RhySearch
Das Forschungs- und Innovationszentrum Rheintal

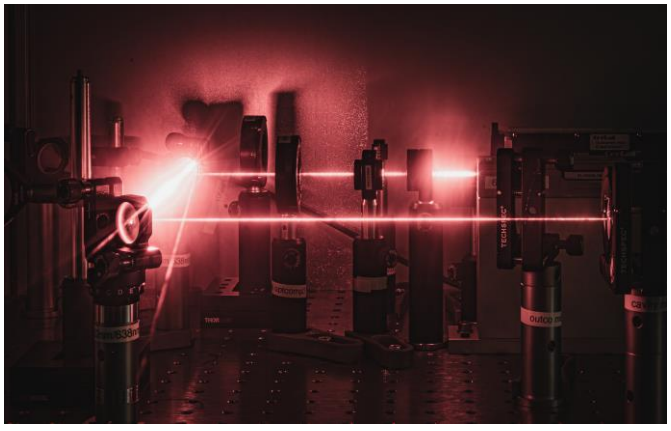
CRD

CAVITY RING DOWN

Test method to measure reflectivity of low loss optics

Cavity Ring Down (CRD) is a highly sensitive measurement allowing an exact measurement of the total loss of high-reflective mirrors (R>99.9%) or anti-reflective coatings (T>99.9%). In contrast to other methods, CRD is independent from intensity variations of the light source. This is because the reflectivity is determined by the lifetime of a single laser pulse in a laser cavity. This allows the measurement of the total optical losses down to single digit ppm, which is the resolution needed in many high-power laser applications.

A laser-pulse is coupled into an optical cavity and is reflected continuously on both high-reflective mirrors. For each round-trip of the laser pulse, some photons leak through the mirror. The number of photons leaked at each round-trip depends on the reflectivity of the mirror and the remaining pulse energy. Therefore, measuring the photons after the first mirror will show an exponential decay of the pulse energy in the laser cavity. Since the decay constant is related to the reflectivity of the cavity mirrors, measuring the pulse decay allows one to determine the reflectivity of the cavity mirrors.

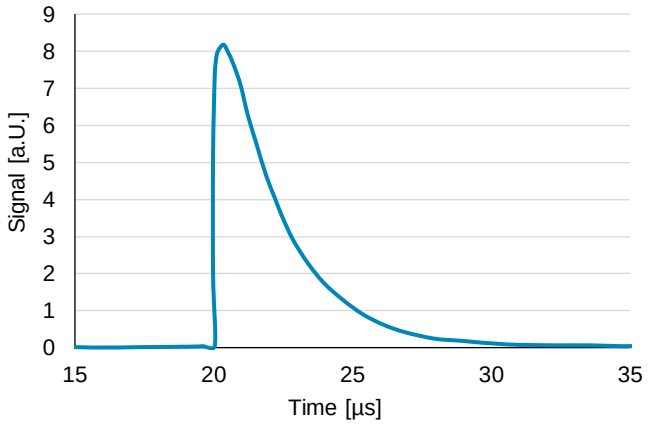


Laser sources
1064 nm, 532 nm, 355 nm
42µJ, 30kW, 1kHz
DPSS pulsed Laser

638 nm
0.5 W
stabilized diode Laser

Test conditions
0° - 45° AOI
Low loss HR or AR
Laminar Flow Box

Standard
ISO 13142



Typical decay curve of a CRD measurement

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