

High Performance Laser Systems for Optical Clocks and Quantum Sensors

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Introduction

Vescent is a supplier of ruggedized frequency-stabilized laser systems for the Quantum ecosystem, enabling Quantum Timing, Sensing, Networking, and Computing. Our ambition is to provide high-performance lasers that work unattended and interrupted as well as to offer solutions for the field. Achieving low noise laser operation in the presence of large environmental perturbations is our specialty.

US Distributor for DFM C₂H₂ Optical Frequency Reference

Stabilaser 1542^e

Optical Frequency Combs

Low-SWaP electronics boards

Rb & Cs MOT laser system

Micro-optics modules

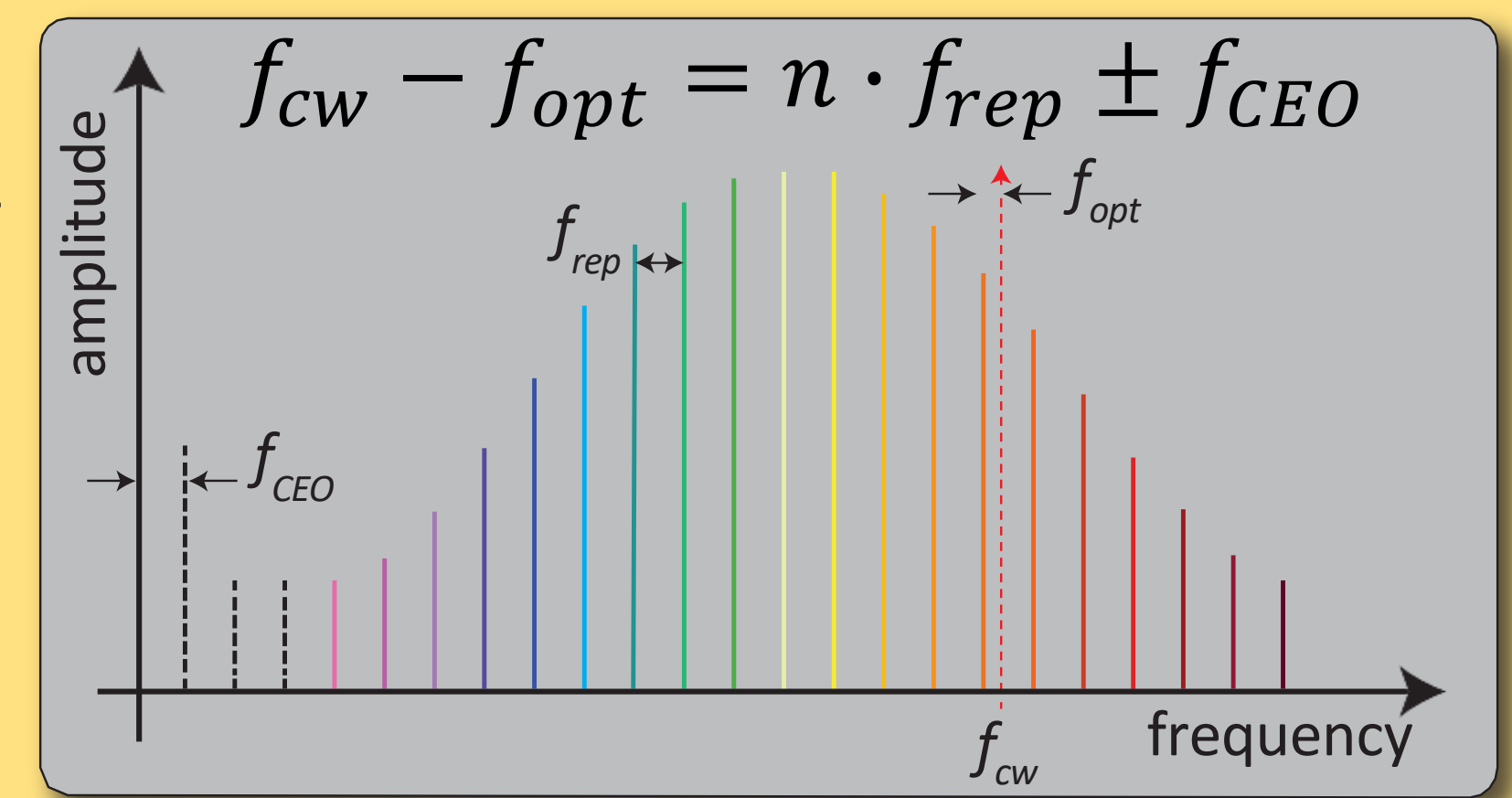
Low-noise, high-speed electronics

Robust, high performance lasers systems are essential for realizing quantum applications

Computing, Networking, Timing, Sensing

Robust optical frequency combs across visible, near-IR, and Mid-IR wavelengths

Vescent offers high-performance, rack-mount optical frequency comb systems for laboratory experiments and beyond.



2U Rack Mount FFC
10 L, 40 W

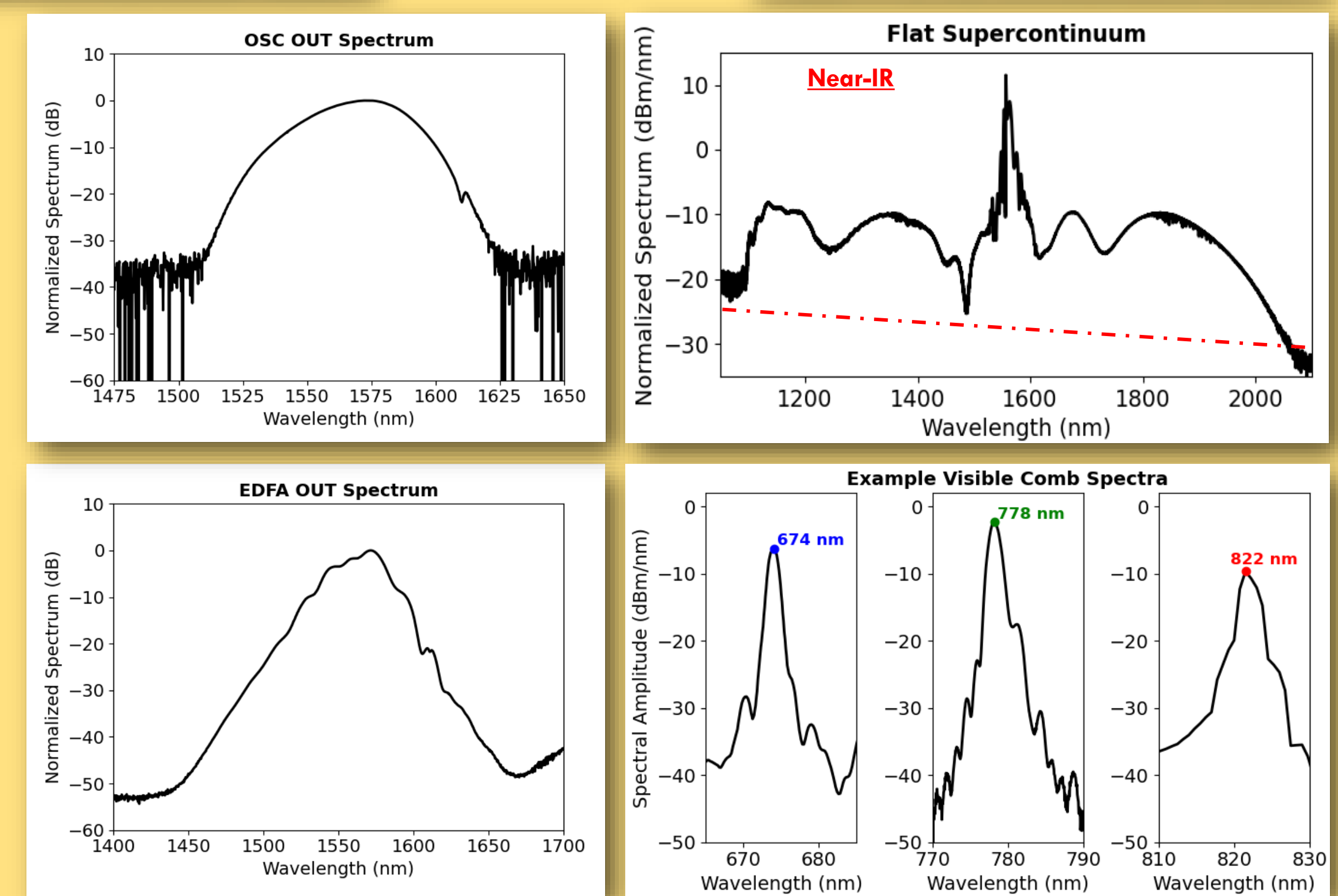
Vescent also offers low-SWaP comb modules for deployable applications such as next-generation optical atomic clocks, dual-comb spectroscopy, and ultra-low phase noise microwave generation.



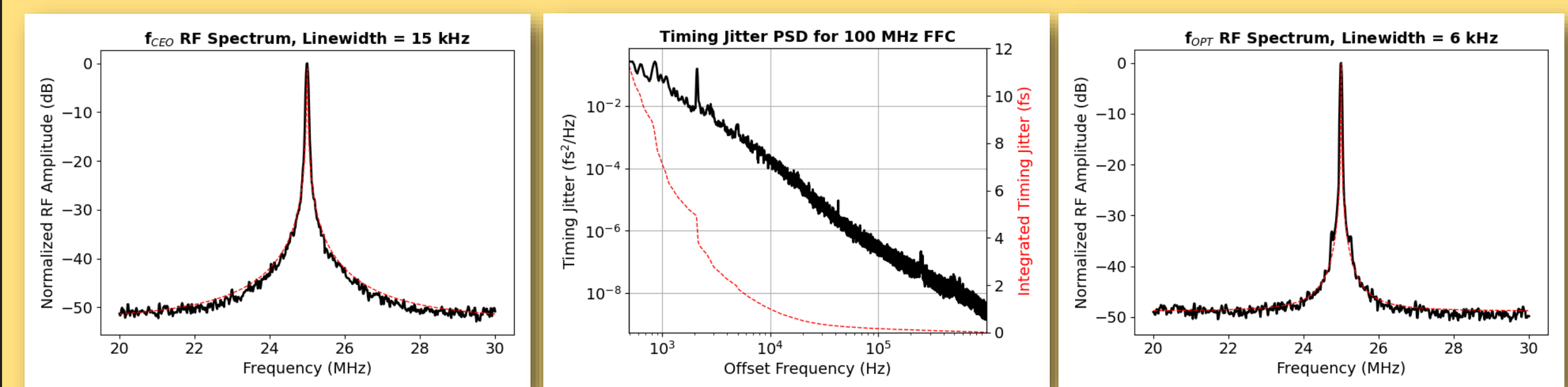
Gen. 2
6L, < 15 W, AVAILABLE NOW

Gen. 3
2L, < 10 W, AVAILABLE 2025

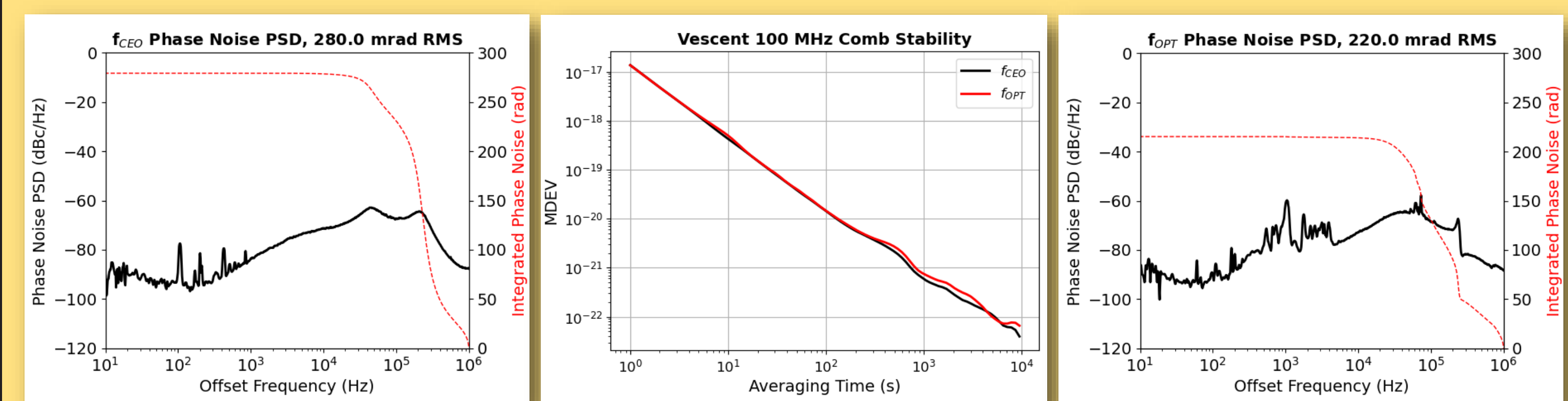
Optical comb outputs are available from either the oscillator or EDFA centered near 1560 nm. Broadband near-IR supercontinua are available from 1000 – 2000 nm, and narrow band visible comb spectra are available from 500 – 1000 nm.



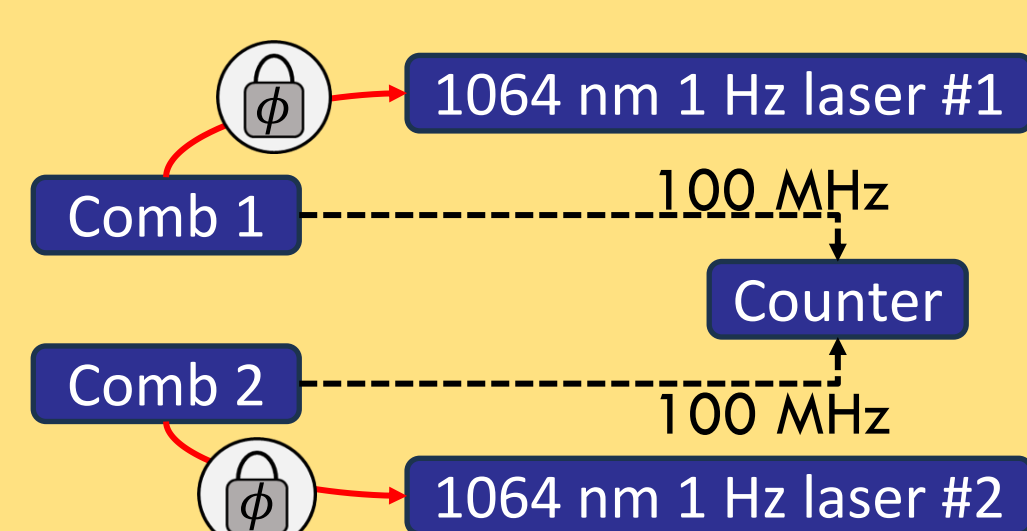
Please inquire with Vescent if you have interests in comb spectra at wavelengths <500 nm or >2000 nm.



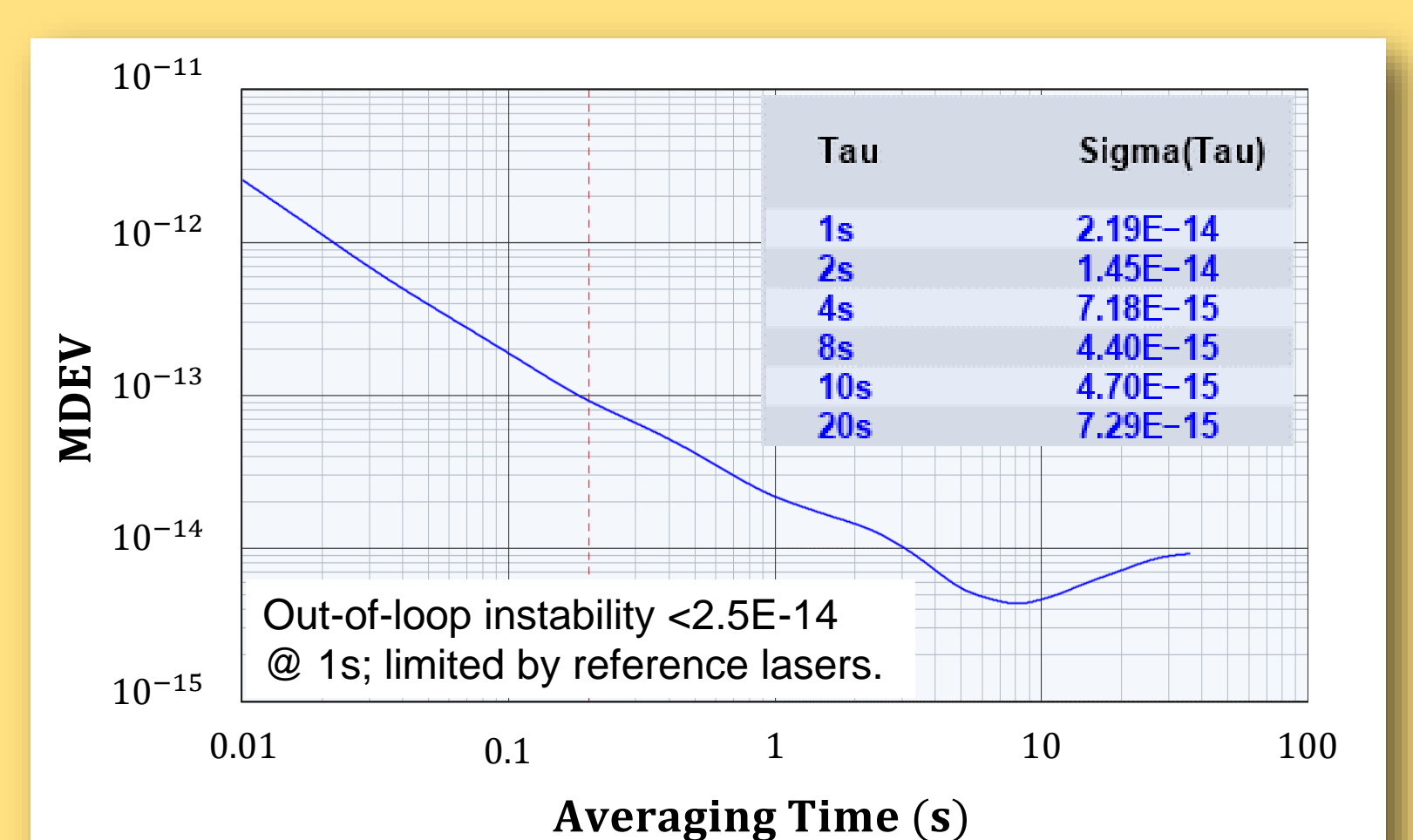
Free-running comb performance supports kHz-level optical linewidths and femtosecond-level timing jitter.



In-loop phase noise power spectral densities and (modified) Allan Deviations show Vescent combs can support demanding low-noise applications such as optical clocks and two-way time transfer.



Out-of-loop MDEVs have been taken in coordination with NASA-Goddard to show Vescent combs can support 10-15 level instability measurements (results were limited by the ULE-cavity stabilized lasers).

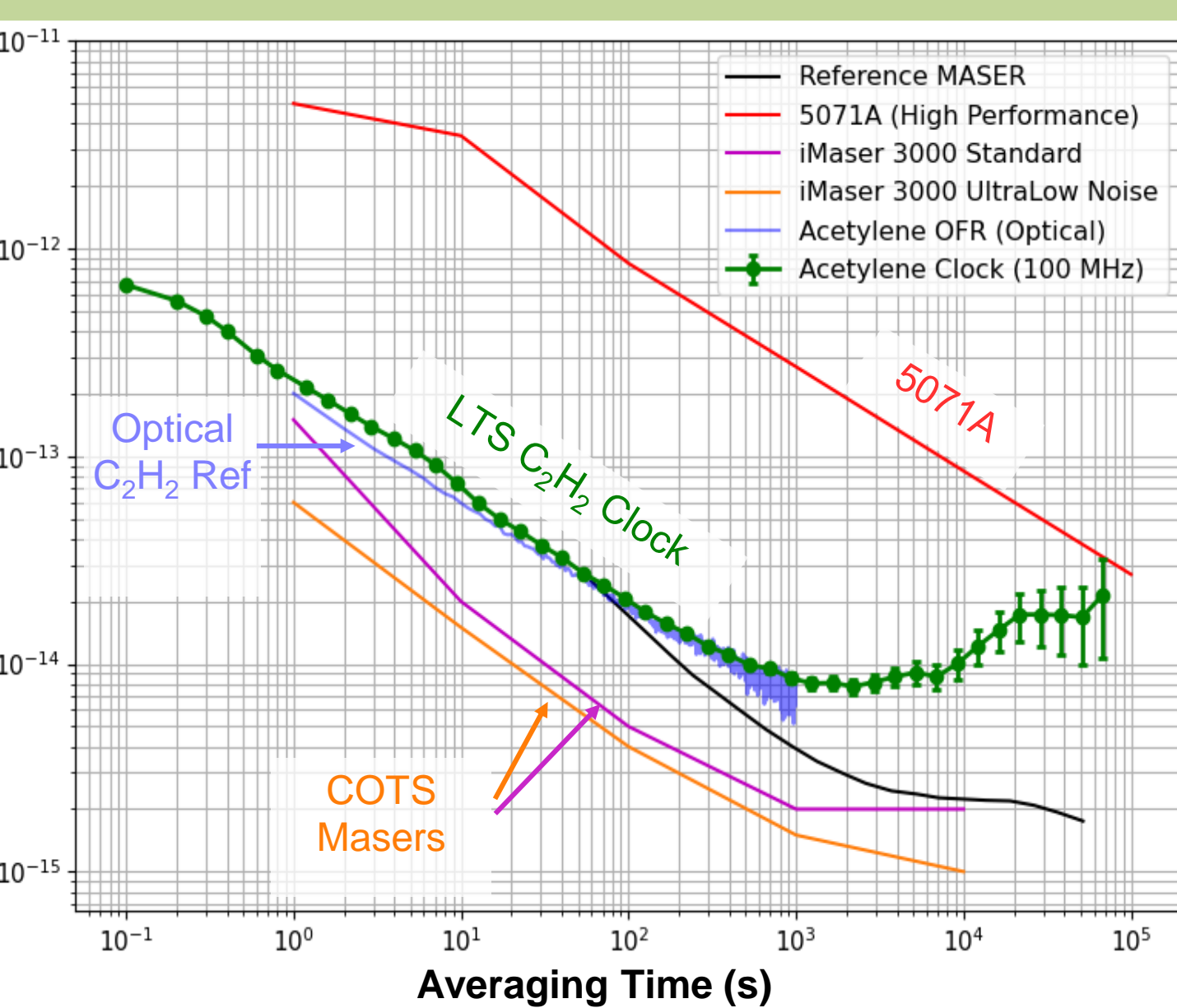
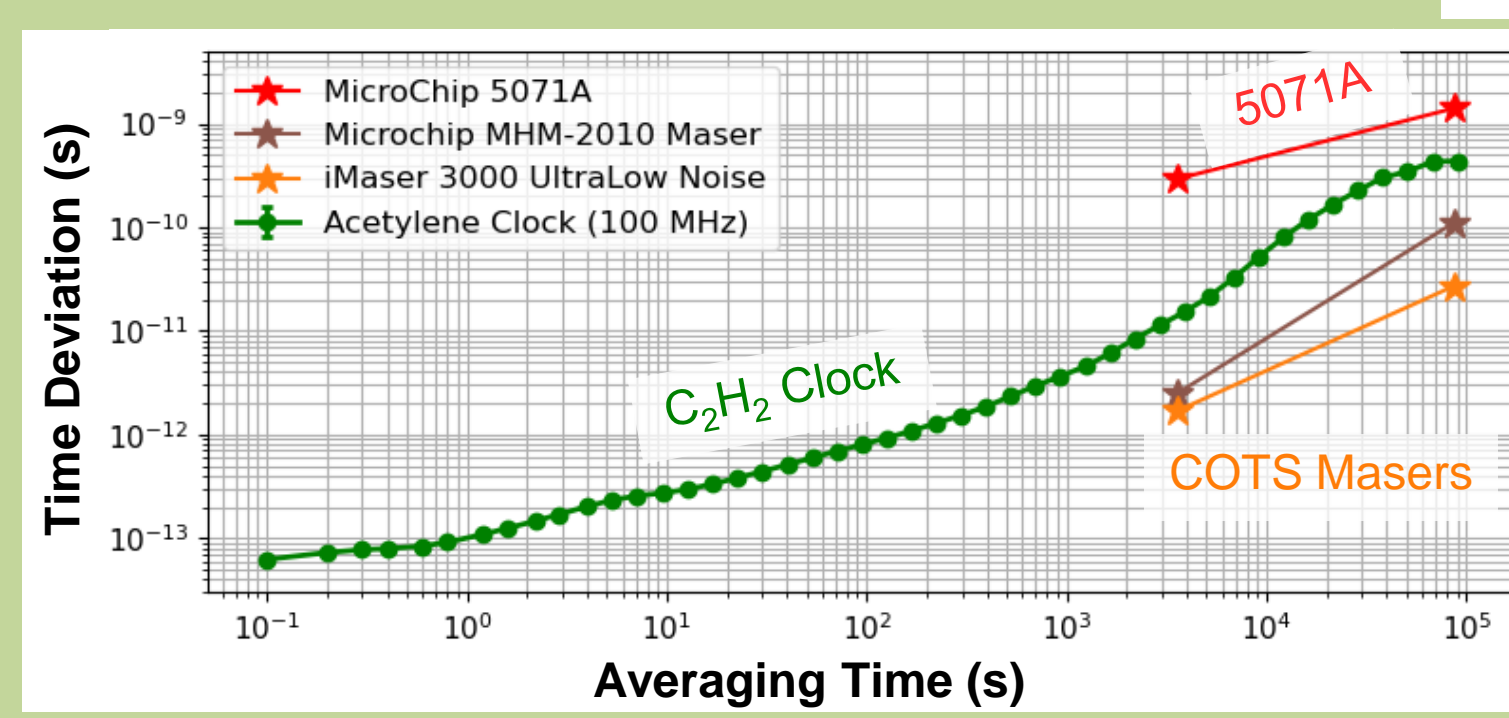


Local Timing System (LTS) Setup



Vescent has released the first commercially-available reconfigurable optical clock kit called the Local Timing System (LTS) Clock Kit as a high stability lab reference for both the optical and the microwave regimes as well as for timing stability backups for GPS-reliant systems. This Kit combines Vescent's optical frequency comb with DFM's Stabilaser optical frequency reference. Performance of this Kit is discussed below.

ADEVs of $<3E-13/\sqrt{\tau}>$ up to 1,000 s with flicker floors $<3E-14>$ show that this system is comparable to masers without the required environmental enclosures that those systems require. While the environmental performance is closer to Cesium beam tube technology (Microchip 5071A), the LTS Clock Kit outperforms this technology at timescales up to 1 day.



TDEVs of <math><1\text{ ps}</math> up to 100 s and <math><1\text{ ns}</math> @ 1 day are achievable with this system. Longer term performance and accuracy is currently being investigated at both Vescent and DFM; inquire with us to find out more!

Frequency controlled lasers for quantum sensors

Low noise laser control electronics are available in both analog and digital version. Functionality includes low noise current control, precision temperature control, atomic feedback control, laser offset phase locking, and high voltage amplifiers.



Robust lasers and electro-optics are available to support Rb, Cs, and K frequency-stabilized laser systems for quantum experiments.

Modular laser systems are under development to support liter-scale deployed quantum sensors. Lasers, spectroscopy cells, and fast photodetectors in deck-of-card sized enclosures are the focus of this new product line and include integrated control electronics with micro-optic packaging.

Inquire at info@vescent.com to learn more about our products!