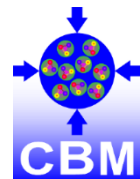
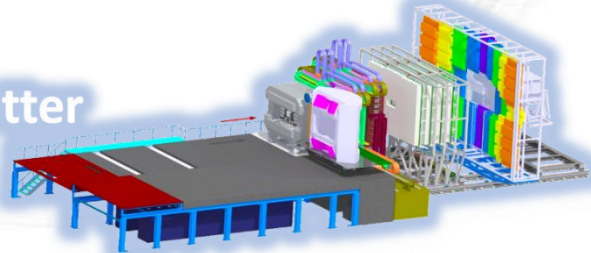


Feasibility study of multiparticle correlations in flow analyses in CBM at FAIR

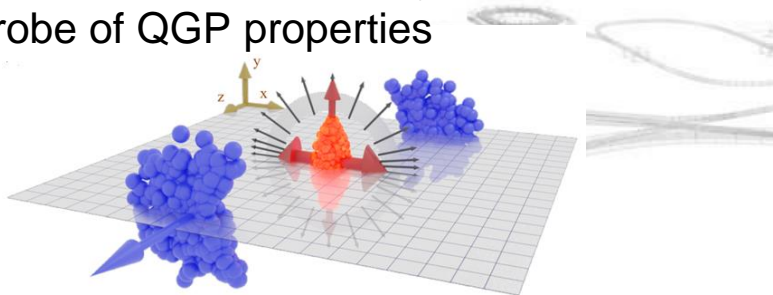
Ante Bilandzic, *for the CBM Collaboration*,
Technical University of Munich,
Ante.Bilandzic@tum.de



Compressed Baryonic Matter
experiment at FAIR



- Anisotropic flow is a very sensitive probe of QGP properties



D.D. Chinellato, ICHEP 2020

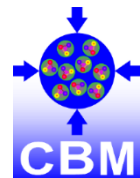
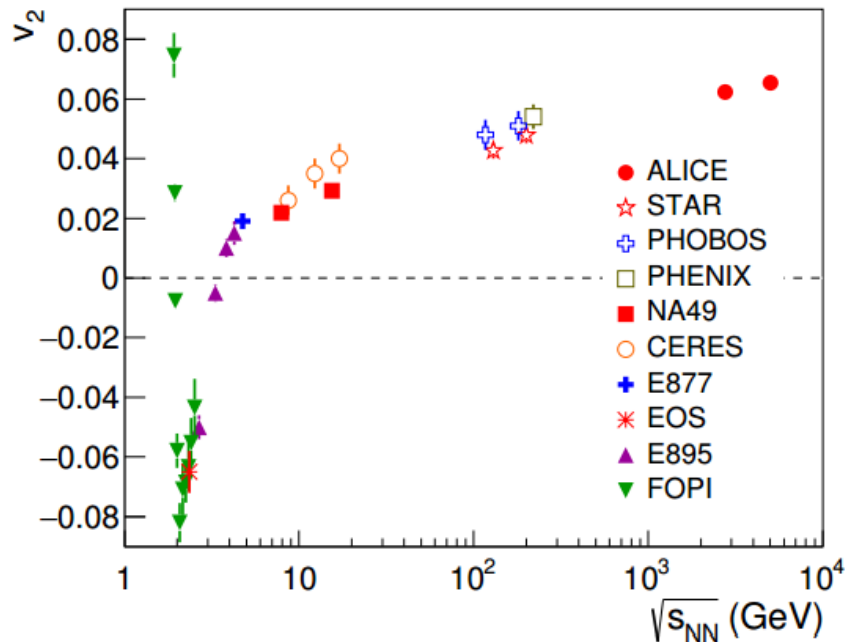
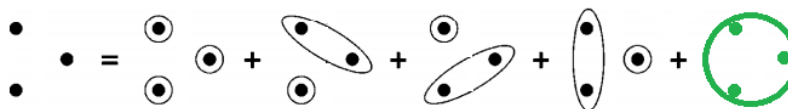
- Multiparticle azimuthal correlations

$$\left\langle e^{i(n_1\varphi_1 + \dots + n_k\varphi_k)} \right\rangle = v_{n_1} \dots v_{n_k} e^{i(n_1\Psi_{n_1} + \dots + n_k\Psi_{n_k})}$$

R. S. Bhalerao, M. Luzum and J.-Y. Ollitrault, Phys. Rev. C **84** 034910 (2011)

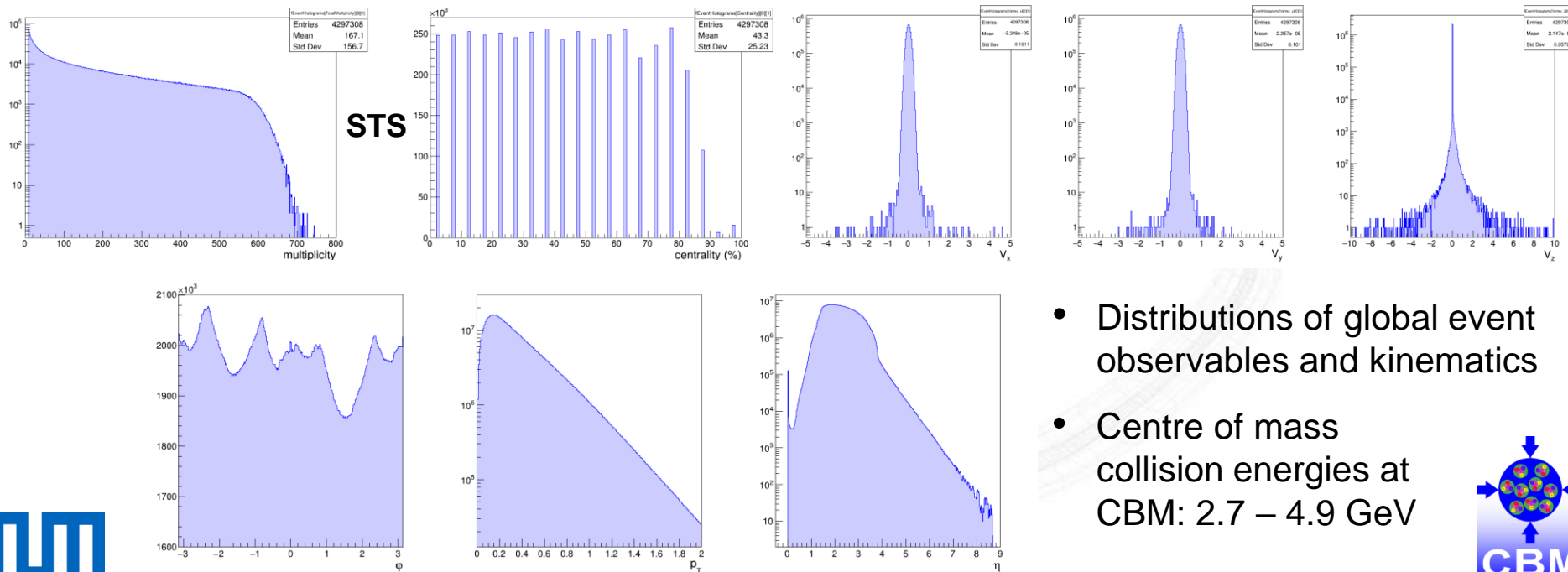
- Multivariate cumulants

R. Kubo, J. Phys. Soc. Jpn. **17** (1962)



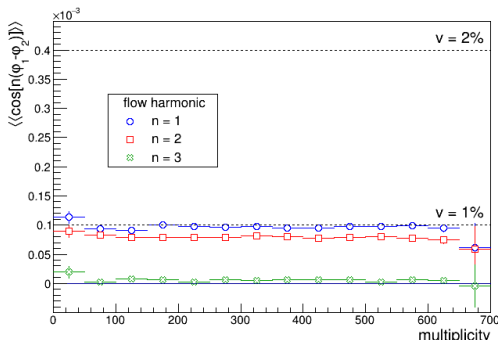
- Multivariate flow observables
 - Q-cumulants (QC) and Symmetric Cumulants (SC)
Phys. Rev. C **83** (2011), 044913; Phys. Rev. C **102** (2020), 024907
- Implementation in ROOT/C++/Bash
 - Standalone analysis class
 - Analysis task
 - Macros and scripts for automation and post-processing
- Support for 'Generic Framework' to correct for various sources of detector inefficiencies with particle weights
Phys. Rev. C **89** (2014) no.6, 064904

- Au+Au collisions at 12A GeV/c simulated with realistic CBM geometry, 4.3 M events
 - Monte Carlo model: DCM-QGSM-SMM

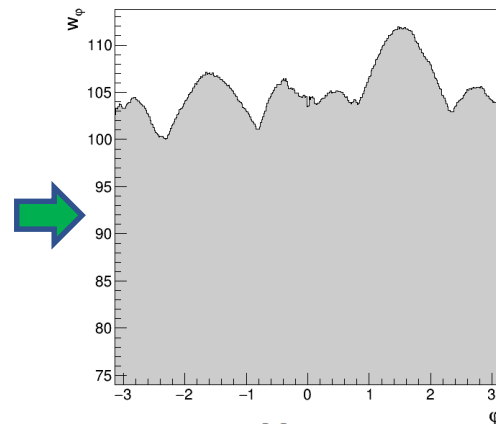
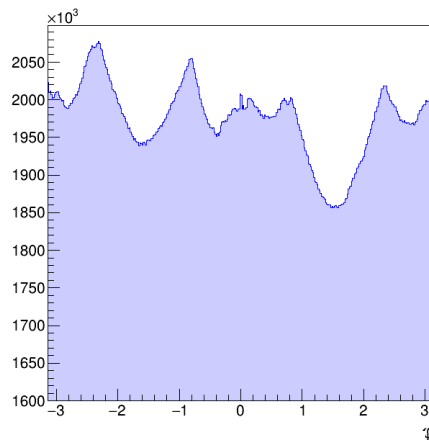
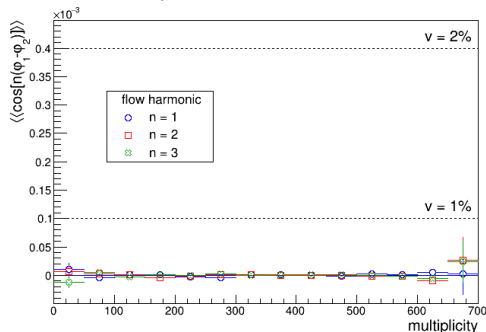


Correction framework

- Estimating effects of spurious flow due to non-uniform acceptance in CBM: real input flow is 0
- Using particle weights and the formalism of Q-vectors to correct for various sources of detector inefficiencies in the measured multiparticle correlations



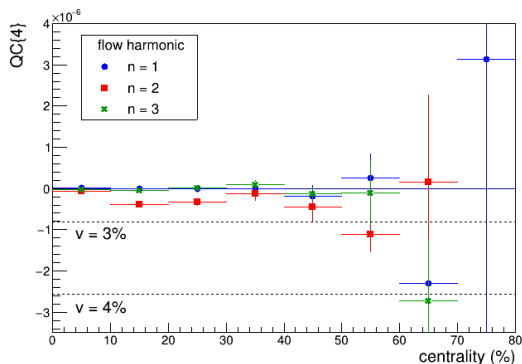
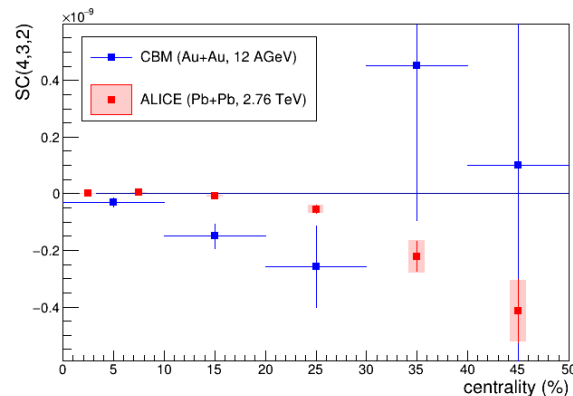
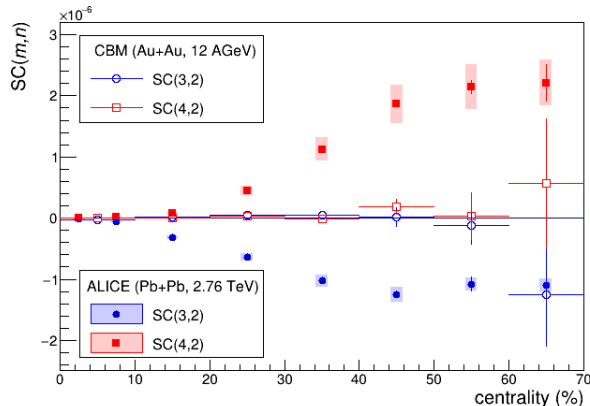
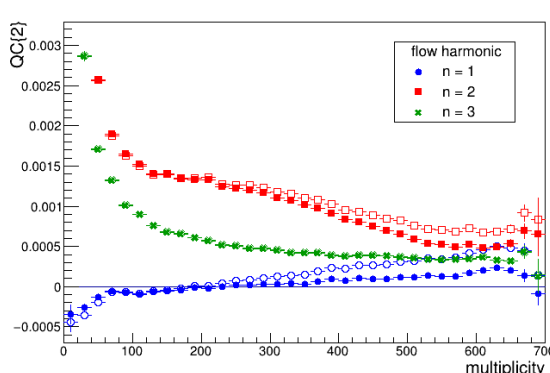
- After correction, results are consistent with 0



$$Q_n \equiv \sum_{k=1}^M e^{in\varphi_k} \quad \rightarrow \quad Q_{n,p} \equiv \sum_{k=1}^M w_k^p e^{in\varphi_k}$$

Phys. Rev. C **89** (2014) no.6, 064904

- Flow harmonics estimated with Q-cumulants and multiharmonic correlations estimated with Symmetric Cumulants:



Summary

- Due to non-uniform azimuthal acceptance and low multiplicity, usage of multiparticle correlation techniques in anisotropic flow analyses at CBM is very challenging
- Nevertheless, the first feasibility studies indicate that it will be possible!

