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Magic wavelengths for the 5s-18s transition in rubidium ELIZABETH GOLDSCHMIDT, DAVID NORRIS, SILVIO KOLLER, ROBERT WYLLIE, ROGER BROWN, TREY PORTO, Joint Quantum Institute, ULYANA SAFRONOVA, University of Nevada, Reno, MARIANNA SAFRONOVA, University of Delaware and Joint Quantum Institute — Magic wavelengths, for which there is no differential ac Stark shift for the ground and excited state of the atom, allow trapping of excited Rydberg atoms without broadening the optical transition. This is an important tool for implementing quantum gates and other quantum information protocols with Rydberg atoms, and reliable theoretical methods to find such magic wavelengths are thus extremely useful. We use a high-precision all-order method to calculate magic wavelengths for the $5s-18s$ transition of rubidium near the $18s-6p$ resonances. We compare the calculation to experiment by measuring the light shift for atoms held in a crossed optical dipole trap with wavelength tuned around the $18s-6p_{3/2}$ resonance at the experimentally convenient wavelength of 1064 nm.

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