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**Artificial gauge fields in a triangular optical lattice allow for an Ising-XY phase transition** JULIETTE SIMONET, JULIAN STRUCK, MALTE WEINBERG, CHRISTOPH OELSCHLAEGER, ROBERT HOEPPNER, LUDWIG MATHEY, PATRICK WINDPASSINGER, KLAUS SENGSTOCK, Institut fuer Laserphysik, University Hamburg, Germany, ANDRE ECKARDT, Max-Planck-Institut fuer Physik komplexer Systeme, Dresden, Germany, PHILIPP HAUKE, MACIEJ LEWENSTEIN, Institut de Ciencies Fotoniques, Barcelona, Spain — The emulation of synthetic gauge fields for ultracold atomic systems is crucial in order to access the rich physics arising when condensed matter is placed into magnetic fields. We report here on the experimental realization of gauge-invariant staggered magnetic fluxes on a periodically driven triangular lattice. The phase distribution of a superfluid submitted to $\pi$ staggered fluxes obeys both the discrete Ising (Z2) and the continuous U(1) global phase symmetry. The interplay of these symmetries naturally raises the question of coupled order parameters and new universality classes of phase transitions. We analyze the behavior of the discrete and continuous order parameters measured for this two-dimensional spin-chirality coupled system. The strength of the staggered artificial gauge field is used to control the Z2 symmetry breaking, by lifting the degeneracy between the Ising states in analogy to a longitudinal homogeneous magnetic field in the standard Ising-Spin model. We observe a thermally driven Ising-type phase transition from an ordered, ferromagnetic to an unordered, paramagnetic state.

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