

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Origin of three-terminal Hanle-type signals in low-temperature ferromagnet-silicon structures with direct Schottky contacts¹ LAN QING, HANAN DERY, University of Rochester, YUICHIRO ANDO, SHINYA YAMADA, KENJI KASAHARA, KOHEI MASAKI, MASANOBU MIYAO, KOHEI HAMAYA, Kyushu University, KENTAROU SAWANO, Tokyo City University — We analyze three-terminal electrical Hanle-type measurements in CoFe/Si devices. We show that at low temperatures there exists a Lorentzian-like dependence of the voltage signal on external magnetic field that does not correspond to the spin lifetime. The signal stems from spin-dependent scattering of electrons by neutral impurities in the bulk Si channel. The measured signal amplitude is explained by exchange interactions between free (injected) and localized electrons, while the “Lorentzian” width by exchange between localized electrons on adjacent impurities. The theory reproduces the observed dependencies on temperature and injected current density.

¹This work is supported by NRI-NSF Contract No. DMR-1124601, NSF Contract No. ECCS-1231570 and DTRA Contract No. HDTRA1-13-1-0013.

Lan Qing
Department of Physics and Astronomy,
University of Rochester, Rochester, New York 14627

Date submitted: 15 Nov 2013

Electronic form version 1.4