atenlab

Single-probe wireless communication measurement system

A

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

www.atenlab.com.tw

Persistence X Eternal

18 We are already here.

Atenlab X Measurement Expert

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.

- Launched EMC Anechoic Chamber, E class
- Launched 3G-WCDMA, A class
- Passed the CTIA Certification
- Atenlab established

2004 atenlab

2007

2008 CTIA

2010

2023
CST

B5G
2024

• Agent CST Studio Suite

• Low Earth Orbits, LEO S class, Wi-Fi 7

• Planning and building TTC laboratory, Passed the ISO17025-5G qualification.

2014

• Launched 5G mmWave CATR, R class

2017
EMC

• Planning and building UL laboratory, Passed the ISO17025-EMC qualification.

5G
2021

• Launched 4G-LTE MIMO, M class

2015

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

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

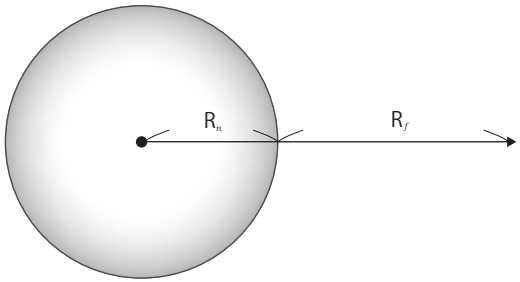
Single-Probe X Communication

A typical single-probe communication system is a single-variable control system with only one input and output (single-input single-output: SISO). This setup is the simplest, lowest-cost, most stable and also most mature technical solution. SISO is the mainstream architecture and is used in 50% of the communication system.

Two major variables in determining the performance of the communication system: passive and active measurement. Passive measurement only measures the performance and feature of the antenna-under-test (AUT). Active measurement links the AUT which is connected to its communication system to measure the performance of the complete communication system. Active measurement measures the radiated power (Tx) and receiving sensitivity (Rx). This measurement can help analyze problems such as power component or noise interference in the system.

A class is a stable, mature and highly-effective measurement tool and popular amongst engineers.

Near-field X Far-field



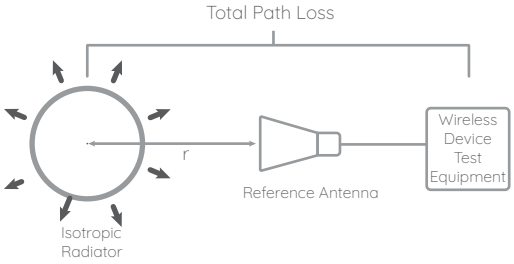
$$R_f > \frac{2D^2}{\lambda} > R_n$$

R_n : Near-field
R_f : Far-field
λ : Wavelength
D : Antenna Size

There are two types of antenna radiation patterns: Near-field and Far-field. For a long time, there is no established standard to estimate the difference between the two of them. But the key factor to tell the difference is to determine if the EM wave is in planar form.
If it is plane wave then it would be Far-field, otherwise, Near-field.
The physical meaning of a plane wave is that the phase of the wave fronts is the same, which means the arrival time of the wave fronts is the same. which is the measurement range of the far field. A non-planar wave can be referred to as a spherical wave, with different arrival times of the wavefront. This range has a larger air loss and is the measurement range of the near field.

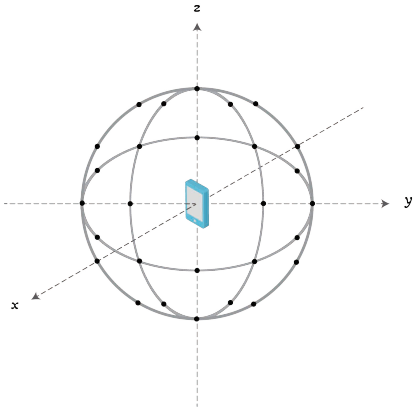
Calibration X Quality

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



Calibration X Quiet Zone

The quiet zone is an imaginary space. The measurement method would be to collect the data on the border of the quiet zone, once the data is captured and organized, the quality of the quiet zone can be verified.



Passive X Measurement

Antenna Gain

Antenna gain is considered as an index of radiating or receiving capability, the unit is in dBi. Measuring the gain of a single antenna from different directions can create an antenna pattern, which, after calculating and analyzing the data, can be visualized to provide the antenna designer with the correct research direction.

dBi vs dBd

dBi and dBd are about the value of gains (power gains), both are relative values, but the reference is different. The reference of dBi is omnidirectional antenna, dBd's reference is dipole. Generally speaking, the dBi value is approximately 2.15 dB higher than the dBd value for the same antenna gain.

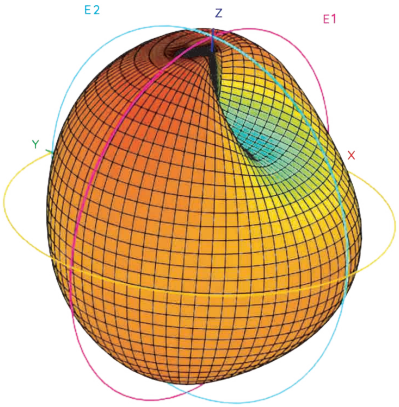
High Frequency X Development

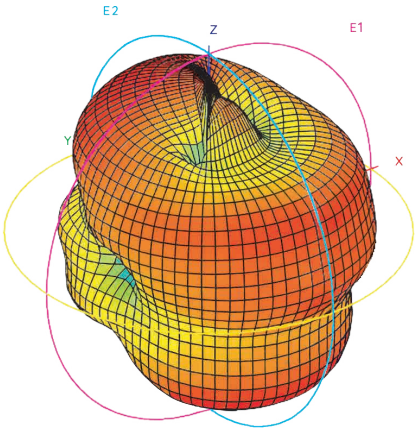
TRP (Total Radiated Power)

Total radiated power is an important parameter in the measurement system, used to represent the total output power of the test object. When the test object is a terminal device, a connection is established between the simulated base station and the terminal to maintain communication. The power value of the test object is taken from different directions, and the calculation and analysis result is TRP.

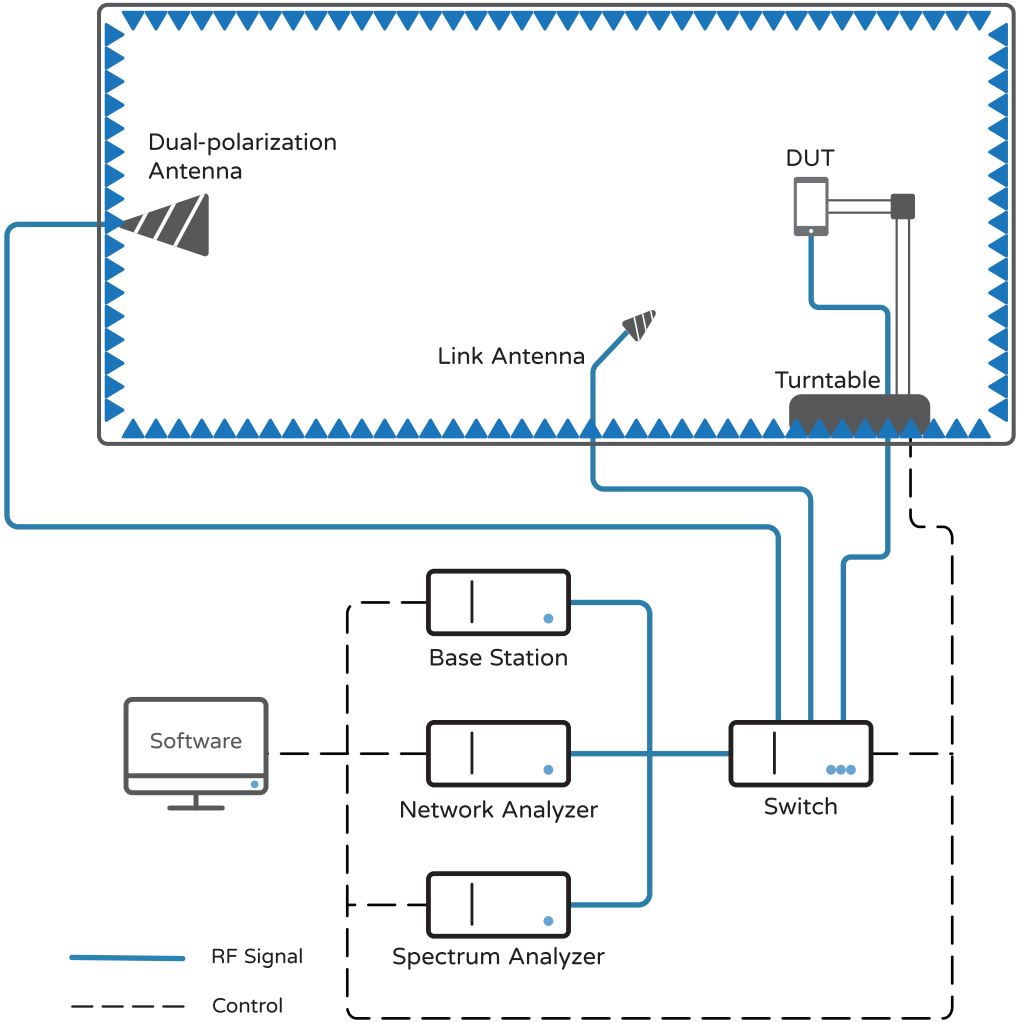
TIS (Total Isotropic Sensitivity)

Omnidirectional sensitivity refers to the sensitivity performance of the test object in all directions. It represents the object's sensitivity to external stimuli and indicates the object's sensitivity to its surroundings. The measurement method is similar to TRP, but the power value is changed to sensitivity measurement, and the calculation analysis result is TIS. When sensitivity measurement takes more time, the communication power must be gradually reduced until the power value that affects the communication quality of the test object is reached, which is sensitivity.





Single Probe X System Architecture



Atenlab X Maxwell

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.

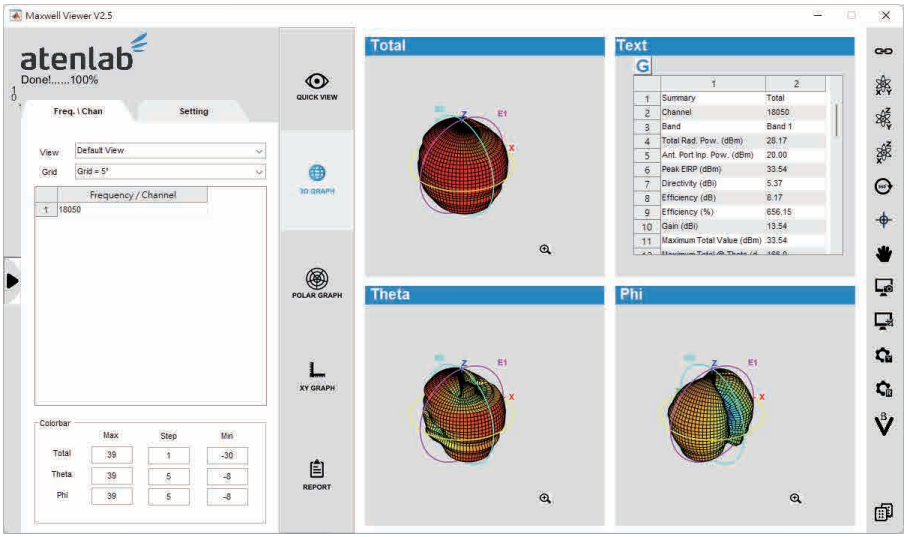
Atenlab integrates all the electromagnetic measurement technology and methods and has successfully sold hundreds of systems since 2004. Atenlab has thousands of active users in the mobile communication and Wi-Fi field. Atenlab's Maxwell family includes MWT, MW5 and MWC, and MWK for calibration and MWV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

Maxwell X Software

MWV

Maxwell Viewer provides the login system, monitor data in real time with multiple info-graphics, and produces test report based on particular needs . It's easy to use and also supports many specifications.

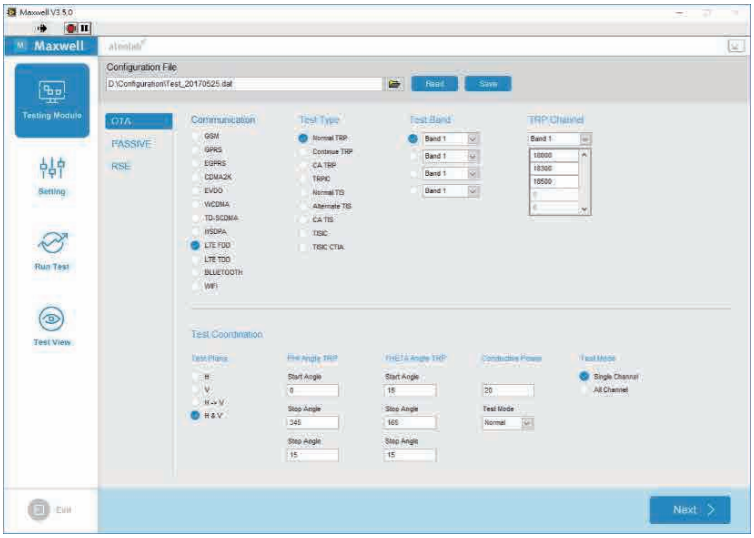
- 2D/ 3D visualization reports show measurement results.
- Varied data analysis and cross-comparison picture.
- Customizable standard report.
- Support major magnetic simulation's data.



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.

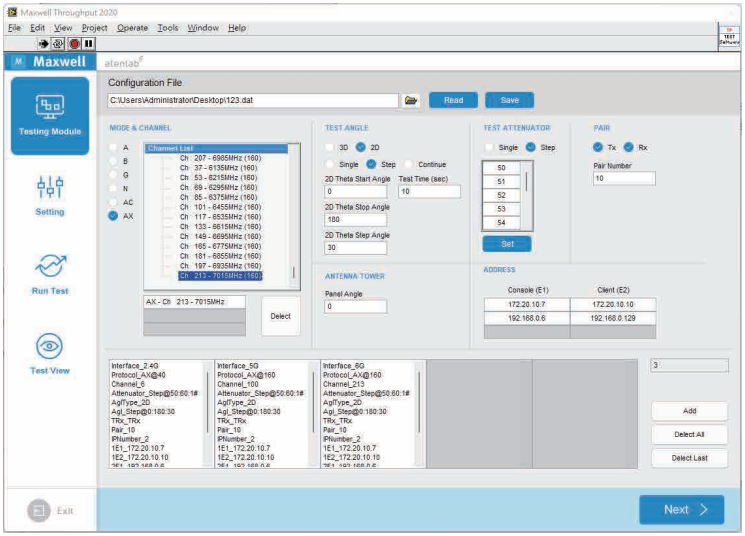
- Support GSM, CDMA, W-CDMA, TD-SCDMA, LTE, 5G FR1, FR2
- UWB, GPS, A-GPS, Bluetooth, Wi-Fi a/b/g/n/ac/ax/be
- Free-trial/ Remotely maintain and upgrade.



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, complying with TR-398.
- The exclusive AP brings you a more efficient measurement process.



Atenlab X Selection

As soon as you choose A class, please spend more time on learning every detail of the A class. This will be the most important decision you've ever made.

Based on the wealth of user experiences, Atenlab provides a variety of practical advice. We encourage you to take more time to carefully consider this decision to avoid future regrets.

A class X Specification Comparison

	A2	A3
Outside Dimension(L/W/H)	1.2 x 0.8 x 1.9 m	3.5 x 1.7 x 2.4 m
Shielding Door Dimension(W/H)	0.5 x 0.5 m	1.0 x 1.0 m
Operating Frequency	0.68 – 8 GHz	0.65 – 8.5 GHz
Upgrade Frequency	2.0 - 18 GHz	0.65 – 13 GHz 2.0 – 18 GHz
Maximum Tested Object	7”Handheld Device	13”Tablet Device
Turntable PHI Load	2 Kg	8 Kg
Measurement Distance	0.9 m	2.1 m
Quiet Zone Size	N/A	30 cm
Quiet Zone Characteristics	N/A	0.3m SD < 1.0
Shielding Effectiveness	0.5-18 GHz > 100 dB	0.03-18 GHz > 100 dB
Software	MWV / MW5	MWV / MW5 / MWT
Weight	< 350 Kg	< 2000 Kg
Working Dimension(L/W/H)	2.0 x 1.0 x 2.0 m	3.7 x 3.2 x 2.5 m

	A6	A8
Outside Dimension(L/W/H)	6.0 x 3.0 x 3.0 m	8.2 x 4.1 x 4.1 m
Shielding Door Dimension(W/H)	1.0 x 2.0 m	1.0 x 2.0 m
Operating Frequency	0.65 – 8.5 GHz	0.45 – 6 GHz
Upgrade Frequency	0.65 – 13 GHz 2.0 – 18 GHz	0.65 – 8 GHz 0.65 – 13 GHz 2.0 – 18 GHz
Maximum Tested Object	19” Laptop	19” Laptop
Turntable PHI Load	15 Kg	15 Kg
Measurement Distance	4 m	5 m
Quiet Zone Size	50 cm	60 cm
Quiet Zone Characteristics	SD < 0.8	SD < 0.8
Shielding Effectiveness	0.03 – 18 GHz > 100 dB	0.03 – 18 GHz > 100 dB
Software	MWV / MW5 / MWT	MWV / MW5 / MWT
Weight	< 4000 Kg	< 6500 Kg
Working Dimension(L/W/H)	6.2 x 4.3 x 3.3 m	8.4 x 5.4 x 4.4 m

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A2 X Mobility

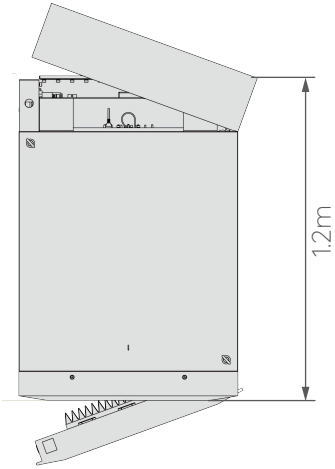
A2 is all about mobility. Transforming your perception on the definition of a laboratory.
Save 80% of space and requires no set up.
Think of it as Plug and Play, simple as that.

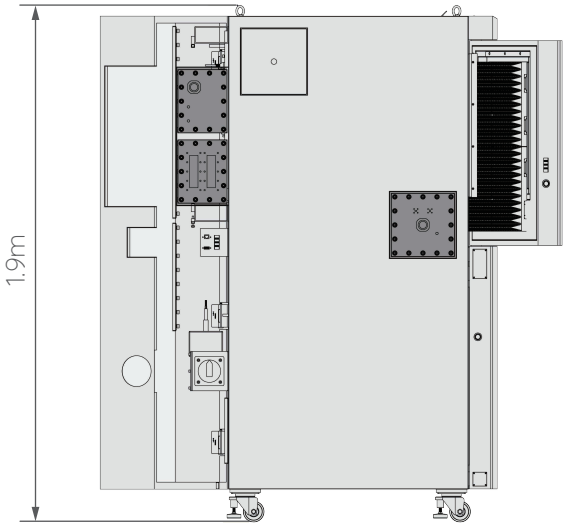
A2 X Appearence

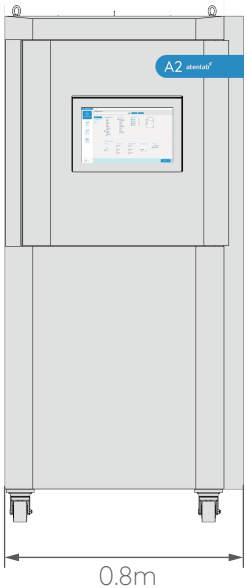
- Mobility
- Plug and Play
- Rapid Measurement

A2 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: 250kg/m2







A2 X Internal

A2 X Specifications

SISO System	A2
Measurement Distance	0.9m
Maximum Tested Object	7.0” Handheld Device
Quiet Zone Size	N/A
Quiet Zone Characteristics	N/A
Operating Frequence	0.68 - 8 GHz
Antenna Framework	Direct Far-Field
Number of Antennas	Single Probe
Passive Test Time	Ant. Eff. < 4min
TRP Test Time	TRP < 6 min / Ch.
TIS Test Time	TIS < 10 min / Ch.
Test Function	Antenna Performance / Receiver Sensitivity Transmit Power / Carrier Aggregation
Test Item	EIRP / EIS / TRP / TIS / Ant. Eff. / Antenna Pattern / Gain
Communication Protocol	5GNR FR1 / LTE TDD / FDD / LTE Cat-M / NB-IoT / Bluetooth Wi-Fi 802.11a / b / g / n / ac / ax / be WCDMA / HSDPA / HSPA / HSPA+ / HSUPA TD-SCDMA / TD-HSDPA / GSM / GPRS / EDGE CDMA2000 / CDMA 1xRTT / CDMA 1xEVDO
System Stability	Ant. Eff. SD < 10%
Path Loss (Typical)	47dB @ 3.8GHz 35dB @ 6.0GHz ,41dB @ 8.0GHz

A2 X Hardware Specifications

Anechoic Chamber	A2
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	0.03-18GHz > 100dB
Shielding Steel Sheet Thickness	SPCC Steel Pan Type By 2 mm Galvanized Steel Sheet
Shielding Door	Electirc 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	1P2W 100-280 VAC / 6A
Signal Filter	USB 3.0 / RS-232 / RS-485 / RJ-45 1Gbps / RJ-45 10Gbps (Optional)
Lighting	N/A
Laser Line	3 Laser Red Line
CCTV	N/A
Weight	350 Kg

Installation Requirement	
Working Dimension(L/W/H)	2.0 x 1.0 x 2.0 m
Electrical	220VAC 50Hz 16A
Regular Lead Time (Working Days)	45
Temporary Storage Spacing	N/A

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

Communication Antenna	
Operating Frequence	0.68-8GHz
Antenna Gain	6 dBi
Polarization	Single Polarization
Polarization Direction	Circular Polarization
Max. Watt	4 Watt CW
Connector	SMA

SISO Switching Box	
Passive DRE	0.5 - 13 GHz with DRE
Wi-Fi / BT DRE Frequency	0.5 - 8 GHz (Optional)
5GNR FR1 DRE Frequency	0.5 - 8 GHz (Optional)
Instrument Port Support	3 Port
Test Item Support	Passive Cellular Tx / Rx (Optional) BT / Wi-Fi Tx / Rx (Optional) Communication Coexistence (Optional) Carrier Aggregation (Optional)

Measurement Antenna	
Operating Frequency	0.65 - 8.0 GHz
Polarization	Dual Linear Polarization Antenna
Polarization Isolation	20dB
Antenna Gain	6 dBi
Connector	SMA

Poisitioner	
Theta Platform Diameter	0.5m
Turntable PHI Load	2.0Kg
Torque	Theta 9 N-m ,Phi 3 N-m
Turntable Type	3D
Turntable Resolution	0.1°
Turntable Accuracy	±0.5°
Max. Turntable Speed	Theta 6 RPM ,Phi 12 RPM
Input Power	220 VAC 50GHz 500W
Phi Axis Removable	N/A
Standard Fixture	Flat Plate Fixture
Optional Fixture	Handheld Device Fixture

Control Unit	
CPU	Intel Core i5
Operating System	Microsoft
Hard Drive	500G HDD
Ram	8GB
Monitor	15”
I/O Interface	GPIB
Instrument Rack	N/A

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A3 X Delicate

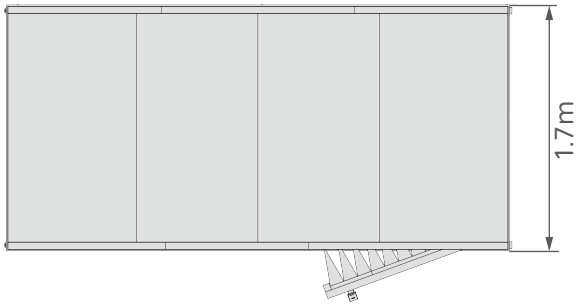
Designed for people who have limited space and budget.
A3 saves 50% of space while maintaining accurate measurement results.

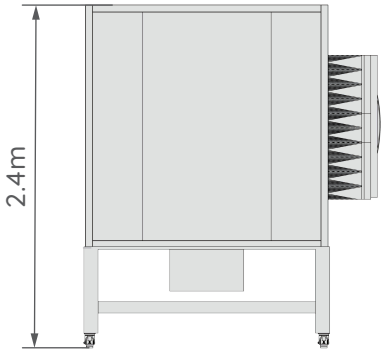
A3 X Appearance

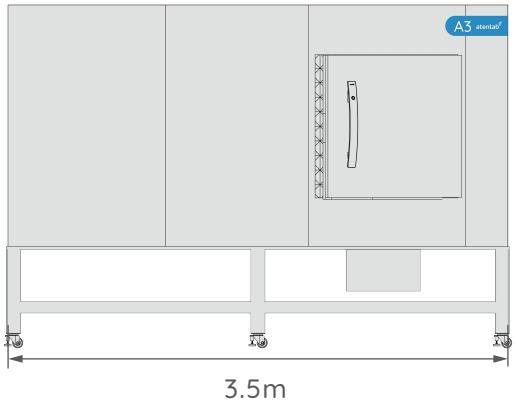
- Compact
- Easy Set Up
- Multipurpose

A3 X Three-View-Drawing

- Size: L3.5 x W1.7 x H2.4 m
- Weight: 2,000kg
- Built space: L3.7 x W3.2 x H2.5 m
- Floor-loading capacity: 250kg/m2







A3

A3 X Internal

A3 X Specifications

SISO System	A3
Measurement Distance	2.1m
Maximum Tested Object	13” Table Device
Quiet Zone Size	0.3m
Quiet Zone Characteristics	SD < 1.0
Operating Frequence	0.65 - 8.5 GHz
Antenna Framework	Direct Far-Field
Number of Antennas	Single Probe
Passive Test Time	Ant. Eff. < 4min
TRP Test Time	TRP < 6 min / Ch.
TIS Test Time	TIS < 10 min / Ch.
Test Function	Antenna Performance / Receiver Sensitivity / Transmit Power Communication Coexistence / Carrier Aggregation
Test Item	EIRP / EIS / TRP / TIS / Ant. Eff. / Antenna Pattern / Gain
Communication Protocol	5GNR FR1 / LTE TDD / FDD / LTE Cat-M / NB-IoT / Bluetooth Wi-Fi 802.11a / b / g / n / ac / ax / be WCDMA / HSDPA / HSPA / HSPA+ / HSUPA TD-SCDMA / TD-HSDPA / GSM / GPRS / EDGE CDMA2000 / CDMA 1xRTT / CDMA 1xEVDO
System Stability	Ant. Eff. SD < 10% TRP SD < 0.5dBm ; TIS SD < 1dBm
Path Loss (Typical)	47dB @ 3.8GHz 35dB @ 6.0GHz ,41dB @ 8.0GHz

A3 X Hardware Specifications

Anechoic Chamber	A3
Outside Dimension (L/W/H)	3.5 x 1.7 x 2.4 m
Inside Dimension (L/W/H)	3.4 x 1.6 x 1.6 m
Shielding Effectiveness	0.03-18GHz > 100dB
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 1.0 m
Number of Shielding Door	1
Air Vent	N/A
Power Source Filter	1P2W 100-280 VAC / 6A
Signal Filter	USB 3.0 / RS-232 / RS-485 / RJ-45 1Gbps / RJ-45 10Gbps (Optional)
Lighting	N/A
Laser Line	3 Laser Red Line
CCTV	N/A
Weight	2000 Kg

Installation Requirement	
Working Dimension(L/W/H)	3.7 x 3.2 x 2.5 m
Electrical	220VAC 50Hz 32A
Regular Lead Time (Working Days)	60
Temporary Storage Spacing	12 x 12m

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)	Suited for Class 100,000 Clean Room
RoHS & REACH	RoHS & REACH Compliant
Fire-retardant Performance	NRL 8093 Test 1&3 / UL94 HBF / ISO 4589-2
Waterproof Rating	IPX5

Communication Antenna	
Operating Frequence	0.65-8GHz
Antenna Gain	6 dBi
Polarization	Single Polarization
Polarization Direction	Circular Polarization
Max. Watt	4 Watt CW
Connector	SMA

SISO Switching Box	
Passive DRE	0.5 - 13 GHz with DRE
Wi-Fi / BT DRE Frequency	0.5 - 8 GHz (Optional)
5GNR FR1 DRE Frequency	0.5 - 8 GHz (Optional)
Instrument Port Support	3 Port
Test Item Support	Passive Cellular Tx / Rx (Optional) BT / Wi-Fi Tx / Rx (Optional) Communication Coexistence (Optional) Carrier Aggregation (Optional)

Measurement Antenna	
Operating Frequency	0.65 - 8.5 GHz
Polarization	Dual Linear Polarization Antenna
Polarization Isolation	20dB
Antenna Gain	10 dBi
Connector	SMA

A3

Poisitioner	
Theta Platform Diameter	0.8m
Turntable PHI Load	8.0Kg
Torque	Theta 9 N-m ,Phi 3 N-m
Turntable Type	3D
Turntable Resolution	0.1°
Turntable Accuracy	±0.5°
Max. Turntable Speed	Theta 6 RPM ,Phi 12 RPM
Input Power	220 VAC 50GHz 500W
Phi Axis Removable	N/A
Standard Fixture	Flat Plate Fixture
Optional Fixture	Hands Fixture / Handheld Device Fixture / Laptop Fixture SPEAG SAM Head Phantom Fixture / Customized Fixture

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

A3 X Upgrade

MIMO System	A3
Measurement Distance	> 1.0m
Operating Frequency	2 - 18GHz
Number of Antennas	3 Antennas
Antenna Array Configuration	Directional
Antenna Installation	Plug - In
Antenna Horizontal Spacing	+/- 67.5°
Antenna Vertical Spacing	N/A
Communication Channel	3T3R
Test Function	Maximum Throughput Test / Range Versus Rate Test Spatial Consistency Test / AP Coexistence Test Stability / TR-398 Compliance
System Stability	Data Throughput SD < 10% in Average
Insertion Attenuation	0-110dB , step 1dB
Path Loss (Include Attenuator)	53dB @ 2.4GHz ; 60dB @ 6GHz
Supported Software	IPerf3 / IxChariot

Shielding Box		
Outside Dimension (L/W/H)	0.7 x 0.9 x 1.2 m	0.7 x 0.9 x 1.8 m
Chambers	2 Chambers	3 Chambers
Shielding Door(W/H)	0.6 x 0.4 m	
Shielding Effectiveness	2.0 GHz - 8.0 GHz > 100dB	
Air Vent	Honeycomb, 0.1 x 0.1m	
Access Panel	0.3 x 0.3 m	
Power Source Filter	1P2W 100 - 280 VAC / 6A	
Signal Filter	USB 3.0 / RS-232 / RS-485 / RJ-45 1Gbps / RJ-45 10Gbps (Optional)	

Programmable Attenuator			
Operating Frequency	DC - 18 GHz		
Channels	4	8	16
Attenuation Range	0 - 121 dB		
Attenuation Step	1 dB		
Insertion Loss	2.5dB at 6GHz		
Connector	SMA		

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A6 X Standard

A6

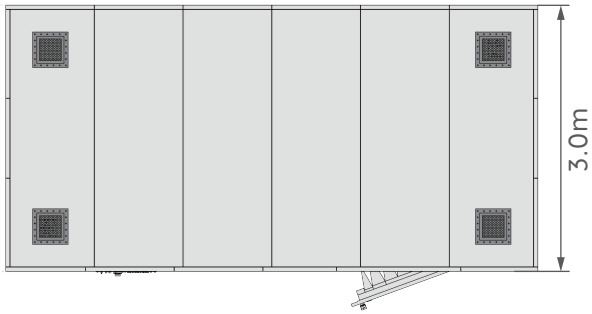
A6 offers more measurement possibilities to customers, while maintaining the balance between measurement speed, measurement frequencies, and measurement accuracy.

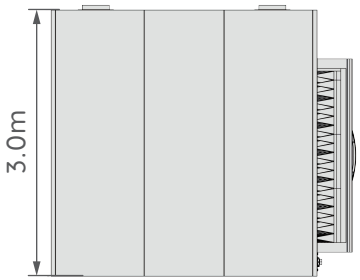
A6 X Appearence

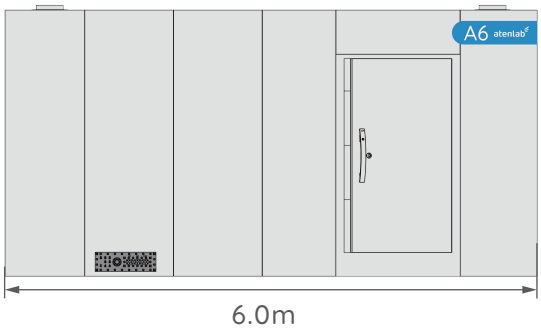
- CTIA Complaint
- Flixible Upgrade Path
- Optimal Measurement

A6 X Three-view drawing

- Size: L6.0 x W3.0 x H3.0 m
- Weight: 4,000 kg
- Built space: L6.2 x W4.3 x H3.3 m
- Floor-loading capacity: 250kg/m2







A6

A6 X Internal

A6 X Specifications

SISO System	A6
Measurement Distance	4.0m
Maximum Tested Object	19” Laptop
Quiet Zone Size	0.5m
Quiet Zone Characteristics	SD < 0.8
Operating Frequence	0.65 - 8.5 GHz
Antenna Framework	Direct Far-field
Number of Antennas	Single Probe
Passive Test Time	Ant. Eff. < 4min
TRP Test Time	TRP < 6 min / Ch.
TIS Test Time	TIS < 10 min / Ch.
Test Function	Antenna Performance / Receiver Sensitivity / Transmit Power Communication Coexistence / Carrier Aggregation
Test Item	EIRP / EIS / TRP / TIS / Ant. Eff. / Antenna Pattern / Gain
Communication Protocol	5GNR FR1 / LTE TDD / FDD / LTE Cat-M / NB-IoT / Bluetooth Wi-Fi 802.11a / b / g / n / ac / ax / be WCDMA / HSDPA / HSPA / HSPA+ / HSUPA TD-SCDMA / TD-HSDPA / GSM / GPRS / EDGE CDMA2000 / CDMA 1xRTT / CDMA 1xEVDO
System Stability	Ant. Eff. SD < 10% TRP SD < 0.5dBm ; TIS SD < 1dBm
Path Loss (Typical)	55dB @ 3.8GHz 42dB @ 6.0GHz ,48dB @ 8.0GHz

A6 X Hardware Specifications

Anechoic Chamber	A6
Outside Dimension (L/W/H)	6.0 x 3.0 x 3.0 m
Inside Dimension (L/W/H)	5.9 x 2.9 x 2.9 m
Shielding Effectiveness	0.03-18GHz > 100dB
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	Honeycomb, 0.3 x 0.3 m
Power Source Filter	1P2W 100-280 VAC / 16A
Signal Filter	USB 3.0 / RS-232 / RS-485 / RJ-45 1Gbps / RJ-45 10Gbps (Optional)
Lighting	LED
Laser Line	3 Laser Red Line
CCTV	2560 x 1440 @ 30fps PTZ Joystick Controller (Optional)
Weight	4000 Kg

Installation Requirement	
Working Dimension(L/W/H)	6.2 x 4.3 x 3.3 m
Electrical	220VAC 50Hz 32A
Regular Lead Time (Working Days)	60
Temporary Storage Spacing	27 x 27m

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

Communication Antenna	
Operating Frequence	0.65 - 8GHz
Antenna Gain	6 dBi
Polarization	Single Polarization
Polarization Direction	Circular Polarization
Max. Watt	4 Watt CW
Connector	SMA

SISO Switching Box	
Passive DRE	0.5 - 13 GHz with DRE
Wi-Fi / BT DRE Frequency	0.5 - 8 GHz (Optional)
5GNR FR1 DRE Frequency	0.5 - 8 GHz (Optional)
Instrument Port Support	3 Port
Test Item Support	Passive Cellular Tx / Rx (Optional) BT / Wi-Fi Tx / Rx (Optional) Communication Coexistence (Optional) Carrier Aggregation (Optional)

Measurement Antenna	
Operating Frequency	0.65 - 8.5 GHz
Polarization	Dual Linear Polarization Antenna
Polarization Isolation	20dB
Antenna Gain	10 dBi
Connector	SMA

Poisitioner	
Theta Platform Diameter	1.2m
Turntable PHI Load	15Kg
Torque	Theta 90 N-m ,Phi 8 N-m
Turntable Type	3D
Turntable Resolution	0.1°
Turntable Accuracy	±0.5°
Max. Turntable Speed	Theta 7 RPM ,Phi 20 RPM
Input Power	220 VAC 50GHz 1000W
Phi Axis Removable	PHi Axis Movable and Removable
Standard Fixture	Flat Plate Fixture
Optional Fixture	Hands Fixture / Handheld Device Fixture / Laptop Fixture SPEAG SAM Head Phantom Fixture / 2D Styrofoam / Customized Fixture

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

A6

A6 X Upgrade

MIMO System	A6
Measurement Distance	> 2.0m
Operating Frequency	2-18GHz
Number of Antennas	8 Antennas
Antenna Array Configuration	Directional
Antenna Installation	Plug - In
Antenna Horizontal Spacing	+/- 67.5°
Antenna Vertical Spacing	+/- 22.5°
Communication Channel	8T8R
Test Function	Maximum Throughput Test / Range Versus Rate Test Spatial Consistency Test / AP Coexistence Test Stability / TR-398 Compliance
System Stability	Data Throughput SD < 10% in Average
Insertion Attenuation	0-110dB , step 1dB
Path Loss (Include Attenuator)	60dB @ 2.4GHz ; 67dB @ 6GHz
Supported Software	IPerf3 / IxChariot

Shielding Box

Outside Dimension (L/W/H)	0.7 x 0.9 x 1.2 m	0.7 x 0.9 x 1.8 m
Chambers	2 Chambers	3 Chambers
Shielding Door(W/H)	0.6 x 0.4 m	
Shielding Effectiveness	2.0 GHz - 8.0 GHz > 100dB	
Air Vent	Honeycomb, 0.1 x 0.1m	
Access Panel	0.3 x 0.3 m	
Power Source Filter	1P2W 100 - 280 VAC / 6A	
Signal Filter	USB 3.0 / RS-232 / RS-485 / RJ-45 1Gbps / RJ-45 10Gbps (Optional)	

Programmable Attenuator

Operating Frequency	DC - 18 GHz		
Channels	4	8	16
Attenuation Range	0 - 121 dB		
Attenuation Step	1 dB		
Insertion Loss	2.5dB at 6GHz		
Connector	SMA		

atenlab

A8 X Pro

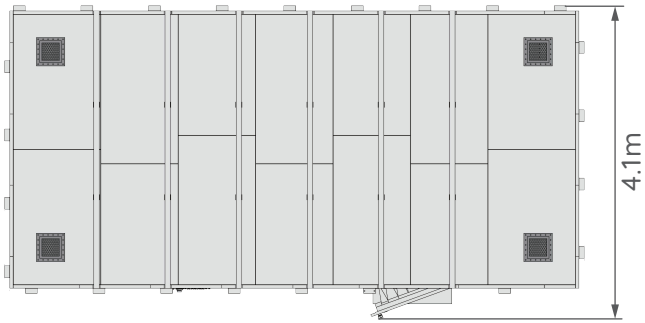
Best quiet zone performance, complying with both software and hardware requirements specified by CTIA standards. Realistic measurement, obtaining from the 5.0m measurement distance and large space.

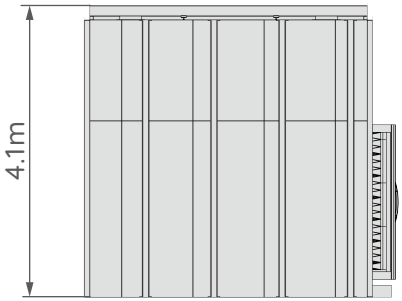
A8 X Appearance

- Highest Precision
- CTIA Certification
- Widest Operating Frequency

A8 X Three-view drawing

- Size: L8.2 x W4.1 x H4.1 m
- Weight: 6,500 kg
- Built space: L8.4 x W5.4 x H4.4 m
- Floor-loading capacity: 250kg/m2





A8

A8 X Internal

A8 X Specification

SISO System	A8
Measurement Distance	5.0m
Maximum Tested Object	19” Laptop
Quiet Zone Size	0.6m
Quiet Zone Characteristics	SD < 0.8
Operating Frequence	0.45 - 6 GHz
Antenna Framework	Direcet Far-field
Number of Antennas	Single Probe
Passive Test Time	Ant. Eff. < 4min
TRP Test Time	TRP < 6 min / Ch.
TIS Test Time	TIS < 10 min / Ch.
Test Function	Antenna Performance / Receiver Sensitivity / Transmit Power Communication Coexistence / Carrier Aggregation
Test Item	EIRP / EIS / TRP / TIS / Ant. Eff. / Antenna Pattern / Gain
Communication Protocol	5GNR FR1 / LTE TDD / FDD / LTE Cat-M / NB-IoT / Bluetooth Wi-Fi 802.11a / b / g / n / ac / ax / be WCDMA / HSDPA / HSPA / HSPA+ / HSUPA TD-SCDMA / TD-HSDPA / GSM / GPRS / EDGE CDMA2000 / CDMA 1xRTT / CDMA 1xEVDO
System Stability	Ant. Eff. SD < 10% TRP SD < 0.5dBm ; TIS SD < 1dBm
Path Loss (Typical)	57dB @ 3.8GHz 45dB @ 6.0GHz ,51dB @ 8.0GHz

A8 X Hardware Specifications

Anechoic Chamber	A8
Outside Dimension (L/W/H)	8.2 x 4.1 x 4.1 m
Inside Dimension (L/W/H)	7.9 x 3.8 x 3.8 m
Shielding Effectiveness	0.03-18GHz > 100dB
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	Honeycomb 0.3 x 0.3 m
Power Source Filter	1P2W 100-280 VAC / 16A
Signal Filter	USB 3.0 / RS-232 / RS-485 / RJ-45 1Gbps / RJ-45 10Gbps (Optional)
Lighting	LED
Laser Line	3 Laser Red Line
CCTV	2560 x 1440 @ 30fps PTZ Joystick Controller (Optional)
Weight	6500 Kg

Installation Requirement	
Working Dimension(L/W/H)	8.4 x 5.4 x 4.4 m
Electrical	220VAC 50Hz 32A
Regular Lead Time (Working Days)	60
Temporary Storage Spacing	48 x 48m

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)	Suited for Class 100,000 Clean Room
RoHS & REACH	RoHS & REACH Compliant
Fire-retardant Performance	NRL 8093 Test 1&3 / UL94 HBF / ISO 4589-2
Waterproof Rating	IPX5

A8

Communication Antenna	
Operating Frequence	0.45 - 8GHz
Antenna Gain	4 dBi
Polarization	Single Polarization
Polarization Direction	Circular Polarization
Max. Watt	4 Watt CW
Connector	SMA

SISO Switching Box	
Passive DRE	0.45 - 13 GHz with DRE
Wi-Fi / BT DRE Frequency	0.45 - 8 GHz (Optional)
5GNR FR1 DRE Frequency	0.45 - 8 GHz (Optional)
Instrument Port Support	3 Port
Test Item Support	Passive Cellular Tx / Rx (Optional) BT / Wi-Fi Tx / Rx (Optional) Communication Coexistence (Optional) Carrier Aggregation (Optional)

Measurement Antenna	
Operating Frequency	0.45 - 6.0 GHz
Polarization	Dual Linear Polarization Antenna
Polarization Isolation	20dB
Antenna Gain	8 dBi
Connector	SMA

Poisitioner	
Theta Platform Diameter	1.2m
Turntable PHI Load	15Kg
Torque	Theta 90 N-m ,Phi 8 N-m
Turntable Type	3D
Turntable Resolution	0.1°
Turntable Accuracy	±0.5°
Max. Turntable Speed	Theta 7 RPM ,Phi 20 RPM
Input Power	220 VAC 50GHz 1000W
Phi Axis Removable	PHi Axis Movable and Removable
Standard Fixture	Flat Plate Fixture
Optional Fixture	Hands Fixture / Handheld Device Fixture / Laptop Fixture SPEAG SAM Head Phantom Fixture / 2D Styrofoam / Customized Fixture

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

A8

A8 X Upgrade

MIMO System	A8
Measurement Distance	> 2.0m
Operating Frequency	2-18GHz
Number of Antennas	16 Antennas
Antenna Array Configuration	Directional
Antenna Installation	Plug - In
Antenna Horizontal Spacing	+/- 67.5°
Antenna Vertical Spacing	+/- 22.5°
Communication Channel	16T16R
Test Function	Maximum Throughput Test / Range Versus Rate Test Spatial Consistency Test / AP Coexistence Test Stability / TR-398 Compliance
System Stability	Data Throughput SD < 10% in Average
Insertion Attenuation	0-110dB , step 1dB
Path Loss (Include Attenuator)	60dB @ 2.4GHz ; 67dB @ 6GHz
Supported Software	IPerf / IxChariot

Shielding Box

Outside Dimension (L/W/H)	0.7 x 0.9 x 1.2 m	0.7 x 0.9 x 1.8 m
Chambers	2 Chambers	3 Chambers
Shielding Door(W/H)	0.6 x 0.4 m	
Shielding Effectiveness	2.0 GHz - 8.0 GHz > 100dB	
Air Vent	Honeycomb, 0.1 x 0.1m	
Access Panel	0.3 x 0.3 m	
Power Source Filter	1P2W 100 - 280 VAC / 6A	
Signal Filter	USB 3.0 / RS-232 / RS-485 / RJ-45 1Gbps / RJ-45 10Gbps (Optional)	

A8

Programmable Attenuator

Operating Frequency	DC - 18 GHz		
Channels	4	8	16
Attenuation Range	0 - 121 dB		
Attenuation Step	1 dB		
Insertion Loss	2.5dB at 6GHz		
Connector	SMA		

Appendix

Everything you need is already here for you to use.

Appendix/

2G Band List Guide

GSM band scope (3GPP TS 45.005 OCW= 200 kHz or others)

Band System	Uplink(MHz)		OBW	Downlink(MHz)		Related
	F_{low}	F_{high}	(MHz)	F_{low}	F_{high}	LTE Band
380 T-GSM	380.2	389.8	9.6	390.2	399.8	
410 T-GSM	410.2	419.8	9.6	420.2	429.8	
450 GSM	450.6	457.4	6.8	460.6	467.6	31
480 GSM	479	485.8	6.8	489	496	
710 GSM	698.2	716.2	18	728.2	746.2	12
750 GSM	777.2	793.2	16	777.2	792.2	
810 T-GSM	806.2	821.2	15	851.2	866.2	27
850 GSM	824.2	848.8	24.6	869.2	894.2	5
900 P-GSM	890.2	914.8	24.6	935	960	
900 E-GSM	880.2	914.8	34.6	925	960	8
900 R-GSM	876.2	914.8	38.6	921	960	
900 T-GSM	870.4	876	5.6	915.4	921	
1800 DCS	1710.2	1784.8	74.6	1805.2	1879.8	3
1900 PCS	1850.2	1909.8	59.6	1930.2	1989.8	2

Appendix/

3G Band List Guide

UMTS FDD/TDD band scope (3GPP TS 25.101 OCW=5 MHz)

FDD Band #	Name	Uplink		Downlink		OBW
		F_{low} (MHz)	F_{high} (MHz)	F_{low} (MHz)	F_{high} (MHz)	(MHz)
1	2100 IMT	1920	1980	2110	2170	60
2	1900 PCS	1850	1910	1930	1990	60
3	1800 DCS	1710	1785	1805	1880	75
4	1700 AWS	1710	1755	2110	2155	45
5	850 CLR	824	848.9	869	893.9	25
6	No name	830	839.9	875	884.9	10
7	2600 IMT-E	2500	2570	2620	2690	70
8	900 E-GSM	880	915	925	960	35
9	No name	1749.9	1784.9	1844.9	1879.9	35
10	900 E-AWS	1710	1770	2110	2170	60
11	1500 LPDC	1427.9	1447.9	1475.9	1495.9	20
12	700 LSMH	699	716	729	746	25
13	700 USMH-C	777	787	746	756	10
14	700 USMH-D	788	798	758	768	10
19	No name	830	845	875	890	15
20	800 EUDD	832	862	791	821	30
21	1500 UPDC	1447.9	1462.9	1495.9	1510.9	15
22	No name	3410	3490	3510	3590	80
25	1900 EPCS	1850	1915	1930	1995	65
26	850 ECLR	814	849	859	894	35
32	1500 L-band	downlink only		1452	1496	44

Appendix/

4G-FDD Band List Guide

E-UTRA band scope (3GPP TS 36.101 R16)

FDD Band #	Name	Uplink		Downlink		OBW
		F_{low} (MHz)	F_{high} (MHz)	F_{low} (MHz)	F_{high} (MHz)	(MHz)
1	2100	1920	1980	2110	2170	60
2	1900 PCS	1850	1910	1930	1990	60
3	1800+	1710	1785	1805	1880	75
4	AWS-1	1710	1755	2110	2155	45
5	850	824	849	869	894	25
6	No name	830	839.9	875	884.9	25
7	2600	2500	2570	2620	2690	70
8	900 GSM	880	915	925	960	35
9	1800	1749.9	1784.9	1844.9	1879.9	35
10	AWS-1+	1710	1770	2110	2170	60
11	1500 Lower	1427.9	1447.9	1475.9	1495.9	20
12	700 a	699	716	729	746	17
13	700 c	777	787	746	756	10
14	700 PS	788	798	758	768	10
17	700 b	704	716	734	746	12
18	800 Lower	815	830	860	875	15
19	800 Upper	830	845	875	890	15
20	800 DD	832	862	791	821	30
21	1500 Upper	1447.9	1462.9	1495.9	1510.9	15
22	3500	3410	3490	3510	3590	80
23	No name	2000	2019.9	2180	2199.9	20
24	1600 L-band	1626.9	1660.9	1525	1559	34
25	1900+	1850	1915	1930	1995	65
26	850+	814	849	859	894	35

E-UTRA band scope (3GPP TS 36.101 R16)

FDD Band #	Name	Uplink		Downlink		OBW
		F_{low} (MHz)	F_{high} (MHz)	F_{low} (MHz)	F_{high} (MHz)	(MHz)
27	800 SMR	807	824	852	869	17
28	700 APT	703	748	758	803	45
29	700 d	-	-	717	728	11
30	2300 WCS	2305	2315	2350	2360	10
31	450	452.5	457.5	462.5	467.5	5
32	1500 L-band	-	-	1452	1496	44
65	2100+	1920	2010	2110	2200	90
66	AWS-3	1710	1780	2110	2180	70
67	700 EU	-	-	738	758	20
68	700 ME	698	728	753	783	30
69	DL 2500	-	-	2570	2620	50
70	AWS-4	1695	1710	1995	2010	15
71	600	663	698	617	652	35
72	450 PMR/PAMR	451	456	461	466	5
73	450 APAC	450	455	460	465	5
74	L-band	1427	1470	1475	1518	43
75	DL 1500+	-	-	1432	1517	85
76	DL 1500-	-	-	1427	1432	5
85	700 a+	698	716	728	746	18
87	410	410	415	420	425	5
88	410+	412	417	422	427	5

Appendix/

4G-TDD Band List Guide

E-UTRA band scope (3GPP TS 36.101 R16)

TDD Band #	Name	F_{low} (MHz)	F_{high} (MHz)	OBW(MHz)
33	TD 1900	1900	1920	20
34	TD 2000	2010	2025	15
35	TD PCS Lower	1850	1910	60
36	TD PCS Upper	1930	1990	60
37	TD PCS Center	1910	1930	20
38	TD 2600	2570	2620	50
39	TD 1900+	1880	1920	40
40	TD 2300	2300	2400	100
41	TD 2600+	2496	2690	194
42	TD 3500	3400	3600	200
43	TD 3700	3600	3800	200
44	TD 700	703	803	100
45	TD 1500	1447	1467	20
46	TD Unlicensed	5150	5925	775
47	TD V2X	5855	5925	70
48	TD 3600	3550	3700	150
49	TD 3600r	3550	3700	150
50	TD 1500+	1432	1517	85
51	TD 1500-	1427	1432	5
52	TD 3300	3300	3400	100
52		2483.5	2495	11.5

Appendix/

5G-FR1 FDD Band List Guide

5G NR (3GPP TS 38.101)

FR1 FDD Band #	Name	Uplink		Downlink		OBW
		F_{low} (MHz)	F_{high} (MHz)	F_{low} (MHz)	F_{high} (MHz)	(MHz)
n1	IMT	1920	1980	2110	2170	60
n2	PCS	1850	1910	1930	1990	60
n3	DCS	1710	1785	1805	1880	75
n5	CLR	824	849	869	894	25
n7	IMT-E	2500	2570	2620	2690	70
n8	Extended GSM	880	915	925	960	35
n12	Lower SMH	699	716	729	746	17
n14		788	798	758	768	10
n18		815	830	860	875	15
n20	Digital Dividend (EU)	832	862	791	821	30
n25	Extended PCS	1850	1915	1930	1995	65
n26		814	849	859	894	35
n28	APT	703	748	758	803	45
n30		2305	2315	2350	2360	10
n65		1920	2010	2110	2200	90
n66	Extended AWS	1710	1780	2110	2200	70
n70	AWS-4	1695	1710	1995	2020	15
n71	Digital Dividend (US)	663	698	617	652	35
n74	Lower L-Band(US)	1427	1470	1475	1518	43

5G NR (3GPP TS 38.101)

FR1 FDD Band #	Name	Uplink		Downlink		OBW
		F_{low} (MHz)	F_{high} (MHz)	F_{low} (MHz)	F_{high} (MHz)	(MHz)
n85		698	716	728	746	18
n91		832	862	1427	1432	30
n92		832	862	1432	1517	30
n93		880	915	1427	1432	35
n94		880	915	1432	1517	35

Appendix/

5G-FR1 TDD Band List Guide

5G NR (3GPP TS 38.101)

FR1 TDD Band #	Name	F_{low} (MHz)	F_{high} (MHz)	OBW(MHz)
n34	IMT	2010	2025	15
n38	IMT-E	2570	2620	50
n39	DCS–IMT Gap	1880	1920	40
n40	S-Band	2300	2400	100
n41	BRS	2496	2690	194
n46		5150	5925	775
n47		5855	5925	70
n48		3550	3700	150
n50	L-Band (EU)	1432	1517	85
n51	Extended L-Band(EU)	1427	1432	5
n53		2483.5	2495	11.5

5G NR (3GPP TS 38.101)

FR1 TDD Band #	Name	F_{low} (MHz)	F_{high} (MHz)	OBW(MHz)
n77	C-Band	3300	4200	900
n78	C-Band	3300	3800	500
n79	C-Band	4400	5000	600
n90		2496	2690	194
n96		5925	7125	1200

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