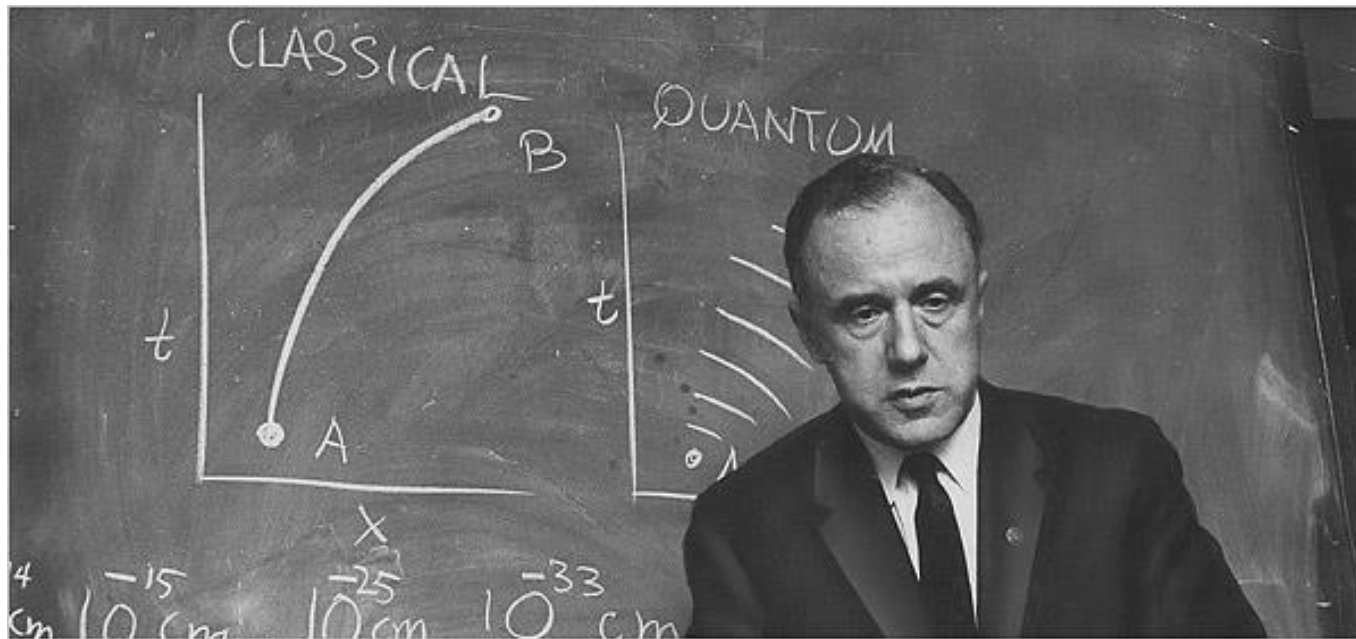


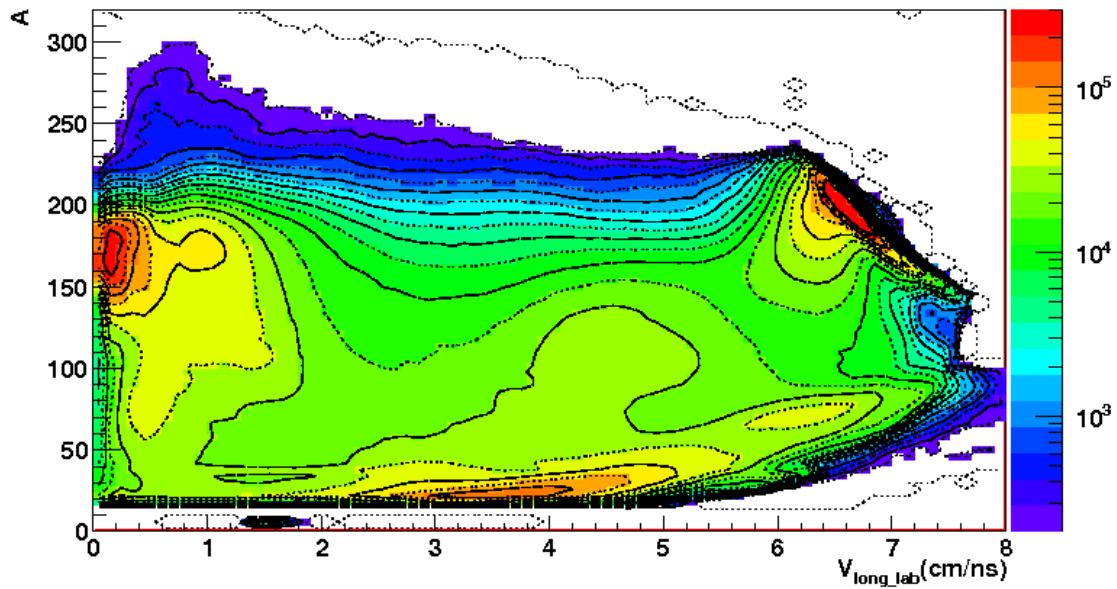
# Freeze-out configuration properties in the Au + Au reaction at 23 AMeV

Rafał Najman

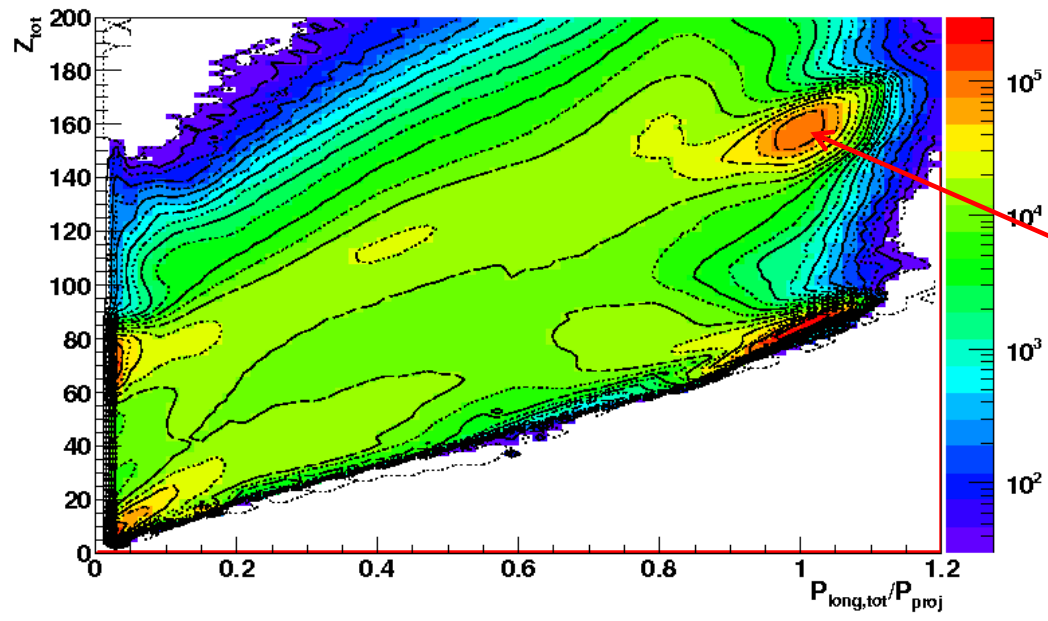
M.Smoluchowski Institute of Physics  
Jagiellonian University  
for CHIMERA collaboration



The existence of nuclei with non-spherical shapes was first suggested by J.A. Wheeler in 1950



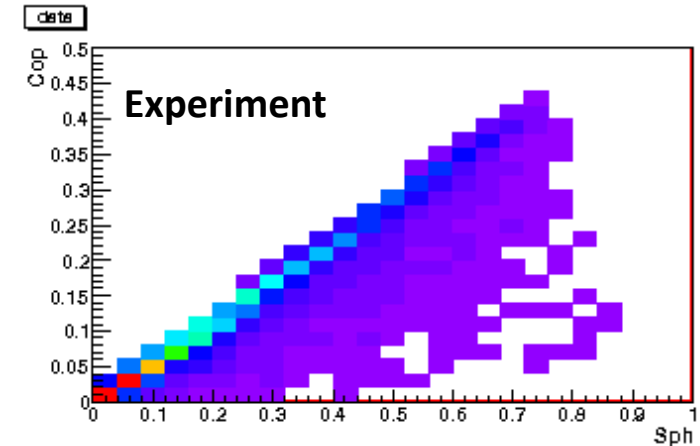
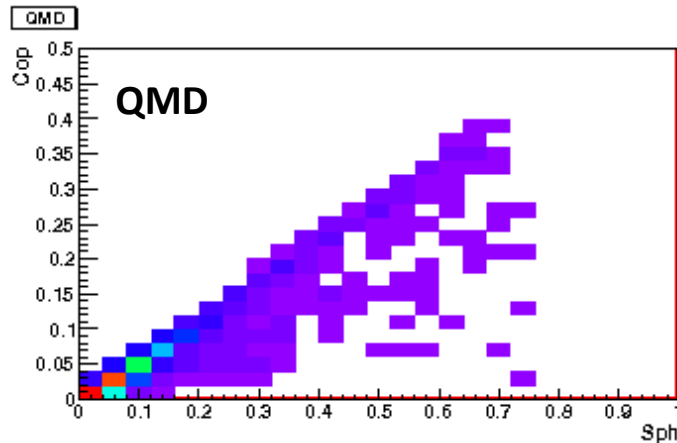
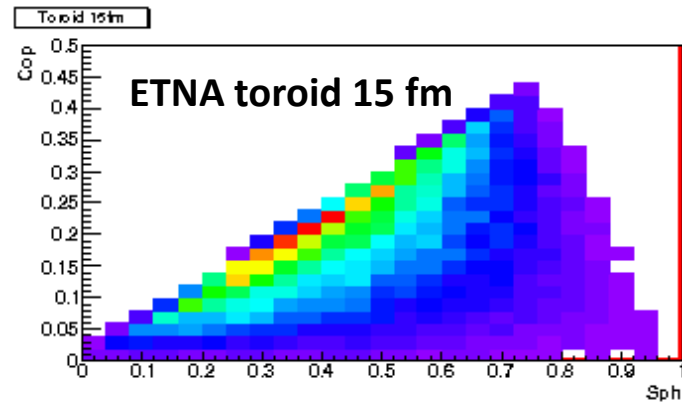
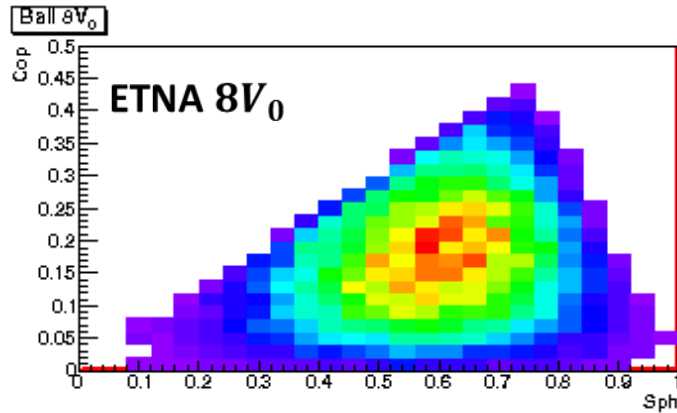
**Au + Au**  
**23 A MeV**



**Well defined events**

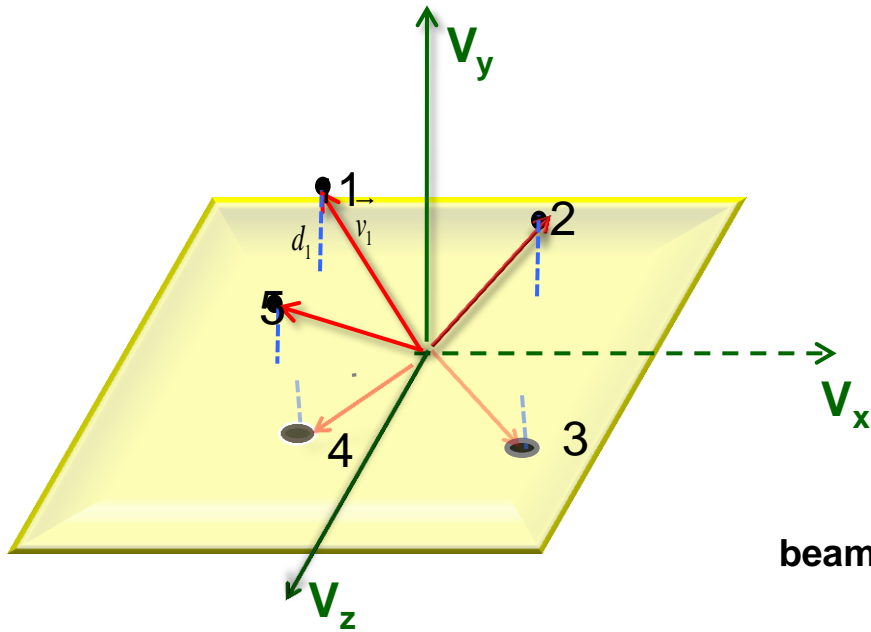
# Shape analysis

$$N_{frag} \geq 5 \quad Z_{frag} \geq 10$$

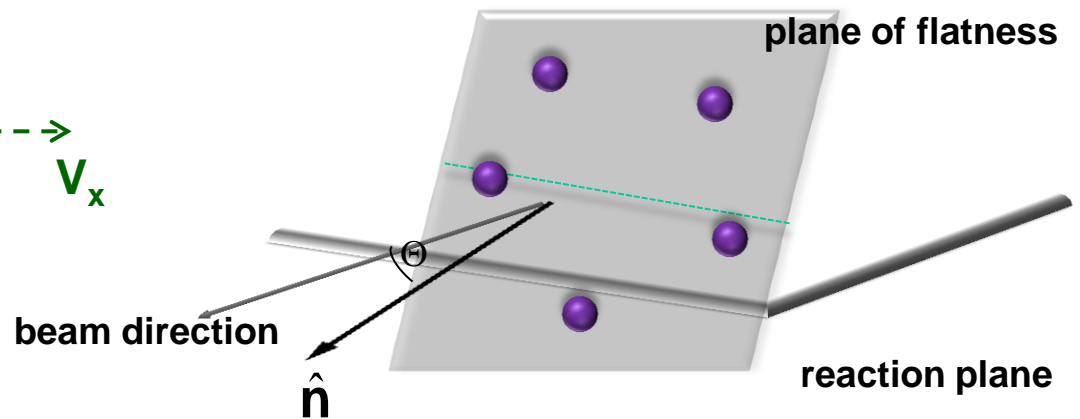


Coplanarity versus sphericity

$\Delta^2$  — measure of event flatness



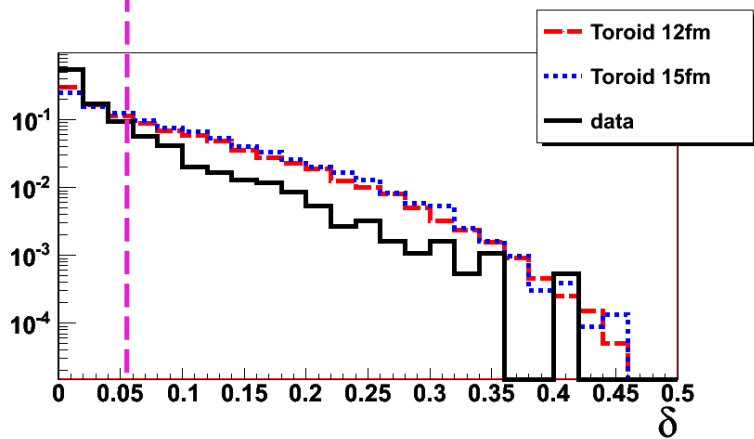
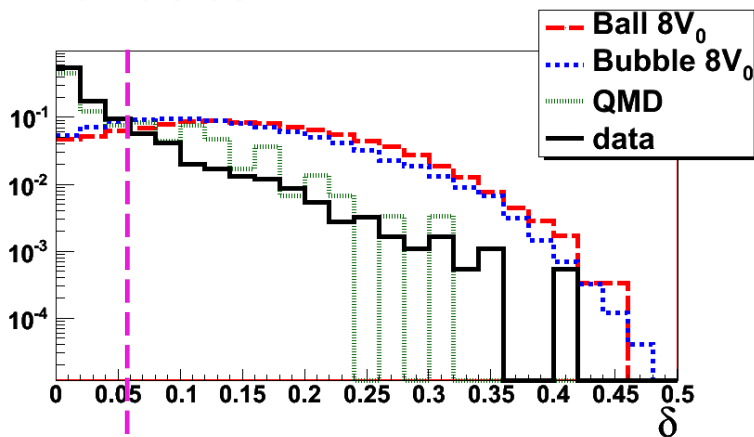
*The  $\theta_{plane}$  definition*



$$d_i = \frac{|A v_{x_i} + B v_{y_i} + C v_{z_i} + D|}{\sqrt{A^2 + B^2 + C^2}}$$
$$\Delta^2 = \min \sum_{i=1}^5 d_i^2(A, B, C, D)$$

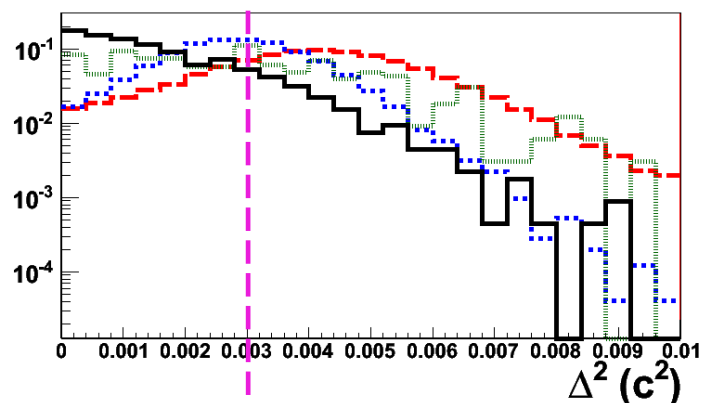
# Observables distributions:

$\delta < 0.05$

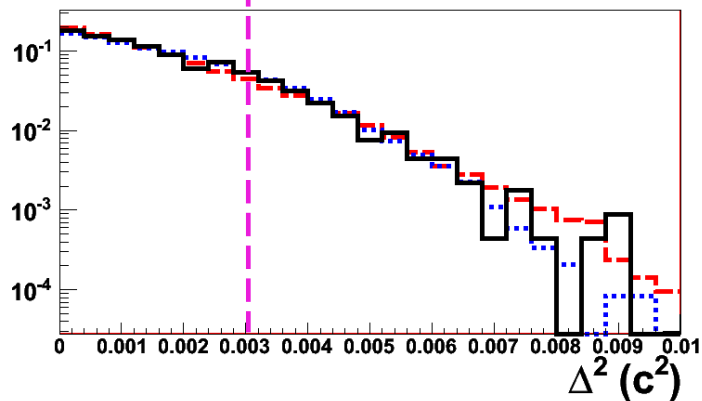


Selection of flat events:

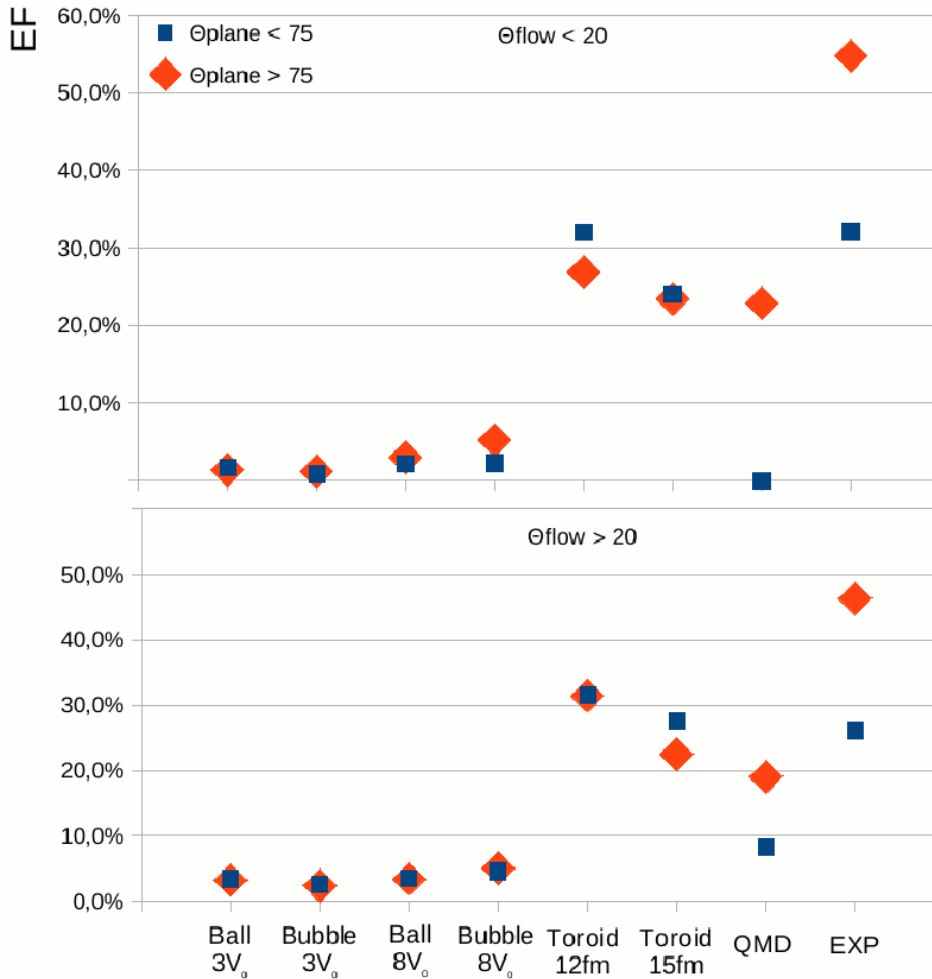
$\Delta^2 < 0.001 c^2$



$\Theta_{Flow} > 20$   
 $\Theta_{Plane} < 75$



# The efficiency factor



**Efficiency factor – ratio of number of events fulfilling the selection conditions to the total number of events with 5 heavy fragments**

## Summary and outlook

- **The bulk properties of the experimental data are shown. The experimental data are compared with ETNA and QMD model predictions.**
- **Efficiency factor is used as indication of formation of exotic freeze-out configuration.**
- **Comparison between experimental data and model predictions may indicate the formation of flat/toroidal nuclear system.**
- **The latest observation need to be verified by more detailed analysis. This analysis is in progress.**