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Triple high energy nuclear and hadron collisions - a new method to study QCD phase diagram at high baryonic densities

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We propose an entirely new method to study the phase diagram of strongly interacting matter by means of scattering the two colliding beams at the fixed target. Here we present the results of simulations of the most central triple nuclear collisions with the UrQMD-3.4 model for the beam center-of-mass collision energies $\sqrt{s_{NN}} = 2.76$ TeV and $\sqrt{s_{NN}} = 200$ GeV. The main outcome of our modelling is that even at these very high collision energies the initial baryonic charge densities are about 3 times higher than the ones achieved in ordinary binary nuclear collisions. For instance, the yields of protons and Λ-hyperons are strongly enhanced in triple nuclear collisions. The other prospective applications of this method are briefly discussed.
We present the convincing arguments that the triple nuclear collisions method will allow the high-energy nuclear physics community to create a new frontier in the studies of the QCD phase diagram and to lift up these studies to an entirely new level.

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