

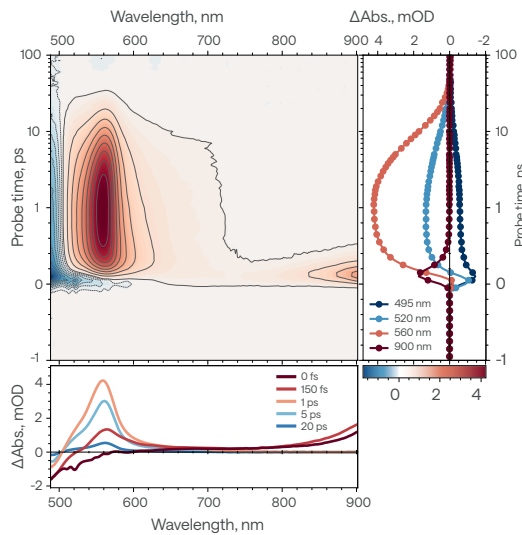
# Ultrafast Spectroscopy

## Femtosecond pump-probe

Spectral dynamics of beta-carotene in solution acquired using HARPIA-TA.

### MEASUREMENT CONDITIONS

Pulse repetition rate: 100 kHz  
 Pump wavelength: 490 nm  
 Pump energy: < 10 nJ  
 Acquisition time: 13 s per spectrum (per delay point)

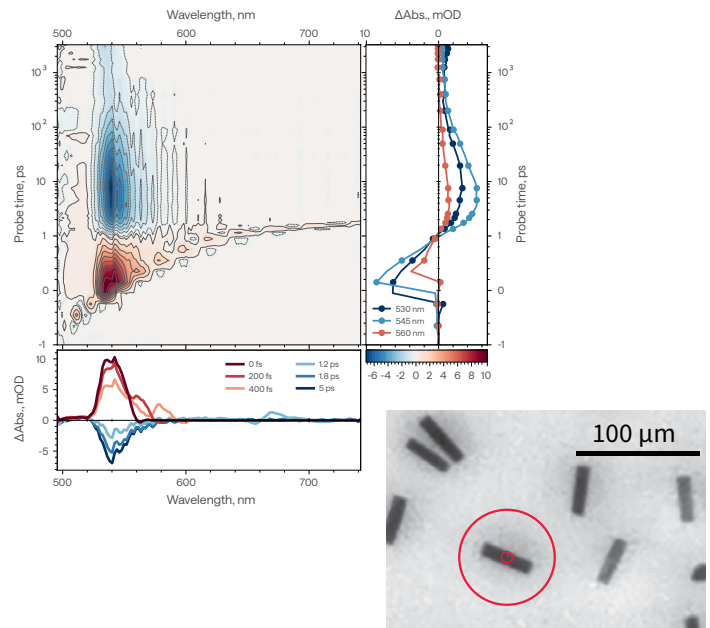


## Femtosecond pump-probe microspectroscopy

Single perovskite crystallite pump-probe spectral kinetics measured using the HARPIA-MM pump at 400 nm.

### MEASUREMENT CONDITIONS

Pulse repetition rate: 200 kHz  
 Pump wavelength: 400 nm  
 Pump energy: 2 nJ  
 Acquisition time: 0.5 s per spectrum  
 Objective: Plan Fluor 4x/0.13



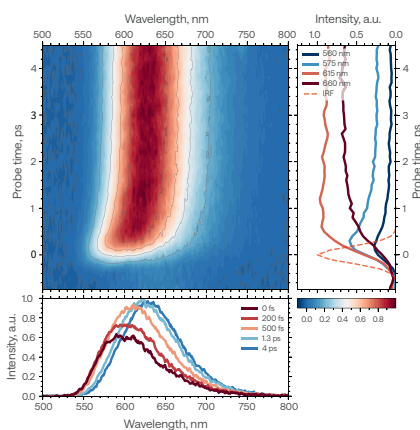
Pump-probe spot marked by the small circle

## Time-resolved fluorescence spectroscopy

Time-resolved fluorescence spectroscopy provides information on molecular processes in the excited state. The HARPIA-TF module for the HARPIA-TA system combines Kerr gate or fluorescence upconversion with TCSPC techniques. Utilizing a high repetition rate PHAROS or CARBIDE femtosecond laser, fluorescence dynamics are measured while exciting the samples with pulse energies down to several nanojoules.

### Kerr gate measurement

Kerr gate measurements in DCM illustrate the method's ability to probe fluorescence evolution with a sub-picosecond temporal resolution.

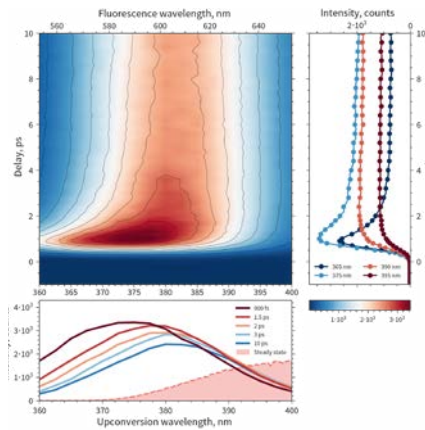


### Fluorescence upconversion

Fluorescence dynamics of DCM laser dye in solution acquired using HARPIA-TF in fluorescence upconversion mode.

### MEASUREMENT CONDITIONS

Repetition rate: 100 kHz  
 Pump wavelength: 430 nm

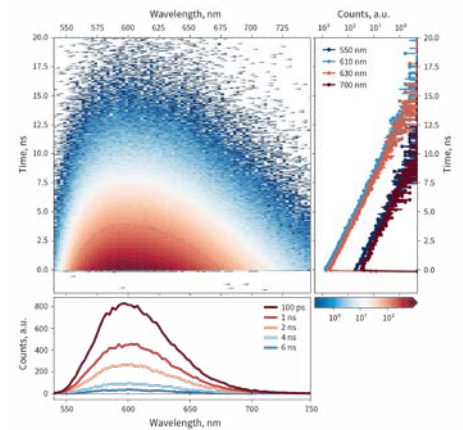


### TCSPC

Fluorescence dynamics of DCM laser dye in solution acquired using HARPIA-TF in TCSPC mode.

### MEASUREMENT CONDITIONS

Repetition rate: 100 kHz  
 Pump wavelength: 430 nm

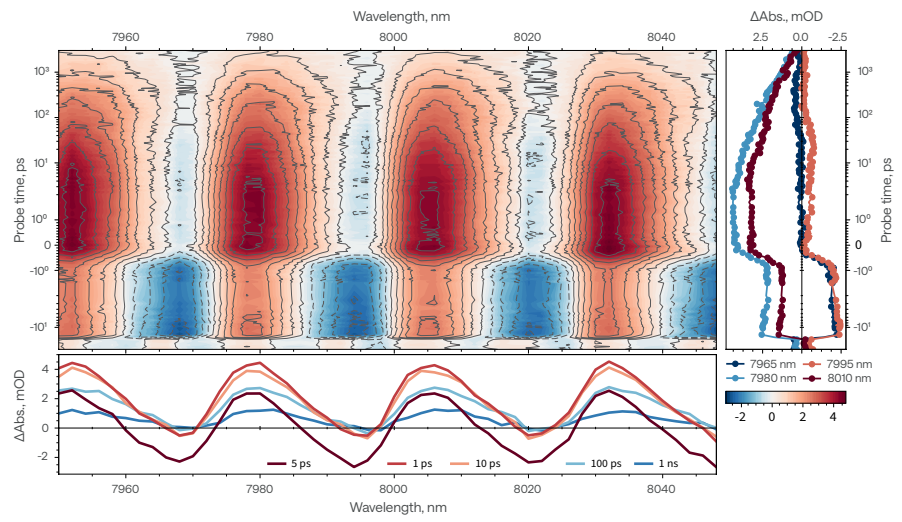


## IR femtosecond pump-probe

Pump-probe dynamics of GaAs wafer in IR measured using signal and reference single-channel detectors of HARPIA-TA.

### MEASUREMENT CONDITIONS

Pulse repetition rate: 75 kHz  
 Pump wavelength: 700 nm  
 Acquisition time: 1 s per point

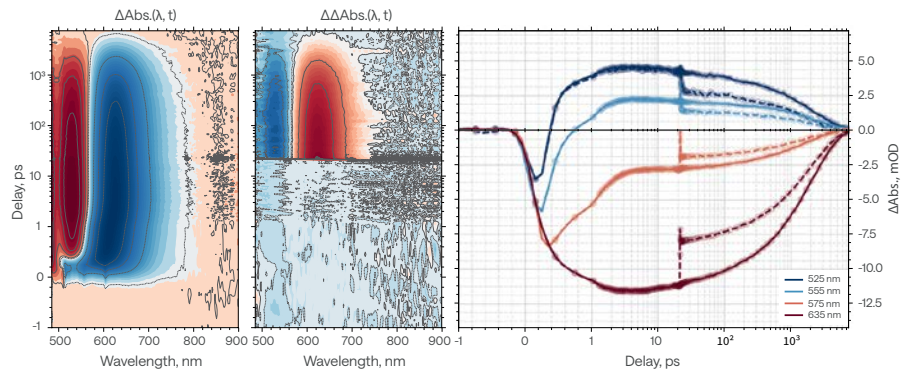


## Femtosecond pump-dump-probe

Pump-dump-probe dynamics of DCM laser dye measured using HARPIA-TB with a dump pulse resonant to the emission band of DCM.

### MEASUREMENT CONDITIONS

Pulse repetition rate: 50 kHz  
 Pump wavelength: 515 nm  
 Dump wavelength: 700 nm  
 Dump delay: 21 ps  
 Pump energy: 90 nJ  
 Dump energy: 190 nJ



## Flash photolysis

Nanosecond spectral dynamics of meso-Tetraphenylporphine in solution acquired using HARPIA-TA-FP flash photolysis mode.

### MEASUREMENT CONDITIONS

Pulse repetition rate: 1.8 kHz  
 Pump wavelength: 343 nm  
 Pump energy: 5.4 μJ

