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Shaping an Itinerant Quantum Field into a Multimode Squeezed Vacuum by Dissipation[1] JUAN JOSE GARCIA-RIPOLL[2], Instituto de Fisica Fundamental, CSIC, DIEGO PORRAS[3], Facultad de Ciencias Fisicas, Universidad Complutense de Madrid — This work shows how to create tunable continuous sources of single and multimode squeezed light by controlling single emitters coupled to propagating modes of the EM field. Our work builds on recent experiments that implement the main tools of cavity Quantum Electrodynamics (QED) using superconducting qubits coupled to microwave transmission lines, as well as quantum dots coupled to microcavity photons, or plasmons. The main results of this letter, presented in sequential order are: A multicolor driving of an artificial atom modifies its coupling to the EM field, inducing sidebands. Combining the sidebands with an auxiliary bath, a single qubit may cool a quantum field in a single mode cavity to a squeezed vacuum. If instead of a cavity, the driven qubit is placed in a waveguide, the high energy modes play the role of a dissipative bath and the result is tunable multimode squeezing of the propagating quantum field. Through the manuscript we will also discuss implementations, measurement schemes and further outlook.

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