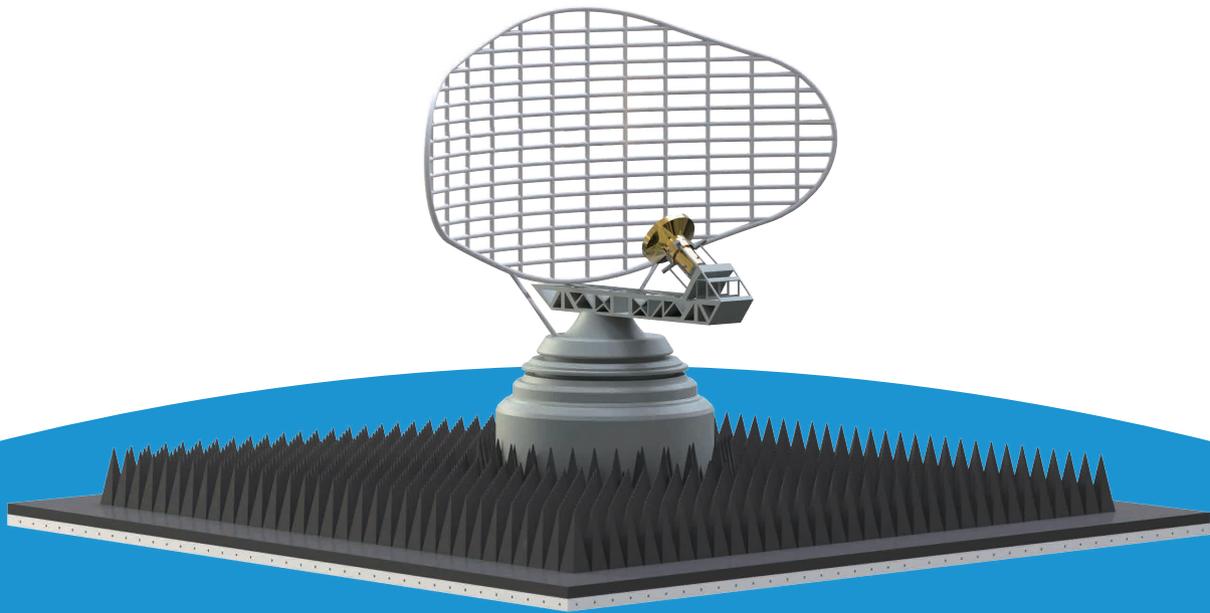


## Compact range wireless communication measurement



- Applicable for communication, IC design and electromagnetic field of study & research.
- Best tools for phone, location-based service, antenna, handhelds and system development.
- Applicable for research, product development and production quality validation and verification.





[www.atenlab.com.tw](http://www.atenlab.com.tw)



## Time X Space

Eternal is the theory of relativity, states that space and time are relative.

## Atenlab X Measurement Expert

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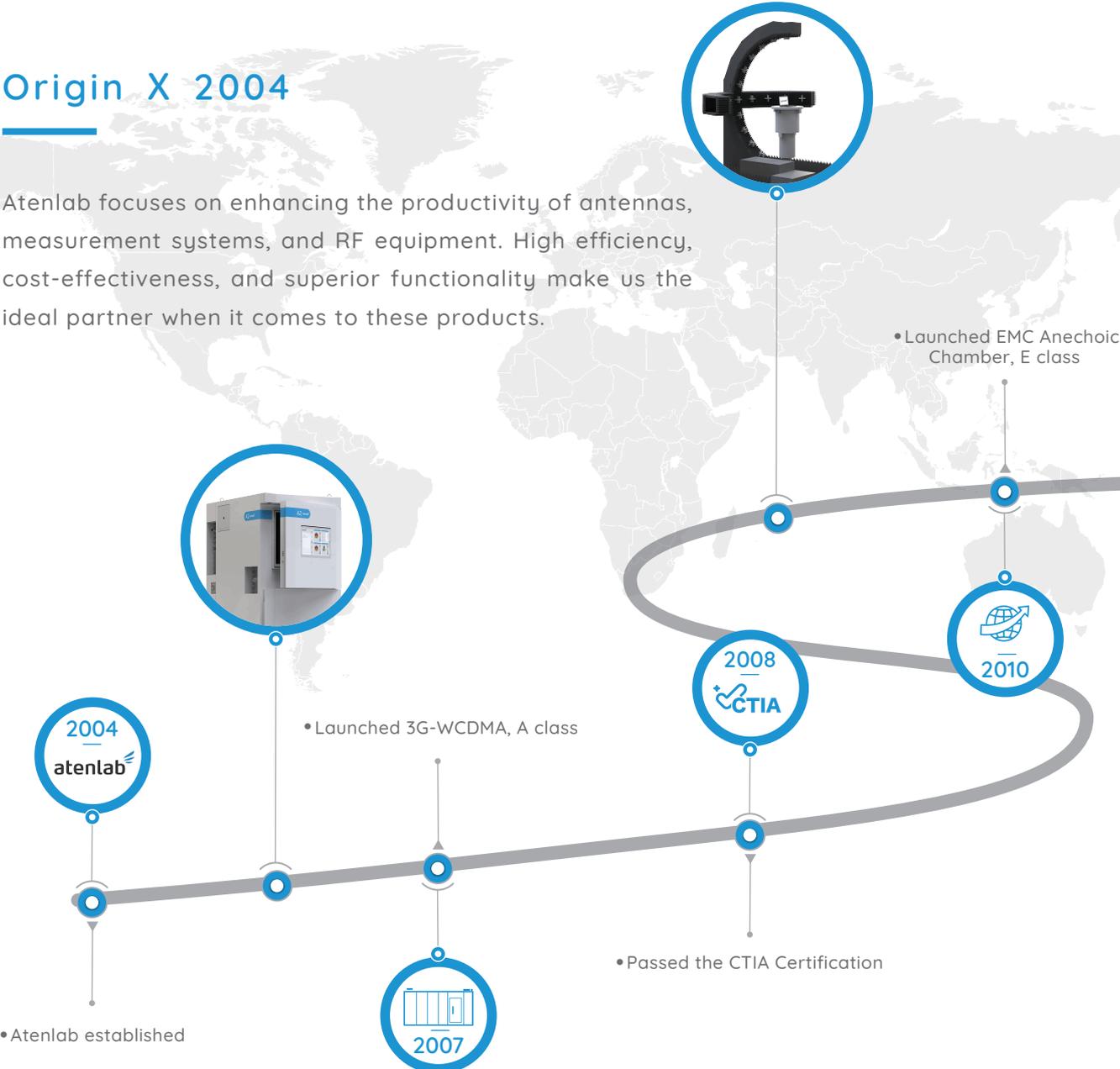
With over 18 years of experience, Atenlab has developed a wealth of expertise, high-quality equipment, and flexible service solutions.

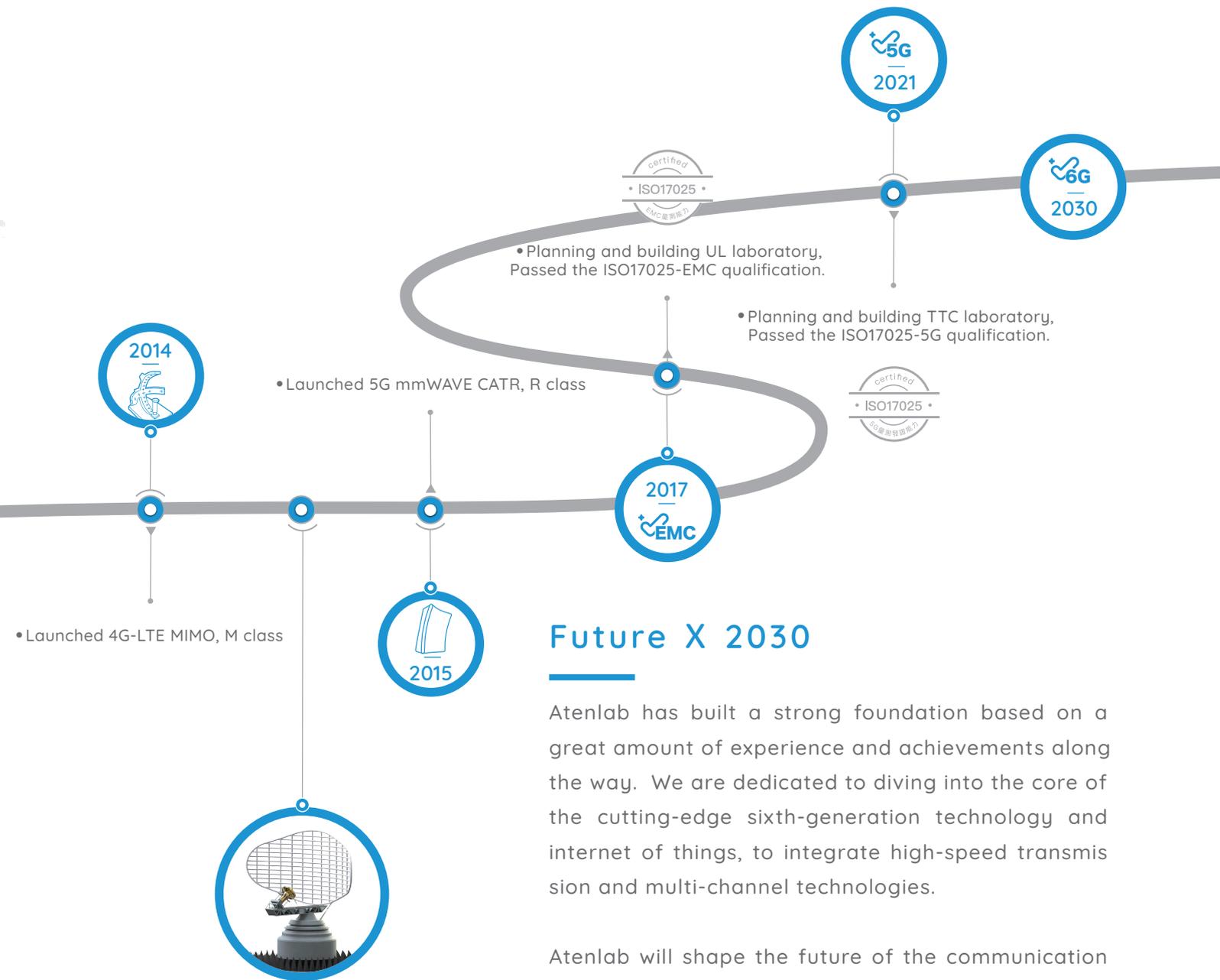
To localize global trade, Atenlab strives to provide real-time support 24/7. To make this possible, Atenlab follows strict review procedures and training programs to help local agents serve every customer well and ensure every problem is addressed instantly. That is why Atenlab is not just an industry expert, but also a reliable partner capable of handling unexpected issues and risks.



# Origin X 2004

Atenlab focuses on enhancing the productivity of antennas, measurement systems, and RF equipment. High efficiency, cost-effectiveness, and superior functionality make us the ideal partner when it comes to these products.





## Future X 2030

Atenlab has built a strong foundation based on a great amount of experience and achievements along the way. We are dedicated to diving into the core of the cutting-edge sixth-generation technology and internet of things, to integrate high-speed transmission and multi-channel technologies.

Atenlab will shape the future of the communication industry in the way it should be.



## Atenlab X The Measurement Foundation

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A measurement system is an applied science, there is no best, only better. It is firmly rooted in fundamental principles.

## mmWave X phased array antenna

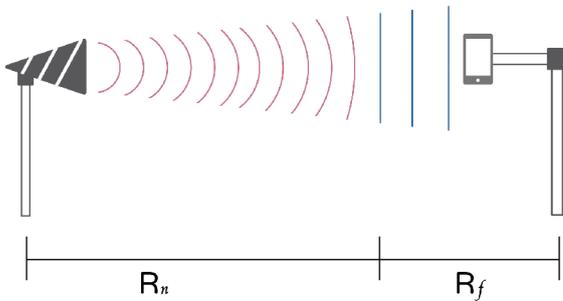
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Multi-channel communication system can't be satisfied with high-speed data transmission. Through military radar as the main architecture, increasing its frequency up to the Ka frequency band (23–40 GHz) is the current 5G communication technology system.

By proportionally reducing the antenna size while increasing the frequency, it becomes possible to arrange multiple antennas in a handheld device. This enables multiple beamforming and beam shifting through precise phase control. By increasing data transmission volume and implementing a multi-channel architecture, along with signal search and multilateration, overall communication efficiency is significantly enhanced.

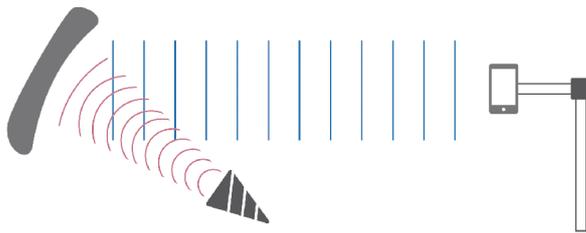
So far, many unknown challenges and technological bottlenecks remain in the mmWave phased-array antenna development field. For passive components, array antenna adaptation becomes increasingly complex. For active components, the integration of phase control chips and software algorithms is significantly more challenging. R-Class serves as a valuable assistant for array-antenna engineers throughout the development process.

## Direct Far Field (DFF) X Indirect Far Field (IFF)



### DFF

When using radiated spherical waves, energy concentration performs excellently; however, air consumption is too high, causing the dynamic range of the measurement system to become narrower. To compensate, either the power output must be increased or the receiver sensitivity improved.



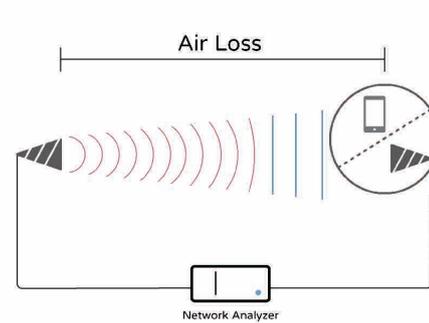
### IFF

Through particular device, the plane wave could be generated, which has little air consumption but increase the dynamic range. The power density is low and not good for minor-caliber device-under-test(DUT).

# Calibration X Quality

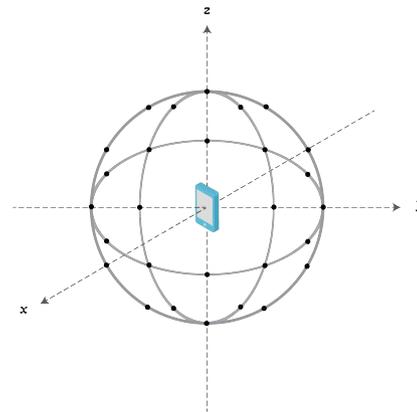
## Far-field Measurement

According to the CTIA calibration instructions, this is the standardized antenna comparison method. The measurement data of the DUT are obtained by comparing it with a standard antenna, and measurement accuracy is based on the standard antenna. Therefore, placing the standard antenna in the system and performing path loss calibration is the fundamental step of this measurement method.



## Quiet Zone

The quiet zone is an imaginary space where measurement accuracy is better than outside the zone. The primary measurement method is to collect data at the boundaries of the quiet zone. Once all the data are organized, the quality of the quiet zone can be calculated.



# LBS X Measurement

## 3GPP TS 38.41-2 Essential 5GNR BS RF Test Suite

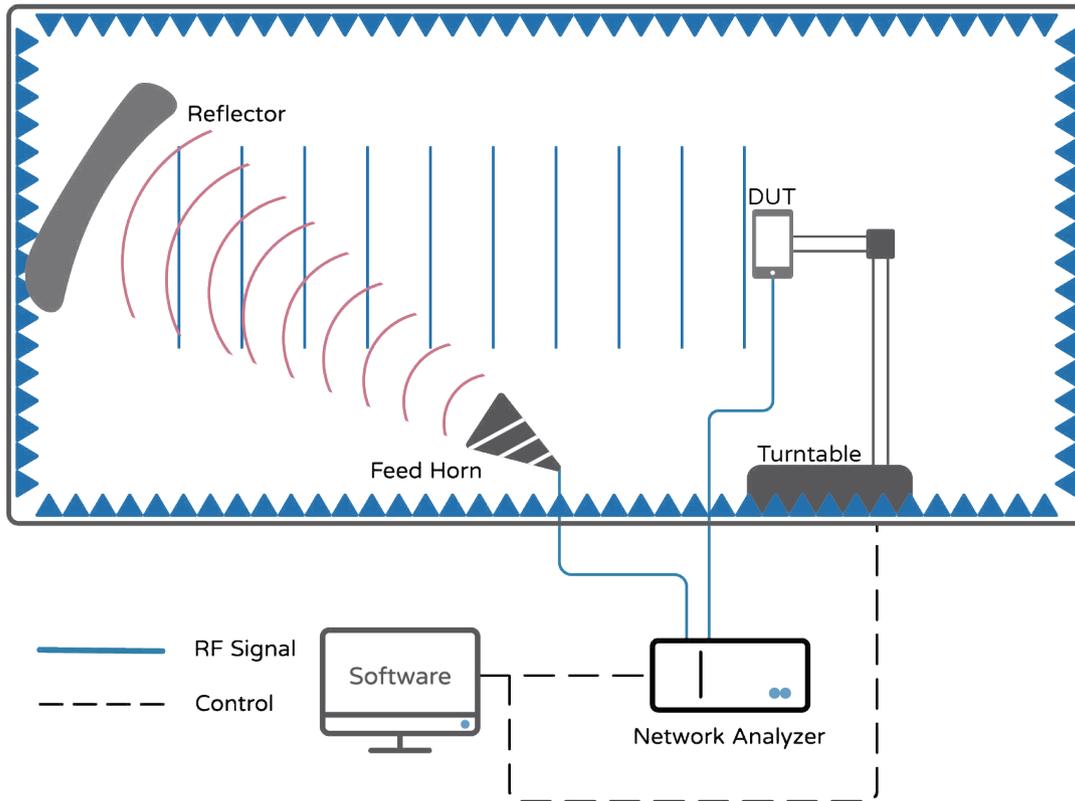
No.	Item	Clause	Regulatory Basic	Dynamic Options
1	Radiated transmit power	6.2	V	
2	OTA base station output power	6.3	V	
3	OTA output power dynamic	6.4		V
4	OTA transmit ON/OFF power	6.5	V	V
5	Transmit signal quality	6.6	V	
6	OTA unwanted emissions	6.7		V
7	OTA transmitter intermodulation	6.8		V
8	OTA sensitivity	7.2		V
9	Reference sensitivity	7.3		V
10	OTA dynamic range	7.4		V
11	OTA in-band selectivity and blocking	7.5		V
12	OTA out-of-band blocking	7.6		V
13	Spurious emissions (Rx)	7.7	V	
14	OTA receiver intermodulation	7.8		V
15	OTA in-channel selectivity	7.9		V

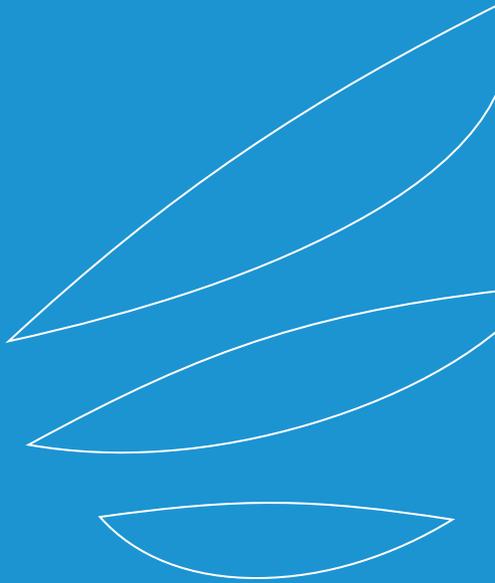
# Terminal X Measurement

## 3GPP TS 38.41-2 Essential 5G NR BS RF Test Suite

			Regulatory Basic
No.	Item	Clause	
1	Transmitter power (EIRP, TRP)	6.2	V
2	Output power dynamics (Power Control)	6.3	
3	Transmit signal quality (EVM)	6.4	V
4	Output RF spectrum emissions (In/out band, RSE)	6.5	V
5	Reference sensitivity power level	7.3	
6	Maximum input level	7.4	
7	Adjacent channel selectivity	7.5	
8	Blocking characteristics	7.6	
9	Spurious response	7.7	
10	Intermodulation characteristics	7.8	

## mmWave X System Architecture





## Atenlab X Maxwell

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Maxwell's equations, developed by a Scottish-born scientist, are a set of partial differential equations describing the electric field, magnetic field, electric charge density, and current density.

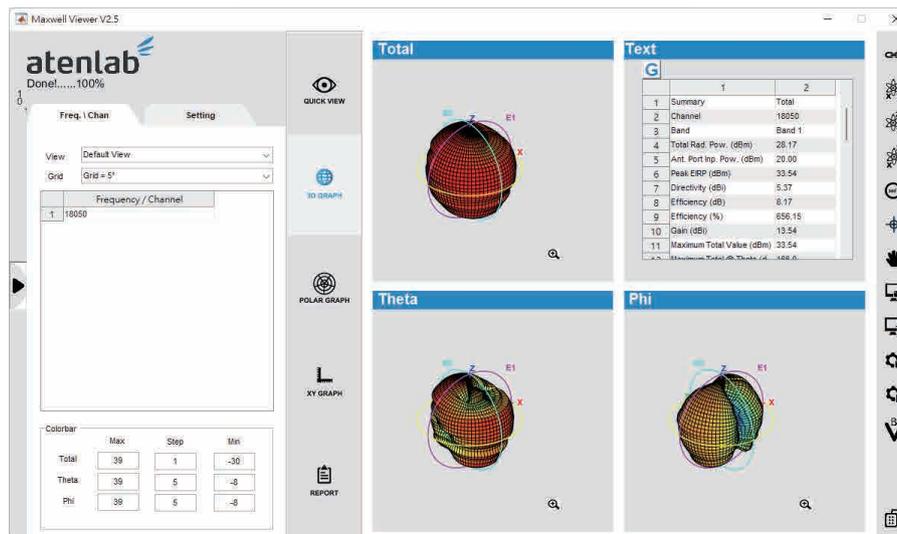
Atenlab integrates all the electromagnetic measurement technology and methods and has successfully sold hundreds of systems since 2004. Atenlab has thousands of active users in the mobile communication and Wi-Fi field. Atenlab's Maxwell family includes MWT, MW5 and MWC, and MWK for calibration and MWV for viewing. They are also constantly upgraded.

## Maxwell X Software

### MWV

Maxwell Viewer provides a login system, monitors data in real time with various infographics, and generates test reports based on specific requirements. It is user-friendly and supports a wide range of specifications.

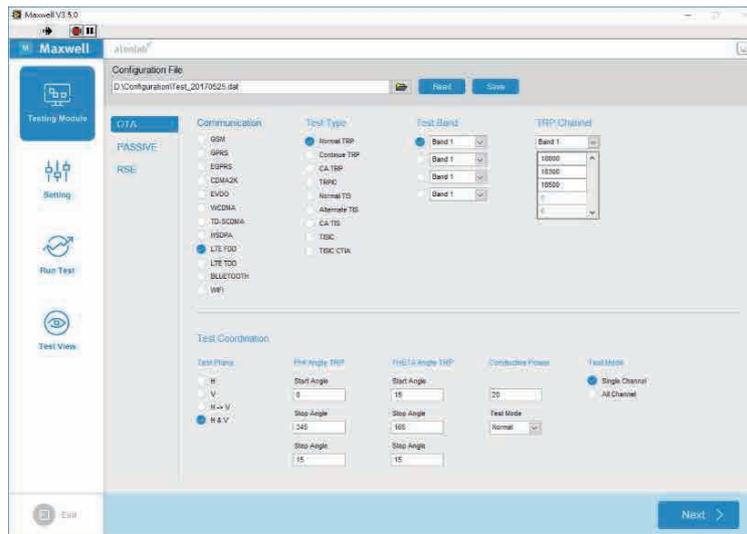
- 2D/3D visualization reports show measurement results.
- Varied data analyses and cross-comparison graphics.
- Customizable standard reports.
- Supports data from major magnetic simulations.



## MW5

The most advanced OTA measurement software. Shipped with the core technology from 2G to 5G, assembled the world-renowned manufacturing firm's control command, and backed by countless user feedback, MW5 is stable and mature .

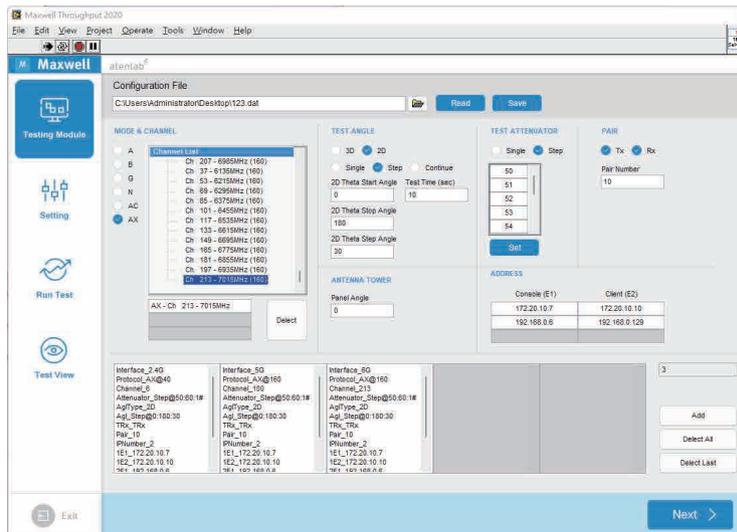
- Support GSM, CDMA, W-CDMA, TD-SCDMA, LTE, 5G FR1, FR2
- UWB, GPS, A-GPS, Bluetooth, Wi-Fi a/b/g/n/ac/ax/be
- Free trial; remote maintenance and upgrades.



## MWT

Introducing a new member from the Maxwell family, Maxwell Throughput. Atenlab provides a specific measurement plan for high-speed data and multi-channel architecture, adding new performance evaluation capabilities to help developers break through existing challenges.

- Supports IxChariot, iPerf3, and chip manufacturer's core algorithms.
- Customized schedules, test items, test channels, and comply with TR-398.
- The exclusive AP brings you a more efficient measurement process.



## Atenlab X Selection

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If you are a developer of mmWave products, R-Class is definitely your best partner. Atenlab simplifies and categorizes currently applied specifications and functions, providing practical engineers with a fair and efficient plan. R-Class offers the most complete functions and scalable plans, ensuring that every penny counts and is not wasted. With the rapid pace of technological change, R-Class is always forward-looking and provides flawless planning, keeping you at the cutting edge of the industry.

## R class X Compare

	R2	R3
Operating Frequency	24 – 50 GHz	24 – 50 GHz
Upgrade Frequency	18 GHz 110 GHz	18 GHz 110 GHz
Outside Dimension(L/W/H)	1.2 x 0.8 x 1.9 m	7.0 x 4.0 x 3.0 m
Reflector Size	0.6 x 0.6 m	1.5 x 1.5 m
Quiet Zone Size	0.3 m	0.6 m
Mechanical Type	L-Shape 3D	L-Shape 3D
Pol. Switching	Automatic	Automatic
Feed Tuner	Fixed	Electrical Adjustable
Feed Selection	24 – 42 GHz	24 – 42 GHz
Feed Selection (Optional)	<b>1 out of 4</b> 24 – 42 GHz 18 – 26.5 GHz 40 – 60 GHz 60 – 90 GHz	<b>1 out of 6</b> 24 – 42 GHz 40 – 60 GHz 60 – 90 GHz 18 – 26.5 GHz 8.2 – 12.4 GHz 12.4 – 18 GHz

	R6	R8
Operating Frequency	24 – 50 GHz	24 – 50 GHz
Upgrade Frequency	18 GHz 110 GHz	18 GHz 110 GHz
Outside Dimension(L/W/H)	10.0 x 5.0 x 4.0 m	12.0 x 6.0 x 6.0 m
Reflector Size	2.1 x 2.1 m	2.7 x 2.7 m
Quiet Zone Size	0.9 m	1.2 m
Mechanical Type	U-Complex	U-Complex
Pol. Switching	Automatic	Automatic
Feed Tuner	Electrical Adjustable	Electrical Adjustable
Feed Selection	24 – 42 GHz	24 – 42 GHz
Feed Selection (Optional)	<b>3 out of 6</b> 24 – 42 GHz 18 – 26.5 GHz 40 – 60 GHz 60 – 90 GHz 8.2 – 12.4 GHz 12.4 – 18 GHz 3.95 – 5.85 GHz 5.85 – 8.2 GHz	<b>4s out of 6</b> 24 – 42 GHz 40 – 60 GHz 60 – 90 GHz 18 – 26.5 GHz 8.2 – 12.4 GHz 12.4 – 18 GHz 1.7 – 2.6 GHz 2.6 – 3.95 GHz 3.95 – 5.85 GHz 5.85 – 8.2 GHz

atenlab 



## R2 X Mobility

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The compact range measurement method requires accurate focus and calibration. R2 is the world's first movable compact range measurement system, featuring a small site area and high mobility, which effectively solves site operation challenges.

## R2 X Appearance

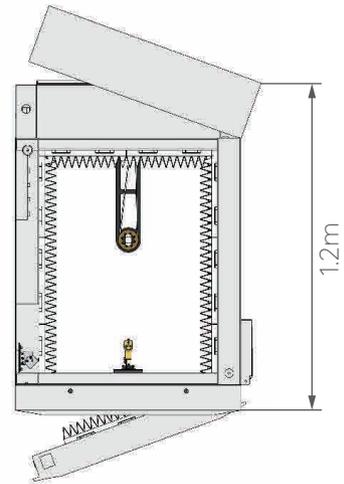
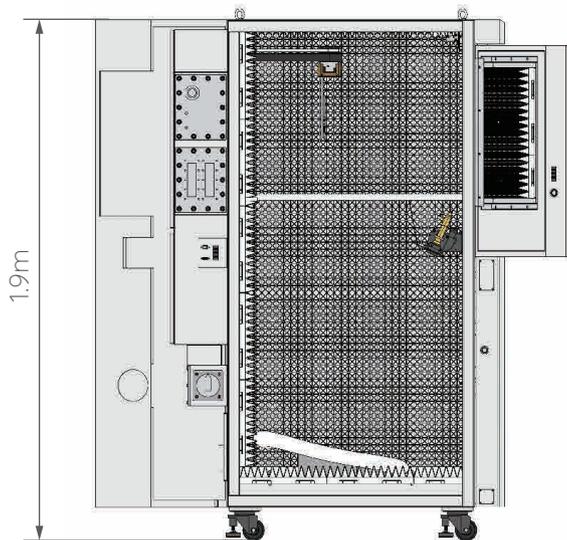
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- Mobility
- Plug & Play
- Precise Measurement



## R2 X Three-View-Drawing

- Size: L1.2 x W0.8 x H1.9 m
- Weight: 350kg
- Built Space: L2.0 x W1.0 x H2.0 m
- Floor-loading Capacity: 400kg/m<sup>2</sup>



R2

## R2 X Internal



## R2 X Specification

R2

R2			
Operating Frequency	24-50 GHz		
Upgrade Frequency	18 or 110 GHz		
Outside Dimension(L/W/H)	1.2 x 0.8 x 1.9 m		
Maximum Tested Object	7.0" Handheld Device		
Quiet Zone Size	0.3 x 0.3 m		
Cross-Pol	-25 dB		
Amplitude Ripple	± 1.2 dB		
Amplitude Taper	2 dB		
Phase Ripple	N/A		
Phase Taper	N/A		
Reflector Shape	Rolled Edge		
Reflector Size	0.6 x 0.6 m		
Test Function	Antenna Performance / Receiver Sensitivity Transmit Power / Carrier Aggregation		
Test Item	TX beam peak direction search / RX beam peak direction search Peak EIRP measurement / Peak EIS measurement / EIRP spherical coverage EIS spherical coverage / TRP measurement / TIS measurement / Blocking measurement		
Pol. of Feed	Dual Polarization		
Pol. Switching	Automatic		
Feed Tuner	Fixed		
Feed Selection	1 out of 4	24 - 42 GHz	40 - 60 GHz 18 - 26.5 GHz 60 - 90 GHz

## R2 X Hardware Specifications

Anechoic Chamber	R2
Outside Dimension(L/W/H)	1.2 x 0.8 x 1.9 m
Inside Dimension(L/W/H)	0.8 x 0.7 x 1.7 m
Shielding Effectiveness	SE> 100 dB, Between 18~50GHz
Shielding Steel Sheet Thickness	SPCC Steel Pan Type By 2 mm Galvanized Steel Sheet
Shielding Door	Electric Auto Latching
Shielding Door Dimension(W/H)	0.5 x 0.56 m
Number of Shielding Door	2
Air Vent	N/A
Power Source Filter	220 VAC 6A, Isolation: 100dB
Signal Filter	USB 3.0 / RJ-45 / DC / WG
AP Size	20 x 20 cm
Lighting	N/A
Laser Line	3 Laser Red Line
CCTV	N/A
Weight	350 Kg

### Absorber

Material	Expandable Polypropylene
Power Density Susceptibility	750 V/m
Operating Temperature	-15 C to +60 C
Operating Humidity	30% to 70%
ISO Dust-Free (Class)	100,000 Clean Room
RoHS & REACH	Compliant
Fire-Retardant Performance	NRL 8093 Test 1&3 / UL94 HBF / ISO 4589-2
Waterproof Rating	IPX5

### Communication Antenna

Operating Frequency	0.65-8GHz
Antenna Gain	6 dBi
Polarization	Single Polarization
Polarization Direction	Circular Polarization
Max. Watt	4 Watt CW
Connector	SMA(F)

#### DUT Turntable

Table Diameter	0.5m
Dynamic Loading	0.5 Kg (beam), 2 Kg (TRP)
Torque	Theta 9 N-m ,Phi 3 N-m
Mechanical Type	L-shape 3D
Turntable Resolution	0.1°
Turntable Accuracy	±0.5°
Max. Turntable Speed	12 RPM
Input Power	110 / 220VAC 200W
Control Protocol	RS-485
Phi Axis Removable	N/A
Standard Fixture	Handheld Device Fixture / Laptop Fixture (Optional)

#### OTA Switch

Frequency Range	0.5 - 50 GHz (Optional)
Application	Passive
Port	2 for V/H
Feed Support	1
Connector	2.4 mm

#### Measurement Antenna

Operating Frequency	24 - 42 GHz
Polarization	Dual Linear Polarization Antenna
Polarization Isolation	25dB
Antenna Gain	14 dBi
Connector	2.92mm(F)

#### Control Unit

CPU	Intel Core i5
Operating System	Windows 10 Enterprise 64 bit
Hard Drive	500G HDD
Ram	8GB
Monitor	15"
I/O Interface	GPIB
Instrument Rack	N/A

#### Accessory

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Industrial Rack	N/A
Control Computer	Embedded IPC
LCD Monitor	Extensible from IPC
Video Surveillance	N/A
Power Consumption	1KW
Measurement Software	Maxwell 5GNR
Viewer Software	Maxwell Viewer

#### Installation Requirement

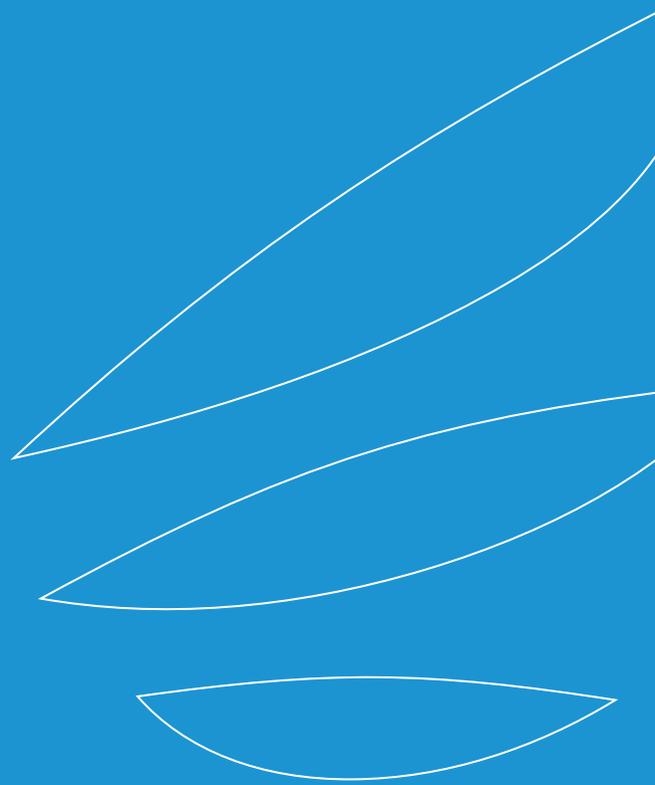
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Working Dimension(L/W/H)	2.0 x 1.0 x 2.0 m
Electrical	220VAC 50Hz 16A

## Acceptance Specifications

Shielding Effectiveness	
Test Frequency	0.7-18GHz
Limit	>100 dB
Pathloss	
Pathloss Calibration	As Feed Range
Quiet Zone Testing	
QZ Calibration	3 Freq. Points Per Feed
QZ Method	7 Pionts
QZ Size	25 cm
SD on Amplitude Ripple	$\pm 1.2$ dB
Reliability Testing	
Repeatability	1 Freq. Points Per Feed by 6 Times
SD on TRP	$\pm 2.0$ dB
Hardware Op Check	Yes

atenlab<sup>≡</sup>



## R3 X Delicate

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Designed for people who have no space and little budget. With R3, you can still enjoy the accurate measurement results with limited budget.

## R3 X Appearance

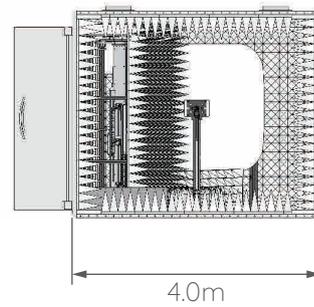
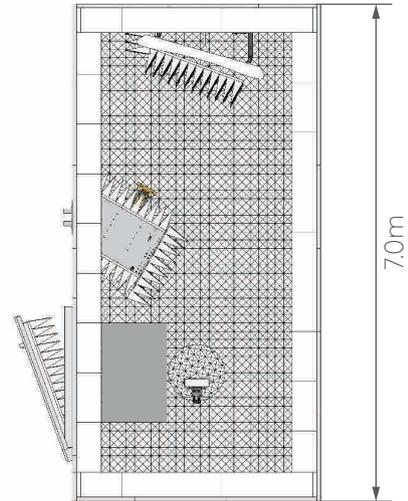
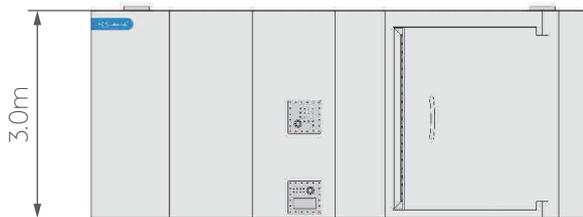
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- Multipurpose
- Small-to-Medium Quiet Zone
- For 5G NR Remote Terminal Unit (RTU)



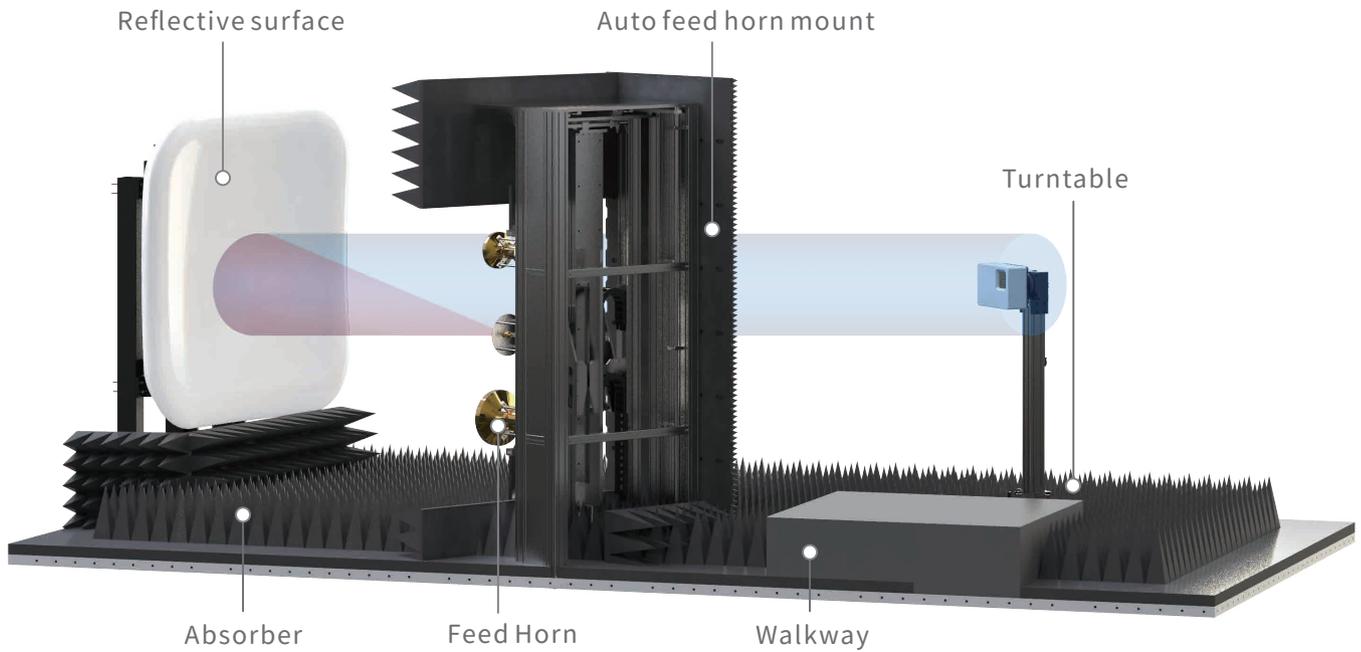
## R3 X Three-View-Drawing

- Size: L7.0 x W4.0 x H3.0 m
- Weight: 4,000kg
- Built Space:L8.0 x W5.0 x H3.5 m
- Floor-loading Capacity: 400 kg/m<sup>2</sup>



R3

## R3 X Internal



# R3 X Specification

## R3

Operating Frequency	24-50 GHz			
Upgrade Frequency	8.2 or 110 GHz			
Outside Dimension(L/W/H)	7.0 x 4.0 x 3.0 m			
Maximum Tested Object				
Quiet Zone Size	0.6 x 0.6 m			
Cross-Pol	-25 dB			
Amplitude Ripple	± 0.5 dB			
Amplitude Taper	1.0 dB			
Phase Ripple	N/A			
Phase Taper	N/A			
Reflector Shape	Rolled Edge			
Reflector Size	1.5 x 1.5 m			
Test Function	Antenna Performance / Receiver Sensitivity Transmit Power / Carrier Aggregation			
Test Item	TX beam peak direction search / RX beam peak direction search Peak EIRP measurement / Peak EIS measurement / EIRP spherical coverage EIS spherical coverage / TRP measurement / TIS measurement / Blocking measurement			
Pol. of Feed	Dual Polarization			
Pol. Switching	Automatic			
Feed Tuner	Electrical Adjustable *1			
Feed Selection	1 out of 6	24 - 42 GHz (FR2) 40 - 60 GHz	60 - 90 GHz 8.2 - 12.4 GHz (LEO)	12.4 - 18 GHz (LEO) 18 - 26.5 GHz (LEO)

R3

## R3 X Hardware Specifications

Anechoic Chamber	R3
Outside Dimension(L/W/H)	7.0 x 4.0 x 3.0 m
Inside Dimension(L/W/H)	
Shielding Effectiveness	SE> 100 dB, Between 8~50GHz
Shielding Steel Sheet Thickness	SPCC Steel Pan Type By 2 mm Galvanized Steel Sheet
Shielding Door	Electric Auto Latching
Shielding Door Dimension(W/H)	1.0 x 2.0 m
Number of Shielding Door	1
Air Vent	0.3 x 0.3 m
Power Source Filter	220 VAC 16A *2 , Isolation: 100dB
Signal Filter	USB 3.0 / RJ-45 / DC / WG
AP Size	20 x 20 cm
Lighting	N/A
Laser Line	3 Laser Red Line
CCTV	N/A
Weight	4,000 Kg

### Absorber

Material	Expandable Polypropylene
Power Density Susceptibility	750 V/m
Operating Temperature	-15 C to +60 C
Operating Humidity	30% to 70%
ISO Dust-Free (Class)	100,000 Clean Room
RoHS & REACH	Compliant
Fire-Retardant Performance	NRL 8093 Test 1&3 / UL94 HBF / ISO 4589-2
Waterproof Rating	IPX5

### Communication Antenna

Operating Frequency	0.65-8GHz
Antenna Gain	6 dBi
Polarization	Single Polarization
Polarization Direction	Circular Polarization
Max. Watt	4 Watt CW
Connector	SMA(F)

#### DUT Turntable

Table Diameter	1.2m
Dynamic Loading	5 Kg (beam), 15 Kg (TRP)
Torque	Theta 9 N-m ,Phi 3 N-m
Mechanical Type	L-shape 3D
Turntable Resolution	0.1°
Turntable Accuracy	±0.5°
Max. Turntable Speed	8 RPM
Input Power	700W
Control Protocol	RS-485
Phi Axis Removable	N/A
Standard Fixture	Handheld Device Fixture / Laptop Fixture (Optional)

#### OTA Switch

Frequency Range	0.5 - 50 GHz (Optional)
Application	Passive / Active
Port	2 for V/H
Feed Support	1
Connector	2.4 mm

### Measurement Antenna

Operating Frequency	24 - 42 GHz
Polarization	Dual Linear Polarization Antenna
Polarization Isolation	25dB
Antenna Gain	14 dBi
Connector	2.92mm(F)

### Control Unit

CPU	Intel Core i5	Intel Core i9	Intel Core i9
Operating System	Microsoft	Microsoft	Microsoft
Hard Drive	1TB HDD	256GB M.2	256GB M.2
Ram	16GB	16GB	16GB
Monitor	24"	24"	24"
I/O Interface	GPIB	GPIB	N/A
Instrument Rack	19"41U	19"41U	19"25U

#### Accessory

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Industrial Rack	19" 35U rack
Control Computer	IPC i9 Win10 64 bit
LCD Monitor	24"
Video Surveillance	CCTV
Power Consumption	1KW
Measurement Software	Maxwell 5GNR
Viewer Software	Maxwell Viewer

#### Installation Requirement

---

Working Dimension(L/W/H)	7.0 x 6.0 x3.0 m
Electrical	220VAC 50Hz 40A

## Acceptance Specifications

### Shielding Effectiveness

Test Frequency 0.7-18GHz

Limit >100 dB

### Pathloss

Pathloss Calibration As Feed Range

### Quiet Zone Testing

QZ Calibration 3 Freq. Points Per Feed

QZ Method 7 Pionts

QZ Size 60 cm

SD on Amplitude Ripple  $\pm 0.5$  dB

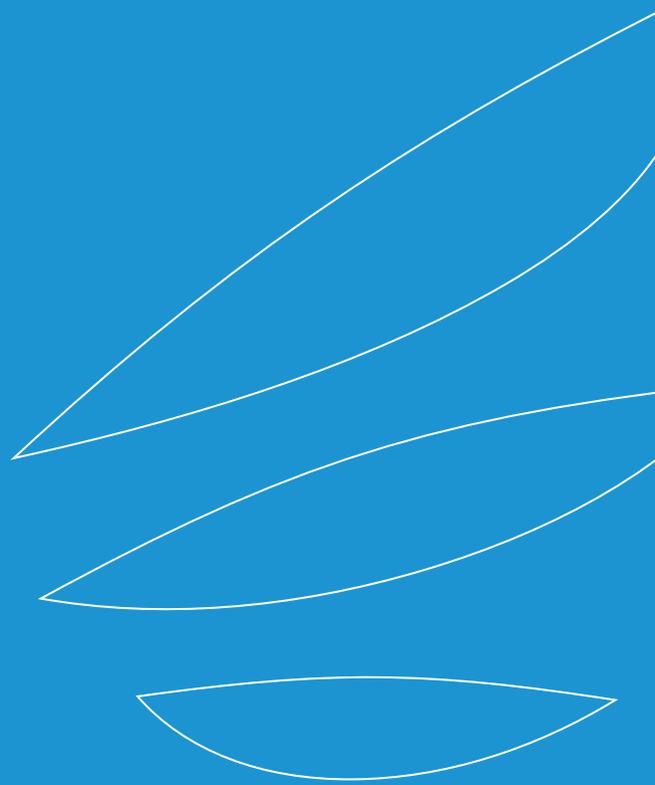
### Reliability Testing

Repeatability 1 Freq. Points Per Feed by 6 Times

SD on TRP  $\pm 1.5$  dB

Hardware Op Check Yes

atenlab<sup>≡</sup>



## R6 X Standard

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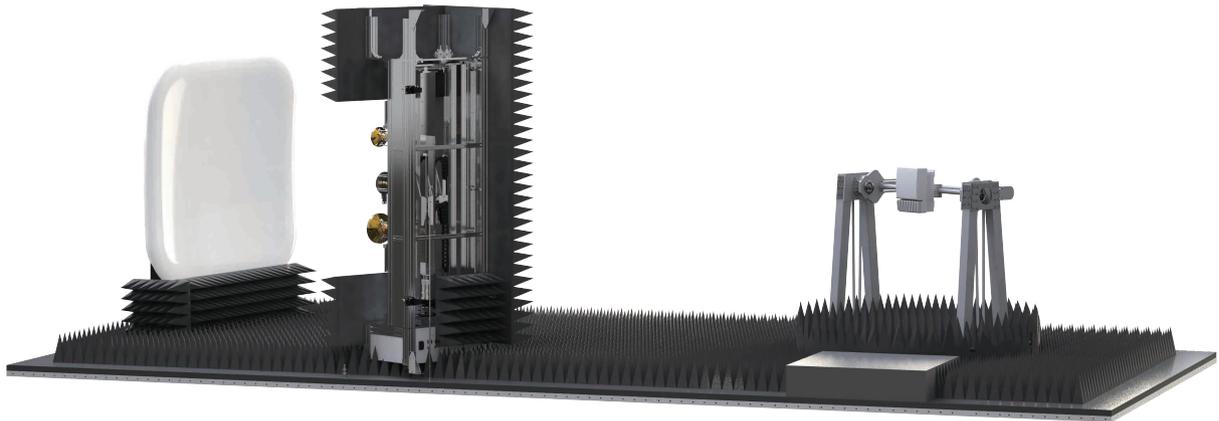
Large-size test items with high frequencies are difficult to measure. R6 provides a standard solution to tackle this problem. You can select different frequency bands, and the system is regulatory compliant and suitable for product manufacturers.

R6

## R6 X Appearance

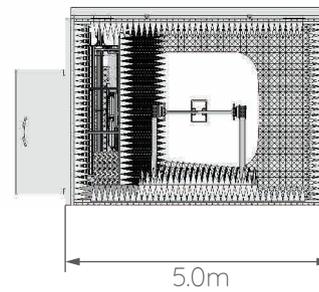
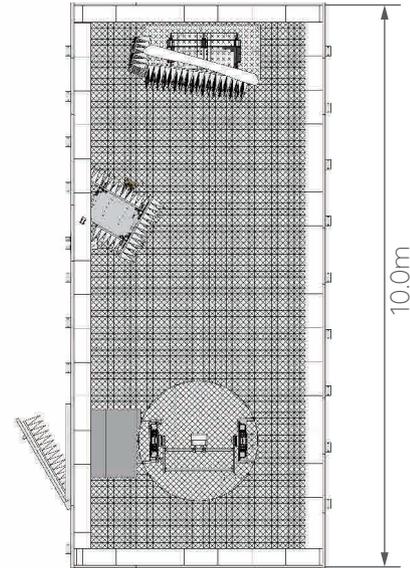
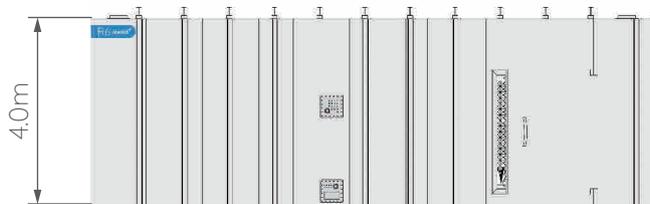
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- Advanced Multitasking
- Built-in LEO Satellite Module
- Large Quiet Zone, Suitable for Base Station Devices



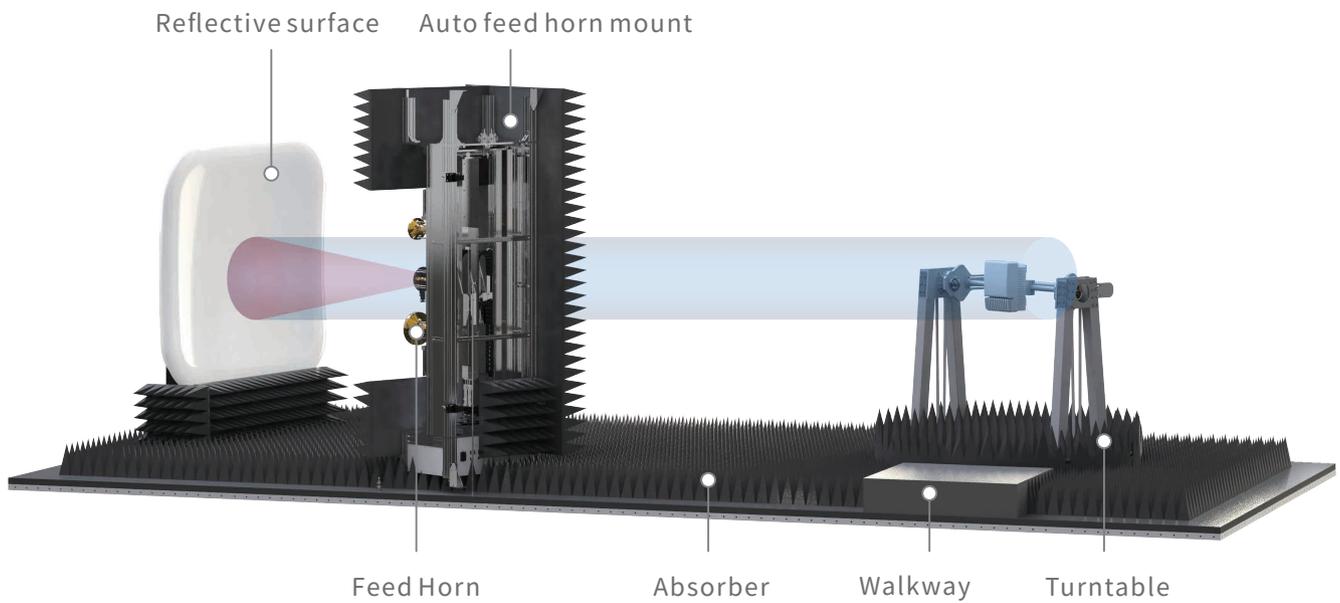
## R6 X Three-View-Drawing

- Size: L10.0 x W5.0 x H4.0 m
- Weight: 5000kg
- Built Space:L10.0 x W5.0 x H4.0 m
- Floor-loading Capacity: 400kg/m<sup>2</sup>



R6

## R6 X Internal



# R6 X Specification

## R6

Operating Frequency	24-50 GHz			
Upgrade Frequency	8.2 or 110 GHz			
Outside Dimension(L/W/H)	10.0 x 5.0 x 4.0 m			
Maximum Tested Object				
Quiet Zone Size	0.9 x 0.9 m			
Cross-Pol	-25 dB			
Amplitude Ripple	± 0.5 dB			
Amplitude Taper	1.0 dB			
Phase Ripple	± 5°			
Phase Taper	10°			
Reflector Shape	Rolled Edge			
Reflector Size	2.1 x 2.1 m			
Test Function	Antenna Performance / Receiver Sensitivity Transmit Power / Carrier Aggregation			
Test Item	TX beam peak direction search / RX beam peak direction search Peak EIRP measurement / Peak EIS measurement / EIRP spherical coverage EIS spherical coverage / TRP measurement / TIS measurement / Blocking measurement			
Pol. of Feed	Dual Polarization			
Pol. Switching	Automatic			
Feed Tuner	Electrical Adjustable *1			
Feed Selection	3 out of 8	24 - 42 GHz (FR2) 40 - 60 GHz (FR2c n263) 60 - 90 GHz (Vehical Radar)	8.2 - 12.4 GHz (LEOa) 12.4 - 18 GHz (LEOb) 18 - 26.5 GHz (LEO)	3.95 - 5.85 GHz (FR1, n46, n79) 5.85 - 8.2 GHz (FR1, n96, n102, n104)

R6

## R6 X Hardware Specifications

Anechoic Chamber	R6
Outside Dimension(L/W/H)	10.0 x 5.0 x 4.0 m
Inside Dimension(L/W/H)	
Shielding Effectiveness	SE> 100 dB, Between 4~50GHz
Shielding Steel Sheet Thickness	SPCC Steel Pan Type By 2 mm Galvanized Steel Sheet
Shielding Door	Electric Auto Latching
Shielding Door Dimension(W/H)	1.5 x 2.0 m
Number of Shielding Door	1
Air Vent	0.3 x 0.3 m
Power Source Filter	220 VAC 60A *1, 220 VAC 16A *1 , Isolation: 100dB
Signal Filter	USB 3.0 / RJ-45 / FO-ST / DC / WG
AP Size	30 x 30 cm
Lighting	LED Lamp *4
Laser Line	3 Laser Red Line
CCTV	N/A
Weight	5,000 Kg

## Absorber

Material	Expandable Polypropylene
Power Density Susceptibility	750 V/m
Operating Temperature	-15 C to +60 C
Operating Humidity	30% to 70%
ISO Dust-Free (Class)	100,000 Clean Room
RoHS & REACH	Compliant
Fire-Retardant Performance	NRL 8093 Test 1&3 UL94 HBF ISO 4589-2
Waterproof Rating	IPX5

## Communication Antenna

Operating Frequency	0.65-8GHz
Antenna Gain	6 dBi
Polarization	Single Polarization
Polarization Direction	Circular Polarization
Max. Watt	4 Watt CW
Connector	SMA(F)

R6

#### DUT Turntable

Table Diameter	1.8m
Dynamic Loading	100 Kg (beam), 200 Kg (TRP)
Torque	Theta 9 N-m ,Phi 3 N-m
Mechanical Type	U-Complex
Turntable Resolution	0.1°
Turntable Accuracy	±0.5°
Max. Turntable Speed	8 RPM
Input Power	1.5 KW
Control Protocol	RS-485
Phi Axis Removable	N/A
Standard Fixture	Handheld Device Fixture / Laptop Fixture (Optional)

#### OTA Switch

Frequency Range	0.5 - 50 GHz (Optionala)
Application	Passive / Active
Port	6 for V/H
Feed Support	3
Connector	2.4 mm

### Measurement Antenna

Operating Frequency	24 - 42 GHz
Polarization	Dual Linear Polarization Antenna
Polarization Isolation	25dB
Antenna Gain	14 dBi
Connector	2.92mm(F)

### Control Unit

CPU	Intel Core i5	Intel Core i9	Intel Core i9
Operating System	Microsoft	Microsoft	Microsoft
Hard Drive	1TB HDD	256GB M.2	256GB M.2
Ram	16GB	16GB	16GB
Monitor	24"	24"	24"
I/O Interface	GPIO	GPIO	N/A
Instrument Rack	19"41U	19"41U	19"25U

### Accessory

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Industrial Rack	19" 41U rack
Control Computer	IPC i9 Win10 64 bit
LCD Monitor	24"
Video Surveillance	Focus Variable CCTV
Power Consumption	5KW
Measurement Software	Maxwell 5GNR
Viewer Software	Maxwell Viewer

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### Installation Requirement

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Working Dimension(L/W/H)	10.0 x 6.0 x 4.0 m
Electrical	220VAC 50Hz 120A

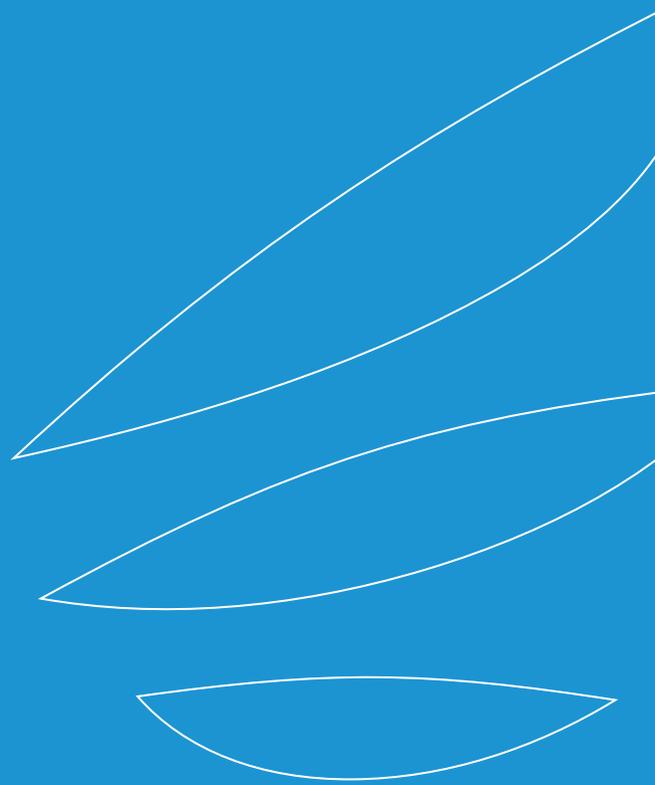
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## Acceptance Specifications

Shielding Effectiveness	
Test Frequency	0.7-18GHz
Limit	>100 dB
Pathloss	
Pathloss Calibration	As Feed Range
Quiet Zone Testing	
QZ Calibration	3 Freq. Points Per Feed
QZ Method	7 Pionts
QZ Size	90 cm
SD on Amplitude Ripple	$\pm 0.5$ dB
Reliability Testing	
Repeatability	1 Freq. Points Per Feed by 6 Times
SD on TRP	$\pm 1.0$ dB
Hardware Op Check	Yes

R6

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## R8 X Pro

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Traditional CATR systems can't satisfy the measurement needs of the near future. R8 offers many scalable functions as well as field-experimentation certification and is TAF certified.

R8

## R8 X Appearance

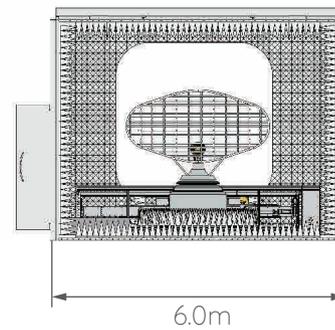
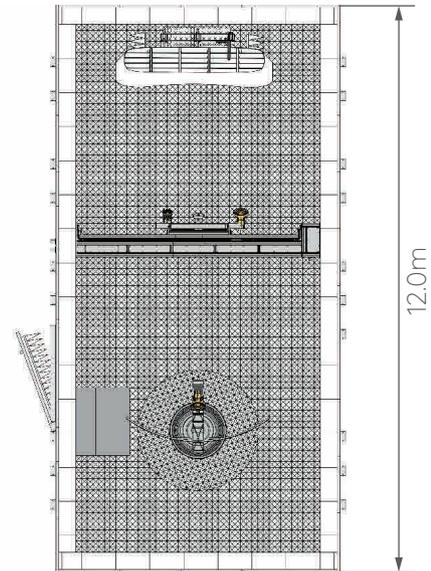
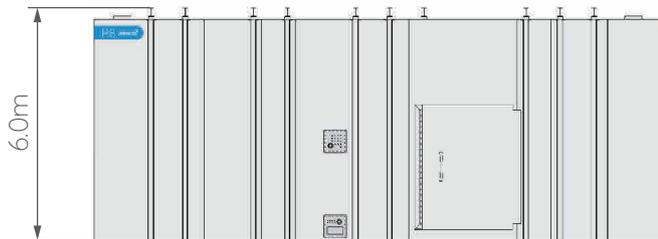
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- Fully Integrated
- TAF Certification
- Suitable for mmWave Antenna Calibration



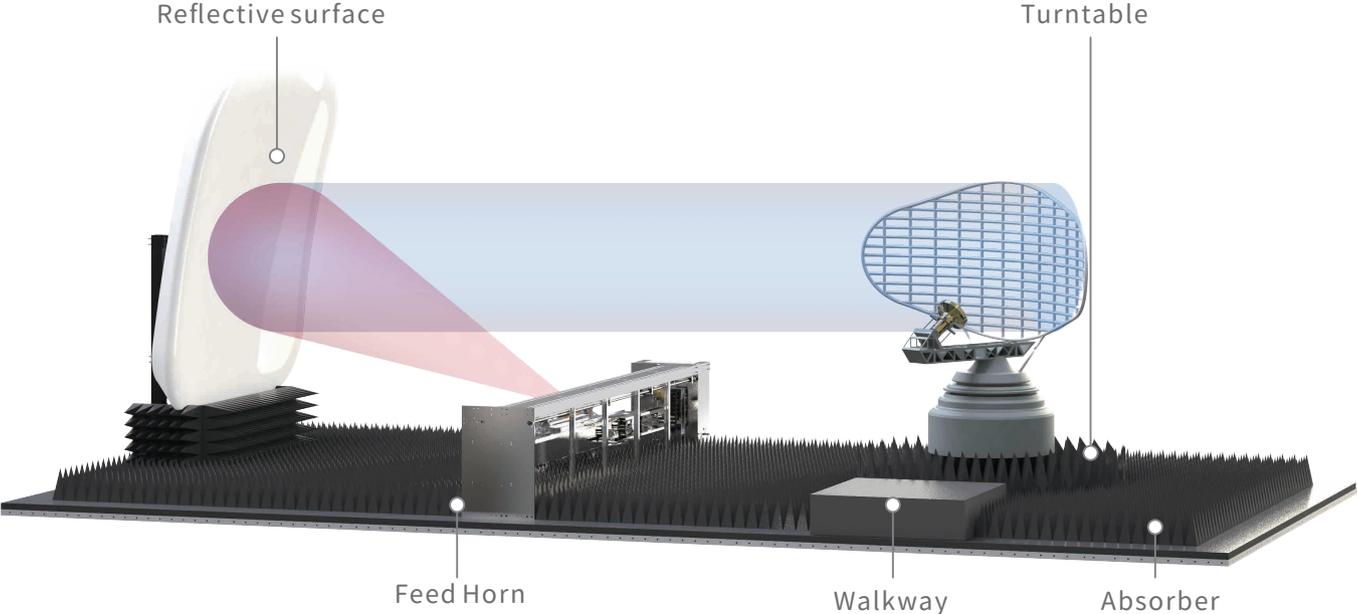
## R8 X Three-View-Drawing

- Size: L12.0 x W6.0 x H6.0 m
- Weight: 6,000kg
- Built Space:L12.0 x W7.0 x H6.0 m
- Floor-loading Capacity: 400kg/m<sup>2</sup>



R8

# R8 X Internal



# R8 X Specification

## R8

Operating Frequency	24-50 GHz			
Upgrade Frequency	2-110 GHz			
Outside Dimension(L/W/H)	12.0 x 6.0 x 6.0 m			
Maximum Tested Object				
Quiet Zone Size	1.2 x 1.2 m			
Cross-Pol	-25 dB			
Amplitude Ripple	± 0.5 dB			
Amplitude Taper	1.0 dB			
Phase Ripple	± 5°			
Phase Taper	10°			
Reflector Shape	Rolled Edge			
Reflector Size	2.7 x 2.7 m			
Test Function	Antenna Performance / Receiver Sensitivity Transmit Power / Carrier Aggregation			
Test Item	TX beam peak direction search / RX beam peak direction search Peak EIRP measurement / Peak EIS measurement / EIRP spherical coverage EIS spherical coverage / TRP measurement / TIS measurement / Blocking measurement			
Pol. of Feed	Dual Polarization			
Pol. Switching	Automatic			
Feed Tuner	Electrical Adjustable *1			
Feed Selection	4 out of 9	24 - 42 GHz (FR2) 40 - 60 GHz (FR2c n263) 60 - 90 GHz (Vehical Radar)	8.2 - 12.4 GHz (LEOα) 12.4 - 18 GHz (LEOb) 18 - 26.5 GHz (LEO)	2.6 - 3.95 GHz (FR1) 3.95 - 5.85 GHz (FR1, n46, n79) 5.85 - 8.2 GHz (FR1, n96, n102, n104)

R8

## R8 X Hardware Specifications

Anechoic Chamber	R8
Outside Dimension(L/W/H)	12.0 x 6.0 x 6.0 m
Inside Dimension(L/W/H)	
Shielding Effectiveness	SE> 100 dB, Between 2~50GHz
Shielding Steel Sheet Thickness	SPCC Steel Pan Type By 2 mm Galvanized Steel Sheet
Shielding Door	Electric Auto Latching
Shielding Door Dimension(W/H)	2.5 x 2.5 m
Number of Shielding Door	1
Air Vent	0.3 x 0.3 m
Power Source Filter	220 VAC 60A *1, 220 VAC 16A *1, Isolation: 100dB
Signal Filter	USB 3.0 / RJ-45 / FO-ST / RS-232 / WG
AP Size	30 x 30 cm
Lighting	LED Lamp *4
Laser Line	3 Laser Red Line
CCTV	N/A
Weight	6,000 Kg

## Absorber

Material	Expandable Polypropylene
Power Density Susceptibility	750 V/m
Operating Temperature	-15 C to +60 C
Operating Humidity	30% to 70%
ISO Dust-Free (Class)	100,000 Clean Room
RoHS & REACH	Compliant
Fire-Retardant Performance	NRL 8093 Test 1&3 / UL94 HBF / ISO 4589-2
Waterproof Rating	IPX5

## Communication Antenna

Operating Frequency	0.65-8GHz
Antenna Gain	6 dBi
Polarization	Single Polarization
Polarization Direction	Circular Polarization
Max. Watt	4 Watt CW
Connector	SMA(F)

R8

#### DUT Turntable

Table Diameter	2.0m
Dynamic Loading	100 Kg (beam), 200 Kg (TRP)
Torque	Theta 9 N-m ,Phi 3 N-m
Mechanical Type	U-Complex
Turntable Resolution	0.1°
Turntable Accuracy	±0.5°
Max. Turntable Speed	8 RPM
Input Power	1.5KW
Control Protocol	RS-485
Phi Axis Removable	N/A
Standard Fixture	Handheld Device Fixture / Laptop Fixture (Optional)

#### OTA Switch

Frequency Range	0.5 - 50 GHz (Optional)
Application	Passive / Active
Port	8 for V/H
Feed Support	4
Connector	2.4 mm

### Measurement Antenna

Operating Frequency	24 - 42 GHz
Polarization	Dual Linear Polarization Antenna
Polarization Isolation	25dB
Antenna Gain	14 dBi
Connector	2.92mm(F)

### Control Unit

CPU	Intel Core i5	Intel Core i9	Intel Core i9
Operating System	Microsoft	Microsoft	Microsoft
Hard Drive	1TB HDD	256GB M.2	256GB M.2
Ram	16GB	16GB	16GB
Monitor	24"	24"	24"
I/O Interface	GPIB	GPIB	N/A
Instrument Rack	19"41U	19"41U	19"25U

R8

### Accessory

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Industrial Rack	19" 41U rack
Control Computer	IPC i9 Win10 64 bit
LCD Monitor	24"
Video Surveillance	Focus Variable CCTV
Power Consumption	5KW
Measurement Software	Maxwell 5GMR
Viewer Software	Maxwell Viewer

### Installation Requirement

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Working Dimension(L/W/H)	12.0 x 7.0 x 6.0 m
Electrical	220VAC 50Hz 120A

## Acceptance Specifications

Shielding Effectiveness	
Test Frequency	0.7-18GHz
Limit	>100 dB
Pathloss	
Pathloss Calibration	As Feed Range
Quiet Zone Testing	
QZ Calibration	3 Freq. Points Per Feed
QZ Method	7 Pionts
QZ Size	120 cm
SD on Amplitude Ripple	$\pm 0.5$ dB
Reliability Testing	
Repeatability	1 Freq. Points Per Feed by 6 Times
SD on TRP	$\pm 1.0$ dB
Hardware Op Check	Yes

R8



## Appendix

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Everything you need is already here for you to utilize.

Appendix/

## 5G-FR2 TDD Band List Guide

5G NR (3GPP TS 38.101)					
Fr2 TDD	Band #	Name	Up/Down link (MHz)		OBW (MHz)
			Flow (MHz)	Fhigh(MHz)(MHz)	
n257		26 LMDS	26500	29500	3000
n258		24 K-band	24250	27500	3250
n259		41 V-band	39500	43500	4000
n260		39 Ka-band	37000	40000	3000
n261		28 Ka-band	27500	28350	
n262		47 V-band	47200	48200	1000

Appendix/

## mmWave Far-field Path Loss Comparison Table

### Far-Field Distance and Path Loss

D (cm)	Frequency (GHz)	Path loss (dB)	NF/FF boundary (cm)
5	28	54.8	47
	100	76.9	167
10	28	66.8	187
	100	88.9	667
15	28	73.9	420
	100	96	1501
20	28	78.9	747
	100	101	2668
25	28	82.7	1167
	100	105	4169
30	28	85.9	1681
	100	108	6004

Note: 100 <-> 28, delta\_pathloss= 22 dB, delta\_boundaryratio=3.5

### IFF Path Loss

DUT size(cm)	Frequency(GHz)	Path Loss(dB)
5	28	52.3
10	28	58.3
15	28	61.8
30	28	67.8

Note:Final values will depend on CATR

## Appendix/ Waveguide Specification Table

Waveguide name		Frequency band name	Cutoff frequency (GHz) of	
EIA	RCSC*		lowest	Higher
WR2300	WG0.0		0.257	0.513
WR2100	WG0		0.281	0.562
WR1800	WG1		0.328	0.656
WR1500	WG2		0.393	0.787
WR1150	WG3		0.513	1.026
WR975	WG4		0.605	1.211
WR770	WG5		0.766	1.533
WR650	WG6	L band	0.908	1.816
WR510	WG7		1.157	2.314
WR430	WG8		1.372	2.745
WR340	WG9A	S band	1.736	3.471
WR284	WG10	S band	2.078	4.156
WR229	WG11A	C band	2.577	5.154
WR187	WG12	C band	3.153	6.305
WR159	WG13	C band	3.712	7.423
WR137	WG14	C band	4.301	8.603
WR112	WG15	—	5.26	10.52
WR90	WG16	X band	6.557	13.114

Waveguide name		Frequency band name	Cutoff frequency (GHz) of	
EIA	RCSC*		lower	Higher
WR75	WG17	—	7.869	15.737
WR62	WG18	Kuband	9.488	18.976
WR51	WG19	—	11.572	23.143
WR42	WG20	K band	14.051	28.102
WR34	WG21	—	17.357	34.715
WR28	WG22	Kaband	21.077	42.154
WR22	WG23	Q band	26.346	52.692
WR19	WG24	U band	31.391	62.782
WR15	WG25	V band	39.875	79.75
WR12	WG26	E band	48.373	96.746
WR10	WG27	W band	59.015	118.03
WR8	WG28	F band	73.768	147.536
WR6	WG29	D band	90.791	181.583
WR7				
WR6.5				
WR5	WG30		115.714	231.429
WR4	WG31		137.243	274.485
WR3	WG32		173.571	347.143

Appendix/

## High-Frequency Probe Specification Table and Base Station Grade Table

RF Coaxial Connector Type and Related Maximum Operation Frequency Table

Type		GHz	Compatible
BNC		6	
N		18	
SMA		26	
3.5 mm	WSMA	34	
2.92 mm	K	46	Conditional with 3.5mm
2.4 mm	Q	50	
1.85 mm	V	65	Conditional with 2.92mm
1.0 mm	W	110	

Base station scale classification table

Class	Scale	Reference Pathloss	Reference Range
Wide Range	Macro Cell	70 dB	35m
Middle Range	Micro Cell	53 dB	5 m
Local Range	Pico Cell	45 dB	2 m

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