

190-fs Mode-locked Erbium Doped Fiber Laser Using Reduced Graphene Oxide onto D-shaped Fiber

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Abstract

Mode-locked fiber lasers based on 2D-nanomaterial saturable absorbers (SA) have been an attractive technology for several photonics applications. Since the emergence of graphene, its precursor such as reduced graphene oxide (r-GO) has also considerable interest due its nonlinear optical properties [1]. Recently, mode-locked Erbium doped fiber lasers (EDFL) were reported by using photonic crystal fiber (PCF) filled with r-GO nanosheets and r-GO SA deposited on fused silica substrate and placed in a free-space coupling inside the cavity, generating pulses of 616 [2] and 390 fs [3], respectively. In this work, we report the ultrashort pulse generation of 190 fs from an EDFL by using spin-coated r-GO SA film [4] deposited onto the side-polished surface of D-shaped optical fiber. The sample exhibited 7.80 dB (83%) of relative polarization extinction ratio [5], which resulted in laser mode-locking measurements: 24 nm of spectral bandwidth and 190 fs of pulse duration (Figure 1) at ring cavity fundamental repetition rate of 15.72 MHz with 80 dB of signal to noise ratio, indicating high stability (Figure 2). This is the best mode-locking performance ever reported in the literature for all-fiber r-GO SA in EDFL configurations.

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References

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Figures

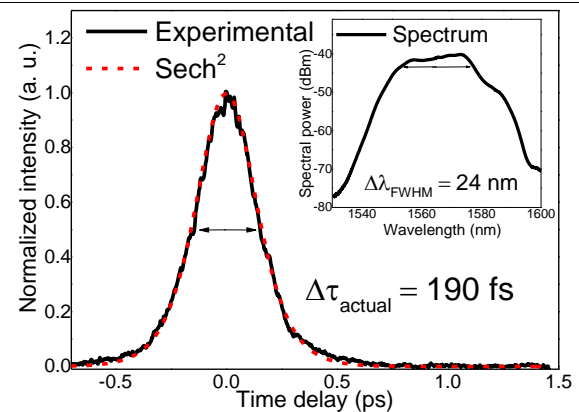


Figure 1: Mode-locked operation. Autocorrelation trace (inset – optical spectrum) obtained with r-GO SA.

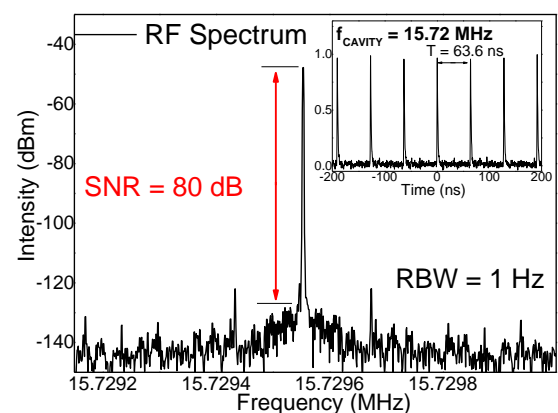


Figure 2: RF spectrum - fundamental repetition rate around 15.72 MHz with 1 Hz resolution (inset – pulse train).