Saddle point approach for high harmonic generation from solids

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Abstract:
Attosecond science is a rapidly developing research field that enables the investigation of ultrafast phenomena and dynamical processes at the natural time and length scales of atomic and molecular systems. The application of attosecond (1 as = 10⁻18 s) pulses cover an interdisciplinary domain incorporating a wide range of physical, chemical and biological phenomena [1]. The understanding of the generation of such short extreme ultraviolet (XUV) pulses heavily relies on strong field physics involving formulas represented in terms of complex multi-dimensional oscillatory integrals. The saddle point approximation (SPA) is a powerful tool to obtain accurate asymptotic solutions of such expressions. The SPA method has been successfully applied to describe high harmonic generation process in gases (GHHG) by calculating the ultrafast response of a single noble gas atom in an intense driving field [2]. However, a clear interpretation of HHG in solid-phase – which involves attosecond scale nonlinear many-body dynamics – is yet to emerge [3, 4]. In this presentation, an introduction will be given to the saddle point approaches serving the understanding of the electron-hole pair dynamics taking place during the generation of high order harmonics from solid state materials.

References:
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