

TA-PRO



High SNR

$\leq 10^{-6}$ OD
(with 100 kHz camera)



High-Speed Scan

90 pts / 10 s



Automation

auto-calibration, auto-switch



Modular Design



Specifications

Laser type	Ti:Sapphire Lasers	Yb-Based Lasers
Spectral range	280-380 nm (optional)	400-600 nm*
	330-650 nm	500-950 nm
	430-800 nm	1100-1600 nm
	850-1500 nm	—
Mode	Transmission/reflection	
Time window	8 ns	
Sensitivity	$\leq 10^{-6}$ OD (with 100 kHz high-speed camera)	
IRF	$\leq 1.5 \times$ Pulse width	
Detector	Vis: 8 kHz (default)	
	NIR: 6 kHz	
Automation system	Auto optical path switching & calibration	
Sample holder	Solution, film, and powder	
Compatibility	Cryostat, diamond anvil cell, magnetic field, and more	
Software	Data acquisition, analysis and fitting	

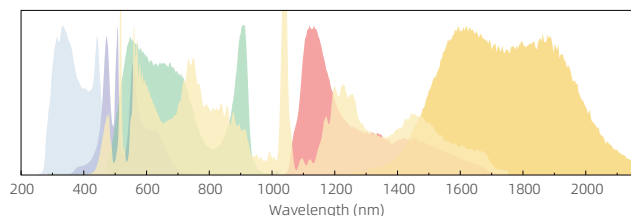
Expandable Modules

TCSPC	Time resolution ≤ 100 ps
Ultrafast FL module	Time resolution $\leq 1.5 \times$ Pulse width
Microscopy module	Microscopic TA imaging
Nanosecond TA module	Nanosecond TA

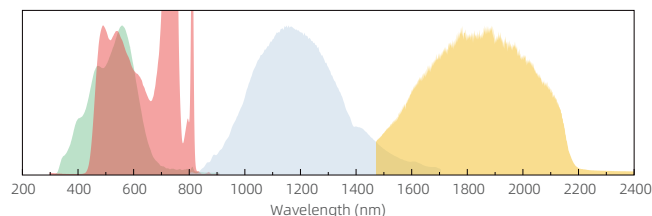
*Higher noise around 515 nm for Yb laser.

Sample Data

Probe Range



280-2200 nm spectral range for
1030 nm femtosecond laser

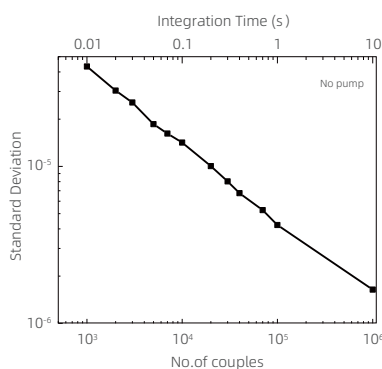


330-2200 nm spectral range for
800 nm femtosecond laser

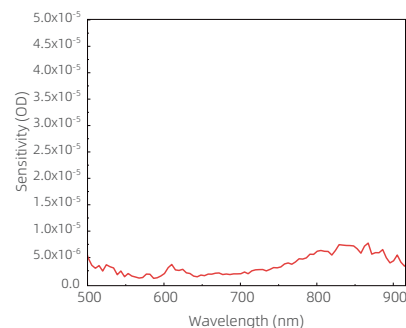
High-Speed Data Collection: 10 s (90 time-delay points)

Sensitivity: 10^{-6} OD by using 100 kHz high-speed camera (optional)

Adopt high speed 100 kHz line array detector implementation pulse-to-pulse detection, high-sensitivity full-spectrum collection (not single-wavelength collection)



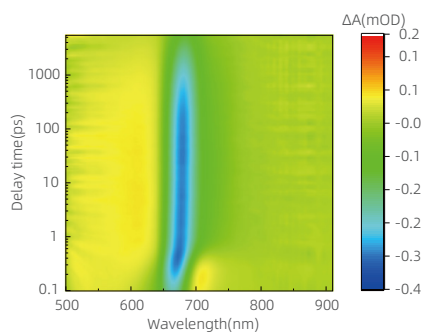
Sensitivity of high-speed camera
under different integration times



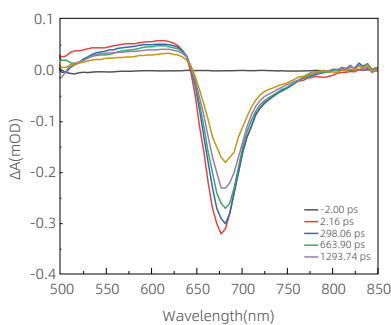
High-speed camera points 10 seconds
visible light signal-to-noise ratio

Low-Excitation Test – Data collection under ultra-low excitation intensity

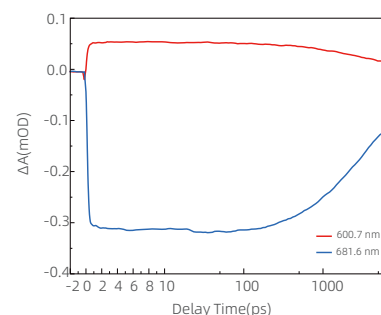
Sample	Perovskite	Probe wavelength	500-950 nm
Excitation wavelength	405 nm	Excitation energy	~ 0.24 nJ (dia.=1 mm)



TA spectra



TA spectra

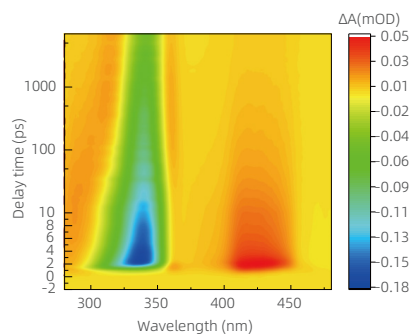


TA kinetics

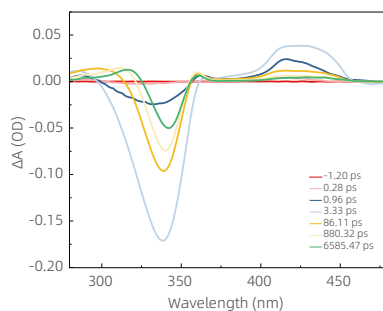
Ultrafast TA Sample Data

DUV Example – Wide-bandgap semiconductors

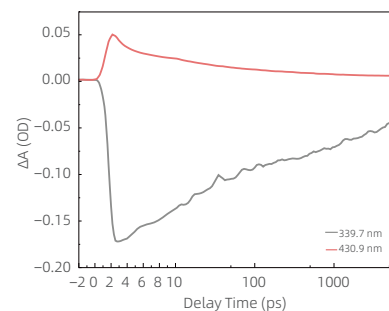
Sample	ZnO	No. of scans	3
Excitation wavelength	257.5 nm	No. of points	150



TA spectra



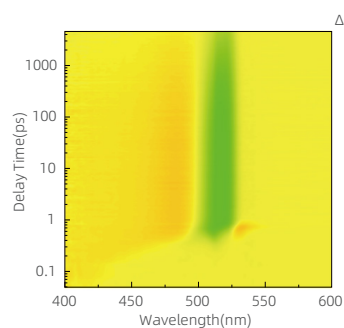
TA spectra



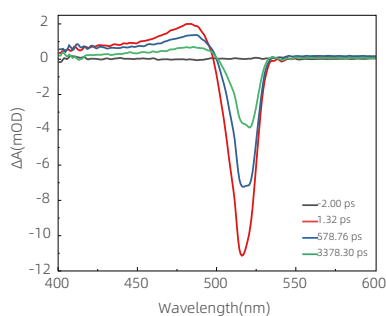
TA kinetics

UV-Vis Example – Charge transport in photovoltaic materials

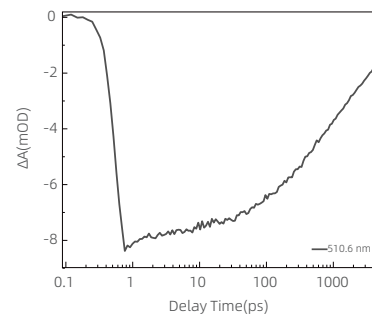
Sample	Perovskite film	No. of scans	5
Excitation wavelength	405 nm	No. of points	150



TA spectra



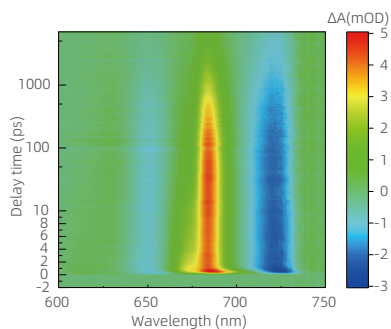
TA spectra



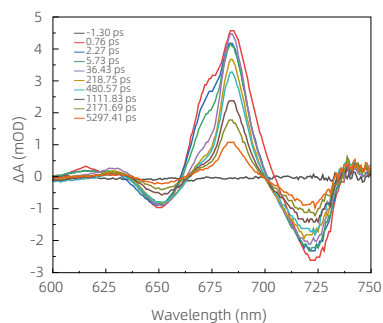
TA kinetics

Vis Example – Charge transfer between layers of 2D materials

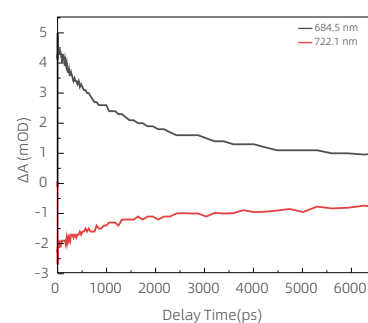
Sample	Bulk MoS ₂	No. of scans	3
Excitation wavelength	515 nm	No. of points	150



TA spectra



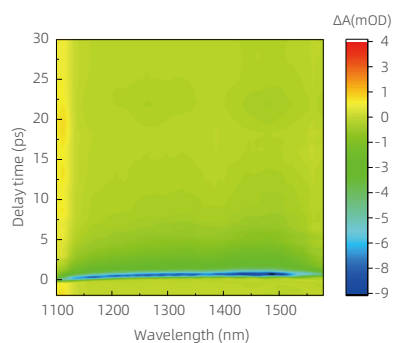
TA spectra



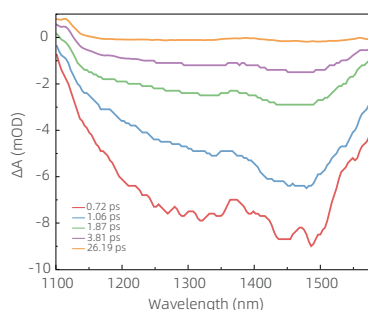
TA kinetics

NIR Example – Narrow bandgap semiconductor and excited state absorption

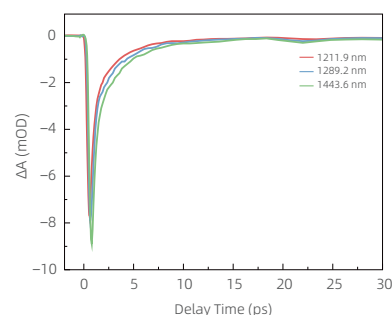
Sample	Multilayer graphite	No. of scans	1
Excitation wavelength	495 nm	No. of points	150



TA spectra



TA spectra



TA kinetics

TA-FL

Ultrafast Fluorescence Lifetime

FL Upconversion

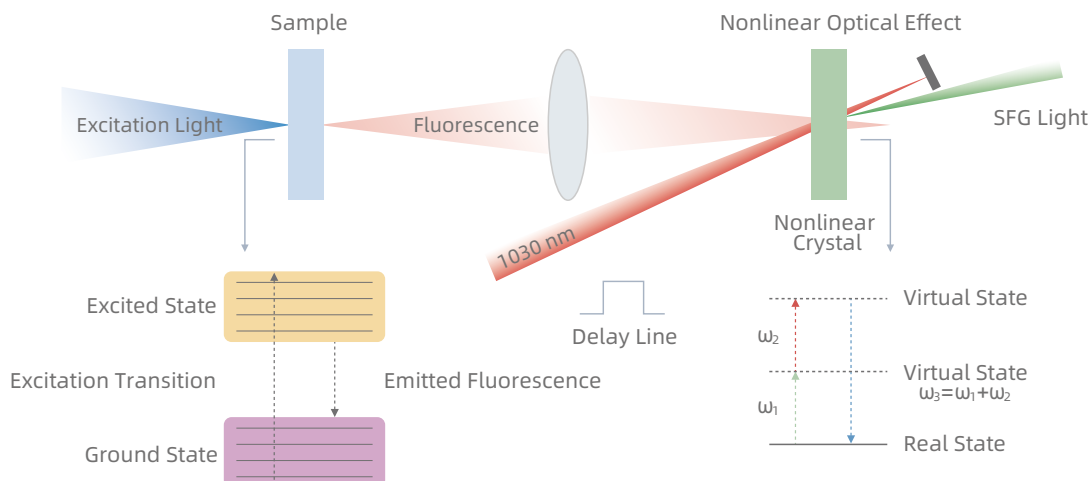
- Single-wavelength scanning acquisition
- Time window: fs to ns
- High sensitivity with background noise suppression

Kerr Gate

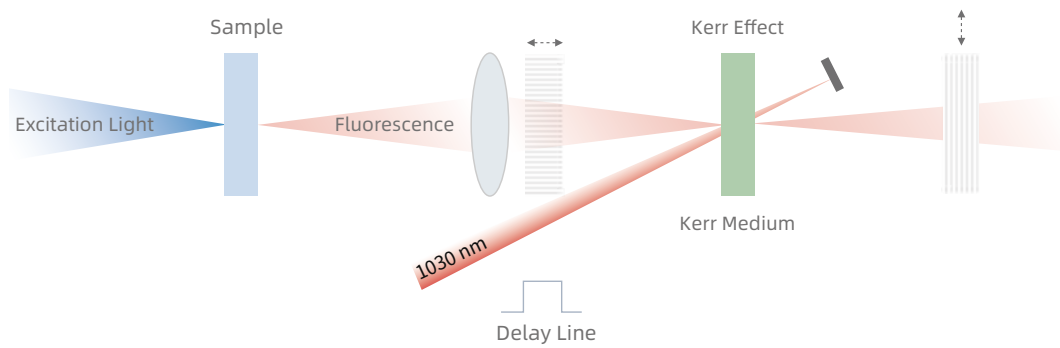
- Direct spectrum acquisition
- Time window: fs to ns
- Enables multi-spectral detection of ultrafast dynamics

Principle

Principle of FL Upconversion



Principle of Kerr Gate



Specifications*

FL Upconversion

FL detection wavelength range	360-950 nm
Time window	8 ns
IRF	≤ 1.4 times pulse width
Detection mode	Single wavelength kinetic scan
	Broadband spectral scan
	Dynamic 3D detection

Kerr Gate

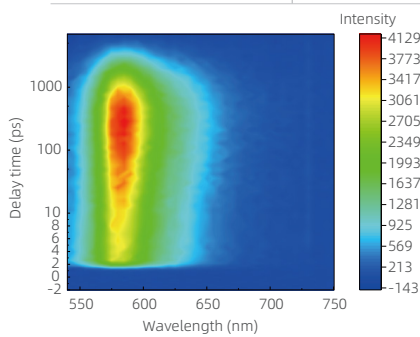
Spectral range	355 nm-1100 nm
Pump range	315-2600 nm
Time resolution	≤ 1 ps
Time window	8 ns
Spectral resolution	0.4 nm
Acquisition mode	Transmission/Reflection

*Paired with 1030 nm laser

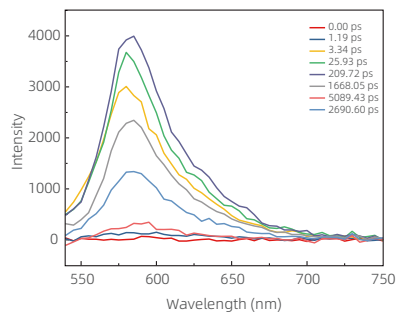
Sample Data

FL Upconversion – Research on the ultrafast FL in dye molecules

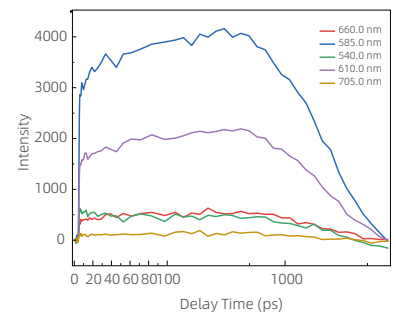
Sample	RhB	No. of scans	3
Excitation wavelength	515 nm: 10 mw	Fluorescence range	530 nm-750 nm



FL spectrum



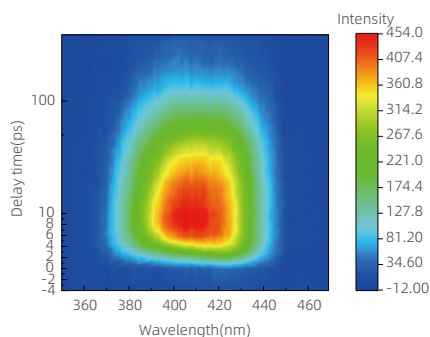
FL spectrum



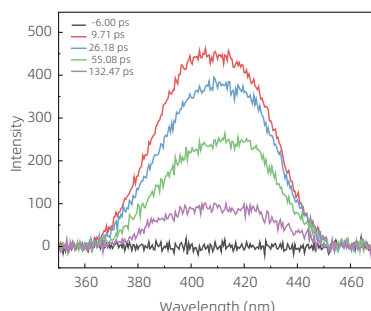
FL kinetics

Kerr Gate – Pterostilbene ultrafast FL kinetics

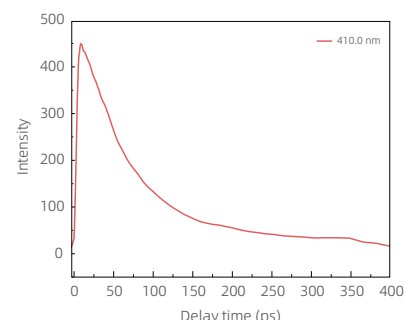
Sample	Pterostilbene	No. of scans	3
Excitation wavelength	345 nm: 2 mw	Collect points	150
Fluorescence range	355 nm-460 nm	Exposure time	6 s



FL spectrum



FL spectrum



FL kinetics

TA-MICRO

Ultrafast Microscopic Imaging

Specifications

Microscopic Kinetics Imaging Module

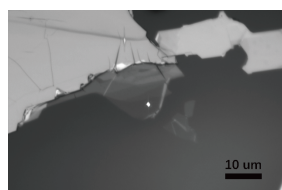
Mode	Micro-spectroscopy acquisition/wide-field TA imaging/carrier migration imaging
Spatial resolution	< 500 nm
Camera wavelength range	400-800 nm 900-1700 nm (NIR)
Carrier migration accuracy	< 50 nm
Objective	10x, 40x, 50x, 100x

Sample Data

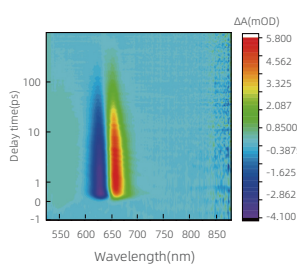
Microscope TA

Micro-area Transmission Test

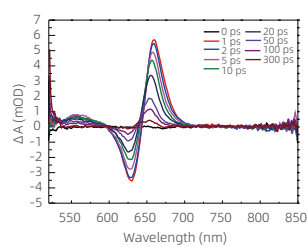
Sample	WS ₂
Excitation wavelength	515 nm
Probe wavelength	500-850 nm



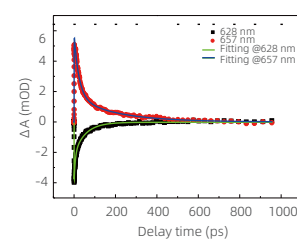
Bright-field mapping



TA spectra



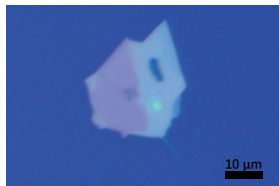
TA spectra



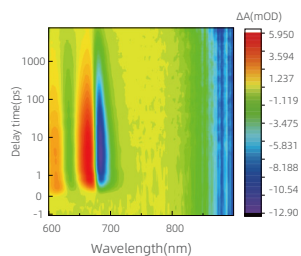
TA kinetics

Micro-area Reflection Test

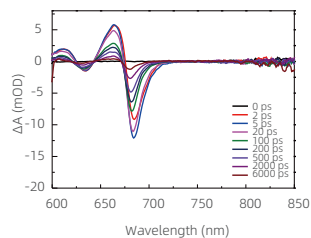
Sample	Monolayer WS ₂ (substrate: Si)
Excitation wavelength	515 nm
Probe wavelength	Visible



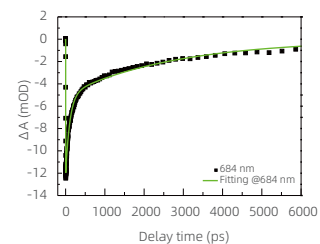
Bright-field mapping



TA spectra



TA spectra

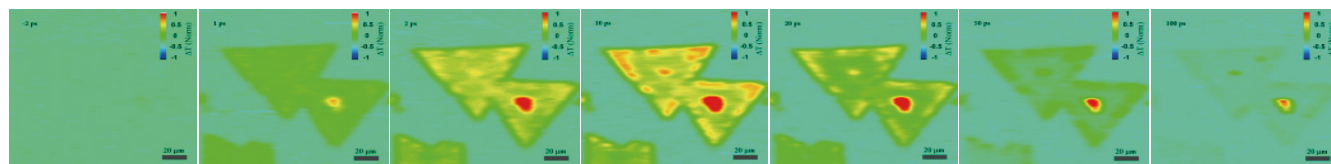


TA kinetics

Micro-area TA Imaging: Spatial Distribution of TA Signals in Micro/Nano Samples

Wide-Field TA Imaging

Sample	WS ₂
Excitation wavelength	515 nm
Probe wavelength	610 nm



-2 ps

1 ps

2 ps

10 ps

20 ps

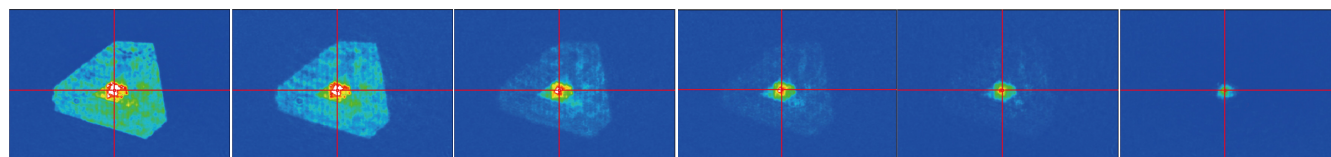
50 ps

100 ps

Wide-field TA mapping

Near Infrared Imaging

Sample	WS ₂
Excitation wavelength	515 nm
Probe wavelength	900 nm



2.1 ps

3.5 ps

5 ps

6.9 ps

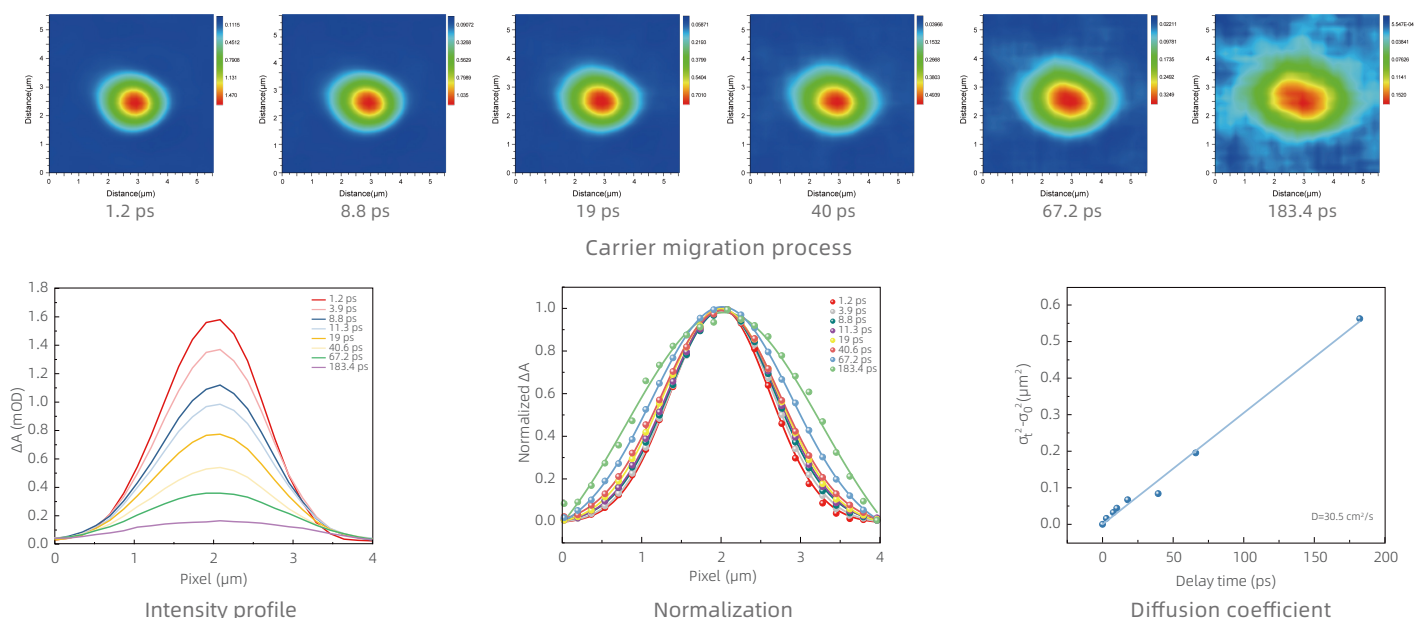
11.5 ps

37 ps

Near-infrared mapping

Carrier Diffusion Data Diagram

Sample	F ₁₆ CuPc
Excitation wavelength	650 nm
Probe wavelength	510 nm



TA-NANO

Nanosecond Transient Absorption

- Integrated nanosecond laser & electrical pulse generator
- Electronic delay & independent supercontinuum white light source
- Sub-ns to ms photo/electrical dynamics detection
- Compatible with ultrafast transient absorption system

Specifications

Main System

Mode	Switchable Transmission/Reflection Mode
Wavelength range	360-1700 nm
Time window	$\leq 400 \mu\text{s}$
Detection time resolution	8 ns (electrically pumped), 1 ns (optically pumped)
Sensitivity	$\leq 0.2 \text{ mOD}$
Reference module	Additional data acquisition & spectral detection system Eliminates probe white light jitter noise High SNR & acquisition efficiency

Nanosecond Supercontinuum White Light Laser

Spectral range	350-1800 nm
Pulse width / repetition rate	$\sim 800 \text{ ps}$, 2 KHz
Power stability	$\pm 1 \%$
Total average optical power	$> 5 \text{ mW}$

Electrical Pump Extension Module

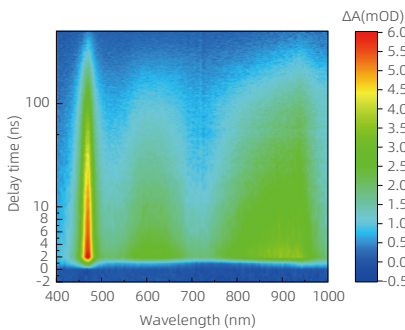
Maximum voltage	0-7 V (50 Ω)
Pulse width	10 ns-990 ms
Repetition rate	1 Hz-1 MHz
Rise time of electrical pulse from 0 to 5 V	≤ 390 μs

Sample Data

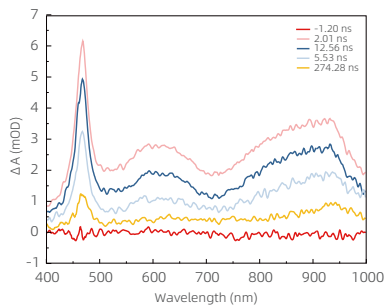
Nanosecond TA Testing

UV-Vis Example

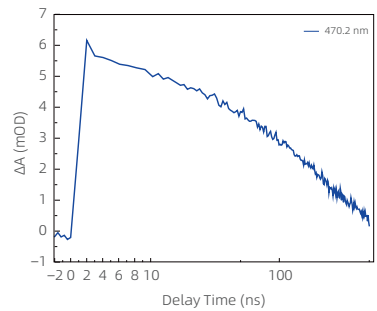
Sample	SiC
Excitation wavelength	343 nm
Probe wavelength	400-1000 nm



TA spectra



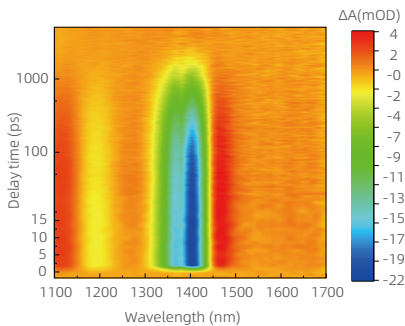
TA spectra



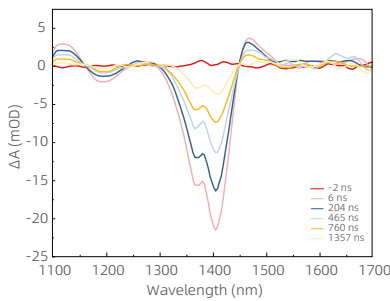
TA kinetics

NIR Example

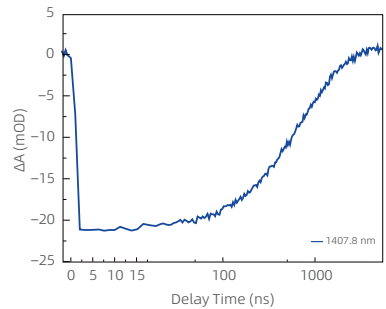
Sample	PbS
Excitation wavelength	343 nm
Probe wavelength	1100-1700 nm



TA spectra



TA spectra



TA kinetics