

Stochastic theory of non-equilibrium spectral line shapes

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Abstract

While considerable attention is placed on the frequency and position of resonances peak in spectroscopy, there is a wealth of information buried in the spectral line shape, especially in time-resolved, coherent probes. The classic theory for this goes back to work in the 50's by Kubo and Anderson. In many instances and especially in semiconducting systems, broadband excitation can create nonstationary background processes that can play an active role in the spectral dynamics. In my talk, I shall discuss our recent advances in incorporating dark exciton processes into the spectral response by modeling these as adaptive stochastic processes. Within a mean-field theory, we can use Ito calculus to compute spectral responses for both uncorrelated and correlated systems and connect our theoretical models with recent experiments on 2d lead-halide perovskite systems.