Non-linear dynamics of the electron wave packet propagating through the resonant tunneling structure under the presence of the electron-photon and inter-electron interactions MASAKAZU MURAGUCHI, KYOZABURO TAKEDA, Waseda University — We solved the TD Schrodinger equation numerically in the framework of the TD Hartree-Fock (HF) approach both in the real space and time, and studied the TD phenomena of an electron wave packet propagating through the time-modulated resonant tunneling structure (TM-RTS). We suppose that a single electron Gaussian wave packet is injected into the TMRTS by varying its group velocity. For the inter-electron interaction in the TM-RTS, we combine Poisson's equation with TD-HF equation. We found that the TD features of the wave function confined in the TMRTS (e.g., lifetime) strongly depend on the choice of the resonant states as well as the frequency and strength of the applied electric field. Furthermore, TD non-linear processes based on the multi-photon interaction are recognized. For extracting characteristics of these TD phenomena, we expanded the resulting wave function in terms of the RTS resonant sates at each time-step. This projection approach enables us not only to estimate the lifetime precisely but also provides a guiding principle to control the wave packet artificially.

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