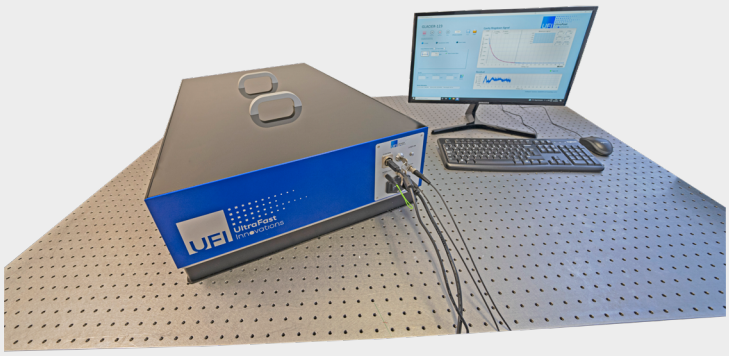
UltraFast Innovations

YOUR KEY to innovation and success

1064 nm Harmonics Reflectometer and Loss Meter

GLACIER®-123

GLACIER-123 is the latest addition to UFI's GLACIER family. Designed as a multi-wavelength system, it is the first of its kind to measure at 355 nm. It includes a microchip laser that emits 1064, 532 and 355 nm radiation, making it particularly interesting for those in need of these harmonic wavelengths.



Our reflectometers use 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. Lower 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**
- **Operating wavelengths: 355, 532 and 1064 nm**
  (possible to add a 4th diode-laser-based wavelength)
- **Standard Footprint: 90 x 55 cm²**

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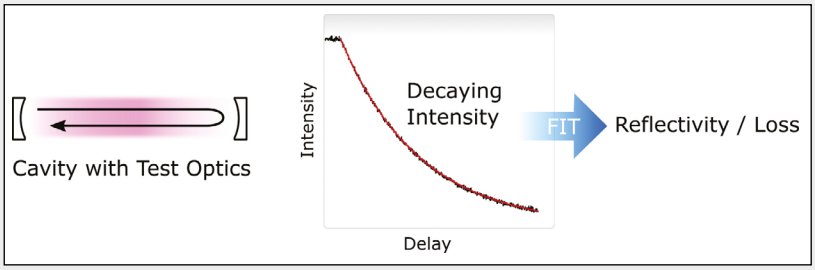
Working Principle:

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 measurements of low-loss mirrors at 1064 nm, 532 nm and 355 nm. To obtain the sample losses, the cavity losses with and without the sample were measured and subtracted. This provides an absolute measurement of the test mirror.