Tunable cw UV laser with <35 kHz absolute frequency instability for precision spectroscopy of Sr Rydberg states

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We present a solid-state laser system that generates over 200 mW of continuous-wave, narrowband light, tunable from 316.3 nm – 317.7 nm and 318.0 nm – 319.3 nm. The laser is based on commercially available fiber amplifiers and optical frequency doubling technology, along with sum frequency generation in a periodically poled stoichiometric lithium tantalate crystal. The laser frequency is stabilized to an atomic-referenced high finesse optical transfer cavity. Using a GPS-referenced optical frequency comb we measure a long term frequency instability of < 35 kHz for timescales between 10−3 s and 103 s. As an application we perform spectroscopy of Sr Rydberg states from n = 37 – 81, demonstrating mode-hop-free scans of 24 GHz. In a cold atomic sample we measure Doppler-limited linewidths of 350 kHz.

- H2020 [2]
- RySQ [3]
- FP7 [4]
- Result [5]
- 15.10.Ry Rydberg atoms [6]

Links:
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