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Abstract: Gluodynamics in accelerated frames using first-principles lattice simulations

At this conference, I will present our latest findings on the properties of gluodynamics in an accelerated frame of reference, investigated via first-principles lattice simulations. To study the accelerated system, we employ Rindler coordinates, wherein a comoving observer cannot receive signals from beyond the Rindler horizon. We investigate the confinement-deconfinement phase transition properties of a pure gauge theory (SU(3) color)—a gluon plasma—under weak acceleration. The system is probed using the Polyakov loop and its associated susceptibility, which are properly renormalized in accordance with the Rindler geometry. Acceleration induces a spatially inhomogeneous transition characterized by a temperature gradient consistent with the Tolman-Ehrenfest (TE) law. Within the studied acceleration regime, and in the vicinity of the critical temperature, our results reveal a weak violation of the TE law in the strongly interacting medium due to vector gluon fields. This deviation from the classical TE prediction, which increases with temperature, suggests a non-trivial modification for vector quantum fields such as gluons. This spatially inhomogeneous transition manifests as a crossover, whose width and height decrease with increasing acceleration. Furthermore, we demonstrate with high precision that the critical temperature remains unchanged compared to standard, non-accelerated gluodynamics.