Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Quenching Plasma Waves in Two Dimensional Electron Gas by a Femtosecond Laser Pulse MICHAEL SHUR, Rensselaer Polytech Inst, SERGEY RUDIN AND GREG RUPPER COLLABORATION[1], ANDREY MURAVIEV COLLABORATION[2] — Plasmonic detectors of terahertz (THz) radiation using the plasma wave excitation in 2D electron gas are capable of detecting ultra short THz pulses. To study the plasma wave propagation and decay, we used femtosecond laser pulses to quench the plasma waves excited by a short THz pulse. The femtosecond laser pulse generates a large concentration of the electron-hole pairs effectively shorting the 2D electron gas channel and dramatically increasing the channel conductance. Immediately after the application of the femtosecond laser pulse, the equivalent circuit of the device reduces to the source and drain contact resistances connected by a short. The total response charge is equal to the integral of the current induced by the THz pulse from the moment of the THz pulse application to the moment of the femtosecond laser pulse application. This current is determined by the plasma wave rectification. Registering the charge as a function of the time delay between the THz and laser pulses allowed us to follow the plasmonic wave decay. We observed the decaying oscillations in a sample with a partially gated channel. The decay depends on the gate bias and reflects the interplay between the gated and ungated plasmons in the device channel.

[1]Army Research Office
[2]Rensselaer Polytechnic Insitute

Michael Shur
Rensselaer Polytech Inst

Date submitted: 02 Dec 2015 Electronic form version 1.4