

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Spin Currents Carried by Spinons in XXZ Spin Chains: Signatures in Polarized Inelastic Neutron Scattering LEONARD PATRICK ENGLISH, HANS-BENJAMIN BRAUN, University College Dublin, JIRI KULDA, Institute Laue-Langevin, Grenoble — Quantum spin chains serve as a paradigm for exploring truly quantum phenomena, with spinons being the elementary excitations. Motivated by compounds such as CsCoBr₃ and CsCoCl₃, we focus on the Ising-like antiferromagnetic Heisenberg XXZ model (spin-1/2). Here we present theoretical results for the total inelastic scattering cross section of spin-polarized neutrons in the presence of an external magnetic field, which is applied transverse to the Ising direction. In particular, we identify the spin current associated with spinons and their corresponding signatures in the neutron scattering cross section. The presence of a transverse magnetic field no longer allows for reliance on S_{tot}^z as a conserved quantity, which has traditionally been assumed in this context. As a striking consequence, we find that the spinons carry a non-vanishing spin current, even in the limit of infinitesimal fields. Our results are shown to be in good agreement with experimental neutron scattering data on CsCoBr₃.

Leonard Patrick English
University College Dublin

Date submitted: 14 Nov 2014

Electronic form version 1.4