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Quantum dynamics of three-dimensional Rydberg-atom systems
MINHYUK KIM, HANSUB HWANG, HEEKUN NHO, WOOJUN LEE, JAE-WOOK AHN, Korea Adv Inst of Sci Tech — There is a great interest for Rydberg-atom programmable quantum simulators because of their advantages in scalability and arbitrary control of individual interactions via Rydberg states [1]. Here we report, three-dimensional quantum systems are constucted with rubidium single atoms arranged by 250 holographic optical tweezers and entangled through Rydberg-state excitation. Their quantum dynamics are successfully observed for various symmetric structures and analyzed with Lindblad master equations for coherent and dissipative many-body system behaviors [2]. Their scaling behavior in the intermediate-scale quantum simulation regime of N=50-100 are to be presented. [1] A. Browaeys and T. Lahaye, Many-body physics with individually controlled Rydberg atoms, Nature Physics (2020). https://doi.org/10.1038/s41567-019-0733-z [2] W. Lee, et al. "Coherent and dissipative dynamics of entangled few-body systems of Rydberg atoms," Physical Review A 99, 043404 (2019).

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