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Thermally Controllable Kerr Comb Generation

A tunable optical comb generator uses a microresonator tuning device to enable Kerr comb generation with a fixed-wavelength laser, greatly reducing complexity and allowing for chip-level integration.

For conventional Kerr comb generating schemes using tunable lasers, the stability and precision of phase detuning is determined by the wavelength stability and precision of the tunable laser. In addition, the excitation wavelength of the source laser has to be tuned to the resonator. Such tunings are complex, so there is an unmet need for a comb generator capable of producing a plurality of wavelengths while maintaining a match between the laser source wavelength and the desired output wavelengths of the resonator in an effective, but simple fashion.

Researchers at Purdue University have developed a tunable optical comb generator having a source laser configured to generate a continuous wave (CW) light at a first wavelength. A microresonator coupled to the source laser is configured to receive the CW light and generate an optical signal which has a plurality of output wavelengths corresponding to the first wavelength. This generator includes a microresonator tuning device coupled to the microresonator and configured to compensate the microresonator for wavelength shifts. A heater coupled to the microresonators in the form of micro rings may be used to adjust the microresonators. This technology makes it possible to generate Kerr combs with just a fixed-wavelength laser. Furthermore, it greatly reduces the complexity of comb generation setup, gives the configuration high potential for chip-level integration, and allows for maintaining the comb's properties during the tuning process.

Advantages:

-Reduced complexity of comb generation

-Allows for use of fixed-wavelength laser

-Properties of comb maintained during tuning

Technology ID

2014-WEIN-66777

Category

Computing/Photonic & Optical Computing Technologies

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Potential Applications:

-High precision spectroscopy

-GPS technology

-Optical atomic clocks

-Optical metrology

TRL: 5

Intellectual Property:

Provisional-Patent, 2014-02-24, United States | Utility Patent, 2015-02-24, United States

Keywords: Kerr comb generator, tunable optical comb generator, microresonator tuning device, fixed-wavelength laser, continuous wave light, high precision spectroscopy, GPS technology, optical atomic clocks, optical metrology, chip-level integration