Abstract Submitted
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All-Optical Subpicosecond Magnetic Switching in NiO(001) W. HÜBNER, G. LEFKIDIS, K. SATITKOVITCHAI, O. NEY, Department of Physics, Kaiserslautern University of Technology, Box 3049, 67653 Kaiserslautern, Germany — All-optical switching scenarios have so far been demonstrated in atomic and molecular systems only, thus being relatively slow. Here we show, for the first time, the potential of intragap states at a solid surface, viz. antiferromagnetic NiO(001), a notoriously strongly correlated electron system of both high spin density as well as separated multiplet states, for *magnetic* switching on the subpicosecond time scale. Employing a previously designed four-level scenario and computing the electronic structure from a high-level *ab initio* quantum chemical method QCISD(T) with the additional inclusion of spin-orbit coupling yields: (1) The fine structure splitting of the $^3T_{2g}$ states of 70 meV found in experiment (optical second harmonic generation) is well reproduced, (2) Using gaussian pulses of 60-120 fs duration switching the magnetic state of the system back and forth is possible with high fidelity on time scales as short as 150 fs per single switch [1]. The decisive roles of the shape, frequency, and duration of the applied laser pulse are analyzed. The switched state can be reached by tuning the laser parameters to any of the multiplets within the gap. [1] R. Gómez-Abal, O. Ney, K. Satitkovitchai, and W. Hübner, PRL **90**, 227402 (2004).

Wolfgang Hübner
Department of Physics, Kaiserslautern University of Technology
Box 3049, 67653 Kaiserslautern, Germany

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