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Negative moment of inertia and rotational instability of gluon plasma

Using first-principle numerical simulations of the lattice SU(3) gauge theory, we calculate the isothermal moment of inertia of the rigidly rotating gluon plasma. We find that the moment of inertia unexpectedly takes a negative value below the "supervortical temperature" $T_s = 1.50(10)T_c$, vanishes at $T = T_s$, and becomes a positive quantity at higher temperatures. The negative moment of inertia indicates a thermodynamic instability of rigid rotation. We derive the condition of thermodynamic stability of the vortical plasma and show how it relates to the scale anomaly and the magnetic gluon condensate.

Primary authors: BRAGUTA, Victor (JINR); Dr CHERNODUB, Maxim (Institut Denis Poisson, University of Tours, France); Dr ROENKO, Artem (JINR, BLTP); SYCHEV, Dmitrii (BLTP JINR, MIPT); KUDROV, Ilya (IHEP)

Presenter: SYCHEV, Dmitrii (BLTP JINR, MIPT)