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Chiral and deconfinement properties of the QCD crossover have a different volume and baryochemical potential dependence

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The crossover from hadronic to quark matter is understood to be both a deconfinement as well as a chiral symmetry restoring transition. Here, we study observables related to both aspects using lattice simulations: the Polyakov loop and its derivatives and the chiral condensate and its derivatives. At zero baryochemical potential, and infinite volume, the chiral and deconfinement crossover temperatures almost agree. However, chiral and deconfinement related observables have a qualitatively different chemical potential and volume dependence. In general, deconfinement related observables have a milder volume dependence. Furthermore, while the deconfinement transition appears to get broader with increasing μ_B, the width as well as the strength of the chiral transition is approximately constant. Our results are based on simulations at zero and imaginary chemical potentials using 4stout-improved staggered fermions with $N_\tau = 12$ time-slices and physical quark masses.

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