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Single-photon superradiance and radiation trapping by atomic shells ANATOLY SVIDZINSKY, FU LI, HONGYUAN LI, XIWEN ZHANG, Department of Physics and Astronomy, Texas AM University, College Station, TX — Collective nature of light emission by atomic ensembles yields fascinating effects such as superradiance and radiation trapping even at the single-photon level. Photon emission is influenced by virtual transitions and collective Lamb shift which yields peculiar features in temporal evolution of the atomic system. We study how two-dimensional atomic structures collectively emit light. Namely, we consider spherical, cylindrical and spheroidal shells with two-level atoms continuously distributed on the shell surface and find exact analytical solution for eigenstates of such systems, their collective decay rates and frequency shifts. We identify states which undergo superradiant decay and states which are trapped and investigate how size and shape of the shell affects collective light emission. Our findings could be useful for quantum information storage and design of optical switches.

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