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Quantum Generation Dynamics of Coherent Phonon in Semiconductors: Analysis of Pulse Laser Dependence YOHEI WATANABE, KENICHI HINO, MUNENAKI HASE, NOBUYA MAESHIMA, University of Tsukuba, Japan — Coherent phonon (CP) generation is induced by an ultrafast pulse laser and investigated in various materials. The mechanism of CP generation has been described by two phenomenological models referred to as the impulsive stimulated Raman scattering and the displacive excitation of CP, respectively, where the initial phase of the CP oscillation is considered to be a key parameter. However the models are little in harmony with the existing experimental results and the initial phase is still one of the controversial problems on CP generation. In the present study, we show the dependence of the initial phases on pulse-laser conditions such as pulse width and Rabi frequency for both of polar and non-polar semiconductors. The initial phases are extracted by ab initio solving quantum dynamic equations concerned with the electron-light interaction and the electron-phonon interaction [1]. The resulting initial phases are attributed to the electron-light interaction and the phase factor of the electron-phonon interaction. [1] Y. Watanabe, K. Hino, M. Hase and N. Maeshima, Phys. Rev. B (submitted), arXiv:1510.00263.

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