Suppressing stimulated Brillouin scattering and speckle effects by adjusting the seed laser wavefront in a high-power multi-mode fibre amplifier system

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High power, single-mode fibre amplifiers maximum power levels have stopped increasing in the last decade due to limitation imposed by non-linear effects, including stimulated Brillouin scattering (SBS) and transverse mode instabilities (TMI) [1]. In previous work [2], we successfully demonstrated the potential of using multi-mode (MM) fibres concurrently with wavefront shaping (WFS) by applying a spatial-light modulator (SLM) to reduce the onset of SBS at high power in single mode and few mode passive fibres.

In this work we continue our investigation of mitigating SBS using a seeded amplifier configuration, where the single-mode seed beam is modified by reflecting off an SLM creating a modified pattern. This pattern is then launched into an active (Er/Yb co-doped, Nufern FUD-4197) fibre under 915 nm pumping condition.

The experimental setup is presented in Fig. 1, where the previously passive MM fibre was replaced with an active fibre and a high-power, multi-mode, 915nm fibre coupled diode is used to cladding-pump the active fibre in a counter-propagating direction. The single mode seed with modified pattern is then amplified in a master-oscillator power amplifier configuration.

Theoretical and experimental results using this configuration will be presented.

Acknowledgments: This work was supported by US Air Force Office of Scientific Research award FA-9550-20-1-0160, Australian Research Council project DP210102442, it was performed, in part, at the Opto Fab node of the Australian National Fabrication Facility supported by Commonwealth and SA State Governments.

References