Fiber and Integrated Optics, 33:56–67, 2014

ISSN: 0146-8030 print/1096-4681 online
DOI: 10.1080/01468030.2013.878417

L-Band Multi-Wavelength Brillouin–Raman Fiber Laser with 20-GHz Channel Spacing

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Abstract *A tunable multi-wavelength L-band Brillouin–Raman fiber laser with a 20-GHz channel spacing utilizing bidirectional ring cavity is proposed and experimentally investigated. The laser employs a co-pumped dispersion compensating fiber as a gain medium for both Brillouin and Raman gains. With a Raman pump of 425 mW, the laser system can generate up to 12 double-spaced Brillouin Stokes signals. This simple laser configuration provides stable Brillouin Stokes signals in the absence of self-lasing cavity modes with a tuning range exceeding 35 nm without using any filtering mechanism. The Stokes signals have more than 20 dB of optical signal-to-noise ratio.*

Keywords Brillouin scattering, L-band fiber laser, Raman fiber laser, Raman scattering

1. Introduction

Multi-wavelength fiber lasers with hybrid gain medium have elicited significant interest because of their wide range of potential applications. These applications include dense wavelength division multiplexed systems, fiber sensors, as well as millimeter and microwave carrier generation [1–3]. The multi-wavelength hybrid gain fiber laser is a combination of either of the following gain media: (1) Brillouin nonlinear and doped-fiber linear gains [4–7] and (2) two nonlinear gains, namely, Brillouin and Raman, participating in the same gain medium [8–11]. Two generations exist for this type of lasers. The first generation is the multi-wavelength Brillouin–erbium fiber laser (MBEFL) that was demonstrated in 1996 [12], and the second generation is the multi-wavelength Brillouin–Raman fiber laser (MBRFL) that was demonstrated in 2001 [13]. The MBRFL has drawn the attention of researchers because of the substantial improvements that are added by this type of laser

Received 11 September 2013; accepted 19 December 2013.
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