

[OEFLK-100]

Fiber Laser System (Educational Kit)

Features:

- Complete solution
- Reconfigurable
- All in-fiber structure
- Easy to handle packaging
- Operational guideline provided

Applications:

- Training in fiber lasers optical laboratory programs for students
- In technical institutes, colleges or universities
- For laboratory experiments and education

Introduction:

The OEFLK-100 Fiber Laser Educational kit from O/E Land Inc. is intended to be used for building fiber lasers in different configurations, during training of students in the fiber optics laboratory programs for in technical institutes, colleges or universities. This kit will give an opportunity to its users to get experienced with different optical component like pump laser, active fiber, fiber Bragg grating (FBG) mirror, all-fiber laser cavity etc. Components are made or pigtailed using single mode fiber (SMF) with 3mm cable for the easy handling, long term use and robustness. The optical fiber is so delicate that professionally trained personal only can safely handle it. This kit designed and packaged for uses without prior experience in optical fiber handling.

The Fiber Laser Educational kit can be used for doing experiments to learn about:

- Fiber laser system
- Laser threshold
- Optical pumping
- Pump saturation
- Conversion efficiency of fiber laser
- Working principle of linear cavity fiber laser
- Working principle of ring cavity fiber laser
- Backward and forward pumping
- And much more ...

Fiber Lasers fundamentals:

Fiber laser is a special type of laser, where active gain medium is an optical fiber doped with rare-earth elements like erbium, ytterbium, thulium etc. Each dopant is characterized by its emission wavelength. The one we discuss here is the erbium (Er^{3+}) highly doped fiber for laser emission around 1550 nm wavelength range of the infrared (IR) spectrum. (This wavelength range is referred as C-band in optical communications). Fiber laser is pumped optically with semiconductor laser or another fiber laser.

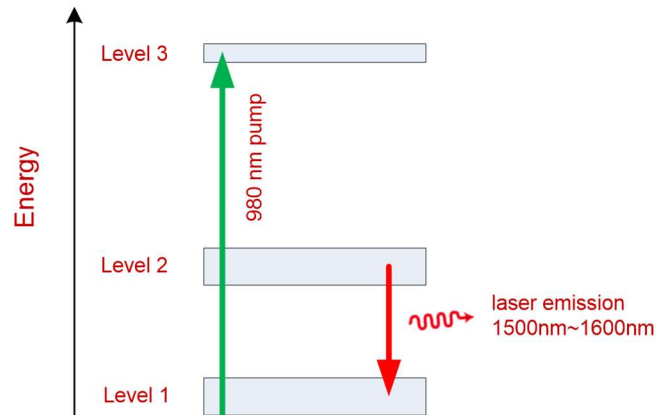


Figure 1: Energy levels of Erbium doped fiber laser

Energy level diagram of erbium doped fiber laser is shown in figure 1. Here laser is pumped by 980nm pump laser (usually semiconductor diode laser) and laser emits in 1500~1600 nm wavelength range. To achieve the laser emission this active gain medium is placed in suitable optical cavity formed by two mirrors. Schematic of a simple erbium-doped fiber laser system is shown in figure 2. Here mirror reflects 1550nm wavelength light, so laser emits at that wavelength. To make the system an *all-fiber* structure, the mirrors can be replaced by fiber Bragg gratings (FBG, a reflective element inscribed within the fiber).

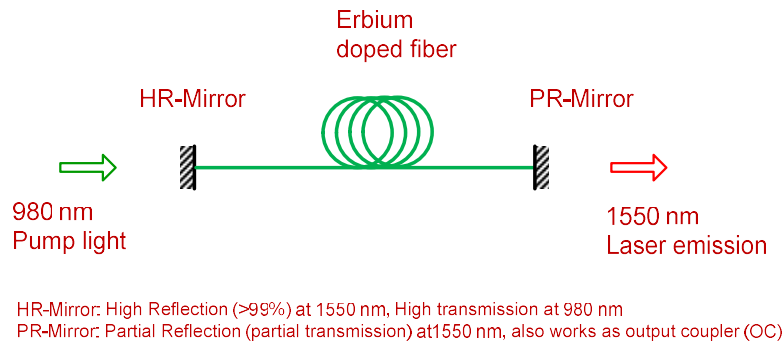


Figure 2: Schematic of erbium-doped fiber laser system

Description of the Fiber Laser System:

All the components are fiber-pigtailed with 3mm PVC tubing and terminated with FC/APC connectors. User can easily connect the components using mating sleeves, which are included in the kit. A fiber laser assembly is shown in figure 3. This is simply a fiber laser with linear structure.

This linear structure can be modified as a ring structure, as shown in figure 4. Here we used a circulator and a power splitter, in addition to the components used in linear structure. Power splitter drop ~30% of the power to the output and remaining ~70% is circulated in the loop.

Configurations of the Fiber Laser System:

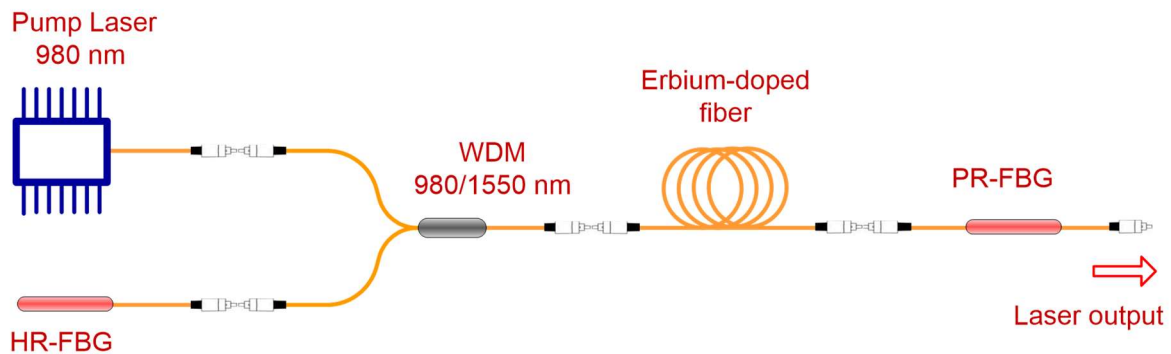


Figure 3: Fiber Laser - linear structure

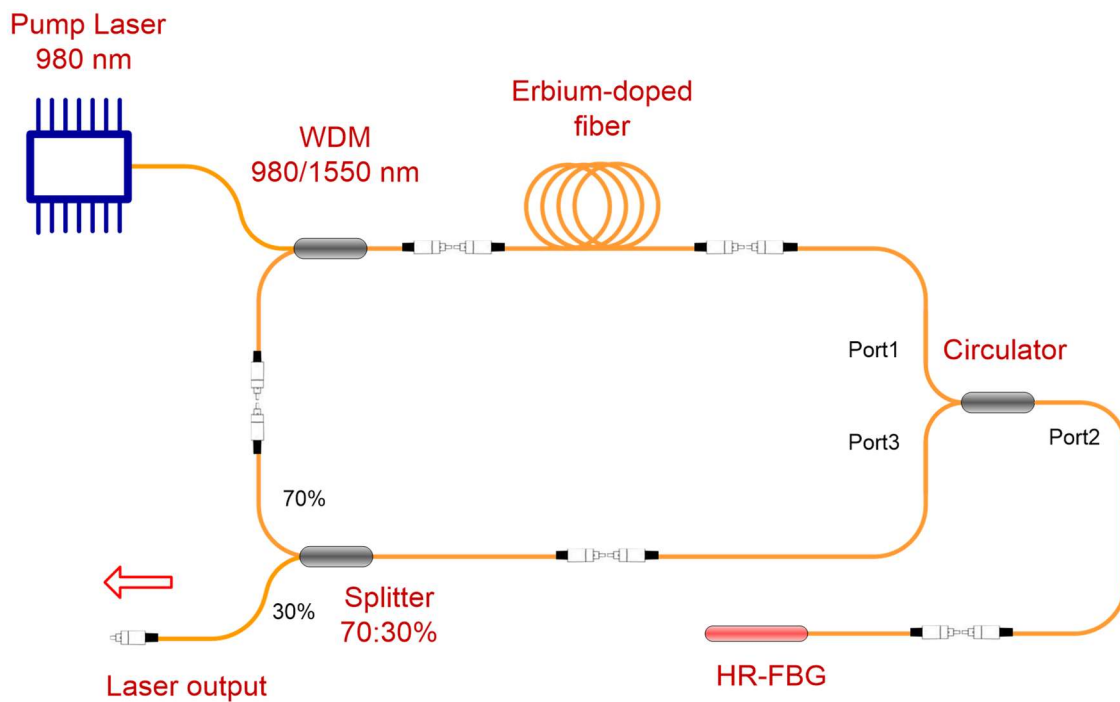

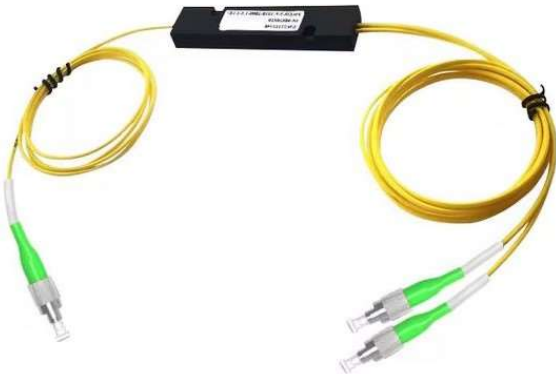



Figure 4: Fiber Laser - ring structure

List of the components in the kit:

Item	Description	Quantity
Pump Laser with mount and driver	<p>Wavelength 980 nm. Maximum output power 150 mW. Fiber pigtailed, terminated with FC/APC connector. Complete turn-key solution.</p> 	1 pc
WDM	<p>Fused-fiber Wavelength Division Multiplexor (WDM). For multiplexing 980 nm pump signal and the generated 1550 nm signal.</p> 	1 pc
Doped fiber	<p>Erbium (Er^{3+}) highly doped single-mode fiber (EDF). Active medium for laser generation. Packaged in 3 mm PVC fiber jacket.</p> 	1 m

HR-FBG	High-reflecting FBG, inscribed in SMF-28 fiber. Acting as high-reflecting mirror (HR).	1 pc
PR-FBG	Partially reflecting FBG, inscribed in SMF-28 fiber. Acting as an Optical Coupler (OC).	1 pc
Circulator	Optical circulator. Provides one-directional connection in the Fiber Laser loop structure.	1 pc
Splitter	Optical coupler. For dividing the power in two, with 70:30% ratio. For Fiber laser with loop structure.	1 pc
Mating sleeve	Adaptor for connecting two FC/APC fiber connectors. To establish all the necessary optical connections.	5 pcs

