Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

DC Rectification of Microwaves in YIG/Pt/Py Trilayers[1]
JOSEPH SKLENAR, JOHN KETTERSON, Northwestern University, MATTHIAS JUNGFLEISCH, WANJUN JIANG, WEI ZHANG, JOHN PEARSON, AXEL HOFFMANN, Argonne National Laboratory, QINGHUI YANG, QIYE WEN, HUAIWU ZHANG, State Key Laboratory of Electronic Films and Integrated Devices, University of Electronic Science and Technology, Chengdu, Sichuan, China, 610054 — The DC voltage arising from the rectification of microwaves passing through a ferromagnet/spin Hall metal bilayer structure at ferromagnetic resonance is a powerful tool in understanding spin-orbit torques from spin Hall effects. Rectification mechanisms such as anisotropic magnetoresistance of the ferromagnetic or spin Hall magnetoresistance of the spin Hall metal can contribute depending on whether the ferromagnet is conductive or insulating. For both types of ferromagnets, spin pumping acting in concert with the inverse spin Hall effect can also generate additional DC voltages. We have studied rectification in a trilayer system of YIG/Pt/Py under conditions where both ferromagnets are simultaneously excited. By tipping the DC magnetic field out of the sample plane we can make the resonances of both ferromagnet materials degenerate. In this simultaneous resonance regime we observe an enhancement in the voltage of the YIG lineshape coming at the expense of the Py signal. Furthermore, at arbitrarily tipped out-of-plane tipping angles we observe asymmetries of the Py signal under field reversal. We compare this observation with the behavior of Py/Pt bilayer samples.

[1]This work was supported by DOE, Office of Science, Materials Science and Engineering Division.

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Date submitted: 14 Nov 2014 Electronic form version 1.4