

Generation of Kelly and dip type sidebands soliton employing Topological insulator (Bi_2Te_3) as saturable absorber

ABSTRACT

Conventional Kelly sidebands soliton and dip-type sidebands soliton were observed with the employment of Bi_2Te_3 as saturable absorber (SA) in Erbium-Doped Fiber Laser (EDFL). The fabricated Bi_2Te_3 possessed the following characteristics: I_{sat} 102 MW/cm², modulation depth 41.4%, and non-saturable absorption at 10%. The Bi_2Te_3 solution was transferred to the end of the fiber ferrule by the optical deposition method. Conventional Kelly sidebands soliton was obtained with a fundamental repetition rate and pulse width of 24 MHz and 0.78 ps, respectively. The existing cavity length was extended and with the appropriate tuning of light polarization, dip-peak intensity soliton sidebands with bunched pulses were observed. The oscillation trace revealed the repetition rate of dip-peak intensity sidebands soliton was ascertained at 13.5 MHz, which was in accordance with the cavity length. There was a total of 144 pulses in a single bunch envelope under the maximum available pump power. With the appropriate tuning of light polarization, constructive and destructive interference between soliton and dispersive waves took place in EDFL resulting in the formation of peak intensity (Kelly sidebands) and dip-peak intensity on the soliton spectrum. To the best of the author's knowledge, this is the first demonstration of dip-peak intensity sidebands soliton using Bi_2Te_3 .