

Graphene-Based Mode-Locked Spectrum-Tunable Fiber Laser Using Mach-Zehnder Filter

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Abstract

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References

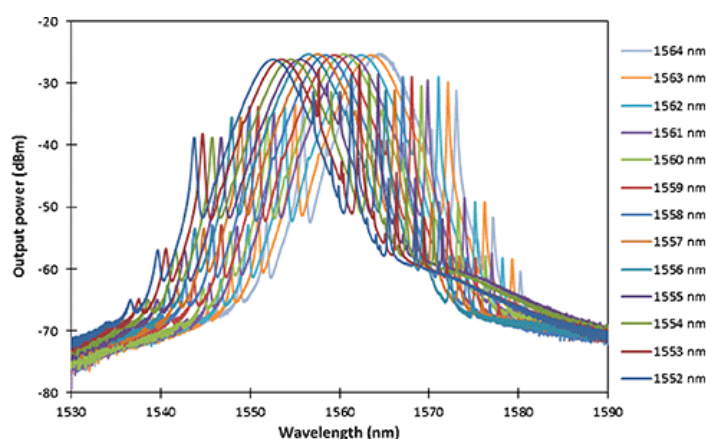
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An ultrafast spectrum-tunable fiber laser using a tunable Mach-Zehnder filter (TMZF) and a graphene-based saturable absorber as a mode-locking element is proposed and demonstrated. The proposed laser uses a 2-m-long zirconia-erbium-doped fiber (Zr-EDF) as the primary gain medium. The Zr-EDF has a dopant concentration of 3800 ppm/wt and an absorption rate of 18.3 dB/m at 980 nm. The proposed laser is able to generate mode-locked solitons, with the central wavelength of the spectrum tunable from 1551 to 1570 nm and covering a wavelength range of about 19 nm. Sidebands are observed with 3-dB bandwidths and pulsewidths of between 3.4 and 3.6 nm and from 730 to 780 fs, respectively, as well as a time-bandwidth product between 0.32 and 0.33. The generated pulse yields an average output power value of ~ 1.4 mW, pulse energy of ~ 128 pJ, and repetition rate of ~ 10.9 MHz. This is the first time, to the knowledge of the authors, that a graphene-based mode-locked spectrum-tunable fiber laser is demonstrated using a TMZF.



Output spectra of the mode-locked pulses at 13 different central wavelengths with conserved Kelly sidebands structures.

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