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$2\,\mu m$ Ho doped amplifiers

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Lasers and amplifiers emitting 2µm single-frequency pulses are used for spectroscopy, remote sensing, and defence applications. The laser sources group at the CSIR National Laser Centre has developed a number of 2µm lasers and amplifiers over the course of five years. We report on three of these, all of which achieved record breaking output energies.

To generate the high energy 2µm pulses, we developed a 70mJ single-frequency, Q-switched Ho:YLF ring MOPA. Both the ring laser and pre-amplifier were pumped by a single commercial 80W, 1940nm, Tm:fibre laser from IPG. The seed laser system delivered up to 73mJ per pulse at 50Hz, with a pulse duration of 365ns in a diffraction limited beam. This system set two world records: it delivered the highest energy from a Ho doped laser, pumped with one Tm:fibre laser, and it was also the highest single-frequency singly-doped Ho:YLF laser.

In order to scale these pulse energies even further, we developed a Tm:YLF pumped slab amplifier system. Amplified single-frequency pulses of up to 210mJ were generated from a 43mm long Brewster cut Ho:YLF and a 20mm long Ho:LuLF slab crystal. However, numerical simulations indicated that longer Ho doped crystals between 80 to 120mm in length would perform significantly better.

A new Ho:YLF slab amplifier was therefore built which consisted of two 50mm long crystals placed close together in series in a double seed pass configuration. This amplifier delivered >330mJ of single-frequency pulses and a small signal gain in excess of 40. This is the highest reported single-frequency $2\mu m$ energy from a Ho:YLF slab MOPA system.

The high-energy $2\mu m$ pulses were then used to pump a $4\mu m$ molecular HBr MOPA, which will also be reported at this conference.

Level (Hons, MSc,
 PhD, other)?

PhD

Consider for a student
 award (Yes / No)?

No

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

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