

MENHIR-1550 SERIES

Menhir Photonics femtosecond laser sources are based on robust and well-engineered designs, offering an excellent reliability with the low-noise performance from soliton mode-locking. Robust, 24/7 operation, user-friendly and self-starting, the MENHIR-1550 series has been made to facilitate OEM integration and enable customers applications.

Key Features

- Ultra low-noise
- Transform-limited pulses
- Hermetically sealed laser
- Compact industrial design
- User-friendly
- 24/7 operation
- All-in-one system

Main Applications

- Optical communication
- Precision microwave
- THz generation
- Amplifier seeder
- Timing distribution
- Frequency comb
- A/D Converter

Key Specifications

- Wavelength: 1560 nm
- Repetition rate: up to 2.5 GHz
- Clean soliton pulses: < 200 fs

Options

- Repetition rate stabilization
- Customized repetition rate
- OEM version



Front View



Rear View

Specifications

| Parameters | MENHIR-1550 (Oscillator, no amplifier) | MENHIR-1550+ (With amplifier) |
|---------------------|---|----------------------------------|
| Average power | > 50 mW | up to 2 W |
| Peak power | > 0.1 kW | up to 4 kW |
| Pulse energy | > 0.05 nJ | up to 1 nJ |
| Repetition rate | Standard - 250, 500 MHz, 1, 1.25, 2 or 2.5 GHz Custom design - 200 MHz to 2.5 GHz* | |
| Center wavelength | 1560 nm +/- 10 nm | |
| Spectral bandwidth | > 12.5 nm (at 3 dB) | |
| Pulse width | < 200 fs, Transform-limited | |
| Optical output port | Fiber output (PM FC/APC), Free-space | |
| Beam quality | TEM ₀₀ , M ² < 1.05 | |
| Polarization | Linear (PER > 23 dB, > 200:1) | |
| Amplitude noise | < 0.1% RMS (24 h) | |
| Timing jitter | < 30 fs [1 kHz-10 MHz] | |

*Please inquire for your specific repetition rate

General

| | | |
|------------------------|--|-----------------|
| Power supply | 5 VDC / 2 A ** | 24 VDC / 2 A ** |
| Power consumption | < 10 W | < 50 W |
| Cooling | Passively air-cooled | |
| Warm-up time | < 10 s (Cold start) | |
| Laser head size/Weight | 240 x 160 x 89 mm ³ / 5 kg | |
| Control unit | No control unit required, All-in-one system | |
| Operating temperature | +5°C to +45°C | |
| Storage temperature | -10°C to +60°C | |
| Relative humidity | < 80% (Non-condensing) | |
| Analog interface | e.g. Power Mod., Alarm, Interlock, Trigger, Status | |
| Digital interface | USB, RS232, ETHERNET, CAN | |

**Power supply for 100 or 240 VAC can be provided as option

Custom modifications are available - Please inquire

Specifications are subject to change without notice - June 2019



MENHIR-1550 SERIES - 250 MHz

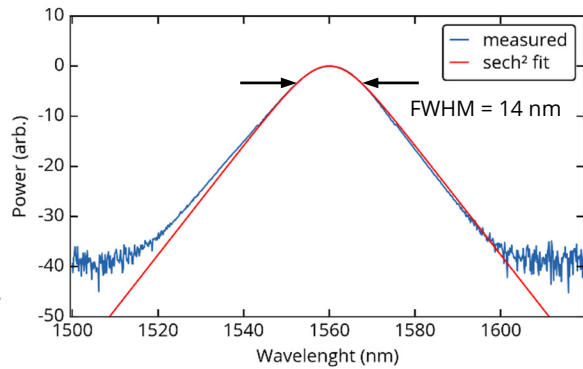
The MENHIR-1550-SERIES is the first industrial-grade femtosecond laser operating around 1550 nm with GHz repetition-rate and ultra-low noise performances. In this document, you can find the full characterization of the same MENHIR-1550 operating at 250 MHz. The laser performance, the noise characteristics as well as the reliability of this laser were tested.

Key Laser Parameters

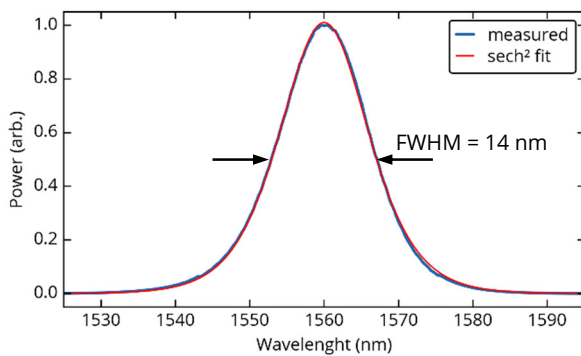
- $f_{\text{rep}} = 250.0 \text{ MHz}$
- $< 200 \text{ fs}$ (supported)
- Power $> 100 \text{ mW}$
- Bandwidth $> 12.5 \text{ nm}$
- $\lambda_0 = 1560 \text{ nm}$
- Sech² shape spectrum
- Clean soliton pulse
- TEM₀₀ - M₂ < 1.05

Laser Parameters

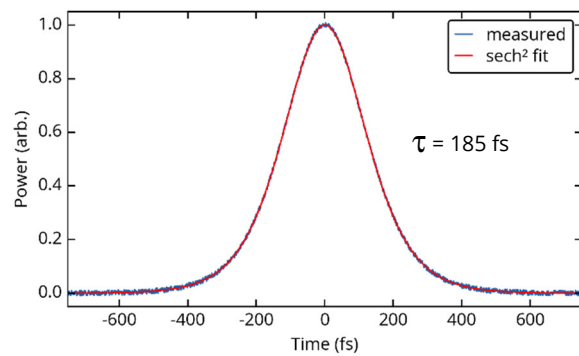
Optical spectrum (log scale)



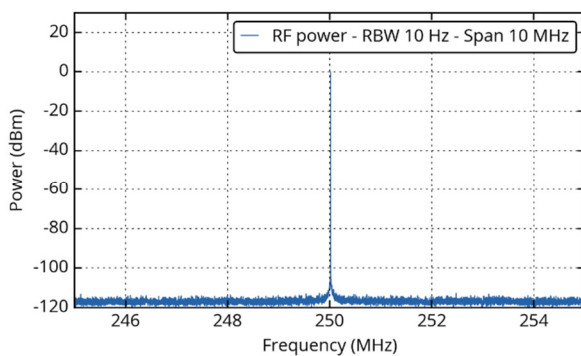
Optical spectrum (linear scale)



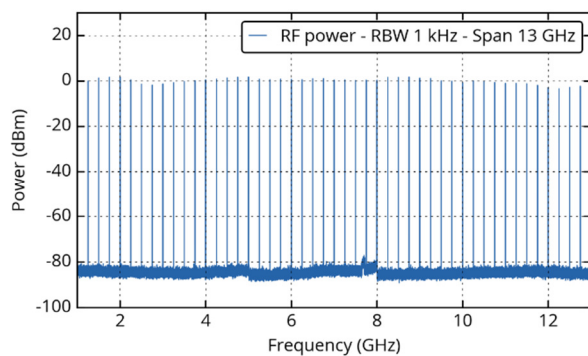
Autocorrelator trace



RF spectrum (zoom on f_{rep})

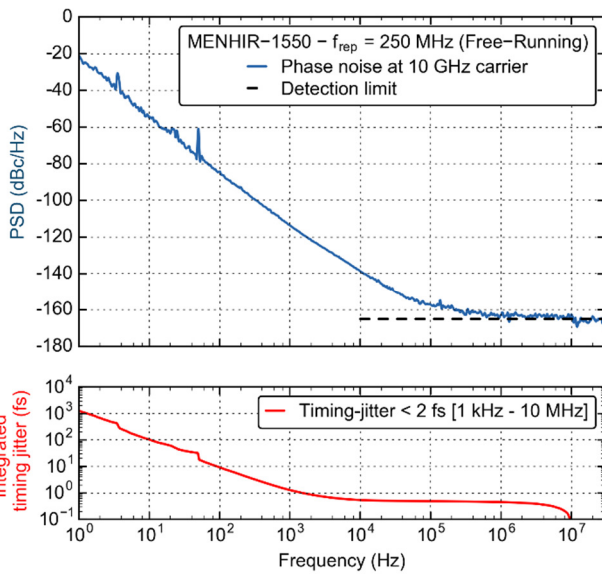


RF spectrum (large span)

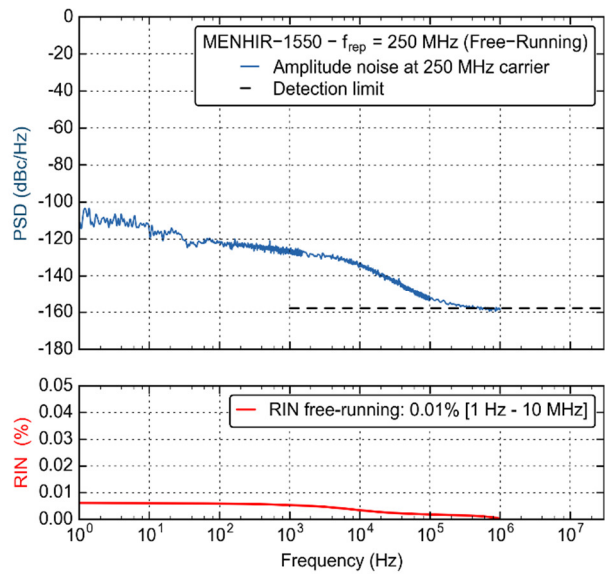


Noise Characterization (free-running)

Phase noise



Amplitude noise

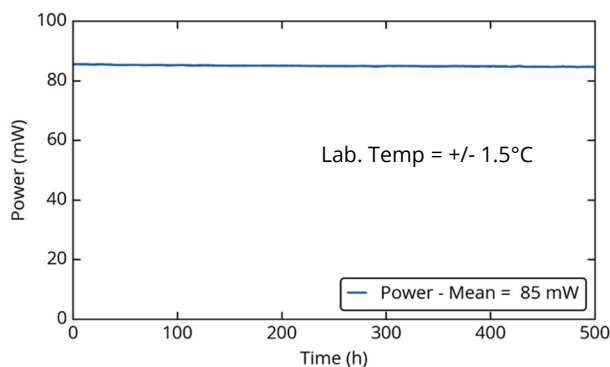


The phase noise of the laser was measured on the 40th harmonic at 10.0 GHz.

| f _c : offset from fundamental harmonic | Phase noise (dBc/Hz) | | Timing-jitter [f _c - 10 MHz] | Amplitude noise RMS [f _c - 10 MHz] |
|---|----------------------|----------------|--|---|
| | 250 MHz carrier | 10 GHz carrier | | |
| 10 kHz | < - 160 | < - 140 | < 1 fs | < 0.01 % |
| 1 kHz | < - 140 | < - 110 | < 2 fs | < 0.01 % |
| 100 Hz | < - 110 | < - 80 | < 10 fs | < 0.01 % |
| 1 Hz | < - 50 | < - 20 | < 1.5 ps | < 0.02 % |

Reliability (free-running) and options

500 h long-term test



Fast actuator for f_{rep} tuning

