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Moment of inertia and instability of rotating gluodynamics

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Using numerical lattice simulations, we analyze the influence of uniform rotation on the equation of state of gluodynamics. For a sufficiently slow rotation, the free energy of the system can be expanded into a series of powers of angular velocity. We calculate the moment of inertia given by the quadratic coefficient of this expansion and determine its dependence on the temperature We find that the moment of inertia unexpectedly takes a negative value below the "supervortical temperature" ~ 1.5, vanishes at $=$, and becomes a positive quantity at higher temperatures. The negative moment of inertia indicates a thermodynamic instability of plasma with respect to rigid rotation, which resembles the rotational instability of spinning Kerr black holes. We discuss how this instability is related to the scale anomaly and the magnetic gluon condensate. We argue that our results are in qualitative agreement with previous lattice calculations indicating that the rigid rotation increases the critical temperature in gluodynamics.

Topical area

QCD at Non-zero Temperature

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