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Compressed Baryonic Matter experiment at FAIR

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The Compressed Baryonic Matter (CBM) experiment is currently under construction at the Facility for Antiproton and Ion Research (FAIR). Its goal is to explore the phase structure of strongly interacting (QCD) matter at high net-baryon densities and moderate temperatures through heavy-ion and hadron collisions in the energy range of $\sqrt{s_{NN}} = 2.9 - 4.9$ GeV using the SIS100 beams. As a fixed-target experiment, CBM is equipped with fast, radiation-hard detector systems and an advanced trigger-less data acquisition scheme. CBM will operate at interaction rates of up to 10 MHz by performing online space-time reconstruction and event selection, enabling the measurement of rare probes such as multi-strange hadrons and their antiparticles, multi-strange hypernuclei, and di-leptons, which have not been extensively studied so far. This presentation will provide an overview of the CBM physics goals, including the investigation of the equation-of-state of compressed nuclear matter, the potential phase transition from the hadronic to the partonic phase, and chiral symmetry restoration. The discussion will cover CBM's physics performance in areas such as (multi-)strange particle production, di-lepton spectroscopy, collective phenomena, and with the special focus on femtoscopy. Additionally, the status of preparations for CBM's construction will be reviewed, including performance evaluations of CBM components in FAIR Phase-0 experiments and the latest results from a CBM demonstrator test setup operating with SIS18 beams (mCBM).

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