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Real-time emission spectrum from a hybrid atom-optomechanical cavity IMRAN MIRZA, Department of Physics, University of Michigan, Ann Arbor, USA — Hybrid quantum systems are promising candidates for opening new avenues for quantum technologies [G. Kurizki et. al, PNAS, 112 (13), 3866-3873 (2015)]. Hybrid atom-optomechanical (HAOM) systems set an intriguing example in this context. From the perspective of practical utilizations of these HAOM systems in future quantum devices, it is crucial to fully understand the excitation dynamics as well as the spectral features of these systems. In this poster, I'll present my calculations of single-photon time-dependent (TD) spectrum emitted by such a HAOM system in a strong atom-cavity as well as strong cavity-mechanics (strong-strong) coupling regime ["Real-time emission spectrum from a hybrid atom-optomechanical cavity", Imran M. Mirza, J. Opt. Soc. Am. B, 32 (8), 1604-1614 (2015)]. In order to make the system more realistic the effects of dissipation through the mechanical oscillator, optical cavity and spontaneous emission from the two-level emitter are also incorporated. The TD spectrum reveals some novel features that are not possible to observe otherwise. For instance, time order in which different side bands appears which explains different photon-phonon interactions responsible for the production of distinct spectral resonances. .

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