



## ERBIUM DOPED FIBER EDUCATION SYSTEMS



### Amplifier and fiber training kit

The aim of this educational kit is to familiarize students with optical components for Telecommunications (Laser diodes, optical fibers, isolators...). We propose a kit containing a laser diode pump, a multiplexer and an erbium doped fiber.

With different components (attenuators, coupler, DFB laser, Bragg Gratings...), it is possible to study :

- the erbium doped fiber amplifier
- the superfluorescent source
- the linear and ring laser

## Amplification

Erbium Doped Fiber Amplifiers (EDFA) have revolutionized Telecommunications. They allow an amplification of 30 dB of optical signal without any bandwidth limitation, on a 40 nm band, centred at 1550 nm. Consequently, fiber optics Telecommunications systems can be upgraded only by changing the emitter and receiver systems. Their wide amplification band also enables the development of WDM transmission, with a capacity of up to 1 Tbits/s. Amplifiers are now the key elements of optical Telecommunications.

**IDIL Fibres Optiques** has developed a laboratory kit allowing a complete study of Erbium Doped Fiber Amplifiers (EDFA). Starting with the basic physical phenomena, this kit is suitable for the complete influence of many parameters such as the pump power, the input signal level on EDFA performances (ASE noise, saturation power, gain, etc.). The kit is complete, with different components including an optical isolator, a 1550 nm DFB laser, three attenuators, a fiber Bragg grating... The documentation explains in detail the fabrication and performance of all these components. It also contains various lecture notes and practical exercises.

## Applications

- Erbium doped fiber amplifier
- Erbium doped fiber laser
- Superfluorescent source (ASE source)
- Linear cavity fiber laser
- Ring cavity fiber laser
- The constant fluorescent level start-up
- The relaxation oscillations
- Fluorescence decay
- Saturation effects
- Gain or loss dependence of the working wavelength...

## Features

- Comprehensive teaching & training manual
- Rack mounted components
- Eye safe connectors
- Competitive pricing
- Modular presentation of the kit
- Pump modulation
- Laser behaviour observation (various spectra)

## Specifications

COMPONENTS INCLUDED
1 Pump laser @ 980 nm, 80 mW
1 Erbium doped fiber (saturation power : 10 dBm, gain : >30 dB)
1 DFB laser diode @ 1550 nm, 1 mW
1 Fiber optic coupler 90/10
2 980/1550 nm multiplexers
3 Optical attenuators (5, 10 and 20 dB)
1 Gold mirrored fiber end
1 Optical isolator
1 Fiber Bragg grating
1 Detector : InGaAs photodiode
9 Patchcords E2000/APC Diamond connectors
ENCLOSED DOCUMENTATION
The documentation of the kit is really complete. It contains, a detailed description of the components, and many experimental examples. Experimental part :
Introduction
Description of components
Laser safety
Experiments : gain, saturation power, noise characteristics, ASE noise, superfluorescent source, linear and ring lasers.
THEORETICAL LECTURE NOTES
Introduction
Theory of atoms
Optical amplification
Pumping mechanisms
Amplifier noise
Erbium doped fiber amplifiers
Erbium doped fiber lasers



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