Docket #: S08-384

Octave-wide mid-infrared frequency comb source

Researchers in Prof. Robert Byer's laboratory have patented a new fiber laser technology for generating frequency combs with broadband output (an octave or more). The frequency combs target the mid-infrared (IR) region, where the molecular signatures for most atmospheric organics, volatiles, and isotopes are found. This ultrabroadband mid-IR source could be an indispensible tool for coherent frequency-comb spectroscopy, combining broad spectral bandwidth, high spectral resolution, precise frequency calibration and ultrahigh detection sensitivity in one experimental platform. The technology can be used to develop tools to perform metrology or spectroscopy analysis with high sensitivity and specificity.

Stage of Research
The inventors have demonstrated that source can be used to transpose a frequency comb to longer waves (to its subharmonic) with simultaneous broadening of the comb spectrum by 2.6 times.

Ongoing Research
The inventors are refining the design for use in the mid-IR range.

Applications

- **Lasers** - frequency comb source with applications in:
  - spectroscopy
  - metrology
  - medical breath analysis
  - hazardous material detection

Advantages

- **Broad spectral bandwidth** - octave or more in the molecular fingerprint range
- **Ultrahigh detection sensitivity** - designed to analyze a large variety of molecules from a small sample
- **High spectral resolution**
- **Precise frequency calibration**
- **Fast acquisition time**
- **Simple and robust design** - with fiber laser pump source

Publications

- Wong, S.T., Plettner, T., Vodopyanov, K.L.,Urbanek, K., Digonnet, MJ.F., Byer, R.L., "Self phase-locked degenerate femtosecond optical parametric oscillator," Optics Letters, Vol. 33, Issue 16, pp. 1896-1898

Patents

- Published Application: 20110058248
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