Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Manipulating femtosecond magnetism through pressure: First-principles calculations MINGSU SI, Lanzhou University, GUOPING ZHANG, Indiana State University — Inspired by a recent pressure experiment in fcc Ni, we propose a simple method to use pressure to investigate the laser-induced femtosecond magnetism. Since the pressure effect on the electronic and magnetic properties can be well controlled experimentally, this leaves little room for ambiguity when compared with theory. Here we report our theoretical pressure results in fcc Ni: Pressure first suppresses the spin moment reduction and then completely diminishes it; further increase in pressure to 40 GPa induces a demagnetization-to-magnetization transition. To reveal its microscopic origin, we slide through the L-U line in the Brillouin zone and find two essential transitions are responsible for this change, where the pressure lowers two valence bands, resulting in an off-resonant excitation and thus a smaller spin moment reduction. In the spin-richest L-W-$W^{'}$ plane, two spin contours are formed; as pressure increases, the contour size retrieves and its intensity is reduced to zero eventually, fully consistent with the spin-dipole factor prediction. These striking features are detectable in time- and spin-resolved photoemission experiments.

Guoping Zhang
Indiana State University

Date submitted: 14 Nov 2013 Electronic form version 1.4