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Effective Polyakov loop models for QCD-like theories at finite chemical potential

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We study QCD-like theories at finite density with three-dimensional Polyakov theories for heavy quarks. These effective theories are derived by combined strong coupling and hopping expansion techniques as previously been used for QCD. In particular we investigate the cold and dense regimes of the phase diagrams where one either expects Bose-Einstein condensation of bosonic or a liquid-gas transition of fermionic baryons, depending on the theory. We explicitly verify that there is no Silver Blaze problem, i.e. that the density tends to zero in the zero temperature limit for all quark chemical potentials below half the diquark mass in two-color and G2-QCD. As the quark number density increases with larger chemical potentials we generally also observe that the Polyakov loop rises indicating the creation of deconfined quark matter.

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