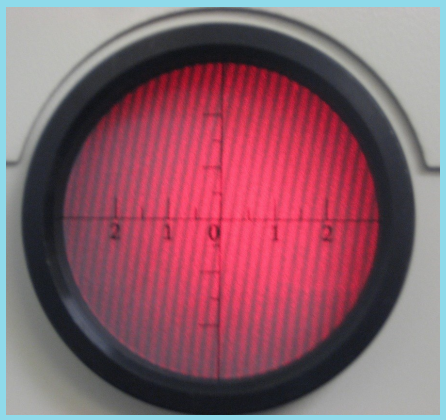
Construct, Conduct & Comprehend Physics Experiments

LEOK-22 Optical Fiber Information and Communication Experiment Kit - Enhanced Model

Note: oscilloscope not included

- *16 fundamental experiments*
- *Flexible solution for different levels of students*
- *Hands-on skill training*
- *Innovative design with quality components*



Interference pattern on ground glass screen

This kit provides an overview of fiber optic technology and basic skills needed to work with fiber optics. It is made up of a number of laboratory experiments. The most commonly used fiber optical components and their parameter measurements are introduced in this kit, together with prime techniques, such as WDM and coupling. Student can understand the characteristics of isolators, attenuators, optical switches, transmitters, amplifiers etc. Upon completing the experiments, one can gain a better understanding of fiber optic fundamentals with hands-on experience in real fiber optic components and techniques. With this carefully designed kit, students will gain a powerful tool to explore the exciting world of fiber communication. This kit is really a must for those wishing to learn fiber optics with related techniques.

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Note: product information is subject to change without notice.

Experimental Contents

1. Fundamentals of fiber optics
2. Optical fiber coupling
3. Numerical aperture (NA) of a multimode fiber
4. Optical fiber transmission loss
5. M-Z optical fiber interference
6. Optical fiber temperature sensing principle
7. Optical fiber pressure sensing principle
8. Visual inspection & fault locating using OTDR
9. Optical fiber beam splitting
10. Variable optical attenuator (VOA)
11. Optical fiber isolator
12. Fiber-based optical switch
13. Wavelength division multiplexing (WDM) principle
14. Principle of EDFA (Erbium-doped fiber amplifier)
15. Transmission of analogue audio signal in free space
16. Transmission of video signal through an optic fiber

Part List

Description	Qty
He-Ne laser (2.5 mW @632.8 nm)	1
650 nm transmitter (audio modulator)	1
Dual-wavelength handheld light source	2
Light power meter	1
Hand held light power meter	1
Fiber interference demonstrator	1
Power supply (dual 5 VDC)	1
Audio demodulator (w/built-in speaker)	1
IR receiver	1
Erbium-doped fiber amplifier module	1
Single-mode fiber (633 nm)	1
Multi-mode fiber (633 nm)	1
Fiber patch cord (1m/3m/50m)	6
Fiber spool (1 km)	1
Hand held OTDR (1550 nm) with VFL (650 nm)	1

Description	Qty
Single mode beam splitter (1310 or1550 nm)	1
Optical isolator (1310 nm)	1
Optical isolator (1550 nm)	1
WDM (1310/1550 nm)	2
Mechanical optical switch (1×2)	1
Variable optical attenuator	1
Fiber scribe	1
Fiber stripper	1
Mating sleeves	5
Radio (AM/FM)	1
CCTV camera	1
LCD display	1
Fiber optic video transmitter	1
Fiber optic video receiver	1

Detailed specifications for each component can be found within the sub-sequent pages **(subject to change without notice)**.

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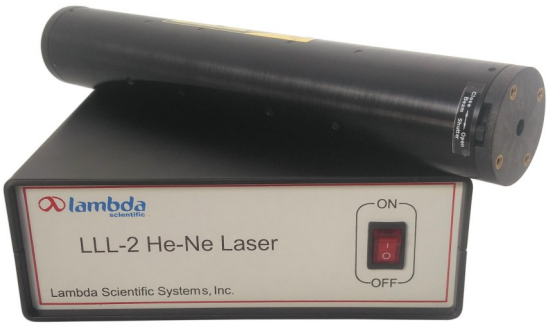
He-Ne Laser with Power Supply

Model: Lambda Scientific LLL-2

Wavelength: 632.8 nm
Mode & output power: $TEM_{00} \geq 2.5$ mW
Polarization: Linear polarization 500:1
Beam divergence: 1.3 mrad full angle
Beam diameter: 0.63 mm at $1/e^2$ point
Tube: length 270 mm and diameter 42 mm
High voltage: 1900 VDC/6.5mA, Alden HV connector
Power supply: 100—240 VAC, 50/60 Hz
Dimensions: 190mm x 80mm x 160mm.



650nm Transmitter (Diode Laser)

Wavelength: 650 nm
Output power: 1 mW
Modulation: Direct modulation input port (3.5mm earphone plug)
With stand holder
5 VDC power supply
Dimensions: 42 mm x 42 mm x 80 mm.

Fiber Optic Video Transmitter

BNC video input connector
FC/PC fiber output connector
5 VDC power supply input port
12 VDC output port for CCTV camera,
Dimensions: 120mm x 100mm x 30mm.

Dual-wavelength Handheld Light Source

Wavelengths: 1310 nm/1550 nm
Output power: ≥ -7 dBm
Spectral width: < 10 nm
Optical connector: 2.5mm FC connector
Stability: ±0.05 dB/15 minutes or ±0.1 dB/8 hours
Modulation frequencies: 0/270/1k/2k Hz
Power supply: 2x AA 1.5V battery
Operating temperature: -10 to 50 °C
Dimensions: 180mm x 89mm x 42mm

Light Power Meter

Model: Lambda Scientific LLM-2
Measurement range: 2 μW ~ 200 mW, 6 scales
Display: 4-digi LED display
Sensor type: silicon detector (300 ~ 1100 nm)
Sensor area:10mm x 10mm
Power supply: 100—240 VAC, 50/60 Hz
Dimensions: 250mm x 200mm x 90mm

IR (Infrared) Receiver

Input port: FC/PC fiber connector
Output port: BNC signal output connector
Dimensions: 25 mm x 25 mm x 50 mm

Handheld Light Power Meter

Calibrated wavelengths: 1310 nm/1550 nm
Response range: 850 ~ 1650 nm
Detector type: InGaAs
Measurement range : -50 ~ +26 dBm
Optical connector: 2.5mm FC Connector
Accuracy: ±0.2 dB
Power supply: 2x AA 1.5V battery
Dimensions: 180mm x 90mm x 42mm

Fiber Optic Receiver

FC/PC input connector
BNC video output port
5 VDC power supply input port
12 VDC output port for LCD display,
Dimensions 120 mm x 100 mm x 30 mm.

Audio Demodulator

Audio decoder with stand holder
Photo sensitive LED receiver
5 VDC power input port
Built-in amplifier and speaker
Dimensions 42 mm x 42 mm x 80 mm

Fiber Interference Demonstrator

Dimensions 350 x 300 x 210 mm. Includes following parts:
(1) 633 nm fiber beam splitter with FC input connector
(2) 20W heater with temperature senor
(3) mounted collimating reflective mirror f175mm
(4) 15 mm travel at 0.01 mm resolution micrometer
(5) diameter 60mm ground glass viewing screen
(6) 80mm x 80mm with cross scales white screen
(7) alignment aperture
(8) fiber holders
(9) fiber coupling objective lens 5x
(10) PID temperature controller
(11) x-y translation stage
(12) x-y-z translation stage
(13) Power supply: 100—240 VAC, 50/60 Hz

DC Regulated Power supply

Input voltage: 100 ~ 240 VAC, 50/60 Hz
Output voltage: dual 5.0 VDC, 2A
Output ports: two identical output ports
Output connectors: 2-pin lock connector
Dimensions: 100mm x 80mm x 65mm

2-Pin Thread-lock Cable

Length 80 cm
5.5/2.1 mm plug on one end

Erbium-doped Fiber Amplifier Module

1550 nm (C-band) EDFA module with these built-in parts:

(1) 10 m Erbium-doped fiber

(2) 1550 nm optical isolator

(3) 980 nm pump laser

(4) 980 nm/1550 nm WDM.

FC/PC connectors, with variable gain & LC display

Input optical power range:-40 dBm to 10 dBm

Modulation frequency range: From DC to 20 GHz

Maximum output power: 15 dBm

Power supply: 5 VDC, 1A

Dimensions: 145 mm x 205 mm x 65 mm.

Single-mode Fiber (633 nm)

Operating wavelength: 633 nm

Length: 1m

Connector type: FC/PC, one end only

Core diameter: 4.3 um

Cladding diameter: 125 um

Coating diameter: 250 um

Numerical aperture: 0.10-0.14,

Cutoff wavelength: 500-600 nm.

Multi-mode Fiber (633 nm)

Operating wavelength: 633 nm
Length: 2m
Connector type: FC/PC, both ends
Core diameter: 9 um
Cladding diameter: 125 um
Insertion loss: <0.3 dB
Return loss: >50 dB

Fiber Patch Cord (1310/1550 nm)

Operating wavelength: 1310/1550 nm
Length: 1m (4 pcs), 3m (1 pc), 50m (1 pc)
Connector type: FC/PC
Core diameter: 9 um
Cladding diameter: 125 um
Cable diameter: 2.0 mm
Insertion loss: <0.3 dB
Return loss: >50 dB

Fiber Spool

Operating wavelength: 1310/1550 nm
Length: 1000 m
Connector type: bare fiber, no connector
Core diameter: 9 um
Cladding diameter: 125 um

Single Mode Fiber Splitter

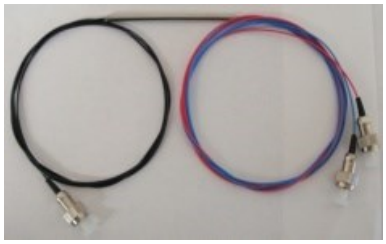
Operating wavelength: 1310 or 1550 nm
Dimensions: 2.0 mm diameter or 80 x 20 mm
Connector type: FC/PC
Insertion loss: < 0.35 dB
Polarization-dependent loss: 0.02~0.03 dB

Optical Isolator

Operating wavelength: 1550 nm (1 pc) and 1310 nm (1 pc)
Polarization sensitivity: insensitive
Stage number: single stage
Connector type: FC/PC
Bandwidth: +/-30 nm
Max insertion loss: 0.7 dB
Minimum isolation: 30 dB （typical 40 dB)
Minimum return loss: 55/50 dB

WDM (Wavelength Division Multiplexing)

Operating wavelengths: 1310/1550 nm
Connector type: FC/PC
Core diameter: 9 um
Insertion loss: 0.6 dB transmission @1310 nm
0.4 dB reflection@1550 nm
Isolation: transmission >25 dB and reflection >15 dB
Max power: 300 mW

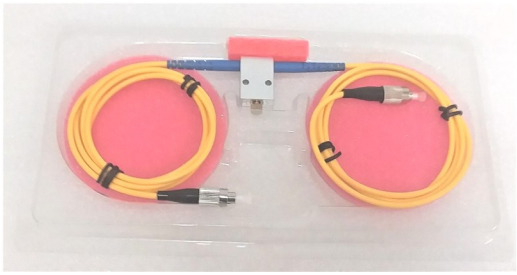


Mechanical Optical Switch

1×2, FC connector
Single mode fiber/length 0.5 m
Wavelength range 1260 nm ~ 1650 nm
5 VDC power supply port
Dimensions 120mm x 120mm x 20 mm
W/transparent protection box (260 mm x 210 mm x 63 mm)

Variable Optical Attenuator

Range: 1~60 dB, FC/PC connector
Single mode fiber/length 1 m
Wavelength range 1290 nm ~ 1625 nm
Insert loss <1.5 dB, return loss > 55dB without connectors
Max power 300 mW,
Attenuation precision <0.2 dB @ 10 dB & <0.3 dB @10-45 dB.



Fiber Scribe

Tip material: carbide
Tip angle: 45°

Fiber Stripper

For strapping 125um fiber with 250um buffer coating

Mating Sleeves

Connector type: FC/PC
Insertion loss: <0.2 dB

Radio

Bands: AM/FM, 2x AA batteries .

LCD Display

4.3” LCD
PAL/NTSC format
Contrast 350:1
Resolution 480*RGB*272
12 VDC power supply

CCTV Camera

PAL/NTSC format
Sensor ¼”, with IR LEDs
Resolution 420 line
Lens focal length 6 mm
BNC output connector
12 VDC power input

2-Pin Push-Pull Cable

Length 80 cm
5.5/2.1 mm plug on one end

Hand Held OTDR with VFL

Hand held optical time domain reflectometer (OTDR):

Single mode fiber, FC/PC, light source 1550 nm, dynamic range 18 dB,

Measurement range 40 km, pulse width 10 ns ~ 10 us, attenuation dead zone 10 m, event dead zone 3 m. Sampling points 40000. Data storage 50.

Visual Fault Locator (VFL): Light source 1 mW 650 nm.

Powered by Li ion rechargeable battery. Type-C USB charger.

Dimensions: 175 mm x 90 mm x 45 mm.