# M9484C VXG and V3080A

Vector signal generator and frequency extender

## Introduction

This data sheet provides key features and specifications for the M9484C VXG vector signal generator and the V3080A vector signal generator frequency extender.

KEYSIGHT

# Table of Contents

# About the M9484C VXG Vector Signal Generator

You're designing the next RF breakthrough and ensuring that your design delivers maximum throughput, robust links, and data handling capabilities. This introduces a new set of design and test challenges, including more bandwidths, frequency bands, and system complexity.

Keysight has created the ultimate VXG signal generator to take your designs to the widest bandwidths, highest frequencies, and multichannel applications. With this fully integrated, calibrated, and synchronized solution, you don't need to worry about the errors caused by additional connections and instruments. Through integration with PathWave Signal Generation software, create performance-optimized reference signals and reduce the time you spend on signal simulation.

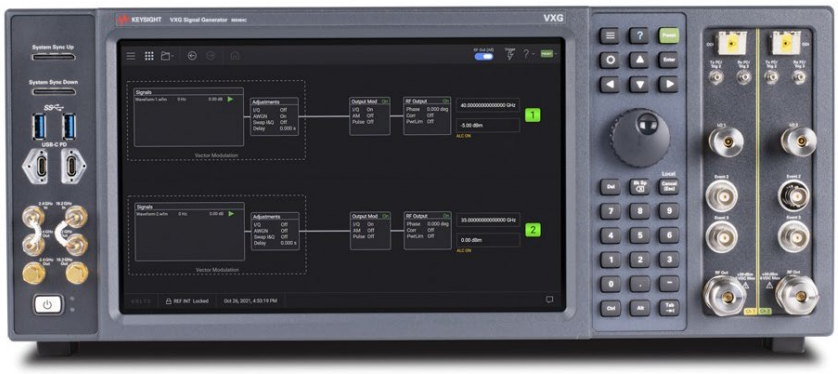



**Figure 1.** M9484C VXG signal generator with two 54 GHz channels.

# Definitions and Conditions

**Specification**

Specifications represent warranted performance of a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature of 0 to 50 °C, unless otherwise stated, and after a 45-minute warm-up period. The specifications include measurement uncertainty. Data represented in this document are specifications unless otherwise noted. Performance specifications do not apply when in SDW or ARF launch mode.

**Typical**

Typical (typ) describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 80 percent of the units exhibit with a 90 percent confidence level at room temperature (approximately 25 °C). Typical performance does not include measurement uncertainty.

**Nominal**

Nominal (nom) values indicate the expected mean or average performance, or an attribute whose performance is by design, such as the 50-ohm connector. This data is not warranted and is measured at room temperature (approximately 25 °C).

**Measured**

Measured (meas) describes an attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is not warranted and is measured at room temperature (approximately 25 °C).

All of the above apply when using the instrument in its default settings unless otherwise stated.

Data contained within this document does not apply to V3080A unless otherwise stated.

V3080A specifications apply only when used with included 2 meter cable (V3080A-7RM) in good condition. V3080A specifications apply after a 5-hour warm-up period. V3080A must be used with an M9484C VXG with instrument software version A.15.00 or later.

# Frequency

**Frequency options**

| Option | CW frequency range | RF output connector |
|---|---|---|
| M9484C-506 | 9 kHz to 6 GHz | Type-N (f) |
| M9484C-508 | 9 kHz to 8.5 GHz | Type-N (f) |
| M9484C-514 | 9 kHz to 14 GHz | 3.5 mm (m) |
| M9484C-520 | 9 kHz to 21.6 GHz | 3.5 mm (m) |
| M9484C-532 | 9 kHz to 31.8 GHz | 1.85 mm (m) |
| M9484C-544 | 9 kHz to 44 GHz | 1.85 mm (m) |
| M9484C-554 | 9 kHz to 54 GHz | 1.85 mm (m) |
| V3080A-F06[1] | 10 MHz to 67 GHz | 1.0 mm (m) |
| V3080A-F07[1] | 10 MHz to 75 GHz | 1.0 mm (m) |
| V3080A-F09[1] | 10 MHz to 90 GHz | 1.0 mm (m) |
| V3080A-F11[1] | 10 MHz to 100 GHz (overrange to 110 GHz) | 1.0 mm (m) |

**Frequency resolution**

| | |
|---|---|
| CW | 0.00001 Hz |

**Phase adjustments**

| | |
|---|---|
| Phase offset range | ± 180° |
| Phase offset resolution | 0.001° |

**Relative phase adjustments (Option PCH and SNC[2])[3]**

| | |
|---|---|
| Relative phase offset range | ± 180° |
| Relative phase offset resolution | 0.001° |
| Relative phase repeatability | 0.0001° (nom)[4] |

| Frequency switching speed[5,6] | M9484C | V3080A |
|---|---|---|
| 10 MHz to 54 GHz | 3.0 ms (meas) | 30 ms (meas) |
| 54 GHz to 110 GHz | - | 36 ms (meas) |
| 10 MHz to 110 GHz, crossing over 54 GHz | - | 50 ms (meas) |

# Frequency Reference

**Frequency accuracy**

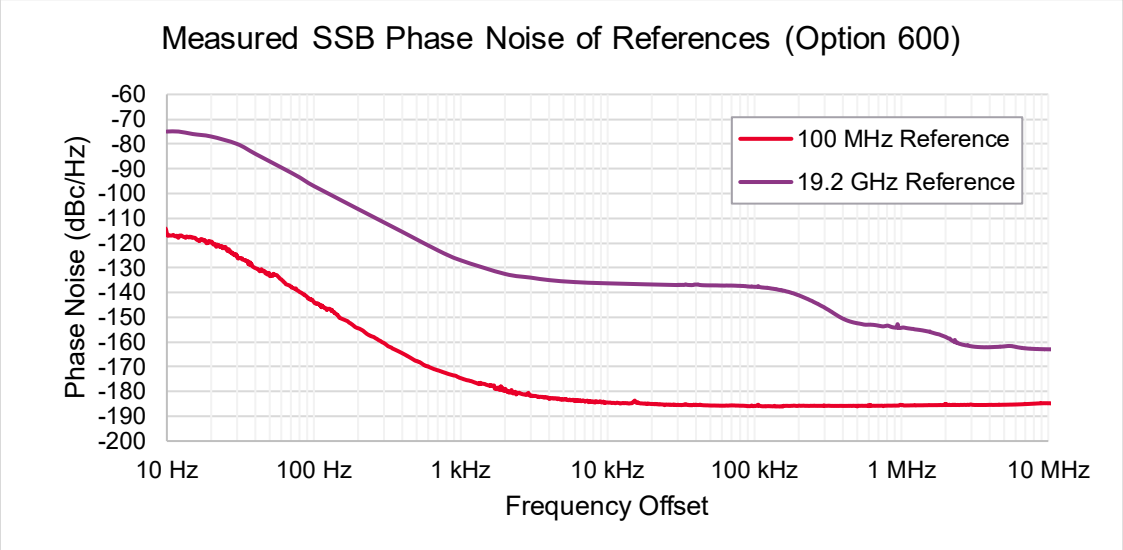
| | | |
|---|---|---|
| Calculation | | ± (time since last adjustment x aging rate) |
| | | ± temperature effects |
| | | ± calibration accuracy |
| Aging rate[7] | First year | 0.05 ppm/year, after 72-hour warm-up |
| | Second year | 0.03 ppm/year, after 72-hour warm-up |
| Temperature effects (nom) | 20 to 30 °C | < ± 10 ppb |
| | Full temperature range | < ± 50 ppb |
| Initial achievable calibration accuracy[8] | | ± 5 x $10^{-8}$ |
| **Warm up (nom)** | | |
| 5 minutes over +20 to +30 °C, with respect to 1 hour | | < ± 0.1 ppm |
| 15 minutes over +20 to +30 °C, with respect to 1 hour | | < ± 0.01 ppm |

1 V3080A requires an M9484C with option AL2 and 532, 544, or 554. If Option 532 or 544 are selected, settable frequency will stop at the specified maximum frequency for that option and resume at 52.8 GHz when the V3080A is connected.
2 Option SNC requires Option PCH on all M9484Cs and appropriate cabling of LOs and trigger lines between M9484Cs to achieve results, taking fanout limitations into consideration.
3 Channel 1 relative to channel 2, for example.
4 When tuning from f1 to f2 and back to f1.
5 Time from receipt of SCPI command to frequency within 0.1 ppm of final frequency or within 100 Hz, whichever is greater, and amplitude within 1 dB of final amplitude.
6 For information on Agile RF mode switching speeds, etc. see *Agile RF (ARF) operating mode* section of this datasheet.
7 Not verified by Keysight N7800A TME Calibration and Adjustment Software. Daily aging rate may be verified as a supplementary chargeable service, on request.
8 At time of shipment.

| External reference input | |
|---|---|
| Standard | 10 MHz, 100 MHz |
| Option 1ER | 1 MHz to 110 MHz flexible reference |
| | External 1 pulse per second (PPS) |
| Input frequency setting resolution (1ER) | 0.1 Hz |
| Wide locking range | ± 1.0 ppm (nom), optimized for best phase stability |
| Narrow locking range | ± 0.6 ppm (nom), optimized for best close-in phase noise |
| Amplitude | -3 dBm to +20 dBm (nom) |
| Connector | BNC female |
| Impedance | 50 Ω (nom) |

| External reference input PLL synchronization bandwidths | | |
|---|---|---|
| **External reference frequency** | **Synchronization loop bandwidth** | |
| | **Narrow** | **Wide** |
| 10 MHz | 0.015 Hz | 70 Hz |
| 100 MHz | 0.015 Hz | 70 Hz |
| Flexible Reference (1ER) 1 – 110 MHz | 0.015 Hz | 70 Hz |

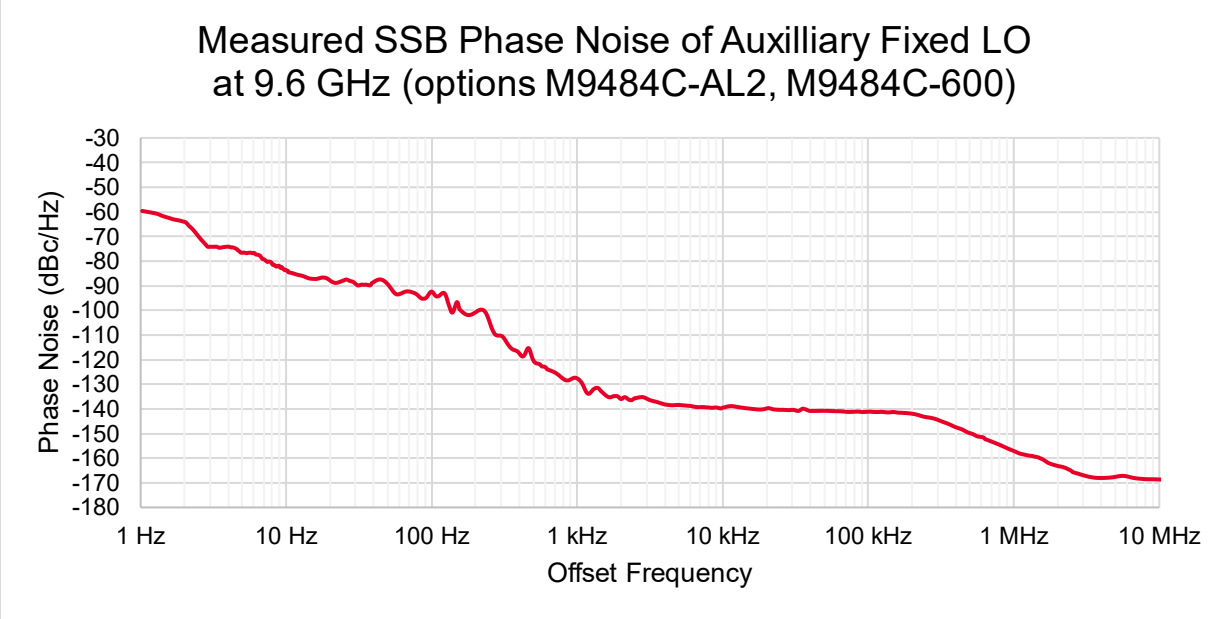
| Reference outputs | |
|---|---|
| **10 MHz out** | |
| Amplitude[9] | ≥ 5 dBm, 7 dBm (typ), square wave |
| Connector | BNC female |
| Impedance | 50 Ω (nom) |
| **19.2 GHz out** | |
| Amplitude[9] | +7.3 dBm (nom) sine wave |
| Connector | SMA female |
| Impedance | 50 Ω (nom) |
| **2.4 GHz out[10]** | |
| Amplitude[9] | +7.3 dBm (nom) sine wave |
| Connector | SMA female |
| Impedance | 50 Ω (nom) |




9 Does not include a guard band for performance distribution, measurement uncertainty, or environmental variables.
10 Available on instruments with Options 514, 520, 532, 544, or 554.

**Auxiliary fixed LO (Option AL2)** [11]

| | Frequency | Amplitude |
|---|---|---|
| User selectable outputs | 2.4 GHz | +11 dBm (meas.) |
| | 4.8 GHz | +7.5 dBm (meas.) |
| | 9.6 GHz | +6 dBm (meas.) |
| | 19.2 GHz | -2 dBm (meas.) |
| Connector | APC 3.5 mm | |
| Impedance | 50 Ω (nom.) | |




11 Available on M9484C with Options 532, 544, or 554.Required to pair M9484C with V3080A.

# Power

**Output parameters**

| | | |
|---|---|---|
| Settable range | Standard | -135 dBm to +20 dBm |
| | Options 1EA, 1EB, or 1EC | -135 dBm to +30 dBm |
| | V3080A | -115 dBm to +30 dBm |
| Resolution | | 0.01 dB |
| Output impedance | | 50 Ω (nom) |
| Maximum reverse power | | +27 dBm, 0 VDC (nom) |
| Attenuator type | | Electronic |

**Maximum output power, temperature range 22 to 28 °C, () = typical**

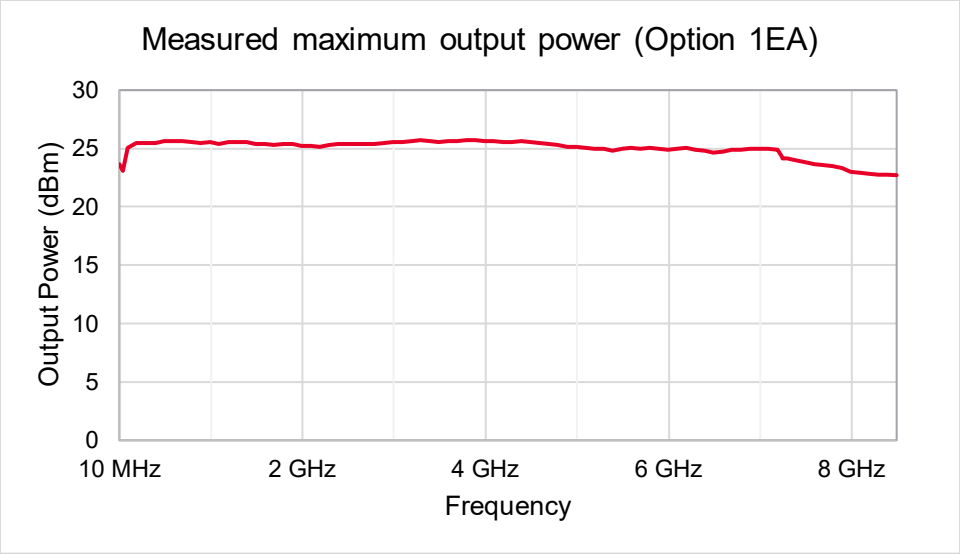
| Options 506 and 508 | | |
|---|---|---|
| **Frequency range** | **Standard** | **Option 1EA** |
| 9 kHz to 1 MHz | (+12 dBm) | (+12 dBm) |
| > 1 MHz to 10 MHz | +10 dBm | +10 dBm (+12 dBm) |
| > 10 MHz to 4 GHz | +18 dBm | +20 dBm (+24 dBm) |
| > 4 GHz to 8.5 GHz | +18 dBm | +20 dBm (+23 dBm) |

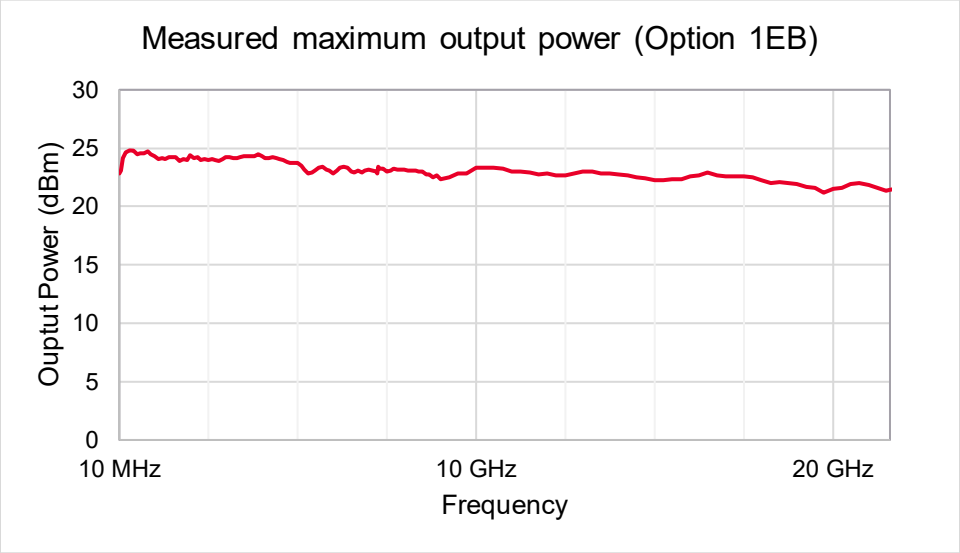
| Options 514 and 520 | | | |
|---|---|---|---|
| **Frequency range** | **Standard** | **Option 1EB** | **Harmonic filters enabled (selectable with option 1EH)[12]** |
| 9 kHz to 1 MHz | (0 dBm) | (0 dBm) | (0 dBm) |
| > 1 MHz to 10 MHz | +10 dBm | +10 dBm (+12 dBm) | +10 dBm (+12 dBm) |
| > 10 MHz to 4 GHz | +18 dBm | +20 dBm (+24 dBm) | +12 dBm (+13 dBm) |
| > 4 GHz to 8.5 GHz | +18 dBm | +20 dBm (+23 dBm) | +7 dBm (+9 dBm) |
| > 8.5 GHz to 14.7 GHz | +18 dBm | +20 dBm (+23 dBm) | +8.5 dBm (+10 dBm) |
| > 14.7 GHz to 19 GHz | +18 dBm | +19 dBm (+22 dBm) | - |
| > 19 GHz to 21.6 GHz | +17 dBm | +17 dBm (+22 dBm) | - |

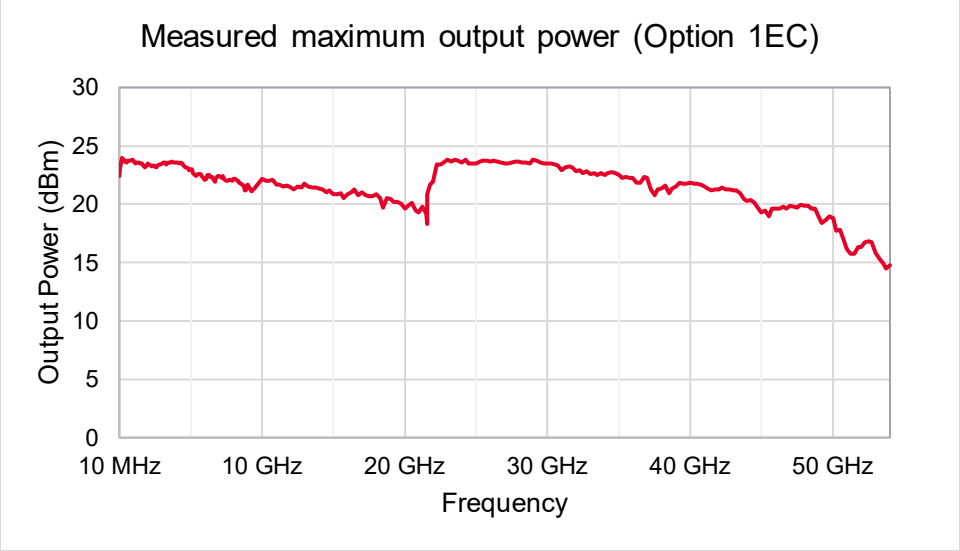
| Options 532, 544, and 554 | | | |
|---|---|---|---|
| **Frequency range** | **Standard** | **Option 1EC** | **Harmonic filters enabled (selectable with option 1EH)[12]** |
| 9 kHz to 1 MHz | (0 dBm) | (0 dBm) | (0 dBm) |
| > 1 MHz to 10 MHz | +10 dBm | +10 dBm (+12 dBm) | +10 dBm (+12 dBm) |
| > 10 MHz to 4 GHz | +18 dBm | +20 dBm (+21 dBm) | +10 dBm (+12 dBm) |
| > 4 GHz to 8.5 GHz | +18 dBm | +20 dBm (+21 dBm) | +5 dBm (+8 dBm) |
| > 8.5 GHz to 14.7 GHz | +18 dBm | +19 dBm (+20 dBm) | +8.5 dBm (+10 dBm) |
| > 14.7 GHz to 19 GHz | +18 dBm | +18 dBm (+19 dBm) | - |
| > 19 GHz to 21.6 GHz | +16 dBm | +16 dBm (+17 dBm) | - |
| > 21.6 GHz to 22.5 GHz | +18 dBm | +18 dBm (+20 dBm) | - |
| > 22.5 GHz to 32 GHz | +18 dBm | +22 dBm (+23 dBm) | - |
| > 32 GHz to 43 GHz | +15 dBm | +19 dBm (+21 dBm) | - |
| > 43 GHz to 44.5 GHz | +11 dBm | +16 dBm (+19 dBm) | - |
| > 44.5 GHz to 50 GHz | +11 dBm | +14.5 dBm (+17.5 dBm) | - |
| > 50 GHz to 54 GHz | +10 dBm | +12 dBm (+14 dBm) | - |

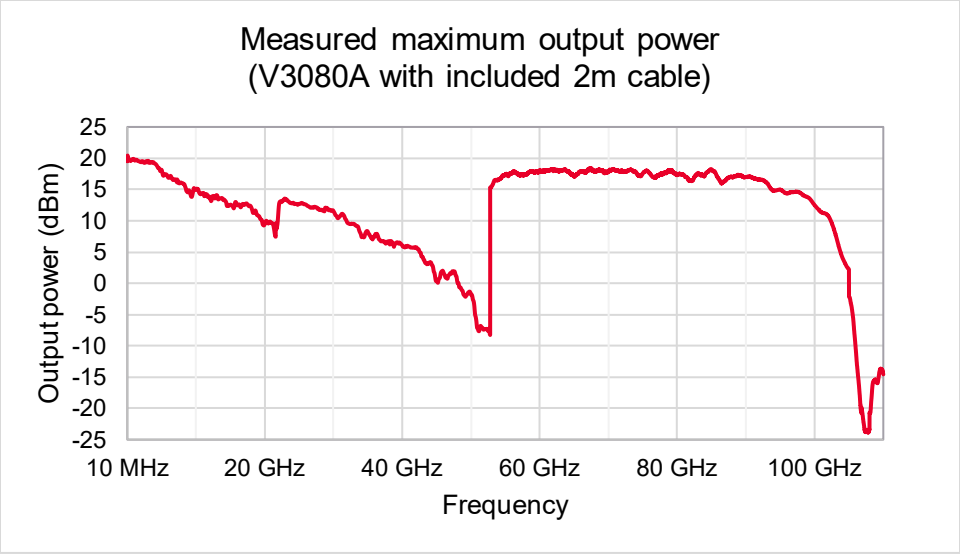
| V3080A[13] | |
|---|---|
| **Frequency range** | **Standard** |
| 9 kHz to < 52.8 GHz | See maximum output power for options 532, 544, and 554 and subtract cable loss and bypass path loss[14] |
| ≥ 52.8 GHz to 65 GHz | +13 dBm (+14.5 dBm) |
| > 65 GHz to 75 GHz | +14.5 dBm (+16.5 dBm) |
| >75 GHz to 90 GHz | +12.5 dBm (+15 dBm) |
| > 90 GHz to 95 GHz | +10.5 dBm (+12 dBm) |
| > 95 GHz to 100 GHz | +5 dBm (+12 dBm) |
| > 100 GHz to 110 GHz | (-25 dBm) |

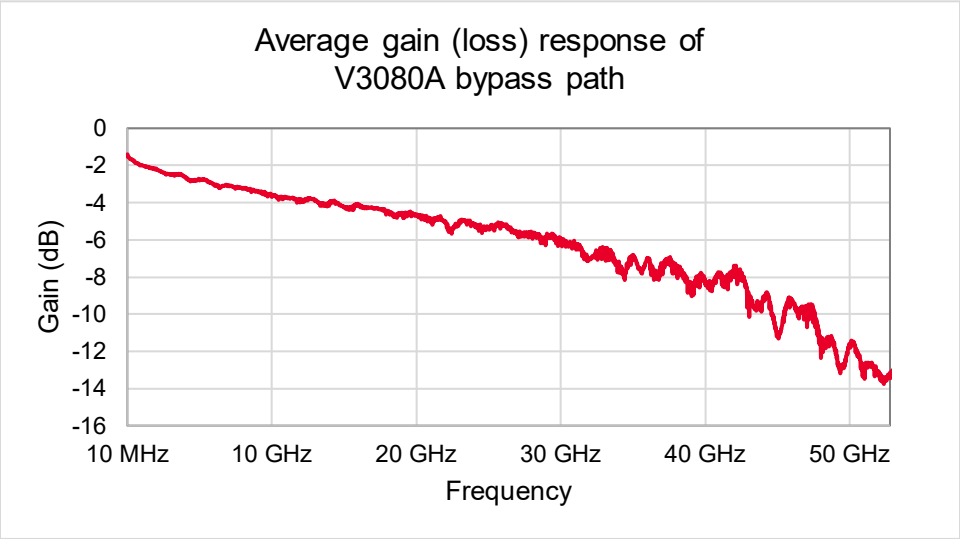
12 Refer to standard, 1EB, or 1EC column for frequencies above 14.5 GHz.
13 V3080A performance applies after a Power Accuracy Adjustment.
14 Refer to V3080A Getting Started Guide for connection diagrams and additional details.

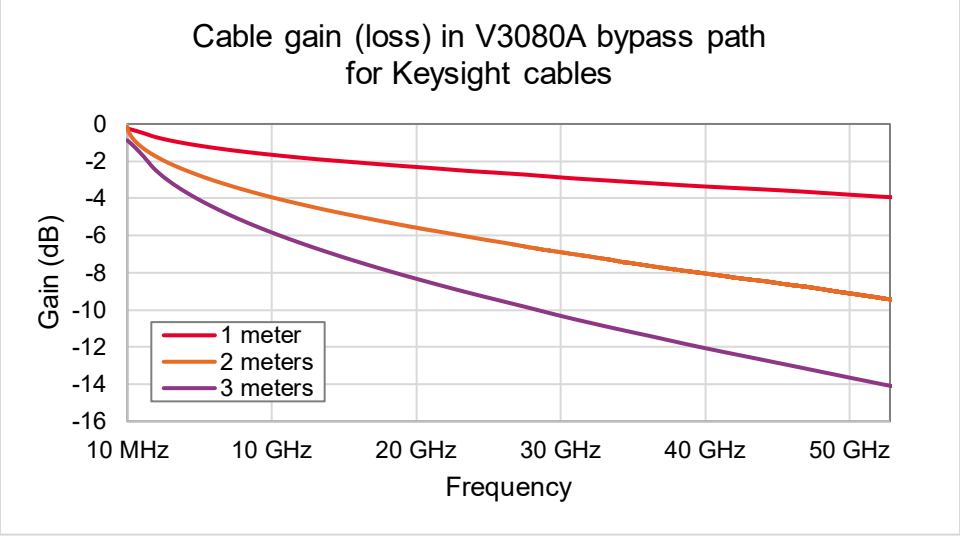

Measured maximum output power (Option 1EA)
Output Power (dBm)
30
25
20
15
10
5
0
10 MHz
2 GHz
4 GHz
6 GHz
8 GHz
Frequency


Measured maximum output power (Option 1EB)
Ouptut Power (dBm)
30
25
20
15
10
5
0
10 MHz
10 GHz
20 GHz
Frequency


Measured maximum output power (Option 1EC)
Output Power (dBm)
30
25
20
15
10
5
0
10 MHz
10 GHz
20 GHz
30 GHz
40 GHz
50 GHz
Frequency


Measured maximum output power
(V3080A with included 2m cable)
Output power (dBm)
25
20
15
10
5
0
-5
-10
-15
-20
-25
10 MHz
20 GHz
40 GHz
60 GHz
80 GHz
100 GHz
Frequency


Average gain (loss) response of
V3080A bypass path
Gain (dB)
0
-2
-4
-6
-8
-10
-12
-14
-16
10 MHz
10 GHz
20 GHz
30 GHz
40 GHz
50 GHz
Frequency


Cable gain (loss) in V3080A bypass path
for Keysight cables
Gain (dB)
0
-2
-4
-6
-8
-10
-12
-14
-16
1 meter
2 meters
3 meters
10 MHz
10 GHz
20 GHz
30 GHz
40 GHz
50 GHz
Frequency

**M9484C absolute level accuracy[15] (CW), temperature range from +22 °C to +28 °C, ALC on, () = typical**

| Frequency range | +15 dBm or maximum specified power to -60 dBm | < -60 dBm to -90 dBm | < -90 dBm to -110 dBm |
|---|---|---|---|
| > 12 MHz to 6 GHz | < ±1.6 dB (±0.3 dB) | < ±1.4 dB (< ±0.3 dB) | < ±1.8 dB (< ±0.5 dB) |
| > 6 GHz to 8.5 GHz | < ±1.1 dB (±0.3 dB) | < ±1.6 dB (< ±0.5 dB) | < ±2.5 dB (< ±1 dB) |
| > 8.5 GHz to 17 GHz | < ±1.2 dB (±0.3 dB) | < ±2.1 dB (< ±0.8 dB) | < ±2.6 dB (< ±1 dB) |
| > 17 GHz to 20 GHz | < ±1.7 dB (< ±0.5 dB) | < ±2.7 dB (< ±1 dB) | < ±2.6 dB (< ±1 dB) |
| > 20 GHz to 37 GHz | < ±1.3 dB (±0.3 dB) | < ±1.8 dB (< ±0.5 dB) | < ±2.6 dB (< ±0.7 dB) |
| > 37 GHz to 44 GHz | < ±1.3 dB (±0.3 dB) | (< ±1.5 dB) | (< ±1.5 dB) |
| > 44 GHz to 50 GHz | < ±2.1 dB (< ±0.7 dB) | (< ±1.5 dB) | (< ±1.5 dB) |
| > 50 GHz to 54 GHz | < ±2.2 dB (< ±0.7 dB) | (< ±1.5 dB) | (< ±2 dB) |

**M9484C absolute level accuracy[15] (CW), temperature range from +22 °C to +28 °C, ALC off, () = typical**

| Frequency range | +10 dBm or maximum specified power to -60 dBm | < -60 dBm to -90 dBm | < -90 dBm to -110 dBm |
|---|---|---|---|
| > 1 MHz to 12 MHz | < ±1.5 dB (< ±0.5 dB) | n/a | n/a |
| > 12 MHz to 6 GHz | < ±1.6 dB (< ±0.3 dB) | < ±1.7 dB (< ±0.4 dB) | < ± 1.8 dB (< ± 0.4 dB) |
| > 6 GHz to 8.5 GHz | < ±1.5 dB (< ±0.5 dB) | < ±1.6 dB (< ±0.5 dB) | < ± 2.5 dB (< ± 1 dB) |
| > 8.5 GHz to 17 GHz | < ±1.7 dB (< ±0.5 dB) | < ± 2.7 dB (< ±1.1 dB) | < ± 2.6 dB (< ± 1.1 dB) |
| > 17 GHz to 20 GHz | < ± 2.5 dB (< ±1 dB) | < ±2.7 dB (< ±1.1 dB) | < ± 2.6 dB (< ± 1.1 dB) |
| > 20 GHz to 37 GHz | < ± 1.6 dB (< ±0.5 dB) | < ± 1.8 dB (< ±0.6 dB) | < ± 3.1 dB (< ± 0.8 dB) |
| > 37 GHz to 44 GHz | < ± 1.6 dB (< ±0.5 dB) | (< ±2 dB) | (< ±2 dB) |
| > 44 GHz to 50 GHz | < ± 2.6 dB (< ±0.8 dB) | (< ±2 dB) | (< ±2 dB) |
| > 50 GHz to 54 GHz | < ± 2.7 dB (< ±0.8 dB) | (< ±1.5 dB) | (< ±2 dB) |

**M9484C absolute level accuracy in IQ mode relative to CW, temperature range from +22 °C to +28 °C, ALC auto, +10 to -20 dBm[16]**

| Frequency range | 3GPP W-CDMA Test model 1 with 64 DPCH, 4 carrier | 5G NR 8cc x 100 MHz (800 MHz), 256QAM, 120 kHz SCS, NRB = 66 |
|---|---|---|
| 12 MHz to 8.5 GHz | ±0.3 dB (nom) | ±0.4 dB (nom) |
| > 8.5 GHz to 20 GHz | ±0.5 dB (nom) | ±0.8 dB (nom) |
| > 20 GHz to 30 GHz | ±0.8 dB (nom) | ±2.0 dB (nom) |
| > 30 GHz to 35 GHz | ±0.2 dB (nom) | ±0.65 dB (nom) |
| > 35 GHz to 54 GHz | ±0.25 dB (nom) | ±0.9 dB (nom) |

**V3080A absolute level accuracy (CW)[17, 18], temperature range from +22 °C to +28 °C, ALC on, () = typical**

| Frequency range | +10 dBm or maximum specified power to < -10 dBm | -10 dBm to < -20 dBm | -20 dBm to < -60 dBm | -60 dBm to < -90 dBm | -90 dBm to -110 dBm |
|---|---|---|---|---|---|
| 10 MHz to < 6 GHz | - | - | < (±1.0 dB) | < (±1.0 dB) | < (±1.25 dB) |
| 6 GHz to < 8.5 GHz | - | - | < (±1.0 dB) | < (±1.0 dB) | < (±1.25 dB) |
| 8.5 GHz to < 17 GHz | - | - | < (±1.0 dB) | < (±1.25 dB) | < (±1.5 dB) |
| 17 GHz to < 20 GHz | - | - | < (±1.25 dB) | < (±1.25 dB) | < (±1.5 dB) |
| 20 GHz to < 37 GHz | - | - | < (±2.25 dB) | < (±2.25 dB) | < (±2.5 dB) |
| 37 GHz to < 44 GHz | - | - | < (±2.25 dB) | < (±2.5 dB) | < (±3.0 dB) |
| 44 GHz to < 50 GHz | - | - | < (±2.0 dB) | < (±2.5 dB) | < (±3.0 dB) |
| 50 GHz to < 52.8 GHz | - | - | < (±2.0 dB) | < (±2.5 dB) | < (±3.0 dB) |
| 52.8 GHz to < 60 GHz | < (±1.25 dB) | < (±1.5 dB) | < (±2.0 dB) | < (±2.0 dB) | < (±2.0 dB) |
| 60 GHz to < 70 GHz | < (±1.0 dB) | < (±1.5 dB) | < (±2.0 dB) | < (±2.0 dB) | < (±2.0 dB) |
| 70 GHz to < 85 GHz | < (±1.0 dB) | < (±1.5 dB) | < (±3.0 dB) | < (±3.0 dB) | < (±3.25 dB) |
| 85 GHz to < 90 GHz | < (±1.0 dB) | < (±1.5 dB) | < (±2.0 dB) | < (±3.0 dB) | < (±3.0 dB) |
| 90 GHz to < 100 GHz | < (±2.0 dB) | < (±1.5 dB) | < (±1.5 dB) | < (±5.0 dB) | < (±5.25 dB) |

15 When harmonic filters are enabled (selectable with Option 1EH), specification ≤ 7.25 GHz is ±2.0 dB at all power levels. For frequencies < 35 MHz specifications <- 70 dBm do not apply.

16 For instruments with Option 532, 544, or 554, absolute level accuracy in IQ mode relative to CW applies +5 to -20 dBm from 7.25 GHz to 21.6 GHz.

17 If the V3080A has been turned off and stored at room temperature, it is recommended that it is turned on and thermally stabilized to bake out any relative amplitude drift. At 70% humidity and 30 °C, a warm up time of:

- 2 hours results in approximately 0.15 dB relative amplitude drift.
- 5 hours results in approximately 0.05 dB relative amplitude drift.
- 10 hours (recommended) results in no measurable relative amplitude drift.

18 V3080A performance applies after a Power Accuracy Adjustment.

**V3080A absolute level accuracy (CW)[19,20], temperature range from +22 °C to +28 °C, ALC off, () = typical**

| Frequency range | +10 dBm or maximum specified power to < -10 dBm | -10 dBm to < -20 dBm | -20 dBm to < -60 dBm | -60 dBm to < -90 dBm | -90 dBm to -110 dBm |
|---|---|---|---|---|---|
| 10 MHz to < 6 GHz | - | - | < (±1.2 dB) | < (±1.2 dB) | < (±1.45 dB) |
| 6 GHz to < 8.5 GHz | - | - | < (±1.2 dB) | < (±1.2 dB) | < (±1.45 dB) |
| 8.5 GHz to < 17 GHz | - | - | < (±1.2 dB) | < (±1.45 dB) | < (±1.7 dB) |
| 17 GHz to < 20 GHz | - | - | < (±1.35 dB) | < (±1.35 dB) | < (±1.6 dB) |
| 20 GHz to < 37 GHz | - | - | < (±2.45 dB) | < (±2.45 dB) | < (±2.7 dB) |
| 37 GHz to < 44 GHz | - | - | < (±2.45 dB) | < (±2.7 dB) | < (±3.2 dB) |
| 44 GHz to < 50 GHz | - | - | < (±2.2 dB) | < (±2.7 dB) | < (±3.2 dB) |
| 50 GHz to < 52.8 GHz | - | - | < (±2.2 dB) | < (±2.7 dB) | < (±3.2 dB) |
| 52.8 GHz to < 60 GHz | < (±1.75 dB) | < (±2.0 dB) | < (±2.5 dB) | < (±2.3 dB) | < (±2.3 dB) |
| 60 GHz to < 70 GHz | < (±1.5 dB) | < (±2.0 dB) | < (±2.5 dB) | < (±2.3 dB) | < (±2.3 dB) |
| 70 GHz to < 85 GHz | < (±1.5 dB) | < (±2.0 dB) | < (±3.5 dB) | < (±3.3 dB) | < (±3.55 dB) |
| 85 GHz to < 90 GHz | < (±1.5 dB) | < (±2.0 dB) | < (±2.5 dB) | < (±3.3 dB) | < (±3.3 dB) |
| 90 GHz to < 100 GHz | < (±2.5 dB) | < (±2.0 dB) | < (±2.0 dB) | < (±5.3 dB) | < (±5.55 dB) |

**V3080A absolute level accuracy in IQ mode relative to CW[19,20], temperature range from +22 °C to +28 °C, ALC auto, +10 to -20 dBm**

| Frequency range | 3GPP W-CDMA Test model 1 with 64 DPCH, 4 carrier | 5G NR 8cc x 100 MHz (800 MHz), 256QAM, 120 kHz SCS, NRB = 66 |
|---|---|---|
| 52.8 GHz to 100 GHz | ±2 dB (nom) | ±2 dB (nom) |

**VSWR (meas)[21]**

| Frequency | Options 506, 508 |
|---|---|
| 240 MHz to 6 GHz | 2.0 |
| 6 GHz to 8.5 GHz | 1.9 |
| **Frequency** | **Options 514, 520** |
| 240 MHz to 6 GHz | 1.6 |
| 6 GHz to 8.5 GHz | 1.7 |
| 8.5 GHz to 17 GHz | 1.8 |
| 17 GHz to 21.6 GHz | 1.9 |
| **Frequency** | **Options 532, 544, 554** |
| 240 MHz to < 7.25 GHz | 1.7 |
| 7.25 GHz to < 21.6 GHz | 1.95 |
| 21.6 GHz to < 25 GHz | 1.75 |
| 25 GHz to < 36.5 GHz | 1.6 |
| 36.5 GHz to < 40 GHz | 2.1 |
| 40 GHz to < 50 GHz | 1.8 |
| 50 GHz to < 54 GHz | 2.1 |
| **Frequency** | **V3080A** |
| 9 kHz to < 6 GHz | 1.375 |
| 6 GHz to < 17 GHz | 1.75 |
| 17 GHz to < 21.6 GHz | 3 |
| 21.6 GHz to < 52.8 GHz | 5.25 |
| 52.8 GHz to < 78 GHz | 2.2 |
| 78 GHz to < 101 GHz | 2.35 |

19 If the V3080A has been turned off and stored at room temperature, it is recommended that it is turned on and thermally stabilized to bake out any relative amplitude drift. At 70% humidity and 30 °C, a warm up time of:

- 2 hours results in approximately 0.15 dB relative amplitude drift.
- 5 hours results in approximately 0.05 dB relative amplitude drift.
- 10 hours (recommended) results in no measurable relative amplitude drift.

20 V3080A performance applies after a Power Accuracy Adjustment.

21 Harmonic filters not enabled (selectable with Option 1EH). For CW operation; level range not valid when vector modulation is on.

| Amplitude switching speed[22] | M9484C | V3080A |
|---|---|---|
| -110 dBm to +15 dBm | 2.8 ms (meas) | 30 ms (meas) |

**Phase linearity vs power (with vector modulation on)**

| Frequency | Power range | Phase linearity vs power |
|---|---|---|
| 10 MHz to 10 GHz | +20 dBm to -80 dBm | 1° RMS (nom) |
| > 10 GHz to 20 GHz | +20 dBm to -80 dBm | 2° RMS (nom) |
| > 20 GHz to 54 GHz | +15 dBm to -18 dBm | 3° RMS (nom) |

| Leveling modes[23] | |
|---|---|
| ALC on | Power leveling with internal temperature stabilized detector feedback loop |
| ALC off | Temperature compensated power control |
| Auto | Automatic selection of ALC on or off depending on instrument settings |

22 Time from receipt of SCPI command to amplitude within 1 dB of final amplitude. For frequencies ≥ 10 MHz.
23 Power alignment is a routine that offsets initial ALC off factory calibration to be in line with local ambient temperature and provides sufficient range for ALC on leveling. It should be run at regular intervals or whenever the operating temperature changes more than ± 5 °C from the previous alignment temperature.

# Spectral Purity

**Harmonics[24], measured using vector CW signal, temperature range from +22 °C to +28 °C**

| | M9484C | | V3080A | |
|---|---|---|---|---|
| Frequency | Standard (+10 dBm) | Option 1EH[25] (+5 dBm) | Standard (-10 dBm)[26] | Option 1EH (-10 dBm)[26] |
| 10 MHz to < 3.75 GHz | -30 dBc | -55 dBc | -30 dBc (typ) | -55 dBc (typ) |
| 3.75 GHz to < 5.5 GHz | -30 dBc | -50 dBc[27] | -30 dBc (typ) | -50 dBc (typ) |
| 5.5 GHz to < 7.25 GHz | -30 dBc | -55 dBc | -30 dBc (typ) | -55 dBc (typ) |
| 7.25 GHz to < 15 GHz | -30 dBc[27] | -53 dBc | -30 dBc (typ) | -53 dBc (typ) |
| 15 GHz to < 21.6 GHz | -55 dBc | -55 dBc | -55 dBc (typ) | -55 dBc (typ) |
| 21.6 GHz to 27 GHz | -55 dBc[27] | -55 dBc[27] | -55 dBc (typ) | -55 dBc (typ) |
| > 27 GHz to 50 GHz | - | - | -55 dBc (typ) | -55 dBc (typ) |

**Non-harmonics[28], +10 dBm or maximum specified power, whichever is lower[29], temperature range from +22 °C to +28 °C**

| | M9484C | | V3080A | |
|---|---|---|---|---|
| Frequency | > 300 Hz offset | Line-related (≤ 300 Hz offset) | > 300 Hz offset | Line-related (≤ 300 Hz offset) |
| 10 MHz to < 7.25 GHz | -60 dBc | -57 dBc (typ) | -60 dBc (typ) | -57 dBc (typ) |
| 7.25 GHz to < 21.6 GHz | -50 dBc[30] | -48 dBc (typ) | -50 dBc (typ) | -48 dBc (typ) |
| 21.6 GHz to < 42.5 GHz | -50 dBc | -40 dBc (typ) | -50 dBc (typ) | -40 dBc (typ) |
| 42.5 GHz to < 50 GHz | -45 dBc | -38 dBc (typ) | -45 dBc (typ) | -38 dBc (typ) |
| 50 GHz to < 52.8 GHz | -40 dBc | -35 dBc (typ) | -40 dBc (typ) | -35 dBc (typ) |
| 52.8 GHz to 54 GHz | -40 dBc | -35 dBc (typ) | -30 dBc (typ) | -35 dBc (typ) |
| > 54 GHz to < 55 GHz | - | - | -30 dBc (typ) | -35 dBc (typ) |
| 55 GHz to < 65 GHz | - | - | -40 dBc (typ) | -35 dBc (typ) |
| 65 GHz to < 70 GHz | - | - | -43 dBc (typ) | -35 dBc (typ) |
| 70 GHz to < 76 GHz | - | - | -36 dBc (typ) | -35 dBc (typ) |
| 76 GHz to < 86 GHz | - | - | -48 dBc (typ) | -35 dBc (typ) |
| 86 GHz to < 92 GHz | - | - | -37 dBc (typ) | -35 dBc (typ) |
| 92 GHz to < 96 GHz | - | - | -50 dBc (typ) | -35 dBc (typ) |
| 96 GHz to 100 GHz | - | - | -35 dBc (typ) | -35 dBc (typ) |

**Fixed spurs with harmonic filters enabled (selectable with option 1EH), unless otherwise stated**

| Frequency | Level (constant over set power level) |
|---|---|
| DC – 1 MHz | -70 dBm (typ), present in all modes of operation |
| 2.4 GHz | -70 dBm (typ) |
| 3.6 GHz | -75 dBm (typ) |
| 4.8 GHz | -75 dBm (typ) |
| 8.4 GHz | -75 dBm (typ) |
| 19.2 GHz | -100 dBm (typ) |

**Subharmonics**

None

24 Performance is unspecified for harmonics beyond the specified frequency range. CW signal enabled with vector modulation. Specifications may degrade when vector modulation is not used.
25 Option 1EH cannot be combined with frequency options 506 or 508.
26 V3080A harmonic performance includes insertion loss from Keysight 1 meter cable (V3080A-60005) or 2 meter cable (V3080A-60006). For 3 meter cable (V3080A-60007), reduce power level by 5 dB (nom).
27 Standard harmonic specification applies ≤ +5 dBm between 7.25 GHz and 15 GHz. Standard harmonic specification applies ≤ 0 dBm between 21.6 GHz and 27 GHz.1EH harmonic specification applies ≤ 0 dBm from 3.75 GHz to < 5.5 GHz and from 21.6 GHz to 27 GHz.
28 Excludes fixed spurs with harmonic filters enabled.
29 V3080A non-harmonic performance below 52.8 GHz measured at -10 dBm.
30 Performance may degrade in enhanced SNR mode. With harmonic filters enabled (selectable with Option 1EH), specification applies at a maximum power of +5 dBm.

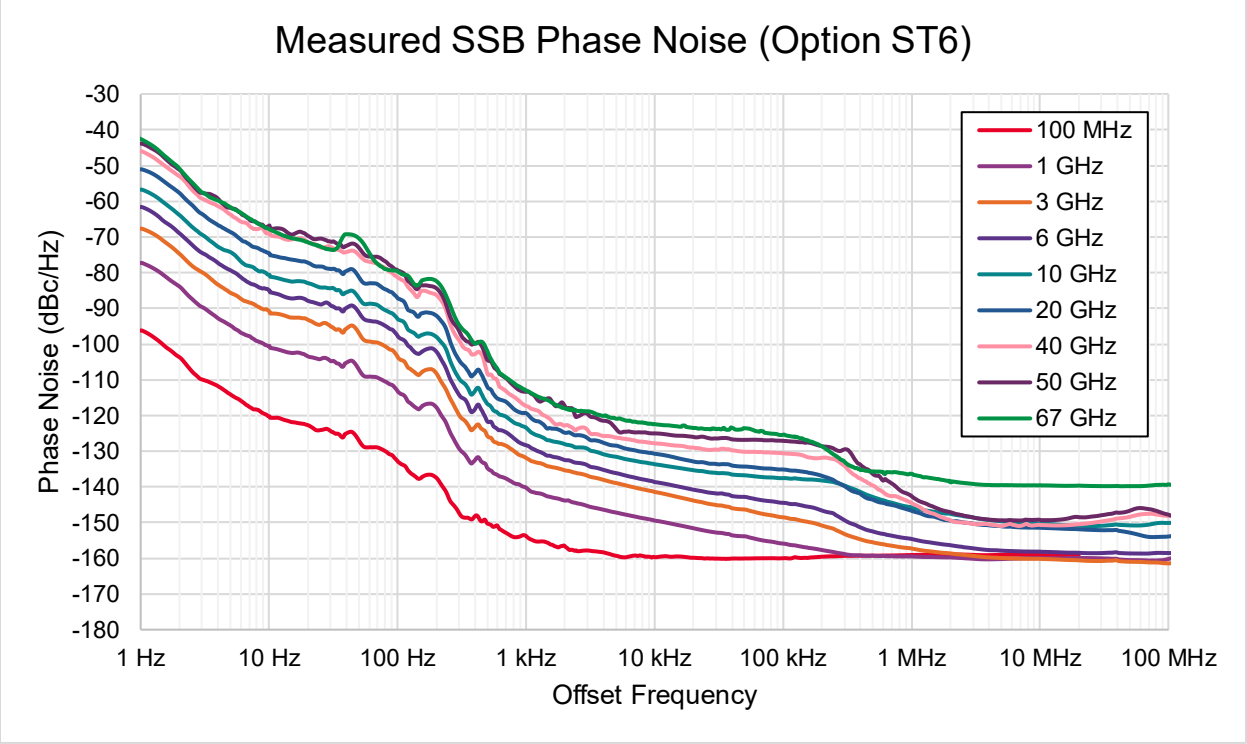
**Absolute SSB phase noise (CW in enhanced SNR mode at +10 dBm) (dBc/Hz) (Options ST6, 600), 22 to 28 °C, () = typical, [ ] = measured**

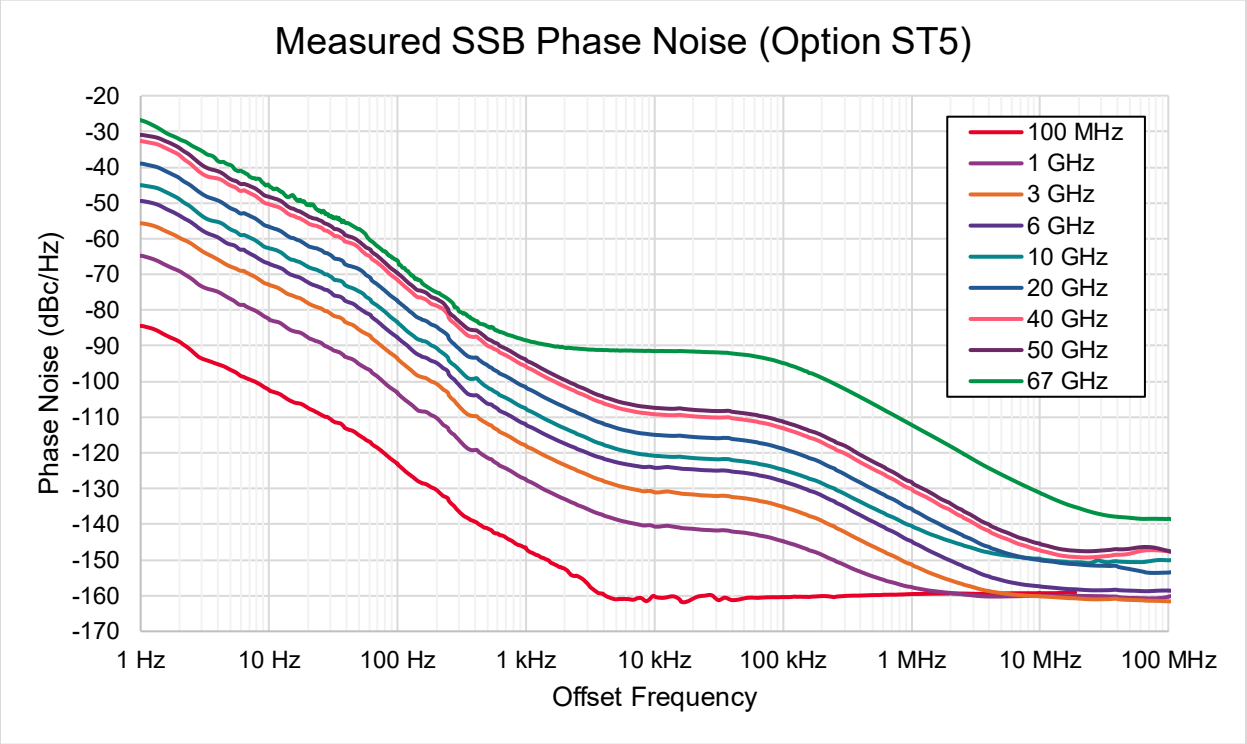
| Frequency[31] | Offset | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 Hz | 10 Hz | 100 Hz | 1 kHz | 10 kHz | 100 kHz | 1 MHz | 10 MHz | 100 MHz |
| 100 MHz | -82 (-91) | -110 (-117) | -125 (-130) | -145 (-150) | -151 (-158) | -153 (-158) | -152 (-158) | -153 (-158) | - |
| 1 GHz | -62 (-72) | -90 (-97) | -105 (-110) | -135 (-139) | -144 (-148) | -151 (-155) | -153 (-159) | -154 (-159) | -154 (-159) |
| 2 GHz | -56 (-65) | -84 (-91) | -99 (-104) | -129 (-133) | -138 (-143) | -146 (-150) | -152 (-158) | -154 (-159) | -155 (-160) |
| 3 GHz | -52 (-62) | -80 (-87) | -95 (-101) | -126 (-130) | -135 (-140) | -143 (-147) | -150 (-156) | -154 (-159) | -155 (-160) |
| 6 GHz | -46 (-56) | -75 (-81) | -89 (-95) | -123 (-127) | -132 (-137) | -140 (-143) | -148 (-154) | -152 (-157) | -152 (-157) |
| 10 GHz | -42 (-51) | -71 (-77) | -84 (-90) | -118 (-121) | -129 (-132) | -133 (-136) | -139 (-144) | -143 (-149) | -142 (-148) |
| 20 GHz | -39 (-48) | -65 (-71) | -80 (-85) | -114 (-118) | -124 (-129) | -131 (-134) | -140 (-145) | -145 (-150) | -146 (-152) |
| 30 GHz | -36 (-46) | -59 (-67) | -72 (-79) | -112 (-117) | -123 (-128) | -130 (-133) | -137 (-145) | -143 (-149) | -138 (-145) |
| 40 GHz | -35 (-44) | -59 (-65) | -70 (-77) | -110 (-115) | -122 (-127) | -126 (-130) | -137 (-145) | -143 (-148) | -138 (-145) |
| 50 GHz | -34 (-41) | -57 (-63) | -67 (-75) | -108 (-112) | -120 (-123) | -122 (-125) | -133 (-140) | -143 (-148) | -138 (-145) |
| 60 GHz | [-32] | [-66] | [-79] | [-114] | [-123] | [-125] | [-133] | [-136] | [-137] |
| 70 GHz | [-40] | [-64] | [-80] | [-114] | [-123] | [-124] | [-137] | [-140] | [-140] |
| 80 GHz | [-39] | [-64] | [-78] | [-112] | [-121] | [-123] | [-135] | [-138] | [-139] |
| 90 GHz | [-37] | [-60] | [-76] | [-109] | [-120] | [-122] | [-134] | [-139] | [-140] |

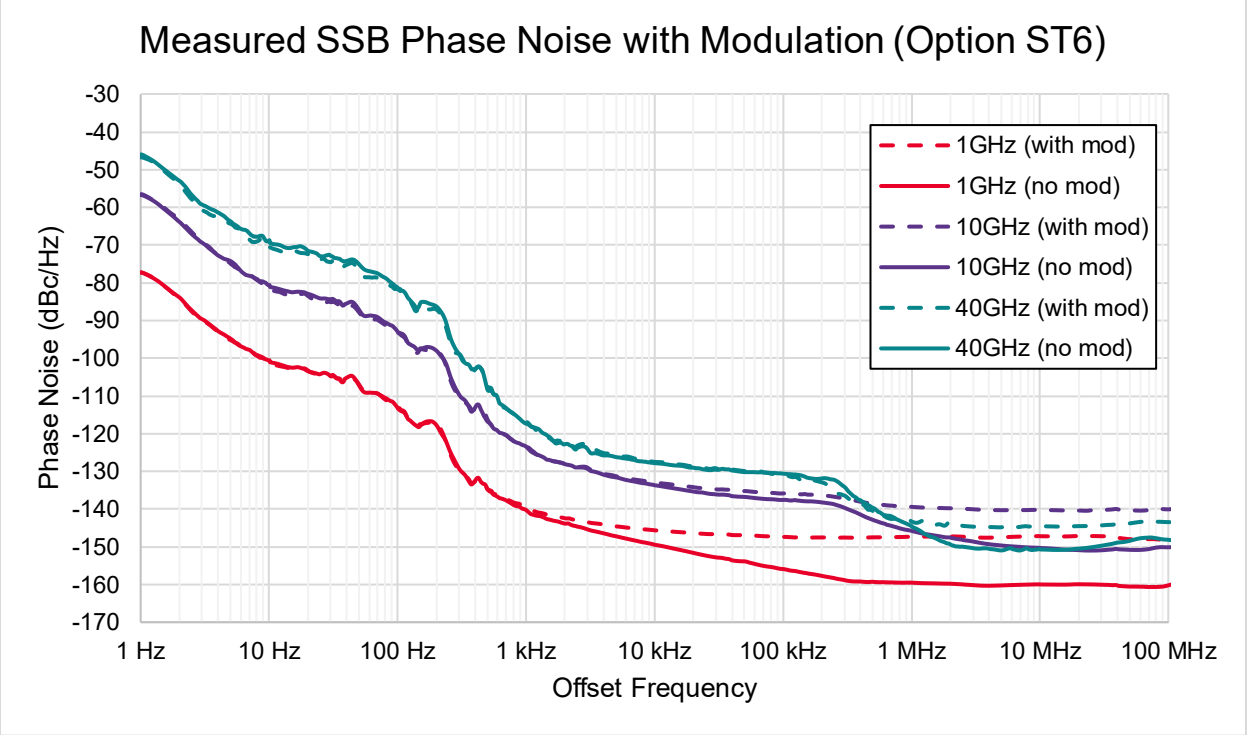
**Absolute SSB phase noise (CW in enhanced SNR mode at +10 dBm) (dBc/Hz) (Options ST5, 500), 22 to 28 °C, () = typical, [ ] = measured**

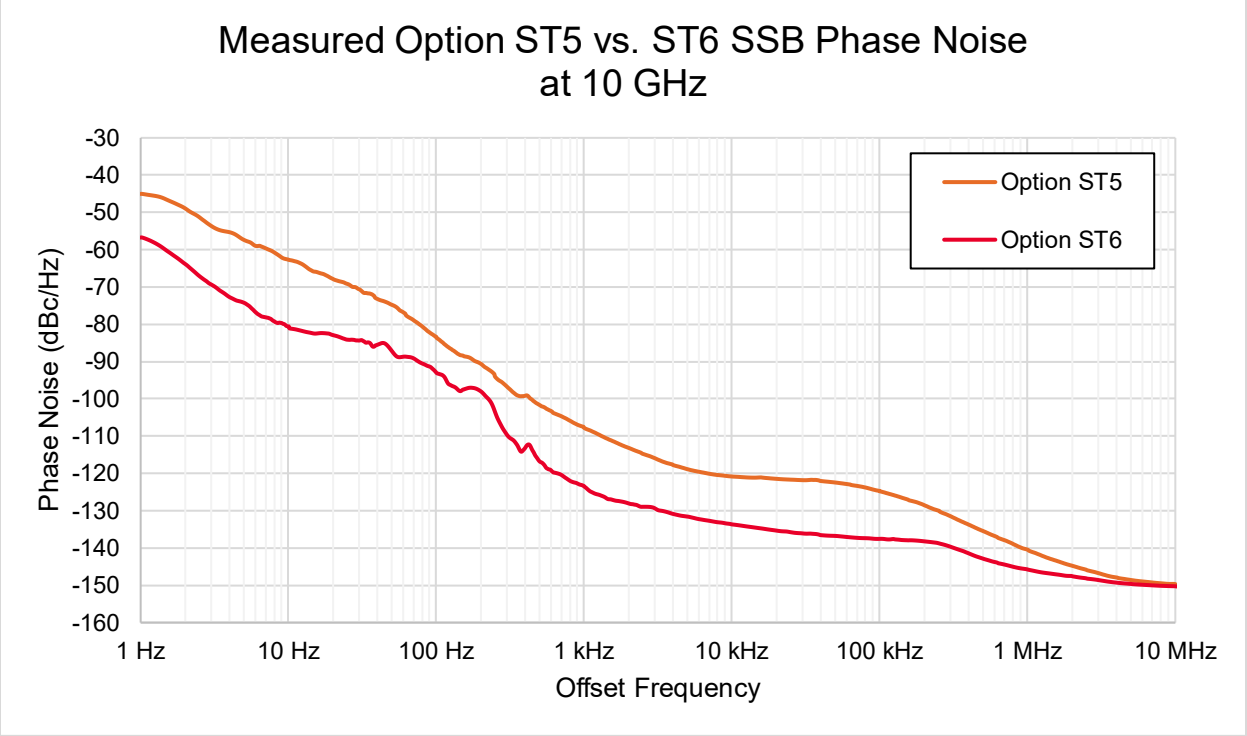
| Frequency[31] | Offset | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 Hz | 10 Hz | 100 Hz | 1 kHz | 10 kHz | 100 kHz | 1 MHz | 10 MHz | 100 MHz |
| 100 MHz | -80 (-83) | -99 (-101) | -119 (-122) | -140 (-144) | -150 (-155) | -153 (-158) | -152 (-158) | -153 (-158) | - |
| 1 GHz | -60 (-63) | -78 (-81) | -99 (-102) | -124 (-127) | -137 (-140) | -142 (-144) | -152 (-157) | -154 (-159) | -153 (-159) |
| 2 GHz | -54 (-57) | -73 (-76) | -93 (-96) | -119 (-121) | -131 (-134) | -136 (-138) | -149 (-153) | -154 (-159) | -153 (-158) |
| 3 GHz | -51 (-54) | -69 (-72) | -90 (-92) | -115 (-117) | -128 (-130) | -132 (-134) | -146 (-150) | -153 (-158) | -153 (-159) |
| 6 GHz | -44 (-48) | -62 (-66) | -83 (-86) | -109 (-111) | -121 (-124) | -125 (-127) | -140 (-144) | -152 (-156) | -152 (-157) |
| 10 GHz | -40 (-43) | -58 (-61) | -79 (-82) | -105 (-107) | -118 (-120) | -122 (-124) | -134 (-139) | -142 (-147) | -140 (-147) |
| 20 GHz | -34 (-37) | -52 (-55) | -73 (-76) | -99 (-101) | -112 (-114) | -116 (-118) | -130 (-135) | -143 (-148) | -143 (-150) |
| 30 GHz | -29 (-33) | -48 (-51) | -69 (-72) | -95 (-97) | -108 (-111) | -113 (-115) | -127 (-132) | -139 (-145) | -136 (-143) |
| 40 GHz | -27 (-31) | -46 (-49) | -67 (-70) | -93 (-95) | -106 (-108) | -110 (-112) | -125 (-129) | -140 (-145) | -137 (-144) |
| 50 GHz | -26 (-29) | -43 (-47) | -65 (-68) | -91 (-93) | -104 (-107) | -108 (-111) | -123 (-127) | -139 (-144) | -138 (-144) |
| 60 GHz | [-28] | [-46] | [-67] | [-88] | [-92] | [-95] | [-112] | [-131] | [-137] |
| 70 GHz | [-28] | [-43] | [-66] | [-88] | [-90] | [-94] | [-111] | [-130] | [-140] |
| 80 GHz | [-30] | [-41] | [-65] | [-86] | [-89] | [-93] | [-110] | [-129] | [-139] |
| 90 GHz | [-25] | [-41] | [-64] | [-85] | [-88] | [-92] | [-109] | [-128] | [-139] |

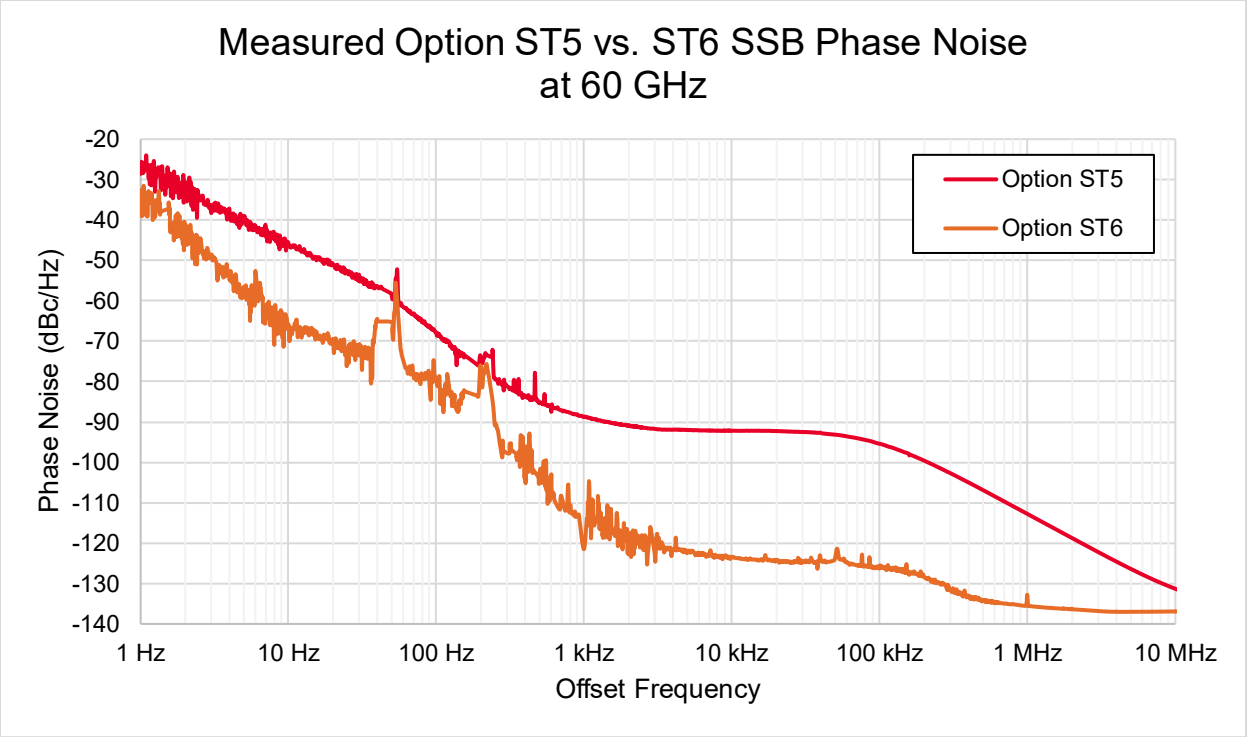
31 Frequency ≤ 50 GHz is applicable for standalone M9484C only. Frequency ≥ 60 GHz is applicable for M9484C with V3080A.


Measured SSB Phase Noise (Option ST6)
Phase Noise (dBc/Hz)
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
1 Hz
10 Hz
100 Hz
1 kHz
10 kHz
100 kHz
1 MHz
10 MHz
100 MHz
Offset Frequency
100 MHz
1 GHz
3 GHz
6 GHz
10 GHz
20 GHz
40 GHz
50 GHz
67 GHz


Measured SSB Phase Noise (Option ST5)
Phase Noise (dBc/Hz)
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
1 Hz
10 Hz
100 Hz
1 kHz
10 kHz
100 kHz
1 MHz
10 MHz
100 MHz
Offset Frequency
100 MHz
1 GHz
3 GHz
6 GHz
10 GHz
20 GHz
40 GHz
50 GHz
67 GHz


Measured SSB Phase Noise with Modulation (Option ST6)
Phase Noise (dBc/Hz)
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
1 Hz
10 Hz
100 Hz
1 kHz
10 kHz
100 kHz
1 MHz
10 MHz
100 MHz
Offset Frequency
1GHz (with mod)
1GHz (no mod)
10GHz (with mod)
10GHz (no mod)
40GHz (with mod)
40GHz (no mod)


Measured Option ST5 vs. ST6 SSB Phase Noise at 10 GHz
Phase Noise (dBc/Hz)
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
1 Hz
10 Hz
100 Hz
1 kHz
10 kHz
100 kHz
1 MHz
10 MHz
Offset Frequency
Option ST5
Option ST6



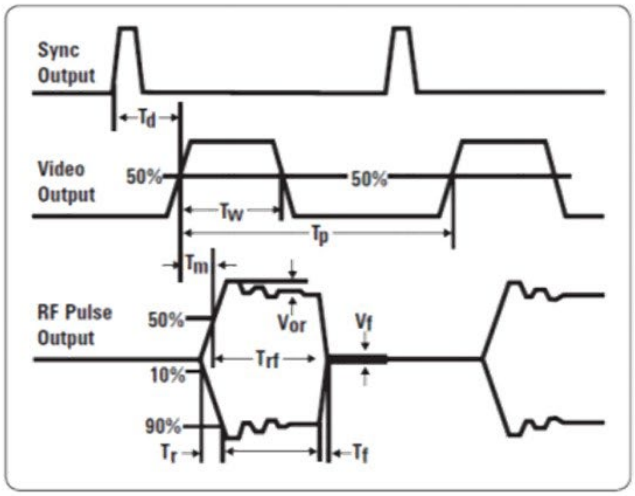

# Pulse Modulation (Option PMR or PME)

**Pulse modulation[32], temperature range 22 to 28 °C, () = typ**

| | | | |
|---|---|---|---|
| Pulse paths | | Internal pulse generator | |
| Minimum pulse width (Tw) with duty cycle ≤ 50%, ALC on or off | Option PMR | 20 ns | |
| | Option PME | 30 ns | |
| On/off ratio[33] | 100 MHz to 54 GHz | 80 dB | |
| | > 54 GHz to 100 GHz[34] | (80 dB) | |
| Rise/fall times (Tr and Tf), ALC on or off | 100 MHz to 54 GHz | 10 ns (6 ns) | |
| | > 54 GHz to 100 GHz[34] | (10 ns) | |
| Level accuracy relative to CW | ALC state | ALC on | ALC off |
| | 100 MHz to 20 GHz | ± 0.6 dB | ± 0.5 dB |
| | > 20 GHz to 45 GHz | ± 1 dB | ± 0.7 dB |
| | > 45 GHz to 54 GHz | ± 1.5 dB | ± 1 dB |
| | > 54 GHz to 100 GHz[34] | (± 1.5 dB) | (± 1 dB) |
| Width compression | 100 MHz to 45 GHz | ± 2 ns | |
| | > 45 GHz to 54 GHz | ± 3 ns | |
| | > 54 GHz to 100 GHz[34] | (± 3 ns) | |
| Video feed-through (Vf) | 100 MHz to < 1 GHz | < 50 mV p-p (< 25 mV p-p) | |
| | ≥ 1 GHz to 54 GHz | < 25 mV p-p (< 12 mV p-p) | |
| | > 54 GHz to 100 GHz[34] | (< 50 mV p-p) | |
| Pulse overshoot | 100 MHz to 45 GHz | < 10% | |
| | > 45 GHz to 54 GHz | < 20% | |
| | > 54 GHz to 100 GHz[34] | (< 20%) | |
| External pulse input | | No analog pulse inputs allowed | |

32 Specifications apply for center frequencies > 100 MHz. Cannot be used in combination with vector modulation.
33 On/off ratio excludes spurs.
34 Frequency > 54 GHz applies to M9484C with V3080A. For M9484C with V3080A at frequencies ≤ 54 GHz, pulse performance is nominal and cable and insertion loss of the V3080A should be considered.

- Td video delay (variable)
- Tw video pulse width (variable)
- Tp Pulse period (variable)
- Tm RF delay
- Trf RF pulse width
- Tf RF pulse fall time
- Tr RF pulse rise time
- Vor pulse overshoot
- Vf video feedthrough




**Internal pulse generator (Option PMR or PME)**

| | | | |
|---|---|---|---|
| Modes | Square, free run, pulse train (Option 320, SCPI only), adjustable doublet, triggered | | |
| Square wave rate | (50 MHz)/k from 0.1 Hz to 25 MHz where k is an integer (nom) | | |
| Signal routing | Pulse trigger input | Trig 1 | |
| | Pulse sync output | Event 1 | |
| | Pulse video output | Event 2 | |
| | | **Option PMR** | **Option PME** |
| Pulse period (PRI) (Tp) | Free run | 30 ns to 42 s | 40 ns to 42 s |
| | Triggered modes | 4.01 µs to 42 s | 4.01 µs to 42 s |
| Pulse width (Tw) | | 20 ns to 42 s – 10 ns | 30 ns to 42 s – 10 ns |
| Settable delay | Free run | -42 s – 10 ns to 42s – 30 ns | -42 s – 10 ns to 42s – 40 ns |
| | Triggered modes | 0 to 42s – 30 ns | 0 to 42s – 40 ns |
| Sync trigger width | | 20 ns to 42 s – 10 ns | 30 ns to 42 s – 10 ns |
| Pulse train generator (Option 320, SCPI only) [35] | Number of pulse patterns | 2047 | 2047 |
| | On time range | 20 ns to 42 s – 10 ns | 30 ns to 42 s – 10 ns |
| | Off time range | 10 ns to 42 s – 20 ns | 10 ns to 42 s – 30 ns |

35 Requires option PMR or PME.

# Analog I/O (Option AN1)

Option AN1 adds input and output connectors to the M9484C VXG that are otherwise not present. The capability provided by Option AN1 is described in the following section. These features may be enhanced with additional options.

**Analog I/O (Option AN1)**

| | | |
|---|---|---|
| **LF output** | | |
| Waveform | Sine | |
| Rate range | 0.1 Hz to 10 MHz | |
| Resolution | 0.1 Hz | |
| Frequency accuracy | Same as RF reference source (nom) | |
| LF audio output | 0 to 5 V peak into 50 Ω (nom) | |
| | -5V to 5V digital offset | |
| **Amplitude, frequency, and phase modulation inputs (requires option UNT for use)** | | |
| Paths (EXT 1, 2) | 2, summed internally for composite modulation | |
| Input impedance | 50 Ω, 600 Ω, 1 MΩ (nom) | |
| Input bandwidth | 10 MHz (nom) | |
| Sensitivity | ±1 V (nom) | |
| **Single ended I/Q outputs** | | |
| Single ended I/Q outputs are included with option AN1. Option DIQ may also be added to enable differential I/Q outputs. Refer to I/Q baseband output for more information. | | |
| **General purpose trigger/marker inputs/outputs** | | |
| 15 additional general purpose inputs/outputs that can be configured for use as triggers or markers. Three utilize SMB connectors. The remaining 12 are accessed with the Aux I/O port. An accessory cable to simplify interfacing with the Aux I/O port can be ordered as Y1308A. | | |
| SMB type connectors (Trig A, B, C) | Input range | 5 V |
| | Input impedance | 50 Ω or 10 kΩ |
| | Output level | 3.3 V |
| | Output impedance | 50 Ω |
| Aux I/O | Input range | 3.3 V |
| | Input impedance | 10 kΩ |
| | Output level | 3.3 V |
| | Output impedance | 50 Ω |

# Analog Modulation

**Frequency modulation (Option UNT, ST6, 600)** [36,37]

| | | | |
|---|---|---|---|
| Modulation paths | | FM Paths 1 and 2 are summed internally for composite modulation | |
| Maximum rate | | 10 MHz (nom) | |
| Maximum peak deviation | | 1.25 GHz (nom) | |
| Resolution | | 1 Hz (nom) | |
| Modulation source | | Internal | External |
| Deviation accuracy, measured at 1 kHz rate with ≤ 10 MHz deviation | ≤ 8.5 GHz | < 1.2% of setting + 20 Hz (typ) | < 1.5% of setting + 20 Hz (meas) |
| | > 8.5 GHz to 20 GHz | < 1.2% of setting + 20 Hz (typ) | < 2.0% of setting + 20 Hz (meas) |
| | > 20 GHz to 30 GHz | < 1.8% of setting + 20 Hz (typ) | < 2.0% of setting + 20 Hz (meas) |
| | > 30 GHz to 40 GHz | < 2.5% of setting + 20 Hz (typ) | < 2.5% of setting + 20 Hz (meas) |
| | > 40 GHz to 50 GHz | < 3.5% of setting + 20 Hz (typ) | < 4.0% of setting + 20 Hz (meas) |
| Distortion, measured at 1 kHz rate with ≤ 10 MHz deviation | ≤ 8.5 GHz | 0.05% (typ) | 0.05% (meas) |
| | > 8.5 GHz to 20 GHz | 0.05% (typ) | 0.07% (meas) |
| | > 20 GHz | 0.1 % (typ) | 0.07% (meas) |
| Modulation frequency response, measured at 100 kHz deviation, 3 dB bandwidth | | 10 Hz to 10 MHz (typ) | |

36 Specifications apply up to 50 GHz. Analog modulation is usable above 50 GHz; however, performance is not warranted.
37 Frequency and phase modulation are only available with option UNT when ordered with Options ST6 and 600. Only amplitude modulation is available with Option UNT when ordered with Options ST5 and 500.

**Phase modulation (Option UNT, ST6, 600)** [38,39]

| | | | |
|---|---|---|---|
| Modulation paths | | ΦM Paths 1 and 2 are summed internally for composite modulation | |
| Maximum rate | | 10 MHz (nom) | |
| Maximum peak deviation | | 100 rad (nom) | |
| Resolution | | 0.001 rad (nom) | |
| Modulation source | | Internal | External[40] |
| Deviation accuracy, measured at 1 kHz rate with ≤ 2 rad deviation | ≤ 8.5 GHz | < 0.5 % of setting + 0.01 rad (typ) | < 1.5 % of setting + 0.01 rad (meas) |
| | > 8.5 GHz | < 0.5 % of setting + 0.01 rad (typ) | < 2.0 % of setting + 0.01 rad (meas) |
| Total harmonic distortion, measured at 1 kHz rate with ≤ 2 rad deviation | ≤ 8.5 GHz | 0.1% (typ) | 0.1% (meas) |
| | > 8.5 GHz | 0.1% (typ) | 0.2% (meas) |
| Modulation frequency response, measured at 3 rad deviation, 3 dB bandwidth | | 10 Hz to 10 MHz (typ) | |

**Amplitude modulation (Option UNT)**[38,39,40]

| | | | |
|---|---|---|---|
| Modulation paths | | AM Paths 1 and 2 are summed internally for composite modulation | |
| AM depth type | | Linear or logarithmic | |
| Maximum depth | | 100% linear or 40 dB logarithmic (nom) | |
| Depth resolution | | 0.1% linear or 0.01 dB logarithmic (nom) | |
| Modulation source | | Internal | External[40] |
| Depth accuracy, measured at 1 kHz rate with depth ≤ 80%, ALC on | ≤ 35 GHz | < 1 % of setting + 1 % (typ) | < 2 % of setting + 1 % (meas) |
| | > 35 GHz to 50 GHz | < 2 % of setting + 1 % (typ) | < 3 % of setting + 1 % (meas) |
| Total harmonic distortion, measured at 1 kHz rate, ≤ 35 GHz, ALC on, depth = 30% or 80% | | 0.6% (typ) | 0.6% (meas) |
| Total harmonic distortion, measured at 1 kHz rate, > 35 GHz, ALC on, depth = 30% or 80% | | 0.6% (typ) | 1.8% (meas) |
| Modulation frequency response, measured at 30% depth, 3 dB bandwidth | | 10 Hz to 10 MHz (typ) | |

**Internal modulation source (Option UNT)**

| | | | |
|---|---|---|---|
| Waveform generator | Provides signal for use with AM, FM, ΦM, or LF output[41] | | |
| Waveforms | Sine, triangle, ramp up, ramp down, pulse, square | | |
| Rate range | Sine | AM, FM, ΦM | 0.01 Hz to 100 MHz (nom) |
| | | LF output | 0.01 Hz to 10 MHz (nom) |
| | All other waveforms | AM, FM, ΦM | 0.01 Hz to 10 MHz (nom) |
| | | LF output | 0.01 Hz to 1 MHz (nom) |
| Resolution | 0.01 Hz (nom) | | |
| Accuracy | Same as time base | | |

**Multifunction generator (Option 303)**

| | |
|---|---|
| The multifunction generator option (Option 303) consists of 7 waveform generators that can be set independently with up to 5 simultaneously using the composite modulation features in AM, FM/PM plus LF out | |
| Function generator 1 | Sine, triangle, ramp up, ramp down, pulse, square |
| Function generator 2 | Sine, triangle, ramp up, ramp down, pulse, square |
| Dual function generator | Sine, triangle, ramp up, ramp down, pulse, square, phase offset and amplitude ratio for Tone 2 relative to Tone 1 |
| Swept function generator | Sawtooth, triangle |
| Noise generator 1 | Uniform, Gaussian |
| Noise generator 2 | Uniform, Gaussian |
| DC | Only for LF output[41] |

38 Specifications apply up to 50 GHz. Analog modulation is usable above 50 GHz; however, performance is not warranted.
39 Frequency and phase modulation are only available with Option UNT when ordered with Options ST6 and 600. Only amplitude modulation is available with option UNT when ordered with Options ST5 and 500.
40 Phase modulation specifications using an external modulation source apply at power levels less than +10 dBm. AM specifications using an internal modulation source apply 6 dB below maximum specified power from 20 to 30 °C. AM distortion specifications using an external modulation source apply at power levels less than +10 dBm.
41 LF output requires Option AN1. See LF output for details.

**Simultaneous and composite modulation per channel**

| | |
|---|---|
| Simultaneous modulation | All modulation types (I/Q, AM, FM/ΦM, and pulse modulation) may be simultaneously enabled except: FM with phase modulation or pulse with I/Q modulation cannot be combined and two modulation types cannot be simultaneously generated using the same modulation source; for example, the baseband I/Q generator, AM, and FM can run concurrently and all will modulate the output RF (this is useful for simulating signal impairments). |
| Composite modulation | AM, FM, and ΦM each consist of two modulation paths which are summed internally for composite modulation. Modulation can be any combination of internal sources. |

| | AM | FM[42] | Phase[42] | Internal Pulse | Internal I/Q |
|---|---|---|---|---|---|
| AM | • | • | • | • | • |
| FM[42] | • | • | — | • | • |
| Phase[42] | • | — | • | • | • |
| Internal pulse | • | • | • | — | — |
| Internal I/Q | • | • | • | — | — |

• = compatible, — = incompatible

**I/Q based analog modulation (N7642APPC)**

This section describes the functionality provided by N7642APPC PathWave Signal Generation for I/Q based amplitude modulation. External inputs are not supported. See user documentation for additional details.

| | | |
|---|---|---|
| **Amplitude modulation** | | |
| Waveform | Sine, dual-sine, triangle, ramp up, ramp down, square | |
| AM rate | Sine | 1 Hz to (maximum baseband bandwidth / 2) [43] |
| | All other waveforms | 1 Hz to (maximum baseband bandwidth / 16)[43] |
| AM depth | 0 to 100% | |
| **Frequency modulation** | | |
| Waveform | Sine, dual-sine, triangle, ramp up, ramp down, square | |
| FM rate | Sine | 1 Hz to (maximum baseband bandwidth / 4) [43] |
| | All other waveforms | 1 Hz to (maximum baseband bandwidth / 16) [43] |
| FM deviation | 0 Hz to 50 MHz | |
| **Phase modulation** | | |
| Waveform | Sine, dual-sine, triangle, ramp up, ramp down, square | |
| PM rate | Sine | 1 Hz to (maximum baseband bandwidth / 4) [43] |
| | All other waveforms | 1 Hz to (maximum baseband bandwidth / 16) [43] |
| PM deviation | 0 to 10 radians | |

**Avionics (N7641APPC)**

This section describes the functionality provided by N7641APPC PathWave Signal Generation for Avionics. See user documentation for additional details.

| | |
|---|---|
| **Type** | |
| Avionics type | VOR, ILS localizer, ILS glide slope, marker beacon |
| **Operating modes** | |
| VOR | NORM, VAR, sub-carrier, sub-carrier + FM |
| ILS localizer | NORM, suppress left, suppress right |
| ILS glide slope | NORM, suppress up, suppress down |
| Marker beacon | Inner, middle, outer |

42 FM and ΦM are available with Option ST6 and 600 only. Not compatible with Options ST5 and 500.
43 See RF (I+Q) bandwidth table for available modulation bandwidth.

# Vector Modulation (Options Bxx, Rxx)

**Internal I/Q baseband generator adjustments**

| | |
|---|---|
| Internal I and Q offset | ± 20% (0.1% resolution) |
| Internal I/Q quadrature angle | ± 20° (0.001° resolution) |
| Internal I/Q gain balance | ± 10 dB (0.001 dB resolution) |
| Internal I/Q time skew | ± 33.33 ns (100 fs resolution) |
| I/Q common delay range | 0 to 16.667 ns |
| I/Q common delay resolution | 100 fs |

**I/Q baseband output (Option AN1 and DIQ)**

| | | |
|---|---|---|
| Type | Single ended (AN1), differential (DIQ) | |
| Output impedance | Single ended | 50 Ω (nom) |
| | Differential | 100 Ω (nom) |
| Frequency range[44] | DC to 1.2 GHz (nom) for each output (2.4 GHz composite IQ) | |
| Common mode I/Q offset | ± 1.5 V (50 µV resolution) (meas) | |
| Differential mode I or Q offset | ± 1.5 V (50 µV resolution) (meas) | |
| Single ended amplitude per port | Up to 200 MHz | 1.9 Vp-p or 0.95 Vp into 50 Ω (nom) |
| | Up to 600 MHz | 1.6 Vp-p or 0.8 Vp into 50 Ω (nom) |
| | Up to 1.2 GHz | 1 Vp-p or 0.5 Vp into 50 Ω (nom) |
| SFDR without harmonics (sine) | 100 MHz or 1 GHz single tone at 500 mV | -70 dBc (meas) |
| SFDR with harmonics (sine) | 100 MHz single tone at 500 mV | -60 dBc (meas) |
| Noise floor | 1 GHz tone at 900 mV Vpeak, 10 MHz offset, measured on I channel output | -155 dBc/Hz (meas) |

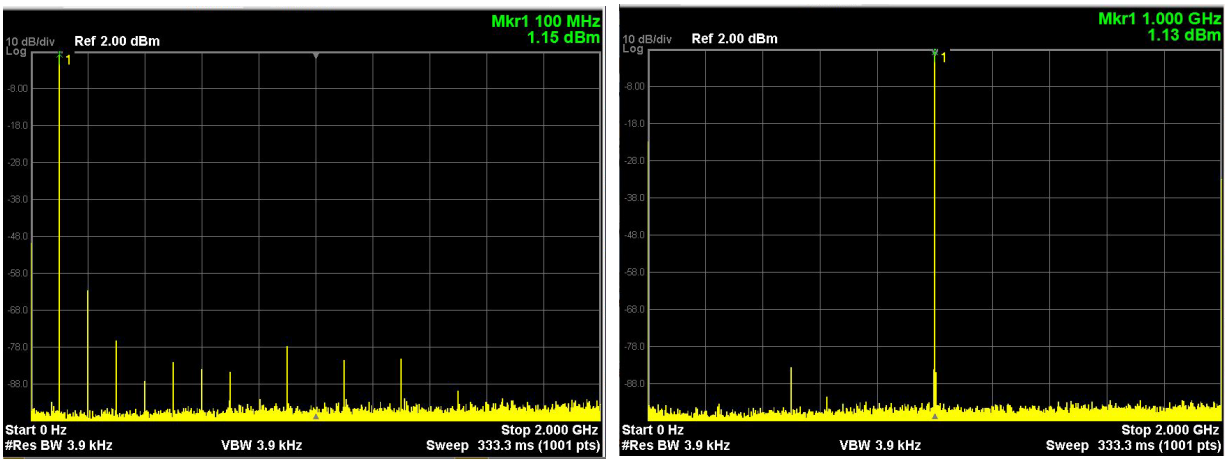



**Figure 2.** (Left) Measured IQ output, 100 MHz tone spectrum. (Right) Measured IQ output, 1 GHz tone spectrum.

44 Maximum frequency may be limited depending on selected modulation bandwidth option (Bxx, Rxx). See RF (I + Q) bandwidth and sample rate section for details.

**Internal real-time complex digital I/Q filters**

Factory channel corrections – corrects the linear phase and amplitude response of the RF outputs of the signal generator using factory calibration arrays.

**Carrier leakage**

None (direct digital modulation, no IQ modulator)

**Frequency response over available modulation bandwidth** [45]

| | M9484C | | V3080A [46] | |
|---|---|---|---|---|
| **Center frequency** | **Amplitude** | **Phase** | **Amplitude** | **Phase** |
| 400 MHz to 21.6 GHz | ±0.25 dB (meas) | ±5° (meas) | ±0.25 dB (meas) | ±5° (meas) |
| > 21.6 GHz to 35 GHz | ±0.25 dB (meas) | ±5° (meas) | ±0.25 dB (meas) | ±5° (meas) |
| > 35 GHz to 52.8 GHz | ±0.5 dB (meas) | ±10° (meas) | ±1.0 dB (meas) | ±10° (meas) |
| > 52.8 GHz to 54 GHz | ±0.5 dB (meas) | ±10° (meas) | ±0.6 dB (meas) | ±5° (meas) |
| > 54 GHz to 70 GHz | - | - | ±0.5 dB (meas) | ±10° (meas) |
| > 70 GHz to 100 GHz | - | - | ±1.0 dB (meas) | ±10° (meas) |

**User defined automatic channel response correction and S-parameter de-embedding (N7653APPC)**

| | |
|---|---|
| **Methods for fixture error removal** | |
| Scatter parameters de-embedding/embedding files generated by a network analyzer or simulation | |
| Automatic channel response correction using a power sensor or spectrum analyzer (amplitude and phase correction) | |
| Scaler user flatness (absolute power correction) | |
| **Scatter parameters** | |
| File format | .s2p, .csv |
| Number of cascadeable calibration sets | 4 |
| **Automated channel response correction (512 taps)** [47] | |
| Recommended maximum amplitude for error correction | ± 5 dB across modulation bandwidth |
| **User flatness** | |
| File format | .uflat, .csv |
| Entry modes | USB or LAN direct power meter control |

**Instrument nonlinear correction (N7653APPC)**

Improve the characteristics of the generated signal by digitally predistorting the waveform to reduce distortion components.

45 See RF (I+Q) bandwidth table for available modulation bandwidth.
46 V3080A performance applies after an RF channel flatness adjustment completed using an N9042B UXA signal analyzer and V3050A signal analyzer frequency extender. For frequencies ≤ 52.8 GHz, measured at power levels between -15 dBm and -25 dBm. For frequencies > 52.8 GHz, measured at power levels between -10 dBm and -20 dBm.
47 Automated routine uses power sensor to correct for linear amplitude response of DUT (equalizer). See User Documentation for more details.

# Internal Baseband Generator (Options Bxx, Rxx)

**Definitions**

| | |
|---|---|
| Channel or port | The number of physical RF outputs |
| Signal[48] | By default, each channel can generate one signal (ex: one waveform file). When option 8SG is included, each channel can generate up to 8 signals, which are summed and played out of the single RF output. |
| Group | A group can contain 1 to 8 signals assigned to a channel |

**Internal baseband generator (Options Bxx, Rxx)**

| | |
|---|---|
| I/Q file resolution | 16 bits |
| Waveform granularity | 1 sample |
| Frequency offset | ± half of maximum baseband bandwidth |
| Signal attenuation | 0 to -100 dB |
| Sample rate resolution | 10 µHz |
| Interpolated I/Q rate | Fixed 3 GHz |

**RF (I + Q) bandwidth[49] and sample rate**

| Option | RF (I + Q) bandwidth (nom) | Sample rate (nom) |
|---|---|---|
| Option B1X | 160 MHz | 200 MSa/s |
| Option B2X | 250 MHz | 300 MSa/s |
| Option B5X | 500 MHz | 600 MSa/s |
| Option R10 | 1 GHz | 1.2 GS/s |
| Option R25 | 2.5 GHz | 3 GS/s |

**RF (I + Q) bandwidth[49] and sample rate, limited options**

| Option | Option R1E | | Option R2E | |
|---|---|---|---|---|
| Frequency | RF (I + Q) bandwidth (nom) | Sample rate (nom) | RF (I + Q) bandwidth (nom) | Sample rate (nom) |
| 9 kHz to ≤ 5.75 GHz | 1 GHz | 1.2 GS/s | 2.5 GHz | 3 GS/s |
| > 5.75 GHz to ≤ 31.25 GHz | 1 GHz | 1.2 GS/s | 2.2 GHz | 3 GS/s |
| > 31.25 GHz to ≤ 31.838 GHz | 1 GHz | 1.2 GS/s | 1 GHz | 3 GS/s |
| > 31.838 GHz to < 36.962 GHz | 550 MHz | 1.2 GS/s | 550 MHz | 3 GS/s |
| 36.962 GHz to < 37.55 GHz | 1 GHz | 1.2 GS/s | 1 GHz | 3 GS/s |
| 37.55 GHz to 54 GHz | 1 GHz | 1.2 GS/s | 2.2 GHz | 3 GS/s |
| > 54 GHz to < 89.05 GHz[50] | 1 GHz | 1.2 GS/s | 2.2 GHz | 3 GS/s |
| 89.05 GHz to 110 GHz[50] | 1 GHz | 1.2 GS/s | 2.5 GHz | 3 GS/s |

**Channel bonding (Option CB5)**

Using an external combiner[51], bond 2 or 4 channels to play waveform files with a maximum bandwidth of 5 or 10 GHz. Requires a multi-channel M9484C with option PCH, Option R25 on each channel, N7653APPC PathWave Signal Generation, and a supported receiver to perform the necessary alignment. See User Documentation for details.

**Arbitrary waveform memory**

| | | |
|---|---|---|
| Maximum arbitrary waveform playback memory | Standard with Option B1X or B2X | 64 MSa |
| | Standard with Option B5X, R10, R1E, R25, or R2E | 256 MSa |
| | Option M05 | 512 MSa |
| | Option M10 | 1024 MSa |
| | Option M20 | 2048 MSa |
| | Option M40 | 4096 MSa |
| Maximum storage capacity including other user data | 32 GB shared with operating systems (nom) | |

48 When AWGN or CW Interferer are enabled, Option 8SG provides 7 signals.
49 RF (I+Q) bandwidth may be limited when harmonic filters are enabled (selectable with Option 1EH). Lower edge of modulated signal is not recommended to extend below 10 MHz. Upper edge of modulated signal is not recommended to extend above 8.5 GHz (Option 508), 21 GHz (Option 520), or 54 GHz (option 554).
50 Frequency range is valid for M9484C with V3080A.
51 Available as accessory kits Y1166A and Y1167A. See Configuration Guide for details.

**Waveform segments**

| | |
|---|---|
| Segment length | 512 samples[52] to maximum arbitrary waveform playback memory |
| Memory allocation blocking factor | 256 samples |

**Waveform sequences**

| | |
|---|---|
| Maximum number of segments per sequence[53] | 65,280 |
| Maximum number of repetitions | $2^{32}$-1 |

**Triggers**

| | | |
|---|---|---|
| Trigger types | | Continuous, single |
| Trigger sources | | Trigger key, external, bus (LAN, GPIB), global trigger (Option PCH), timer, date/time (Option PCH) |
| Trigger modes | Continuous | Free run, trigger and run, reset and run |
| | Single | Buffered trigger, no retrigger, restart on trigger |
| Trigger features | | External trigger playback synchronization |
| Trigger delay range | | 0 to 41 s |
| Trigger delay resolution | | 333 ps |
| I/Q delay range | | See Internal I/Q baseband generator adjustments section |
| I/Q delay resolution | | See Internal I/Q baseband generator adjustments section |
| Trigger jitter | | ± 1.67 ns (1/300 MHz clock rate) |
| Trigger latency[54] | Reset and run, single restart on trigger | 4 us (nom) to stop, 37 µs (nom) to start of playback for sample rates > 1.7 MSa/s[55] |
| | All other trigger modes | 4 µs (nom) |
| Date/time trigger | | Hardware assisted time via PPS input (Opt 1ER and PCH) can be enabled to provide within 10 ns (nom) correction to the current date/time. Without hardware assist, based on NTP for millisecond timing accuracy. See User Documentation for details. |

**Multi-channel baseband synchronization primary/secondary (Option PCH and SNC[56])**

| | |
|---|---|
| Global trigger delay range | 0 to 41 s |
| Global trigger delay resolution | 333 ps |
| Global trigger jitter | ± 10 ns (nom) relative to asynchronous external system trigger event |
| Global trigger channel-to-channel relative trigger repeatability | After synchronization alignment, all channels will start on the same clock edge. See User Documentation for synchronization alignment details. |

**Markers**

| | |
|---|---|
| Markers are defined in a segment during the waveform generation process. Markers can be routed to the external outputs. See User's Documentation for more information. | |
| Marker polarity | Positive |
| Number of markers | 4 |
| Marker routing | Event 1-3, Trig 1- 3, Trig A-C, AIO 1-12 via aux connector |
| Marker to waveform jitter (event outputs) | < 52 ps (nom) (sample rate is a submultiple of 3 GHz)<br>< 333 ps (nom) (sample rate is not a submultiple of 3 GHz) |
| Marker to waveform jitter (trigger outputs) | < 1.67 ns (nom) |
| Marker edge update rate | 1.67 ns |
| Marker combining (Option 8SG) | Multiple markers can be combined on one output connector via an OR operation |

52 Waveforms with fewer samples will be repeated or extended as selected.
53 Sequence memory is shared with all signals on a channel. The consumption is non-uniform based on size of waveforms, trigger type, and nested sequences.
54 Trigger latency may increase when using global trigger as the trigger source. Contact Keysight for details.
55 Contact Keysight for sample rates ≤ 1.7 MSa/s
56 Option SNC requires option PCH on all M9484Cs and appropriate cabling of LOs and trigger lines between M9484Cs to achieve results, taking fanout limitations into consideration.

**AWGN (Option 403)**

| | | |
|---|---|---|
| Type | Real-time | |
| Modes of operation | Standalone signal[57] or digitally added to signals[58] | |
| Bandwidth | 1.6 Hz to maximum baseband bandwidth, 0.8 Hz resolution | |
| Crest factor | Standalone signal | 21.8 dB (nom) |
| | Digitally added to signals | 18.5 dB (nom) |
| Randomness | Standalone signal | 6 hours |
| | Digitally added to signals | 194 years at 2.5 GHz bandwidth |
| Carrier-to-noise ratio | ± 100 dB when added to signal | |
| Carrier-to-noise ratio formats | C/N, Eb/No | |

**CW interferer (Option 403)**

| | |
|---|---|
| Type | Real-time |
| Modes of operation[59] | Standalone signal or digitally added to signals |
| Power control | Absolute, relative to signal power |
| Frequency offset | ± half of maximum baseband bandwidth[60] |

**Single tone, multitone and noise power ratio (NPR) (N7621APPC)**

| | | |
|---|---|---|
| Type | Arbitrary waveform file | |
| Number of tones | Multitone mode | 2 to 200,001 |
| | Single tone mode[61] | 1 |
| Tone spacing | 100 Hz to Floor [(maximum baseband bandwidth[60])/((number of tones) - 1)/100] * 100 | |
| Phase distribution | Random, constant, parabolic | |
| Number of notches | 0 to 20 | |
| Corrections[62] | In-band and out-of-band pre-distortion for intermodulation distortion (IMD) products or adjacent channel power ratio (ACPR), including flatness correction | |

**Eight virtual signal generators (Option 8SG)**

| | |
|---|---|
| Combined signal sample rate | ≤ 3 GSa/s |
| Combined signal bandwidth | ≤ maximum baseband bandwidth[60] |
| Individual signal sample rate | ≤ maximum sample rate[60] |
| Individual signal frequency offset | ± half of maximum baseband bandwidth[60] |
| Individual signal phase offset | ± 360° |
| Individual signal attenuation | 0 to -100 dB |

**Optical digital I/Q streaming inputs (Option DS1)**

| | | |
|---|---|---|
| Lane rate | | 14.1 Gbps or 12.5 Gbps |
| Payload format (VITA-49) | | 16-bit IQ data, no marker data |
| | | 14-bit IQ data, 2-bit marker data |
| | | 24-bit IQ data, 8-bit marker data |
| Number of streams | Without eight virtual signal generators (Option 8SG) | 1 |
| | With eight virtual signal generators (Option 8SG) | 1 to 8 |
| Sample rate | | 100 Hz to maximum sample rate[60] |

**Custom Fading (N7605APPC and F9860400A)** [63]

| | |
|---|---|
| Generate signals with custom fading for receiver testing using *.tdlx files exported from the Keysight Channel Studio tapped delay line (TDL) modeling tool to configure parameters. | |
| Power delay profiles | up to 24 paths |
| Amplitude distributions | Constant phase, Raleigh, Rice |
| Doppler profiles | Pure doppler, Jakes, Flat, Rounded |
| MIMO | Up to 8x8, Low/Medium/Medium-A/High-correlation |

57 With Option 8SG, each of the 8 signals can support independently tunable AWGN.
58 When AWGN is enabled, option 8SG provides 7 signals.
59 When CW interferer is enabled, Option 8SG provides 7 signals.
60 For maximum baseband bandwidth and sample rate, see RF (I+Q) bandwidth and sample rate.
61 Single tone generates a single CW tone at a specified offset to the channel's RF frequency.
62 Correction requires signal analyzer. See User Documentation for details.
63 See User Documentation for additional details.

**3GPP MIMO Fading (5G NR FR1 & FR2, LTE) (N7605AP0C)[63]**

| | MIMO order (user selectable) | |
|---|---|---|
| **M9484C configuration** | **Without eight virtual signal generators (Option 8SG)** | **With eight virtual signal generators (Option 8SG)** |
| One channel (001) | 1x1 | 1x1, 2x1, 4x1, 8x1 |
| Two channels (002, PCH) | 1x1, 1x2 | 1x1, 1x2, 2x1, 2x2, 4x1, 4x2, 8x1, 8x2 |
| Four channels (004, PCH) | 1x1, 1x2, 1x4 | 1x1, 1x2, 1x4, 2x1, 2x2, 2x4, 4x1, 4x2, 4x4, 8x1, 8x2, 8x4 |
| Eight channels (SNC) | 1x1, 1x2, 1x4, 1x8 | 1x1, 1x2, 1x4, 1x8, 2x1, 2x2, 2x4, 2x8, 4x1, 4x2, 4x4, 4x8, 8x1, 8x2, 8x4, 8x8 |
| **Supported channel models** | | |
| 5G | Static, TDLA10/30, TDLB100, TDLC300, TDLD10/30, UL Timing Scenario X/Y/Z, HST Scenario 1/3/4 | |
| LTE | Static, EPA1/5, EVA5/70, ETU1/5/70/200/300/600, UL Timing Scenario 1/2, HST Scenario 1/3 | |

**GNSS (N7609APPC) [64]**

Create validated real-time signals that simulate satellites from the US Global Positioning System (GPS). Requires option for 500 MHz RF bandwidth or greater. See Technical Overview for details.

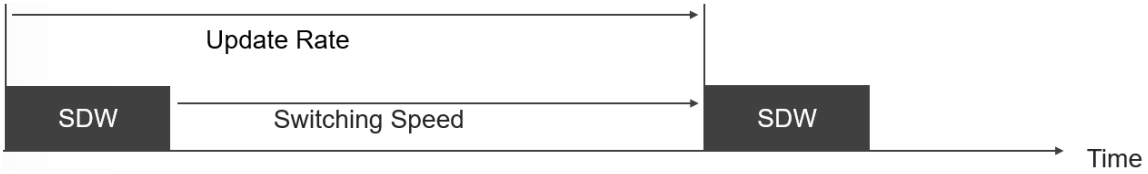
**Signal descriptor word streaming (including pulse descriptor word (PDW))[65]**

| | |
|---|---|
| Option SDW | SDW option enables agile control of frequency, amplitude, phase, time, and waveform inside the instantaneous bandwidth of the baseband. Each SDW (PDW) will address an IQ waveform segment or create the IQ in real time, including pulse modulation. Channel flatness correction is available in SDW-only mode. The SDW packets can be streamed from a file or over LAN for dynamic long duration scenarios. |
| **Virtual channels** | |
| Enables the simultaneous stream of SDW channels within IF bandwidth | |
| Option 2CH | Enables up to 2 simultaneous SDW streams |
| Option 4CH | Enables up to 4 simultaneous SDW streams |
| Option 8CH | Enables up to 8 simultaneous SDW streams |

**Agile RF (ARF) operating mode**

| | |
|---|---|
| Option ARF | Option ARF requires Option SDW for operation with both options installed on the same M9484C channel. ARF works with SDW to enable agile control of frequency, amplitude, phase, time and waveform from 9 kHz to 20 GHz. In an M9484C with frequency range Options 532, 544, or 554, ARF mode is limited to 20 GHz frequency range. ARF is a separate launch mode from SDW-only and Normal modes and is enabled via the SDW file. Channel flatness correction is not available when using ARF mode. If Option ARF is ordered as an upgrade to an existing instrument, calibration & adjustment may be required at the time upgrade, depending upon the instrument status; consult Keysight prior to purchase. |

| **Parameter** | **Value (meas)** | | **Additional Information** |
|---|---|---|---|
| ARF Mode Amplitude Switching Speed | 210 ns (Option 1EH *OFF*) | 1.45 µs (option 1EH *ON*, freq. <7.25 GHz) | Defined as the minimum time between the end of the last SDW and start of the next SDW, settled to within 1dB. |
| ARF Mode Update Rate | 800 ns | | Defined as sustainable SDW throughput.<br>Note: 942 samples required between SDWs |




64 See User Documentation for additional details.
65 Signal descriptor word streaming (SDW), agile RF (ARF) mode and virtual channel options (2CH, 4CH, and 8CH) are controlled for export under the International Traffic in Arms Regulations (ITAR). A license from the U.S. Department of State is required prior to the export of these options from the United States.

# Multi-instrument Synchronization (Option SNC)

**Multi-instrument synchronization mechanism**

| | Basic multi-instrument synchronization |
|---|---|
| Number of endpoints | Up to 8 |
| Instrument configuration | Any configuration combination, see multi-instrument synchronization configurations for details and limitations |
| Operating modes | With leader, independent |

**Multi-instrument synchronization configurations**

The leader instrument must be able to supply the required inputs to each follower. For configurations where the number of required follower inputs exceeds the available leader outputs, a power splitter or distribution amplifier may be required. See Startup Guide for input/output power level requirements.

| | | | Basic multi-instrument synchronization | | | |
|---|---|---|---|---|---|---|
| Hardware Configuration | | | Number of available outputs as a leader | | Number of required inputs as a follower | |
| Number of channels | Maximum frequency | Endpoints | 19.2 GHz | 2.4 GHz | 19.2 GHz | 2.4 GHz |
| 1 (Opt. 001) | 6 GHz or 8.5 GHz (Opt. 506 or 508) | 1 | 3 | 0 | 1 | 0 |
| | 14 GHz or 20 GHz (Opt. 514 or 520) | 1 | 1 | 1 | 1 | 1 |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) | 1 | 1 | 1 | 1 | 1 |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) with one V3080A | 1 | 1 | 1 | 1 | 1 |
| 2 (Opt. 001 and 002) | 6 GHz or 8.5 GHz (Opt. 506 or 508) | 2 | 2 | 0 | 2 | 0 |
| | 14 GHz or 20 GHz (Opt. 514 or 520) | 2 | 1 | 1 | 1 | 1 |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) | 1 | 1 | 1 | 1 | 1 |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) with one V3080A | 1 | 1 | 1 | 1 | 1 |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) with two V3080As | 1 | 1 | 1 | 1 | 1 |
| 4 (Opt. 001, 002, 003, and 004) | 6 GHz or 8.5 GHz (Opt. 506 or 508) | 1 | 2 | 0 | 1 | 0 |
| | 14 GHz or 20 GHz (Opt. 514 or 520) | 1 | 1 | 1 | 1 | 1 |

# Error Vector Magnitude (EVM)[66]

**EVM for 5G NR FR1 bands, -10 dBm to +5 dBm, Option ST6**

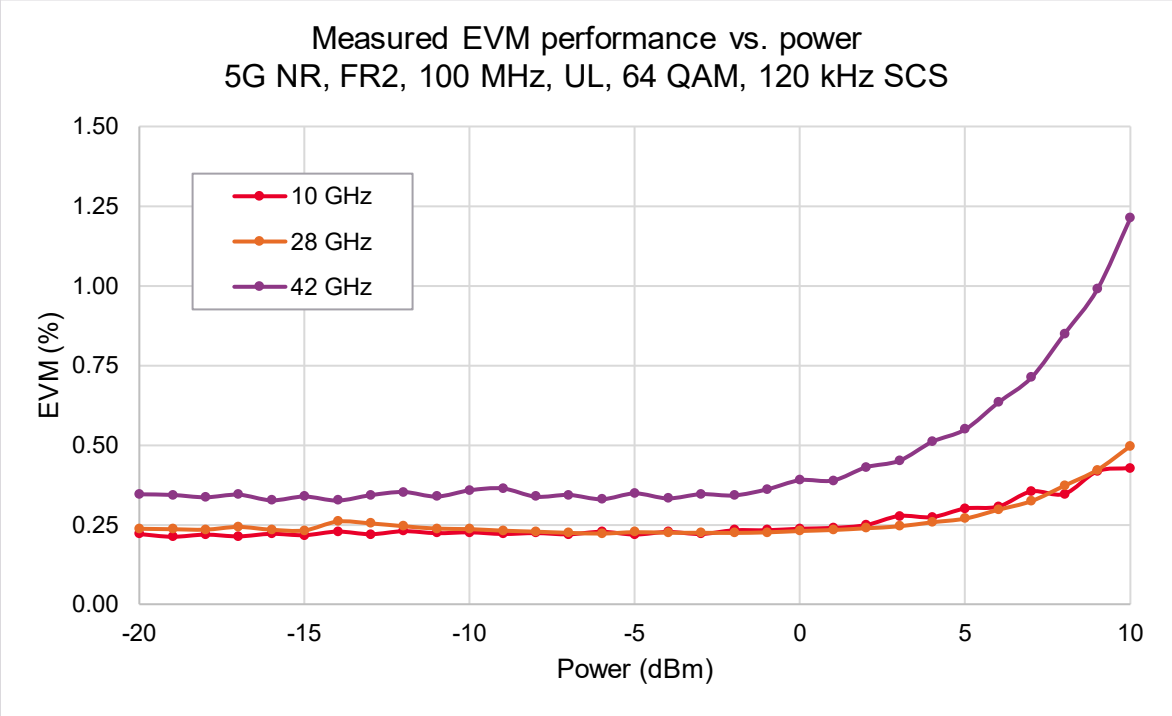
| Frequency | 100 MHz, DL, 256QAM, 30 kHz SCS |
|---|---|
| 2 GHz | 0.13% (meas) |
| 4.5 GHz | 0.18% (meas) |

**EVM for 5G NR FR2 bands and IFs, -10 dBm to +5 dBm, Option ST6**

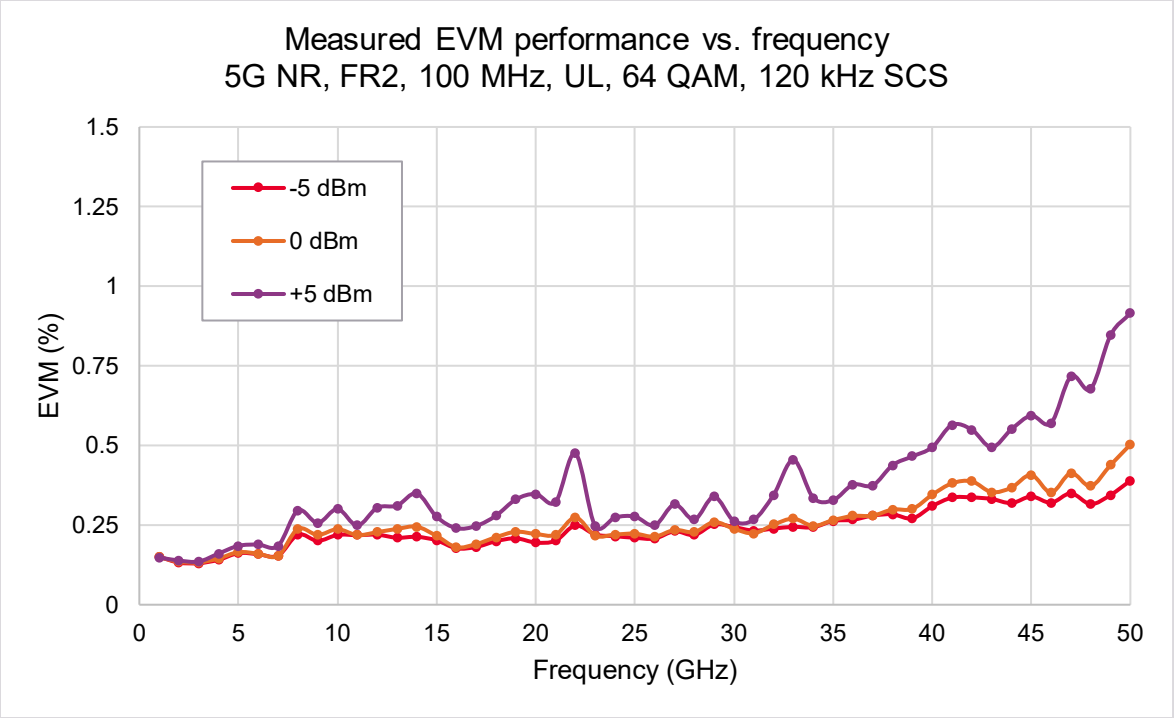
| Frequency | 100 MHz, UL, 64QAM, 120 kHz SCS | 400 MHz, UL, 64QAM, 120 kHz SCS |
|---|---|---|
| 10 GHz | 0.30% (meas) | 0.40% (meas) |
| 12 GHz | 0.31% (meas) | 0.40% (meas) |
| 24 GHz | 0.28% (meas) | 0.35% (meas) |
| 28 GHz | 0.27% (meas) | 0.36% (meas) |
| 39 GHz | 0.47% (meas) | 0.55% (meas) |
| 42 GHz | 0.55% (meas) | 0.63% (meas) |
| 70 GHz[67] | 1.07% (meas) | 1.23% (meas) |

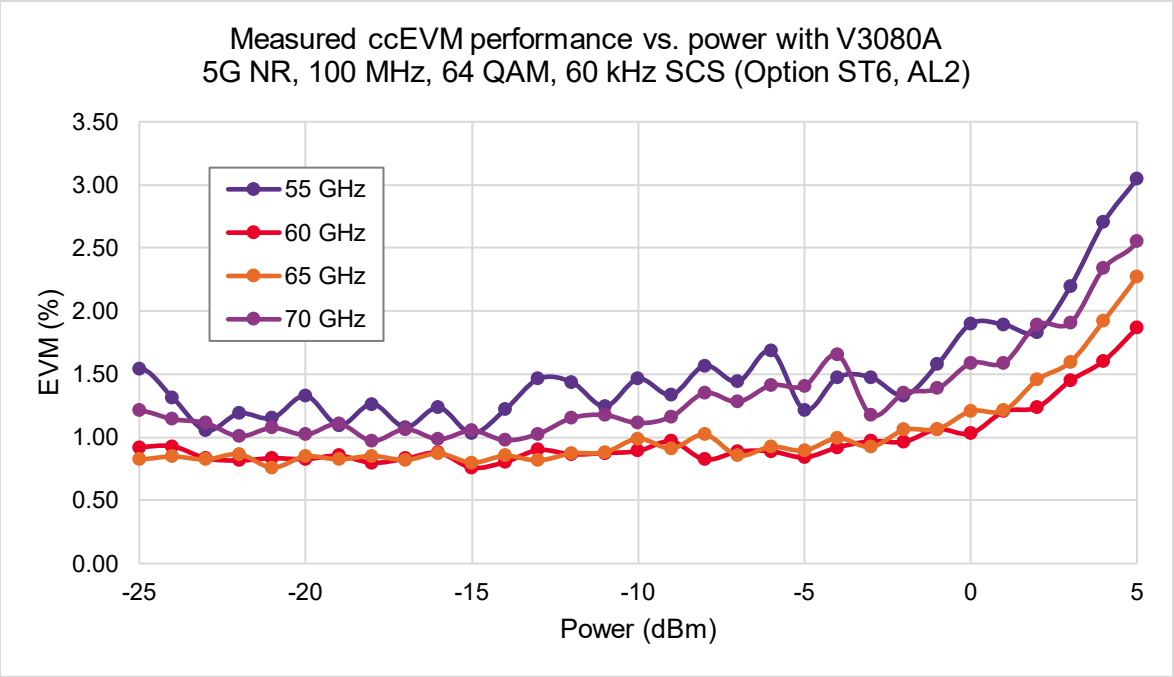
**EVM for WLAN, -10 dBm to +5 dBm, Option ST6**

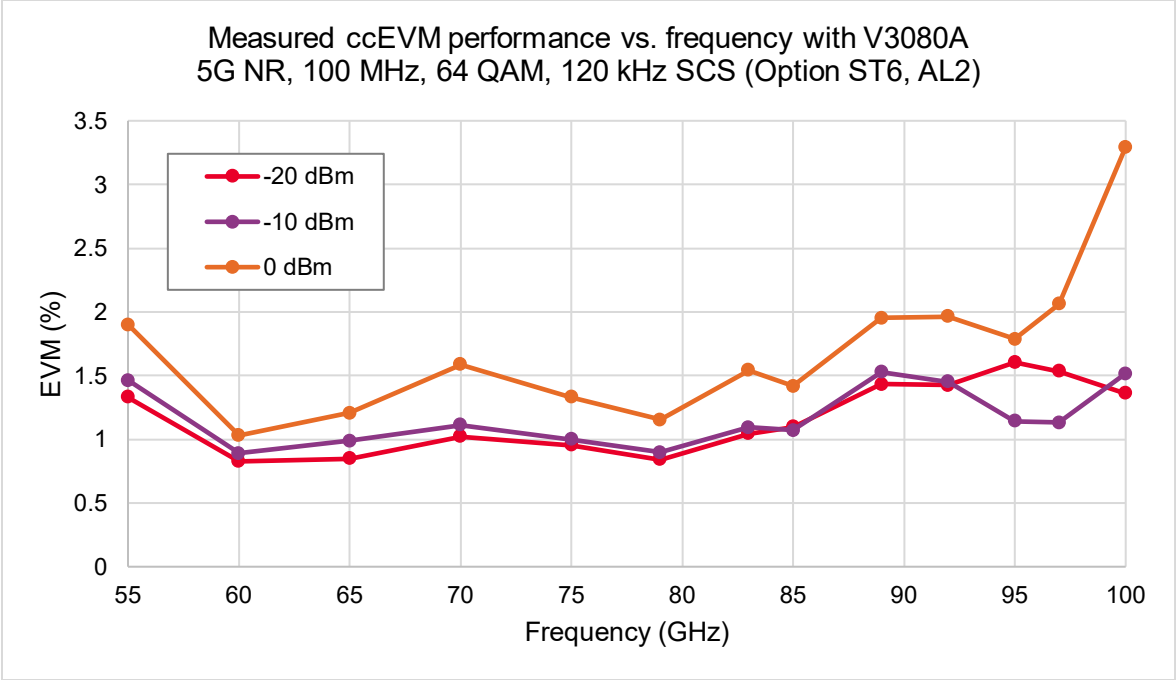
| Frequency | 802.11be, 320 MHz, MCS13, 300 µs, Ch Estimation Seq Only |
|---|---|
| 7 GHz | -52 dB (meas) |

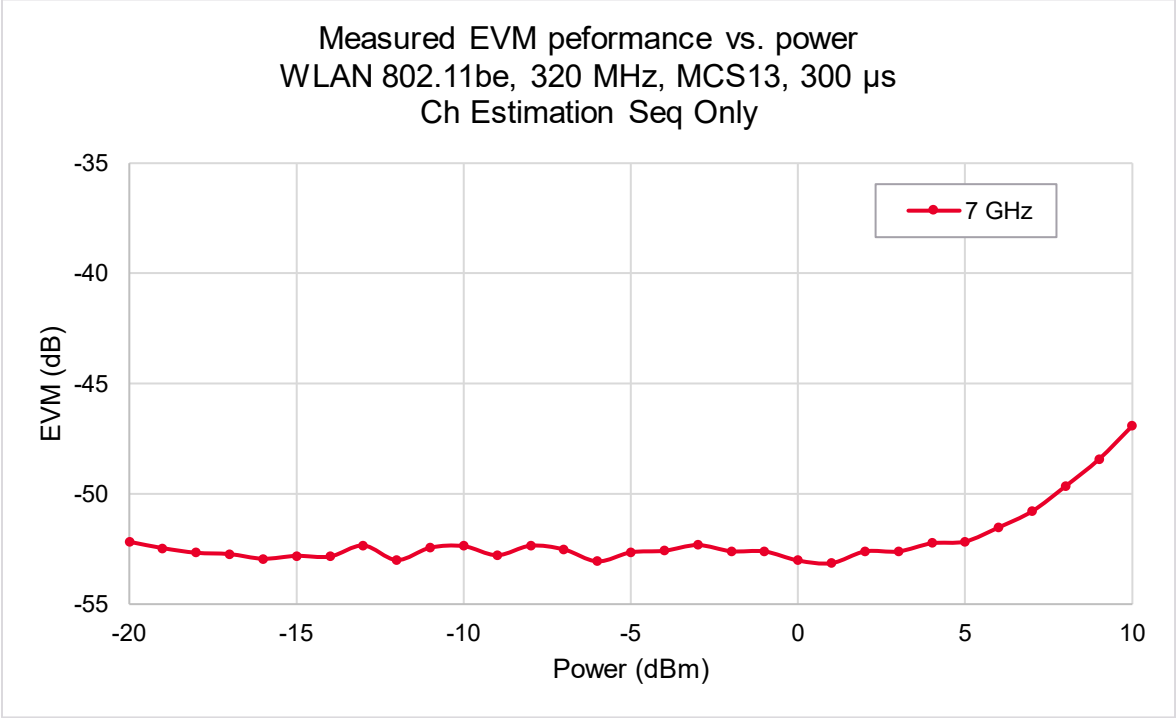



66 Unless otherwise stated, IQNC technique has been applied to minimize receiver noise contribution.
67 Valid for M9484C with V3080A from -25 dBm to -10 dBm, using cross-correlated EVM measurement technique.


Measured EVM performance vs. frequency
5G NR, FR2, 100 MHz, UL, 64 QAM, 120 kHz SCS
EVM (%)
1.5
1.25
1
0.75
0.5
0.25
0
-5 dBm
0 dBm
+5 dBm
0
5
10
15
20
25
30
35
40
45
50
Frequency (GHz)


Measured ccEVM performance vs. power with V3080A
5G NR, 100 MHz, 64 QAM, 60 kHz SCS (Option ST6, AL2)
EVM (%)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
55 GHz
60 GHz
65 GHz
70 GHz
-25
-20
-15
-10
-5
0
5
Power (dBm)


Measured ccEVM performance vs. frequency with V3080A
5G NR, 100 MHz, 64 QAM, 120 kHz SCS (Option ST6, AL2)
-20 dBm
-10 dBm
0 dBm
EVM (%)
3.5
3
2.5
2
1.5
1
0.5
0
55
60
65
70
75
80
85
90
95
100
Frequency (GHz)


Measured EVM peformance vs. power
WLAN 802.11be, 320 MHz, MCS13, 300 µs
Ch Estimation Seq Only
7 GHz
EVM (dB)
-35
-40
-45
-50
-55
-20
-15
-10
-5
0
5
10
Power (dBm)

# Distortion Performance (Adjacent Channel Power Ratio)

**3GPP LTE-FDD distortion performance, -10 dBm to + 5 dBm[68], () = typ**

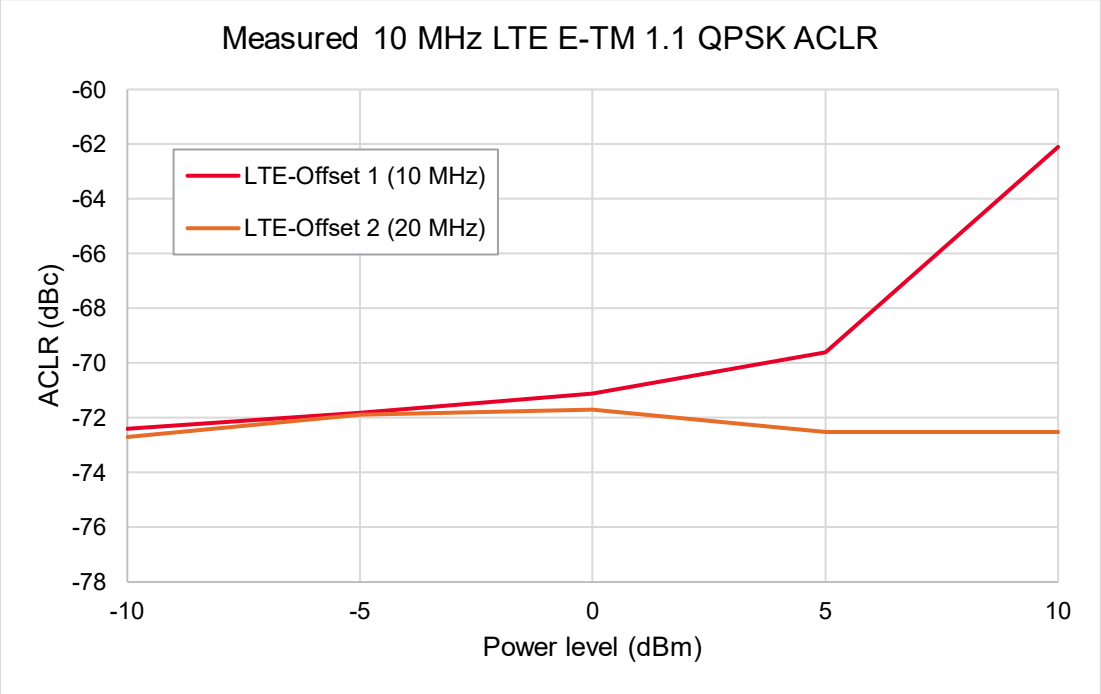
| | 10 MHz E-TM 1.1 QPSK | | |
|---|---|---|---|
| **Frequency** | **Offset[69]** | **Options 506, 508** | **Options 514, 520, 532, 544, 554** |
| 1800 to 2200 MHz | Adjacent (10 MHz) | -64 dBc (-68 dBc) | -63 dBc (-67 dBc) |
| | Alternate (20 MHz) | -65 dBc (-68 dBc) | -63 dBc (-67 dBc) |

**5G NR FR1 bands distortion performance, -10 dBm to +5 dBm, Options 506, 508, 514, 520**

| **Frequency** | **100 MHz, 256QAM, 120 kHz SCS, NRB = 135** |
|---|---|
| 3.4 GHz | -56 dBc (meas) |

**5G NR FR2 bands and IFs distortion performance, -10 dBm to +5 dBm**

| **Frequency** | **100 MHz, 256QAM, 120 kHz SCS, NRB = 66** | **400 MHz, 256QAM, 120 kHz SCS, NRB = 264** | **8cc x 100 MHz (800 MHz), 256QAM, 120 kHz SCS, NRB = 66** | **14cc x 100 MHz (1.4 GHz), 256QAM, 60 kHz SCS, NRB = 66** |
|---|---|---|---|---|
| 9 GHz to 20 GHz | -56 dBc (typ) | -51 dBc (typ) | -48 dBc (typ) | -45 dBc (typ) |
| > 20 GHz to 30 GHz | -51 dBc (typ) | -46 dBc (typ) | -45 dBc (typ) | -41 dBc (typ) |
| > 30 GHz to 50 GHz | -50 dBc (typ)[70] | -43 dBc (typ)[70] | -42 dBc (typ)[70] | -38 dBc (typ)[70] |
| > 50 GHz to < 52.8 GHz | -46 dBc (typ)[71] | -41 dBc (typ)[71] | -38 dBc (typ)[71] | -35 dBc (typ)[71] |
| 52.8 GHz to 71 GHz[72] | -43 dBc (typ) | -40 dBc (typ) | -36 dBc (typ) | n/a |




68 This is rms power. Convert from rms to peak envelope power with the following equation: PEP = rms power + crest factor (for example, 3GPP test model 1 with 64 DPCH has a crest factor 11.5 dB, therefore at +5 dBm rms, the PEP = 5 dBm + 11.5 dB = +16.5 dBm PEP).
69 ACPR measurement configuration: reference channel integration BW: 9.015 MHz, offset channel integration bandwidth: 9.015 MHz.
70 Valid over power range from -5 dBm to +5 dBm.
71 Valid over power range from -10 dBm to 0 dBm.
72 Frequency range valid for M9484C with V3080A.

# Remote Programming

| Remote programming | |
|---|---|
| Interfaces | GPIB (IEEE-488.2,1987) with listen and talk, and 1000BaseT LAN interface |
| Control languages | SCPI version 1999.0 |
| IEEE-488 functions | SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT0, C0, E2 |
| Keysight IO libraries | Keysight's IO Library Suite helps you quickly establish an error-free connection between your PC and instruments – regardless of the vendor. It provides robust instrument control and works with the software development environment you choose. |

# General Specifications

| Environmental specifications and regulatory compliance (nom) | | |
|---|---|---|
| Temperature | Operating | 0 to 50 °C |
| | Storage | -40 to +70 °C |
| Type tested maximum relative humidity | | 95% RH up to 40 °C, decreases linearly to 57% RH at 50 °C[73] |
| Altitude | Operating | 3,000 m (Up to 10,000 feet approx.) |
| | Storage | 4,572 m (Up to 15,000 feet) |
| EMC | | Complies with the essential requirements of the European EMC Directive and the UK Electromagnetic Compatibility Regulations 2016 as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity):<br>– IEC/EN 61326-1<br>– CISPR Pub 11 Group 1, class A<br>– AS/NZS CISPR 11<br>– CSA ICES/NMB-001(A)<br>This ISM device complies with Canadian ICES-001.<br>Cet appareil ISM est conforme a la norme NMB-001 du Canada. |
| Environmental testing | | Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation and end-use. Those stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power-line conditions. Test methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3. |

73 From 40 °C to 50 °C, the maximum % relative humidity follows the line of constant dew point.

**Power requirements (nom)**

| Number of channels | Maximum frequency | Power requirements | Typical power consumption |
|---|---|---|---|
| 1 (Opt. 001) | 6 GHz or 8.5 GHz (Opt. 506 or 508) | 100-120 VAC, 50/60/400 Hz, 1350 W Max<br>200-240 VAC, 50/60 Hz, 2000W Max. | 550 W |
| | 14 GHz or 20 GHz (Opt. 514 or 520) | 100-120 VAC, 50/60/400 Hz, 1350 W Max<br>200-240 VAC, 50/60 Hz, 2000W Max. | 600 W |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) | 100-120 VAC, 50/60/400 Hz, 1350 W Max<br>200-240 VAC, 50/60 Hz, 2000W Max. | 800 W |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) with one V3080A | 100-120 VAC, 50/60/400 Hz, 1350 W Max<br>200-240 VAC, 50/60 Hz, 2000W Max. | 821 W |
| 2 (Opt. 001 and 002) | 6 GHz or 8.5 GHz (Opt. 506 or 508) | 100-120 VAC, 50/60/400 Hz, 1350 W Max<br>200-240 VAC, 50/60 Hz, 2000W Max. | 750 W |
| | 14 GHz or 20 GHz (Opt. 514 or 520) | 100-120 VAC, 50/60/400 Hz, 1350 W Max<br>200-240 VAC, 50/60 Hz, 2000W Max. | 860 W |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) | 100-120 VAC, 50/60/400 Hz, 1350 W Max<br>200-240 VAC, 50/60 Hz, 2000W Max. | 1200 W |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) with one V3080A | 200-240 VAC, 50/60 Hz, 2000W Max. | 1221 W |
| | 31.8 GHz, 44 GHz, or 54 GHz (Opt. 532, 544, or 554) with two V3080As | 200-240 VAC, 50/60 Hz, 2000W Max. | 1242 W |
| 4 (Opt. 001, 002, 003, and 004) | 6 GHz or 8.5 GHz (Opt. 506 or 508) | 100-120 VAC, 50/60/400 Hz, 1350 W Max<br>200-240 VAC, 50/60 Hz, 2000W Max. | 1200 W |
| | 14 GHz or 20 GHz (Opt. 514 or 520) | 200-240 VAC, 50/60 Hz, 2000W Max. | 1500 W |

**M9484C physical specifications (nom)**

| | Configuration | One channel (001) | Two channels (002) | Four channels (004) |
|---|---|---|---|---|
| Weight | Options 506, 508 | 61.4 lbs. | 66.0 lbs. | 76.2 lbs. |
| | Options 514, 520 | 63.0 lbs. | 67.6 lbs. | 77.8 lbs. |
| | Options 532, 544, 554 | 64.5 lbs. | 73.2 lbs. | - |
| Dimensions | Height | | 193 mm | |
| | Width with strap handles | | 461.5 mm | |
| | Width without strap handles | | 445 mm | |
| | Length including connectors and jumper cables | | 635.0 mm | |

**V3080A physical specifications (nom)**

| | | |
|---|---|---|
| Weight | 0.62 kg | |
| Dimensions | Height | 81 mm |
| | Width | 48 mm |
| | Length | 116 mm |

**Display (nom)**

| | |
|---|---|
| Resolution | 1280 x 768 pixels |
| Size | 10.6 in (26.9 cm) diagonal |

**Data storage (nom)**

| | |
|---|---|
| Internal | Removable solid-state drive (256 GB) |
| External | Supports USB 3.0/2.0 compatible memory devices |

**Recommended calibration cycle**

1 year

# Keysight Support Services

Accelerate your learning curve, enhance your test uptime, and confidently guarantee your instrument accuracy with Keysight Support Services. Keysight Services are here to support your test needs with expert technical support, instrument repair and calibration, training, alternative acquisition program options, and more.

A KeysightCare agreement provides dedicated, proactive support through a single point of contact for an extensive group of instruments, software, and solutions to ensure optimal uptime, with fast response times and resolution. Explore the services that are right for you.

## Keysight Services

| Offering | Benefits |
|---|---|
| KeysightCare   | KeysightCare provides elevated support for Keysight instruments and software, with access to technical support experts who respond within a specified time and ensure committed repair and calibration turnaround times (TAT). KeysightCare offers multiple service agreement tiers, including KeysightCare Assured, Enhanced, and Application Software Support. See the KeysightCare data sheet for details. |
| KeysightCare Assured | KeysightCare Assured provides a commitment to respond to your engineer's technical needs quickly. When unexpected repairs are necessary, you can count on a committed repair service turnaround time to get you back up and running. |
| KeysightCare Enhanced | KeysightCare Enhanced includes all the benefits of KeysightCare Assured plus Keysight's accurate and reliable Calibration Services, accelerated and committed TAT, and technical response. |
| Keysight Support Portal & Knowledge Center | All KeysightCare tiers include access to the Keysight Support Portal, where you can manage support and service resources related to your assets, such as service requests and status, or browse the Knowledge Center. |
| Education Services | Build confidence and gain new skills to make accurate measurements, with flexible Education Services developed by Keysight experts. Including Start-up Assistance. |
| **Alternative acquisition options** | |
| KeysightAccess | Reduce budget challenges with a lease-based subscription service that offers low monthly payments, enabling you to get the instruments, software, and technical support you want for your test needs. |

## Recommended services

Maximize your instrument uptime and confidently make accurate measurements by securing technical support, repair, and calibration services with committed response and turnaround times. High-performance instruments include 1 year of KeysightCare Assured or KeysightCare Warranty Plus. Obtain multi-year KeysightCare upfront to eliminate the need for lengthy and tedious paperwork and yearly requests for maintenance budget. Plus, you benefit from secured service for 2, 3, or 5 years.

| Service | Function |
|---|---|
| **KeysightCare Enhanced*** | **Includes tech support, warranty and calibration** |
| R-55B-001-1 | KeysightCare Enhanced – Upgrade 1 year |
| R-55B-001-2 | KeysightCare Enhanced – Extend to 2 years |
| R-55B-001-3 | KeysightCare Enhanced – Extend to 3 years (Recommended) |
| R-55B-001-5 | KeysightCare Enhanced – Extend to 5 years (Recommended) |
| **KeysightCare Assured*** | **Includes tech support and warranty** |
| R-55A-001-2 | KeysightCare Assured – Extend to 2 years |
| R-55A-001-3 | KeysightCare Assured – Extend to 3 years |
| R-55A-001-5 | KeysightCare Assured – Extend to 5 years |
| **Start-Up Assistance** | |
| PS-S40-01 | Included – instrument fundamentals and operations starter |
| PS-S40-04 | Recommended – instrument fundamentals and operations starter |
| PS-S40-02 | Optional, technology & measurement science standard learning |

* Limited availability might apply. Please review the service definition tool for model number availability and the datasheet for country availability. Coverage might be limited to KeysightCare Warranty Plus (R-55F-001). If KeysightCare Enhanced is available. R-55B-001-2/3/5 must be ordered with R-55B-001-1.

# Related Literature

| Publication title | Publication number |
|---|---|
| M9484C VXG Configuration Guide | 3121-1509EN |
| M9484C VXG Signal Generator Startup Guide | M9484-90001 |