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Graphene-based mode-locked spectrum-tunable fiber laser using Mach-Zehnder filter (Article) (Open Access)

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Abstract

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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. © 2009-2012 IEEE.

SciVal Topic Prominence

Topic: Saturable Absorbers | Erbium-Doped Fiber | Mode-locked Fiber Lasers

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Author keywords

Graphene-based saturable absorber | Mach-Zehnder filter | spectrum tunable mode-locked | zirconia-based erbium-doped fiber

Indexed keywords

Engineering uncontrolled terms: Average output power | Central wavelength | Dopant concentrations | Erbium doped fibers | Mach-Zehnder | Mode-locked | Time-bandwidth products | Wavelength ranges

Engineering controlled terms: Bandwidth | Fiber lasers | Graphene | Locks (fasteners) | Pulse generators | Saturable absorbers | Semiconductor quantum wells | Solitons | Zirconia | Zirconium

Engineering main heading: Mode-locked fiber lasers

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