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Photon statistics from a large number of independent single-photon emitters.

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<p>The coherence of light provides a paramount resource in modern physics. At the atomic scale, its source and properties can be often mimicked by different phenomena. We present the experimental characterization of coherence properties of light emitted from ensembles of trapped Ca+ ions with a number of contributing particles ranging from a single ion up to the Coulomb crystals with several hundred trapped ions. </p>

<p>The radiofrequency linear Paul trap where confined ions scatter the light from the exciting 397 nm laser beam was used. The light was collected using a lens in the radial position and focal point carefully optimized for maximizing the fluorescence detection efficiency. </p>

<p>We study the dependence of the second-order coherence on the number of independently contributing ions in the Coulomb crystal in the single-mode detection regime. We observe unambiguous evidence of indistinguishable emission from ion crystals by measurement of photon bunching. The g(2)(τ = 0) gradually increases from a single-ion sub-Possonian value to approximately 1.5 for a large number of contributing ions. The observed phenomena correspond to a first controllable and scalable demonstration of a finite coherence between a large number of independent single-photon emitters. It provides a testbed for further experimental studies of the generation of complex nonclassical states of light and atoms.</p>

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