

IQFROG

FREQUENCY-RESOLVED
OPTICAL GATING
PULSE ANALYZER

SPECIFICATION SHEET

The IQFROG measures pulse intensity and phase in both spectral and temporal domains, yielding a complete pulse characterization.

With its long delay arm and high resolution spectrometer, the IQFROG measures chirped pulses up to 50 ps wide, or, if transform limited, up to 7.5 ps wide (1.0 μ m) or 10 ps wide (1.5 μ m).



Autocorrelator function

The IQFROG can scan and save autocorrelation traces, even if the pulse is too broad (with a very narrow spectral width) or is unsuitable for FROG recovery. The IQFROG can be used as an autocorrelator and measure pulses up to 50 ps.

Long temporal scan range

The IQFROG uses a long mechanical translation stage to provide up to 200 ps of scan range to allow autocorrelation measurement of up to 50 ps long pulses. It is one of the few pulse analyzers on the market which can measure such

broad picosecond pulses, as well as short pulses down to 300 fs width. In comparison the competitive SPIDER technique is limited in the ability to measure pulses broader than 1 ps.



Connectorized input

The connectorized input makes coupling of the beam easy and fast by eliminating the need to align the beam into the unit manually. IQFROG is by far the most easy-to-use optical pulse analyzer on the market.

Full software control

The mechanical control, alignment and tuning is controlled by the software, no more need to align manually.

Ease of Use

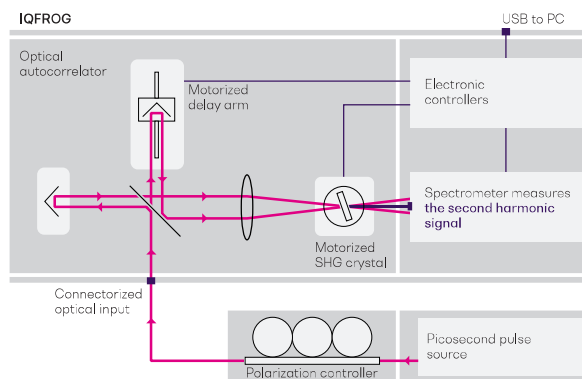
The IQFROG with its connectorized input, user-friendly full software control and USB connection to PC, makes it the smarter plug and play pulse analyzer.

HOW IT WORKS

The IQFROG is a spectrally resolved Second Harmonic Generation (SHG) autocorrelator.

It can resolve sub-picosecond pulses since it is not limited by the response time of the detector. At each delay position on the autocorrelation, a complete SHG spectrum is measured, recording both the spectral and temporal characteristics of the pulse simultaneously.

The two dimensional plot of SHG spectrum as a function of delay is referred to as a 'spectrogram'. Once a spectrogram has been measured, a fast mathematical recovery algorithm is used to completely recover all the characteristics of the pulse, including pulse shape, spectrum, chirp and group delay.



FROG schematic diagram

HIGH SPECTRAL RESOLUTION

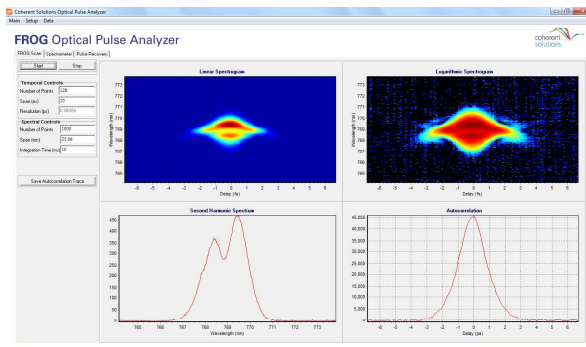
The FROG measurement technique requires the measurement of second harmonic spectrum of the pulse.

The resolution of the spectral measurement often limits the broadest pulse width that a pulse analyzer can measure, most other competitive products can only measure pulses less than 1ps. Coherent Solutions' IQFROG has a built-in high-resolution spectrometer to enable measurement of transform limited pulses.

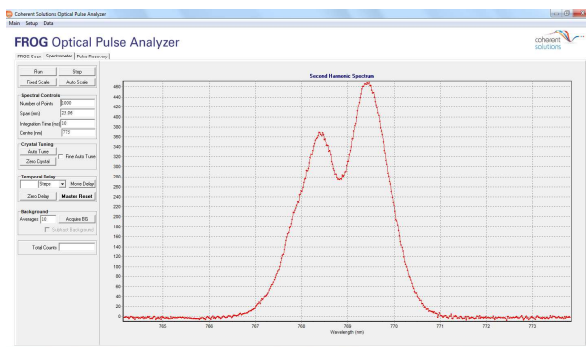
The IQFROG 1.0 μm enables measurement of transform limited pulses of up to 7.5 ps width, or broader if the pulse has a frequency chirp. It has a 1000 - 1100 nm input pulse wavelength range, making it a perfect fit for seed laser pulses for chirped pulse amplification (CPA).

The IQFROG 1.5 μm enables measurement of transform limited pulses of up to 10 ps width, or broader if the pulse has a frequency chirp. It has a 1520 - 1610 nm input pulse wavelength range, making it a perfect fit for C-band femtosecond and picosecond pulsed fiber lasers.

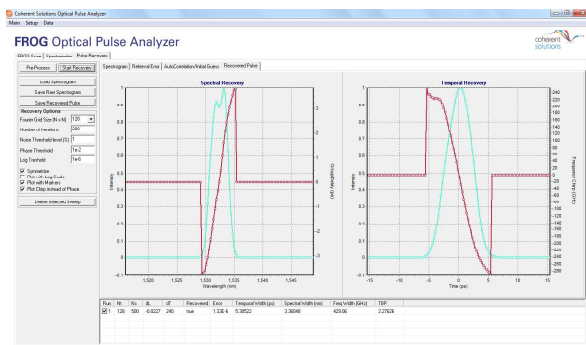
The IQFROG comes with dedicated all-in-one software, ‘Optical Pulse Analyzer’ (OPA) which controls the mechanicals and measures and recovers optical pulses using an intuitive graphical user interface.



FROG Scan functionality measuring the spectrogram and displaying its autocorrelation trace.



Spectrometer functionality displaying the second harmonic spectrum.



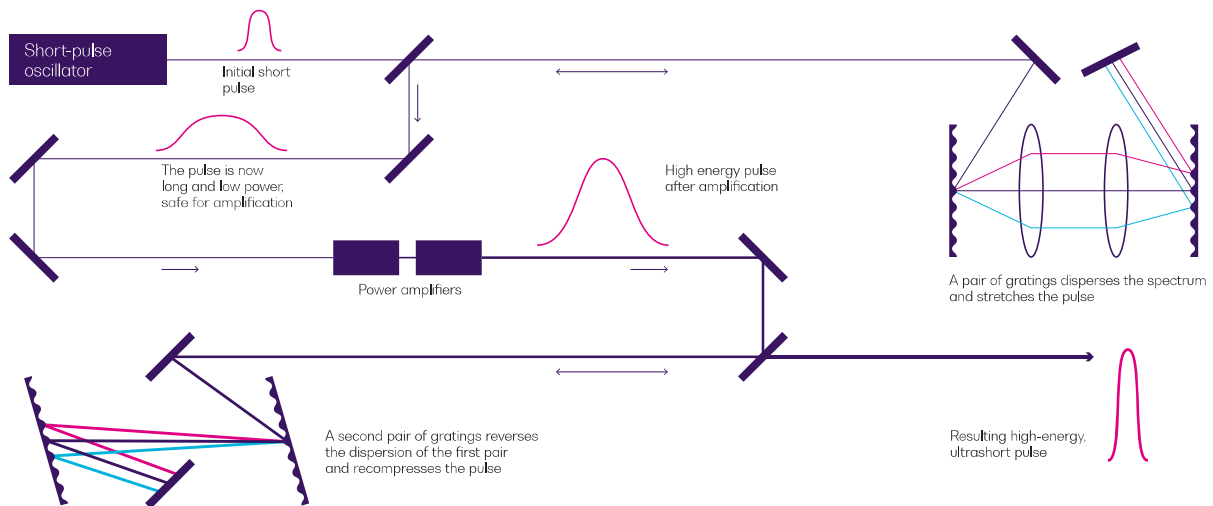
FROG pulse recovery functionality showing the pulse shape and chirp in both temporal and spectral domains.

- Use the IQFROG to obtain the complete expression of electric field of your optical pulse, so that it can be used in numerical simulations
- Characterize and optimize the optical pulses generated from lasers such as, Erbium Doped Fiber Laser, Gain switched laser, Saturable Absorber mode-locked laser and externally modulated pulse source
- Generate transform-limited pulses by compensating for the chirp measured using IQFROG
- Generate optical pulses with desired intensity and chirp profiles using an arbitrary optical filter and check the results with an IQFROG
- Device characterization using comparative measurements of input and output pulses

High power femtosecond and picosecond optical pulses are used for micromachining applications such as; ablating, etching and cutting of a wide range of materials as they minimize the thermal damage on the substrate.

A common technique employed to amplify the power of ultra-short pulses is Chirped Pulse Amplification (CPA).

CPA broadens, amplifies and then compresses the pulse and it is necessary to know the chirp and pulse characteristics at each stages of the CPA. IQFROG measures all the pulse characteristics necessary to optimize the CPA setup.



Chirped pulse amplification diagram

MODELNAME TECHNICAL SPECIFICATIONS

Crystal type	IQFROG 1.0 μM		IQFROG 1.5 μM
	BBO CRYSTAL	KDP CRYSTAL	LiNbO3
Input pulse temporal FWHM ^a	0.3 - 7.5 ps (transform limited pulses)		0.3 - 10 ps (transform limited pulses)
Temporal scan range	200 ps		200 ps
Temporal resolution	15 fs		15 fs
Input centre wavelength ^b	1000 - 1100 nm		1520 - 1610 nm
Input pulse spectral FWHM	0.2 - 15 nm	0.2 - 25 nm	0.2 - 10 nm
Spectral resolution	150 pm		120 pm
Pulse repetition rate	Independent		Independent
Input RF clock required	No		No
Input peak power (saturation)	0.5 W ²	10 W ²	7 W ²
Input peak power (sensitivity) ^c	0.002 W ²	0.01 W ²	0.005 W ²
Input connector type	FC/APC or FC/PC		FC/APC or FC/PC

General Specification	IQFROG 1.0 μM	IQFROG 1.5 μM
Dimensions W x D x H	440 x 450 x 128 mm 17.32 x 17.72 x 5.04 inch	440 x 450 x 128 mm 17.32 x 17.72 x 5.04 inch
Weight	14 kg 30.9 lbs	14 kg 30.9 lbs
PC interface method	USB 2.0	USB 2.0
Operating system requirement	Windows 7, 8 or 10 (32 or 64 bit)	Windows 7, 8 or 10 (32 or 64 bit)
Power supply	-100 - 240 V; 50 / 60 Hz; 500 W	-100 - 240 V; 50 / 60 Hz; 500 W
Operating temperature range	5 °C to 45 °C 41 °F to 113 °F	5 °C to 45 °C 41 °F to 113 °F
Storage temperature range	-40 °C to 70 °C -40 °F to 158 °F	-40 °C to 70 °C -40 °F to 158 °F

Notes

- a. Broader pulses of up to 50 ps are measurable if the spectral FWHM is within the specified range.
- b. Other centre wavelengths are also available. Please enquire for details.
- c. Minimum value needed for a good recovery; product of average and peak power.

ORDERING INFORMATION

IQFROG - 1.0 MICRON - XXX - XX

Crystal type

BBO = BBO - Barium Borate

KDP = KDP - Potassium Dideuterium Phosphate

Connector Type

FC = FC/PC

FA = FC/APC

SC = SC/PC

SA = SC/APC

IQFROG - 1.5 MICRON - LINBO₃ - XX

Connector Type

FC = FC/PC

FA = FC/APC

SC = SC/PC

SA = SC/APC

WARRANTY INFORMATION

This product comes with a standard 3 year warranty.

An optional 5 year extended warranty is also available, please discuss with your sales representative at the time of purchase.

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