



Features

- 50 MHz to 22 GHz synthesizer
- USB Type-C interface
- Low phase noise
- GUI and API control

Applications

- Wireless infrastructure design
- Up-converting and down-converting
- Educational / university lab use
- Production verification and test setups
- Automated Test Equipment (ATE)
- General RF lab use
- Flexible and portable LO sourcing

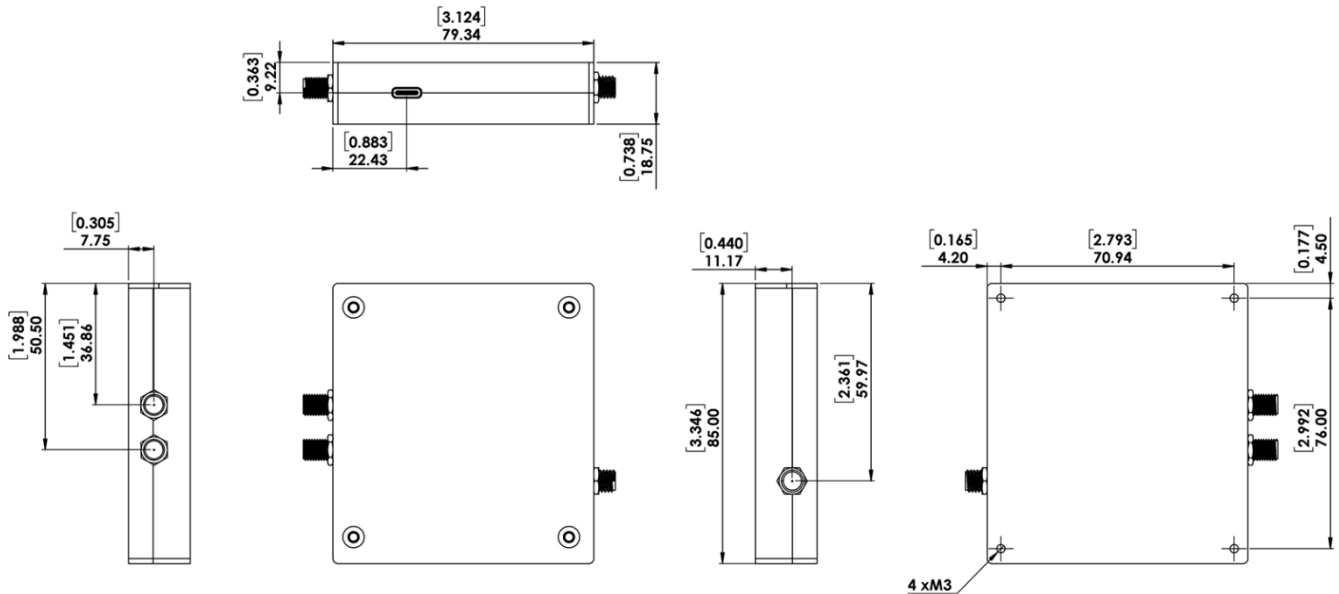
Electrical Specifications

Parameter	Min	Typical	Max
Frequency Range	50 MHz		22 GHz
Frequency Resolution		1 Hz	
Frequency Stability ¹		± 1 ppm	
Operating Temperature	0°C		50°C

¹ Measured after 10 minutes of operation.



Outline Drawing



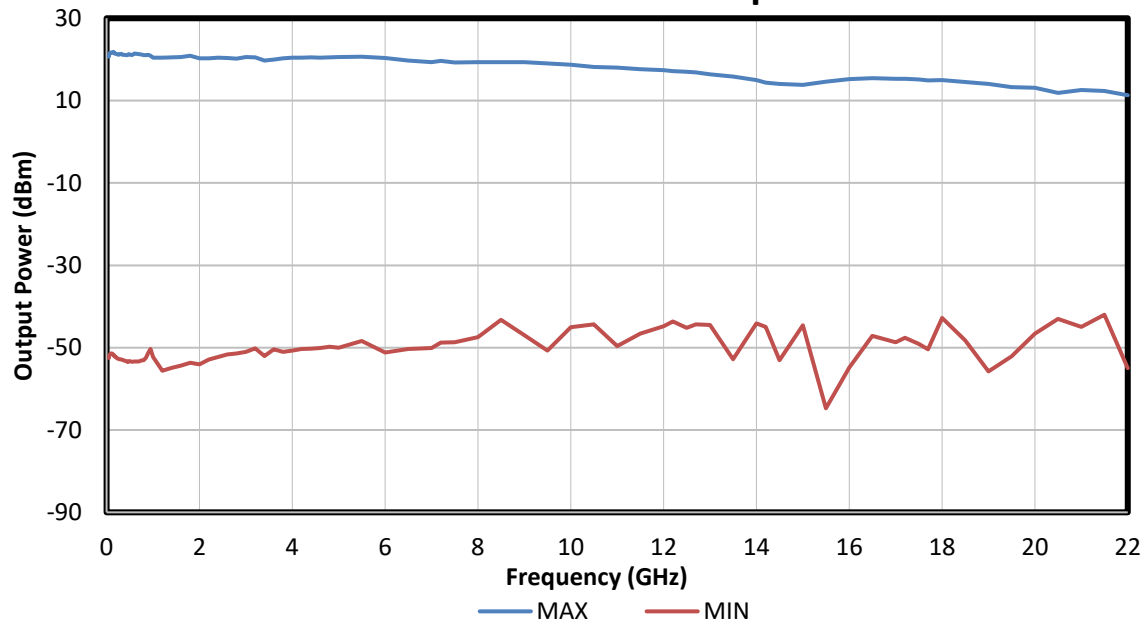
Output Power Level ²

Parameter	Typical
RF Maximum Output Power	
50 MHz - 8 GHz	20 dBm
8 GHz - 15 GHz	17 dBm
15 GHz - 20 GHz	14 dBm
20 GHz - 22 GHz	13 dBm
RF Minimum Output Power	-40 dBm
RF Output Leakage when Off	-90 dBm
RF Output Power Resolution	0.5 dB
RF Output Power Accuracy (Pout ≥ -20 dBm)	
15 GHz - 20 GHz	± 1.5 dBm
20 GHz - 22 GHz	± 2 dBm
Output Return Loss	-9 dB

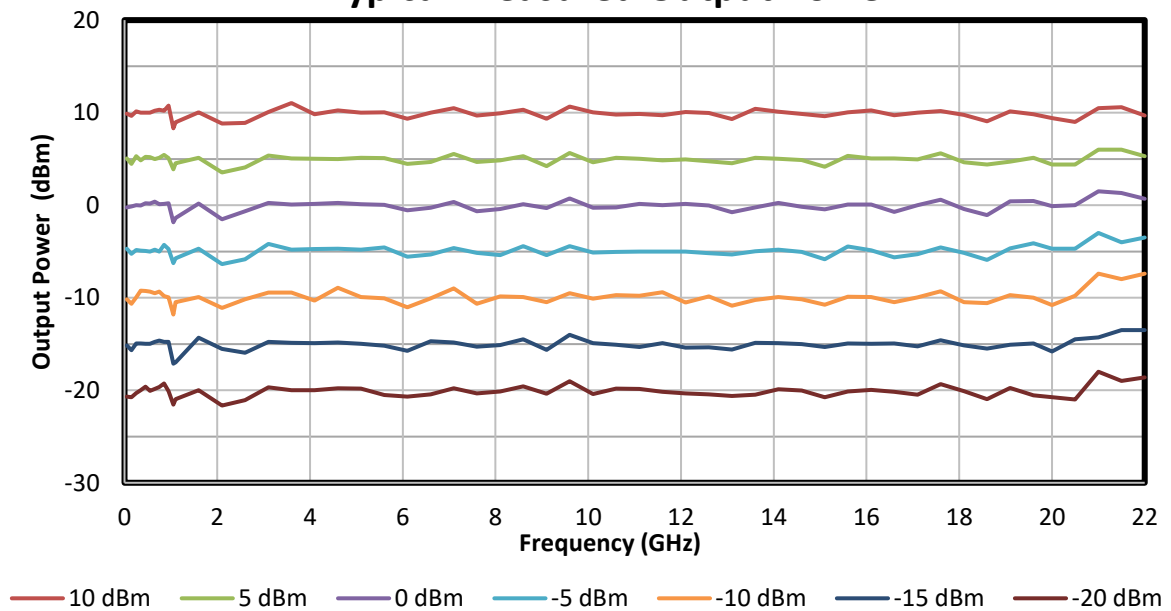
² Measured at room temperature and after 10 minutes of operation.



Maximum and Minimum Output Power

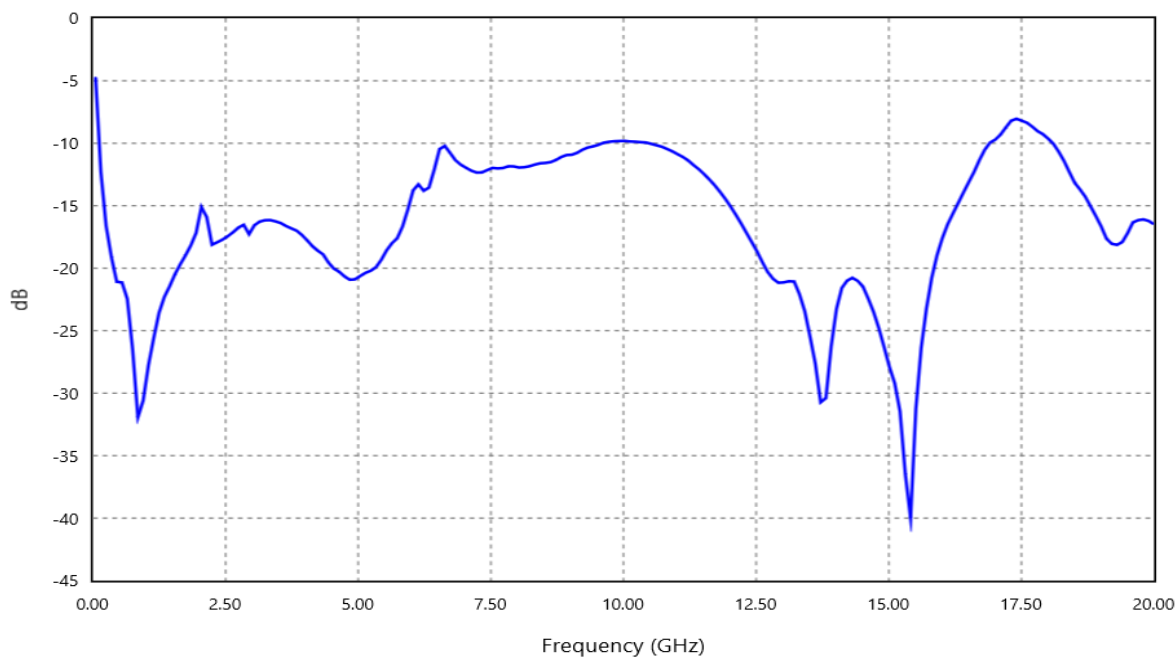


Typical Measured Output Power





Output Return Loss



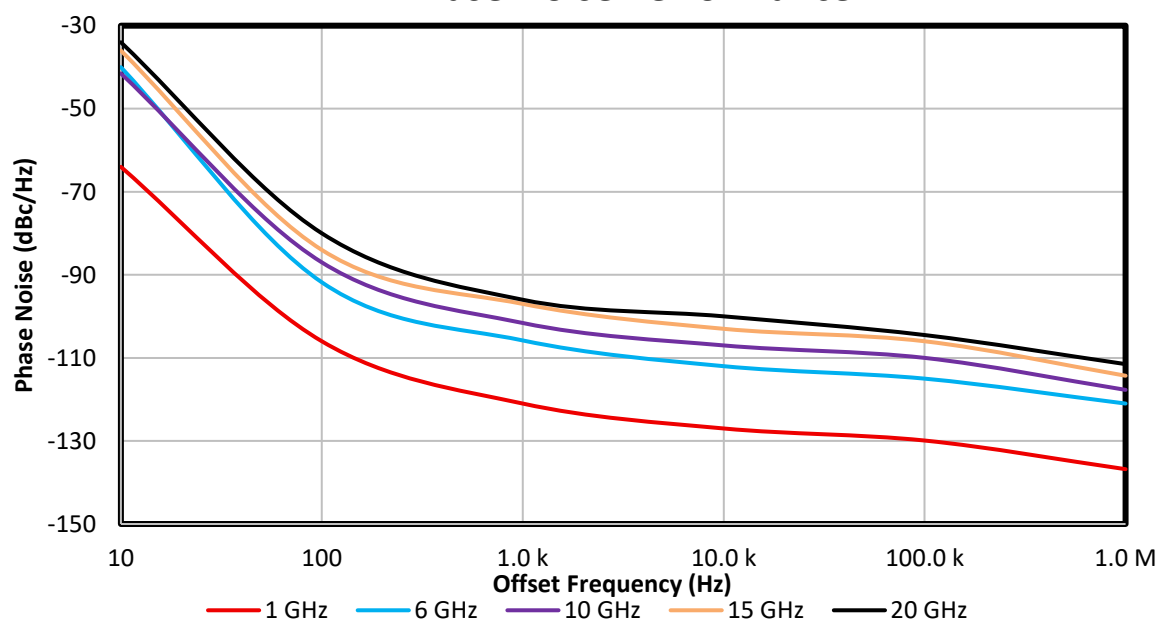
Phase Noise

Frequency	Typical
1 GHz	
Offset 10 Hz	-64 dBc/Hz
Offset 100 Hz	-106 dBc/Hz
Offset 1 kHz	-121 dBc/Hz
Offset 10 kHz	-127 dBc/Hz
Offset 100 kHz	-130 dBc/Hz
Offset 1 MHz	-137 dBc/Hz
6 GHz	
Offset 10 Hz	-40 dBc/Hz
Offset 100 Hz	-92 dBc/Hz
Offset 1 kHz	-106 dBc/Hz
Offset 10 kHz	-111 dBc/Hz
Offset 100 kHz	-115 dBc/Hz
Offset 1 MHz	-122 dBc/Hz



10 GHz Offset 10 Hz Offset 100 Hz Offset 1 kHz Offset 10 kHz Offset 100 kHz Offset 1 MHz	-40 dBc/Hz -87 dBc/Hz -102 dBc/Hz -107 dBc/Hz -110 dBc/Hz -118 dBc/Hz
15 GHz Offset 10 Hz Offset 100 Hz Offset 1 kHz Offset 10 kHz Offset 100 kHz Offset 1 MHz	-36 dBc/Hz -84 dBc/Hz -97 dBc/Hz -101 dBc/Hz -105 dBc/Hz -114 dBc/Hz
20 GHz Offset 10 Hz Offset 100 Hz Offset 1 kHz Offset 10 kHz Offset 100 kHz Offset 1 MHz	-34 dBc/Hz -80 dBc/Hz -96 dBc/Hz -100 dBc/Hz -104 dBc/Hz -111 dBc/Hz

Phase Noise Performance



**Spectral Purity ³**

Parameter	Fundamental Frequency	Typical
1/2 Harmonic	50 MHz - 11 GHz 11 - 22 GHz	NA -40 dBc
2nd Harmonic	50 MHz - 10 GHz	-17 dBc
3rd Harmonic	50 MHz - 5 GHz 5 - 7 GHz	-10 dBc -15 dBc
Non-Harmonic Spurious Close-in ⁴ at output step size of 5 MHz ⁵ Close-in at output step size 1 MHz ⁶ Close-in at output step size 100 kHz ⁷ Far-out ⁸	50 MHz - 22 GHz	-65 dBc -40 dBc -25 dBc -50 dBc

³ The harmonic values in the table were measured at the maximum output power

⁴ Close-in spurious is measured within ± 10 MHz of the output center frequency.

⁵⁻⁷ Spurious performance varies based on the frequency step size (5 MHz, 1 MHz, 100 kHz).

Ex. 5 MHz step: 50, 55, 60 MHz ... 20 GHz;

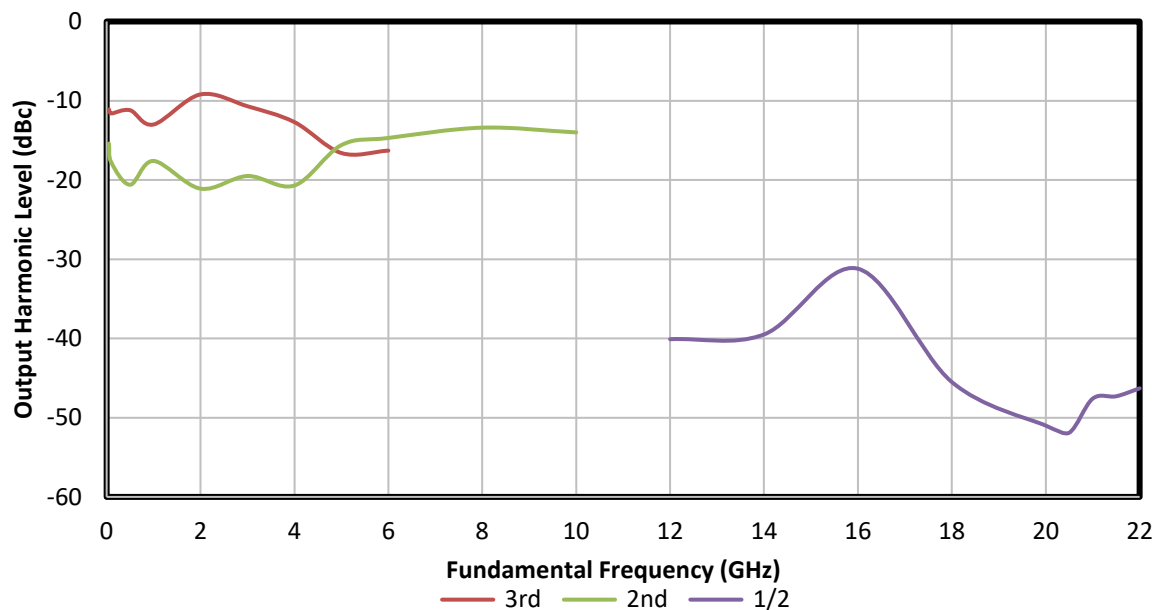
1 MHz step: 50, 51, 52 MHz ... 20 GHz;

100 kHz step: 50, 50.1, 50.2 MHz ... 20 GHz.

⁸ Far-out spurious is measured from 50 MHz to 20 GHz, excluding close-in spurious.

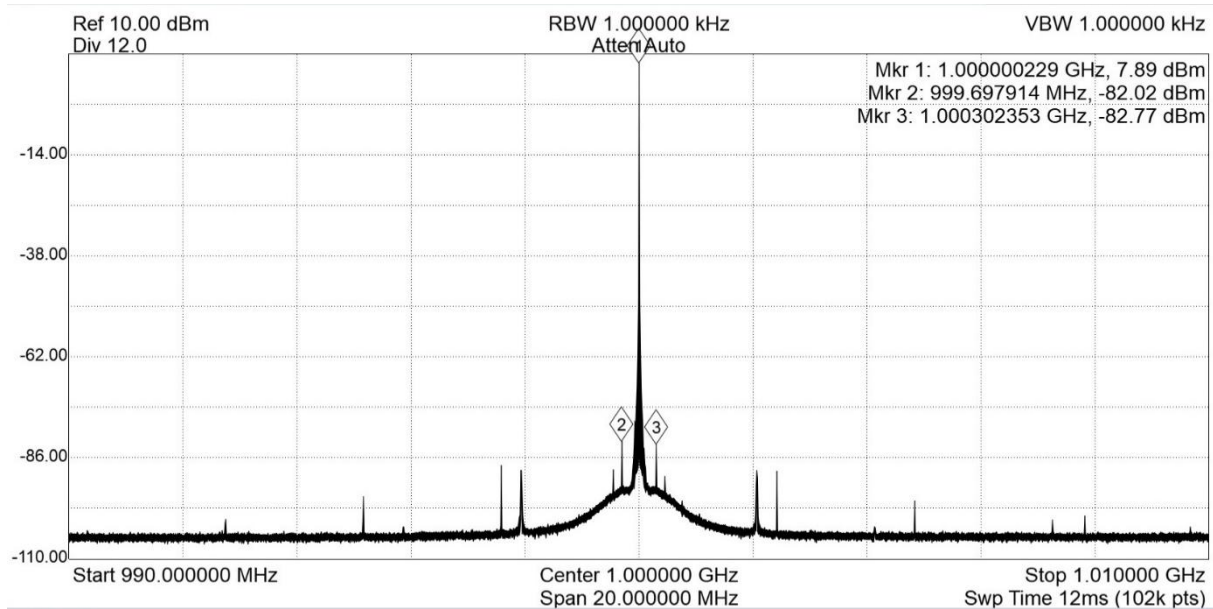


Harmonic and Sub-Harmonic

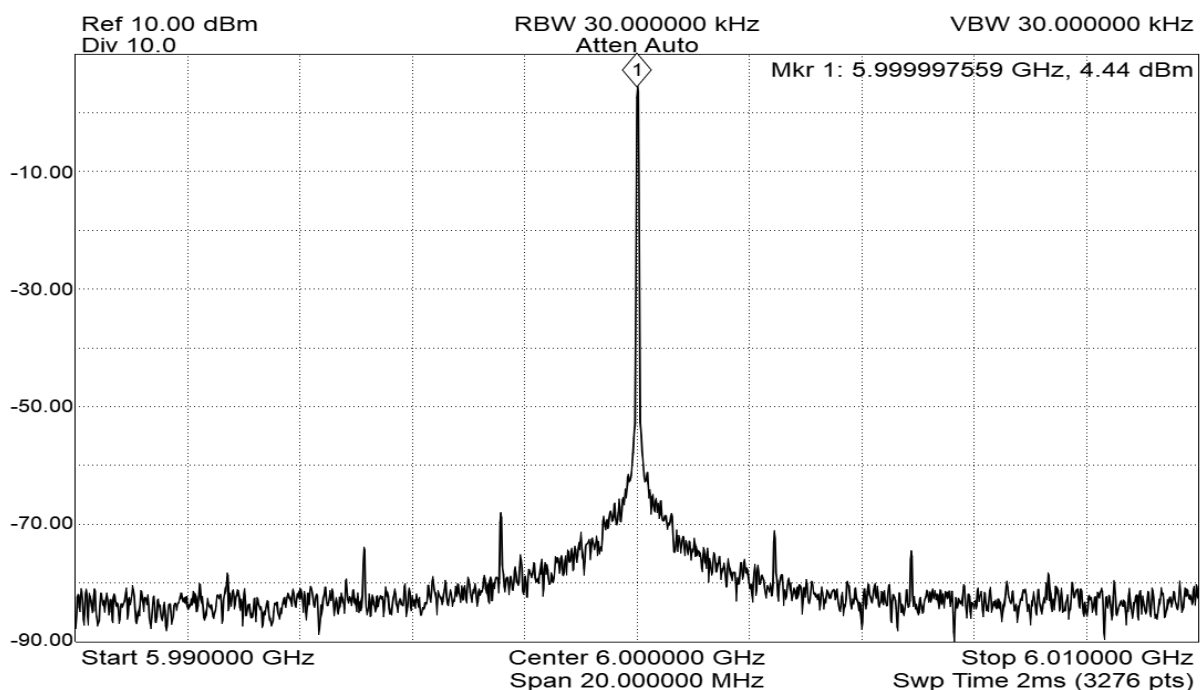




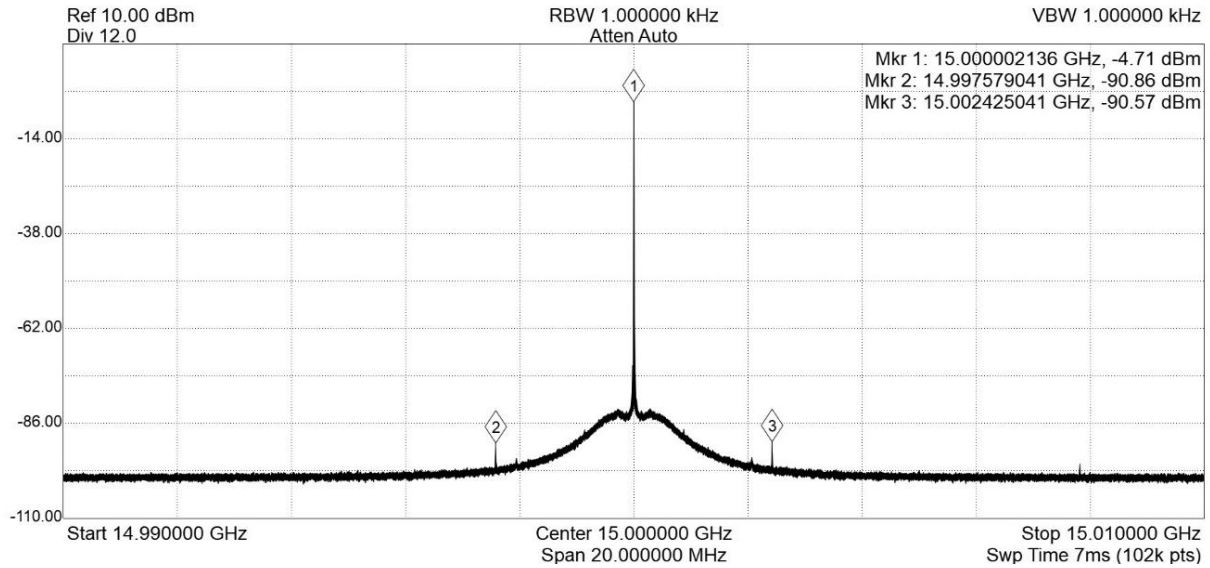
Frequency Spectrum



Measurement results of spurious, output frequency is 1 GHz, span is 20 MHz.



Measurement results of spurious, output frequency is 6 GHz, span is 20 MHz.



Measurement results of spurious, output frequency is 15 GHz, span is 20 MHz.



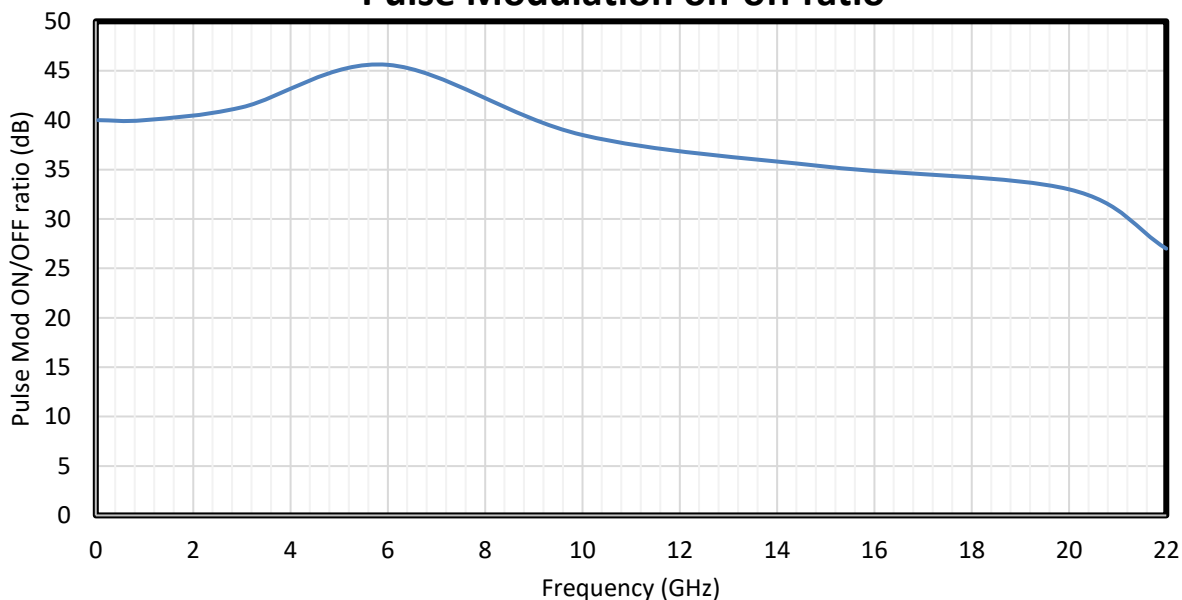
Pulse Modulation

Parameter	Min	Typical	Max
Pulse Modulation Source		Internal/External	
On/Off Ratio		35 dB	
Rise/fall time		30 ns	
Pulse Width (High & Low) ⁹	100 ns		30 s
Duty Cycle ¹⁰ (Internal source)	0.1%		99.9%
Trigger Voltage (External source)		High-Enable	
High-Level	1.7 V		3.3 V
Low-Level	0 V		0.7 V

⁹ Both high and low pulse widths must be within the range of 100 ns to 30 s.

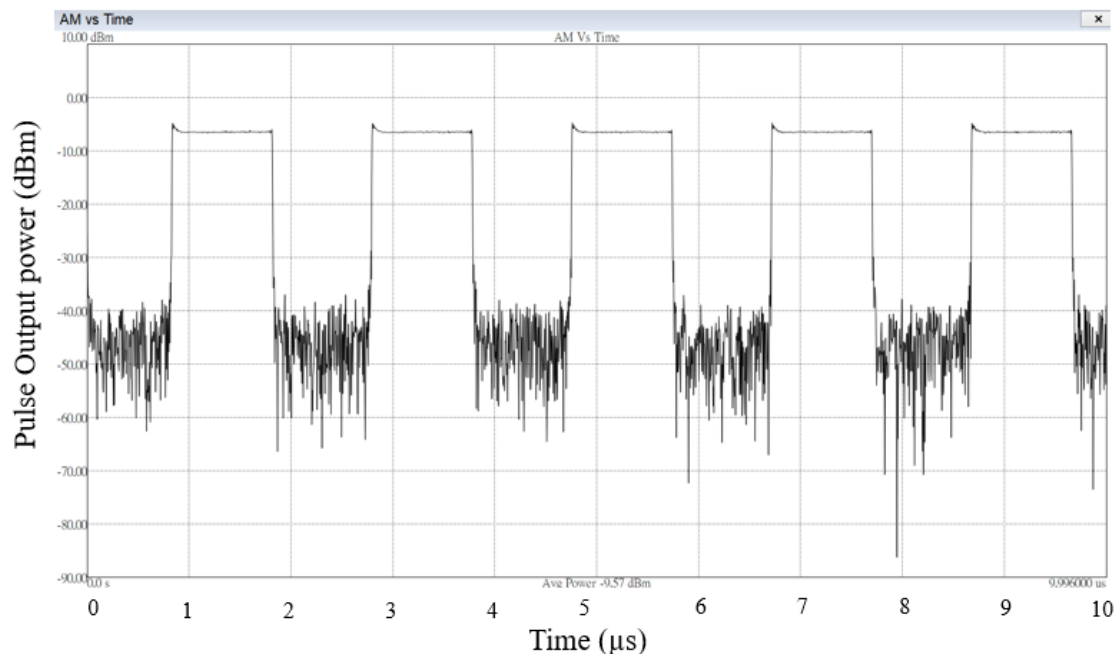
¹⁰ The duty cycle is limited to 1% to 99% when either high or low pulse widths are between 0.5 us and 5 us.

Pulse Modulation on-off ratio





Pulse Modulation



Pulse width 1 μ s and Duty Cycle 50 % when Output Frequency is 6 GHz.

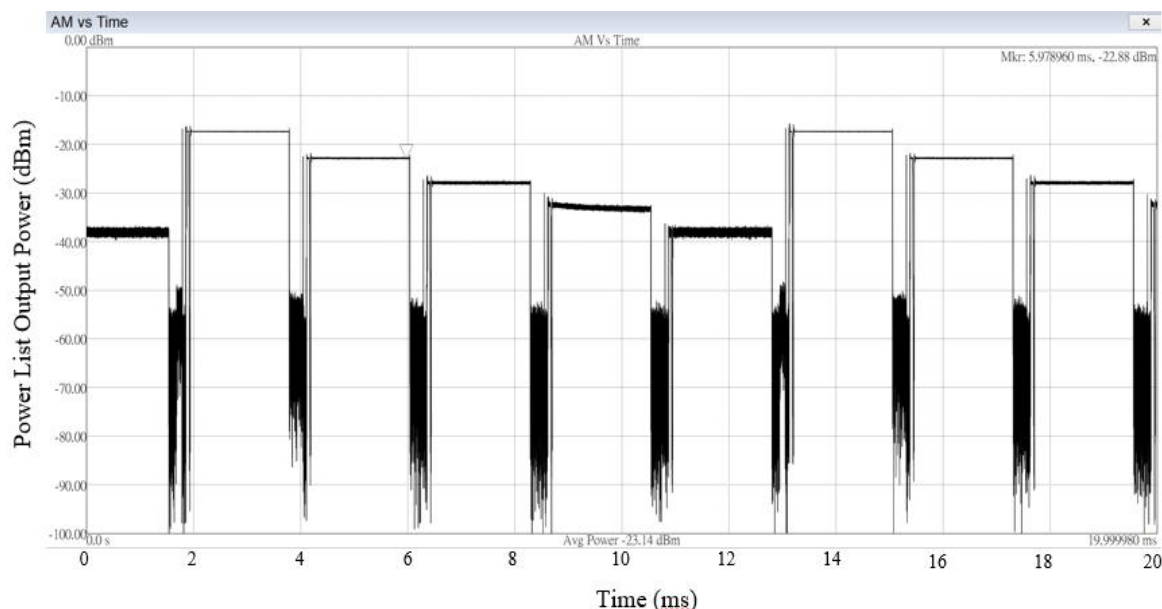
List Mode (Frequency/Power List)

Parameter	Min	Typical	Max
Frequency List Switching Time ¹¹		1 ms	
Power List Switching Time ¹¹		0.5 ms	
Dwell Time	1 ms		

¹¹ The switching time is defined as the time interval from the previous output signal falling to 90% to the next output signal rising to 90%. The RF output remains inhibited during the switching duration.



Power List Mode



The output signal is set to 9 GHz, with a power sweep from 0 dBm to -20 dBm in 5 dB steps.

External Input Reference Clock

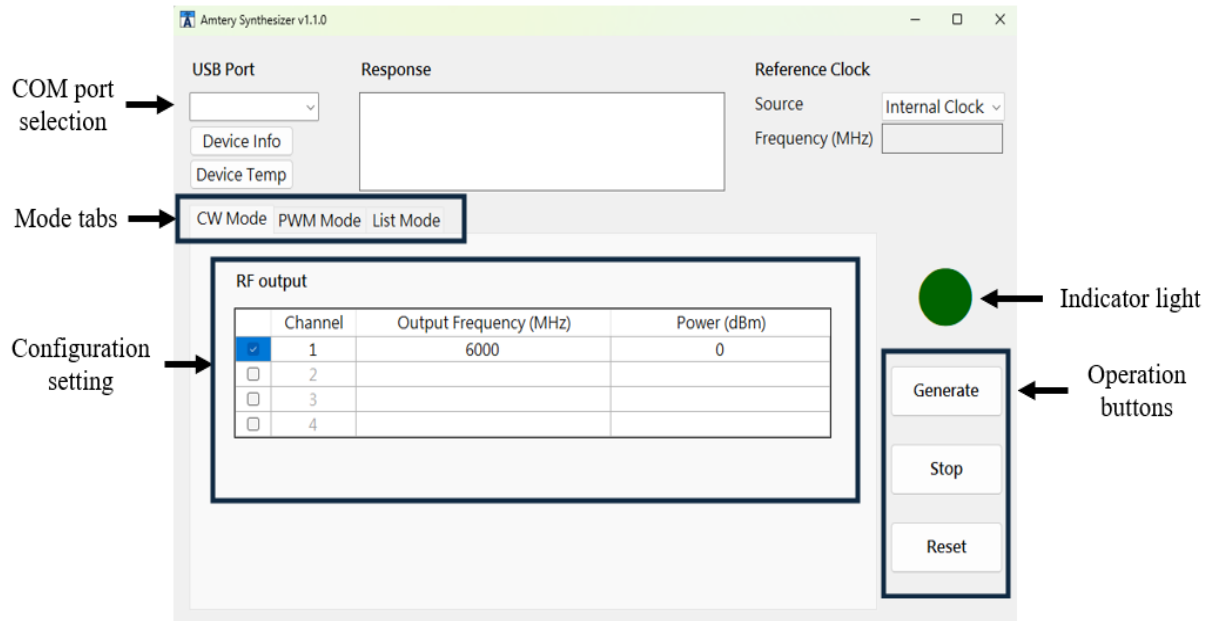
Parameter	Min	Typical	Max
Frequency	10 MHz	100 MHz	110 MHz
Single-ended Input Power	-3 dBm	10 dBm	15 dBm
Single-ended Input Voltage	0.3 Vpp	2 Vpp	3.6 Vpp

Connector

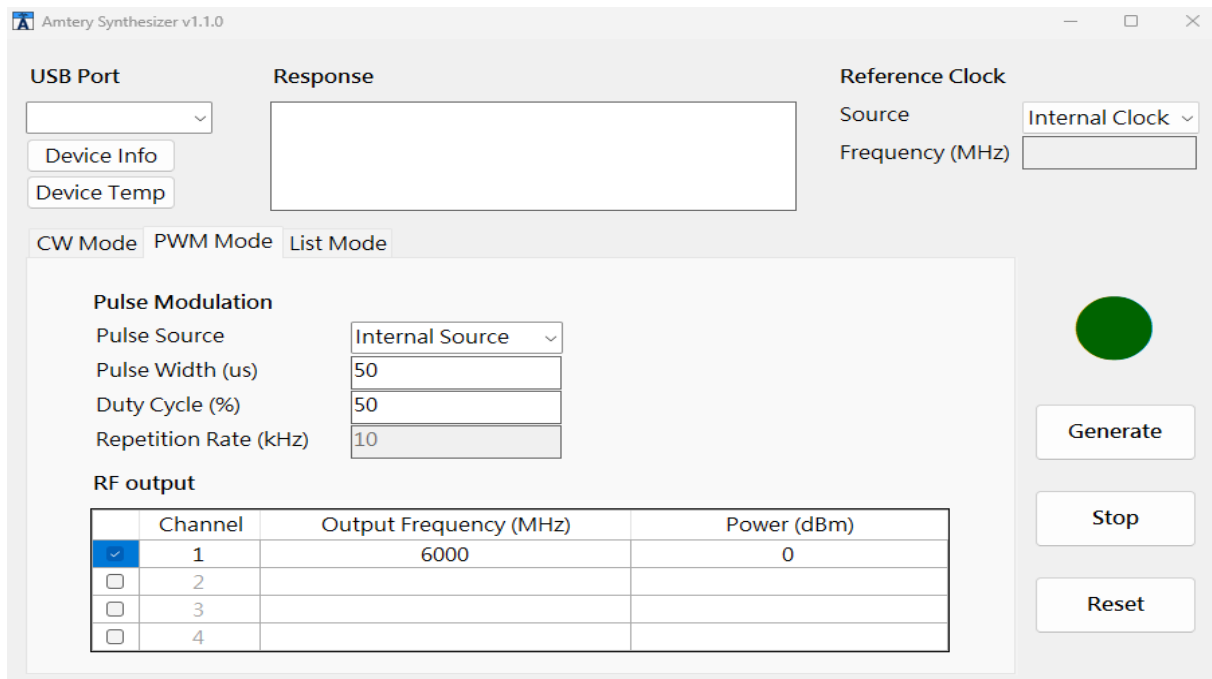
Parameter	Description
RF Output	SMA female
External Pulse In	SMA female
Reference Clock In	SMA female
Control & Power Interface	USB 3.2 Gen1, Type-C connector. (Recommendation: Connect to the host via Type-C port.)



Graphical User Interface (GUI)



GUI - Continuous Wave (CW) Mode



GUI - Pulse Width Modulation (PWM) Mode



Amtery Synthesizer v1.1.0

USB Port:

Response:

Reference Clock:
 Source:
 Frequency (MHz):

☐ Frequency List

Channel:
 Start (MHz):
 Stop (MHz):
 Step (MHz):
 Power (dBm):
 Dwell Time (ms):
 Loop:
 *Input "0" to loop infinitely

☐ Power List

Channel:
 Start (dBm):
 Stop (dBm):
 Step (dB):
 Frequency (MHz):
 Dwell Time (ms):
 Loop:
 *Input "0" to loop infinitely

GUI - Frequency/Power List Mode

Note: Specifications are subject to change without notice.