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Output power stability of an all-fibre Erbium doped fibre laser

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Stable and single-longitudinal-mode Erbium-doped fiber ring lasers (EDFRLs) have been studied intensively due to their wide range application in field like optical communication and fiber sensors. Because of the fiber vulnerability to perturbation of temperature and vibration, it has been demonstrated that the output power of the conventional fiber ring lasers are unstable. In this report, the output power and stability of a narrow linewidth Erbium-doped fiber ring lasers as a function of the laser parameters was experimentally investigated. The fiber laser configuration include two narrow spectral bandwidth optical filters namely, fiber Bragg grating and fiber Fabry-Perot tunable filter. Without changing the basic scheme of the fiber laser, the study focuses on the optimization of key parameters of the fiber laser cavity namely, Erbium-doped fiber length, pump power, output coupling ratio and Erbium ions concentration. We have demonstrated that the output power as well as the power stability of the fiber laser increase as the output coupling ratio increase. The maximum power fluctuation of the output power of 7.52 %, corresponding to 0.24 dB is observed for 10 % output coupling. The power stability of 0.71 % and 0.8 % were observed for 80 % and 90 % coupling ratio respectively. To improve the power stability we have introduced 1.5 m umpumped Erbium-doped fiber into the fiber laser system. A stable output power was obtained for all coupling ratio during a measurement period of 120 min.

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Rodolfo Martínez Manuel, and J. Meyer

Primary author: Mr KABOKO, jean jacques monga (university of johannesburg)

Co-authors: Prof. MEYER, Johan (University of Johannesburg); Dr MARTINEZ MANUEL, Rodolfo (Centro de Investigaciones en Óptica, A.C. Photonics, Prol. Constitución 607, Fracc. Reserva Loma Bonita, Aguascalientes 20200, México)

Presenter: Mr KABOKO, jean jacques monga (university of johannesburg)

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