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Intense Laser Solid State Physics: Bridging the Gap between Attosecond Science and Solid State Physics (I)

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Over the last several years, there has been a growing interest in ultrafast, intense-laser driven processes in solids. Recent high harmonic generation (HHG) experiments in dielectrics [1] and in semiconductors [2] have revealed ways to transfer attosecond technology from atomic gases to solids. This has given birth to attosecond condensed matter physics. Further, experiments on intense laser driven dielectrics have revealed population transfer to the conduction band to be oscillatory in time [3]; this is in stark contrast to ionization in semiconductors [4]. The oscillatory response of dielectrics to intense lasers can be exploited to optically modulate conductivity. This effect has opened the possibility to extend ultrafast electronics into the PHz domain [5]. Here we will discuss some theoretical aspects of ionization [6] and HHG [7] in solids exposed to intense laser fields.

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