Canadian Association of Physicists

Association canadienne des physiciens et physiciennes

Contribution ID: **4225** Type: **Poster not-in-competition (Graduate Student) / Affiche non-compétitive (Étudiant(e) du 2e ou 3e cycle)**

(G) (POS-61) Heating due to High-Harmonic Generation in Solids: Results from a Simulated Two-Level Model

Tuesday 28 May 2024 18:03 (2 minutes)

High-harmonic generation (HHG) and attosecond scale physics are important areas of current research, combining aspects optical, atomic, molecular, and condensed matter physics. In the past decade, the study of HHG has been extended from atomic gases to solids. HHG in solids does not follow the behaviour of atomic gas HHG due to the added complexity of bulk inter-atomic interaction, and this makes HHG in solids particularly suited for the exploration of properties of e.g. electronic band structure and spacing. While higher laser intensity allows for higher-order HHG cutoff, the application of such high energies can also lead to heating or damage to the sample through processes whereby the induced electron excitations thermalize with the lattice and induce lattice disruption or structural change. This thermal damage is potentially a limiting factor in experiment, and therefore the means of controlling thermal damage are of great practical interest. Here we present an initial study of the heating process following HHG in a solid state scenario. We consider a simple two-level model exhibiting HHG via direct simulation of the time-dependent Schrodinger equation, through which we determine how the energy deposited by the high intensity pulse heats the sample, and in turn the eventual thermalization of the excited electronic states. We explore the features of this model with varying pulse parameters (i.e. envelope, intensity, duration) to test the sensitivity of thermalization to the characteristics of the stimulation pulse. Finally, we discuss how these results may apply to more detailed models including the full electronic band structure.

Keyword-1

high harmonic generation

Keyword-2

heating

Keyword-3

Primary author: Mr RODGER, Clifford (University of Windsor)

Co-authors: Dr RANGAN, Chitra (University of Windsor); Dr RAU, Jeffrey (University of Windsor)

Presenter: Mr RODGER, Clifford (University of Windsor)

Session Classification: DCMMP Poster Session & Student Poster Competition (11) | Session d'affiches DPMCM et concours d'affiches étudiantes (11)

Track Classification: Technical Sessions / Sessions techniques: Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)