Thermal Hall Effect of Spins in a Paramagnet

HYUNYONG LEE, JUNG HOON HAN, Department of Physics, Sungkyunkwan University, Suwon 440-746, Korea, PATRICK LEE, Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA — Theory of Hall transport of spins in a correlated paramagnetic phase is developed. By identifying the thermal Hall current operator in the spin language, which turns out to equal the spin chirality in the pure Heisenberg model, various response functions can be derived straightforwardly. Subsequent reduction to the Schwinger boson representation of spins allows a convenient calculation of thermal and spin Hall coefficients in the paramagnetic regime using self-consistent mean-field theory. Comparison is made to results from the Holstein-Primakoff reduction of spin operators appropriate for ordered phases.