

Low threshold L-band mode-locked ultrafast fiber laser assisted by microfiber-based single wall carbon nanotube saturable absorber

ABSTRACT

We demonstrate a passively mode-locked erbium-doped fiber laser in L-band wavelength region with low mode-locking threshold employing a 1425 nm pump wavelength. The mode-locking regime is generated by microfiber-based saturable absorber using carbon nanotube-polymer composite in a ring cavity. This carbon nanotube saturable absorber shows saturation intensity of 9 MW/cm². In this work, mode-locking laser threshold is observed at 36.4 mW pump power. At the maximum pump power of 107.6 mW, we obtain pulse duration at full-width half-maximum point of 490 fs and time bandwidth product of 0.33, which corresponds to 3-dB spectral bandwidth of 5.8 nm. The pulse repetition rate remains constant throughout the experiment at 5.8 MHz due to fixed cavity length of 35.5 m. Average output power and pulse energy of 10.8 mW and 1.92 nJ are attained respectively through a 30% laser output extracted from the mode-locked cavity. This work highlights the feasibility of attaining a low threshold mode-locked laser source to be employed as seed laser in L-band wavelength region.

Keyword: Ultrashort pulse; Pulsed fiber laser; Carbon nanotube.