Universität Bielefeld | Fakultät für Physik

Physikalisches Kolloquium

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Universität Bielefeld

Antrittsvorlesung:

Calculating the properties of extremely hot end dense matter

Exploring the properties and phase structure of strong interaction matter from first principles is an extremely active and numerically intense field of research. The last 15 years have seen tremendous progress in the quality of lattice regularized Quantum Chromodynamics (QCD) calculations. It is now possible to perform QCD calculations with physical quark masses and reliable continuum extrapolations for bulk thermodynamic quantities at nonzero temperatures. A small baryon number density can be introduced by a Taylor expansion approach. In this accessible region the QCD phase diagram can now be explored in detail, with some applications to heavy ion physics and cosmology. What remains to be an important and unsolved issue are calculations at large baryon number densities.

I will review recent lattice QCD results on bulk thermodynamics at nonzero temperature and small baryon number densities, which includes the equation of state as well as recent results on the density dependence of the QCD transition temperature. I will further discuss how thermal fluctuations of baryon number, electric charge and strangeness can be used to connect QCD calculations with heavy ion experiments conducted at the Relativistic Heavy Ion Collider (RHIC) in Brookhaven.

Finally, I will sketch some strategies for QCD calculations that might help to go beyond a Taylor expansion and overcome the infamous sign problem that is faced in numerical QCD calculations.

Montag, 25.06.2018, 16:15 Uhr
Ort: Hörsaal 6

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