

Ultrafast Spectroscopy in Conjugated Polymers

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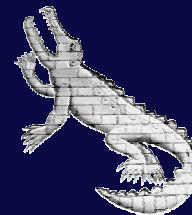
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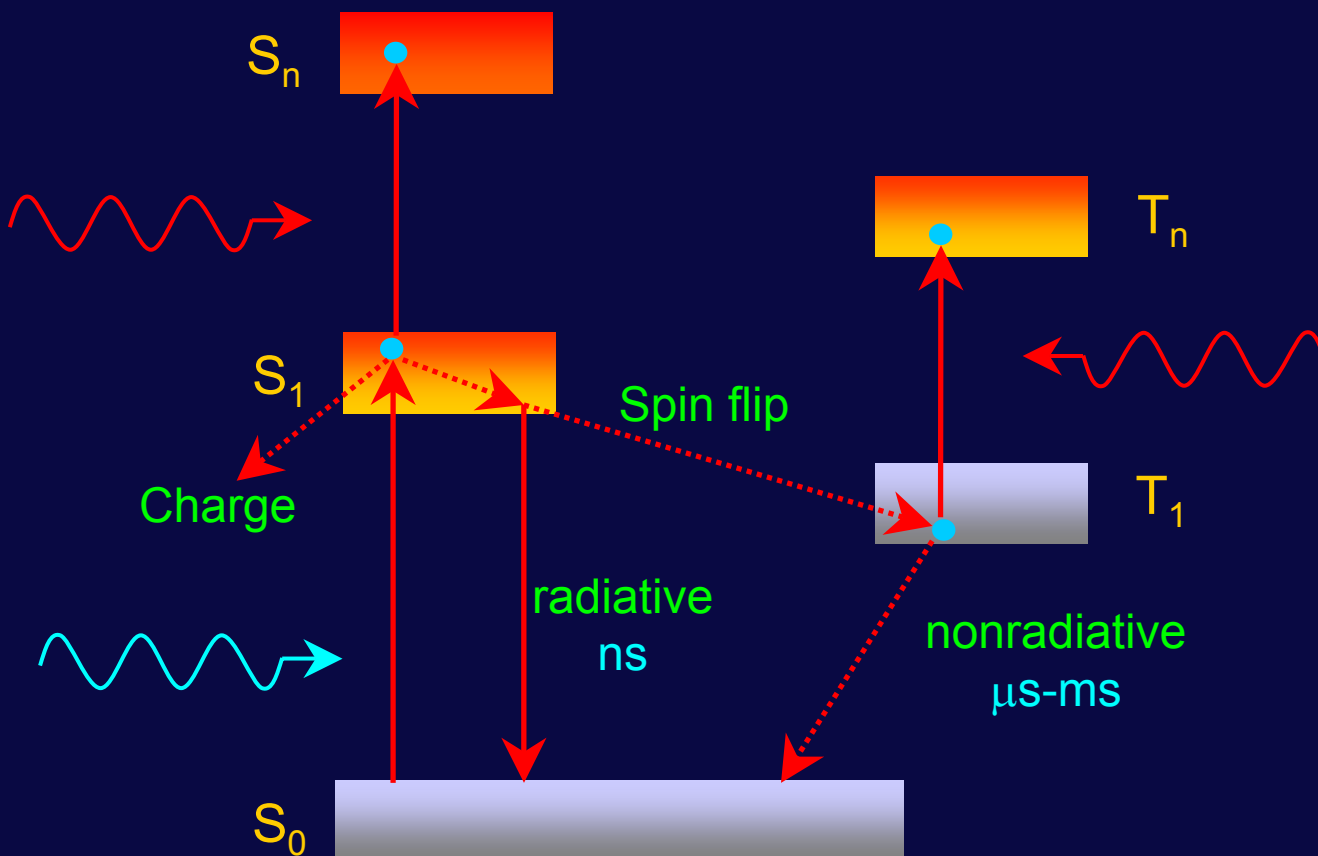
Outline

- Introduction to ultrafast pump-probe system
- Excited state absorption cross section measurements
- Progress and problems

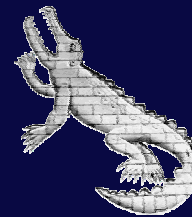
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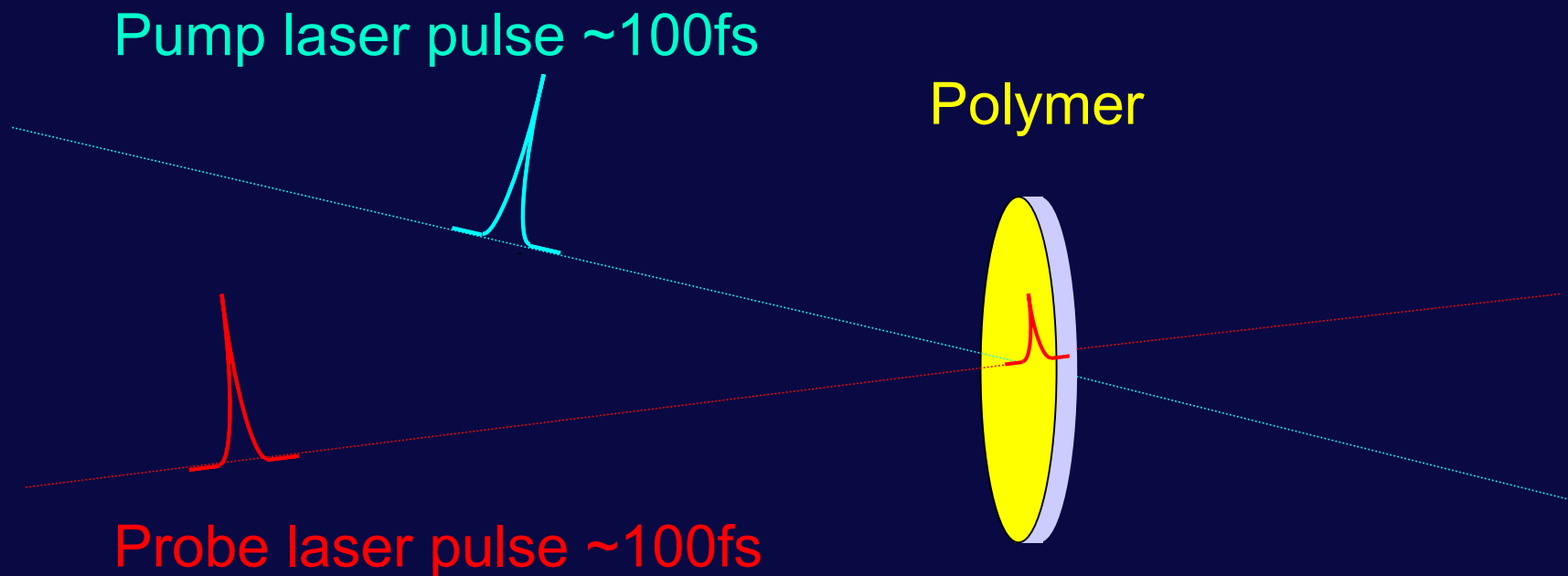
Introduction



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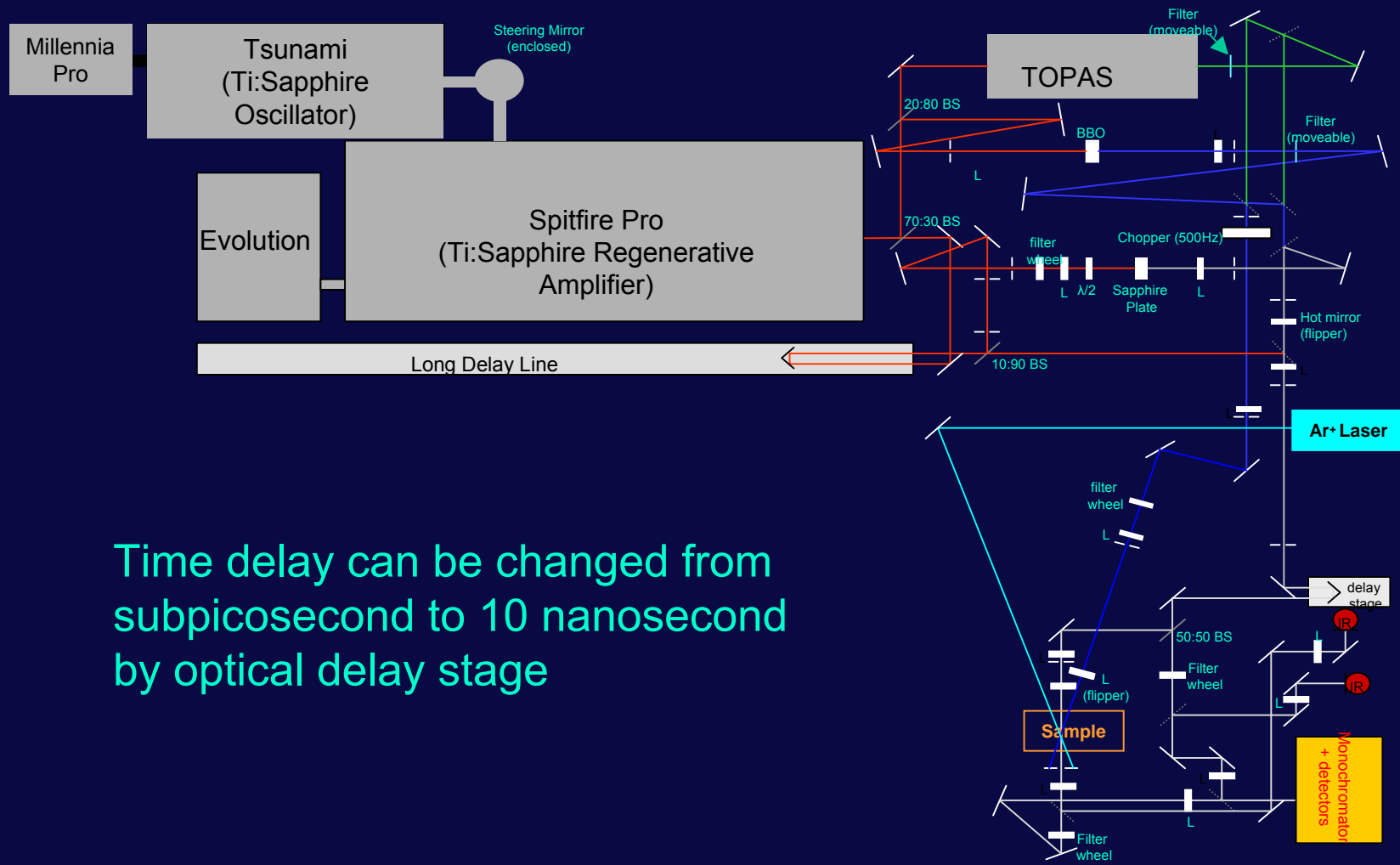
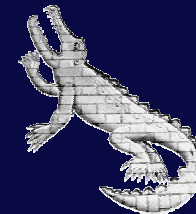
Pump-probe



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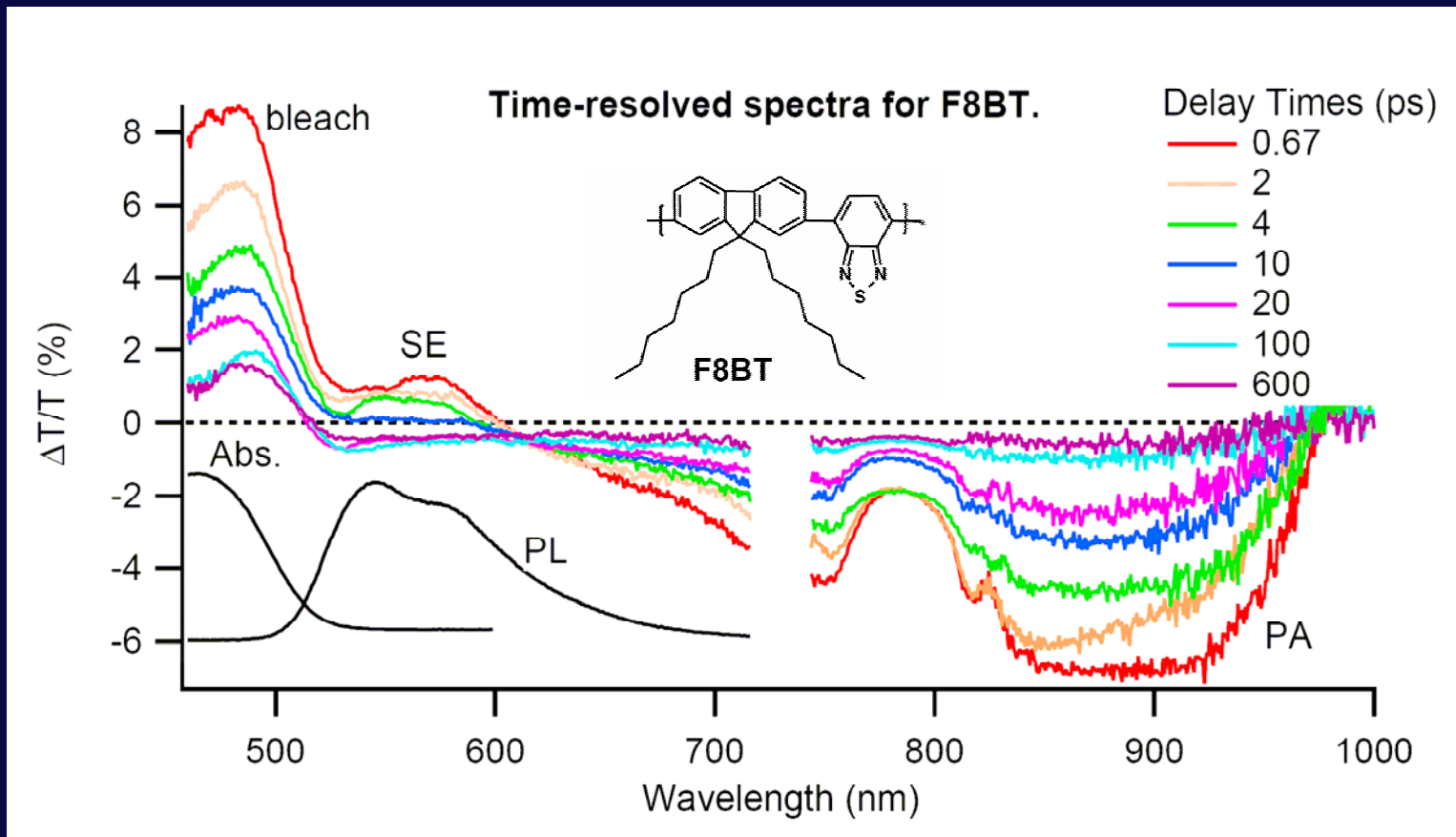
Ultrafast Pump-probe System



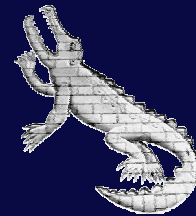
Time delay can be changed from subpicosecond to 10 nanosecond by optical delay stage



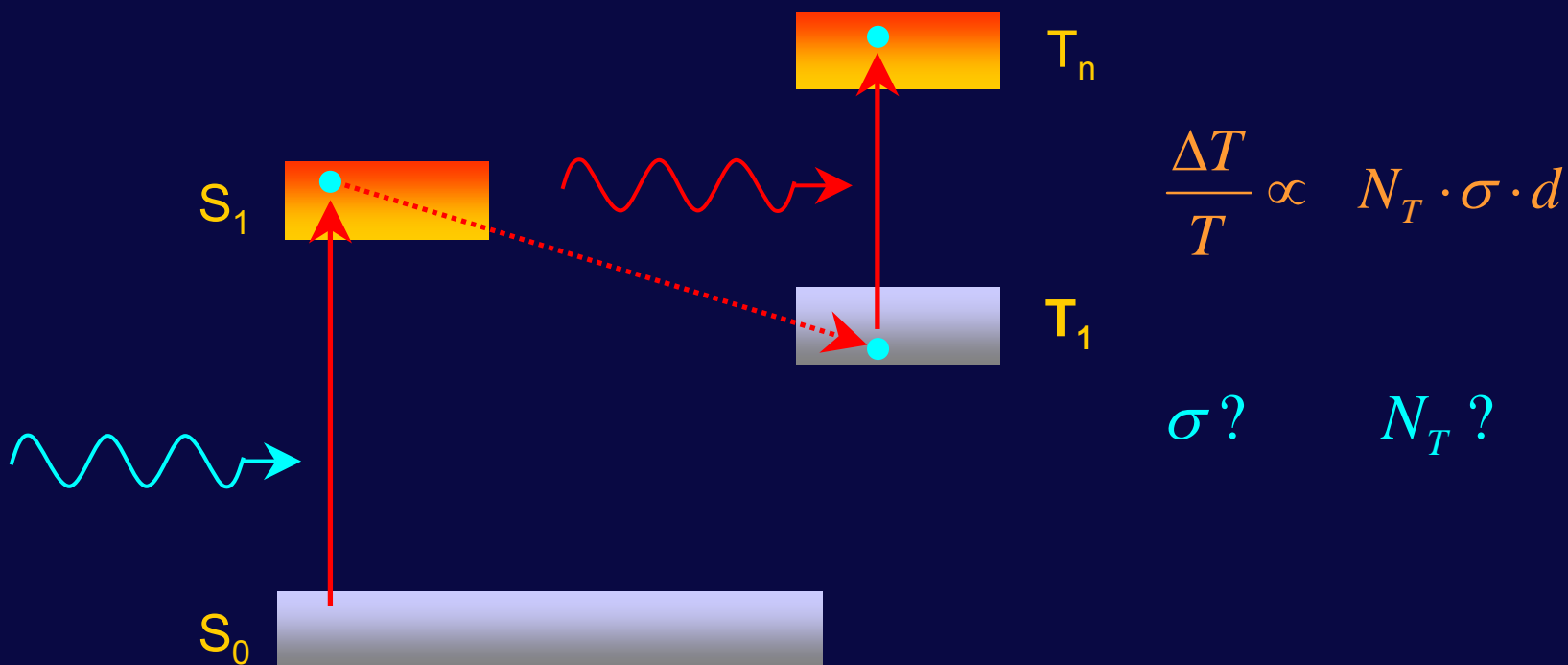
Time resolved spectra



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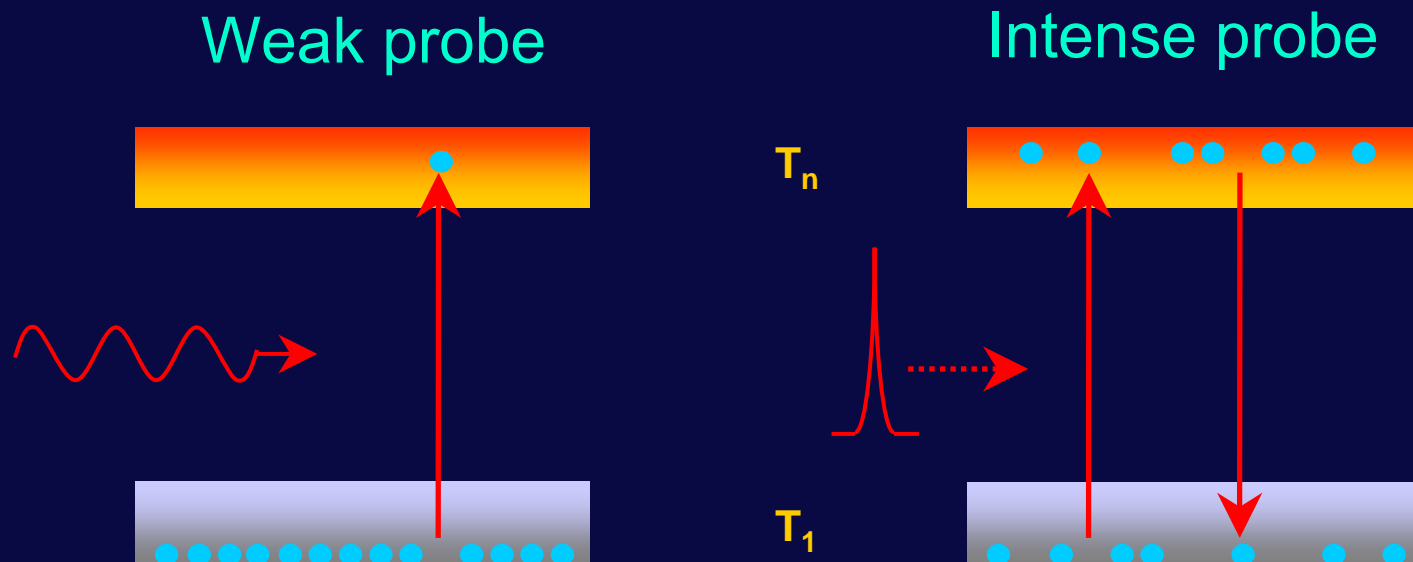


Photoinduced absorption of triplet excitons

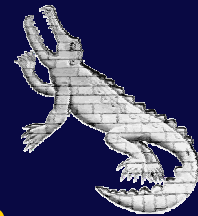




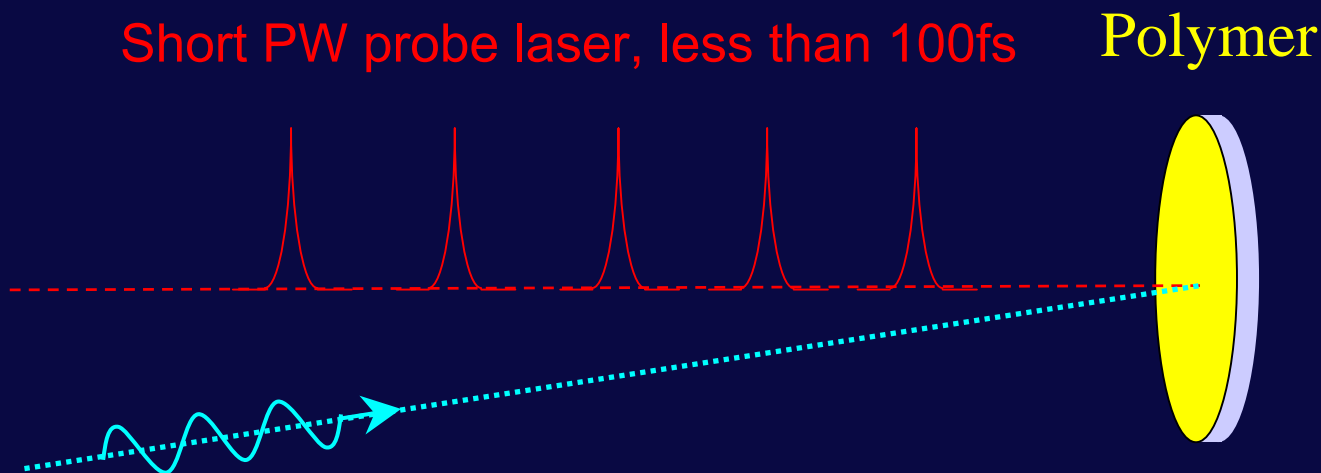
Absorption Saturation



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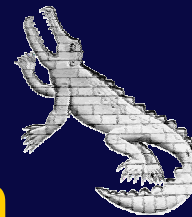


Photoinduced Saturated Absorption

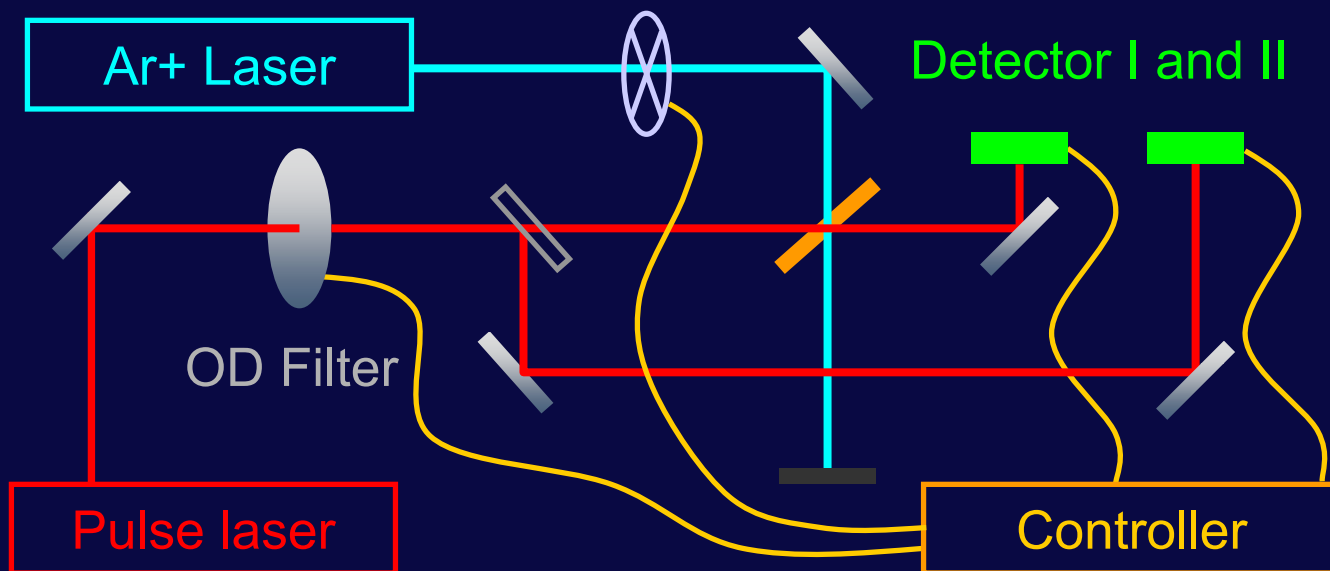


Triplet exciton has long lifetime (μs -ms)
CW pump laser generates large
population of triplet excitons

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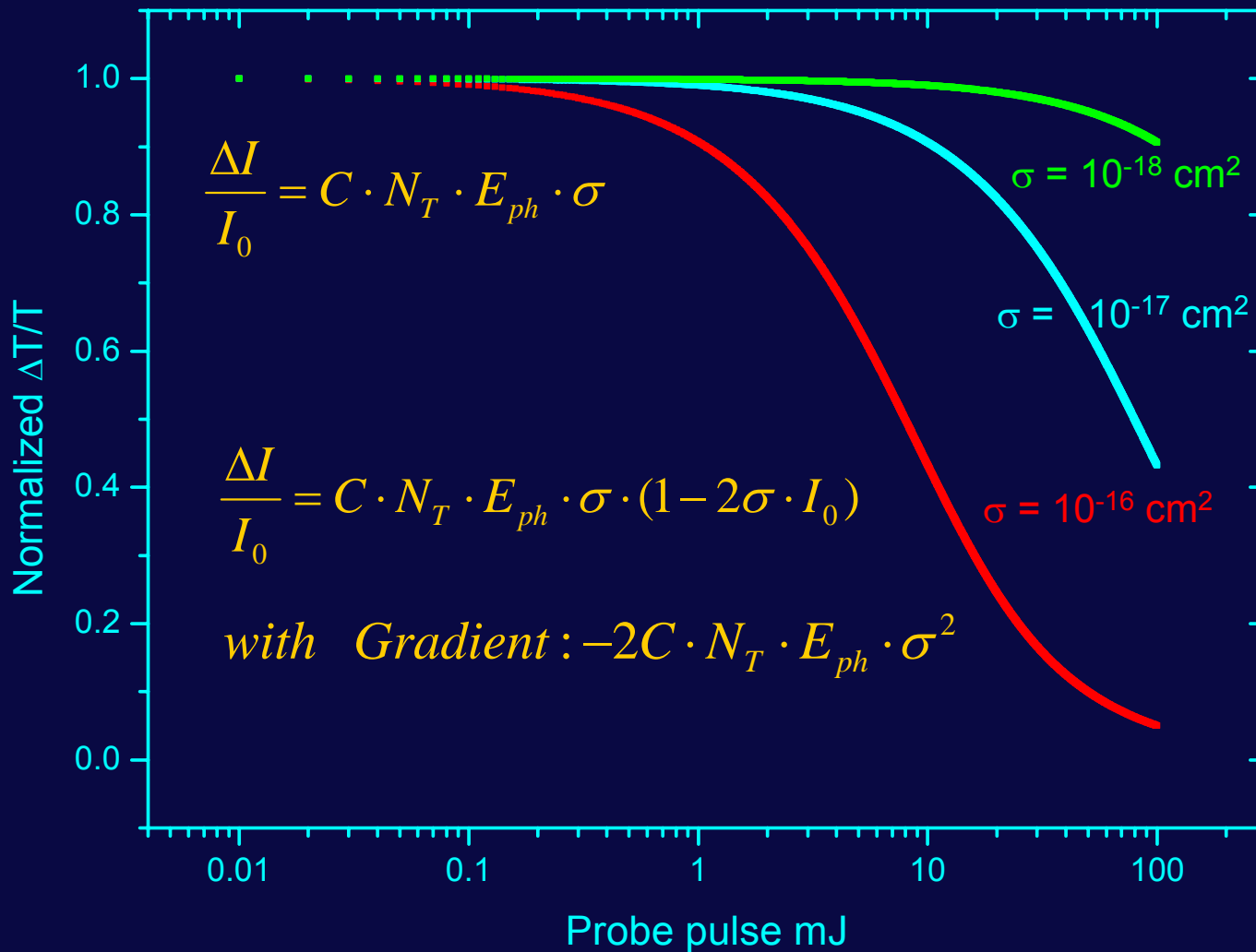
Photoinduced Saturated Absorption System Schematic

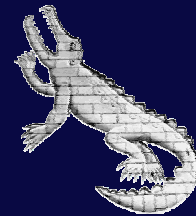


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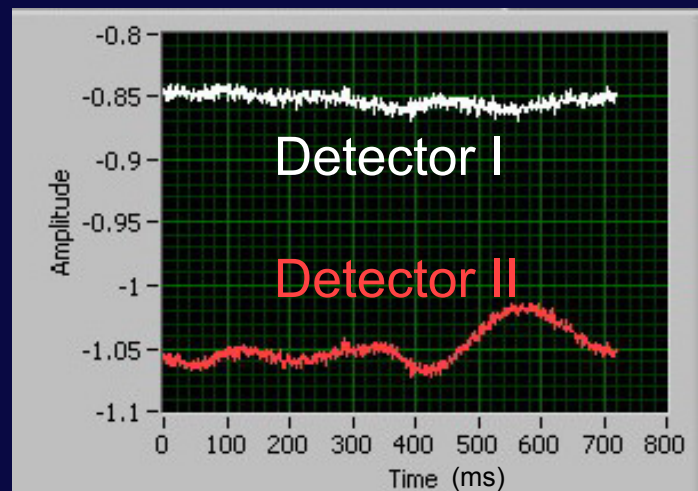
Saturated Absorption

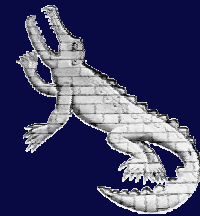




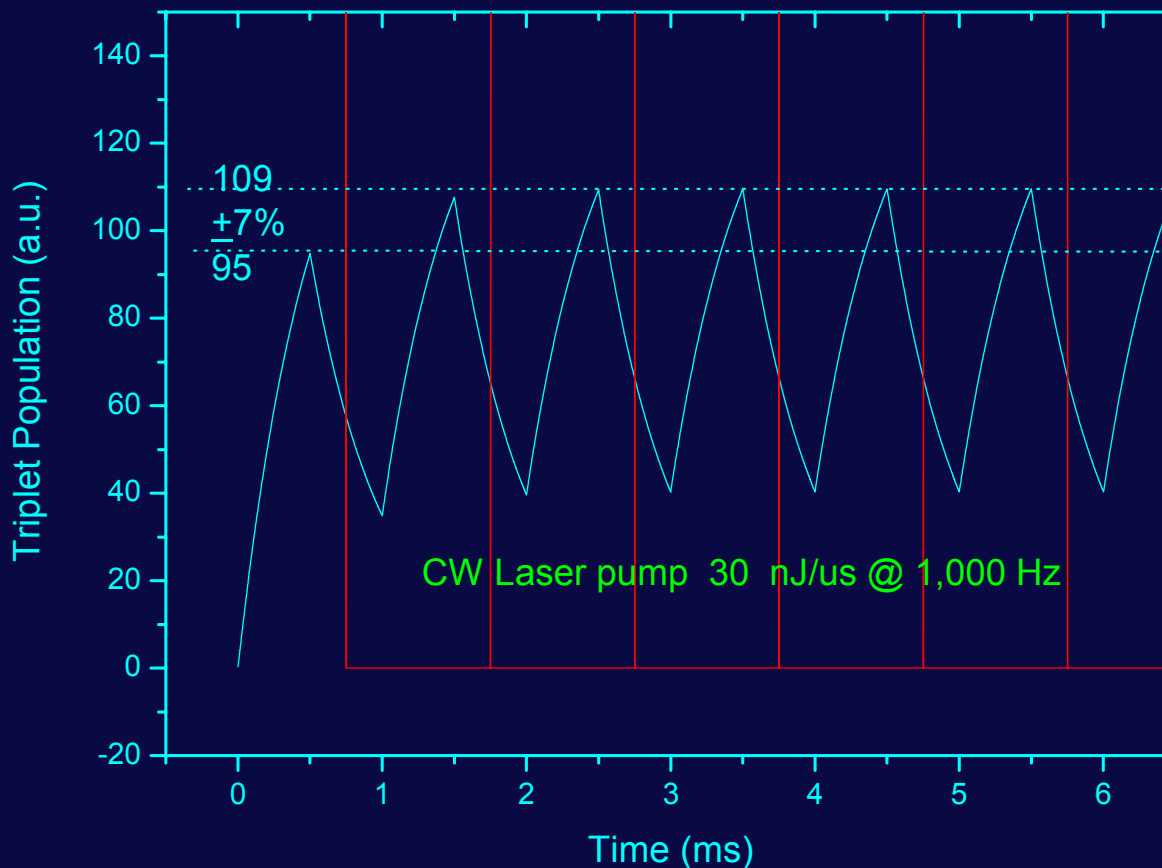
Problems

- Probe intensity fluctuates from pulse to pulse
- Noise from other parts of system
- Linear response of two detectors needed over several orders of intensity
- Maximum probe intensity is limited by damage threshold
- Complex experiment requiring long measurement times

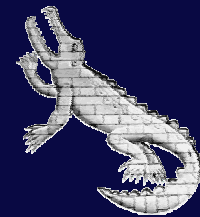




Synchronous Pump-probe



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Outlook

- Adjustment to increase the signal noise ratio, reliability and efficiency
- Properties of triplet in polymers or blends, such as F8BT and PFB
- Selective excitation method to determine the relationship between intermediate state and triplet state

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