

Rotating QCD matter in strong coupling limit in lattice QCD approach

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Analytic strong-coupling calculations and previous rotating-lattice simulations appear to predict opposite responses of deconfinement to rotation. We investigate this tension in pure $SU(3)$ gauge theory on anisotropic lattices at imaginary angular velocity over $1.5 \leq \beta \leq 4.5$. At strong coupling we find a reentrant deconfined–confined–deconfined sequence near the zero-rotation transition, in qualitative agreement with analytic strong-coupling theory. The corresponding nonmonotonic phase boundary locally continues to a decreasing transition temperature at real rotation. As β increases, the reentrant interval closes between $\beta = 2.75$ and 3.0 ; at larger β and moderate temperatures above T_c^0 , the Polyakov loop instead initially increases with imaginary angular velocity, recovering the response observed in earlier lattice studies. We further show that quadratic and quartic fits to the same imaginary-rotation boundary yield opposite trends after analytic continuation. The results reconcile the strong-coupling and previous lattice observations as distinct coupling–temperature regimes and expose the cutoff and ansatz dependence that must be controlled when extrapolating to real rotation.

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