

Ultrafast instrumentation (No Alignment!)

We offer products specialized in ultrafast metrology with strong expertise in the production and characterization of high energy ultrashort pulses. We provide robust and reliable measurement devices for ultrafast lasers, already used in some state of the art laboratories.

Our current product-line includes a single shot autocorrelator, capable of measuring few cycle pulses with interferometric resolution, and an innovative SHG single shot FROG. Both are suitable for several wavelength ranges (from UV to mid-IR) and several pulse durations, down to 5 fs. We also develop a innovative compact spectrometer and beam profilers.

Beside their intrinsic technical performances, our products are very easy to use, compact, portable and versatile, which make them the ideal tools for customer services. The products are associated with a high quality user-friendly software which contributes to make them easy and pleasant to use. We also make vacuum compatible measurement devices and custom products upon request and we provide our expertise on ultrafast metrology.

ULTRAFAST INSTRUMENTATION

... to ease your measurements!

Very easy to use

Our 2 major products can be installed in only 2 minutes with no necessary calibration. It comes in an ultra compact (50x50x150mm) package for the long pulse model and a 50x50x250mm package for the fs one.

No internal freespace alignment

Designed specifically to be ultra easy to use and to align onto the laser beam. They cannot be misaligned, there is no need for calibration or tweaking and even after transport! **Save hours on freespace alignment** and spend more time on your experiments!

High level of accuracy

Our autocorrelator provides single shot measurements up to 200 kHz and down to 5 femtosecond pulses while our achromatic and non-dispersive single shot FROG can go down under 5 femtosecond pulses.

Intuitive, powerful companion software

The companion Femto Easy software can run either on Linux or Windows. It is heavily optimized and specifically designed from the ground up to provide accurate control and readings of the Femto Easy products.

STFE-ROC series Ultra compact Autocorrelator (Alignment-free!)

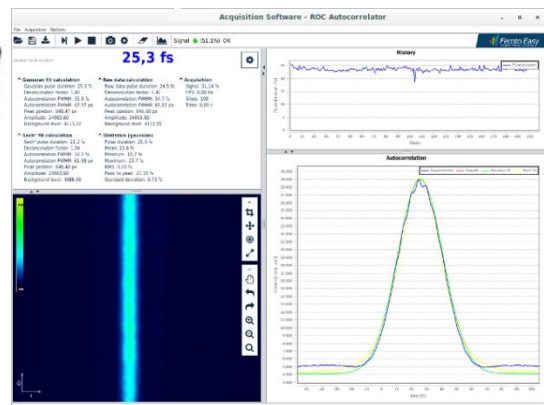
ROC stands for Row Optical Correlator. The ROC autocorrelators are ultra compact and robust single shot autocorrelators. As the name implies, they are designed specifically to be ultra easy to use and to align onto the laser beam. They cannot be misaligned, there is no need for calibration or tweaking and they are easily transportable. And yes, they are rock-solid!

Besides those advantages, the ROCs autocorrelators provide excellent technical performances and highly accurate measurements.

The ROCs autocorrelators are available for several wavelength and several pulse duration.

Features:

- No internal freespace alignment !
- Extreme ease of use
- High level of accuracy
- Only 2 minutes to install and start measuring!
- No calibration necessary
- Down to 5 femtoseconds
- Single shot measurements up to 200 kHz
- Broad spectral range (450-2000 nm for the broadband model)
- Ultra compact: 50x50x250mm for short pulse model, 50x50x180mm for long pulse model



Software interface:

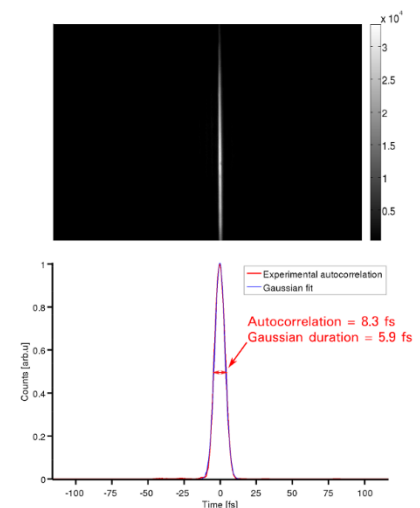
The software has been designed to be user friendly and intuitive. This is a modern software compatible with touchscreen that can run either under Linux or Windows. It allows distant control of the devices via PC, tablet or smartphone. We can also provide custom software developments upon request.

Measurement of few cycle pulses:

This is an autocorrelation measurement sample of ultrashort pulse that has been performed in Politecnico di Milano with our short pulse model autocorrelator ROC FC-700.

On the top, the raw image of the spatially resolved autocorrelation trace.

At the bottom, the analysed autocorrelation trace integrated over the spatial coordinate. The experimental data (in red) are fitted by a Gaussian function (in blue). The full width at half maximum of the autocorrelation trace is 8.3 fs. The corresponding Gaussian pulse duration is 5.9 fs.

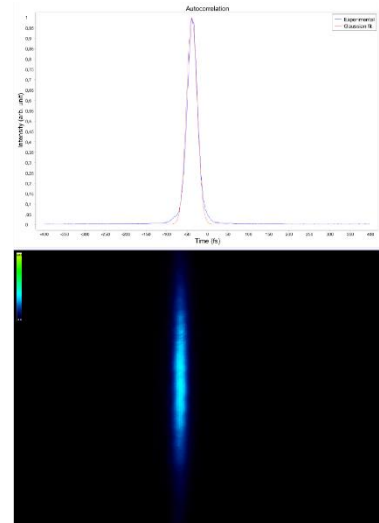


Measurement of low energy pulses:

This measurement has been performed on a femtosecond Ti:Sapph oscillator at LCAR with a ROC FC-400 autocorrelator.

The average power used for the measurement was with only 20 mW at 62 MHz repetition rate. It means that in this conditions 0.3 nJ per pulse was enough to get a clean measurement. At the bottom, the raw image of the spatially resolved autocorrelation trace.

On the top, the analysed autocorrelation trace integrated over the spatial coordinate. The experimental data (in blue) are fitted by a Gaussian function (in red). The full width at half maximum of the autocorrelation trace is 30.4 fs for a Gaussian pulse duration of 21.5 fs.



Models	STFE-ROC-FC600	STFE-ROC-FC400	STFE-ROC-FS600	STFE-ROC-FS400	STFE-ROC-PS600	STFE-ROC-PS400
Pulse duration [fs]	5 - 150 fs	5 - 150 fs	20 - 500 fs	20 - 500 fs	50-10,000 fs ¹	50-5,000 fs ¹
Wavelength range [nm]	600-2100 ²	450-2100 ³	600-2100 ²	450-2100 ³	600-2100 ²	450-2100 ³
Input pulse repetition rate	From Hz to GHz ⁴					
Input pulse energy [nJ] ⁵ Single shot : 1 MHz : 1 GHz :	>1000 >10 > 0.05 (with low energy option)					
Input polarization	Linear vertical or horizontal					
Detection	CMOS 12 bit – 3Mpx – 72dB					
PC interface	USB 3 or GigE					
Beam height [mm]	30 – no limit					
Dimensions [mm]	55x56x265	55x56x265	55x56x265	55x56x265	55x56x195	55x56x`95

1. Four pulse duration ranges available:

- PS1: 50-1,000 fs
- PS3: 200-3,000 fs
- PS5: 300-5,000 fs
- PS10: 500- 10,000 fs

2. Four wavelength options for ROC 600:

- 700 - 1200 nm (R)
- 1000 - 1600 nm (IR1)
- 1400 - 2100 nm (IR2)
- 700 - 2100 nm (BB)

3. Six wavelength options for ROC 400:

- same 3 than ROC 700 (R,IR1, IR2)
- 450 - 640 nm (B)
- 500 - 800 nm (G)
- 450 - 2100 nm (BB)

4. Over 80 kHz, the measurements are average over several shots. The number of shot shots depends on the laser rep rate (ex: 4 shots for 200 kHz). Devices with higher shot to shot measurement capacity can be made upon request.

5. The minimum average input power is 10 mW at 1 MHz. The maximum average input power is 2.5 W, it means that in most of the cases the beam can be injected directly into the ROC.

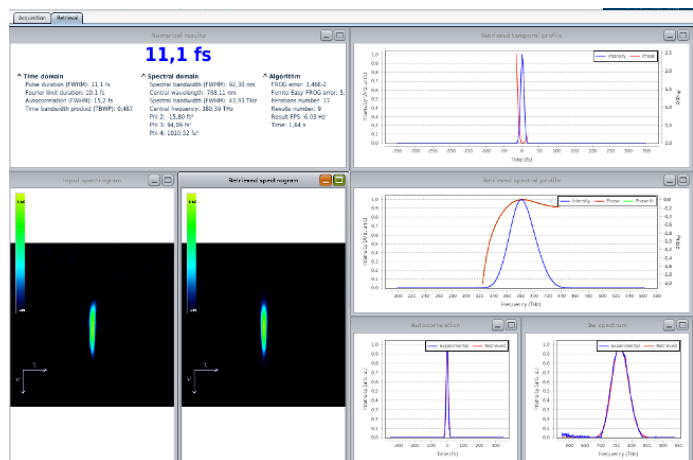
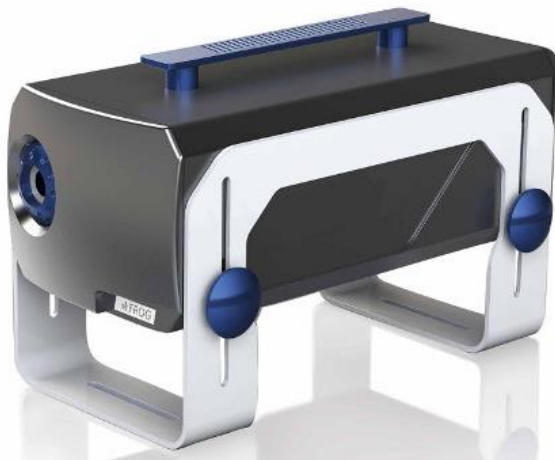
STFE-FROG series FROG with real time phase retrieval

The Fast FROG product line provides reliable and compact single shot FROG based on second harmonic generation. Key design features such as the wavefront division technique and the mini imaging spectrometer make the Fast Frog very easy to use and provide a high level of accuracy. Six models are available to cover a broad spectral range and a broad pulse duration range from sub-5 fs pulse to 5 ps.

FROG stands for Frequency Resolved Optical Gating. The Fast Frog product line provides reliable and compact single shot FROGs, based on second harmonic generation. Key design features, such as the wavefront division technique and the mini imaging spectrometer, make the Fast Frog very easy to use and provide a high level of accuracy. Six models are available to cover a broad spectral range and a broad pulse duration range from sub-5 fs to 10 ps. Two designs are available : one for long pulses mainly relying on transmission optics, and one for ultrashort pulses which is completely achromatic. We also propose a wavelength tunable Fast FROG that combines a very broad spectral range with a high spectral resolution.

Features:

- Extremely easy to use
- High level of accuracy
- Real time phase retrieval
- No calibration and no tweaking necessary
- Sub-5 fs pulses
- Single shot up to 80 kHz¹
- Broad spectral range (450-2000 nm)²
- Achromatic and non-dispersive for the few cycle model³
- The only real single shot FROGs on the market



Software interface:

Furthermore it is very user friendly, the Fast FROG software comes with an optimized retrieval algorithm, that allows you to retrieve time and spectral informations in real time.

GigaHertz / low energy (pJ) measurement sample:

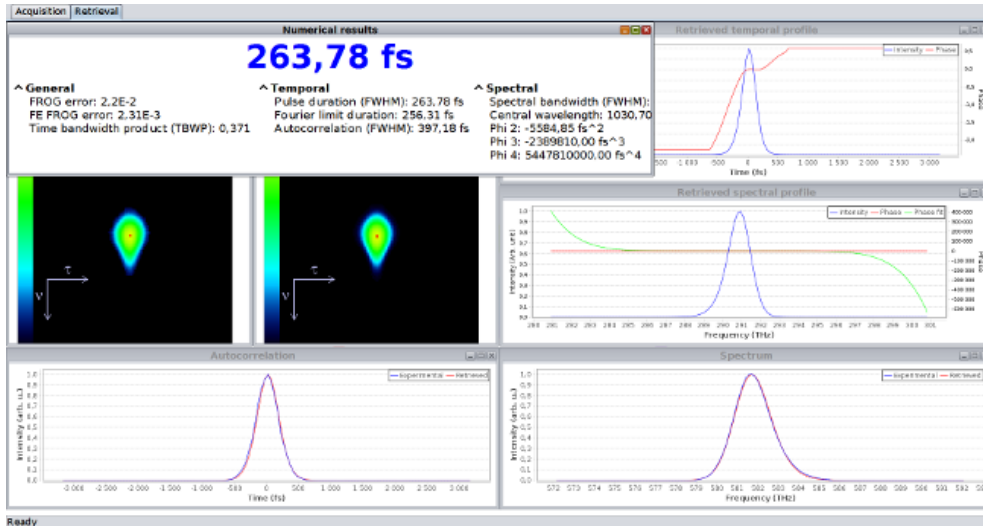
This is a FROG measurement performed with Fast FROG PS-700 with a low energy option and small beam option.

The measured laser was a SESAM modelocked VECSEL developed at ETH Zurich[1], assembled, amplified and CEO stabilized at the University of Neuchatel[2].

This was the very first measurement of a GHz rep. rate Laser with a single shot device.

1 D. Waldburger, S. M. Link, M. Mangold, C. G. E. Alfieri, E. Gini, M. Golling, B. W. Tilma, U. Keller, "High-power 100-femtosecond semiconductor disk lasers", Optica, vol. 3, No. 8, pp. 844-852, 2016

2 N. Jornod, K. Gürel, V. J. Wittwer, P. Brochard, S. Hakobyan, S. Schilt, D. Waldburger, U. Keller, T. Südmeyer, "Towards Self-Referencing of a VECSEL Frequency Comb", in ECLEO:2017, p. CF-1-4



Specifications:

Models	STFE-FROG-FC600	STFE-FROG-FC400	STFE-FROG-FS600	STFE-FROG-FS400	STFE-FROG-PS600	STFE-FROG-PS400
Pulse duration [fs]	4 - 150 fs	4 - 150 fs	10 - 300 fs	10 - 300 fs	50-10,000 fs ⁴	50-5,000 fs ⁴
Wavelength range [nm]	600-2000 ²	450-2000 ²	600-2000 ²	450-2000 ²	600-2000 ²	450-2000 ²
Shot to shot measurement capacity	80 kHz with synchronisation / 40kHz without ¹					
Input pulse repetition rate	From Hz to GHz					
Input pulse energy [nJ] Single shot : 1 MHz : 100 MHz : 1 GHz :	>5000 >100 > 5 > 0.050 (with low energy option)					
Input polarization	Linear vertical or horizontal					
Detection	CMOS 12 bit – 3Mpx – 72dB					
PC interface	USB 3 or GigE					
Beam height [mm]	83-180					
Dimensions [mm]	55x56x265	55x56x265	55x56x265	55x56x265	55x56x195	55x56x 95

- Over 80 kHz, the measurements are average over several shots. The number of shot shots depends on the laser rep rate (ex: 4 shots for 200 kHz). Devices with higher shot to shot measurement capacity can be made upon request.
- The announced spectral range is the bandwidth accessible in factory. The customers have to choose a detection window of width $\Delta\lambda$ within this range. Custom spectral window and spectral resolution can be made upon request.
- The FC and FS models are non-dispersive and achromatic to achieve non-ambiguous phase retrieval.
- Four pulse duration ranges available:
 -PS1: 50-1,000 fs
 -PS3: 200-3,000 fs
 -PS5: 300-5,000 fs
 -PS10: 500- 10,000 fs

STFE-BOAR series Autocorrelator phase retrieval

BOAR stands for Biprism based Optical Autocorrelation with Retrieval.

This is a new technique of ultrashort pulses characterization relies on interferometric single shot autocorrelation and two photon absorption. The time delay is encoded into a spatial interferogram which is used to evaluate the pulse duration, the 2ω spectrum and the chirp. There is no non-linear crystal and no phase matching issues, the spectral working range is therefore very broad (1200 - 2400 nm). The BOAR is actually combining all the advantages : simple, extremely robust, accurate and reliable measurements, spatially resolved, suitable for rather chirped pulses and the retrieval is done in real time directly by Fourier transformation. Two models are available for two different temporal windows.



Features:

- Very easy to use
- Temporal and spectral measurement
- Real time chirp measurement
- No phase matching issues
- Broad spectral range
- Nonsensitive to polarization
- Suitable for any rep rate
- Single shot up to 150 kHz
- Sub-10 fs in the NIR
- Achromatic and non-dispersive

Software interface:

Like every product, the BOAR comes with a powerful and very user friendly software, especially designed for touch screens, in order to give you the best user experience.

Models	STFE-BOAR-FS	STFE-BOAR-PS
Pulse duration range [fs]	Sub-10 to 750 fs	Sub-10 to 1350 fs
Temporal window ΔT	3 ps	5.5 ps
Spectral range (nm)	1200- 2400 nm ¹	
Shot to shot measurement capacity	150 kHz with synchronisation 75 kHz without ¹	30 kHz with synchronisation 15 kHz without ¹
Input pulse repetition rate	From Hz to GHz	
Input pulse energy and average power (for 100 fs pulses)	Standard models Single shot: 100nJ 1 MHz: 5nJ / 5 mW 100MHz: 200 pJ / 20 mW	
	With low energy option Single shot: 5nJ 1 MHz : 100 pJ / 100 μ W 100 MHz : 10pJ / 1 mW 1 GHz : 1 pJ / 1 mW	
Input polarization	Any	
Detection	CMOS 12 bit – 6 Mpx – 72 dB – USB 3.1	CMOS 12 bit – 18 Mpx – 72 dB – USB 3.1
Dimensions [mm]	125 x 150 x 80	

1. with a single optics set. The spectral range is directly accessible and there is no need for any manipulations.

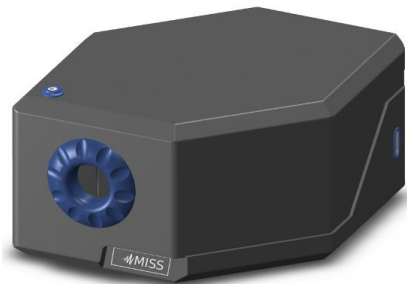
2. Over 80 kHz, the measurements are average over several shots. The number of shots depends on the laser rep rate (ex: 4 shots for 200 kHz). Devices with higher shot to shot measurement capacity can be made upon request.

STFE-MISS series compact imaging spectrometer

MISS stands for Mini Imaging Spatial Spectrometer. This innovative spectrometer provides the same information as a spectrograph in a tiny footprint. The measured spectrum is spatially resolved along the incident beam diameter. The acquisition can be single shot up to 40 kHz. Thanks to its compact design, the MISS is easily integrable at different stages of amplified laser systems. It can be used in free space mode to take benefit of the spatial resolution, or with a fiber input, like a regular spectrometer.

Specifications:

- Powerful and user friendly software
- Compact design
- From 190 to 1100 nm models available
- High spatial and spectral resolution
- Input beam diameter up to 12.7 mm
- Fiber input compatible



Software interface:

The MISS comes with a powerful and very user friendly software, especially designed for touch screens, in order to give you the best user experience.

Specifications:

Models	STFE-MISS-UV-VIS1	STFE-MISS-UV-VIS2	STFE-MISS-IR1	STFE-MISS-IR2	STFE-MISS-Yb
Spectral range [nm]	190-865	190-635	655-1000	635-1100	960-1090
Resolution	2456x2054, 5Mpx				
Spectral resolution [nm]	0.28	0.22	0.14	0.23	0.06
Optical spectral resolution for 15µm slit [nm]	0.96	0.63	0.49	0.66	0.19
Input beam size [mm]	8.8	12.7	8.8	12.7	8.8
Max spatial resolution [µm]	4.3	5.2	4.3	5.2	4.3
Exposure time min – max [ms]	0.027 – 999				
Sensor type	CMOS 12 bits with 72 dB dynamic				
PC interface	USB 3, 36 frames per second				
Synchronisation	Yes				
Dimensions	130x77x53	155x77x53	130x77x53	155x77x53	130x77x53

STFE-BP series BeamPro beam profiler

The BeamPro takes advantage of our user friendly software, and provides thorough analysis and statistics of your laser beam. The BeamPro software uses standard communication protocols. It is therefore easily integrable in more complex environments. Several BeamPro can be controlled from a remote screen through networks. They are suitable for wavelength from 190 to 1100 nm and beams as large as 11 mm. There are also high resolution models with pixels as small as 2.2 μm for focusing beams measurement.



Specifications:

- Powerful and user friendly software
- Compact design
- Two wavelength range available
- Neutral density filters available
- C-mount (adapters CS or SM1 provided)
- Custom sensor design available
- Windowless options available

Software interface

Like every product, the BeamPro comes with a powerful and very user friendly software, especially designed for touch screens, in order to give you the best user experience.

Models	STFE-BP-6.4	STFE-BP-9.7	STFE-BP-11.7	STFE-BP-11.11	STFE-BP-13.9
Spectral range [nm]	350-1100, 190-1100 with UV option				
Sensor size [mm]	5.6x4.2	8.5x7.1	11.3x7.1	11.2x11.2	13.1x8.7
Sensor format	1/2"	2/3"	1/1.2"	1"	1"
Resolution	2560x1920 5Mpx	2456x2054 5Mpx	1936x1216 5Mpx	2048x2048 5Mpx	5472x3648 5Mpx
Pixel size [μm]	2.2	3.45	5.86	5.5	2.4
Frames per second	15	36	47	80	18
Exposure time min – max [ms]	0.031-2745	0.027-999	0.030-998	0.038-500	0.067-30,000
Dynamic [dB]	60	72	73	58	72
Sensor type	CMOS 12 bits				
PC interface	USB 3				
Synchronisation	Yes				
Dimensions[mm]	30x30x35				