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Protection against a spin gap in two-dimensional insulating antiferromagnets with a Chern-Simons term IMAM MAKHFUDZ, PIERRE PUJOL, LPT-IRSAMC and Univ. Paul Sabatier Toulouse France — We propose a mechanism for the protection against spin gapped states in doped antiferromagnets. It requires the presence of a Chern-Simons term that can be generated by a coupling between spin and an insulator.We first demonstrate that in the presence of this term the vortex loop excitations of the spin sector behave as anyons with fractional statistics. To generate such a term, the fermions should have a massive Dirac spectrum coupled to the emergent spin field of the spin sector. The Dirac spectrum can be realized by a planar spin configuration arising as the lowest-energy configuration of a square lattice antiferromagnet Hamiltonian involving a Dzyaloshinskii- Moriya interaction. The mass is provided by a combination of dimerization and staggered chemical potential.We finally showthat for realistic parameters, anyonic vortex loop condensationwill likely never occur and thus the spin gapped state is prevented.We also propose real magnetic materials for an experimental verification of our theory. Reference: Imam Makhfudz and Pierre Pujol,Phys.Rev. B 92, 144507(2015).

Imam Makhfudz
LPT-IRSAMC and Univ. Paul Sabatier Toulouse France

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