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Investigating the properties of the QGP and searching for its smallest scale

The primary goal of the ultra-relativistic heavy-ion collision program at the Large Hadron Collider (LHC) is to study the properties of the Quark-Gluon Plasma (QGP), a novel state of strongly interacting matter which exists in the early universe. Anisotropic flow, which quantifies the anisotropy of the momentum distribution of final state particles, is sensitive to the fluctuating initial conditions and the transport properties of the created QGPs. The successful description of the measured anisotropic flow coefficients by hydrodynamic calculations suggests that the created medium behaves as a nearly perfect fluid.

In this talk, I will show the latest flow measurements in Xenon–Xenon collisions at $\sqrt{s_{\mathrm{NN}}} = 5.44$ TeV, Lead–Lead collisions at $\sqrt{s_{\mathrm{NN}}} = 2.76$ and 5.02 TeV at the LHC. The standard anisotropic flow, as well as the newly developed flow observables, will be discussed. In addition, I will show the new results of anisotropic flow in proton–lead at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV and proton–proton collisions at $\sqrt{s} = 13$ TeV, to search for a smallest drop of QGP created at the LHC. Possible explanations on the origins of the observed collectivity will be discussed.

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