

# Laser Examples

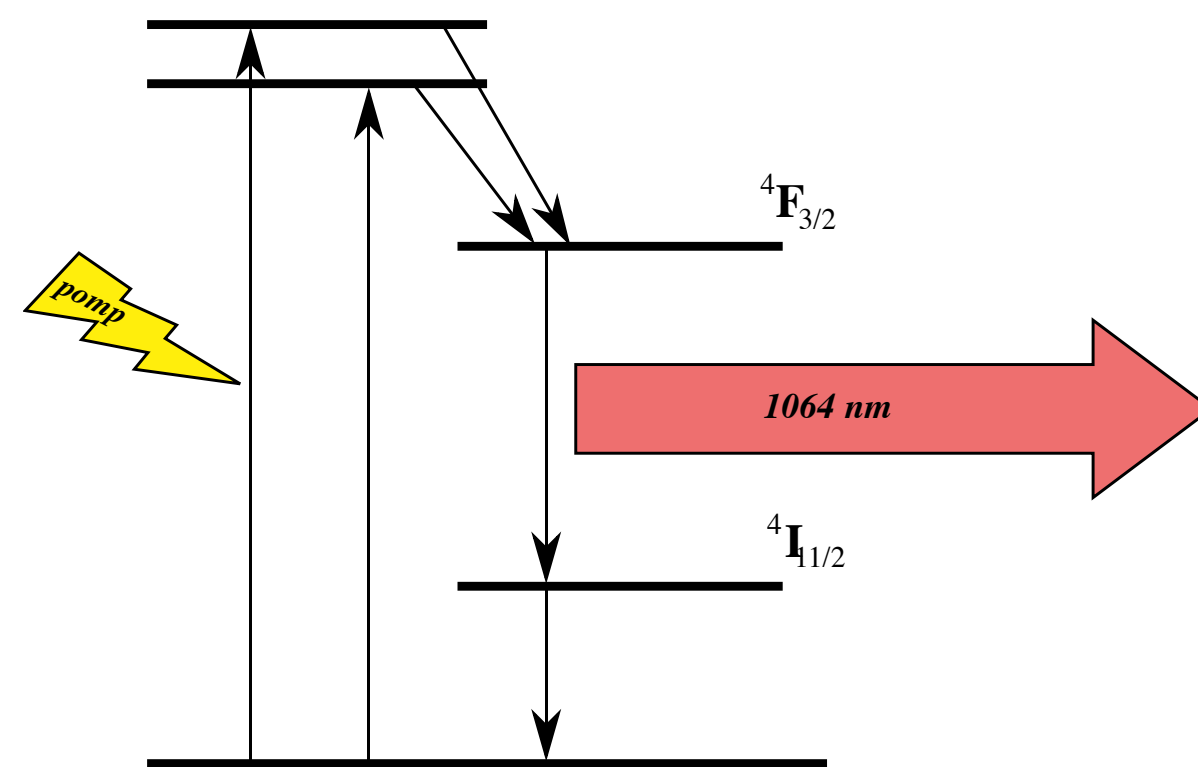
**PHYS 525**

**April 16, 2026**

# Nd:YAG laser

- Rare-earth doped
  - Yttrium replaced by Neodymium atoms
- Can be pumped with 808 nm using a semiconductor laser
- Laser wavelength 1064 nm, but typically unconverted to 532 nm (green)
- Example applications: manufacturing, medicine, laser pointers

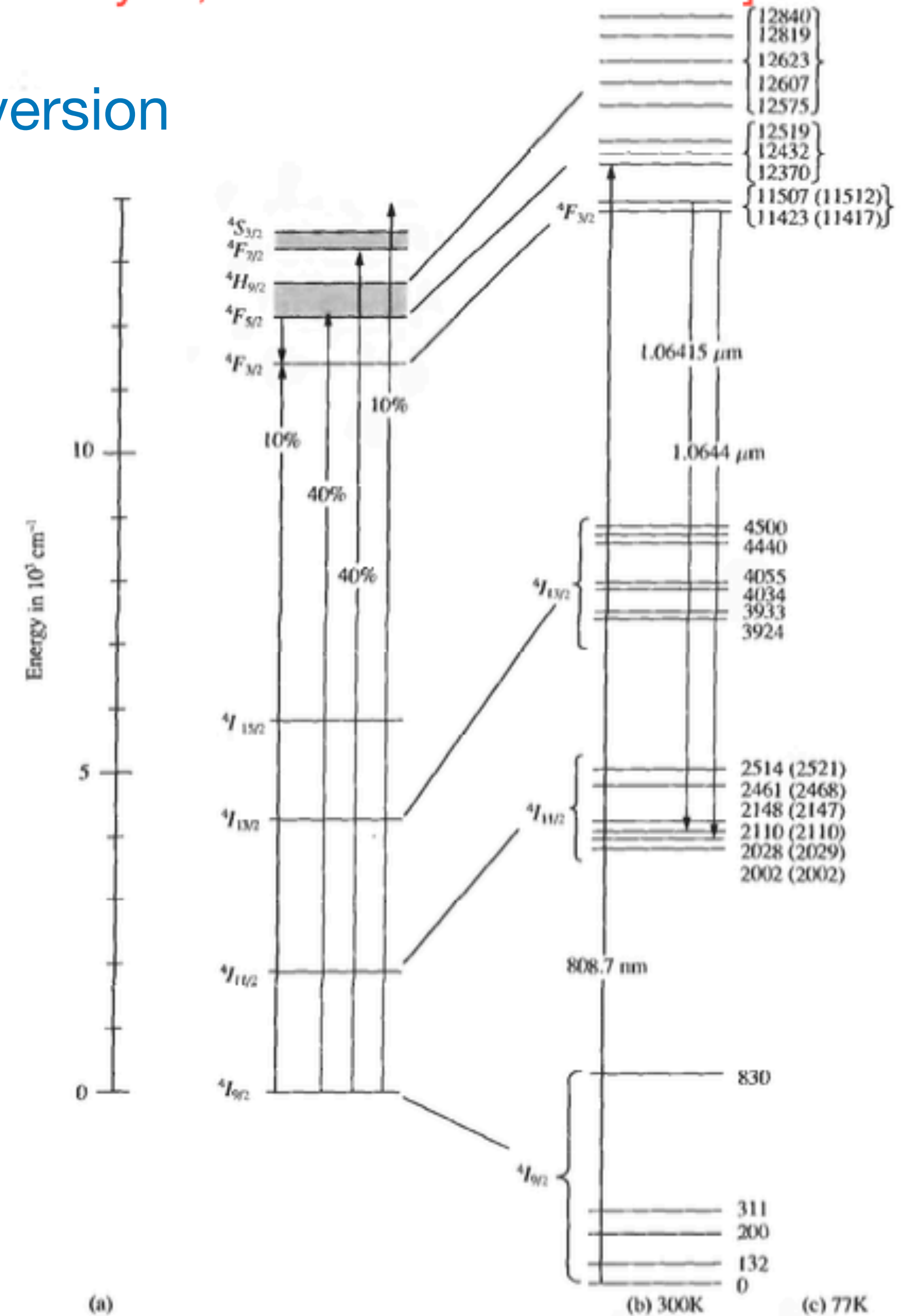
Simplified version



[Wikipedia]

[Verdeyen, Laser Electronics 1995]

Detailed version

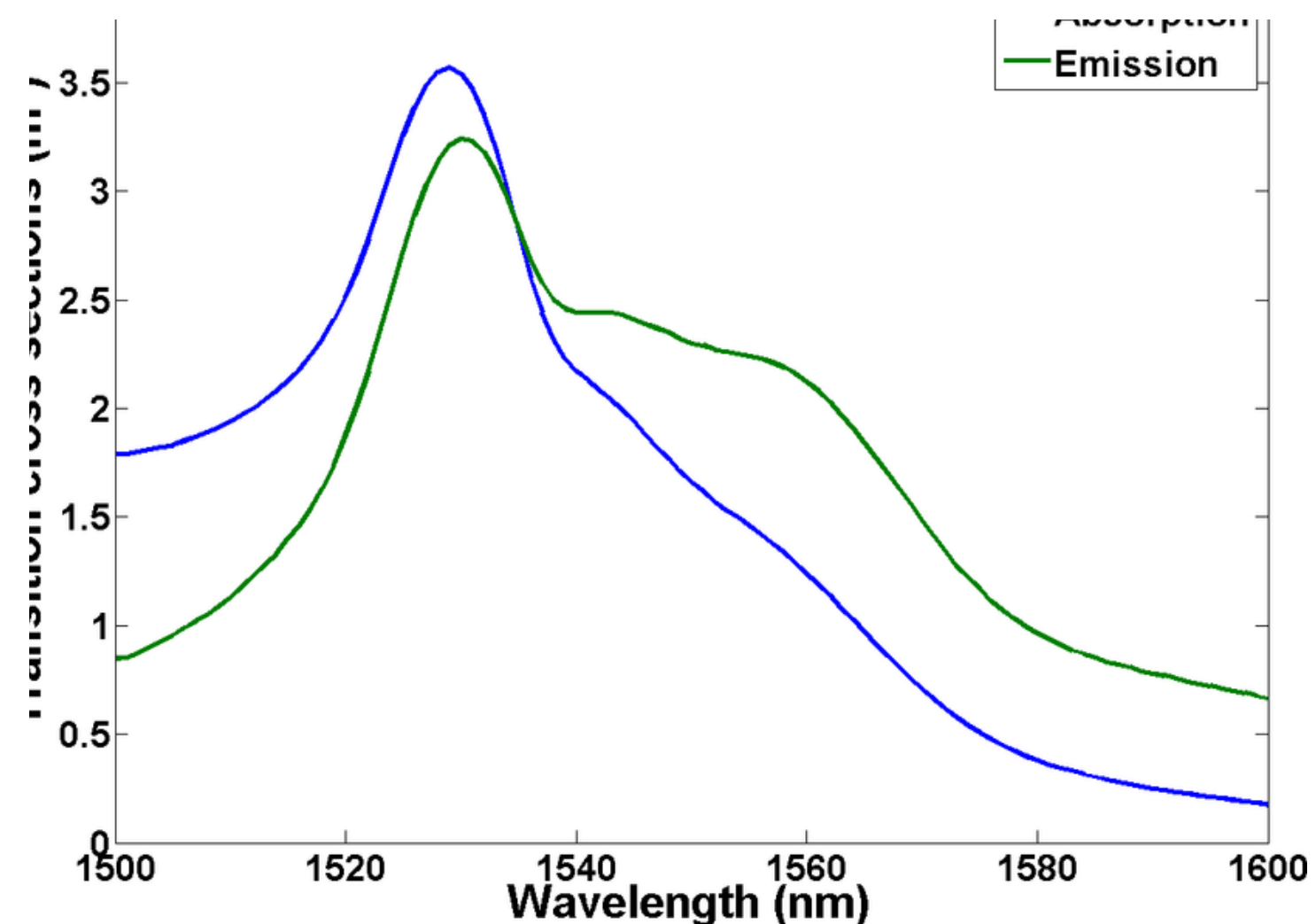
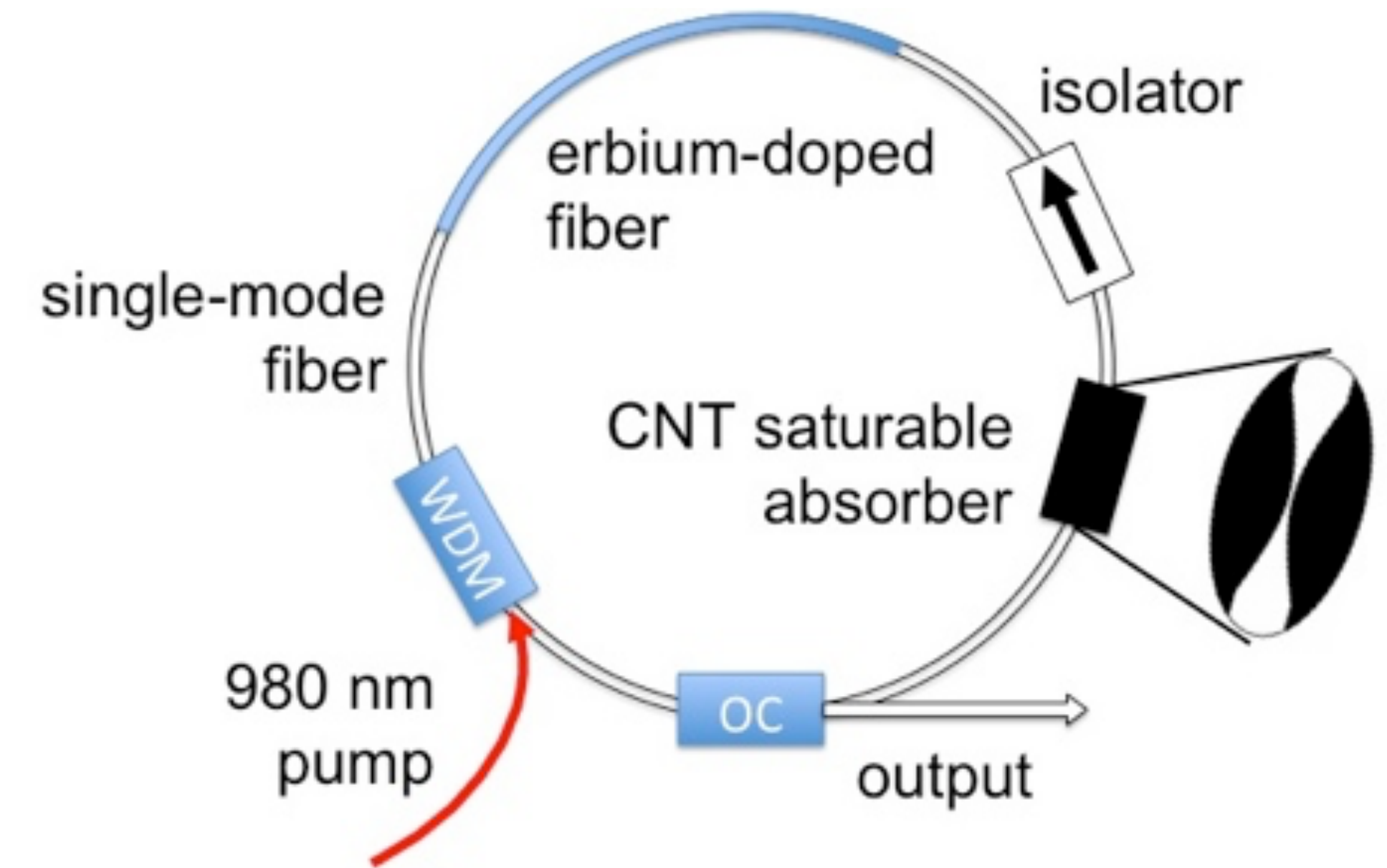


**FIGURE 10.5.** Energy level for neodymium in YAG. (a) Structure of YAG showing the pumping routes with the percentages referring to a pump with a broad spectral output. (b) Details of the manifold at 300 K showing the dominant transitions, the semiconductor laser pumping route is also shown. (c) Energy levels at 77 K. [Data from Kaminski [25]. See also Koechner [24].]

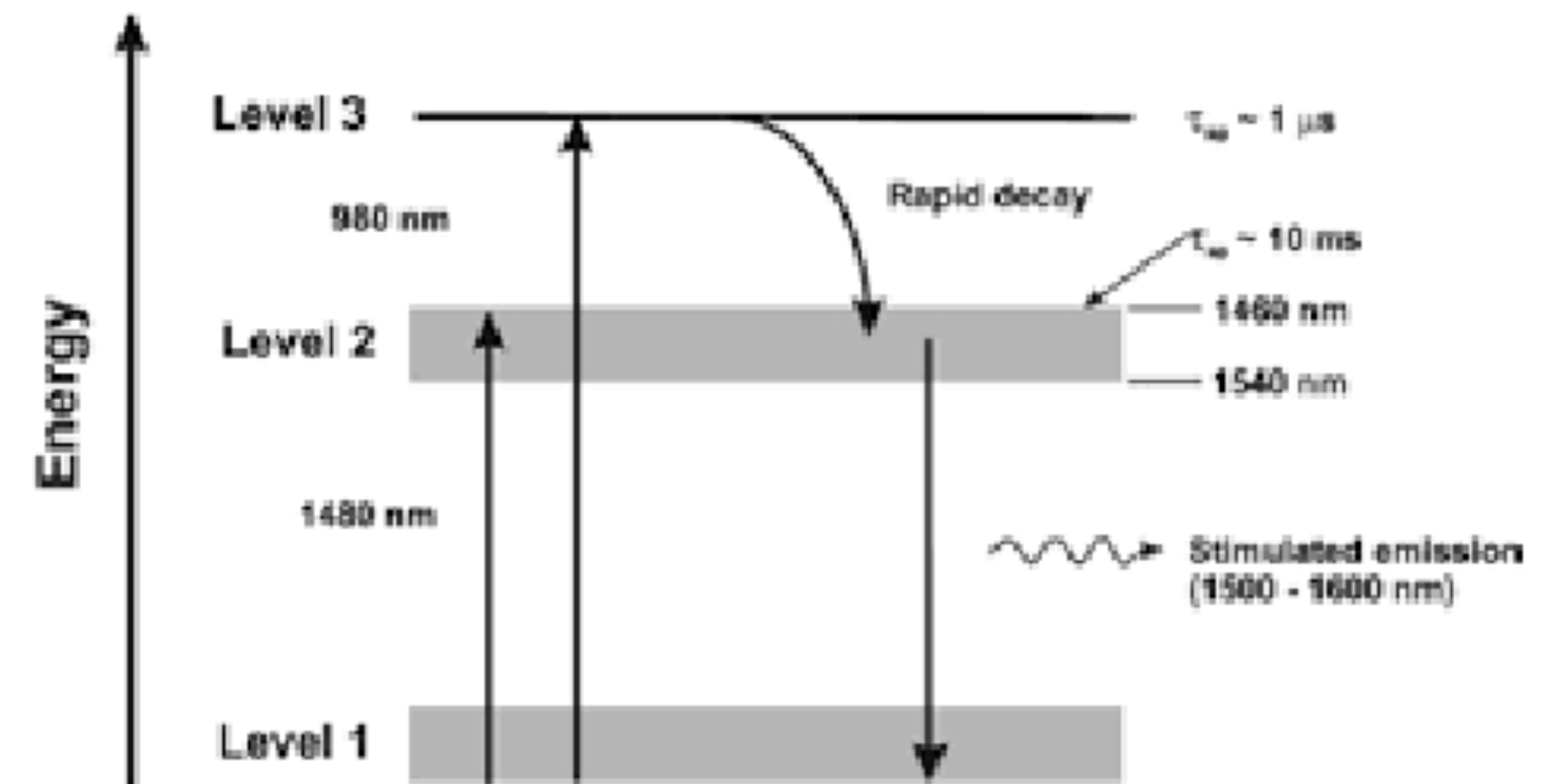
# Erbium-doped fiber laser

[https://advlabs.aapt.org/wiki/Ultrafast\\_Optics\\_with\\_a\\_Fiber\\_Laser](https://advlabs.aapt.org/wiki/Ultrafast_Optics_with_a_Fiber_Laser)

- Glass with erbium atoms
- Transition at 1550 nm (but the gain is
- Pump at 980 nm
- 3-level system with clusters of levels
- Broadband (can use bandwidth for mode locking or wavelength multiplexing)



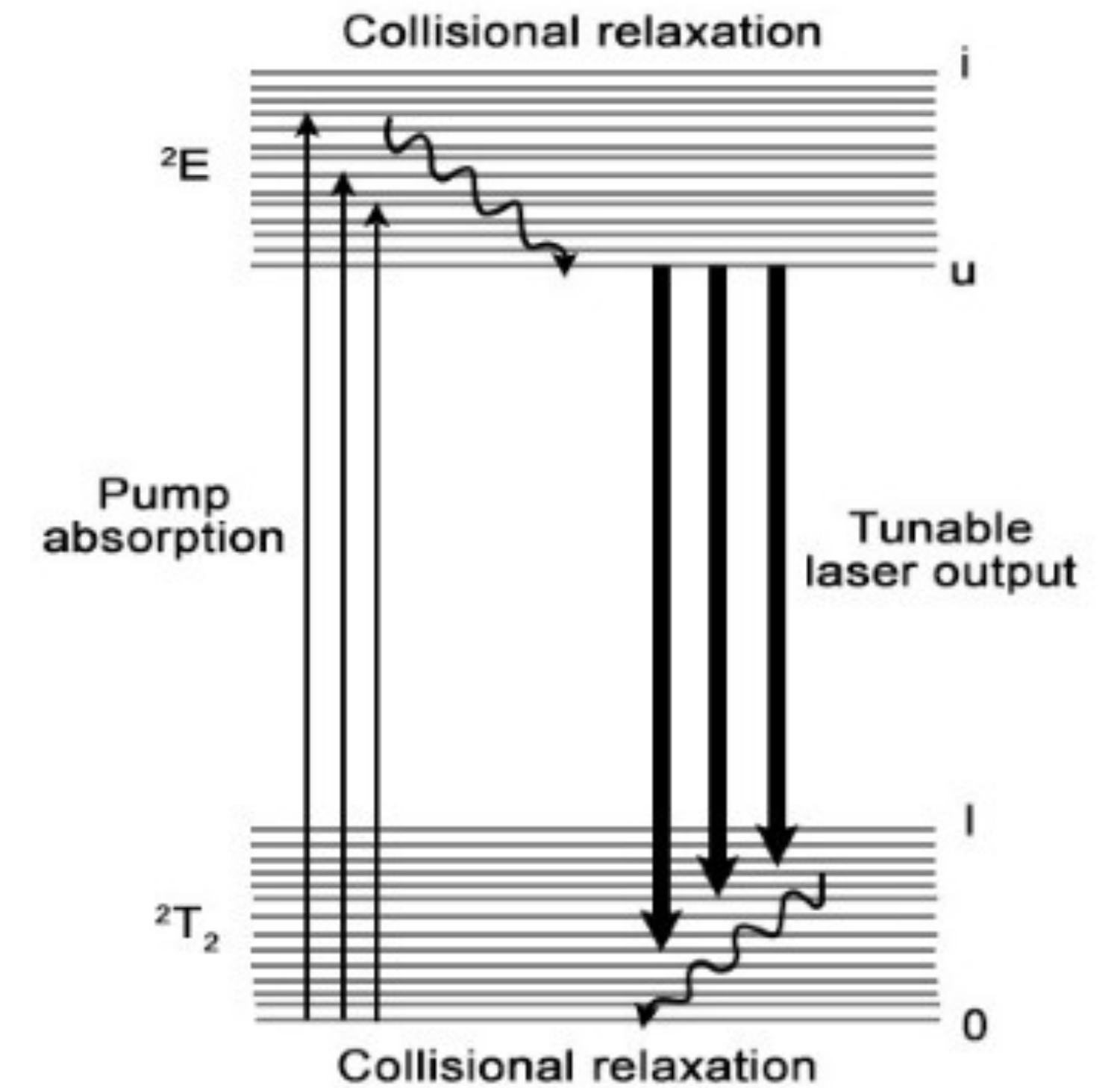
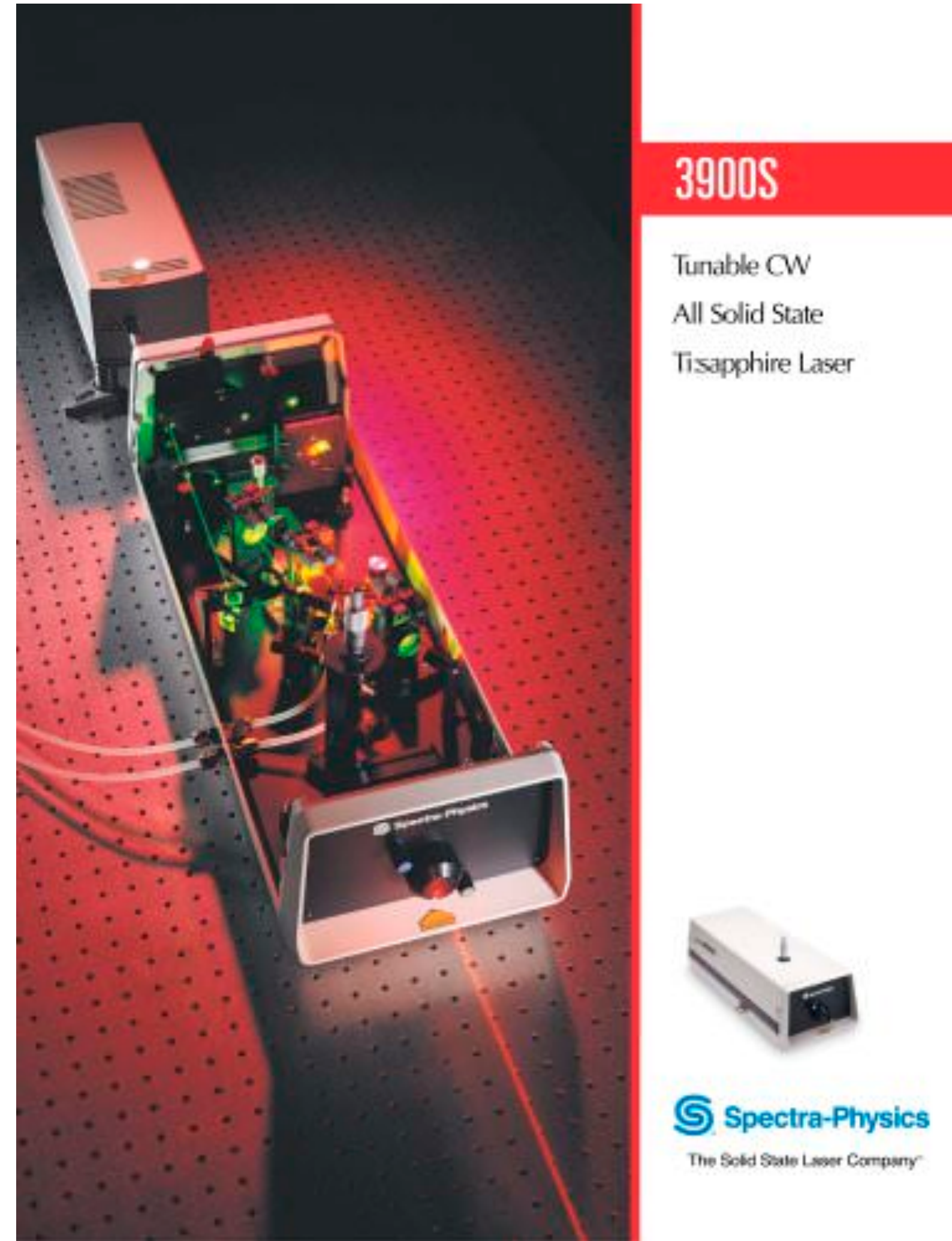
Srivastava et. al 2018



Subramaniam 2015

# Titanium sapphire laser

- Tunable
- Can use 532 nm pump (upconverted Nd:YAG)
- Emission ~600 - 1000 nm
- Can mode lock to generate sharp pulses



## Tuning configuration

