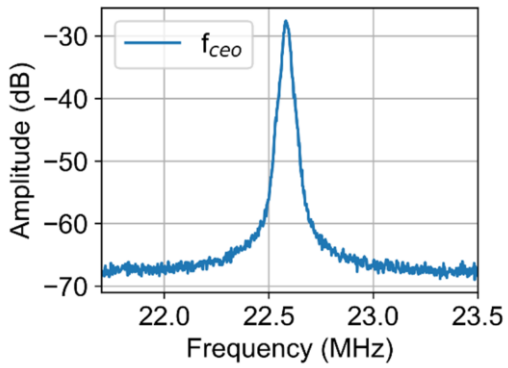
Comb Offset Stabilization Module (COSMO)

Summary: The Octave Photonics Comb Offset Stabilization Module (COSMO) provides a compact and convenient solution for *f-2f* self-referencing a laser frequency comb. Additionally, the COSMO allows the carrier-envelope-offset frequency (f_{CEO}) to be detected with exceptionally low pulse energies, enabling lower power consumption or higher repetition rates.

Usage: The COSMO connects to the laser with a fiber connector (FC/APC or similar) and provides an electrical output (SMA) that can be connected to the comb stabilization electronics. The pulse must be compressed at the entrance to the COSMO, so appropriate length of fiber and/or dispersion-compensating fiber must be used. Additionally, control over the input pulse energy allows the signal-to-noise ratio of the f_{CEO} signal to be optimized.



Specification	COSMO
Input pulse wavelength	~1560 nm
Recommended input pulse energy	>150 pJ
Recommended input pulse duration	<200 fs
Input fiber	PM1550
Input optical connector	FC/APC or similar
Output electrical connector	SMA
Dimensions (excluding connectors)	50x35x22 mm*
Typical power consumption (without TEC)	0.6 Watts (50 mA @12 V)
Weight	75 grams
Thermoelectric cooler (TEC)	Optional
Input average power (with TEC)	<4 Watts
Operating temperature (with TEC)	0 to 40 C
Signal-to-noise of CEO peak	>35 dB**

* Contact Octave Photonics for custom COSMO designs.

** Observed signal-to-noise ratio depends on laser stability. >35 dB assumes a low-noise laser system.

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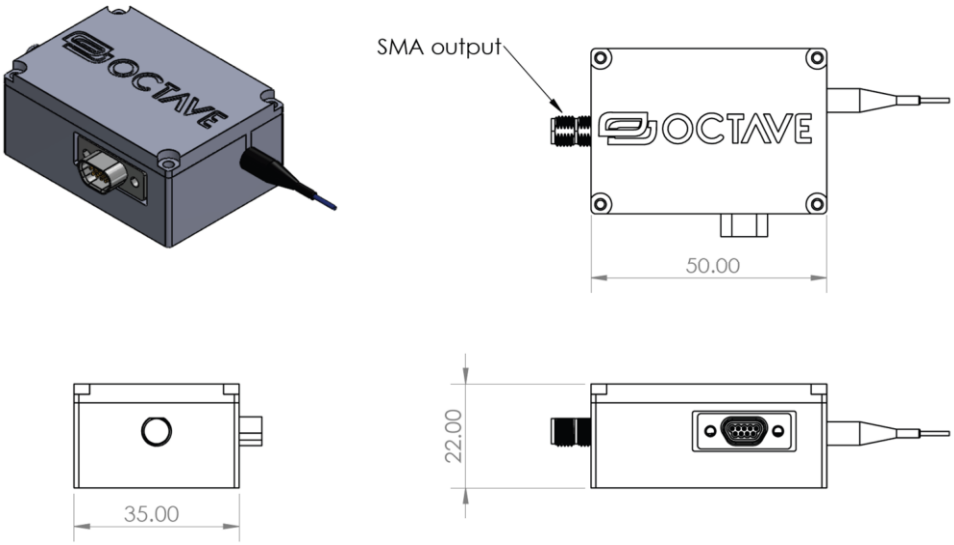
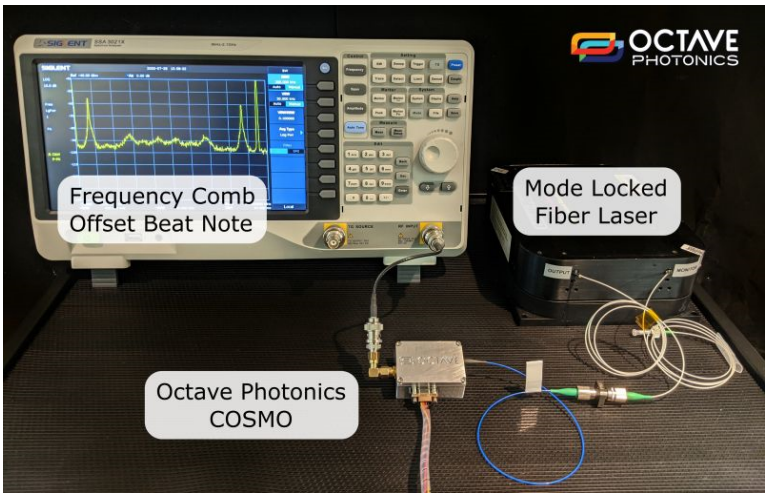
Schematic and dimensions:

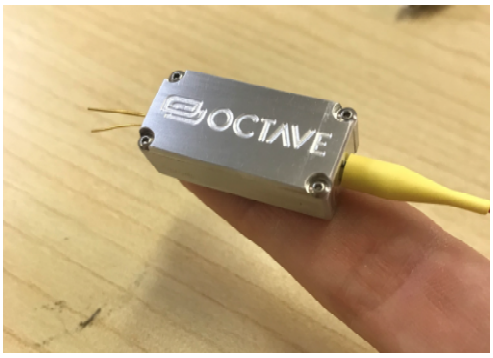


Dimensions are in millimeters. The SMA connector provides RF output from detector. The Micro-D connector provides connections for detector power (5-15 VDC, ~0.6 W), thermistor, and built-in thermo-electric cooler.

Example offset detection: In this simple configuration, the COSMO is connected to the output of an Er:fiber laser. The RF spectrum analyzer shows three peaks: f_{CEO}, $f_{CEO} - f_{rep}$, and f_{rep}, where f_{rep} is the laser repetition rate.



Customization: The COSMO can be customized to meet specific requirements. In the photo, a miniaturized version of the COSMO (the COSMO-mini) has been constructed to keep the size and weight to a minimum. The COSMO-mini does not contain the electronic amplifier, and instead provides direct electronic access to the photodiode. The COSMO can be provided in other form factors as applications require.



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