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A CW and Actively Q-switched Thulium-doped Fibre Laser

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Abstract content
 (Max 300 words)

New 2 μm Thulium-doped fibre lasers have the potential to be used for a variety of applications such as eye-safe lidar systems, remote sensing, directed infrared countermeasures, non-linear wavelength conversion and range finding. In general, fibre lasers are robust, high brightness sources that offer high average output power with excellent beam quality and efficiency.

A diode-pumped, CW & Q-switched (Pulsed) Thulium-doped fibre laser was designed, developed and characterized at the National Laser Centre in Pretoria. Two lengths of active fibre were used to construct the fibre laser. A variety of high-reflective mirrors as well as a Volume Bragg Grating (VBG) was utilized to constitute the laser resonator. The laser operating in CW mode was characterized with regard to its slope efficiencies, beam profile, polarization, spectral output and temporal behaviour. Results obtained compare favourably with those found in the literature and indicate current limitations and instabilities within the laser setup. Additionally, the influence of misalignment within the setup is observed.

Pulsed mode of the fibre laser was facilitated with an Acousto Optic Modulator (AOM) acting as the Q-switch. Initial results indicate erratic pulse behaviour. To generate consistent, stable pulse trains, improvements to the laser setup and are implemented and outlined. The pulsed behaviour is partially characterized for a constant pulse repetition rate of 10 kHz and average power of 2 W. This yields pulse energies and durations of 200 μJ and 77 ns with a corresponding pulse peak power of 2.6 kW.

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MSc

Main supervisor (name and email)
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