The phase diagram of QCD

The phase diagram of matter is one of the most important subjects in physics since it also has important implications on chemistry and biology. Accordingly, the phase diagram of ‘strongly interacting matter’ is a topic of utmost interest since decades and substantial experimental and theoretical efforts have been invested to shed light on this issue.

The early universe went through different phases at practically vanishing baryon chemical potential when expanding to its present size. Relativistic and ultra-relativistic heavy-ion collisions nowadays offer the unique possibility to study some of these phases, in particular a quark-gluon plasma (QGP) phase and its phase boundary to the hadronic one.

The present experimental data from heavy-ion collisions are investigated within effective field theory as well as non-equilibrium transport calculations and an approximate phase boundary is extracted from the detailed comparisons. Furthermore, transport properties of the QGP will be confronted with computations from lattice QCD calculations.

The spatial distribution of hadrons in the late stage of a relativistic Au+Au collision from a microscopic transport (PHSD) calculation. The color coding separates particles according to their rapidity \( y \), i.e., the longitudinal relativistic velocity.