

Abstract Submitted
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Blackbody effects in high-precision microwave spectroscopy with circular Rydberg atoms STEPHEN DIORIO, ANDIRA RAMOS, KAITLIN MOORE, GEORG RAITHEL, University of Michigan — Rydberg atoms experience a shift in transition frequencies and a shortening of lifetimes due to blackbody radiation (BBR). In a proposed Rydberg-constant measurement (RCM), which hopes to contribute to solving the “proton radius puzzle” [Bernauer, Pohl, *Sci. Am.* 310, 32 (2014)], circular Rydberg atoms are used. This work requires a careful examination of BBR effects. Typically, approximations are made to account for BBR effects, however, since BBR at room temperature matches the frequency range of our transitions, we follow the exact procedure outlined by Farley and Wing [Farley, Wing, *Phys. Rev. A* 23, 2397 (1981)] to calculate these shifts. We present calculations for BBR shifts in different temperature regimes and show that these calculated shifts converge and do not necessitate the consideration of continuum transitions. We also present calculated lifetimes of the relevant states in different temperature regimes.

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