

A cold-atom quantum simulator for SU(2) Yang-Mills lattice gauge theory

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Non-Abelian gauge theories play an important role in the standard model of particle physics, and unfold a partially unexplored world of exciting physical phenomena. In this Letter, we suggest a realization of a non-Abelian lattice gauge theory—SU(2) Yang-Mills in (1+1) dimensions, using ultracold atoms. Remarkably, and in contrast to previous proposals, in our model gauge invariance is a direct consequence of angular momentum conservation and thus is fundamental and robust. Our proposal may serve as well as a starting point for higher-dimensional realizations.

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