DFC SDL

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Frequency-comb-stabilized laser system

TOPTICA's offset-free frequency comb DFC (Difference Frequency Comb) and tunable cw diode lasers (DL pro) can be combined into easy-to-use laser systems delivering frequency-stable cw-output at any wavelength between 420 nm and 2200 nm. A complete laser system contains a DFC CORE, wavelength extensions (DFC EXT), cw diode lasers (DL pro), beat units (DFC BC, DFC MD), all necessary stabilization electronics, a wavelength meter (High Finesse), RF-reference, counter, spectrum analyzer, control server (PC) and user software.

All these components can now be integrated into a single transportable 19-inch rack. The standard system comes with two frequency stable cw-outputs and all required accessories (see next page for components). The control software runs on an integrated PC acting as server, it can be operated remotely using the client GUI. The laser frequencies can be set manually within the comb extension and DL pro bandwidth and are displayed live by the software.

The operating principle of the offset-free Difference Frequency Comb (DFC) relies on generating a broadband supercontinuum from the output of a low noise Er-fiber mode-locked oscillator and subsequent optical difference frequency generation (DFG) between the low- and high-frequency parts of the octave spanning spectrum in a nonlinear crystal. The most important features are an improved stability and a more simple and reliable, all passive frequency offset stabilization. The comb is free from fluctuations of the offset-phase and offset-frequency due to common mode suppression of the two parts of the original spectrum. Additionally, the carrier envelope offset frequency f_{CEO} of the DFC is fixed to zero.

TOPTICA's DL pro is the ultimate tunable diode laser. Its revolutionary mechanical design allows for both easy operation and extreme stability at the same time. It offers highest output powers, and optimized mode-hop-free tuning with a perfectly positioned virtual pivot point for the grating movement (Patents: DE 10 2007 028 499 and US 7970024). Together with the digital control DLC pro controller it shows unrivalled linewidth and drift.

Applications

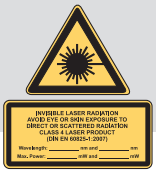
- High-resolution Spectroscopy
- Interferometry
- Optical Clocks
- Transportable AMO Systems
- Quantum Computing

Key Features

- Rack-mounted
- Complete, Stabilized Laser Systems
- 420 - 2200 nm Spectral Range
- One Central Software
- Transportable

TOPTICA PHOTONICS

DFC SDL

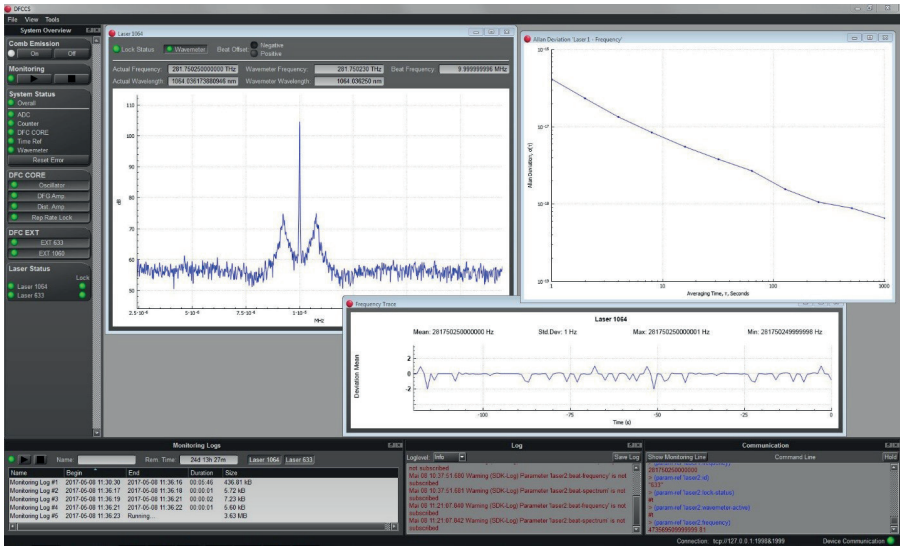


General Specifications	
Laser outputs*	2 cw outputs between 420 nm and 2200 nm
Power	Depends on DL pro specifications, typ. 10 .. 300 mW before isolator
Linewidth	typ. < 100 kHz, e.g. 75 kHz @ 633 nm**
Output coupling	Polarization maintaining fiber (FC/APC)
Stability	Same as reference, < $5 \cdot 10^{-13}$ /24 h with GPS module, typ. < $1 \cdot 10^{-15}$ in 1 s with opt. Reference
Dimensions (H x W x D)*	182 x 55.3 x 80 cm
Power supply	100...120 V / 220...240 VAC, 50...60 Hz (auto detect)

* up to 8 cw outputs in up to 3 racks with equal dimensions
** Beat width DFC vs. 3 kHz HeNe in 5 ms

Components	
1x DFC CORE	Low-noise f_{CEO}-free frequency comb: 4/8 outputs @ 1560 nm, f_{rep} = 80 MHz, Bandwidth > 20 nm, Power > 10 mW
1x DFC EXT*	Wavelength extension: 3 outputs between 420 and 2200 nm in one 19 inch box
1x DL DFC**	2 x DL pro with output between 420 and 2200 nm, 2 x beat units DFC BC, DFC MD
1x DLC pro	Digital Laser Controller, drives 2 x DL pro
RF Reference	Low-noise OCXO and GPS module, other references on request
Locking Electronics	All electronics for phase-locking DFC CORE to RF-reference and 2 DL pro to DFC CORE/DFC EXT
Counter	RF counter for counting rf-beats
Spectrum Analyser	4 channel digital oscilloscope with FFT for beat monitoring
Wavelength Meter with Switch	Comb line order determination, 2-8 channels
PC	Server for laser system control
User Software	Single software interface for all components, remote access

* up to 3 DFC EXT in one system
** up to 4 DL DFC in one system



Key Features Software

- Central GUI for all modules
- Push-button start of DFC CORE / DFC EXT
- Beat monitoring with cw lock status
- Automatic data log
- Automatic calculation of Allan deviation
- Laser frequency trace and statistic
- Remote control

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