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## Future physics programme and facilities for relativistic heavy-ion collisions

Relativistic heavy-ion collisions are essential to advancing our understanding of Quantum Chromodynamics (QCD) under extreme conditions of temperature and density. These experiments recreate the quark-gluon plasma (QGP), a state of matter that dominated the early universe, providing critical insights into the emergent phenomena of QCD such as strangeness enhancement and collective particle emission. The upcoming upgrades to the ALICE experiment at the CERN LHC, culminating in the next-generation ALICE 3 detector, are designed to deliver unprecedented precision in heavy-flavor and electromagnetic probe measurements, enabling differential studies of QGP properties with high statistics and low backgrounds. Complementarily, the FAIR facility at GSI will probe the QCD phase diagram at lower collision energies, where the net baryon density is highest and signals of a first-order phase transition or critical point may emerge. Together, these experimental programs will provide a multi-dimensional map of strongly interacting matter across a wide range of conditions, shaping the future of relativistic heavy-ion physics and our comprehension of the strong force.

Author:DOBRIGKEIT CHINELLATO, David (Austrian Academy of Sciences)Presenter:DOBRIGKEIT CHINELLATO, David (Austrian Academy of Sciences)Session Classification:Plenary Session

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