

TITANIUM-SAPPHIRE LASER

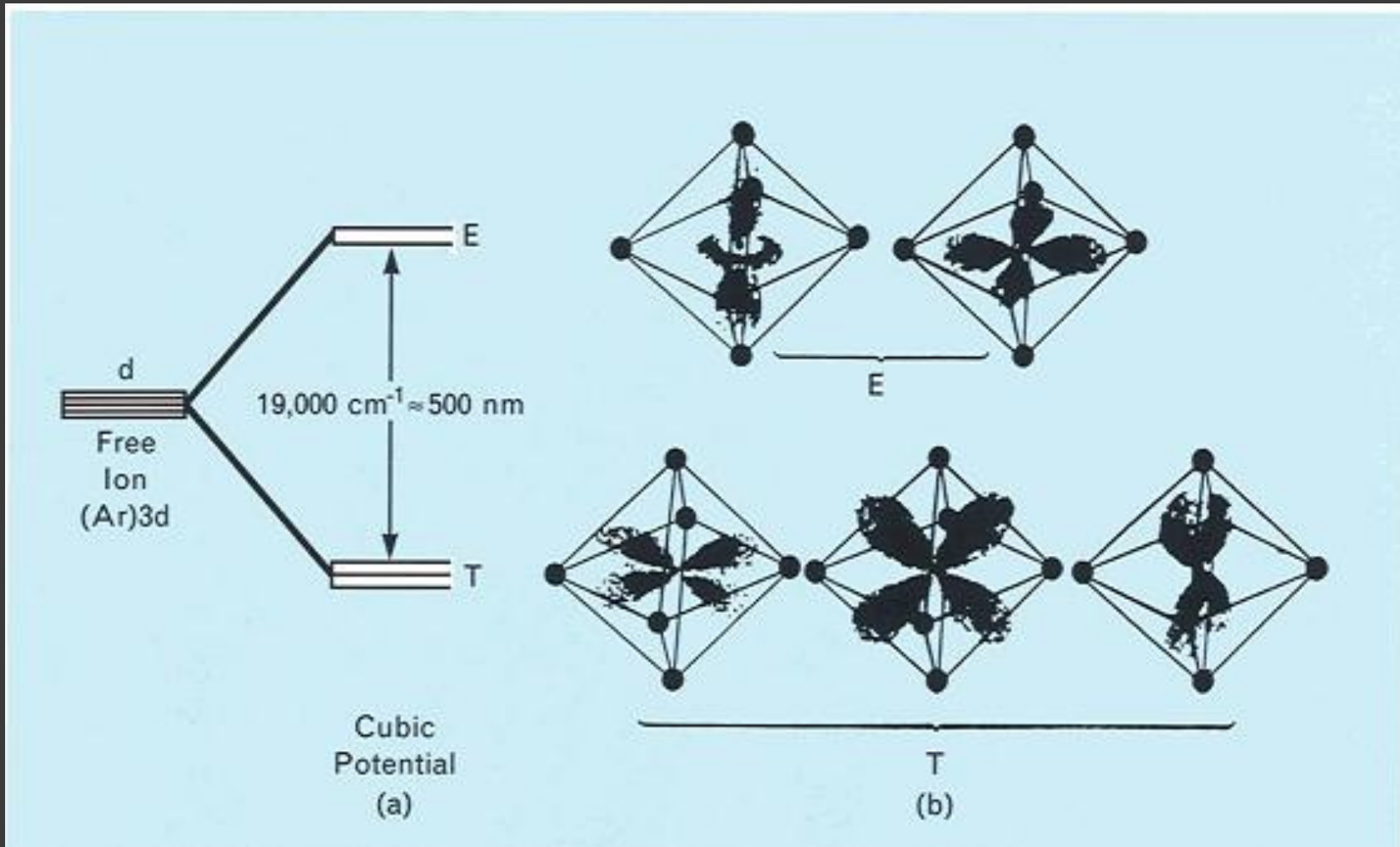
PROPERTIES

- Large tuning range of 660nm – 1180nm.
- Advantages of Ti-Sapphire:
 - Transparent from UV to infra-red.
 - Non-hygrosopic and very hard.
 - Good thermal conductivity.
- Used in average to medium-high power ranges.

MECHANISM

- Lattice vibrations lead to the emission or absorption of photons.
- Vibrionic transitions provide gain over a large bandwidth. Hence these lasers can be used as tunable lasers.

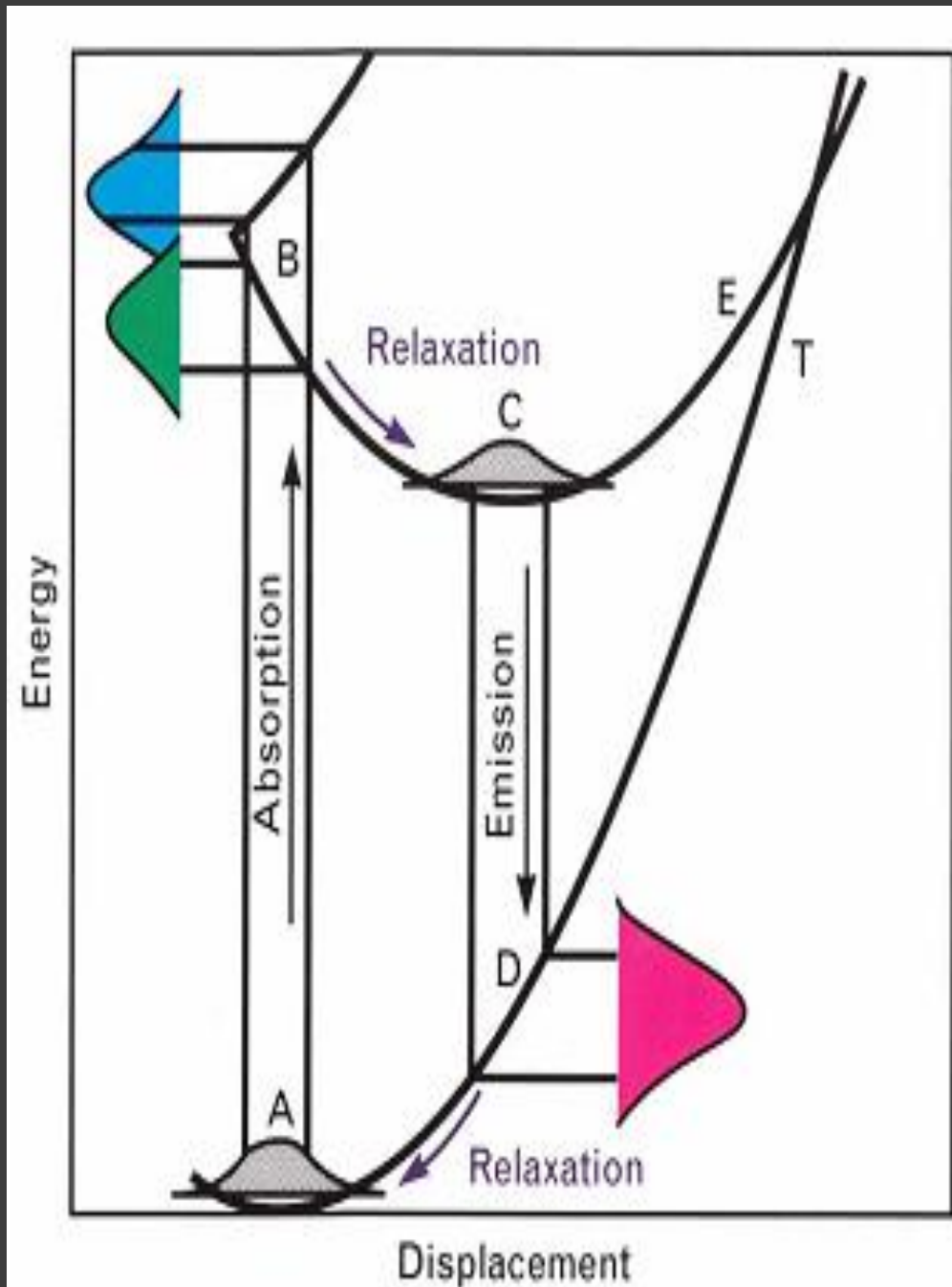
BAND-SPLITTING



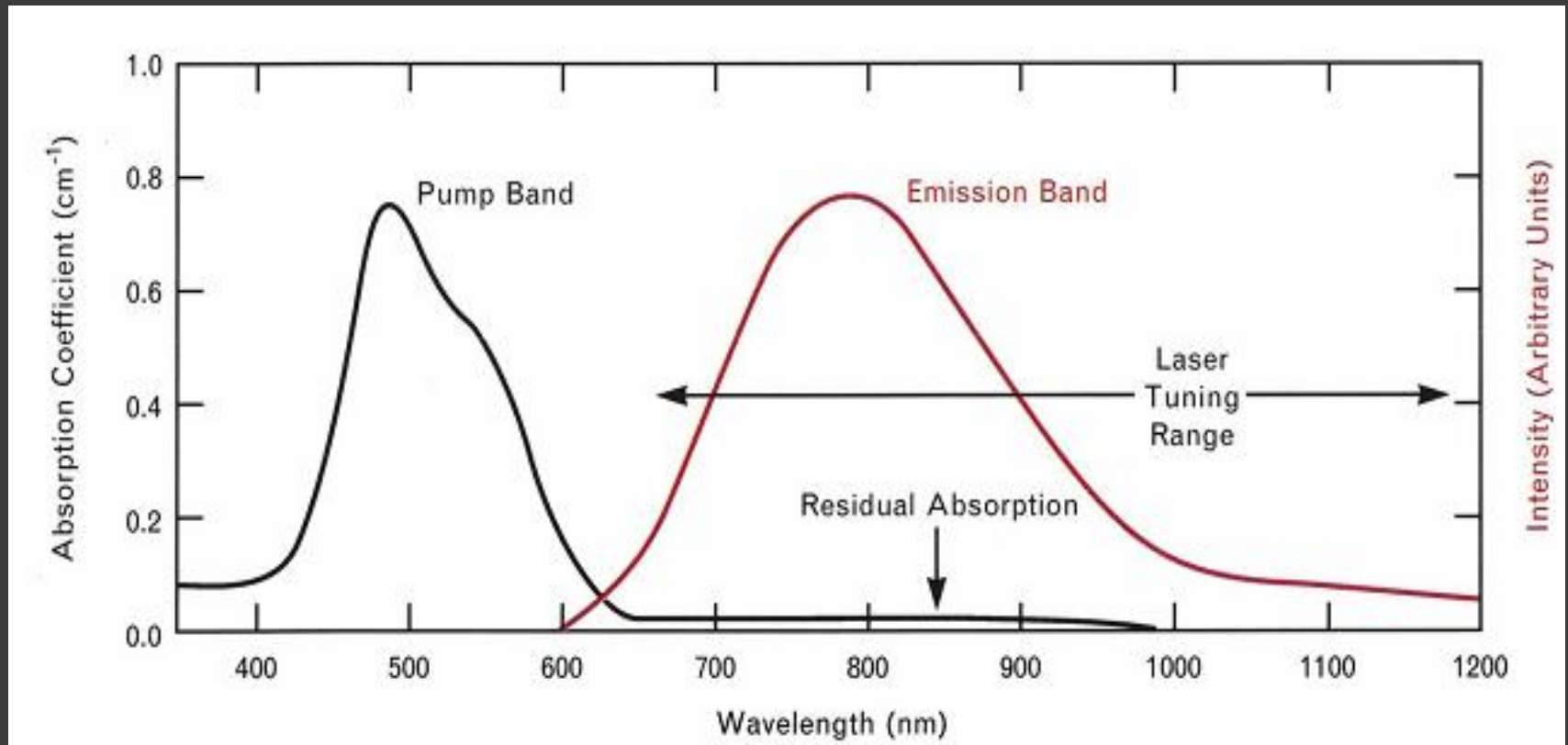
The five-fold degeneracy of the 3d electrons are split into triplet T and double E states.

BAND DIAGRAM

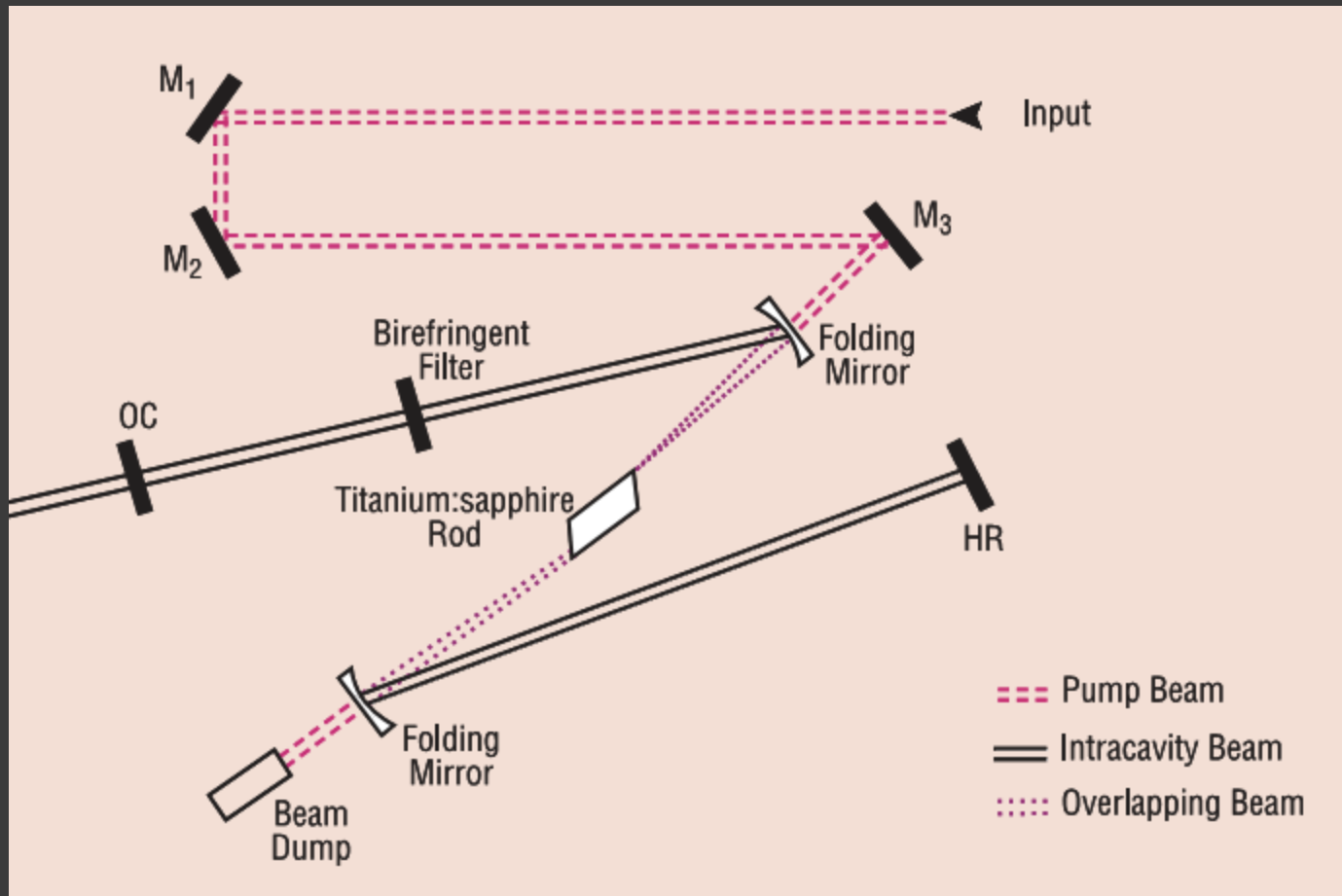
- Sapphire lattice further perturbs the Ti ions and a low energy state can be achieved if the ion displaces itself wrt the surrounding oxygen atoms.
- This removes the degeneracy of the excited states.
- As Ti-ions moves to new equilibrium position, it excites phonons.
- On absorption or emission of a phonon, the 3d electrons rearranges its orbital faster than the Ti ion, leading to optical transitions.



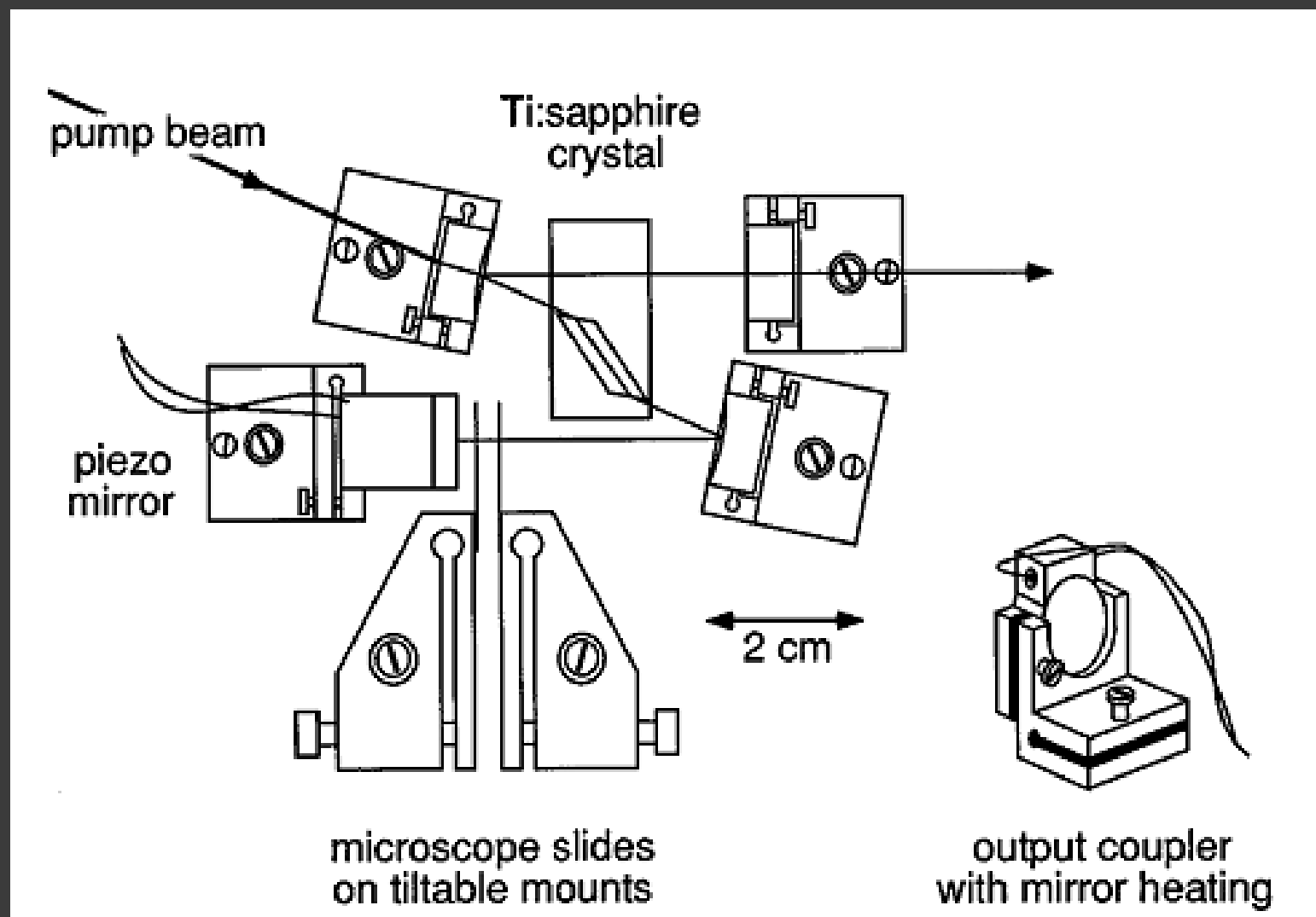
ABSORPTION / EMISSION SPECTRA



SCHEMATIC I



SCHEMATIC II



THANK YOU

