Simultaneous beam shaping and suppression of simulated Brillouin scattering by adjusting the input wavefront in a multimode fiber

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Though great achievements have been made in the development of near infrared diffraction limited high power fiber lasers (HPFLs) [1], there still remain some limitations, one of which is stimulated Brillouin scattering (SBS) [2]. In this work, we experimentally demonstrate that beam-shaping and SBS suppression in a passive multimode fiber (MMF) can be achieved simultaneously through controlling the input wavefront. Here, a high power 1550 nm pulsed laser (t_p=200 ns, F=10^4 Hz) was used to excite SBS, and wavefront-shaped using a spatial light modulator (SLM). The experimental results indicate that controlling the phase front of the light beam could be an effective approach to power scaling coherent lasers and amplifiers using MMF.

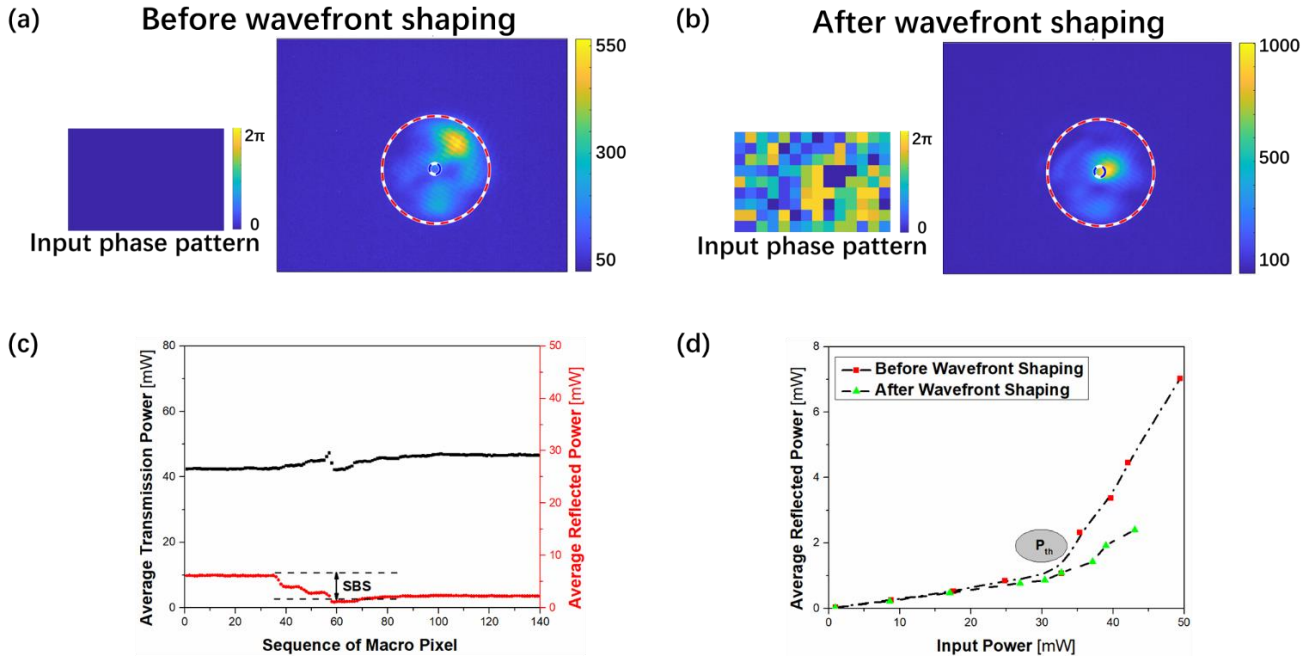

Fig. 1. The MMF output beam at near field together with corresponding SLM pattern at the beginning (a) and the end of the wavefront shaping process (b). The color of each macro pixel represents the optimized phase value. (c) Variation of average transmission and reflection power during wavefront shaping process. (d) Variation of average reflection power before and after wavefront shaping.

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Reference

[1] M. N. Zervas and C. A. Codemard, "High power fiber lasers: a review," *IEEE J. Sel. Top. Quant.* **20**, 0904123 (2014)

[2] https://www.lasersystemseurope.com/analysis-opinion/bright-future-fibre-lasers.