

## OFC-160-1550-λ-X

### Erbium fiber frequency comb



The AOSense erbium fiber frequency comb is a compact, low-noise, polarization-maintaining (PM) device that is built upon an architecture demonstrated at NIST [Sinclair, et al., Opt. Exp. 22, 6996 (2014)]. Key features of the optical package include:

- Turnkey modelocking with an all-PM fiber architecture centered around 1550 nm. No user optimization is necessary.
- 160 MHz repetition rate with an ability of repetition rate matching for dual comb applications.
- Low-noise oscillator exhibiting a free-running CEO linewidth of <200kHz.
- Temperature insensitive f-2f interferometer that delivers CEO beatnotes of SNR > 45dB (RBW = 300 kHz).
- Dual fast/slow cavity length actuators with bandwidth > 300 kHz.
- Integrated optical heterodyne module: the user supplies a fiber-coupled optical reference frequency on a specified ITU grid location, and the fiber-coupled optical beat note is output.
- Robust design and packaging: maintains lock during >10g shock and >10 K temperature excursions (specific results dependent upon servo electronics).
- Demonstrated Allan deviation  $<5 \times 10^{-18}$  at 1 s and  $\sim 10^{-20}$  after  $10^5$  s as well as phase-slip free operation for more than 30 days.

An integrated comb electronics package is currently under development.

AOSense has also developed several all-fiber extensions to visible wavelengths corresponding to atomic transitions. This functionality is integrated into the standard optical package and does not require external modules. Current offerings include:

- Wavelength extensions to 657 nm, 689 nm, 698 nm, 780 nm, and 1064 nm. Contact us for additional information.
- Visible wavelength heterodyne module is included in the optical package. The user supplies a fiber-coupled CW wavelength, and a fiber-coupled optical beatnote is output from the package.
- Typical beatnote SNRs between the supplied reference and a single comb tooth are 40-55 dB (300 kHz RBW).

AOSense erbium fiber frequency comb parameters	Standard values
Optical package dimensions	8" x 6.75" x 1.25"
Center wavelength	1550 nm
Repetition rate (matching available)	160 MHz
Free-running CEO linewidth	< 200 kHz
CEO beatnote	SNR > 45 dB (RBW = 300 kHz)
Repetition rate tuning with slow length actuator	~1 kHz
Fast cavity-length actuator bandwidth	~300 kHz
Comb output power	~20 mW

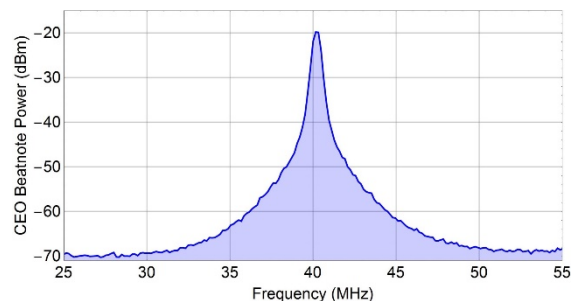


Figure 1: Typical CEO beatnote in 300 kHz RBW.

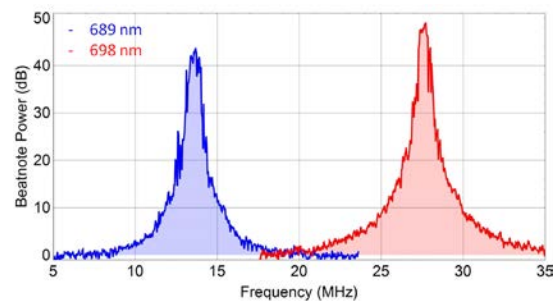


Figure 2: Free-running 689 nm (blue) and 698 nm (red) optical beatnotes (300 kHz RBW) simultaneously measured with a dual visible wavelength comb.