GW-based \textit{ab initio} downfolding aiming at strongly correlated electron system\textsuperscript{1} KAZUMA NAKAMURA, Dept. of Applied Physics, Univ. Tokyo, TAICHI KOSUGI, Dept. of Physics, Univ. Tokyo, YOSHIHIDE YOSHI-MOTO, ISSP, Univ. Tokyo, RYOTARO ARITA, RIKEN, MASATOSHI IMADA, Dept. of Applied Physics and JST-CREST, Univ. Tokyo — Aiming at \textit{ab initio} description of real complex systems under effects of strong electron correlations, we develop a GW-based downfolding scheme formulated in the plane-wave basis set. Our method is successfully applied to organic conductors, the family of \((\text{BEDT-TTF})_2X\). At the heart of our downfolding scheme lies utilizing the energy hierarchy of the system [1]: The low-energy hierarchy near the Fermi level \((\varepsilon_f \pm 2\sim 3 \text{ eV})\) determines physics while is affected by the remaining high-energy part of hierarchy. We renormalize the high-energy part into low energy, based on the GW scheme. The renormalization generates a low-energy model characterized by renormalized transfers and effective screened Coulomb/exchange interactions, having frequency dependence arising from retarded screening by eliminated high-energy electrons. Thus, the low-energy frequency-dependent effective model is mapped out from the whole high- plus low-energy system in an \textit{ab initio} procedure. [1] F. Aryasetiawan \textit{et al.}, Phys. Rev. B 70, 19514 (2004); I. V. Solovyev and M. Imada, \textit{ibid}. 71, 045103 (2005).

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