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Two-photon direct frequency comb spectroscopy of alkali atoms¹ CHRISTOPHER PALM, TRINITY PRADHANANGA, California State University - East Bay, KHOA NGUYEN, San Jose State University, CAITLIN MONTCRIEFFE, DEREK KIMBALL, California State University - East Bay — We have studied transition frequencies and excited state hyperfine structure in rubidium using 2-photon transitions excited directly with the frequency-doubled output of a erbium fiber optical frequency comb. The frequency comb output is directed in two counterpropagating directions through a vapor cell containing the rubidium vapor. A pair of optical filters is used to select teeth of the comb in order to identify the transition wavelengths. A photomultiplier tube (PMT) measures fluorescence from a decay channel wavelength selected with another optical filter. Using different combinations of filters enables a wide range of transitions to be investigated. By scanning the repetition rate, a Doppler-free spectrum can be obtained enabling kHz-resolution spectral measurements. An interesting dependence of the 2-photon spectrum on the energy of the intermediate state of the 2-photon transition is discussed. Our investigations are laying the groundwork for a long-term research program to use direct frequency comb spectroscopy to understand the complex spectra of rare-earth atoms.

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