Supplementary

Diode-pumped high-power continuous-wave intracavity frequency-doubled Pr3+:YLF ultraviolet lasers around 349 nm

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# Multi-wavelength CW UV lasers

**Results**

Thanks to the transmission peak broadening effect introduced by the β-BBO crystal, multi-wavelength CW UV lasers could also be obtained by the scheme for the discrete tunable UV lasers. The laser spectra results are presented in Fig. 1. As seen, Multi-wavelength CW UV lasers at 348.7/354.4/360.3 and 348.7/351.1/353.3/356.8 nm were obtained. The output powers of the two lasers were measured to be 63 and 23 mW, respectively. To get the multi-wavelength UV lasers, we first rotated the Lyot filter to achieve multi-wavelength deep red lasers, and then inserted the β-BBO crystal and tilted the β-BBO crystal to find the proper angles for multiple UV emittings. The output powers were low due to the relatively small acceptance angle band of the β-BBO crystal[1].

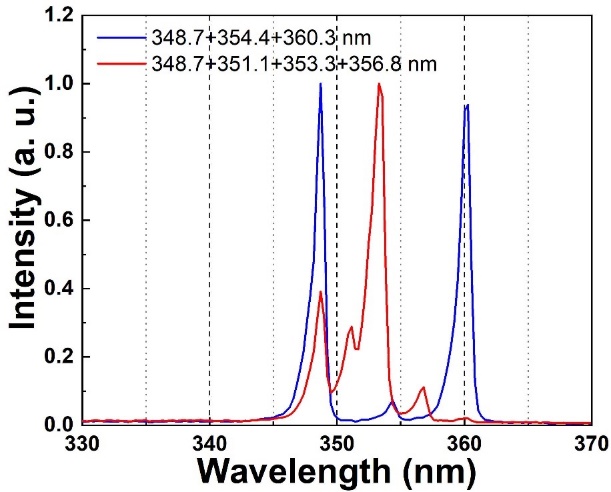


Fig. 1. The laser spectra of the multi-wavelength CW UV lasers.

**Analyses**

The acceptance angles at different wavelengths could be calculated through[2]:

(6)

where is the acceptance angle, is the length of the nonlinear crystal, is the fundamental laser wavelength, is the phase-matching angle, the refractivities () at different frequencies and polarization directions can be intuitively read by the subscripts. The simulation results are presented in Fig. 2. As seen, the acceptance angles of the β-BBO crystal used in the experiment were much smaller than the relative phase-matching angles listed in the previous section. Thus, it’s rational that the conversion efficiencies of the multi-wavelength UV lasers were extremely low.

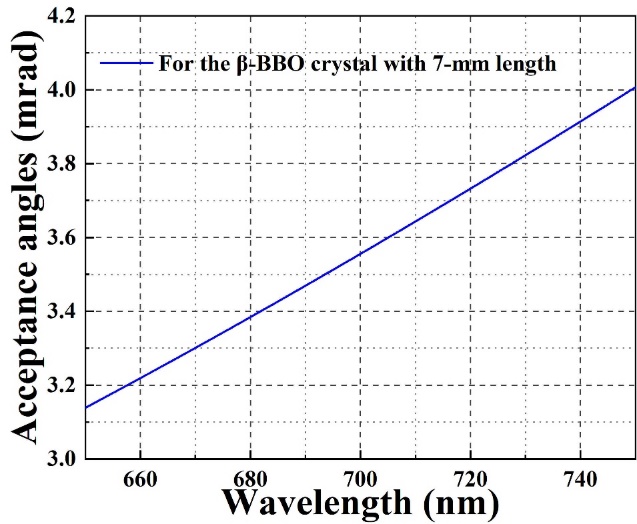


Fig. 2. The acceptance angles of the 7-mm-long β-BBO crystal used in the experiment.

References

1. D. N. Nikogosyan, "Beta barium borate (BBO): A review of its properties and applications," Appl. Phys. Solids Surf. **52**(6), 359–368 (1991).

2. T. Kellner, F. Heine, and G. Huber, "Efficient laser performance of Nd: YAG at 946 nm and intracavity frequency doubling with LiJO3, β-BaB2O4, and LiB3O5.," Appl. Phys. B Lasers Opt. **65**(6), (1997).