

MAR17-2016-020399

Abstract for an Invited Paper  
for the MAR17 Meeting of  
the American Physical Society

**Direct detection of the spin precession of a pure AC spin current using synchrotron x-rays**

Z. Q. QIU, University of California at Berkeley

Despite the great progress in spin-current research, the detection of spin-current has mostly remained indirect by measuring the induced effect of spin-current (e.g., inverted spin Hall effect) that could sometimes generate ambiguous interpretations. By synchronizing a microwave waveform with synchrotron x-ray pulses, we directly probed the spin precession of a pure AC spin-current using pump-probe X-ray Magnetic Circular Dichroism (XMCD). In this experiment, the ferromagnetic resonance of a Py layer in Py/Cu/CuMn/Cu/Co pumps an AC spin-current into the Cu/CuMn/Cu spacer layer and the ferromagnetic Co layer. The x-ray pulses, whose frequency is synchronized with the spin precession frequency, then probe element by element of the spin precessions of the CuMn and Co layers. The AC XMCD signal unambiguously identified the ac spin current in the paramagnetic CuMn layer. In addition, phase-resolved measurement identified a bipolar phase behavior of the Co spin precession which is a finger print of spin-current generated spin precessions.