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Non-Markovian dynamics of superconducting qubit in open multimode resonator MOEIN MALEKAKHLAGH, ALEXANDRU PETRESCU, HAKAN TURECI, Princeton Univ — We study the dynamics of a transmon qubit that is capacitively coupled to an open multimode superconducting resonator. Our effective equations are derived by eliminating resonator degrees of freedom while encoding their effect in the Greens function of the electromagnetic background. We account for the dissipation of the resonator exactly by employing a spectral representation for the Greens function in terms of a set of non-Hermitian modes and show that it is possible to derive effective Heisenberg-Langevin equations without resorting to the rotating wave, two level, Born or Markov approximations. A well-behaved time domain perturbation theory is derived to systematically account for the nonlinearity of the transmon. We apply this method to the problem of spontaneous emission, capturing accurately the non-Markovian features of the multimode qubit dynamics valid for any qubit-resonator coupling strength. References: Moein Malekakhlagh, Alexandru Petrescu, Hakan E. Türeci, arXiv:1609.00359

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