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Lattice studies of Sp(2N) gauge theories using GRID

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Four-dimensional gauge theories based on symplectic Lie groups have been introduced as the microscopic origin for elegant proposals of several new physics models. Numerical studies pursued on the lattice can provide the quantitative information necessary for the application of such models.
To this purpose, we implemented $Sp(2N)$ gauge theories using Monte Carlo techniques within Grid, a performant framework designed for the numerical study of field theories on the lattice.
We show the first results obtained using this library in symplectic gauge theories, focusing on the $Sp(4)$ theory coupled to $N_{(as)}$ Wilson-Dirac fermions transforming in the 2-index antisymmetric representation.
Preliminary tests of the algorithm are discussed, checking the behavior of the integrators, and the implementation of the symmetries. We then study the Wilson flow as a scale setting procedure and monitor ergodicity using the topological charge.
To set the stage for future large-scale numerical studies, we vary the number of fermions in the antisymmetric representation, $N_{(as)}$, and scan the lattice parameter space, to map the critical lines of bulk phase transitions in the whole class of theories.

Topical area

Particle Physics Beyond the Standard Model

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