Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Electrically Detected Study of Variable Range Hopping in Silicon Nitrides[1] RYAN WASKIEWICZ, MICHAEL MUTCH, PATRICK LENAHAN, Pennsylvania State University, SEAN KING, Intel Corporation — Electrically detected magnetic resonance (EDMR) offers greatly improved sensitivity over conventional electron paramagnetic resonance (EPR) studies in semiconductor/insulator systems; in EDMR measurements, one observes EPR via changes in device currents which are spin-dependent. In our study, we observe EDMR via spin-dependent trap assisted tunneling (SDTAT) via variable range hopping (VRH) through stoichiometric silicon nitride dielectric films. In these films, leakage current effectively changes at resonance. In our study, we have investigated the EDMR response as a function of dielectric electric field and temperature for films of various thicknesses. We believe that these measurements allow us to identify the defects responsible for transport in such these thin films using EDMR and to some extent measure the distances between the defects. The separation between the defects can, at least in principle, be measured using the recently demonstrated half-field EDMR response and we can also count total number of spins responsible for transport through dielectric films. Although we present results only on silicon nitride thin films, we believe that the approach utilized will be widely applicable to other dielectric films in which electronic transport is of interest.

[1]This project is sponsored in part by Intel Corporation and in part by the Department of Defense, Defense Threat Reduction Agency under grant number HDTRA1-16-0008.

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Date submitted: 10 Nov 2016 Electronic form version 1.4