Postersession

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poster

Efficient superfluorescent light sources with very broad bandwidth

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Low coherence light sources with high spectral power density over a broad wavelength range in a single spatial mode are needed for a number of applications. Such light sources can be made with rare-earth doped single-mode fibres, generating amplified spontaneous emission (ASE). Both neodymium-doped [1] and erbium-doped [2] fibres have been used to produce ASE output powers of hundreds of milliwatts, however with a FWHM bandwidth below 5 nm, while more bandwidth has been achieved at lower output powers, typically up to 30 nm for output powers well below 100 mW [3, 4] In this paper we describe a way to achieve an even much larger bandwidth of up to 65 nm at an output power of more than 100 mW. Our approach is based on spectral filtering. The ASE generated in one path through an ytterbium-doped fibre is spectrally filtered before being amplified to high power during a second pass through the same fibre. The spectral filter is adjusted so that those wavelengths with highest gain are attenuated so as to obtain a flat and very wide intensity spectrum at the output.

Our spectral filter consists of a pair of bulk gratings to separate the different wavelengths spatially, and a simple spatial modulator, realized in the form of an array of fine screws. This array is mounted above the beam so that each screw can attenuate a particular wavelength range of a few nm bandwidth when positioned so as to partially obstruct the beam. With this technique, applied to an ytterbium-doped fibre which was pumped with 295 mW (incident) at 975 nm, we achieved a 3-dB bandwidth of 39 nm at a total output power of 70 mW. Using a longer pump wavelength of 1010 nm, even 62 nm bandwidth at 62 mW output power were obtained. Finally we have demonstrated a 108 mW output with 65 nm bandwidth by using an additional neodymium-doped fibre which extented the spectrum to longer wavelengths.

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