

## IRis-core

# Turnkey mid-IR dual-comb source

### Use the advantages of dual-comb spectroscopy also in your application

Dual-comb spectroscopy is increasingly employed in stand-off detection, open path detection and other applications due to its merits in speed, suppression of background radiation and high optical powers.

The IRis-core is an ideal basis for the setup of such a system in the mid-IR range: It offers two overlapping free-running QCL-based frequency comb lasers in a single system. The system outputs already co-aligned beams and comes with a set of drive instructions with factory-characterized heterodyning conditions. The system comes complete with drive electronics and a control computer with a graphical user interface.

### Modular approach

The IRis-core consists of a laser module and a receiving bay, which connects to driving and control electronics. In this modular approach, it is possible to exchange the dual-comb laser module and run it with the same receiving bay and drive electronics.



The laser modules are compatible with the laser modules of IRsweep's IRis-F1 dual-comb spectrometer and ensure maximum flexibility in future applications.

Suitable detection systems with data-processing capabilities that are integrated can also be provided with the system.

### APPLICATIONS

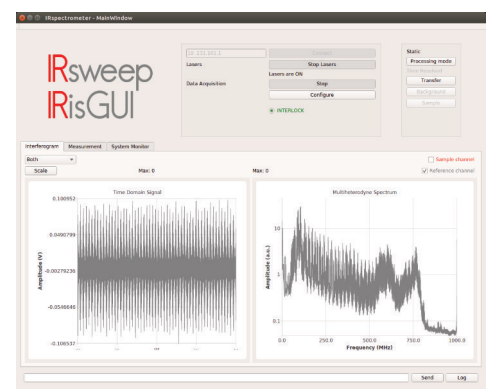
- Stand-off detection
- Open path measurements
- Integration in own systems

### BENEFITS

- Turnkey co-aligned dual-comb system
- Includes drive electronics
- Controlled via GUI on PC
- Compatible with IRis-F1 spectrometer laser module

### CONFIGURATIONS

- High amplitude sensitivity:  
Both lasers penetrate the sample, leading to maximum absorption sensitivity
- Phase sensitivity:  
Separate laser apertures of the frequency combs



## SYSTEM SPECIFICATIONS

Laser platform	Quantum Cascade Laser
Light source	Co-aligned frequencycomb sources.
Modularity	Yes: Laser source exchangeable and compatible with IRis-F1
Center wavenumbers	2200 cm <sup>-1</sup> (4.5μm) - 900 cm <sup>-1</sup> (11.1μm)
Spectral coverage	typically 60 cm <sup>-1</sup> per exchangeable laser source
Optical power	20 mW - 300 mW
Spectral resolution	< 10 MHz (0.0003 cm <sup>-1</sup> )
Spectral sampling	0.16 cm <sup>-1</sup> – 0.5 cm <sup>-1</sup>
User interface	Graphical user interface on PC platform
Detection system	Optionally available, 1 GHz bandwidth with spectrum recovery
Power consumption	110 – 230 VAC, 700 W typical including electronics
Cooling requirement	Cooling Water with +/- 0.05 K stability

## OPTIONAL DETECTION SYSTEM

The IRis-detect is an optional detection system that is available for the IRis-core. It consists of two high bandwidth thermoelectrically cooled MCT detectors for sample and reference channel along with a fast sampling system to collect, process and store the multi-heterodyne data. Data can be processed and represented as transmission or absorption by the system and triggering, and typical measurement schemes are readily available. Examples are short time-resolved acquisitions covering time ranges from microseconds to tens of milliseconds and time-averaged data that can be acquired over longer time scales.

Processing is done live on the detection system, which is a requirement to achieve long measurements beyond tens of milliseconds, due to very large raw data rates. Data processing includes a proprietary coherent averaging algorithm optimized to reduce systematic errors including QCL specific drift correction and comb state analysis. The final data is stored in the open HDF5 format. The detection system is controlled through a graphical user interface allowing live inspection of the data in time and frequency domain. The graphical user interface can also control the IRis-core dual-comb emitter system.

## SYSTEM SPECIFICATIONS

Detector type	2xMCT
Cooling	Thermo-electically. No liquid nitrogen required
Bandwidth	> 900 MHz
Data acquisition	Dual-channel 14 bit data acquisition
Data processing	Spectrum-recovery to transmission or absorption. Proprietary coherent averaging algorithm optimized to reduce systematic errors including QCL specific drift correction
Data export format	HDF5 (open format)
Live data processing while acquisition	yes