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Lattice simulations of G2-QCD at finite density I

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In G2-QCD the $SU(3)$ gauge group of QCD is replaced by the exceptional Lie group G2. This replacement leads to a theory that does not have a sign problem and can be simulated at finite baryon density using standard lattice techniques. The price to pay is that it contains bosonic as well as fermionic baryons. The physics of the light bosonic baryons is expected to be analogous to other QCD-like theories without sign problem such as two-color QCD or QCD with adjoint quarks. As adjoint QCD, it also contains fermionic baryons such as nucleons and deltas to form G2-nuclear matter while it is known from quenched simulations that it resembles QCD more closely than adjoint QCD does. We review the properties of G2-QCD, our results on its baryon spectrum, and how the observed mass hierarchy in this spectrum is reflected in the baryon density at finite chemical potential.

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