

High-Speed Dual-Comb Lasers

Gigahertz repetition rate modelocked laser pairs

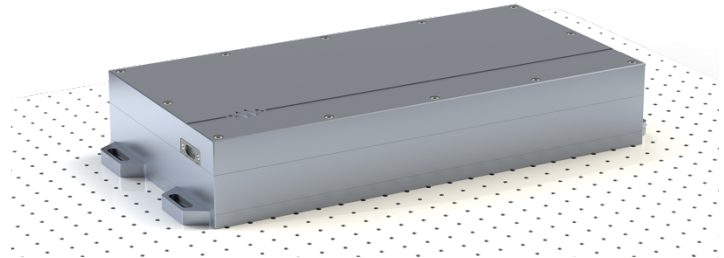


Ideal tool for spectroscopy,
ranging, and optical
sampling applications

>100 mW or **>2 W** per comb

1 GHz repetition rate

<80 fs pulse duration



1 nanosecond optical
delay sweep

Measurement update
rates up to 100 kHz

Ultra-low RIN
and timing noise

The system produces a pair of modelocked femtosecond lasers (optical frequency combs) with a slightly different pulse repetition rate. In the time domain, the optical delay is rapidly swept through a range of 1 nanosecond at speeds of up to 100 kHz. In the frequency domain, beat notes between each pair of optical comb lines are generated via heterodyne detection. Due to the gigahertz repetition rate, high power per comb line is obtained. Through a novel shared-cavity

architecture, our system is able to achieve ultra-low noise simply in free-running operation. In particular, the laser pair is passively stable with highly correlated intensity, timing, and phase noise properties between the two combs. Since there is only one laser cavity and no high-speed locking electronics or optical amplification, most of the complexity of conventional dual-comb and ASOPS systems is removed, while providing a small footprint and superior performance.

Options

- Second harmonic generation
- Spectral broadening
- Wavelength conversion to the IR / mid-IR
- High power 80 MHz version

Applications

- THz time-domain spectroscopy
- Pump-probe measurements
- Dual-comb spectroscopy
- Absolute distance sensing / LIDAR



Laser specifications

| | Low power version (passively cooled) | High power version (actively cooled) |
|----------------------------------|---|---|
| Power per comb | >100 mW | >2 W |
| Pulse duration | <100 fs | <100 fs |
| Repetition rate | 1 GHz (inquire for options) | |
| Pulse energy | >100 pJ | >2 nJ |
| Center wavelength | 1050 +/- 10 nm | |
| Beam quality factor M^2 | <1.1 | |
| Beam diameters, $1/e^2$ | 1.0 x 1.0 mm ² (inquire for options) | |
| Individual comb RIN | <-160 dBc/Hz for frequencies >500 kHz | |
| Repetition rate difference range | +/- 100 kHz | |

Available outputs

| | |
|---------------------------------|--|
| Optical | Two spatially separated pulse trains |
| Pulse timing signals | $f_{rep,1}$ and $f_{rep,2}$ 5 GHz bandwidth electronic pulses |
| Analog cross-correlation signal | Δf_{rep} signal pulse with >80 MHz analog bandwidth |
| Digital signals | Digital Δf_{rep} values with better than 10^{-6} precision |

Controls

| | |
|----------------------------|---|
| Pump power | Digital control (analog available upon request) |
| Repetition rate difference | |
| Repetition rate | |

Physical properties

| | Low power version (passively cooled) | High power version (actively cooled) |
|--------------------------|---|---|
| Laser head (L x W x H) | 500 x 250 x 90 mm ³ | 500 x 250 x 90 mm ³ |
| Power supply (L x W x H) | 483 x 343 x 150 mm ³ or smaller | 483 x 343 x 150 mm ³ or smaller |
| Cooling | Passively cooled | Water cooled |

Requirements

| | | |
|-------------------------|--------------------------|-------|
| Operating temperature | 15 – 30 °C | |
| Relative humidity | <70 % (non-condensing) | |
| Electrical requirements | 85 ~ 264 VAC, 47 ~ 63 Hz | |
| Rated power | 25 W | 150 W |

We strive to excel in performance. Specifications can change – please inquire for the latest model