

# Keysight S9100A 5G Base Station Manufacturing Test Solution

380 MHz to 6 GHz and 24.25 to 43.5 GHz



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## Non-Warranted System Performance Conditions

Information and data contained in this data sheet is subject to change without notice.

In addition to the following conditions, the S9100A non-warranted system performance, documented in this data sheet, is valid for an ambient temperature of 25 °C unless otherwise noted.

- The system is within its calibration cycle
- The system has been stored at an ambient temperature within the allowed operating range for at least two hours before being turned on
- The system has been powered on for at least 45 minutes warm-up time, with the X-series application (e.g. 5G NR) or M9410A Soft Front Panel software running.
- All alignments have been run after the warm up period:
  - Within the previous 8 hours
  - If the temperature has changed more than 5°C from the previous “Align All” operation

## Characteristics

### Notes

- The characteristics provided in this data sheet for operation at or below 6 GHz are a subset of the specifications for the Keysight M9410A PXIe VXT Vector Transceiver module. For the most recent and more detailed performance information, refer to the Data Sheet for the M9410A (literature no. 5992-3331EN).
- The M9410A in this S9100A 5G Base Station Manufacturing Test Solution is configured with Option B12 (1.2 GHz BW) and Option M05 (512 MSa memory).

## Definitions

<b>typical (typ)</b>
Describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 80% of the units exhibit with a 95% confidence level at room temperature (approximately 25 °C). Typical performance does not include measurement uncertainty. Typical performance is not warranted.
<b>nominal (nom)</b>
Describes the expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ω connector. This data is measured at room temperature (approximately 25 °C). Nominal performance is not warranted.
<b>measured (meas)</b>
Describes an attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is measured at room temperature (approximately 25 °C). Measured performance is not warranted.

## Recommended Best Practices

- Use slot blockers and EMC filler panels in empty module slots to ensure proper operating temperatures. Keysight chassis and slot blockers optimize module temperature performance and reliability of test.
- Set chassis fan to high at environmental temperatures above 45°C.

## Vector Signal Analyzer Performance

Performance		
Capture Depth	512 MSa, shared with ARB waveform memory	
Frequency		
	Frequency Range	
RF Transceiver RF Ports (RF In & RF Out)	380 MHz to 6 GHz	
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	
	Frequency Reference	
Accuracy, aging rate, stability	Refer to M9300A specifications	
Signal Analysis Bandwidth		
	Center Frequency	Maximum Bandwidth
RF Transceiver RF Ports (RF In & RF Out)	380 to 550 MHz 550 to 1310 MHz 1310 to 2000 MHz 2000 to 5480 MHz 5480 to 6000 MHz	100 MHz 200 MHz 600 MHz 1200 MHz (6080 MHz – Center Frequency) × 2 MHz
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	800 MHz 1.2 GHz

Amplitude Accuracy Range			
<b>Settable Input Level Ranges</b>			
RF Transceiver RF Ports (RF In & RF Out)	380 to 6000 MHz	-150 dBm to +27 dBm	
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	-70 dBm to +5 dBm	
Absolute Amplitude Accuracy (CW mode)			
	Frequency Range	Level	Accuracy
RF Transceiver RF Ports (RF In & RF Out)	380 to 680 MHz	-70 dBm ≤ Input < -30 dBm	< ± 0.45 dB, < ± 0.20 dB, typical
		-30 dBm ≤ Input ≤ -8 dBm	< ± 0.45 dB, < ± 0.20 dB, typical
		-8 dBm < Input ≤ +27 dBm	< ± 0.45 dB, < ± 0.20 dB, typical
	680 to 910 MHz	-70 dBm ≤ Input < -30 dBm	< ± 0.45 dB, < ± 0.25 dB, typical
		-30 dBm ≤ Input ≤ -8 dBm	< ± 0.45 dB, < ± 0.20 dB, typical
		-8 dBm < Input ≤ +27 dBm	< ± 0.50 dB, < ± 0.25 dB, typical
	910 to 1310 MHz	-70 dBm ≤ Input < -30 dBm	< ± 0.55 dB, < ± 0.30 dB, typical
		-30 dBm ≤ Input ≤ -8 dBm	< ± 0.55 dB, < ± 0.30 dB, typical
		-8 dBm < Input ≤ +27 dBm	< ± 0.60 dB, < ± 0.35 dB, typical
	1310 to 2000 MHz	-70 dBm ≤ Input < -30 dBm	< ± 0.60 dB, < ± 0.35 dB, typical
		-30 dBm ≤ Input ≤ -8 dBm	< ± 0.65 dB, < ± 0.35 dB, typical
		-8 dBm < Input ≤ +27 dBm	< ± 0.65 dB, < ± 0.35 dB, typical
	2000 to 3500 MHz	-70 dBm ≤ Input < -30 dBm	< ± 0.70 dB, < ± 0.40 dB, typical
		-30 dBm ≤ Input ≤ -8 dBm	< ± 0.80 dB, < ± 0.45 dB, typical
		-8 dBm < Input ≤ +27 dBm	< ± 0.60 dB, < ± 0.30 dB, typical
	3500 to 4500 MHz	-70 dBm ≤ Input < -30 dBm	< ± 0.65 dB, < ± 0.35 dB, typical
		-30 dBm ≤ Input ≤ -8 dBm	< ± 0.70 dB, < ± 0.35 dB, typical
		-8 dBm < Input ≤ +27 dBm	< ± 0.75 dB, < ± 0.35 dB, typical
4500 to 5400 MHz	-70 dBm ≤ Input < -30 dBm	< ± 0.90 dB, < ± 0.45 dB, typical	
	-30 dBm ≤ Input ≤ -8 dBm	< ± 0.95 dB, < ± 0.45 dB, typical	
	-8 dBm < Input ≤ +27 dBm	< ± 0.85 dB, < ± 0.45 dB, typical	
5400 to 6000 MHz	-70 dBm ≤ Input < -30 dBm	< ± 1.20 dB, < ± 0.60 dB, typical	
	-30 dBm ≤ Input ≤ -8 dBm	< ± 1.15 dB, < ± 0.60 dB, typical	
	-8 dBm < Input ≤ +27 dBm	< ± 1.05 dB, < ± 0.55 dB, typical	
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	± 2 dB, (-70 dBm to 0 dBm), nominal	
Flatness			
	Frequency Range	Bandwidth	Flatness
RF Transceiver RF Ports (RF In & RF Out)	380 to 6000 MHz	100 MHz	± 0.80 dB, typical
		200 MHz	± 1.00 dB, typical
		300 MHz	± 0.90 dB, typical
		600 MHz	± 0.90 dB, typical
		1200 MHz	± 1.00 dB, typical
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	800 MHz	± 2 dB, nominal
		1200 MHz	

Input Voltage Standing Wave Ratio (VSWR)		
	Frequency Range	Input VSWR
RF Transceiver RF Ports (RF In & RF Out)	380 to 1310 MHz 1310 to 2000 MHz 2000 to 3500 MHz 3500 to 4500 MHz 4500 to 5200 MHz 5200 to 6000 MHz	< 1.5:1, nominal < 1.7:1, nominal < 1.5:1, nominal < 1.6:1, nominal < 1.7:1, nominal < 2.0:1, nominal
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	< 2.0:1
Error Vector Magnitude (EVM)		
Test signal: 5G NR, 120 kHz subcarrier spacing, 256QAM		
	<b>FR1 (Sub 6 GHz)</b>	<b>EVM, nominal</b>
RF Transceiver RF Ports (RF In & RF Out)	100 MHz BW signal at 4000 MHz and 5000 MHz	< 0.3% at -10 dBm input power
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	<b>24.25 to 29.5 GHz</b>	<b>EVM, measured</b>
	100 MHz BW signal at 28 GHz	< 1.0% at -40 to 0 dBm input power
	400 MHz BW signal at 28 GHz	< 1.6% at -40 to 0 dBm input power
	<b>37 to 40 GHz</b>	<b>EVM, measured</b>
	100 MHz BW signal at 39 GHz	< 1.2% at -40 to 0 dBm input power
	400 MHz BW signal at 39 GHz	< 1.8% at -40 to 0 dBm input power
Adjacent Channel Leakage Ratio (ACLR)		
Test signal: 5G NR, 120 kHz subcarrier spacing, 256QAM, noise correction ON		
	<b>FR1 (Sub 6 GHz)</b>	<b>ACLR adjacent channel, nominal</b>
RF Transceiver RF Ports (RF In & RF Out)	100 MHz BW signal at 5 GHz	< -63 dBc at 0 dBm input power
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	<b>24.25 to 29.5 GHz</b>	<b>ACLR adjacent channel, measured</b>
	100 MHz BW signal at 28 GHz	< -45 dBc, -40 to 0 dBm input power
	400 MHz BW signal at 28 GHz	< -40 dBc, -40 to 0 dBm input power
	<b>37 to 40 GHz</b>	<b>ACLR adjacent channel, measured</b>
	100 MHz BW signal at 39 GHz	< -44 dBc, -40 to -4 dBm input power < -42 dBc, -4 to 0 dBm input power
	400 MHz BW signal at 39 GHz	< -38 dBc, -40 to 0 dBm input power

## Vector Signal Generator Performance

Performance		
ARB Depth	512 MSa, shared with Capture memory	
Frequency		
	Frequency Range	
RF Transceiver RF Ports (RF In & RF Out)	380 MHz to 6 GHz	
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	
	Frequency Reference	
Accuracy, aging rate, stability	Refer to M9300A specifications	
Signal Generation Bandwidth		
	Center Frequency	Maximum Bandwidth
RF Transceiver RF Ports (RF In & RF Out)	380 to 550 MHz 550 to 1310 MHz 1310 to 2000 MHz 2000 to 5480 MHz 5480 to 6000 MHz	100 MHz 200 MHz 600 MHz 1200 MHz (6080 MHz – Center Frequency) × 2 MHz
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	800 MHz 1.2 GHz
Amplitude Range		
	Frequency Range	Settable Output Level Range
RF Transceiver RF Ports (RF In & RF Out)	380 to 6000 MHz	<b>CW:</b> –120 dBm to +5 dBm (up to +20 dBm with Option 1EA)  <b>Modulated:</b> Depends on the Crest Factor
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	<b>CW:</b> –70 dBm to +10 dBm  <b>Modulated:</b> –40 dBm to +5 dBm

Absolute Amplitude Accuracy (CW mode)			
	Frequency Range	Level	Accuracy
RF Transceiver RF Ports (RF In & RF Out)	380 to 550 MHz	≤ +20 to −15 dBm	< ± 0.55 dB, < ± 0.35 dB, typical
		≤ −15 to −80 dBm	< ± 0.55 dB, < ± 0.35 dB, typical
		≤ −80 to −120 dBm	< ± 0.80 dB, < ± 0.40 dB, typical
	550 to 2000 MHz	≤ +20 to −15 dBm	< ± 0.70 dB, < ± 0.40 dB, typical
		≤ −15 to −80 dBm	< ± 0.55 dB, < ± 0.40 dB, typical
		≤ −80 to −110 dBm	< ± 0.85 dB, < ± 0.50 dB, typical
	2000 to 3900 MHz	≤ +20 to −15 dBm	< ± 0.60 dB, < ± 0.35 dB, typical
		≤ −15 to −80 dBm	< ± 0.70 dB, < ± 0.45 dB, typical
		≤ −80 to −110 dBm	< ± 1.30 dB, < ± 0.75 dB, typical
	3900 to 6000 MHz	≤ +20 to −15 dBm	< ± 0.80 dB, < ± 0.40 dB, typical
		≤ −15 to −80 dBm	< ± 1.10 dB, < ± 0.60 dB, typical
		≤ −80 to −100 dBm	< ± 1.20 dB, < ± 0.65 dB, typical
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	−70 dBm to +10 dBm	± 2.0 dB, nominal
Flatness			
	Frequency Range	Bandwidth	Flatness
RF Transceiver RF Ports (RF In & RF Out)	380 to 6000 MHz	100 MHz	± 0.5 dB, typical
		200 MHz	± 0.8 dB, typical
		300 MHz	± 1.0 dB, typical
		600 MHz	± 1.0 dB, typical
		1200 MHz	± 1.5 dB, typical
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	800 MHz 1.2 GHz	± 2 dB, nominal
Voltage Standing Wave Ratio (VSWR)			
	Frequency Range	Input VSWR	
RF Transceiver RF Ports (RF In & RF Out)	380 to 4200 MHz	< 1.7:1, nominal	
	4200 to 6000 MHz	< 1.6:1, nominal	
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	24.25 to 29.5 GHz 37 to 40 GHz	< 2.0:1, nominal	
Error Vector Magnitude (EVM)			
Test signal: 5G NR, 120 kHz subcarrier spacing, 256QAM			
	<b>FR1 (Sub 6 GHz)</b>	<b>EVM, nominal</b>	
RF Transceiver RF Ports (RF In & RF Out)	100 MHz BW signal at 4 GHz	< 0.4% at −10 dBm output power	
	100 MHz BW signal at 5 GHz	< 0.6% at −10 dBm output power	
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	<b>24.25 to 29.5 GHz</b>	<b>EVM, measured</b>	
	100 MHz BW signal at 28 GHz	< 1.0% at −20 to 5 dBm output power	
	400 MHz BW signal at 28 GHz	< 1.6% at −20 to 5 dBm output power	



	<b>37 to 40 GHz</b>	<b>EVM, measured</b>
	100 MHz BW signal at 39 GHz	< 1.2% at –20 to 5 dBm output power
	400 MHz BW signal at 39 GHz	< 2.0% at –20 to 5 dBm output power
<b>Adjacent Channel Leakage Ratio (ACLR)</b>		
Test signal: 5G NR, 120 kHz subcarrier spacing, 256QAM, noise correction ON		
	<b>FR1 (Sub 6 GHz)</b>	<b>ACLR adjacent channel, nominal</b>
RF Transceiver RF Ports (RF In & RF Out)	100 MHz BW signal at 4 GHz	< –57 dBc at 0 dBm output power
	100 MHz BW signal at 5 GHz	< –55 dBc at 0 dBm output power
M1740A mmWave Ports (RF Tx/Rx 1 & RF Tx/Rx 2)	<b>24.25 to 29.5 GHz</b>	<b>ACLR adjacent channel, measured</b>
	100 MHz BW signal at 28 GHz	< –45 dBc at –20 to 5 dBm output power
	400 MHz BW signal at 28 GHz	< –38.5 dBc at –20 to 5 dBm output power
	<b>37 to 40 GHz</b>	<b>ACLR adjacent channel, measured</b>
	100 MHz BW signal at 39 GHz	< –45 dBc at –20 to 5 dBm output power
	400 MHz BW signal at 39 GHz	< –38 dBc at –20 to –18 dBm output power < –39 dBc at –18 to 5 dBm output power

## Frequency Reference Performance

<b>Frequency Reference</b>	
Accuracy, aging rate, stability	Refer to M9300A PXIe reference specifications.
Recommended Calibration Cycle	1 year
<b>M9300A External Reference Input</b>	
Frequency	1 MHz to 110 MHz, sine wave
Lock range	± 1 ppm, nominal
Input Amplitude	0 to 10 dBm, nominal
Connector	1 SMB snap-on
Impedance	50 Ω, nominal

## General Performance

Environmental Characteristics		
S9100A <sup>1</sup>	<ul style="list-style-type: none"> <li>For indoor use only</li> <li>Altitude up to 6,561.68 ft (2,000 m)</li> <li>Operating Temperature 10 to 40° C, 5% to 85% (non-condensing) relative humidity.</li> </ul>	
Power Requirements		
	Voltage & frequency	Power consumption
S9100AX <sup>2</sup>	100/120 V, 50/60 Hz 220/240 V, 50/60 Hz	650 W (1200 W maximum) 800 W (1300 W maximum)
M1740A	36 VDC	34 W
E7770A	100/120 V, 50/60 Hz 220/240 V, 50/60 Hz	480 W maximum
Size and Weights		
Dimensions		
S9100AX	Height: 192.4 mm (7.6 in); with feet removed Height: 197.8 mm (7.8 in); with feet installed Width: 449.5 mm (17.7 in); with rugged panel Depth: 568.9 mm (22.4 in); with rugged panel	
M1740A	Height: 66 mm (2.60 in) Width: 139 mm (5.47 in) Depth: 183 mm (7.20 in)	
E7770A	Height: 145.6 mm (5.7 in); with feet installed Width: 449 mm (17.7 in); across handles Depth: 424 mm (16.7 in); across front connectors and rear feet	
S9100A Rack Space	2 X 2U x 1 rack width	
Weight		
S9100AX	20.4 kg (45.0 lbs)	
M1740A	2.2 kg (4.85 lbs)	
E7770A	18.1 kg (40 lbs)	
Maximum applied reverse power		
RF Transceiver RF Ports (RF In & RF Out)	+30 dBm CW, 0 VDC	
M1740A (via RF Tx/Rx Ports)	+20 dBm CW, 15 VDC	
Remote programming		
Interface	PCIe, LAN RJ-45	
Warranty		
Standard 1-year warranty		
Calibration Cycle		
The recommended calibration cycle is one year; calibration services are available through Keysight service centers.		

<sup>1</sup> Keysight S9100A 5G Base Station Manufacturing Test Solution

<sup>2</sup> Keysight S9100AX is an S9100A IF Subsystem (PXIe chassis w/ modules, Rugged Panel, and Cables)

## S9100AX<sup>1</sup> Interface Front Panel (with Rugged Panel)

LAN TCP/IP interface	
Standard (1 port)	1000BASE-T
Connector (1 port)	RJ-45 (LAN network cable)
Monitor output	
Connector	DisplayPort (DP) compatible with DisplayPort to VGA adapter
USB 2.0 ports	
Standard	Compatible with USB 2.0
Connector	USB Type-A (f)
Output current	0.5 A
10 MHz Out	
Connector	BNC (f), 50 $\Omega$
Output amplitude	9.5 dBm
Ref In	
Connector	BNC (f), 50 $\Omega$
Characteristics	(See Frequency Reference)
Trigger Connections (Trig 1 and Trig 2)	
Connector	BNC (f)
Input impedance	>10 k $\Omega$
Trigger level range	-5 V to +5 V

## M1740A mmWave Transceiver Front Panel

RF connections, Connectors	
M1740A (IF ports)	SMA (f), 50 $\Omega$ , 4 m cable SMA (m) to Type-N (f)
M1740A (RF mmWave)	2.4 mm (f)

## E7770A Common Interface Unit (CIU) Front Panel and Rear Panel

Local Oscillator Card (LO Card), Connectors	
10 MHz In	BNC (f), 50 $\Omega$ , nominal
LO Aux Out	SMA (f), 50 $\Omega$ , nominal
Ref Out	SMA (f), 50 $\Omega$ , nominal (Intended for future use.)
CLK In	SMA (f), 50 $\Omega$ , nominal (Intended for future use.)
LO Out	SMA (f), 50 $\Omega$ , nominal (Use with a second independent LO source.)
LO Distribution Card, Connectors	
LO In, LO In 2,	SMA (f), 50 $\Omega$ , nominal
LO Out 1, 2, 3, 4	SMA (f), 50 $\Omega$ , nominal
LO Aux 1, 2, 4, 4	SMA (f), 50 $\Omega$ , nominal
Channel Card - No DUT IF, Connectors	
LO In	SMA (f), 50 $\Omega$ , nominal
IF In, IF Out, and DUT IF In/Out	These IF connectors are not used in this S9100A configuration.
Channel Card - No DUT IF, Rear Panel Connectors	
LO/CTRL/PWR	TNC (f), 50 $\Omega$ , nominal: 6 to 12 GHz, 10 dBm minimum, +36 VDC, 1A
DUT IF IN and DUT IF OUT	These DUT IF connectors are not used in this S9100A configuration.

<sup>1</sup> Keysight S9100AX is an S9100A IF Subsystem (PXIe chassis w/ modules, Rugged Panel, and Cables)

## Related Literature

For more detailed product and specification information refer to the following literature and web pages:

- Keysight S9100A 5G Base Station Manufacturing Test Solution, Startup Guide (literature no. [S9100-90001](#))
- Keysight S9100A 5G Base Station Manufacturing Test Solution, Data Sheet (literature no. [5992-3561EN](#))
- Keysight M9019A PXIe 18 slot Chassis, Data Sheet (literature no. [5992-1481EN](#))
- Keysight M9037A PXIe High Performance Embedded Controller (Option EC1), Data Sheet (literature no. [5991-3661EN](#))
- Keysight M9024A PXIe High Performance System Module (Option SM1), Data Sheet (literature no. [5992-0377EN](#))
- Keysight M9410A and M9411A PXIe VXT Vector Transceivers, Data Sheet (literature no. [5992-3331EN](#))
- Keysight X-Series Measurement Applications, Brochure (literature no. [5989-8019EN](#))
- Keysight Signal Studio Software, Brochure (literature no. [5989-6448EN](#))

## Web

Product page:

<http://www.keysight.com/find/solution-5GNR>

Learn more at: [www.keysight.com](http://www.keysight.com)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

