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Speed of sound exceeding the conformal bound in dense QCD-like theories

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We investigate the phase structure and the equation of state (EoS) for dense two-color QCD at low temperatures using the lattice Monte Carlo simulations. A rich phase structure below the pseudo-critical temperature T_c as a function of quark chemical potential μ has been revealed. In high density regime, we can see a superfluid phase, where the diquark condensate takes non-zero expectation value. We newly found that the speed of sound exceeds the conformal bound, $c_s^2/c^2 = 1/3$, which is the value of relativistic free theory.

Primary author: ITOU, Etsuko (YITP, Kyoto U.)

Presenter: ITOU, Etsuko (YITP, Kyoto U.)

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