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***Ab initio* Optical Absorption by A Simple and Efficient Method: Single Excitation Configuration Interaction After Downfolding** KAZUMA NAKAMURA, Dept. of Applied Physics, University of Tokyo, YOSHIHIDE YOSHIMOTO, ISSP, University of Tokyo, RYOTARO ARITA, RIKEN, MASATOSHI IMADA, Dept. of Applied Physics, University of Tokyo, SHINJI TSUNEYUKI, Dept. of Physics, University of Tokyo — We present a simple and efficient *ab initio* method for calculating electronic excited states and optical absorption spectra of solids. The method is based on a single-excitation configuration-interaction calculation after downfolding to model Hamiltonians represented by maximally-localized Wannier functions. Single-excitation configurations are crucially important in evaluating a linear absorption, because they can describe a so-called excitonic effect; interactions in electron-hole pairs generated by excitations. A test was performed for a semiconductor GaAs, and detailed analyses for the resulting spectra and single-excitation many-body wavefunctions are presented. This work is supported by a Grant-in-Aid for Scientific Research in Priority Areas, "Development of New Quantum Simulators and Quantum Design" (No. 17064004) of the Ministry of Education, Culture, Sports, Science and Technology, Japan.

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