

Single-wavelength ring-cavity fiber laser employed preamplification technique to reduce threshold by circulating spontaneous Brillouin scattering

ABSTRACT

In this paper, two types of ring-cavity fiber laser structures that operate as a single wavelength laser were investigated on the threshold performance. The two structures are namely Brillouin fiber laser and Brillouin erbium fiber laser. In the first structure, the Brillouin pump signal was amplified before being injected into the laser cavity which namely as Brillouin fiber laser. Meanwhile, for second structure respectively, the Brillouin pump signal was pre-amplified in the laser cavity which namely as Brillouin Erbium fiber laser. We found that the stimulated Brillouin scattering threshold power was lowered significantly by circulating the spontaneous Brillouin scattering in the gain medium utilizing the pre-amplification technique. The optimum stimulated Brillouin scattering threshold power was about 1.4 mW, and this was achieved at optimum output coupling ratio of 95%. By comparing to the first structure in which the Brillouin pump signal was amplified before entering the laser cavity, stimulated Brillouin scattering threshold power was only achieved at 2.62 mW at a similar wavelength. The pre-amplification technique proposed in this paper has been shown to improve the performance of single-wavelength ring-cavity fiber lasers via significant reduction of the stimulated Brillouin scattering threshold power which was around 1.22 mW.

Keyword: Brillouin fiber laser; Nonlinear; Ring cavity; Stimulated; Brillouin scattering; Single wavelength; Threshold