

Hristo Iliev, Ivan Buchvarov. HIGH POWER ND: YVO₄ LASER MODE-LOCKED BY CASCADING SECOND ORDER NONLINEARITY

Experimental results on passive mode-locking of an Nd: YVO₄ laser using type-I intracavity frequency doubling in bulk and periodically poled nonlinear crystals are reported. Both, negative $\chi^{(2)}$ lensing and frequency doubling nonlinear mirror (FDNLM) are exploited for the laser mode-locking. The FDNLM based on intensity dependent reflection in the laser cavity ensures self-starting and self-sustaining mode-locking while the $\chi^{(2)}$ lens process contributes to substantial pulse shortening. This hybrid technique enables generation of stable trains of pulses at high-average output power with several picoseconds pulse width. The pulse repetition rate of the laser is in order of 110 MHz with average output power ranging from 3.2- 4.1 W in the case of using bulk lithium triborate (LBO) nonlinear crystal and 0.7 W to 2.7 W in the case of using periodically-poled stoichiometric lithium tantalate. The measured pulse durations were 8.3 ps and 6.3 ps respectively.

Keywords: Diode pumped lasers, passive mode-locking, quasi-phase matching, periodically-poled crystals

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