

OPTIMIZATION OF STOKES PULSE CHARACTERISTICS IN Q-SWITCHED LASERS WITH INTRACAVITY RAMAN CONVERSION

Yu. V. Loiko, A. A. Demidovich, A. P. Voitovich

Institute of Molecular and Atomic Physics, NASB, Minsk

The optimization problems in Q-switched lasers with intracavity conversion of laser frequency by the stimulated Raman scattering (SRS) have been theoretically investigated in dependence on the parameters of nonlinear media and cavity elements at Stokes-shifted frequency. In particular, we consider the output mirror reflectivity at Stokes frequency and the length of the Raman active medium as the main control parameters. The optimizations of Stokes pulse energy, peak power, and pulse width have been studied. We consider the case when the laser parameters at fundamental laser frequency are fixed.

It has been found that the Stokes pulse energy can be optimized by appropriate choice of the output mirror reflectivity at Stokes frequency at fixed length of the Raman medium. The maximum value of output Stokes pulse energy gradually increases with increasing the Raman medium length. Simultaneously the mirror reflectivity which optimizes the Stokes pulse energy shifts to the smaller values.

We also found that the Stokes pulse width and peak power can be optimized by changing either mirror reflectivity or Raman medium length. But the values of these control parameters which optimize the mentioned Stokes pulse characteristics in general case are different. The optimum value of mirror reflectivity at Stokes frequency for Stokes pulse peak power is found to be larger than that which optimizes the Stokes pulse width.

Hence it has been shown that there are sets of the mirror reflectivity and length of Raman medium each of which optimizes the Stokes pulse width or peak power in Q-switched lasers with intracavity SRS.