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Phase structure of three and four flavor QCD

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We investigate the phase structure of QCD at finite temperature and light-quark chemical potential. We improve upon earlier results for $N_f=2+1$ dynamical quark flavors and investigate the effects of charm quarks in an extension to $N_f=2+1+1$. We determine the quark condensate and the Polyakov loop potential using solutions of a coupled set of (truncated) Dyson-Schwinger-equations for the quark and gluon propagators of Landau gauge QCD. At zero chemical potential we find excellent agreement with results from lattice-QCD. With input fixed from physical observables we find only a very small influence of the charm quark onto the resulting phase diagram at finite chemical potential. We discuss the location of the emerging critical end-point and compare with expectations from lattice gauge theory.

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