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Deconfinement Transition in Equilibrium Lattice Gauge Theory with Realistic Boundary Conditions HAO WU, Physics Graduate Student, Florida State University, BERND BERG, Professor of Physics, Florida State University — Heavy-ion collision experiments carried out at the Brookhaven National Laboratory provide evidence that matter can be driven from a confined, low-temperature phase into a deconfined high-temperature phase of liberated quarks and gluons. Understanding of the deconfinement transition can bring our knowledge of strongly-interacting matter to a deeper level. *Ab initio* equilibrium studies of the thermodynamic equation of state in the deconfined phase are possible in the framework of lattice gauge theory. It is most desired in such studies to work on as large lattices as possible in order to approach the infinite volume thermodynamic limit. To accomplish it quickly, most of them have implemented periodic boundary conditions on the physical systems. However, the physical volumes created at the Brookhaven National Laboratory are small and exploratory work for pure $SU(3)$ lattice gauge theory suggests that boundary effects cannot be neglected. In this work we studied the $SU(3)$ deconfined equilibrium phase in small volumes with inside and outside temperatures in the $SU(3)$ scaling region, using a lattice geometry of the double-layered torus. Our results show substantial finite size effects on the deconfining transition temperature under realistc boundary conditions.

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