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Thermodynamical probe of collectivity in small systems

Quantum Chromodynamics, the theory of strong interactions, predicts the existence, under extreme conditions, of a deconfined state of matter known as the quark-gluon plasma (QGP). We have strong evidence that such an extreme state is produced in relativistic heavy-ion collision experiments, such as RHIC and the LHC. A daring question is what is the smallest possible QGP size, one that can be rephrased as "what is the possible smallest fluid in the universe?". To investigate this question, we have utilised a state-of-the-art hybrid model to simulate p-Pb collisions and calculate a series of thermodynamical quantities, such as the hadronisation temperature, entropy density and the number of degrees of freedom. Together with experimental data, they allow us to probe whether the collective description of the matter produced in small systems collisions is consistent with first-principles calculations from Lattice QCD.

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