

# S9100A

## 5G Multi-Band Vector Transceiver

380 MHz to 6 GHz and 24.25 to 43.5 GHz

The Keysight S9100A 5G Multi-Band Vector Transceiver is a streamlined, non-signaling measurement system that enables automated testing of 5G New Radio (5G NR) infrastructure equipment in both the FR1 (380 MHz to 6 GHz) and millimeter wave FR2 (24.25 to 43.5 GHz) frequencies; some configurations also enable automated testing in High IF (6 to 12 GHz) frequencies.

The base system is available in three standard configurations:

- Keysight S9100A Option RH1 5G Multi-Band Vector Transceiver
- [Keysight S9100A Option 007 mmWave Transceiver with High IF](#)
- [Keysight S9100A Option 022 mmWave Transceiver with High IF and Blocker](#)



# Table of Contents

- System Performance..... 3
- S9100A Standard Configurations ..... 5
- Vector Signal Analyzer (Rx) Performance ..... 7
- Vector Signal Generator (Tx) Performance ..... 13
- General Performance..... 19
- S9100A Base System Front Panel (with Rugged Panel)..... 20
- M1740A mmWave Transceiver..... 22
- E7770A Common Interface Unit (CIU) Front Panel and Rear Panel..... 24
- Related Literature..... 25
- Web..... 25

# 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 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 powered on.
- The system has been powered on continuously for at least two hours warm-up time, with the IQ Analyzer or X-Series application (for example, 5G NR) running, and the M1740A mmWave Transceiver powered on (verify that LEDs are on). If the system met these warm-up requirements and there is a brief power shutdown, such as a system reboot, allow 45 minutes of warm-up time after the system is powered back on.
- The “Align Now All” alignments have been run in the M9410A PXIe VXT module, within the previous 7 days, after the warm-up period.
- A “Fast Alignment” has been run:
  - within the previous 8 hours
  - if the temperature has changed more than 5°C from when the previous “Fast Alignment” was performed
- Amplitude accuracy characteristics apply after system calibration has been performed in the current environment and humidity has not changed by more than  $\pm 10\%$ .

## 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 M9410A Data Sheet (literature no. 5992-3331EN). Note that the performance characteristics in that data sheet apply at the input/output connectors of the M9410A module, but in the S9100A system, there is approximately 0.25 to 0.5 dB of insertion loss between the S9100A front panel connectors and the M9410A due to the M9155C switch module and cabling.
- The S9100A Option 022 system includes both a primary transceiver (M9410A PXIe VXT) that generates a “Wanted” signal and a secondary transceiver (M9410A PXIe VXT) that generates a “Blocker” signal (interfering signal) for testing the performance of a base station receiver.

These RF signals are combined in a hybrid before being routed to the S9100A front panel. In these systems, there is approximately 3 dB of insertion loss between the primary transceiver (M9410A PXIe VXT) and the S9100A front panel RF Out connector, and there is approximately 18 dB of loss between the secondary transceiver (M9410A PXIe VXT) and the S9100A front panel RF Out connector.
- The Sub 6 GHz amplitude characteristics in this data sheet include the effects of the added system insertion loss.

- The M9410A-001 in this S9100A 5G Multi-Band Vector Transceiver is configured with:
  - Option F06 (Frequency range, 380 MHz to 6 GHz),
  - Option B12 (1.2 GHz BW),
  - Option M05 (512 MSa memory),
  - Option 1EA (High output power).

## Definitions

### Typical

---

Describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 95% 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.

---

### Measured

---

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.

---

### Nominal

---

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.

---

## Recommended best practices

- Set chassis fan to high at environmental temperatures above 45°C.

# S9100A Standard Configurations

This data sheet contains system performance for S9100A base systems available in three standard configurations with multiple output and input connectors that have different system performance:

- Keysight S9100A Option RH1 5G Multi-Band Vector Transceiver
- Keysight S9100A Option 007 mmWave Transceiver with High IF
- Keysight S9100A Option 022 mmWave Transceiver with High IF and Blocker

## S9100A connectors (ports 1 to 8)

Each S9100A standard configuration has a different set of output and input connectors (ports):

- All S9100A standard configurations have mmWave ports, on the M1740A mmWave Transceiver, that are RF Tx/Rx 1 ① and RF Tx/Rx 2 ②
- All S9100A standard configurations have RF Transceiver ports, on the rugged front panel, that are either: RF Out ③ and RF In ④ or RF Out ⑤ and RF In ⑥
  - S9100A Option RH1 and Option 007 have RF Transceiver ports RF Out ③ and RF In ④, and
  - S9100A Option 022 have RF Transceiver ports RF Out ⑤ and RF In ⑥

Although ports RF Out ⑤ and RF In ⑥ with a Blocker have the same name on the external labeling as ports RF Out ③ and RF In ④ without a Blocker, they have different performance.

Differences are because an S9100A Option 022 has different source system performance than an S9100A Option RH1. On S9100A Option 022, Transmit (Tx) RF Out ⑤, 380 MHz to 6 GHz, the signal path is routed through a hybrid combiner with additional cabling and switching that combines the RF Out of a primary transceiver (M9410A PXIe VXT), “Wanted” signal, with the RF Out of a secondary transceiver (M9410A PXIe VXT), “Blocker” signal.

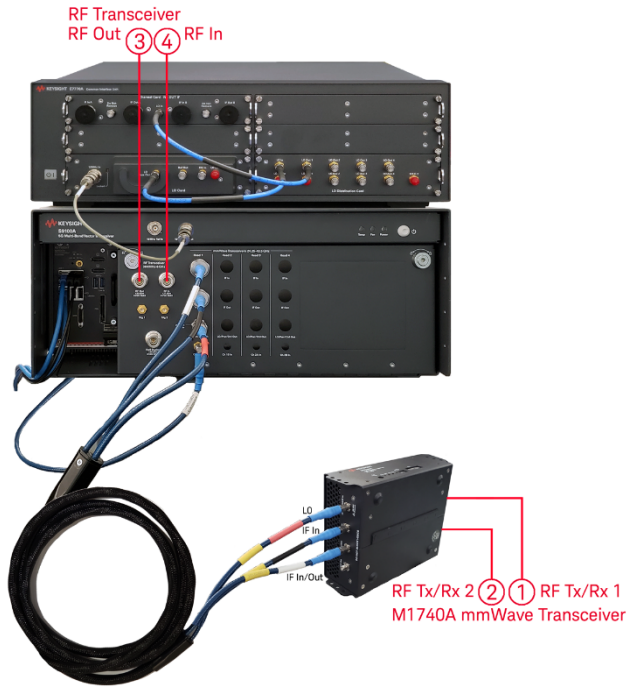
The RF In ⑥ path is not affected by the Blocker on an S9100A Option 022.

- Some S9100A standard configurations have High IF ports RF Out ⑦ and RF In ⑧
  - S9100A Option 007 and Option 022 with RF Transceiver High IF ports RF Out ⑦ and RF In ⑧ route signal paths through up and down converters, located in the Keysight E7770A Common Interface Unit (CIU), along with additional cabling and switching, resulting in 6 to 12 GHz signals.

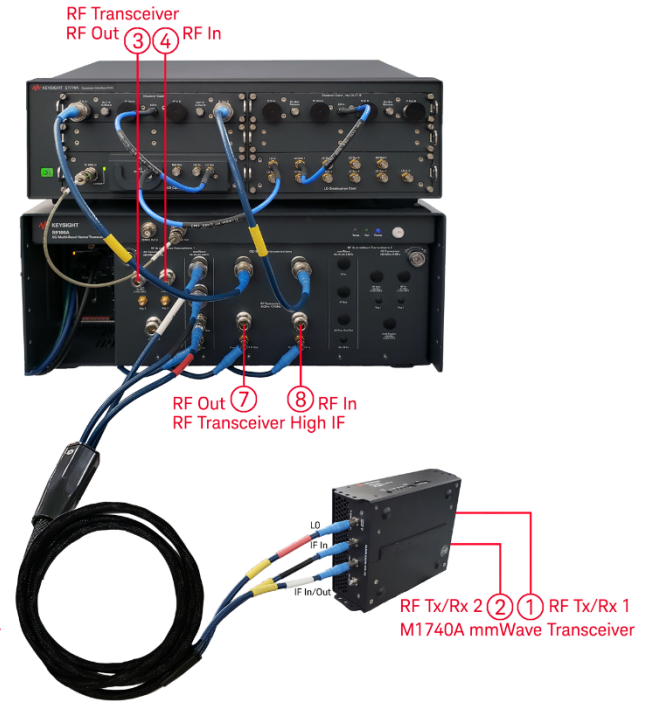
### Output and input ports

RF Tx/Rx 1 ① RF Tx/Rx 2 ②	All S9100A standard configurations <b>M1740A mmWave transceiver connectors</b> (RF Tx/Rx 1 & RF Tx/Rx 2)
RF Out ③ RF In ④	S9100A Option RH1 or Option 007 <b>RF transceiver connectors</b> (RF Out & RF In)
RF Out ⑤ RF In ⑥	S9100A Option 022 with Blocker <b>RF transceiver connectors</b> (RF Out & RF In)
RF Out ⑦ RF In ⑧	S9100A Option 007 or Option 022 with High IF <b>RF transceiver High IF connectors</b> (RF Out & RF In)

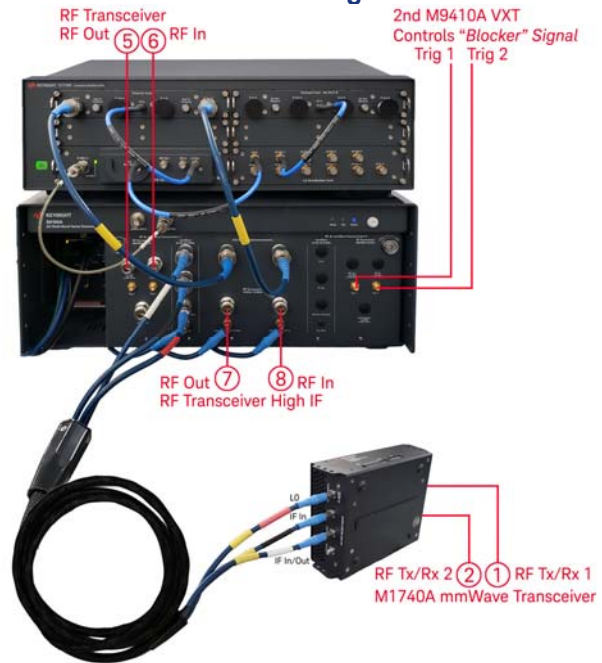
**S9100A Option RH1  
5G Multi-Band Vector Transceiver**



**S9100A Option 007  
mmWave Transceiver w/ High IF**



**S9100A Option 022  
mmWave Transceiver w/ High IF and Blocker**



# Vector Signal Analyzer (Rx) Performance

## Performance

Capture depth	512 MSa	
Frequency		
	Frequency range	
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	22.7 to 43.5 GHz, settable	
All S9100A standard configurations RF transceiver connectors RF In ④ or RF In ⑥	380 to 6000 MHz	
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF In ⑧	6 to 12 GHz	
	Frequency reference	
Accuracy, aging rate, stability	Refer to frequency reference information in the General Performance section.	
Signal analysis bandwidth		
	Center frequency	Maximum bandwidth, nominal
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	24.25 to 30.5 GHz 30.5 to 43.5 GHz	800 MHz 1.2 GHz
All S9100A standard configurations RF transceiver connectors RF In ④ or RF In ⑥	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
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF In ⑧	6 to 12 GHz	800 MHz

## Amplitude range

	Frequency range	Settable input level ranges
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	22.7 to 43.5 GHz	-70 dBm to +5 dBm
All S9100A standard configurations RF transceiver connectors RF In ④ or RF In ⑥	380 to 6000 MHz	-150 dBm to +27 dBm
Half duplex connector (Option HDX)	380 to 6000 MHz	-150 dBm to +27 dBm
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF In ⑧	6 to 12 GHz	-70 dBm to +10 dBm

## Absolute amplitude accuracy (CW mode)

	Frequency range	Level	Accuracy, <i>typical</i>
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	24.25 to 33 GHz	-70 dBm to 0 dBm	$\pm 1.75$ dB
	33 to 37 GHz	-70 dBm to 0 dBm	$\pm 2.50$ dB
	37 to 43.5 GHz	-70 dBm to 0 dBm	$\pm 1.75$ dB
All S9100A standard configurations RF transceiver connectors RF In ④ or RF In ⑥	380 to 680 MHz	-70 to +27 dBm	$\leq \pm 0.45$ dB
	680 to 910 MHz	-70 to -8 dBm	$\leq \pm 0.45$ dB
		-8 to +27 dBm	$\leq \pm 0.50$ dB
	910 to 1310 MHz	-70 to -8 dBm	$\leq \pm 0.55$ dB
		-8 to +27 dBm	$\leq \pm 0.60$ dB
	1310 to 2000 MHz	-70 to -30 dBm	$\leq \pm 0.60$ dB
		-30 to +27 dBm	$\leq \pm 0.65$ dB
	2000 to 3500 MHz	-70 to -30 dBm	$\leq \pm 0.70$ dB
		-30 to -8 dBm	$\leq \pm 0.80$ dB
		-8 to +27 dBm	$\leq \pm 0.60$ dB
	3500 to 4500 MHz	-70 to -30 dBm	$\leq \pm 0.65$ dB
		-30 to -8 dBm	$\leq \pm 0.70$ dB
-8 to +27 dBm		$\leq \pm 0.75$ dB	
4500 to 5400 MHz	-70 to -30 dBm	$\leq \pm 0.90$ dB	
	-30 to -8 dBm	$\leq \pm 0.95$ dB	
	-8 to +27 dBm	$\leq \pm 0.85$ dB	
5400 to 6000 MHz	-70 to -30 dBm	$\leq \pm 1.20$ dB	
	-30 to -8 dBm	$\leq \pm 1.15$ dB	
	-8 to +27 dBm	$\leq \pm 1.05$ dB	



	Frequency range	Level	Accuracy, typical
Half duplex connector (Option HDX)	380 to 910 MHz	-70 to -30 dBm	$\leq \pm 0.50$ dB
		-30 to -8 dBm	$\leq \pm 0.35$ dB
		-8 to +27 dBm	$\leq \pm 0.45$ dB
	910 to 1310 MHz	-70 to -30 dBm	$\leq \pm 0.60$ dB
		-30 to -8 dBm	$\leq \pm 0.45$ dB
		-8 to +27 dBm	$\leq \pm 0.55$ dB
	1310 to 3500 MHz	-70 to -30 dBm	$\leq \pm 0.75$ dB
		-30 to -8 dBm	$\leq \pm 0.70$ dB
-8 to +27 dBm		$\leq \pm 0.65$ dB	
3500 to 4500 MHz	-70 to -30 dBm	$\leq \pm 0.95$ dB	
	-30 to +27 dBm	$\leq \pm 0.80$ dB	
4500 to 5400 MHz	-70 to -30 dBm	$\leq \pm 1.15$ dB	
	-30 to -8 dBm	$\leq \pm 0.95$ dB	
	-8 to +27 dBm	$\leq \pm 1.00$ dB	
5400 to 6000 MHz	-70 to -30 dBm	$\leq \pm 1.35$ dB	
	-30 to -8 dBm	$\leq \pm 1.10$ dB	
	-8 to +27 dBm	$\leq \pm 1.05$ dB	
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF In ⑧	6 to 12 GHz	-70 dBm to +10 dBm	$\pm 1.5$ dB, typical

#### Linearity (CW mode)

	Frequency range	Input level	Linearity
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	22.75 to < 24.25 GHz	-50 to -30 dBm	$\leq \pm 0.90$ dB typical
		-30 to -25 dBm	$\leq \pm 0.70$ dB typical
		-25 to -17 dBm	$\leq \pm 0.50$ dB typical
		-17 to -10 dBm	$\leq \pm 0.40$ dB typical
		-10 to 0 dBm	$\leq \pm 0.30$ dB typical
	24.25 to < 33.3 GHz	-50 to -45 dBm	$\leq \pm 1.4$ dB, $\leq \pm 0.60$ dB typical
		-45 to -30 dBm	$\leq \pm 1.4$ dB, $\leq \pm 0.50$ dB typical
		-30 to -20 dBm	$\leq \pm 1.4$ dB, $\leq \pm 0.30$ dB typical
	33.3 to < 37.0 GHz	-20 to 0 dBm	$\leq \pm 1.4$ dB, $\leq \pm 0.20$ dB typical
		-50 to -30 dBm	$\leq \pm 0.90$ dB typical
		-30 to -25 dBm	$\leq \pm 0.70$ dB typical
		-25 to -17 dBm	$\leq \pm 0.50$ dB typical
	37.0 to < 43.5 GHz	-17 to -10 dBm	$\leq \pm 0.40$ dB typical
		-10 to 0 dBm	$\leq \pm 0.30$ dB typical
		-50 to -30 dBm	$\leq \pm 1.4$ dB, $\leq \pm 0.70$ dB typical
		-30 to -27 dBm	$\leq \pm 1.4$ dB, $\leq \pm 0.50$ dB typical
43.5 GHz	-27 to -10 dBm	$\leq \pm 1.4$ dB, $\leq \pm 0.40$ dB typical	
	-10 to 0 dBm	$\leq \pm 1.4$ dB, $\leq \pm 0.30$ dB typical	

### Scale fidelity (CW mode)

	Frequency range	Input level	Scale fidelity
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	22.75 to < 24.25 GHz	-50 to -48 dBm	$\leq \pm 0.23$ dB typical
		-48 to -40 dBm	$\leq \pm 0.20$ dB typical
		-40 to 0 dBm	$\leq \pm 0.10$ dB typical
	24.25 to < 33.3 GHz	-50 to -40 dBm	$\leq \pm 0.7$ dB, $\leq \pm 0.20$ dB typical
		-40 to 0 dBm	$\leq \pm 0.7$ dB, $\leq \pm 0.10$ dB typical
33.3 to < 37.0 GHz	-50 to -48 dBm	$\leq \pm 0.23$ dB typical	
	-48 to -40 dBm	$\leq \pm 0.20$ dB typical	
	-40 to 0 dBm	$\leq \pm 0.10$ dB typical	
37.0 to 43.5 GHz	-50 to -48 dBm	$\leq \pm 0.7$ dB, $\leq \pm 0.22$ dB typical	
	-48 to -40 dBm	$\leq \pm 0.7$ dB, $\leq \pm 0.20$ dB typical	
	-40 to 0 dBm	$\leq \pm 0.7$ dB, $\leq \pm 0.10$ dB typical	

### IF flatness

	Frequency range	Bandwidth	Flatness
M1740A mmWave connectors <sup>1</sup> RF Tx/Rx 1 ① RF Tx/Rx 2 ②	24.25 to 29.5 GHz	800 MHz	$\pm 1.75$ dB, typical
	37 to 43.5 GHz	1200 MHz	$\pm 2.20$ dB, typical
All S9100A standard configurations RF transceiver connectors RF In ④ or RF In ⑥	380 to 6000 MHz	100 MHz	$\pm 1.10$ dB, typical
		200 MHz	$\pm 1.35$ dB, typical
		400 MHz	$\pm 1.25$ dB, typical
		800 MHz	$\pm 1.45$ dB, typical
		1200 MHz	$\pm 1.80$ dB, typical
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF In ⑧	6 to 12 GHz	800 MHz	$\pm 2.0$ dB, typical

<sup>1</sup> Performance can be improved at a specific frequency by performing an IF Flatness Calibration using the Keysight S910xA System Calibration software application.

## Error vector magnitude (EVM)

---

Test signal for FR1: 5G NR, 30 kHz subcarrier spacing, 256QAM

---

Test signal for FR2: 5G NR, 120 kHz subcarrier spacing, 256QAM

---

### M1740A mmWave connectors

RF Tx/Rx 1 ① RF Tx/Rx 2 ②

24.25 to 29.5 GHz	EVM, <i>typical</i>
100 MHz BW signal	$\leq -39$ dB, $-40$ to $-4$ dBm input power $\leq -38$ dB, $-4$ to $0$ dBm input power
400 MHz BW signal	$\leq -36$ dB, $-40$ to $0$ dBm input power

37 to 40 GHz

100 MHz BW	$\leq -39$ dB, $-40$ to $-13$ dBm input power $\leq -37$ dB, $-13$ to $-8$ dBm input power $\leq -39$ dB, $-8$ to $-3$ dBm input power $\leq -36$ dB, $-3$ to $0$ dBm input power
400 MHz BW	$\leq -35$ dB, $-40$ to $-2$ dBm input power $\leq -34.5$ dB, $-2$ to $0$ dBm input power

### All S9100A standard configurations RF transceiver connectors

RF In ④ or RF In ⑥

FR1 (Sub 6 GHz)	EVM, <i>nominal</i>
100 MHz BW signal at 5000 MHz	$< 0.3\%$ at $-10$ dBm input power

### S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors

RF In ⑧

6 to 12 GHz	EVM, <i>typical</i>
100 MHz BW	$\leq -37$ dB, $-40$ to $-30$ dBm input power $\leq -38$ dB, $-30$ to $0$ dBm input power
400 MHz BW	$\leq -31$ dB, $-40$ to $-32$ dBm input power $\leq -33$ dB, $-32$ to $-4$ dBm input power $\leq -32$ dB, $-4$ to $0$ dBm input power

## Adjacent channel leakage ratio (ACLR)

Test signal for FR1: 5G NR, 30 kHz subcarrier spacing, 256QAM, noise correction ON		
Test signal for FR2: 5G NR, 120 kHz subcarrier spacing, 256QAM, noise correction ON		
M1740A mmWave connectors		
RF Tx/Rx 1 ① RF Tx/Rx 2 ②	24.25 to 29.5 GHz	ACLR, <i>typical</i>
	100 MHz BW	$\leq -44$ dBc, $-40$ to $0$ dBm input power
	400 MHz BW	$\leq -39$ dBc, $-40$ to $0$ dBm input power
	37 to 40 GHz	
	100 MHz BW	$\leq -44$ dBc, $-40$ to $-14$ dBm input power $\leq -42$ dBc, $-14$ to $-2$ dBm input power $\leq -41$ dBc, $-2$ to $0$ dBm input power
	400 MHz BW	$\leq -38$ dBc, $-40$ to $-12$ dBm input power $\leq -37$ dBc, $-12$ to $0$ dBm input power
All S9100A standard configurations RF transceiver connectors		
RF In ④ or RF In ⑥	FR1 (Sub 6 GHz)	ACLR adjacent channel, <i>nominal</i>
	100 MHz BW signal at 5 GHz	$< -63$ dBc at $0$ dBm input power
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors		
RF In ⑧	6 to 12 GHz	ACLR, <i>typical</i>
	100 MHz BW	$\leq -40$ dBc, $-40$ to $-34$ dBm input power $\leq -45$ dBc, $-34$ to $-30$ dBm input power $\leq -47$ dBc, $-30$ to $0$ dBm input power
	400 MHz BW	$\leq -34$ dBc, $-40$ to $-32$ dBm input power $\leq -40$ dBc, $-32$ to $-24$ dBm input power $\leq -43$ dBc, $-24$ to $0$ dBm input power

# Vector Signal Generator (Tx) Performance

## Performance

ARB depth	512 MSa	
Frequency		
	Frequency range	
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	22.7 to 43.5 GHz, settable	
All S9100A standard configurations RF transceiver connectors RF Out ③ or RF Out ⑤	380 MHz to 6000 MHz	
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF Out ⑦	6 to 12 GHz	
	Frequency reference	
Accuracy, aging rate, stability	Refer to frequency reference information in the General Performance section.	
Signal generation bandwidth		
	Center frequency	Maximum bandwidth, <i>nominal</i>
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	24.25 to 30.5 GHz 30.5 to 43.5 GHz	800 MHz 1.2 GHz
All S9100A standard configurations RF transceiver connectors RF Out ③ or RF Out ⑤	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
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF Out ⑦	6.0 to 8.6 GHz 8.6 to 9.3 GHz 9.3 to 12.0 GHz	800 MHz 400 to 600 MHz 800 MHz

## Amplitude range

	Frequency range	Settable output level range
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	22.7 to 43.5 GHz	CW: -70 dBm to +10 dBm  Modulated: -40 dBm to +5 dBm
S9100A Option RH1 or Option 007 RF transceiver connectors RF Out ③	380 to 6000 MHz	CW: -120 dBm to +20 dBm  Modulated: Depends on the crest factor
S9100A Option 022 w/ Blocker RF transceiver connectors RF Out ⑤	380 to 6000 MHz	CW: Primary transceiver (M9410A PXIe VXT) “Wanted” signal: -120 dBm to +17 dBm  Secondary transceiver (M9410A PXIe VXT) “Blocker” signal: -120 dBm to +2 dBm  Modulated: Depends on the crest factor
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF Out ⑦	6 to 12 GHz	CW: -50 dBm to +10 dBm  Modulated: Depends on the crest factor

Absolute amplitude accuracy (CW mode)

	Frequency range	Level	Accuracy, <i>typical</i>
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	24.25 to 33.3 GHz 33.3 to 37.0 GHz 37.0 to 43.5 GHz	-70 to +10 dBm	$\pm 2.0$ dB
S9100A Option RH1 or Option 007 RF transceiver connectors RF Out ③	380 to 550 MHz	$\leq +20$ to $-80$ dBm $\leq -80$ to $-120$ dBm	$< \pm 0.55$ dB $< \pm 0.80$ dB
	550 to 2000 MHz	$\leq +20$ to $-15$ dBm $\leq -15$ to $-80$ dBm $\leq -80$ to $-110$ dBm	$< \pm 0.70$ dB $< \pm 0.55$ dB $< \pm 0.85$ dB
	2000 to 3900 MHz	$\leq +20$ to $-15$ dBm $\leq -15$ to $-80$ dBm $\leq -80$ to $-110$ dBm	$< \pm 0.60$ dB $< \pm 0.70$ dB $< \pm 1.30$ dB
	3900 to 5700 MHz	$\leq +20$ to $-15$ dBm $\leq -15$ to $-80$ dBm $\leq -80$ to $-100$ dBm	$< \pm 0.80$ dB $< \pm 1.10$ dB $< \pm 1.20$ dB
	5700 to 6000 MHz	$\leq +20$ to $-15$ dBm $\leq -15$ to $-80$ dBm $\leq -80$ to $-90$ dBm	$< \pm 0.80$ dB $< \pm 1.10$ dB $< \pm 1.20$ dB
S9100A Option 022 w/ Blocker RF transceiver connectors RF Out ⑤	380 to 550 MHz	$\leq +17$ to $-83$ dBm $\leq -83$ to $-120$ dBm	$\leq \pm 0.55$ dB $\leq \pm 0.80$ dB
	550 to 2000 MHz	$\leq +17$ to $-18$ dBm $\leq -18$ to $-83$ dBm $\leq -83$ to $-113$ dBm	$\leq \pm 0.70$ dB $\leq \pm 0.55$ dB $\leq \pm 0.85$ dB
Primary transceiver, "Wanted" signal	2000 to 3900 MHz	$\leq +17$ to $-18$ dBm $\leq -18$ to $-83$ dBm $\leq -83$ to $-113$ dBm	$\leq \pm 0.60$ dB $\leq \pm 0.70$ dB $\leq \pm 1.30$ dB
	3900 to 5700 MHz	$\leq +17$ to $-18$ dBm $\leq -18$ to $-83$ dBm $\leq -83$ to $-103$ dBm	$\leq \pm 0.80$ dB $\leq \pm 1.10$ dB $\leq \pm 1.20$ dB
	5700 to 6000 MHz	$\leq +17$ to $-18$ dBm $\leq -18$ to $-83$ dBm $\leq -83$ to $-93$ dBm	$\leq \pm 0.80$ dB $\leq \pm 1.10$ dB $\leq \pm 1.20$ dB
S9100A Option 022 w/ Blocker RF transceiver connectors RF Out ⑤	380 to 550 MHz	$\leq +2$ to $-98$ dBm $\leq -98$ to $-120$ dBm	$\leq \pm 0.55$ dB $\leq \pm 0.80$ dB
	550 to 2000 MHz	$\leq +2$ to $-33$ dBm $\leq -33$ to $-98$ dBm $\leq -98$ to $-120$ dBm	$\leq \pm 0.70$ dB $\leq \pm 0.55$ dB $\leq \pm 0.85$ dB
Secondary Transceiver, "Blocker" signal	2000 to 3900 MHz	$\leq +2$ to $-33$ dBm $\leq -33$ to $-98$ dBm $\leq -98$ to $-120$ dBm	$\leq \pm 0.60$ dB $\leq \pm 0.70$ dB $\leq \pm 1.30$ dB
	3900 to 5700 MHz	$\leq +2$ to $-33$ dBm $\leq -33$ to $-98$ dBm $\leq -98$ to $-118$ dBm	$\leq \pm 0.80$ dB $\leq \pm 1.10$ dB $\leq \pm 1.20$ dB
	5700 to 6000 MHz	$\leq +2$ to $-33$ dBm $\leq -33$ to $-98$ dBm $\leq -98$ to $-108$ dBm	$\leq \pm 0.80$ dB $\leq \pm 1.10$ dB $\leq \pm 1.20$ dB

	Frequency range	Level	Accuracy, <i>typical</i>
Half duplex connector (Option HDX)	380 to 550 MHz	$\leq +5$ to $-80$ dBm	$\leq \pm 0.50$ dB
		$\leq -80$ to $-90$ dBm	$\leq \pm 0.65$ dB
	550 to 2000 MHz	$\leq +5$ to $-15$ dBm	$\leq \pm 0.55$ dB
		$\leq -15$ to $-80$ dBm	$\leq \pm 0.60$ dB
$\leq -80$ to $-90$ dBm		$\leq \pm 0.75$ dB	
2000 to 3900 MHz	$\leq +5$ to $-15$ dBm	$\leq \pm 0.50$ dB	
	$\leq -15$ to $-80$ dBm	$\leq \pm 0.80$ dB	
	$\leq -80$ to $-90$ dBm	$\leq \pm 1.10$ dB	
3900 to 6000 MHz	$\leq +5$ to $-15$ dBm	$\leq \pm 0.90$ dB	
	$\leq -15$ to $-80$ dBm	$\leq \pm 1.25$ dB	
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF Out ⑦	6 to 12 GHz	$-50$ to $+10$ dBm	$\pm 1.5$ dB, <i>typical</i>

#### Linearity (CW mode)

	Frequency range	Level	Linearity
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	22.75 to < 24.25 GHz	$-50$ to $-40$ dBm	$\leq \pm 0.40$ dB <i>typical</i>
		$-40$ to $-30$ dBm	$\leq \pm 0.30$ dB <i>typical</i>
		$-30$ to $-3$ dBm	$\leq \pm 0.25$ dB <i>typical</i>
		$-3$ to $+5$ dBm	$\leq \pm 0.40$ dB <i>typical</i>
	24.25 to < 33.3 GHz	$-50$ to $-40$ dBm	$\leq \pm 2.0$ dB, $\leq \pm 0.45$ dB <i>typical</i>
		$-40$ to $-18$ dBm	$\leq \pm 2.0$ dB, $\leq \pm 0.40$ dB <i>typical</i>
		$-18$ to $-12$ dBm	$\leq \pm 2.0$ dB, $\leq \pm 0.30$ dB <i>typical</i>
		$-12$ to $+5$ dBm	$\leq \pm 2.0$ dB, $\leq \pm 0.15$ dB <i>typical</i>
	33.3 to < 37.0 GHz	$-50$ to $-40$ dBm	$\leq \pm 0.40$ dB <i>typical</i>
		$-40$ to $-30$ dBm	$\leq \pm 0.30$ dB <i>typical</i>
		$-30$ to $-3$ dBm	$\leq \pm 0.25$ dB <i>typical</i>
		$-3$ to $+5$ dBm	$\leq \pm 0.40$ dB <i>typical</i>
	37.0 to 43.5 GHz	$-50$ to $-30$ dBm	$\leq \pm 2.0$ dB, $\leq \pm 0.50$ dB <i>typical</i>
		$-30$ to $-20$ dBm	$\leq \pm 2.0$ dB, $\leq \pm 0.40$ dB <i>typical</i>
		$-20$ to $+5$ dBm	$\leq \pm 2.0$ dB, $\leq \pm 0.30$ dB <i>typical</i>



## IF Flatness

	Frequency range	Bandwidth	Flatness, <i>typical</i>
M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	24.25 to 29.5 GHz 37 to 40 GHz	800 MHz 1.2 GHz	$\pm 2$ dB
All S9100A standard configurations RF transceiver connectors RF Out ③ or RF Out ⑤	380 to 6000 MHz	100 MHz 200 MHz 400 MHz 800 MHz 1200 MHz	$\pm 0.5$ dB $\pm 0.8$ dB $\pm 1.0$ dB $\pm 1.0$ dB $\pm 1.5$ dB
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF Out ⑦	6 to 8.6 GHz 8.6 to 9.3 GHz 9.3 to 12.0 GHz	800 MHz 400 to 600 MHz 800 MHz	$\pm 3$ dB

## Error vector magnitude (EVM)

Test signal for FR1: 5G NR, 30 kHz subcarrier spacing, 256QAM

Test signal for FR2: 5G NR, 120 kHz subcarrier spacing, 256QAM

M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	<b>24.25 to 29.5 GHz</b>	<b>EVM, typical</b>
	100 MHz BW	-42 dB, -20 to 5 dBm output power
	400 MHz BW	-36 dB, -20 to 5 dBm output power
	<b>37 to 40 GHz</b>	
	100 MHz BW	-39 dB, -20 to -15 dBm output power -40 dB, -15 to 5 dBm output power
	400 MHz BW	-34 dB, -20 to 5 dBm output power
All S9100A standard configurations RF transceiver connectors RF Out ③ or RF Out ⑤ <sup>1</sup>	<b>FR1 (Sub 6 GHz)</b>	<b>EVM, nominal</b>
	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
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF Out ⑦	<b>6 to 12 GHz</b>	<b>EVM, typical</b>
	100 MHz BW	-45 dB, -20 to -15 dBm output power -47 dB, -15 to -4 dBm output power -45 dB, -4 to -2 dBm output power -43 dB, -2 to 0 dBm output power
	400 MHz BW	-39 dB, -20 to -18 dBm output power -40 dB, -18 to -14 dBm output power -42 dB, -14 to -2 dBm output power -40 dB, -2 to 0 dBm output power

<sup>1</sup> The S9100A Option 022 system includes both a primary transceiver (M9410A PXIe VXT) that generates a "Wanted" signal and a secondary transceiver (M9410A PXIe VXT) that generates a "Blocker" signal. EVM characteristics apply to the RF Output of the primary transceiver.

## Adjacent channel leakage ratio (ACLR)

Test signal for FR1: 5G NR, 30 kHz subcarrier spacing, 256QAM, noise correction ON

Test signal for FR2: 5G NR, 120 kHz subcarrier spacing, 256QAM, noise correction ON

M1740A mmWave connectors RF Tx/Rx 1 ① RF Tx/Rx 2 ②	<b>24.25 to 29.5 GHz</b>	<b>ACLR, typical</b>
	100 MHz BW signal at 28 GHz	-44 dBc, -20 to -12 dBm output power -45 dBc, -12 to 5 dBm output power
	400 MHz BW signal at 28 GHz	-38 dBc, -20 to 5 dBm output power
	<b>37 to 40 GHz</b>	
	100 MHz BW	-45 dBc, -20 to -16 dBm output power -46 dBc, -16 to 0 dBm output power -45 dBc, 0 to 5 dBm output power
	400 MHz BW	-34 dB, -20 to 5 dBm output power
All S9100A standard configurations RF transceiver connectors RF Out ③ or RF Out ⑤ <sup>1</sup>	<b>FR1 (Sub 6 GHz)</b>	<b>ACLR, nominal</b>
	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
S9100A Option 007 or 022 w/ High IF RF transceiver High IF connectors RF Out ⑦	<b>6 to 12 GHz</b>	
	100 MHz BW	-47 dBc, -20 to -16 dBm output power -50 dBc, -16 to -4 dBm output power -43 dBc, -4 to 0 dBm output power
	400 MHz BW	-40 dBc, -20 to -12 dBm output power -45 dBc, -12 to -2 dBm output power -42 dBc, -2 to 0 dBm output power

<sup>1</sup> The S9100A Option 022 system includes both a primary transceiver (M9410A PXIe VXT) that generates a "Wanted" signal and a secondary transceiver (M9410A PXIe VXT) that generates a "Blocker" signal. ACLR characteristics apply to the RF Output of the primary transceiver.

# General Performance

## Environmental characteristics

### S9100A<sup>1</sup>

- For indoor use only
- Altitude up to 6,561.68 ft (2,000 m)
- Operating Temperature 10 to 40° C,  
Maximum Relative Humidity (non-condensing): 85% RH

#### Note

The Keysight S9100A 5G Multi-Band Vector Transceiver is a sensitive measurement apparatus by design and may have some performance loss, with possible measurements up to 100% EVM between 2.0 and 4.1 GHz, when exposed to ambient continuous electromagnetic phenomenon in those frequency ranges and when DC Puncturing is turned off for the EVM measurement setup.

## Power requirements

	Voltage & frequency	Power consumption
S9100A Base System <sup>2</sup>	100/120 V, 50/60 Hz 220/240 V, 50/60 Hz	1200 W Max (Lower range) 1300 W Max (Upper range)
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

S9100A base system	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

S9100A base system	20.4 kg (45.0 lbs)
M1740A	2.2 kg (4.85 lbs)
E7770A	18.1 kg (40 lbs)
E7770A channel card (IF In A & IF Out B)	19.0 kg (42 lbs) used w/ S9100A Option 007 or 022 configurations

<sup>1</sup> Keysight S9100A 5G Multi-Band Vector Transceiver

<sup>2</sup> Keysight S9100A Base System is a PXIe chassis with modules, rugged panel, and cables

## Remote programming

Interface	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.

# S9100A Base System<sup>1</sup> Front Panel (with Rugged Panel)

## LAN, display port, USB connectors, and M9037A PXIe embedded controller

### LAN 1 and LAN 2 (TCP/IP interface)

Connectors	Two, 10/100/1000BASE-T (RJ-45) Gigabit Ethernet ports
------------	---

### Video/dual display ports

Connector	Two, Dual Mode DisplayPort++ connectors can support either a DisplayPort or DVI-D monitor
-----------	---

### USB 2.0 ports

Connectors	Four, USB 2.0 (Type A)
------------	------------------------

Connectors	Two, USB 3.0
------------	--------------

### Trig (PXI trigger in/out)

Connector	SMB (m) snap-on, bi-directional trigger connector for routing an external trigger signal to/from PXI backplane
-----------	--

### GPIB

Connector	GPIB (Micro-D 25-pin)
-----------	-----------------------

### PCIe

Connector	x8 Gen 3 PCIe IPASS connector for controlling a second PXIe or AXIe chassis or RAID storage
-----------	---

<sup>1</sup> Keysight S9100A Base System is a PXIe chassis with modules, rugged panel, and cables

## Frequency reference, 10 MHz Ref In/Out connectors above the rugged front panel

### 10 MHz Ref Out, frequency reference

Accuracy	< $\pm 1.6$ Hz, <i>typical</i> , within 1 year since last calibration, from 20 to 30°C. Refer to the Keysight M9300A PXIe Frequency Reference Data Sheet for details on accuracy, aging rate, and stability.
Recommended calibration cycle	1 year
Connector	BNC (f)
Amplitude	9.5 dBm, <i>nominal</i>

10 MHz Ref In  
(Connects behind the rugged panel, to M9300A PXIe Reference Ref In, and locks to another reference with a value of 10 MHz or 100 MHz.)

Connector	BNC (f)
Frequency <sup>1</sup>	10 MHz or 100 MHz, sine wave
Lock range	$\pm 1$ ppm, <i>nominal</i>
Input amplitude	0 to 10 dBm, <i>nominal</i>
Impedance	50 $\Omega$ , <i>nominal</i>

## Transceiver connectors, RF 380 MHz to 6 GHz on the rugged front panel

### RF Out

Connector	Type-N (f), 50 $\Omega$ , <i>nominal</i>
Frequency range	380 MHz to 6 GHz
Amplitude	0 VDC, +30 dBm Maximum Applied Reverse Input Power

### RF In

Connector	Type-N (f), 50 $\Omega$ , <i>nominal</i>
Frequency range	380 MHz to 6 GHz
Amplitude	0 VDC, +27 dBm Maximum Safe Input Power

### Trig 1 and Trig 2 (input or output, selectable)

Connector	SMA (f)
Input Impedance	1 k $\Omega$ or 50 $\Omega$ , <i>nominal</i>
Input level Range	-3.3 V to +3.3 V
Output Impedance	50 $\Omega$ , <i>nominal</i>
Output Level Range	3.3 V LVTTTL

### Half Duplex, Option HDX

Connector	Type-N (f)
Frequency range	380 MHz to 6 GHz
Amplitude	0 VDC, +30 dBm maximum safe input power

<sup>1</sup> The 10 MHz Ref In connector frequency range, on S910xA systems, is different from the M9300A PXIe Frequency Reference Data Sheet. The S910xA systems only support 10 MHz or 100 MHz inputs.

## Transceiver connectors, head mmWave 24.25 to 43.5 GHz on the rugged front panel

### IF In

Connector	Type-N (f), 50 $\Omega$ , <i>nominal</i>
Frequency range	380 MHz to 6 GHz
Amplitude	$\pm$ 10 VDC, +33 dBm Maximum

### IF Out

Connector	Type-N (f), 50 $\Omega$ , <i>nominal</i>
Frequency range	380 MHz to 6 GHz
Amplitude	$\pm$ 10 VDC, +33 dBm Maximum

### LO/Pwr/Ctrl Out

Connector	TNC (f)
-----------	---------

### Ch 1A In

Connector	SMA (f)
-----------	---------

### Note

- IF In, IF Out, and LO/Pwr/Ctrl Out connect to the M1740A.
- Head 1 Ch 1A In connects to the LO/Ctrl/Pwr Output connector behind the rugged front panel.

## M1740A mmWave Transceiver

### RF Tx/Rx 1 and RF Tx/Rx 2

Connector	2.4 mm (f), 50 $\Omega$ , <i>nominal</i> These ports can be configured either to supply a mmWave signal to a Device Under Test (DUT) or to receive a mmWave signal from a DUT.
Amplitude	15 VDC, +20 dBm maximum input

### Note

Although the M1740A mmWave Transceiver is operational from 22.7 to 43.5 GHz, the performance information for the S9100A is only provided for the frequency bands called out in this Data Sheet.

LO/IF Out  
(In the S9100A configuration, this port is not used.)

---

Connector	SMA (f), 50 $\Omega$ , <i>nominal</i> This port provides the IF output of the downconverter in the M1740A. This port also accepts an LO input to be used by the downconverter.
-----------	---

---

IF In/Out  
(In the S9100A configuration, this port is used as the IF output from the M1740A.)

---

Connector	SMA (f), 50 $\Omega$ , <i>nominal</i> This port can be used either to accept an IF input to the upconverter in the M1740A or to provide the IF output of the downconverter in the M1740A.
IF frequency range	2.5 to 4 GHz
IF input power range	-20 to -30 dBm minimum, CW
IF output power range	-24 to -8 dBm, CW

---

IF In  
(In the S9100A configuration, this port is used as the IF input to the M1740A.)

---

Connector	SMA (f), 50 $\Omega$ , <i>nominal</i> This port accepts an IF input to the upconverter in the M1740A.
IF frequency range	2.5 to 4 GHz
IF input power range	-20 to -30 dBm minimum, CW

---

LO/Pwr/Ctrl/IF In  
(In the S9100A configuration, this port is used as the power, control, and LO input to the M1740A.)

---

Connector	SMA (f), 50 $\Omega$ , <i>nominal</i> This port accepts the following combined inputs: An LO input to be used by the upconverter and/or downconverter in the M1740A. A +36 VDC voltage input to power the M1740A. A control signal to operate the M1740A. This port can also accept an IF input to the upconverter in the M1740A, but this function is not used in the S9100A configuration.
LO frequency range	6 to 12 GHz
LO power level	-20 dBm, minimum
DC power	+36 VDC, 1A

---

**CAUTION**

Do not connect or disconnect the LO/Pwr/Ctrl cable, at either end, while the M1740A mmWave Transceiver is powered on.

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

## Local oscillator card (LO card), connectors

---

10 MHz In	BNC (f), 50 $\Omega$ , <i>nominal</i>
LO Aux Out	SMA (f), 50 $\Omega$ , <i>nominal</i>
Ref Out and CLK In	SMA (f), 50 $\Omega$ , <i>nominal</i> (Intended for future use.)
LO Out	SMA (f), 50 $\Omega$ , <i>nominal</i>

---

## LO distribution card, connectors

---

LO In, LO In 2,	SMA (f), 50 $\Omega$ , <i>nominal</i>
LO Out 1, 2, 3, 4	SMA (f), 50 $\Omega$ , <i>nominal</i>
LO Aux 1, 2, 4, 4	SMA (f), 50 $\Omega$ , <i>nominal</i>

---

## Channel card - No DUT IF, connectors

---

LO In	SMA (f), 50 $\Omega$ , <i>nominal</i>
IF In A, IF Out A, IF In B, IF Out B	These connectors are not used in some S9100A configurations.

---

## Channel card - No DUT IF, rear panel connectors

---

LO/CTRL/PWR	TNC (f), 50 $\Omega$ , <i>nominal</i> : 6 to 12 GHz, 10 dBm minimum,
DUT IF IN and DUT IF OUT	+36 VDC, 1A
	These connectors are not used in some S9100A configurations.

---

## Channel card - S9100A Option 007 and Option 022 with High IF, front panel connectors

---

IF In A and IF Out B	Type-N (f), 50 $\Omega$ , <i>nominal</i>
IF Out A and IF In B	These two connectors are not used in S9100A Option 007 and 022 configurations.

---

## Channel Card - S9100A Option 007 and Option 022 with High IF, Rear Panel Connectors

---

LO/CTRL/PWR	TNC (f), 50 $\Omega$ , <i>nominal</i> : 6 to 12 GHz, 10 dBm minimum,
CHANNEL 1B, DUT IF IN and	+36 VDC, 1A
CHANNEL 1A, DUT IF OUT	Type-N (f) connectors are used in S9100A Option 007 and 022 configurations.

---



## Related Literature

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

Description	Pub number
Keysight S9100A 5G Multi-Band Vector Transceiver, Startup Guide	<a href="#">S9100-90001</a>
Keysight S9100A 5G Multi-Band Vector Transceiver, Configuration Guide	<a href="#">5992-3562EN</a>
Keysight M9019A PXIe 18 slot Chassis, Data Sheet	<a href="#">5992-1481EN</a>
Keysight M9037A PXIe High Performance Embedded Controller, Data Sheet	<a href="#">5991-3661EN</a>
Keysight M9410A and M9411A PXIe VXT Vector Transceivers, Data Sheet	<a href="#">5992-3331EN</a>
Keysight X-Series Measurement Applications, Brochure	<a href="#">5989-8019EN</a>
Keysight Signal Studio Software, Brochure	<a href="#">5989-6448EN</a>

## Web

Product page:

<http://www.keysight.com/find/S9100A>



For more information on Keysight Technologies' products, applications, or services, please visit: [www.keysight.com](http://www.keysight.com)

This information is subject to change without notice. © Keysight Technologies, 2019 - 2022, Published in USA, August 9, 2022, 5992-3561EN