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Report No.: 1412RSU01503
Report Version: V01
Issue Date: 12-23-2014

MEASUREMENT REPORT
FCC Part 15B

FCC ID:	NCY-A600
APPLICANT:	Trango Systems, Inc.

Application Type:	Certification
Product:	Altum AC600
Model No.:	A600-25-US, A600-19-US, A600-EXT-US
Brand Name:	Trango
FCC Classification:	FCC Class B Digital Device (JBP)
FCC Rule Part(s):	FCC Part 15 Subpart B
Test Procedure(s):	ANSI C63.4: 2009
Test Date:	Jul. 30 ~ Dec. 22, 2014

Reviewed By : Robin Wu
(Robin Wu)

Approved By : Marlin Chen
(Marlin Chen)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2009. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date
1412RSU01503	Rev. 01	Initial report	12-23-2014

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Description Page

§2.1033 General Information

Applicant:	Trango Systems, Inc
Applicant Address:	14118 Stowe Dr, Suite B, Poway, CA 92064 USA
Manufacturer:	Trango Systems, Inc
Manufacturer Address:	14118 Stowe Dr, Suite B, Poway, CA 92064 USA
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT FCC Registration No.:	809388
Model No.:	A600-25-US, A600-19-US, A600-EXT-US
FCC ID:	NCY-A600
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	FCC Class B Digital Device (JBP)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

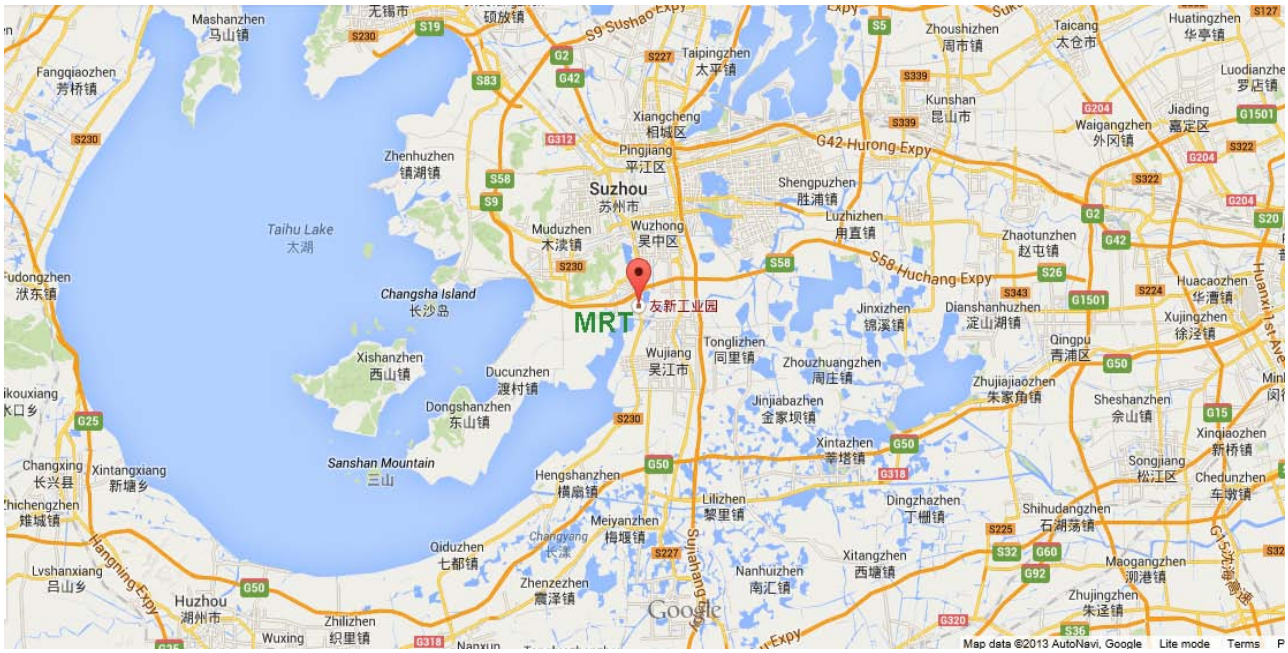
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Altum AC600
Model No.	A600-25-US, A600-19-US, A600-EXT-US
Power Type	POE input
Frequency Range	**For 2.4GHz Band:** 802.11b/g/n: 2412 ~ 2462 MHz **For 5.0GHz Band:** 802.11a/n/ac: 5150 ~ 5250MHz 5725 ~ 5850MHz
Type of Modulation	802.11b: DSSS 802.11g/a/n/ac: OFDM
Adapter	Power Over Ethernet (Gigabit) M/N: HS36-2401250US Input: 100-240V ~ 50/60Hz 1.0A Output: +24.0V ~ 1250mA

Note: The difference of models is that the product uses the different antennas.

2.2. Description of Available Antennas

Antenna Type	Frequency Band (GHz)	Manufacturer	Tx Paths	Max Directional Gain (dBi)
Panel Antenna 1#	2.45	SANNY TELECOM CO., LTD	2	9
Panel Antenna 2#	5.1 ~ 5.8	Trango Systems, Inc	2	25
Panel Antenna 3#	5.1 ~ 5.8	Trango Systems, Inc	2	19

2.3. Device Capabilities

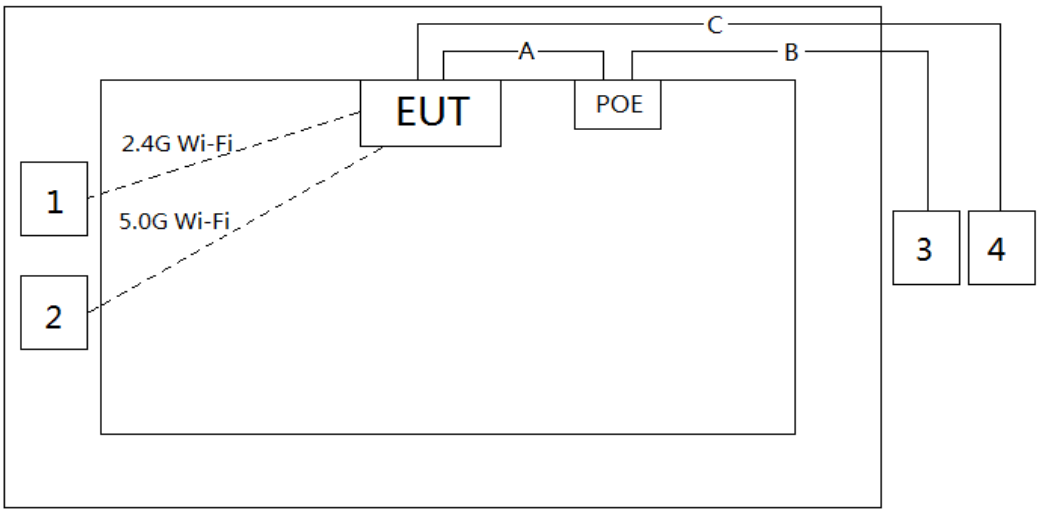
This device contains the following capabilities:

2.4G&5GHz (DTS/UNII)

2.4. Test Configuration

The Altum AC600 FCC ID: NCY-A600 was tested per the guidance FCC Part 15 Subpart B: 2013 and ANSI C63.4: 2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

Connection Diagram (Mode 1: Communication)



Signal Cable Type		Signal cable Description
A	LAN Cable	Non-shielding, 1.0m
B	LAN Cable	Non-shielding, >10m
C	LAN Cable	Non-shielding, >10m

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Lenovo	E430c	MP-4CFX213/10	Non-Shielded, 1.8m
2	Notebook	Lenovo	X201	3626AM3	Non-Shielded, 1.8m
3	Personal Computer	DELL	Vostro270	N/A	Non-Shielded, 1.8m
4	Personal Computer	DELL	Vostro270	N/A	Non-Shielded, 1.8m

2.5. Test Software

Not applicable.

2.6. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.7. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2009) was used in the measurement of the **Altum AC600 FCC ID: NCY-A600.**

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150 kHz to 30 MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site.

Line conducted emissions test results are shown in Section 6.2.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.
For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30 MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30 MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.
Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB beam-width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	101209	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	101683	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	101684	1 year	2015/11/07
Temperature/ Meter Humidity	Anymetre	TH101B	SR2-01	1 year	2015/11/14

Radiated Emission

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MY45300136	1 year	2015/12/09
Preamplifier	MRT	AP01G18	1310002	1 year	2015/12/13
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	1 year	2015/11/08
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	1 year	2015/11/08
Broadband Horn Antenna	Schwarzbeck	BBHA9170	9170-549	1 year	2015/12/11
Temperature/Humidity Meter	Anymetre	TH101B	AC1-01	1 year	2015/11/14

5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: ±3.5dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~1GHz: 4.07dB 1GHz~18GHz: 4.16 dB Vertical: 30MHz~1GHz: 4.18 dB 1GHz~18GHz: 4.76 dB

6. TEST RESULT

6.1. Summary

Product Name: **Altum AC600**
FCC ID: **NCY-A600**
FCC Classification: **FCC Class B Digital Device (JBP)**
Test Mode: **Communication**

FCC Part Section(s)	Test Description	Test Result
15.107	Conducted Emissions	Pass
15.109	Radiated Emissions	Pass

6.2. Conducted Emission Measurement

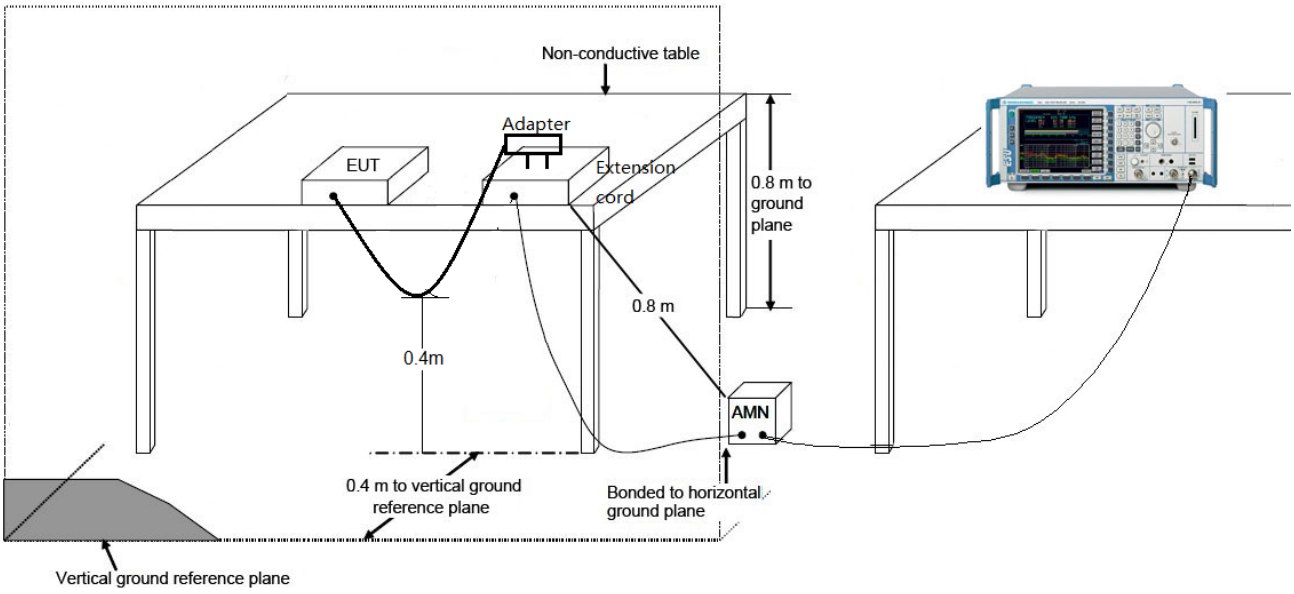
6.2.1. Test Limit

FCC Part 15.107 Limits		
Frequency (MHz)	QP (dBμV)	AV (dBμV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

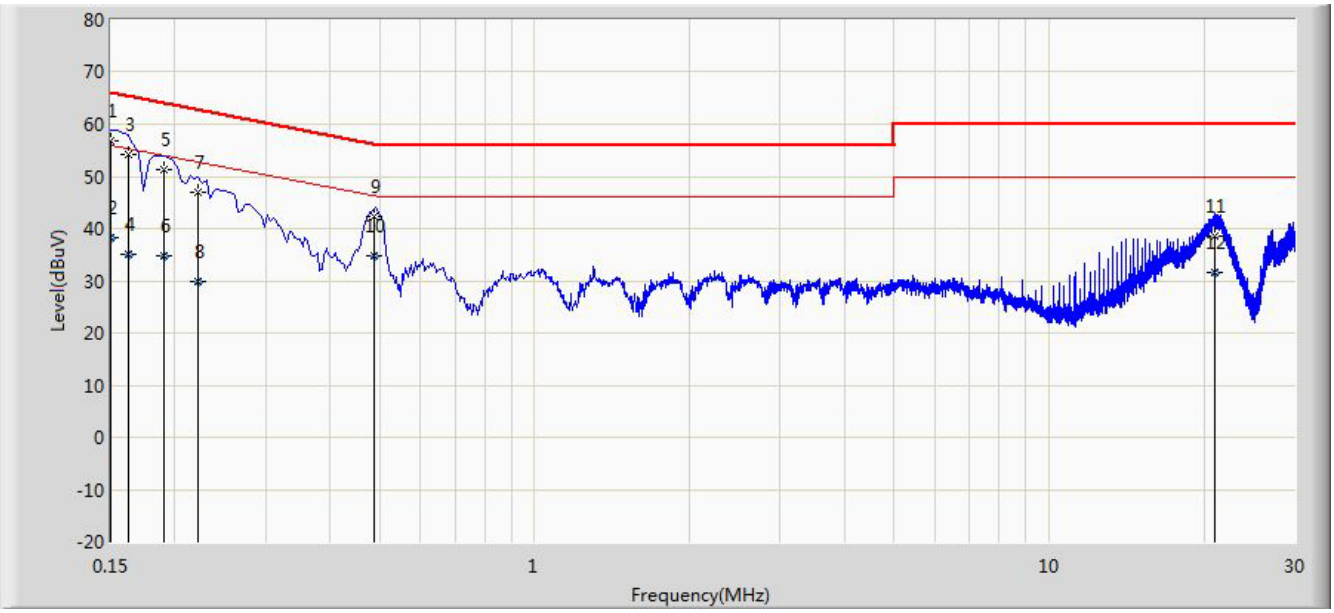
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.2.2. Test Setup



6.2.3. Test Result

Site: SR2	Time: 2014/12/16 - 20:10
Limit: FCC_Part15.107_CE_AC Power_ClassB	Engineer: Milo Li
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: Altum AC600	Power: AC 120V/60Hz
Note: Mode 1	

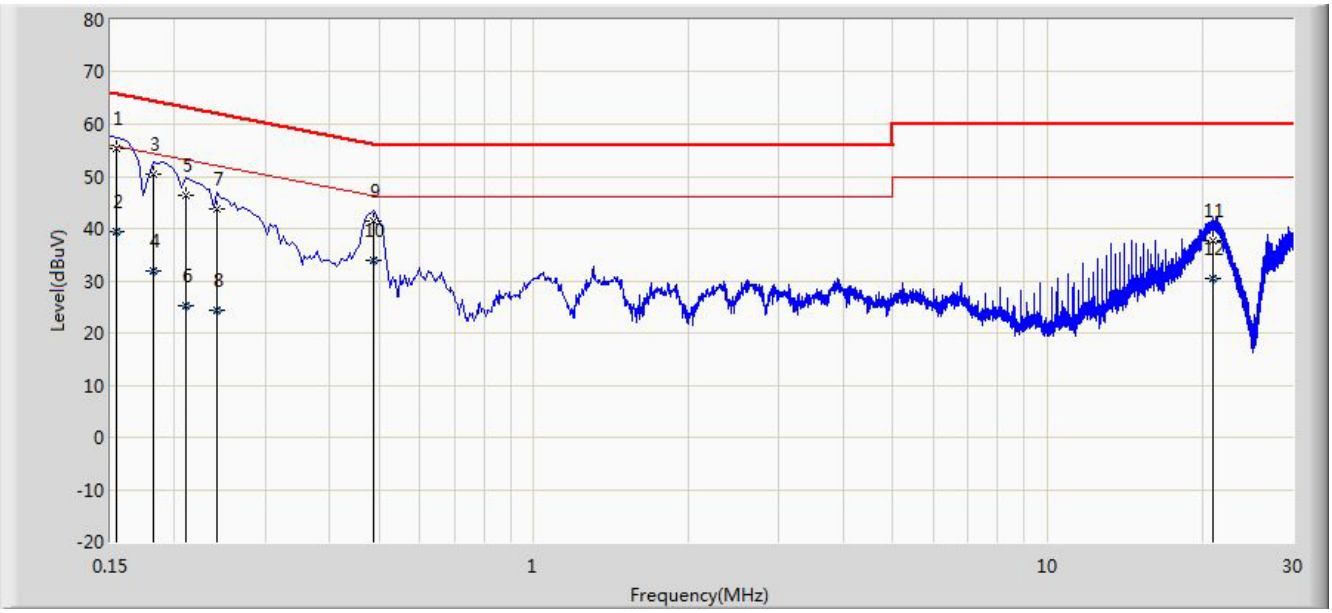


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.150	56.679	45.511	-9.321	66.000	11.168	QP
2			0.150	38.279	27.111	-17.721	56.000	11.168	AV
3			0.162	54.085	43.988	-11.275	65.361	10.097	QP
4			0.162	35.186	25.089	-20.175	55.361	10.097	AV
5			0.190	51.207	41.179	-12.829	64.037	10.029	QP
6			0.190	34.801	24.773	-19.235	54.037	10.029	AV
7			0.222	46.969	37.028	-15.775	62.744	9.941	QP
8			0.222	29.760	19.819	-22.984	52.744	9.941	AV
9			0.486	42.343	32.188	-13.893	56.236	10.155	QP
10			0.486	34.675	24.520	-11.561	46.236	10.155	AV
11			21.046	38.651	28.506	-21.349	60.000	10.145	QP
12			21.046	31.519	21.375	-18.481	50.000	10.145	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Site: SR2	Time: 2014/12/16 - 20:16
Limit: FCC_Part15.107_CE_AC Power_ClassB	Engineer: Milo Li
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: Altum AC600	Power: AC 120V/60Hz
Note: Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.154	55.498	44.782	-10.283	65.781	10.716	QP
2			0.154	39.352	28.636	-16.429	55.781	10.716	AV
3			0.182	50.497	40.454	-13.897	64.394	10.042	QP
4			0.182	31.995	21.952	-22.399	54.394	10.042	AV
5			0.210	46.498	36.504	-16.707	63.205	9.995	QP
6			0.210	25.360	15.365	-27.845	53.205	9.995	AV
7			0.242	43.633	33.638	-18.395	62.027	9.995	QP
8			0.242	24.417	14.423	-27.610	52.027	9.995	AV
9			0.486	41.567	31.391	-14.669	56.236	10.176	QP
10			0.486	33.948	23.772	-12.288	46.236	10.176	AV
11			21.026	37.741	27.554	-22.259	60.000	10.187	QP
12			21.026	30.514	20.327	-19.486	50.000	10.187	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

6.3. Radiated Emission Measurement

6.3.1. Test Limit

FCC Part 15.109 Limits		
Frequency (MHz)	Distance (m)	Level (dBμV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

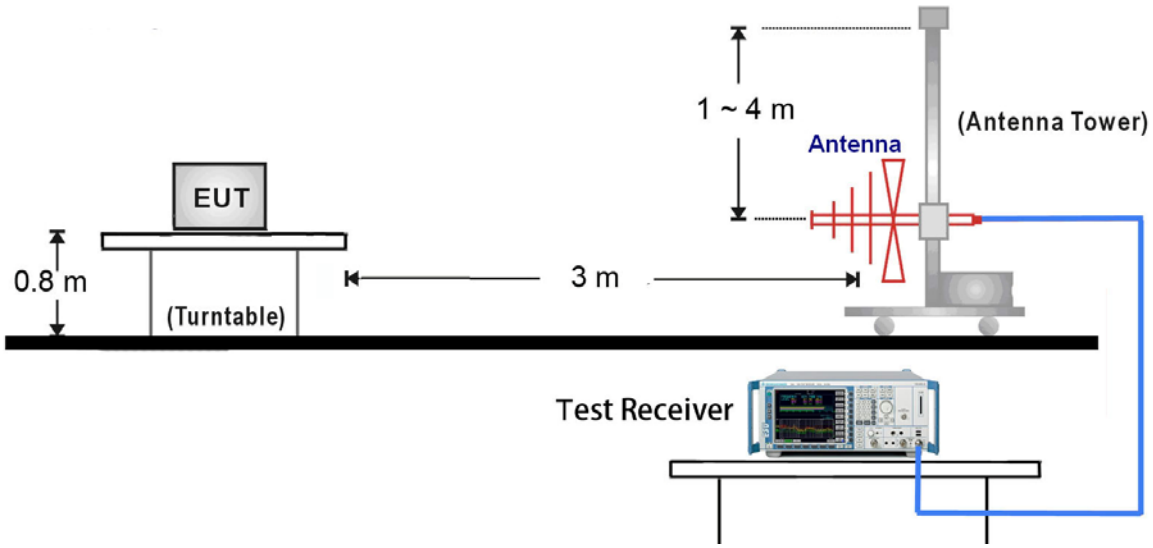
Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

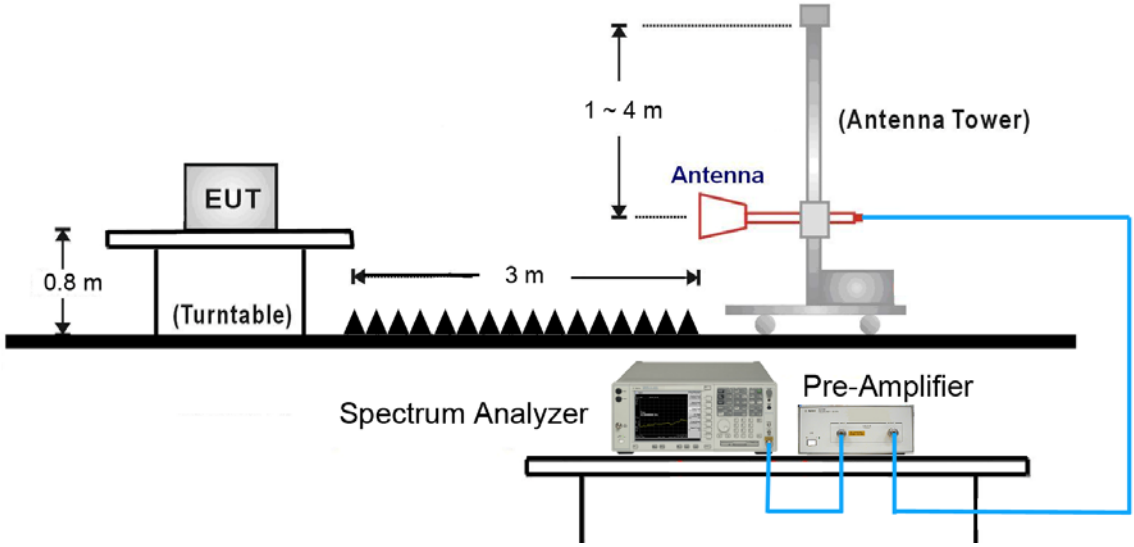
Note 3: E field strength (dBμV/m) = 20 log E field strength (uV/m)

6.3.2. Test Setup

30MHz ~ 1GHz Test Setup:

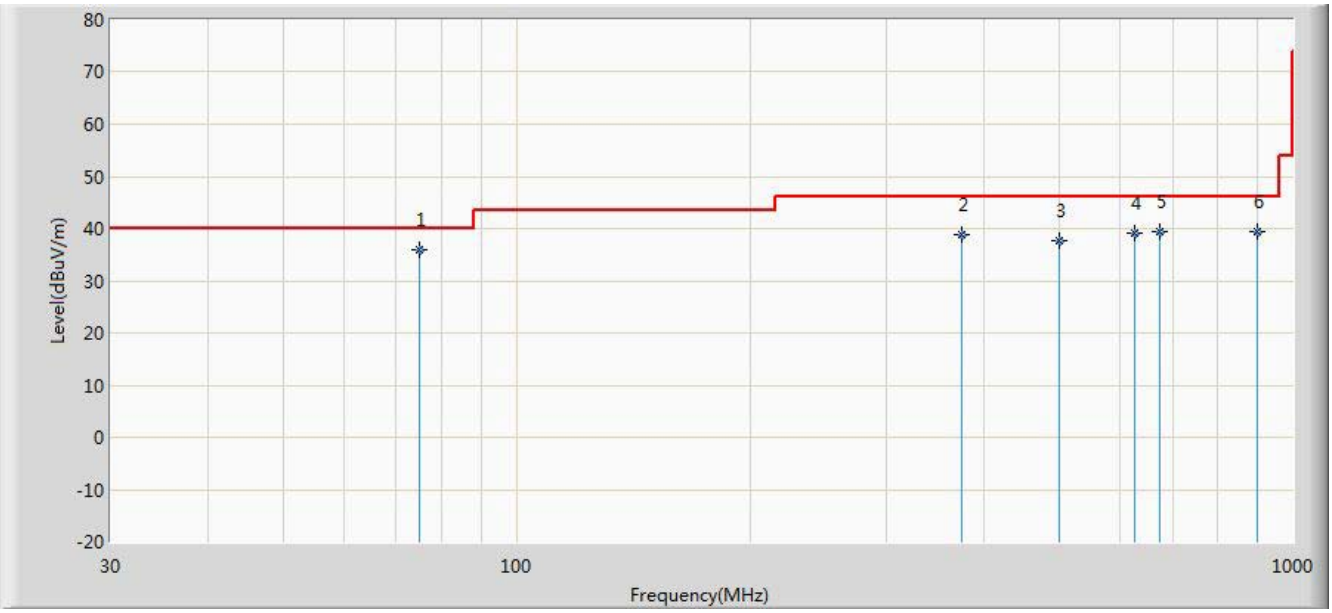


1GHz ~18GHz Test Setup:



6.3.3. Test Result

Site: AC1	Time: 2014/12/24 - 13:28
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Knight Lu
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: Altum AC600	Power: AC 120V/60Hz
Note: Mode 1	

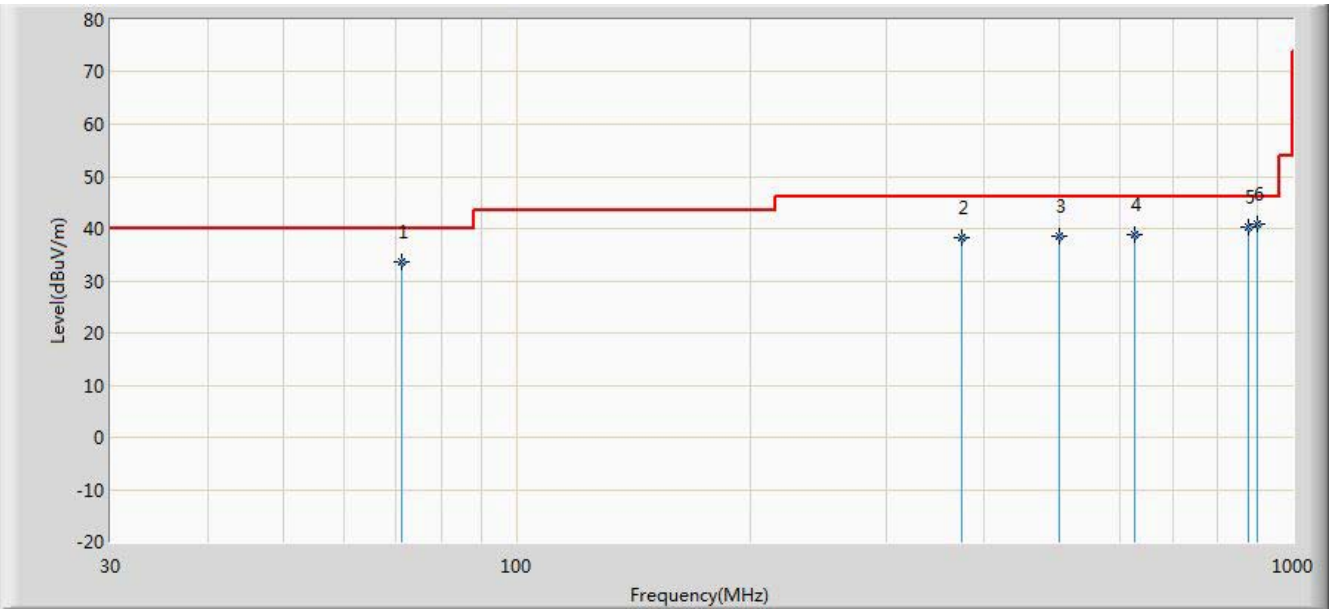


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	75.113	35.916	26.230	-4.084	40.000	9.687	QP
2			375.089	38.784	22.630	-7.216	46.000	16.154	QP
3			499.998	37.540	19.310	-8.460	46.000	18.230	QP
4			625.102	39.205	18.943	-6.795	46.000	20.262	QP
5			675.023	39.474	18.456	-6.526	46.000	21.018	QP
6			900.012	39.459	15.480	-6.541	46.000	23.979	QP

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2014/12/24 - 13:30
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Knight Lu
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: Altum AC600	Power: AC 120V/60Hz
Note: Mode 1	

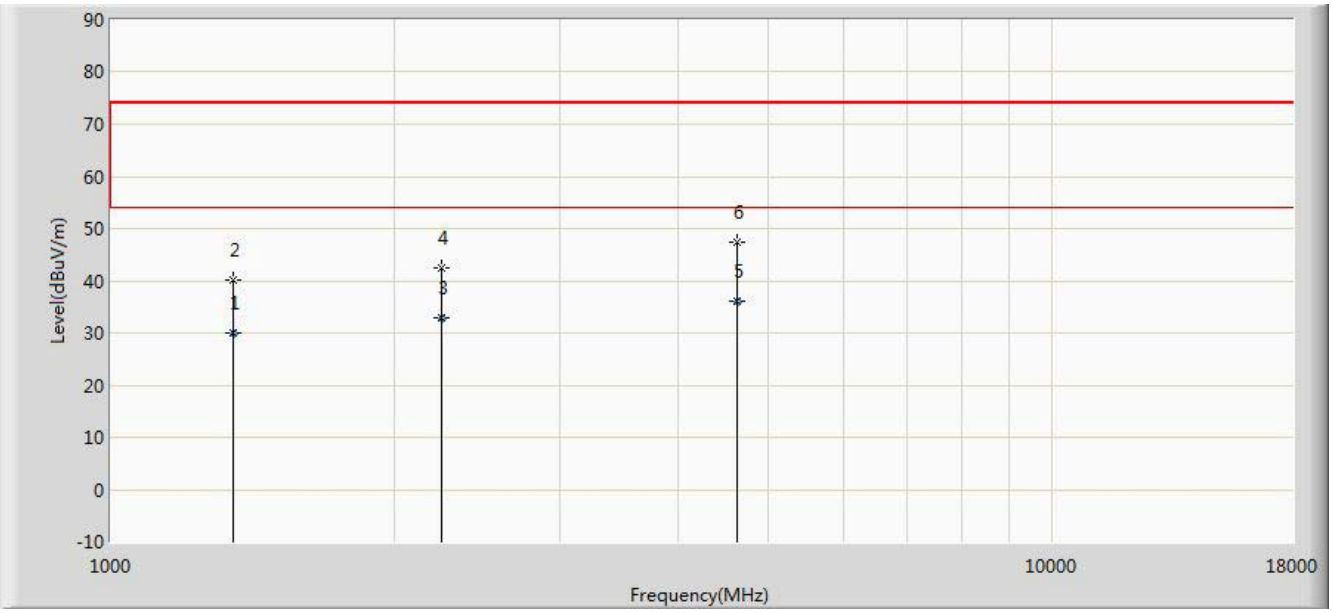


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			71.230	33.764	23.180	-6.236	40.000	10.584	QP
2			374.996	38.342	22.190	-7.658	46.000	16.152	QP
3			500.040	38.630	20.400	-7.370	46.000	18.230	QP
4			624.850	38.902	18.643	-7.098	46.000	20.259	QP
5			875.201	40.339	16.560	-5.661	46.000	23.779	QP
6		*	900.040	40.809	16.830	-5.191	46.000	23.979	QP

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2014/12/24 - 13:30
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Knight Lu
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Altum AC600	Power: AC 120V/60Hz
Note: Mode 1	

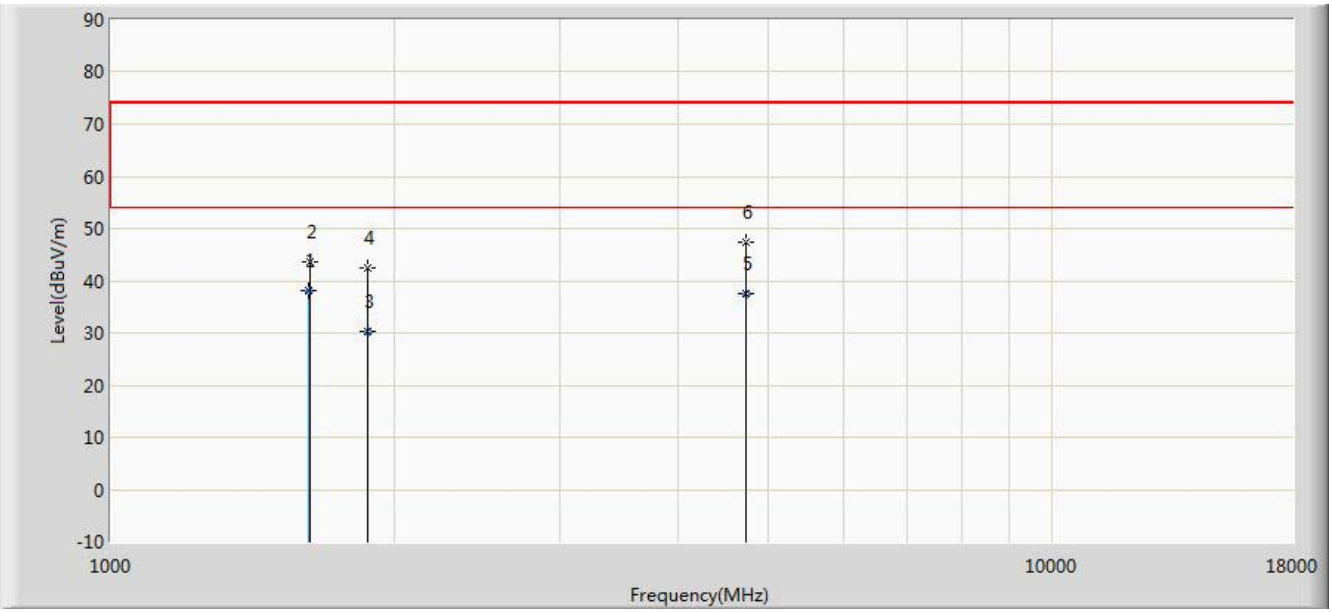


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			1347.569	29.863	37.255	-24.137	54.000	-7.392	AV
2			1348.500	40.238	47.622	-33.762	74.000	-7.385	PK
3			2248.625	32.837	35.659	-21.163	54.000	-2.821	AV
4			2249.500	42.504	45.323	-31.496	74.000	-2.819	PK
5		*	4620.026	36.121	33.259	-17.879	54.000	2.862	AV
6			4621.000	47.284	44.420	-26.716	74.000	2.864	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre_Amplifier Gain (dB)

Site: AC1	Time: 2014/12/24 - 13:31
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Knight Lu
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Altum AC600	Power: AC 120V/60Hz
Note: Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	1625.030	38.097	45.250	-15.903	54.000	-7.153	AV
2			1629.000	43.692	50.846	-30.308	74.000	-7.154	PK
3			1875.026	30.255	36.125	-23.745	54.000	-5.870	AV
4			1875.500	42.532	48.398	-31.468	74.000	-5.866	PK
5			4722.165	37.458	34.255	-16.542	54.000	3.203	AV
6			4723.000	47.362	44.156	-26.638	74.000	3.206	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre_Amplifier Gain (dB)

7. CONCLUSION

The data collected relate only the item(s) tested and show that the **Altum AC600 FCC ID: NCY-A600** has been tested to comply with the requirements specified in §15.107 and §15.109 of the FCC Rules.

The End