



**22. June 2012 - 13:15**  
**FLASH HALL, Seminar Room (28c)**

---

## **Mark I. Stockman**

*Department of Physics and Astronomy, Georgia State University, Atlanta, GA 30303, USA*

### **Solids in Ultrafast and Strong Optical Fields**

This talk will consider phenomena in insulator nanofilms and bulk crystals subjected to strong and ultrafast optical fields with carrier frequency much below the bandgap. Such fields cause adiabatic phenomena such as the Wannier-Stark localization, formation of quantum bouncers at the surfaces, and anticrossings of adiabatic levels. In the dielectric nanofilms subjected to sufficiently slow fields, the anticrossings of the quantum-bouncer levels of the valence and conduction bands is predicted to lead to adiabatic metallization of the solid<sup>1</sup>. In the ultrafast optical fields, a combination of the adiabatic and non-adiabatic effects leads to the increased polarizability of the system making it similar to semiconductors or plasmonic metals<sup>2</sup>. We will also discuss response of a dielectric solid to near-single cycle strong optical fields, where new theoretical and experimental results have been recently obtained in collaboration with MPQ at Garching.

<sup>1</sup> M. Durach, A. Rusina, M. F. Kling, and M. I. Stockman, *Metallization of Nanofilms in Strong Adiabatic Electric Fields*, Phys. Rev. Lett. **105**, 086803-1-4 (2010)

<sup>2</sup> M. Durach, A. Rusina, M. F. Kling, and M. I. Stockman, *Predicted Ultrafast Dynamic Metallization of Dielectric Nanofilms by Strong Single-Cycle Optical Fields*, Phys. Rev. Lett. **107**, 0866021-5 (2011)