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Overview of linear-cavity tunable fiber lasers with narrow linewidth

Recently, much more attention has been directed to diode-pumped single-longitudinal-mode (SLM) fiber lasers because of their high reliability, compactness, and capability of shot-noise-limited operation in the megahertz frequency range. On the other hand, tunable laser sources have seen various applications in recent years such as optical switching, network protection or digital communication. Among various lasers, fiber lasers present the advantages of high brightness, low intensity noise, thermal stability, excellent coupling into a single mode fiber and better compatibility with fiber components. In this talk, we will review and discuss several types of single-longitudinal mode (SLM) linear cavity, tunable fiber lasers, either in C+L band or 1064 nm band. For linear-cavity fiber laser schemes, the elements may base on a loopback optical circulator (OC), a broadband mirror, a Faraday rotator mirror or a 2x2 fiber coupler integrated a partial reflectance fiber Bragg grating (FBG) as the front cavity end. For SLM selection, using multiple subring cavities based on the Vernier effect, a piece of gain fiber saturable absorber as modes filter or their hybrid type. For wide-tuning range fiber laser, the wavelength tuning mechanism include the use of a broadband fiber mirror (BFM) integrated tunable FBGs as cavity ends, using bending device to facilitate wavelength tuning of FBG, a large tuning range cover C+L band with good resolution of 0.1 nm is obtained. Laser characteristics such as output, signal-to-noise ratio, linewidth, threshold pump power, pumping slope efficiency and side mode suppress ratio are measured. One example of fiber laser characteristics are 1 MHz, 59 dB, 13% and 0.1 dB, respectively, for linewidth, side-mode suppression ratio, quantum efficiency and power variation of whole tuning range. The pumping power efficiency may be improved more than 10% by recycling the residual pump power to the gain medium. Have the advantages of simpler structure, larger pump slope efficiency and shorter cavity, these fiber lasers may find potential applications in various ways.

Biography

Shien-Kuei Liaw received double Doctorate in Photonics Engineering from National Chiao-Tung University in 1999 and in Mechanical Engineering from National Taiwan University in 2014, respectively. He joined the Chunghua Telecommunication, Taiwan, in 1993. Since then, he has been working on optics communication, sensing 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 autumn 2011. Currently, he was the Director of Optoelectronic Research Center and now is the distinguished Professor at National Taiwan University of Science and Technology (Taiwan Tech). He has been awarded 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. He is a senior member of IEEE, OSA and SPIE.

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