



Quantitative analysis of optical power budget of bismuth oxide-based erbium-doped fiber

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Abstract

We investigated optical power budget of Bi₂O₃-based erbium-doped fiber (BIEDF). Lateral spontaneous emissions and scattering laser powers in the BIEDF were measured quantitatively by using an integrating sphere. Compared with the power of amplified spontaneous emission and signal detected at the output fiber end, it was found that considerable powers were consumed by the laterally emitting lights. As an optically undetected loss limits power conversion efficiency (PCE) of the fiber amplifier, the effect of nonradiative decay from the termination level of pump excited state absorption (pump ESA) was estimated from decay rate analyses of the relevant levels. The nonradiative loss was comparable to amplified signal power in the BIEDF when pumped with a 980-nm LD. Nonradiative decay following cooperative upconversion (CUP) process is also discussed using rate equations analysis.

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