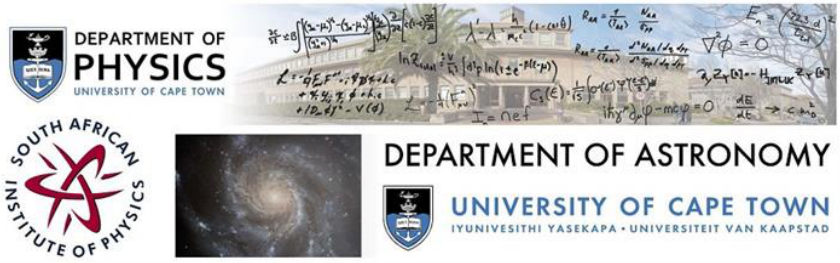

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14 W Mid-Infrared Optical Parametric Oscillator based on Zinc Germanium Phosphate

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Abstract content
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Although laser sources emitting in the 3-5 micron region is of great interest for applications in remote sensing, medicine, and directed infra-red countermeasures; the availability of high-power sources emitting in this region remains limited.

An efficient approach to obtain coherent light in the 3-5 micron region is by converting light from a 2 micron laser source, such as a pulsed solid-state Ho:YLF laser or thulium fibre laser, by pumping an optical parametric oscillator (OPO).

In this paper we present a high-power mid-infrared OPO based on Zinc Germanium Phosphate (ZnGeP2). The OPO consisted of a linear, single-pass-pump cavity containing a single ZGP crystal. The ZGP crystal was pumped with a 2064 nm Ho:YLF master oscillator power amplifier (MOPA) that was developed at the National Laser Centre. The input coupler mirror was highly reflective for 3 to 5 micron light and highly transmissive for the pump light, while the output coupler mirror was partially reflective from 3 to 5 micron, while being highly transmissive for the pump light.

The OPO had a slope efficiency of 35% with regards to incident pump power when operated at a pulse repetition frequency of 20 kHz. A maximum output power of 14 W was measured when pumped with 48.8 W. This was a significant improvement on previous work, where we obtained 5 W from a similar configuration. The OPO operated near degeneracy at a centre wavelength of 4.1 micron. The beam quality factor was measured to be better than 4 at 10 W of output power.

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