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Lattice investigations of the chimera baryon spectrum in the Sp(4) gauge theory

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Abstract: We study the Sp(4) gauge theory coupled to hyperquark matter fields. This theory potentially serves as an ultraviolet completion of the Standard model in the framework of composite Higgs models that utilise partial compositeness to generate the top-quark mass. We focus on the spectroscopy of chimera baryons, which are composite states composed of two fundamental and one antisymmetric hyperquarks. The chimera baryons having the same quantum number as the top quark are the top partners, which effectively lift the mass of the top quark by mixing with it. Specifically, we investigate, in the quenched approximation, the three lowest-lying parity-even states: Λ_{CB}, Σ_{CB} (both with spin 1/2), and Σ*_{CB} (spin 3/2). The spin-1/2 states are considered as top partner candidates. We extrapolate our results to the continuum and massless limits by applying an effective treatment inspired by Wilson chiral perturbation theory. This study sets the stage for our ongoing lattice simulations with the dynamical hyperquarks.

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