Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Coherent spin waves in epitaxial Fe films on GaAs (001) HAIBIN ZHAO, DIYAR TALBAYEV, GUNTER LUEPKE, College of William and Mary, AUBREY HANBICKI, CONNIE LI, BEREND JONKER, Naval Research Laboratory — Recently, coherent spin waves have been investigated in ferromagnetic thin film using optical pump-probe technique by exploiting the temperature dependence of the magnetic anisotropy. Here, we report on low-order spin wave modes in the dipole-exchange regime in Fe films epitaxially grown on GaAs (001). Three precession modes with zero in-plane wave-vector are observed by applying an external magnetic field along the in-plane hard axis. The lowest frequency mode can be well described by the uniform magnetization precession. The cubic magnetocrystalline anisotropy constant K_1/M_s and effective demagnetization field $4\pi M_s$ are determined to be 270 Oe and 17.5 KOe, respectively. The modes with higher frequencies correspond to the first- and second-order spin waves. An effective exchange stiffness constant of $0.8*10^{-6}$ erg/cm is obtained from the calculation assuming the single sine- or cosine- type standing spin waves with free spins at both interfaces. The exchange constant is smaller than the values obtained from high order spin wave modes in ferromagnetic resonance experiments and neutron scattering. The difference may result from pinning effects, which modifies the location of the surface antinodes of the standing spin waves thereby changing their effective wavelength.

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Date submitted: 29 Nov 2005 Electronic form version 1.4