

# 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 millimeter-wave (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 transmitter (Tx) and receiver (Rx) performance of 5G RFFEes, base stations, chipsets, and devices including UE power class 1 fixed wireless access (FWA) devices such as customer-premises equipment (CPE) using stimulus and analysis provided by one of several Keysight platforms.



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.



#### Compact Design

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

Remote radio head approach improves repeatability and accuracy.

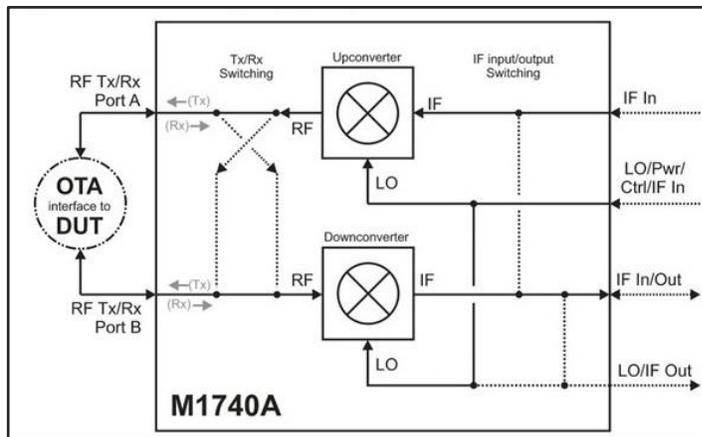


Figure 2. M1740A block diagram

## 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 only valid at room temperature ( $23 \pm 5$  °C).

#### Nominal (nom)

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

#### Measured (meas)

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

### Conditions

The specifications in this document apply to a single M1740A RRH. The RRH must be used as a component in a mmWave 5G solution connected to one of the following platforms:

- E6640A EXM Wireless Test Set with E7770A common interface unit (CIU)
- E7515B UXM 5G Wireless Test Platform with E7770A CIU
- E7760B Wideband Transceiver
- M9410A or M9411A VXT PXI Vector Transceiver with E7770A CIU
- PROPSIM 5G Channel Emulation Solution with E7770A CIU
- S9100A or S9101A 5G Multi-Band Transceiver

These platforms are designed to use the appropriate intermediate frequency (IF) ranges and power levels, local oscillator (LO) ranges and power levels, and 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 <sup>1</sup>	$< \pm 1.75 \text{ dB}$ , typical	-50 to 5 dBm input
CW linearity referenced to 0 dBm	$< \pm 1.4 \text{ dB}$ , $< \pm 0.60 \text{ dB}$ , typical	24.25 to 29.5GHz -50 to 5 dBm input
	$< \pm 1.4 \text{ dB}$ , $< \pm 0.65 \text{ dB}$ , typical	37 to 43.5 GHz -50 to 5 dBm input
Maximum applied reverse power	20 dBm, CW; 15 V DC 7 dBm, modulated	Port configured to receive
Error vector magnitude (EVM) <sup>2,3</sup>	Performance	Conditions
100 MHz, 1 carrier, 64QAM	$< -40 \text{ dB}$ , nominal	24.25 to 29.5 GHz 38 to $< 41 \text{ GHz}$ -40 to 0 dBm input
	$< -39 \text{ dB}$ , nominal	37 to 38 GHz 41 to $< 42.5 \text{ GHz}$ -40 to 0 dBm input
		42.5 to 43.5 GHz -35 to 0 dBm input

<sup>1</sup> Performance can drift with differing relative humidity levels. Keysight recommends a two-hour warm-up period to stabilize performance when switched off for more than two hours.

<sup>2</sup> An E8267D PSG vector signal generator provided the LO input for EVM performance. An M8190A arbitrary waveform generator provided the IF input. The IF output connected to an N9040B UXA signal analyzer. An external power supply provided the DC power.

<sup>3</sup> 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 <sup>4</sup>	$< \pm 2.0$ dB, typical	-50 to 5 dBm
CW linearity referenced to 0 dBm	$< \pm 2.0$ dB, $< \pm 0.8$ dB, typical $< \pm 2.0$ dB, $< \pm 0.25$ dB, typical	24.25 to 29.5GHz -50 to 5 dBm output -15 to 5 dBm output
	$< \pm 2.0$ dB, $< \pm 0.8$ dB, typical	37 to 43.5 GHz -50 to 5 dBm output
Maximum applied reverse power	20 dBm, CW; 15 V DC	Port configured to transmit
EVM <sup>5,6,7</sup>	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

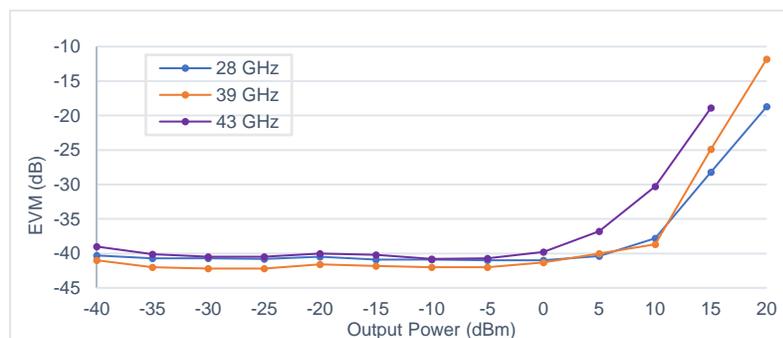


Figure 3. EVM vs. output power

<sup>4</sup> Performance can drift with differing relative humidity levels. Keysight recommends a two-hour warm-up period to stabilize performance when switched off for more than two hours.

<sup>5</sup> EVM performance degrades with output power levels  $> 3$  dBm. See Figure 3 for example performance.

<sup>6</sup> An E8267D PSG vector signal generator provided the LO input for EVM performance. An M8190A arbitrary waveform generator provided the IF input. The IF output connected to an N9040B UXA signal analyzer. An external power supply provided the DC power.

<sup>7</sup> 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 Store the M1740A in an environment with low relative humidity.
Calibration cycle	1 year
Regulatory information	Performance
EMC	<p>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):</p> <ul style="list-style-type: none"> <li>• IEC/EN 61326-1</li> <li>• CISPR 11, Group 1, class A</li> <li>• AS/NZS CISPR 11</li> <li>• ICES/NMB-001</li> </ul> <p>This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.</p> <p>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.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>사용자 안내문</p> <p>이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.</p> </div>
Safety	<p>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):</p> <ul style="list-style-type: none"> <li>• IEC/EN 61010-1</li> <li>• Canada: CSA C22.2 No. 61010-1</li> <li>• USA: UL std no. 61010-1</li> </ul>

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, visit [www.keysight.com/go/conformity](http://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	Type
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

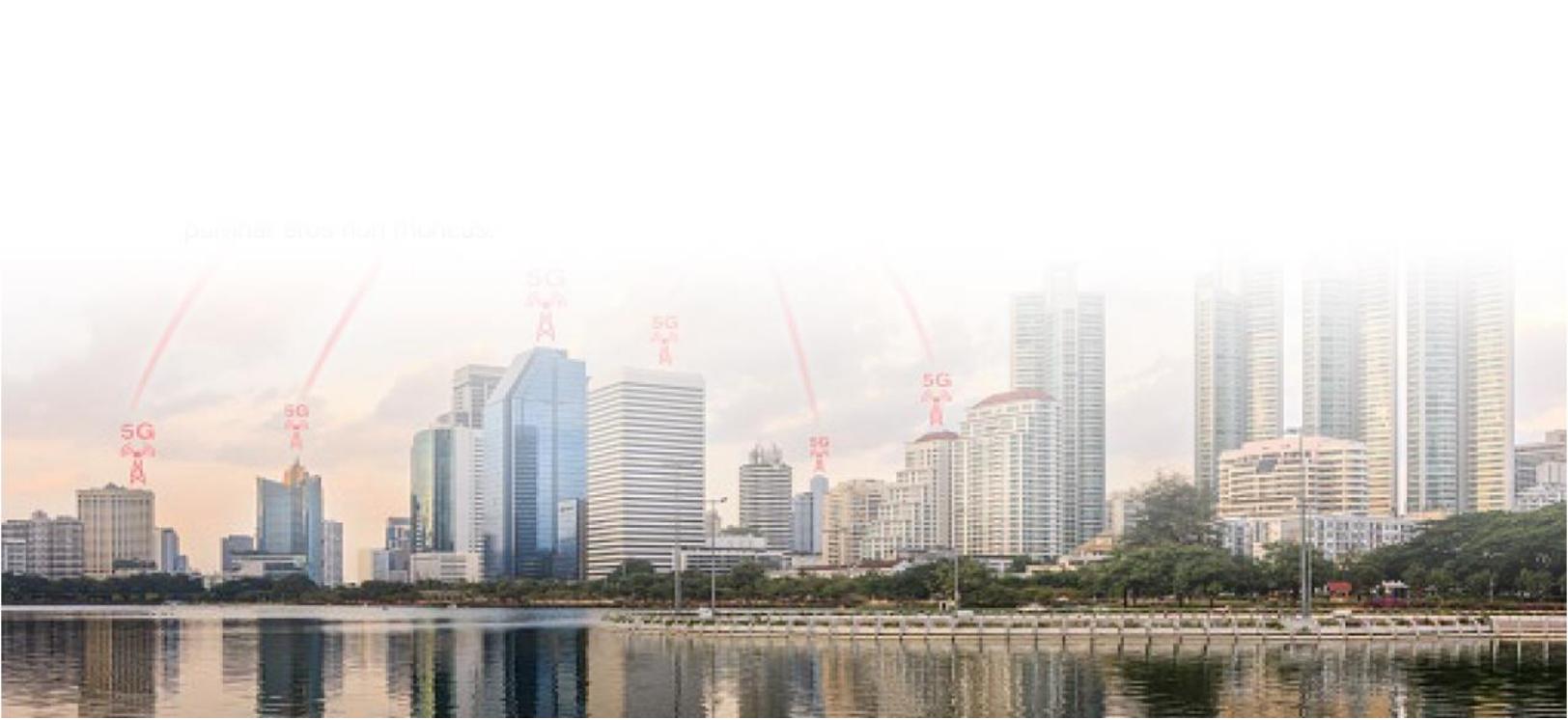
Product/Option	Description
M1740A	mmWave transceiver for 5G
M1740A-AMG	Calibration + uncertainties + guardbanding (accredited)
M1740A-CA4	RF cable N-SMA, 4m
M1740A-CB4	RF cable TNC-SMA, 4m
M1740A-UK6	Commercial calibration certificate with test data

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

You must order the M1740A RRH 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 RRH 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 a component in many mmWave 5G solutions.

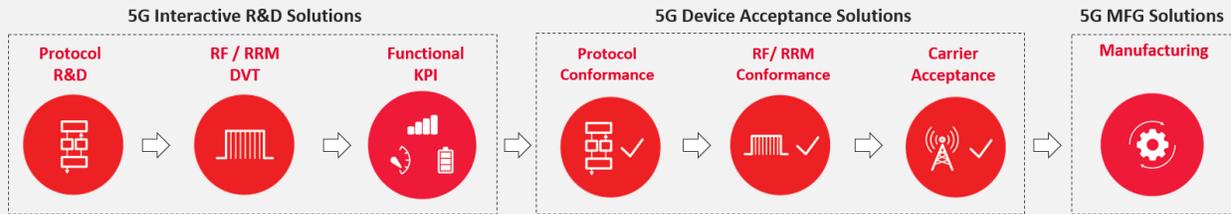


Figure 4: Workflow Solutions

For information about Keysight 5G solutions, visit [www.keysight.com/find/5G](http://www.keysight.com/find/5G).

For information about Keysight PathWave, visit [www.keysight.com/find/pathwave](http://www.keysight.com/find/pathwave).

For information about the M1740A mmWave transceiver, visit [www.keysight.com/find/rrh](http://www.keysight.com/find/rrh).

For information about the E7770A CIU, visit [www.keysight.com/find/ciu](http://www.keysight.com/find/ciu).

For information about the E6640A EXM wireless test set, visit [www.keysight.com/find/exm](http://www.keysight.com/find/exm).

For information about E7515B UXM 5G solutions, visit [www.keysight.com/find/uxm5g](http://www.keysight.com/find/uxm5g).

For information about E7760B mmWave 5G solutions, visit [www.keysight.com/find/e7760b](http://www.keysight.com/find/e7760b).

For information about PROPSIM channel emulation solutions, visit [www.keysight.com/find/propsim](http://www.keysight.com/find/propsim).

For information about VXT PXI vector transceiver solutions, visit:

- M9410A VXT PXI vector transceiver: [www.keysight.com/find/m9410a](http://www.keysight.com/find/m9410a)
- M9411A VXT PXI vector transceiver: [www.keysight.com/find/m9411a](http://www.keysight.com/find/m9411a)
- S9100A 5G multi-band vector transceiver: [www.keysight.com/find/s9100a](http://www.keysight.com/find/s9100a)
- S9101A 5G multi-band vector transceiver: [www.keysight.com/find/s9101a](http://www.keysight.com/find/s9101a)

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)

