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The RICH detector of the CBM experiment and its physics potential

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The Compressed Baryonic Matter (CBM) experiment at the future FAIR facility will investigate high baryon density matter at moderate temperatures in A+A collisions from 4-35 AGeV beam energy. One of the key observables of the CBM physics program is electromagnetic radiation from the early fireball carrying undistorted information on its conditions to the detector. This includes detailed investigations of low-mass vector mesons in their di-electron channel. In CBM, electrons will be identified with a RICH detector complemented by several layers of TRD. Aiming at a stable, robust and fast gaseous detector and relying to a large extent on components from industry, the RICH concept foresees a 1.7 m long CO2-radiator, a plane of 40 × 40 cm2 trapezoidal spherical mirrors with a curvature radius of 3 m and Multi-Anode PhotoMultiplier Tubes (MAPMTs) as photo-detectors. This concept is the outcome of a series of detector simulations, feasibility studies, R&D activities on individual components, and of beam tests with a real size prototype. A Technical Design Report of the RICH detector has been accepted by FAIR. In this presentation, the RICH concept and R&D results will be discussed. Based on realistic detector descriptions implemented from the testbeam results into the CBMROOT simulation framework, feasibility studies on the measurement of di-electrons (low-mass vector mesons and J/psi) have been performed and will be presented.Results show, that both observables will be accessible with very good signal-to-background ratios and efficiencies. using a self-triggering readout electronics. Results of the feasibility studies and of the detector development will be presented and discussed.

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