IR GRENOUILLEs

THE WORLD'S MOST POWERFUL AND EASIEST TO USE ULTRASHORT- LASER-PULSE MEASUREMENT DEVICE NOW MEASURES IR PULSES!

Swamp Optics' IR GRENOUILLEs measure pulses with wavelengths from 900 to 1100 nm and 1220 to 1620 nm.

As **FROG** devices, GRENOUILLEs yield the pulse intensity and phase vs. time and the spectrum and spectral phase with great accuracy and reliability, making no assumptions about the pulse or its shape.

GRENOUILLEs measure the actual pulse, not the coherent artifact, which is all that is currently measured by most other methods.

Both devices also yield the **pulse-front tilt** and **spatial chirp**, and the Model 10-100-USB yields the **beam spatial profile**.

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

Remarkably, GRENOUILLEs **need no alignment—ever!** Even placing one in the beam is amazingly easy.

Free-space coupling is standard (in all models), but the Models 15-40-USB and 15-100-USB also include (as standard) fiber coupling for simple integration with fiber-optic systems.

And weighing only about 1 kg, they're light and compact, with a footprint smaller than a foot!

IR GRENOUILLEs AT A GLANCE

- **The pulse intensity and phase vs. time**
- **The pulse spectrum and spectral phase vs. wavelength**
- **The actual pulse, not the coherent artifact**
- **The beam spatial profile (1μm models)**
- **The spatial chirp**
- **The pulse-front tilt**
- **The autocorrelation**
- **No assumptions**
- **No alignment**
- **Very easy to use**
- **High sensitivity**
- **Real-time intensity and phase retrieval**
- **Minimal weight and size**

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

Voted one of the year's 100 most technologically significant inventions in 2003 and one of the top 25 new optics products of 2004, GRENOUILLE represents a huge leap forward in ultrashort-pulse-measurement technology.

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IR GRENOUILLE SPECIFICATIONS

FROG/GRENOUILLE model	10-100-USB	10-300-USB	15-40-USB	15-100-USB
Wavelength range	0.9 – 1.1 μm	0.9 – 1.1 μm	1.22 – 1.65 μm	1.32 – 1.62 μm
Pulse-length range	~0.1 – ~1 ps	~0.3 – ~3 ps	~40 – ~400 fs	~0.1 – ~1 ps
Delay increment (resolution)	1.145 fs/pixel	~4 fs/pixel	2.25 fs/pixel	5.41 fs/pixel
Temporal range[1]	1.9 ps	9 ps	1.9 ps	3.8 ps
Spectral resolution	0.4 nm	0.4 nm	3.0 nm	1.0 nm
Spectral range[1]	35 nm	35 nm	150 nm	100 nm
Pulse complexity	Time-bandwidth product < 10			
Intensity accuracy	2%			
Phase accuracy	0.01 rad (intensity-weighted phase error)			
Single-shot operation?	Yes (free-running mode and triggered single shot are standard)			
Sensitivity (single-shot)	1 μJ			
Sensitivity (at 10^3 pps)	100 μW (100 nJ)			
Sensitivity (at 10^8 pps)	10 mW (100 pJ)			
Sensitivity (at 10^{10} pps)	100 mW (10 pJ)			
Spatial-profile accuracy	< 0.2% (8 bits; 480 x 640 pixels)		NA	
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!)			
Fiber-coupling available?	No		Yes	
Desired input-beam diameter	2 – 4 mm (collimated)		2 – 4 mm (if not fiber coupled)	
Input-beam lateral-displacement tolerance	1 mm (if not fiber-coupled)			
Number of alignment knobs	Zero			
Time to set up	~ 10 minutes			
Dimensions (L x W x H)	33 cm x 4.5 cm x 11.5 cm		26 cm x 4.5 cm x 11.5 cm	
Weight	1.2 kg		1.2 kg	

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

ADDITIONAL NOTES

- Absolute wavelength is determined to a few nm by the calibrated crystal-angle dial.
- GRENOUILLE is a second-harmonic-generation (SHG) FROG and hence has an ambiguity in the direction of time, but this one-bit ambiguity can be removed easily. (In contrast, autocorrelation has infinitely many non-removable ambiguities.)
- Feedback on measurement quality is obtained from comparison with the retrieved trace.
- Input-beam mode quality should be good (but single transverse mode is not required).
- Free-running operation and triggered single-shot mode are both standard on all models. Just connect the USB cable; no power supply needed.

R&D 100 Award Winner

Circle of Excellence Award Winner

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