ULTRAFAST GENERATION OF MAGNETIC FIELDS IN A SCHOTTKY DIODE

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A straightforward way to change the magnetization of magnetic material is the application of a magnetic field. In recent advanced experiments aimed at studying the precessional motion of the magnetization or at observing precessional switching, micro-coils or microstrip lines are used: a sudden current pulse, induced e.g. by an Auston switch, is launched into the micro-conductor, that produces the fast magnetic field pulse required to start precession or domain wall displacement.
Thus, a crucial element for these experiments is the creation of a local magnetic field pulse that initiates the motion of the magnetization vector. Here we report a new scheme for producing local, ultrafast magnetic fields that are capable of starting the precessional motion.
A ferronmagnetic film -- which is the magnetic active part of the device -- is deposited on top of a semiconductor (in the present case eptiaxial films of FeCo/GaAs (100)) and a Schottky diode is formed. Optical pumping of this diode produces a photocurrent, which generates a magnetic field. Using an ultrashort, spatially focussed laser pulse we were able to launch and detect the precessional motion of the magnetization within the ferromagnetic side of the diode. With respect to previous methods of inducing the motion of the magnetization vector, this scheme integrates the magnetic field producing device and the magnetic element in one single junction with the possibility of controlling the process by tuning e.g. the voltage across the diode or the laser intensity.