SILENTSYS
ultralow noise systems

DATA REPORT

HIGH SPECTRAL PURITY LASER SOURCE

SLIM LINER

Model: SLIM LINER
S/N: SYSL0037
Date: 2024-12-13

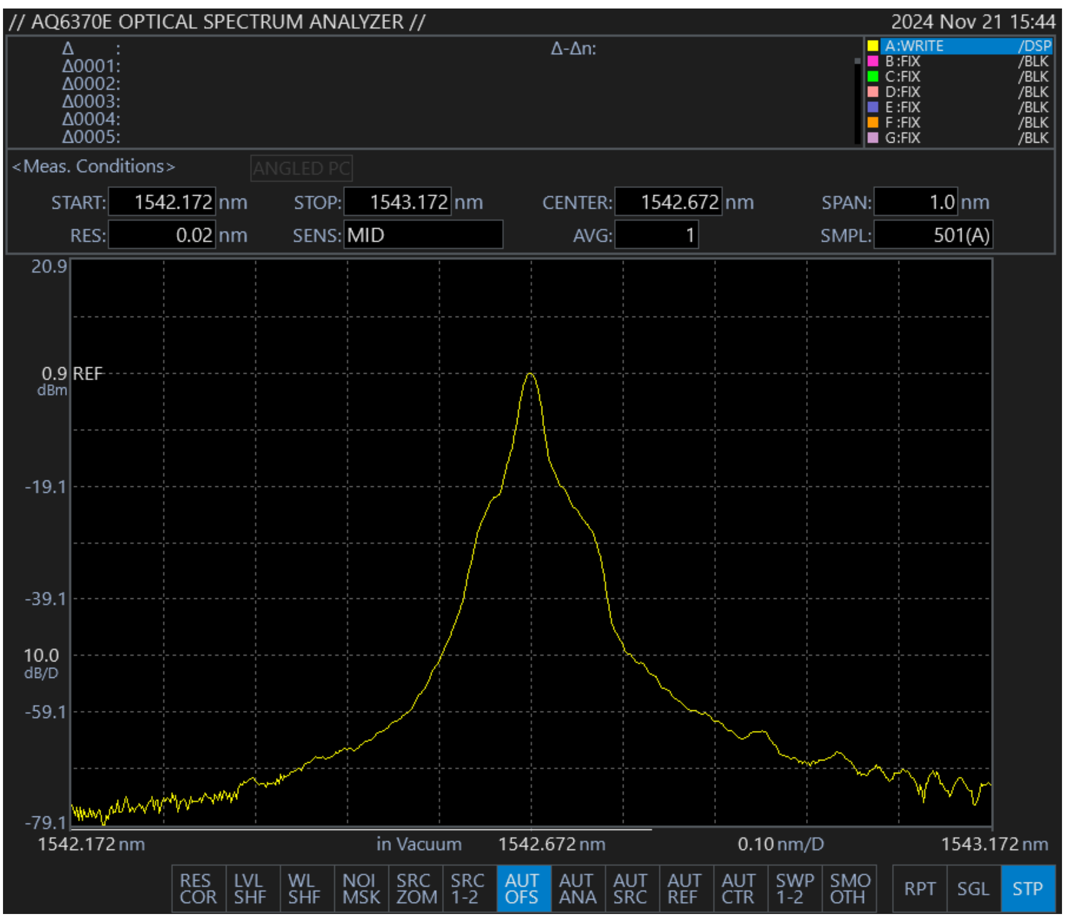
DATA REPORT

Thank you for ordering the SLIM LINER – High Spectral Purity Laser Source with the serial number SYSL0046. Your SLIM LINER has the following optical characteristics.

- Optical output connector: PM FC/APC with Narrow key (2.0 mm)
- Laser emission: Continuous Wave (CW)
- Output wavelength: 1542.672 nm
- Output power: typ. 5.6 mW
- Polarization Extinction Ratio (PER): 19.45 dB

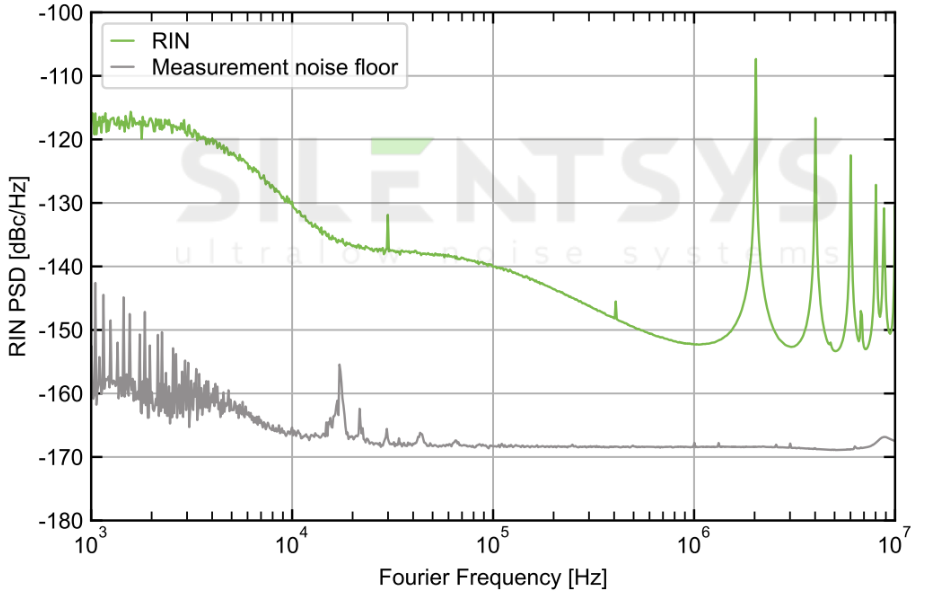
Optical Spectrum Analyzer Measurement

The following graph shown the optical output spectrum measured using a YOKOGAWA AQ6370E Optical Spectrum Analyzer. The peak wavelength is determined at 1542.672 nm.



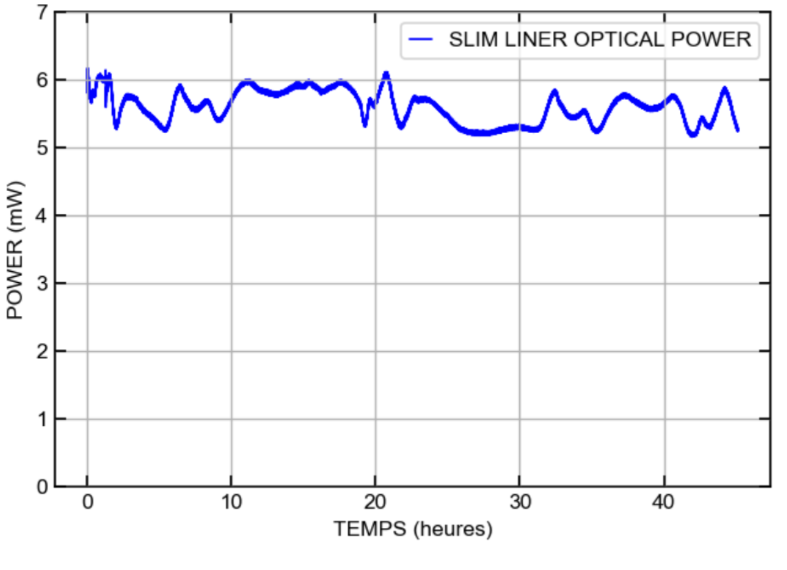
INTENSITY NOISE AND STABILITY

The SLIM LINER optical output was connected to the positive channel of a SILENTSYS Ultralow Noise Balanced Photodetector (ULN-PDB). The graph below shows the measured Relative Intensity Noise (RIN), so the voltage noise PSD normalized by the mean value.



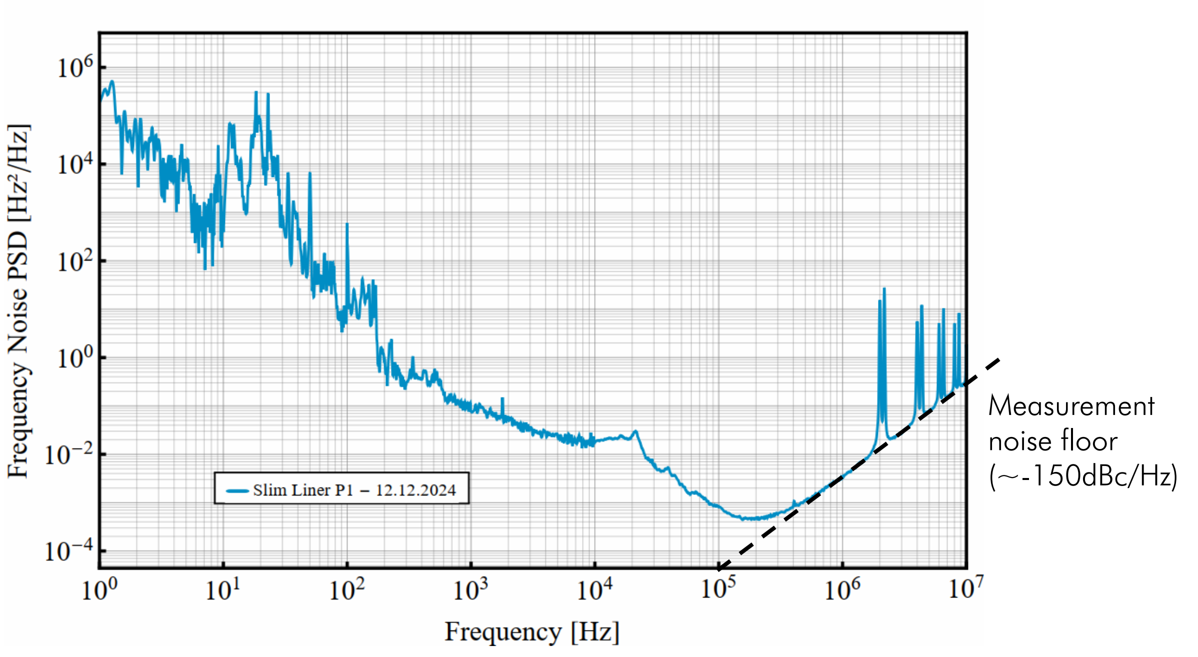
The graph below shows the measured laser output power stability measured with a Moku-Pro datalogger.

Mean value : 5.6mW
Stability : 4.2 % rms over 48h

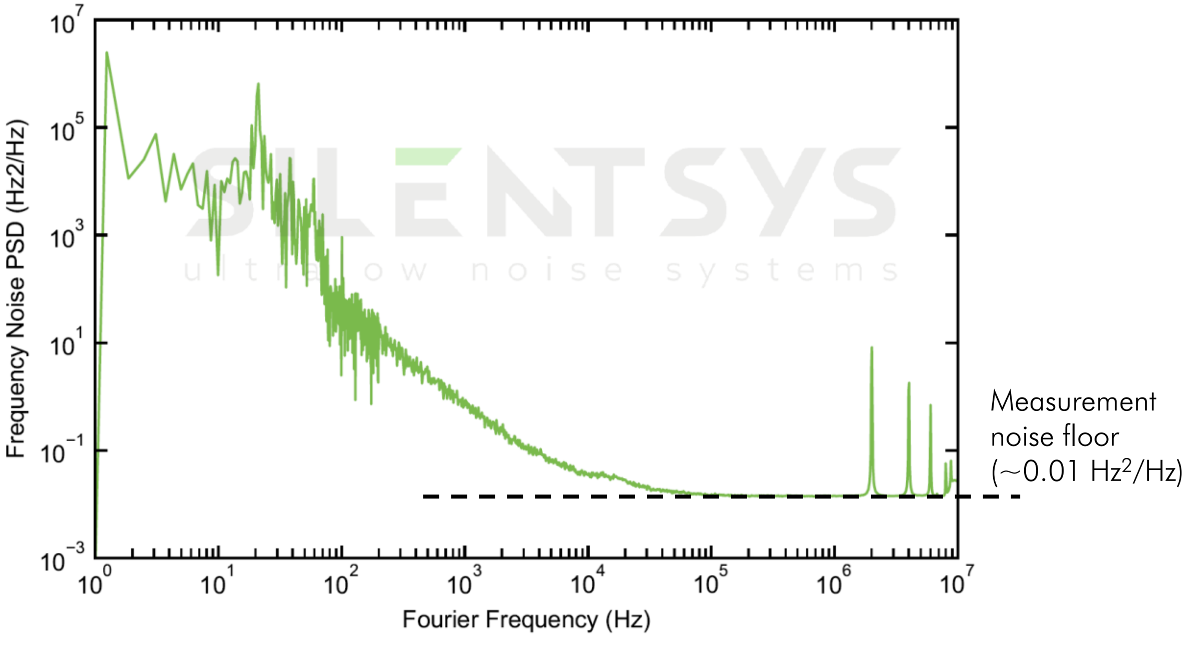


FREQUENCY NOISE

The optical frequency noise spectrum was obtained by measuring the beat frequency between 2 SLIM LINER using a fast photodiode connected to a Rohde & Schwartz FSPN26 Phase Noise Analyzer.

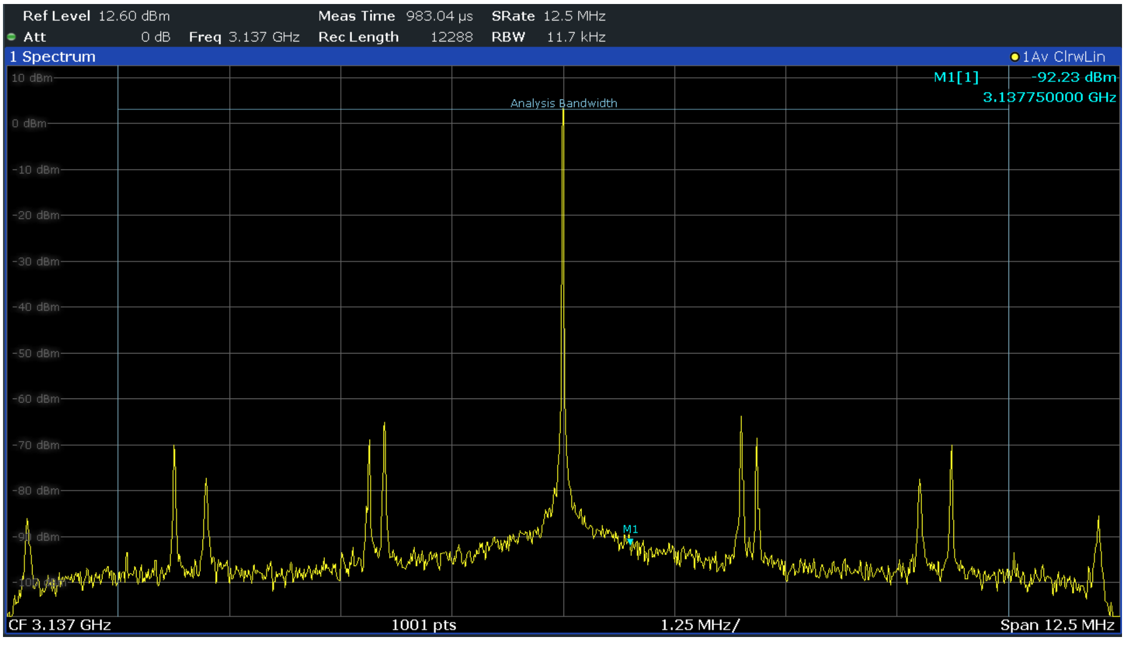


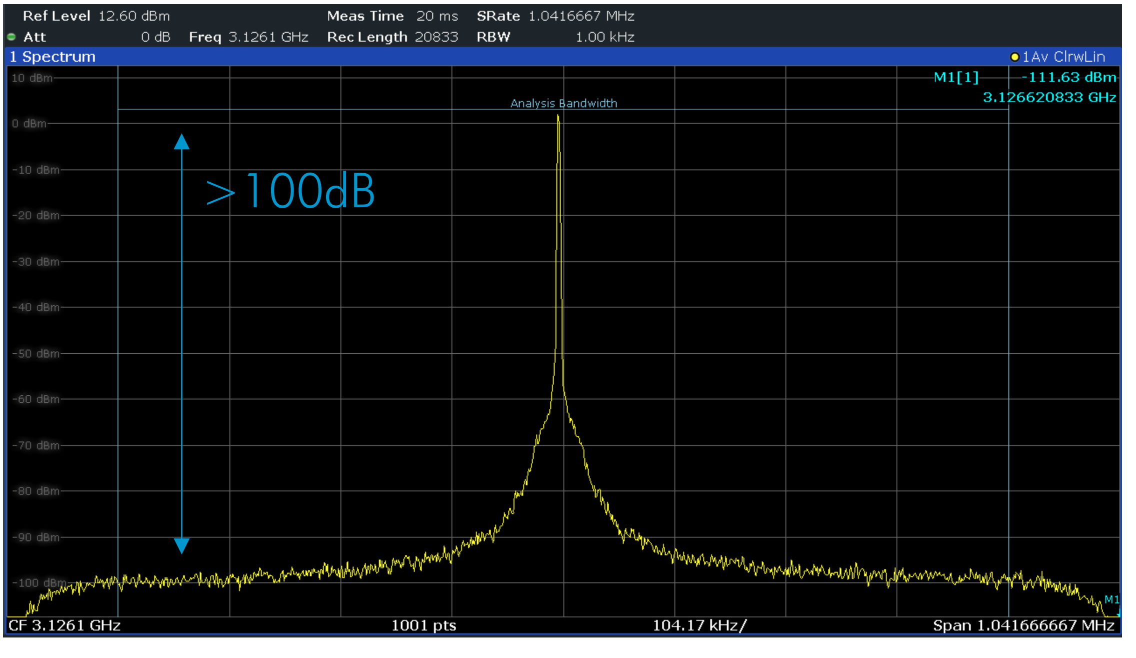
It has been also measured using an OFD (SILENTSYS OPTICAL FREQUENCY DISCRIMINATOR) with a 10MHz FSR as a comparison.



LASER POWER SPECTRUM

The optical power spectrum was obtained by measuring the beat frequency between 2 SLIM LINER using a fast photodiode connected to a Rohde & Schwartz FSPN26 Phase Noise Analyzer. The graphs below show the power spectrum with two different frequency spans.

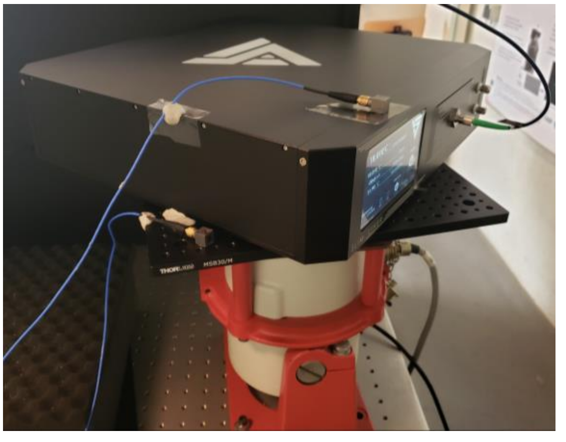


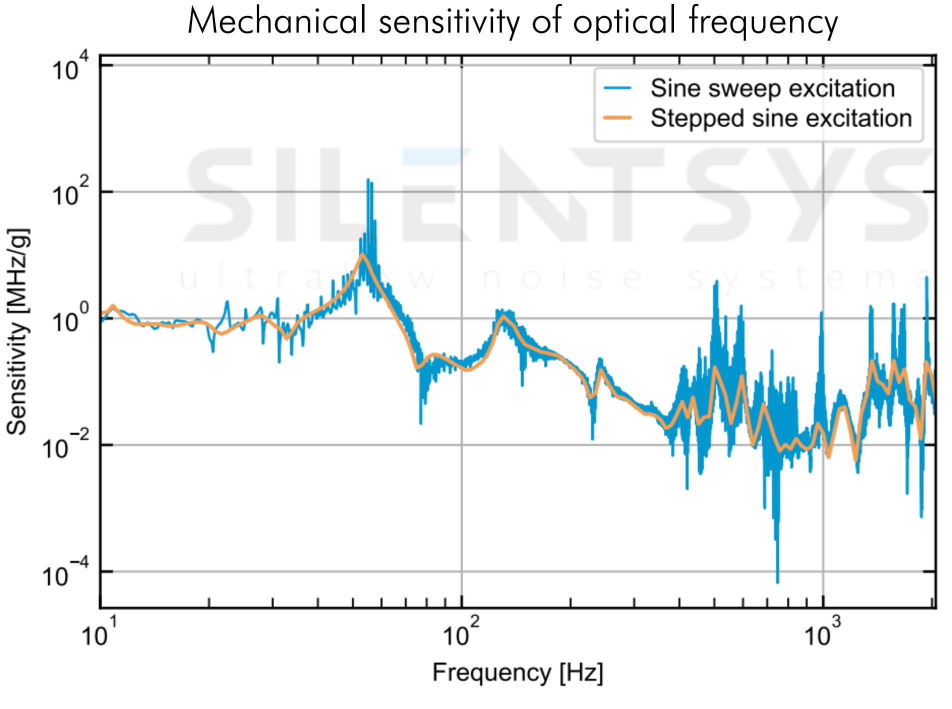


VIBRATION SENSITIVITY

The SLIM-LINER was submitted to controlled vibrations to measure the mechanical sensitivity of the optical output. The system was instrumented with accelerometers and placed on an LDS V406 electrodynamic shaker.

The optical output of the SLIM LINER was fed into a SILENTSYS Optical Frequency Discriminator (OFD) to convert the optical frequency fluctuations into voltage fluctuations. Measurements were performed over the frequency range 10-2000 Hz using both a sine sweep excitation and a stepped sine excitation. A frequency response function is graphed below by taking the ratio between the spectra of the OFD output and the mechanical acceleration.



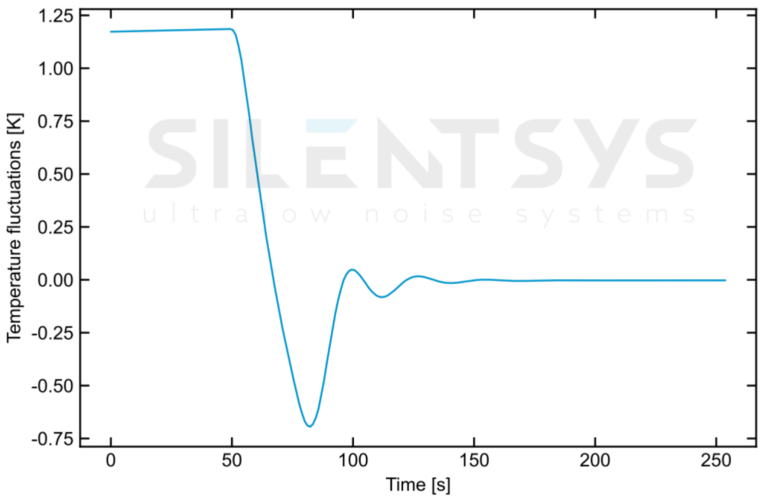


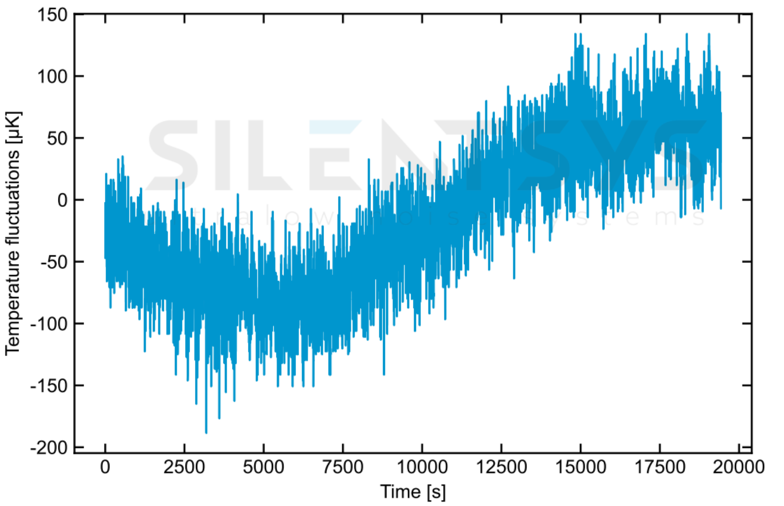
TEMPERATURE CONTROL

TEMPERATURE LOCKING CHARACTERIZATION

Different temperature stabilities have been measured with an out-of-loop setup to ensure the validity of the data. The measurements have been done in a non temperature regulated room with very high temperature changes that affects the long-term temperature drift measured.

The first graph shows the temperature evolution around 23°C at the beginning of the temperature lock and the second graph shows the fluctuations when the device is stabilized.





EXTERNAL CONTROL OF THE BRILLOUIN CAVITY TEMPERATURE

The SLIM LINER has two SMA connectors on the far-right side of the front panel (see next page). One is labelled “NTC 10kΩ“ and internally connected to a 10 kΩ NTC thermistor to monitor the optical cavity temperature. The other is labelled “Ext Temp IN” and is a voltage input port that acts on the temperature by controlling the current in a Peltier element through a voltage to current converter. These SMA connectors are isolated from the mechanical enclosure of the SLIM LINER.

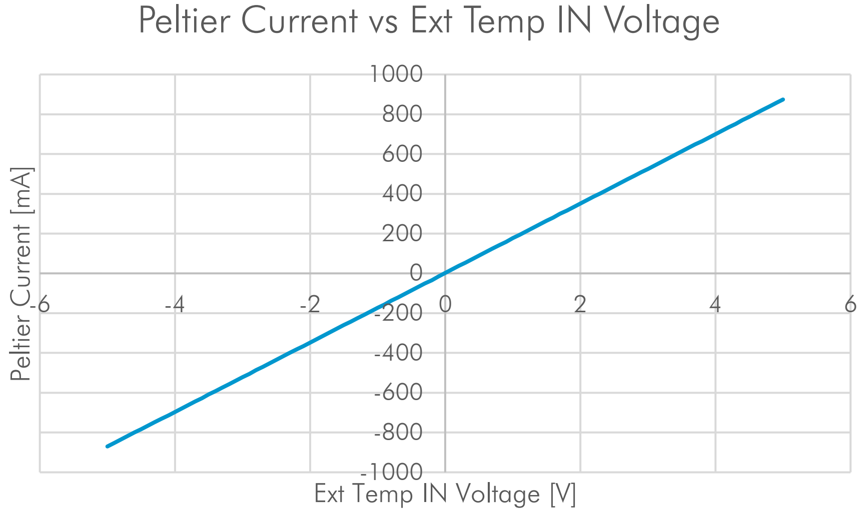
TEMPERATURE CONTROL

The next graph gives the current response in function of the voltage applied. The response is linear with a maximum range of ±5 V to cover ±900 mA, so a slope of ~360 mA/V.

In terms of the transfer function, the conversion bandwidth from voltage to current is about 100 kHz. However, the response in temperature will be much lower as the thermal mass is significant.

In terms of amplitude, as an example, a sinusoidal modulation signal of 4 V_{pp} (i.e., 1440 mA_{pp}) and 100 mHz creates a temperature modulation of about 8 mK (this a rough example and will depend on a few other parameters).

This external control of the cavity temperature is a feature that enables slight tuning of the laser frequency.



IMPORTANT: The NTC has a resistance of 10 kΩ (±1%) at 25°C, and a Beta value of 3435 K (±1%).

IMPORTANT: Avoid screwing on the SMA connectors too tightly. By hand is sufficient as no high frequency signals are used.

For any request, please feel free to contact us by email or phone. We will be happy to assist you.

ENJOY YOUR SLIM LINER !

SILENTSYS
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SILENTSYS SAS
10 rue Xavier Bichat
72000, Le Mans
FRANCE

support@silentsys.com
www.silentsys.com

SIRET : 89362851100022 VAT : FR30893628511