Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

A New Electrically Detected Magnetic Resonance Approach: Spin Dependent Charge Pumping[1] MARK ANDERS, PATRICK LENAHAN, Pennsylvania State Univ, AIVARS LELIS, U.S. Army Research Laboratory — Electrically detected magnetic resonance (EDMR) studies have provided important insight into semiconductor/insulator interface defects. However, virtually all of these studies involve spin dependent recombination (SDR). Since SDR utilizes a recombination current, it is sensitive only to deep level defects. A new EDMR technique, spin dependent charge pumping (SDCP), overcomes this limitation. In SDCP, a trapezoidal waveform applied to the gate cycles the Fermi level from near the conduction to valence band edges. Interface traps are repeatedly filled and then emptied, creating a current which is sensitive to defects in most of the band gap. The sensitivity of SDCP is very nearly field and frequency independent, allowing for a wide range of resonance field/frequency measurements. SDCP at low resonance frequency allows for: (1) partial separation of spin-orbit coupling and hyperfine effects on magnetic resonance spectra, (2) observation of otherwise forbidden half-field effects which make EDMR, at least in principle, quantitative, and (3) observation of Breit-Rabi shifts in superhyperfine measurements. In addition, a strong SDCP response near zero magnetic field can provide some hyperfine information and EDMR-like detection without the expense and complexity of a resonance spectrometer. We present results on 4H-SiC MOSFETs, but the approach utilized should be widely applicable to other interfaces.

[1]This work at Penn State supported by the U,S, Army Research Laboratory

Mark Andes
Pennsylvania State Univ

Date submitted: 11 Nov 2016 Electronic form version 1.4