

Invited Seminar
University of Michigan
Ann Arbor, MI
November 30, 2004

Title & Abstract:

Quantum Magnets in One Dimension

Stephen E. Nagler
HFIR Center for Neutron Scattering
Condensed Matter Sciences Division
Oak Ridge National Laboratory

This talk will address some of the peculiar physics observed in nearly one-dimensional magnetic materials. The underlying model is the antiferromagnetic chain of spin $\frac{1}{2}$ particles interacting via Heisenberg exchange. The ground state of this model system was solved by Bethe in 1931, but more than fifty years elapsed before the nature of the excited states was appreciated. The natural magnetic excitations are pairs of spinons, leading to an unusual continuum spectrum of quantum fluctuations. We understand now that the model is a prototypical “quantum critical” system. These and other exotic features are illustrated by inelastic neutron scattering experiments on model materials, in particular the insulator KCuF_3 . If time permits there will be some discussion of opportunities presented by new and more powerful neutron instruments, including those planned at the SNS and the upgraded HFIR.