atenlab

OTA Measurement System

Wireless communication measurement system

A Series

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

Since its establishment in 2004, Atenlab has successfully built measurement systems for hundreds of customers, which include some well-known major communication and electronic equipment makers in the world. With our expertise and experiences in microwave and communication, we provide stable and accurate measurement systems and services to every customer. Also, we emphasize on optimal benefits to each customer by providing customization.

Atenlab has long been cooperating with domestic and overseas laboratories and research institutes to continue our development on future communication measurement system so that we can provide customers with the best support and newly developed technology. In facing the increasingly changing communication industry, our customers can still keep their high competitive edges.

2004
Atenlab was established

2005
2G/GSM measurement system was announced

2006
First antenna measurement system was sold

2007
3G/WCDMA measurement system was announced

2008
Helped US CCS pass CTIA certification

2009
CTIA certification consultation service launched in Taiwan

2010
Over 10 sets sold in the world

2011
4G/LTE measurement system was announced

2012
Over 30 sets sold in the world

2013
LTE MIMO laboratory was established

2014
Over 60 sets sold in the world

2015
First LTE MIMO measurement system was announced

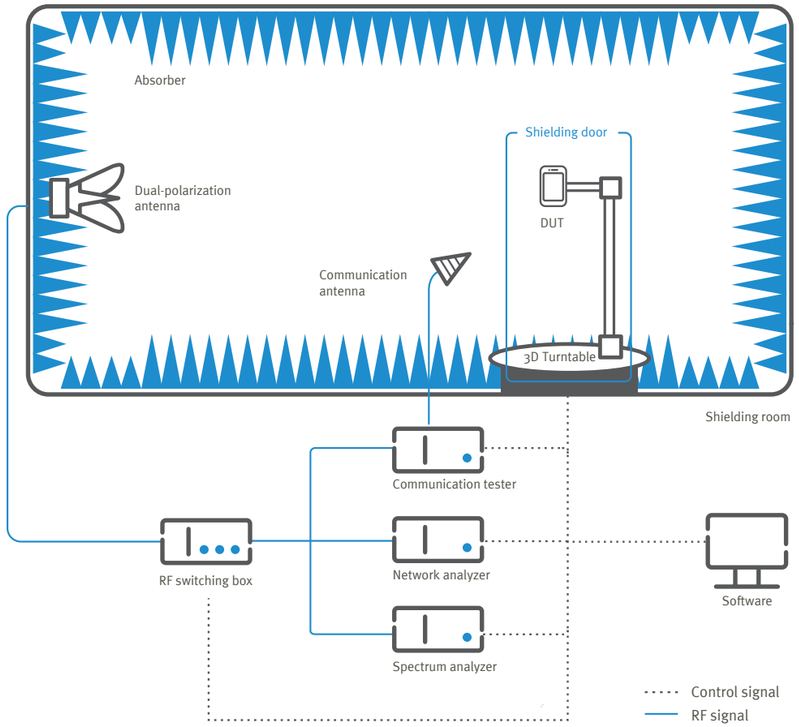
2016
5G laboratory was established

2017
Cumulatively over 100 sets sold in the world

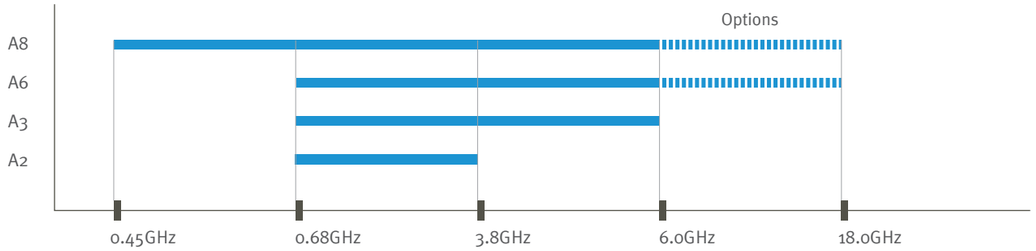
A holistic OTA measurement systems

Atenlab strives for providing customers with various customized services. Since its establishment, Atenlab has developed four major categories of OTA measurement systems to meet various requirements - A2 light type, A3 compact type, A6 standard type and A8 professional type. The OTA measurement system is in widely used in the major communication and electronic equipment manufacturers, its functions can also create competitive advantages for customers and make services more complete.

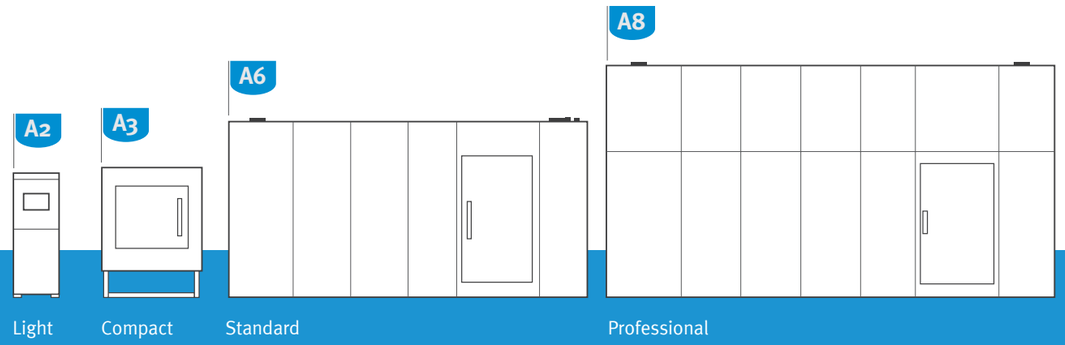
OTA system architecture



OTA system comparisons



Remarks 6.0-18.0GHz of A6 and A8 need to be upgraded with options.



	A2	A3	A6	A8
Frequency range	0.68 – 3.8GHz	0.68 – 6.0GHz	0.68 – 6.0GHz	0.45 – 6.0GHz
Shielding door	0.5 X 0.5 m	1.0 X 1.0 m	1.0 X 2.0 m	1.0 X 2.0 m
Quiet zone size	-	30cm	50cm	50cm
Measurement distance	1.0m	2.1m	4.0m	5.0m
Turntable load	1kg(phi)	15kg(phi)	25kg(phi)	25kg(phi)
Shielding effect	>80dB	>100dB	>100dB	>100dB
Quiet zone characteristics*[1]	-	SD <1.0	SD <0.8	SD <0.65
System stability*[2]	TRP: SD*[3] <1.0dB TIS: SD <1.5dB	Antenna efficiency <10%	Antenna efficiency <10%	Antenna efficiency <10%
Mobility	•			
Antenna measurement		•	•	•
2G/3G/4G	•	•	•	•
MIMO upgrading				•
Quick testing	•			
Space saving	•	•		
Standard test			•	•
Access operation			•	•
Supports cellphone test	•	•	•	•
Supports tablet test		•	•	•
Supports laptop test			•	•
Supports SAM head test			•	•
Phi axis adjustment			•	•
CTIA accreditation				•
Maxwell OTA		•	•	•
Maxwell Lite	•			
Viewer		•	•	•

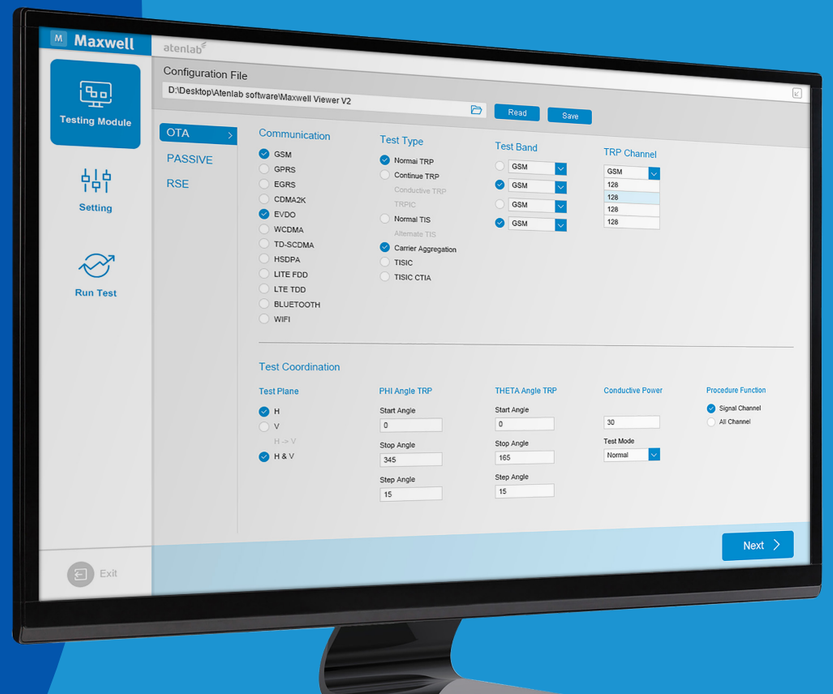
Remarks
*[1] Quiet zone characteristics: 836.5/1,880/2,450/5,500MHz frequency points of CTIA v3.2 for testing A6 and A8; 836.5/1,880/2,450MHz for testing A3
*[2] System stability: continuously test the passive standard element for 3 times and compare antenna efficiencies and the dispersion degree of mean values
*[3] SD: Standard deviation

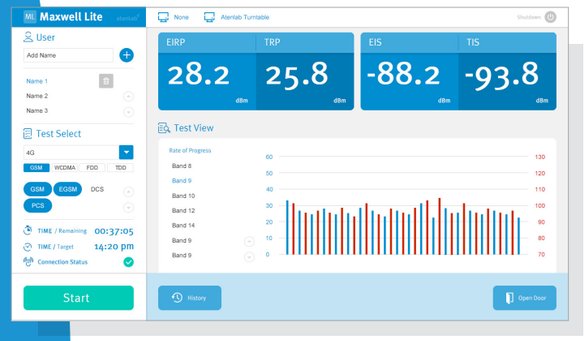
The major measurment software of OTA system

Maxwell

- **Operations with one touch**
- **Supports multiple systems supports 2G, 3G and 4G**
- **Supports major measuring instrument brands**

2G, 3G, 4G, Bluetooth, and TRP & TIS measurements of Wi-Fi.
2D/3D, AR, ECC antenna measurement
Latest Carrier Aggregation testing functions





Maxwell Lite

- **By touching the one-piece machine, make your testing work more convenient**
- **Complete 3 channel tests of TRP & TIS in 15 minutes.**

Measurements of 2G, 3G and 4G
Graphic real time data
Quick checking historical data
Customized user parameter setting record
Hardware equipment status display

Maxwell Viewer

- **Free download of installation program increases the work efficiency**
- **Graphical data expedite the analysis capability**

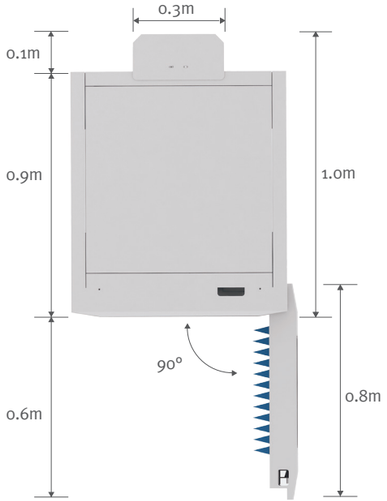
Overlaying comparisons of multiple frequencies and angle data
Provides 3D/polar/xy multiple display methods
Parameters of graphic and raw data are customized

A2 Light type OTA measurement system

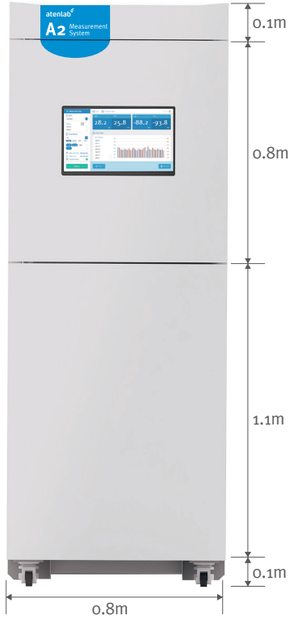
- **Minimized space-saving design**
- **Plug and play, no need for extra construction**
- **Simplified testing steps and lessen measurement time while maintaining stable and accurate data**

A2-light type will provide the max. productivity of measurement when collocate with A6 or A8 OTA system.

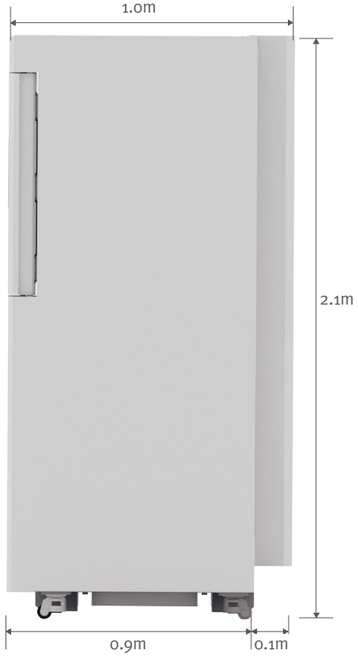
Top view



Front view



Side view



A2 Specifications

System	
Operating frequency	0.68 – 3.8GHz
Dimension (L/W/H)	1.0 X 0.8 X 2.1m
Maximum tested object	6.5" hand-held device
Measurement distance	1.0m
Shielding effect	0.68 – 3.8GHz > 80dB
Quiet zone size	-
Quiet zone characteristics	-
Absorber	Emerson & Cuming non-toxic proof (RoHS and REACH)
Path loss Active typically	45dB @ 3.8GHz
System stability	TIS SD *1 < 1.5dB TRP SD < 1dB
Antenna test time	-
TRP / TIS test time	15 minutes (TRP 3 channels + TIS 3 channels)
Power consumption	1.0KW
Input power	110VAC / 220VAC
Software	• Maxwell Lite

Shielding chamber	
Chamber gross weight	350Kg
Shielding door dimension (W/H)	0.5 X 0.5m
Shielding door type	Electric auto latching
Shielding steel sheet thickness	2mm
Shielding vent size	-
Lighting	-
Laser position monitoring	-
Power source filter	24VDC / 10A
Internal power source	-
Signal filter	-
Interface connector	N-Type

3D Turntable	
Turntable diameter	0.5m
Turntable load	< 1Kg
Turntable type	3D
Turntable accuracy	1 degree
Turntable resolution	0.1 degree
Max. turntable speed	Phi 10RPM, Theta 12RPM
Input power	110VAC 60Hz
Control interface	-
Phi axis removal/moving	-
Standard fixtures	6.5" hand-held device fixtures
Optional fixtures	-

Measurement antenna	
Operating frequency	0.65 – 6.0GHz
Polarization	Circular polarization cone spiral antenna
Polarized isolation	-
Antenna gain	13 dBi @ 1GHz
Connector type	SMA (Female)
Dimension (L/W/H)	0.25 X 0.25 X 0.3m
Weight	1.0Kg
Communication antenna	-

Microwave path assembly (including cable)	
Operating frequency	0.65 – 3.8GHz
Active path loss*2	10dB @ 3.8GHz
Path type / quantity	• Purely active, measure with a combined testing instrument TRP and TIS • Do not support the spectrum analyzer
Total number of instruments	Supports a single combined testing instrument
Control interface	-
Input power	-
Option contents	-

Control unit	
Control unit	• Industrial computer • Windows operating system • Microsoft spreadsheet (Excel) • GPIB interface card

Installation requirement	
Working dimension (L/W/H)	2.0 X 2.0 X 2.5m
Equipment power requirement	110/220VAC 50/60Hz 20Amp

Remarks *1 SD: Standard deviation

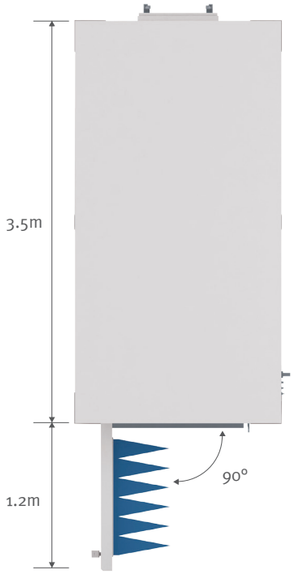
*2 Includes high-frequency cables

A3 Compact type OTA measurement system

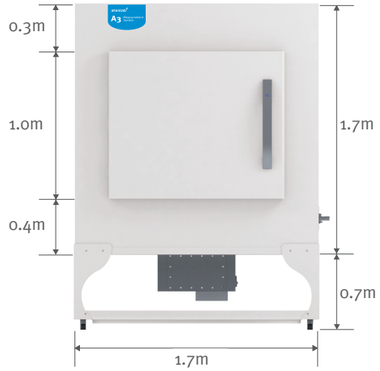
- **Flexible space design and can be installed in the conference room**
- **Supports all mobile communication testing functions (Cellular)**
- **Supports cellphones, tablet antenna testing fixtures**

A3-compact type OTA measurement system needs a small footprint, has many testing functions, able to meet customer's basic measuring requirements.

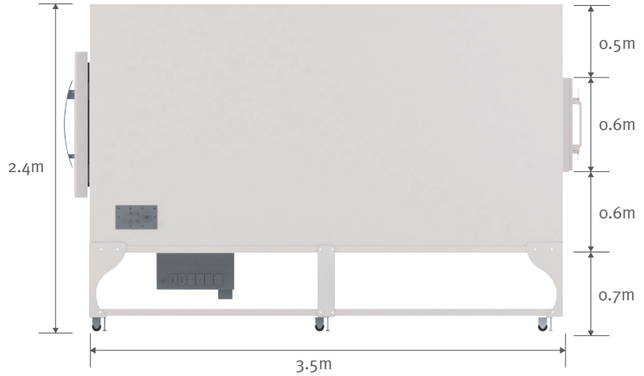
Top view



Front view



Side view



A3 Specifications

System	
Operating frequency	0.68 – 3.8GHz
Dimension (L/W/H)	3.5 X 1.7 X 1.7m (height excludes 0.7m base)
Maximum tested object	13" tablet type device
Measurement distance	2.1m
Shielding effect	0.68 – 6.0GHz > 100dB
Quiet zone size	30cm
Quiet zone characteristics	SD *1 < 1.0 @ 836.5 / 1,880 / 2,450MHz
Absorber	Emerson & Cuming non-toxic proof (RoHS and REACH)
Path loss Active typically Passive typically	 50dB @ 3.8GHz 60dB @ 6.0GHz
System stability	Antenna efficiency SD < 10%
Antenna test time	10 minutes
TRP test time	12 minutes / channel
TIS test time	17 minutes / channel
Power consumption	3.5KW
Input power	220VAC
Software	• Maxwell OTA • Maxwell Viewer

Shielding chamber	
Chamber gross weight	2,000Kg
Shielding door dimension (W/H)	1.0 X 1.0m
Shielding door type	Electric auto latching
Shielding steel sheet thickness	2mm
Shielding vent size	-
Lighting	-
Laser position monitoring	-
Power source filter	• 220V 16A • IL: 100dB, 14KHz – 18GHz
Internal power source	220VAC
Signal filter	RS-232
Interface connector	• N-Type • 2" Wave guide pipe

3D Turntable	
Turntable diameter	0.8m
Turntable load	< 15Kg
Turntable type	3D
Turntable accuracy	1 degree
Turntable resolution	0.1 degree
Max. turntable speed	Phi 25RPM, Theta 12RPM
Input power	220VAC 50Hz
Control interface	RS-232
Phi axis removal/moving	-
Standard fixtures	• Hand-held device fixtures • Tablet type fixtures
Optional fixtures	• Laptop fixtures • Head fixtures (for SPEAG SAM Head only) • Hand fixtures

Measurement antenna	
Operating frequency	0.65 – 6.0GHz
Polarization	Linear dual-polarized antenna
Polarized isolation	20dB
Antenna gain	13dBi @ 6.0GHz
Connector type	N-Type Female
Dimension (L/W/H)	0.42 X 0.27 X 0.27m
Weight	4.5Kg
Communication antenna	Operating frequency: 0.65 – 6.0GHz Polarization: circular polarization Gain: 5dBi

Microwave path assembly (including cable)	
Operating frequency	0.65 – 6.0GHz
Active path loss*2	8dB @ 3.8GHz
Passive path loss	18dB @ 6.0GHz
Path type / quantity	Passive, TRP, TIS, SISO, Wi-Fi Throughput
Total number of instruments	Supports six combined testing instruments (or six sets of paths)
Control interface	RS-232
Input power	110VAC 60Hz, 220VAC 50Hz
Option contents	• SISO Wi-Fi Throughput • LTE CA • BT OTA • Wi-Fi OTA

Control unit	
Control unit	• Industrial computer • Windows operating system • Microsoft spreadsheet (Excel) • GPIB interface card
Instrument rack	19"41U standard instrument rack
Worktable	Electric lifting table
Fixtures cart	Movable fixtures stowing cart

Installation requirement	
Working dimension (L/W/H)	3.7 X 3.2 X 2.7m
Equipment power requirement	220VAC 50Hz 16A

Remarks

*1 SD: Standard deviation

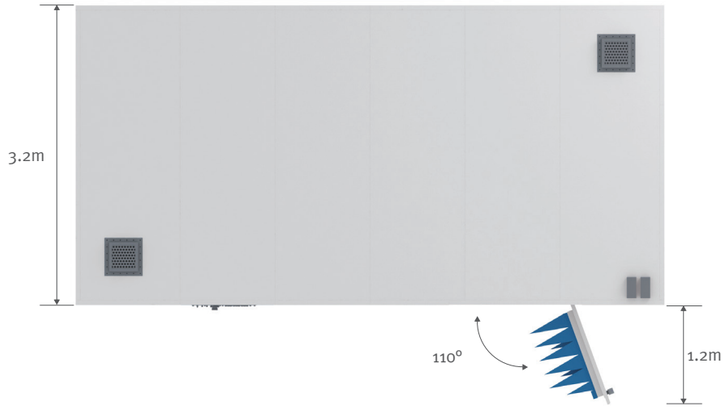
*2 Includes high-frequency cables and the RF switching box

A6 Standard type OTA measurement system

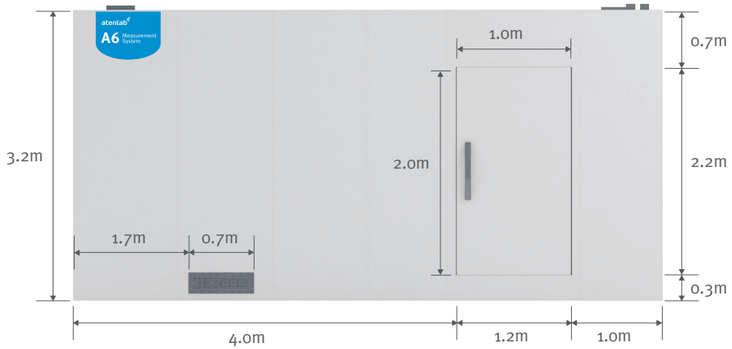
- **Optimum performance and price ratio**
- **Optimized test environment, fulfilling CTIA pre-testing requirement**
- **Supports commonly used testing frequency bands, 100% meets the test requirement for the communication products**
- **Supports cellphones, tablet antennas, SAM head and laptop test fixtures**

A6-standard type OTA measurement system can meet most testing functions. Its performance is more stable and reliable than A3.

Top view



Front view



Side view

A6 Specifications

System	
Operating frequency	0.68 – 6.0GHz
Dimension (L/W/H)	6.2 X 3.2 X 3.2m
Maximum tested object	19" Laptop
Measurement distance	4.0m
Shielding effect	0.68 – 6.0GHz > 100dB
Quiet zone size	50cm
Quiet zone characteristics	SD *1 < 0.8 (Refer CTIA v3.2 @ 836.5 / 1,880 / 2,450 / 5,500MHz)
Absorber	Emerson & Cuming non-toxic proof (RoHS and REACH)
Path loss Active typically Passive typically	 55dB @ 3.8GHz 66dB @ 6.0GHz
System stability	Antenna efficiency SD < 10%
Antenna test time	10 minutes
TRP test time	12 minutes / channel
TIS test time	17 minutes / channel
Power consumption	5KW
Input power	220VAC
Software	• Maxwell OTA • Maxwell Viewer

Shielding chamber	
Chamber gross weight	4,000Kg
Shielding door dimension (W/H)	1.0 X 2.0m
Shielding door type	Electric auto latching
Shielding steel sheet thickness	2mm
Shielding vent size	0.3 X 0.3m
Lighting	Single beam fiber glass with LED white lamp
Laser position monitoring	• 1.4 million pixels camera • 5mW red light quadrature axis projection
Power source filter	• 220V 16A • IL: 100dB, 14KHz – 18GHz
Internal power source	220VAC
Signal filter	• RS-232 • RJ-45 Giga
Interface connector	• N-Type • 2" Wave guide pipe

3D Turntable	
Turntable diameter	1.2m
Turntable load	Phi 25Kg, Theta 250Kg
Turntable type	3D
Turntable accuracy	1 degree
Turntable resolution	0.1 degree
Max. turntable speed	Phi 25RPM, Theta 12RPM
Input power	220VAC 50Hz
Control interface	RS-232
Phi axis removal/moving	The PHi axis can be moved and removed
Standard fixtures	• Hand-held device fixtures • Tablet fixtures • Laptop fixtures • Head fixtures (for SPEAG SAM Head only) • Hand fixtures
Optional fixtures	• 2D Styrofoam test bench • Customized fixtures

Measurement antenna	
Operating frequency	0.65 – 6.0GHz
Polarization	Linear dual-polarized antenna
Polarized isolaion	20dB
Antenna gain	13dBi @ 6.0GHz
Connector type	N-Type Female
Dimension (L/W/H)	0.54 X 0.51 X 0.51m
Weight	8.5Kg
Communication antenna	Operating frequency: 0.65 – 6.0GHz Polarization: circular polarization Gain: 5dBi

Microwave path assembly (including cable)	
Operating frequency	0.65 – 6.0GHz
Active path loss*2	8dB @ 3.8GHz
Passive path loss	19dB @ 6.0GHz
Path type / quantity	Passive, TRP, TIS, SISO, Wi-Fi Throughput, RSE
Total number of instruments	Supports six combined testing instruments (or six sets of paths)
Control interface	RS-232
Input power	110VAC 60Hz, 220VAC 50Hz
Option contents	• SISO Wi-Fi Throughput • RSE • LTE CA • BT OTA • Wi-Fi OTA

Control unit	
Control unit	• Industrial computer • Windows operating system • Microsoft spreadsheet (Excel) • GPIB interface card
Instrument rack	19"41U standard instrument rack
Worktable	Electric lifting table
Fixtures cart	Movable fixtures stowing cart

Installation requirement	
Working dimension (L/W/H)	6.4 X 4.7 X 3.5m
Equipment power requirement	220VAC 50Hz 16A

Remarks

*1 SD: Standard deviation

*2 Includes high-frequency cables and the RF switching box

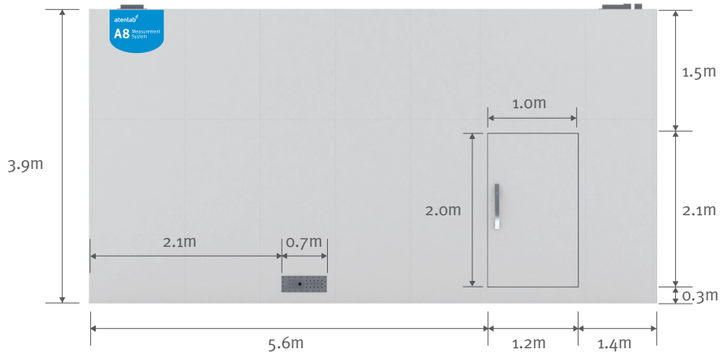
A8 Professional type A8 OTA measurement system

- **Optimum quiet zone performance, both software and hardware can meet the requirements of CTIA regulations.**
- **Has a 5.0m measuring distance and the wide space, showing the most realistic test results**
- **The LTE MIMO Single Cluster testing functions can be upgraded in future**
- **Supports the lower frequency testing performance**

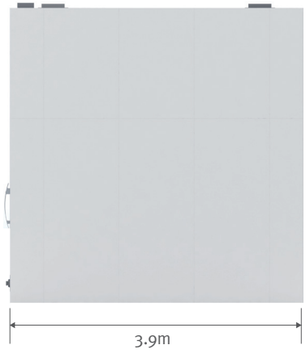
A8-professional type OTA measurement system can meet all testing functions. Its performance is better than both A3 and A6.
A8 supports cellphones, tablet antennas, SAM head and laptop computer testing fixtures.
A8 can obtain CTIA certification with the assistance from the original maker.

Top view

Front view



Side view



A8 Specifications

System	
Operating frequency	0.45 – 6.0GHz
Dimension (L/W/H)	8.2 X 3.9 X 3.9m (height excludes 0.2m H-type steel)
Maximum tested object	19" Laptop
Measurement distance	5.0m
Shielding effect	0.45 – 6.0GHz > 100dB
Quiet zone size	50cm
Quiet zone characteristics	SD *1 < 0.65 (Refer CTIA v3.2 @ 836.5 / 1,880 / 2,450 / 5,500MHz)
Absorber	Emerson & Cuming non-toxic proof (RoHS and REACH)
Path loss Active typically Passive typically	 57dB @ 3.8GHz 68dB @ 6.0GHz
System stability	Antenna efficiency SD < 10%
Antenna test time	10 minutes
TRP test time	12 minutes / channel
TIS test time	17 minutes / channel
Power consumption	5KW
Input power	220VAC
Software	• Maxwell OTA • Maxwell Viewer

Shielding chamber	
Chamber gross weight	6,500Kg
Shielding door dimension (W/H)	1.0 X 2.0m
Shielding door type	Electric auto latching
Shielding steel sheet thickness	2mm
Shielding vent size	0.3 X 0.3m
Lighting	Single beam fiber glass with LED white lamp
Laser position monitoring	• 1.4 million pixels camera • 5mW red light quadrature axis projection
Power source filter	• 220V 16A • IL: 100dB, 14KHz – 18GHz
Internal power source	220VAC
Signal filter	• RS-232 • RJ-45 Giga
Interface connector	• N-Type • 2" Wave guide pipe

3D Turntable	
Turntable diameter	1.2m
Turntable load	Phi 25Kg, Theta 250Kg
Turntable type	3D
Turntable accuracy	1 degree
Turntable resolution	0.1 degree
Max. turntable speed	Phi 25RPM, Theta 12RPM
Input power	220VAC 50Hz
Control interface	RS-232
Phi axis removal/moving	The PHi axis can be moved and removed
Standard fixtures	• Hand-held device fixtures • Tablet fixtures • Laptop fixtures • Head fixtures (for SPEAG SAM Head only) • Hand fixtures
Optional fixtures	• 2D Styrofoam test bench • Customized fixtures

Measurement antenna	
Operating frequency	0.45 – 6.0GHz
Polarization	Linear dual-polarized antenna
Polarized isolation	20dB
Antenna gain	13dBi @ 6.0GHz
Connector type	N-Type Female
Dimension (L/W/H)	0.54 X 0.51 X 0.5m
Weight	8.5Kg
Communication antenna	Operating frequency: 0.65 – 6.0GHz Polarization: circular polarization Gain: 5dBi

Microwave path assembly (including cable)	
Operating frequency	0.45 – 6.0GHz
Active path loss*2	8dB @ 3.8GHz
Passive path loss	19dB @ 6.0GHz
Path type / quantity	Passive, TRP, TIS, SISO, Wi-Fi Throughput, RSE
Total number of instruments	Supports six combined testing instruments (or six sets of paths)
Control interface	RS-232
Input power	110VAC 60Hz, 220VAC 50Hz
Option contents	• SISO Wi-Fi Throughput • RSE • LTE CA • BT OTA • Wi-Fi OTA • LTE MIMO OTA

Control unit	
Control unit	• Industrial computer • Windows operating system • Microsoft spreadsheet (Excel) • GPIB interface card
Instrument rack	19"41U standard instrument rack
Worktable	Electric lifting table
Fixtures cart	Movable fixtures stowing cart

Installation requirement	
Working dimension (L/W/H)	8.4 X 5.4 X 4.4 m
Equipment power requirement	220VAC 50Hz 16A

Remarks

*1 SD: Standard deviation

*2 Includes high-frequency cables and the RF switching box

Software item specifications

Item	Description	Applicable to
Maxwell OTA - 2D/3D Passive	2D/3D Antenna Pattern Measurement	A2 A3 A6 A8
Maxwell OTA - Passive advanced	• ECC • Axial Ratio	A3 A6 A8
Maxwell OTA - GSM/ CDMA/ WCDMA	GSM/ CDMA/ WCDMA	
Maxwell OTA - LTE	TDD-LTE/ FDD-LTE	
Maxwell OTA - TD-SCDMA	TD-SCDMA License	
Maxwell OTA - Bluetooth	Bluetooth	
Maxwell OTA - Wi-Fi	Wi-Fi	
Maxwell OTA - GPRS/ EGPRS	GPRS/ EGPRS	
Maxwell OTA - HSDPA/ HSUPA/ HSPA+	HSDPA/ HSUPA/ HSPA+	
Maxwell OTA - 1xEV-DO	1xEV-DO	
Maxwell OTA Software - LTE CA	LTE Carrier Aggregation	
Maxwell OTA - RSE	RSE	A2 A3 A6 A8
MIMO OTA	MIMO single cluster for CTIA	A8
Maxwell OTA Lite - LTE	TDD-LTE/ FDD-LTE	A2
Maxwell OTA Lite - WCDMA	GSM/ WCDMA	
Maxwell OTA Lite - CDMA	GSM/ CDMA	
Maxwell OTA Lite - TD-SCDMA	GSM/ TD-SCDMA	
Maxwell OTA Lite - Bluetooth	Bluetooth	
Maxwell OTA Lite - Wi-Fi	Wi-Fi	

*RSE: Radiated Spurious Emission

*ECC: Envelope Correlation Coefficient

Hardware item specifications

Wi-Fi OTA

Item	Description	Applicable to
RF Measurement	• RF circuit set • Wi-Fi signal dynamic amplifier	A2 A3 A6 A8
Calibration & Acceptance	• Wi-Fi OTA path loss calibration: 2.3 – 2.6GHz, 5.0 – 6.0GHz • Wi-Fi OTA function validation: The test prototype performs once the TRP and TIS test, and verifies that the tested functions are normal by using the defined settings.	

BT OTA

Item	Description	Applicable to
RF Measurement	• RF circuit set • BT signal dynamic amplifier	A2 A3 A6 A8
Calibration & Acceptance	• BT OTA path loss calibration: 2.3 – 2.6GHz • BT OTA function validation: The engineering test prototype provided by the customer performs once the TRP and TIS tests, and verifies that the tested functions are normal by using the defined settings.	

RSE

Item	Description	Applicable to
RF Measurement	•RF circuit set •RSE circuit coupling switcher •RSE RF antenna set •RSE RF filter	A2 A3 A6 A8
Calibration & Acceptance	RSE function validation: Use the test prototype to perform once the RSE test and verify that the tested functions are normal by using the defined settings.	

LTE MIMO OTA

Item	Description	Applicable to
RF Measurement	• RF antenna x 2 • RF circuit set • RF dynamic amplifier • RF switching box LTE MIMO OTA dedicated fixtures set	A8
Calibration & Acceptance	LTE MIMO OTA function validation: Use the test prototype to perform once the LTE MIMO SIR TIS test and verify the tested functions are normal by using the defined setting.	

Atenlab Corporation

Tel: +886-2-2799-8715
Fax: +886-2-2799-8915
E-mail: atenlab@atenlab.com.tw
6F., No.8, Aly. 15, Ln. 120, Sec. 1, Neihu Rd.,
Neihu Dist., Taipei City 114, Taiwan

www.atenlab.com.tw

atenlab

SC17-11A