Abstract Submitted
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Tracking the non-linear optical response in plasmonic nanoparticles with strong-field photoemission spectroscopy[1] JEFFREY POWELL, INRS-EMT, JIANXIONG LI, Louisiana State University, ADAM SUMMERS, ICFO, SEYYED JAVAD ROBATJAZI, Kansas State University, MICHAEL DAVINO, UConn, PHILIPP RUPP, LMU, Munich, CHRIS SORENSEN, DANIEL ROLLES, Kansas State University, MATTHIAS KLING, LMU, Munich; MPQ, CARLOS TRALLERO-HERRERO, UConn, UWE THUMM, ARTEM RUDENKO, Kansas State University — The ability to reversibly manipulate the electronic structure and optical response of nanometer-sized metal and semiconductor structures at a femtosecond timescale holds strong promise to enhance our understanding of the transient electronic response of solid matter and enable novel applications in ultrafast electro-optical devices. In order to probe the transient optical response of such structures, we exposed solid gold nanospheres and gold spherical shells with silica cores to intense pulses of infrared light and measured the emitted photoelectrons. Comparing photoemission yields from these samples, we can relate the cut-off energy to the plasmonic dielectric response near the nanoparticle surfaces as a function of the incident-pulse intensity. Our measured intensity-dependent changes in the cut-off energy for emission from these nanoparticles is compatible with the onset of the non-linear response in gold. At low intensities, the cut-off energies of shelled particles greatly exceed the solid particles while at the highest intensities their responses are identical. This effectively constitutes an ultrafast optical switch.

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