Optical Comb Generation in S-Band Region using a Brillouin Erbium Fiber Laser

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Abstract:

There has been increased research effort in multi-channel laser sources, to meet the possible demand from wavelength multiplexed sensor/communication systems. Densely shifted wavelength spacing and stabilized/flattened peak powers between neighbor channels are two key performance parameters of real interest. A hybrid Brillouin/erbium fiber laser (BEFL) is one of the strong candidates for realizing multi-wavelength operation with equal channel spacing. It utilizes both the nonlinear Brillouin gain in the single-mode fiber (SMF) and linear gain in erbium-doped fiber (EDF) to generate multiple wavelength operation with channel spacing of approximately 11 GHz in the 1550 nm region. Most of the multi-wavelength BEFL systems are focused in conventional band (C-band) and long wavelength band (L-band) due to the bandwidth limitation of Erbium-doped fiber amplifier (EDFA), which has been demonstrated by various laboratory [1-3]. Recently, a new S-band amplification technique, which utilizes erbium doped silica fiber with depressed cladding design and 980nm pump laser to generate EDF gain extension effect, has been reported [4]. By using this S-band amplifier, the operating wavelengths of BEFL can be extended to S-band range. In this paper, a multi-wavelength BEFL system, which can operates in short wavelength band (S-band) is proposed and demonstrated for the first time. The system employs both linear gain and non-linear gain from a 20m S-Band Erbium doped Fiber and a 500m single mode fiber, respectively to generate optical wavelength comb with spacing of approximately 0.084 nm. Two 80/20 couplers were used in the system as an internal feedback of generated stokes signal in order to produce cascaded Brillouin stokes for multi-wavelength operation. A stable output laser comb of up to 7 lines was obtained with a Brillouin Pump of 3.5mW and a 980nm pump of 200mW.

References:

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