Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Time domain mapping of spin torque oscillators dynamics JIEYI ZHANG, YUJIN CHEN, UC Irvine, GRAHAM ROWLANDS, Cornell University, ILYA KRIVOROTOV, UC Irvine, PATRICK BRAGANCA, JEFF CHILDRESS, BRUCE GURNEY, Hitachi Global Storage Technologies, UC IRVINE, HGST AND CORNELL UNIV COLLABORATION — Time domain measurements of spin torque oscillators (STOs) offer important insights into the magnetization dynamics under the action of spin torque. We use the time domain data to map statistical distributions of the STO free layer trajectories and analyze them in the framework of the Fokker-Planck effective energy approach. We make time-resolved measurements of the microwave voltage signal generated by an STO based on a 90 nm circular nanopillar patterned from IrMn/ Co/CoFe/ CoFeGe/ CoFe/ Cu/ CoFe/ CoFeGe/ CoFe multilayer. Based on our time domain data and the angular dependence of giant magneto-resistance of the device, we map out dynamic trajectories of the free layer. We then apply the Fokker-Planck approach to calculate spin torque dependent STO effective energy E_{eff} from the experimentally measured statistical distributions of the free layer trajectories. We compare the measured E_{eff} to that calculated in the macrospin approximation and discuss how such a comparison can be used for quantification of non-linear damping in the high-amplitude regime of STO operation.

Jieyi Zhang
UC Irvine

Date submitted: 14 Nov 2014 Electronic form version 1.4