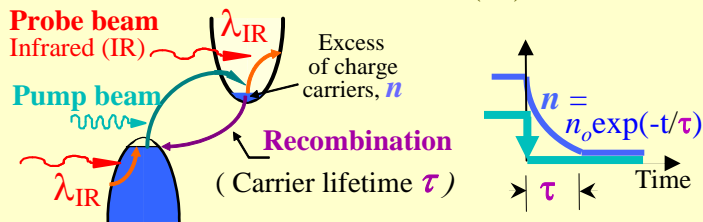


Near-field Characterization of Nanostructures and Devices

Pump-probe optical characterization of semi-conductor materials.

Carrier lifetime measurement (τ)



Carriers are excited with **pulsed visible light** and their time decay τ is probed with **cw infrared radiation**.

τ is a parameter indicative of **material quality**. A large value of τ implies a defects-free material.

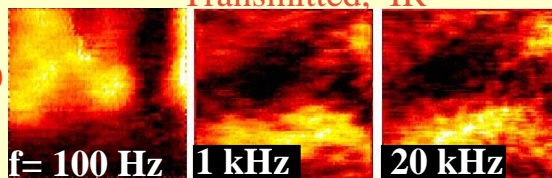
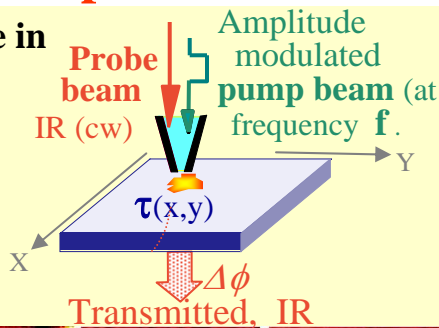
Objectives:

- Development of a Frequency-Resolved Near-field Imaging technique for characterizing the dynamics of charge-carriers in bulk- and mesoscopic-semiconductor materials, and devices.
- Characterization of **material quality** (defects) with high lateral resolution.
- Understand quantum transport mechanisms of charge carriers in nanostructures (affects of defects.).
- Study interaction of bio-electronic interfaces (role of defects and impurities).

Near-field Optics Implementation

Mapping carrier lifetime in silicon.

After excitation (using a **pump beam**), the dynamic response of carriers is synchronously monitored through the changes $\Delta\phi$ experienced by an **infrared (IR) probe beam**.



Impact:

- Development of **energy efficient** devices.
- Improve **reliability** of nanoelectronic devices.

Collaborators:

J. Freeouf (PSU, Physics Department).

