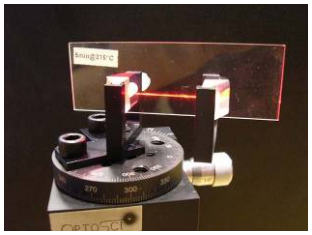
Principles of Optical Waveguiding

Educator Kit — ED-WAVE

COMPREHENSIVE LABORATORY BASED EDUCATIONAL PACKAGE IN THE FUNDAMENTALS OF OPTICAL WAVEGUIDING


R&R CONFIGURATION


WAVE CONFIGURATION



MAIN FEATURES AND BENEFITS:

- All optical, optoelectronic and opto-mechanical 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 considerable course, literature and hardware development effort

THE EXPERIMENTAL INVESTIGATION* ADDRESSES:

- Reflection and refraction, Snell's Law
- Fresnel relationships
- Brewster's angle, the critical angle and total internal reflection
- Prism coupling and waveguide measurements
- Step and graded index waveguides
- Measurement and analysis of mode spectra
- Mode effective indices and index profile determination
- Design of single mode waveguides

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

OPTOSCI Limited
9 Cambuslang Road
Glasgow G32 8NB
Scotland

Tel / Fax: +44 (0)141 641 2344
E-Mail: info@optosci.com
www.optosci.com

Laboratory Exercises

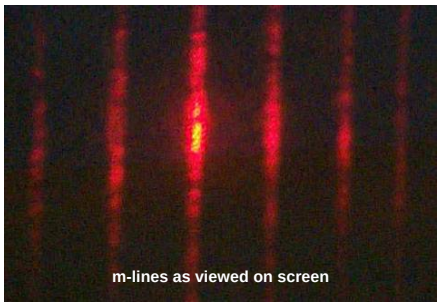
This educator kit enables the student to investigate the conditions under which optical waveguiding occurs in dielectric media, and then appreciate how these fundamental principles are applied by examining mode propagation in, and charaterising, multi mode and single mode planar waveguides. The Reflection & Refraction (R&R) and Optical Waveguiding (WAVE) experiments are conducted sequentially by reconfiguring the hardware and include:

R&R Configuration:

- Measurement of refraction angles enabling the student to confirm Snell's Law.
- Determination of the reflection coefficient of an internal and external optical interface for both vertical and horizontal polarisation states.
- Confirmation of the Fresnel equations and identification of such features as; the critical angle for total internal reflection, and Brewster's angle.
- Determination of the refractive index of an optical element

WAVE Configuration:

- Selective launch of modes (TE or TM) into step index and graded index multimode planar waveguides using prism coupling techniques and threshold conditions for the excitation of specific modes.
- Measurement of the mode spectrum, modal effective indices, and the polarisation dependence of various designs of multimode (step and graded index) planar waveguides using prism coupling techniques and m-line investigations.



m-lines as viewed on screen

- Estimation of the refractive index profile and depth of the multimode waveguides under study.
- Design of a single mode waveguide from an appreciation of mode cut-off concepts, and measurements of waveguide depth and modal effective indices.
- Experimental confirmation of single mode operation in a pre-fabricated waveguide which closely matches the student's design.

Product Description

The OPTOSCI Principles of Optical Waveguiding educator kit consists of the following hardware elements:

- An optical rail bench fitted with a visible semiconductor diode laser with integral drive electronics plus mount, a polariser with a graduated rotational mount, a mounted lens, a precision graduated rotation stage with y- and z- translation mounts, and an optical receiver with integral power readout and a remote detector head on a rotational mount.
- For the reflection / refraction experiments a glass half cylinder is mounted on a graduated table with indicator arm.
- For the waveguiding experiments the rotation stage is fitted with a high index prism coupling assembly into which the waveguide is mounted.
- A selection of multimode and single mode step index waveguides fabricated by thin film deposition.
- A variety of graded index multimode and single mode waveguides fabricated by glass ion exchange.

In addition, a comprehensive literature package accompanies each educator kit:

- Student laboratory manual, describing the background theory and experimental procedure, with associated exercises to encourage the student to discuss the implications of their results.
- Instructor's manual dealing with all aspects of using the equipment and providing sample results for the experiments and exercises.
- Extensive lecture notes on basic optics and waveguiding phenomena detailing the principles of all the issues explored in the laboratory exercises.
- A comprehensive set of tutorial examples and their solutions.

Related Modules

- ***Fibre Optics (FIB Ext.)*** add-on to ED-WAVE allows students to investigate: free space coupling of light into optical fibres, output mode patterns, fibre NA, axial misalignment, connector loss, bend loss & attenuation in optical fibres.
- The two individual modules, which combine to form ED-WAVE, are also available separately as Reflection & Refraction (R&R) and Optical Waveguiding (WAVE).

Waveguide Analysis Software

- ***SWAN(MIC)****:* Excel based optical waveguide analysis software for use with ED-WAVE allowing the user to study planar optical waveguides experimentally and theoretically (see separate datasheet for full details).

Ordering Information

ED-WAVE	Principles of Optical Waveguiding
FIB Ext.	Fibre Optics add-on to ED-WAVE
R&R	Reflection & Refraction Module
WAVE	Optical Waveguiding Module
SWAN(MIC)	Waveguide Analysis Software

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

Date: March 2018

OPTOSCI Limited
9 Cambuslang Road
Glasgow G32 8NB
Scotland

Tel / Fax: +44 (0)141 641 2344
E-Mail: info@optosci.com
www.optosci.com