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Directed and Elliptic Particle Flow and Reaction Plane reconstruction performance in the CBM experiment

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Particle flow and reaction plane reconstruction performance using the Projectile Spectator Detector (PSD) in the CBM experiment at the future FAIR facility will be presented. The PSD is a compensating lead-scintillator calorimeter designed to measure the energy distribution of the forward going projectile nucleons and nuclei fragments (spectators) produced close to the beam rapidity. The main purpose of the PSD is to provide experimental estimates of heavy-ion collision centrality and reaction plane orientation. Directed and elliptical proton flow is studied for Au+Au collisions using five heavy-ion collision event generators: iQMD, UrQMD, DCM-QGSM, LA-QGSM and HSD. Reaction plane reconstruction performance was investigated for produced particles transported with the GEANT Monte-Carlo through realistic CBM detector geometry. Simulations are performed for the range of beam energies between 1 and 30 AGeV, which covers the expected beam energy range of the SIS100 and the SIS300 accelerator rings at FAIR. Performance of the reaction plane determination is shown with the PSD as a standalone detector and in a combination with other CBM subsystems. Results are compared with the experimental data from HADES, FOPI, AGS E877, E895 and STAR. Results on higher order harmonics of particle flow are also overviewed for 1.23AGeV energy compared with FOPI and HADES experimental data.

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