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Single-photon Superradiance[1] DAWEI WANG, Texas AM University — Timed Dicke states (TDS), the phase-correlated single-photon superradiant states, have versatile interesting phenomena such as directional emission , cooperative Lamb shift, and collective Rabi oscillation which inspired quantum amplification by superradiant emission of radiation (QASER). It also has promising applications in Heisenberg limit metrology and X-ray reflection. Recently, we found that the TDS can simulate interesting condensed matter physics in easily controllable quantum optical systems. The TDS of a collection of three-level atoms can form a tight-binding lattice in momentum space, the superradiance lattice (SL). The quantum behavior of electrons in lattices, such as Wannier-Stark ladders and Bloch band collapsing can be simulated in the SL. The SL can be extended to two, three and higher dimensions where no real-space lattices exist and fascinating physics beckons.

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