

NEAR-IR GRENOUILLES

THE WORLD'S MOST POWERFUL AND EASIEST TO USE
ULTRASHORT-LASER-PULSE MEASUREMENT DEVICE

As a **FROG** device, GRENOUILLE yields the pulse intensity and phase vs. time and spectrum and spectral phase with great accuracy and reliability, requiring no assumptions about the pulse.

In addition, GRENOUILLE also measures the **beam spatial profile**.

What's more, it also simultaneously yields the otherwise-difficult-to-measure spatio-temporal distortions, **spatial chirp** and **pulse-front tilt**, which occur in most ultrashort pulses but are almost never measured. GRENOUILLE is the only commercially available device to measure these distortions and the most accurate diagnostic for pulse-front tilt ever developed.

It yields the approximate pulse **absolute wavelength**, too.

And, with accompanying QuickFROG pulse-retrieval software, it does all this on a single shot and in **real time!**

Remarkably, it **needs no alignment—ever!** Even placing it in the beam is amazingly easy.

GRENOUILLE tells you more about your pulse with less effort than ever imagined!

And weighing as little as 1 kg, it's light and compact, with a footprint smaller than a foot!



GRENOUILLE AT A GLANCE

- **The pulse intensity and phase vs. time**
- **The pulse spectrum and spectral phase vs. wavelength**
- **The beam spatial profile**
- **The approximate spatial chirp**
- **The pulse-front tilt**
- **The autocorrelation**
- **No assumptions**
- **No alignment**
- **High sensitivity**
- **Real-time intensity and phase retrieval**
- **Minimal weight and size**
- **Laptop-friendly**
- **Very easy to use**
- **Just connect the USB cable and go!**

A single GRENOUILLE can measure pulses from a wide variety of sources, from the lowest-energy oscillator to the highest-intensity amplifier.

Voted one of the 100 most important inventions of the year (across all fields) by R&D Magazine, and one of the top 25 optics inventions of the year by Photonics Spectra, GRENOUILLE represents a huge leap forward in ultrashort-pulse-measurement technology.



NEAR-IR GRENOUILLE MODELS AND SPECIFICATIONS

GRENOUILLE model:	8-9-USB	8-20-USB	8-50-USB
Wavelength range:	700 – 1100 nm		
Pulse-length range @ 800 nm:	~10 – ~100 fs	~20 – ~200 fs	~50 – ~500 fs
Pulse-length range @ 1050 nm:	~8 – ~80 fs	~15 – ~80 fs	~30 – ~100 fs
Delay increment¹:	0.95 fs/pixel	0.85 fs/pixel	1.15 fs/pixel
Temporal range³:	336 fs	480 fs	1.9 ps
Spectral resolution⁴ @ 800 nm:	2 nm	1.5 nm	0.7 nm
Spectral resolution⁴ @ 1050 nm:	2.2 nm	5 nm	2 nm
Spectral range @ 800 nm³:	300 nm	160 nm	50 nm
Spectral range @ 1050 nm³:	400 nm	400 nm	125 nm
Pulse complexity:	Time-bandwidth product < ~10		
Intensity accuracy:	2%		
Phase accuracy:	0.01 rad (intensity-weighted phase error)		
Single-shot operation?	Optional ²	Yes; both free-running mode & triggered single-shot are now standard.	
Sensitivity (single-shot):	0.1mJ	1 μJ	
Sensitivity (at 10³ pps):	500 μW (500 nJ)	100 μW (100 nJ)	
Sensitivity (at 10⁸ pps):	50 mW (500 pJ)	10 mW (100 pJ)	
Spatial profile accuracy:	< 0.2 % (Camera has true 8 bits and 480 x 640 pixels)		
Spatial chirp accuracy (dx/dλ):	1 μm/nm		
Pulse-front tilt accuracy (dt/dx):	0.05 fs/mm		
Required input polarization:	Any (just rotate GRENOUILLE!)		
Required input-beam diameter:	2 – 4 mm (collimated)		
Input-beam lateral-displacement tolerance:	> 1 mm		
Number of alignment knobs:	Zero		
Time to set up:	~ 10 minutes		
Dimensions (L x W x H) w/camera:	33 cm x 7.5 cm x 16.5 cm	33 cm x 7.5 cm x 16.5 cm	33 cm x 4.5 cm x 11.5 cm
Weight:	3 kg	3 kg	1.2 kg

1. At full camera resolution.

2. The Model 8-9USB can be modified to allow single-shot measurement using a thinner crystal, but this reduces its sensitivity.

3. Temporal and spectral "ranges" are the full-scale ranges, not the pulse FWHM (which is typically a factor of 3 smaller).

4. Achieving optimal spectral resolution involves spectral deconvolution, which improves spectral resolution by a factor of ~3.

ADDITIONAL NOTES

- Spatial chirp is easily revealed by tilt in the otherwise symmetrical measured trace.
- Pulse-front tilt is easily revealed by a displacement of the trace along the delay axis.
- Absolute wavelength is indicated to a few nm by the crystal-angle dial.
- FROG & GRENOUILLE have a (removable) ambiguity in the direction of time. (In contrast, autocorrelation has infinitely many ambiguities.)
- Triggered single-shot operation is now standard on all models, except for the Model 8-9USB, which uses an angle-dithered crystal.
- Comparison of the retrieved and measured traces confirms the measurement.
- Input-beam mode quality should be good; GRENOUILLE's spatial-profile measurement helps to ensure this.
- Just connect to your computer's USB port; no power supply needed.
- The Model 8-50USB has one camera, which is switchable between temporal and spatial profiles. All other Ti:Sapphire models use two cameras for simultaneous display of spatial and temporal profiles.
- Models 8-20USB, 8-50USB are GRENOUILLE designs. Model 8-9USB is a FROG with a spectrometer for spectral resolution.



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