Quantum Spin Fluctuations and magnons in antiferromagnetically coupled bilayers with tuneable intra-bilayer exchange - the case of \( \text{Cr}_2\text{W(Te)O}_6 \)

KINGSHUK MAJUMDAR, Grand Valley State Univ, S. D. MAHANTI, Michigan State University, East Lansing — Recent neutron diffraction studies have shown that in \( \text{Cr}_2(\text{W,Te})\text{O}_6 \) systems, which consist of bilayers with strong antiferromagnetic inter-bilayer coupling between Cr moments, the intra-bilayer coupling between the Cr moments can be tuned from ferro (for W) to antiferro (for Te). Ab initio density functional calculations provide a microscopic understanding of the magnetic structure but cannot explain the magnitude of the ordered \( \text{Cr}^{3+} \) moments. In order to understand the reduction of the ordered moment (ROM) caused by quantum spin fluctuations we have studied the magnon dispersion and ROM using a two parameter quantum Heisenberg spin Hamiltonian with tunable intra-\((j)\) and antiferromagnetic inter- \((J)\) bilayer couplings. The magnon dispersion and sublattice magnetization have been calculated using non-linear spin wave theory up to second-order corrections in spin \( S \).

We acknowledge the use of HPC cluster at GVSU, supported by the National Science Foundation Grant No. CNS-1228291.

Kingshuk Majumdar
Grand Valley State Univ

Date submitted: 03 Nov 2015

Electronic form version 1.4