

Abstract Submitted  
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**Filling-fraction dependent emission in a matter-wave emitter array**<sup>1</sup> JOONHYUK KWON, MICHAEL STEWART, DOMINIK SCHNEBLE, Stony Brook University — Ultracold atoms in optical lattices realize a tunable open quantum system in the context of matter-wave emission into vacuum [1]. Previously, we observed deviations from single-particle dynamics in sparsely populated emitter arrays, due to atom reabsorption. Moreover, for arrays with large filling fractions, superradiant emission effects have been predicted [2]. We present an experimental investigation of the decay dynamics as a function of the filling fraction of the initial state in our optical lattice system.

[1] L. Krinner, M. Stewart, A. Pazmio, J. Kwon, D. Schneble, Spontaneous emission of matter waves from a tunable open quantum system, *Nature* 559, 589592 (2018)

[2] de Vega, I., Porras, D. Cirac, J. I. Matter-wave emission in optical lattices: single particle and collective effects. *Phys. Rev. Lett.* 101, 260404 (2008).

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