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Characterizing Plasmonic Excitations of Quasi-2D Chains EMILY TOWNSEND, GARNETT BRYANT, Joint Quantum Institute: UMD NIST — A quantum description of the optical response of nanostructures and other atomic-scale systems is desirable for modeling systems that use plasmons for quantum information transfer, or coherent transport and interference of quantum states, as well as systems small enough for electron tunneling or quantum confinement to affect the electronic states of the system. Such a quantum description is complicated by the fact that collective and single-particle excitations can have similar energies and thus will mix. We seek to better understand the excitations of nanosystems to identify which characteristics of the excitations are most relevant to modeling their behavior. In this work we use a quasi 2-dimensional linear atomic chain as a model system, and exact diagonalization of the many-body Hamiltonian to obtain its excitations. We compare this to previous work in 1-d chains which used a combination of criteria involving a many-body state's transfer dipole moment, balance, transfer charge, dynamical response, and induced-charge distribution to identify which excitations are plasmonic in character.

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