S9110A 5G Multi-Band Vector Transceiver

380 MHz to 6 GHz and
22.7 to 49.2 GHz or 10 to 32 GHz

KEYSIGHT

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System Performance

Conditions

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

In addition to the following conditions, the S9110A 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 45 minutes warm-up time, with the IQ Analyzer or X-Series application (e.g. 5G NR) running, and the M1742A/M1749B uWave/mmWave Transceiver powered on (verify that LEDs are on, refer to “Time since start up” on base box GUI). If the system met these warm-up requirements and there is a brief power shutdown, such as a system reboot, allow 20 minutes of warm-up time after the system is powered back on.
- The alignments have been run in order of “Align Now All”, “Align LO Clock Synchronization”, “Align IF Cable” and “Align RRH Amplitude” for the first use, after the warm-up period.

- For F32, the alignments have been run in order of “Align Now All”, “Align LO Clock Synchronization”, “Align IF Cable” and “Align RRH Amplitude” after the warm-up period: If more than 7 days have elapsed.
- For F43/F49, the alignments have been run in order of “Align Now All”, “Align IF Cable”, “Align RRH LO Power” and “Align RRH Amplitude”, after the warm-up period:
  - If more than 7 days have elapsed since the previous “Align Now All” alignment.
  - If more than 30 days have elapsed since the previous “Align IF Cable”, “Align RRH LO Power” or “Align RRH Amplitude” alignments.
- A “Fast Alignment” and “Align Fast RRH Amplitude” (required by F32 only) have been run within the previous 8 hours.
- The alignments have been run in order of “Align Now All”, “Align IF Cable” and “Align RRH Amplitude”, if IF cables have been disconnected, reconnected, moved or replaced.
- Corresponding alignment have been run if the base box / RRH internal temperature has changed more than 5 °C from when the previous same alignment was performed.

Characteristics

- 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 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 S9110A system, there is approximately 0.25 to 0.5 dB of insertion loss between the S9110A front panel connectors and the M9410A due to the M9155C switch module and cabling.
- The S9110A-BK1 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 combiner before being routed to the S9110A-BK1 front panel. In these systems, there is approximately 3 dB of insertion loss between the Primary Transceiver and the S9110A-BK1 front panel RF Out connector, and there is approximately 18 dB of loss between the Secondary Transceiver and the S9110A-BK1 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 S9110A 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 (typ)	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.
Nominal (nom)	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.
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 measured at room temperature (approximately 25 °C). Measured performance is not warranted.

Recommended best practices

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

S9110A Standard Configurations

This data sheet contains system performance for the S9110A base system that is available in three standard configurations with multiple input and output connectors. Each configuration is specified with different uWave/mmWave transceiver frequency ranges:

Standard configuration	Frequency range option	Work with uWave/mmWave Transceiver
S9110A-TR1	F32	M1742A
	F43, F49	M1749B
S9110A-BK1	F43, F49	M1749B
S9110A-TR2	F32	M1742A
	F43, F49	M1749B

- Keysight S9110A-TR1 5G Multi-Band Vector Transceiver
- Keysight S9110A-BK1 5G Multi-Band Vector Transceiver TR1 with Blocker
- Keysight S9110A-TR2 5G Multi-Band Vector Transceiver
- Option F32 - uWave Transceiver Range 10-32 GHz
- Option F43 - mmWave Transceiver Range 22.7-43.5 GHz
- Option F49 - mmWave Transceiver Range 22.7-49.2 GHz

S9110A connectors (ports 1 to 6)

Note: Please refer to figures 1 through 3 below for locations of the referenced connections.

Each S9110A standard configuration has a different set of output and input connectors (ports):

- All S9110A-TR1 and S9110A-BK1 standard configurations have uWave/mmWave ports on the uWave/mmWave Transceiver that are **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②
- All S9110A-TR1 standard configurations have RF Transceiver RF ports **RF Out** ③and **RF In** ④
- All S9110A-BK1 standard configurations have RF Transceiver RF ports **RF Out** ⑤and **RF In** ⑥

  Although output and input ports **RF Out** ⑤ and **RF In** ⑥ with a Blocker on an S9110A-BK1 have the same name on the external labeling as ports **RF Out** ③ and **RF In** ④ without a Blocker on an S9110A-TR1, they have different system performance.

  The differences are because the S9110A-BK1 has different source system performance than an S9110A-TR1. On an S9110A-BK1, the Transmit (Tx) **RF Out** ⑤**,** 380 MHz to 6 GHz, 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 S9110A-BK1.

- **All** S9110A-TR2 standard configurations have two sets of uWave/mmWave ports and two sets RF ports:
  - M1742A/M1749B uWave/mmWave Transceiver 1 has ports **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②
  - RF Transceiver 1 has ports **RF Out** ③ and **RF In** ④
  - M1742A/M1749B uWave/mmWave Transceiver 2 has ports **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②
    - RF Transceiver 2 has ports **RF Out** ③ and **RF In** ④

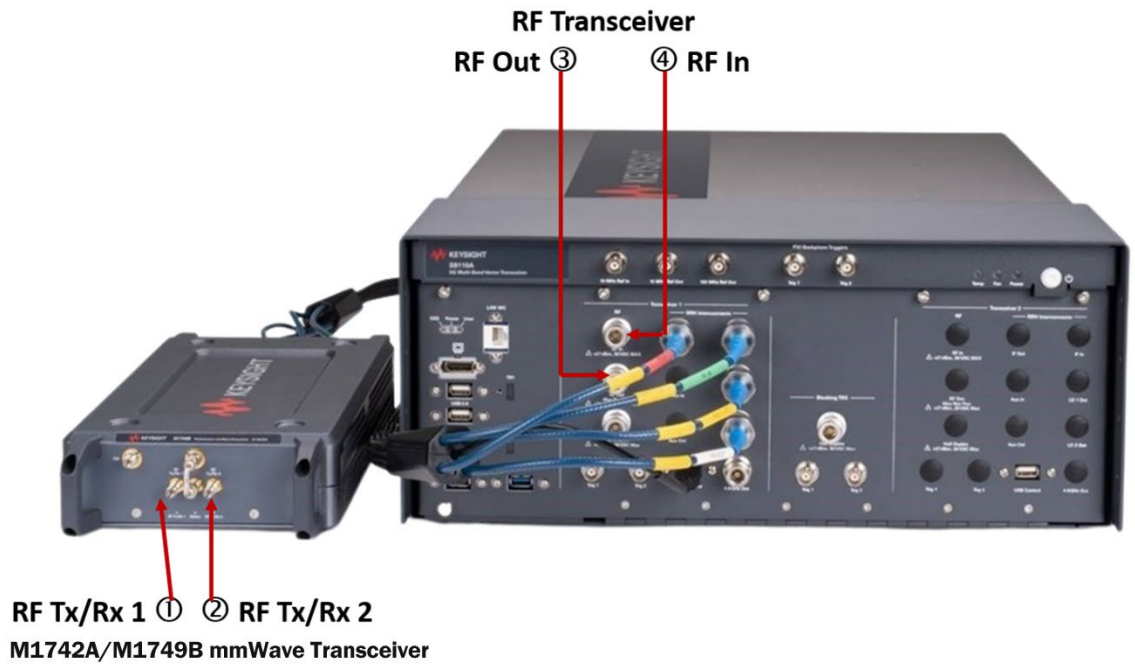

Figure 1. S9110A-TR1 (with F32, F43 or F49 options) 5G Multi-Band Vector Transceiver configuration[1]

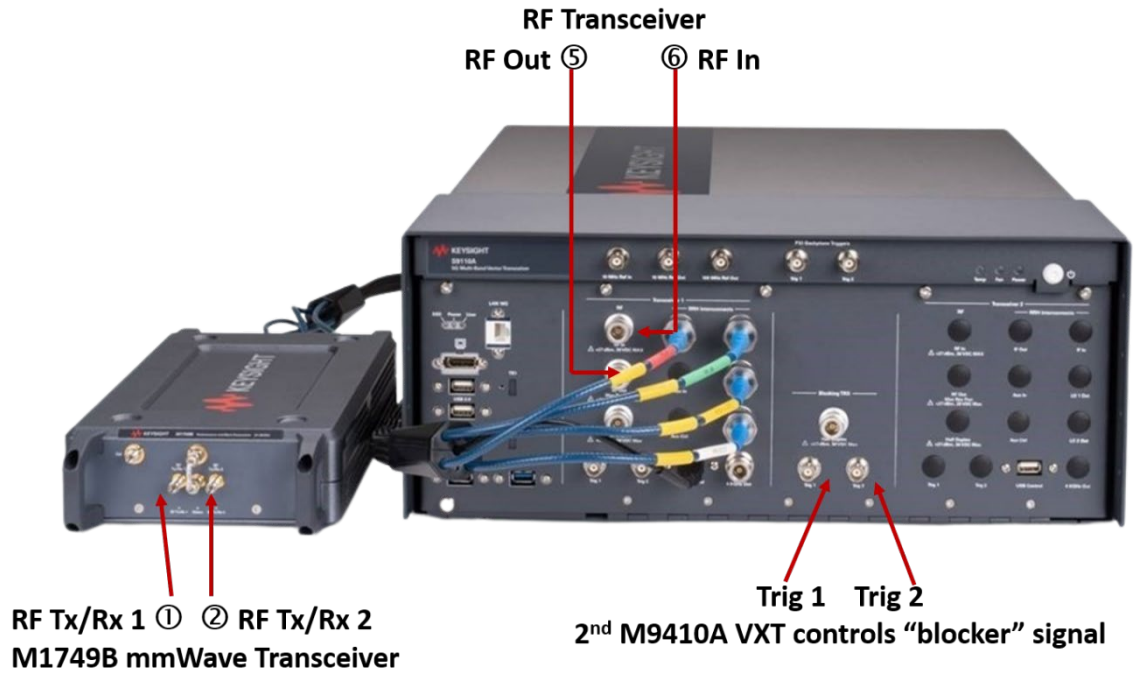

Figure 2. S9110A-BK1 (with F43 or F49 options) 5G Multi-Band Vector Transceiver TR1 with Blocker configuration

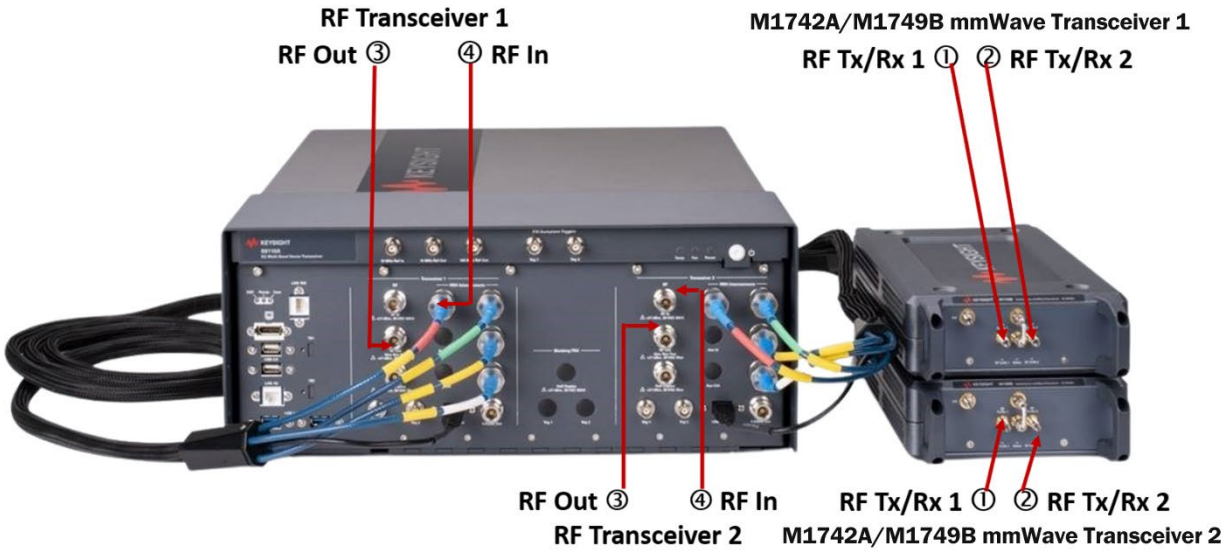

Figure 3. S9110A-TR2 (with F32, F43 or F49 options) 5G Multi-Band Vector Transceiver configuration[1]

1. The illustration on this page depicts configuration with M1749B mmWave Transceiver. There may be differences in the front panel and rear panel connectors of M1742A. For accurate information regarding the illustration of M1742A and M1749B, refer to S9110A User's Guide.

Vector Signal Analyzer (Rx) Performance

When working with M1749B, the following specs reflect the F49 Option. For the F43 option all instances of 49.2 GHz are limited to 43.5 GHz.

Performance		
Capture depth	512 MSa	
Frequency		
	Frequency range	
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	10 to 32 GHz, settable	
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 to 49.2 GHz, settable	
All S9110A standard configurations RF Transceiver connectors **RF In** ④ or **RF In** ⑥	380 to 6000 MHz	
	Frequency reference	
Accuracy, aging rate, stability	Refer to Frequency Reference information in General Performance section.	
Signal analysis bandwidth		
	Center frequency	**Maximum bandwidth (nominal)**
M1742A uWave connectors **RF Tx/Rx 1** ① **and RF Tx/Rx 2** ②	10 to 10.6 GHz	(Center frequency – 10000 MHz) x 2 MHz
	10.6 to 31.4 GHz	1.2 GHz
	31.4 to 32 GHz	(32000 MHz – Center frequency) x 2 MHz
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 to 24.2 GHz	100 MHz
	24.2 to 24.3 GHz	800 MHz
	24.3 to 49.2 GHz	1.2 GHz
All S9110A Standard Configurations RF Transceiver Connectors **RF In** ④ or **RF In** ⑥	380 to 550 MHz	100 MHz
	550 to 1310 MHz	200 MHz
	1310 to 2000 MHz	600 MHz
	2000 to 5480 MHz	1200 MHz
	5480 to 6000 MHz	(6080 MHz – Center frequency) x 2 MHz
Amplitude range		
	Frequency range	**Settable input level ranges**
M1742A uWave connectors **RF Tx/Rx 1** ① **and RF Tx/Rx 2** ②	10 to 32 GHz	-100 dBm to +100 dBm [1]
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 GHz - 49.2 GHz	-100 dBm to +100 dBm [1]
All S9110A 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 HD1, HD2)	380 to 6000 MHz	-150 dBm to +27 dBm

1. This is settable input range in instrument software. For actual maximum allowed input level, refer to “Amplitude” specification of “RF Tx/Rx 1 and RF Tx/Rx 2” section of M1742A and M1749B on page 18, 19.

Absolute amplitude accuracy (CW mode)			
M1742A uWave connectors **RF Tx/Rx 1 ①** ***and*** **RF Tx/Rx 2 ②**	**Frequency range**	**Level**	**Accuracy (nominal)**
	10 to 32 GHz	-50 dBm to 0 dBm	≤ ± 0.8 dB
M1749B mmWave connectors **RF Tx/Rx 1 ①** ***and*** **RF Tx/Rx 2 ②**	**Frequency range**	**Level**	**Accuracy (nominal)**
	22.7 to 49.2 GHz	-50 dBm to -10 dBm	≤ ± 1.4 dB
		-10 dBm to 0 dBm	≤ ± 0.95 dB
All S9110A standard configurations RF Transceiver connectors **RF In ④** or **RF In ⑥**	**Frequency range**	**Level**	**Accuracy (nominal)**
	380 to 680 MHz	-70 to +27 dBm	≤ ± 0.45 dB
	680 to 910 MHz	-70 to -8 dBm	≤ ± 0.45 dB
		-8 to +27 dBm	≤ ± 0.50 dB
	910 to 1310 MHz	-70 to -8 dBm	≤ ± 0.55 dB
		-8 to +27 dBm	≤ ± 0.6 dB
	1310 to 2000 MHz	-70 to -30 dBm	≤ ± 0.6 dB
		-30 to +27 dBm	≤ ± 0.65 dB
	2000 to 3500 MHz	-70 to -30 dBm	≤ ± 0.7dB
		-30 to -8 dBm	≤ ± 0.8 dB
		-8 to +27 dBm	≤ ± 0.6 dB
	3500 to 4500 MHz	-70 to -30 dBm	≤ ± 0.65 dB
		-30 to -8 dBm	≤ ± 0.70 dB
		-8 to +27 dBm	≤ ± 0.75 dB
	4500 to 5400 MHz	-70 to -30 dBm	≤ ± 0.90 dB
		-30 to -8 dBm	≤ ± 0.95 dB
		-8 to +27 dBm	≤ ± 0.85 dB
	5400 to 6000 MHz	-70 to -30 dBm	≤ ± 1.20 dB
		-30 to -8 dBm	≤ ± 1.15 dB
		-8 to +27 dBm	≤ ± 1.05 dB
Half duplex connector (Option HD1, HD2, HDB)	**Frequency range**	**Level**	**Accuracy (nominal)**
	380 to 910 MHz	-70 to -30 dBm	≤ ± 0.5 dB
		-30 to -8 dBm	≤ ± 0.35 dB
		-8 to +27 dBm	≤ ± 0.45 dB
	910 to 1310 MHz	-70 to -30 dBm	≤ ± 0.60 dB
		-30 to -8 dBm	≤ ± 0.45 dB
		-8 to +27 dBm	≤ ± 0.55 dB
	1310 to 3500 MHz	-70 to -30 dBm	≤ ± 0.75 dB
		-30 to -8 dBm	≤ ± 0.70 dB
		-8 to +27 dBm	≤ ±0.65 dB
	3500 to 4500 MHz	-70 to -30 dBm	≤ ± 0.50 dB
		-30 to +27 dBm	≤ ± 0.80 dB
	4500 to 5400 MHz	-70 to -30 dBm	≤ ± 1.15 dB
		-30 to -8 dBm	≤ ± 0.95 dB
		-8 to +27 dBm	≤ ± 1.00 dB
	5400 to 6000 MHz	-70 to -30 dBm	≤ ±1.35 dB
		-30 to -8 dBm	≤ ± 1.10 dB
		-8 to +27 dBm	≤ ± 1.05 dB
Linearity (CW mode) (reference power level is -5 dBm)			
M1742A uWave connectors **RF Tx/Rx 1 ①** and **RF Tx/Rx 2 ②**	**Frequency range**	**Input level**	**Linearity (nominal)**
	10 - 32 GHz	-50 to -10 dBm	≤ ± 1.0 dB
		-10 to 0 dBm	≤ ± 0.7 dB
M1749B mmWave connectors **RF Tx/Rx 1 ①** and **RF Tx/Rx 2 ②**	**Frequency range**	**Input level**	**Linearity (nominal)**
	24.0 - 49.2 GHz	-50 to -20 dBm	≤ ± 1.0 dB
		-20 to 0 dBm	≤ ± 0.75 dB
Scale fidelity (CW mode)			
M1742A uWave connectors **RF Tx/Rx 1 ①** and **RF Tx/Rx 2 ②**	**Frequency range**	**Input level**	**Scale fidelity (nominal)**
	10 - 32 GHz	-50 to -40 dBm	≤ ± 0.5 dB
		-40 to 0 dBm	≤ ± 0.3 dB
M1749B mmWave connectors **RF Tx/Rx 1 ①** and **RF Tx/Rx 2 ②**	**Frequency range**	**Input level**	**Scale fidelity (nominal)**
	24.0 - 49.2 GHz	-50 to -40 dBm	≤ ± 0.6 dB
		-40 to -0 dBm	≤ ± 0.3 dB

IF Flatness

M1742A: The center frequency can be set > than 31.4 GHz, but bandwidth will be reduced as 32 GHz is approached.
M1749B: The center frequency can be set > than 48.6 GHz, but bandwidth will be reduced as 49.2 GHz is approached.

	Frequency range	Bandwidth	Flatness (nominal)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	10.6 to 31.4 GHz	1200 MHz	± 1.0 dB
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 to 24.2 GHz	100 MHz	± 1.25 dB
	24.2 to 24.3 GHz	800 MHz	± 1.25 dB
	24.3 to 48.6 GHz	1200 MHz	± 1.25 dB
	Frequency range	**Bandwidth**	**Flatness (nominal)**
All S9110A standard configurations RF Transceiver connectors **RF In** ④ or **RF In** ⑥	380 to 6000 MHz	100 MHz	± 1.1 dB
		200 MHz	± 1.35 dB
		400 MHz	± 1.25 dB
		800 MHz	± 1.45 dB
		1200 MHz	± 1.8 dB

Error Vector Magnitude (EVM)

Test signal: FR1: 5G NR, 30 kHz subcarrier spacing, 256QAM
Test signal: FR2: 5G NR, 120 kHz subcarrier spacing, 256QAM

	Frequency range 10.6 to 31.4 GHz	EVM (nominal)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ② Measured in loopback	100 MHz BW	≤ –37 dB, –40 to –30 dBm input power
		≤ –45 dB, –30 to 0 dBm input power
	400 MHz BW	≤ –32 dB, –40 to –30 dBm input power
		≤ –40 dB, –30 to –20 dBm input power
		≤ –44 dB, –20 to 0 dBm input power
	8 x 100 MHz	≤ –28 dB, –40 to –30 dBm input power
		≤ –37 dB, –30 to –20 dBm input power
		≤ –39 dB, –20 to 0 dBm input power
	Frequency range 24.5 to 48.7 GHz	**EVM (nominal)**
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	100 MHz BW	≤ –37 dB, –40 to –30 dBm input power
		≤ –43 dB, –30 to 0 dBm input power
	400 MHz BW	≤ –32 dB, –40 to –25 dBm input power
		≤ –42 dB, –25 to –5 dBm input power
		≤ –40 dB, –5 to 0 dBm input power
	8 x 100 MHz	≤ –30 dB, –40 to –25 dBm input power
		≤ –42 dB, –25 to 0 dBm input power
All S9110A standard configurations RF Transceiver connectors **RF In** ④ or **RF In** ⑥	**FR1 (Sub 6 GHz)**	**EVM (nominal)**
	100 MHz BW signal at 5000 MHz	< 0.3% at –10 dBm input power

Test signal: Custom DFT-S OFDM

	Frequency range 10.6 to 31.4 GHz	EVM (nominal)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ② Measured in loopback	1000 MHz BW	≤ –27 dB, –40 to –35 dBm input power
		≤ –32 dB, –35 to –30 dBm input power
		≤ –36 dB, –30 to –25 dBm input power
		≤ –39 dB, –25 to –20 dBm input power
		≤ –41 dB, –20 to –15 dBm input power
		≤ –42 dB, –15 to 0 dBm input power

Test signal: DVB-S2X
Equalizer filter length: 51
EVM normalization reference: Reference RMS

	Frequency range 10.6 to 31.4 GHz	EVM (nominal)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ② Measured in loopback	500 MHz BW	≤ –30 dB, –40 to –35 dBm input power
		≤ –35 dB, –35 to –30 dBm input power
		≤ –40 dB, –30 to –25 dBm input power
		≤ –43 dB, –25 to –20 dBm input power
		≤ –44 dB, –20 to 0 dBm input power

Adjacent **C**hannel **Le**akage **R**ation (ACLR)		
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ② Measured in loopback	**Frequency range 10.6 to 31.4 GHz**	**ACLR (nominal)**
	100 MHz BW	≤ –51 dBc, –40 to 0 dBm input power
	400 MHz BW	≤ –42 dBc, –40 to 0 dBm input power
	8 x 100 MHz	≤ –40 dBc, –40 to 0 dBm input power
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	**Frequency range 22.7 to 48.6 GHz**	**ACLR (nominal)**
	100 MHz BW	≤ –43 dBc, –10 to 0 dBm input power
		≤ –50 dBc, –30 to –10 dBm input power
		≤ –47 dBc, –40 to -30 dBm input power
	400 MHz BW	≤ –43 dBc, –5 to 0 dBm input power
		≤ –44 dBc, –30 to –5 dBm input power
		≤ –41 dBc, –40 to –30 dBm input power
	8 x 100 MHz	≤ –38 dBc, –5 to 0 dBm input power
		≤ –42 dBc, –30 to –5 dBm input power
		≤ –37 dBc, –40 to –30 dBm input power
All S9110A standard configurations RF Transceiver connectors **RF In** ④ or **RF In** ⑥	**FR1 (Sub 6 GHz)**	**ACLR (nominal)**
	100 MHz BW signal at 5000 MHz	< -63 dBc at 0 dBm input power

Vector Signal Generator (Tx) Performance

Performance		
ARB depth	512 MSa	
Frequency		
	Frequency range	
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	10 to 32 GHz, settable	
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 to 49.2 GHz, settable	
All S9110A standard configurations RF Transceiver connectors **RF Out** ③or **RF Out** ⑤	380 to 6000 MHz	
	Frequency reference	
Accuracy, aging rate, stability	Refer to Frequency Reference information in General Performance section.	
Signal generation bandwidth		
	Center frequency	**Maximum bandwidth (nominal)**
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	10 to 10.6 GHz	(Center frequency – 10000 MHz) x 2 MHz
	10.6 to 31.4 GHz	1.2 GHz
	31.4 to 32 GHz	(32000 MHz – Center frequency) x 2 MHz
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 to 24.2 GHz	100 MHz
	24.2 to 24.3 GHz	800 MHz
	24.3 to 49.2 GHz	1.2 GHz
All S9110A standard configurations RF Transceiver connectors **RF Out** ③or **RF Out** ⑤	380 to 550 MHz	100 MHz
	550 to 1310 MHz	200 MHz
	1310 to 2000 MHz	600 MHz
	2000 to 5480 MHz	1200 MHz
	5480 to 6000 MHz	(6080 MHz – Center frequency) x 2 MHz
Amplitude range		
	Frequency range	**Maximum amplitude**
M1742A uWave connectors **RF Tx/Rx 1** ①	10 to 32 GHz	CW: -70dBm to +10 dBm Modulated: -40 dBm to +5 dBm
M1742A uWave connectors **RF Tx/Rx 2** ②	10 to 32 GHz	CW: -70dBm to +8 dBm Modulated: -40 dBm to +3 dBm
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 GHz - 49.2 GHz	CW: -70dBm to +10 dBm Modulated: -40 dBm to +5 dBm
S9110A option TR1 or TR2 RF transceiver connectors **RF Out** ③	380 to 6000 MHz	CW: -120 dBm to +20 dBm Modulated: Depends on Crest Factor
S9110A option BK1 RF transceiver connectors **RF Out** ⑤		CW: Primary Transceiver "wanted" signal: -120 dBm to +7 dBm Secondary Transceiver "Blocker: signal: -120 dBm to +2 dBm Modulated: Depends on Crest Factor
Option HD1 (RFHD), HD2, HDB	380 to 6000 MHz	CW: -120 dBm to +5 dBm

Absolute amplitude accuracy (CW mode)			
	Frequency range	**Level**	**Accuracy (nominal)**
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	10 to 30 GHz	-50 dBm to 0 dBm	≤ ± 0.9 dB
	30 to 32 GHz	-50 dBm to 0 dBm	≤ ± 1.3 dB
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 to 49.2 GHz	-50 dBm to -10 dBm	≤ ± 1.2 dB
		-10 dBm to 0 dBm	≤ ± 1.0 dB
	Frequency range	**Level**	**Accuracy (nominal)**
S9110A Option TR1 or TR2 RF transceiver connectors **RF Out** ③	380 to 550 MHz	≤ +20 to -80 dBm	≤ ± 0.55 dB
		≤ -80 to -120 dBm	≤ ± 0.80 dB
	550 to 2000 MHz	≤ +20 to -15 dBm	≤ ± 0.70 dB
		≤ -15 to -80 dBm	≤ ± 0.55 dB
		≤ -80 to -110 dBm	≤ ± 0.85 dB
	2000 to 3900 MHz	≤ +20 to -15 dBm	≤ ± 0.60 dB
		≤ -15 to -80 dBm	≤ ± 0.70 dB
		≤ -80 to -110 dBm	≤ ± 1.30 dB
	3900 to 5700 MHz	≤ +20 to -15 dBm	≤ ± 0.80 dB
		≤ -15 to -80 dBm	≤ ± 1.10 dB
		≤ -80 to -100 dBm	≤ ± 1.20 dB
	5700 to 6000 MHz	≤ +20 to -15 dBm	≤ ± 0.80 dB
		≤ -15 to -80 dBm	≤ ± 1.10 dB
		≤ -80 to -90 dBm	≤ ± 1.20 dB
S9110A Option BK1 RF transceiver connectors **RF Out** ⑤ Primary transceiver, "Wanted" signal	380 to 550 MHz	≤ +17 to -83 dBm	≤ ± 0.55 dB
		≤ -83 to -120 dBm	≤ ± 0.80 dB
	550 to 2000 MHz	≤ +17 to -18 dBm	≤ ± 0.70 dB
		≤ -18 to -83 dBm	≤ ± 0.55 dB
		≤ -83 to -113 dBm	≤ ± 0.85 dB
	2000 to 3900 MHz	≤ +17 to -18 dBm	≤ ± 0.60 dB
		≤ -18 to -83 dBm	≤ ± 0.70 dB
		≤ -83 to -113 dBm	≤ ± 1.30 dB
	3900 to 5700 MHz	≤ +17 to -18 dBm	≤ ± 0.80 dB
		≤ -18 to -83 dBm	≤ ± 1.10 dB
		≤ -83 to -103 dBm	≤ ± 1.20 dB
	5700 to 6000 MHz	≤ +17 to -18 dBm	≤ ± 0.80 dB
		≤ -18 to -83 dBm	≤ ± 1.10 dB
		≤ -83 to -93 dBm	≤ ± 1.20 dB
S9110A Option BK1 RF transceiver connectors **RF Out** ⑤ Secondary transceiver, "Blocker" signal	380 to 550 MHz	≤ +2 to -98 dBm	≤ ± 0.55 dB
		≤ -98 to -120 dBm	≤ ± 0.80 dB
	550 to 2000 MHz	≤ +2 to -33 dBm	≤ ± 0.70 dB
		≤ -33 to -98 dBm	≤ ± 0.55 dB
		≤ -98 to -120 dBm	≤ ± 0.85 dB
	2000 to 3900 MHz	≤ +2 to -33 dBm	≤ ± 0.60 dB
		≤ -33 to -98 dBm	≤ ± 0.70 dB
		≤ -98 to -120 dBm	≤ ± 1.30 dB
	3900 to 5700 MHz	≤ +2 to -33 dBm	≤ ± 0.80 dB
		≤ -33 to -98 dBm	≤ ± 1.10 dB
		≤ -98 to -118 dBm	≤ ± 1.20 dB
	5700 to 6000 MHz	≤ +2 to -33 dBm	≤ ± 0.80 dB
		≤ -33 to -98 dBm	≤ ± 1.10 dB
		≤ -98 to -108 dBm	≤ ± 1.20 dB
	Frequency range	**Level**	**Accuracy (nominal)**
Half duplex connector (Option HD1, HD2, HDB)	380 to 550 MHz	≤ +5 to -80 dBm	≤ ± 0.50 dB
		≤ -80 to -90 dBm	≤ ± 0.65 dB
	550 to 2000 MHz	≤ +5 to -15 dBm	≤ ± 0.55 dB
		≤ -15 to -80 dBm	≤ ± 0.60 dB
		≤ -80 to -90 dBm	≤ ± 0.75 dB
	2000 to 3900 MHz	≤ +5 to -15 dBm	≤ ± 0.50 dB
		≤ -15 to -80 dBm	≤ ± 0.80 dB
		≤ -80 to -90 dBm	≤ ± 1.10 dB
	3900 to 6000 MHz	≤ +5 to -15 dBm	≤ ± 0.90 dB
		≤ -80 to -90 dBm	≤ ± 1.25 dB

Linearity (CW mode) (reference power level is -5 dBm)

	Frequency range	Input level	Linearity (nominal)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	10 – 32 GHz	-50 to 0 dBm	≤ ± 0.9 dB
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	22.7 - 49.2 GHz	-50 to -30 dBm	≤ ± 1.5 dB
		-30 to -0 dBm	≤ ± 1.0 dB

IF flatness

When working with M1749B, the center frequency can be set > than 48.6 Ghz, but bandwidth will be reduced as 49.2 GHz is approached.
When working with M1742A, the center frequency can be set > than 31.4 Ghz, but bandwidth will be reduced as 32 GHz is approached.

	Frequency range	Bandwidth	Flatness (typical)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	10.6 to 31.4 GHz	1200 MHz	± 1.2 dB
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	24.3 to 48.6 GHz	1200 MHz	± 1.5 dB
All S9110A standard configurations RF Transceiver connectors **RF Out** ③ or **RF Out** ⑤	380 to 6000 MHz	100 MHz	± 0.5 dB
		200 MHz	± 0.8 dB
		400 MHz	± 1.0 dB
		800 MHz	± 1.0 dB
		1200 MHz	± 1.5 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

	Frequency range 10.6 to 31.4 GHz	EVM (nominal)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ② Measured in loopback	100 MHz BW	≤ –37 dB, –40 to –30 dBm input power
		≤ –45 dB, –30 to 0 dBm input power
	400 MHz BW	≤ –32 dB, –40 to –30 dBm input power
		≤ –40 dB, –30 to –20 dBm input power
		≤ –44 dB, –20 to 0 dBm input power
	8 x 100 MHz	≤ –28 dB, –40 to –30 dBm input power
		≤ –37 dB, –30 to –20 dBm input power
		≤ –39 dB, –20 to 0 dBm input power

	Frequency range 22.7 to 49.2 GHz	EVM (nominal)
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	100 MHz BW	≤ –33 dB, –40 to –30 dBm input power
		≤ –42 dB, –30 to 0 dBm input power
	400 MHz BW	≤ –28 dB, –40 to –30 dBm input power
		≤ –37 dB, –30 to –25 dBm input power
		≤ –41 dB, –25 to 0 dBm input power
	8 x 100 MHz	≤ –30 dB, –35 to –25 dBm input power
		≤ –38 dB, –25 to -0 dBm input power

All S9110A standard configurations RF Transceiver connectors **RF Out** ③ or **RF Out** ⑤	**FR1 (Sub 6 GHz)**	**EVM (nominal)**
	100 MHz BW signal at 4000 MHz	< 0.4% at –10 dBm output power
	100 MHz BW signal at 5000 MHz	< 0.6% at –10 dBm output power

Test signal: Custom DFT-S OFDM

	Frequency range 10.6 to 31.4 GHz	EVM (nominal)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ② Measured in loopback	1000 MHz	≤ –27 dB, –40 to –35 dBm input power
		≤ –32 dB, –35 to –30 dBm input power
		≤ –36 dB, –30 to –25 dBm input power
		≤ –39 dB, –25 to –20 dBm input power
		≤ –41 dB, –20 to –15 dBm input power
		≤ –42 dB, –15 to 0 dBm input power

Test signal: DVB-S2X
Equalizer filter length: 51. EVM Normalization Reference: Reference RMS.

	Frequency range 10.6 to 31.4 GHz	EVM (nominal)
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ② Measured in loopback	500 MHz	≤ –30 dB, –40 to –35 dBm input power
		≤ –35 dB, –35 to –30 dBm input power
		≤ –40 dB, –30 to –25 dBm input power
		≤ –43 dB, –25 to –20 dBm input power
		≤ –44 dB, –20 to 0 dBm input power

Adjacent Channel Leakage Ration (ACLR)		
Test signal for FR1: 5G NR, 30 kHz subcarrier spacing, 256QAM Test signal for FR2: 5G NR, 120 kHz subcarrier spacing, 256QAM		
	Frequency range 10.6 to 31.4 GHz	**ACLR (nominal)**
M1742A uWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ② Measured in loopback	100 MHz BW	≤ –51 dBc, –40 to 0 dBm input power
	400 MHz BW	≤ –42 dBc, –40 to 0 dBm input power
	8 x 100 MHz	≤ –40 dBc, –40 to 0 dBm input power
M1749B mmWave connectors **RF Tx/Rx 1** ① and **RF Tx/Rx 2** ②	**Frequency range 22.7 to 49.2 GHz**	**ACLR (nominal)**
	100 MHz BW	≤ –47 dBc, -5 to 0 dBm input power
		≤ –48 dBc, –25 to -5 dBm input power
		≤ –43 dBc, –40 to -25 dBm input power
	400 MHz BW	≤ –43 dBc, –30 to 0 dBm input power
		≤ –42 dBc, –35 to –30 dBm input power
		≤ –40 dBc, –40 to –35 dBm input power
	8 x 100 MHz	≤ –37 dBc, –30 to 0 dBm input power
		≤ –36 dBc, –40 to –30 dBm input power
All S9110A standard configurations RF Transceiver connectors **RF Out** ③ or **RF Out** ⑤ Note: The S9110A-BK1 systems include 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.	**FR1 (Sub 6 GHz)**	**ACLR (nominal)**
	100 MHz BW signal at 4000 MHz	< -57 dBc at 0 dBm input power
	100 MHz BW signal at 5000 MHz	< -55 dBc at 0 dBm input power

General Performance

Environmental characteristics		
S91110A 5G multi-band vector transceiver	For indoor use only	
	Altitude up to 6,561.68 ft (2,000 m)	
	Operating temperature 15 to 35° C maximum relative humidity (non-condensing): 85% RH	
Power requirements		
	Voltage & frequency	**Power consumption**
S9110A base system (PXIe chassis with modules, rugged panel, and cables)	100/120 V, 50/60 Hz 220/240 V, 50/60 Hz	1200 W Max (lower range) 1300 W Max (upper range)
M1742A	120 VAC (via supplied 0950-6166 AC/DC adapter)	103 W
M1749B	120 VAC (via supplied 0950-6166 AC/DC adapter)	105 W
Size and weights		
Dimensions		
S9110A base system	Height: 197.8 mm (7.79 in); with feet installed	
	Width: 449.5 mm (17.70 in); with rugged panel	
	Depth: 568.9 mm (22.40 in); with rugged panel (from back bumper to front BNC)	
M1742A	Height: 70 mm (2.76 in)	
	Width: 175 mm (6.89 in)	
	Depth: 345 mm (13.58 in)	
M1749B	Height: 70 mm (2.76 in)	
	Width: 175 mm (6.89 in)	
	Depth: 345 mm (13.58 in)	
S9101A rack space	2 X 2U x 1 rack width	
Weight		
S9110A-TR1 base system	20.4 kg (45.0 lbs)	
S9110A-TR2 base system	22.6 kg (49.8 lbs)	
S9110A-BK1 base system	24.0 kg (53.0 lbs)	
M1742A	3.5 kg (7.7 lbs)	
M1749B	3.5 kg (7.7 lbs)	
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.		

LAN, Display Port, and USB Connectors, M9038A PXIe Embedded Controller

LAN 1 and LAN2 (TCP/IP interface)	
Connectors (Ethernet)	One, 10/100/1000 BASE-T (RJ-45) One, 100/1000/10GB BASE-T (RJ-45)
Video/Dual Display Ports	
Connectors (video)	One, DisplayPort++
USB 2.0 and 3.0	
Connectors	Two, USB 2.0 (Type A)
Connectors	Two, USB 3.0 (Type A)

S9110A Base System Front Panel (with Rugged Front Panel)

Frequency reference, 100 MHz Ref Out and 10 MHz Ref In/Out connectors above the rugged front panel

100 MHz Ref Out, frequency reference (if available)	
Accuracy	± 16 Hz, typical, 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 (nominal)
10 MHz Ref Out, Frequency Reference	
Accuracy	± 1.6 Hz, typical, 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 (nominal)
10 MHz Ref In	
Connects behind rugged panel to M9300A PXIe Reference Ref In and locks to another reference with a value from 1 to 110 MHz.	
Connector	BNC (f)
Frequency	1 MHz to 110 MHz, sine wave
Lock range	± 1 ppm (nominal)
Input amplitude	0 to 10 dBm (nominal)
Impedance	50 Ω (nominal)

Trig 1 and Trig 2 Connectors above the rugged front panel

Trig 1 and Trig 2	
Connects behind rugged panel to M9019A PXIe Chassis Trig 1 and Trig 2. These two front panel trigger connectors (Trig 1 and Trig 2) above the rugged front panel connect to the PXI [0:7] backplane trigger bus in the M9019A chassis and can be configured as Input or Output.	
Connector	BNC (f)
Direction control	Input or output (configurable)
Output level	3.3 V CMOS (TTL compatible, 5 V tolerant)
Output impedance	50 Ω (typical)
Output trigger source	PXI_Trig0 - PXI_Trig7 (Segment 2 or 3)
Input level	3.3 V CMOS (TTL compatible, 5 V tolerant)
Input impedance	3 kΩ (typical)
Input trigger destination	PXI_Trig0 - PXI_Trig7 (Segment 2 or 3)
Input threshold	1.65 V (typical)
Minimum swing	250 mV (typical)
Minimum pulse width	100 ns (typical)

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

RF In	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	380 MHz to 6 GHz
Amplitude	0 VDC, +27 dBm maximum safe input power
RF Out	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	380 MHz to 6 GHz
Amplitude	0 VDC, +30 dBm maximum applied reverse input power
Half duplex, Option HD1, HD2	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	380 MHz to 6 GHz
Amplitude	0 VDC, +30 dBm maximum safe input power
Trig 1 and Trig 2	
Connector	BNC (f)
Direction control	Input or Output
Input impedance	1 kΩ or 50 Ω nominal
Input level	Range: 0 to +3.3v
Output impedance	50 Ω nominal
Output Level	+3.3V LVTTL, LVDS

Transceiver Connectors, Head uWave/mmWave 10 to 32 GHz or 22.7 to 49.2 GHz on the rugged front panel

IF In, IF Out, and LO/Pwr/Ctrl Out connect to the M1742A or M1749B.	
IF In	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	380 MHz to 6 GHz
Amplitude	± 10 VDC, +33 dBm maximum
IF Out	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	380 MHz to 6 GHz
Amplitude	± 10 VDC, +33 dBm maximum
LO1 and LO2 Out	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	380 MHz to 6 GHz
USB control	
Connector	USB 2.0 (Type A)
4.8Ghz Out (not used with F43/F49 options)	
Connector	Type-N (f), 50 Ω (nominal)

M1742A uWave Transceiver

Although the M1742A uWave Transceiver is operational from 10 to 32 GHz, the performance information for the S9110A is only provided for the frequency bands called out in this Data Sheet.	
RF Tx/Rx 1 and RF Tx/Rx 2	
Connector	2.4 mm (f), 50 Ω (nominal) These ports can be configured either to supply a uWave signal to a Device Under Test (DUT) or to receive a uWave signal from a DUT.
Amplitude	30 VDC, +25 dBm maximum input
Cal	
Connector	2.4 mm (f), 50 Ω (nominal)
Rx IF Out/Tx IF In	
Connector	3.5 mm (f), 50 Ω (nominal)
Tx LO In/Rx LO In	
Connector	3.5 mm (f)
Ref In	
Connector	3.5 mm (f)
Ref Out	
Connector	3.5 mm (f)
USB	
Connector	USB micro-B (f)
Trig 1/Trig 2	
Connector	SMB (m)
Control (not used with S9110A)	
Connector	SMA (f)
Power	
Connector	19 V DC power supply input

M1749B mmWave Transceiver

Although the M1749B mmWave Transceiver is operational from 22.7 to 49.2 GHz, the performance information for the S9110A is only provided for the frequency bands called out in this Data Sheet.	
RF Tx/Rx 1 and RF Tx/Rx 2	
Connector	2.4 mm (f), 50 Ω (nominal) 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	10 VDC, +10 dBm maximum input
Cal (internal use only)	
Connector	2.4 mm (f), 50 Ω (nominal)
Rx IF Out /Tx IF In	
Connector	SMA (f), 50 Ω (nominal)
LO In	
Connector	3.5 mm (f)
9.6 GHz In	
Connector	3.5 mm (f)
9.6 GHz Out	
Connector	3.5 mm (f)
USB	
Connector	USB micro-B (f)
Trig 1/Trig 2	
Connector	SMB (m)
Control (not used with S9110A)	
Connector	SMA (f)
Power	
Connector	19 V DC power supply input

Related Literature

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

Keysight M9019A PXIe 18 slot Chassis, Data Sheet (literature no. 5992-1481EN)

Keysight M9038A PXIe High Performance Embedded Controller, Data Sheet (literature no. 3122-1717.EN)

Keysight M9410A and M9411A PXIe VXT Vector Transceivers, Data Sheet (literature no. 5992-3331EN)

Product page:

http://www.keysight.com/find/S9110A