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A Microscopic Compound Nucleus in the Time-dependent Mean-field Theory

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Modern time-dependent density functional theory (TDDFT) codes (see e.g. Comput. Phys. Commun. 229, 211 (2018)) can be used to describe the excited states of nuclei via a number of reaction mechanisms: Through external multipole field excitation, Coulomb scattering, as fission fragments, in heavy ion collisions from around the Coulomb barrier up to deep-inelastic regimes, and via mechanisms such as quasi-fusion and multi-nucleon transfer.

The physics input to the method is a microscopic (at the level of individual nucleons) effective interaction, along with the approximation that the dynamics are driven by a time-varying mean potential.

In this work we present an overview of the theory, highlighting how quantities such as gamma strength functions can be extracted through Fourier analysis, and discuss the successes and limitation of the method as a description of the compound nucleus.

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