

High-power master-oscillator power amplifiers based on rare-earth-doped fibres

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Abstract

In recent years there have been dramatic advances in fibre lasers. Currently, conventional single-strand cladding-pumped fibre lasers can generate output powers beyond 1 kW with high beam quality. Indeed, this fibre circuitry combined with pump-diode technology provides a unique high-gain environment for robust designs, which is also all-solid state, compact, stable, reliable, and reproducible.

Applications often require fibre sources operating in a range of refined regimes, such as single-frequency, tunable-frequency, or pulsed with femtosecond to microsecond duration. Master-oscillator power amplifier (MOPA) configurations look very attractive to reach such highly refined high power output from rare-earth-doped fibres because they allow the seed sources to be designed for controllability and precision, while high power can be designed into the amplifiers.

Here we review the recent progress in high-power MOPAs based on rare-earth-doped fibres and discuss fundamental aspects and prospects. We present our up-to-date experimental results with particular attention to a multitude of cladding-pumped, refined power amplifier regimes, including continuous-wave and pulsed fibre MOPA sources based on ytterbium-doped fibres operating at 1.1 μm and erbium:ytterbium co-doped fibres at 1.5 μm .