Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

**Surface plasmonic responses in semiconductor and metal nanostructures investigated by ultrafast electron diffraction**[1] KISEOK CHANG, TZONG-RU T. HAN, FEI YUAN, CHONG-YU RUAN, Physics and Astronomy Department, Michigan State University — Incorporating metallic nanostrcutures in the molecular sensing, nanoelectronics, and catalysis devices has often yielded significantly enhanced efficiency, despite many open questions remain. Using ultrafast electron diffraction as a sensitive contact free voltammetry probe, we find the photoinduced voltages across the heterojunctions consisting of nanostructures and semiconductor or metal surfaces can be highly enhanced when the surface plasmon excitation is used as the ponderomotive drive to induce photocurrent. By using the effective circuit model, and aided by the time domain finite difference method, we are able to describe the observed timescales and spectral responses in the context of dielectric coupling, interfacial charge transfer, and strong proximity-field induced at the interfaces between the nanostrcutures, the substrate, and the surrounding medium, which help understand different origins of the surface plasmon enhancement effect.

[1]Research at Michigan State University is supported by Department of Energy under Grant No. DE-FG02- 06ER46309.

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Date submitted: 09 Nov 2012 Electronic form version 1.4