Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

High harmonic generation spectroscopy of laser induced phase transitions in strongly correlated systems RUI EMANUEL FERREIRA DA SILVA, Max-Born-Institut, Max Born Strasse 2A, D-12489 Berlin, Germany, IGOR BLINOV, Russian Quantum Center, Skolkovo 143025, Russia, OLGA SMIRNOVA, Max-Born-Institut, Max Born Strasse 2A, D-12489 Berlin, Germany, ALEXEY RUBTSOV, Russian Quantum Center, Skolkovo 143025, Russia, MISHA IVANOV, Max-Born-Institut, Max Born Strasse 2A, D-12489 Berlin, Germany — We study theoretically high harmonic generation in the 1D Fermi-Hubbard model in the quantum tunneling regime with intense mid-infrared (MIR) and THz fields. This is the first theoretical study of high harmonic generation in strongly correlated solids, with electron correlation effects explicitly taken into account with no additional approximations beyond the Fermi-Hubbard Hamiltonian itself. We find that the mechanism of harmonic emission in strongly correlated solids is distinct from the one observed in semiconductors and dielectrics. The mechanism relies on the production of doublon-hole pairs via Landau-Dykhne type tunneling and is inherently linked to an insulator-to-metal phase transition. We show that high harmonic generation can be used to time this phase transition with the accuracy of a few femtoseconds, i.e. within the fraction of the single oscillation of the driving electromagnetic field. Our work opens the window for the investigation of ultrafast phase transitions in the condensed phase using high harmonic spectroscopy.

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Date submitted: 27 Jan 2017 Electronic form version 1.4