

In The Name of God

New Generation of Medical Lasers



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Laser in Medicine

Dentistry

Dermatology

Urology

Ophthalmology

Neurology

Tissue welding

Wound healing

Pain relief

PDT

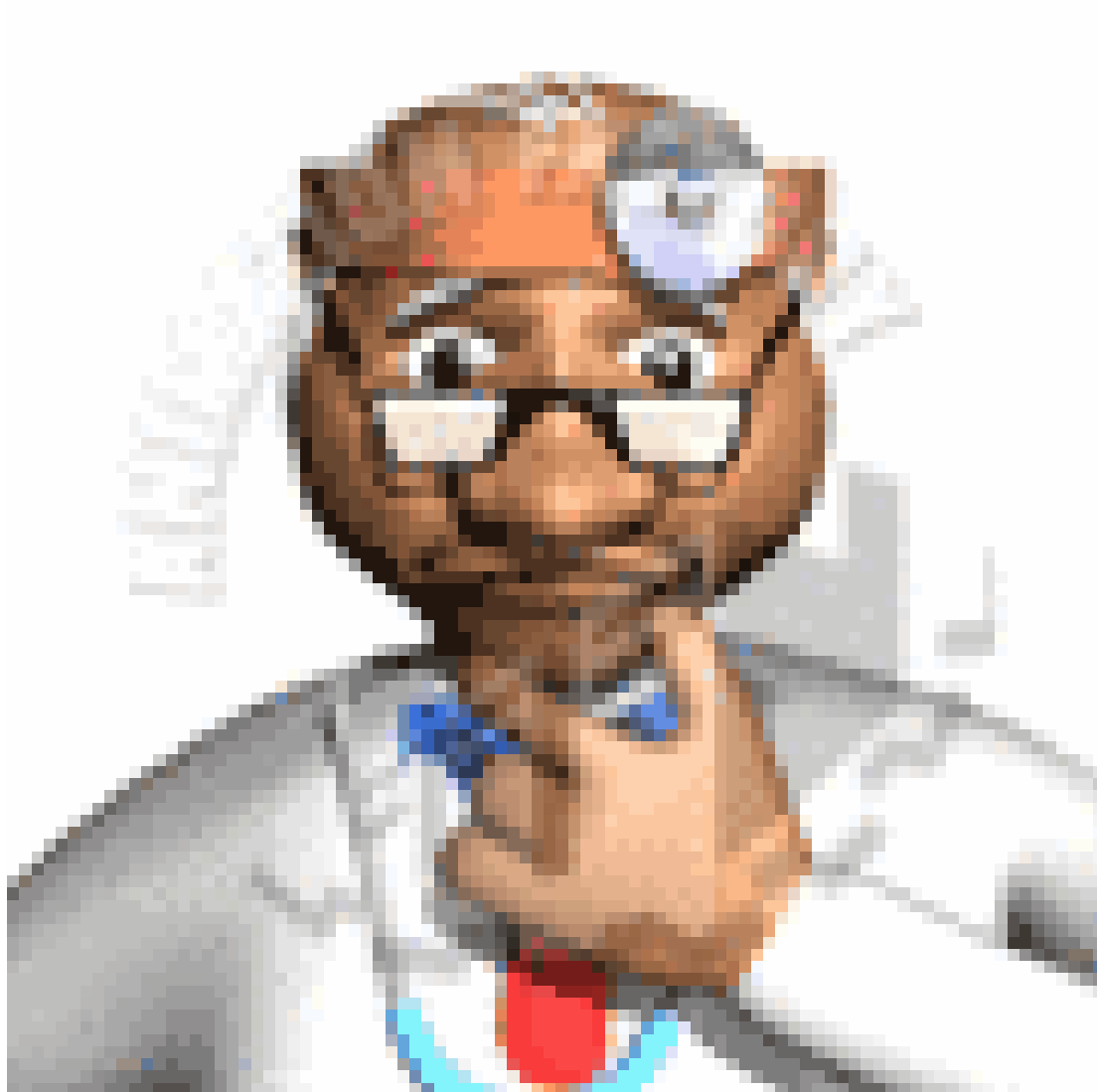
ENT

General surgery

Orthopedic

....

**I want to know more about the
new medical lasers**



Properties of Laser

1- Coherent

2- Monochromatic

3- Collimated (Low Divergent)

4- High Intensity

A few factors of Laser Interaction

Laser

- Wavelength
- Power
- Energy density
-

A dream of Dr

Laser specification

Several wavelength

Lightweight

Inexpensive

Easy to use

Small in size (Military&medical)



Type of Lasers



```
graph TD; A[Type of Lasers] --> B[1. Gas]; A --> C[2. Solid-State]; A --> D[3. Semiconductor]; A --> E[4. Liquid];
```

1. Gas

3. Semiconductor

2. Solid-State

4. Liquid

Diode Laser

Fiber

Fiber Lasers 1

Diode Laser



Fiber

fiber coupled
diode laser

Fiber Lasers 2

Diode Laser



Fiber

Fiber laser

Fiber Lasers 1

Diode Laser



Fiber

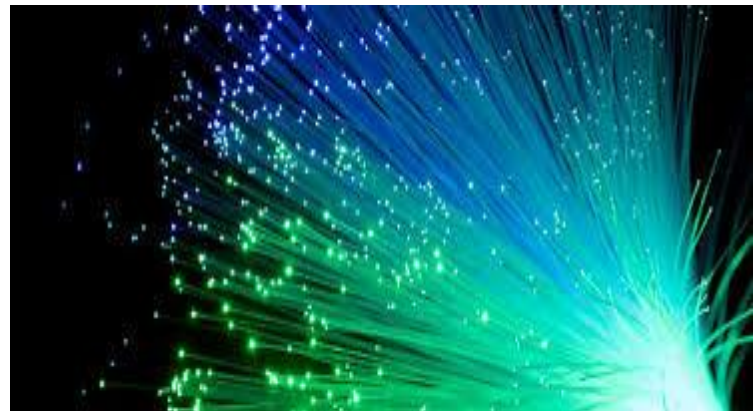
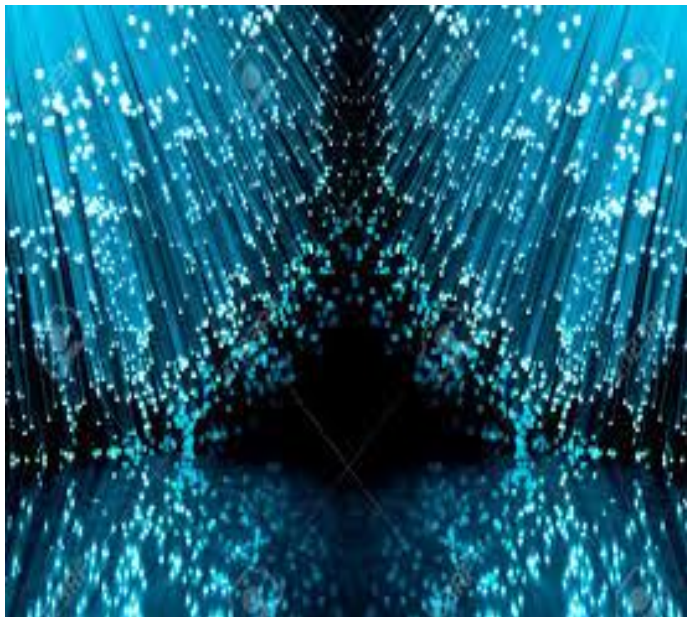
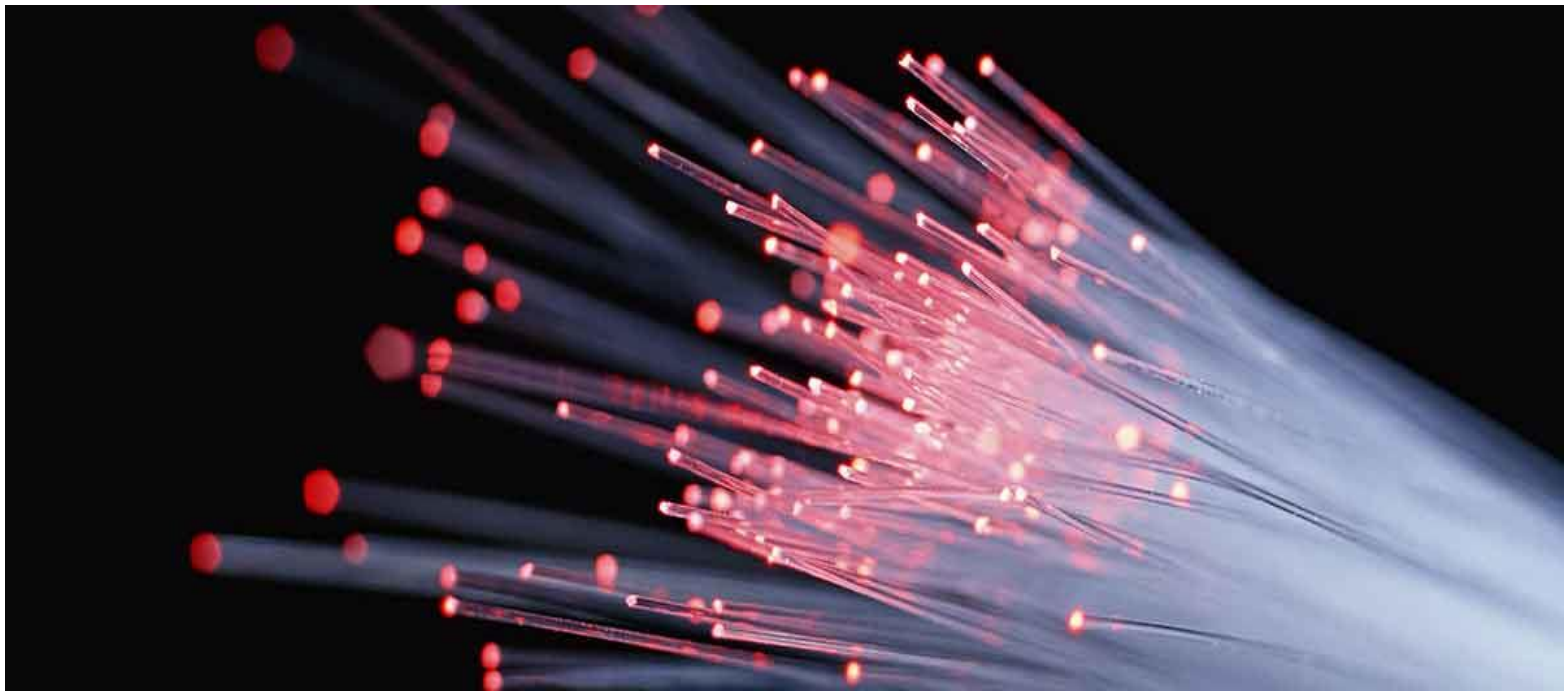
Fiber Coupled
Diode Laser

**1W
850nm**

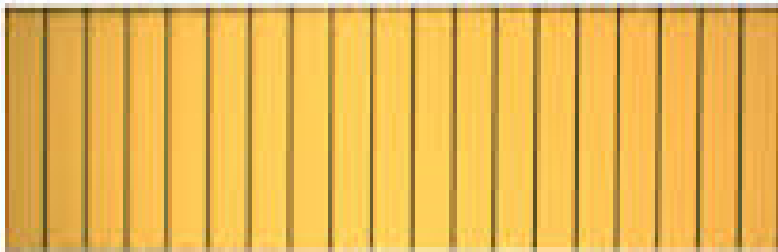


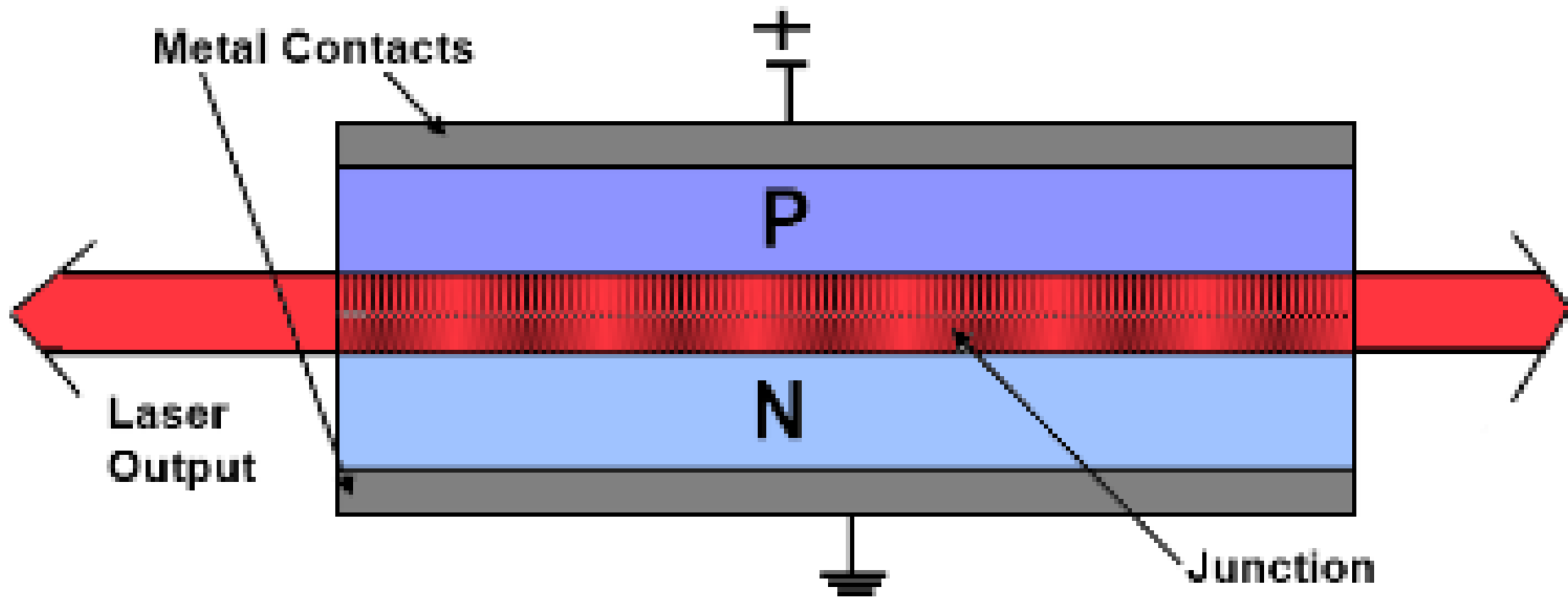
Diode Laser
Semiconductor Laser
لیزر های نیمه هادی

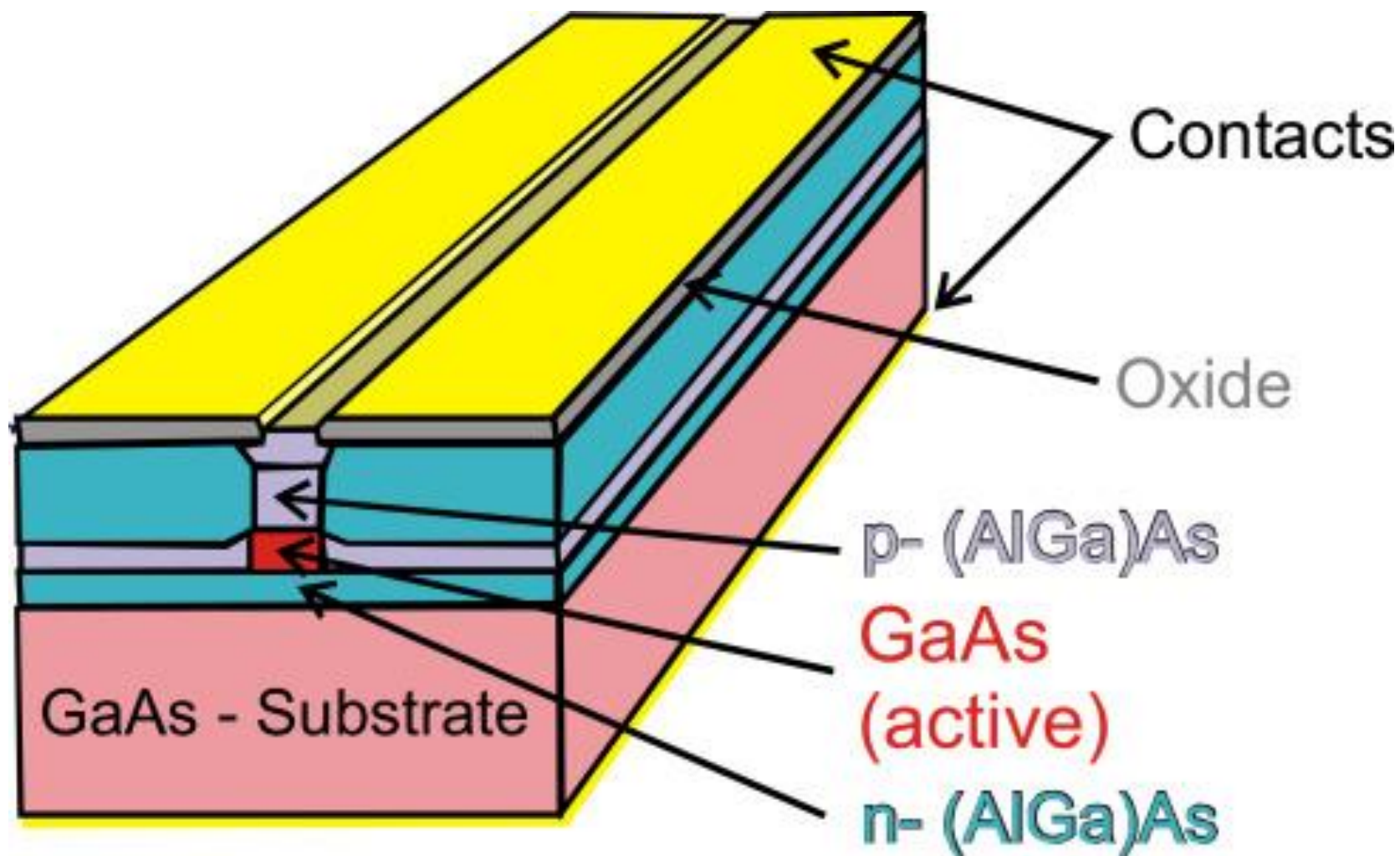




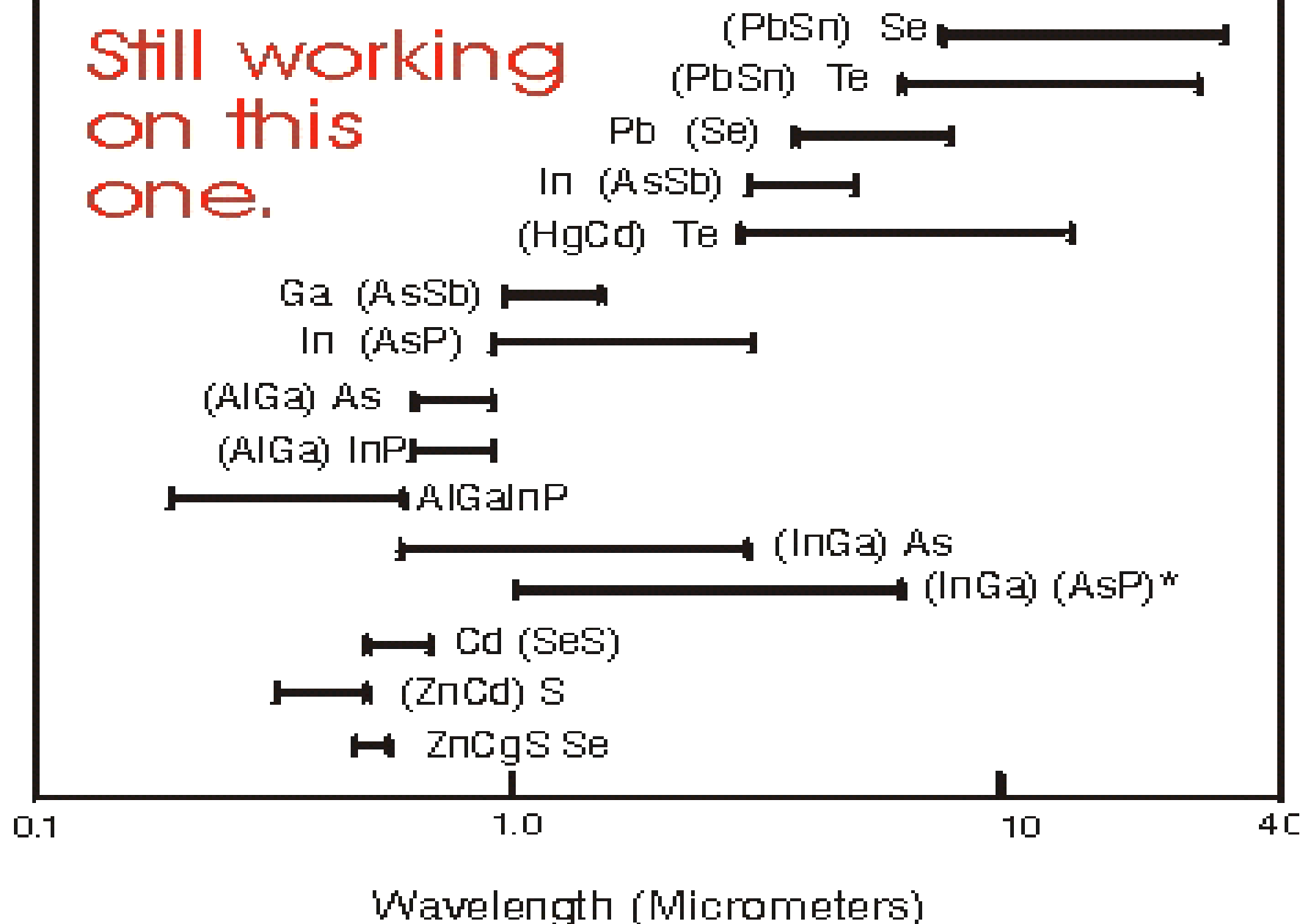


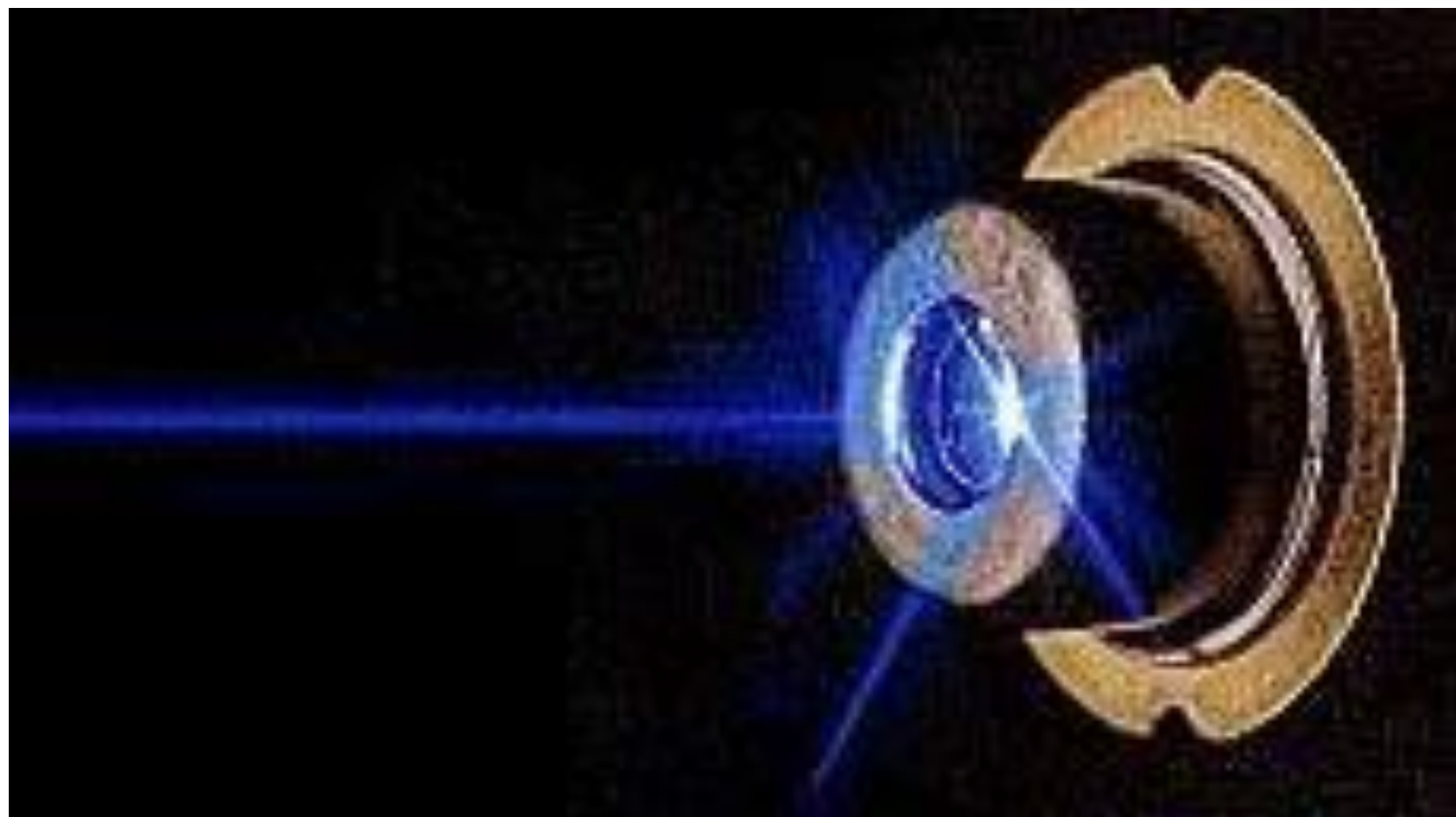






Still working
on this
one.



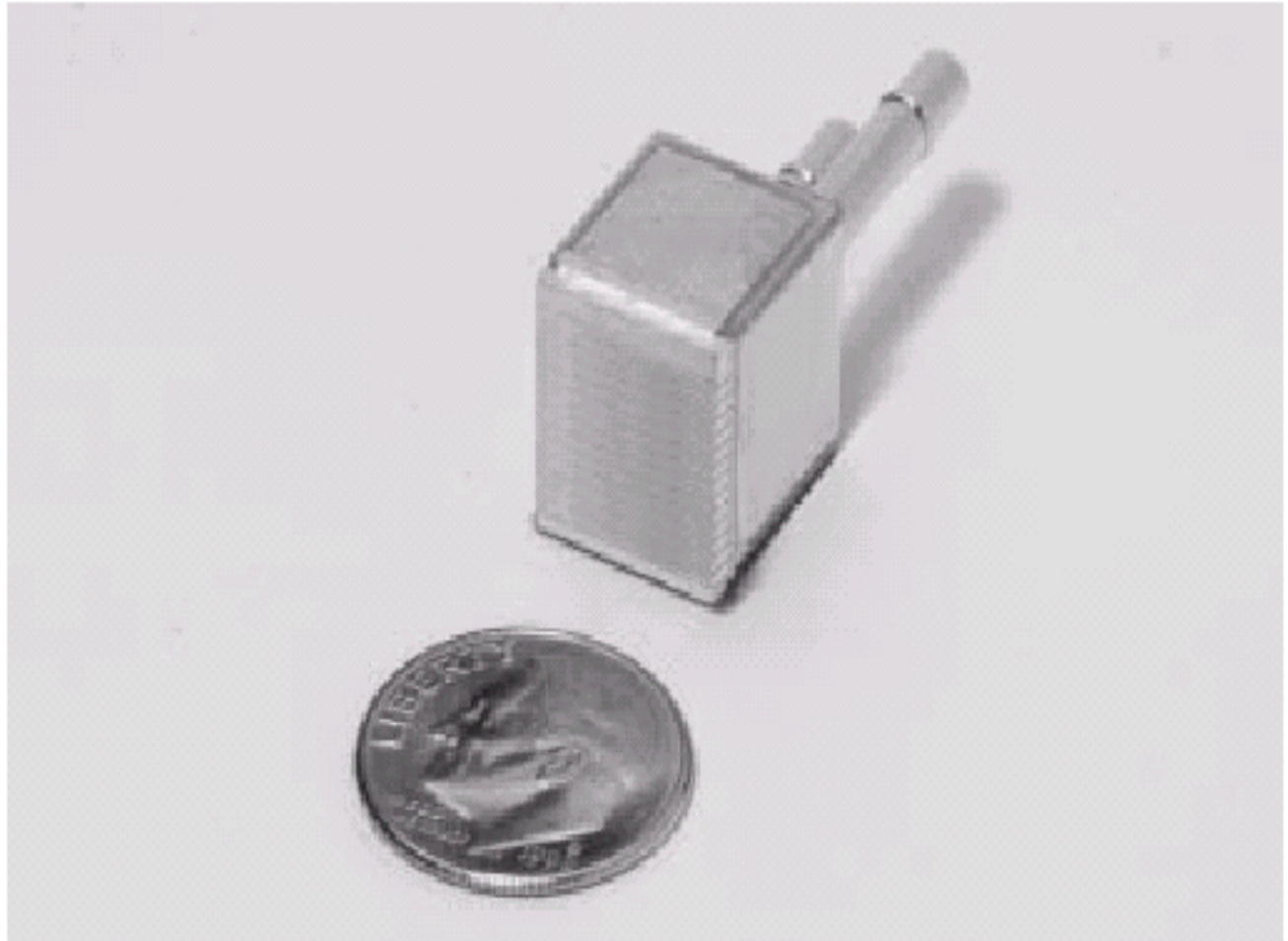


High power laser diodes

940nm 500W QCW Lensed Laser Diode Array
Part Number: LAR23P500

E2 PACKAGE

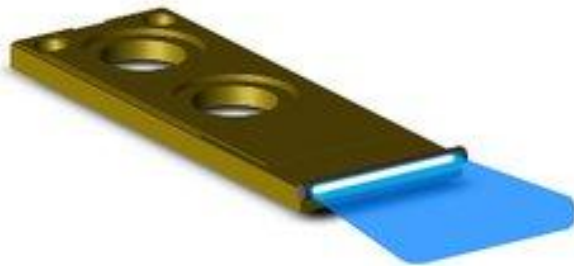
- Packaged 13-Bar Lensed Laser Diode Array
- Available Wavelengths
785-1064nm
- Other Powers Are Also
Available



5 W



50 W



500 W



Epilation

for all areas (besides directly around the eyes)

for all skin types (extra care with skin type VI)

for all hair colors (besides grey, light blonde and red)

• Vascular treatments

Extended vessels (Ø ca. 0.5 to 2mm)

Hemangioma

Eruptive Angiomas

Venous Lake

Lymph angiomas

Spider Naevi

• Acne

Acne vulgaris

Acne inversa

• Rejuvenation

Skin rejuvenation

Reduction of little wrinkles

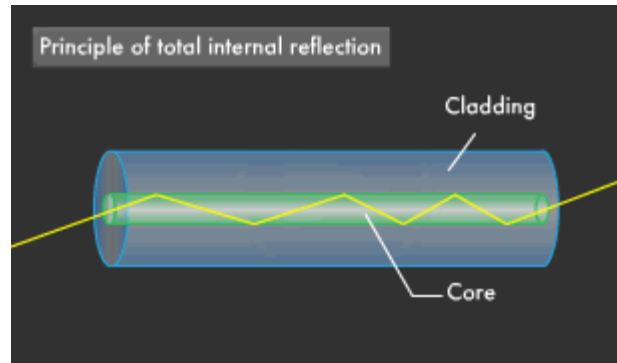
Improvement of the texture

Reduction of the pore size

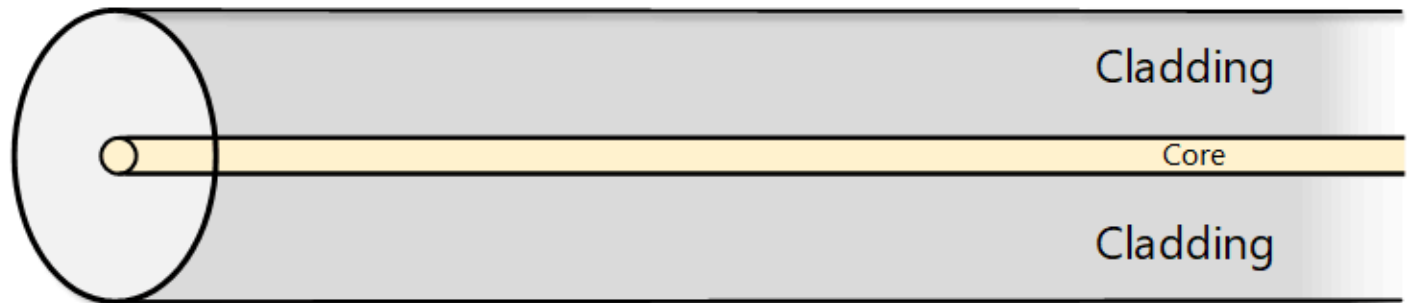
• White & Tight

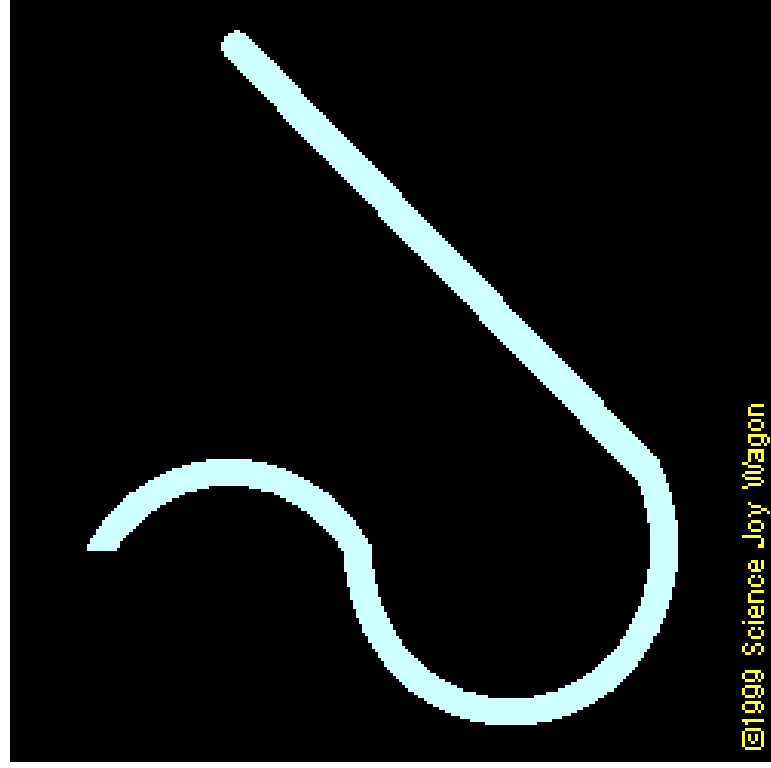
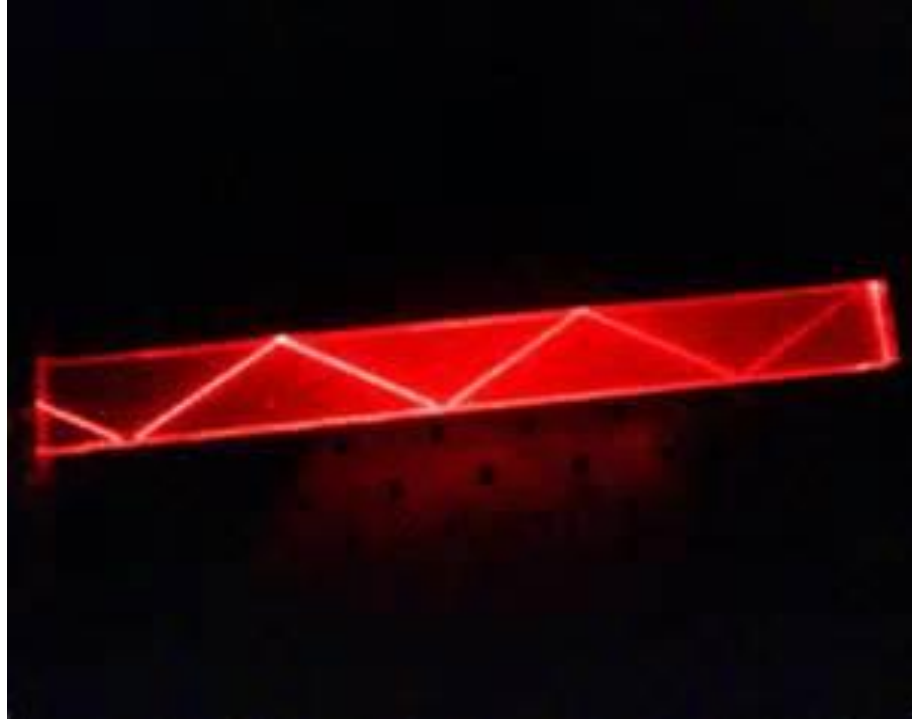
Skin whitening & tightening combined treatment

Indications Diode Laser



LASER







Fiber-coupled diode laser.



Fiber Lasers 2

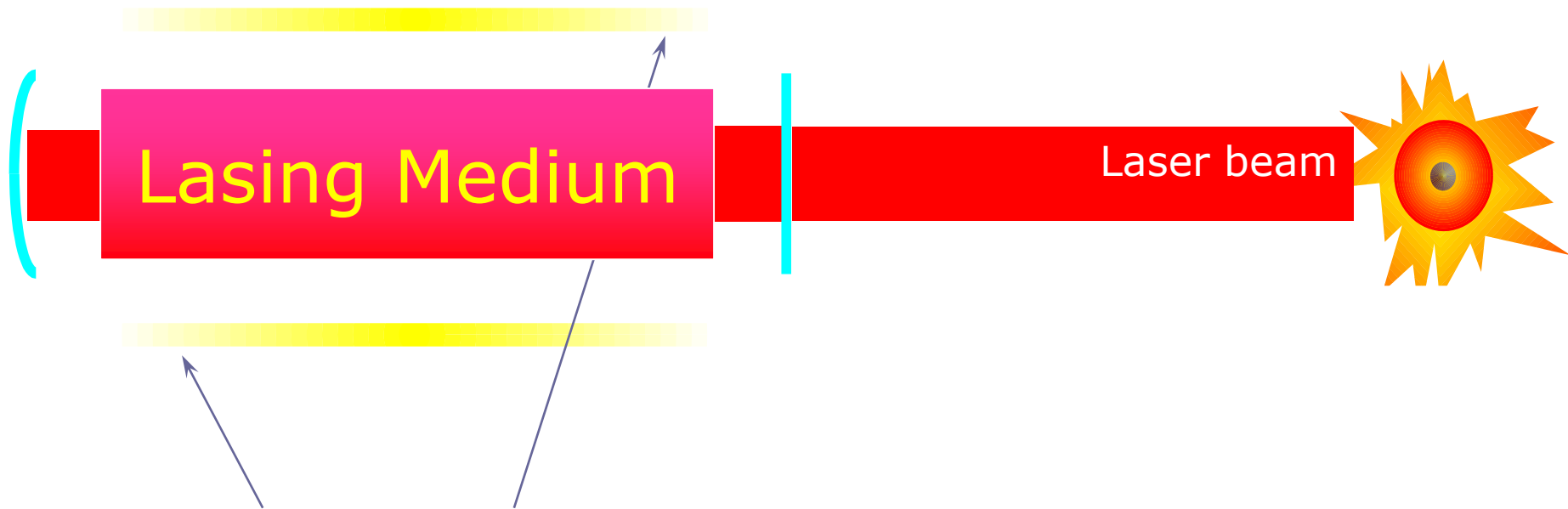
Diode Laser



Fiber

Fiber laser

Basics of a Laser System



Pumping Source

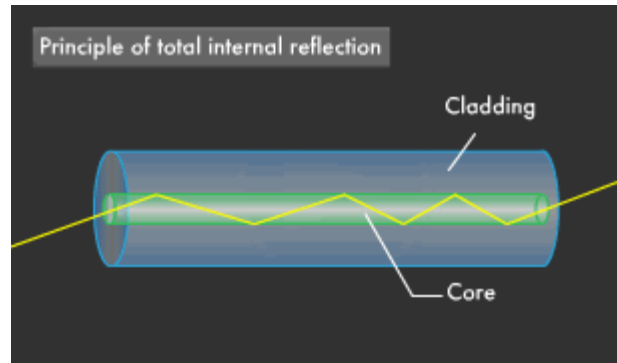
$R = .5 \text{ cm}$

$L = 10\text{-}80 \text{ cm}$



$R = 100 \text{ u}$

$L = 250 \text{ m}$

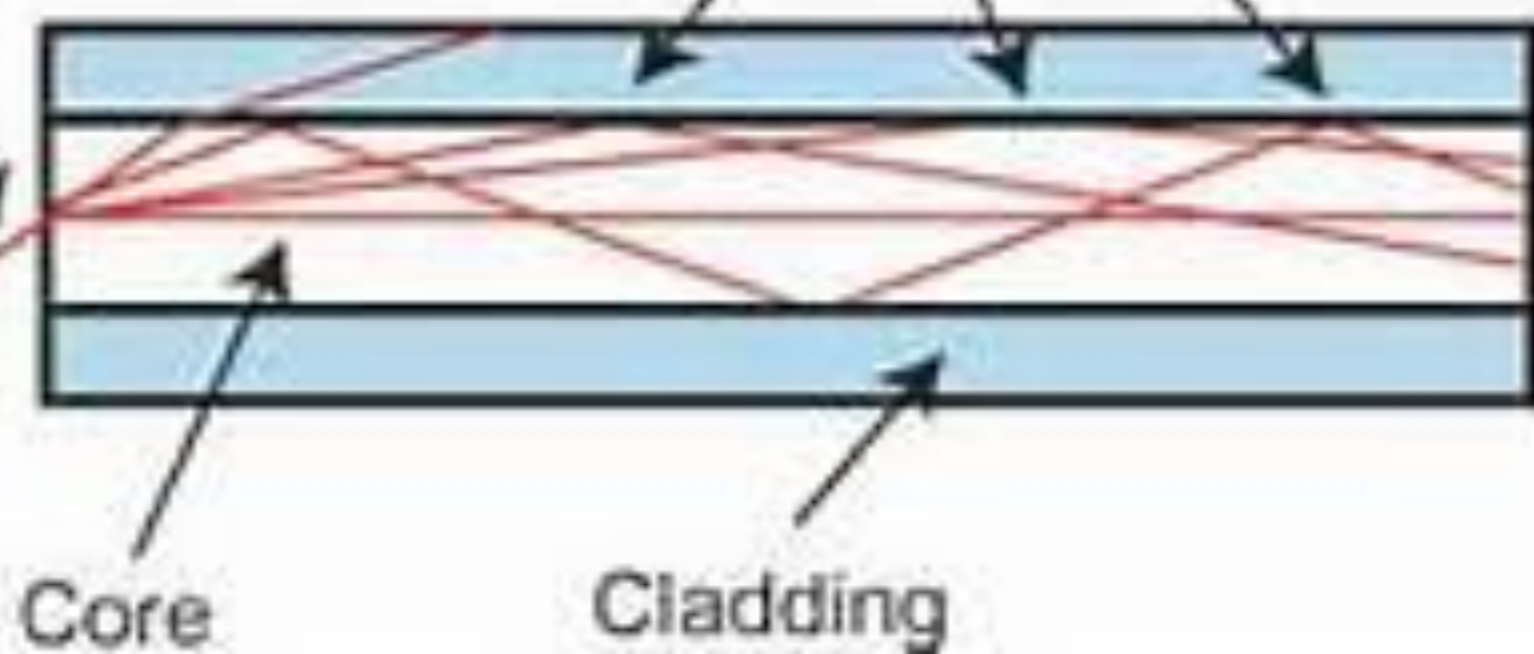


LASER



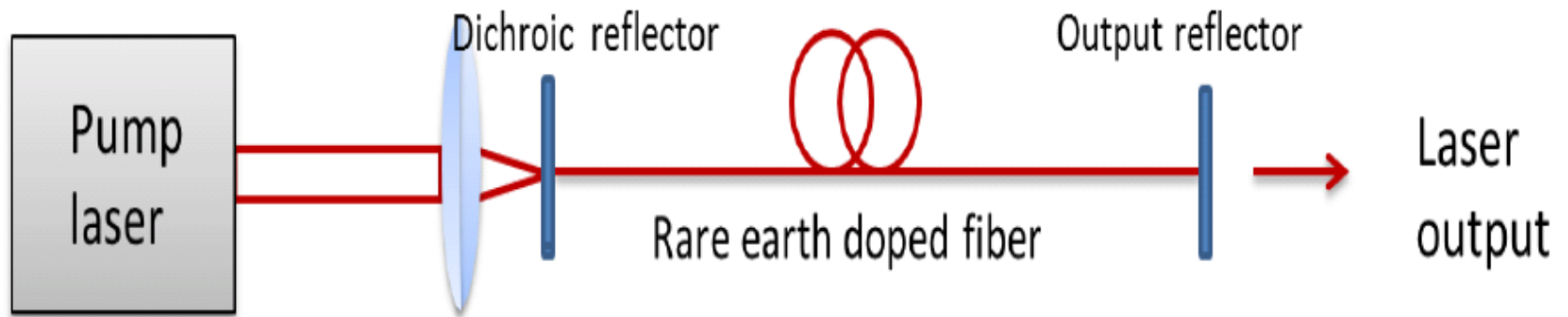
Light Rays

Total Internal Reflection



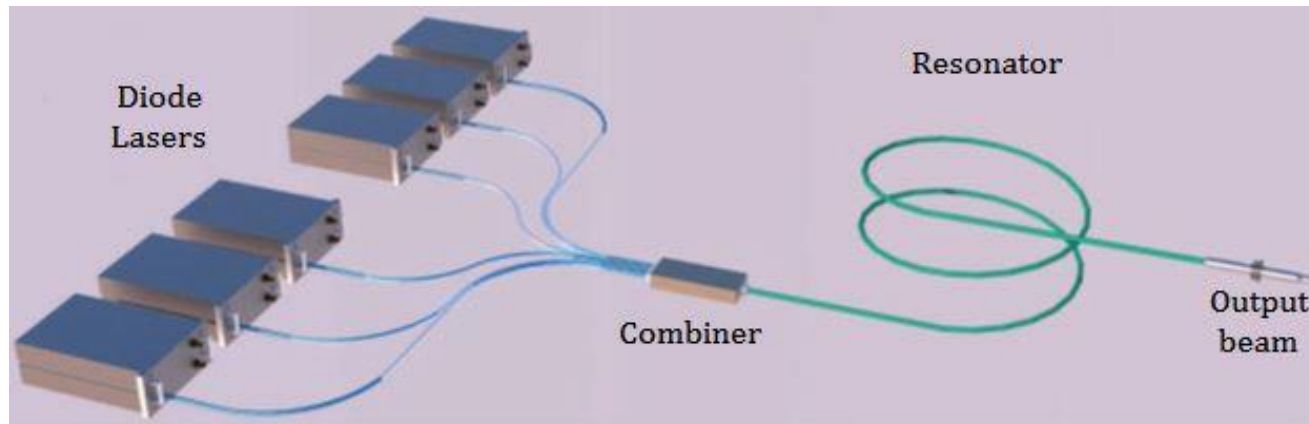
Fiber Lasers Optical Resonators

- Fabry-Perot resonator with dielectric reflectors

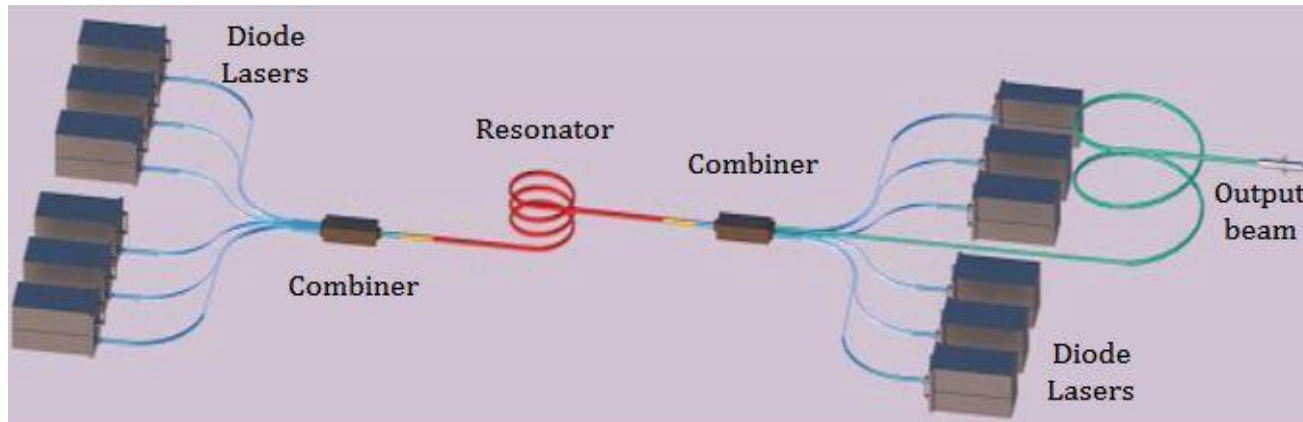


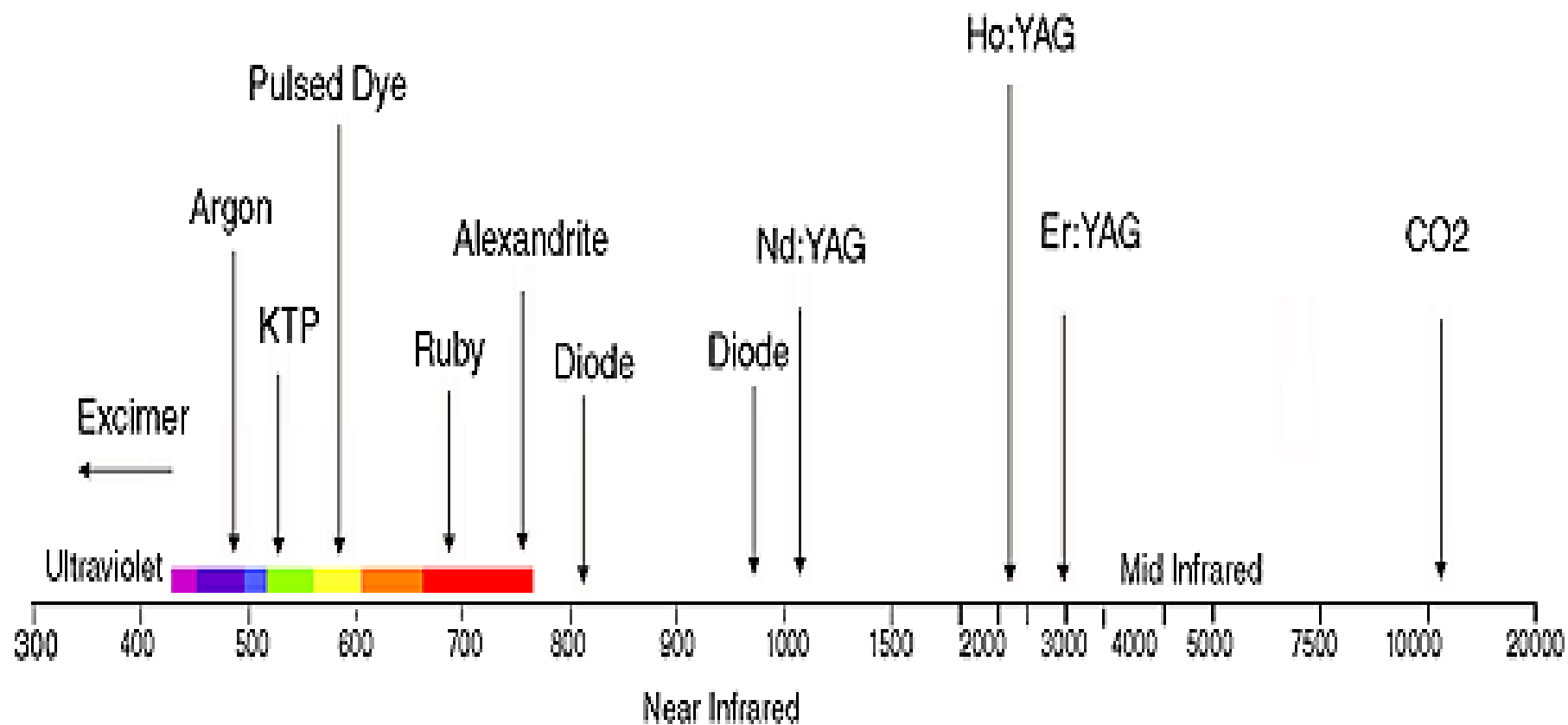
End pumping configurations

- One end pumping for low output powers

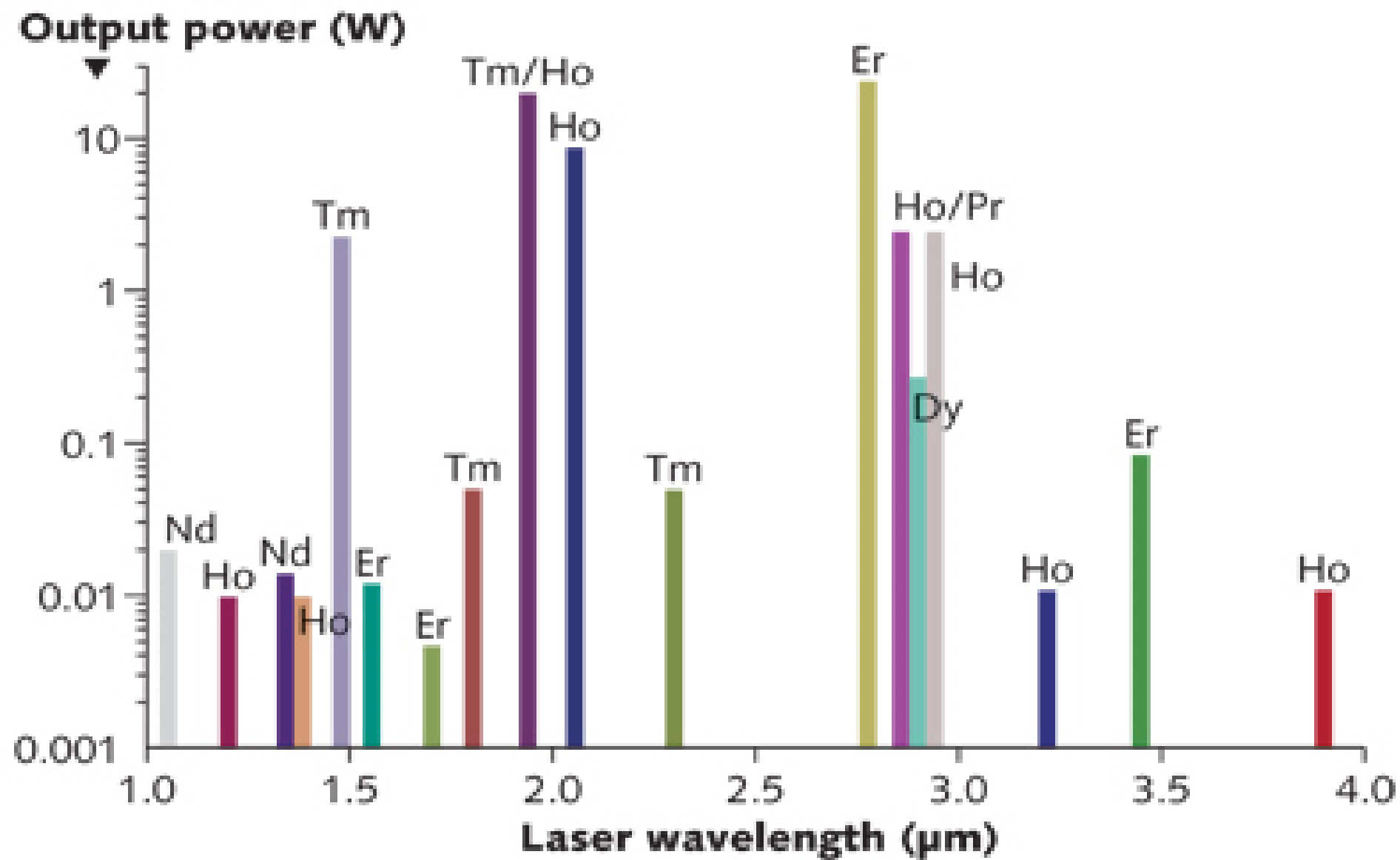


- Double end pumping for high output powers

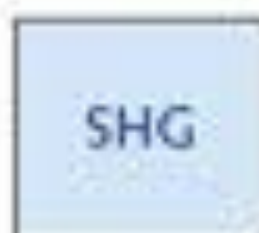




Wavelength (nm)



Yb fiber
1064 nm



532 nm

Er fiber
1540 nm



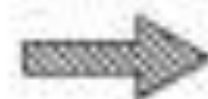
775 nm

Raman fiber
1100–1400 nm

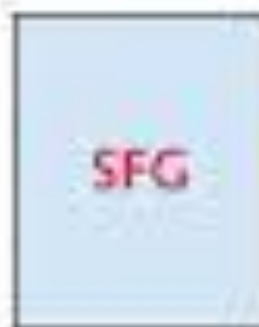


550–700 nm

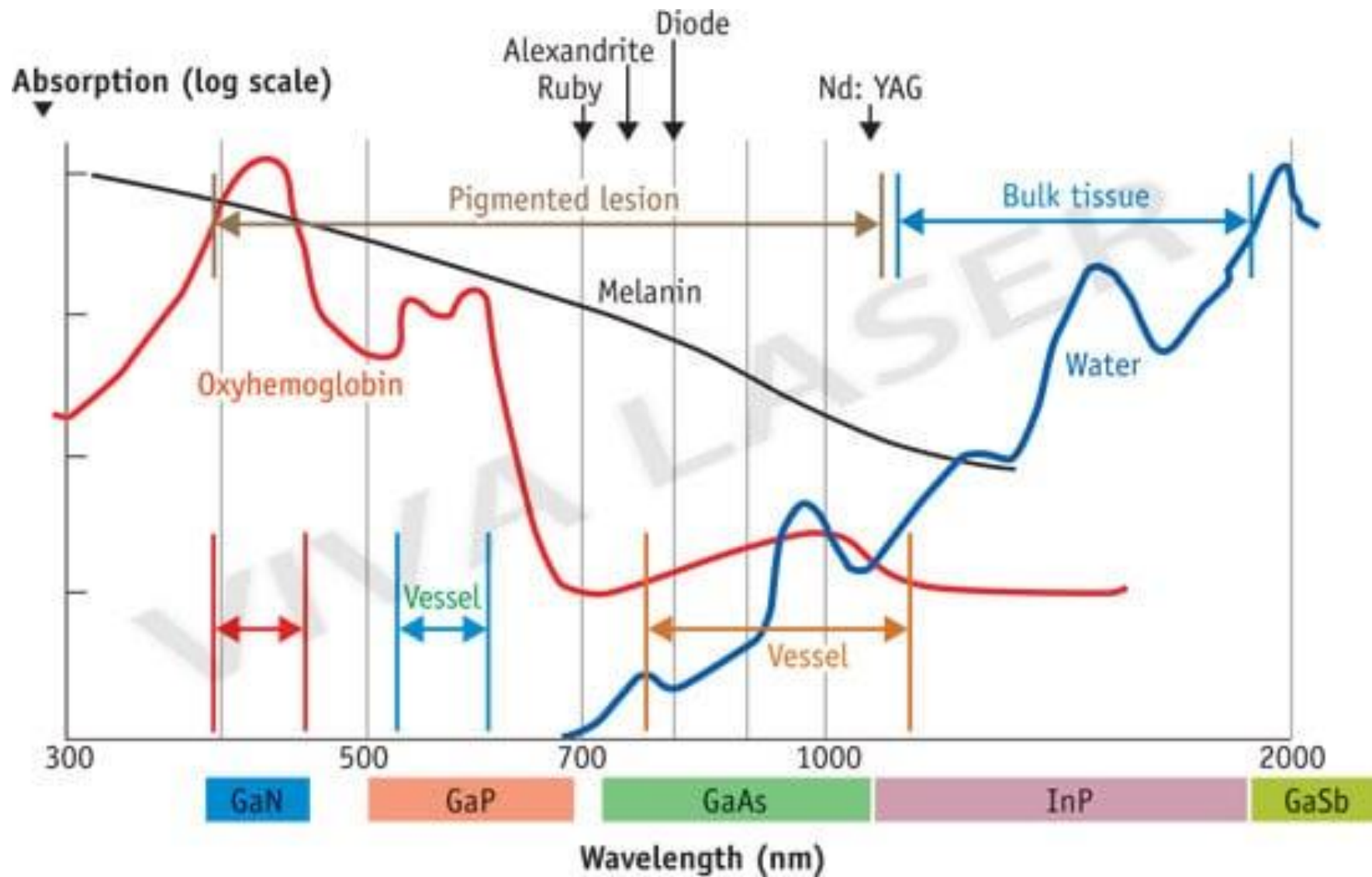
Er fiber
1540 nm



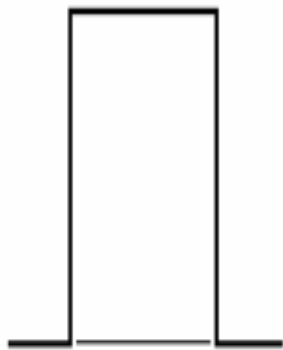
Yb fiber
1064 nm



625–645 nm



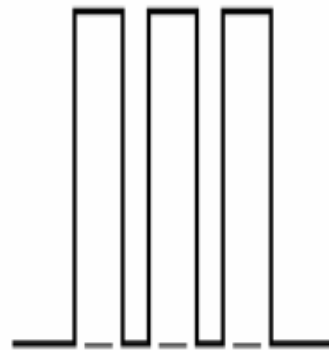
Pulse type



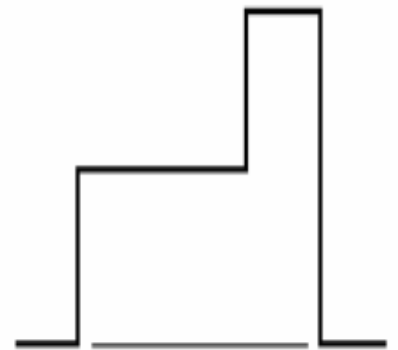
SHORT



LONG



BURST

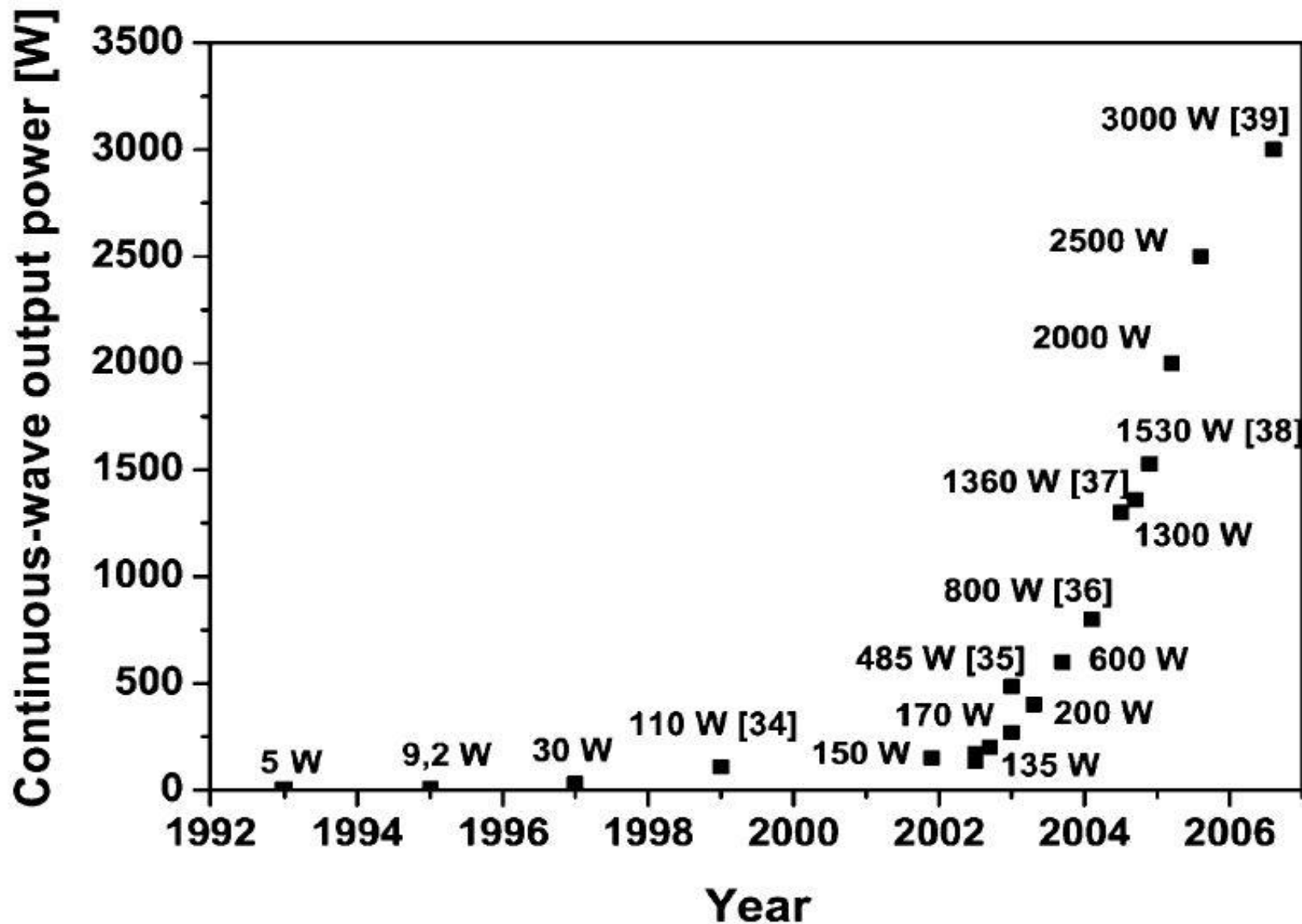


BLEND

Fiber laser advantages 1

- Achieving potential to high powers
- High ratio of surface to Volume which makes efficient cooling and reduction of thermal effects
- Pumped by diode lasers
- High mechanical stability
- Easy transportation

Power growing of fiber laser

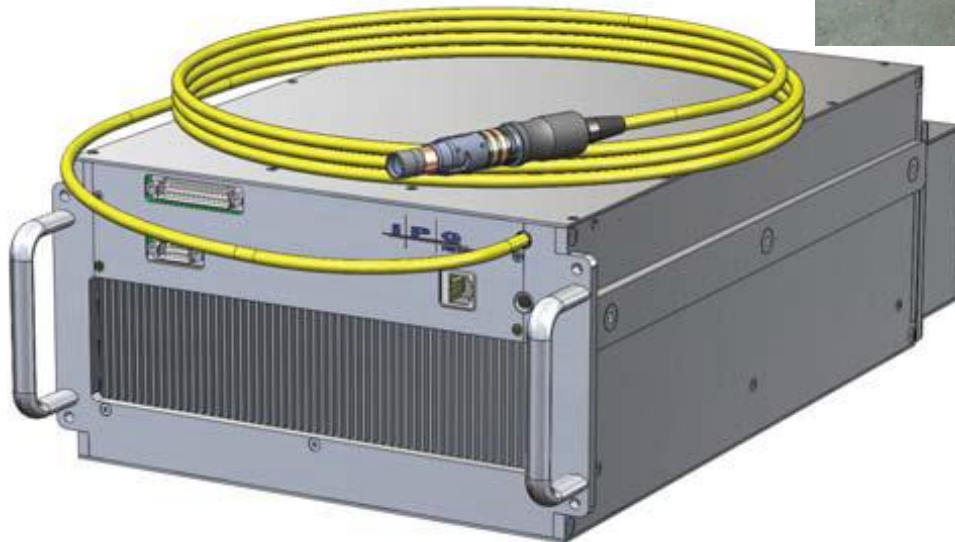


Fiber Lasers

Principles, Advantages & Applications



CO2:
CW 200 W Water cooled
Dimensions:
1550 mm*1140 mm*900 mm
Weight: 200 kg



Fiber laser:
CW 200 W Water cooled
Dimensions:
355 mm* 407mm* 53 mm
Weight : 25 kg

500 watt Ytterbium Fiber Laser



500 W CW Single Mode Output Power

TEM₀₀ operation ($M^2 < 1.05$)

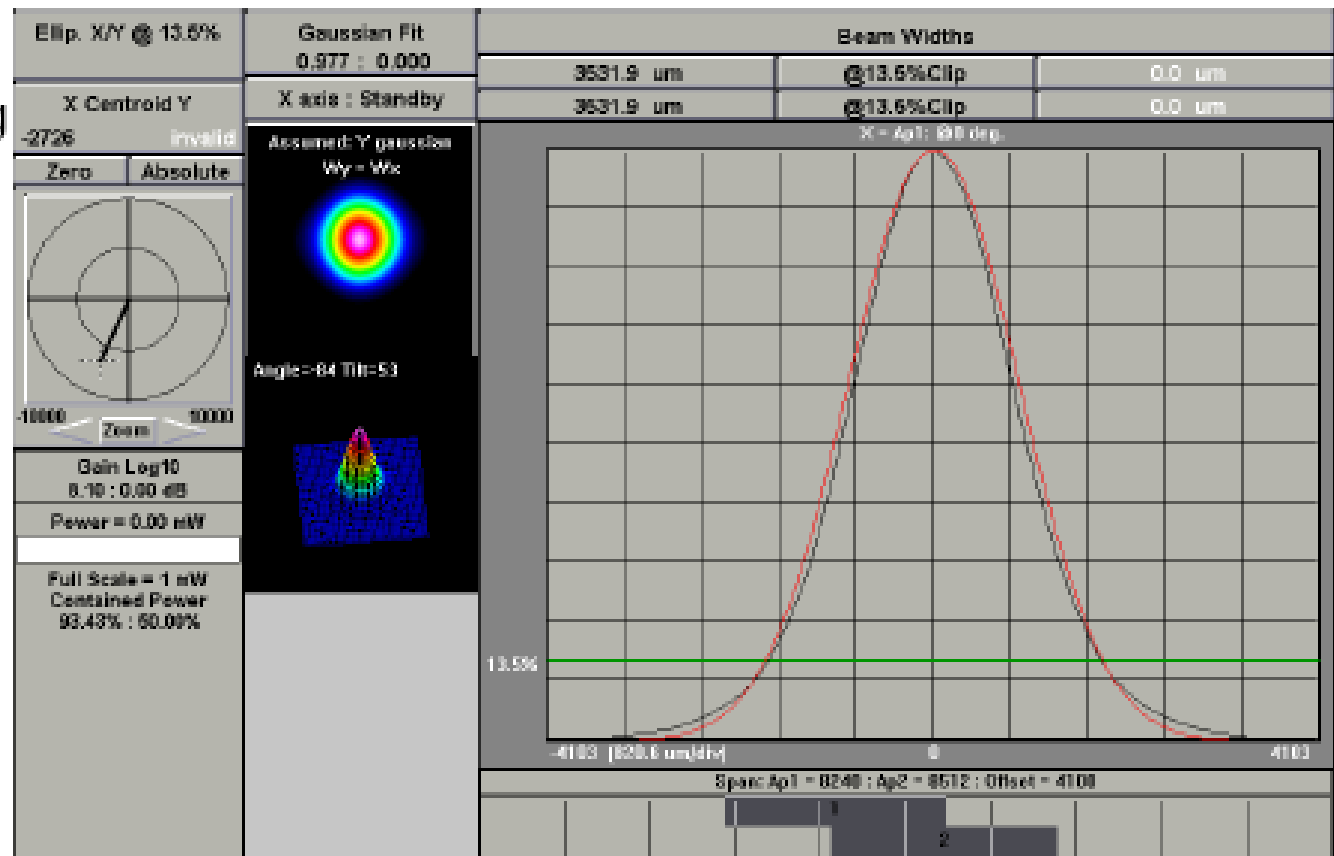
Single Mode Fiber Delivery Line

Size: 19 x 7 x 18 inches Weight: 20kg Air Cooled / 110-220V AC

Beam Quality

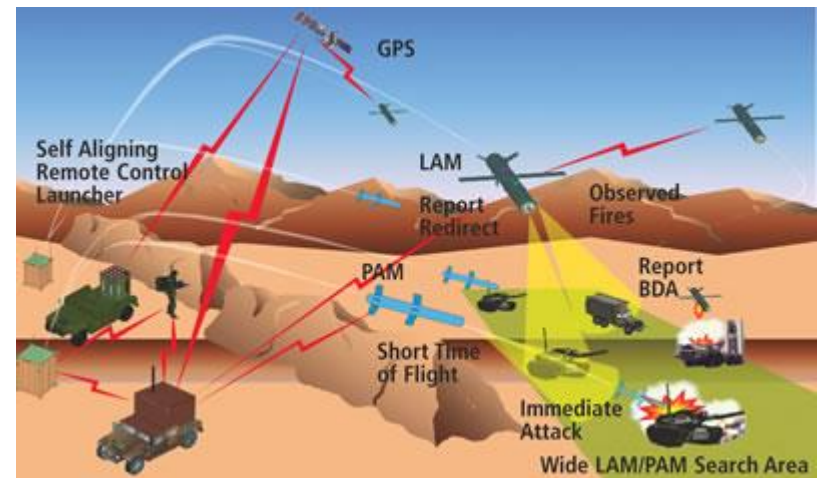
Single Mode

- TEM 00, $M^2 = 1$,
Pure Gaussian
- Used for cutting,
High speed welding
Micro machining



Application of Fiber Lasers

- Fiber Laser application: Industrial, Military, Medical,...



Collagen provides the support network to our skin. As we age, the collagen breaks down causing lines and wrinkles. The laser works by stimulating collagen production. As the new collagen is generated, lines and wrinkles are decreased.

Non-ablative photorejuvenation uses **laser** source that *penetrate the skin in depth without vaporising part of it.*

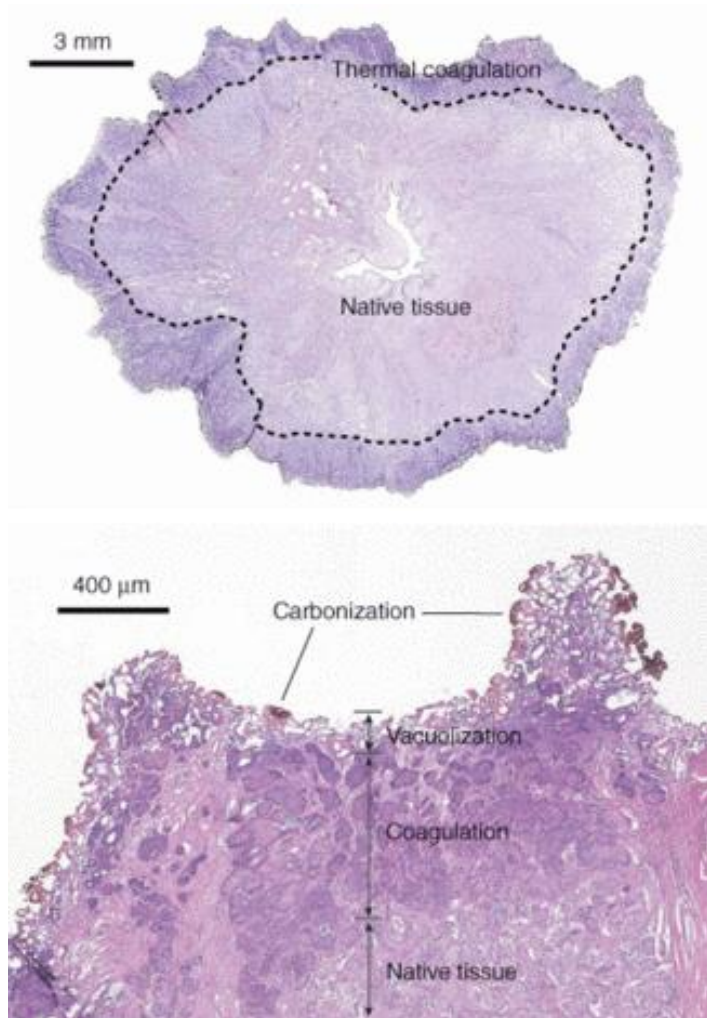
The advantage of such sources is that they do not produce any partial or total removal of the epidermis, thus eliminating the problems associated with this practice.

The advantages of this method are its **non-invasive nature** and **rapid recovery times**, without having to wait for reepithalisation of the epidermis. The drawbacks are that it is less effective than more invasive

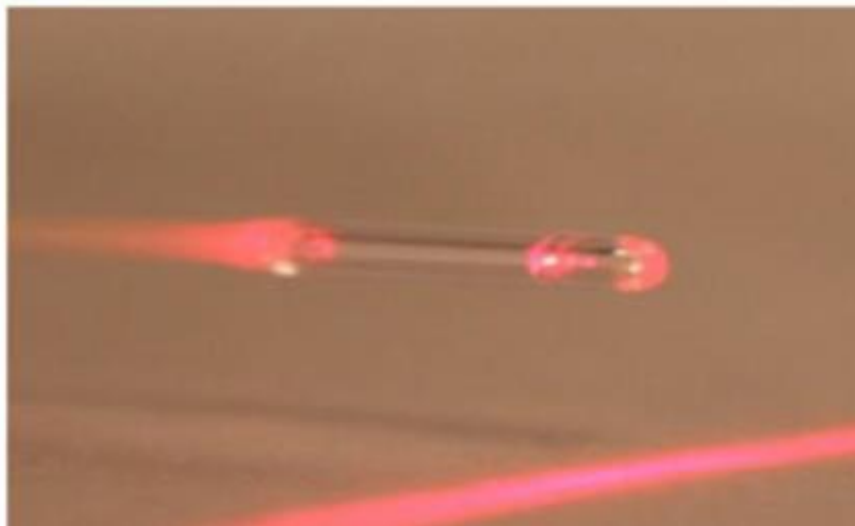
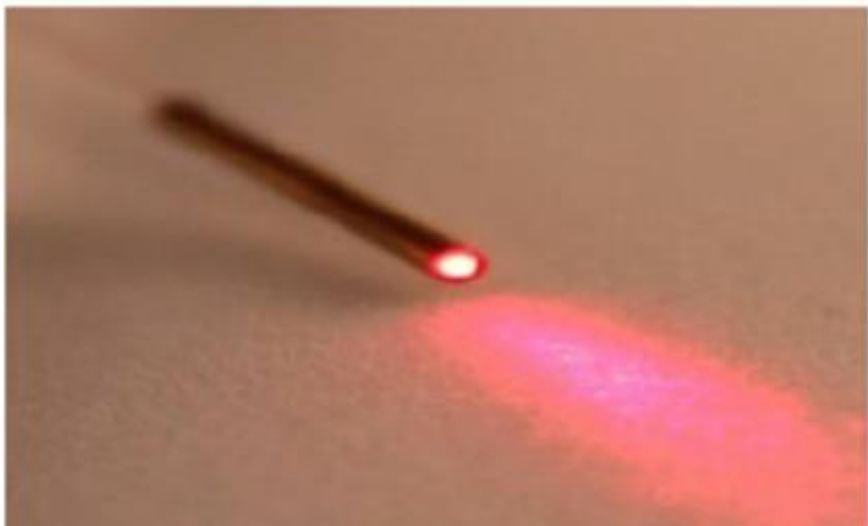
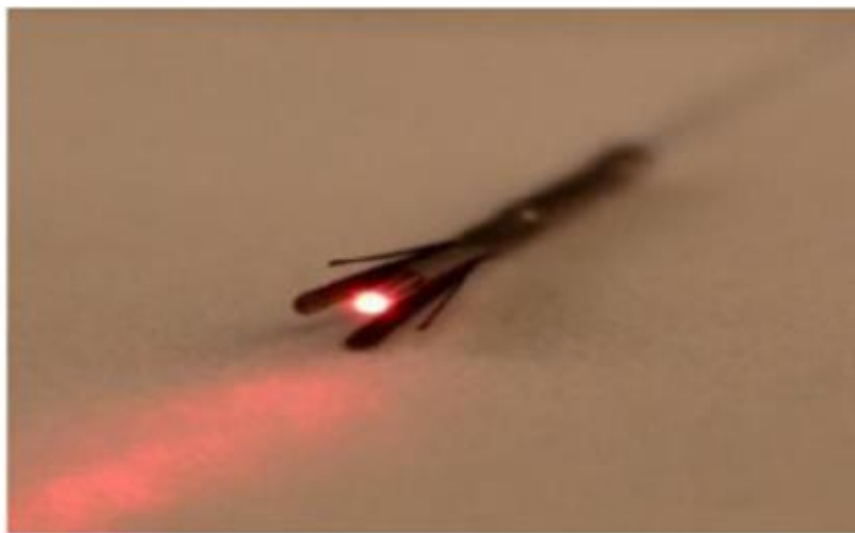
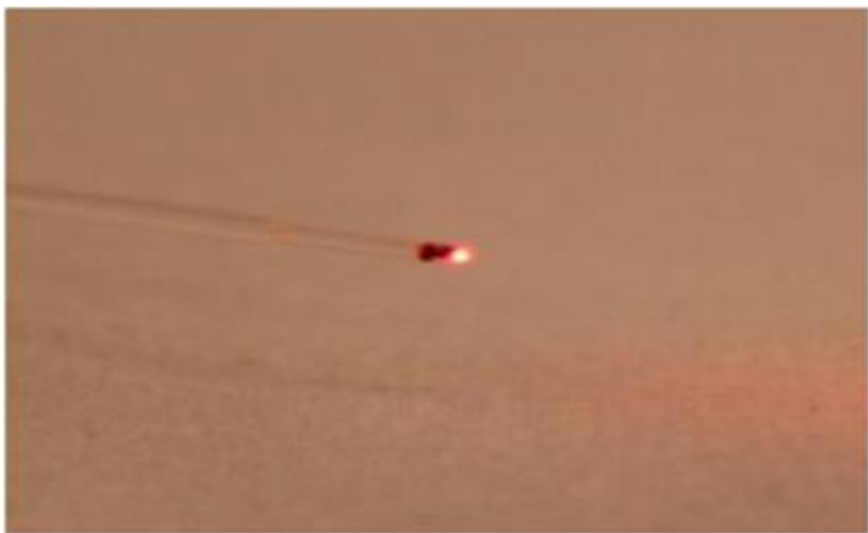


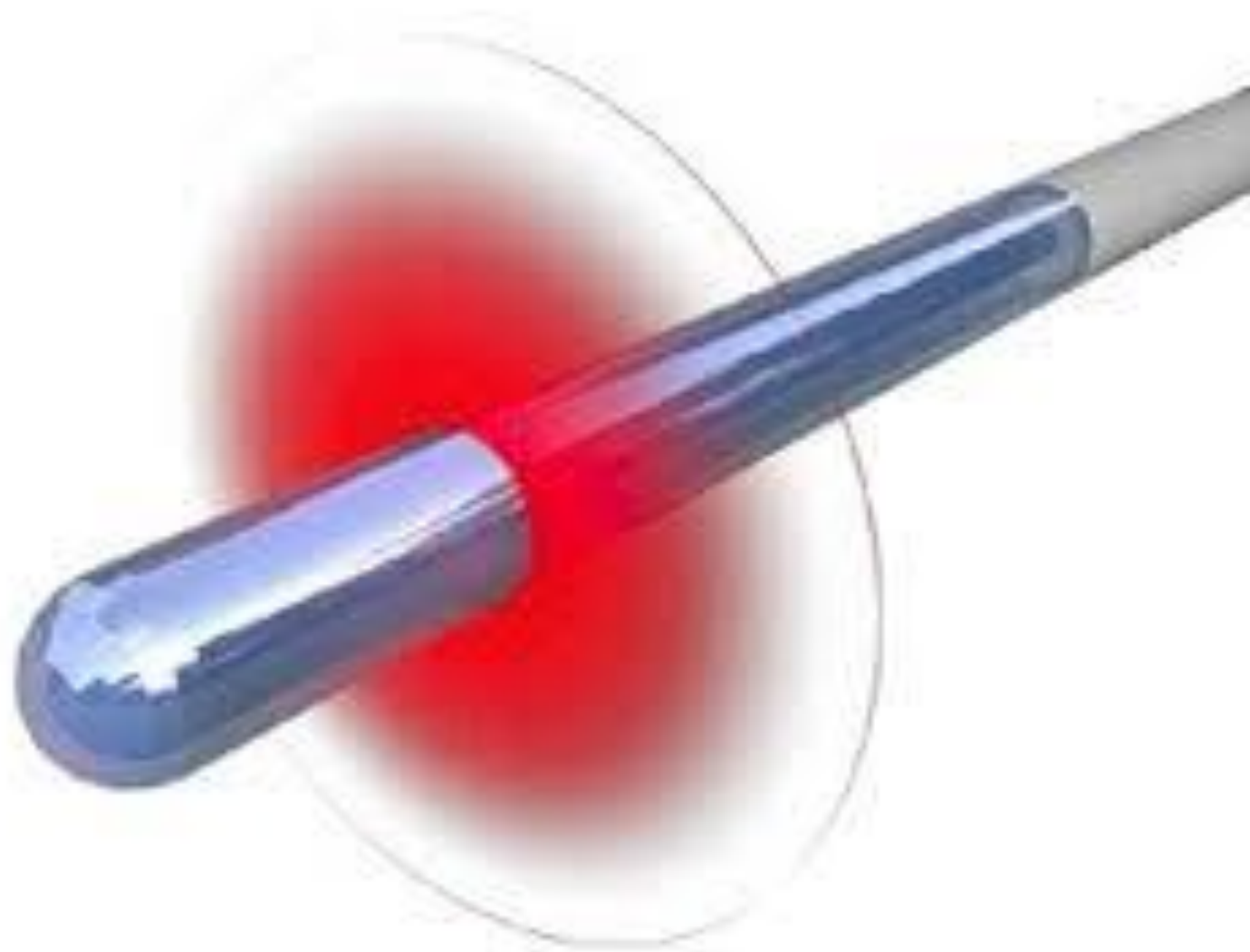
ENDOLIFT®

Medical Fiber Lasers



Using a 110-W thulium fiber laser operating at 1.9 μm , researchers rapidly vaporized prostate tissue at a rate of 0.83 ± 0.11 g/min and with a thermal coagulation zone of 500 to 2000 μm , demonstrating the potential for hemostasis.

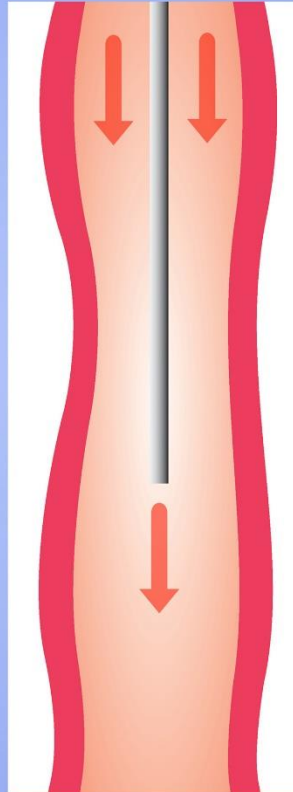




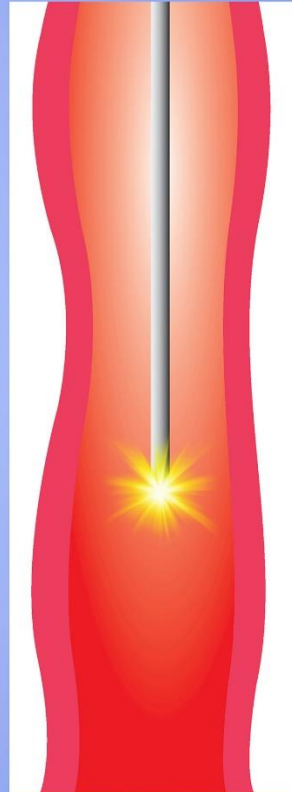
ENDOVENOUS LASER TREATMENT



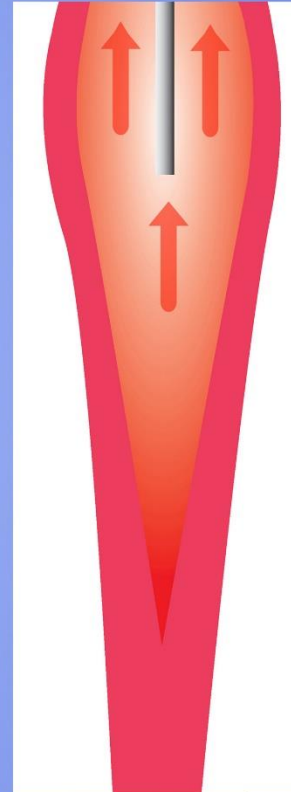
BEFORE



Laser fiber is
inserted in
vein



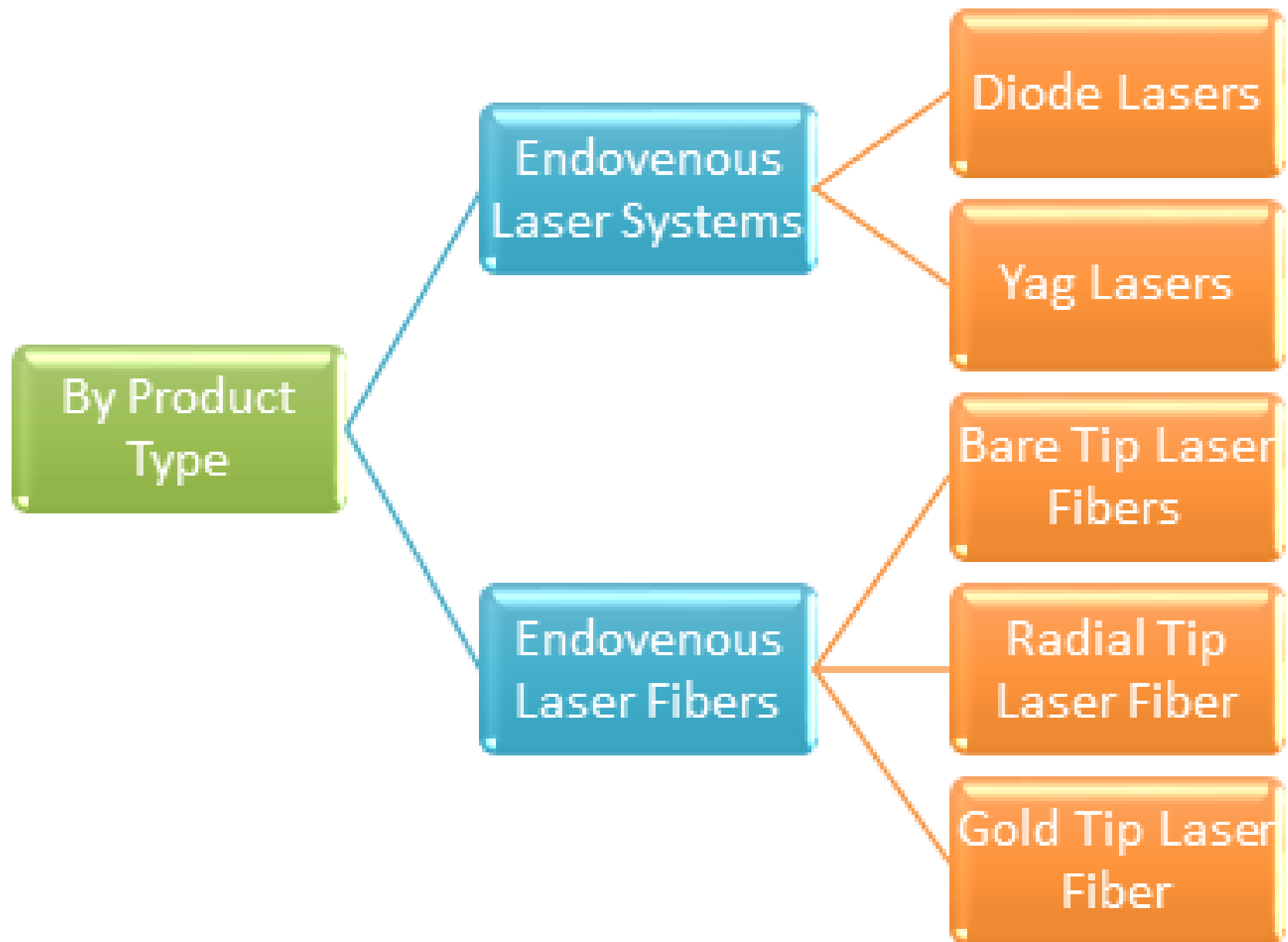
Laser firing
in vein



Laser fiber is
slowly removed.
Closed vein



AFTER

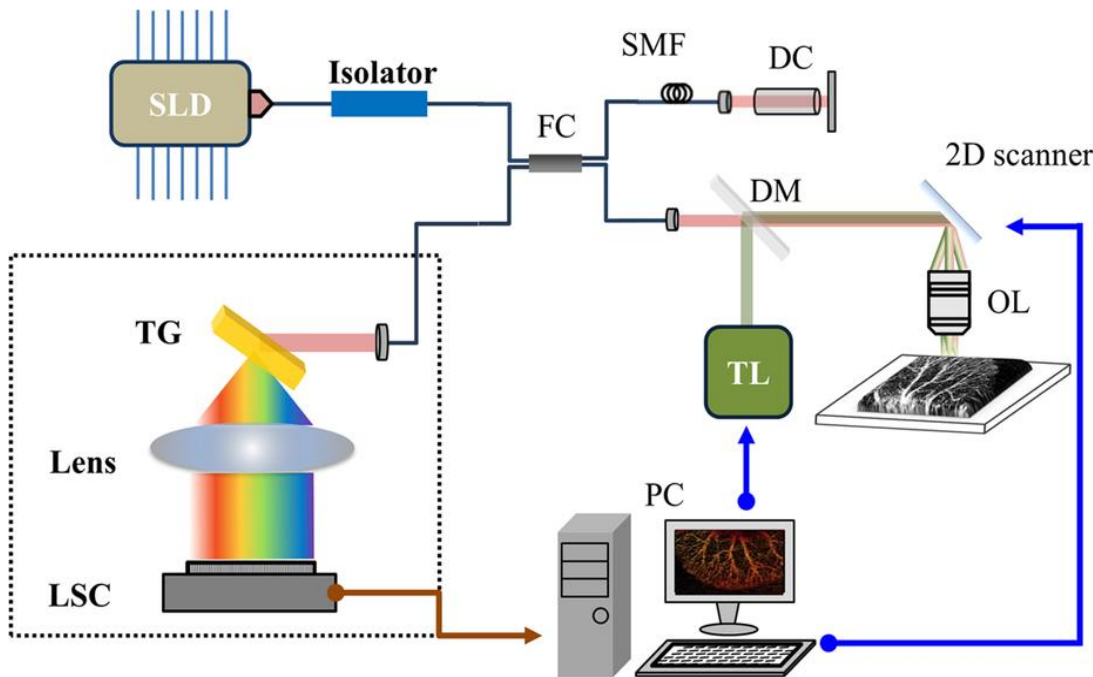


Medical Applications:

● Yb-doped fiber lasers

($\lambda=1.3\mu\text{m}$ and 500mW)

Optical coherence tomography (OCT)



Significant Growth for Fiber Laser Sources

Fiber Laser Market Analysis

