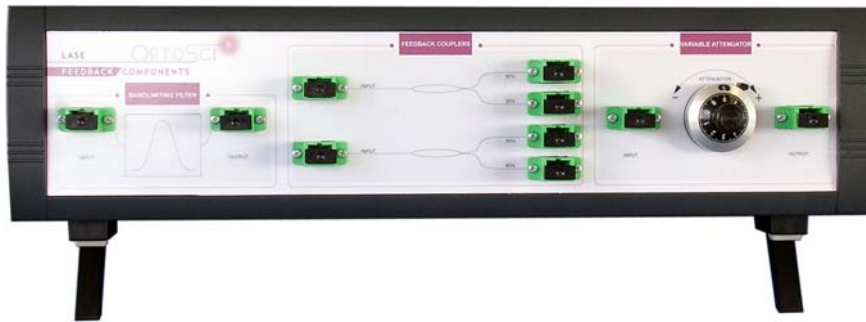


**EXTENSION TO THE ED-AMP EDUCATOR KIT TO ALLOW THE USER TO PERFORM ADDITIONAL EXPERIMENTS IN LASERS**



#### MAIN FEATURES AND BENEFITS:

- When used as an extension to the ED-AMP kit, provides all fibre optic hardware required to perform the experimental investigation
- Extensive literature support including: student and instructor's manuals with exercises, solutions & sample results
- Detailed lecture notes, tutorial examples and solutions to assist with the development of courses
- Saves significant course, literature and hardware development effort

#### THE EXPERIMENTAL INVESTIGATION\* ADDRESSES:

- Full gain characteristics of the Erbium doped fibre (EDF) gain medium
- Construction of a fibre ring laser
- Measurement of lasing threshold
- Measurement of slope efficiency
- Effect of intra-cavity loss on the slope efficiency and threshold
- Influence of output coupling ratio on slope efficiency and threshold
- Laser dynamics: relaxation oscillations, excitation lifetime, laser onset time

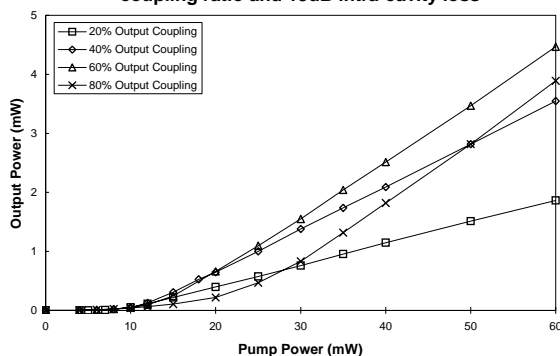
\* Full details of the experiments and equipment specifications are provided overleaf

## Laboratory Exercises

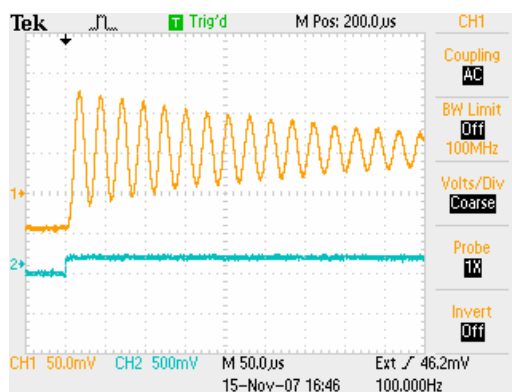
The LASE module enables students to consolidate their knowledge and understanding and to gain practical experience in the investigation of optical amplification and lasers. When used with the ED-AMP kit the following experiments can be performed:

- Measurement of output power and gain of the EDF amplifier over a large range of input signal levels for several fixed pump levels. This enables investigation of small signal gain, large signal gain and gain saturation (See ED-AMP data sheet for full details of the optical amplifier investigation).
- Construction and operation of an EDF ring laser

Laser output characteristics for 4 values of output coupling ratio and 13dB intra-cavity loss



- Measurement of laser output power and gain as a function of pump power for various levels of intra-cavity loss.
- Measurement of laser output power and gain as a function of pump power for various values of the output coupling ratio.
- Investigation of slope efficiency and threshold as a function of intra-cavity loss.
- Examination of slope efficiency and threshold as a function of output coupling ratio.



- Measurement of relaxation oscillations and laser onset time delay as a function of different pump powers, levels of intra cavity loss and output coupling ratios.
- Investigation of the square of the relaxation oscillation frequency versus pump power in order to derive the excitation lifetime.

## Product Description

The OPTOSCI LASE module is an extension of OPTOSCI's ED-AMP educator kit. It uses the erbium doped fibre amplifier and interrogation unit employed in ED-AMP (see ED-AMP data sheet for full details) with the addition of the following equipment:

- A set feedback couplers (20%, 40%, 60% and 80%) to alter the output coupling ratio (i.e. mirror reflectivities).
- An in-line external variable attenuator (0 to 30dB) to simulate intracavity loss.
- A bandpass filter ( $\lambda_c \approx 1550\text{nm}$ ) to stabilise the laser operating wavelength and to suppress ASE power.
- All of the necessary fibre cable patchcords and adaptors to enable connection between the various units of the system.

In addition, a comprehensive literature package accompanies each kit:

- A set of student laboratory manuals describing the background theory and experimental procedure, with associated exercises to encourage the student to discuss the implications of their results.
- A complete instructor's manual dealing with all aspects of using the equipment and providing sample results for the experiments and exercises.
- Extensive lecture notes on laser oscillator characteristics, fibre ring lasers and their applications.
- A comprehensive set of tutorial examples and their solutions.

*Additional required equipment:-*

- OPTOSCI ED-AMP educator kit.
- Signal/Function generator capable of a 0 to 5V square wave output of 10Hz & 100Hz.
- A two channel laboratory oscilloscope.

## Accessories

- Laser safety spectacles with OD3+ at 1550nm are available directly from OPTOSCI.

## Full ED-LASE Educator Kit

- A fully independent ED-LASE Principles of Lasers educator kit is also available (see ED-LASE datasheet for full details)

## Ordering Information

LASE Lasers Module

SPECS Laser Safety Specs OD3+ 1550nm

ED-AMP Erbium Doped Fibre Amplifiers

Since OPTOSCI are committed to continuously improving the design and performance characteristics of our products, these specifications are subject to change without notice.

Date: Aug 2011