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Relativistic heavy-ion collisions and relics from the early universe

Ahmed Hamed
University of Mississippi, USA

World-wide efforts over the past half-century have produced a remarkably successful theoretical framework, the Standard Model (SM) describing matter and energy (only ~4% of the Universe) in a flat 4-dimensional space-time, as built of certain constituents, interacting through specific forces according to general principles of symmetry, relativity and quantum mechanics. The SM of particle physics predicts two phase transitions that are relevant for the evolution of the early universe; one occurs at temperatures of a few hundred GeV (electroweak symmetry breaking) and another is expected to occur at ~200 MeV (chiral symmetry breaking). The predictions for the latter phase to be created in a domain where complete analytical calculations are unobtainable increase the challenges at the theoretical level. Nevertheless, this situation provides an exciting opportunity for an experimentalist to lead the endeavor, hence the relativistic heavy-ion program, which was proposed in 1974. The Relativistic Heavy ion experiment is constructed to produce the Quark Gluon Plasma (QGP), a proposed precursor phase to the Big Bang Nucleo-synthesis.

amhamed@olemiss.edu

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