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Two-colour QCD at finite density with two flavours of staggered quarks

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Lattice simulations of two-colour QCD can be performed at finite density without sign problem and by now have a long history already. The physics of the bosonic diquark baryons is believed to be fairly well understood and qualitatively resembles QCD at finite isospin density with pion condensation. There is good guidance from effective field theory predictions and model studies of the BEC-BCS crossover inside the condensed phase. We have revisited the question how well this can all be described with rooted staggered quarks. A potential problem thereby is the proximity of the bulk phase. We therefore use an improved gauge action and lattice couplings that somewhat larger than those of the early studies with $N_f=8$ and 4 flavours.

This implies that we have to worry about additive renormalization in the chiral condensate before we can compare our results with the effective field theory predictions. We also confirm that the Polyakov-loop does not appear to respond to the finite density in the staggered formulation, and we perform some basic meson and diquark spectroscopy at finite density.

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