Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Interfacial exchange, magnetic coupling and magnetoresistance in ultra-thin GdN/NbN/GdN tri-layers[1] YOTA TAKAMURA, MIT, JSPS, Japan, Tokyo Tech, Japan, RAFAEL S. GONCALVES, MIT, Federal Univ. of Viosa, Brazil, JUAN PEDRO CASCALES, MIT, ATILGAN ALTINKOK, Giresun Univ., Turkey, CLODOALDO I. L. DE ARAUJO, Federal Univ. of Viosa, Brazil, VALERIA LAUTER, Oak ridge National Lab, JAGADEESH S. MOODERA, MIT, MIT TEAM — Superconducting spin-valve structures with a superconductive (SC) spacer sandwiched between ferromagnetic (FM) insulating layers [Li PRL 2013, Senapati APL 2013, Zhu Nat. Mat. 2016.] are attractive since the SC and FM characteristics can mutually be controlled by the proximity effect. We investigated reactively sputtered GdN/NbN/GdN tri-layer structures with various (SC) NbN spacer thicknesses (d_{NbN}) from superconducting to normal layers. Magnetoresistive behavior similar to GMR in metallic magnetic multilayers was observed in the tri-layers with d_{NbN} between 5-10 monolayers (ML), where thinner NbN layers did not show superconductivity down to 4.2 K. The occurrence of GMR signal indicates the presence of ˜a ML of FM metallic layers at the GdN/NbN interfaces. Susceptibility and transport measurements in these samples revealed that the interface layers (ILs) are ferromagnetically coupled with adjacent GdN layers. The thickness of each of the IL is deduced to be about 1.25 ML, and as a result for d_{NbN} <2.5-ML the two FM layers in the tri-layer were magnetically coupled and switched simultaneously. These findings and interfacial characterization by various techniques will be presented.

[1]Work supported by NSF and ONR grants.

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Date submitted: 17 Jan 2017 Electronic form version 1.4