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Report No.: 1508RSU01203
Report Version: V01
Issue Date: 09-06-2015

MEASUREMENT REPORT
FCC Part 15B & ICES-003

FCC ID:	2ABX8SH-000000011
IC:	12219A-00000000011
APPLICANT:	Zhejiang shenghui lighting Co., Ltd. Shanghai Branch

Application Type:	Certification
Product:	Element hub
Model No.:	Z01-hub
Trademark:	sengled
FCC Classification:	FCC Class B Digital Device (JBP)
FCC Rule Part(s):	FCC Part 15 Subpart B: 2015
IC Rule(s):	ICES-003 Issue 5: 2012 Class B
Test Procedure(s):	ANSI C63.4: 2014
Test Date:	August 26 ~ September 01, 2015

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 C63.4-2014. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date
1508RSU01203	Rev. 01	Initial report	09-06-2015

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Description Page

§2.1033 General Information

Applicant:	Zhejiang shenghui lighting Co., Ltd. Shanghai Branch
Applicant Address:	Rm. 801, 1st Xinye Building, 388 Tianlin Rd., Caohejing Development Zone, Shanghai, 200233, China
Manufacturer:	ZHEJIANG SHENGHUI LIGHTING Co., Ltd
Manufacturer Address:	South Jiachuang Rd., Xiuzhou Industrial Park Jiaxing, Zhejiang 314015 P.R. China
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
MRT IC Registration No.:	11384A
Model No.:	Z01-hub
FCC ID:	2ABX8SH-000000011
IC:	12219A-00000000011
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

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.**

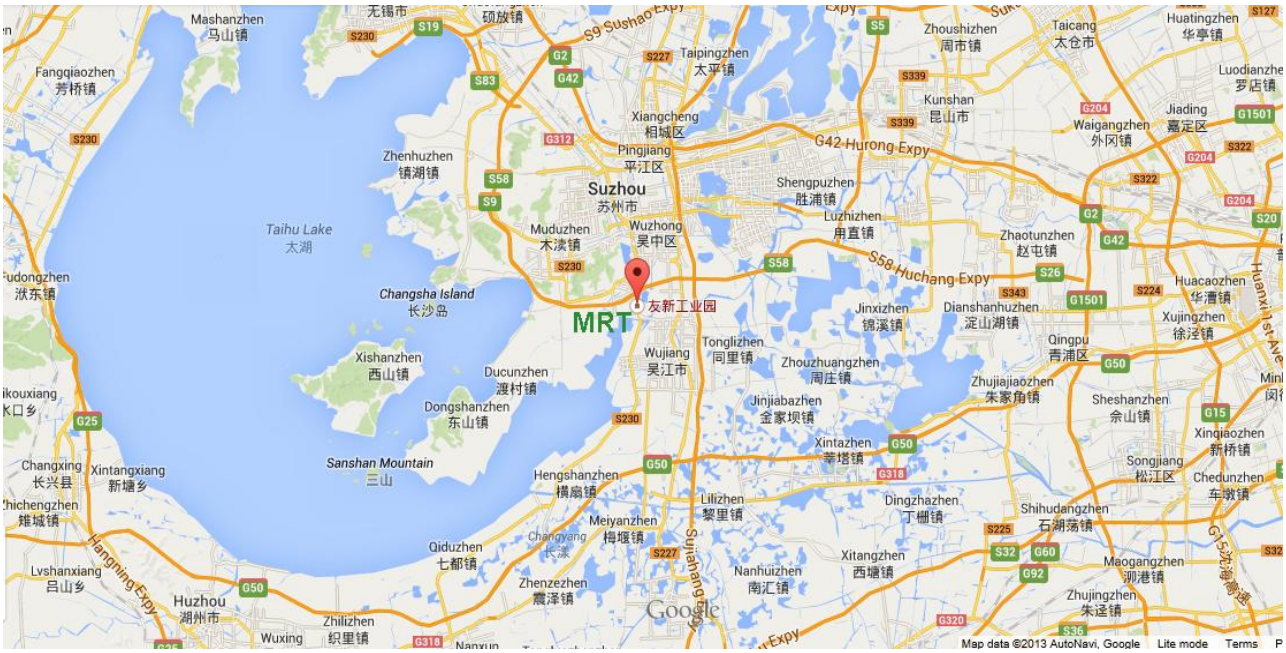
1. INTRODUCTION

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	Element hub
Model No.	Z01-hub
Zigbee Specification	802.15.4
Wi-Fi Specification	802.11b/g/n

2.2. Device Capabilities

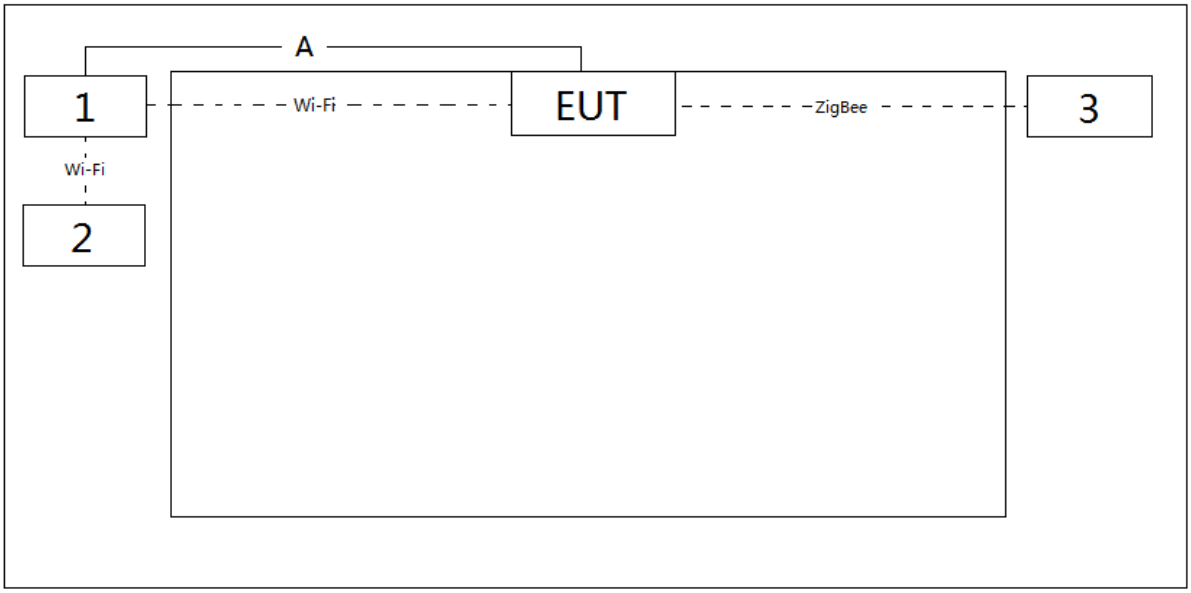
This device contains the following capabilities:

2.4GHz Zigbee (DTS) & 2.4GHz WLAN (DTS)

2.3. Test Configuration

The Element hub FCC ID: 2ABX8SH-000000011 was tested per the guidance FCC Part 15 Subpart B: 2015 and ANSI C63.4: 2014 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

Connection Diagram



Signal Cable Type		Signal cable Description
A	LAN Cable	Non-Shielded, > 10m

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Wi-Fi Router	NETGEAR	R6300v2	N/A	Non-Shielded, 1.8m
2	Mobile Phone	Apple	A1387	N/A	N/A
3	LED Lamp	sengled	Z01-A19NAE26	1528D500046	Non-Shielded, 1.8m

2.4. Test Software

(1), Power on all equipments as shown above.
(2), Connect Element hub to the Wi-Fi Router (1) via the LAN cable (A) provided.
(3), Connect your mobile (2) app to the Wi-Fi Router (1), and open the app to create an account, also add LED Lamp (3) and configure their settings. Then the LED Lamp can now be controlled by the app.
(4), Start to test.

2.5. EMI Suppression Device(s)/Modifications

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

2.6. 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 C63.4-2014) was used in the measurement of the **Element hub FCC ID: 2ABX8SH-000000011.**

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.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2015/11/07
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06114	1 year	2015/11/20

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2015/10/09
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Preamplifier	Agilent	83017A	MRTSUE06020	1 year	2015/12/13
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2015/11/08
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06115	1 year	2015/11/20

Software	Version	Function
e3	V8.3.5	EMI Test Software

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

Company Name: **Zhejiang shenghui lighting Co., Ltd. Shanghai Branch**

FCC ID: **2ABX8SH-000000011**

IC: **12219A-00000000011**

FCC Classification: **FCC Class B Digital Device (JBP)**

Test Mode: **Normal Operation**

Normative References	Test Description	Test Result
FCC Part 15 Subpart B: 2015 ICES-003 Issue 5: 2012 Class B ANSI C63.4: 2014	Conducted Emission	Pass
FCC Part 15 Subpart B: 2015 ICES-003 Issue 5: 2012 Class B ANSI C63.4: 2014	Radiated Emission	Pass

6.2. Conducted Emission Measurement

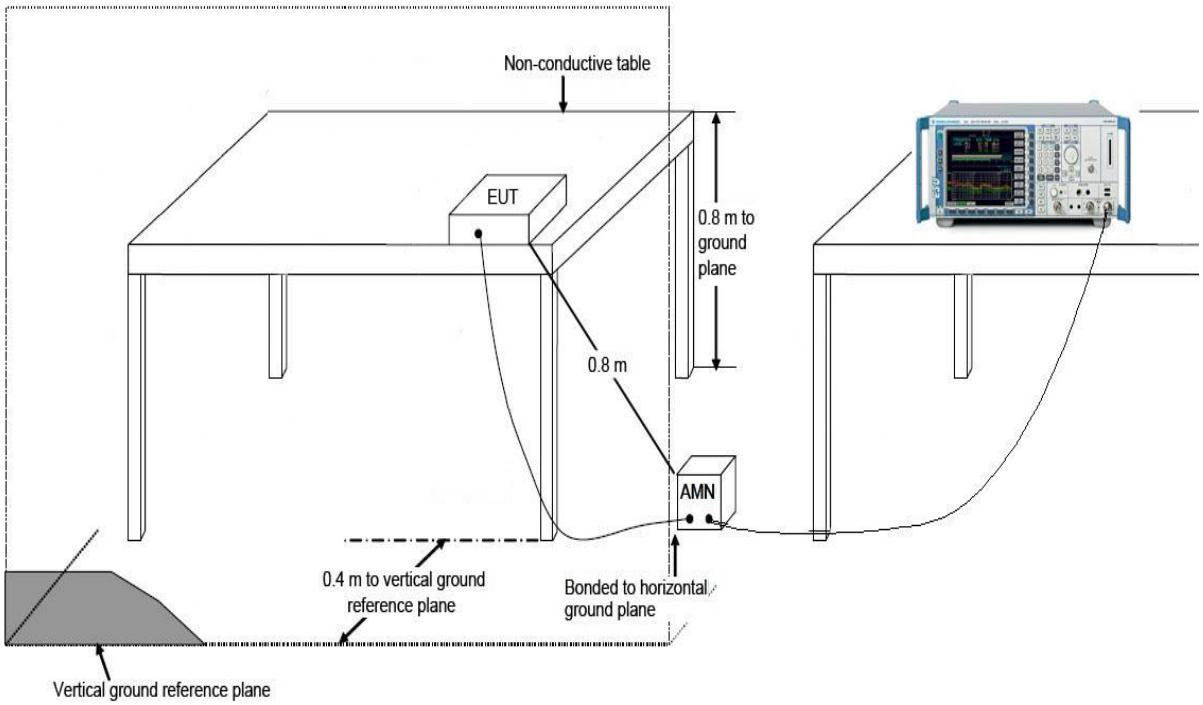
6.2.1. Test Limit

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.

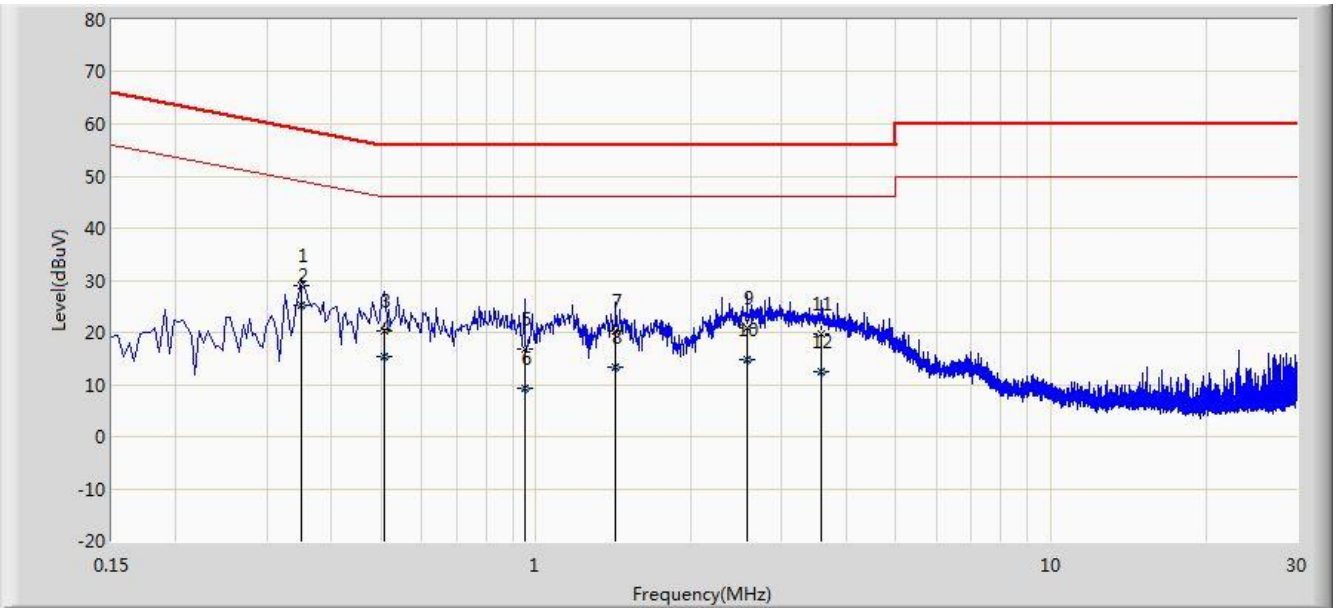
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.2.2. Test Setup



6.2.3. Test Result of Conducted Emissions

Site: SR2	Time: 2015/09/01 - 10:22
Limit: FCC_Part15.107_CE_AC Power Class B	Engineer: Roy Cheng
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: Element hub	Power: AC 120V/60Hz
Note: Normal Operation	

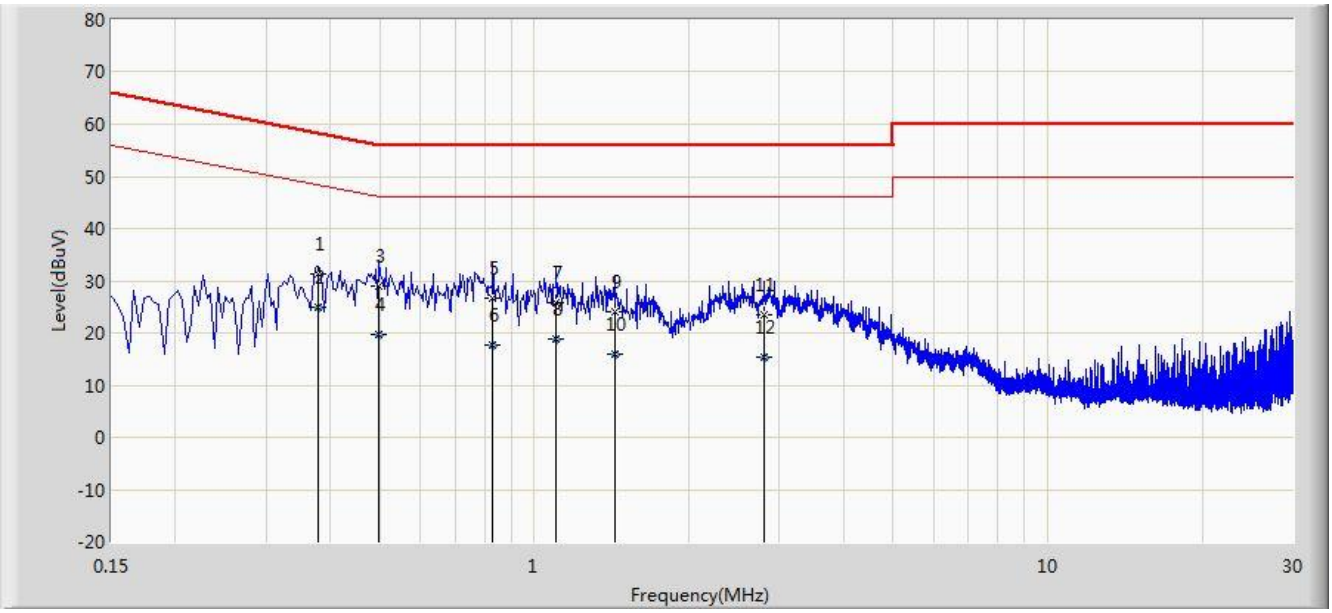


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.350	28.959	18.914	-30.004	58.962	10.044	QP
2		*	0.350	25.335	15.291	-23.627	48.962	10.044	AV
3			0.506	20.157	10.000	-35.843	56.000	10.157	QP
4			0.506	15.441	5.284	-30.559	46.000	10.157	AV
5			0.950	16.776	6.842	-39.224	56.000	9.934	QP
6			0.950	9.250	-0.684	-36.750	46.000	9.934	AV
7			1.430	20.339	10.447	-35.661	56.000	9.892	QP
8			1.430	13.349	3.458	-32.651	46.000	9.892	AV
9			2.574	20.827	10.973	-35.173	56.000	9.854	QP
10			2.574	14.718	4.864	-31.282	46.000	9.854	AV
11			3.590	19.647	9.731	-36.353	56.000	9.917	QP
12			3.590	12.361	2.445	-33.639	46.000	9.917	AV

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

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

Site: SR2	Time: 2015/09/01 - 10:28
Limit: FCC_Part15.107_CE_AC Power Class B	Engineer: Roy Cheng
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: Element hub	Power: AC 120V/60Hz
Note: Normal Operation	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.378	31.178	21.082	-27.145	58.323	10.096	QP
2		*	0.378	24.820	14.724	-23.503	48.323	10.096	AV
3			0.498	29.098	18.920	-26.941	56.039	10.178	QP
4			0.498	19.733	9.555	-26.306	46.039	10.178	AV
5			0.830	26.668	16.665	-29.332	56.000	10.002	QP
6			0.830	17.587	7.584	-28.413	46.000	10.002	AV
7			1.102	25.758	15.854	-30.242	56.000	9.905	QP
8			1.102	18.807	8.902	-27.193	46.000	9.905	AV
9			1.434	23.951	14.059	-32.049	56.000	9.893	QP
10			1.434	15.799	5.907	-30.201	46.000	9.893	AV
11			2.802	23.374	13.522	-32.626	56.000	9.852	QP
12			2.802	15.239	5.387	-30.761	46.000	9.852	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

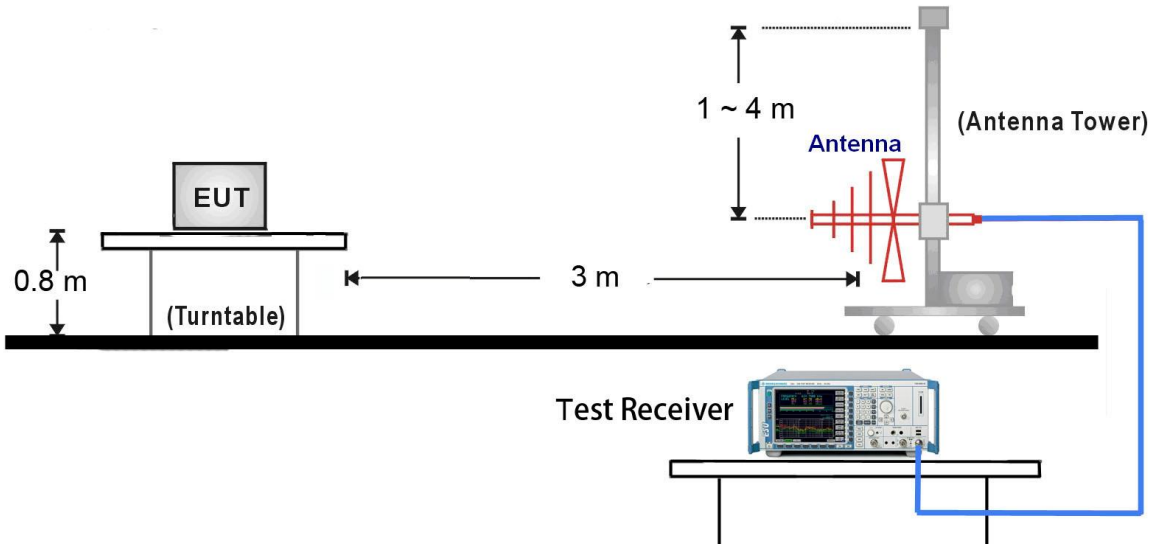
Note 1: The lower limit shall apply at the transition frequency.

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.

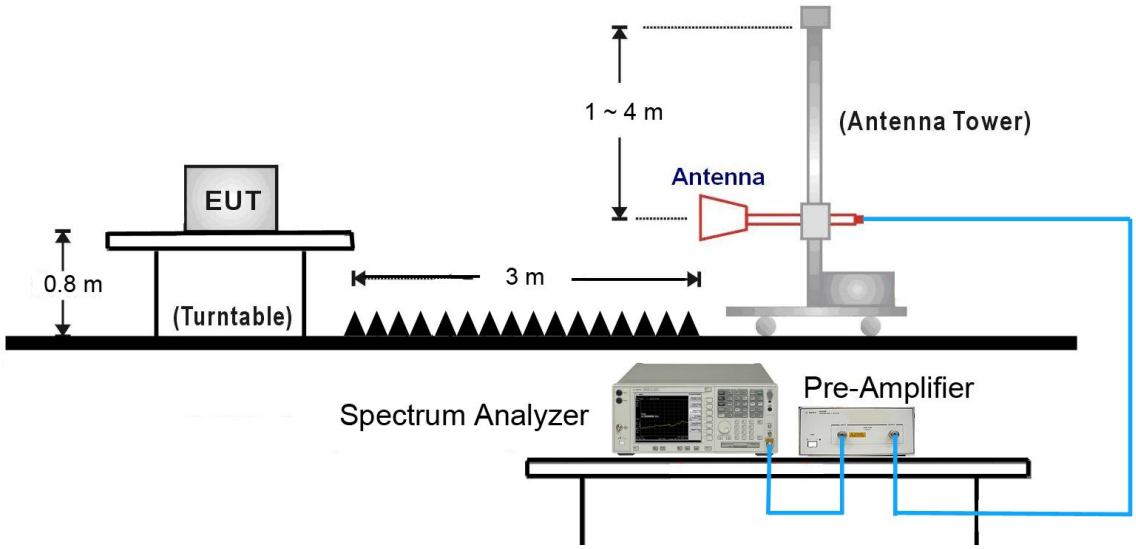
Note 3: E field strength (dBμV/m) = 20 log E field strength (uV/m)

6.3.2. Test Setup

30MHz ~ 1GHz Test Setup:

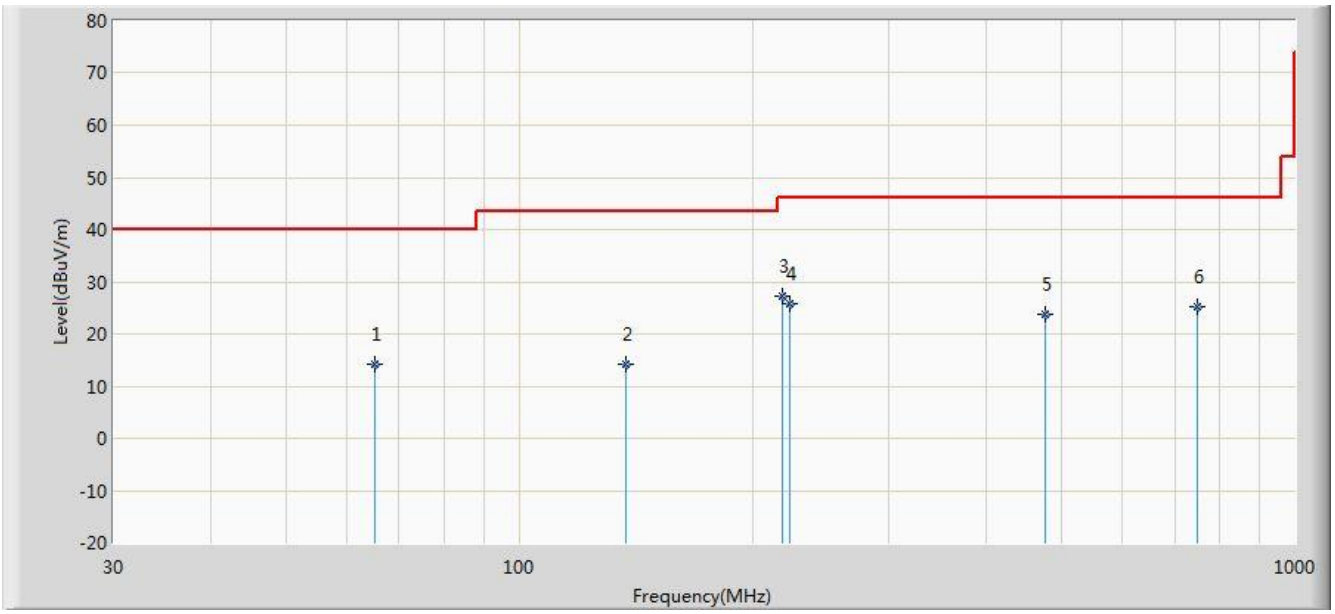


1GHz ~18GHz Test Setup:



6.3.3. Test Result of Radiated Emissions

Site: AC 1	Time: 2015/09/01 - 22:26
Limit: FCC_Part15.109_RE(3m)_Class B	Engineer: Milo Li
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: Element hub	Power: AC 120V/60Hz
Note: Normal Operation	

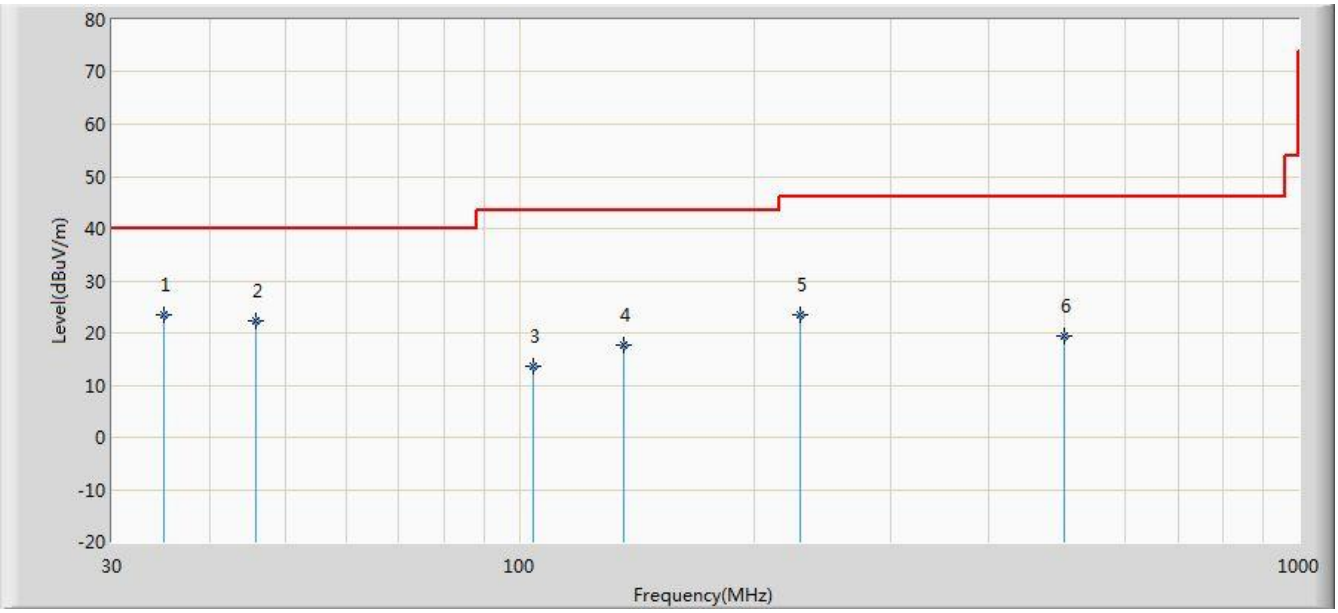


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		65.040	14.194	1.630	-25.806	40.000	12.564	123	254	QP
2		137.200	14.228	4.510	-29.272	43.500	9.717	145	186	QP
3	*	218.710	27.357	14.540	-18.643	46.000	12.817	204	310	QP
4		223.470	25.770	12.840	-20.230	46.000	12.931	115	270	QP
5		475.820	23.907	5.820	-22.093	46.000	18.087	110	235	QP
6		750.150	25.159	2.750	-20.841	46.000	22.410	116	251	QP

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

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

Site: AC 1	Time: 2015/09/01 - 22:28
Limit: FCC_Part15.109_RE(3m)_Class B	Engineer: Milo Li
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: Element hub	Power: AC 120V/60Hz
Note: Normal Operation	

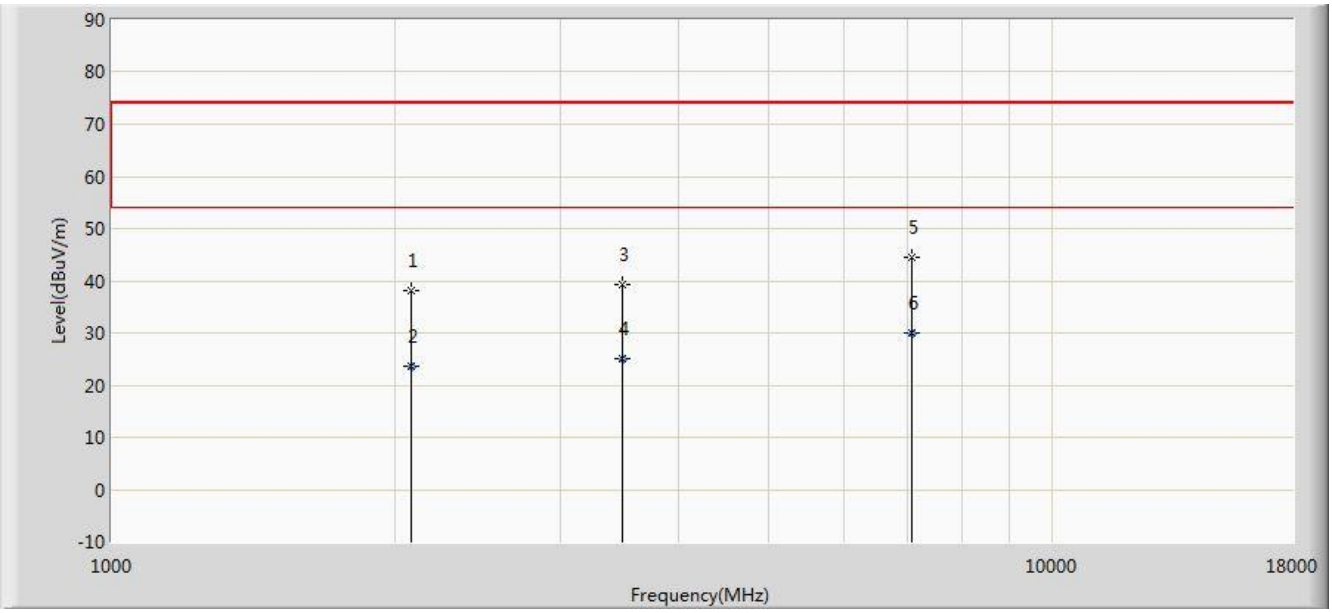


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		35.020	23.556	10.430	-16.444	40.000	13.127	145	207	QP
2		45.860	22.377	7.430	-17.623	40.000	14.947	137	118	QP
3	*	104.120	13.658	0.410	-29.842	43.500	13.248	126	236	QP
4		136.300	17.672	7.910	-25.828	43.500	9.762	147	67	QP
5		229.650	23.337	10.160	-22.663	46.000	13.177	133	89	QP
6		500.050	19.290	0.890	-26.710	46.000	18.399	147	158	QP

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

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

Site: AC 1	Time: 2015/09/01 - 22:34
Limit: FCC_Part15.109_RE(3m)_Class B	Engineer: Milo Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Element hub	Power: AC 120V/60Hz
Note: Normal Operation	

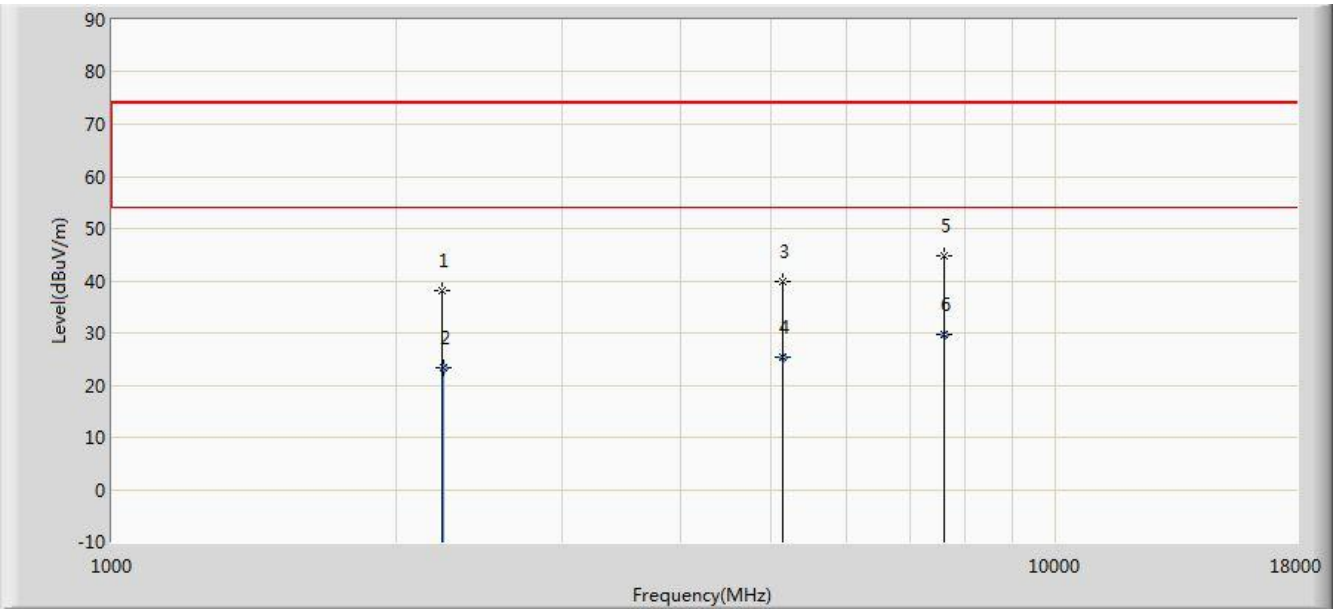


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		2079.500	38.226	43.164	-35.774	74.000	-4.938	179	247	PK
2		2080.810	23.539	28.464	-30.461	54.000	-4.925	169	258	AV
3	*	3490.500	39.244	40.411	-34.756	74.000	-1.168	114	358	PK
4		3492.700	24.977	26.133	-29.023	54.000	-1.156	109	344	AV
5		7077.500	44.533	37.251	-29.467	74.000	7.282	127	27	PK
6		7083.910	29.995	22.675	-24.005	54.000	7.321	134	36	AV

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre-Amplifier Gain (dB).

Site: AC 1	Time: 2015/09/01 - 22:34
Limit: FCC_Part15.109_RE(3m)_Class B	Engineer: Milo Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Element hub	Power: AC 120V/60Hz
Note: Normal Operation	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		2241.000	37.999	41.473	-36.001	74.000	-3.474	208	174	PK
2		2243.500	23.248	26.715	-30.752	54.000	-3.467	211	189	AV
3	*	5131.000	39.954	36.647	-34.046	74.000	3.307	175	251	PK
4		5132.875	25.441	22.133	-28.559	54.000	3.309	163	268	AV
5		7621.500	44.836	36.787	-29.164	74.000	8.048	126	164	PK
6		7625.781	29.732	21.688	-24.268	54.000	8.044	118	157	AV

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 **Element hub FCC ID:**

2ABX8SH-000000011 has been tested to comply with the requirements specified in §15.107 and

§15.109 of the FCC Rules.

The End