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Moat Regimes and their Signatures in Heavy-Ion Collisions

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Dense QCD matter can exhibit spatially modulated regimes. They can be characterized by particles with a moat spectrum, where the minimum of the energy is over a sphere at nonzero momentum. Such a moat regime can either be a precursor for the formation inhomogeneous condensates, or signal a quantum pion liquid. We discuss the underlying physics of the moat regime based on studies in low-energy models and preliminary results in QCD. Heavy-ion collisions at small beam energies have the potential to reveal the rich phase structure of QCD at low temperature and nonzero density. We show how moat regimes can be discovered through such collisions. Particle production is enhanced at the bottom of the moat, resulting in a peak at nonzero momentum, instead of zero, in the particle spectrum. Particle number correlations can even increase by several orders of magnitude at nonzero momentum in the moat regime.

Primary author: Dr RENNECKE, Fabian (Giessen University)

Co-author: PISARSKI, Robert (Brookhaven National Lab.)

Presenter: Dr RENNECKE, Fabian (Giessen University)

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