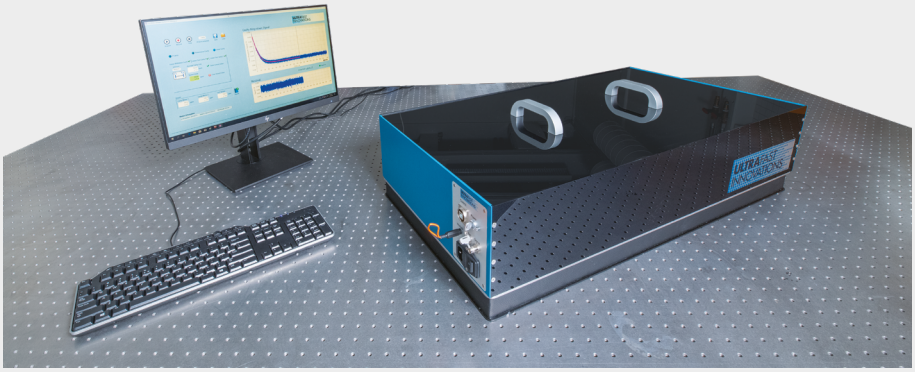
UltraFast Innovations

YOUR KEY to innovation and success

Cavity-Ringdown (CRD) Reflectometer and Loss Meter

GLACIER®

Our reflectometer GLACIER uses the extreme sensitivity of cavity ring-down spectroscopy to quantify the losses of advanced optical coatings down to 5 ppm. As a typical application the device can characterize supra-mirrors with up to 99.9995% reflectivity. Conventional absorption and reflection measurements are not sufficiently sensitive to quantify today´s super-reflective mirror coatings and are typically limited to the >1000 ppm range (corresponding to <99.9% reflectivity). Cavity ring-down spectroscopy measures optical losses by the decay of the energy stored inside a cavity.



The technique reaches unrivalled sensitivity because the losses are experienced over and over again after every round trip inside the cavity. Smaller losses lead to longer intra-cavity dwell time thereby automatically increasing the measurement precision. The device features high-speed data acquisition and allows to record measurements within seconds. It is delivered complete with a computer and a user-friendly software interface for acquisition and real-time analysis.

Key Product Features:

- **Reflectivity measurements**
  - Reflectivities up to 99.9995%
  - Various angles of incidence: 5°-45° (and 0°)
  - s and p polarization (separately)
- **Antireflective coating characterization**
  Reflectivity down to 0.0005% (5 ppm)
- **Simple and reproducible alignment**
  for 0.5", 1" and 2" optics
- **Spring-loaded mirror fixtures**
  for reproducible mounting without strain
- **Computer and user-friendly software interface included**
- **High-speed data acquisition and real-time analysis**
  Complete measurement and analysis within seconds
- **Available wavelengths:** 375-1550 nm
  other wavelenghts upon request
- **Standard Footprint:** 90 x 45 cm^2

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UltraFast Innovations is a spin-off from the LMU Munich and the Max Planck Society.

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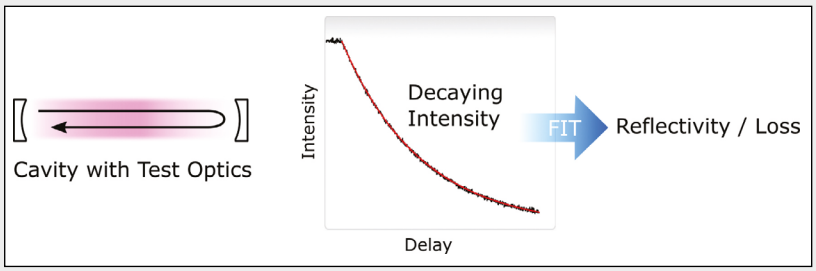
	GLACIER	GLACIER⁺	GLACIER⁺⁺
Number of wavelengths	One	Two	Three
Wavelength range	375-1550 nm	375-1550 nm	375-1550 nm
Footprint	90 x 45 cm²	90 x 55 cm²	

Working Principle:

Glacier uses the principle of reflectivity/loss measurements with cavity ring-down spectroscopy based on very low losses at each mirror bounce. The laser pulses travel inside a cavity experiencing optical losses over and over again during each round trip.



Sketch of the working principle of GLACIER, measurement and fitting procedure.

The device measures the time-dependent intensity $I(t)$ leaked through an end mirror of the cavity (center). The signal decays with a time constant depending on the intra-cavity losses and can be fitted to the following exponential function:

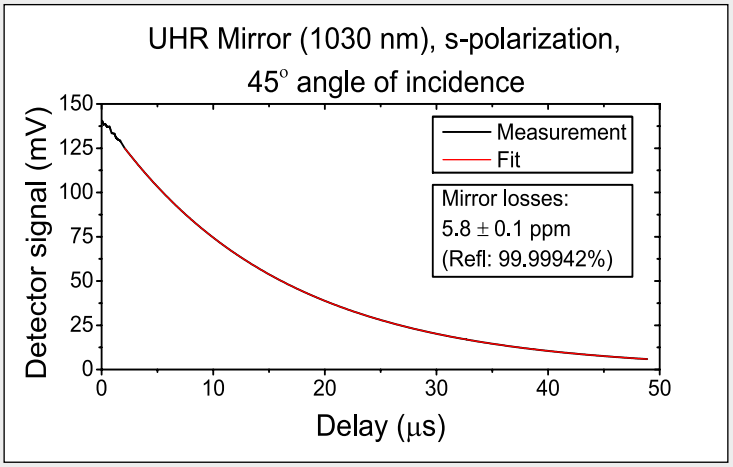
$$I(t) = I(t_0) \cdot \exp\left(-\frac{t}{\tau}\right)$$

The time constant τ is inversely proportional to the optical losses $(1\text{-}R)$ of the cavity with total reflectivity R:

$$\tau = \frac{n}{c} \cdot \frac{l}{(1\text{-}R)}$$

where n is the refractive index, c is the speed of light, and l is the cavity length.

Sample Measurement:



Typical GLACIER measurement of an ultra-high-reflective mirror for 1030 nm. To obtain the data, the cavity losses with and without the sample were measured and subtracted. This provides an absolute measurement of the test mirror.