EFO-COMB. Optical Frequency Comb Synthesizer

- All-fiber PM scheme for 24/7 operation
- 520-2200 nm full spectral coverage
- Complete single-source frequency comb system
- Beat detection unit (optional)
- Flexible customization (e.g. DFG)

Optical unit of the EFO-COMB optical frequency comb synthesizer

Product overview

The EFO-COMB is a highly precise optical frequency synthesizer designed for a number of research and industrial applications, such as atom laser cooling, ultraprecise length measurements, optical clock, LIDARs, astronomy, ultra-stable microwave generators, optical transmission of frequency reference signals and timestamps, infrared spectroscopy etc.

The optical synthesizer unit is a turn-key device comprising an Er-doped mode-locked fiber laser with stabilization of pulse repetition rate f_{rep} and carrier envelope offset f_{ceo}. The comb generator unit may be designed to be referenced to an RF reference source (providing transfer stability of $5*10^{-13}$ at 1s), as well as to an optical reference system (down to $\sim 10^{-16}$ at 1 s). The system has a built-in supercontinuum generator and an f-2f interferometer for f_{ceo} stabilization. The standard unit features 4 low-power fiber-coupled outputs around 1560 nm for various applications and connection of various optional features. All-PM-fiber layout ensures turn-key uninterrupted operation. A separate control rack contains the PSU-CU unit, phase-lock loop (PLL) unit, data collection and indication system.
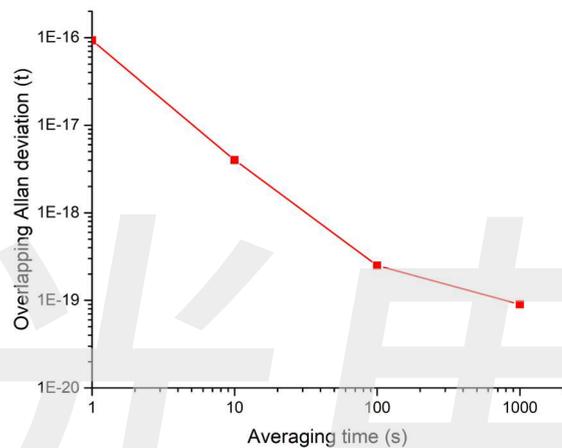
Typical Allan deviation of the EFO-COMB optical unit referenced to an optical highly-stable laser source

Modular system architecture allows seamless integration of optional features such as:

- stabilized supercontinuum spectral comb in the range of 1000-2200 nm, up to 200 mW
- stabilized supercontinuum spectral comb in the range of 500-1000 nm, up to 80 mW
- separate narrowband output(s) with Δλ ~2...5 nm anywhere in the range of 500-1000 nm and 1000-2200 nm
- high-power output at 1560 nm, up to 250 mW, f_{rep} and f_{ceo} stabilization
- high-power output at 780 nm, up to 100 mW, f_{rep} and f_{ceo} stabilization
- beat detection units (BDUs) providing RF beat signal between the optical frequency of the comb generator and an external continuous-wave laser
- phase-lock loop unit for stabilization of an external continuous wave laser to the optical frequency of the comb generator
- ultrastable RF output in the frequency range of 10 MHz to 10 GHz
- difference frequency generator (DFG) (e.g. 3400 nm)

	EFO-COMB
Comb spacing (f_{rep})	100 MHz
Stability with connection to an RF reference	<5*10^-13 at 1 s or same as reference
Stability with connection to an optical reference	<1*10^-16 at 1 s or same as reference
Tuning range of comb spacing	>0.7 MHz
Tuning range of offset frequency f_{ceo}	>100 MHz
Optical outputs	2 or 4 fiber-coupled output ports or collimated free-space outputs at 1560 nm, 520-1000 nm, 1000-2200 nm, other wavelengths upon request (optional)
Central wavelength (fixed)	1560±10 nm
Full spectral coverage (with additional options)	520-1000 nm; 1000-2200 nm; other wavelengths upon request
Output power	>5 mW from each output; >250 mW @ 1560 nm (optional); >200 mW @1000-2200 nm (optional); >80 mW @ 520-1000 nm (optional)
Optical unit dimensions (L x W x H)	356 x 492 x 110 mm
Control rack dimensions (W x L)	640 x 553 mm (rack height depends on exact configuration)
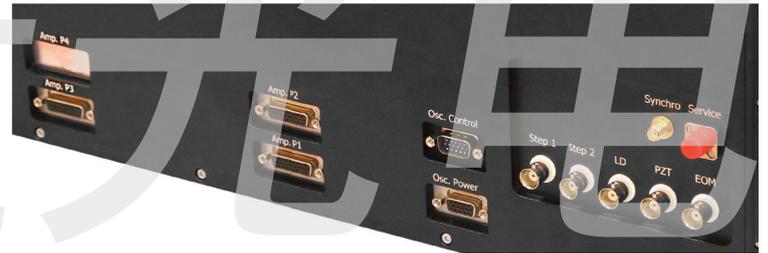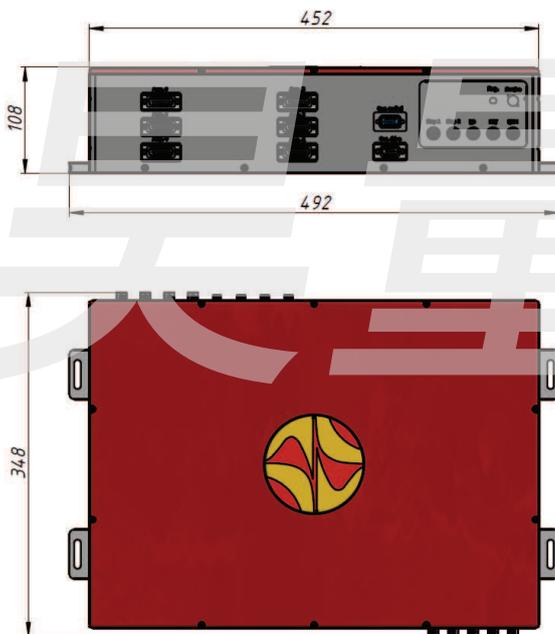
Rear panel connections of the EFO-COMB optical unit, may vary depending on exact system configuration
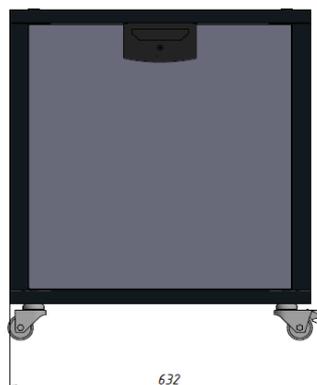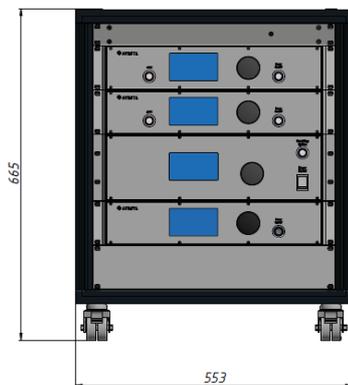
Dimensions of the EFO-COMB optical unit and control unit rack (mm); may vary depending on exact system configuration