«NATIONAL RESEARCH NUCLEAR UNIVERSITY MEPHI»

Optimisation of photon identification for neutral meson analysis with ECAL

Supervisor: Blau D. S.

Student: Kayukov A.A.

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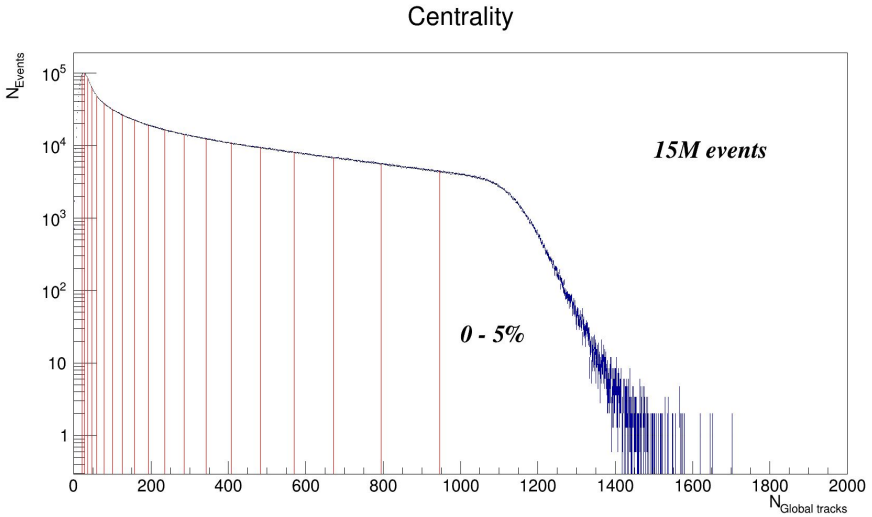
Goals and objectives of the work

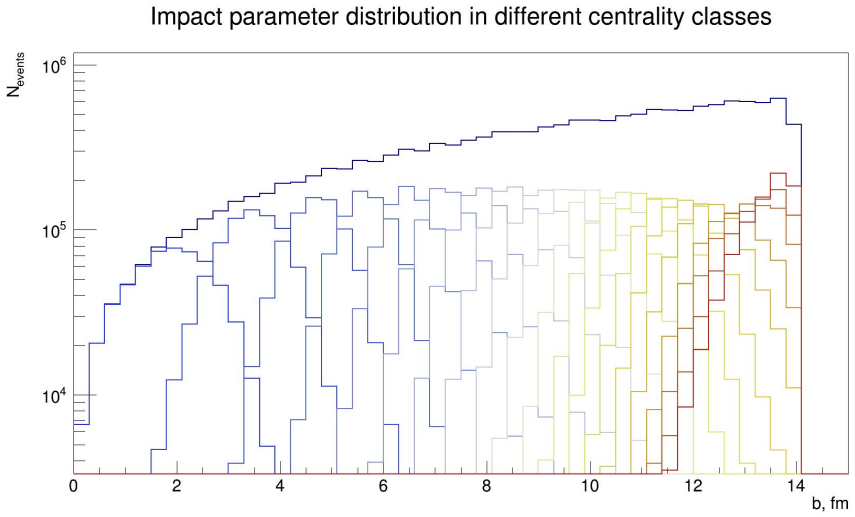
The aim of the work is to develop and optimize neutral meson reconstruction programs for the ECal calorimeter.

Tasks:

- Development of photon identification criteria
- Application of criteria to cluster pairs to calculate the number of π^0 - mesons under the peak in the invariant mass spectrum

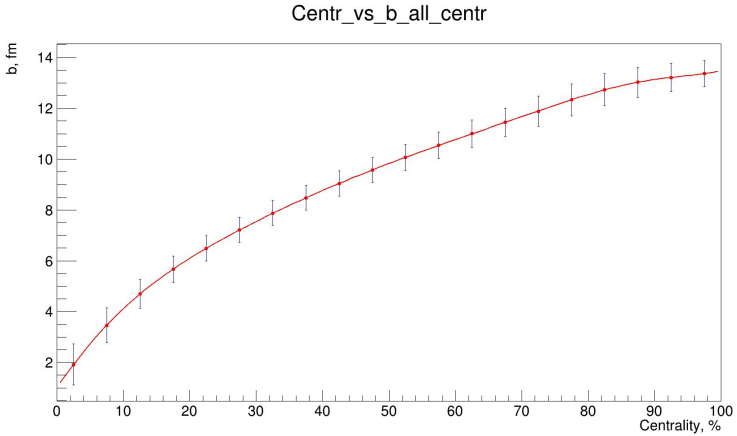
Centrality classes



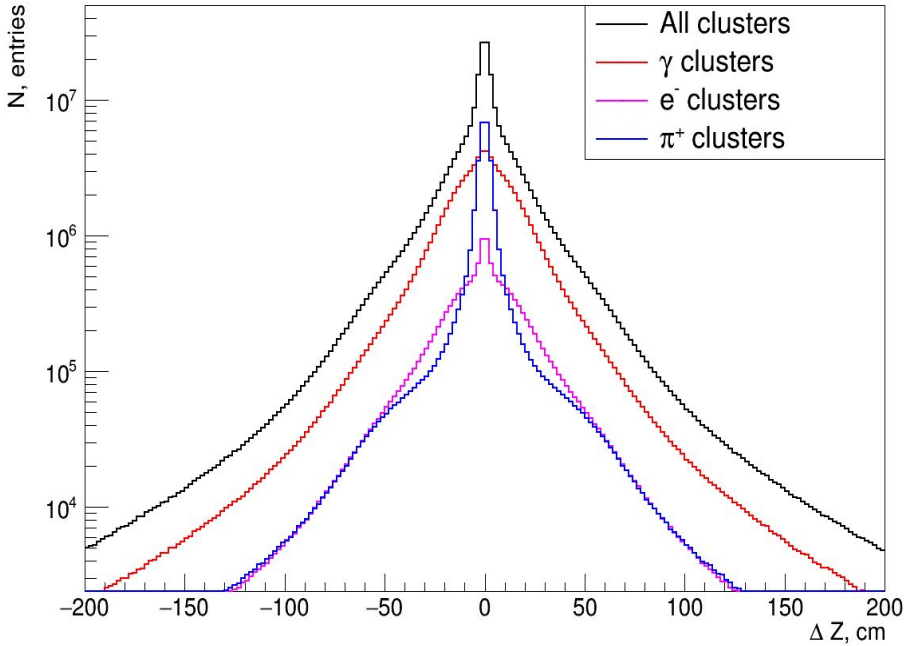


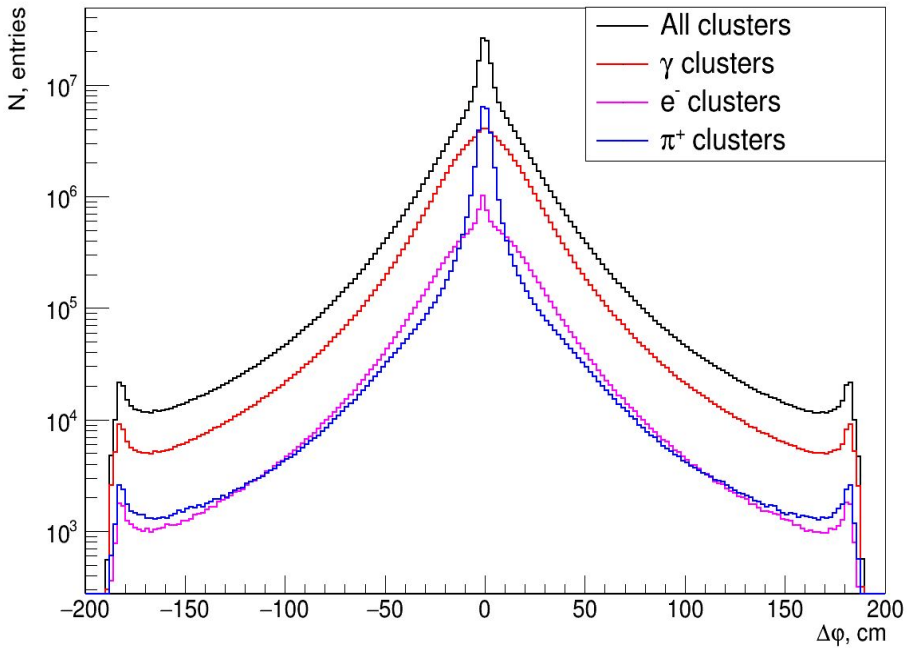
$\mathrm{Bi}^{209}_{83} + \mathrm{Bi}^{209}_{83}$ $\sqrt{s} = 9.2\ ГэВ$

b = 0 - 14 фм $15 \cdot 10^6$ *событий*



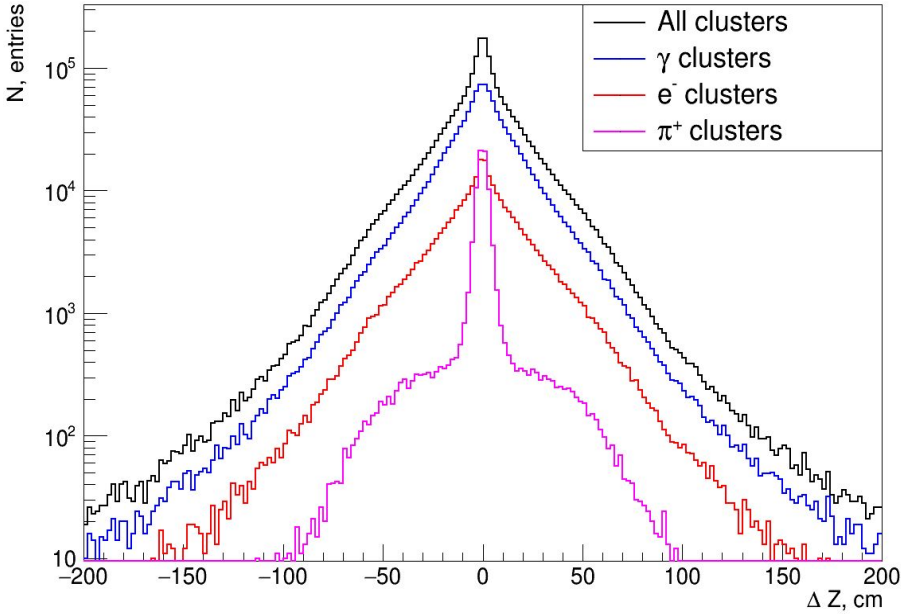
Neutrality

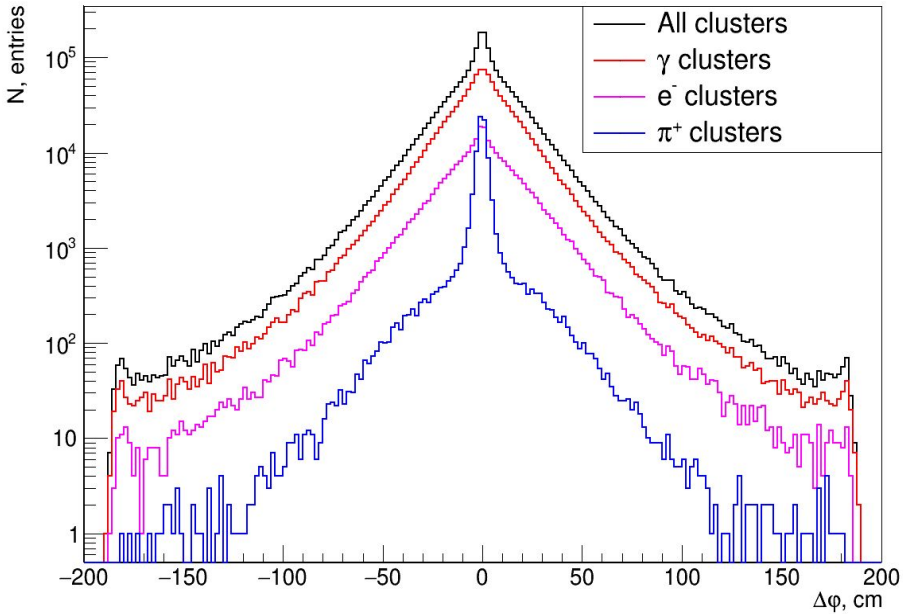




Distribution of distances between the cluster center and the nearest extrapolated track in the TPC. Cluster energy range is 0.5 - 0.6 GeV

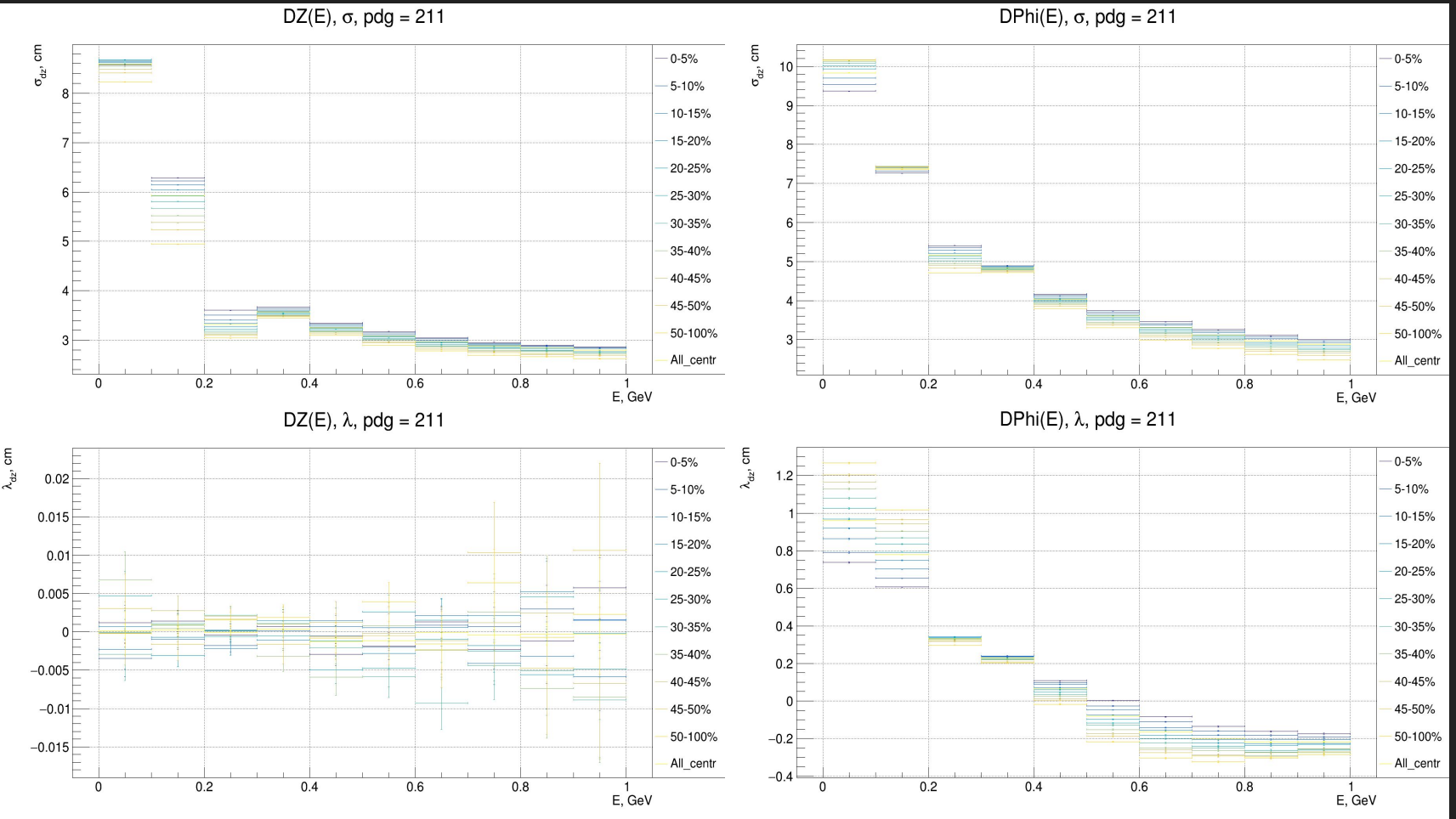
Neutrality



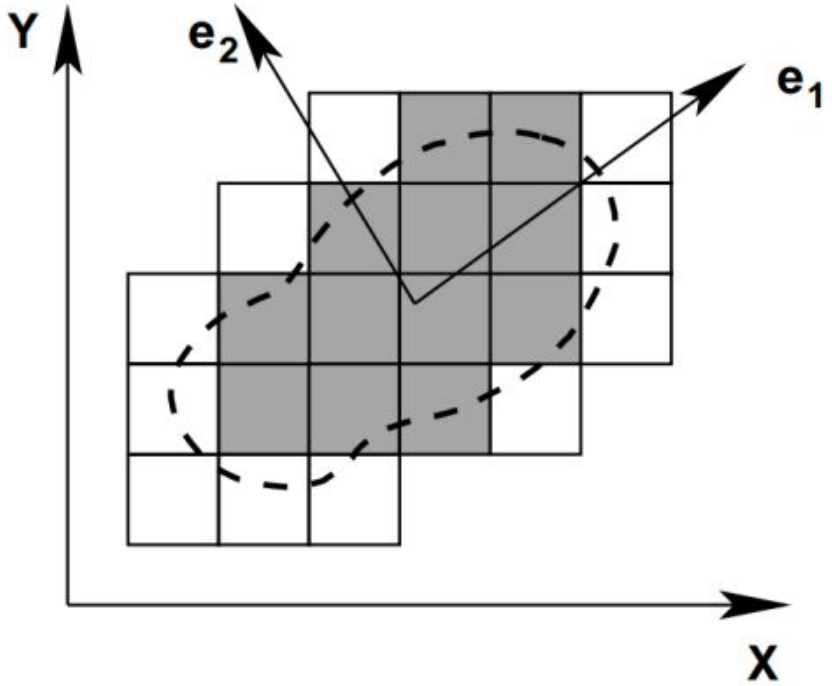


Distribution of distances between the cluster center and the nearest extrapolated track in the TPC. Cluster energy range is 1.8 - 2.0 GeV

Neutrality


DZ(E), σ, pdg = 211
σ_dz, cm
E, GeV
DPhi(E), σ, pdg = 211
σ_dz, cm
E, GeV
DZ(E), λ, pdg = 211
λ_dz, cm
E, GeV
DPhi(E), λ, pdg = 211
λ_dz, cm
E, GeV
0-5%
5-10%
10-15%
15-20%
20-25%
25-30%
30-35%
35-40%
40-45%
45-50%
50-100%
All_centr

Dispersion cut



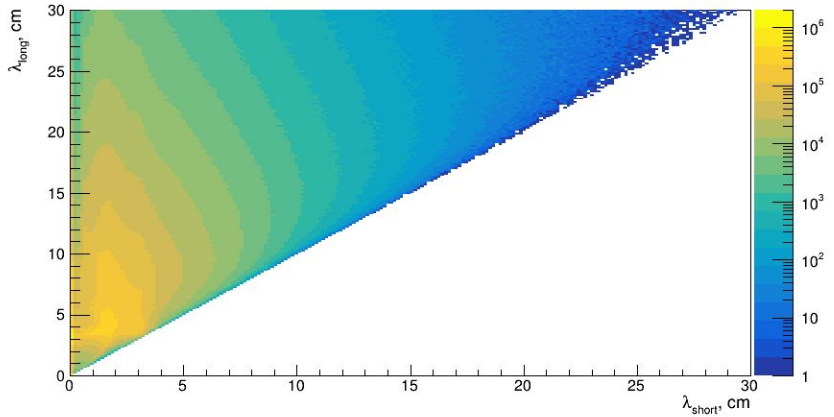
$$S = \begin{pmatrix} s_{xx} & s_{xz} \\ s_{zx} & s_{zz} \end{pmatrix},$$

$$s_{xx} = \langle (x - \overline{x})^2 \rangle,$$

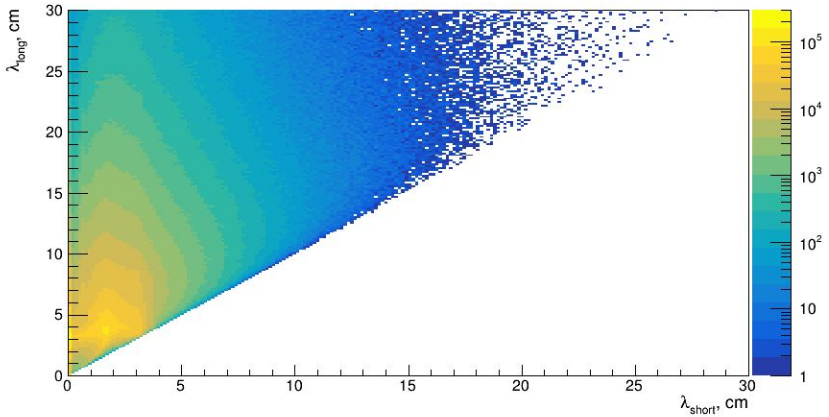
$$s_{xz} = \langle (x - \overline{x})(z - \overline{z}) \rangle$$

Dispersion cut

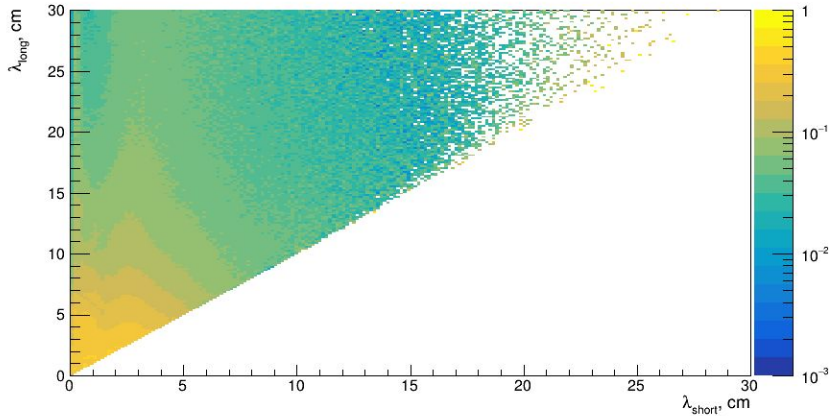
All clusters



γ from π^0- clusters

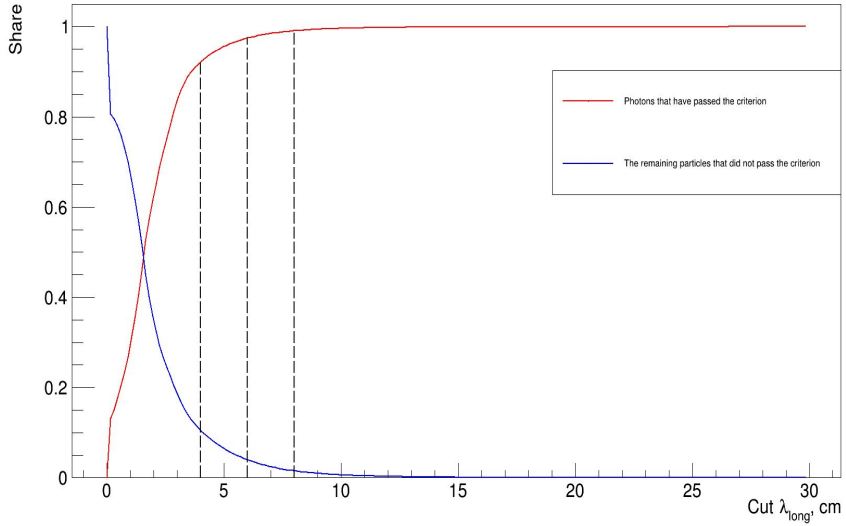


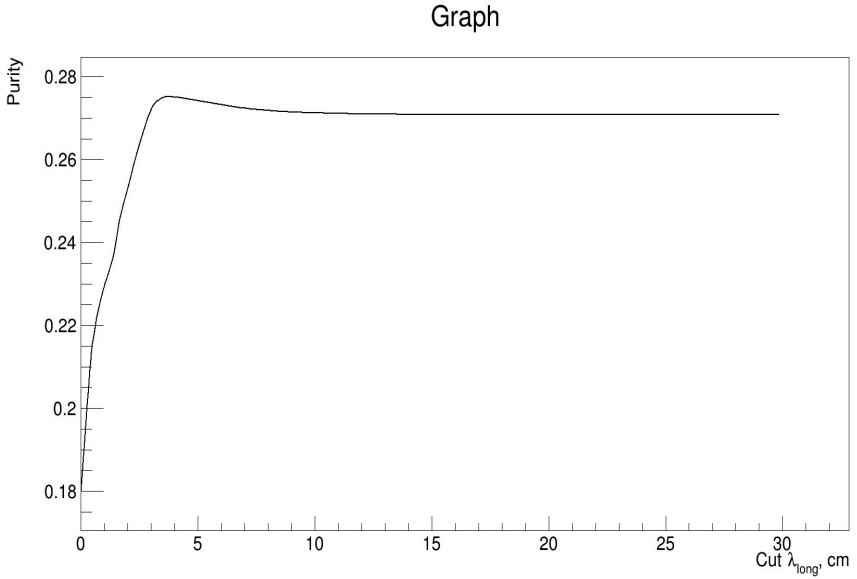
The ratio of clusters from γ to all clusters



$\lambda_{long} < 4,\ 6$ или 8 см.

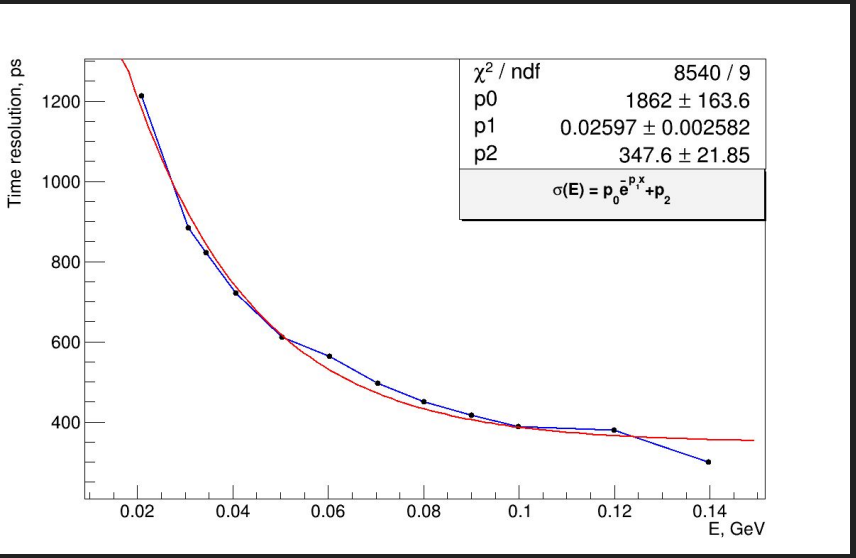
Dispersion cut





$$0.2 < E_{clu} < 0.3\ GeV$$

The time of flight cut

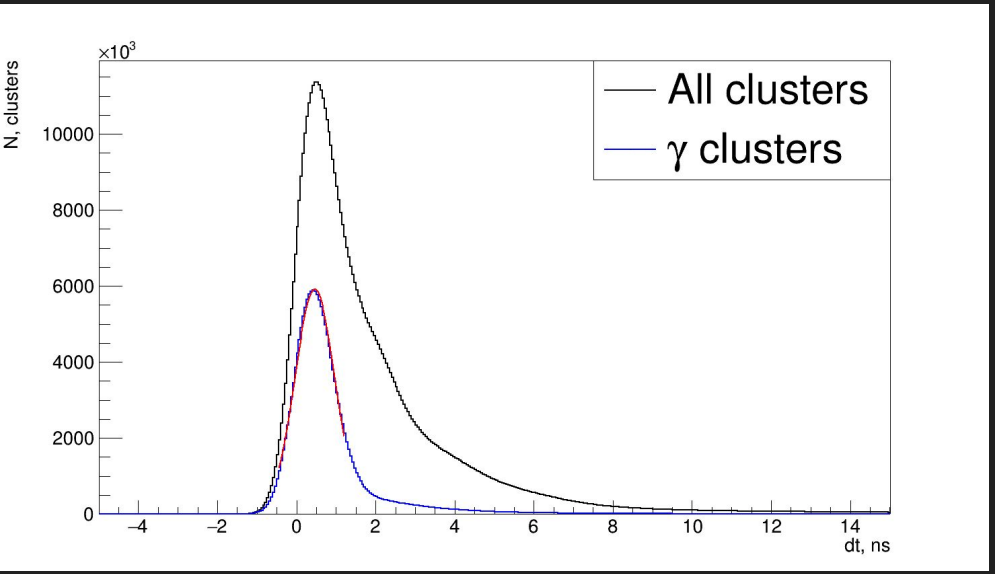


Dependence of the time resolution on the cluster energy

The information about the cluster's time of flight was smeared using the time resolution using the Gaussian function:

t = t + F(0,res), where res = TimeResolution(E) - a function that depends on the energy of the cluster.

The time of flight cut



$$\Delta t = t_{clu} - \frac{\Delta r}{c}$$

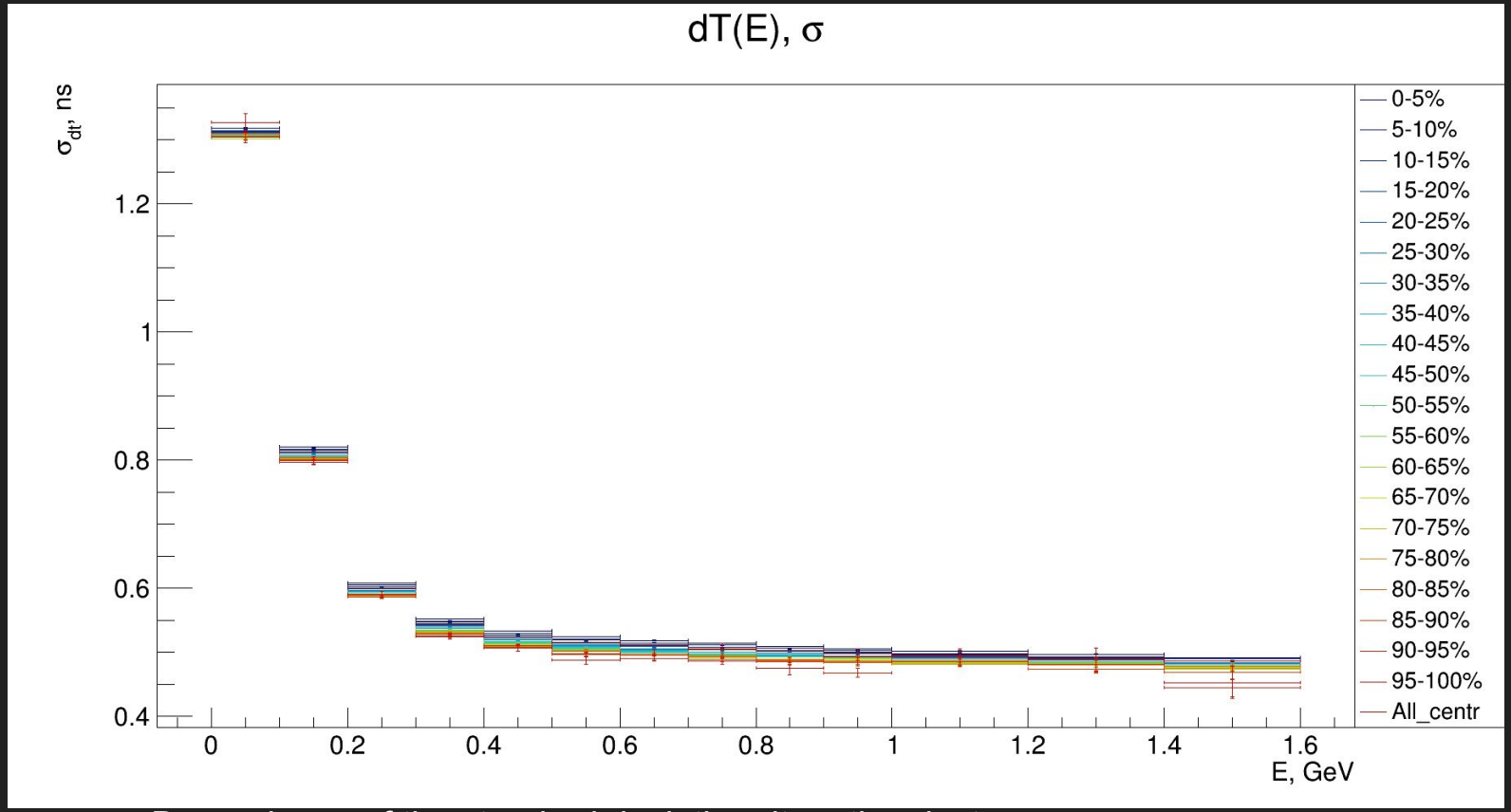
t_{clu} - experimentally measured cluster appearance time

Δr - distance from the cluster to the primary vertex

Distribution of the time of flight of particles to the calorimeter.

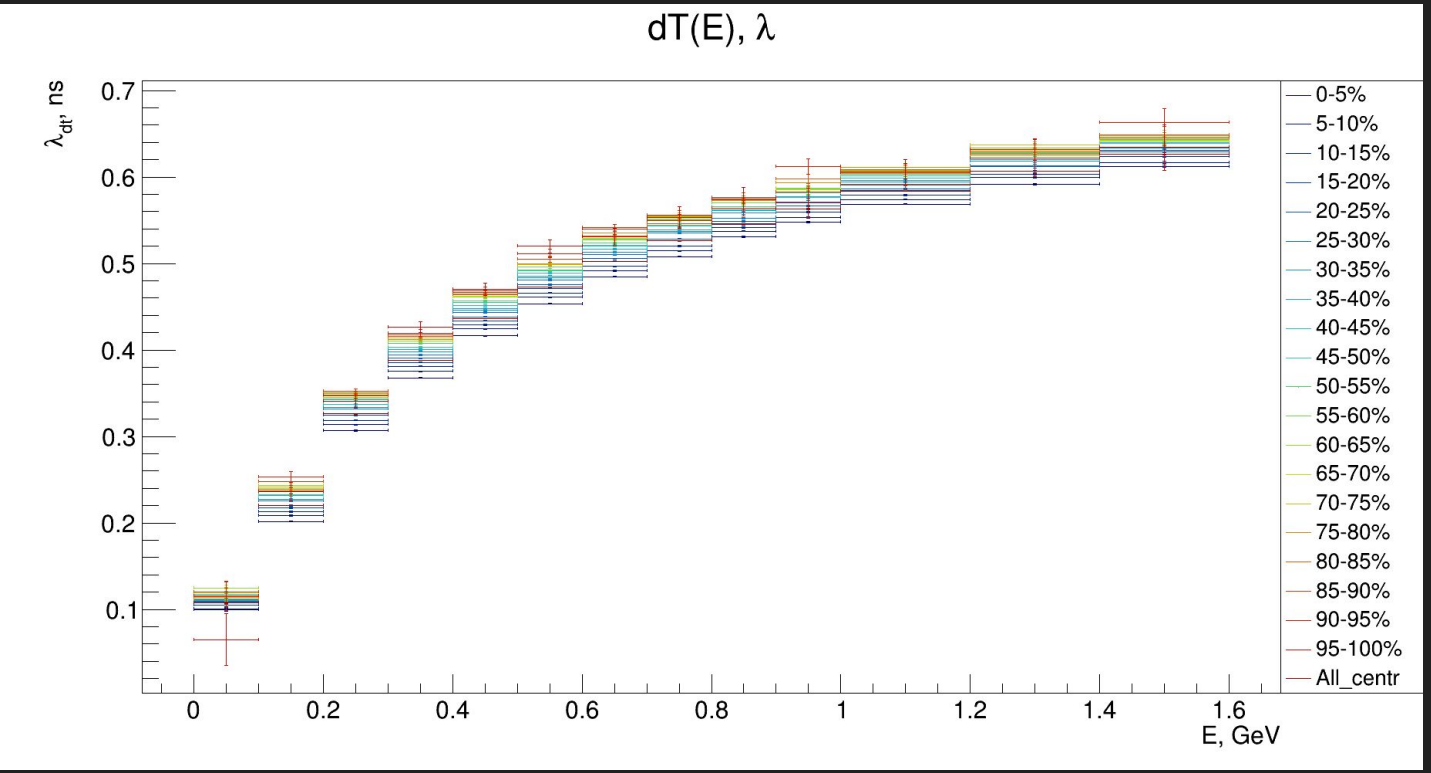
$0.3 < E_{clu} < 0.4\ GeV$

The time of flight cut



Dependence of the standard deviation dt on the cluster energy

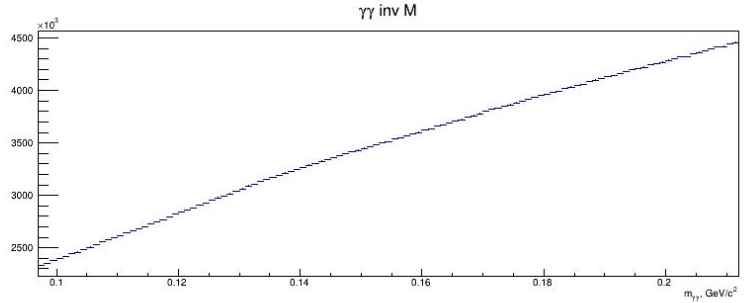
The time of flight cut

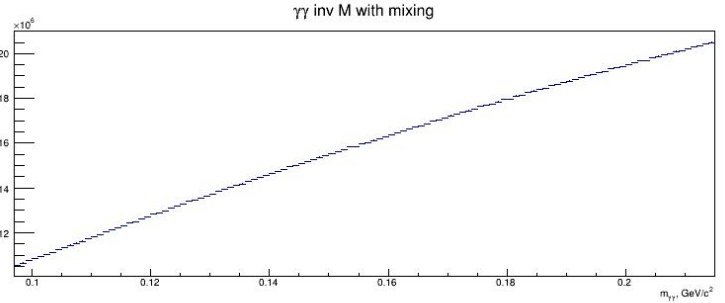


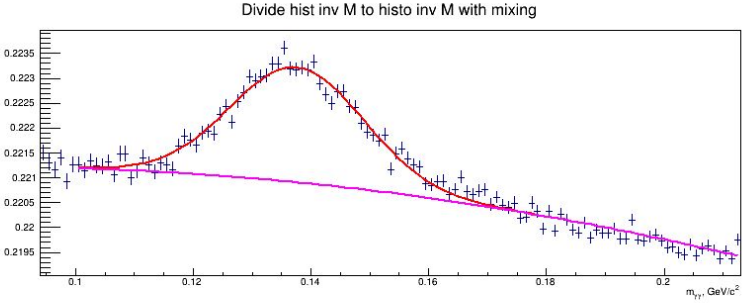
Dependence of the average dt value on the cluster energy

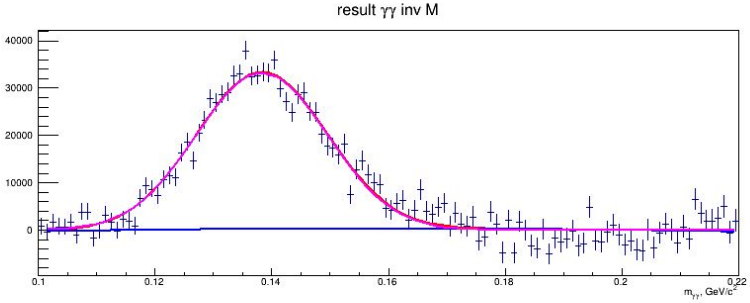
$$|dt - \lambda_{dt}(E)| > N \cdot \sigma_{dt}(E)$$

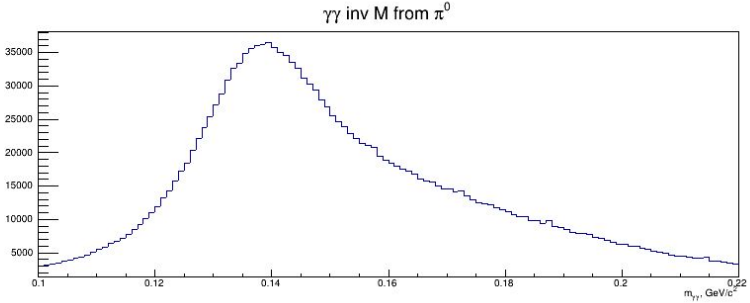
The spectrum of invariant masses







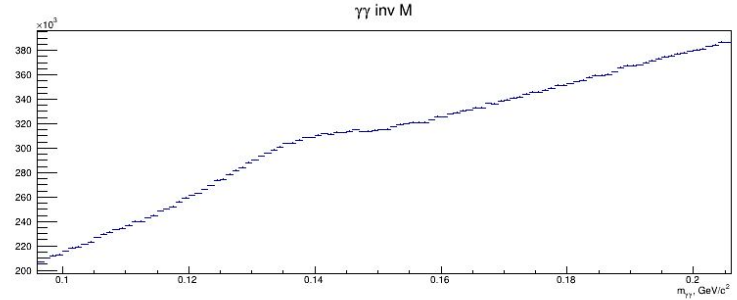


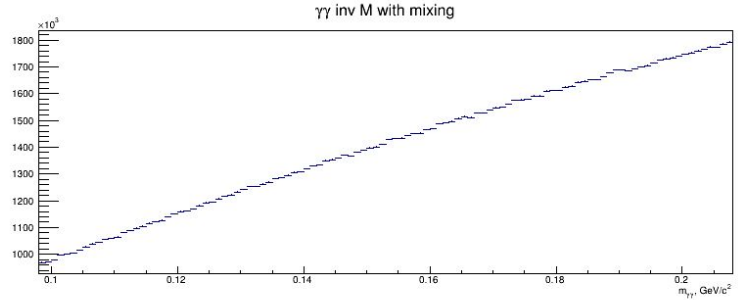


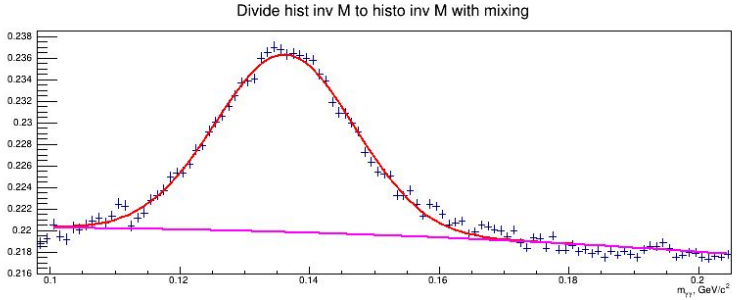
Before applying the criteria

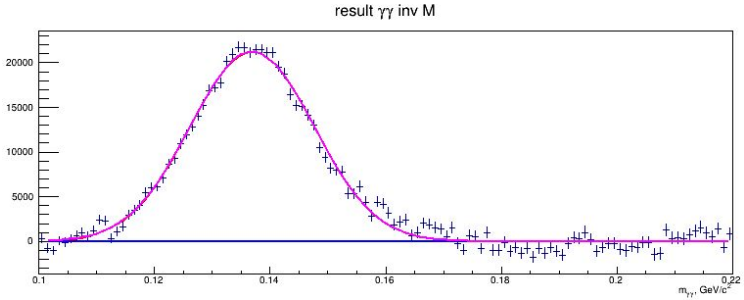
$$0.9 < Pt < 1.2\,,\ \frac{GeV}{c}$$

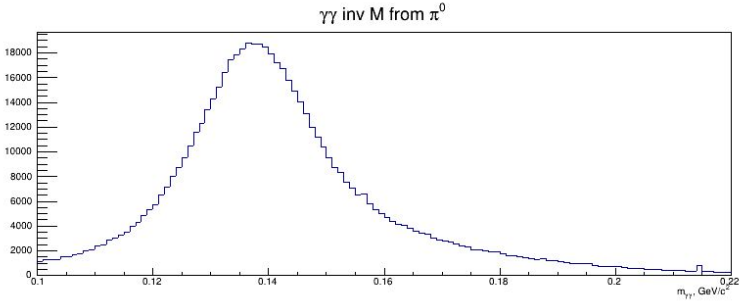
The spectrum of invariant masses







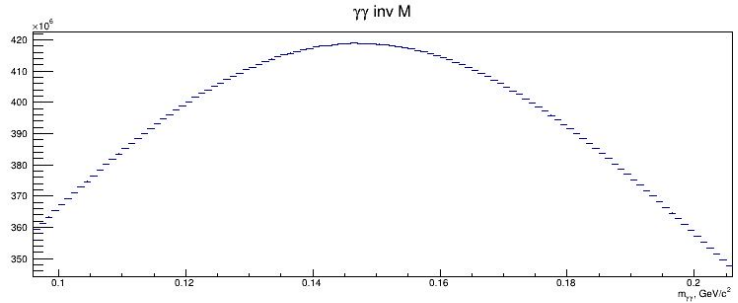


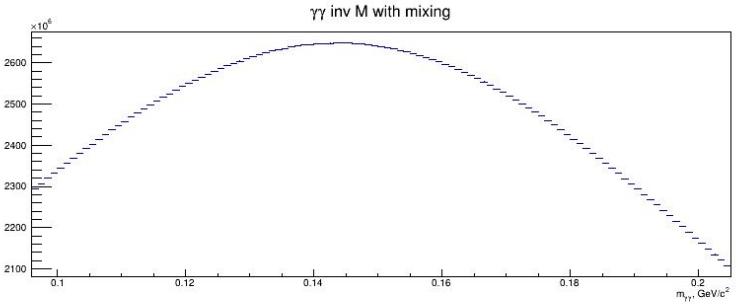


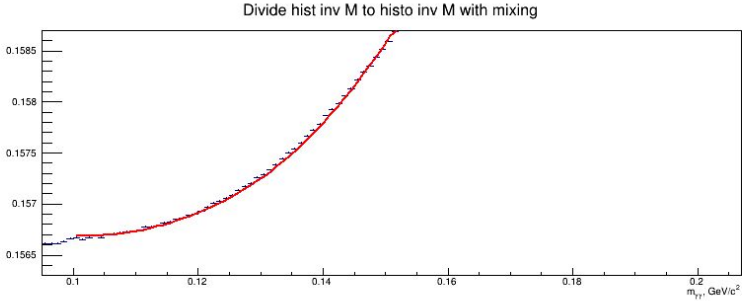
After applying the criteria

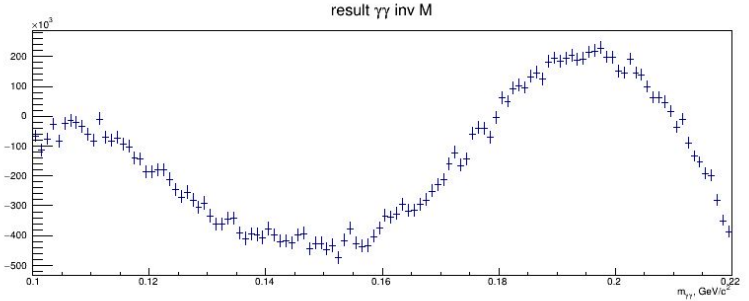
$$0.9 < Pt < 1.2, \frac{GeV}{c}$$

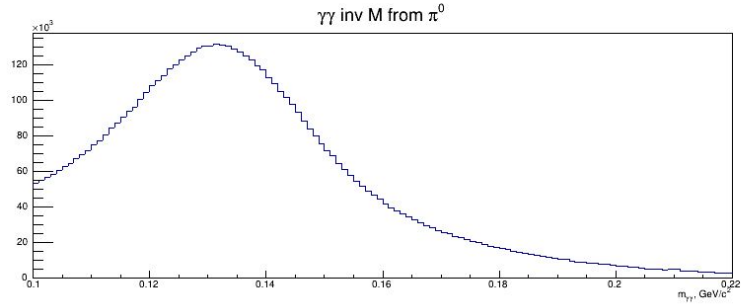
The spectrum of invariant masses





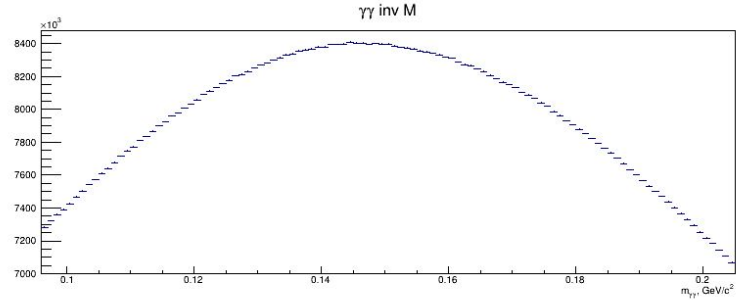


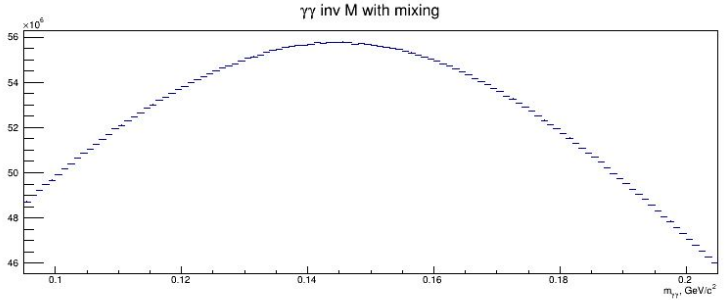


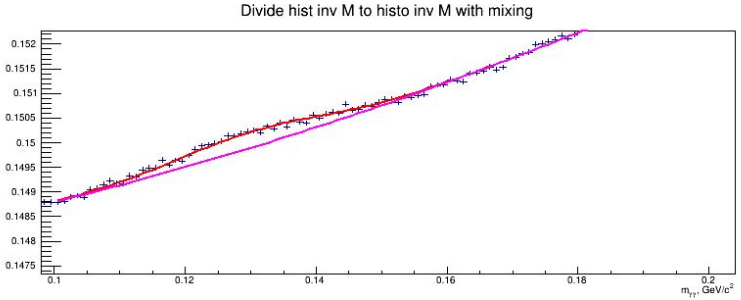


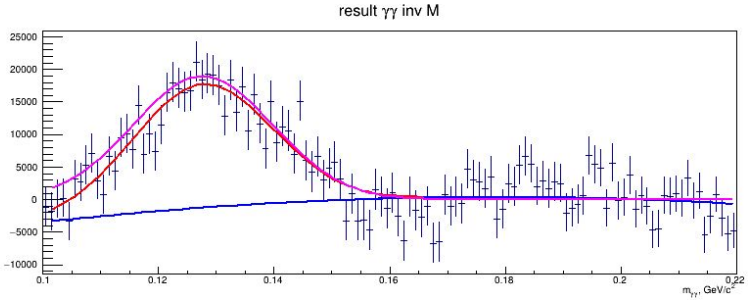
$$0.1 < Pt < 0.3, \frac{GeV}{c}$$

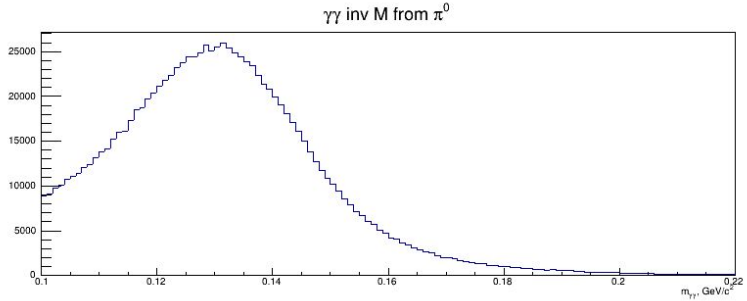
The spectrum of invariant masses











$$0.1 < Pt < 0.3, \frac{GeV}{c}$$

Conclusion

- Criteria for the selection of neutral clusters have been developed
- In accordance with the obtained criteria, the distributions of invariant masses of cluster pairs are constructed

Thanks for your attention