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Determining the reaction volume with CBM

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The main goal of the Compressed Baryonic Matter (CBM) Experiment at FAIR is to probe the QCD phase diagram at high net-baryon densities and moderate temperatures with nucleus-nucleus collisions, in order to locate the possible first order phase transition from hadronic to partonic matter and its critical end point (CEP). The higher moments (cumulants) of conserved quantities, such as baryon number, strangeness and electrical charge, are suggested to be sensitive to the proximity of the CEP. In order to assess the behavior of these cumulants, it is crucial to determine the reaction volume. Indeed, different procedures for centrality selection, based on participant multiplicity with the STS detector or on spectator multiplicity with the new FSD detector, allow us to study reaction volume fluctuations and their impact on net-baryon cumulants. In this work, we explore these different procedures using the hadronic transport models SMASH and PHQMD.

Hauptautor: ARTUR, Beatriz (IFK)

Vortragende(r): ARTUR, Beatriz (IFK)

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