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Insights in the T-matrix formalism PINA ROMANIELLO, LSI, Ecole Polytechnique and ETSF, FRIEDHELM BECHSTEDT, Friedrich-Schiller-Universitaet Jena and ETSF, LUCIA REINING, LSI, Ecole Polytechnique and ETSF — In many-body perturbation theory the self-energy $\Sigma = iGWT$ plays a key role since it contains all the many body effects of the system. The exact self-energy is not known and approximations are needed. As first approximation one can neglect the vertex Γ , and obtain the GW approximation. In some cases this is not sufficient, and one needs to go beyond this approximation. In this work we elucidate the concept of T-matrix [1] and its relation with Hedin's equations [2]: we look for a unified framework including GW, T-matrix, and GWT . We discuss this in relation to two main shortcomings of the GW approximation: the self-screening error and the incorrect atomic limit [3].

[1] L. P. Kadanoff and G. Baym, Quantum Statistical Mechanics, W. A. Benjamin, Inc. New York, (1962).

[2] L. Hedin, Phys. Rev. **139**, A796 (1965).

[3] P. Romaniello, S. Guyont, and L. Reining, J. Chem. Phys. **131**, 154111 (2009).

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