

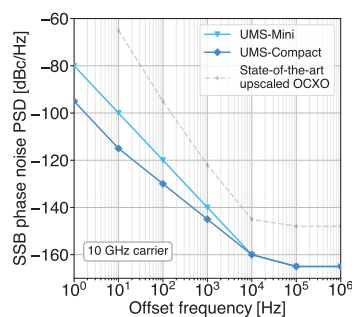
UMS-Compact

Ultrastable Microwave System

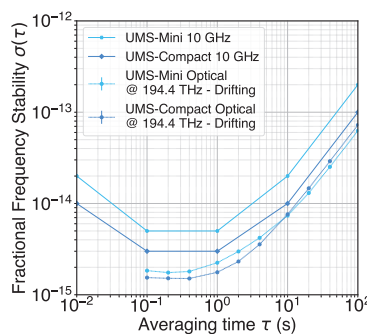


Ultrastable Microwave System: photonic microwave technology representing a paradigm shift in microwave signal synthesis. This groundbreaking advancement is the first commercially-available photonic microwave source that utilizes the phase-coherent division of high-fidelity optical signals into the microwave domain. By employing this innovative approach, we can drastically reduce optical phase noise to levels that were previously physically impossible with more established technologies like multiplied OCXOs or room-temperature Sapphire oscillators.

The UMS-Compact is the bigger brother of the UMS-Mini. It also includes a fully autonomous ultrastable laser and a frequency comb, in a robust custom-designed rack-system to be operated in telecom cabinets, radar and radio-astronomy domes. It allows for the addition of customizable extensions for multiple frequency outputs, both in RF/Microwave or for comb-line synthesis at specific optical frequencies. The UMS-Compact can be further synchronized, on request, to optical or microwave signals as inputs, making it an ideal flywheel for metrological fiber networks and RF over fiber nodes. It is the follow-up system to the Menlo device featured in *Jahangir et al 2023**.



Absolute phase noise specifications for a 10 GHz carrier signal delivered by the UMS-Compact and UMS-Mini, in comparison with the best on the market upscaled OCXO.



Absolute frequency stability of the 10 GHz signal delivered by the UMS-Compact and UMS-Mini. The optical stability of the reference system is also shown.

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APPLICATIONS

- Atomic Clocks / Optical and Microwave Time-scale Realization
- Very Large Baseline Interferometry (VLBs)
- Fiber-link Networks
- Quantum Computing
- Test & Measurements
- OCXOs / Oscillators Calibration / Measurements
- Telecom 5G/6G

FEATURES

- Complete robust solution, comprising an ultrastable laser and an optical frequency comb
- Fully remotely controllable
- Customizable, with the possibility to equip the unit with multiple outputs, both optical and RF/Microwave frequencies
- Highest stability

KEY SPECIFICATIONS

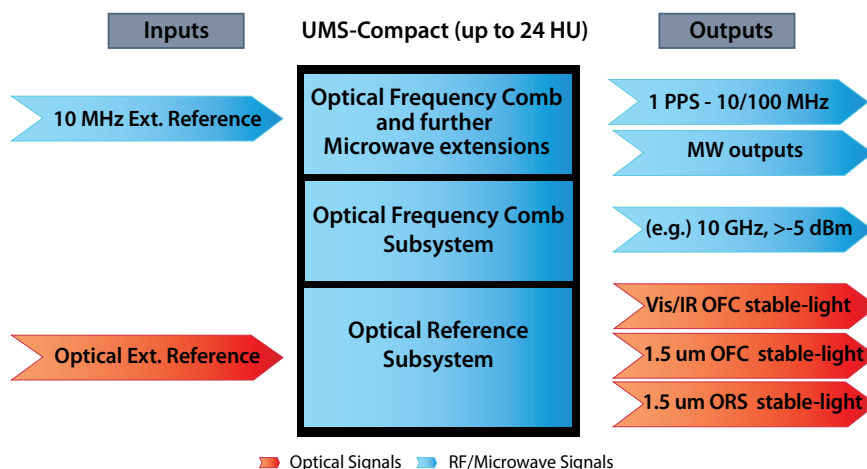
- Configurable with multiple phase-coherent RF and Microwave frequency outputs: 1-20 GHz with guaranteed spectral purity
- Includes 1 PPS, 10 MHz and 100 MHz outputs
- Phase noise as low as <-95 dBc/Hz at 1 Hz, -160 dBc/Hz at ≥ 10 kHz from a 10 GHz carrier
- Frequency instability (for X-Band signals) as low as <2E-15 at 1 s, <5E-11 (50 ppt) at 1 day (without drift-removal)
- De-drift option available (via GPS or more stable references)

*Jahangir, M. et al. "Building a Quantum-Enabled, Networked Radar Testbed for Urban Surveillance of Low Observable Aerial Targets – Current Status," in 10th Military Sensing Symposium (NATO STO, 2023). doi:10.14339/STO-MP-SET-311.

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SPECIFICATIONS

Offset frequency (Hz)	Phase noise			Averaging time (s)	Frequency stability (absolute*)		
	10 MHz	100 MHz	10 GHz		10 MHz	100 MHz	10 GHz
1	-140	-125	-95	0.1	<3E-14	<5E-14	<3E-15
10	-150	-135	-115	1	<3E-14	<5E-14	<3E-15
100	-155	-145	-130	10	<1E-13	<1E-13	<1E-14
1k	-165	-150	-145	100	<5E-13	<5E-13	<1E-13
10k	-165	-155	-160	1000	<5E-12	<5E-12	<1E-12
100k	<-165	-155	<-160	>10000	<5E-11	<5E-11	<1E-11
1M	<-165	-155	<-165				

System can be equipped with GPS receiver for long-term steering. De-drift function can be configured for handover at the appropriate time to a more stable reference.
*Inquire for residual.

OUTPUTS

	1/100 MHz	Microwave
Level, 50 Ω	>7 dBm	>-5 dBm**
Isolation	>70 dB	>80 dB
Spurious	<-90 dBc	<-70 dBc

**Please inquire for change of specs for amplified power levels.

POWER / ENVIRONMENTAL REQUIREMENTS

Operating Voltage	100/115/230 VAC
Line Frequency	50 to 60 Hz
Operating Temperature	22 ± 5 °C
Power Consumption	<250 W

ORDERING INFORMATION

Product Code UMS-Compact

Please call for pricing. Specifications are subject to change without notice. Custom modifications are available, please inquire. The cubic cavity is an NPL patented design that is sold under a licensing agreement with the National Physical Laboratory (NPL). This configuration of the NPL cavity is intended for terrestrial use only. For further information on space-customised or space-qualified cavities, please contact NPL.

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Laser Radiation
Class1 Laser Product
according to DIN EN 60825-1:2015-07

