

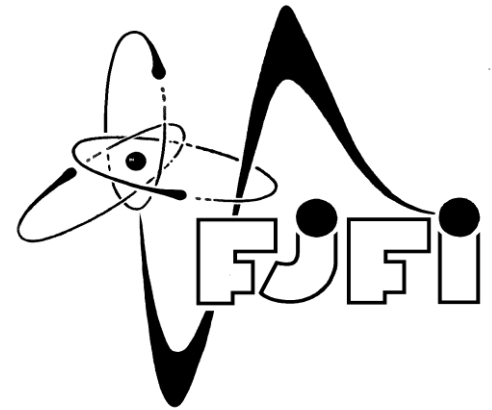
Correlation femtoscopy at the STAR experiment



Výzkumný úkol

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ČVUT-FJFI



Outline

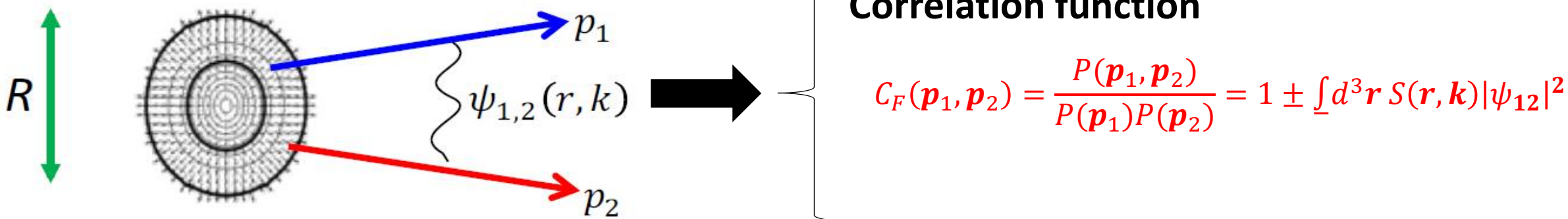
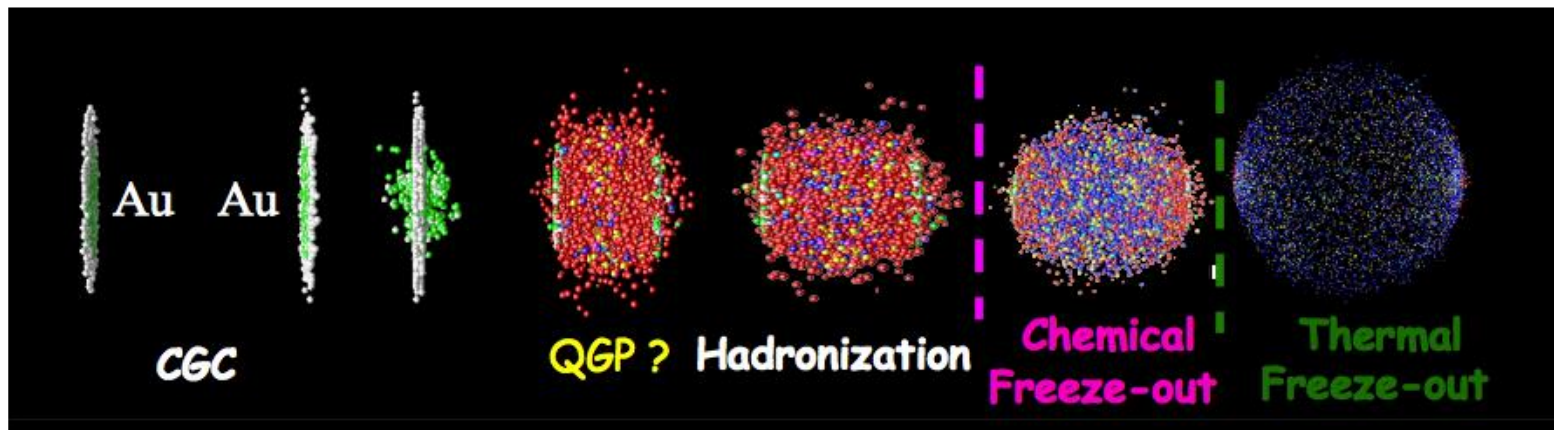
- Motivation
- Introduction to Femtoscopy
- Data and cuts
- Results
- Summary
- Future plans

Motivation

- Understanding of the space-time development of heavy-ion collision
- Study of non Gaussian source in p-Au collision

Femtoscscopy

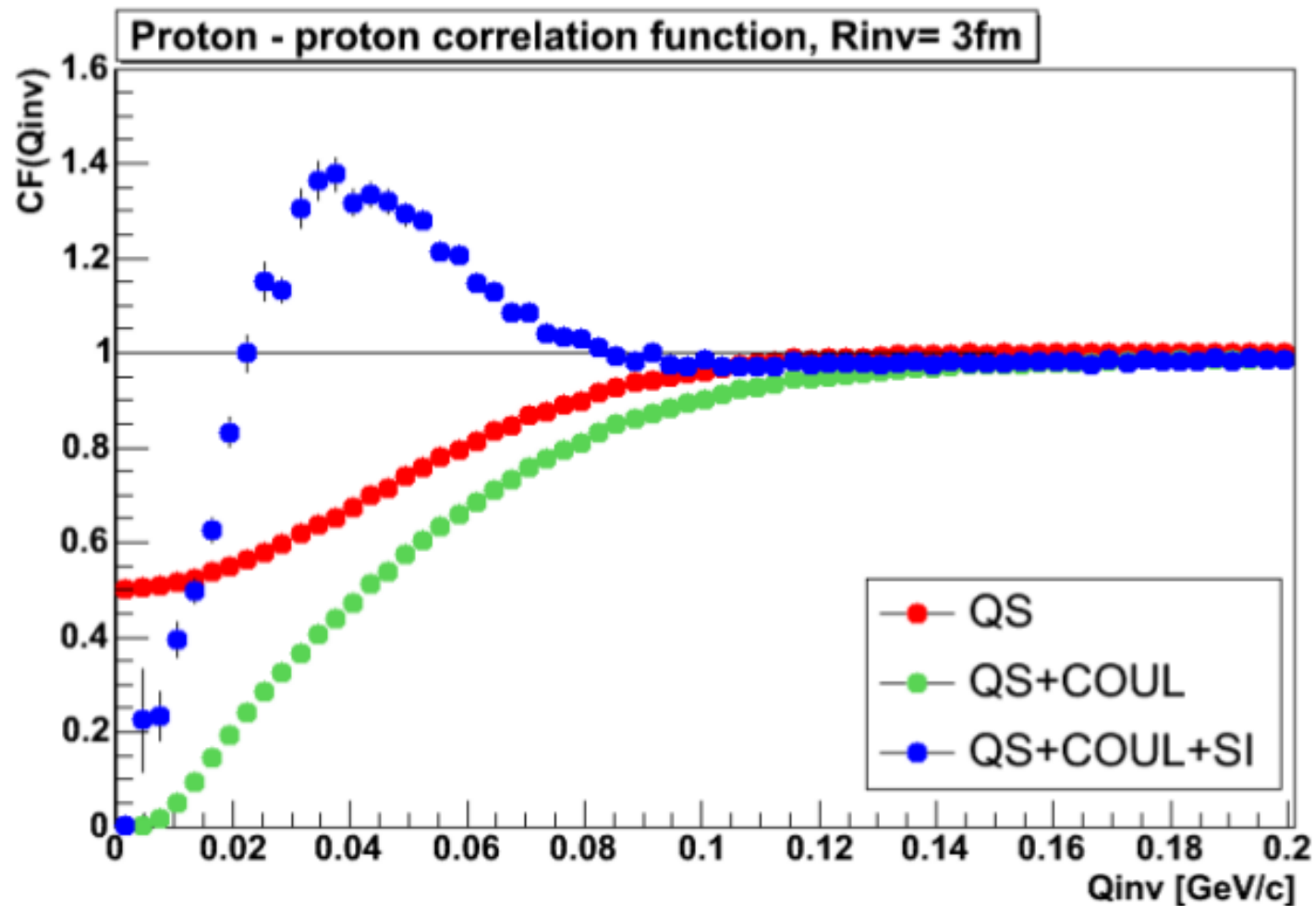
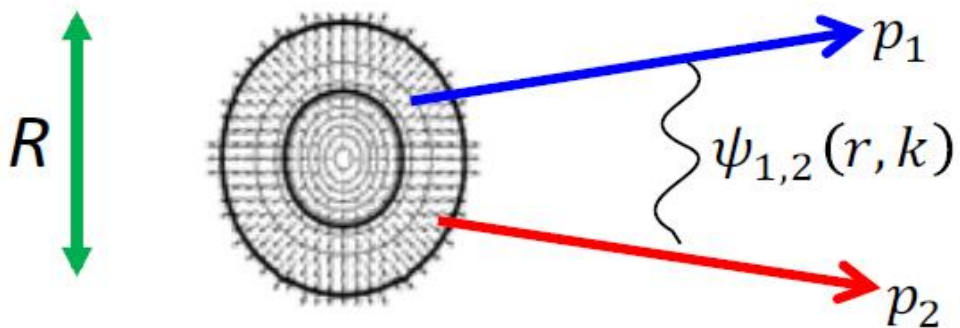
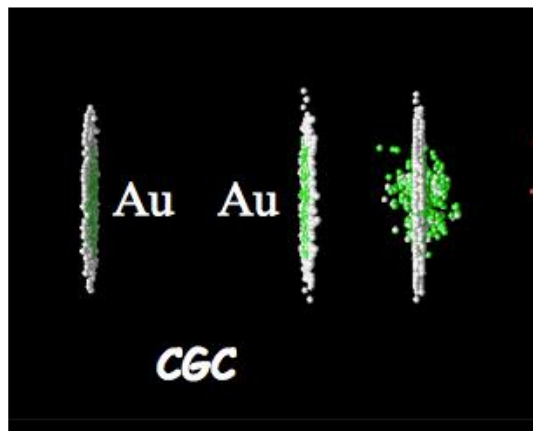
- Study space-time extents of the source at the thermal freeze-out



Two-particle correlation function is sensitive to the separation distribution of the source and interaction at the thermal freeze-out.

Femtoscscopy

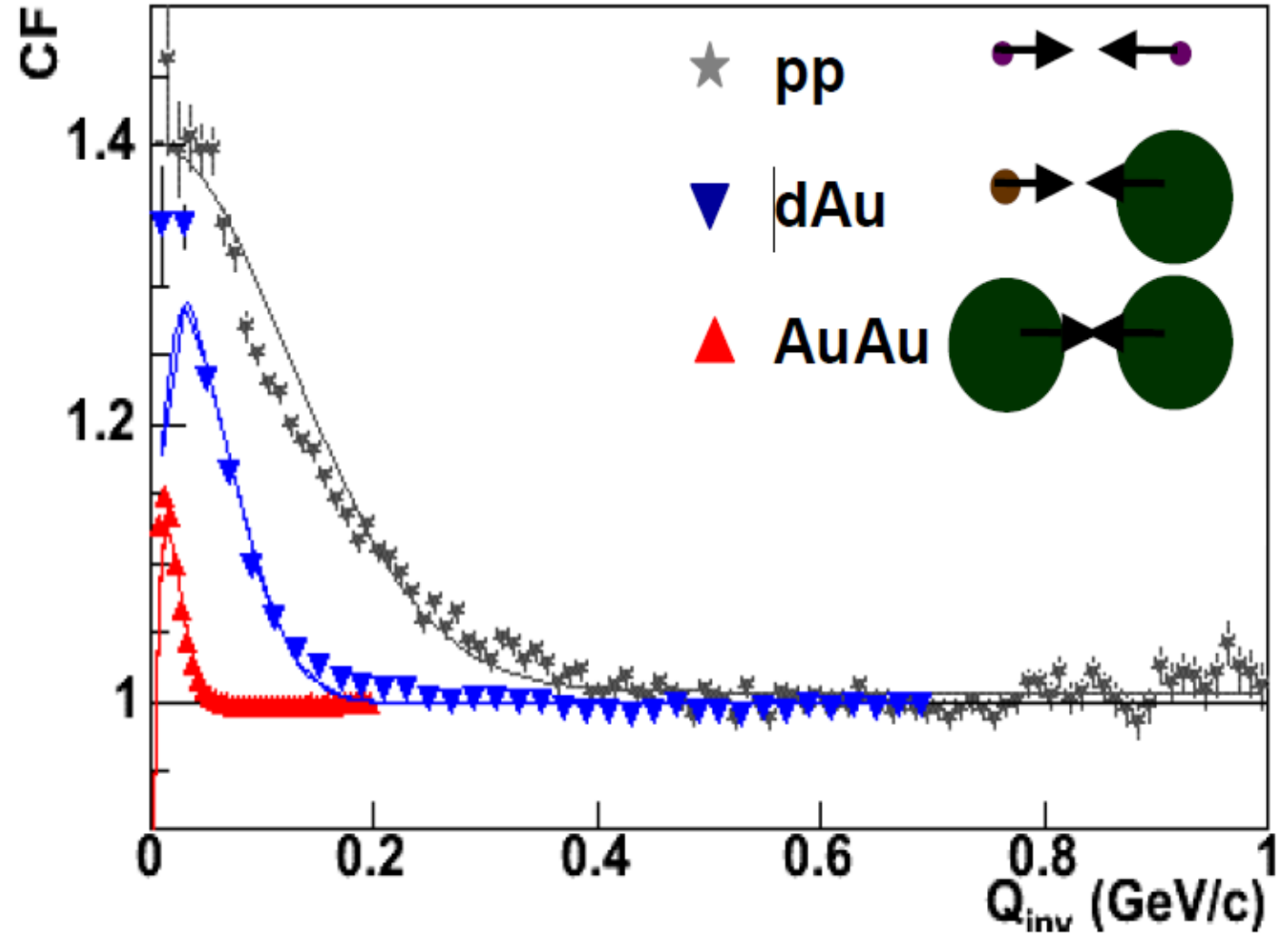
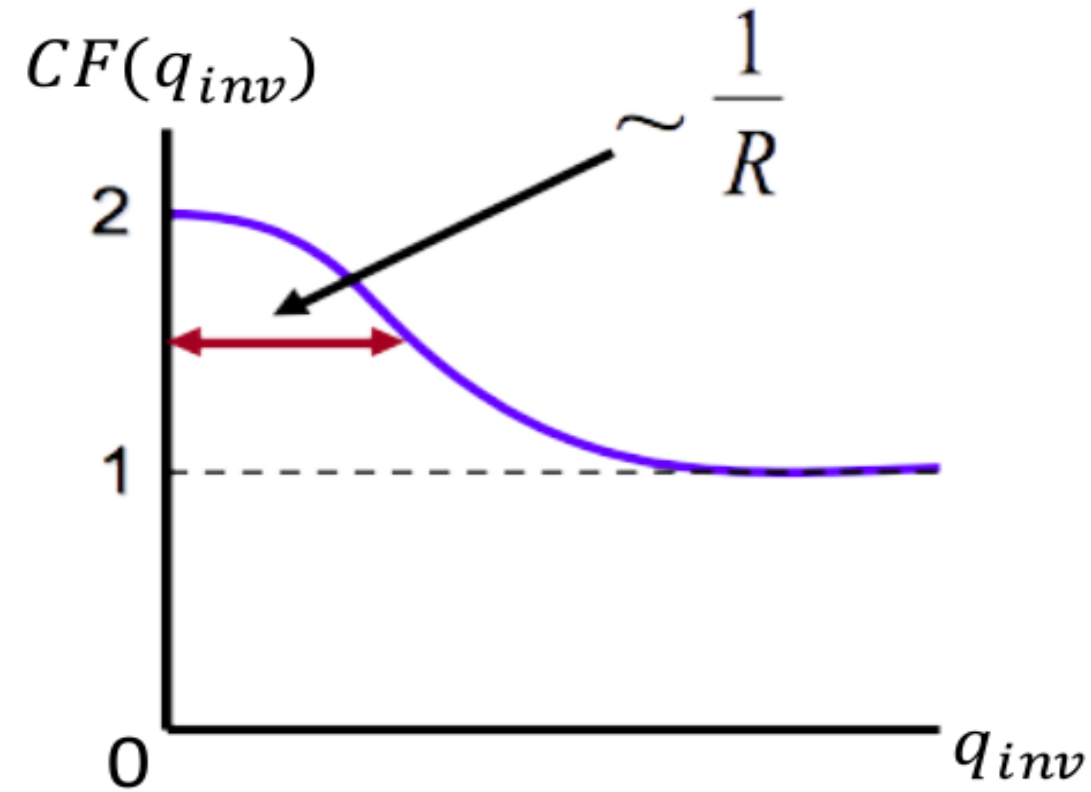
- Study space-time extents of the s



Two-particle correlation function is sensitive to the separation distribution of the source and interaction at the thermal freeze-out.

$$C_F(q_{inv}) = 1 \pm \exp(-R_{inv}^2 q_{inv}^2)$$

(if assuming Gaussian source)

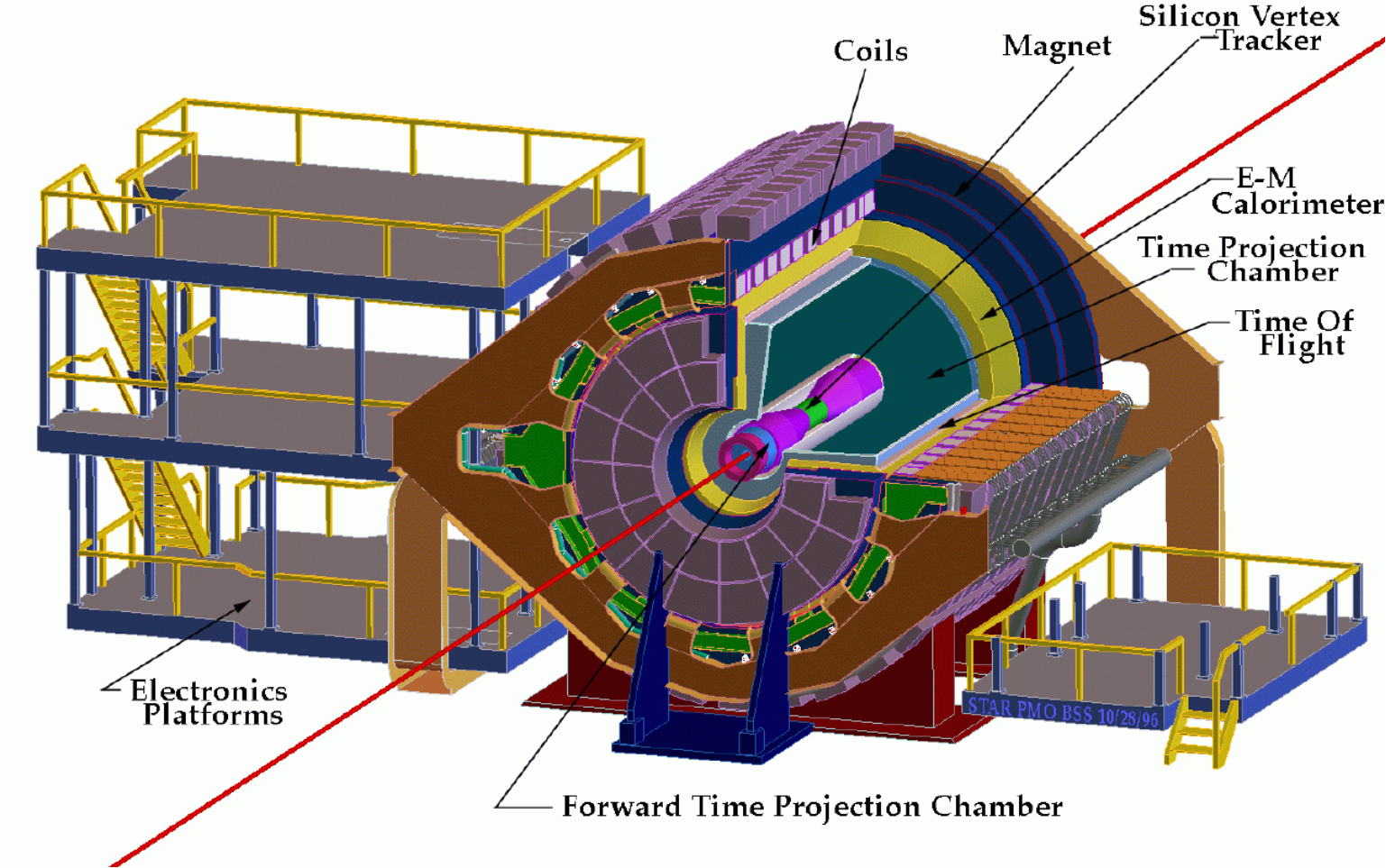


Width of the correlation function $\sim 1/R$

$$R_{AuAu} \gg R_{dAu} > R_{pp}$$

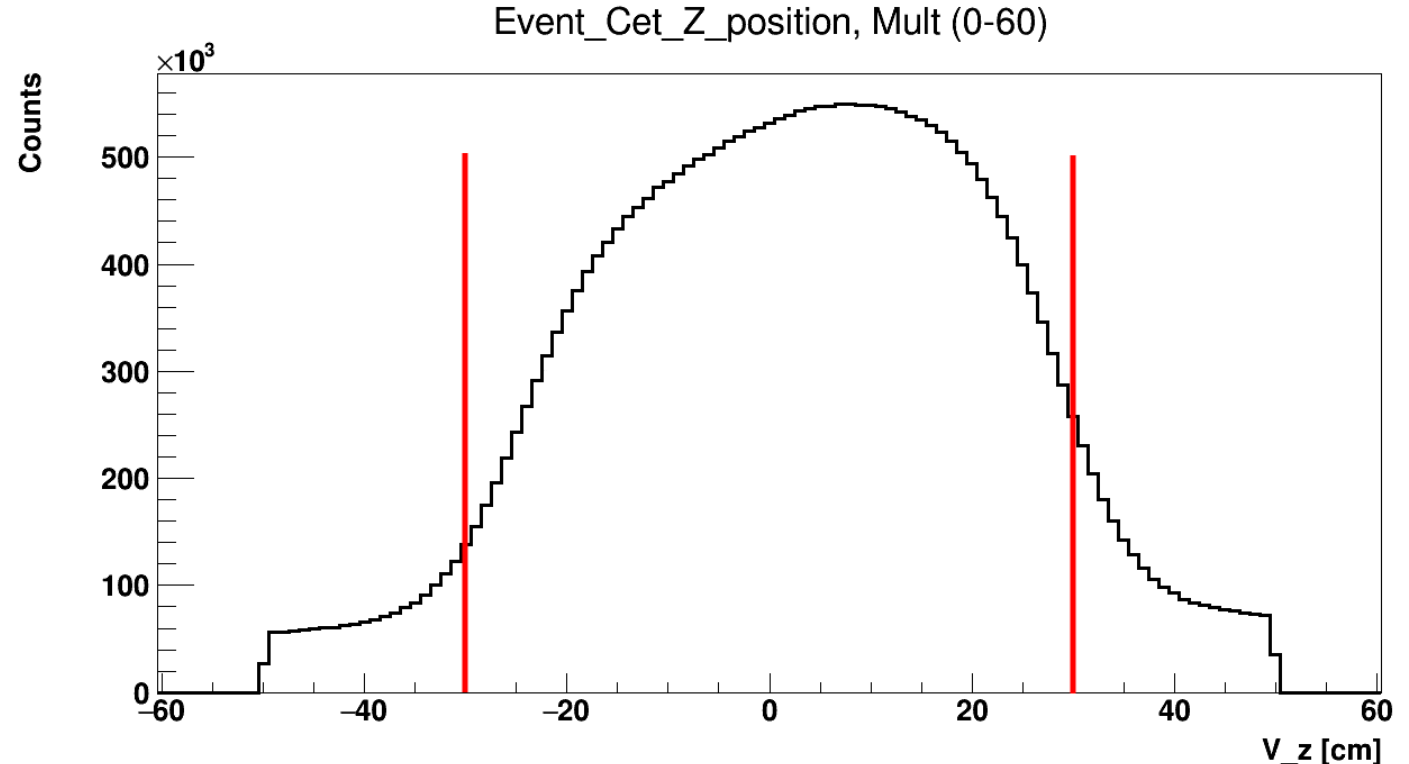
RHIC-STAR
Run 15
p-Au at 200 GeV

STAR Detector

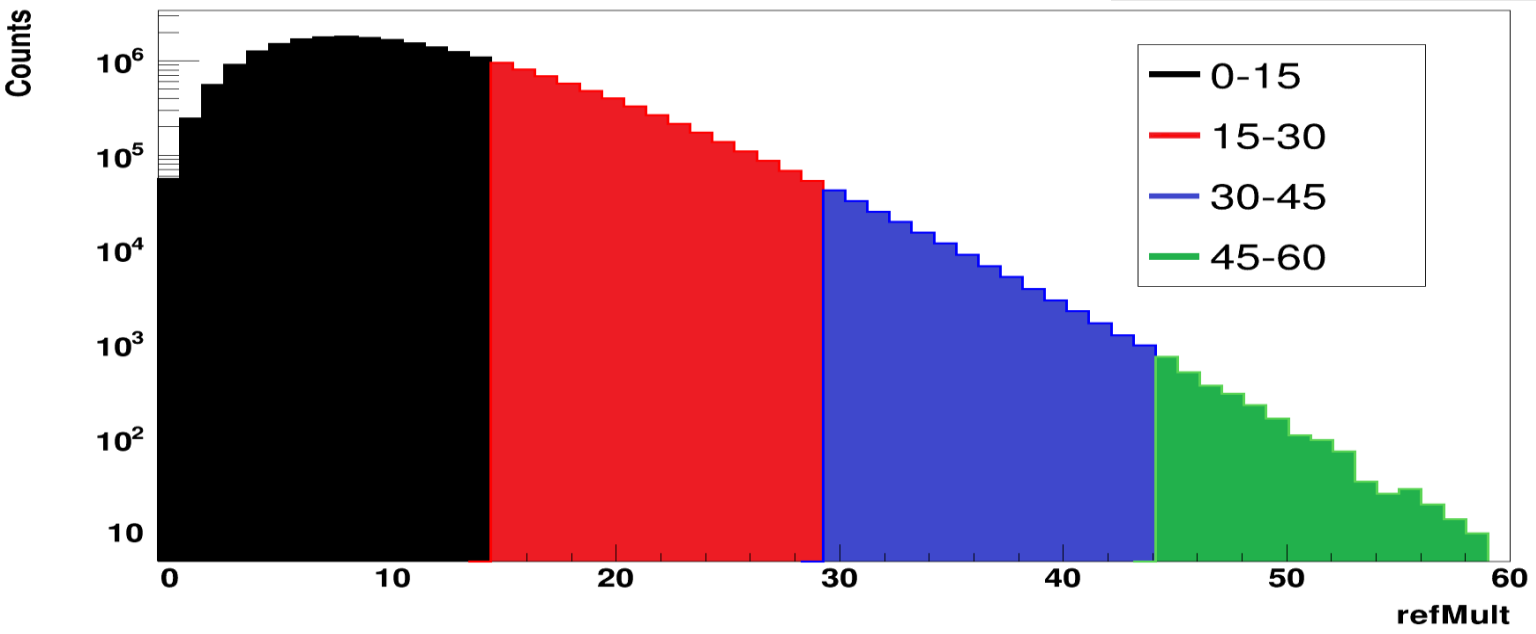


Event selection

primary vertex position: $-30 < V_z < 30 \text{ cm}$

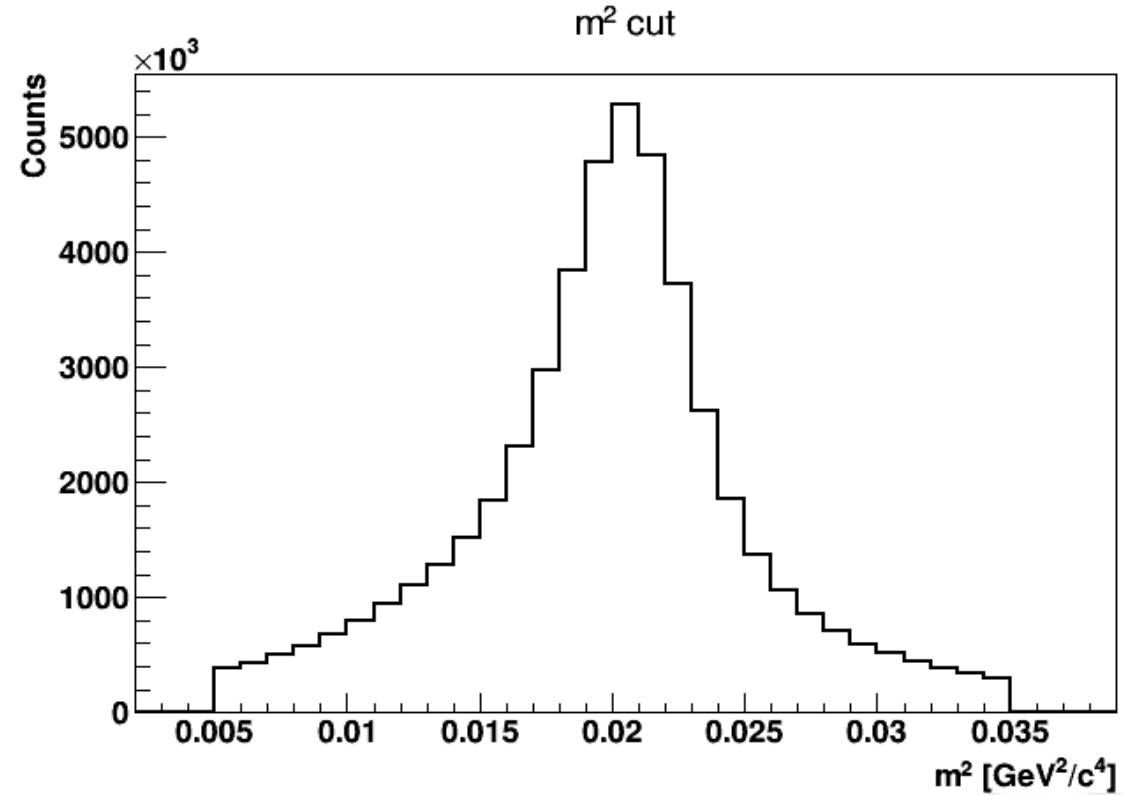
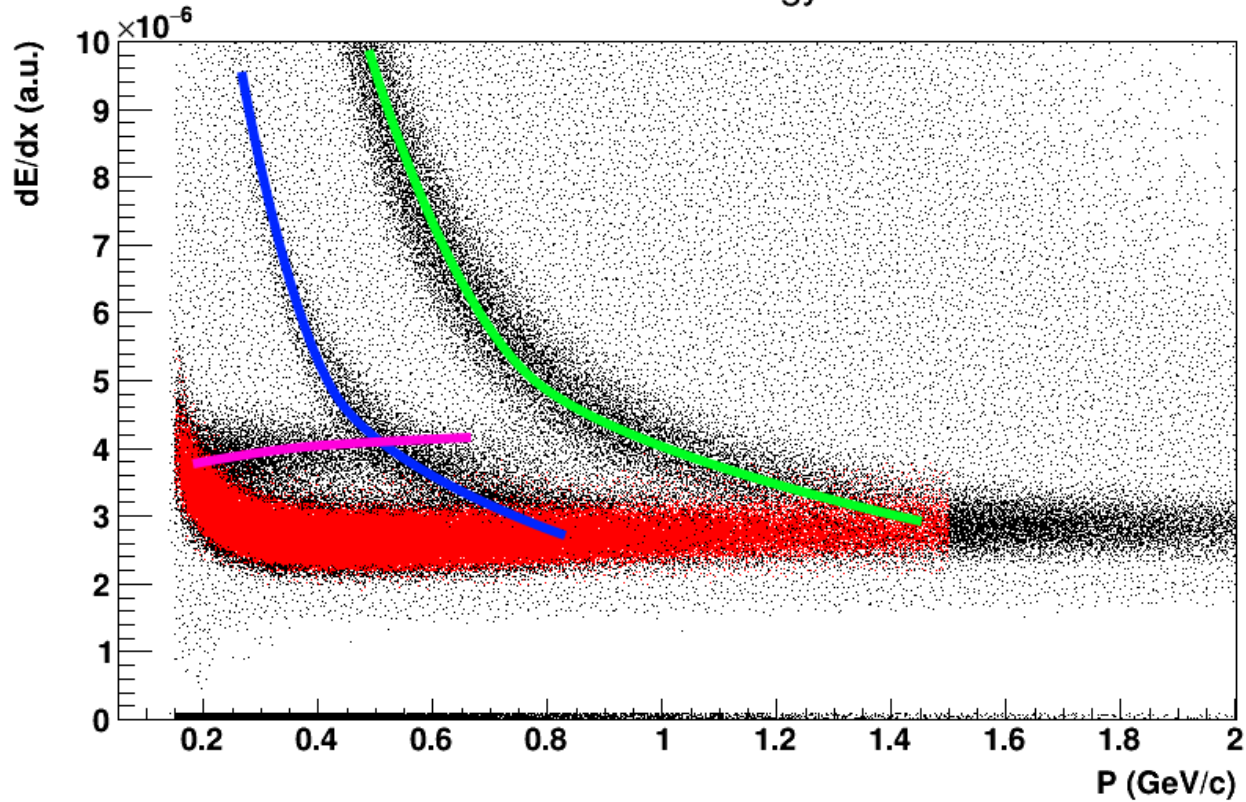


Multiplicity event cuts



Particle selection

Momentum vs Energy Loss



particle momentum: $0,15 < p < 1,5 \text{ GeV}/c$

transverse particle momentum: $0,15 < p_T < 1,5 \text{ GeV}/c$

transverse pair momentum: $0 < k_T < 1,5 \text{ GeV}/c$

ToF mass: $0,005 < m^2 < 0,035 \text{ GeV}^2/c^4$

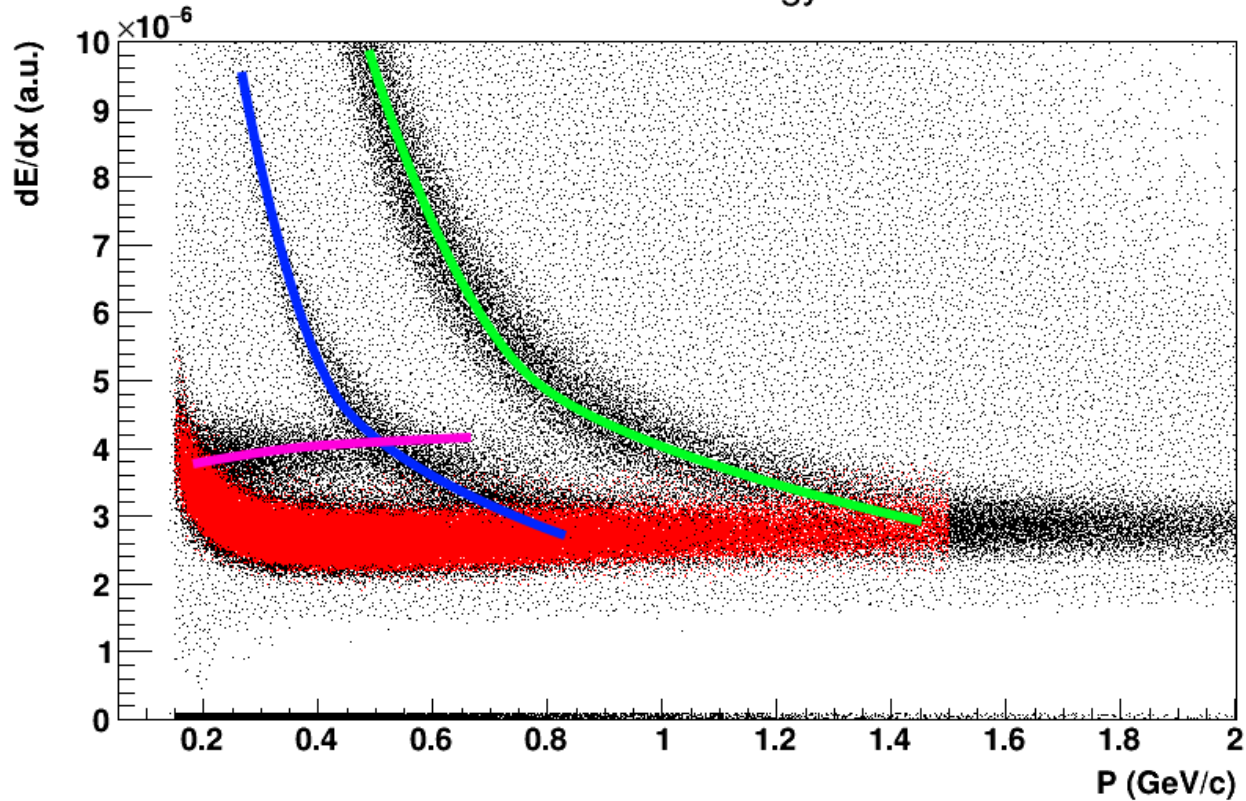
TPC Only: $|N_{\sigma,K}| > 2$, $|N_{\sigma,\pi}| < 2$, $|N_{\sigma,p}| > 2$, $|N_{\sigma,e}| > 2$

TPC + ToF: $|N_{\sigma,\pi}| < 2$

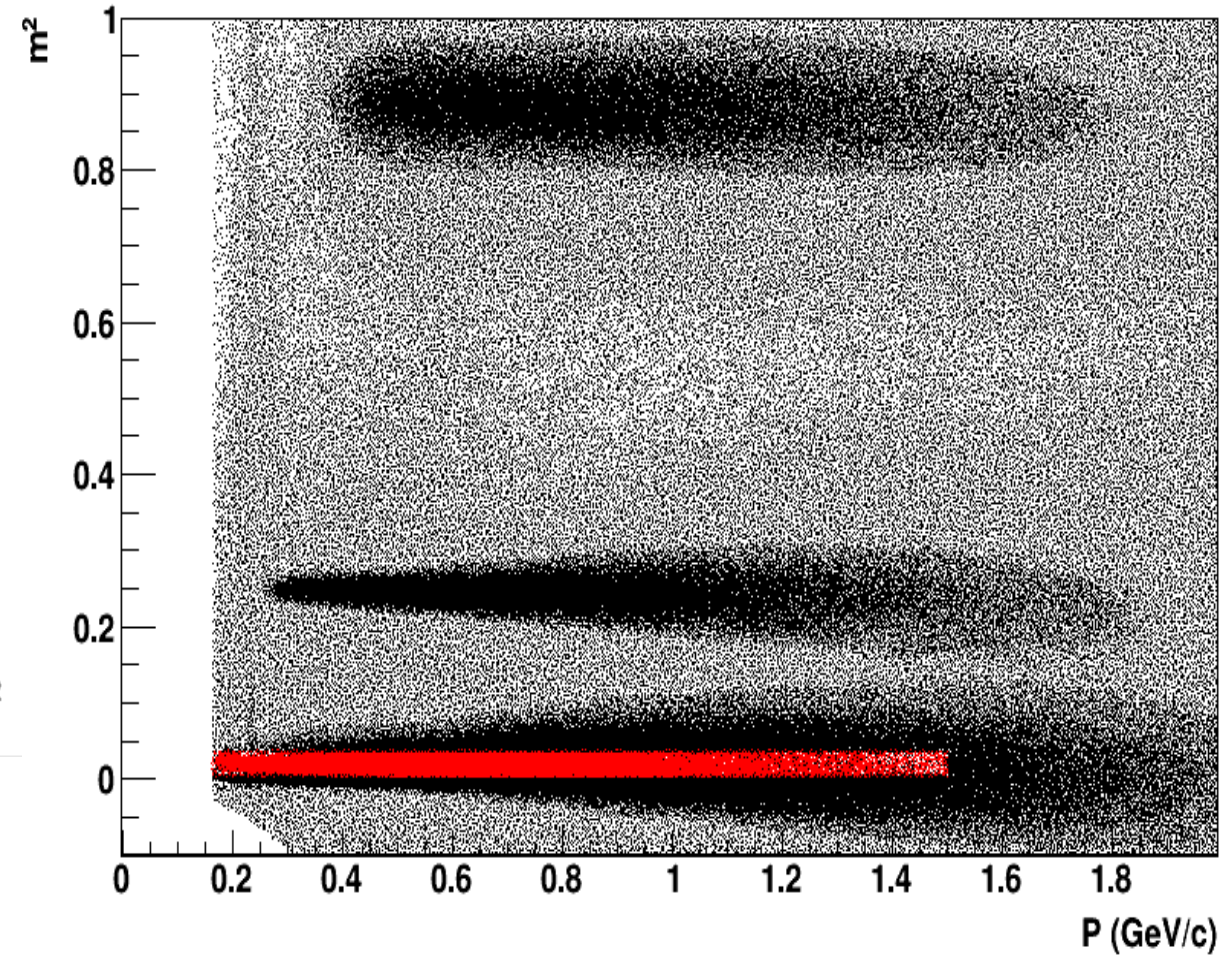
pseudorapidity range: $|\eta| < 1$

Particle selection

Momentum vs Energy Loss



Momentum vs TOF m^2



particle momentum: $0,15 < p < 1,5 \text{ GeV}/c$

transverse particle momentum: $0,15 < p_T < 1,5 \text{ GeV}/c$

transverse pair momentum: $0 < k_T < 1,5 \text{ GeV}/c$

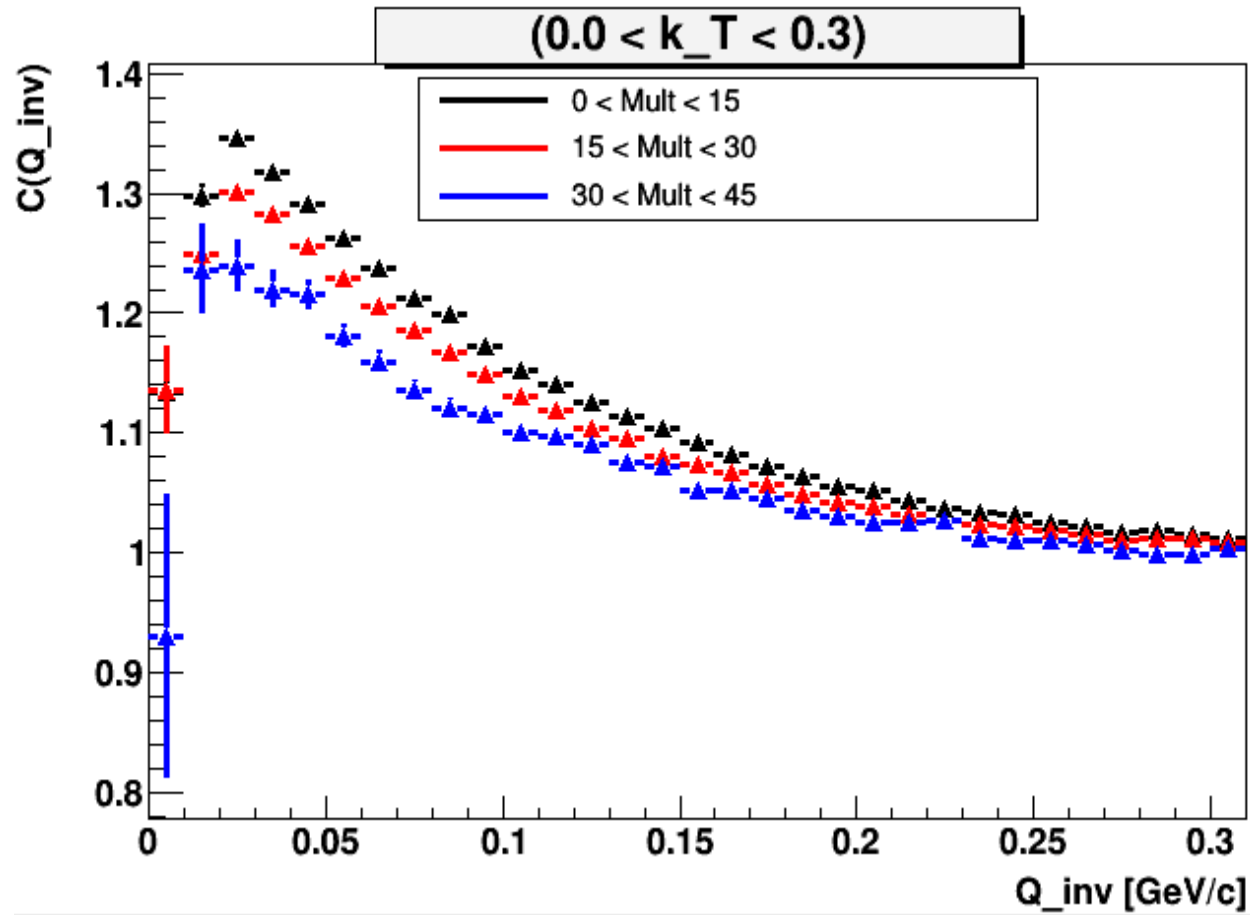
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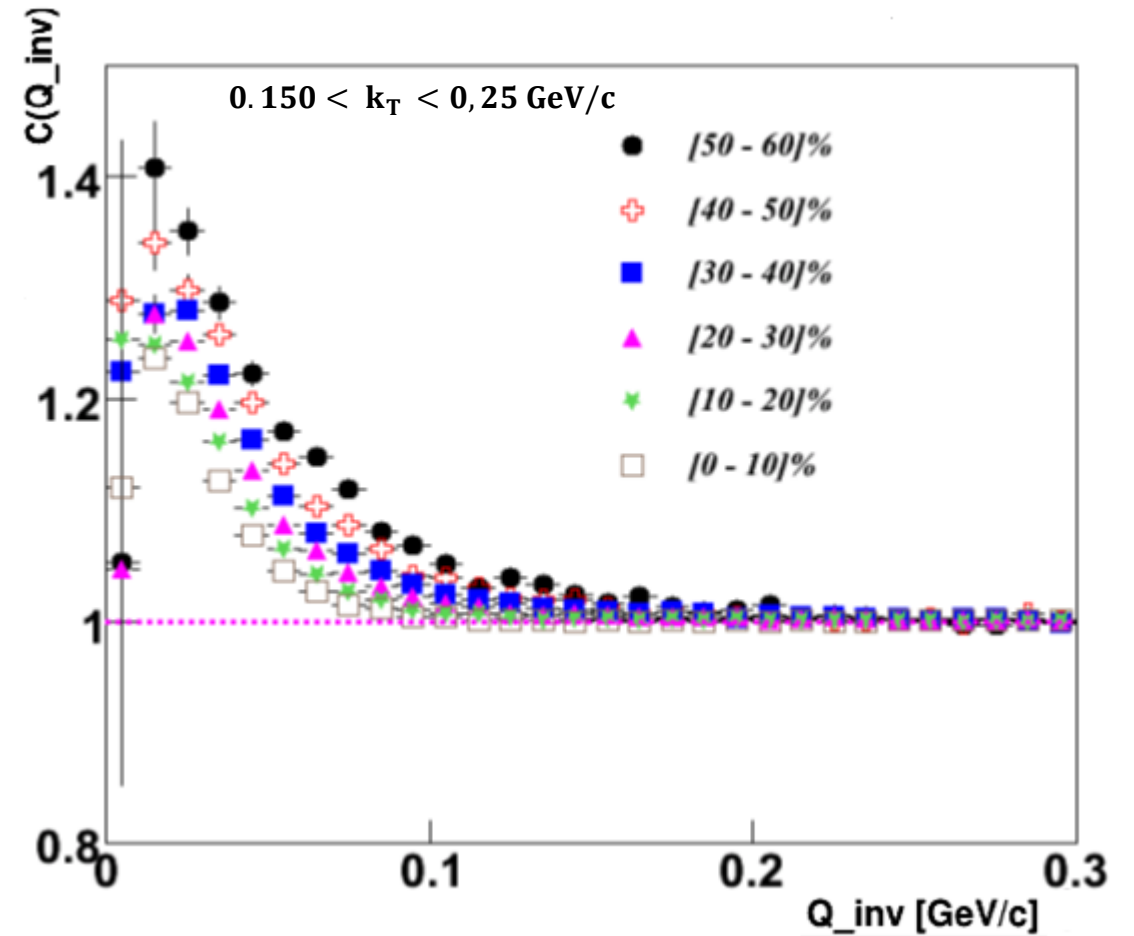
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pseudorapidity range: $|\eta| < 1$

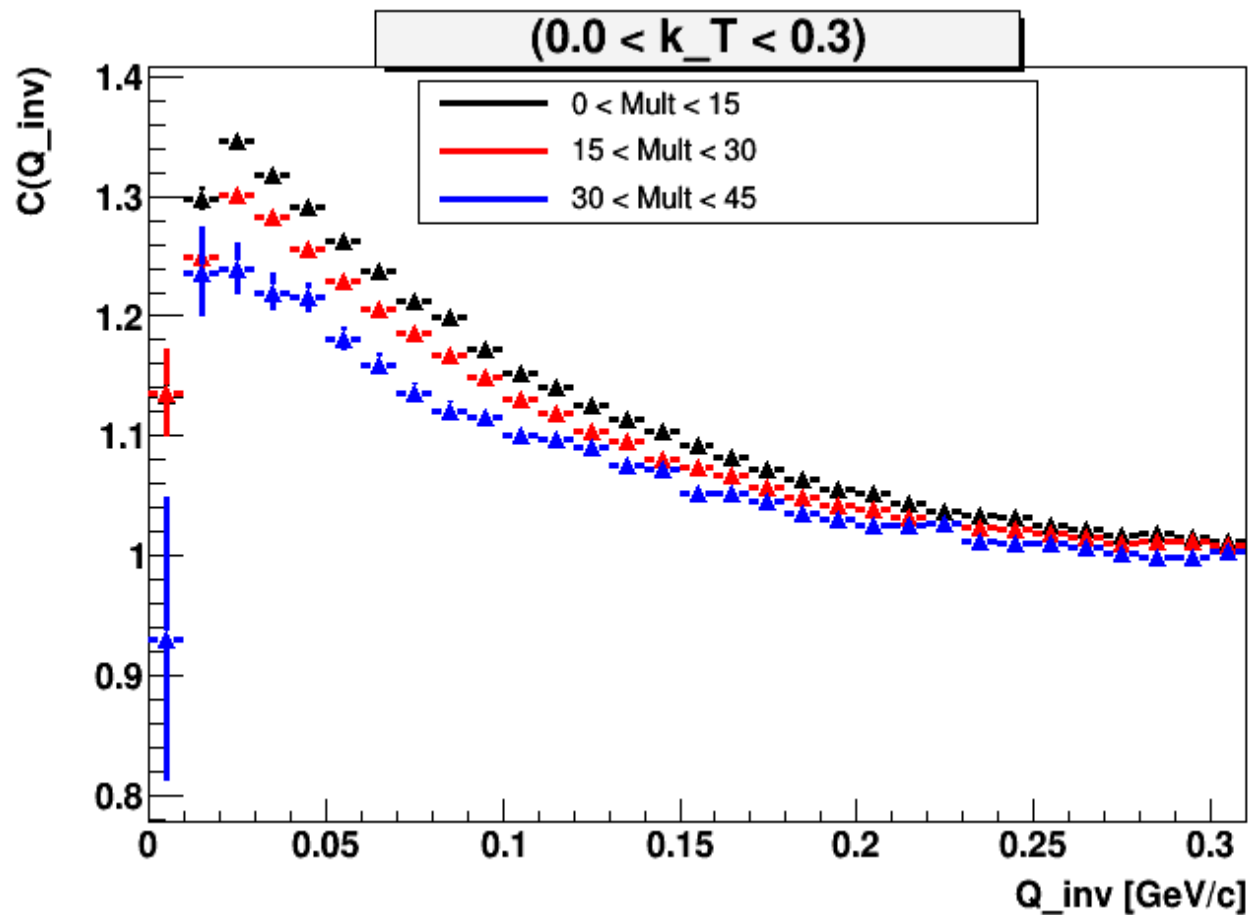
1-D Correlation functions for p+Au at 200 GeV (Pions)



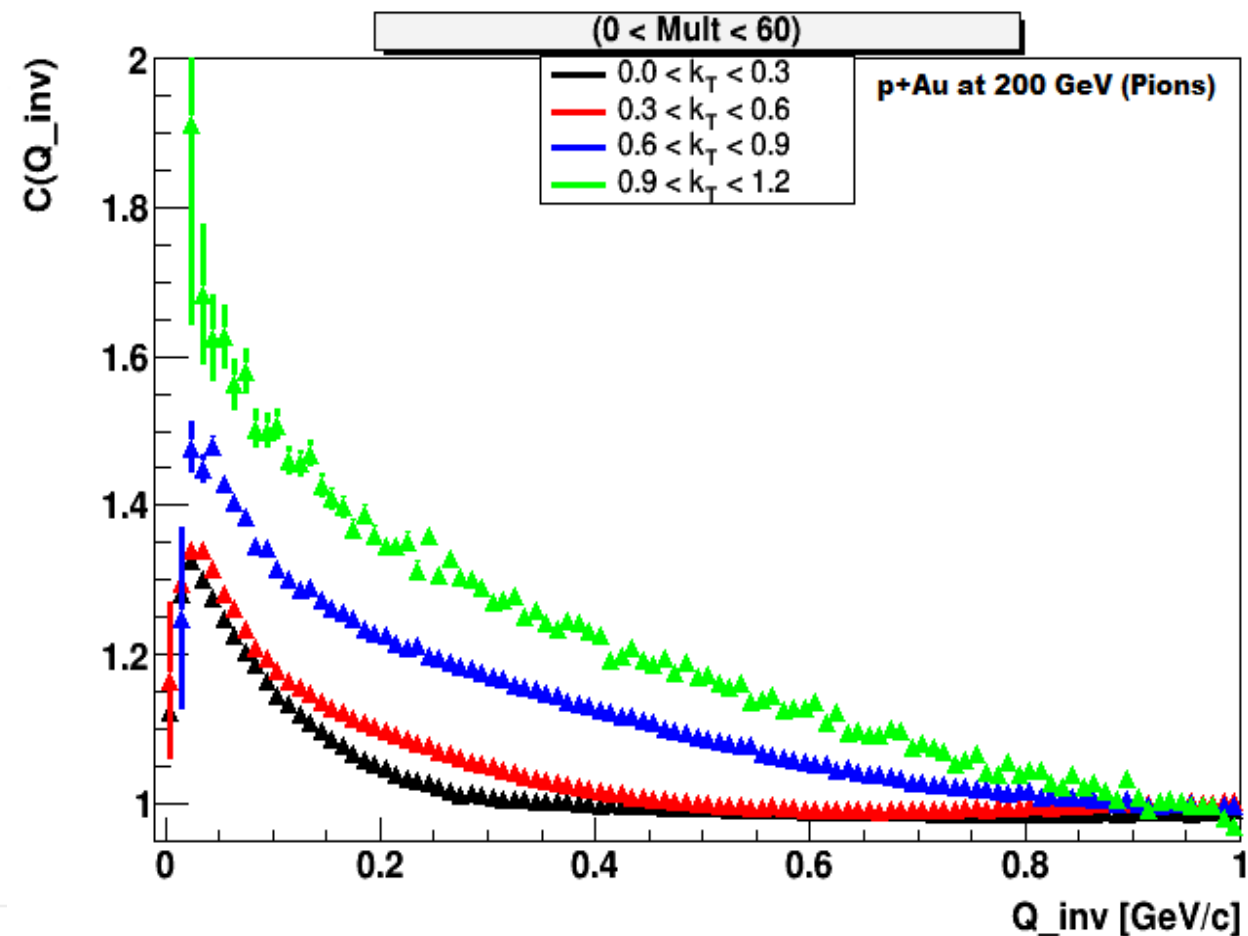
1-D Correlation functions for Cu+Cu at 200 GeV (Pions)

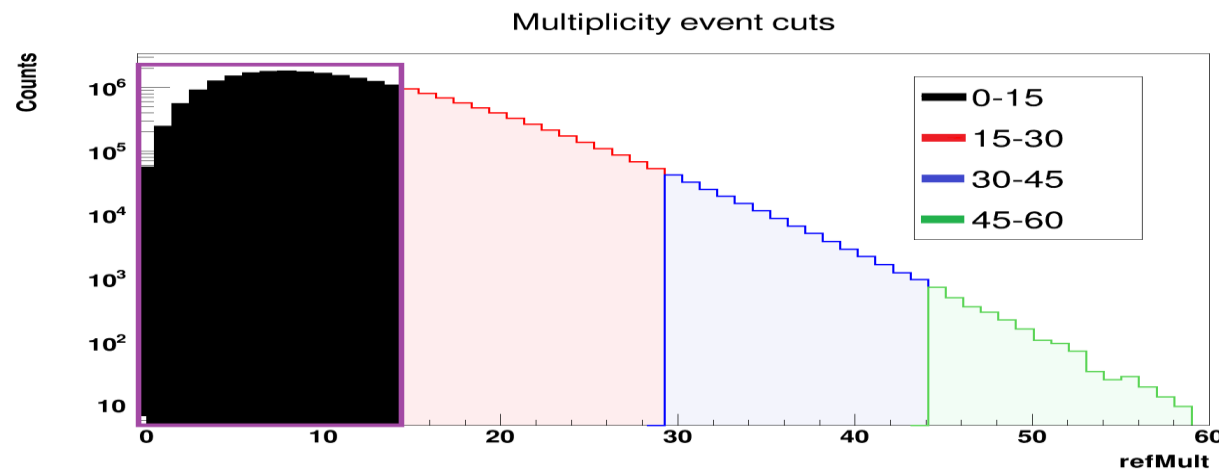
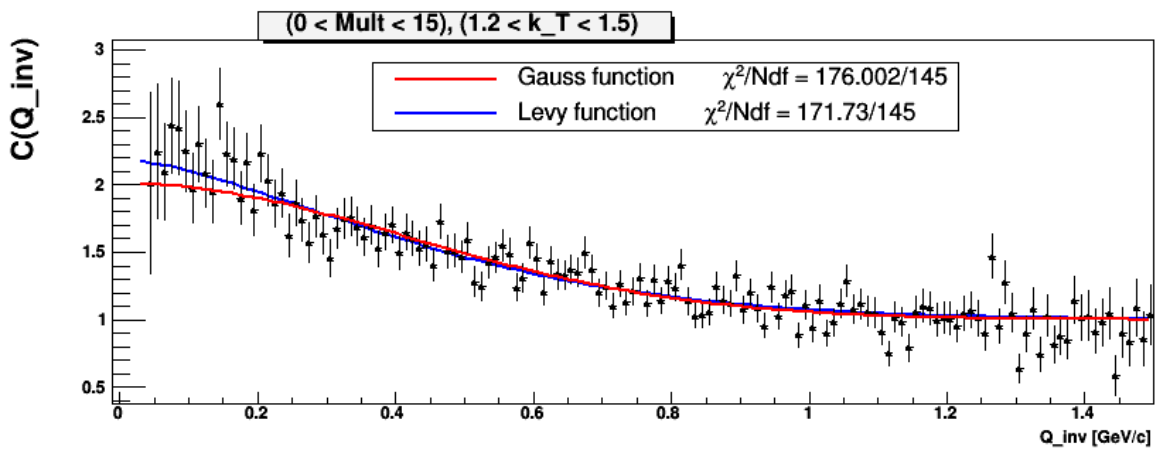
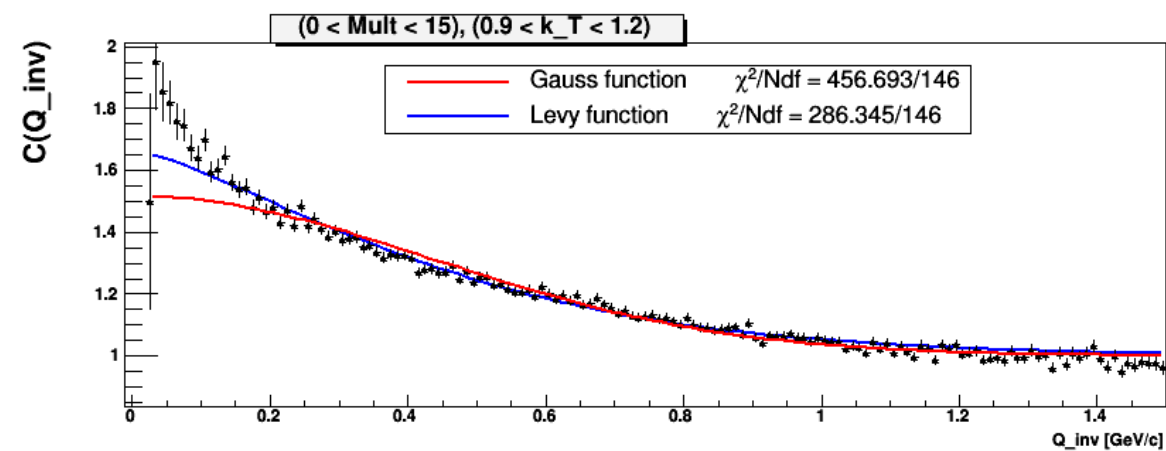
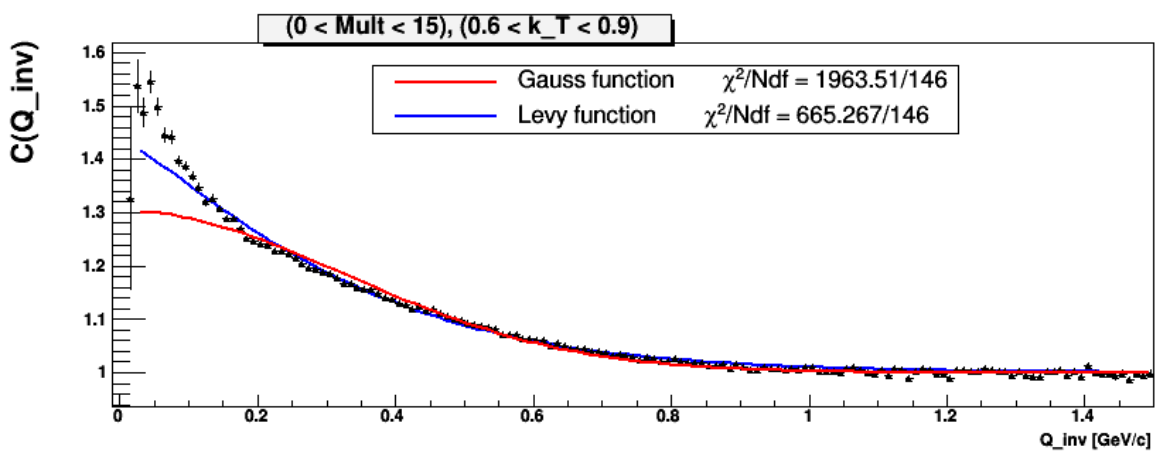
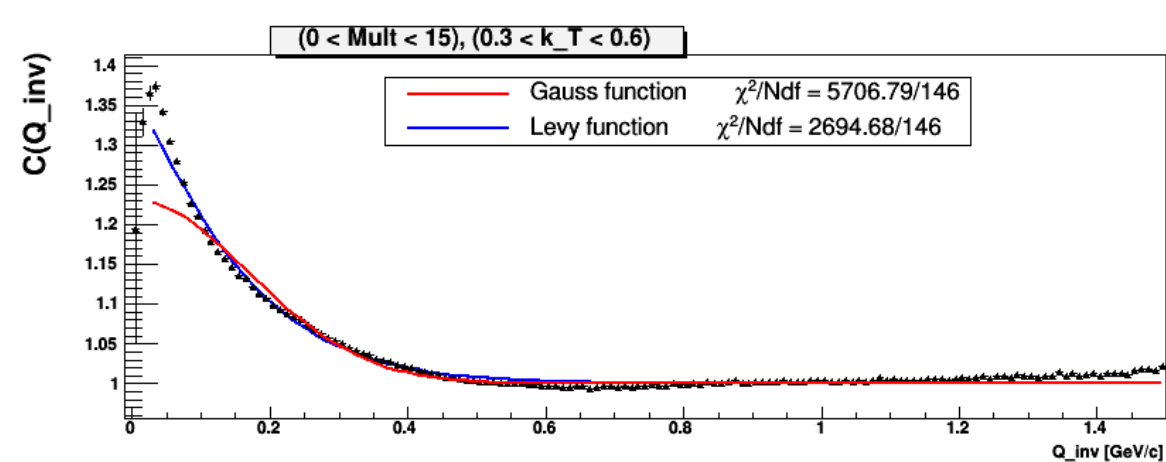
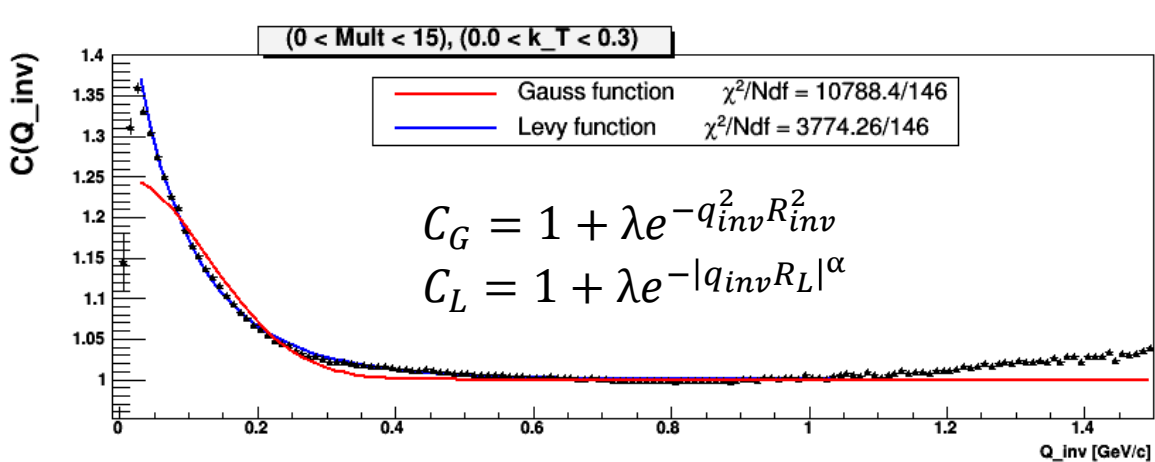


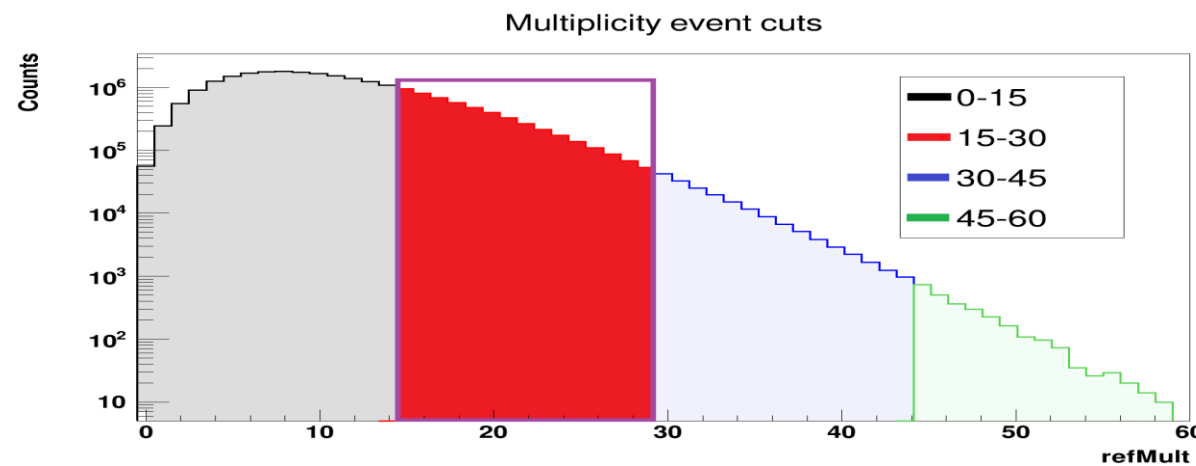
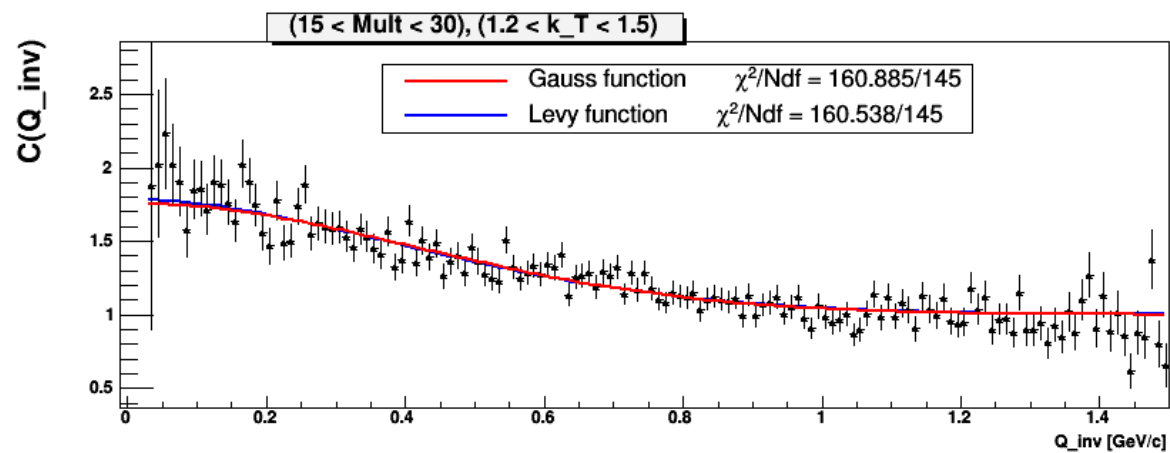
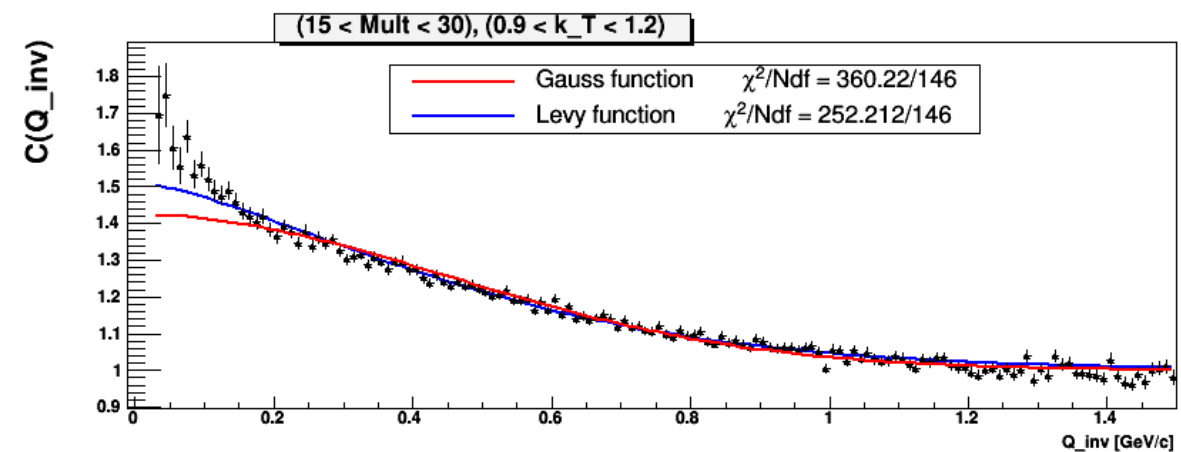
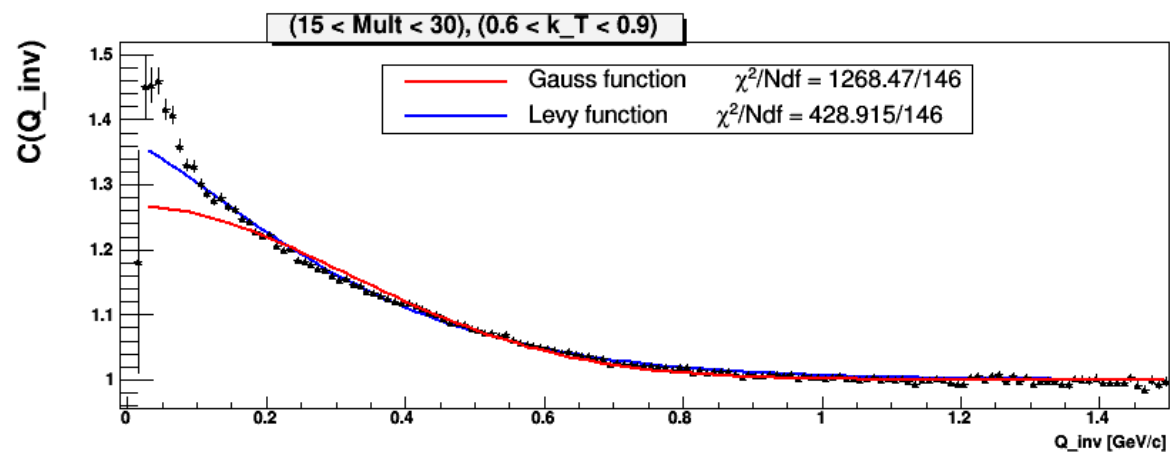
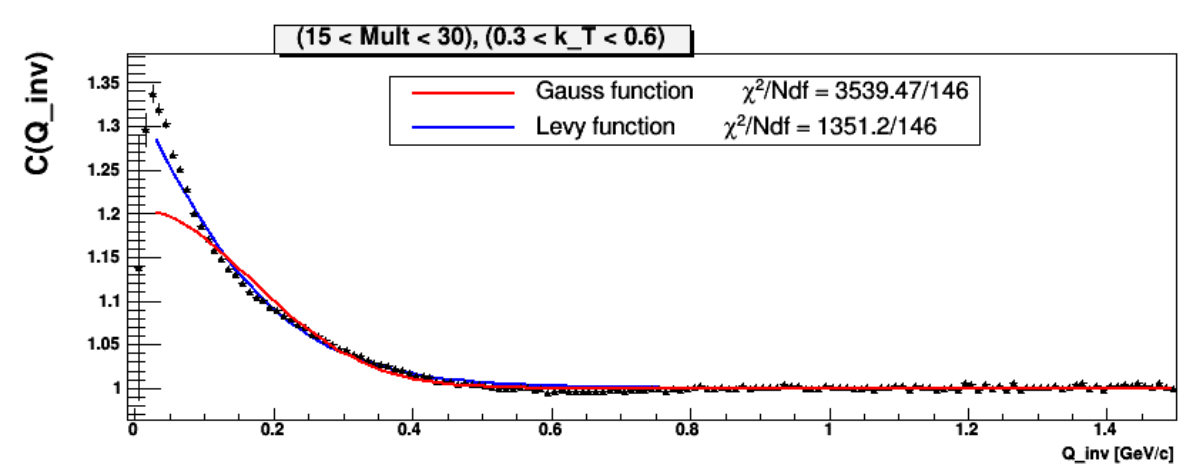
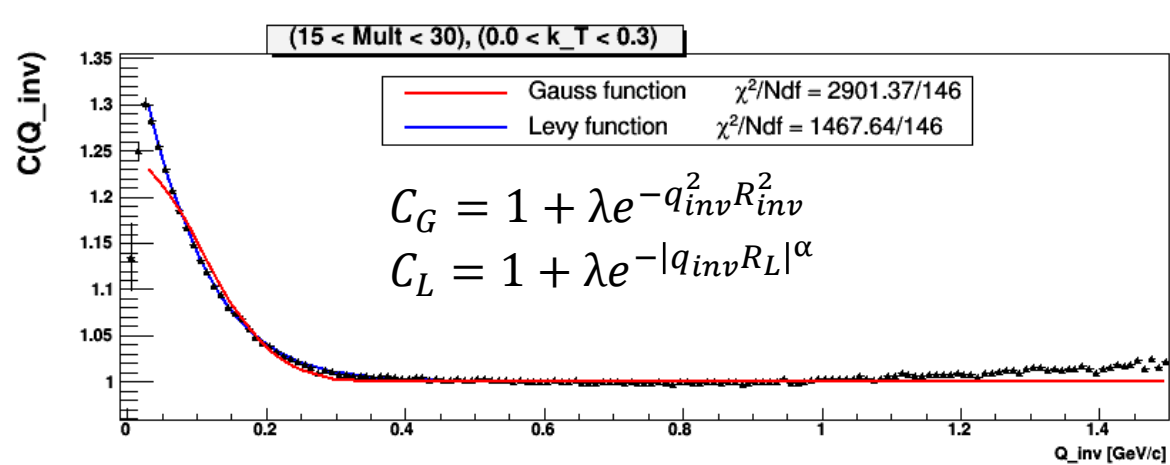
1-D Correlation functions for p+Au at 200 GeV (Pions)

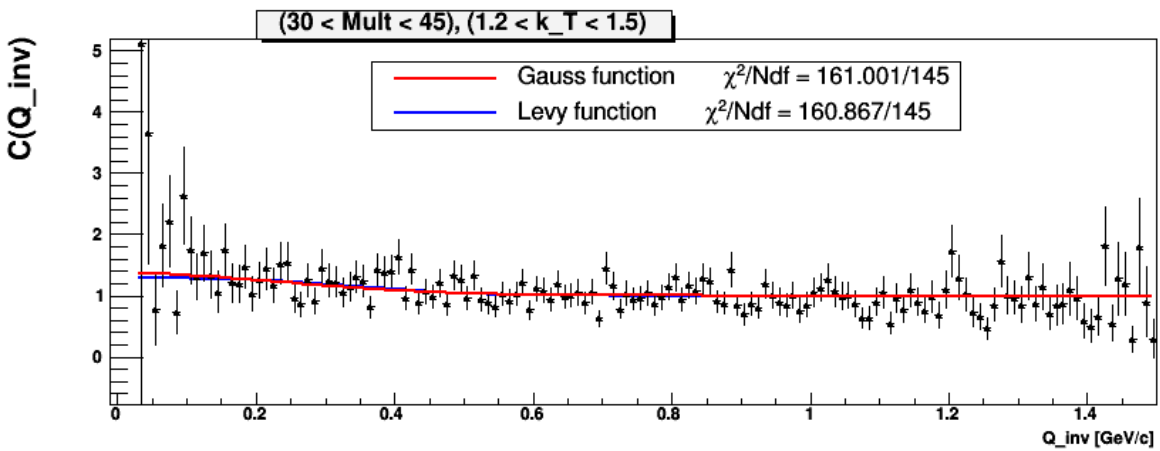
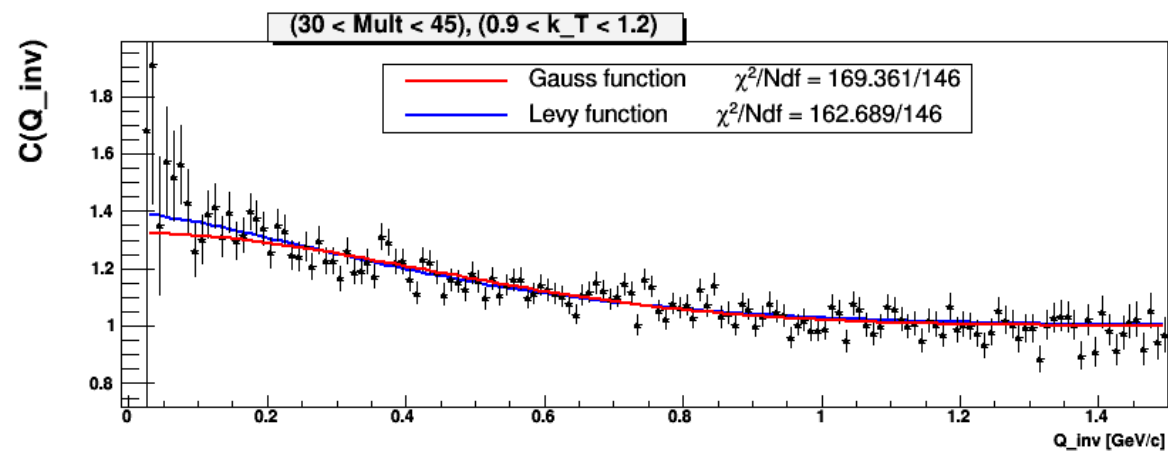
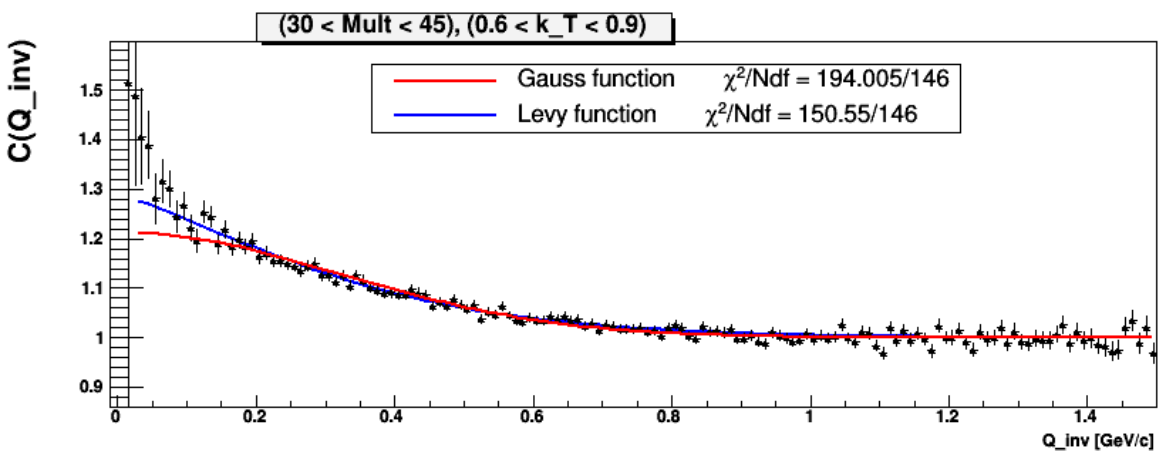
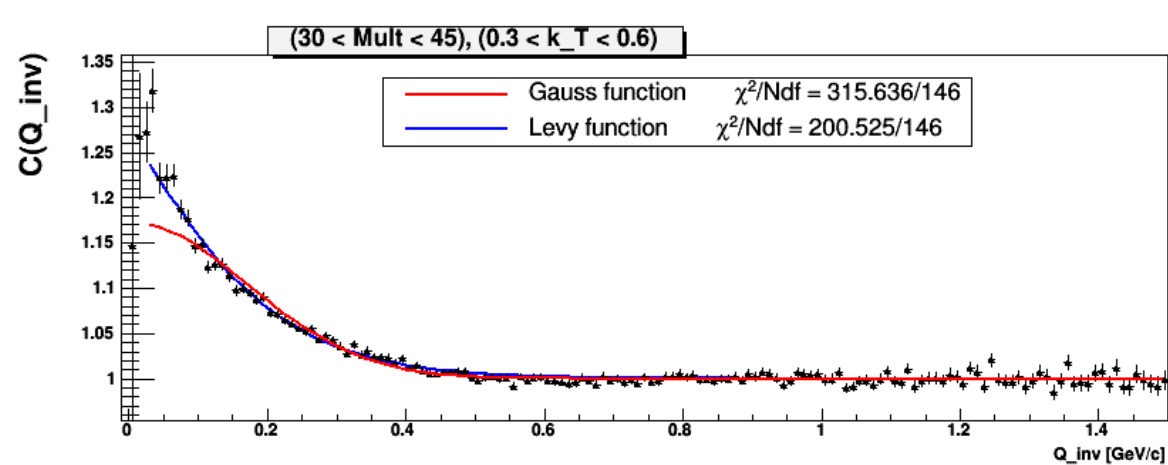
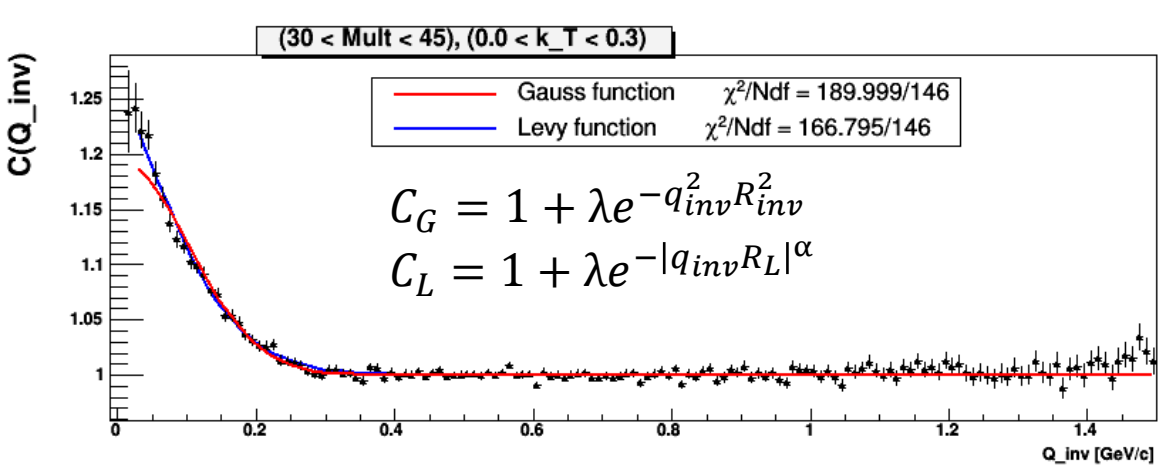


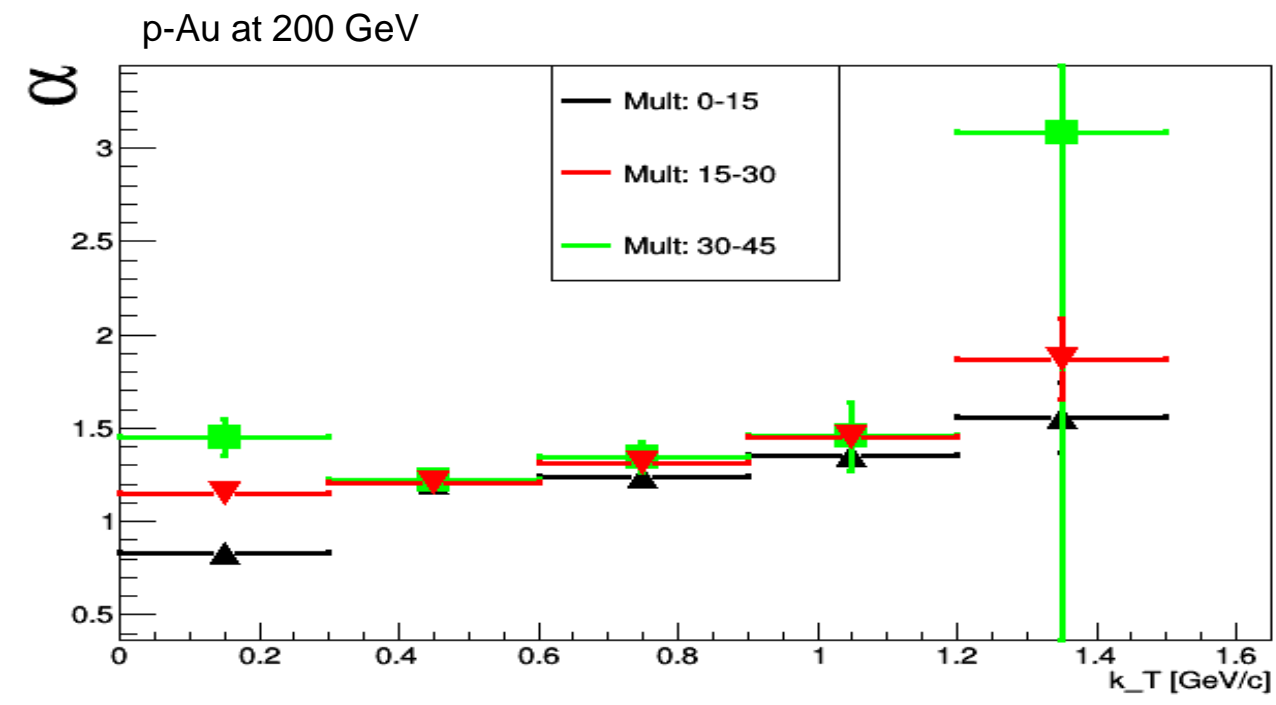
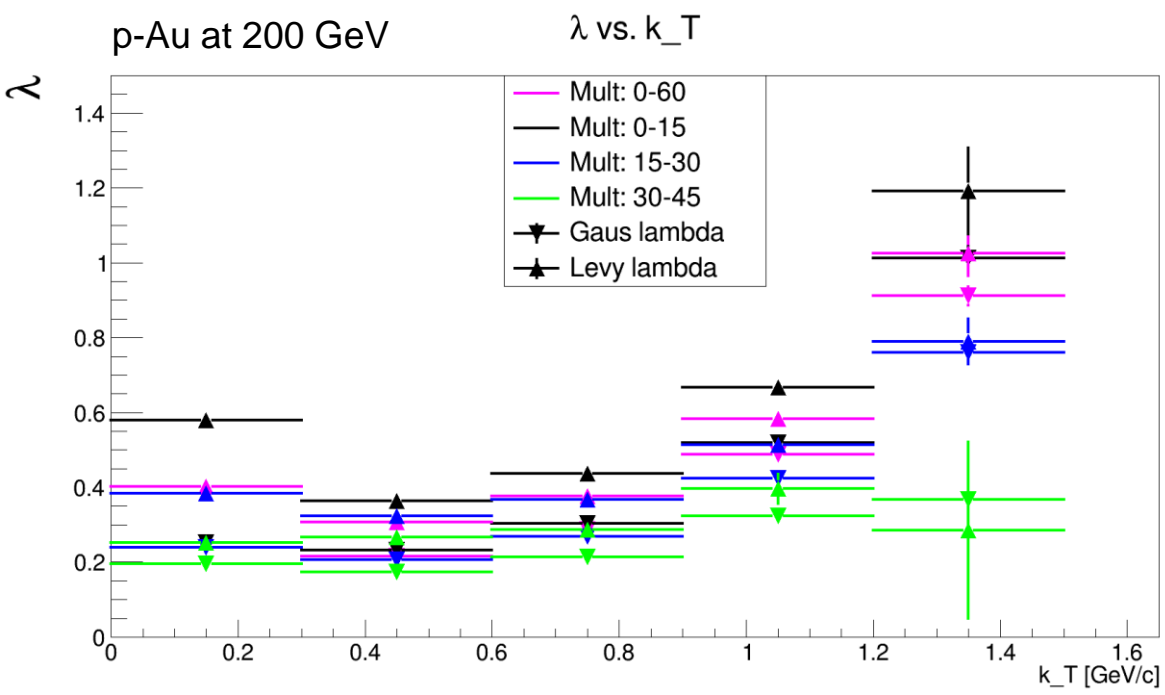
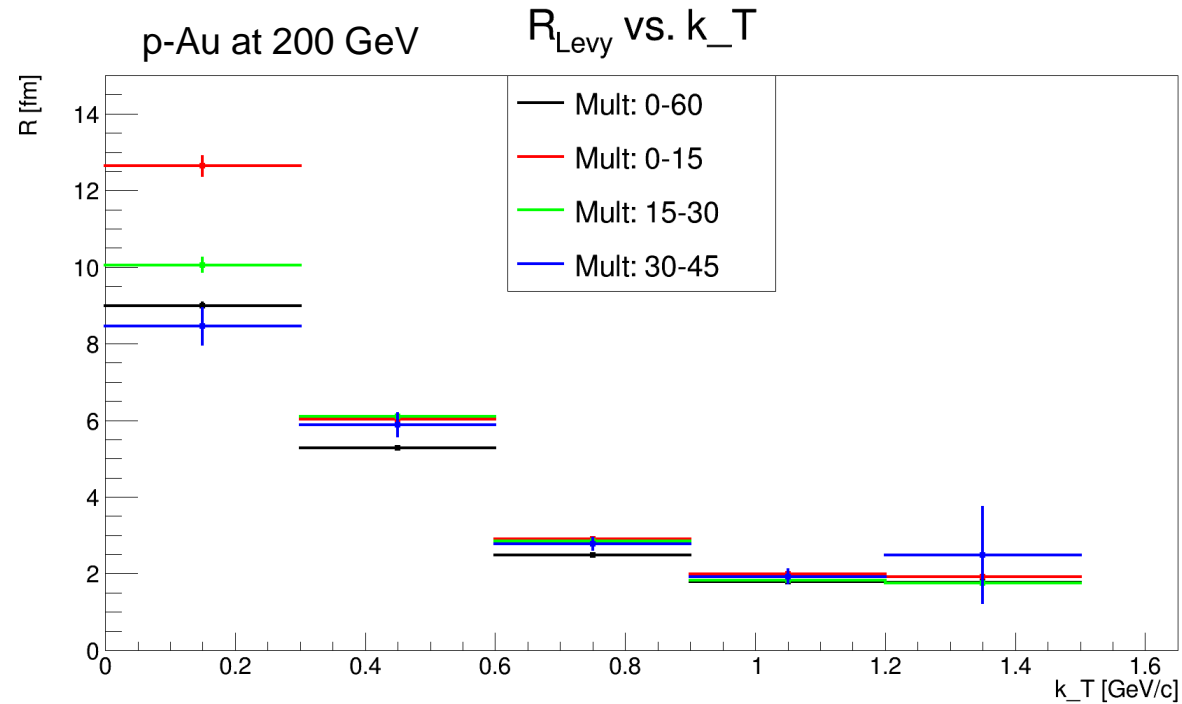
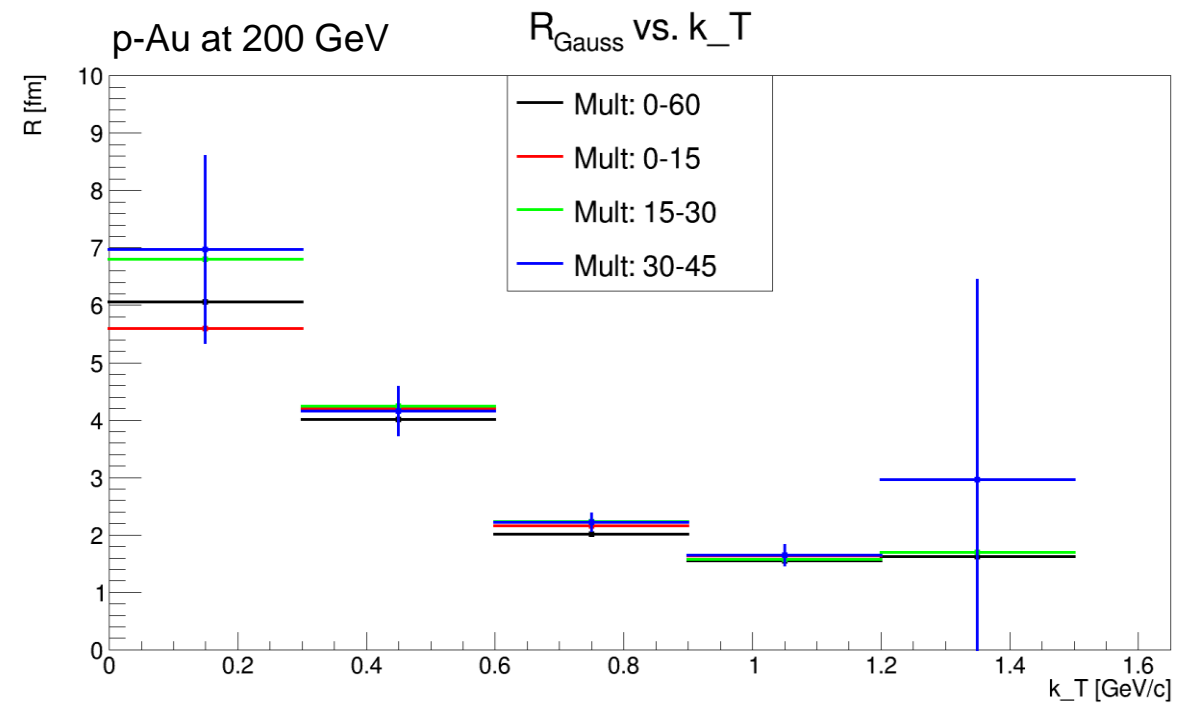
1-D Correlation functions for p+Au at 200 GeV (Pions)











Summary

- Acquaintance with the heavy-ion collisions and femtoscopy
- The first femtoscopy measurement for p-Au collisions at RHIC
- Non Gaussian source for p-Au collisions
- Better description of data with Levy function
- Dependence of HBT radii and lambdas on transverse pair momentum (k_T) a multiplicity

Future plans

- Improvement of fits
- Comparison with different collisions (Au-Au and d-Au) which were measured at the same detector and conditions
- Comparing with models (EPOS,...)

```
bool question;
while(true)
{
    question = audience.ask_question();
    if(question == true)
    {
        presenter.give_response();
        continue;
    }
    else
    {
        presenter.thanks();
        break;
    }
}
```