Abstract Submitted
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A Superconductor in the Presence of an Exchange Field and Spin-orbit Interaction[1] MARIUS EICH, FBML, MIT, JOHANNES C. LEUTENANTSMEYER, FBML, MIT and I. Phys. Inst., Georg-August-Universitaet Goettingen, PENG WEI, FBML, MIT, MARKUS MUENZENBERG, I. Phys. Inst., Georg-August-Universitaet Goettingen, JAGADEESH S. MOODERA, FBML and Physics Dept., MIT — A superconductor (SC) in contact with a magnetic semiconductor experiences a large internal exchange field (IEF) that acts on the spins [1,2]. The quasi particle density of states (*q-DOS*) in the SC splits by the Zeeman energy, $2\mu H_{EX}$ where μ is the electron magnetic moment and H_{EX} is the IEF [1,2]. Here we combine IEF and spin-orbit (S-O) interaction to investigate the properties of Al by superconductive (SIS) tunneling spectroscopy [1]. Thin film sandwich junction 4EuS/4.5Al/(*d*-Au)/Al_2O_3/8Al (film thickness in nm and *d* from 0 to 0.06nm) was studied: ferromagnetic EuS layer provides the IEF whereas the Au layer creates the S-O scattering in Al. Tunnel conductance measured at 0.4K showed a large Zeeman splitting of *q-DOS* in Al film due to the IEF, even at $H_{appl} = 0$. In zero H the large asymmetry in the conductance peaks and reduction in the Zeeman splitting were observed due to S-O scattering when compared to control junctions (no Au). The sharp features in the SIS tunnel conductance allowed these studies even at the lowest level of S-O scattering.

[1] R. Meservey and P. M. Tedrow, Phys. Rep. 238, 173 (1994).
[2] J. S. Moodera, T. S. Santos and T. Nagahama, J. Phys.: Condens. Matter 19, 165202 (2007)

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