



# FCC Test Report

**APPLICANT** : Ubiquiti Networks, Inc.  
**EQUIPMENT** : Front Row Camera  
**BRAND NAME** : ULABS  
**MODEL NAME** : FR  
**FCC ID** : SWX-FR  
**STANDARD** : FCC 47 CFR FCC Part 15 Subpart B  
**CLASSIFICATION** : Certification

The product was received on Mar. 30, 2017 and testing was completed on Apr. 18, 2017. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Louis Wu / Manager

Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

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SPORTON INTERNATIONAL INC.

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FCC ID : SWX-FR

Page Number : 1 of 19

Report Issued Date : May 09, 2017

Report Version : Rev. 01

Report Template No.: BU5-FD15B Version 2.0



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### REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC741250	Rev. 01	Initial issue of report	May 09, 2017



## SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.107	AC Conducted Emission	< 15.107 limits	PASS	Under limit 6.60 dB at 0.190 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 4.09 dB at 194.970 MHz for peak



# 1. General Description

## 1.1. Applicant

Ubiquiti Networks, Inc.  
2580 Orchard Parkway San Jose, CA 95131

## 1.2. Manufacturer

Ubiquiti Networks, Inc.  
2580 Orchard Parkway San Jose, CA 95131

## 1.3. Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac.

Product Specification subjective to this standard	
Antenna Type	WLAN: Internal Antenna Bluetooth: Internal Antenna

## 1.4. Modification of EUT

No modifications are made to the EUT during all test items.



### 1.5. Test Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

<b>Test Site</b>	SPORTON INTERNATIONAL INC.	
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	
	CO05-HY	03CH06-HY

### 1.6. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC 47 CFR FCC Part 15 Subpart B
- ♦ ANSI C63.4-2014

**Remark:** All test items were verified and recorded according to the standards and without any deviation during the test.



## 2. Test Configuration of Equipment Under Test

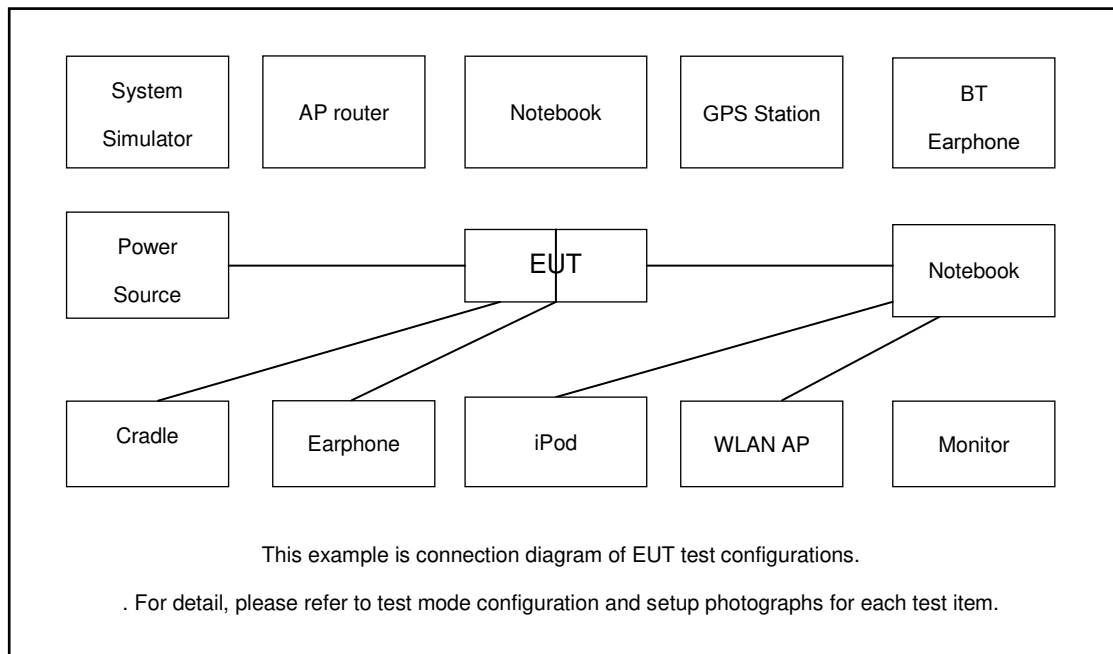
### 2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
AC Conducted Emission	Mode 1 : Bluetooth Idle + WLAN (2.4GHz) Idle + Camera (Front) + USB Cable (Data Link with Notebook) Mode 2 : Bluetooth Idle + WLAN (5GHz) Idle + Camera (Rear) + USB Cable (Data Link with Notebook) Mode 3 : Bluetooth Idle + WLAN (2.4GHz) Idle + MPEG4 + USB Cable (Data Link with Notebook)
Radiated Emissions	Mode 1 : Bluetooth Idle + WLAN (2.4GHz) Idle + Camera (Front) + USB Cable (Data Link with Notebook) Mode 2 : Bluetooth Idle + WLAN (5GHz) Idle + Camera (Rear) + USB Cable (Data Link with Notebook) Mode 3 : Bluetooth Idle + WLAN (5GHz) Idle + MPEG4 + USB Cable (Data Link with Notebook)
<b>Remark:</b> <ol style="list-style-type: none"> <li>1. The worst case of AC is mode 1; only the test data of this mode was reported.</li> <li>2. The worst case of RE is mode 3; only the test data of this mode was reported.</li> <li>3. Data Link with Notebook means data application transferred mode between EUT and Notebook.</li> </ol>	

## 2.2. Connection Diagram of Test System



## 2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
4.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A





## **2.4. EUT Operation Test Setup**

The EUT was synchronized to the BCCH, and is in continuous receiving mode by setting system simulator's paging reorganization.

At the same time, the EUT was attached to the Bluetooth earphone or WLAN AP, and the following programs installed in the EUT were programmed during the test.

1. Data application is transferred between Laptop and EUT via USB cable.
2. Execute "Video Player" to play MPEG4 files.
3. Turn on camera to capture images.
4. EUT links with Notebook and execute ping.



### 3. Test Result

#### 3.1. Test of AC Conducted Emission Measurement

##### 3.1.1 Limits of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

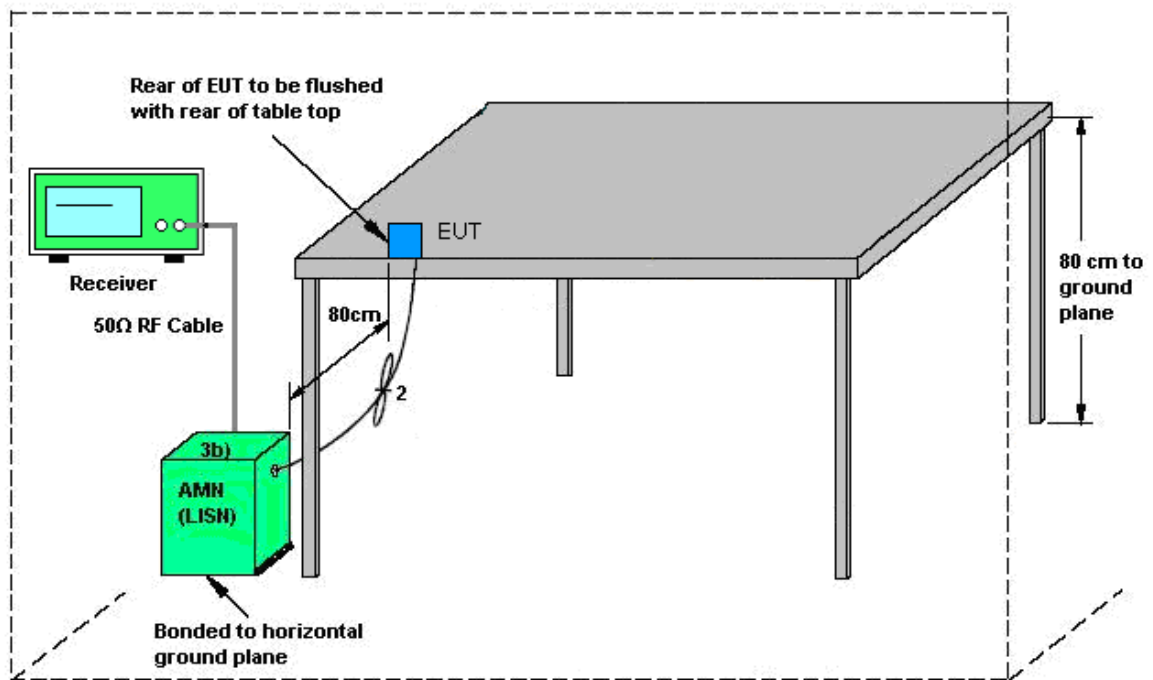
##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

##### 3.1.3 Test Procedure

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

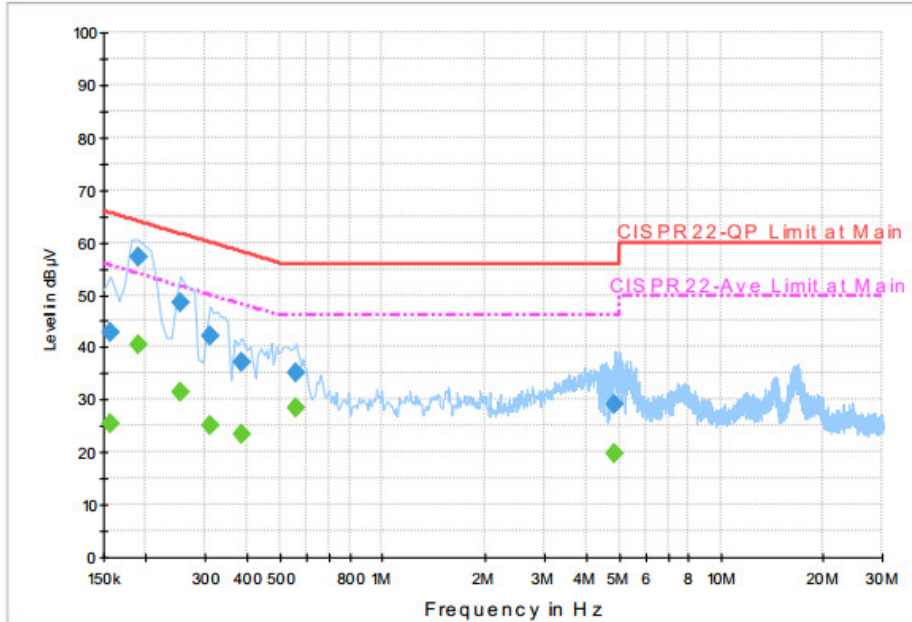
### 3.1.4 Test Setup



AMN = Artificial mains network (LISN)  
AE = Associated equipment  
EUT = Equipment under test  
ISN = Impedance stabilization network

### 3.1.5 Test Result of AC Conducted Emission

Test Engineer :	Eric Jeng	Temperature :	21~24°C
		Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line



#### Final Result : Quasi-Peak

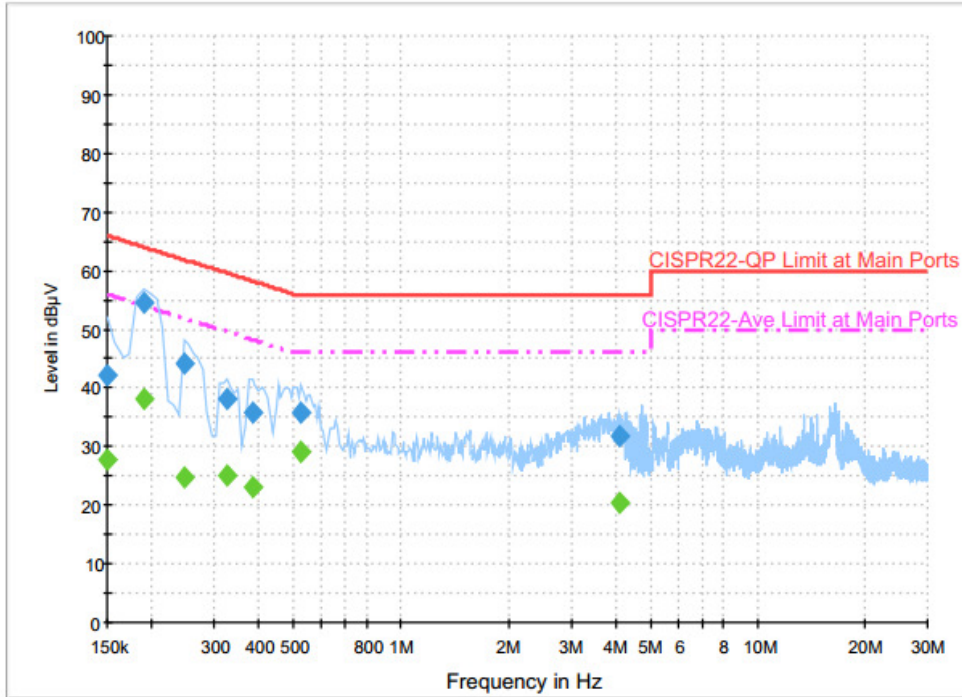
Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	43.0	Off	L1	19.5	22.6	65.6
0.190000	57.4	Off	L1	19.5	6.6	64.0
0.254000	48.7	Off	L1	19.5	12.9	61.6
0.310000	42.3	Off	L1	19.5	17.7	60.0
0.382000	37.3	Off	L1	19.5	20.9	58.2
0.558000	35.1	Off	L1	19.5	20.9	56.0
4.846000	29.2	Off	L1	19.6	26.8	56.0

#### Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	25.3	Off	L1	19.5	30.3	55.6
0.190000	40.3	Off	L1	19.5	13.7	54.0
0.254000	31.5	Off	L1	19.5	20.1	51.6
0.310000	25.0	Off	L1	19.5	25.0	50.0
0.382000	23.4	Off	L1	19.5	24.8	48.2
0.558000	28.4	Off	L1	19.5	17.6	46.0
4.846000	19.6	Off	L1	19.6	26.4	46.0



Test Engineer :	Eric Jeng	Temperature :	21~24°C
		Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



**Final Result : Quasi-Peak**

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	42.2	Off	N	19.5	23.8	66.0
0.190000	54.6	Off	N	19.5	9.4	64.0
0.246000	44.1	Off	N	19.5	17.8	61.9
0.326000	38.2	Off	N	19.5	21.4	59.6
0.382000	35.6	Off	N	19.5	22.6	58.2
0.526000	35.9	Off	N	19.5	20.1	56.0
4.126000	31.8	Off	N	19.6	24.2	56.0

**Final Result : Average**

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	27.9	Off	N	19.5	28.1	56.0
0.190000	38.0	Off	N	19.5	16.0	54.0
0.246000	24.7	Off	N	19.5	27.2	51.9
0.326000	25.1	Off	N	19.5	24.5	49.6
0.382000	23.0	Off	N	19.5	25.2	48.2
0.526000	29.0	Off	N	19.5	17.0	46.0
4.126000	20.2	Off	N	19.6	25.8	46.0



### 3.2. Test of Radiated Emission Measurement

#### 3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

#### 3.2.2. Measuring Instruments

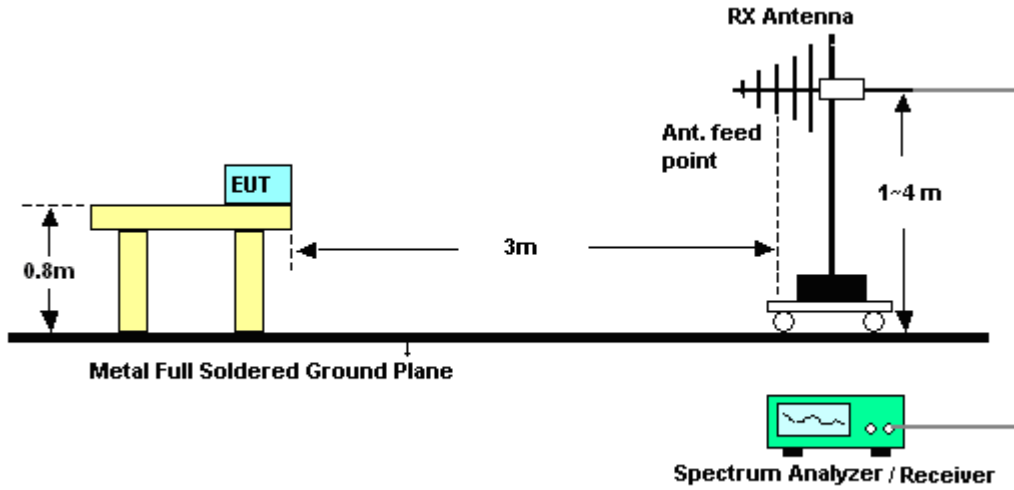
The measuring equipment is listed in the section 4 of this test report.

#### 3.2.3. Test Procedures

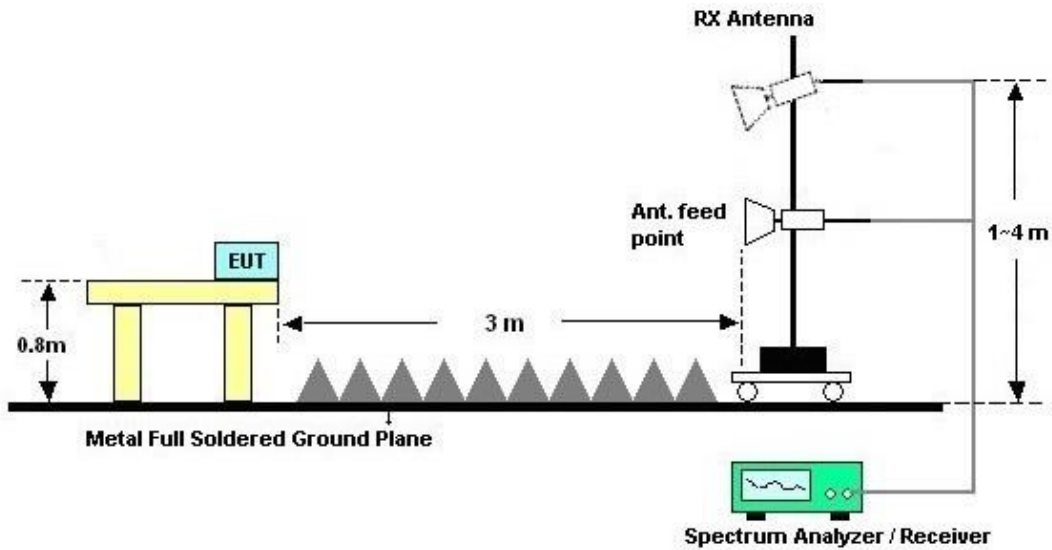
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBµV/m) = 20 log Emission level (µV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

### 3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz



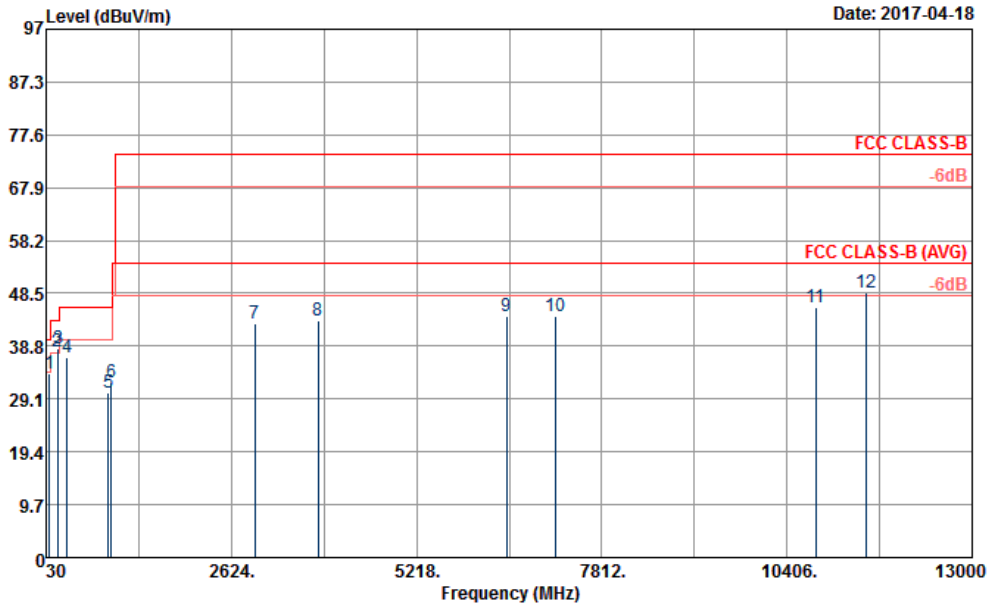
For radiated emissions above 1GHz





3.2.5. Test Result of Radiated Emission

Test Engineer :	Donny Tang	Temperature :	21~24°C
		Relative Humidity :	51~53%
Test Distance :	3m	Polarization :	Horizontal



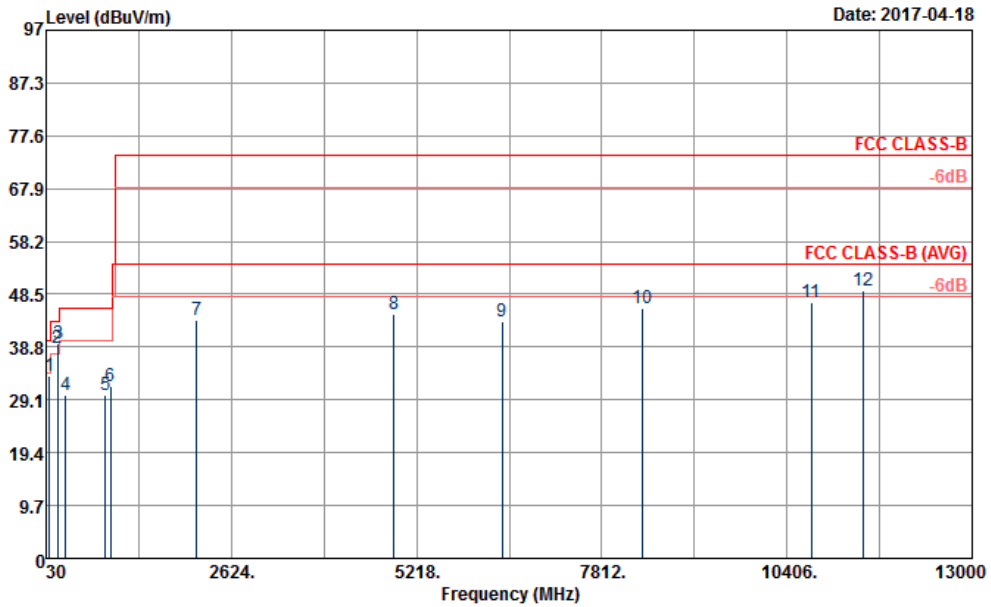
Site : 03CH06-HY  
 Condition : FCC CLASS-B 3m 9120D\_1156\_160817 HORIZONTAL  
 Project : 741250  
 Power : FromSystem  
 Mode : Mode 4  
 Plane : Y

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos	T/Pos	Remark	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	71.58	33.90	-6.10	40.00	51.28	12.32	2.04	31.74	---	---	Peak
2	187.14	37.74	-5.76	43.50	52.78	14.71	1.97	31.72	---	---	Peak
3	195.51	38.35	-5.15	43.50	53.30	14.82	1.95	31.72	100	151	Peak
4	321.00	36.67	-9.33	46.00	46.64	19.47	2.26	31.70	---	---	Peak
5	898.50	30.32	-15.68	46.00	28.96	29.51	3.39	31.54	---	---	Peak
6	941.20	32.07	-13.93	46.00	29.33	30.77	3.11	31.14	---	---	Peak
7	2958.00	42.85	-31.15	74.00	67.05	28.90	7.66	60.76	---	---	Peak
8	3840.00	43.54	-30.46	74.00	64.84	29.96	10.15	61.41	---	---	Peak
9	6474.00	44.20	-29.80	74.00	56.37	35.53	12.15	59.85	---	---	Peak
10	7172.00	44.36	-29.64	74.00	55.69	36.92	11.92	60.17	---	---	Peak
11	10810.00	46.02	-27.98	74.00	49.41	41.00	14.80	59.19	---	---	Peak
12	11524.00	48.74	-25.26	74.00	48.31	42.42	16.02	58.01	100	126	Peak





Test Engineer :	Donny Tang	Temperature :	21~24°C
		Relative Humidity :	51~53%
Test Distance :	3m	Polarization :	Vertical



Site : 03CH06-HY  
 Condition : FCC CLASS-B 3m 9120D\_1156\_160817 VERTICAL  
 Project : 741250  
 Power : FromSystem  
 Mode : Mode 4  
 Plane : Y

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos	T/Pos	Remark	
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	cm	deg	
1	71.85	33.49	-6.51	40.00	50.87	12.32	2.04	31.74	---	---	Peak
2	186.06	38.66	-4.84	43.50	53.69	14.72	1.97	31.72	---	---	Peak
3	194.97	39.41	-4.09	43.50	54.37	14.81	1.95	31.72	100	199	Peak
4	300.70	29.94	-16.06	46.00	40.16	19.19	2.28	31.69	---	---	Peak
5	863.50	30.05	-15.95	46.00	29.01	29.39	3.33	31.68	---	---	Peak
6	929.30	31.49	-14.51	46.00	29.11	30.45	3.19	31.26	---	---	Peak
7	2134.00	43.77	-30.23	74.00	70.88	26.81	6.48	60.40	---	---	Peak
8	4900.00	44.78	-29.22	74.00	62.09	31.61	11.11	60.03	---	---	Peak
9	6414.00	43.40	-30.60	74.00	55.66	35.40	12.08	59.74	---	---	Peak
10	8376.00	46.05	-27.95	74.00	53.22	38.36	13.67	59.20	---	---	Peak
11	10750.00	46.93	-27.07	74.00	50.59	41.00	14.67	59.33	---	---	Peak
12	11482.00	49.10	-24.90	74.00	48.72	42.45	15.95	58.02	100	190	Peak



## 4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Mar. 30, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Mar. 30, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Mar. 30, 2017	Nov. 28, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 06, 2016	Mar. 30, 2017	Dec. 05, 2017	Conduction (CO05-HY)
Bilog Antenna	Schaffner	CBL6111C&N-6-06	2725&AT-N0601	30MHz~1GHz	Oct. 15, 2016	Mar. 31, 2017 ~ Apr. 18, 2017	Oct. 14, 2017	Radiation (03CH06-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Dec. 29, 2016	Mar. 31, 2017 ~ Apr. 18, 2017	Dec. 28, 2017	Radiation (03CH06-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Aug. 05, 2016	Mar. 31, 2017 ~ Apr. 18, 2017	Aug. 04, 2017	Radiation (03CH06-HY)
Preamplifier	SONOMA	310N	187231	9kHz~1GHz	Jan. 09, 2017	Mar. 31, 2017 ~ Apr. 18, 2017	Jan. 08, 2018	Radiation (03CH06-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1850117	1GHz ~ 18GHz	Jun. 22, 2016	Mar. 31, 2017 ~ Apr. 18, 2017	Jun. 21, 2017	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF78020821 2	1m~4m	N/A	Mar. 31, 2017 ~ Apr. 18, 2017	N/A	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0-360 degree	N/A	Mar. 31, 2017 ~ Apr. 18, 2017	N/A	Radiation (03CH06-HY)



## 5. Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.7
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.9
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.7
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