A HIGH POWER Q-SWITCHED ERBIUM FIBRE LASER PRODUCING 50μJ PULSES

H. H. Kee, G. P. Lees, D. Taverner, D. J. Richardson, T. P. Newson
Optoelectronics Research Centre
University of Southampton
Southampton SO17 1BJ

Q-switched fibre lasers have been extensively researched since the first development in 1986 [1]. Recent numerical modeling [2] has suggested that two methods can be used to improve the energy storage per unit length within a fibre. One technique is to increase the Erbium concentration which will however, lead to clustering of Erbium ions which decreases the efficiency of the fibre through co-operative up-conversion. The method which we will present is based on using a novel fibre geometry using a large mode field area. Single-mode operation is maintained by decreasing the N.A. of the fibre.

The setup for the experiment is as shown in Figure 1. An Argon pumped Ti-Sapphire laser provides a pump source of up to 600mW at 980nm through the fibre. To prevent unwanted lasing from 4% Fresnel relection, the far end of the fibre was angle polished at 16%. The optimised length of the fibre was 60cms. Due to the low diffraction efficiency of the acousto-optic modulator (AOM), the optimum results were obtained though zero order operation.

Using this configuration, peak powers in excess of 4kW with corresponding pulse widths of 11ns were obtained at a repetition rate below 1kHz. The variation of peak powers and pulse widths with repetition rate will be shown to be typical for that of a Q-switched Erbium laser. At high pump powers, the increase in pulse energy was saturated due to the increase of ASE power, clamping the available gain. For an input pump power of 600mW, the output pulse energy was 50μJ.

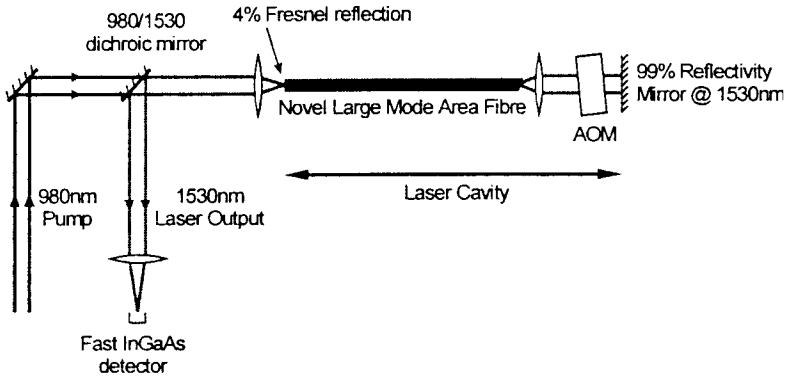

Figure1: Experimental setup for the Q-switched laser

[1] R.J.Mears, L.Reekie, S.B.Poole, D.N.Payne: Electronics Letters **22**, 159 (1986)
[2] J.Nilsson, B.Jaskorzynska: Optics Letters **18**, 2099 (1993)