RBX

Rubidium frequency & time reference for precision timing and navigation systems



DESCRIPTION

RBX is a high-performance rubidium frequency and time reference designed for precision timing, synchronization and navigation applications. Proven in demanding environments, including space ground segments, it delivers low phase noise and excellent frequency stability for mission-critical operation.

RBX provides 6x 10 MHz outputs and 4x 1PPS outputs as standard. Optional 100 MHz and 10.23 MHz outputs support high-frequency timing and navigation applications. RBX can be disciplined via external 1PPS or GNSS inputs, ensuring long-term accuracy while maintaining low noise performance.

A robust architecture with redundant power supply, monitoring, and control interfaces ensures reliable operation and seamless integration into complex timing infrastructures.

BENEFITS

- Ultra-low phase noise and excellent long-term stability, exceeding CAT A clock requirements
- Proven reliability for mission-critical operations
- External 1PPS/GNSS disciplining
- Coherent F&T outputs (10 MHz, 1PPS, 10.23 MHz optional, 100 MHz optional)

APPLICATIONS

- Ground segments and satellite tracking
- Time realization and metrology
- Navigation & GNSS infrastructures
- Scientific facilities and particle accelerators
- Test & measurement

SPECIFICATIONS

Parameter	Specification	Comment	
Dimensions	1U or 2U	19” rack module, U depends on the chosen options	
Output signals	6x 10 MHz 4x 1PPS	standard module, see options for additional 10.23 MHz and 100 MHz outputs	
Control system interface	TCP/IP	Telnet and HTTP	
Power supply	2x redundant units	100 – 240 VAC, 50 – 60 Hz, max. 120 W	
6x 10 MHz outputs			
Output frequency	10 MHz	sine wave	
Output power	12 dBm ± 2 dB	load impedance 50 Ω	
Factory frequency accuracy	≤ ± 5.0E-11	at 25°C	
Aging	≤ ±1.2E-10/month ≤ ±2.4E-11/month	Standard (STD) option Ultra-low-noise (ULN) option	
Harmonic suppression	≤ -40 dBc		
Spurious suppression	≤ -80 dBc	100 kHz bandwidth	
Phase noise at 10 MHz	**Offset frequency** 1 Hz 10 Hz 100 Hz 1 000 Hz 10 000 Hz	**STD option** -95 dBc/Hz -125 dBc/Hz -145 dBc/Hz -150 dBc/Hz -155 dBc/Hz	**ULN option**[1] -115 dBc/Hz -140 dBc/Hz -152 dBc/Hz -158 dBc/Hz -160 dBc/Hz

© Cycle GmbH – Specifications subject to change without notice. Product image for illustration purposes only. September 26

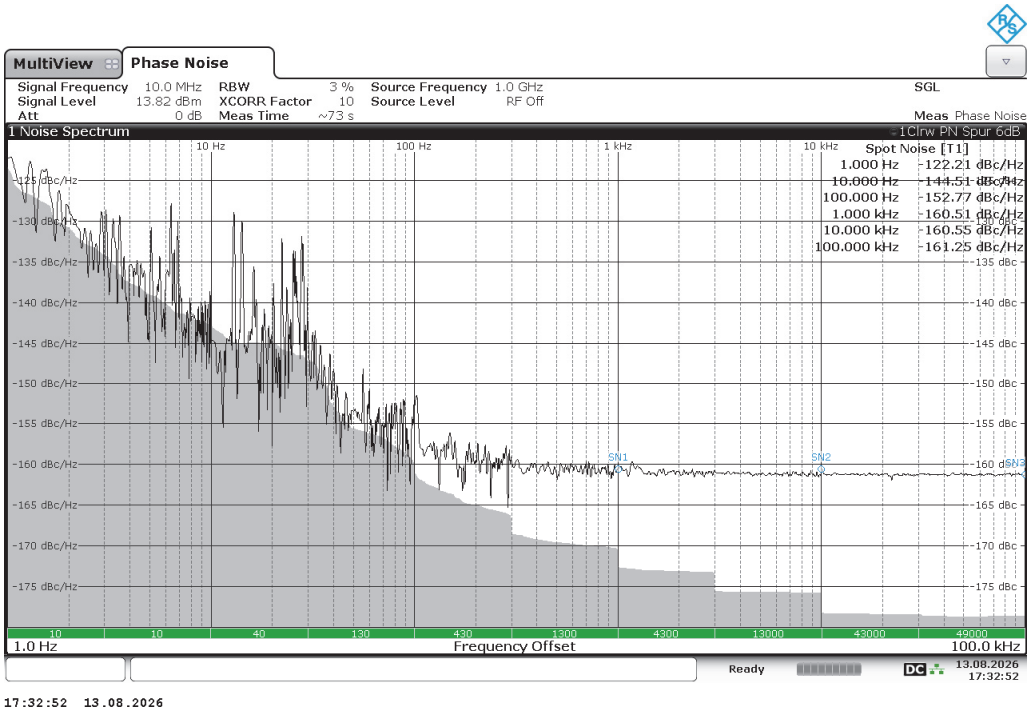
ADEV[2]	**Tau** 1 s 10 s 100 s 1 000 s 10 000 s	**STD option** < 5.0E-12 < 4.0E-12 < 3.0E-12 < 3.0E-12 < 3.0E-12	**ULN option[1]** < 5.0E-13 < 5.0E-13 < 5.0E-13 < 6.0E-13 < 6.0E-13
4x 1PPS outputs			
Signal level	2.5 V TTL	50 Ω impedance	
Pulse rise and fall times	≤ 1 ns	from 10% to 90% level	
Pulse width	500 µs – 500 ms	default 100 ms, adjustable with 12.5 ns	
External 1PPS disciplining			
Input signal	1PPS	SMA type, level: TTL/LVTTL, 1PPS jitter should be less than 20ns (RMS)	
Option RBX-100: additional 4x 100 MHz outputs			
Output frequency	100 MHz	sine wave	
Output power	12 dBm ± 2 dB	load impedance 50 Ω	
Harmonic suppression	≤ -40 dBc		
Spurious suppression	≤ -80 dBc	100 kHz bandwidth	
Phase noise at 100 MHz	**Offset frequency** 1 Hz 10 Hz 100 Hz 1 000 Hz 10 000 Hz	**STD option** -75 dBc/Hz -100 dBc/Hz -120 dBc/Hz -145 dBc/Hz -155 dBc/Hz	**ULN option[1]** -95 dBc/Hz -115 dBc/Hz -132 dBc/Hz -160 dBc/Hz -165 dBc/Hz
ADEV[2]	**Tau** 1 s 10 s 100 s 1 000 s 10 000 s	**STD option** < 5.0E-12 < 4.0E-12 < 3.0E-12 < 3.0E-12 < 3.0E-12	**ULN option[1]** < 5.0E-13 < 5.0E-13 < 5.0E-13 < 6.0E-13 < 6.0E-13
Option RBX-ULN1023: additional ultra-low-noise 4x 10.23 MHz outputs			
Output frequency	10.23 MHz	sine wave	
Output power	12 dBm ± 2 dB	load impedance 50 Ω	
Harmonic suppression	≤ -40 dBc		
Spurious suppression	≤ -80 dBc	100 kHz bandwidth	
Phase noise at 10.23 MHz	**Offset frequency** 1 Hz 10 Hz 100 Hz 1 000 Hz 10 000 Hz	**ULN1023 option[1]** -110 dBc/Hz -130 dBc/Hz -150 dBc/Hz -160 dBc/Hz -160 dBc/Hz	
ADEV[2]	**Tau** 1 s 10 s 100 s 1 000 s 10 000 s	**ULN1023 option[1]** < 6.0E-13 < 6.0E-13 < 6.0E-13 < 7.0E-13 < 7.0E-13	
Option RBX-GNSS: external GNSS disciplining			
Input signal	GNSS	Furuno GT-100 (multi-GNSS RX), SMA type, Antenna voltage: 5 VDC	
Environmental ratings			
Temperature	+5°C to +50°C -50°C to +85°C	operating temperature storage temperature	
Humidity	≤ 85 %	non-condensing	

[1]Export-controlled item (End-User Statement required).

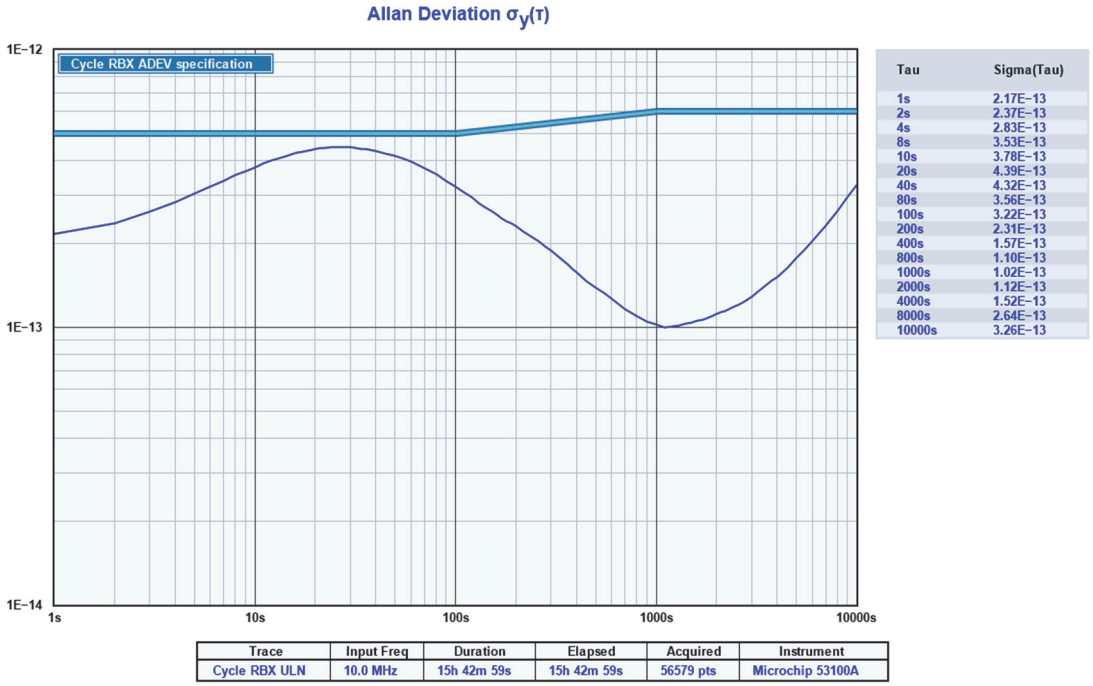
[2]Unit temperature from +15 to +30°C, with slope < 0.4°C/h and variation < 1°C pk-pk; humidity < 60 %RH with variation < 10 %RH pk-pk.

MEASUREMENT DATA

Phase noise at 10 MHz (RBX-ULN Option)



ADEV at 10 MHz (RBX-ULN Option, free-running)

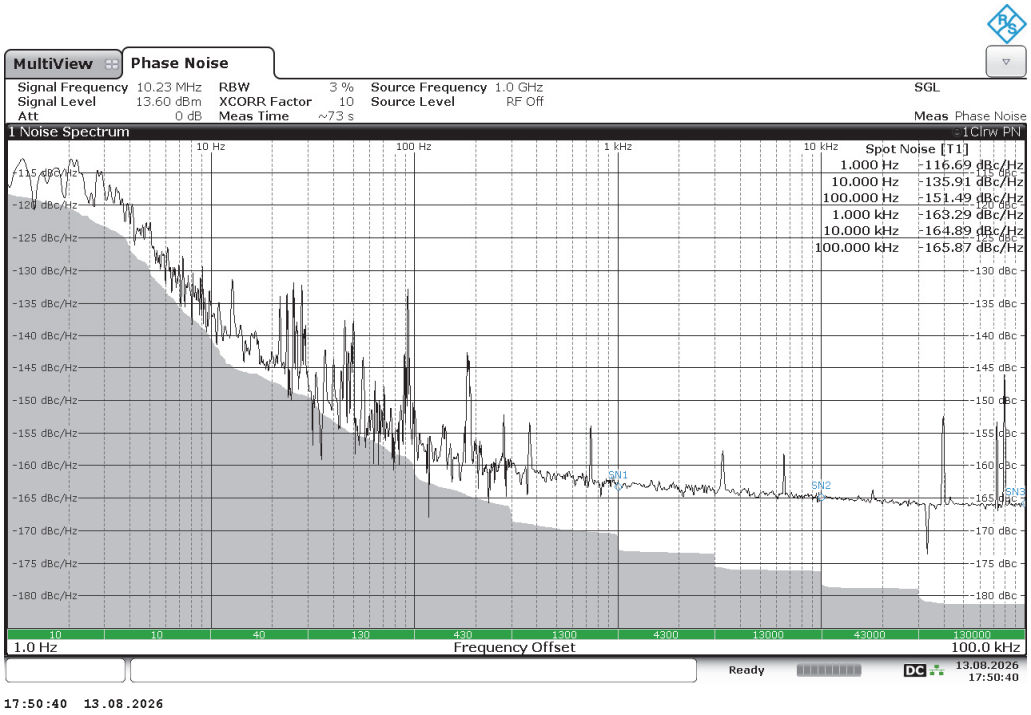


Tau	Sigma(Tau)
1s	2.17E-13
2s	2.37E-13
4s	2.83E-13
8s	3.53E-13
10s	3.78E-13
20s	4.39E-13
40s	4.32E-13
80s	3.56E-13
100s	3.22E-13
200s	2.31E-13
400s	1.57E-13
800s	1.10E-13
1000s	1.02E-13
2000s	1.12E-13
4000s	1.52E-13
8000s	2.64E-13
10000s	3.26E-13

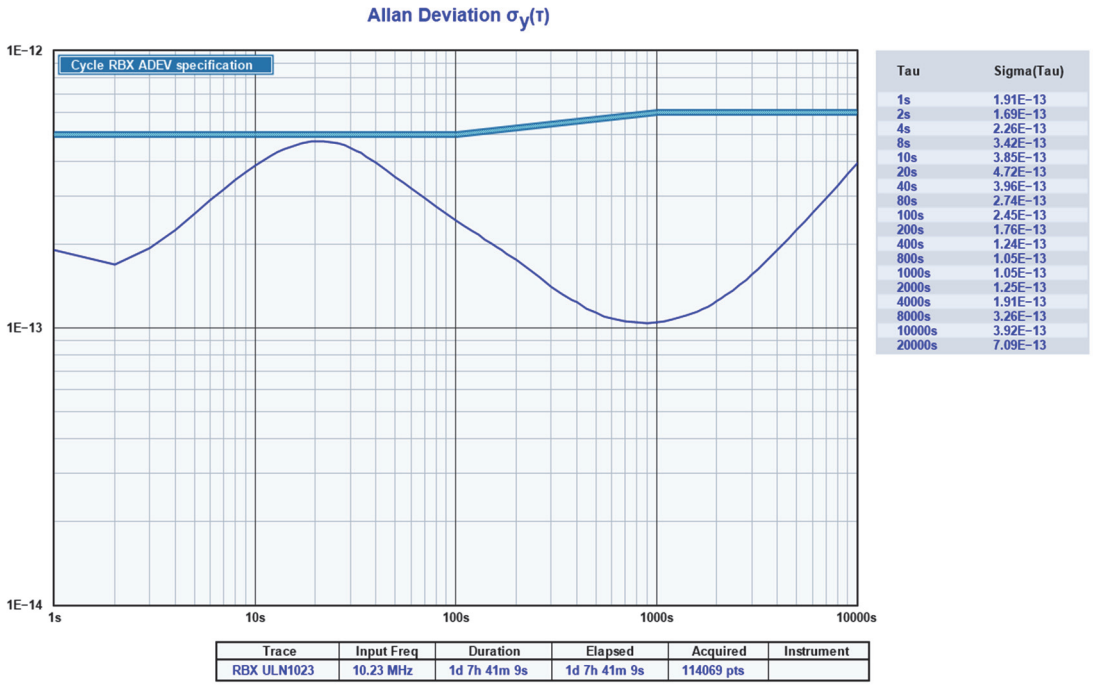
Trace	Input Freq	Duration	Elapsed	Acquired	Instrument
Cycle RBX ULN	10.0 MHz	15h 42m 59s	15h 42m 59s	56579 pts	Microchip 53100A

MEASUREMENT DATA

Phase noise at 10.23 MHz (RBX-ULN1023 Option)



ADEV at 10.23 MHz (RBX-ULN1023 Option, free-running)

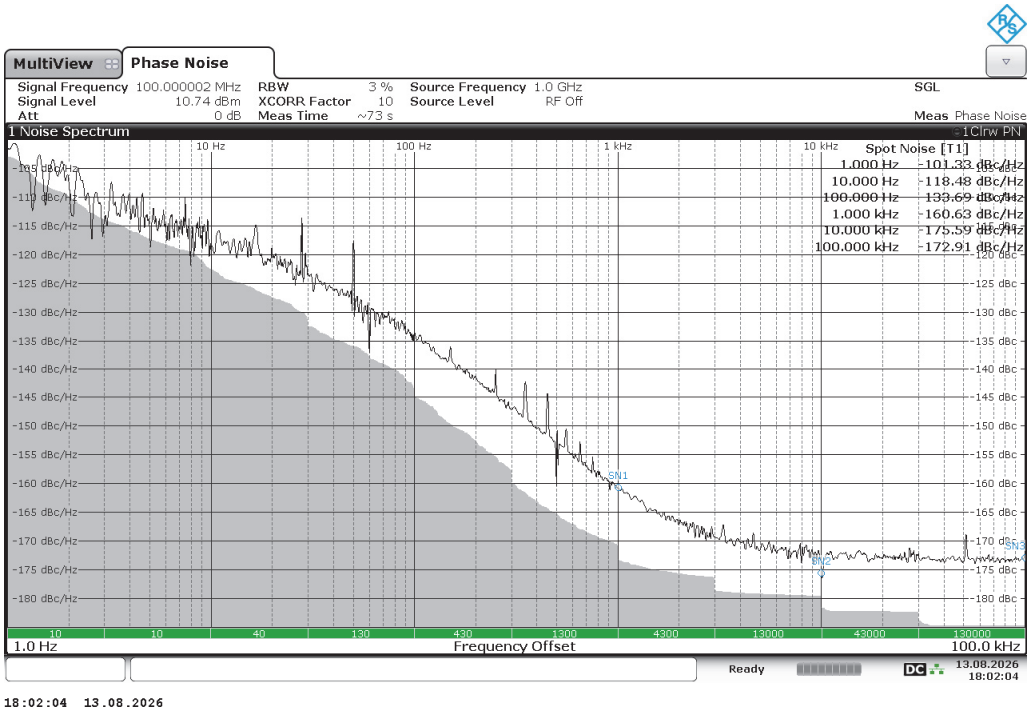


Tau	Sigma(Tau)
1s	1.91E-13
2s	1.69E-13
4s	2.26E-13
8s	3.42E-13
10s	3.85E-13
20s	4.72E-13
40s	3.96E-13
80s	2.74E-13
100s	2.45E-13
200s	1.76E-13
400s	1.24E-13
800s	1.05E-13
1000s	1.05E-13
2000s	1.25E-13
4000s	1.91E-13
8000s	3.26E-13
10000s	3.92E-13
20000s	7.09E-13

Trace	Input Freq	Duration	Elapsed	Acquired	Instrument
RBX ULN1023	10.23 MHz	1d 7h 41m 9s	1d 7h 41m 9s	114069 pts	

MEASUREMENT DATA

Phase noise at 100 MHz (RBX-ULN + RBX-100 Options)



ADEV at 100 MHz (RBX-ULN + RBX-100 Options, free-running)

