Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Role of Quantum Fluctuations in the triangular antiferromagnet Cs_2CuCl_4[1] MARTIN Y. VEILLETTE, JOHN CHALKER, Rudolf Peierls Center for Theoretical Physics — We have performed a detailed comparison of static properties of the anisotropic triangular antiferromagnet Cs_2CuCl_4 with a calculation taking into account the leading order of the zero point fluctuations at zero temperature. The Hamiltonian of the Cs_2CuCl_4 compound is known to a high degree of accuracy and allows for a parameter-free calculation. A distinction must be made between transverse and longitudinal field due to a weak Dzyaloshinkii-Moriya interaction that introduce an easy-plane anisotropy in the Hamiltonian. The phase diagram is determined in a classical approximation along the two field directions. Building on these results, we calculate the contribution of quantized spin-waves in a large S expansion to themagnetization, ordering wavevector, sublattice magnetization and transverse spin component. The results are shown to depend sensitively on the weak anisotropy. In high field, we find the zero-point fluctuations to be quenched and use a mapping to a dilute Bose gas to determine the exact quantum contribution near the critical field. The results of the linear spin wave analysis are found to be in excellent agreement with the experimental data.

[1]It is a pleasure to acknowledge invaluable discussions with Radu Coldea

Martin Veillette
Rudolf Peierls Center for Theoretical Physics

Date submitted: 01 Dec 2004 Electronic form version 1.4