

# DATASHEET APMSXXG-ULN

## Specification v1.66

(Serial Number \*\*\*-\*\*\*[M]\*\*\*\*\*-\*\*\*\* or higher)

Multi-Channel RF and MW Signal Generators  
300 kHz to 6, 12, 20, 33 and 40 GHz



**Document size:**

1 title page  
21 content pages

## DEFINITIONS

- The specifications in the following pages describe the warranted performance of the instrument for  $23 \pm 5$  °C after a 30-minute warm-up period

**Typical:** Expected mean values, not warranted performance

**Min and max:** Parameter range that is guaranteed by product design, and/or production tested. Warranted performance specifications include guard-bands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

## INTRODUCTION

- **A compact, 300 kHz to 6, 12, 20, 33, or 40 GHz ultra-low phase noise, 25  $\mu$ s phase coherent switching, multi-channel signal generator**

The APMSXXG-ULN is a phase-coherent, multi-channel, high output power, ultra-fast switching and ultra-low phase noise signal generator with a frequency range from 300 kHz to 6, 12, 20, 33 or 40 GHz. It is ideally suited for a wide range of applications, where good signal quality, accurate and wide output power ranges, and very stable phase coherence among all channels are required. Excellent phase noise is combined with good spurious, harmonic rejection and optionally leading-edge switching speed of 25  $\mu$ s.

A high-stability OCXO reference provides excellent frequency accuracy and stability. The generator accepts a wide range of external references including the commonly used 10 and 100 MHz for higher phase synchronization, and a flexible reference choice in the range of 1-250 MHz for those applications with customer- or system-specific reference frequencies. Moreover, the APMSXXG-ULN features a pair of ANAPICO-specific high-frequency CLK ports (one input and one output) that enables excellent phase synchronization among the outputs from multiple APMSXXG-ULN modules.

The APMSXXG-ULN comes in a standard 19 inch 1U (up to 4 channels) rack-mountable module form. It can be intuitively controlled by a PC based GUI Software. Moreover, the instrument offers various communication interfaces like USB, LAN or GPIB. Each interface allows for easy and fast communication using SCPI 1999 command set. Remote control of the instrument can be quickly attained from any host system. A customer-supplied application programming interface (API) or programming examples for Matlab, Labview, C++ and other commercially available tools make the control implementation very straightforward.

# SPECIFICATIONS

## Signal Specifications

| PARAMETER   | MIN     | TYPICAL                             | MAX              | NOTE  |
|---|---------|-------------------------------------|------------------|---|
| <b>Frequency Range</b>                                      | 300 kHz |                                     | 6 GHz            | APMS06G-ULN   |
|   | 300 kHz |                                     | 12 GHz           | APMS12G-ULN   |
|   | 300 kHz |                                     | 20 GHz           | APMS20G-ULN   |
|   | 300 kHz |                                     | 33 GHz           | APMS33G-ULN   |
|   | 300 kHz |                                     | 40 GHz           | APMS40G-ULN   |
| <b>Resolution</b>   |         | <0.001 Hz                           |                  |   |
| <b>Phase Adjustment Range</b>                               | 0 deg   |                                     | 360 deg          | individually adjustable per channel                 |
| <b>Phase Resolution</b>                                     |         | 0.1 deg                             |                  |   |
| <b>Switching Speed</b><br>CW Mode<br>Sweep / List Mode      |         | 1.5 ms<br>500 μs<br>500 μs<br>25 μs |                  | after SCPI command received<br><br><b>Option FS</b> |
| <b>SSB Phase noise at 1 GHz (max output power; ALC Off)</b> |         |                                     |                  | see plots/tables                                    |
| at 10 Hz from carrier                                       |         | -87 dBc/Hz                          |                  | <b>Option LN</b>                                    |
| at 1 kHz from carrier                                       |         | -100 dBc/Hz                         |                  |   |
| at 100 kHz from carrier                                     |         | -130 dBc/Hz                         |                  |   |
| <b>Output Power Level APMS06/12/20/33/40G</b>               |         |                                     |                  |   |
| < 100 MHz   | -30 dBm |                                     | +20 dBm          |   |
| 100 MHz to 6 GHz  | -30 dBm |                                     | +25 dBm          |   |
| 6 GHz to 18 GHz   | -30 dBm |                                     | +23 dBm          |   |
| 18 GHz to 20 GHz  | -30 dBm |                                     | +20 dBm          |   |
| 20 GHz to 40 GHz  | -30 dBm |                                     | +18 dBm          |   |
| <b>Output Power Level APMS06/12/20G</b>                     |         |                                     |                  | <b>Option PE4</b>                                   |
| 10 MHz to 6 GHz   | -90 dBm |                                     | +22 dBm          |   |
| 6 GHz to 12 GHz   | -90 dBm |                                     | +21 dBm          |   |
| 12 GHz to 15GHz   | -90 dBm |                                     | +18 dBm          |   |
| 15 GHz to 20 GHz  | -90 dBm |                                     | +16 dBm          |   |
| > 20 GHz  | -90 dBm |                                     | +12 dBm          |   |
| <b>Output Power Level APMS33G/40G</b>                       |         |                                     |                  | <b>Option PE4</b>                                   |
| 10 MHz to 12 GHz  | -60 dBm |                                     | +23 dBm          |   |
| 12 GHz to 20 GHz  | -60 dBm |                                     | +21 dBm          |   |
| 20 to 33 GHz  | -60 dBm |                                     | +16 dBm          |   |
| > 33 GHz  | -60 dBm |                                     | + 15 dBm         |   |
| <b>Power Resolution</b>                                     |         | 0.01 dB                             |                  |   |
| <b>Thermal Drift</b>  |         | 0.015 dB/°C                         |                  |   |
| <b>Power Level Uncertainty</b>                              |         |                                     |                  |   |
| < 6 GHz   |         | 0.25 dB                             | 0.8 dB<br>1.2 dB | -15 to +15 dBm<br>-60 to -15 dBm or > 15 dBm        |
| 6 to 12.75 GHz  |         | 0.3 dB                              | 0.9 dB<br>1.3 dB | -15 to +15 dBm<br>-60 to -15 dBm or > 15 dBm        |
| 12.75 to 26 GHz   |         | 0.3 dB                              | 1.0 dB<br>1.6 dB | -15 to +15 dBm<br>-60 to -15 dBm or > 15 dBm        |
| 26 to 40 GHz  |         | 0.4 dB                              | 1.2 dB<br>1.7 dB | -15 to +15 dBm<br>-50 to -15 dBm or > 15 dBm        |
|   |         | 4 dB                                |                  | < -60 dBm   |
| <b>Reverse Power Protection</b>                             |         |                                     |                  |   |
| DC Voltage  |         |                                     | ±10 V            |   |
| RF Power  |         |                                     | 26 dBm           |   |

| PARAMETER                             | MIN   | TYPICAL           | MAX               | NOTE                                 |
|---------------------------------------|-------|-------------------|-------------------|--------------------------------------|
| <b>Output impedance</b>               |       | 50 Ohms           |                   |                                      |
| <b>VSWR</b>                           |       | 1.3<br>1.6<br>1.9 | 1.5<br>1.8<br>2.2 | < 15 GHz<br>15 to 35 GHz<br>> 35 GHz |
| <b>Harmonics</b>                      |       |                   |                   | at +5 dBm output power               |
| 10 to 200 MHz                         |       | -30 dBc           | -20 dBc           |                                      |
| 200 MHz to 6 GHz                      |       | -40 dBc           | -30 dBc           |                                      |
| 6.5 to 12.75 GHz                      |       | -35 dBc           | -30 dBc           |                                      |
| 12.75 to 20 GHz                       |       | -45 dBc           | -30 dBc           |                                      |
| 20 to 40 GHz                          |       | -40 dBc           | -30 dBc           |                                      |
| <b>Sub-Harmonics</b>                  |       |                   |                   |                                      |
| < 5GHz                                |       | -75 dBc           | -70 dBc           |                                      |
| 5-20 GHz                              |       | -70 dBc           | -65 dBc           |                                      |
| > 20GHz                               |       | -55 dBc           |                   |                                      |
| <b>Non-Harmonic Spurious</b>          |       |                   |                   | > 10 kHz offset                      |
| < 1.2 GHz                             |       | -90 dBc           | -85 dBc           |                                      |
| 1.2 to 2.5 GHz                        |       | -92 dBc           | -88 dBc           |                                      |
| 2.5 to 5 GHz                          |       | -87 dBc           | -82 dBc           |                                      |
| 5 to 10 GHz                           |       | -80 dBc           | -75 dBc           |                                      |
| 10 to 20 GHz                          |       | -75 dBc           | -70 dBc           |                                      |
| 20 to 40 GHz                          |       | -67 dBc           |                   |                                      |
| <b>Channel to Channel Performance</b> |       |                   |                   |                                      |
| <b>Isolation</b>                      |       |                   |                   |                                      |
| < 3 GHz                               | 90 dB |                   |                   |                                      |
| 3 to 6.5 GHz                          | 70 dB | 80 dB             |                   |                                      |
| > 6 GHz                               |       | > 60 dB           |                   |                                      |
| 300 kHz to 40 GHz                     | 80 dB | > 90 dB           |                   | <b>Option HI</b> , see plot          |
| <b>Relative Phase Stability</b>       |       |                   |                   | See plot                             |
| Between channels                      |       | 0.096 ps          |                   | 3 mrad at 5 GHz over 5 hours         |
| Between synchronized Modules          |       | 0.160 ps          |                   | 5 mrad at 5 GHz over 5 hours         |
| <b>Phase-Coherent Switching</b>       |       |                   |                   |                                      |
| Phase mismatch at outputs             |       | 15 ps             |                   |                                      |

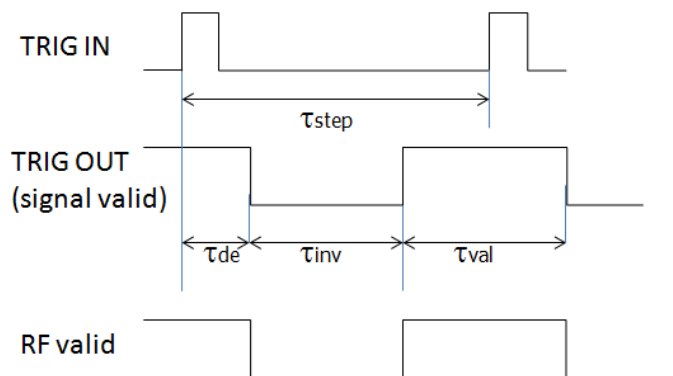
## Modulation Capabilities

| PARAMETER                                   | MIN                        | TYPICAL                 | MAX            | NOTE  |
|---|----------------------------|-------------------------|----------------|---|
| <b>Pulse Modulation</b>                     |                            |                         |                |   |
| Modulation Source                           |                            | Internal/<br>External   |                |   |
| External input amplitude                    | TTL                        |                         |                |   |
| Pulse rise/fall time                        |                            | 10 ns                   |                |   |
| On/off ratio                                |                            | 90 dB<br>80 dB<br>75 dB | 80 dB<br>70 dB | Pout > +10 dBm, f < 6.5 GHz<br>6.5 to 18 GHz<br>> 18 GHz  |
| Pulse overshoot                             |                            |                         | 10%            |   |
| Pulse delay                                 |                            | 20 ns                   |                |   |
| Pulse polarity                              |                            | Normal,<br>inverse      |                | selectable  |
| <b>Internal pulse generator</b>             |                            |                         |                |   |
| Repetition frequency (PRF)                  | 0.1 Hz                     |                         | 50 MHz         | = 1/T   |
| Duty cycle                                  | 1 % to 99 %<br>in 1% steps |                         |                | within specified minimum pulse<br>width   |
| Pulse Pattern Modulation & Staggered<br>PRF |                            |                         |                | using internal pattern generator  |
| Pulse width                                 | 10 ns                      |                         | 20 s           |   |
| Programmable pattern length                 | 2                          |                         | 65536          |   |
| Duty cycle                                  | 0.05%                      |                         | 99.95%         |   |
| Pulse width resolution                      |                            | 5 ns                    |                |   |
| Pulse period (T) accuracy                   |                            | 0.00005xT+<br>3ns       |                |   |
| Pulse width accuracy                        |                            | 0.00005xT+<br>5ns       |                |   |
| Pulse jitter                                |                            | 2 ns                    | 5 ns           |   |
| Polarity                                    |                            | selectable              |                |   |
| <b>Amplitude Modulation</b>                 |                            |                         |                |   |
|   |                            |                         |                | <b>Option MOD</b>   |
| Modulation Source                           |                            | Internal                |                |   |
| Modulation Depth                            | 0%                         |                         | 90%            |   |
| Deviation accuracy                          |                            | 2%                      | 4%             | 1 kHz rate, 30% depth   |
| Deviation resolution                        |                            | 1%                      |                |   |
| Distortion (THD)                            |                            |                         | 1%             | 1 kHz rate, 30% depth   |
| Modulation rate                             | 0.1 Hz                     |                         | 20 kHz         |   |
| Modulation waveforms                        | Sine                       |                         |                |   |
| <b>Frequency Modulation</b>                 |                            |                         |                |   |
|   |                            |                         |                | <b>Option MOD</b>   |
| Modulation source                           |                            | Internal                |                |   |
| Maximum Frequency deviation (peak)          | N · 200 MHz                |                         |                | < 1.25 GHz (N=1)<br>1.25 GHz to 2.5 GHz (N=0.125)<br>2.5 GHz to 5 GHz (N=0.25)<br>5 GHz to 10 GHz (N=0.5)<br>10 GHz to 20 GHz (N=1)<br>20 GHz to 40 GHz (N=2) |
| Deviation accuracy                          |                            | 0.50%                   | 2%             |   |
| Distortion (THD)                            |                            | < 1 %                   |                | 1 kHz rate, 10 kHz deviation  |
| Modulation rate                             | 0.1 Hz                     |                         | 80 kHz         |   |
| Modulation waveforms                        | Sine                       |                         |                |   |

| PARAMETER               | MIN    | TYPICAL  | MAX                            | NOTE                           |
|-------------------------|--------|----------|--------------------------------|--------------------------------|
| <b>Phase Modulation</b> |        |          |                                | <b>Option MOD</b>              |
| Modulation Source       |        | Internal |                                |                                |
| Phase deviation (peak)  | 0      |          | $300 \cdot N \cdot \text{rad}$ |                                |
| Deviation accuracy      |        | 0.50%    | 2%                             |                                |
| Modulation rate         | 0.1 Hz |          | 80 kHz                         |                                |
| Modulation waveforms    | Sine   |          |                                |                                |
| Distortion (THD)        |        | < 1%     |                                | 1 kHz rate & N x rad deviation |

## Sweeping Capability

| PARAMETER                       | MIN                                     | TYPICAL | MAX                           | NOTE  |
|---------------------------------|---|---------|-------------------------------|---|
| <b>Sweep Parameters</b>         | Frequency, power, phase, list           |         |                               |   |
| <b>Sweep type</b>               | Linear, logarithmic, random             |         |                               |   |
| Step time ( $t_{step}$ )        | 500 $\mu$ s<br>25 $\mu$ s<br>50 $\mu$ s |         | 19998 s<br>19998 s<br>19998 s | <b>Option FS</b> (2 sync channels)<br><b>Option FS</b> (3 or 4 sync channels) |
| Dwell time ( $t_{dwell}$ )      | 15 $\mu$ s                              |         | 9999 s                        |   |
| Off time ( $t_{off}$ )          | 15 $\mu$ s                              |         | 9999 s                        |   |
| Time resolution                 |   | 5 ns    |                               |   |
| Timing delay ( $\tau_{de}$ )    |   | 50 ns   |                               |   |
| Transient time ( $\tau_{inv}$ ) |   |         | 15 $\mu$ s                    |   |
| Timing accuracy per point       |   | 5 ns    |                               |   |



## Frequency Reference

| PARAMETER   | MIN    | TYPICAL               | MAX                          | NOTE  |
|---|--------|-----------------------|------------------------------|---|
| <b>Internal Reference Frequency</b>                               |        | 100 MHz<br>10 MHz     |                              | <b>Option LN</b>                            |
| Temperature stability 0 to 50 degC                                |        |                       | ±100 ppb<br>±20 ppb          | <b>Option LN</b>                            |
| Aging 1st year  |        |                       | 1000 ppb<br>30 ppb<br>20 ppb | <b>Option LN</b><br><b>Option LN+</b>       |
| Aging per day   |        |                       | 0.5 ppb                      | after 30 days operations                    |
| Warm-up time  |        | 5 min                 |                              |   |
| Output of internal reference                                      |        | 10 MHz<br>100 MHz     |                              | REF OUT port, selectable                    |
| Output of High Frequency Clock                                    |        | 3 GHz                 |                              | CLK OUT port<br>high phase synchronous mode |
| Output power  |        | 0 dBm<br>9 dBm        |                              | 10 MHz, 3 GHz<br>100 MHz                    |
| Output impedance  |        | 50 Ohms               |                              |   |
| <b>Bypass Internal Reference Input</b>                            |        | 100 MHz<br>1 GHz      |                              |   |
| <b>Phase Lock to External Reference</b>                           | 1      | 10 MHz<br>integer MHz | 250                          | REF IN port<br><b>Option VREF</b>           |
| <b>High Frequency Clock Input<br/>(Bypass Internal Reference)</b> |        | 3 GHz                 |                              | CLK IN port<br>high phase synchronous mode  |
| <b>Reference input level</b>                                      |        |                       |                              |   |
| 10 MHz or 1-250 MHz or 3 GHz                                      | -5 dBm | 0 dBm                 | +10 dBm                      |   |
| 100 MHz or 1 GHz  | 5 dBm  |                       | +13 dBm                      |   |
| <b>Lock Range</b>   |        |                       |                              |   |
| 10 MHz or 1-250 MHz   |        |                       | ±1.5 ppm                     |   |
| 100 MHz   |        |                       | 100 ppm                      |   |
| <b>Reference Input Impedance</b>                                  |        | 50 Ohms               |                              |   |





## Multi-Purpose Output (TRIG OUT)

Output is TRIG OUT at rear panel

| PARAMETER                          | MIN          | TYPICAL      | MAX                      | NOTE                                   |
|------------------------------------|--------------|--------------|--------------------------|--|
| <b>MULTIFUNCTION GENERATOR</b>     |              |              |                          |  |
| sine, triangle, square wave        |              |              |                          |  |
| Frequency range                    | 1 Hz<br>1 Hz |              | 3 MHz<br>1 MHz<br>50 kHz | sine<br>triangle<br>square             |
| Frequency resolution               |              | 0.1 Hz       |                          |  |
| Output voltage amplitude peak-peak | 10 mV        | 5V           | 2 V                      | Sine, triangle<br>Square (CMOS output) |
| Harmonic Distortion                |              | 1 %          |                          | < 100 kHz, 1 Vpp                       |
| Output impedance                   |              | 50 Ω<br>CMOS |                          | Sine, triangle<br>square wave          |

### VIDEO OUTPUT (of internal pulse modulator)

|             |       |       |      |  |
|-------------|-------|-------|------|--|
| Output      |       | CMOS  |      |  |
| Period      | 20 ns |       | 50 s |  |
| Pulse Width | 10 ns |       | 50 s |  |
| RF delay    |       | 10 ns |      |  |

### TRIGGER OUT Synchronization mode for multiple sources

|       |   |           |
|-------|---|-----------|
| Modes | Trigger on sweep start<br>Trigger on each point<br>Signal Valid | Option FS |
|-------|---|-----------|



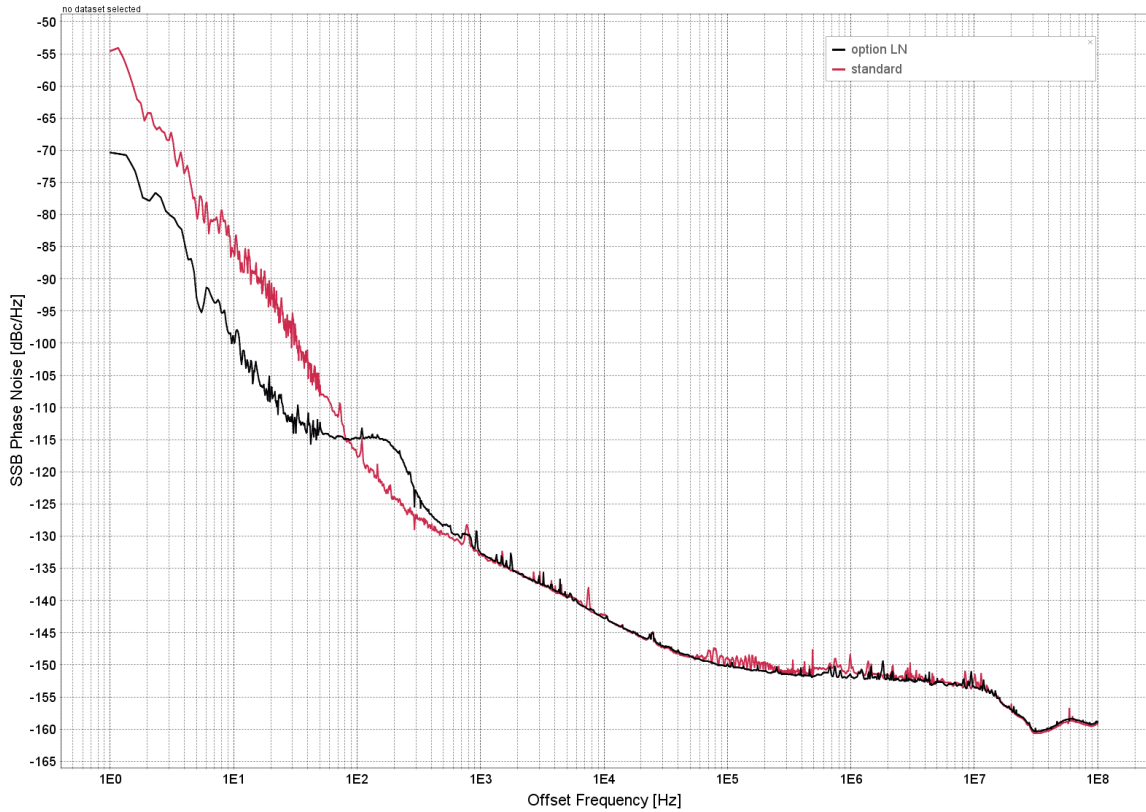
## Trigger (TRIG IN)

| PARAMETER                 | MIN   | TYPICAL  | MAX  | NOTE                              |
|---------------------------|-------|--|------|-----------------------------------|
| Trigger Types             |       | Continuous<br>Single (point)<br>Gated<br>Gated direction |      |                                   |
| Trigger Source            |       | External<br>Bus (LAN, USB)                               |      |                                   |
| Trigger Modes             |       | Continuous free run<br>Trigger and run<br>Reset and run  |      |                                   |
| Trigger latency           |       | 5 ns   |      |                                   |
| Trigger uncertainty       |       | 10 ns  |      |                                   |
| External trigger delay    | 50 ns |  | 40 s | settable                          |
| External delay resolution |       | 5 ns   |      |                                   |
| Trigger Modulo            | 1     |  | 255  | execute only on Nth trigger event |
| Trigger Polarity          |       | Rising<br>Falling  |      |                                   |

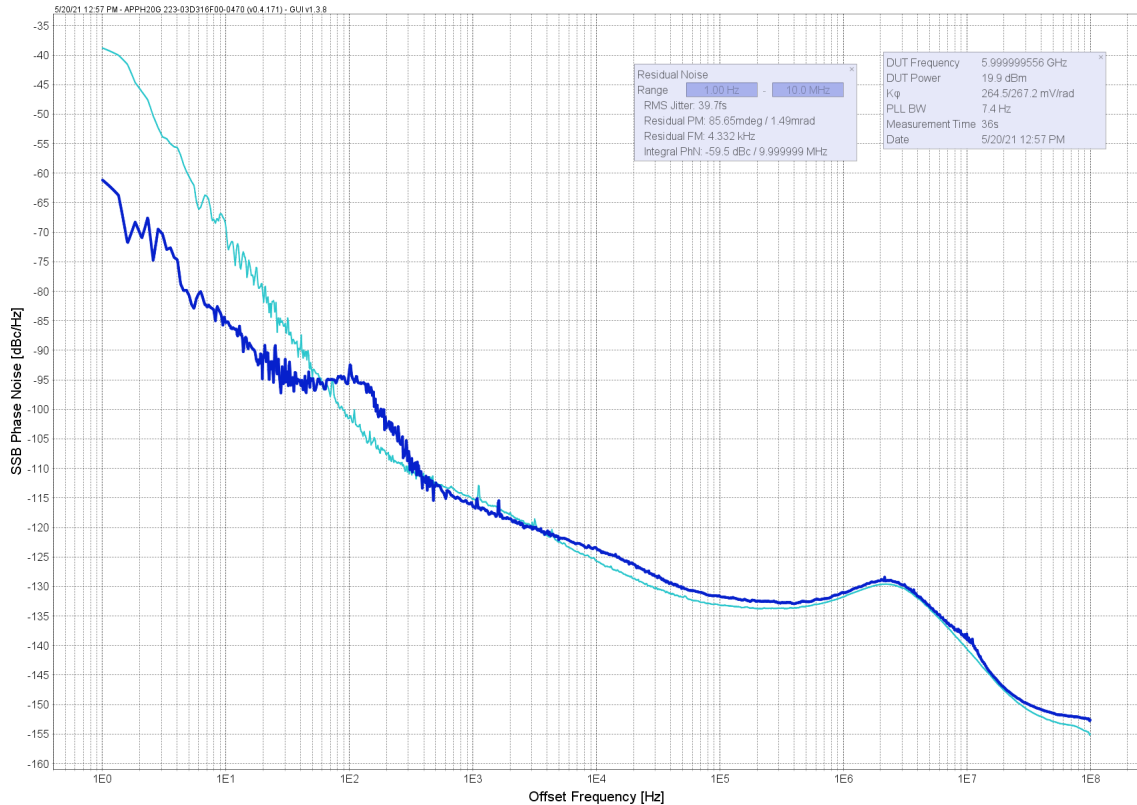
# PERFORMANCE CURVES

## Phase Noise with and without Option LN

(at 1 GHz and 20dBm output power)

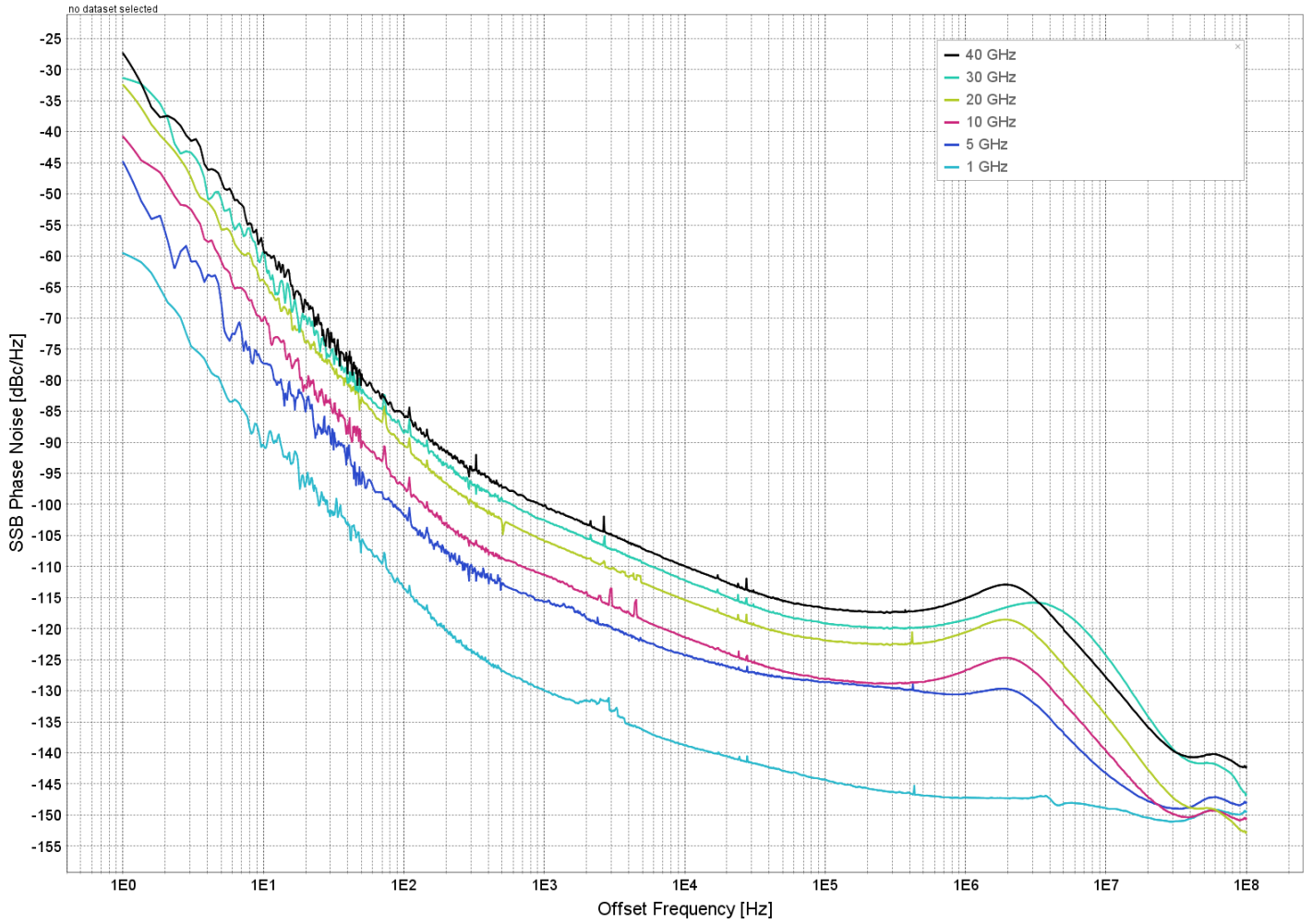


(at 6 GHz and 20dBm output power)

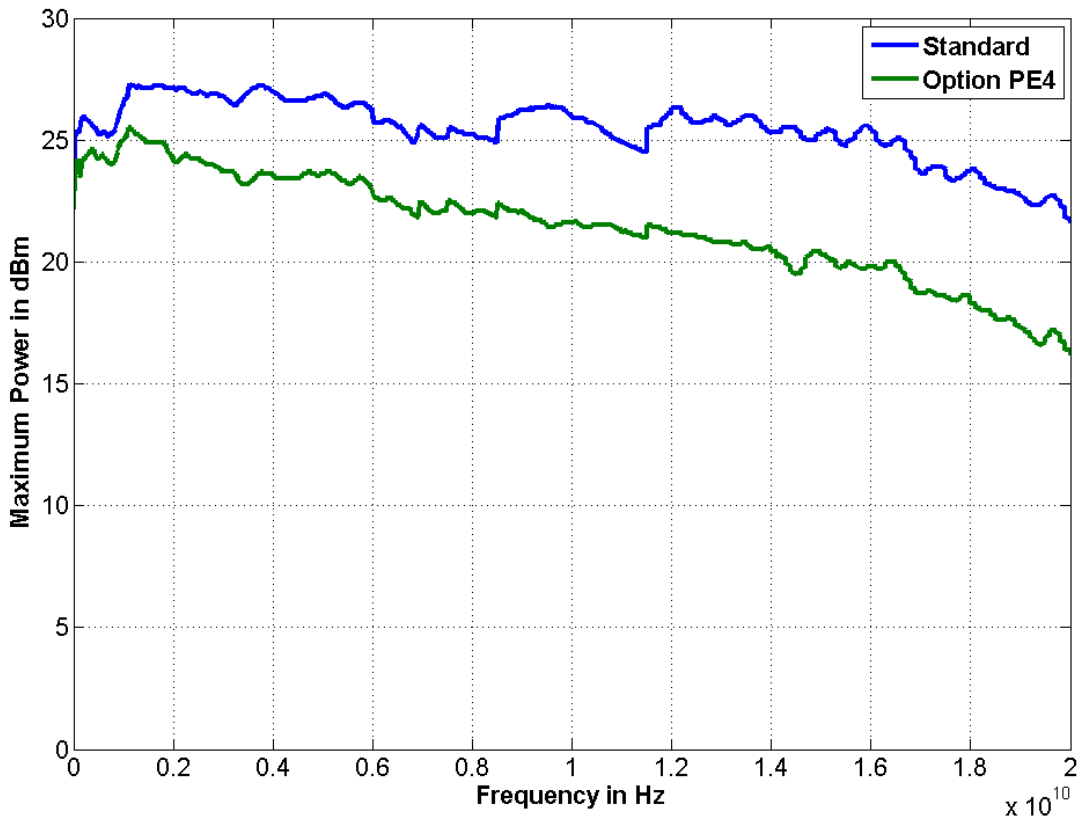




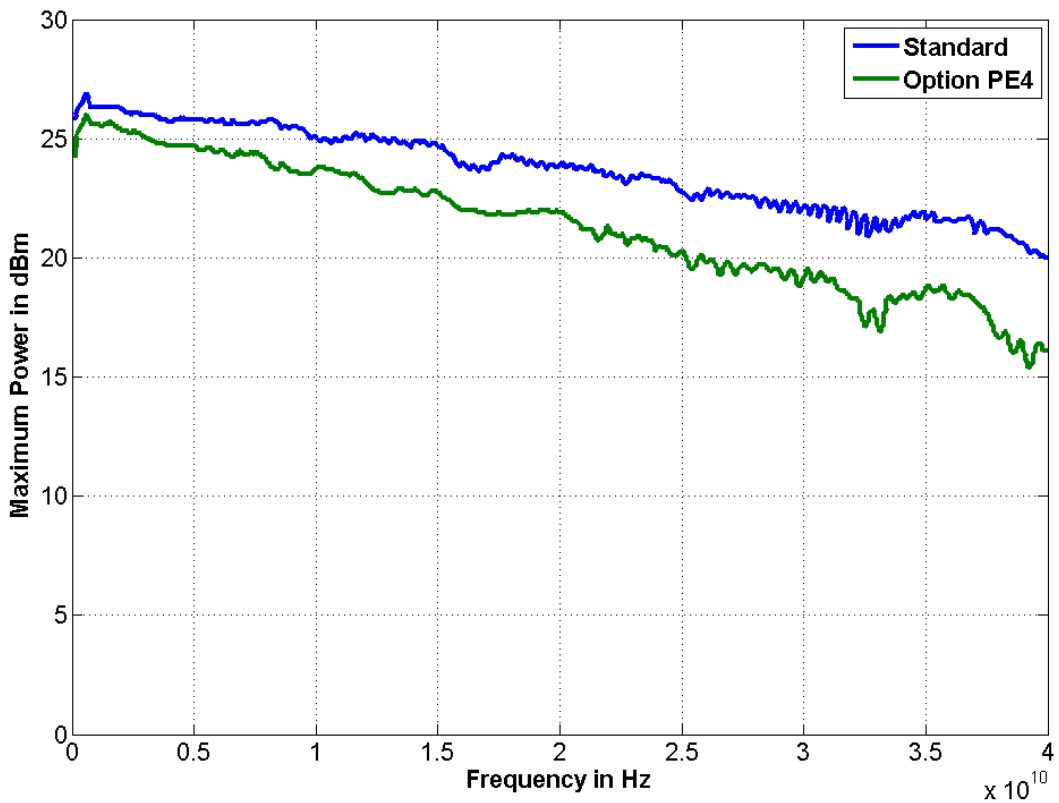
# Phase Noise without Option LN (at max. output power)



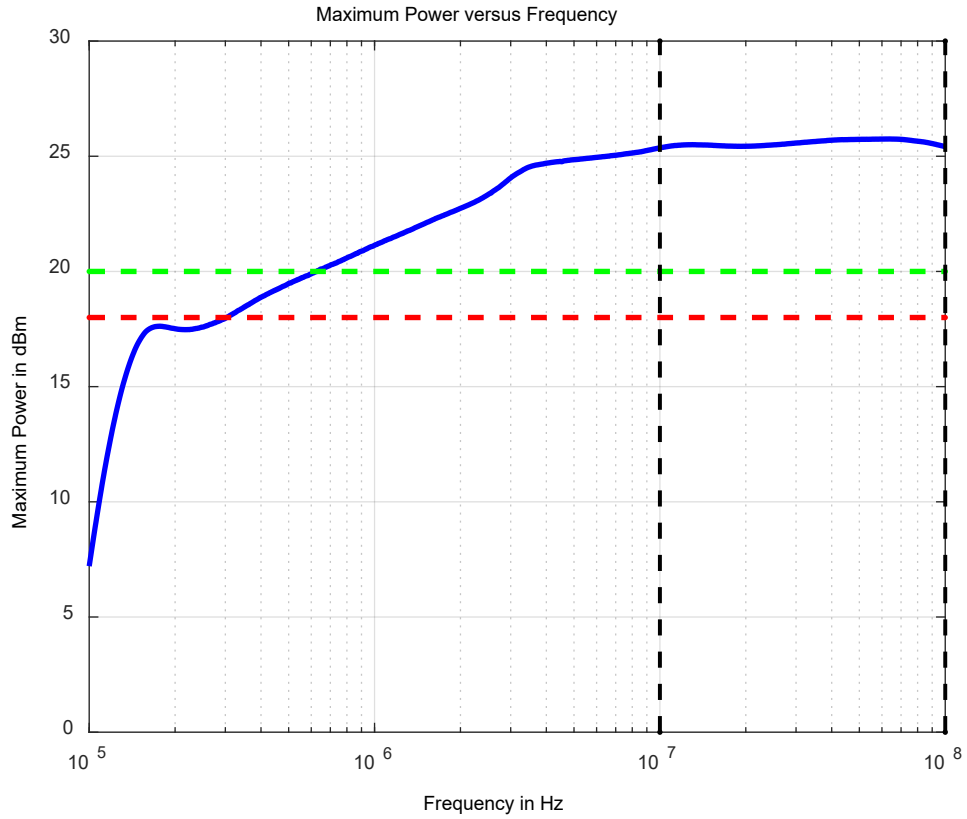
## Maximum Output Power APMS20G with and without Option PE4



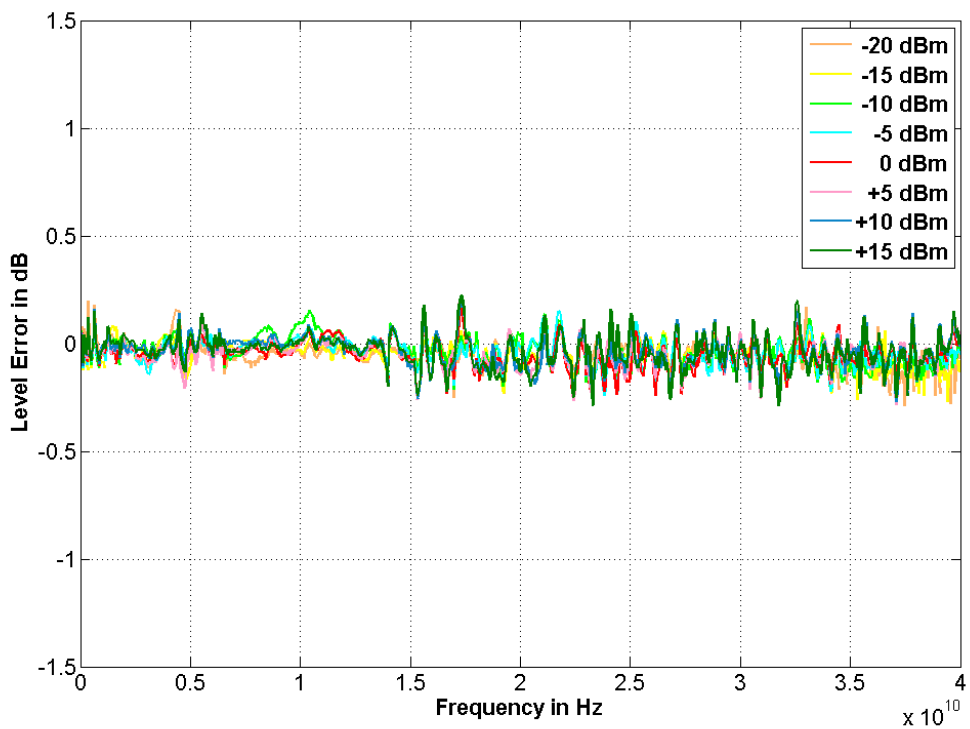
## Maximum Output Power APMS40G with and without Option PE4

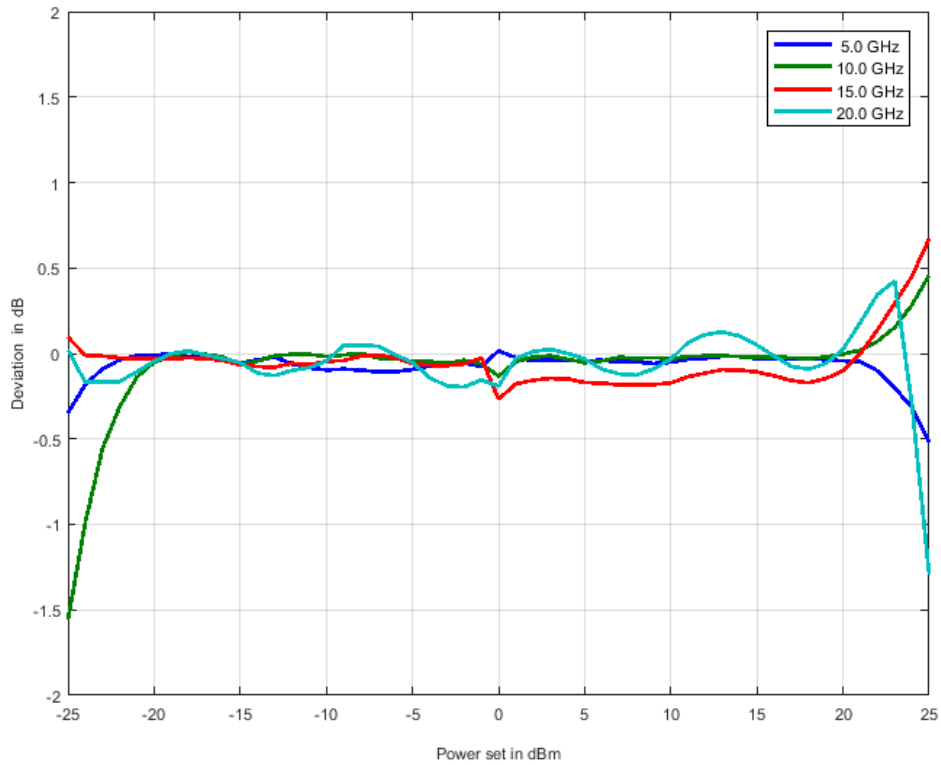



## Low Frequency Response APMS20G (100 kHz to 100 MHz)

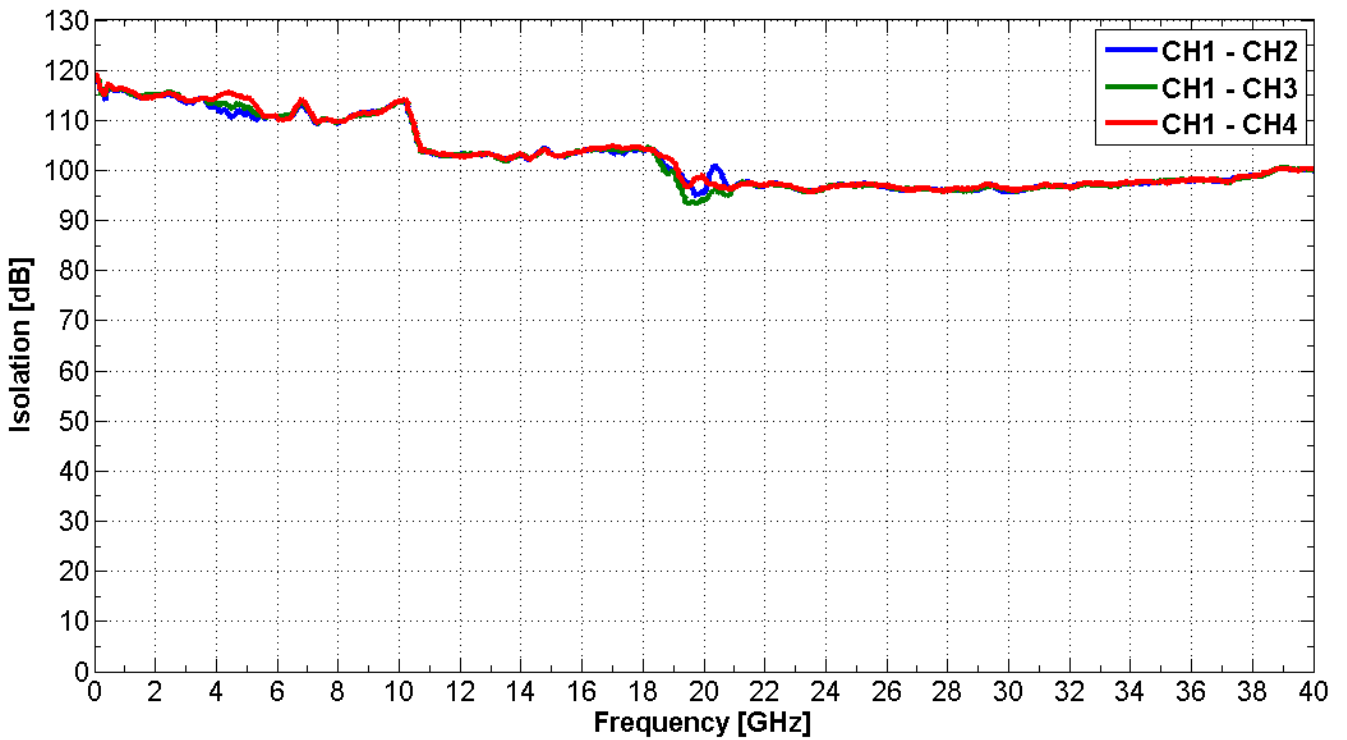


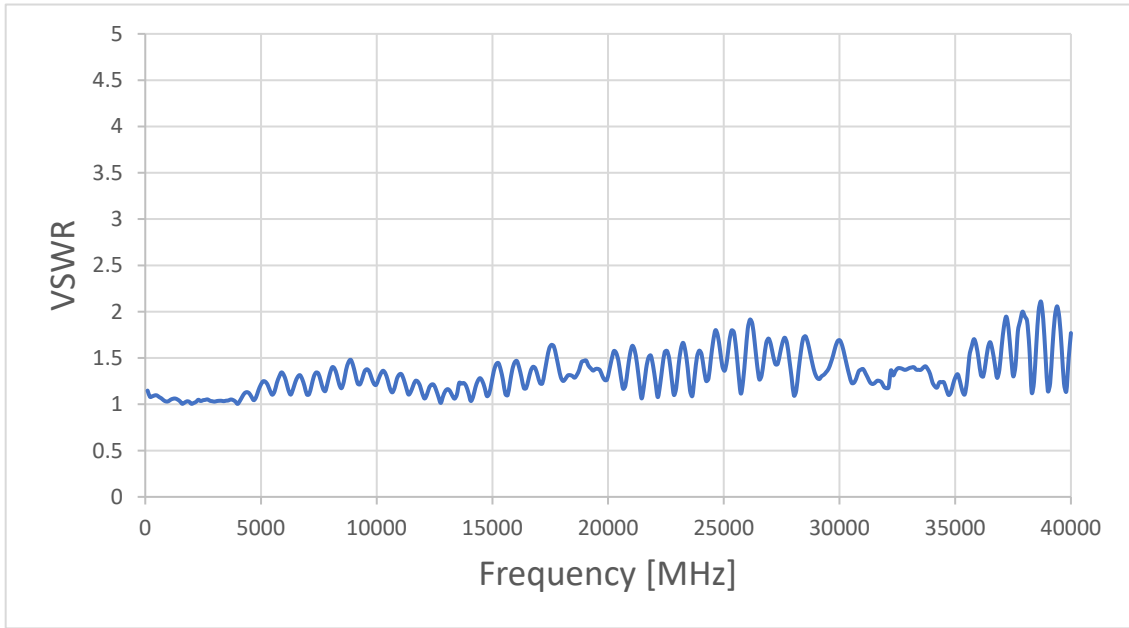
## Level Error (300 kHz to 40 GHz, APMS40G)



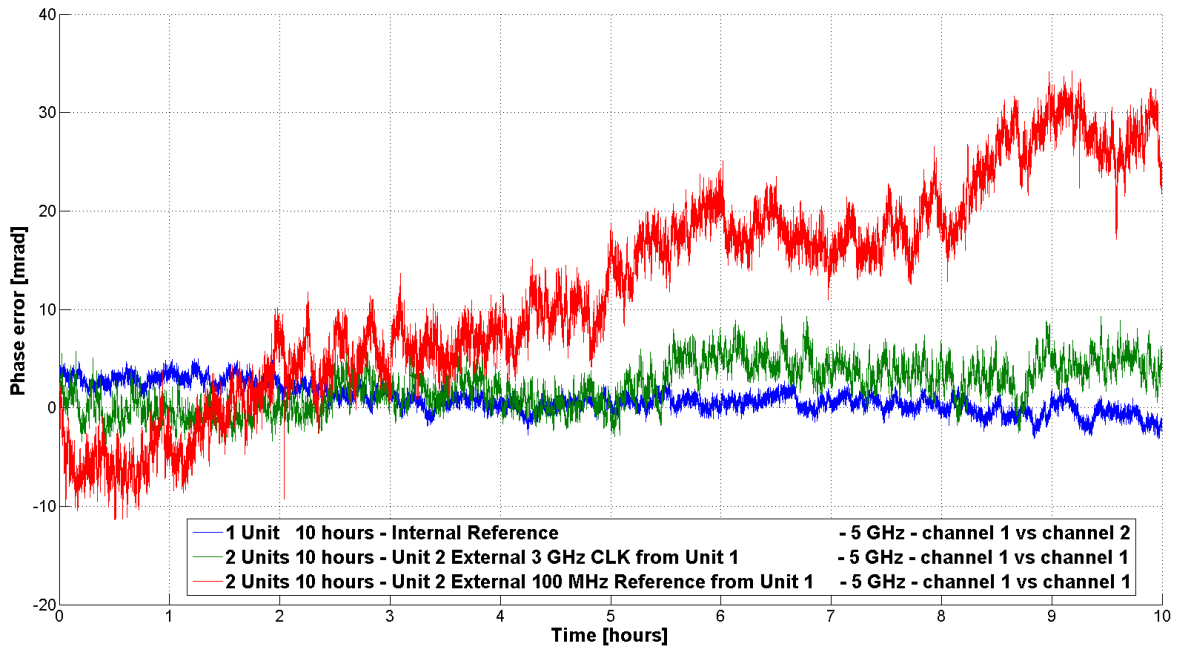


 **Channel-to-Channel Isolation with Option HI**  
 (Channel under test: Channel 1, frequency  $f$ , power 10 dBm  
 Channel 2, 3 and 4: frequency  $f + 9$  MHz, power 10 dBm  
 Measurement made on channel 1 at frequency  $f + 9$  MHz)





 Channel-to-Channel Phase Stability under Different Test Conditions



## Connectors (Front)



- RF outputs:
- APMS33G, 40G: K (2.92 mm) female
- APMS06G, 12G, 20G: SMA female
- External pulse modulation inputs: BNC female
- DC power switch

## Connectors (Rear)



- Unit-to-unit synchronization signal input (SYNC IN): SMA female
- Unit-to-unit synchronization signal output (SYNC OUT): SMA female
- High Stability Reference input (CLK IN, 3 GHz): SMA female
- High Stability Reference output (CLK OUT, 3 GHz): SMA female
- Trigger output: BNC female
- Trigger input: BNC female
- Reference output (REF OUT): BNC female
- Reference input (REF IN): BNC female
- GPIB: IEEE-488.2, 1987 with listen and talk (optional)
- USB 2.0 device
- LAN connection: RJ-45
- FUSE (3.15 A)
- 100-240 VAC power plug



 Casings Standard 19" 1HU



High Isolation Casing 19" 1HU (Option HI, rack mount kit included)



High Isolation Casing 19" 1HU (Option HI using the rack mount kit)



## ORDERING INFORMATION



| Host Model No. | Product              | Description   |
|----------------|----------------------|---|
| APMSXXG-ULN    | APMS06G-2-ULN        | 2-channel 300 kHz to 6 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module  |
| APMSXXG-ULN    | APMS06G-3-ULN        | 3-channel 300 kHz to 6 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module  |
| APMSXXG-ULN    | APMS06G-4-ULN        | 4-channel 300 kHz to 6 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module  |
| APMSXXG-ULN    | APMS12G-2-ULN        | 2-channel 300 kHz to 12 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS12G-3-ULN        | 3-channel 300 kHz to 12 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS12G-4-ULN        | 4-channel 300 kHz to 12 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS20G-2-ULN        | 2-channel 300 kHz to 20 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS20G-3-ULN        | 3-channel 300 kHz to 20 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS20G-4-ULN        | 4-channel 300 kHz to 20 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS33G-2-ULN        | 2-channel 300 kHz to 33 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS33G-3-ULN        | 3-channel 300 kHz to 33 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS33G-4-ULN        | 4-channel 300 kHz to 33 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS40G-2-ULN        | 2-channel 300 kHz to 40 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS40G-3-ULN        | 3-channel 300 kHz to 40 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG-ULN    | APMS40G-4-ULN        | 4-channel 300 kHz to 40 GHz ultra-low phase noise, fast switching signal generator, 19" 1HU rack-mount module |
| APMSXXG        | <b>Option LN</b>     | Enhanced close in phase noise and frequency stability   |
| APMSXXG        | <b>Option LN+</b>    | Option LN with improved long term frequency stability   |
| APMSXXG        | <b>Option PHS</b>    | Phase coherent switching  |
| APMSXXG        | <b>Option FS</b>     | Ultra-fast switching speed  |
| APMSXXG        | <b>Option VREF</b>   | Flexible external reference frequency support in range 1 to 250 MHz   |
| APMSXXG        | <b>Option MOD</b>    | Amplitude, Frequency, Phase modulations added.  |
| APMS06/12G     | <b>Option PE4-12</b> | Electrical step attenuator (6 & 12 GHz version)   |
| APMS20G        | <b>Option PE4-20</b> | Electrical step attenuator (20 GHz version)   |
| APMS33/40G     | <b>Option PE4-40</b> | Electrical step attenuator (33 & 40 GHz version)  |
| APMSXXG        | <b>Option GPIB</b>   | GPIB interface  |

|                |                     |  |
|----------------|---------------------|--|
| <b>APMSXXG</b> | <b>Option HI</b>    | High Isolation 19" 1HU casing (highly improved channel-to-channel isolation) |
| <b>APMSXXG</b> | <b>Option WE</b>    | One-year warranty extension (standard: 2 years)                              |
| <b>APMSXXG</b> | <b>Option ReCal</b> | Recalibration with test data (recommended: 2 years interval)                 |

## GENERAL CHARACTERISTICS

### Remote programming interfaces:

- Ethernet 100BaseT LAN interface
- USB 2.0 device
- GPIB (IEEE-488.2,1987) with listen and talk (Option GPIB)
- Control Language SCPI Version 1999.0

**Power requirements:** 100 - 240 VAC, 50 or 60 Hz, 160W maximum (80W + 20W per channel)

**Environmental:** Levels similar to MIL-PRF-28800F Class 3/4

Environmental stress Samples of this product have been type tested to be robust against the environmental stresses of storage, transportation, and end-use; those stresses to temperature, humidity, shock, vibration, altitude, and power line conditions.

**Operating temperature range** 0 to 40 °C

**Storage temperature range** -40 to 70 °C

**Operating and storage altitude** up to 15,000 feet (4600 m)



notice

Safety / EMC comply with applicable Safety and EMC regulations and directives.

### Weight:

**Standard casing:** ≤ 10.0 kg (22.05 lbs) net

**HI casing:** ≤ 12.0 kg (26.45 lbs) net

**Dimensions:** 19" 1HU enclosure

APMS06/12/20G: 43 mm H x 426 mm W x 460 mm L [1.7 in H x 16.8 in W x 18.1 in L]

APMS33/40G: 43 mm H x 426 mm W x 480 mm L [1.7 in H x 16.8 in W x 18.9 in L]

**Dimensions with option HI:** 19" 1HU enclosure

All models: 44 mm H x 440 mm W x 470 mm L [1.73 in H x 17.32 in W x 18.5 in L]

## Document History

| Version | Date       | Author | Notes   |
|---------|------------|--------|---|
| V10     | 2015-06-15 | jk     | First release   |
| V1.01   | 2015-08-15 | jk     | Updated power ranges  |
| V1.02   | 2015-09-15 | jk     | Added harmonic and spurious specs   |
| V1.10   | 2016-02-15 | jk     | Refined parameters  |
| V1.11   | 2016-02-22 | jk     | Added phase noise plot  |
| V1.20   | 2016-04-08 | jk     | Pictures, Sweeping and Trigger information, Dimensions, Options                                   |
| V1.21   | 2016-07-12 | sd     | Replaced pictures with higher resolution  |
| V1.30   | 2016-07-18 | jk     | Additional performance data   |
| V1.31   | 2016-12-02 | jk     | Added pictures  |
| V1.32   | 2017-1-09  | jk     | Frequency stability information added<br>harmonic specs refined                                   |
| V1.40   | 2017-2-19  | jk     | Production release  |
| V1.41   | 2017-5-30  | jk     | Power level accuracy refined, phase stability specified   |
| V1.42   | 2017-7-27  | jk     | Intra-Pulse Modulation  |
| V1.43   | 2017-10-27 | jk     | Updates for 20 GHz model  |
| V1.45   | 2017-12-5  | jk     | Updates for 20 GHz model  |
| V1.50   | 2018-2-5   | jk     | Updates for option ULN; PHS, IPM  |
| V1.51   | 2018-3-15  | jk     | Mode updates on option ULN  |
| V1.52   | 2018-4-5   | jk     | Added parameters for reference section  |
| V1.53   | 2018-5-15  | jk     | New plots   |
| V1.54   | 2018-6-25  | jk     | Ch to ch isolation, phase stability specs   |
| V1.55   | 2018-7-25  | jk     | Ref input   |
| V1.56   | 2018-10-18 | MH     | Ref inputs / outputs, SYSREF, ordering information  |
| V1.57   | 2019-02-28 | MH     | New layout<br>Added option LN and option FS   |
| V1.58   | 2019-03-07 | MH     | Corrected Harmonic Values < 200MHz, APMS33/40G enclosure dimensions                               |
| V1.59   | 2019-04-08 | MH     | Added power consumption, edited Options   |
| v.1.60  | 2019-05-11 | MH     | ULN only  |
| v.1.61  | 2019-06-24 | MH     | Corrected connectors description  |
| v.1.62  | 2020-11-23 | MH     | Changed reference output options, updated phase noise plots, added option HI                      |
| v.1.64  | 2020-12-07 | MH     | Added Channel-to-channel phase stability in picoseconds   |
| v.1.65  | 2021-01-20 | MH     | Updated pulse width, option MOD (adds AM, FM and Phase Mod capability), added option LN+          |
| v.1.66  | 2021-05-21 | MH     | Added new plots, 1 GHz Reference input, completed specifications for HI casing, LFO functionality |

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