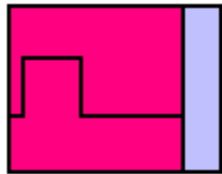


Optical Sources

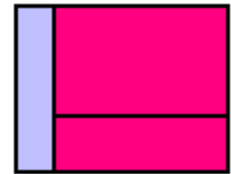
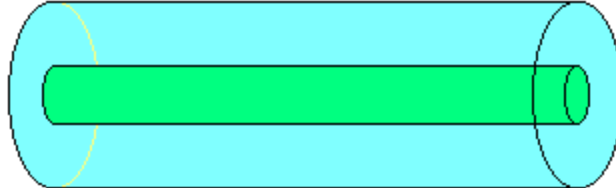


OPTICAL FIBER Communication

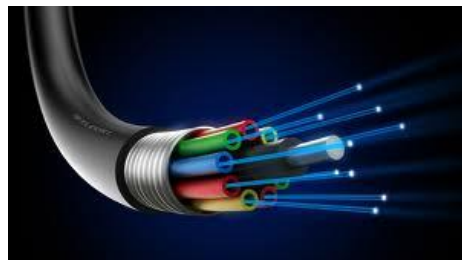
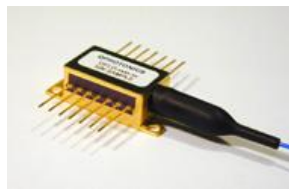
Optical Fiber



Tx optical Source



Rx optical detector



Types of Optical Fiber compatible Sources

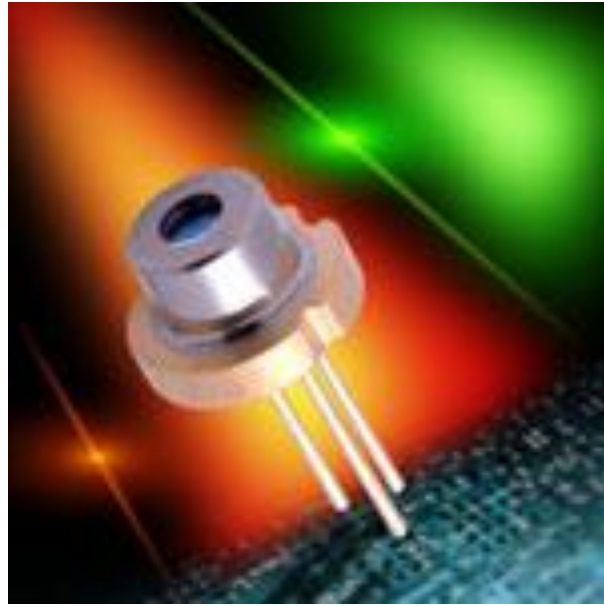
- LED (Light Emitting Diodes)



- LASER

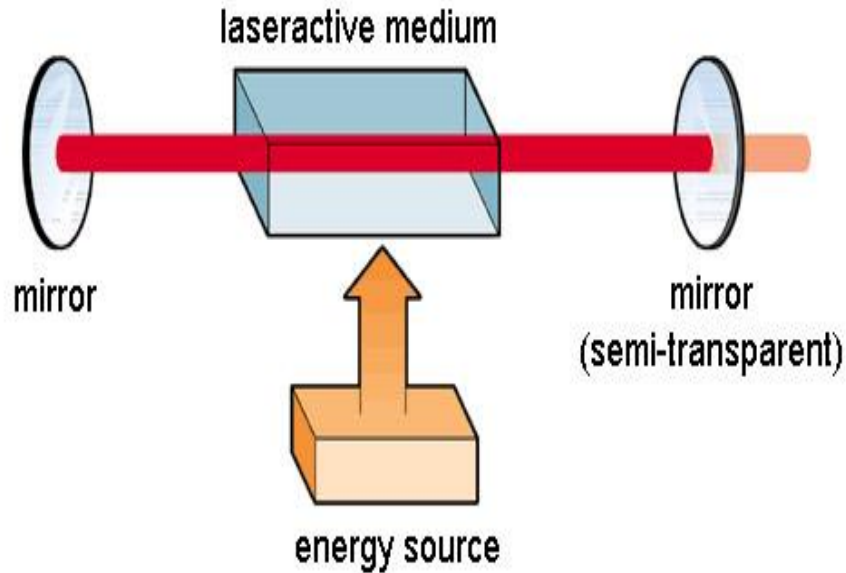
(Light Amplification by Stimulated Emission of Radiation)





Laser Diodes

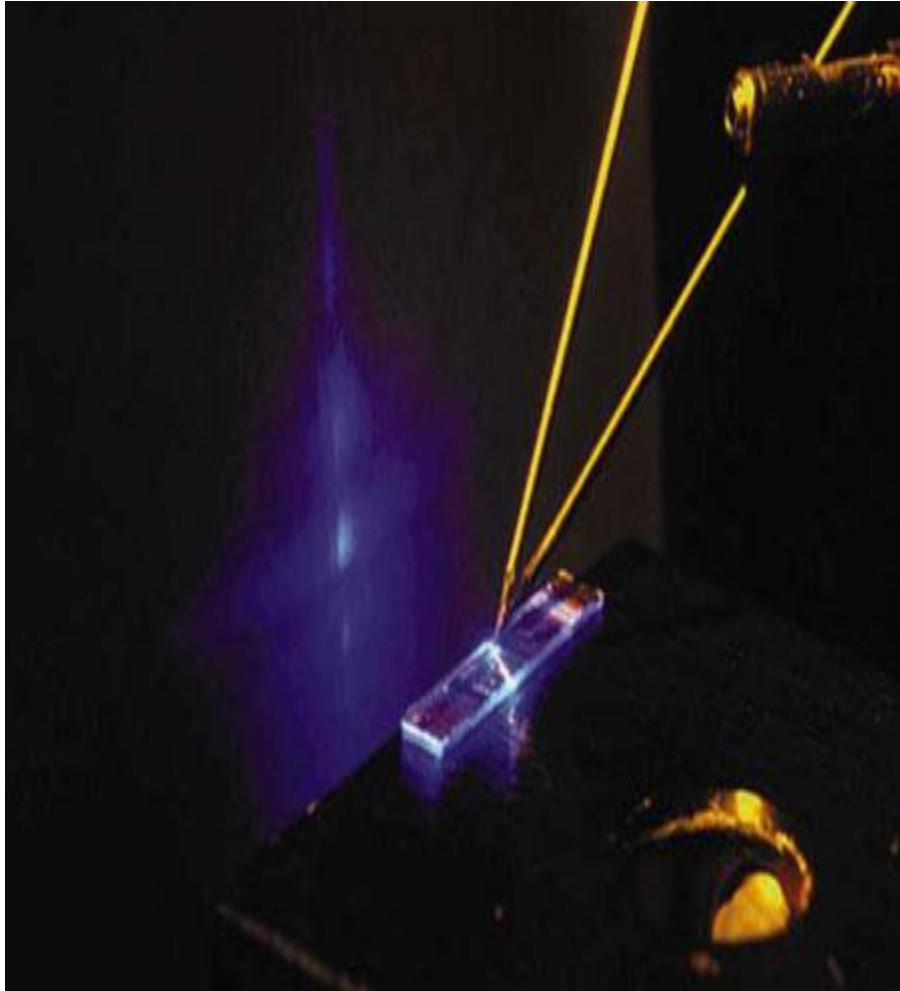
Laser Block Components



Major Components:

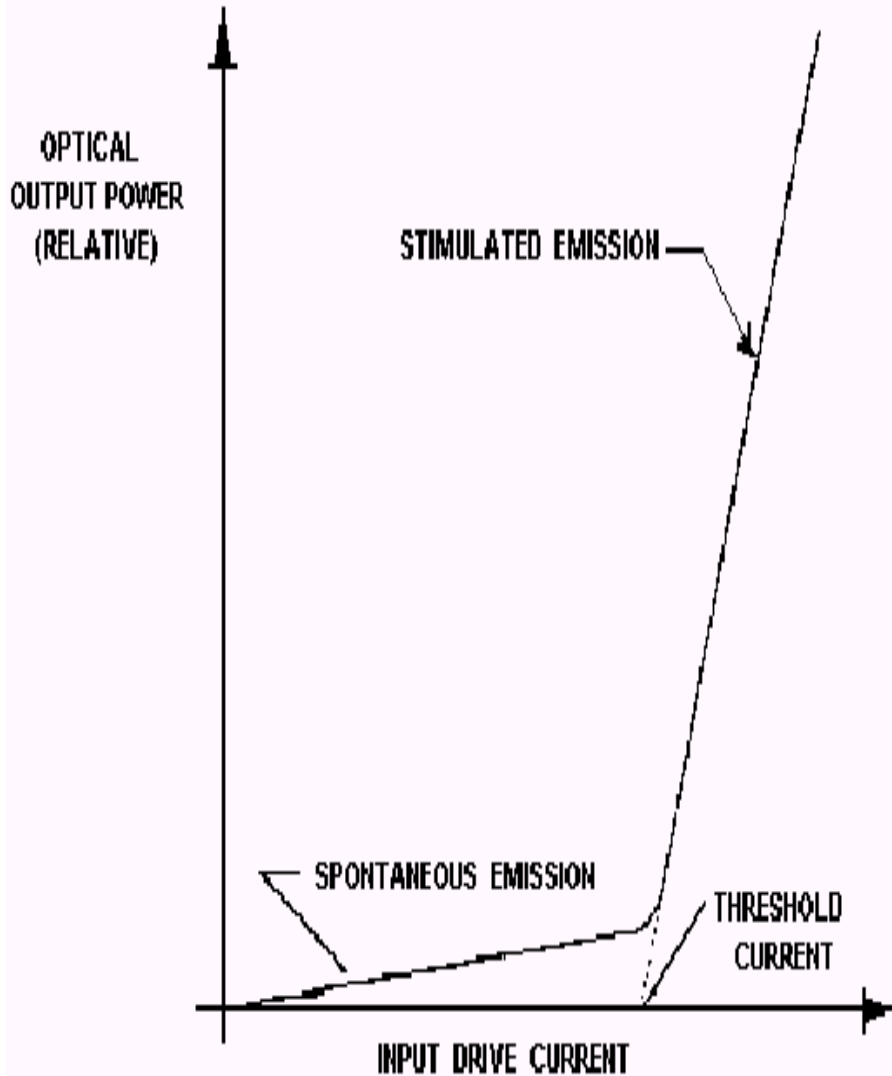
- **Active medium**
- **Pumping Source**
- **Mirrors**

LDs – Laser Diodes



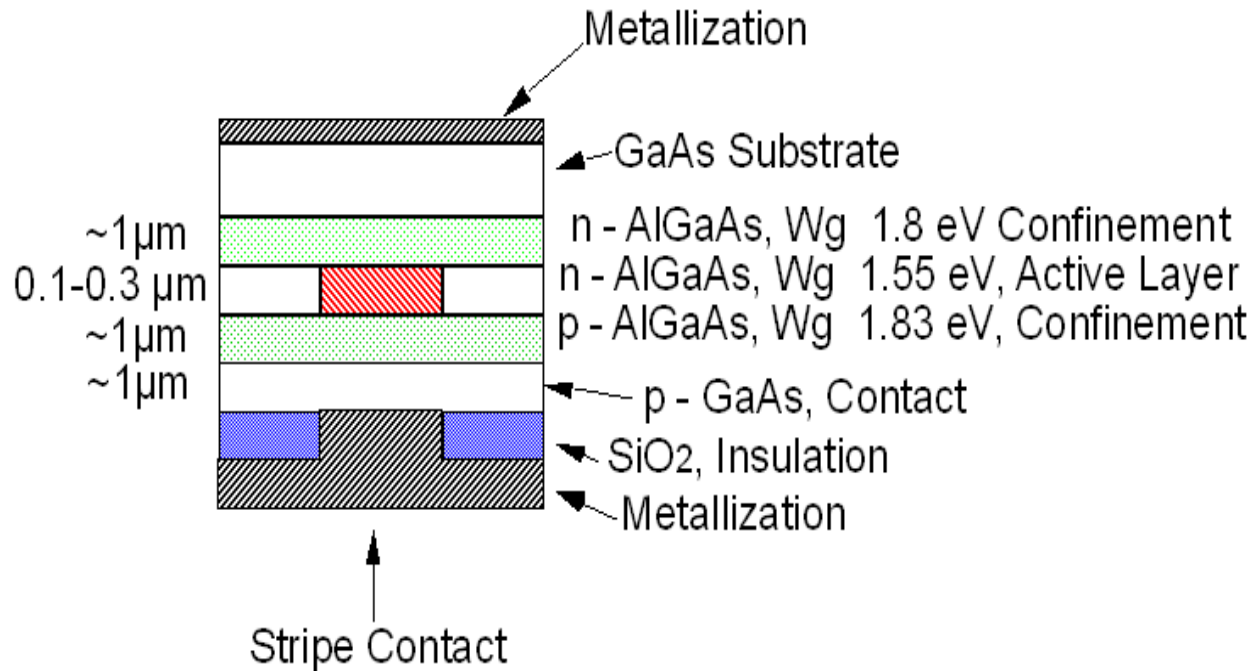
- Emit coherent light through stimulated emission
- Mainly used in Single Mode Systems
- Light Emission range: 5 to 10 degrees
- Require Higher complex driver circuitry than LEDs
- Laser action occurs from three main processes: photon absorption, spontaneous emission, and stimulated emission.

Lasing Characteristics



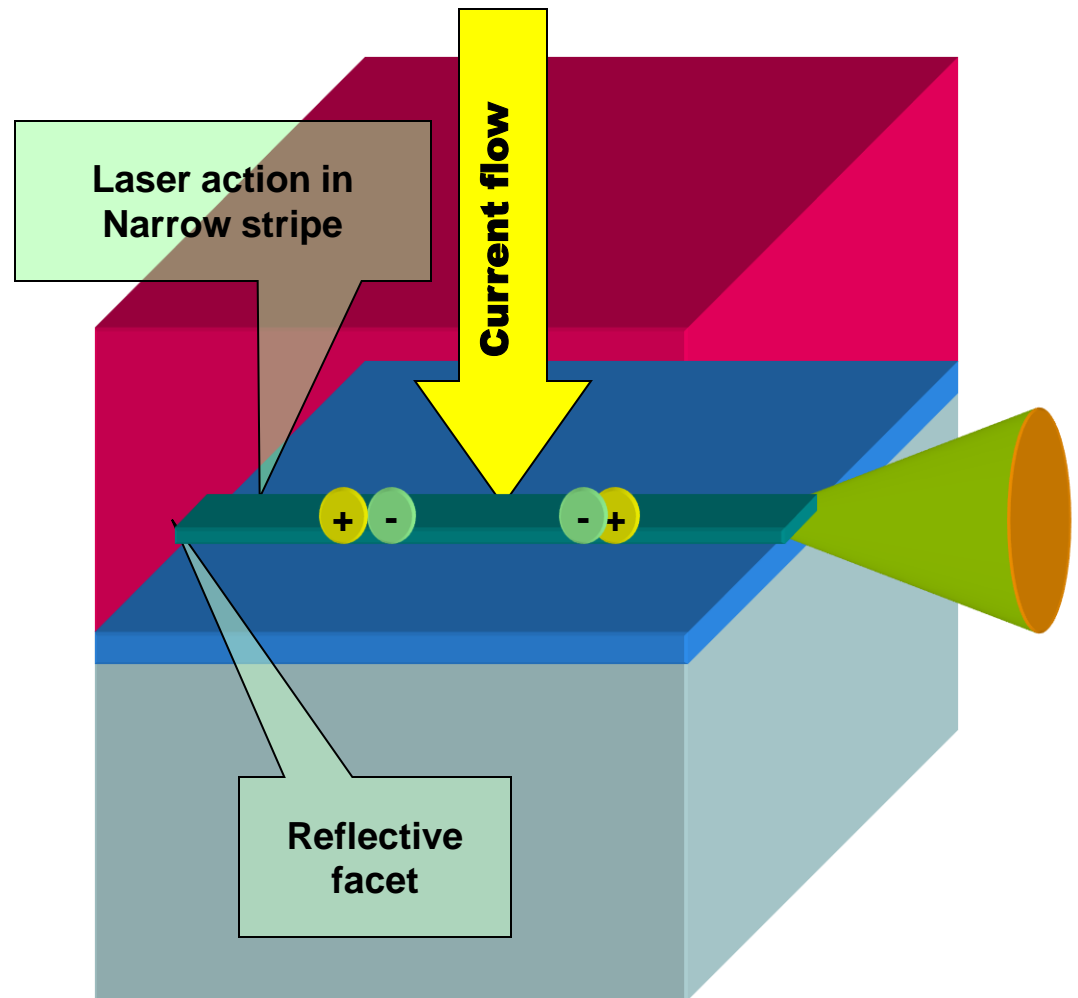
- Lasing threshold is minimum current that must occur for stimulated emission
- Any current produced below threshold will result in spontaneous emission only
- At currents below threshold LDs operate as ELEDs
- LDs need more current to operate and more current means more complex drive circuitry with higher heat dissipation
- Laser diodes are much more temperature sensitive than LEDs

Semiconductor Laser Diode



Edge emitting lasers

- Active layers very thin
- Light emitting area $\sim 0.5 \mu\text{m} \times 5 \mu\text{m}$
- Diffraction causes rapid beam spread



Source Comparison

LDs.	LED	SLED	LD
Principle of Light Generation	Spontaneous Emission	Amplified Spontaneous Emission	Stimulated Emission
Optical Spectrum	Broadband	Broadband	Narrowband or multiple Fabry-Perot modes
Total optical output power	Medium	Medium	High
Optical power density	Low	Medium	High
Optical waveguide	No	Yes	Yes
Light Emittance	All directions	Divergence-limited	Divergence-limited
Spatial coherence	Low	High	High
Coupling into single-mode fibers	Poor	Efficient	Efficient
Temporal coherence	Low	Low	High
Generation of speckle noise	Low	Low	High

Thank you