

**Broadly tunable all-solid-state picosecond
LBO optical parametric oscillator**

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Abstract

We report a synchronously-pumped optical parametric oscillator with a tuning range of 0.72-1.91 μ m, average output powers up to 89mW and pulse durations of 1.5psec.

Summary

We recently reported the efficient and widely-tunable operation of an all-solid-state synchronously pumped optical parametric oscillator in lithium triborate (LBO) [1]. In that work, only the longer wavelength nonresonated wave was coupled as an output, with the output of the OPO falling when tuned away from degeneracy due to the increasing reflection loss of the antireflection coatings on the LBO crystal. Here, we report a significant improvement through the use of a Brewster angle configuration for the LBO crystal. This avoids the limiting constraints of antireflection coatings and provides for a very low round trip cavity loss across the entire tuning range. A four-mirror astigmatically compensated resonator was used with 3% output coupling at the resonated wavelength. The threshold average pump power at 523.5nm was 170mW in 2psec pulses at 105MHz. The output slope efficiency for the resonated wave was 40%, resulting in a maximum average output power of 89mW at 850nm for a pump power of 340mW. Using two mirror sets the resonated wave was temperature-tuned over the range 978-721nm. The nonresonated wave tuned over the corresponding range of 1126-1911nm. The output power was >50mW over the range 978-744nm and >30mW over the range 1164-1813nm. The OPO output pulses were 1.5psec in duration (sech² fit) with a time-bandwidth product of 0.9. More accurate control of the excess bandwidth should result in transform-limited subpicosecond pulse generation across the tuning range.

References

1. S. D. Butterworth, M. J. McCarthy, and D. C. Hanna, *Topical Meeting on Advanced Solid State Lasers*, New Orleans LA, 1993, postdeadline paper PD10.