Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**Localization of Fe d-states in Ni-Fe-Cu alloys and implications for ultrafast demagnetization** TOM SILVA, NIST, Boulder, CO, USA, RONNY KNUT, JILA, Boulder, CO, USA, ERNA DELCZEG-CZIRJAK, Uppsala University, Uppsala, Sweden, JUSTIN SHAW, HANS NEMBACH, NIST, Boulder, CO, USA, PATRIK GRYCHTOL, DMITRIY ZUSIN, CHRISTIAN GENTRY, EMRAH TURGUT, HENRY KAPTEYN, MARGARET MURNANE, JILA, Boulder, CO, USA, DARIO ARENA, University of South Florida, Tampa, FL, USA, OLLE ERIKSSON, OLOF KARIS, Uppsala University, Uppsala, Sweden — $Ni_{0.8}Fe_{0.2}$ (Py) and Py-Cu exhibit intriguing ultrafast demagnetization behavior, where the Ni magnetic moment shows a delayed response relative to the Fe. To unravel the mechanism responsible for this behavior, we have studied Py-Cu alloys for a wide range of Cu concentrations using X-ray magnetic circular dichroism (XMCD). The magnetic moments of Fe and Ni are found to respond very differently to Cu alloying: Fe becomes a strong ferromagnet in Py, with the magnetic moment largely unaffected by Cu alloying. In contrast, the Ni magnetic moment decreases continuously with increasing Cu concentration. Ab-initio calculations corroborate these results and we discuss the electronic structure in the framework of virtual bound states (VBSs). Fe exhibits VBSs in the minority band that lie approximately 1 eV above the Fermi level in pure Py, and which move closer to the Fermi level upon Cu alloying. A strong interaction between the VBSs and electrons above the Fermi level enhances the formation of magnons at Fe sites. This mechanism is consistent with a demagnetization delay between Fe and Ni, as found experimentally.

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Date submitted: 06 Nov 2015 Electronic form version 1.4