

F9642A 2D Multi-Probe Anechoic Chamber (MPAC) Pro

Millimeter-wave and sub-6 GHz over-the-air measurement chamber

Introduction

The Keysight F9642A 2D Multi-Probe Anechoic Chamber (MPAC) Pro is a shielded anechoic chamber for Protocol and Functional testing of FR2 direct far-field capability with 1 or 3 AoA, and FR1 4X4 MIMO throughput capability supporting extreme temperature control and thermal imaging.



Overview

The Keysight F9642A 2D Multi-Probe Anechoic Chamber (MPAC) Pro is a shielded anechoic chamber for Protocol and Functional testing of FR2 direct far-field capability with 1 or 3 AoA, and FR1 4X4 MIMO throughput capability supporting extreme temperature control and thermal imaging.

The chamber includes connections for up to six FR2 RF heads connected to a range of up to three feed antenna locations, arranged in an arc to simulate variable angles of arrivals or multiple beams. The FR2 antennas are located within the angle of $\pm 15^\circ$ from the positioner rotation center, creating the angle of 30° for a range length of 106 cm.

There are four dual polarization FR1 antennas located in each corner of the roof with room for polarization rotation to provide maximal signal de-correlation.

Thermal camera is also located on the roof to give unobstructed view to Device-Under-Test (DUT).

The DUT is placed in a software-controlled positioner, capable of providing full spherical coverage.

Key Features

The key features of Keysight F9642A 2D MPAC Pro are:

- FR2 protocol, RF and functional testing with three Angle-of-Arrivals (AoA) within a 30° angular separation
- FR1 functional testing with up to 4x4 MIMO throughput
- Thermal camera
- Laser-guided crosshair for accurate DUT placement
- Fully shielded and filtered
- Low path loss
- Temperature maintenance through forced air ventilation
- Lit interior facilitates working inside the chamber
- Requires Keysight software for positioner control, Vector Network Analysis (VNA) based chamber calibration, and coordinate system mapping

Supported Use Cases

Keysight F9642A 2D MPAC Pro supports, for example, the following use cases:

- Software protocol testing with various antenna configurations
- RF module testing (white box testing)
- Beamforming of one or three AoAs
- Antenna testing (white box testing)
- Wireless cable connection (black box testing)
- Protocol / Demod / 1 AoA RRM (black box testing)
- FR1 4X4 MIMO data throughput
- DUT surface temperature measurement (Hot Spot)

Contact Keysight to discuss about further use cases as the OTA Test Bed performance is a task to evaluate with care.



System Specifications

F9642A: Anechoic chamber

Description	Specification (nominal)	Supplemental information
Construction	NA	Aluminum frame and aluminum panels
Height (external / internal)	1880 mm (74.0") / 1628 mm (64.1")	With RRHs
Width (external / internal)	775 mm (30.5") / 733 mm (28.9")	With handles
Depth (external / internal)	957 mm (37.7") / 880 mm (34.6")	With door handles and locks
Weight	214 kg (472 lb)	Transportation weight 320 kg (705 lb) with U-positioner and without RRHs
Anechoic treatment	50 mm (2") corrugated anechoic foam	
Enclosure frequency range	700 MHz to 68 GHz	
Operating voltage	48 V DC	External power supply 110-230 V
Power consumption	<220 W	
DUT positioning	Laser-based Wavelength: 635 nm Max power: 7 mW	Crosshair laser for exact positioning of the DUT
Illumination	LED-based	
Camera	USB output	
Ventilation	Two honeycomb structures with 1 x fan for forced air flow	
Power ports	1 x DC power 1 x DC power	2.1 x 5.5 mm (for chamber) 2.1 x 5.5 mm (for DUT)
Connectivity ports	4 x USB 3.0 1 x RJ45 Ethernet	1 x USB 3.0 for Positioner, camera RJ45, PoE+ Reserved for Thermal Camera. Compliant for power over the ethernet requirement.
Operating temperature	22 ± 10 °C (71 ± 18 °F)	
Relative humidity	50 % RH ± 20 % RH	

F9642A-0R1: RF connector panel

Description	Specification (nominal)	Supplemental information
RF connections	10 x SMA 1 x 2.4 mm	8 x SMA for FR1, Trigger IN/OUT

F9642A-0D1: DUT connectivity extension panel (can order up to quantity 2)

Description	Specification (nominal)	Supplemental information
Connectivity port	1 x USB 3.1 Gen 2 Type C	SuperSpeed+, 10 G
Power delivery	Downstream Facing Port Supports 4 Power Profiles over CC1 and CC2: 15W (5VDC 3A) 27W (9VDC 3A) 45W (15VDC 3A) 60W (20VDC 3A)	Red LED, Power Indicator Yellow LED, High Power High Voltage Indicator Off High Voltage Indicator On High Voltage Indicator On High Voltage Indicator On
Data cables	USB 3.1 Gen 2 Male/Male 10 Gbps	Includes 2 cables

F9642A-P01: Motor control box

F9642A-PB1: DUT positioner

Description	Specification (nominal)	Supplemental information
Type	Elevation over Azimuth	
Azimuth Axis		
Range	±180 °	
Resolution	0.1 °	
Accuracy	±0.01 °	
Speed	2.3 rpm, 13.8 °/s	
Elevation Axis		
Range	±180 °	
Resolution	0.1 °	
Accuracy	±0.1 °	
Speed	3 rpm, 18 °/s	
DUT max weight	5 kg (11.02 lb)	
DUT max dimensions (H x W)	∅ 300 mm, centered	Black box testing
Max depth of the DUT depends on the type of DUT holder used in testing.	280 mm x 210 mm 560 mm x 420 mm	White box testing with full offset, maximum height, and width of DUT White box testing with no offset, maximum height, and width of DUT

F9642A-PA1: DUT table

Description	Specification (nominal)	Supplemental information
Dimensions	∅ 250 mm x 387 mm	

F9642A: FR2 RF characteristics

Description	Specification (nominal)	Supplemental information
Cross-polarization	< -30 dB	Max for SP antenna Max for DP antenna
Free space path loss	$FSPL = \frac{(4\pi R)^2}{\lambda^2}$	e.g., 61.9 dB for 106 cm, at 28 GHz
Reflectivity	< -50 dB	Measured with an empty chamber
Minimum isolation at 28 GHz	65 dB (±5 dB)	From DUT to outside of the chamber
Minimum isolation at 40 GHz	60 dB (±5 dB)	

F9642A-AG1: FR2 22-50 GHz dual polarized antenna

Description	Specification (nominal)	Supplemental information
Antenna frequency range	22-50 GHz	
Connector type	2 x 1.85 mm (f)	
Return loss	12 dB	Min
Gain	9.5 dBi at 28 GHz 11 dBi at 40 GHz	
Beamwidth vs frequency	52 ° at 28 GHz 40 ° at 40 GHz	
Cross port isolation	< -40 dB	Coupling H to V
Cross-polarization	< -25 dB	Coupling to cross-polarized mode compared co-polarized mode
Cable loss to the RF head	~ 2 dB	Varies with frequency

FR1 RF characteristics

Description	Specification (nominal)	Supplemental information
Minimum isolation at 2.5 GHz	60 dB (±5 dB)	From DUT to outside of the chamber
Minimum isolation at 5.0 GHz	55 dB (±5 dB)	chamber

F9642A-AJ1: FR1 4x4 MIMO dual polarized antenna

Description	Specification (nominal)	Supplemental information
Antenna frequency range	600-8000 MHz	
Connector type	SMA (f)	
Return loss	< -6 dB	580
Gain	> 0 dBi	630-8000 MHz

F9642A-AH1: FR1 link antenna

Description	Specification (nominal)	Supplemental information
Antenna frequency range	600-6000 MHz	
Connector type	SMA (f)	

F9642BC1A: Calibration kit

Description	Specification (nominal)	Supplemental information
Antenna frequency range	6-67 GHz	
Antenna connector	1.85 mm (f)	RF transparent holding fixture with the cable

F9642A-Dxx: DUT holders

Description	Specification (nominal)	Supplemental information
Alignment option	DUT type	Model option
1 & 3	Smartphones and tablets	F9642A-D01
2	Smartphones and tablets	F9642A-D02

F9642A-MA1: Thermal camera

Description	Specification (nominal)	Supplemental information
Temperature range	-20 °C to 175 °C (-4 °F to 347 °F)	
Accuracy	±2 °C (±3.6 °F)	
Thermal resolution	< 35 mK	
IR resolution	464 * 348 pixels	
Connection	RJ45	PoE+

F9631A: Temperature control unit

Description	Specification (nominal)	Supplemental information
Facility requirements	Clean Dry Air	See site preparation guide for more details
Electrical requirements	240 V / 30 A, single phase	See site preparation guide for more details
Maximum inlet air pressure to TCU	120 PSIG (8.3 BAR)	
Maximum inlet air flow to TCU	30 CFM	
Maximum outlet air flow to DUT temperature enclosure kit	15 CFM	

F9631TC1A: DUT temperature enclosure kit

Description	Specification (nominal)	Supplemental information
Enclosure size (outer, L x W x H)	42.0 cm x 42.0 cm x 56.0 cm	Polymethacrylimide (PMI) based structural foam material
Enclosure size (inner, L x W x H)	34.8 cm x 34.8 cm x 48.8 cm	
Standard temperature range	-10 °C to +55 °C	Requires F9629040A license
Extended temperature range	-40 °C to +80 °C	Requires F9629041A license
Transmission loss	<1 dB for 24-50 GHz	

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