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High-power hybrid fiber amplifiers with pumping power recycling mechanism

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Wideband optical amplifiers have become increasingly important in the rapid growth of data traffic in optical communications and optical networks. So far, there are many types of optical amplifier such as doped fiber amplifier (DFA), Raman fiber amplifier (RFA) and semiconductor fiber amplifier (SOA). DFAs are optical amplifiers that used a doped optical fiber as a gain medium to amplify optical signals. The most common example is the erbium doped fiber amplifier (EDFA), where the core of a silica fiber is doped with trivalent erbium ions and can be efficiently pumped with laser light source at a wavelength of 980 nm or 1480 nm and exhibits gain in the C+L band region. In our prior work, we proposed hybrid fiber amplifiers (EDFA and RFA). This type of hybrid fiber amplifier has advantages of high gain, gain equalization and either dispersion compensated. In this paper, we investigated a high power co-doped hybrid fiber amplifier. It composed of an EDFA and an erbium ytterbium co-doped fiber amplifier (EYDFA). We set EDFA at 1st stage to reduce the noise figure and EYDFA at 2nd and 3rd to amplify the signal power. The main reasons why we used EYDFA were the possibility of doping the fiber with high gain, pump efficiency and the broadening of the absorption band from 850 to 1100 nm which offers greater flexibility in selection of the pump wavelength. The maximum gain was around 34 dB with 0 dBm signal power and the NF was around 4.53 dB. The slope efficiency and polarization dependent gain (PDG) were 28% and 0.35 dB, respectively. In addition, the bit error rate (BER) performance between 32 and 64 ports splitter was 0.88 dB. This kind of hybrid EDFA/EYDFA may find vast applications in WDM long-haul systems and optical networks.

Biography

Shien-Kuei Liaw has received double Doctorates in Photonics Engineering from National Chiao-Tung University in 1999 and in Mechanical Engineering from National Taiwan University in 2014, respectively. He has joined the Chunghua Telecommunication, Taiwan, in 1993. Since then, he has been working on optics communication and fiber based devices. He was a Visiting Researcher at Bellcore (now Telcordia), US for six months in 1996 and a Visiting Professor at University of Oxford, UK in 2011. Currently, he is a distinguished Professor at National Taiwan University of Science and Technology (NTUST). He has been awarded about 37 patents and has published 240 journal articles and international conference presentations. He has been actively contributing for various conferences as program chair, organizing committee chair, session chair and invited speaker. His research interests are in optical sensing, optical communication, fiber optics and reliability testing.

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