

Spider Pulse Characterization

Spectral and Temporal Characterization of Ultrashort Laser Pulses

- The Spider series by APE is an all-purpose and frequently used solution for complete characterization of ultrashort laser pulses. Even complex pulse shapes can be measured rapidly and at fast update rates. Different models are available to cover various pulse durations, bandwidths, and wavelengths.
- Our Compact LX Spider has been designed specifically for use with Ti:Sa lasers and any applications requiring easy portability and handling.
- The FC Spider (Few Cycle Spider) is the best choice for very short pulses down to sub 5 fs and supports pulse spectra that cover up to one octave.
- The Spider IR is ideal for infrared laser pulses with a central wavelength of around 1 μm .



Compact LX Spider

- Compact version, ideal for the characterization of Ti:Sa Lasers
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FC Spider

- Measurement of very short pulses with only a few cycles
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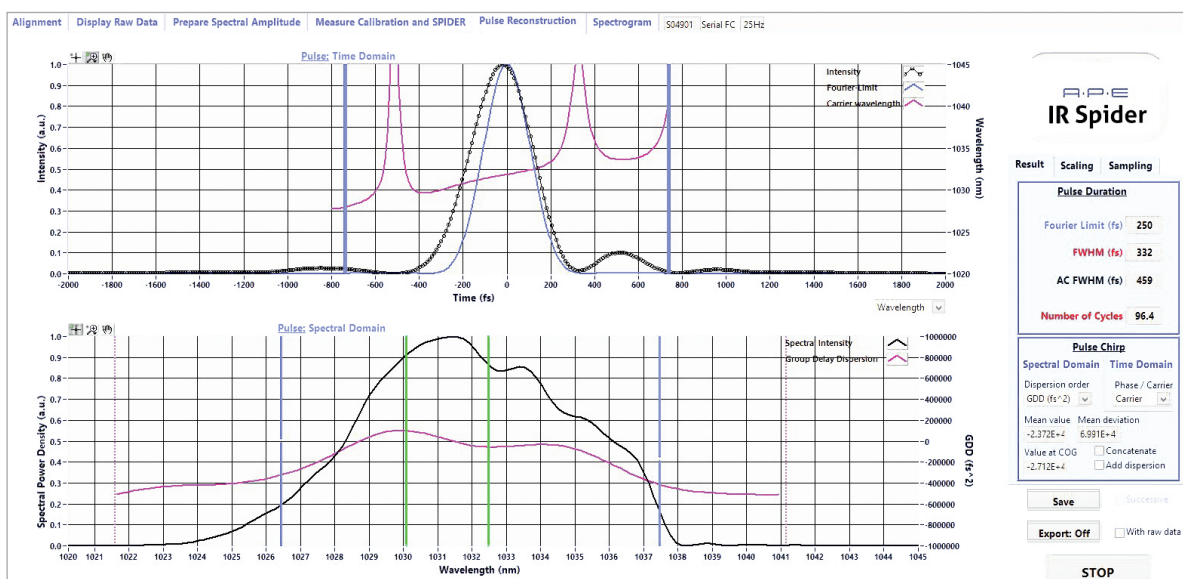
Spider IR

- Measurement at central wavelengths of around 1 μm
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... Spider Software

Spider Software Features

- Important software features for advanced pulse characterization are provided with all APE Spiders. If desired, a PC or notebook with pre-installed software will be delivered together with the instrument.



Software Interface FC Spider and Spider IR

FC Spider, Spider IR (Software)

- Spectral and temporal reconstruction
- Alternative interferogram demodulation methods: Fourier / Wavelet
- E-field plot
- Peak power calculation
- Measurement of phase differences
- Spectral phase derivation up to fourth order
- Simulation of additional theoretical dispersion (GDD, TOD, FOD)
- Spectrogram (X-FROG, SHG-FROG) and Wigner trace representation of the pulse

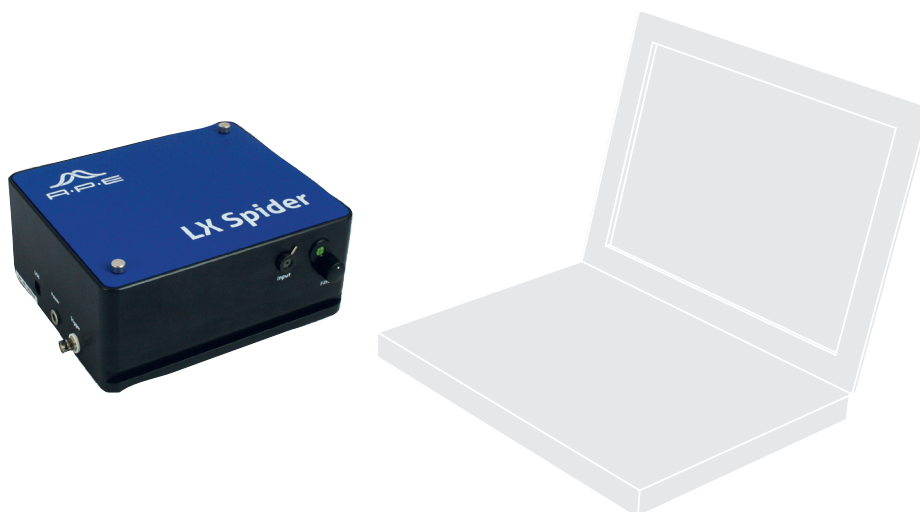
Compact LX Spider (Software)

- Spectral and temporal reconstruction
- Bar plot of dispersion orders
- Spectral phase fit and analysis up to fourth order

Compact LX Spider

The Compact Choice for the Ti:Sa Wavelength Range

- The Compact LX Spider by APE is a portable, compact and robust instrument for spectral and temporal characterization of femtosecond laser pulses. It is the ideal candidate for Ti:Sa laser applications and other ultrashort pulse oscillators or amplifiers in the wavelength range 750 - 900 nm.
- Two interchangeable Optics Sets are available to cover pulse durations between 16 and 300 fs.
- Based on the popular Spider method (Spectral Phase Interferometry for Direct Electric-field Reconstruction), the Compact LX Spider allows you to visualize the spectral and temporal characteristics of the measured pulse.
- The patented optical design* incorporates a long crystal to up-convert two test pulse replicas. It also introduces spectral shear without the need for an additional chirped pulse. Both the temporal amplitude and the phase are calculated in real-time.
- The Compact LX Spider has been drastically simplified to feature fewer optical components, making it much easier to align and use. It is delivered as a pre-calibrated unit, complete with hardware and software. One click of the mouse and recalibration of this fully automated device is performed within seconds.



- Ideal for the wavelength range of 750 - 900 nm, e.g. Ti:Sa Laser
- Compact and robust design for easy portability
- Real-time measurement of phase/intensity profiles
- Software suite included
- Fully automated

* International Patent No.: US 7,599,067 B2, WO 2006123148

Compact LX Spider Specifications

Specifications

Wavelength Range	750 - 900 nm
Typical Application	Ti:Sa Laser characterization
Optics Sets	Exchangeable
Spectral Bandwidth	Depending on Optics Set Optics Set 1: 13 ... 65 nm Optics Set 2: 5 ... 15 nm
Pulse Width	Depending on Optics Set Optics Set 1: 16 ... < 150 fs Optics Set 2: 70 ... < 300 fs
Laser Repetition Rate	Any; Single Shot
Input Polarization	Linear (any orientation)
Input Power	> 10 mW at e.g. 80 MHz, 80 fs 20 mW at e.g. 5 kHz, 35 fs
Input Trigger	TTL for $f < 10$ Hz
Connection	USB
Software	Included; Features e.g. <ul style="list-style-type: none"> ▪ Spectral and temporal reconstruction ▪ Bar plot of dispersion orders suitable for alignment purpose ▪ Spectral phase fit and analysis up to fourth order

Options

- Optics Set 1 or Optics Set 2
- Notebook with pre-installed Software

Dimensions

228 x 99 x 192 mm (W x H x D) (See appendix for details)

FC Spider Few Cycles

Precise Characterization of Very Short Pulses Down to < 5 fs

- The FC Spider (Few Cycle Spider) by APE provides spectral and temporal characterization of ultrashort laser pulses down to below 5 fs. It covers both the red and near infrared range, and visible wavelength region with the FC Spider VIS.
- This high-precision tool is ideal for aligning and monitoring the performance of broadband Ti:Sa oscillators and amplifier chains with bandwidths starting at 30 nm.
- The FC Spider VIS supports the visible spectral region down to 450 nm, suitable for characterization of e.g. nonlinear optical parametric amplifiers (NOPA).
- Based on the proven and patented Spider* technology, using a non-drifting, etalon interferometer and a material dispersion stretcher, the FC Spider directly measures the spectral phase by analyzing a spectral interferogram. In combination with a simultaneously measured power spectrum, real-time calculation and visualization of the spectral and temporal amplitude and phase is accomplished.



- Short pulse characterization down to < 5 fs
- Spectral coverage in the IR range and VIS range
- Real-time and single-shot measurement of phase and intensity
- High level of automated software support and internal camera-assisted alignment
- Full software suite included
- Ideal for broadband Ti:Sa oscillators, hollow-core fiber compressors, and NOPA

*Spectral Phase Interferometry for Direct Electric-field Reconstruction;

International Patent No.: EP 1000315, WO 1999/006794

FC Spider Specifications

Specifications	FC Spider NIR	FC Spider VIS
Wavelength Range	550 ... 1050 nm *	450 ... 900 nm *
Typical Application	Characterization of very short pulses, broad bandwidths; E.g. Ti:Sa Laser, hollow-core fiber compressor	Characterization of very short pulses, broad bandwidths; Visible wavelength range; E.g. NOPA
Spectral Bandwidth	> 30 nm at e.g. 800 nm	10 ... 50 nm at e.g. 550 nm, other options available
Pulse Width	< 5 ... 200 fs	10 ... < 150 fs at e.g. 550 nm, other options available
Laser Repetition Rate	Any; Single Shot	Any; Single Shot
Input Polarization	Linear horizontal	Linear horizontal
Input Power	> 50 mW at e.g. 80 MHz, 10 fs 20 mW at e.g. 1 kHz, 20 fs	On request
Input Trigger	TTL for f < 10 Hz	TTL for f < 10 Hz
Connection	USB	USB
Software	Included; Features e.g. <ul style="list-style-type: none"> ▪ Alternative interferogram demodulation analysis: Fourier / Wavelet ▪ Peak power calculation ▪ Measurement of phase differences (Dispersion measurement) ▪ Spectral phase derivation up to fourth order ▪ Simulation of additional theoretical dispersion (GDD, TOD, FOD) ▪ Spectrogram (X-FROG, SHG-FROG) and Wigner trace representation of the pulse ▪ E-field plot 	

Options

<ul style="list-style-type: none"> ▪ Wavelength Range 	500 ... 1000 nm 660 ... 1160 nm Customized wavelengths on request	Pre-mounted optics optimized for various center wavelengths, e.g. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Center Wavelength:</th> <th>Pulse width:</th> <th>Spectral bandwidth:</th> </tr> </thead> <tbody> <tr> <td>▪ 500 nm</td> <td>12 ... 180 fs</td> <td>6 ... 30 nm</td> </tr> <tr> <td>▪ 600 nm</td> <td>8 ... 120 fs</td> <td>14 ... 70 nm</td> </tr> <tr> <td>▪ 700 nm</td> <td>6 ... 100 fs</td> <td>25 ... 125 nm</td> </tr> <tr> <td>▪ 800 nm</td> <td>7 ... 80 fs</td> <td>40 ... 140 nm</td> </tr> </tbody> </table>	Center Wavelength:	Pulse width:	Spectral bandwidth:	▪ 500 nm	12 ... 180 fs	6 ... 30 nm	▪ 600 nm	8 ... 120 fs	14 ... 70 nm	▪ 700 nm	6 ... 100 fs	25 ... 125 nm	▪ 800 nm	7 ... 80 fs	40 ... 140 nm
Center Wavelength:	Pulse width:	Spectral bandwidth:															
▪ 500 nm	12 ... 180 fs	6 ... 30 nm															
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▪ 700 nm	6 ... 100 fs	25 ... 125 nm															
▪ 800 nm	7 ... 80 fs	40 ... 140 nm															
<ul style="list-style-type: none"> ▪ External Beam Splitter and Beam Routing Kit 	For lasers with low repetition rates (kHz or less)	For lasers with low repetition rates (kHz or less)															
<ul style="list-style-type: none"> ▪ Pre-installed Notebook 	Available	Available															
<ul style="list-style-type: none"> ▪ Fiber Coupling 	Available for fundamental input port	Not available															

Dimensions

561 x 244 x 316 mm (W x H x D)
See appendix for details

561 x 244 x 316 mm (W x H x D)
See appendix for details

* Other wavelength ranges on request

Spider IR 1 μm Central Wavelength

Towards Short Pulses at 1 μm Central Wavelength

- The Spider IR is a precision tool optimized for the complete spectral and temporal characterization of laser pulses in the infrared. Based on the patented Spider* technology, it extends the existing range of APE Spider models to cover longer pulses, between 30 and 500 fs, at a central wavelength of around 1 μm .
- It also supports detection of the chirp sign for stretched pulses greater than 2 ps width, making it a smart choice for the alignment of pulse compressors.
- With its two internal spectrometers (for fundamental spectrum and upconverted interferogram) the Spider IR is able to simultaneously measure and analyze both spectra needed for pulse reconstruction, by using the same pulse. This gives it true single-shot capability.
- Furthermore, the Spider IR control software supports real-time calculation of the temporal amplitude and phase. The user-friendly design features highly automated software to guide the operator through calibration and alignment procedures and enable measurements to be executed with a minimum of data input.



- Best choice for pulses between 30 and 500 fs at 1 μm central wavelength
- Spectral intensity and phase plus temporal intensity and phase measurement
- Real-time and true single-shot measurement of intensity and phase
- High level of automated software support and internal camera-assisted alignment
- Full software suite included

*Spectral Phase Interferometry for Direct Electric-field Reconstruction; International Patent No.: EP 1000315, WO 1999/006794

Spider IR Specifications

Specifications

Wavelength Range	970 ... 1070 nm *
Typical Application	Characterization of lasers with small bandwidths, larger pulse widths, e.g. 1 μ m laser
Spectral Bandwidth	> 6 ... 50 nm
Pulse Width	30 ... 500 fs; 5 ps for chirp direction measurement only
Laser Repetition Rate	Any; Single Shot
Input Polarization	Linear horizontal
Input Power	~ 100 mW at e.g. 80 MHz; ~ 20 mW at e.g. 1 kHz
Input Trigger	TTL for $f < 10$ Hz
Connection	USB
Software	Included; Features e.g. <ul style="list-style-type: none"> ▪ Alternative interferogram demodulation analysis: Fourier / Wavelet ▪ E-field plot ▪ Peak power calculation ▪ Measurement of phase differences (Dispersion measurement) ▪ Spectral phase derivation up to fourth order ▪ Simulation of additional theoretical dispersion (GDD, TOD, FOD) ▪ Spectrogram (X-FROG, SHG-FROG) and Wigner trace representation of the pulse

Options

- External Beam Splitter and Beam Routing Kit For lasers with low repetition rates (kHz or less)
- Pre-installed Notebook Available
- Wavelength Ranges Customized wavelength ranges on request

Dimensions

561 x 289 x 320 mm (W x H x D) (See appendix for details)

* Other wavelength ranges on request

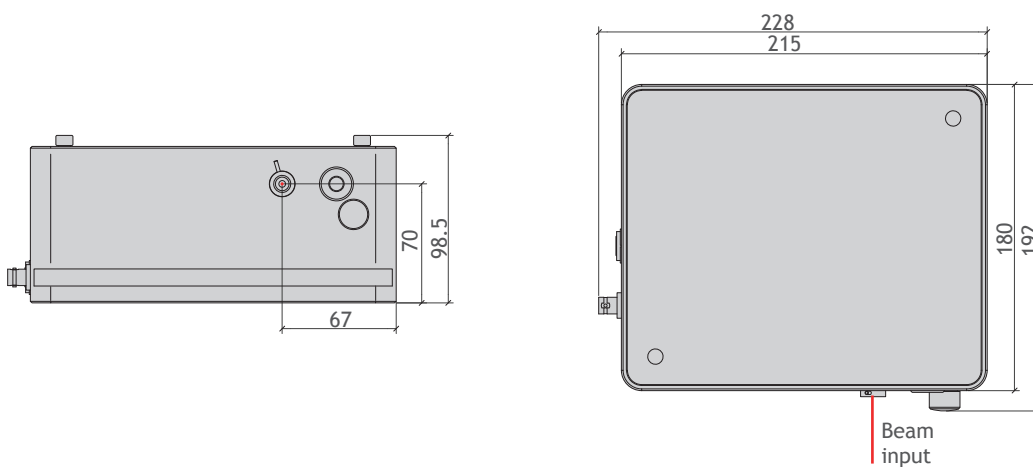
Appendix Technical Drawings

All Dimensions in mm

Compact LX Spider

- Compact version, ideal for the characterization of Ti:Sa lasers

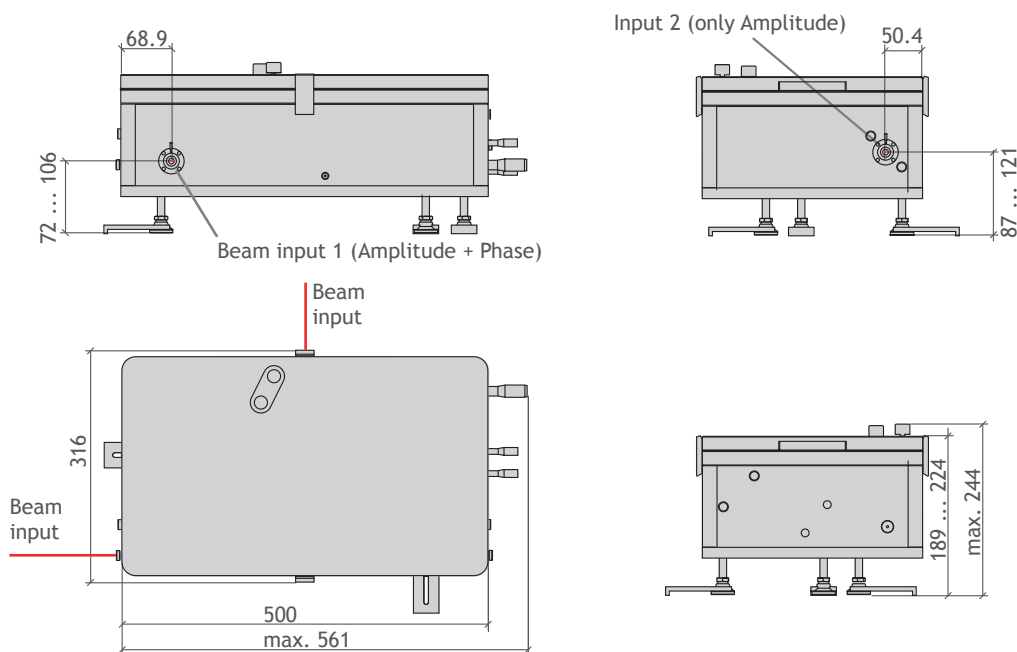
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FC Spider

- Measurement of very short pulses with only a few cycles

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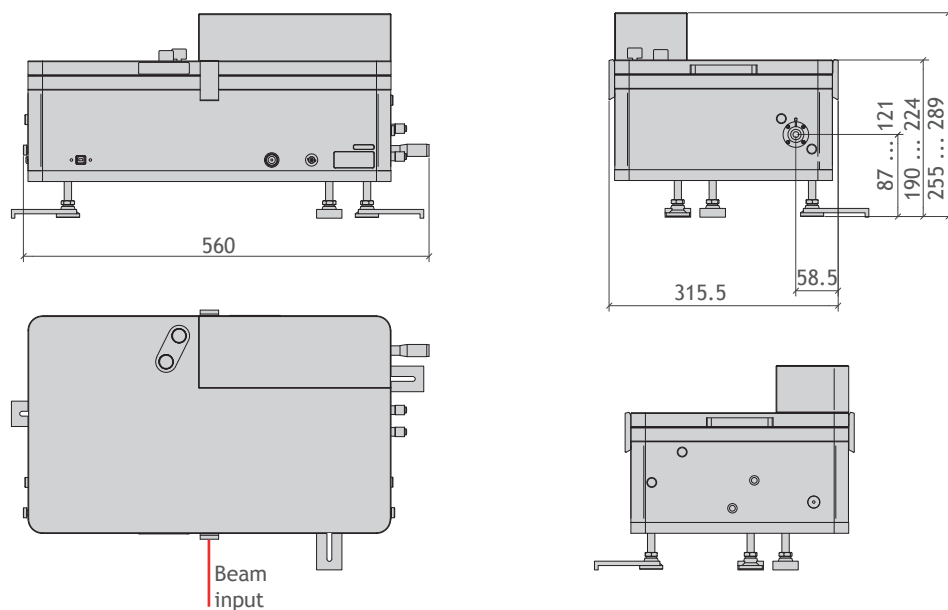


IR Spider Technical Drawings

IR Spider

- Measurement at central wavelengths of around $1 \mu\text{m}$

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Similar Products

- pulseCheck - Autocorrelator multitalent for any task
- Mini PD - Autocorrelator routine tasks with a fixed wavelength range
- Carpe - Autocorrelator first choice for multiphoton microscopy
- waveScan - High resolution spectrometer
- peakDetect - Pulse quality monitoring

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APE follows a policy of continued product improvement. Therefore, specifications are subject to change without notice.

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