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2 µm pumped HBr Oscillator-amplifier

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<p>Optically pumped molecular lasers are attractive alternatives to generate high energy pulses in the mid-infrared wavelength range, compared to non-linear conversion that can suffer from optical damage. One such laser is based on HBr, for which it has been experimentally demonstrated to emit laser light in the 4 µm wavelength range when pumped at 1.3 µm or at 2 µm. Prior to the work presented here the highest reported output energy from an optically pumped HBr oscillator was 2.5 mJ in a 132 ns pulse at 50 Hz repetition rate when pumped at 2.064 µm.

To scale the output energy of this technology we have designed and implemented an HBr master oscillator power amplifier (MOPA) system which was pumped by a Ho:YLF slab amplifier (pumped by a Tm:YLF slab laser) which amplified the 70 mJ output of our single longitudinal mode 2.064 µm Ho:YLF oscillator (pumped by a Tm:fibre laser) to 330 mJ per pulse at 50 Hz pulse repetition rate.

Initially all the available pump energy from the Ho:YLF amplifier was coupled into the HBr oscillator which produced up to 5.5 mJ per pulse for 200 mJ incident energy, at which point optical damage of the HBr oscillator cell window was observed due to the high intensity of the pump light in the double-pass configuration. The oscillator was subsequently operated at a reduced input energy of 50 – 60 mJ at the point where the HBr laser was most efficient with respect to incident energy.

The HBr MOPA system produced 9 mJ per pulse when seeded with 2.3 mJ from the HBr oscillator and pumped with 200 mJ incident energy, of which approximately 75

Level (Hons, MSc,
   PhD, other)?

Doctorate

Consider for a student
   award (Yes / No)?

No

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 Proceedings (Yes / No)?

Yes

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