

Abstract Submitted  
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**Rydberg Electrons in a Bose-Einstein Condensate**<sup>1</sup> JIA WANG, MARKO GACESA, ROBIN CÔTÉ, Department of Physics, University of Connecticut, Storrs, CT 06269, USA — We investigate a hybrid system composed of ultracold Rydberg atoms immersed in an atomic Bose-Einstein condensate (BEC). The coupling between the Rydberg electrons and BEC atoms leads to the excitation of phonons, the exchange of which induces Yukawa interaction between Rydberg atoms. The range of such interaction is equal to the healing length of the BEC, which can be tuned by adjusting the scattering length of the BEC atoms. For a BEC with a small healing length, the Yukawa potential is short-ranged, and distorts the BEC locally, “mapping” the electron density onto the BEC density. For large healing lengths, the Yukawa potential is long-ranged and can bind Rydberg atoms and form a new type of ultra-long-range molecule.

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Jia Wang  
Univ of Connecticut - Storrs

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