Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

On Spin 1/2 Excitations and Quantum Criticality in Two Dimensional $O(3)$ Antiferromagnets ZAIRA NAZARIO, DAVID SANTIAGO, Stanford University — We utilize the $2+1$ $O(3)$ nonlinear sigma model for antiferromagnets to study the suggestion that there are corrections to quantum criticality due to low energy degrees of freedom intrinsic to the quantum critical point. The Nèel ordered ground state, besides the gapless Goldstone excitations, has gapped skyrmion and antiskyrmion topological configurations. These are responsible for the system being disordered at all finite temperatures, as they gain energy by becoming arbitrarily large and thus lead to finite correlation length no matter how few of them are present. We map the skyrmions and antiskyrmions to $SU(2)$ spin 1/2 objects and further show that they superpose in exactly the same way as spin 1/2 objects. Therefore the Nèel ground state has gapped spin 1/2 excitations, i.e. spinons. This conclusion is not due to a Hopf term and it is independent of whether the microscopic spins are integral or half integral. We write an effective low energy field theory that correctly takes into account the spinon and Goldstone excitations, and their interactions.

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Date submitted: 04 Dec 2004 Electronic form version 1.4