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B2: Latent heat and pressure gap at the first-order deconfining phase transition of SU(3) Yang–Mills theory using the small flow-time expansion method

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We study latent heat and the pressure gap between the hot and cold phases at the first-order deconfining phase transition temperature of the SU(3) Yang–Mills theory. Performing simulations on lattices with various spatial volumes and lattice spacings, we calculate the gaps of the energy density and pressure using the small flow-time expansion (SFtX) method. We find that the latent heat ϵ in the continuum limit is $\epsilon/T^4 = 1.117 \pm 0.040$ for the aspect ratio $N_s/N_t = 8$ and 1.349 ± 0.038 for $N_s/N_t = 6$ at the transition temperature $T = T_c$. We also confirm that the pressure gap is consistent with zero, as expected from the dynamical balance of two phases at T_c. From hysteresis curves of the energy density near T_c, we show that the energy density in the (metastable) deconfined phase is sensitive to the spatial volume, while that in the confined phase is insensitive. Furthermore, we examine the effect of alternative procedures in the SFtX method—the order of the continuum and the vanishing flow-time extrapolations, and also the renormalization scale and higher-order corrections in the matching coefficients. We confirm that the final results are all very consistent with each other for these alternatives.

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