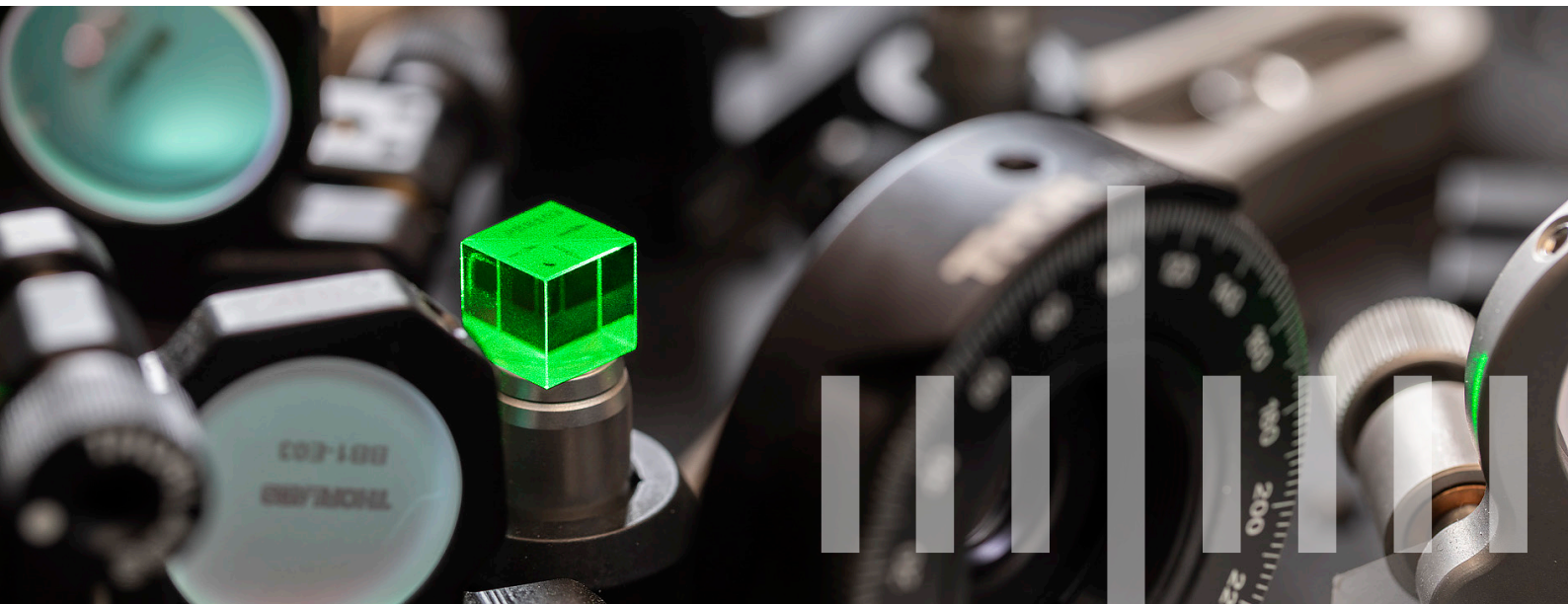




RIN MEASUREMENTS



WHAT IS RIN?

Relative intensity noise (RIN) is the intensity noise power normalized to the average power level. The RIN noise term is an important parameter to describe lasers used for optical communication, bio-optics, LIDAR sensing and many more applications. RIN is specified as a relative power density over a specified frequency range (Power Spectral Density, PSD) in dBc/Hz. RIN may also be specified as an RMS value over a frequency range, relative to the output power.

TECHNOLOGY

Our calibration technique is based on self-homodyne detection, where the currents from two photodetectors are either added or subtracted. In the frequency domain the sum and difference photocurrents are directly

proportional to the intensity noise and shot noise of the laser, respectively. DFM performs RIN measurements for lasers in the visible range to NIR (400 nm-1800 nm). The uncertainty of our service is +/- 2 dBc/Hz at the -160 dBc/Hz level.

MEASUREMENTS CAPABILITY (CMC)

Parameter	Range
Wavelength	400 - 1800 nm
Powerrange	Up to +3 dBm
Bandwidth	25 kHz - 150 MHz
Uncertainty	± 2 dBc/Hz at the -160 dBc/Hz level (K = 2)



The figures on the right shows an example of a RIN measurement of a 1064 nm fiber laser. You see the typical relaxation noise of the system at approximately 2 MHz, which sets the limit of the laser's performance. For this particular laser, the relaxation noise has a value of -112 dBc/Hz around 2 MHz, and the laser is shot-noise limited for frequencies above 15 MHz.

APPLICATIONS

Thanks to the wide wavelength range, wide bandwidth and low noise floor the RIN measurements at DFM allow characterization of lasers for optical communication, bio-optics, LIDAR sensing and much more.

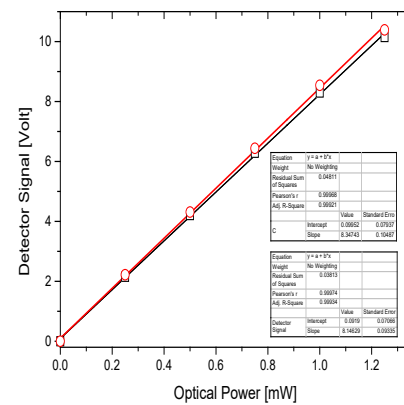
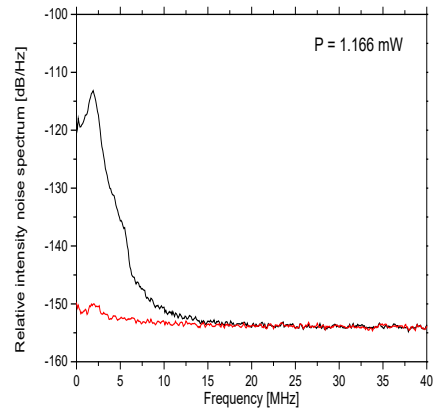
Contact DFM to get more information on RIN measurements, and to find out how you may benefit from our knowledge within photonics and laser technology, or to get a quotation.

SERVICES

DFM offers other services besides calibrations. We can offer the following services:

- Custom measurements
- Characterization of equipment, samples, etc.
- Review of measurement methods, procedures and setups
- Development of custom calibration methods or measurement setups

For more details about our services, please visit www.dfm.dk or www.dfm-metrology.com



ABOUT DFM

DFM is Denmark's National Metrology Institute (NMI). DFM is a signatory to the CIPM-MRA arrangement that ensures mutual recognition of measurements worldwide

TRACEABILITY

All measurements are traceable to recognized national and international standard.

ISO CERTIFICATION

All services are covered by DFM's ISO 9001 certification

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