Generation of octave-spanning Raman comb stabilized to an optical frequency standard

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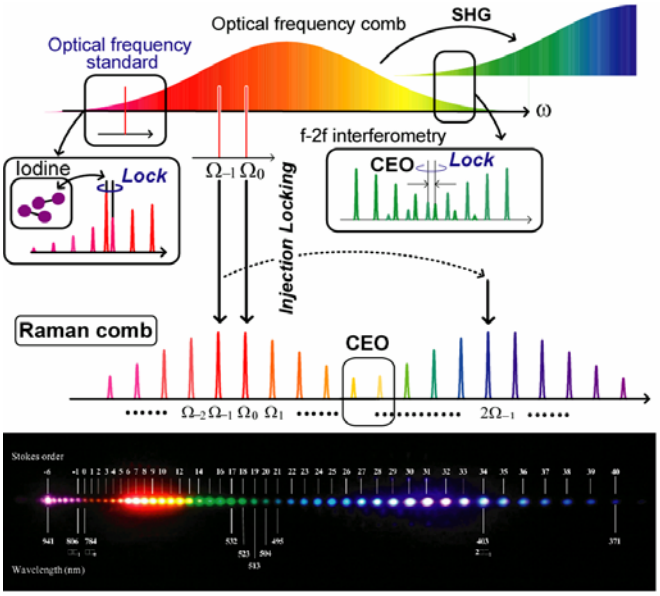

Fig. 1. Conceptual schematic for generation of Octave-spanning Raman comb stabilized to an optical frequency standard.

We demonstrate generation of octave-spanning Raman sidebands [1] with accurate control of the carrier envelope offset (CEO) frequency, which is realized by stabilizing the two-wavelength driving-laser radiations to an optical frequency standard [2]. The generated broad Raman sidebands have potential to produce monocycle ultrashort pulses with an absolute-phase control [3]. The conceptual schematic is illustrated in Fig. 1. The driving laser system is a dual-wavelength, injection-locked, nanosecond pulsed Ti:sapphire laser [4]. The two-wavelength seeds having a frequency spacing of 10.6 THz, were phase-locked with each other through a femtosecond-laser optical-frequency-comb that had an absolute frequency stability equivalent to an optical frequency standard. The photograph is the generated Raman comb projected on a screen after being dispersed with a prism. 47 monochromatic radiations were generated with a high-quality Gaussian profile (M^2: typically < 1.1). The whole bandwidth covered 300 ~ 900 THz (330 ~ 1,000 nm), which is far beyond an octave. The controllbility of the CEO frequency was examined by picking up a single component, the 22th (487 nm), in the overlap region, and observing a beat frequency in the time domain. It was clearly confirmed that the CEO frequency could be accurately controlled by the synthesizer in the phase-locking loop.

References

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