

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Bound states and E_8 symmetry effects in perturbed quantum Ising chains JONAS KJALL, University of California, Berkeley, FRANK POLLMANN, University of California, Berkeley and Academia Sinica, JOEL MOORE, University of California, Berkeley and Lawrence Berkeley National Laboratory — In a recent experiment on CoNb_2O_6 , Coldea et al. found for the first time experimental evidence of the exceptional Lie algebra E_8 . The emergence of this symmetry was theoretically predicted long ago for the transverse quantum Ising chain in the presence of a weak longitudinal field. We consider an accurate microscopic model of CoNb_2O_6 incorporating additional couplings and calculate numerically the dynamical structure function using a recently developed matrix-product-state method. We compare the signatures of this model to those found in the transverse Ising chain in a longitudinal field and to experimental data, with focus on how far the effects of integrability extends and how robust they are to the additional interactions. The excitation spectra show bound states characteristic of the weakly broken E_8 symmetry and a bound state continuum carrying spectral weight comparable to the higher bound states.

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Date submitted: 19 Nov 2010

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