In this talk we employ an exact Fock space representation to study Holstein-Su-Schrieffer-Hamiltonian systems[1,2] coupled to quantized photon modes. In particular, we include non-linear electron-phonon couplings, which originate from an expansion to second order in the nuclear displacement[3]. We perform exact diagonalizations and real-time propagations for the model in Fock space and investigate the effect of the nonlinear couplings on photoemission (PE), inverse photoemission (IPE) and Raman spectra.


Part: DY
Type: Vortrag; Talk
Topic: Quantendynamik, Dekohärenz und Quanteninformation; Quantum dynamics, decoherence and quantum information
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