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Radiative lifetime measurements of high-n Rb Rydberg states<sup>1</sup> DUNCAN TATE, MAO ZHENG, DREW BRANDEN, TAMAS JUHASZ, Colby College, ANDREW KORTYNA, Lafayette College — We have measured the radiative lifetimes of S, P, and D states of rubidium in the range  $30 \le n \le 50$  using cold atoms in a MOT. Two experimental techniques have been adopted to reduce random and systematic errors. First, a frequency doubled, pulse amplified diode laser is used to excite the target  $n\ell$  Rydberg state. The output from this laser has a Fourier-transform linewidth of  $\approx 100$  MHz at 480 nm, and results in minimal shotto-shot variation in the Rydberg state population when it is used to drive the  $5p_{3/2}$  $\rightarrow n\ell$  transition. Second, we monitor the target state population as a function of time delay from the 480 nm laser pulse using a short mm-wave pulse that is resonant with the two-photon transition  $n\ell \to (n+1)\ell$ . We then selectively field ionize the  $(n+1)\ell$  state, and detect the resulting electrons with a microchannel plate (MCP). We step the time delay between the laser pulse and the mm-wave pulse and acquire the MCP signal as a function of the delay. This signal is an accurate mirror of the  $n\ell$  population, which we fit to an exponential decay to recover the  $n\ell$  state lifetime.

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Duncan Tate Colby College

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