Optical Fiber Communications

Chapter 4

Optical Sources – Laser Diode

Laser Diode (LD)

Did you know…

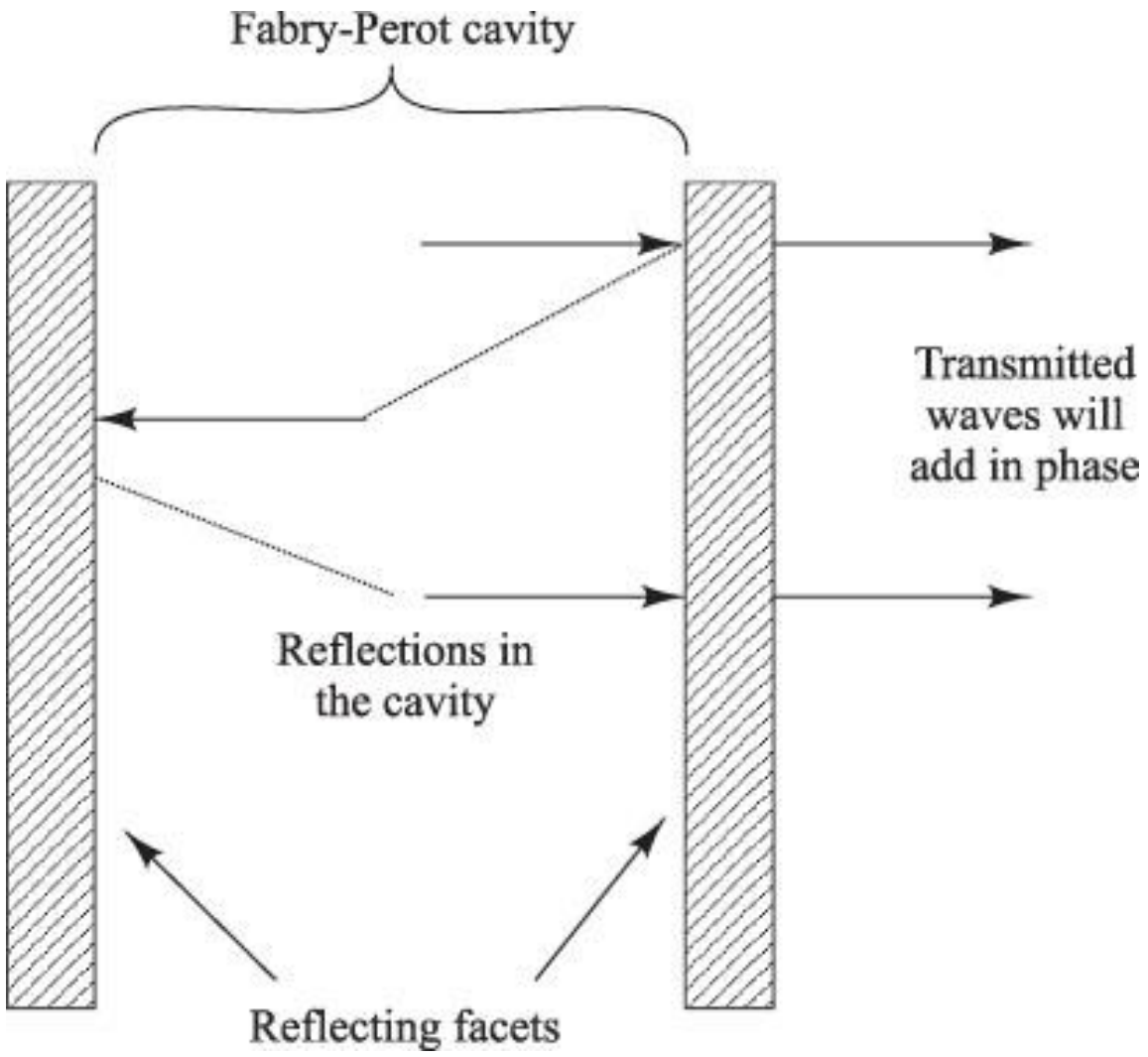
- LASER is an acronym?

Did you know…

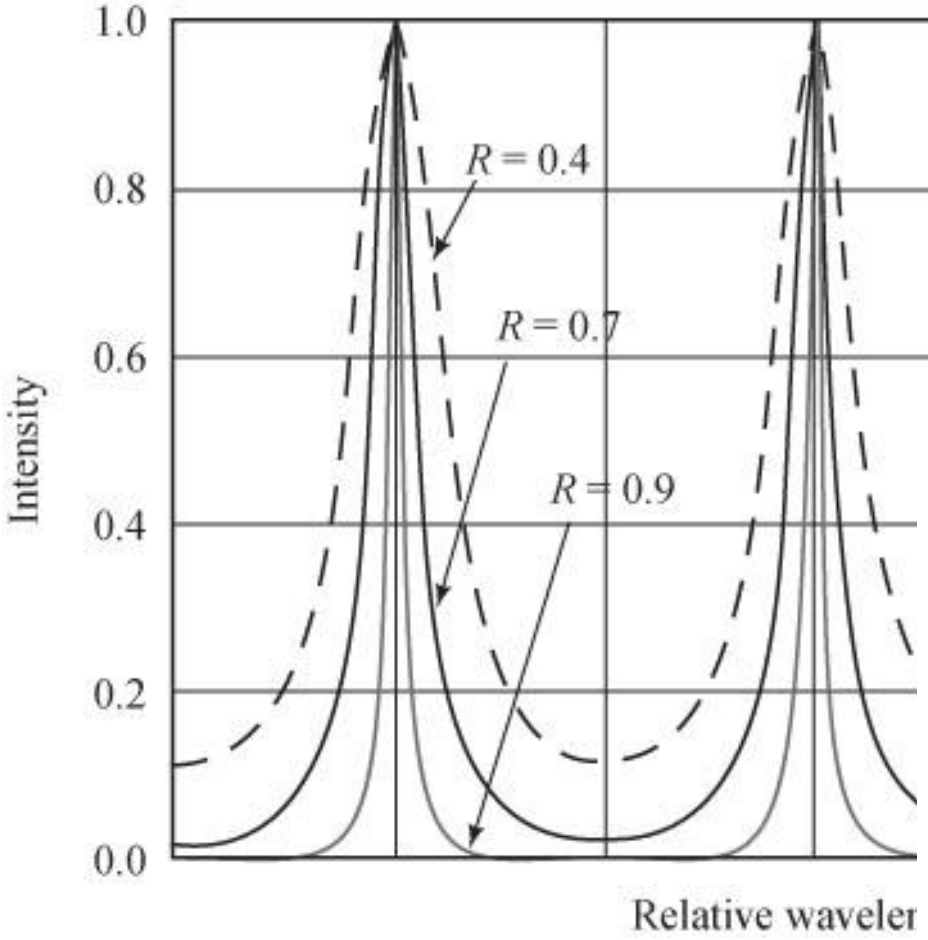
- LASER is an acronym?
  - It stands for **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation
  - This explains the working principle for the LASER

Fabry Perot (FP) Laser

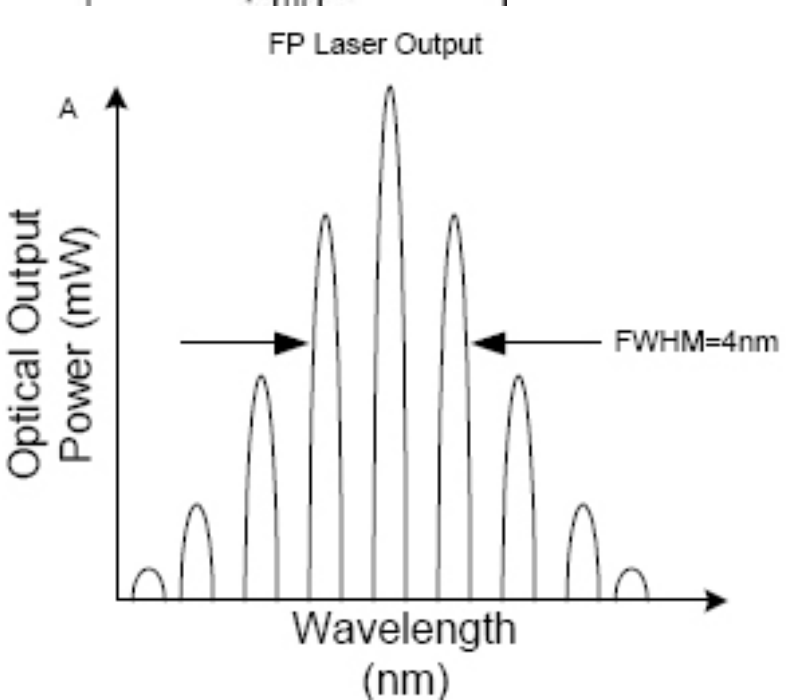
Basic Laser Structure (FP laser)



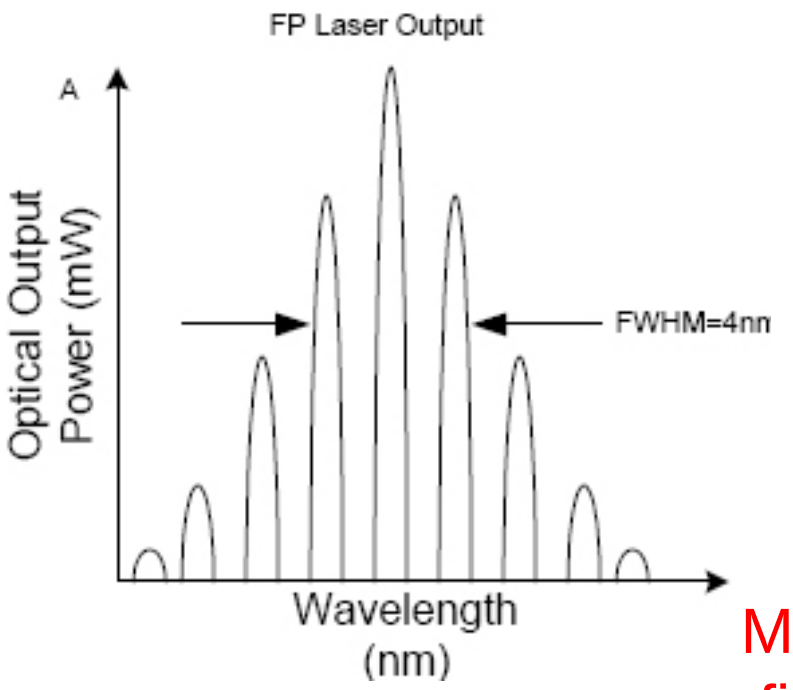
Basic Laser Structure (FP laser)



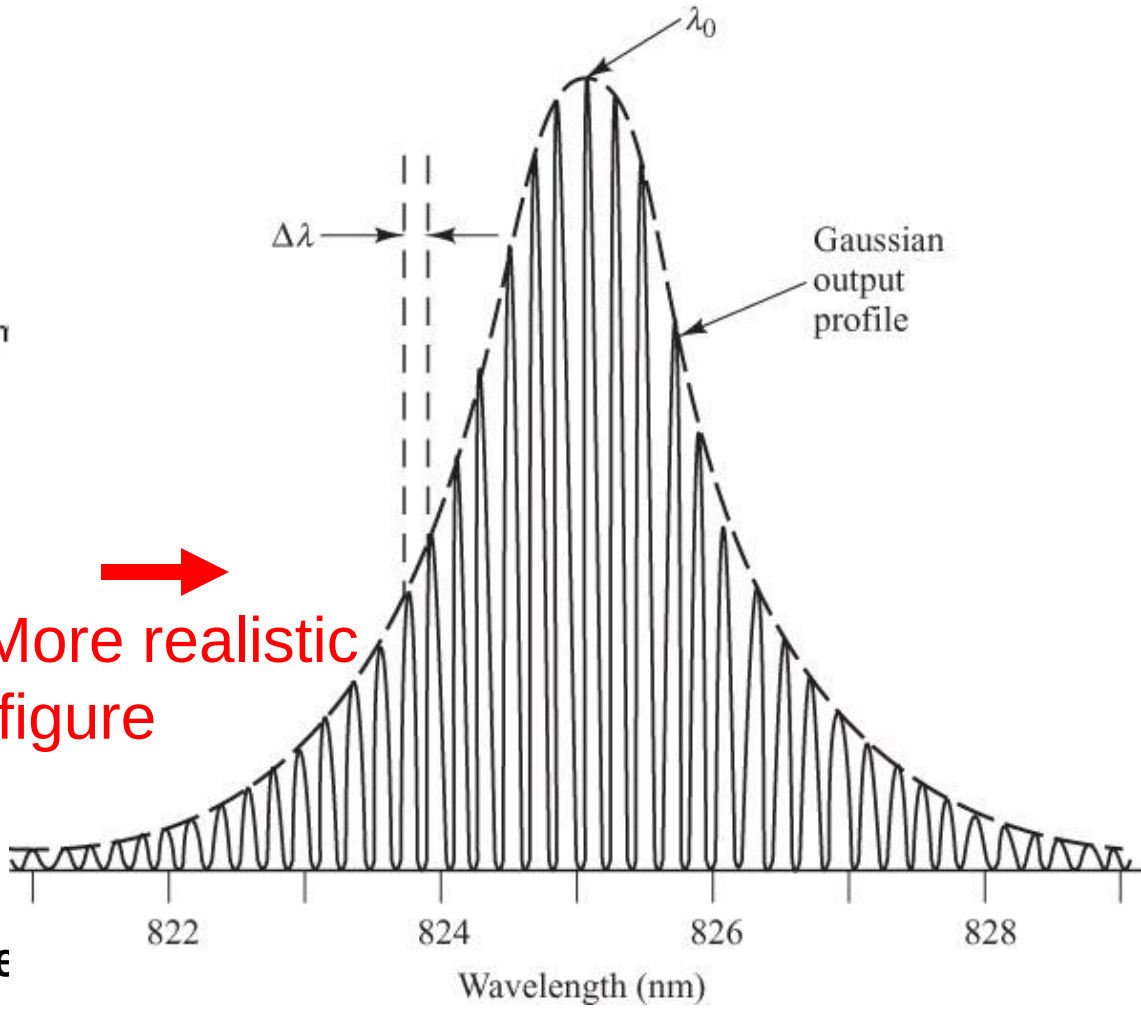
Multi-mode Laser



Basic Laser Structure (FP laser)

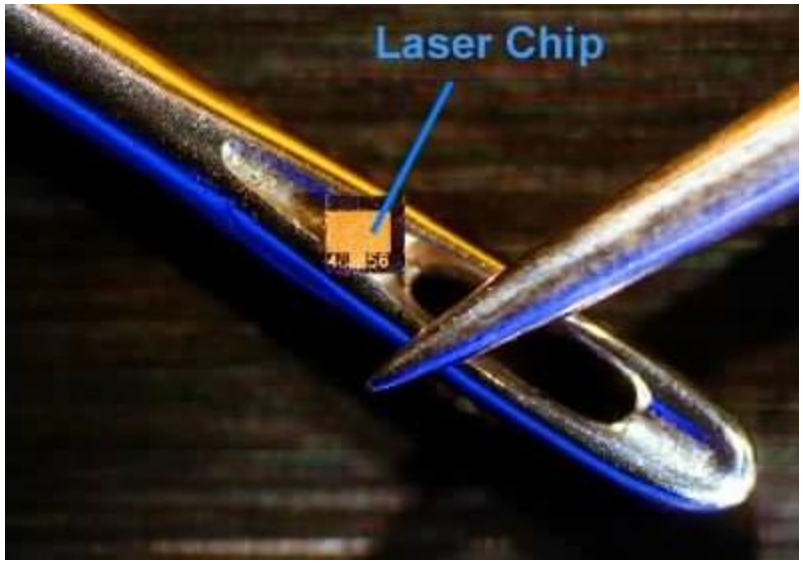


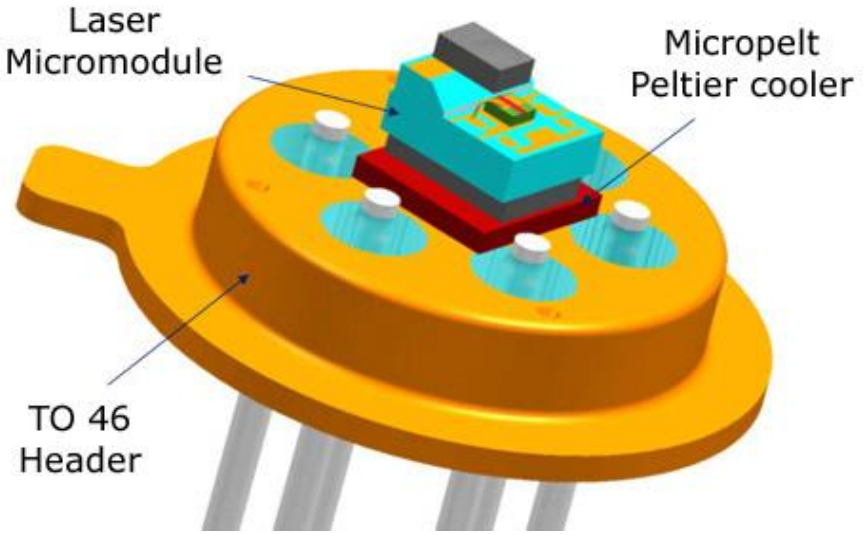
More realistic figure



Multi-mode Lase

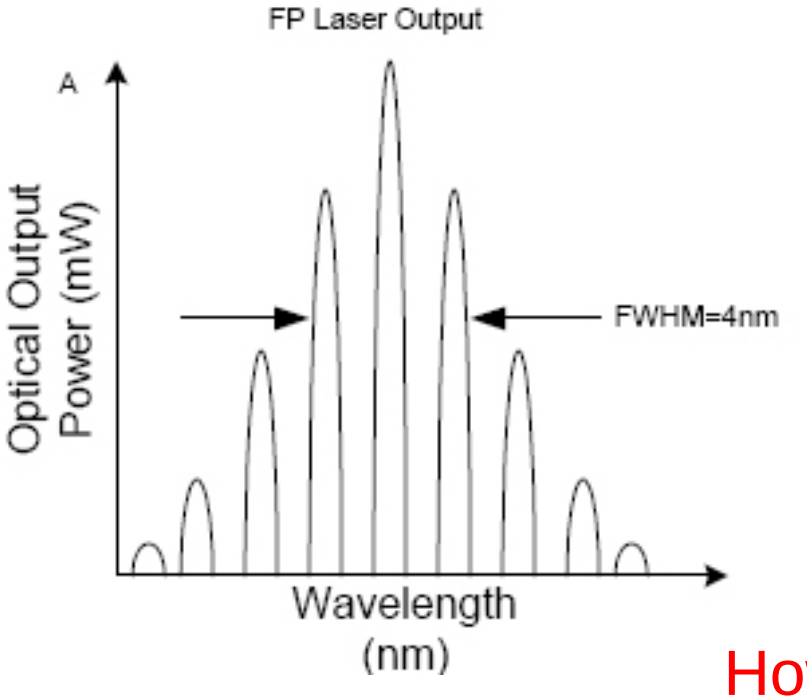
Basic Laser Structure (FP laser)

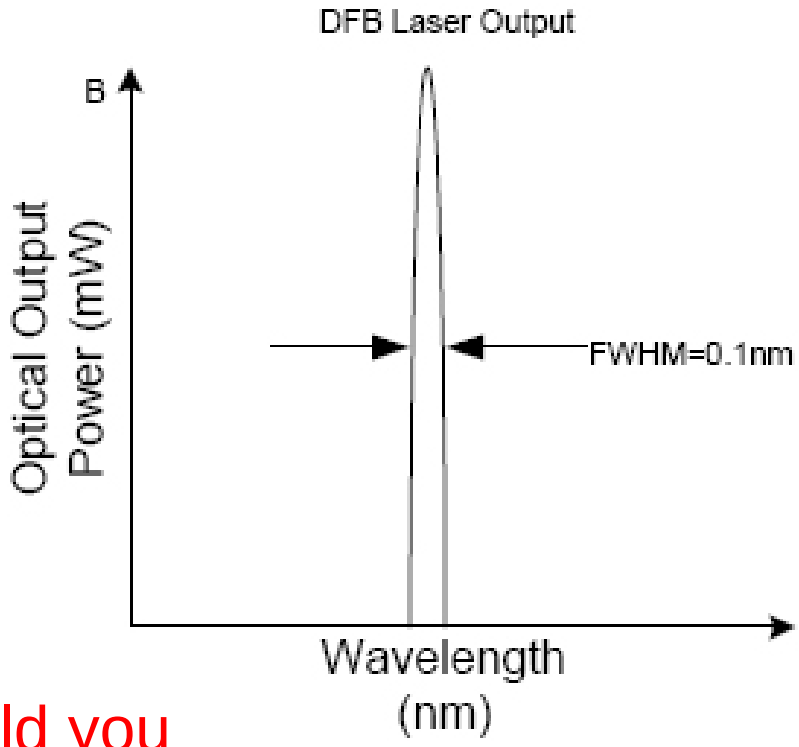




DFB (Distributed Feedback) Laser

DFB Laser Structure



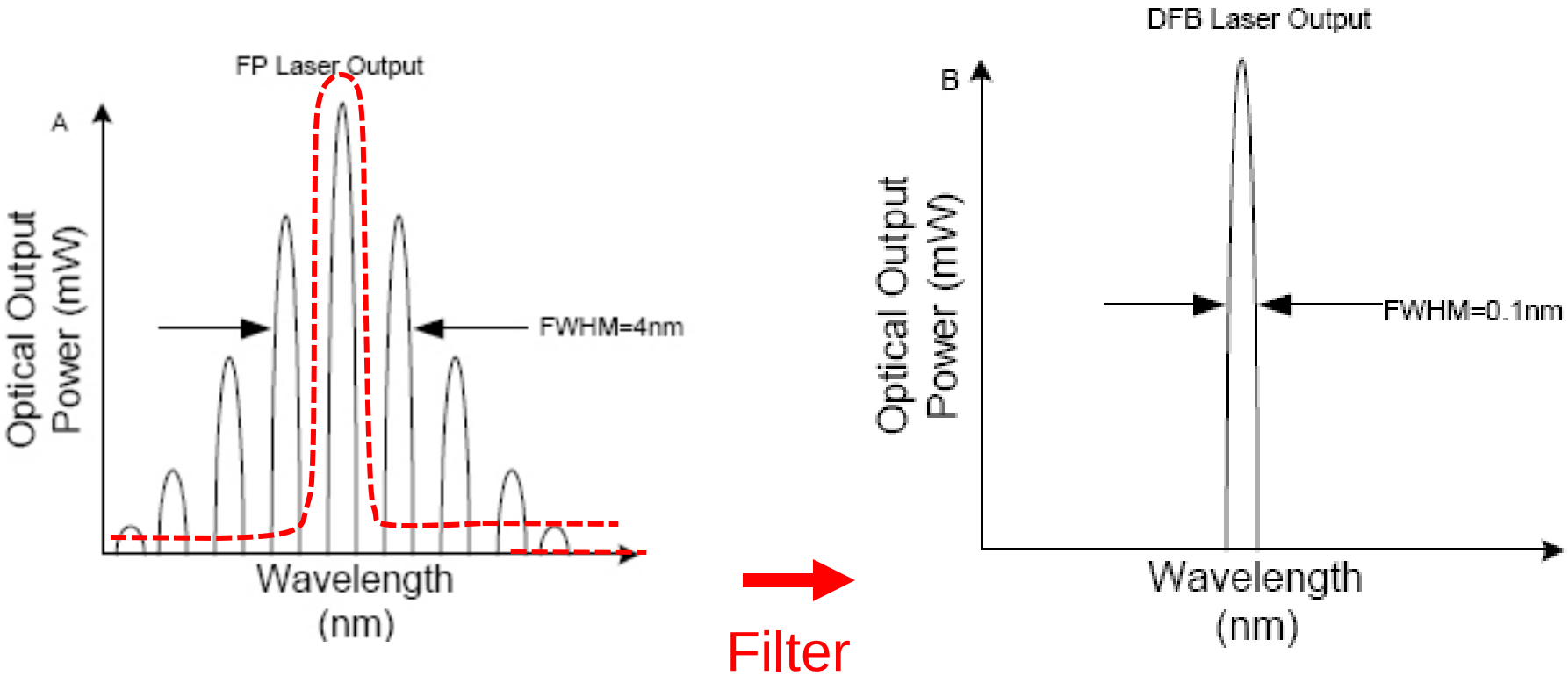


How would you create this?

Multi-mode Laser (Basic Laser)

Single-mode Laser

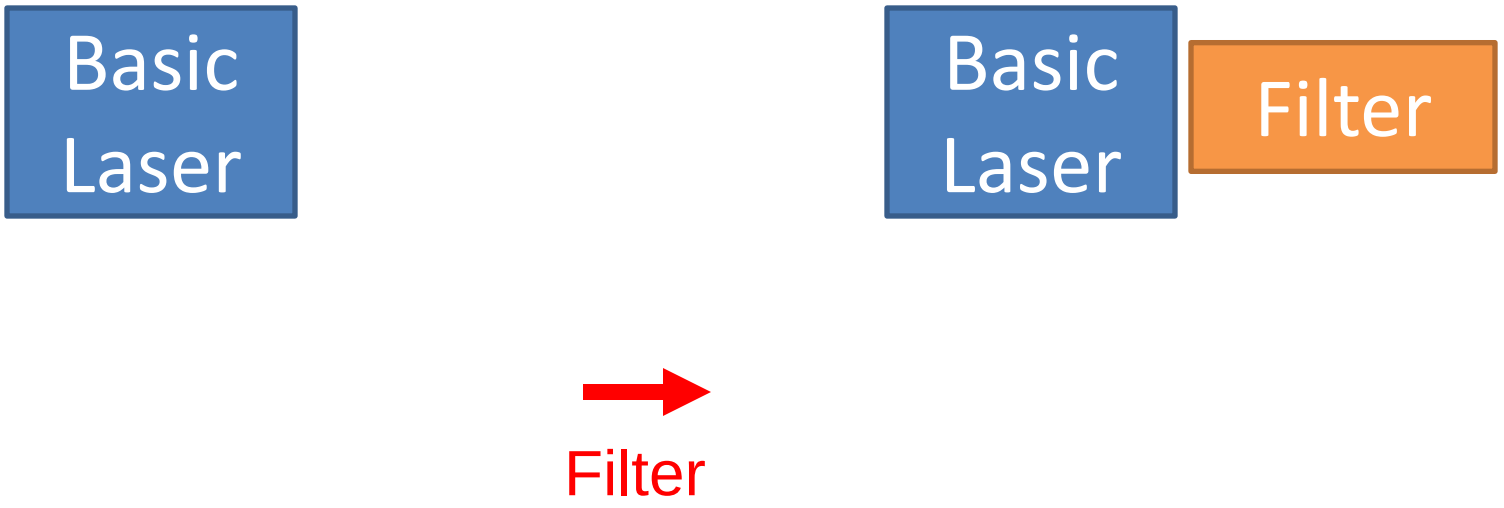
DFB Laser Structure



Multi-mode Laser (Basic Laser)

Single-mode Laser

DFB Laser Structure

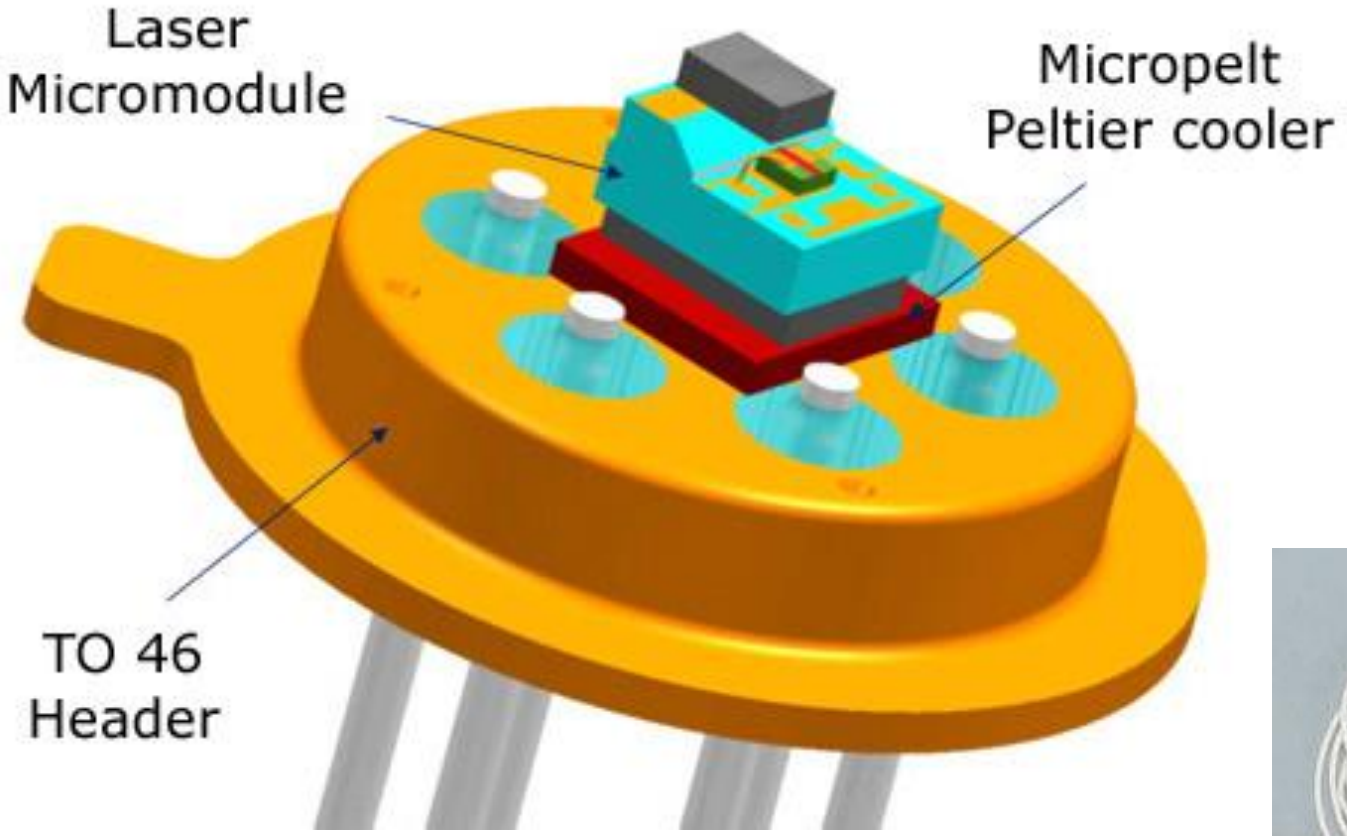


Multi-mode Laser (Basic Laser)

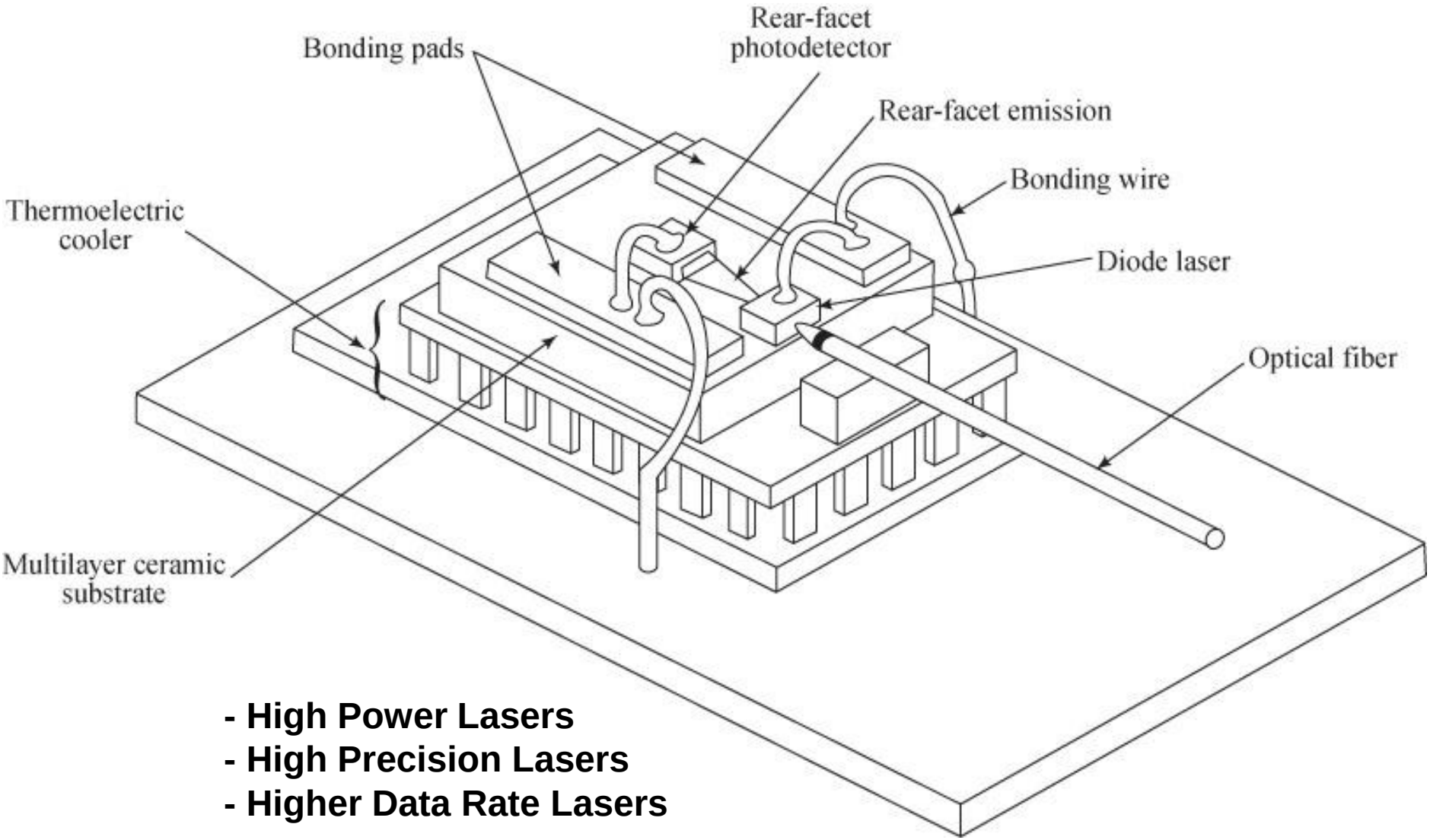
Single-mode Laser

Laser Packages

TO Can Package

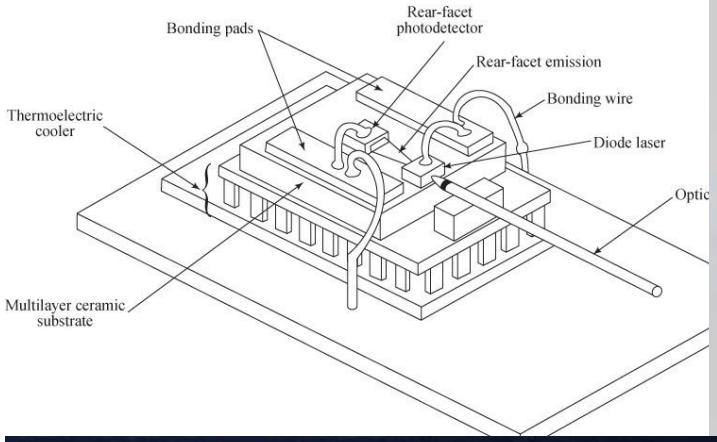


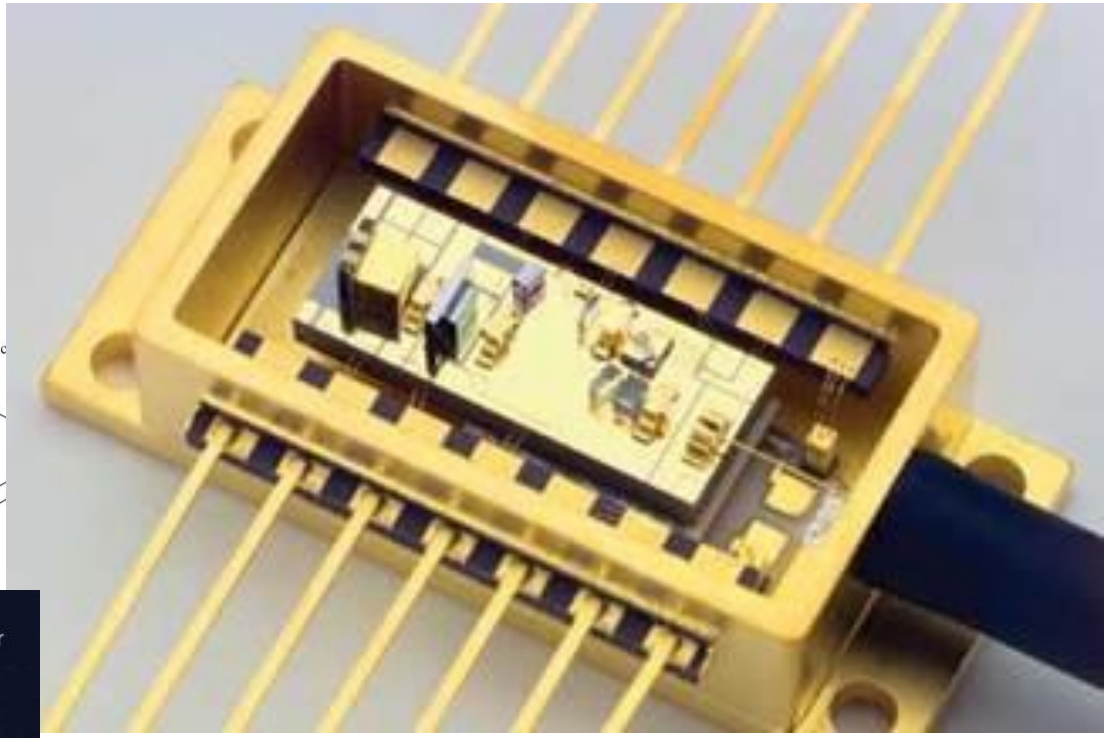
Butterfly Package

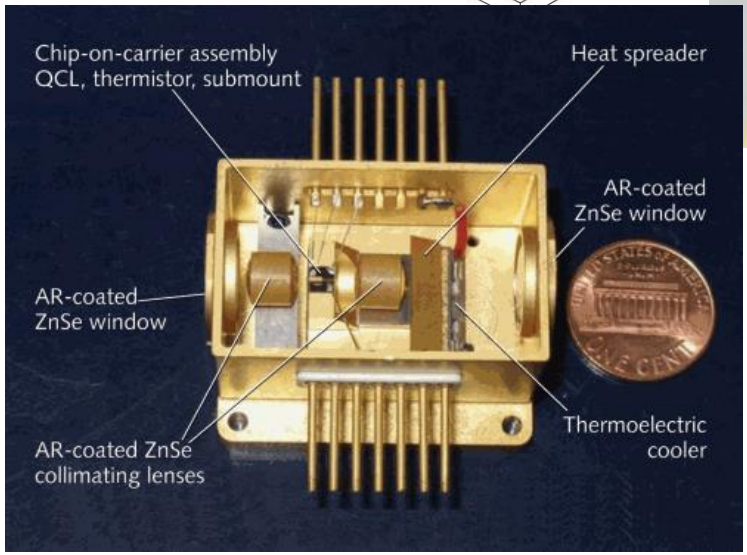


- **High Power Lasers**
- **High Precision Lasers**
- **Higher Data Rate Lasers**

Butterfly Package





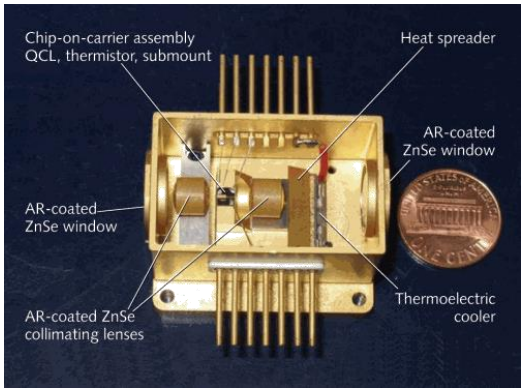


Optical Transmitter Packages

Hierarchy in Fiber Optics

Laser Chip

Process : nm
Size : mm

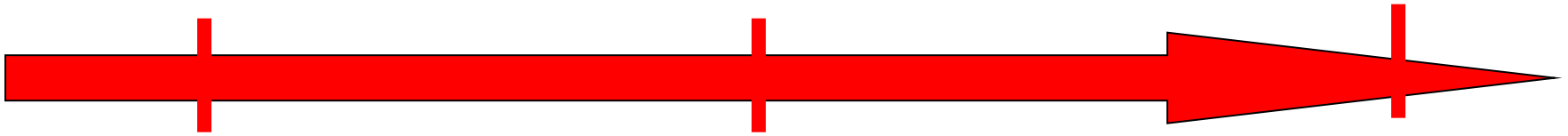


Laser Diode Package

Process : um
Size : cm

Optical Transmitter (Receiver) Package

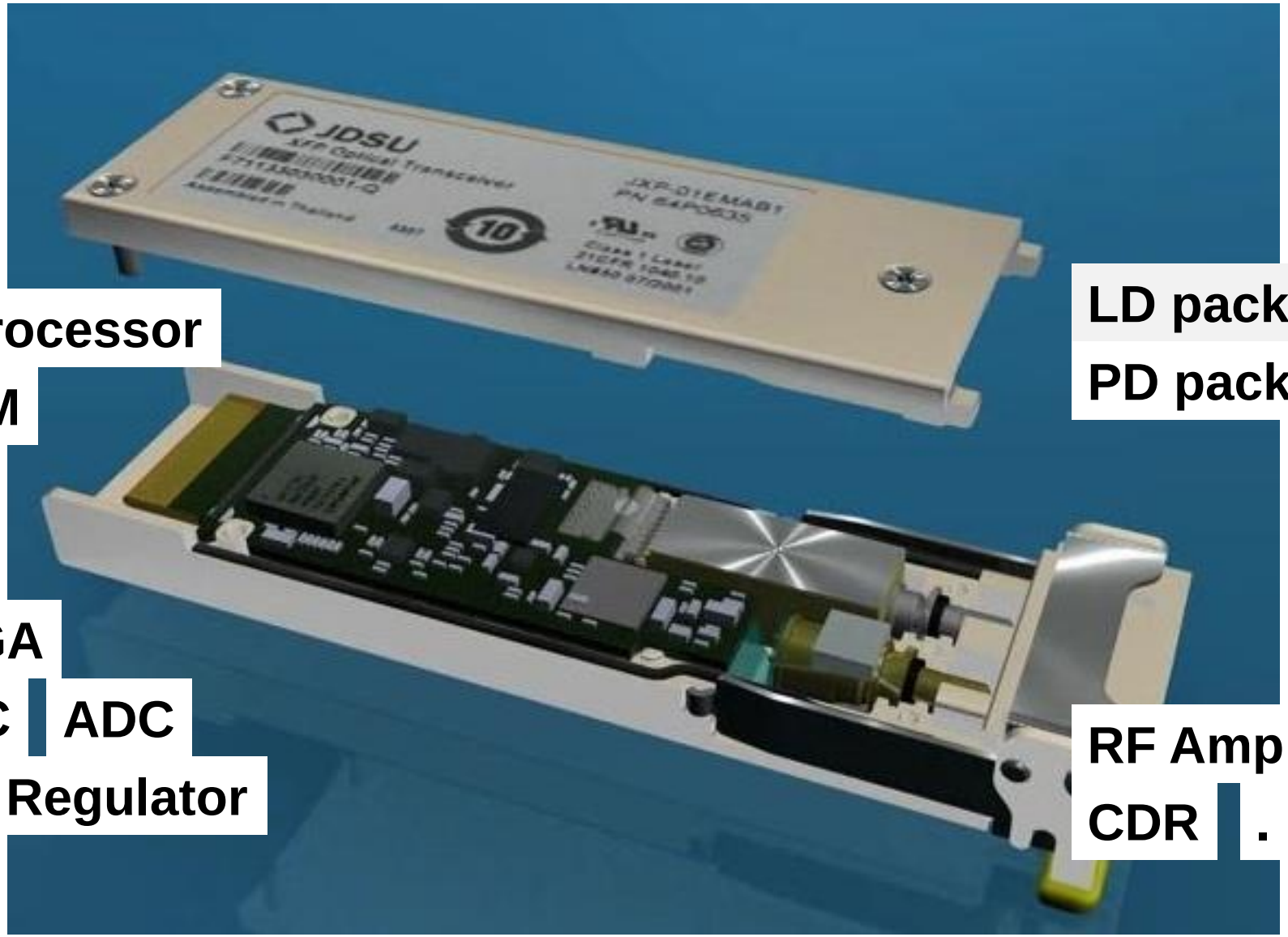
Process : mm
Size : cm



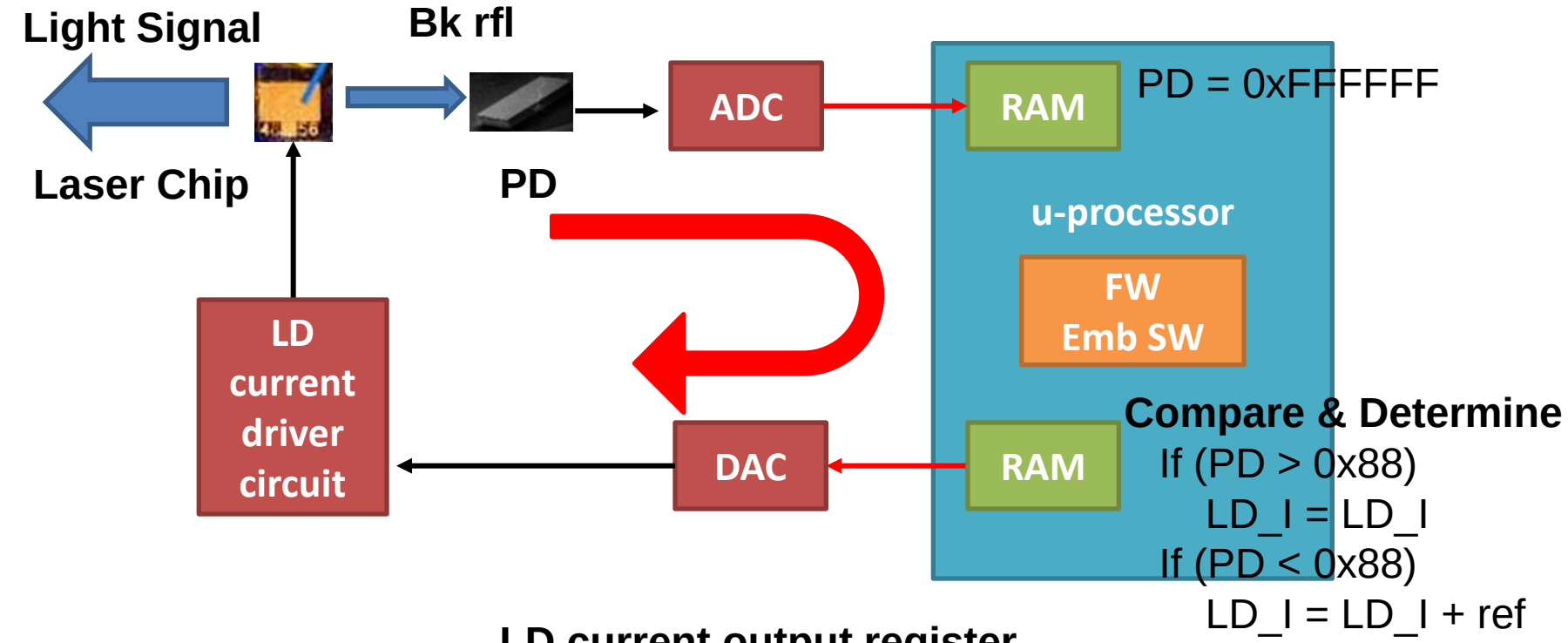
Optical Transmitter Package

- Not only “fiber optic” system anymore
- The system has a brain
  - Which monitors itself
  - Which controls itself

Optical Transmitter Package



(Ex) Feedback loop for const. opt. pwr



PD input table

PD = 0x000000
PD = 0x000001
PD = 0x000010
PD = 0xFFFFFF

Compare & Determine

If (PD > 0x88)
LD_I = LD_I
If (PD < 0x88)
LD_I = LD_I + ref

LD current output register

LD = 0x000088 → 20mA
LD = 0x000100 → 35mA