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Cavity Ring-Down – CRD

Reflectance characterization of ultra low loss mirrors

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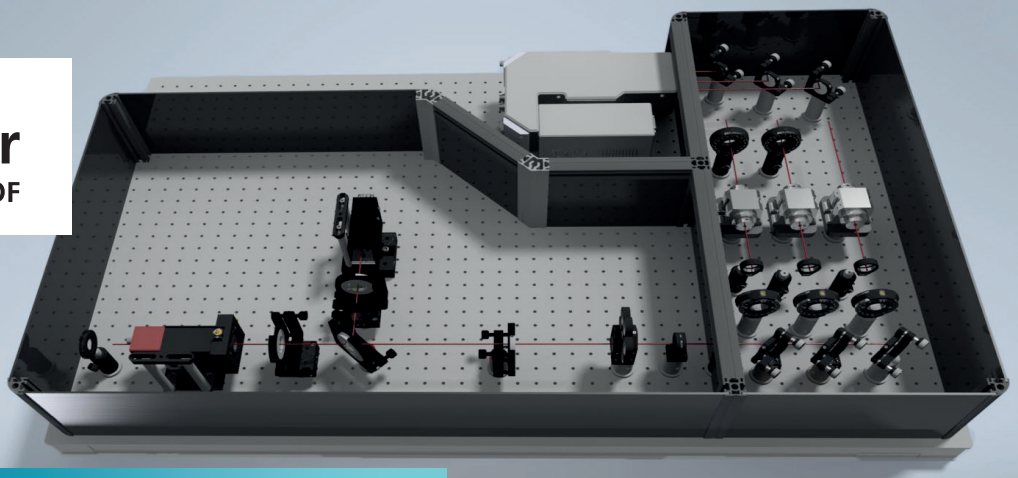


Cavity Ring-Down - CRD

Reflectance characterization of ultra low loss mirrors

Cover: Optical coatings.

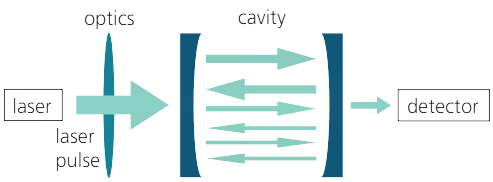
Top: Three wavelength CRD setup (355 nm, 532 nm, 1064 nm) for two angles of incidence (0°, 45°).

Background

Ultra low loss mirrors with reflectance of more than 99.9 % are impossible to characterize by standard reflectance measurements such as spectrophotometry because of measurement uncertainties in the range of 0.5 %. This can be overcome with the help of the cavity ring-down (CRD) technique, which enables reflectance measurements of 99.99 % or even 99.999 %.

Working principle

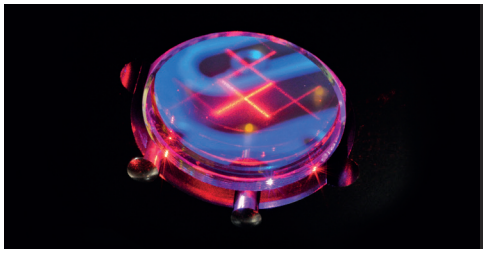
The fundamental idea of the CRD technique is the injection of (pulsed) laser light into a passive optical cavity. With every round trip within the cavity, the trapped light decreases due to the optical losses in the cavity. The decrease is described by a single exponential decay with a characteristic time constant. For negligible intra-cavity losses, this ring-down time allows calculating the total reflectivity of the cavity mirrors.



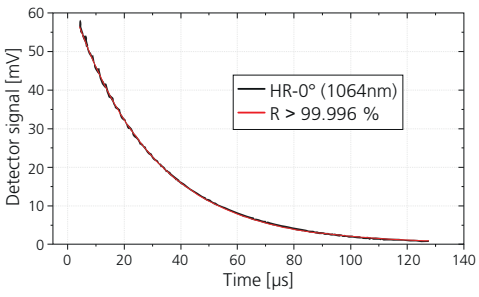
Measurement principle.

Key parameters

- Reflectance values > 99.999 %
- Angles of incidence: normal incidence and/or 10° - 45°
- s and p polarization, separately
- Easy and reproducible alignment for up to Ø = 2“ optics
- Wavelength range: 355 – 1550 nm
- Customized setups and measurement service
- User-friendly software interface
  - High-speed data acquisition
  - Real-time reflectivity analysis



Low loss laser mirror measured at a wavelength of 638 nm (AOI = 45°).



Measurement signal of a dielectric mirror with a reflectance of > 99.996 %.

Contact

Department
Functional Surfaces and Coatings

Scientific Group
Surface and Thin Film Characterization

Project Leader
Dr. Christian Mühlig
Phone +49 3641 807-346
christian.muehlig@iof.fraunhofer.de

Group Leader
Dr. Marcus Trost
Phone +493641807-242
marcus.trost@iof.fraunhofer.de

Fraunhofer IOF
Albert-Einstein-Strasse 7
07745 Jena
Germany
www.iof.fraunhofer.de

www.
more info