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Development of Single Mode 2076.4 nm Holmium-doped Fibre Laser

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High power $2\mu\text{m}$ laser sources have a wide range of applications in remote sensing, eye-safe LIDAR, non-linear frequency conversion, materials processing, medical and defence applications. In particular, fibre lasers possess high brightness and are robust and compact, offering high efficiency and are comparatively cost effective, thus attracting a vast amount of recent research interest. Unlike thulium-doped fibre lasers ($1.8\text{--}2.0\mu\text{m}$), the development holmium-doped fibre lasers ($2.0\text{--}2.1\mu\text{m}$) are still in its infancy. This is due to the high absorption of silica glass beyond $2.1\mu\text{m}$ wavelength. In this work, a holmium-doped fibre laser was designed, developed and characterised using home-drawn single mode active fibre.

A commercial Tm:fibre laser was used to core-pump the single-clad Ho-doped fibre ($8.5\mu\text{m}$ core, $125\mu\text{m}$ cladding diameter). The resonator cavity consist of the 3m of active fibre spliced to a pair of fibre Bragg gratings (2076.4 nm) that were written on mode-matched passive fibres.

Preliminary results yielded CW power output of $\sim 2\text{W}$ and slope efficiency of 48%.

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Primary author: Dr WU, Lorinda (CSIR-NLC)

Co-authors: Dr KIR'YANOV, Alexander (Centro de Investigaciones en Optica); Mr JACOBS, Cobus (CSIR National Laser Centre); Dr STRAUSS, Hencharl (CSIR (National Laser Centre)); Mr KOEN, Wayne (CSIR National Laser Centre)

Presenter: Dr WU, Lorinda (CSIR-NLC)

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