MilliBox™

MMWAVE ANTENNA TEST SYSTEMS

Product Guide

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mmWave Chambers

COMPACT- The device under test (DUT) antenna size and operating frequency dictates the far-field distance requirement for over-the-air (OTA) testing and drives the chamber dimensions. At mmWave frequencies, the far-field dimension is small enough so that MilliBox chambers can comfortably fit on a lab benchtop.

The deck has multiple measurement positions with 8cm (3") pass-through holes for direct wiring without connector ports. Conveniently, measurement instruments can be placed just below the MilliBox chamber deck, which reduces the RF coax length and cable loss.

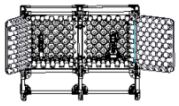
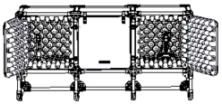
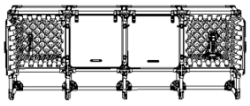
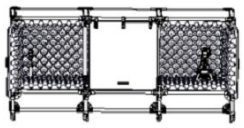
The horn post and the DUT positioners are placed on opposite ends of the chamber deck. Access to the inside is granted through the front doors that close to seal the chamber during test.

MODULAR- MilliBox chambers are built of modular construction components allowing the creation of several configurations to address differing needs. The MBX0x series is made of 60cm (24") cubic modules and the MBX3x series of 80cm (30") cubic modules. The chamber size is selected to satisfy your far-field requirements, and extension "cubes" can be added later if the need arises.

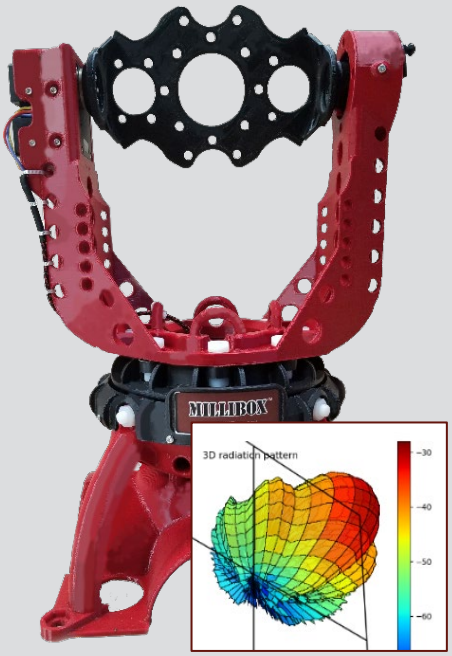
The four top corners of the chamber feature passthrough access for accessories like air extraction, cameras, lights, or sensors. Other accessories, like sniffer mounts and fixed or oscillating trihedral corner reflector mounts, are also available.

AFFORDABLE- Compared to "Do-It-Yourself" systems, MilliBox are complete solutions that are priced advantageously, offer better performance, and do not waste scarce engineering resources to develop and maintain.

MilliBox chambers come standard with a GIM01 3D DUT positioner, matching HOR01 horn post with WR2.2 to WR15 horn clamp, power supply, USB dongle, and Python controller software. Other options are available.

	MBX02	MBX03	MBX04	MBX33
				
Exterior Dimensions (W x H x D)	128 x 95 x 66cm (50" x 37" x 26")	188 x 95 x 66cm (74" x 37" x 26")	245 x 95 x 66cm (96" x 37" x 26")	240 x 112 x 82cm (95" x 44" x 32")
Interior Cavity (W x H x D)	101 x 40 x 40cm (40" x 16" x 16")	161 x 40 x 40cm (63" x 16" x 16")	221 x 40 x 40cm (87" x 16" x 16")	213 x 57 x 57cm (84" x 22" x 22")
Far Field (GIM01/GIM1D)	77cm (30")	138cm (54")	198cm (78")	186cm (73")
Far Field (GIM03)	72cm (28")	133cm (52")	193cm (76")	176cm (69")
Measurement Positions	2	4	6	8
Instrument Bay Height	29cm (12")			
Absorber Performance	–50dB from 18GHz to 95GHz			
Manufacturer Warranty	1 year all parts			

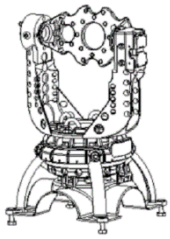
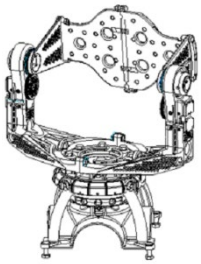
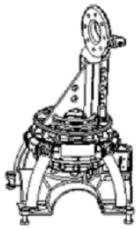
mmWave Positioners



PRACTICAL- MilliBox offers several positioners for different DUT size and weight requirements. The positioners are built of high-performance printed PLA biomaterial with low dielectric constant limiting stray reflections. The wiring to the DUT is done using a passthrough in the horizontal and vertical bearings to prevent wire tangling during operation.

ACCURATE- A laser crosshair guide helps precisely align the initial DUT boresight direction to the measurement horn. The real-time position control is achieved with the feedback of a built-in 12-bit absolute position encoder.

OPEN FRAMEWORK- MilliBox positioners are controlled over USB with Python software delivered in source. The software also controls any SCPI-compatible instrument connected by LAN, GPIB, or USB. All this helps to seamlessly integrate MilliBox into your existing RF testing environment. Many radiation pattern types like HV plots or 3D plots come standard and can be easily modified and augmented as desired.

	GIM01	GIM03	GIM1D
			
Max DUT Width	11cm (4”)	27cm (10”)	–
Max DUT Weight	0.5kg (1lb)	3kg (6lb)	5kg (10lb)
Position Range	360° x 360°	360° x 360°	360° Azimuth only
Angular Resolution	0.088°		
Variable Velocity	0 to 11 RPM	0 to 9 RPM	0 to 11 RPM
Measurement Height	32.7cm (13”)		
Wiring Passthrough Diameter	20mm (0.79”)	24mm (1”)	–

Customization

OPTIONS- Standard horn clamp options are available for common waveguide sizes, and MilliBox can design and fabricate custom horn and DUT mounts, when needed. Design files of critical mechanical parts are available upon request to help you design accessories, mounts, or modify the original design.

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GIM04: 3-Axis Positioners

GIM04 is MilliBox's latest generation of mmWave and THz positioners. It can control 3 axes of rotation in Elevation, Azimuth and Polarization from a single USB controller. Its construction allows GIM04 to adjust to various DUT form factors. GIM04 adds a new level of versatility for daily over-the-air measurements.

POLARIZATION CONTROL- GIM04 positioners support the new **X-Pol** platform system adding polarization as a 3rd axis to the device under test (DUT) control in addition to elevation and azimuth axes.

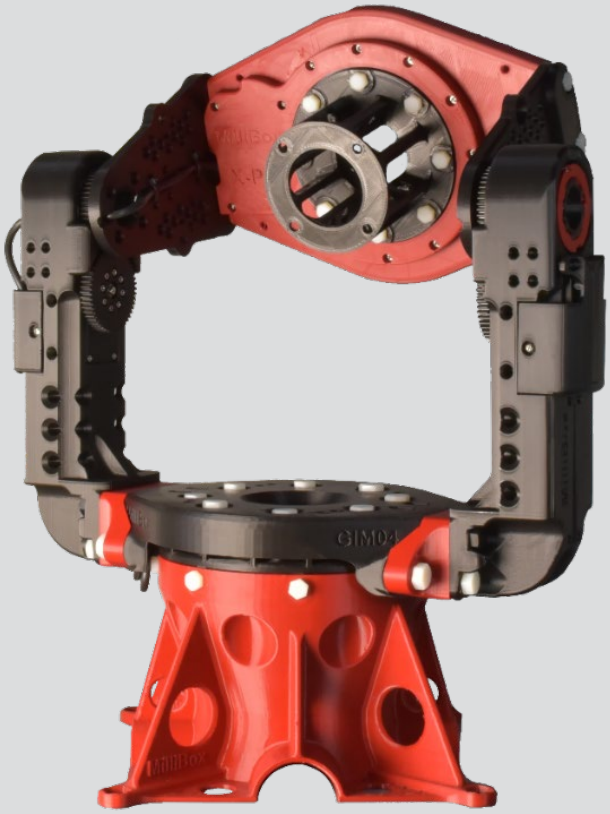
ROBUST AND ACCURATE- All gears in GIM04 are made of precision machined Delrin™ material for higher strength, precsion and long life span. GIM04 is equipped with smart actuators with absolute encoders resolution below 0.1°.

ADJUSTABLE PLATFORM DEPTH- The DUT platform can be placed at 2 depth from rotation axis: This makes is easier to accommodate various DUT thickness and form factors.

MODULAR SIZE- GIM04 comes in 4 standard sizes all based on the same components. Upsizing and downsizing is possible as DUT requirements evolves over time.

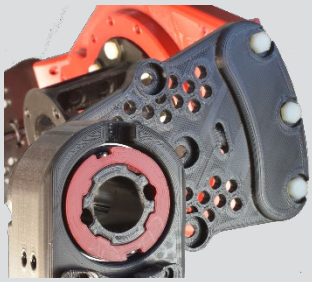
CABLE ROUTING-To bring power, control or RF to the DUT efficiently, GIM04 provides pass-thru channels at the center of each rotation axis and numerous anchor points along the path. This way, no connectors or slip rings are needed from source to DUT.

OPEN FRAMEWORK- As with all our other positioners, GIM04 is controlled by a Python based software provide in source which allows easy integration with any instrument or DUT with several built-in capture modes in multiple dimensions.

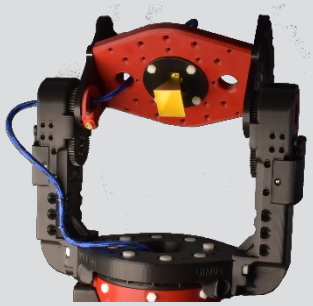


Key Features

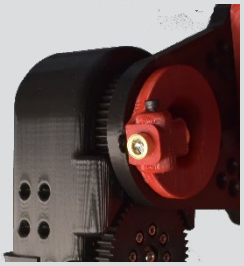
X-Pol: polarization control



2 platform depths

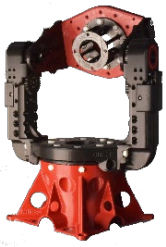


Tangle free wiring



Laser Guide

Comparison Chart

	GIM04-200	GIM04-230	GIM04-300	GIM04-380
				
Max DUT width	200mm / 8”	230mm / 9”	300mm / 12”	380mm / 15”
Max DUT weight	3kg	3kg	3kg	3kg
DUT depth	108mm / 4.5” 50mm/ 2”	108mm / 4.5” 50mm/ 2”	124mm / 5” 66mm/ 2.6”	124mm / 5” 66mm/ 2.6”
Measurement height	327mm (12.8”)	327mm (12.8”)	386mm (15.2”)	386mm (15.2”)
X-Pol support	✗	✓	✓	✓
Fits in MBX0x chambers	✓	✓	✗	✗
Fits In MBX3x chambers	✓	✓	✓	✓
Manufacturer warranty	1 year all parts			

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MBX-PGG4-03

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GIM05: Spherical Roll positioner

GIM05 brings a revolutionary solution for antenna over-the-air (OTA) mmWave and THz measurement with a spherical roll design offering the widest possible unobstructed field of view. Traditional Azimuth-Elevation positioners have arm structures on the sides of the device under test (DUT) which blocks the measurement path at some high angles. Instead GIM05 holds the DUT from the back which completely clears the sides from obstruction and stray reflections coming from the positioner body.

ROBUST AND ACCURATE- All gears in GIM05 are made of precision machined Delrin™ material for higher strength, precision and long life span. GIM05 is activated by smart actuators with absolute encoders resolution below 0.1°.

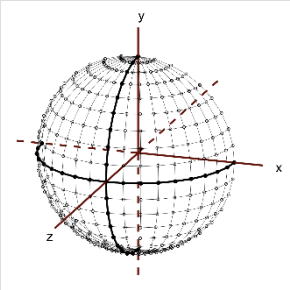
POLARIZATION CONTROLLER- The probe side is motorized such that the probe can match the polarization of the DUT during the rolling capture sweep. Also, it can also be programmed for any other cross polarization measurement.

MODULAR SIZE- GIM05 design allows the depth and the height to be mechanically adjusted, to accommodate various DUT size requirement. Two standard sizes are 340mm and 440mm representing the maximum width of the DUT.

CABLE ROUTING-To bring power, control or RF to the DUT efficiently, GIM05 provides pass-thru channels at the center of each rotation axis and numerous anchor points along the path. This way, no connectors or slip rings are needed from source to DUT.

OPEN FRAMEWORK- As with all our other positioners, GIM05 is controlled by a Python based software provide in source which allows easy integration with any instrument or DUT with several built-in capture modes in multiple dimensions.

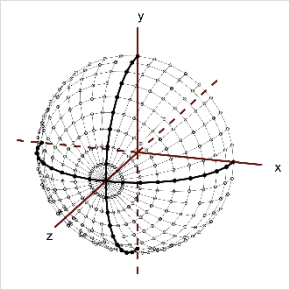
Spherical Roll coordinates



Typical Azimuth/Elevation coordinates

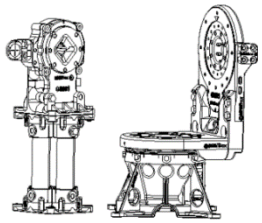
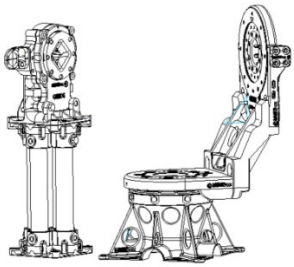
GIM05 uses a new set of coordinates for its rotation which eliminates the need for side arms. This coordinate system can cover the entire sphere around the DUT but the measurement paths are different.

Because the DUT is rotating on its radiation axis, the measurement probe has to follow the polarization of the DUT at all time to catpure accurate measurement.



GIM05 Spherical Roll coordinates

Comparison Chart

	GIM05-340	GIM05-440
		
Max DUT width	340mm / 13”	440mm / 17”
Max DUT weight	5kg	5kg
DUT depth	113mm / 4.5”	175mm / 7”
Measurement height	327mm (12.8”)	386mm (15”)
Polarization Control	✓	✓
Fits in MBX0x chambers	✓	✗
Fits In MBX3x chambers	✓	✓
Manufacturer warranty	1 year all parts	

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