

High-Power Dual-Comb Laser

80 MHz optical sampling system



Ideal tool for asynchronous optical sampling (ASOPS) and pump-probe measurements

>2 W per beam

<200 fs pulse duration

Sub-cycle relative timing jitter



Compact solution
to ASOPS

High-power for
nonlinear studies

Ultra-low RIN and
relative timing noise

The system provides a pair of nearly identical femtosecond lasers which have a slightly different pulse repetition rate. This difference implies that the relative optical delay between the pulse trains is swept rapidly over time. Through a novel shared-cavity architecture, our system is able to achieve ultra-low intensity and timing noise simply in free-running operation.

The passively stable nature of the laser makes it ideal for sampling applications: it has only one compact laser cavity, and no high-speed locking electronics are needed. This removes most of the complexity from traditional ASOPS and dual-comb systems, while simultaneously improving noise performance and reducing the footprint.

Options

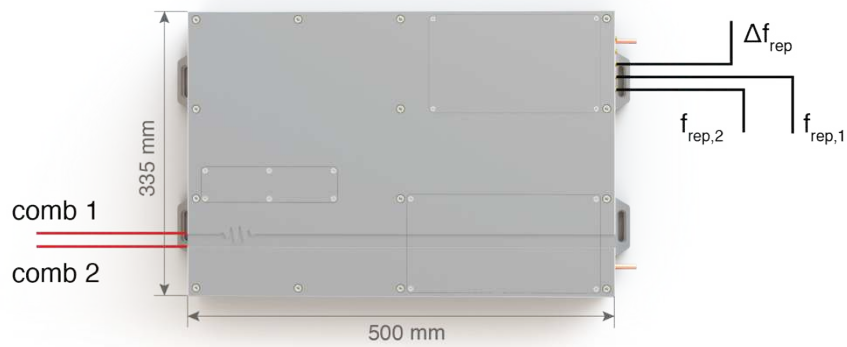
- Second harmonic generation
- Wavelength conversion via OPO
- Gigahertz repetition rate version
- Spectral broadening

Applications

- Pump-probe sampling¹
- Picosecond ultrasonics²
- Transient absorption
- THz time-domain spectroscopy
- Long-distance ranging
- Dual-comb spectroscopy

¹ Nussbaum-Lapping *et al.*, "Absolute SESAM characterization via polarization-resolved non-collinear equivalent time sampling", *Applied Physics B* **128**, 24 (2022)

² Pupeikis *et al.*, "Picosecond ultrasonics with a free-running dual-comb laser", *Optics Express* **29**, 35735 (2021)



Laser specifications

Power per comb	>1.6 W
Pulse duration	<200 fs
Repetition rate	80 MHz (inquire)
Pulse energy	>20 nJ
Center wavelength	1050 +/- 10 nm
Beam quality factor M^2	<1.1
Beam diameters, $1/e^2$	1.4 x 1.4 mm ²
Individual comb RIN	<-160 dBc/Hz for frequencies >300 kHz

Dual-comb specifications

Repetition rate difference range	+/- 500 Hz
Relative timing noise	<-160 dBc/Hz for frequencies >1 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 dimensions

Laser head (L x W x H)	500 x 335 x 90 mm ³
Power supply (L x W x H)	483 x 343 x 150 mm ³ or smaller
Chiller	Options available

Requirements

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

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