Abstract Submitted
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Ultralong-range polyatomic Rydberg molecules formed by a polar perturber MICHAEL MAYLE, JILA, University of Colorado and National Institute of Standards and Technology, SETH T. RITTENHOUSE, ITAMP, Harvard-Smithsonian Center for Astrophysics, PETER SCHMELCHER, Center for Optical Quantum Technologies, University of Hamburg, HOSSEIN R. SADEGHPOUR, ITAMP, Harvard-Smithsonian Center for Astrophysics — The internal electric field of a Rydberg atom electron can bind a polar molecule to form a giant ultralong-range polyatomic molecule [1]. Such molecules not only share their properties with Rydberg atoms, they possess huge permanent electric dipole moments and in addition allow for coherent control of the polar molecule orientation. The involved binding mechanism stems from the anisotropic, long-range charge-dipole interaction that couples a set of $(n+3)s$ Rydberg states with the $n(l>2)$ nearly degenerate Rydberg manifolds in alkali metal atoms [2]. The resulting avoided crossings in the Born-Oppenheimer potentials enable the formation of the giant polyatomic Rydberg molecules with standard two-photon laser photoassociation techniques.

[1] S. T. Rittenhouse and H. R. Sadeghpour, Phys. Rev. Lett. **104**, 243002 (2010).
[2] S. T. Rittenhouse, M. Mayle, P. Schmelcher and H. R. Sadeghpour, arXiv:1101.5353v1 [physics.atom-ph].

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