

Cooperative Lamb shift in a quantum emitter array

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Whenever several quantum light emitters are brought in proximity with one another, their interaction with common electromagnetic fields couples them, giving rise to cooperative shifts in their resonance frequency. Such collective line shifts are central to modern atomic physics, being closely related to superradiance on one hand and the Lamb shift on the other. Although collective shifts have been theoretically predicted more than fifty years ago, the effect has not been observed yet in a controllable system of a few isolated emitters. Here, we report a direct spectroscopic observation of the cooperative shift of an optical electric dipole transition in a system of up to eight Sr^+ ions suspended in a Paul trap. We study collective resonance shift in the previously unexplored regime of far-field coupling, and provide the first observation of cooperative effects in an array of quantum emitters. These results pave the way towards experimental exploration of cooperative emission phenomena in mesoscopic systems.