

ALL FIBRE SLIDING FREQUENCY SOLITON LASER

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Recently, impressive progress has been made in the development of fiber acoustooptic frequency shifters using acoustically driven, four-port null couplers [1]. Losses as low as 0.1 dB and frequency conversion efficiencies higher than as 99% with carrier suppression of >30 dB have been obtained for acoustic drive powers as low as 2 mW at frequency shifts as high as 10 MHz. Moreover, the devices also act as tunable optical bandpass filters, can be designed to be polarising, and do not give rise to internal back reflections. As such they are ideal modelocking elements for sliding frequency fibre soliton lasers in which frequency shifting, filtering, and polarising components are required [2,3]. Fibre frequency shifters perform all of these function simultaneously and permit the construction of extremely simple all-fibre, wavelength tunable, low-loss laser cavities (see Fig. 1). In all schemes demonstrated to date these functions have been performed by discrete/lossy bulk componentry.

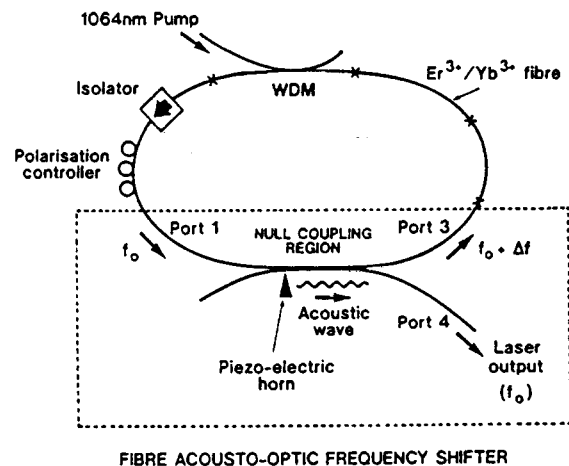


Fig.1 Laser configuration

In this paper we describe the construction and performance of just such a laser, demonstrating the generation of 18-60 psec pulses and electronically controlled wavelength and output coupling tunability. Furthermore we report fundamental mode-locking and the observation of electrostrictional harmonic repetition rate stabilisation at 500 MHz. Finally we report simultaneous bi-directional pulsed laser operation from a completely all fibre version of the system (isolator removed cavity). The results demonstrate the great potential of such all-fibre tapered devices in all-fibre laser systems.

References

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- [2] H. Sabert et al, *Electron. Lett.*, **29**, 2122 (1993).
- [3] F. Fontana et al, *Electron. Lett.*, **30**, 321 (1994).