F9681A Manufacturing Chamber

Verify 5G FR2 Devices Over the Air

Quickly Check Device Behavior

Millimeter-wave (mmWave) frequencies introduce new challenges for radio frequency (RF) testing. Devices must be calibrated, characterized, and verified over the air without direct connection to test equipment. Path loss is significant at these high frequencies and beam transmission and reception require careful adjustments for accurate measurement. These challenges add more complexity to production test facilities.

The F9681A manufacturing chamber is a compact solution for testing 5G mmWave devices. Combined with a Keysight test platforms such as the E6681A EXM-WB or the E7515B UXM 5G and a radio head such as the M1740A mmWave transceiver, the F9681A completes the solution needed to test devices over the air. Sized to fit in a rack or on a bench, the chamber is useful for repair, production, and bench-top testing.

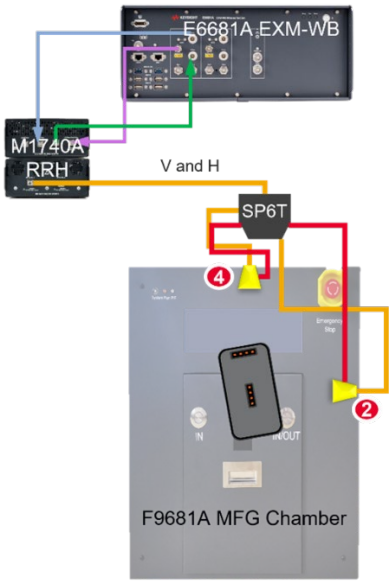

Figure 1. Example system configuration



Figure 2. F9681A manufacturing chamber

The compact size of the F9681A makes it easy to quickly check antenna behavior over the air. Whether in a rack on a production line or on a repair bench, the F9681A is an ideal solution when space is important.

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Performance Characteristics

Definitions

Nominal

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, about 23 °C.

RF characteristics

Anechoic chamber	Characteristic	Conditions
Frequency range	24 to 43.5 GHz	
Conducted path loss		From horn antenna to common port of switch with 2 m cable
	< 8 dB, nominal	30 GHz
	< 11 dB, nominal	40 GHz
Reflectivity	< -35 dB, nominal	Normal incident angle
Isolation	> 65 dB, nominal	24 and 36 GHz
	> 60 dB, nominal	43.5 GHz

Orthogonally-polarized dual horn antenna	Characteristic	Conditions
Frequency range	24 to 43.5 GHz	
VSWR	< 2.0:1, nominal	
Gain Port 1	> 10.30 dB, nominal	24 GHz
	> 12.44 dB, nominal	30 GHz
	> 13.02 dB, nominal	36 GHz
	> 13.68 dB, nominal	42 GHz
	> 14.16 dB, nominal	43.5 GHz
Gain Port 2	> 10.05 dB, nominal	24 GHz
	> 11.36 dB, nominal	30 GHz
	> 13.21 dB, nominal	36 GHz
	> 14.57 dB, nominal	42 GHz
	> 14.50 dB, nominal	43.5 GHz
3 dB beamwidth Port 1	58.51°, nominal 72.29°, nominal	24 GHz E plane H plane
	30.39°, nominal 45.98°, nominal	30 GHz E plane H plane
	36.27°, nominal 36.31°, nominal	36 GHz E plane H plane
	43.75°, nominal 50.91°, nominal	42 GHz E plane H plane
	41.62°, nominal 48.43°, nominal	43.5 GHz E plane H plane

Orthogonally-polarized dual horn antenna	Characteristic	Conditions
3 dB beamwidth Port 2	56.77°, nominal 68.26°, nominal	24 GHz E plane H plane
	32.84°, nominal 44.94°, nominal	30 GHz E plane H plane
	38.37°, nominal 37.74°, nominal	36 GHz E plane H plane
	38.43°, nominal 50.32°, nominal	42 GHz E plane H plane
	41.75°, nominal 48.62°, nominal	43.5 GHz E plane H plane
Cross-port isolation	> 35 dB, nominal	Coupling H to V and V to H

Circularly-polarized horn antenna	Characteristic	Conditions
Frequency range	24 to 43.5 GHz	
VSWR	< 1.6:1, nominal	
Gain	> 7 dB, nominal	24 GHz
	> 10 dB, nominal	28 GHz
	> 11 dB, nominal	40 GHz
	> 12 dB, nominal	43.5 GHz

System Characteristics

General attributes	Characteristic	Conditions
Dimensions	663 x 610 x 691 mm	H x W x D
Weight	126 kg	
Device holder dimensions	180 x 100 x 20 mm	
Device holder weight	< 2 kg	
Anechoic treatment	20 mm flat anechoic foam	
Power consumption	< 120 W	
Current consumption	< 5 A DC	
Operating voltage	24 V DC	
Operating temperature range	0 to 45 °C	

Antenna adjustment	Characteristic	Conditions
Coverage directions	1 to 4	Horn antenna positions at left, right, top, and back
Adjustable range	175 mm, horizontal 25 mm, vertical	Left and right horn antennas
	100 mm, horizontal 175 mm, vertical	Top horn antenna
	100 mm, horizontal 25 mm, vertical	Back horn antenna
Resolution	0.1 mm, nominal	
Accuracy	< ±0.1 mm, nominal	

System Inputs and Outputs

Front features	Label	Description
Emergency stop	Emergency Stop	Press to switch off power Turn the knob clockwise to restore power
System indicators	System	Green light indicates normal power
	Run	Orange light indicates device is under test
	P/F	Green light indicates device has passed Red light indicates device has failed
Door controls	IN	Press simultaneously with IN/OUT to manually close the door
	IN/OUT	Press to manually open the door

Rear features	Label	Description
Ground connector	GND	Connect to building ground
Air pressure meter	Air Pressure Meter	Displays the air pressure for controlling the pneumatic door
Control connection	RJ45	Connect to external PC for control
Air source	Air Source	Connect to compressed air source
AC power	Power Supply	Connect to AC power
USB connectors	DUT USB1	Connect to external PC with USB cable to send control commands to the device under test (DUT)
	DUT USB2	Connect to external PC with USB cable to send control commands to the DUT if two-port communication is needed
	MCB USB	Connect to external PC with USB cable when firmware on the main control needs to be updated

Side features	Label	Description
Air pressure regulator	Air Pressure Regulator	Pull out the knob and rotate to adjust the air pressure
Air pressure threshold	Digital Pressure Switch	Set the air pressure threshold to stop the door from closing and prevent pinching
Door speed regulator	Cylinder Speed Regulator	Adjust the closing and opening speed of the pneumatic door

Top features	Label	Description
Antenna position display	Antenna Position Indicator	Displays the vertical and horizontal position of a horn antenna during adjustments, the control board IP address, and the language of operation

Test 5G FR2 Devices with a Compact Chamber

The F9681A manufacturing chamber is a compact solution for testing 5G mmWave devices. Sized to fit in a rack or on a bench, the chamber is useful for repair, production, and bench-top testing used manually or with automation.

- Quickly verify 5G FR2 device behavior over the air using four horn antennas with adjustable positions
- Minimize path loss with integrated switches and mounting space for the radio head located close to horn antenna connections
- Simplify configuration with two types of antennas, integrated switches and a pneumatic door easily controlled via Ethernet

Find more information

Click on the following links for more information about 5G test solutions.

- F9681A Manufacturing Chamber
- Additional 5G OTA chambers
- 5G device testing
- Device manufacturing testing
- E6681A EXM-WB Wireless Test Set
- E7515B UXM 5G Wireless Test Platform
- 5G Non-signaling Manufacturing Test Solution

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