Time-dependent *GW*

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March 10, 2023

1 Time-dependent *GW*

A large family of material characterization techniques are essentially measuring the density or current response of the system under an external electromagnetic field. Many-body perturbation theory (MBPT) methods, the most famous and prevalent ones being the *GW* approximation and the Bethe-Salpeter equation (BSE), have been applied to study electromagnetic response of materials. The main weakness of these approaches is they are unable to systematically capture higher order susceptibilities.

2 Adiabatic approximation

The term "adiabatic" here means "with no memory of the past", i.e. the time dependence of Σ is $\Sigma = \Sigma(t)$, with no retardation effects.