# The Higgs Amplitude mode in Ferromagnetic Metals

Yi Zhang,[1] Henrique B. Brentan,[2] Paulo F. Farinas,[2] and Kevin S. Bedell[1]

[1] *Department of Physics, Boston College, Chestnut Hill, Massachusetts 02467, USA*

[2] *Departamento de Física, Universidade Federal de São Carlos, 13565-905, São Carlos, SP, Brazil*

Using Ferromagnetic Fermi liquid (FFL) theory, Bedell and Blagoev derived the collective low-energy excitations of a weak ferromagnet. They obtained the well-known magnon (Nambu-Goldstone) mode and found a new gapped mode that was never studied (or seen) in weak ferromagnetic metals. Recently we have identified this mode as the Higgs boson (amplitude mode) of a ferromagnetic metal. This is identified as the Higgs amplitude mode since it can be show that it corresponds to a fluctuation of the amplitude of the order parameter and it is a propagating mode. We use the FFL theory to describe the single particle and collective excitations of the itinerant-electron ferromagnetic material MnSi. By fitting the model with the existing experimental results, we calculate the dynamical structure function and see well-defined peaks contributed from the magnon and the Higgs. Our estimates of the relative intensity of the Higgs amplitude mode suggest that it can be seen in neutron scattering experiments on MnSi. The influence an external magnetic field will have upon these results is also investigated.