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Hybrid Modeling of Heavy-Ion Collisions for the Precision Era

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under extreme conditions, where quarks and gluons form the quark–gluon plasma (QGP). To capture the full evolution of these collisions, hybrid models have become the standard approach, combining descriptions of the early non-equilibrium stage, the QGP fluid dynamic regime, and the late hadronic phase.

With the wealth of precision data from RHIC and the LHC, these models must be upgraded to meet the new demands of quantitative QCD. In this talk, I will present a collection of recent developments that advance hybrid modeling on several fronts, including an improved description of the pre-equilibrium stage, a refined framework for particlization, and the proposal of a new observable that exposes a universal feature in transverse momentum spectra together with a novel way to analyze it.

These results highlight how theoretical progress, guided by precision data, is deepening our understanding of QCD matter and sharpening the role of heavy-ion collisions as a probe of the strong interaction.

Altas energias

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