

# OTA Measurement System

Wireless communication measurement system

R Series 



# Atenlab focuses on the development and manufacturing of microwave, communication and electromagnetism-compatibility measurement equipment



## Leading brand in wireless communication measurement

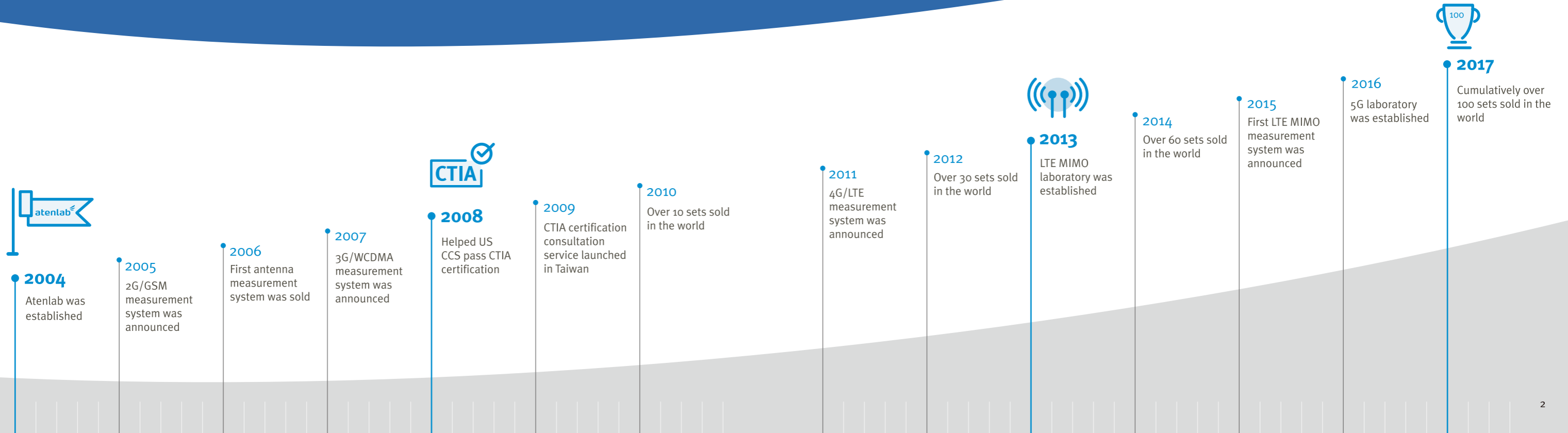
Atenlab specializes in the design, production and distribution of the communication measurement system as well as to provide highest-quality system integration and customization services. Atenlab is the largest supplier for antenna measurement system in Taiwan, and has successfully built and sold hundreds of measurement systems to enterprises around the world, including leading brands in communication and electronics.

## In-house Software and Hardware Research & Development

Atenlab's in-house software and hardware Research and Development team has created the most user friendly and intuitive software, which provides coherence and compatibility in both software and hardware. Atenlab also collaborates with international manufacturers and agencies in the development of their measurement systems to ultimately guarantee best user experience and perfect system performance.

## Extraordinary Competitiveness

Atenlab has been consistently challenged itself and strive for improvement. We have been highly regarded by numerous Well- Brands in Silicon Valley and Taiwan in the research and development in multiple fields, from automation equipment to wireless communication measurement system. Atenlab will continue to provide comprehensive services and solutions and align our goals with the clients' requirement in terms of precision, dedication, and professionalism.



## CATR OTA measurement systems

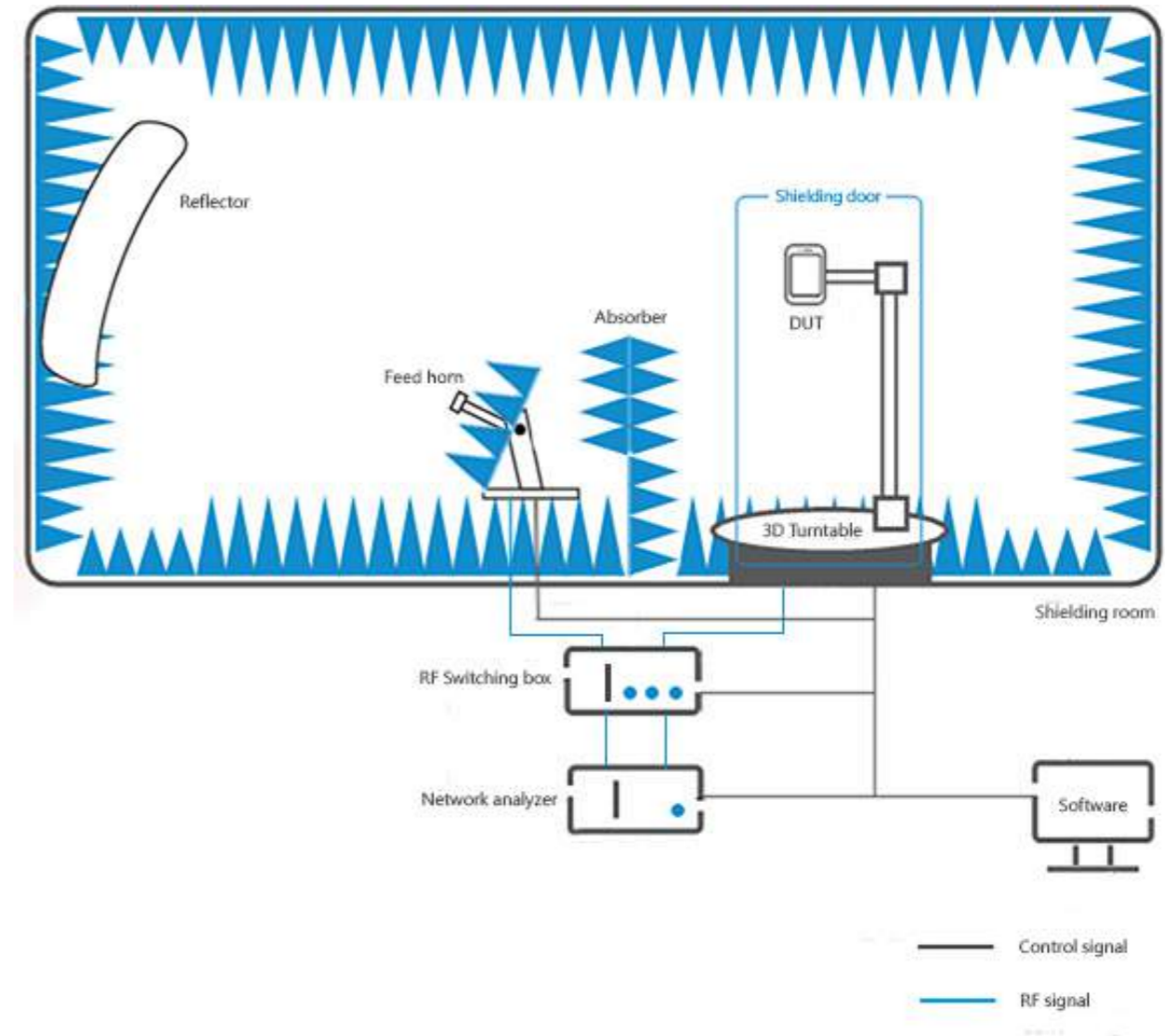


The most significant advantage of the R Series is the ability to measure mmWave and large objects in relatively much shorter measurement distance compared to conventional OTA measurement system. mmWave measurement covers soon-to-be mainstream 5G mmWave products, such as the advanced 5G mobile phone antenna and automotive radar. Large objects include military antennas and satellite dishes.

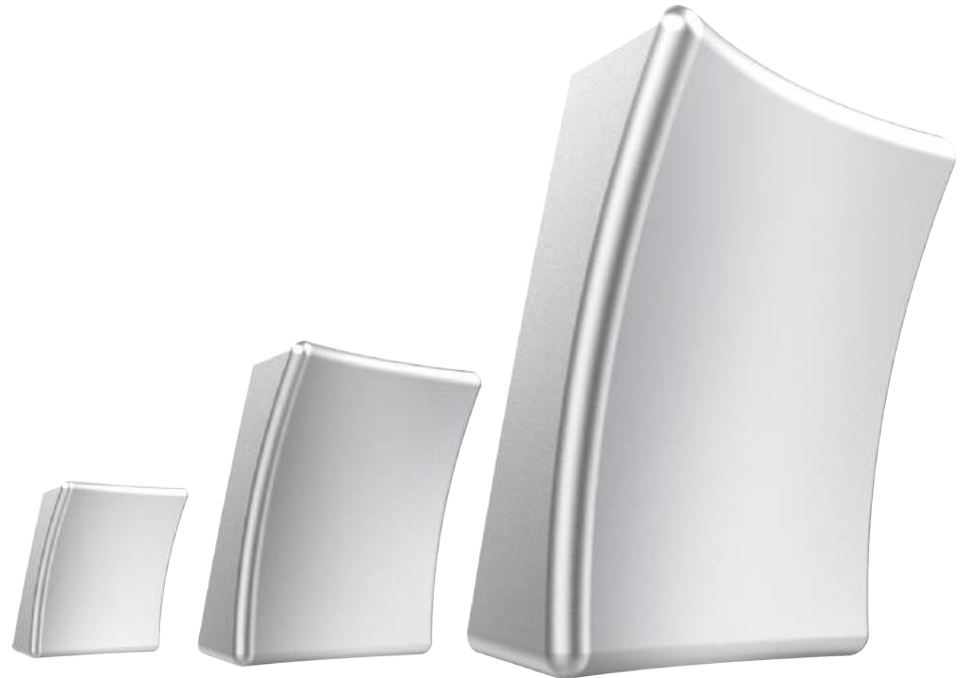
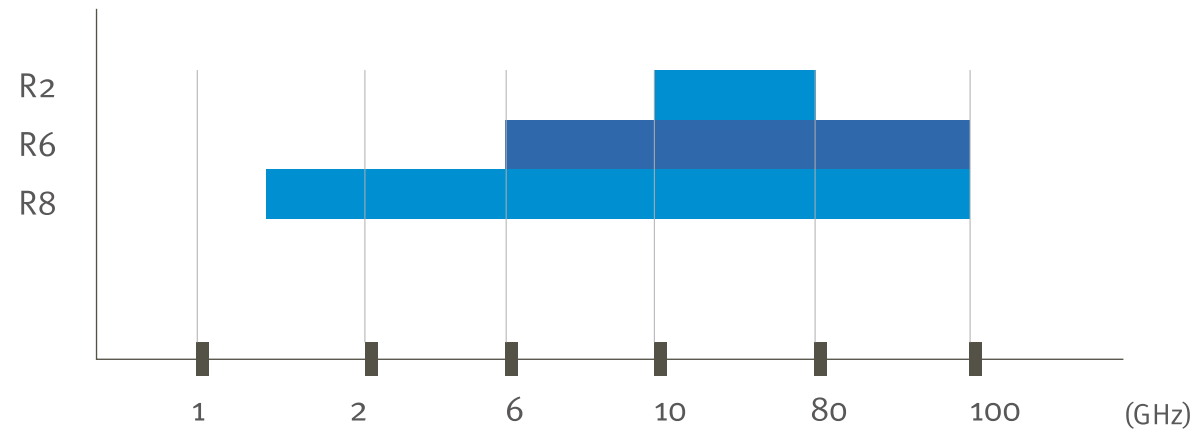
However, the measurement for such large objects requires extremely long distances. It's challenging to build a test lab for that kind of scale. Atenlab has developed the R Series measurement systems to capture accurate and consistent data despite of limited space.

The R Series offers 3 models of CATR OTA Measurement System: R2, R6, and R8, which are able to measure up to 100GHz. The larger the compact range reflector, the larger the Device Under Test (DUT) can be. The R Series also demonstrated its ideal quiet zone for Sub-6 GHz. Clients can choose between the 3 models of R Series based on their needs and DUTs' sizes.

## OTA system architecture



# OTA system comparisons



**R2**  
 Quiet Zone=0.2m  
 Reflector Size=0.6m

**R6**  
 Quiet Zone=0.9m  
 Reflector Size=2.0m

**R8**  
 Quiet Zone=> 1.0m  
 Reflector Size=>1.5m

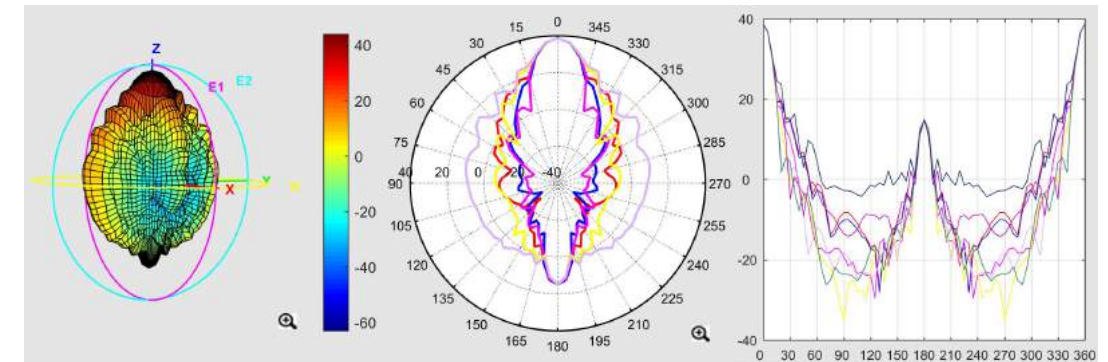
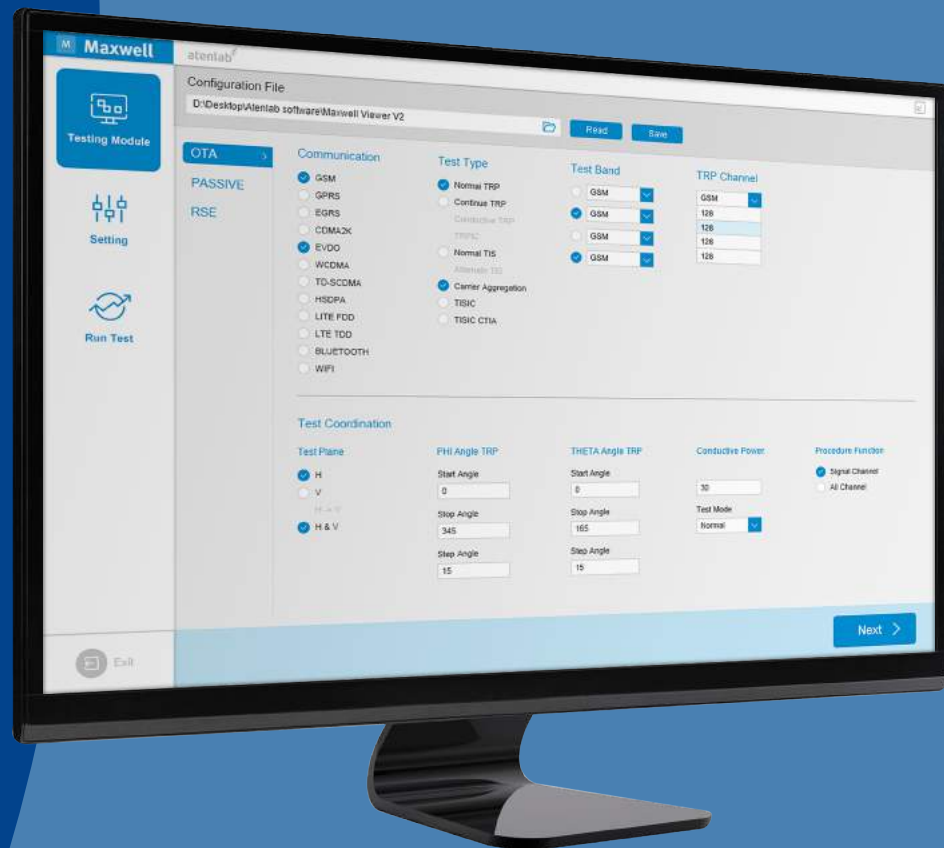
	R2	R6	R8
Frequency range	10 - 80 GHz	6 - 100 GHz	1.5- 100 GHz
Chamber outer size (L/W/H)	1.8 x 0.8 x 1.8 m	6.2 x 3.15 x 3.15 m	Customization
Quiet zone size	0.2 x 0.2 x 0.2 m	0.9 x 0.9 x 0.9 m	>1.0x 1.0 x 1.0 m
Cross polarization	-30 dB	-30 dB	-30 dB
Amplitude ripple	± 0.6 dB	± 0.5 dB	± 0.5 dB
Amplitude taper	1.3dB	1 dB	1 dB
Phase ripple	± 6 °	± 5 °	± 5 °
Phase taper	± 5 °	± 4 °	± 3 °
Reflector shape	Rolled edge	Rolled edge	Rolled edge
Reflector size	0.6 x 0.6 m	2.0 x 2.0 m	>2.5 x 2.5 x 2.5 m
Feed polarization	Single linear polarization	Single linear polarization	Single linear polarization
polarization switch	Manual switch	Manual switch	Auto switch
Feed positioner	Manual adjust	Manual adjust	Robot adjust
Feed antenna Gain	10 dBi	10 dBi	10 dBi
<20cm EUT	•		
<90cm EUT	•	•	
>90cm EUT			•
Moveable system	•		
<10GHz Frequency		•	•
Customization			•
Auto-feed switching		•	•
OTA upgrade		•	•
Space less	•		
Space require <7x4x3.5m	•		



# R Series 2 Major Software for OTA System Measurement

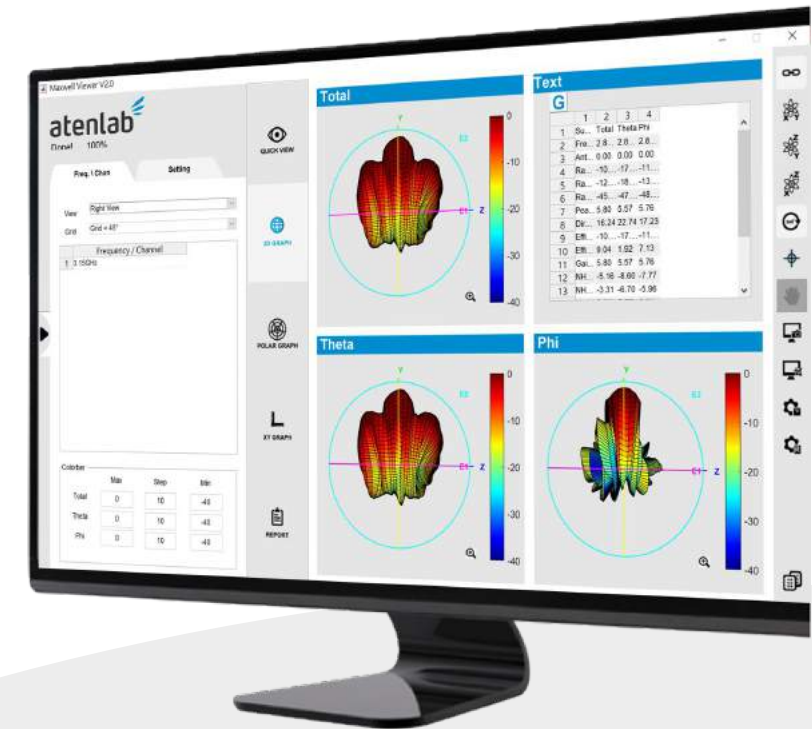
## Maxwell OTA

- Captures readings from the most nuanced angles by accommodating a variety of antenna sizes
- Provides user-friendly, intuitive, and simple user interface
- Real-time display of data with dynamic charts and flexible visual displays
- Supports equipment from various manufacturers to provide wide range of applications



## Maxwell Viewer

- Retrieves accurate data from Maxwell OTA prior to data analysis
- Graphical display of data is easier to read and comprehend
- Generates reports automatically for further analysis and planning
- Supports different formats of reports from other brands; easy for cross-referencing

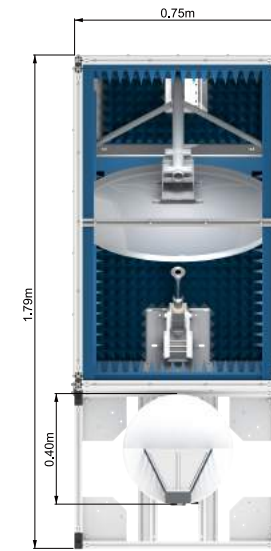


# R2 Mobility OTA measurement system

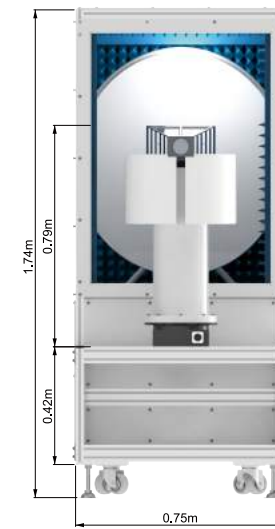
- Lightest and smallest unit in the R Series
- Plug and play installation, no onsite construction needed
- Suitable for measuring small mmWave antenna
- Beneficial for academic research and product development



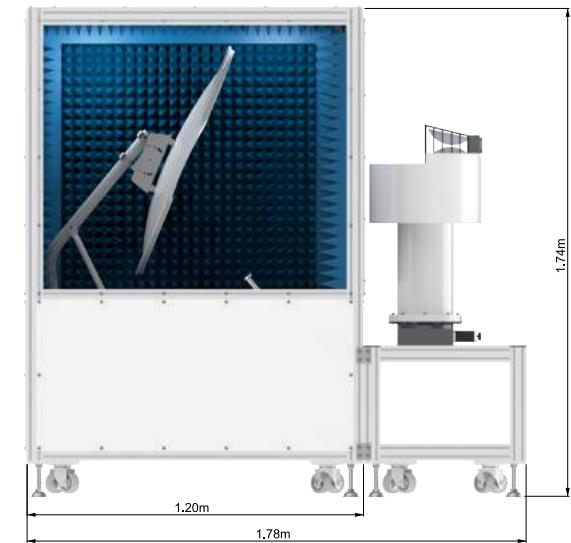
Top view



Front view



Side view

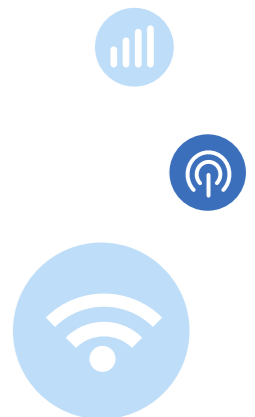


## R2 Specifications

System	
Frequency range	10 - 80 GHz
Chamber outer size (L/W/H)	1.8 x 0.8 x 1.8 m
Quiet zone size	0.2 x 0.2 x 0.2 m
Cross polarization	-30 dB
Amplitude ripple	± 0.6 dB
Amplitude taper	1.3dB
Phase ripple	± 6 °
Phase taper	± 5 °
Application	Education Research
Reflector shape	Rolled edge
Reflector size	0.6 x 0.6 m
Feed polarization	Single linear polarization
polarization switch	Manual switch
Feed positioner	Manual adjust
Feed antenna Gain	10 dBi

Anechoic Chamber	
Chamber outer size (L/W/H)	1.8 x 0.8 x 1.8 m
Chamber door	N/A
Chamber door size (W/H)	N/A
Chamber Shielding efficiency	N/A
Chamber air vent	N/A
Chamber lighting	N/A
Power filter	N/A
Absorber	Emerson & Cuming (RoHS and REACH)

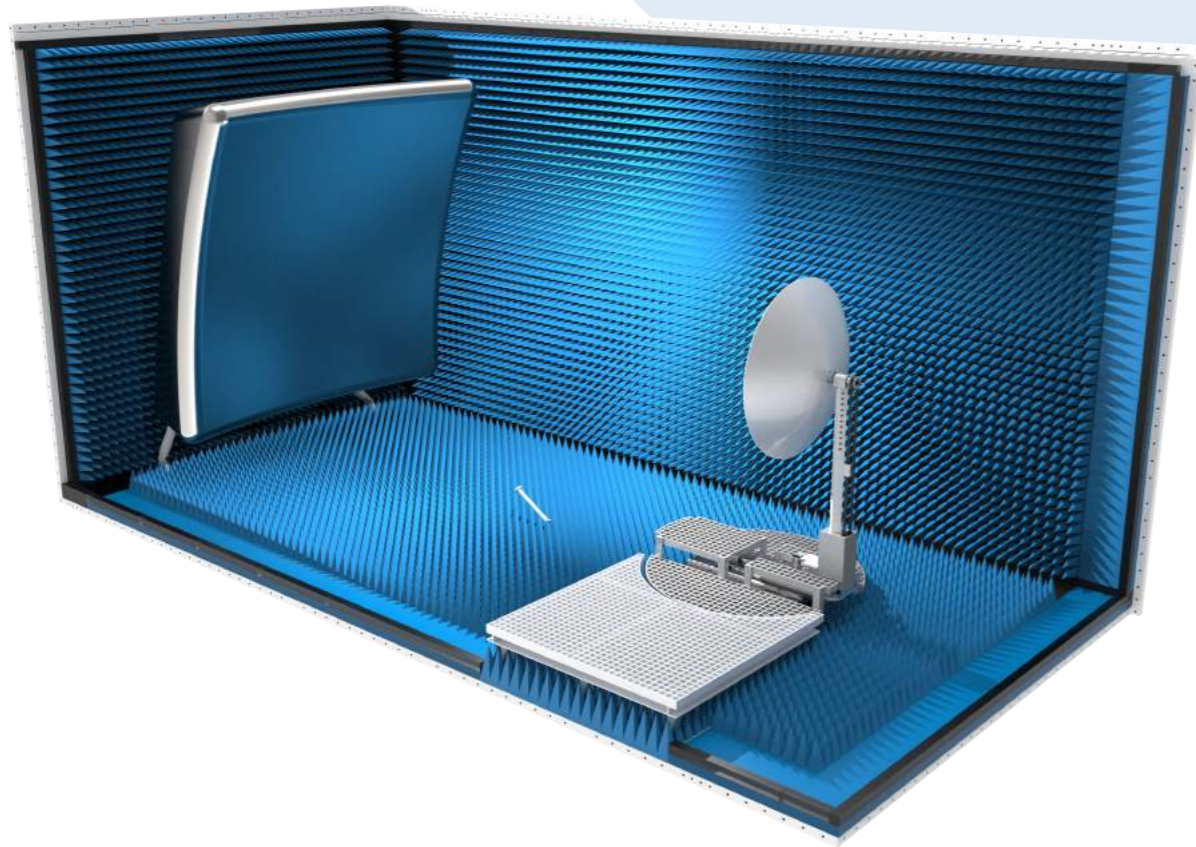
DUT positioner	
DUT positioner	3D (Azimuth)
DUT positioner loading	30 kg
DUT positioner resolution	0.1 degree
DUT positioner accuracy	0.2 degree
DUT positioner speed (unloaded)	8 RPM
DUT Positioner control interface	RS-232
DUT positioner input power	110 / 220 VAC
Control system	
Operate table	N/A
Rack	N/A
Control Unit	IPC
Power consumption	1KW
Measurement software	Maxwell OTA
Viewer software	Maxwell viewer



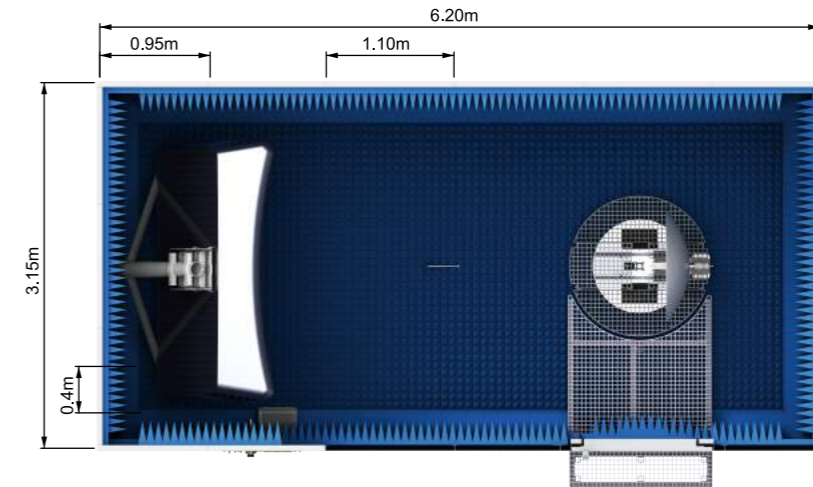


## R6 Agility OTA measurement system

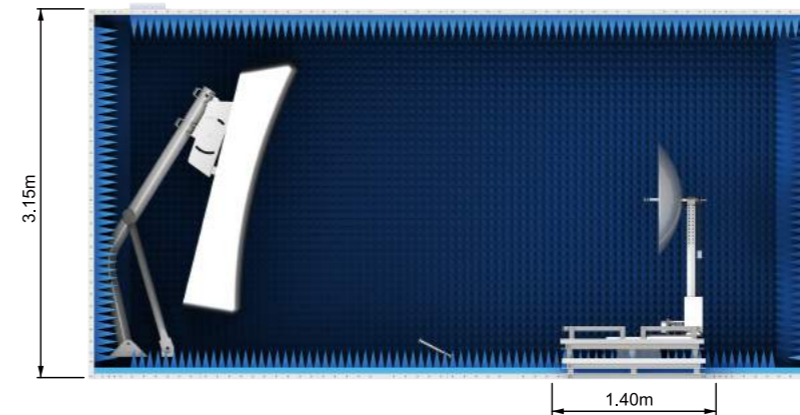
- Extremely flexible and adaptable for wide range of applications
- Compatible with Sub-6GHz measurement
- Suitable for small and midsize antennas
- Direct upgrade to R6 for clients who currently own OTA measurement labs, which can effectively reduce cost and enhance efficiency.



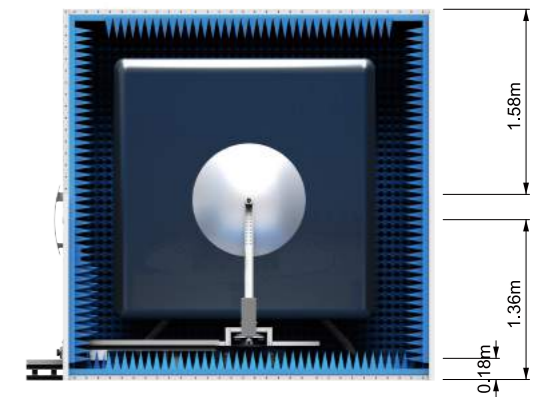
Top View



Front View



Side View



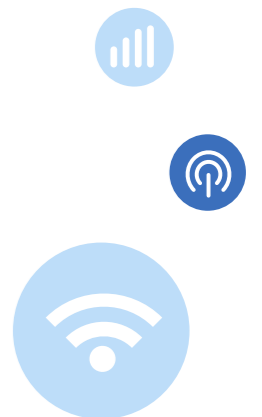


## R6 Specifications

System	
Frequency range	6 - 100 GHz
Chamber outer size (L/W/H)	6.2 x 3.15 x 3.15 m
Quiet zone size	0.9 x 0.9 x 0.9 m
Cross polarization	-30 dB
Amplitude ripple	± 0.5 dB
Amplitude taper	1 dB
Phase ripple	± 5 °
Phase taper	± 4 °
Application	Education Research
Reflector shape	Rolled edge
Reflector size	2.0 x 2.0 m
Feed polarization	Single linear polarization
polarization switch	Manual switch
Feed positioner	Manual adjust
Feed antenna Gain	10 dBi

Anechoic Chamber	
Chamber outer size (L/W/H)	6.2 x 3.15 x 3.15 m
Chamber door	Auto latching swing door
Chamber door size (W/H)	1.0 x 2.0 m
Chamber Shielding efficiency	1 - 18GHz > 100 dB
Chamber air vent	0.3 x 0.3 m
Chamber lighting	LED lamp
Power filter	220VAC 16A Insertion Loss: 0.0dB, 14KHz - 18GHz"
Absorber	Emerson & Cuming (RoHS and REACH)

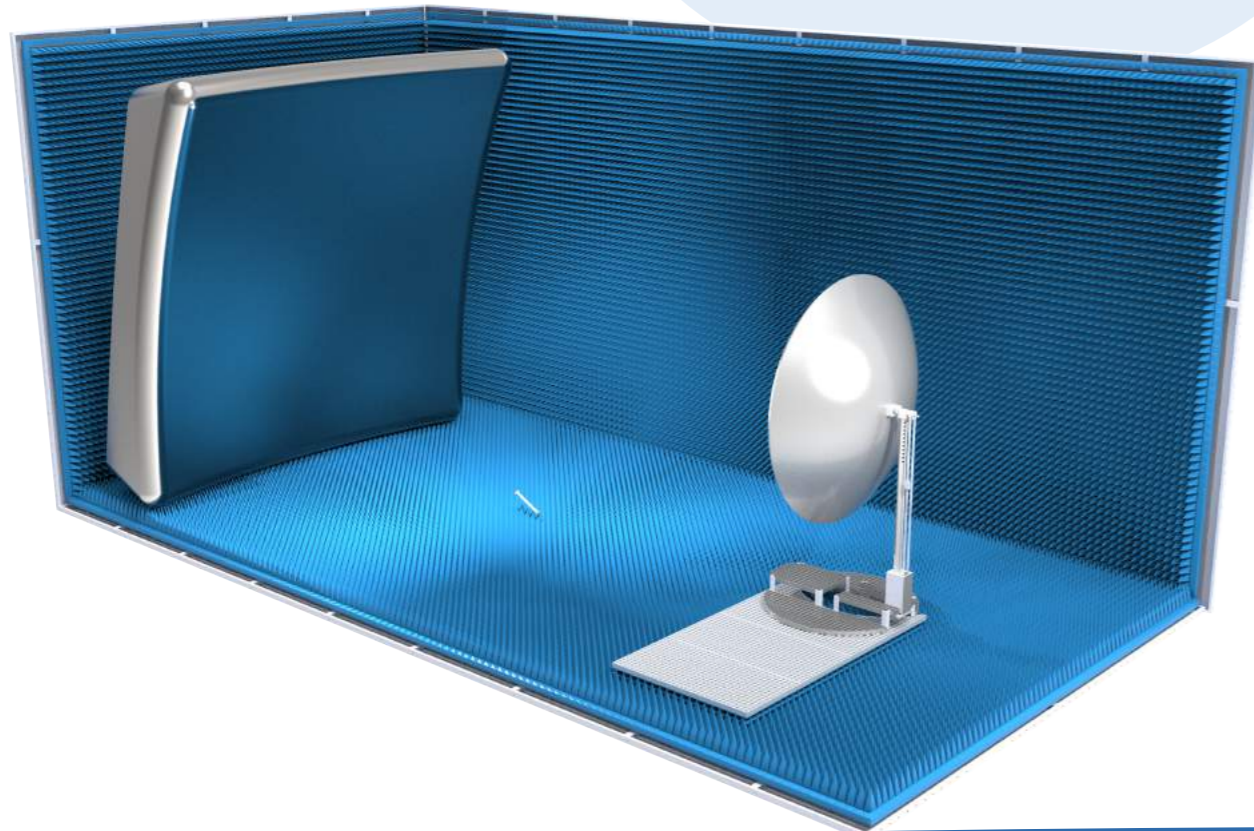
DUT positioner	
DUT positioner	Azimuth
	Roll
	Manual slide
DUT positioner loading	200 kg (Azimuth) 30 kg (Roll)
DUT positioner resolution	0.1 degree (Azimuth)
DUT positioner accuracy	0.1 degree (Azimuth)
DUT positioner speed (unloaded)	10 RPM (Azimuth) 25 RPM (Roll)"
DUT Positioner control interface	RS-232
DUT positioner input power	111 / 220 VAC
Control system	
Operate table	Auto-lifting table
Rack	19" 35U rack
Control Unit	IPC
Power consumption	5KW
Measurement software	Maxwell OTA
Viewer software	Maxwell viewer



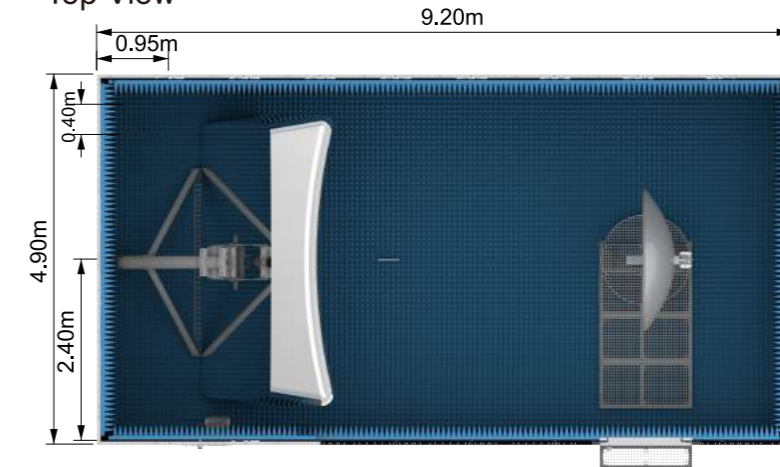
R8

## Holistic OTA measurement system

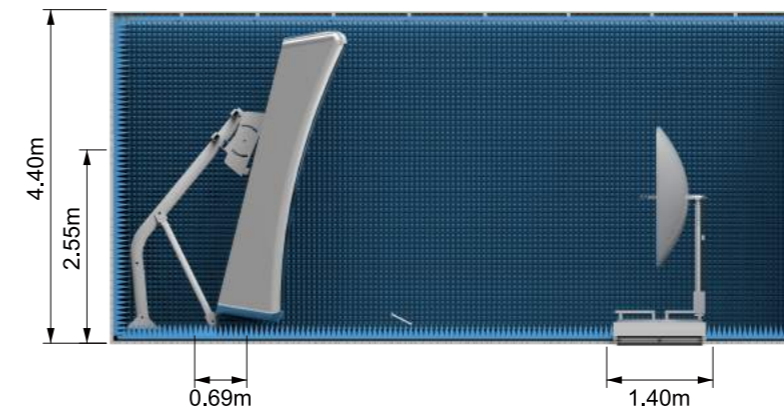
- The largest unit in the R Series
- Ideal for large antennas and military equipment
- Perfect design for its reflective sphere, which yields extraordinary performance in measuring Sub-6G
- Flexible upgrade package, total coverage from Sub-6G to mmWave



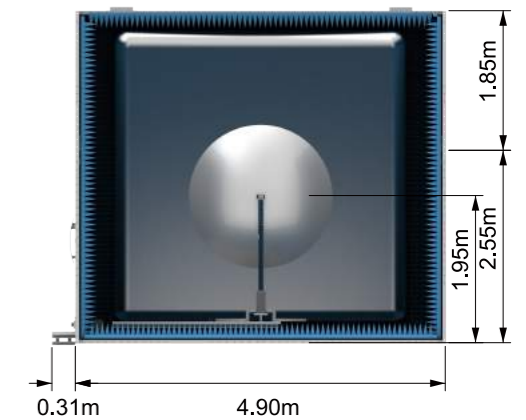
Top View



Front View



Side View

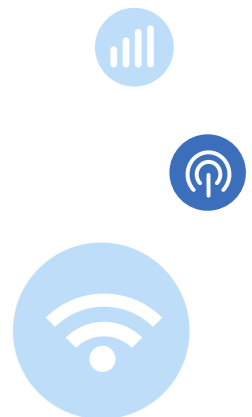


## R8 Specifications

System	
Frequency range	1.5- 100 GHz
Chamber outer size (L/W/H)	Customization
Quiet zone size	>1.0x 1.0 x 1.0 m
Cross polarization	-30 dB
Amplitude ripple	± 0.5 dB
Amplitude taper	1 dB
Phase ripple	± 5 °
Phase taper	± 3 °
Application	Education Research Defense
Reflector shape	Rolled edge
Reflector size	>2.5 x 2.5 x 2.5 m
Feed polarization	Single linear polarization
polarization switch	Auto switch
Feed positioner	Robot adjust
Feed antenna Gain	10 dBi

Anechoic Chamber	
Chamber outer size (L/W/H)	Customization
Chamber door	Auto latching swing door
Chamber door size (W/H)	Customization
Chamber Shielding efficiency	1 - 18GHz >100 dB
Chamber air vent	0.3 x 0.3 m
Chamber lighting	LED lamp
Power filter	220VAC 16A Insertion Loss: 0.0dB, 14KHz - 18GHz"
Absorber	Emerson & Cuming ( RoHS and REACH )

DUT positioner	
DUT positioner	Azimuth
	Roll
	Manual slide
DUT positioner loading	200 kg (Azimuth) (Customizable) 30 kg (Roll)
DUT positioner resolution	0.1 degree (Azimuth)
DUT positioner accuracy	0.1 degree (Azimuth)
DUT positioner speed (unloaded)	10 RPM (Azimuth) 25 RPM (Roll) "
DUT Positioner control interface	RS-232
DUT positioner input power	112 / 220 VAC
Control system	
Operate table	Auto-lifting table
Rack	19" 35U rack
Control Unit	IPC
Power consumption	5KW
Measurement software	Maxwell OTA
Viewer software	Maxwell viewer



## Software item specification

### Wi-Fi OTA

Item	Description	Applicable to
RF Measurement	-RF circuit set -Active link antenna -Wi-Fi signal dynamic amplifier	R6、R8
Calibration & Acceptance	-Wi-Fi OTA path loss calibration: 2.3 - 2.6GHz; 5.0 - 6.0GHz -Wi-Fi OTA function validation: The test prototype perform the Wi-Fi TRP and Wi-Fi TIS test to verify the test functions are normal by using the defined settings.	

### LTE CA

Item	Description	Applicable to
RF Measurement	-RF circuit set -Active link antenna -Active RF switching box	R8
Calibration & Acceptance	-LTE CA path loss calibration: 0.68 - 6 GHz -The test prototype perform the LTE CA TRP and TIS test to verify the test functions are normal by using the defined settings.	

### BT OTA

Item	Description	Applicable to
RF Measurement	-RF circuit set -Active link antenna -BT signal dynamic amplifier	R6、R8
Calibration & Acceptance	-BT OTA path loss calibration: 2.3 - 2.6GHz -BT OTA function validation: The test prototype perform the BT TRP and BT TIS test to verify the test functions are normal by using the defined settings.	

### SISO Wi-Fi Throughput

Item	Description	Applicable to
RF Measurement	-RF circuit set -Console Shielding box -Autotest console	R6、R8
Calibration & Acceptance	-Wi-Fi Throughput path loss calibration: 2.3 - 2.6GHz -The test prototype perform the Wi-Fi Through put test to verify the test functions are normal by using the defined settings.	

### RSE

Item	Description	Applicable to
RF Measurement	-RF circuit set -Active link antenna -RSE circuit amplifier and filter	R2、R6、R8
Calibration & Acceptance	-RSE function validation: The test prototype perform the RSE test to verify the test functions are normal by using the defined settings.	

### Cellular OTA

Item	Description	Applicable to
RF Measurement	-RF circuit set -Active link antenna -Active RF switching box	R6、R8
Calibration & Acceptance	-Cellular OTA path loss calibration: 0.68 - 6 GHz -The test prototype perform the LTE TRP and TIS test to verify the test functions are normal by using the defined settings.	

## Rectangular Waveguide Sizes

Band	Standard	Frequency Limits (GHz)	Waveguide Dimensions (mm)	Waveguide Dimensions (inch)
L	WR-650	1.12 - 1.70	165.1 X 82.55	6.500 X 3.250
R	WR-430	1.70 - 2.60	109.22 X 54.61	4.300 X 2.150
S	WR-284	2.60 - 3.95	72.136 X 34.036	2.840 X 1.340
G	WR-187	3.95 - 5.85	47.5488 X 22.1488	1.872 X 0.872
C	WR-137	5.85 - 8.20	34.8488 X 15.7988	1.372 X 0.622
X	WR-90	8.20 - 12.4	22.86 X 10.16	0.900 X 0.400
X-Ku	WR-75	10.0 - 15.0	19.05 X 9.525	0.750 X 0.375
Ku	WR-62	12.4 - 18.0	15.7988 X 7.8994	0.622 X 0.311
K	WR-51	15.0 - 22.0	12.954 X 6.477	0.510 X 0.255
K	WR-42	18.0 - 26.5	10.668 X 4.318	0.420 X 0.170
Ka	WR-28	26.5 - 40.0	7.112 X 3.556	0.280 X 0.140
Q	WR-22	33 - 50	5.6896 X 2.8448	0.224 X 0.112
U	WR-19	40 - 60	4.7752 X 2.3876	0.188 X 0.094
V	WR-15	50 - 75	3.7592 X 1.8796	0.148 X 0.074
E	WR-12	60 - 90	3.0988 X 1.5494	0.122 X 0.061
W	WR-10	75 - 110	2.54 X 1.27	0.100 X 0.050
F	WR-8	90 - 140	2.032 X 1.016	0.080 X 0.040



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