of clusters
θ (deg)
n reco AZ
n reco ITEF


γ 100MeV
E measured (GeV)
θ (deg)
E reco AZ
E reco ITEF


γ 1GeV
E measured (GeV)
θ (deg)
E reco AZ
E reco ITEF





From the tests performed, it follows that both clustering programs work and give realistic results, but these results have some differences. Further research is needed to find out the reasons for discrepancies in the results and improve the work of the programs.

1. Both of types work correctly.

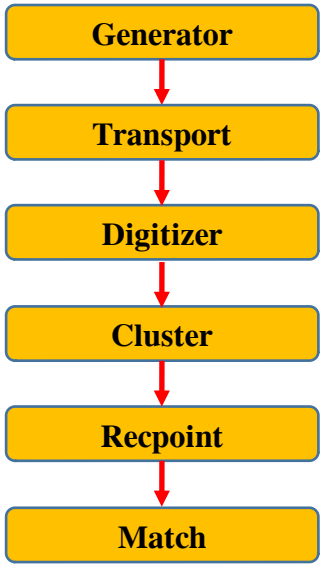
2. For low energy it’s better to use type I.

3. For high energy, type II is more precise.

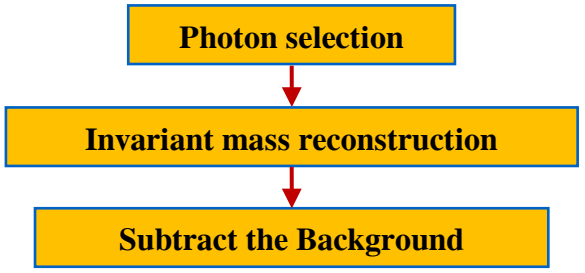
4. II type already have Matching class.

5. Next step is to make Matching class for I type.

π^0 reconstruction by Yan Huang



Selection of Photon



The method of π^0 reconstruction

$x^2 \leq 15.0$ && $E/p \leq 0.8$

$$M_{\gamma\gamma}=\sqrt{2E_{\gamma 1}E_{\gamma 2}(1-\cos(\theta_{12}))}$$

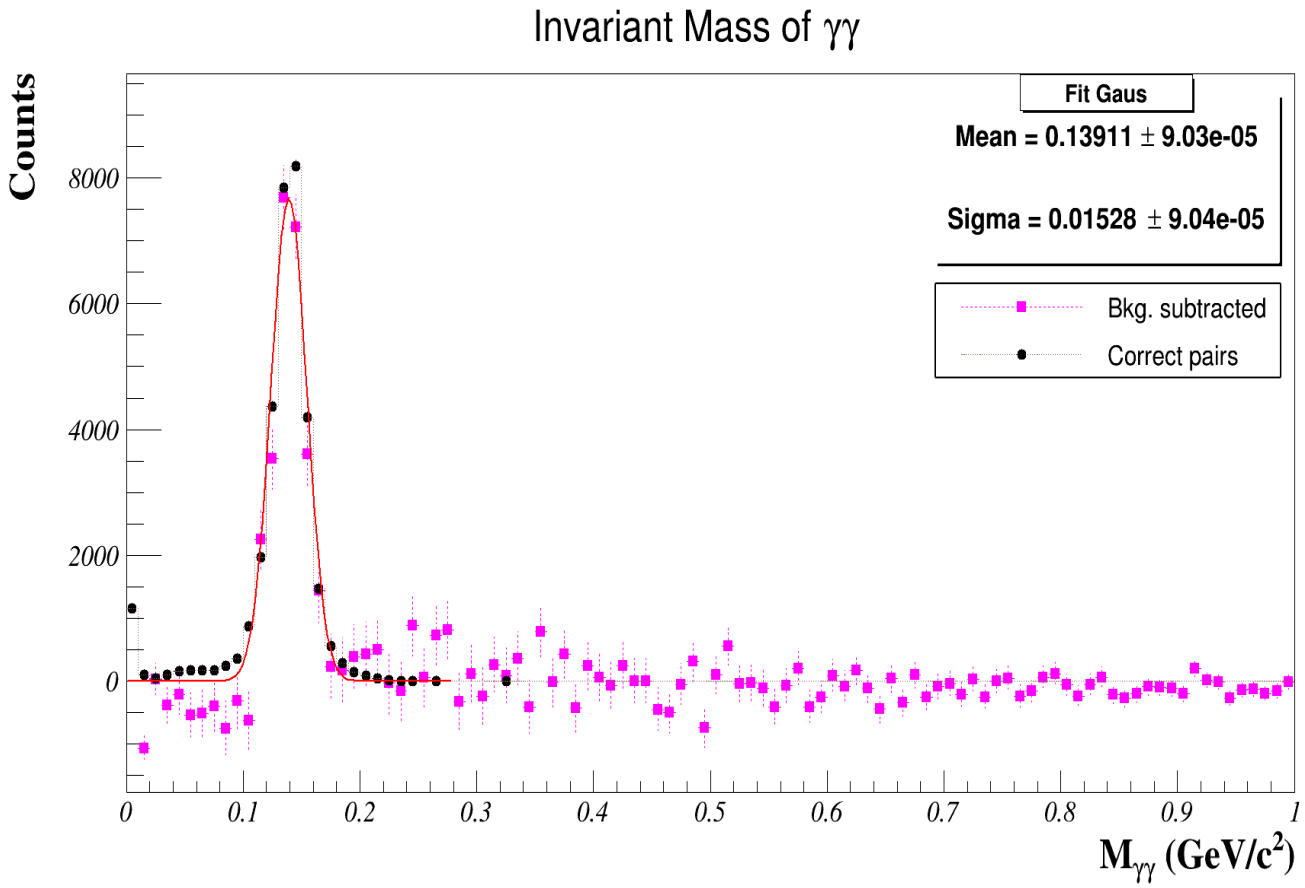
Event mixed method and scaling

1.HypYpt Generator;

2.Multiplicity 200;

3.Geometry:

- magnet_v4
- tpc_v8
- tof_v7
- emc_v2

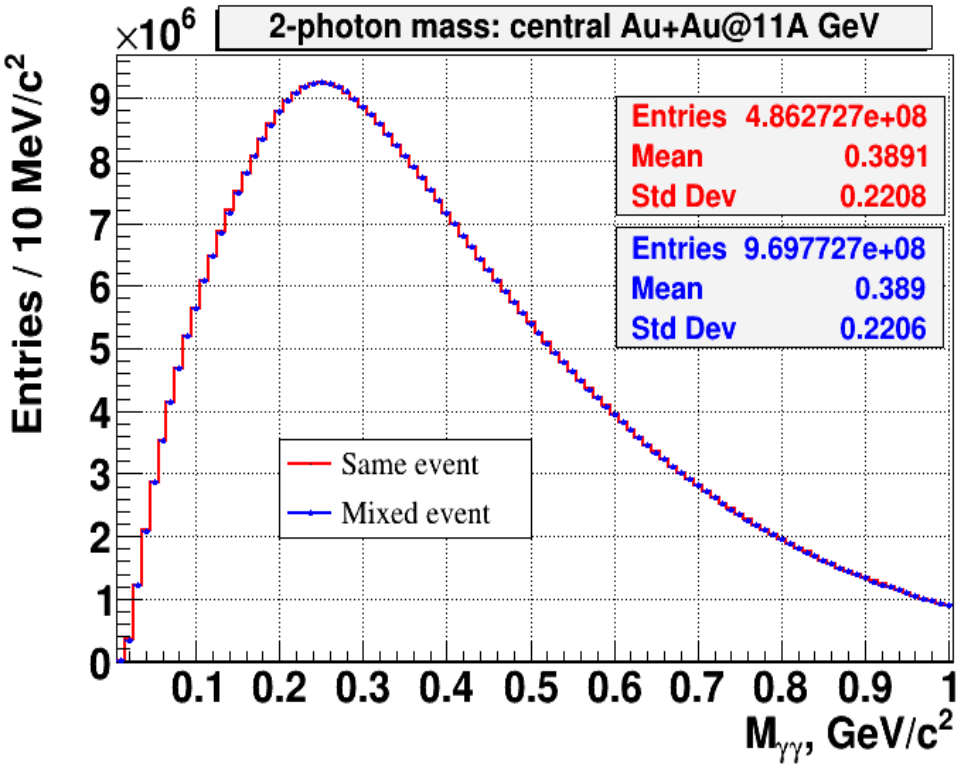


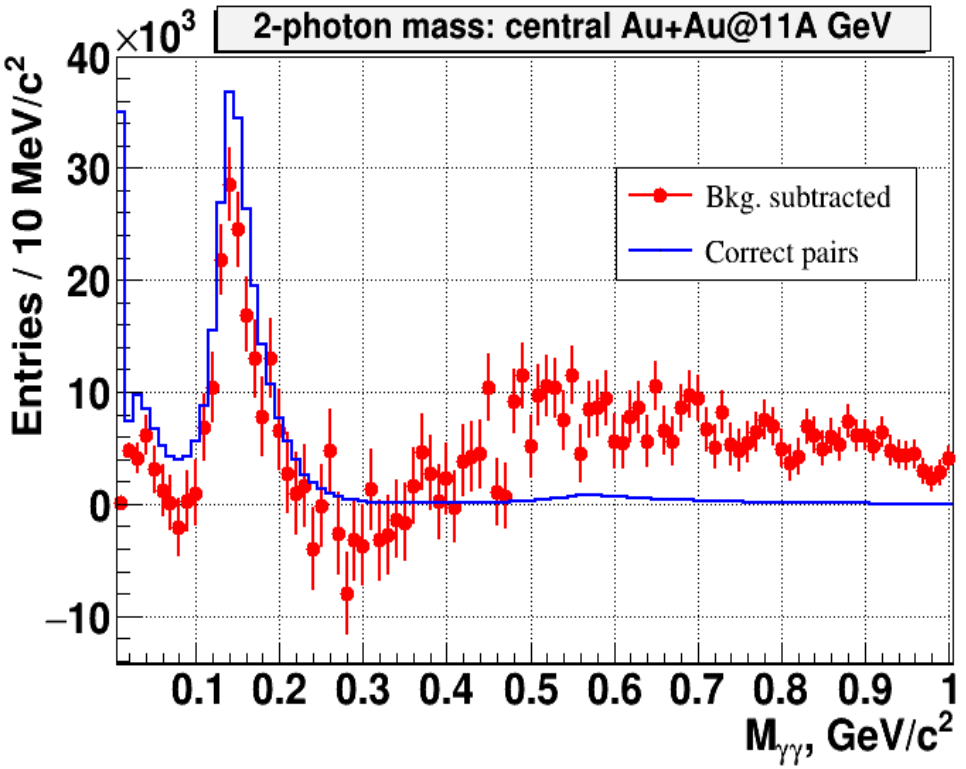
π^0 reconstruction by A. Zinchenko

1.UrQMD Generator;

2.Au+Au;

3.Events 5000;





Conclusions and future steps:

1. The new chapter in TDR ECal was added - **2.4 MC detector study with clustering algorithm;**

2. To make new Matching class for I type of cluster method (ITEP);

3. Continues to study π^0 reconstruction with both cluster types;

4. Dileptons reconstruction is not yet done, but we expect results soon;

Thank you for your attention!