

GRENOUILLE Model 8-50-ECO

THE WORLD'S MOST POWERFUL AND CONVENIENT ULTRASHORT-LASER-PULSE MEASUREMENT DEVICE: NOW UNDER US\$10K

Swamp Optics now offers the re-engineered very economical (ECO) GRENOUILLE.

Like all other Swamp Optics' **FROG** devices, it yields the **pulse intensity and phase vs. time** and the **spectrum and spectral phase** with high accuracy and reliability **in real-time**, making no assumptions about the pulse or its shape.

The Model 8-50-ECO also yields the **spatial chirp** and the real time **beam spatial profile**.

GRENOUILLE also reveals possible pulse-shape instability in a pulse train.

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

Its accompanying pulse-retrieval software is very easy to use, elegant, and free!

Remarkably, all GRENOUILLEs **require no alignment—ever!** Even placing one in the beam is remarkably easy.

And weighing only about 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 spatial chirp**
- **The autocorrelation**
- **No assumptions**
- **No alignment**
- **Very easy to use**
- **High sensitivity**
- **Real-time operation**
- **Minimal weight and size**
- **Laptop and USB compatibility**
- **Low cost**

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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GRENOUILLE 8-50-ECO SPECIFICATIONS

FROG/GRENOUILLE model:	Model 8-50-ECO
Wavelength range:	700 – 1050 nm
Pulse-length range @ 800 nm:	~50 - ~500 fs
Pulse-length range @ 1050 nm:	~30 fs – ~100 fs
Delay increment ¹ (resolution):	1.15 fs / pixel
Temporal range ² :	1.9 ps
Spectral resolution @ 800 nm:	0.7 nm
Spectral resolution @ 1050 nm:	2 nm
Spectral range ² @ 800 nm:	50 nm
Spectral range ² @ 1050 nm:	125 nm
Pulse complexity:	Time-bandwidth product <~10
Intensity accuracy:	2%
Phase accuracy:	0.01 rad (intensity-weighted phase error)
Single-shot operation?	Yes
Sensitivity (single-shot)	1 μ J
Sensitivity (at 10 ³ pps):	100 μ J (100 nJ)
Sensitivity (at 10 ⁸ pps):	10mW (100 pJ)
Spatial-profile accuracy:	<0.2 % (Camera has true 8 bits and 480 x 640 pixels)
Spatial-chirp accuracy (dx/d λ):	1 μ m/nm
Pulse-front tilt accuracy (dt/dx):	Eco models do not measure the pulse front tilt
Required input polarization:	Horizontal
Desired input-beam diameter:	2 - 4 mm
Input-beam lateral-displacement tolerance:	>1 mm
Number of alignment knobs:	zero
Time to set up:	15 minutes
Dimensions (L x W x H):	33 mm x 12 mm x 8 mm
Weight:	1 kg

1. At full camera resolution.

2. 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. Indeed, it has recently been shown that alternative pulse-measurement techniques suffer from "coherent artifact) problems and so underestimate the pulse length significantly when pulse-shape instability is present. GRENOUILLE does not suffer from this problem and has recently been shown to reveal pulse-shape instability better than any other method.
- Input-beam mode quality should be good (but single transverse mode is not required).
- To use, just connect the USB cable to your laptop or desktop; no power supply needed.



**R&D 100
Award Winner 2003**



**Circle of Excellence
Award Winner 2004**

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- The ECO model is slightly different than the Standard 8-50-USB model. The ECO model costs less and can measure one single pulse, but can't be triggered to measure a specific single pulse in a train of pulses. And the ECO model roughly measures the pulse front tilt that is qualitative, but not quantitative, which requires ultra precise alignment that is available in the standard model 8-50-USB.