DUAL COMB FOURIER TRANSFORM SPECTROSCOPY IN THE GREEN REGION

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Laser combs in combination with other advancing tools of laser science, nonlinear optics, photonics, and electronic signal processing have the potential to vastly enhance the range and capabilities of molecular laser spectroscopy.
The high versatility of frequency comb sources can indeed harness new techniques for ultra-rapid and ultra-sensitive recording of complex molecular spectra. The recent proof-of-principle demonstrations of dual comb Fourier transform spectroscopy have mostly been carried out in the near-infrared region, around 1.0 and 1.5 μm. The mode-locked ytterbium- or erbium-doped fiber femtosecond laser systems emitting in this range indeed require few adjustment thanks to their guided light and permit reliable unattended operation. With expanded wavelength coverage and continued improvements in speed and sensitivity, dual comb spectroscopy should find use as a novel, time-domain spectroscopic analytical tool. As far as molecular spectroscopy is concerned, the mid-infrared and visible-ultraviolet wavelength regions show both the potential for specificity and sensitivity for tracing molecules. In particular, the visible-ultraviolet region complements the mid-infrared molecular fingerprint range, as it provides access to many electronic transitions, in particular belonging to reactive species.
In this contribution, we report on our progress in the implementation of dual comb spectroscopy in the 520 nm green region. We present preliminary results on a powerful new sensitive ultra-rapid tool for linear rovibronic absorption spectroscopy, based on frequency-doubled ytterbium-doped fiber lasers and we discuss its intriguing prospects for spectroscopy of short lived transient species.