

Spontaneous scattering of Raman photons from cavity-QED systems in the ultrastrong coupling regime

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We show that spontaneous Raman scattering of incident radiation can be observed in cavity-QED systems without external enhancement or coupling to any vibrational degree of freedom. Raman scattering processes can be evidenced as resonances in the emission spectrum, which become clearly visible as the cavity-QED system approaches the ultrastrong coupling regime. We provide a quantum mechanical description of the effect, and show that ultrastrong light-matter coupling is a necessary condition for the observation of Raman scattering. This effect, and its strong sensitivity to the system parameters, opens new avenues for the characterization of cavity QED setups and the generation of quantum states of light.

The project that gave rise to these results received the support of a fellowship from “la Caixa” Foundation (ID 100010434) and from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Grant Agreement No. 847648, with fellowship code LCF/BQ/PI20/11760026, and financial support from the Proyecto Sine Órgico CAM 2020 Y2020/TCS-6545 (NanoQuCo-CM). F. N. is supported in part by Nippon Telegraph and Telephone Corporation (NTT) Research, the Japan Science and Technology Agency (JST) [via the Quantum Leap Flagship Program (Q-LEAP) program, and the Moonshot R&D Grant No. JPMJMS2061], the Japan Society for the Promotion of Science (JSPS) [via the Grants-in-Aid for Scientific Research (KAKENHI) Grant No. JP20H00134], the Army Research Office (ARO) (Grant No. W911NF-18-1-0358), the Asian Office of Aerospace Research and Development (AOARD) (via Grant No. FA2386-20-1-4069), and the Foundational Questions Institute Fund (FQXi) via Grant No. FQXi- IAF19-06. S. S. acknowledges the Army Research Office (ARO) (Grant No. W911NF1910065).