

Open cavity hybrid Raman-erbium random fiber laser with common pump

ABSTRACT

A symmetrical 80-km open cavity erbium-integrated hybrid random distributed feedback fiber laser (HRFL) was proposed and experimentally demonstrated. A variation of pumping schemes and cavity lengths was first investigated prior to the integration of the EDF. The impact of Raman and EDF hybrid amplification was then investigated through EDF length variation. The proposed scheme used a single common pump to incite both Raman and erbium gain to produce a single peak at a 1567-nm wavelength with maximum OSNR of 62.37 dB. A maximum total output power generation of 1420 mW was achieved with high-slope efficiency of 38%. The proposed hybrid setup has shown improved performance despite using open-ended cavity sustained by only a single pump in contrast to previous more complex hybrid schemes. Prolonged chaotic regime manifesting spontaneous pulse burst was also observed before the stable regime. The simple operation with the high performance of the proposed configuration offers a great potential for long distance or remote access applications such as heavy metals sensing or even for biological hazard sensing.

Keyword: Fiber lasers; Raman scattering; Random fiber lasers; Rayleigh scattering; Erbium