



DFM

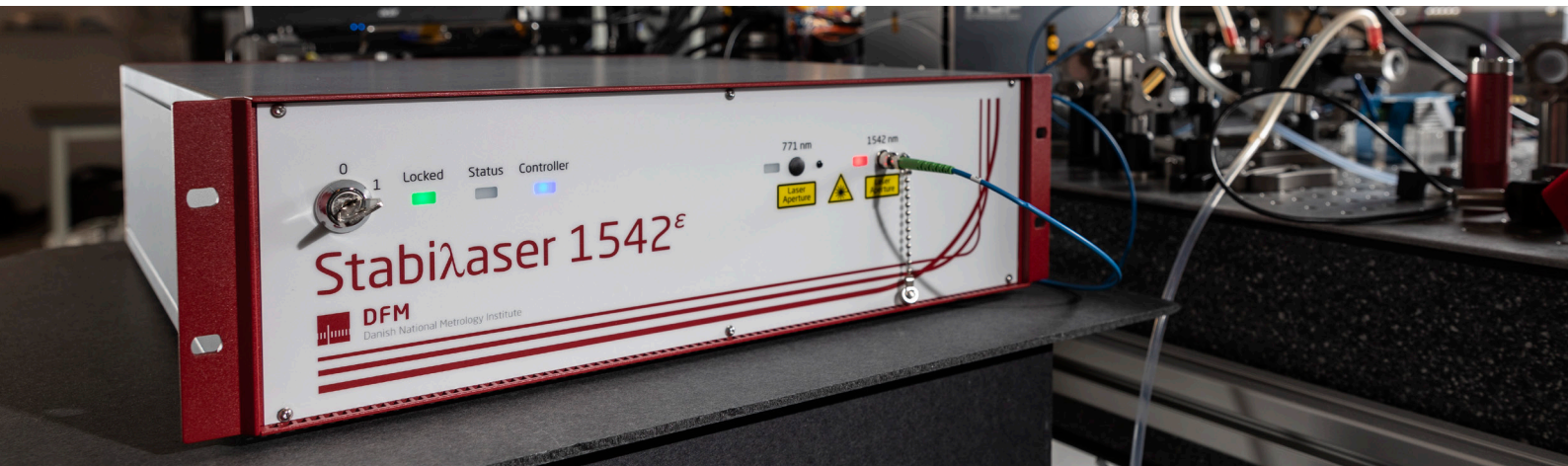
Danish National Metrology Institute

STABILASER 1542^ε - EPSILON EDITION



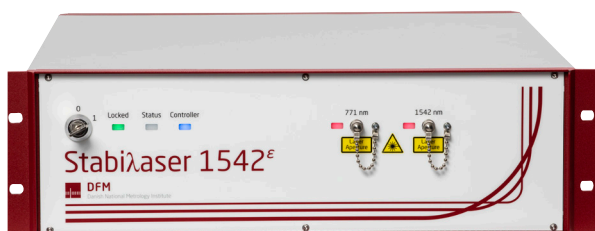
PRODUCT DATASHEET
STABILASER 1542^ε

rev#_2022-01-12



EXCELLENT FOR METROLOGY

The Stabīlaser 1542^ε (epsilon edition) is a 2. gen acetylene-stabilized fiber laser that exhibits the same narrow linewidth, excellent long-term stability and high accuracy as its predecessor. The design maintains the short-term linewidth of a high-end fiber laser, and adds the long term stability and accuracy from a molecular transition of acetylene. The result is a high-performance laser source offering continuous trouble-free operation without user intervention.



ULTRA STABLE LASER IN THE FAR-RED SPECTRUM

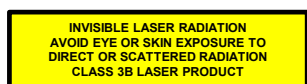
By combining the Stabīlaser 1542^ε with all-fiber based frequency doubling technology, it is possible to get an additional output at 771 nm. The solution ensures that

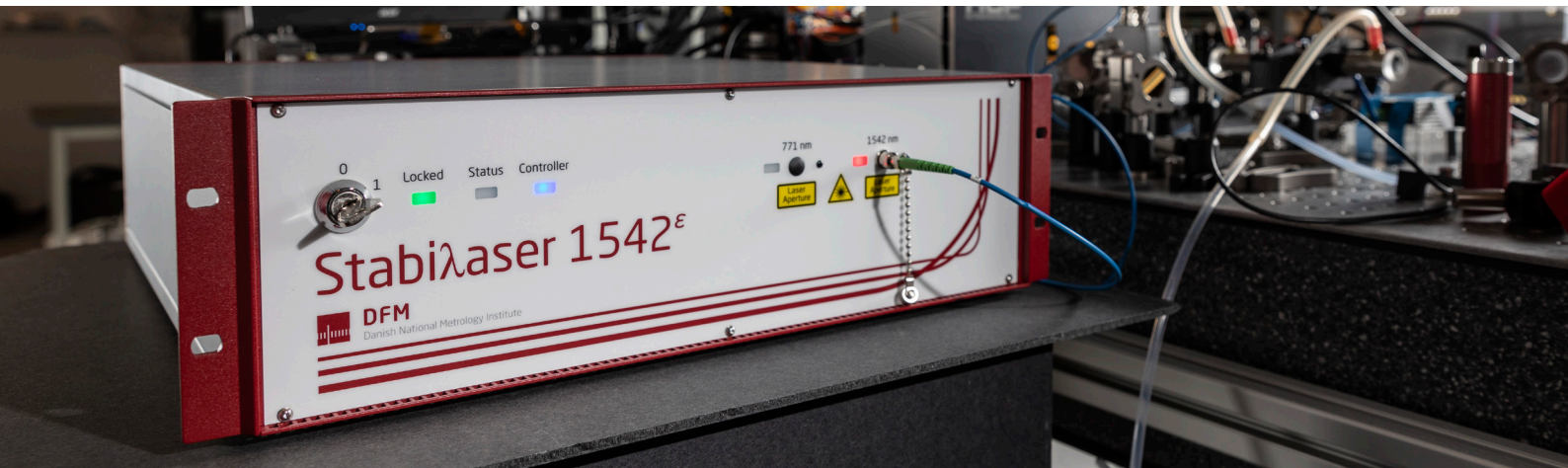
the laser signal at 771 nm inherits the excellent short-term linewidth and long-term stability of the Stabīlaser 1542^ε. The Stabīlaser 1542^ε can provide both 1 mW of power at 771 nm and 15 mW of power at 1542 nm. It is possible to upgrade the Stabīlaser 1542^ε with this solution later on.

ENABLING NEXT-LEVEL APPLICATIONS

Thanks to the Stabīlaser 1542^ε, affordable access to the high levels of performance needed for cutting edge scientific research, is now available. A diverse and growing range of applications include stabilization of frequency combs and length metrology. As a reference, the Stabīlaser 1542^ε is an essential component for stabilization and line narrowing of lasers for spectroscopy or laser cooling on narrow-line atomic or molecular transitions, as well as in dual comb spectroscopy.

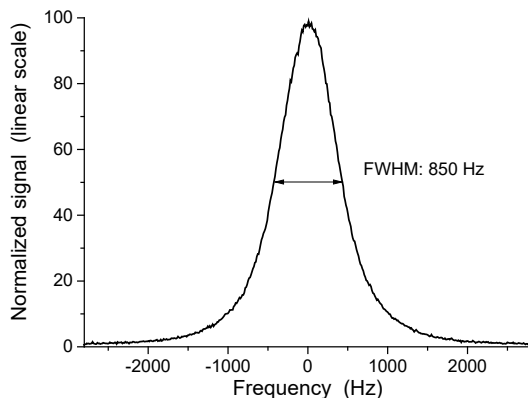
The 771 nm module is designed for dimensional metrology based on interferometric methods where lasers in, or near, the visible spectrum are required. In length metrology applications, the specific wavelength of 771 nm may lead to relaxed requirements in the calibration process. Additionally, wavelength meters can now be calibrated with unprecedented accuracy at a wavelength outside the IR spectrum.



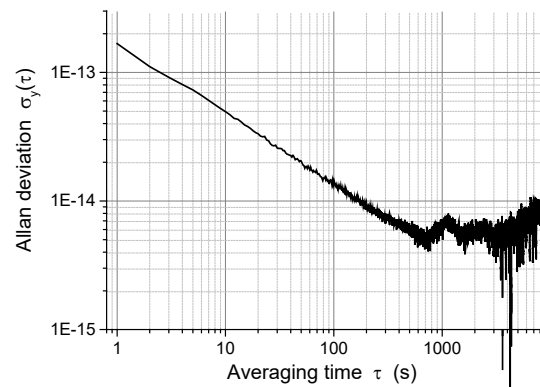


TECHNOLOGY

At the heart of the Stabilaser 1542 ϵ is a compact ultra low-noise fiber laser stabilized to the acetylene $^{13}\text{C}_2\text{H}_2$ P(16) ($\nu_1 + \nu_3$) transition at $\lambda = 1542.3837$ nm, corresponding to the frequency $f = c/\lambda = 194\,369\,569\,384$ kHz (laser output is shifted 80 MHz due to internal modulation). The laser meets the conditions of the CIPM recommendation on standard frequencies and can be used as a primary standard with an uncertainty of 5 kHz. The proprietary optical design and control software ensure both autonomous operation and a high quality laser output.



Measured beat note between two Stabilaser 1542 ϵ units averaged for one hour.



The figure shows a typical Allan Deviation (ADEV) plot for a Stabilaser 1542 ϵ

WHATS NEW

Changes to the new Stabilaser 1542 ϵ :

- The design has been updated
- The new 3U chassis is smaller, lighter and rack mountable
- The control PC is integrated into the chassis
- New 771 nm module option, this option can be retrofitted subsequently
- The 100 mW EDFA input/output have been removed from the front panel
- The Lock TTL has been moved to the back
- The internal design has been improved so the laser is less sensitive to external temperature fluctuations

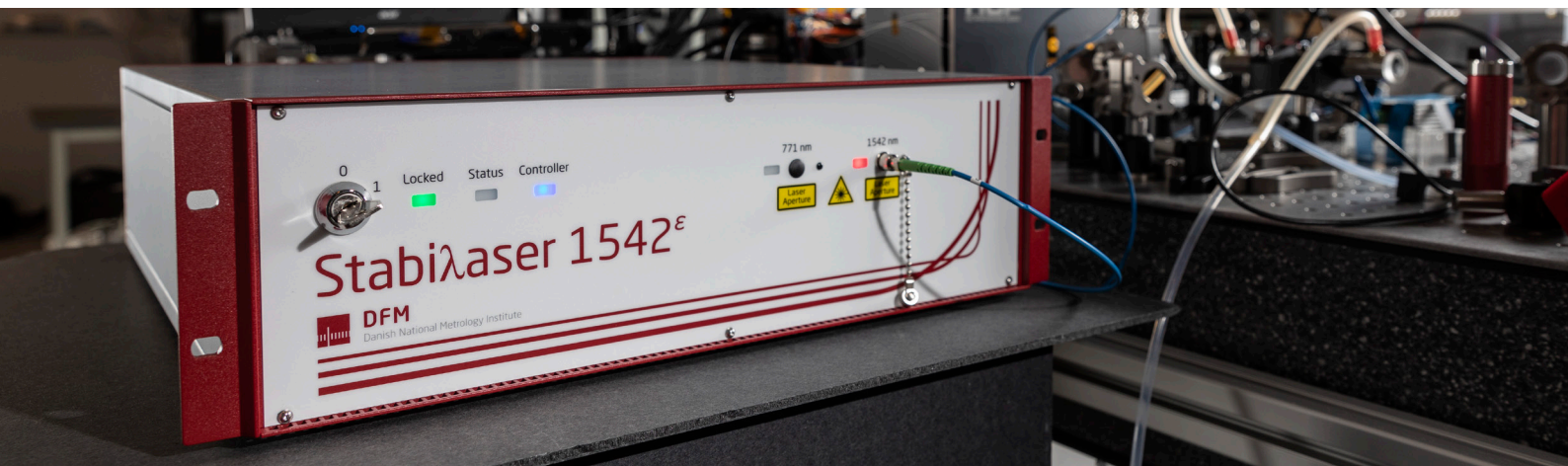


INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
CLASS 3B LASER PRODUCT



PRODUCT DATASHEET
STABILASER 1542 ϵ

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SPECIFICATION

Specs	
Wavelength	1542.3843472 nm (vacuum)
Linewidth	300 Hz (short term)
Stability	$\leq 3 \times 10^{-13}$ (ADEV ≥ 1 s)
Long-term accuracy	$\leq 2 \times 10^{-12}$ drift per year
Output power, locked	15 mW (nominal)
Option: 771 nm module	
Wavelength	771.19217360 nm (vacuum)
Linewidth	600 Hz (short term)
Stability	$\leq 3 \times 10^{-13}$ (ADEV ≥ 1 s)
Long-term accuracy	$\leq 2 \times 10^{-12}$ drift per year
Output power, locked	1 mW (nominal)
Power requirements	100 - 240 VAC, 50 or 60 Hz
Dimension (h x w x d)	13.3 cm x 48.3 cm x 49.6 cm

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 standards.

ISO CERTIFICATION

All services are covered by DFM's ISO 9001 certification.

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