5.6 Development of a Master Oscillator Power Amplifier (MOPA) Laser System at 2.1 μm Wavelength

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Laser systems operating at 2.1 μm are very interesting for many applications since they operate in the eye safe spectral region. Potential applications range from medicine to remote sensing and range finding. With the development of suitable active solid state materials new opportunities for the development of small, reliable and cost effective lasers have emerged. We have developed a flashlamp pumped Q-switched master oscillator power amplifier system operating at 2.1 μm. The active material used was Cr,Tm,Ho:YAG. Cavity loss modulation necessary for Q-switched mode of operation was obtained by spinning the rear 100% flat resonator mirror with angular frequency slightly above 20000 rpm. The master oscillator laser is producing approximately 80 ns long pulses with a typical energy of 35 to 40 mJ and with near-Gaussian wavefront quality. To increase the energy per pulse and to simultaneously preserve the beam quality we added an additional optical amplification stage. This was built with an identical laser head as the one used for the master oscillator. We were able to increase the pulse energy by a factor of two. This is not a very high gain but was sufficient to perform required experiments above the threshold for stimulated Brilloun scattering. Further increase of the pulse energy would be possible with optimization of the whole setup. The wavefront quality of the amplified beam was within the measurement accuracy, similar as the quality of the master oscillator output. Amplifier induced depolarization was measured to be less than 10%.