Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Singlet-Triplet Excitations in the Unconventional Spin-Peierls System TiOBr J.P. CLANCY, B.D. GAULIN, McMaster University, C.P. ADAMS, St. Francis Xavier University, G.E. GRANROTH, A.I. KOLESNIKOV, T.E. SHERLINE, Oak Ridge National Laboratory, F.C. CHOU, National Taiwan University — TiOBr belongs to a select group of quasi-one-dimensional materials which undergo a spin-Peierls (SP) phase transition and develop a dimerized singlet ground state at low temperatures. However, unlike conventional SP systems, TiOBr exhibits not one, but two successive phase transitions upon cooling: a continuous transition into an incommensurate SP state at $T_{C2} \sim 48$ K, followed by a discontinuous transition into a commensurate SP state at $T_{C1} \sim 27$ K. We have performed time-of-flight neutron scattering measurements on powder samples of TiOBr using the fine-resolution Fermi chopper spectrometer (SEQUOIA) at the Spallation Neutron Source. These measurements reveal two branches of magnetic excitations within the commensurate and incommensurate SP phases, which we associate with n = 1 and n = 2 triplet excitations out of the singlet ground state. This study represents the first direct measure of the singlet-triplet energy gap in TiOBr, which we have determined to be $E_g = 21.2 \pm 1.0$ meV.

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Date submitted: 28 Dec 2010 Electronic form version 1.4