M1740A

mmWave Transceiver for 5G

Reduce Path Loss at mmWave with Multi-band Remote Radio Head

Keysight's multi-band M1740A remote radio head (RRH) enables users to confidently test over-the-air (OTA) in mmWave frequency bands, including 24, 28, 39 and 40 GHz bands. The M1740A uniquely supports bi-directional testing across four mmWave frequency bands with a single hardware set.

Verify transceiver (Tx) and receiver (Rx) performance of 5G RFFEs, base stations, chipsets and devices using stimulus and analysis provided by one of several Keysight platforms.

Compact Design

The compact head is mounted near an OTA test chamber to optimize floor space.

Remote radio head approach improves repeatability and accuracy.

Figure 1: M1740A mmWave transceiver for 5G has two mmWave Tx/Rx ports to support two horn antennas or a single dual polarized horn antenna configuration

Versatile 5G Solutions to Reduce Test Time and Achieve More Consistent Results

The M1740A RRH with accompanying platforms lets you flexibly analyze mmWave 5G performance with and without signaling. Improve time to market by finding and resolving issues early in the product life cycle. Reduce development and test time by accessing consistent results from Keysight's common measurement algorithms.

KEYSIGHT TECHNOLOGIES

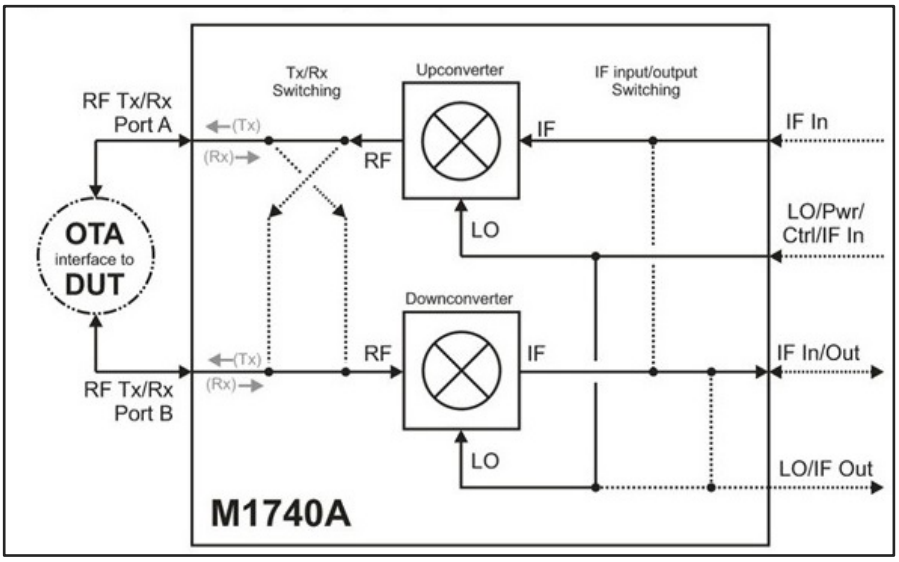

Figure 2: M1740A Block Diagram

Performance Characteristics

Definitions

Specification (spec)

Specifications are warranted for a calibrated instrument that has been stored for a minimum of two hours within the operating temperature range and after a two-hour warm up period. Specifications are valid from 20 to 35 °C unless otherwise noted.

Typical (typ)

The characteristic performance, that 95 percent of the units exhibit with a 95 percent confidence level. This data, shown in Italics, is not warranted, does not include measurement uncertainty, and is valid only at room temperature (23 ± 5 °C).

Nominal (nom)

The mean or average characteristic performance, or the value of an attribute that is determined by design. This data is not warranted and is measured at room temperature (23 ± 5 °C).

Measured (meas)

An attribute measured during development for purposes of communicating the expected performance. This data is not warranted and is measured at room temperature (23 ± 5 °C).

Conditions

The specifications in this document apply to a single M1740A remote radio head. The RRH must be used as a component in a mmWave 5G solution connected to one of the following platforms and/or interface products:

- E6640A EXM Wireless Test Set with E7770A CIU
- E7515B UXM 5G Wireless Test Platform with E7770A CIU
- E7760B Wideband Transceiver
- M9410A VXT PXI Vector Transceiver with E7770A CIU
- PROPSIM 5G Channel Emulation Solution with E7770A CIU

These platforms are designed to use the appropriate IF ranges and power levels, LO ranges and power levels, DC power and control information.

Use of M1740A with other platforms is not warranted and performance is not covered by this document.

mmWave Downconverter (Rx In) Performance Characteristics

Frequency	Performance	Conditions
Frequency ranges	24.25 to 29.5 GHz, 37 to 43.5 GHz	
Bandwidth, maximum	800 MHz 1.4 GHz	24.25 to 29.5 GHz 37 to 43.5 GHz
Amplitude	**Performance**	**Conditions**
CW input level range	-70 to 5 dBm	
CW gain (level) accuracy[1]	< ±1.75 dB, typical	-50 to 5 dBm input
CW linearity referenced to 0 dBm	< ±1.4 dB, < ±0.65 dB, typical	24.25 to 29.5GHz 37 to 43.5 GHz -50 to 5 dBm input
	< ±0.5 dB, typical	24.25 to 29.5GHz -50 to 5 dBm input
Maximum applied reverse power	20 dBm CW, 15 V DC	
Error Vector Magnitude (EVM)[2,3]	**Performance**	**Conditions**
100 MHz, 1 carrier, 64QAM	< -40 dB, nominal	24.25 to 29.5 GHz 38 to < 41 GHz -40 to 0 dBm input
	< -39 dB, nominal	37 to 38 GHz 41 to < 42.5 GHz -40 to 0 dBm input
		42.5 to 43.5 GHz -35 to 0 dBm input

[1] Performance can drift with differing relative humidity levels. A two-hour warm-up period is recommended to stabilize performance when switched off for more than two hours.
[2] For EVM performance, the LO input was provided by an E8267D PSG vector signal generator. The IF input was provided by an M8190A arbitrary waveform generator. The IF output was connected to an N9040B UXA signal analyzer. DC power input was provided by an external power supply.
[3] Performance characteristics above 40 GHz are valid for M1740A with serial numbers larger than US5848xxxx or MY5848xxxx.

mmWave Upconverter (Tx Out) Performance Characteristics

Frequency	Performance	Conditions
Frequency ranges	24.25 to 29.5 GHz, 37 to 43.5 GHz	
Bandwidth, maximum	800 MHz 1.4 GHz	24.25 to 29.5 GHz 37 to 43.5 GHz
Amplitude	**Performance**	**Conditions**
CW output power range	-70 to 10 dBm	
Modulated output power range	-40 to 10 dBm	
CW gain (level) accuracy[4]	< ±2.0 dB, typical	-50 to 5 dBm
CW linearity reference to 0 dBm	< ±2.0 dB, < ±0.8 dB, typical	24.25 to 29.5GHz 37 to 43.5 GHz -50 to 5 dBm output
	< ±0.25 dB, typical	24.25 to 29.5 GHz -15 to 5 dBm output
Error Vector Magnitude (EVM)[5,6,7]	**Performance**	**Conditions**
100 MHz, 1 carrier, 64QAM	< -40 dB, nominal	28 GHz, 39 GHz, 42 GHz -5 dBm output
	< -39 dB, nominal	24.25 to 29.5 GHz 38 to 43.5 GHz -5 dBm output

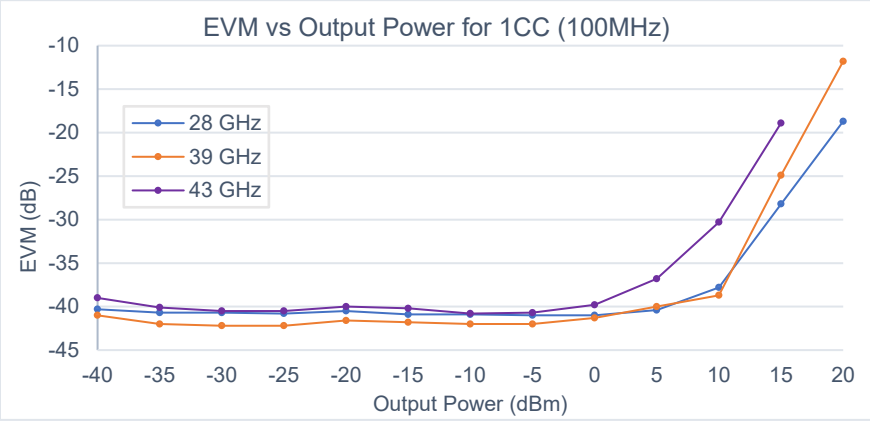

Figure 3: EVM vs. Output Power

[4] Performance can drift with differing relative humidity levels. A two-hour warm-up period is recommended to stabilize performance when switched off for more than two hours.
[5] EVM performance degrades with output power levels > 3 dBm. See Figure 3 for example performance.
[6] For EVM performance, the LO input was provided by an E8267D PSG vector signal generator. The IF input was provided by an M8190A arbitrary waveform generator. The IF output was connected to an N9040B UXA signal analyzer. DC power input was provided by an external power supply.
[7] Performance characteristics above 40 GHz are valid for M1740A with serial numbers larger than US5848xxxx or MY5848xxxx.

Instrument Performance Characteristics

General Attributes	Performance
Power consumption	34 W with 36 V DC
Dimensions (W x H x D)	165 x 64 x 139 mm, 6.5 x 2.51 x 5.46 inches
Weight	2.2 kg, 4.85 pounds
Operating temperature	10 to 40 °C, < 85 % relative humidity (RH)
Storage temperature	-40 to 70 °C, < 85 % RH M1740A should be stored in an environment with low relative humidity.
Calibration cycle	1 year
Regulatory Information	**Performance**
EMC	Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity): • IEC/EN 61326-1 • CISPR 11, Group 1, class A • AS/NZS CISPR 11 • ICES/NMB-001 This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada. South Korean Class A EMC declaration: This equipment has been conformity assessed for use in business environments. In a residential environment this equipment may cause radio interference. 사 용 자 안 내 문 이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.
Safety	Complies with the essential requirements of the European Low Voltage Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity): • IEC/EN 61010-1 • Canada: CSA C22.2 No. 61010-1 • USA: UL std no. 61010-1

Regulatory Information	Performance
Acoustic statement	(European Machinery Directive) Acoustic noise emission LpA <70 dB Operator position Normal operation mode per ISO 7779

To find a current Declaration of Conformity for a specific Keysight product, go to:
www.keysight.com/go/conformity

Inputs and Outputs

Front Panel	Label	Description	Type
Trigger input port	Ext Trig	Trigger input typically included in the combined input signal to the control input port	SMP
USB port		Control input for Keysight internal testing	
Auxiliary connector	Aux	Power input for Keysight internal testing	
DUT-Facing Side	**Label**	**Description**	**Type**
mmWave ports	RF Tx/Rx 1/2	Two RF in/out ports	2.4 mm
Instrument-Facing Side	**Label**	**Description**	
LO/IF port	LO/IF Out	IF output of the downconverter or LO input to downconverter	SMA
IFIO port	IF In/Out	IF input to the upconverter or IF output of the downconverter	SMA
IF input port	IF In	IF input to the upconverter	SMA
Control input port	LO/Pwr/Ctrl/IF In	IF input to the upconverter combined with LO input for upconverter and/or downconverter, DC voltage input, control signal	SMA

Ordering Information

Product/Option	Description
M1740A	mmWave transceiver for 5G
M1740A-CA4	RF cable N-SMA, 4m
M1740A-CB4	RF cable TNC-SMA, 4m

Hardware support, warranty, calibration and services are available. Please contact your sales representative for options and pricing.

The M1740A RRH must be ordered with a Keysight platform or interface product designed to use the appropriate IF ranges and power levels, LO ranges and power levels, DC power and control information.

Upgrades and Accessories

Product/Option	Description	Comments
M1740AU	mmWave transceiver for 5G	Add remote radio head to existing solution
M1740AU-CA4	RF cable N-SMA, 4m	Add or replace cable
M1740AU-CB4	RF cable TNC-SMA, 4m	Add or replace cable

Keysight 5G Solutions

Keysight's solutions span the entire 5G workflow. The M1740A RRH is one component in many mmWave 5G solutions.

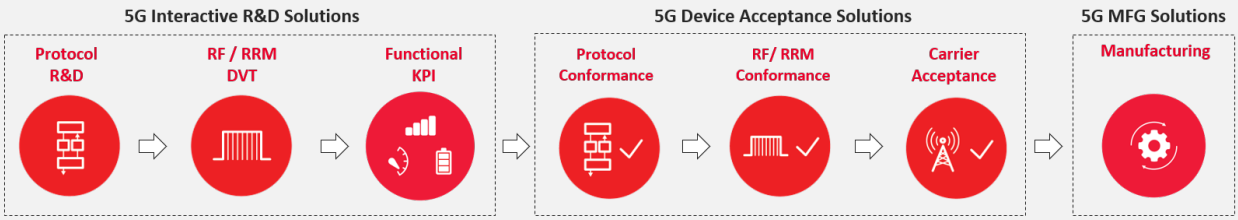

Figure 4: Workflow Solutions

For more information about Keysight's 5G solutions, visit www.keysight.com/find/5G.

For more information about Keysight's PathWave, visit www.keysight.com/find/pathwave.

For more information on the M1740A mmWave transceiver, visit www.keysight.com/find/m1740a.

For more information on the E7770A CIU, visit www.keysight.com/find/e7770a.

For more information about the E6640A EXM wireless test set, visit www.keysight.com/find/e6640a.

Additional information about Keysight solutions enabled by the E7515B is available at

- E7515B UXM 5G wireless test platform: www.keysight.com/find/e7515b
- 5G Protocol R&D Toolset: www.keysight.com/find/5g-protocol
- 5G RF DVT Toolset: www.keysight.com/find/5g-rf

For information about mmWave 5G non-signaling solutions, visit www.keysight.com/find/e7760b.

Additional information about Keysight solutions enabled by the M9410A is available at:

- M9410A VXT PXI vector transceiver: www.keysight.com/find/m9410a
- S9100A 5G multi-band vector transceiver, reference solution: http://www.keysight.com/find/solution-5gmfg

For more information on PROPSIM channel emulation solutions, visit www.keysight.com/find/propsim.

Learn more at: 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

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