

# FCC RF Test Report

**APPLICANT** : Ubiquiti Networks,Inc.  
**EQUIPMENT** : Access Point  
**BRAND NAME** : UBIQUITI  
**MODEL NAME** : M5GHP  
**FCC ID** : SWX-M5GHP  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

The product was received on Sep. 06, 2013 and testing was completed on Mar. 05, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown to be compliant 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: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

**No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.**

SPORTON INTERNATIONAL INC.

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FCC ID : SWX-M5GHP

Page Number : 1 of 47

Report Issued Date : Mar. 24, 2014

Report Version : Rev. 01



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### REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR390612	Rev. 01	Initial issue of report	Mar. 24, 2014

## SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-210 A8.2(a)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	RSS-Gen 4.6.1	99% Bandwidth	-	Pass	-
3.2	15.247(b)	RSS-210 A8.4	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	RSS-210 A8.5	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
			Conducted Spurious Emission		Pass	-
3.5	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 0.46 dB at 11570.000 MHz
3.6	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 11.40 dB at 0.438 MHz
3.7	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

# 1 General Description

## 1.1 Applicant

**Ubiquiti Networks, Inc.**

12F, No. 105, Song Ren Rd., Sin Yi District, Taipei 110, Taiwan

## 1.2 Manufacturer

**Ubiquiti Networks, Inc.**

12F, No. 105, Song Ren Rd., Sin Yi District, Taipei 110, Taiwan

## 1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Access Point
Brand Name	UBIQUITI
Model Name	M5GHP
FCC ID	SWX-M5GHP
EUT supports Radios application	WLAN 11a/n HT20/HT40
EUT Stage	Identical Prototype

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	802.11a/n: 5745~5825MHz.
Maximum (Peak) Output Power to Antenna	802.11a : 25.65 dBm (0.3673 W) 802.11n HT20 : 25.87 dBm (0.3864 W) 802.11n HT40 : 25.94 dBm (0.3926 W)
99% Occupied Bandwidth	802.11a : 18.00MHz 802.11n HT20 : 18.80MHz 802.11n HT40 : 36.80MHz
Antenna Type	Grid Antenna with gain 28.0 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

## 1.5 Modification of EUT

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

## 1.6 Testing Site

<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 Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978			
<b>Test Site No.</b>	<b>Sporton Site No.</b>			<b>FCC/IC Registration No.</b>
	TH02-HY	CO05-HY	03CH07-HY	722060/4086B-1

**Note:** The test site complies with ANSI C63.4 2003 requirement.

## 1.7 Applied Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01
- ♦ ANSI C63.4-2003

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



## 2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz) and radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

### 2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4	149	5745	159	5795
	151	5755	161	5805
	153	5765	165	5825
	157	5785	-	-



## 2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test shown in the following tables.

5GHz 802.11a mode								
Data Rate (MHz)	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Peak Power (dBm)	25.65	25.60	25.45	25.56	25.53	25.46	25.34	25.53

5GHz 802.11n HT20 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	25.87	25.63	25.60	25.73	25.72	25.75	25.74	25.76

5GHz 802.11n HT40 mode								
Data Rate (MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Peak Power (dBm)	25.94	25.92	25.89	25.84	25.85	25.91	25.84	25.88





### 2.3 Test Mode

Final results of test modes, data rates and test channels are shown as following table.

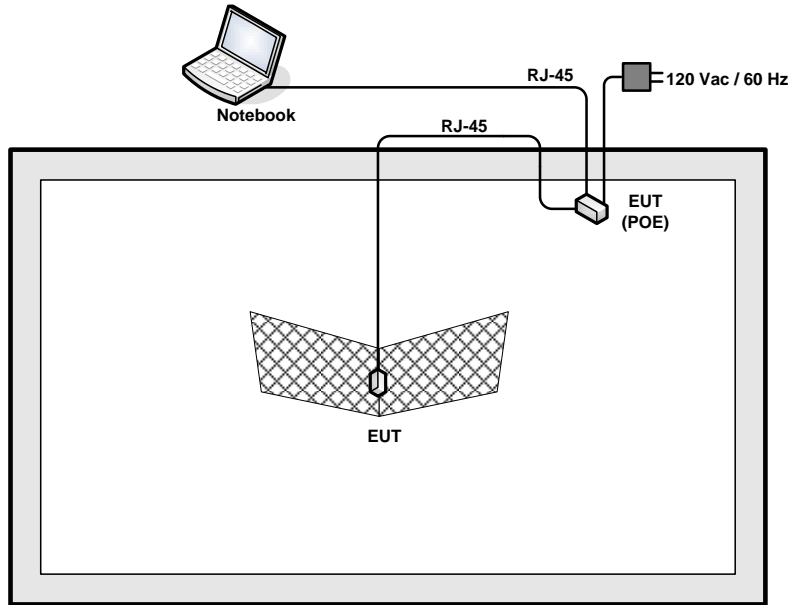
<5GHz>

Test Cases				
Conducted TCs	Test Items	Mode	Data Rate	Test Channel
	Conducted TCs	6dB and 99% BW Power Spectral Density	802.11a	6 Mbps
802.11n HT20			MCS0	149/157/165
802.11n HT40			MCS0	151/159
Output Power		802.11a	6 Mbps	149/157/165
		802.11n HT20	MCS0	149/157/165
		802.11n HT40	MCS0	151/159
Conducted Band Edge		802.11a	6 Mbps	149/165
		802.11n HT20	MCS0	149/165
		802.11n HT40	MCS0	151/159
Conducted Spurious Emission	802.11a	6 Mbps	149/157/165	
	802.11n HT20	MCS0	149/157/165	
	802.11n HT40	MCS0	151/159	
Radiated TCs	Radiated Band Edge	802.11a	6 Mbps	149/165
		802.11n HT20	MCS0	149/165
		802.11n HT40	MCS0	151/159
	Radiated Spurious Emission	802.11a	6 Mbps	149/157/165
		802.11n HT20	MCS0	149/157/165
		802.11n HT40	MCS0	151/159

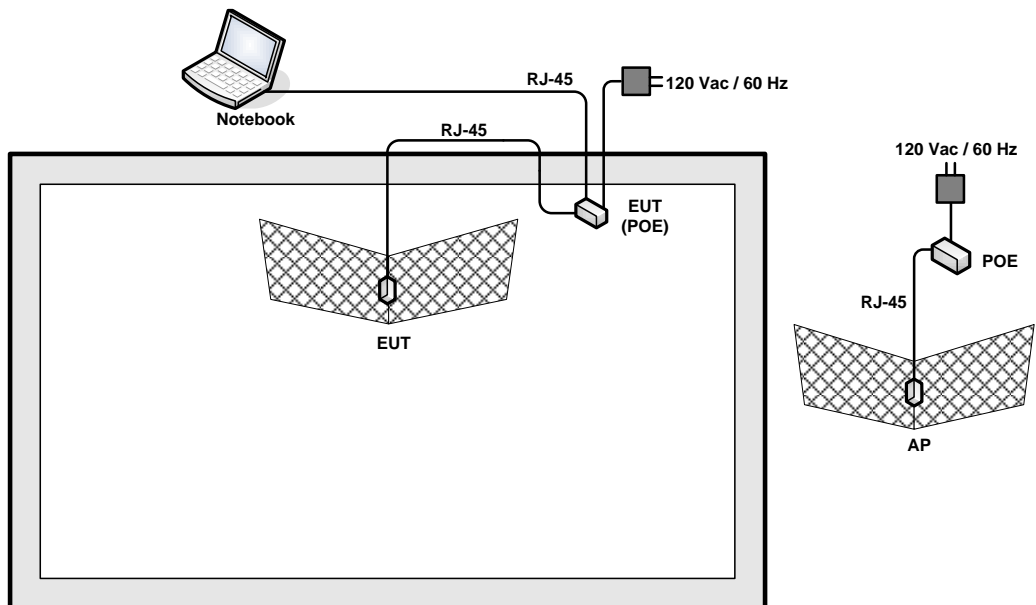
Test Cases	
AC Conducted Emission	Mode 1 : WLAN Link + POE + LAN Link

## 2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



## 2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	DELL	P20G	FCC DoC	Unshielded, 2.0 m	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	Notebook	DELL	Latitude E6320	N/A	Unshielded, 2.0 m	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	AP	UBIQUITI	AirGridM5-HP	N/A	N/A	N/A
4.	POE	UBIQUITI	GP-A240-050G	N/A	Unshielded, 2.0 m	Unshielded, 0.5m

## 2.6 EUT Operation Test Setup

For WLAN function, programmed RF utility, “Atheros Radio test2” installed in the notebook make the EUT provides functions like channel selection and power level for continuous transmitting and receiving signals.

## 2.7 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

### 3 Test Result

#### 3.1 6dB and 99% Bandwidth Measurement

##### 3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

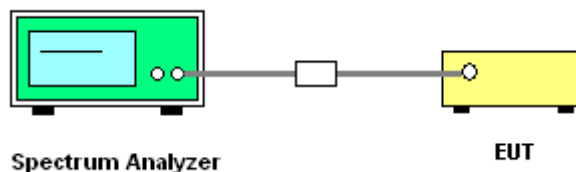
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r01.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

##### 3.1.4 Test Setup

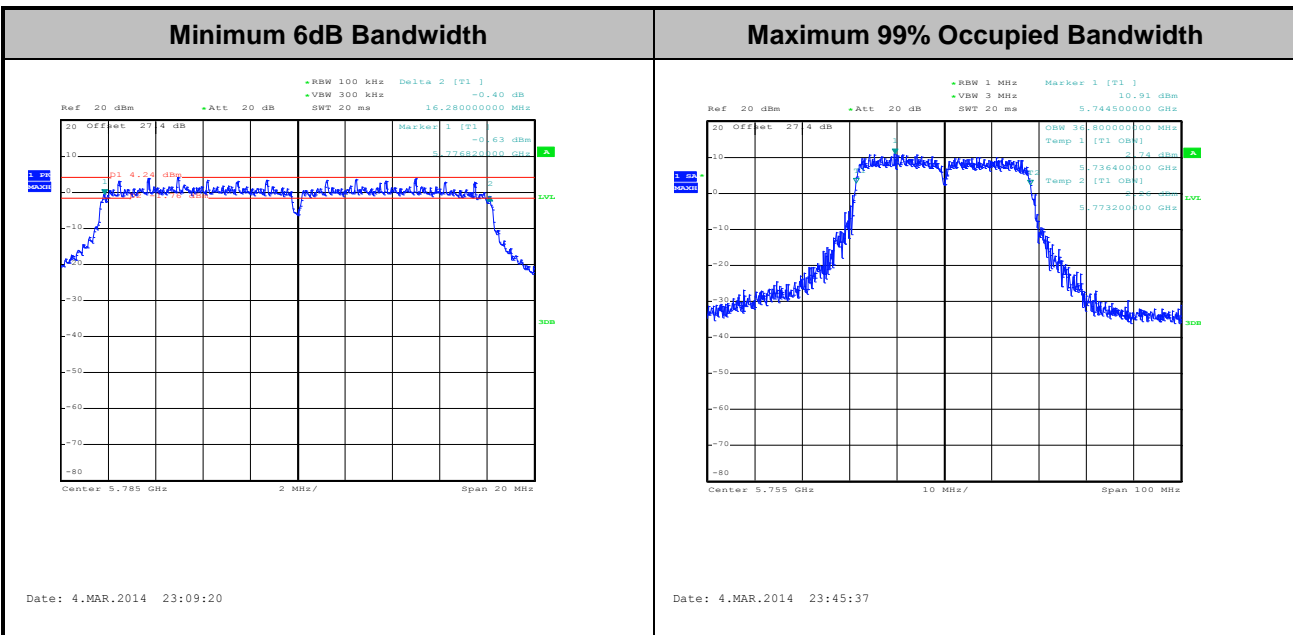




3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Test Band :	5GHz band 4	Temperature :	21~26°C
Test Engineer :	Osolemio Chang	Relative Humidity :	45~54%

Mod.	Data Rate	N <sub>TX</sub>	Channel	Freq. (MHz)	99% Bandwidth (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
11a	6Mbps	1	149	5745	17.85	16.32	0.5	Pass
11a	6Mbps	1	157	5785	17.90	16.28	0.5	Pass
11a	6Mbps	1	165	5825	18.00	16.32	0.5	Pass
HT20	MCS0	1	149	5745	18.75	17.12	0.5	Pass
HT20	MCS0	1	157	5785	18.75	17.32	0.5	Pass
HT20	MCS0	1	165	5825	18.80	17.28	0.5	Pass
HT40	MCS0	1	151	5755	36.80	35.68	0.5	Pass
HT40	MCS0	1	159	5795	36.80	35.92	0.5	Pass



## 3.2 Output Power Measurement

### 3.2.1 Limit of Output Power

For systems using digital modulation in the 5725-5850MHz, the limit for peak output power is 30dBm. Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

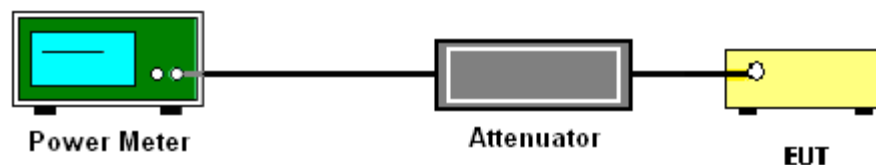
### 3.2.2 Measuring Instruments

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

### 3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r01.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

### 3.2.4 Test Setup





3.2.5 Test Result of Peak Output Power

Test Mode :	5GHz band 4	Temperature :	21~26°C
Test Engineer :	Osolemio Chang	Relative Humidity :	45~54%

Mod.	Data Rate	N <sub>TX</sub>	Channel	Freq. (MHz)	RF Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11a	6Mbps	1	149	5745	23.52	30	28.00	Pass
11a	6Mbps	1	157	5785	24.15	30	28.00	Pass
11a	6Mbps	1	165	5825	25.65	30	28.00	Pass
HT20	MCS0	1	149	5745	25.09	30	28.00	Pass
HT20	MCS0	1	157	5785	25.51	30	28.00	Pass
HT20	MCS0	1	165	5825	25.87	30	28.00	Pass
HT40	MCS0	1	151	5755	25.27	30	28.00	Pass
HT40	MCS0	1	159	5795	25.94	30	28.00	Pass

Note: Measured power (dBm) has offset with cable loss.



3.2.6 Test Result of Average output Power (Reporting Only)

Test Mode :	5GHz band 4	Temperature :	21~26°C
Test Engineer :	Osolemio Chang	Relative Humidity :	45~54%

Mod.	Data Rate	N <sub>TX</sub>	Channel	Freq. (MHz)	Duty Factor (dB)	Average Output Power (dBm)	Power Limit (dBm)	DG (dBi)	Pass/Fail
11a	6Mbps	1	149	5745	0.06	12.98	30.00	28.00	Pass
11a	6Mbps	1	157	5785	0.06	13.69	30.00	28.00	Pass
11a	6Mbps	1	165	5825	0.06	15.25	30.00	28.00	Pass
HT20	MCS0	1	149	5745	0.05	14.49	30.00	28.00	Pass
HT20	MCS0	1	157	5785	0.05	15.53	30.00	28.00	Pass
HT20	MCS0	1	165	5825	0.05	15.82	30.00	28.00	Pass
HT40	MCS0	1	151	5755	0.07	15.62	30.00	28.00	Pass
HT40	MCS0	1	159	5795	0.07	16.84	30.00	28.00	Pass

Note: Measured power (dBm) has offset with cable loss and duty factor.



### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

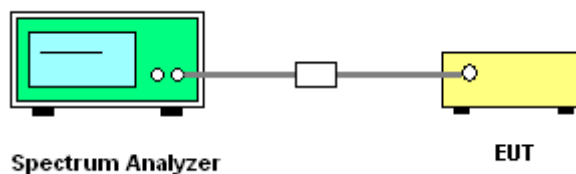
#### 3.3.2 Measuring Instruments

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

#### 3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

#### 3.3.4 Test Setup



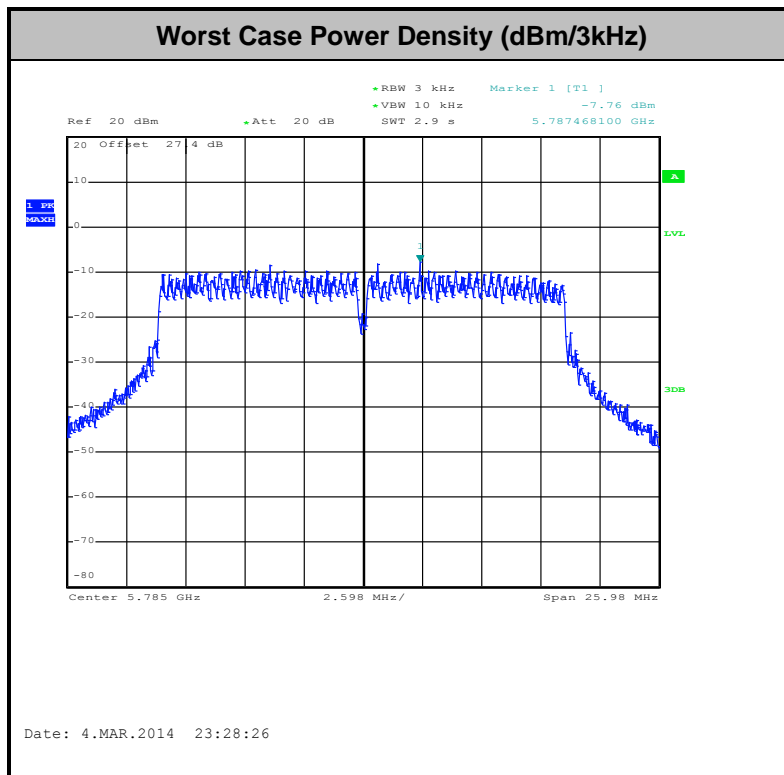


3.3.5 Test Result of Power Spectral Density

Test Mode :	5GHz band 4	Temperature :	21~26°C
Test Engineer :	Osolemio Chang	Relative Humidity :	45~54%

Mod.	Data Rate	N <sub>TX</sub>	Channel	Freq. (MHz)	Peak Power Density (dBm/3kHz)	Max. Limits (dBm/3kHz)	DG (dBi)	Pass/Fail
11a	6Mbps	1	149	5745	-11.58	8.00	28.00	Pass
11a	6Mbps	1	157	5785	-9.63	8.00	28.00	Pass
11a	6Mbps	1	165	5825	-7.92	8.00	28.00	Pass
HT20	MCS0	1	149	5745	-10.28	8.00	28.00	Pass
HT20	MCS0	1	157	5785	-7.76	8.00	28.00	Pass
HT20	MCS0	1	165	5825	-8.52	8.00	28.00	Pass
HT40	MCS0	1	151	5755	-8.47	8.00	28.00	Pass
HT40	MCS0	1	159	5795	-10.42	8.00	28.00	Pass

Note: Measured power density (dBm) has offset with cable loss.



## 3.4 Conducted Band Edges and Spurious Emission Measurement

### 3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

### 3.4.2 Measuring Instruments

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

### 3.4.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### 3.4.4 Test Setup



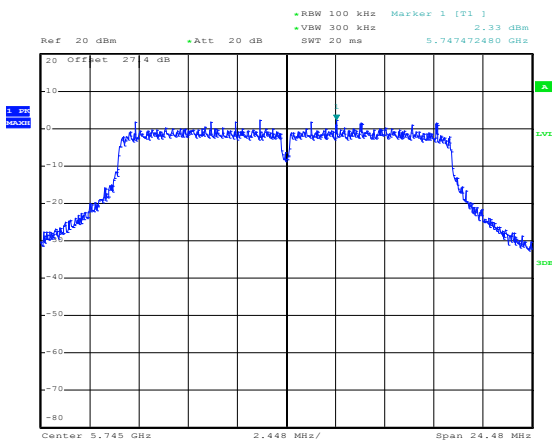


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11a	Temperature :	21~26°C
Test Band :	5GHz Low	Relative Humidity :	45~54%
Test Channel :	149	Test Engineer :	Osolemio Chang

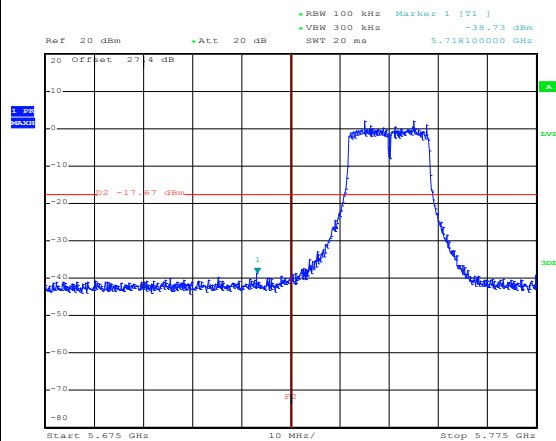
WLAN 802.11a Channel 149

100kHz PSD reference Level



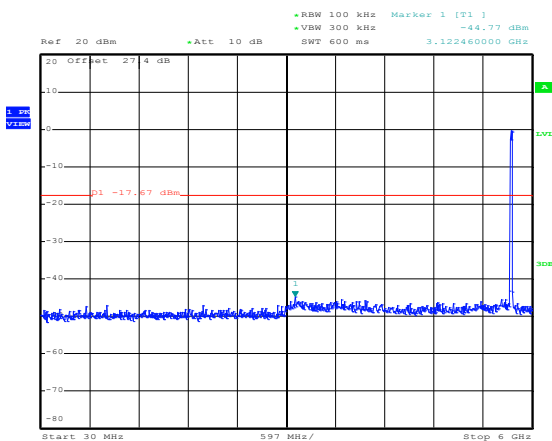
Date: 4.MAR.2014 23:04:44

Low Channel Plot



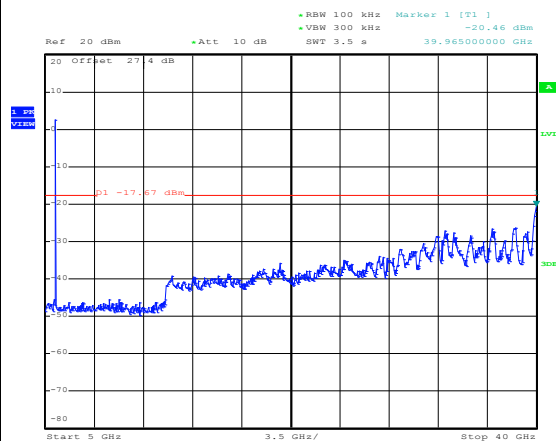
Date: 4.MAR.2014 23:04:58

Spurious Emission 30MHz~6GHz



Date: 5.MAR.2014 03:00:51

Spurious Emission 5GHz~40GHz



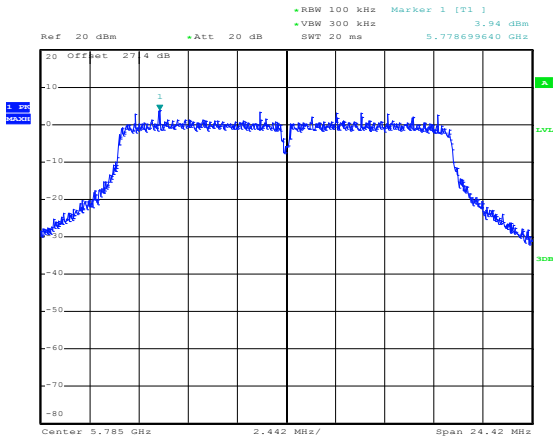
Date: 5.MAR.2014 03:01:09



Test Mode :	802.11a	Temperature :	21~26°C
Test Band :	5GHz Mid.	Relative Humidity :	45~54%
Test Channel :	157	Test Engineer :	Osolemio Chang

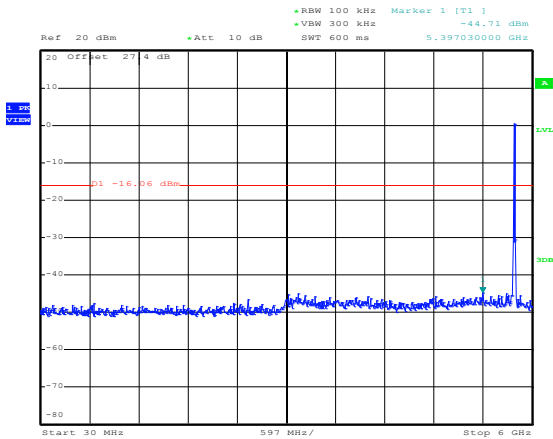
WLAN 802.11a Channel 157

100kHz PSD reference Level



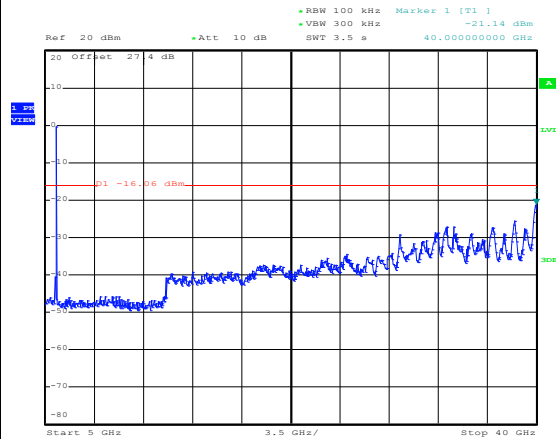
Date: 4.MAR.2014 23:09:50

Spurious Emission 30MHz~6GHz



Date: 5.MAR.2014 03:02:27

Spurious Emission 5GHz~40GHz



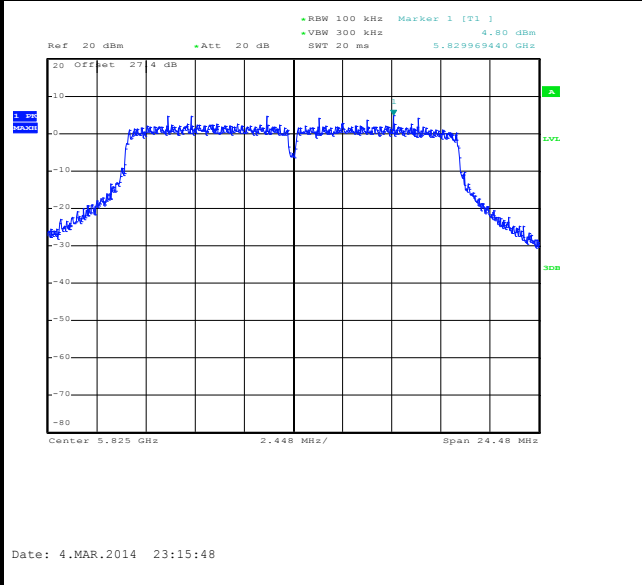
Date: 5.MAR.2014 03:02:45



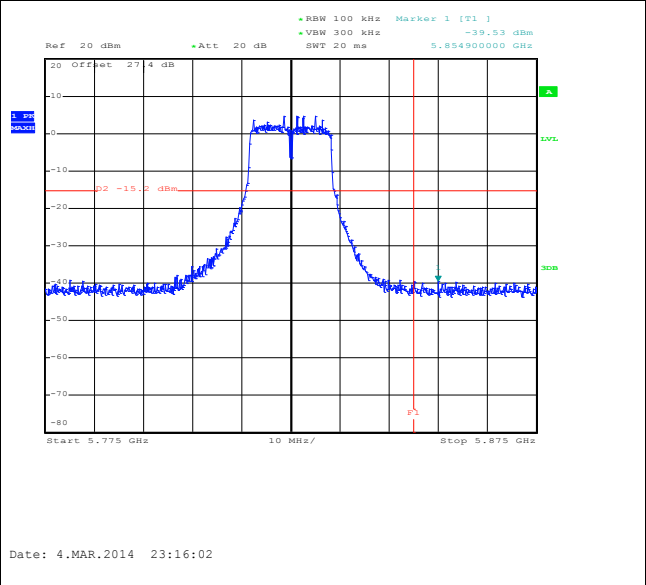
Test Mode :	802.11a	Temperature :	21~26°C
Test Band :	5GHz High	Relative Humidity :	45~54%
Test Channel :	165	Test Engineer :	Osolemio Chang

WLAN 802.11a Channel 165

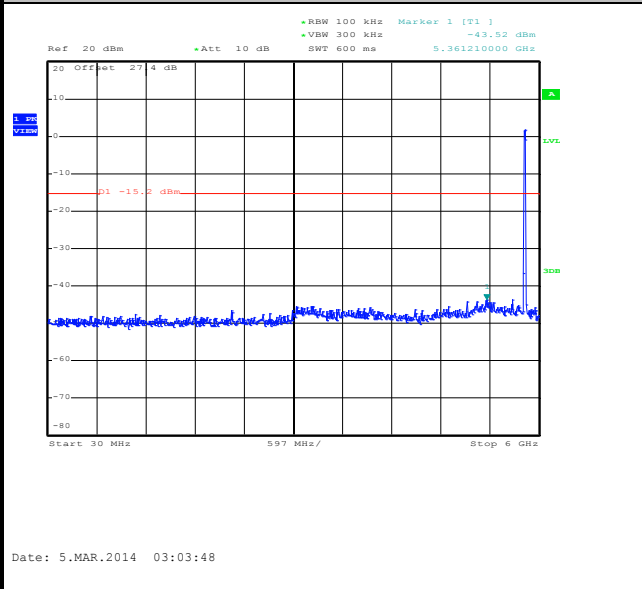
100kHz PSD reference Level



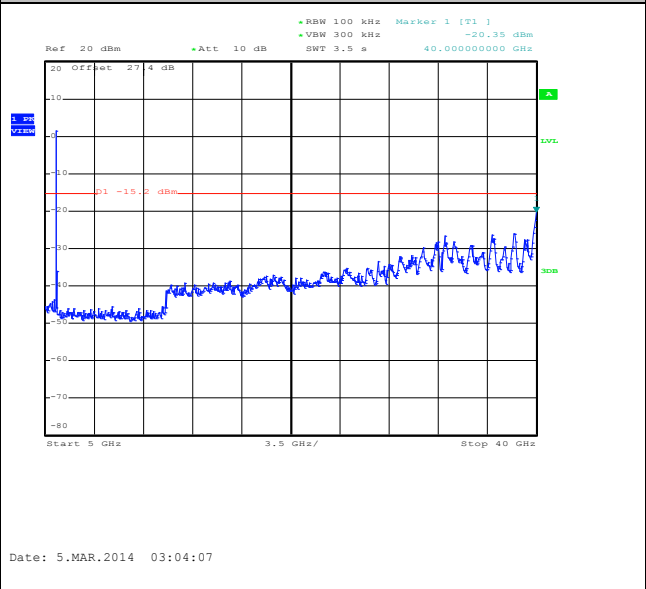
High Channel Plot



Spurious Emission 30MHz~6GHz



Spurious Emission 5GHz~40GHz

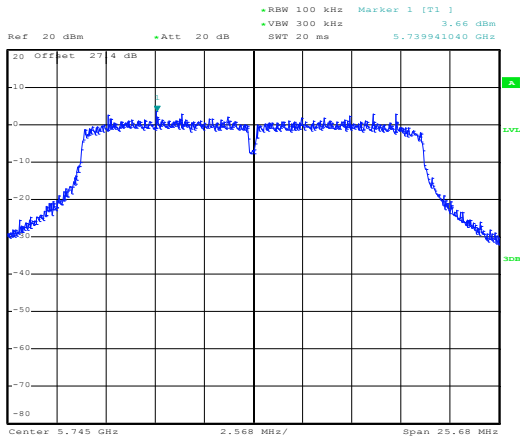




Test Mode :	802.11n HT20	Temperature :	21~26°C
Test Band :	5GHz Low	Relative Humidity :	45~54%
Test Channel :	149	Test Engineer :	Osolemio Chang

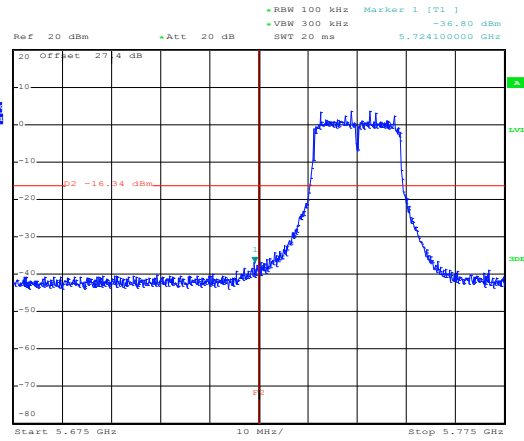
WLAN 802.11n HT20 Channel 149

100kHz PSD reference Level



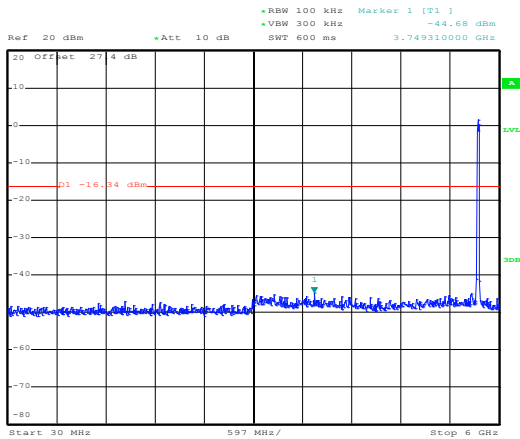
Date: 4.MAR.2014 23:20:50

Low Channel Plot



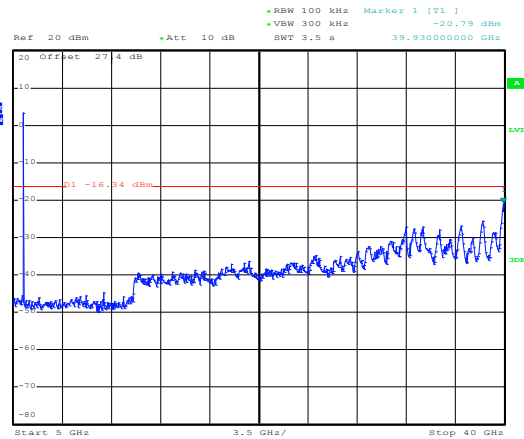
Date: 4.MAR.2014 23:35:44

Spurious Emission 30MHz~6GHz



Date: 5.MAR.2014 03:07:24

Spurious Emission 5GHz~40GHz



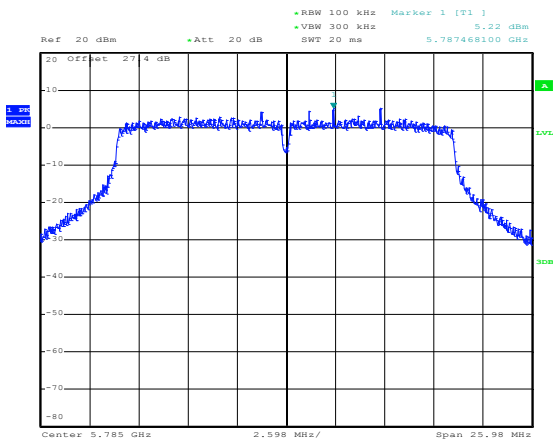
Date: 5.MAR.2014 03:07:43



Test Mode :	802.11n HT20	Temperature :	21~26°C
Test Band :	5GHz Mid	Relative Humidity :	45~54%
Test Channel :	157	Test Engineer :	Osolemio Chang

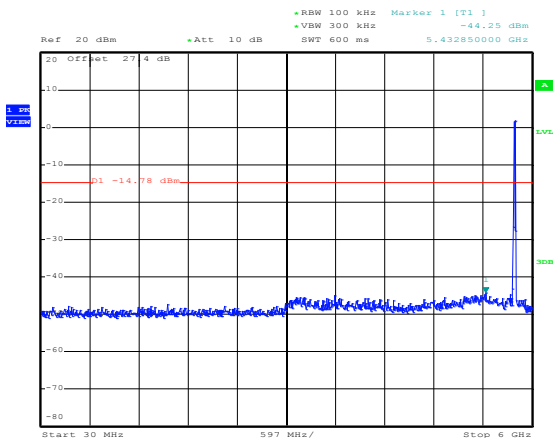
WLAN 802.11n HT20 Channel 157

100kHz PSD reference Level



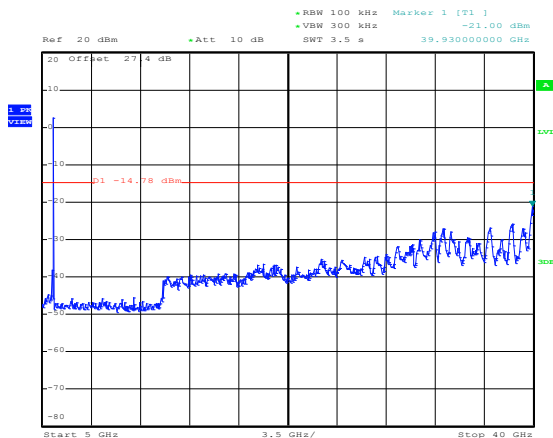
Date: 4.MAR.2014 23:28:35

Spurious Emission 30MHz~6GHz



Date: 5.MAR.2014 03:08:44

Spurious Emission 5GHz~40GHz



Date: 5.MAR.2014 03:09:02

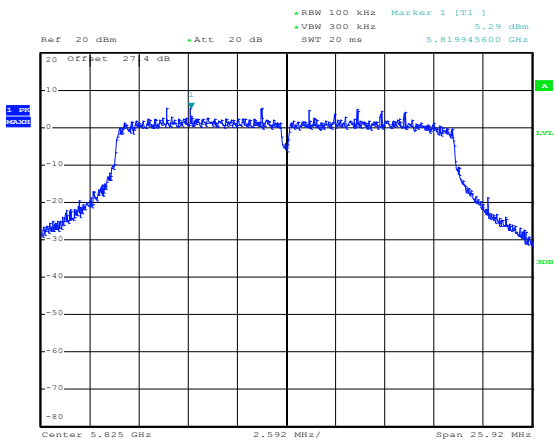




Test Mode :	802.11n HT20	Temperature :	21~26°C
Test Band :	5GHz High	Relative Humidity :	45~54%
Test Channel :	165	Test Engineer :	Osolemio Chang

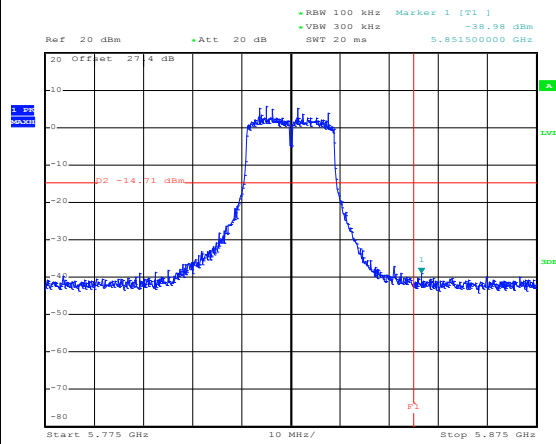
WLAN 802.11n HT20 Channel 165

100kHz PSD reference Level



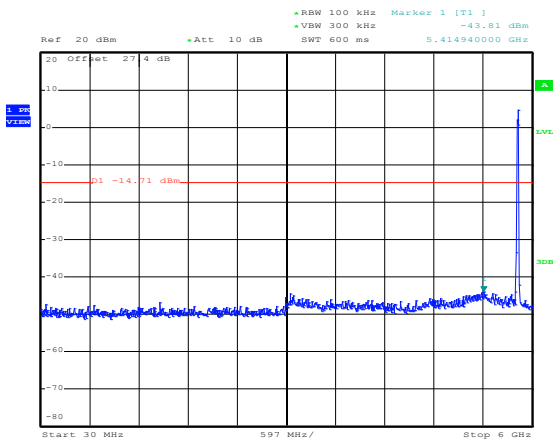
Date: 4.MAR.2014 23:38:22

High Channel Plot



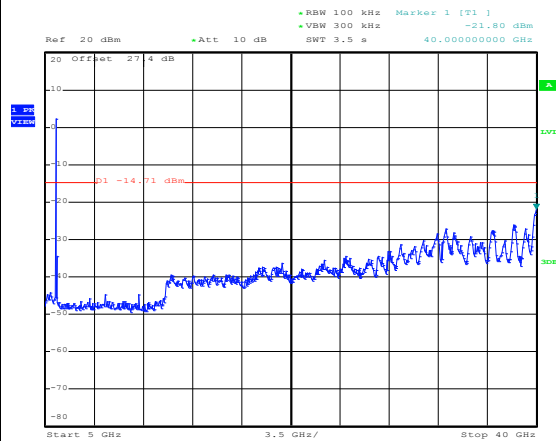
Date: 4.MAR.2014 23:38:36

Spurious Emission 30MHz~6GHz



Date: 5.MAR.2014 03:09:58

Spurious Emission 5GHz~40GHz



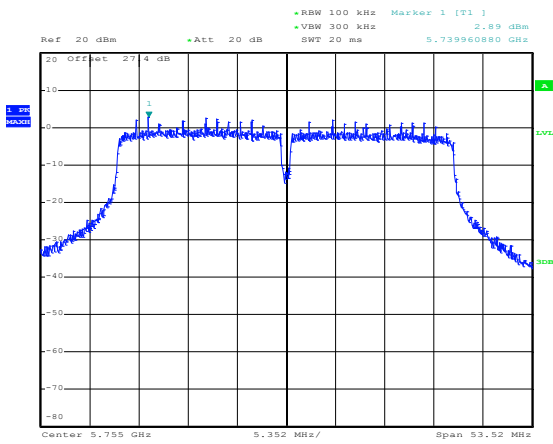
Date: 5.MAR.2014 03:10:17



Test Mode :	802.11n HT40	Temperature :	21~26°C
Test Band :	5GHz Low	Relative Humidity :	45~54%
Test Channel :	151	Test Engineer :	Osolemio Chang

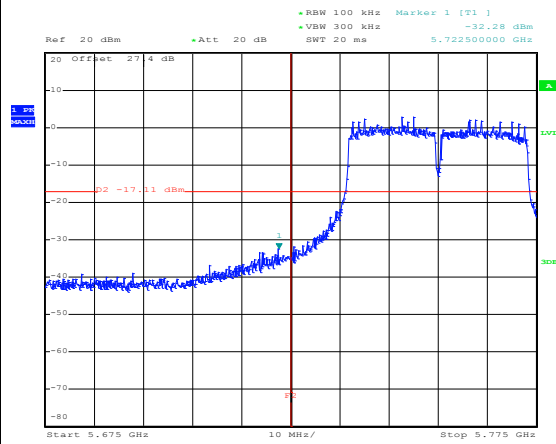
WLAN 802.11n HT40 Channel 151

100kHz PSD reference Level



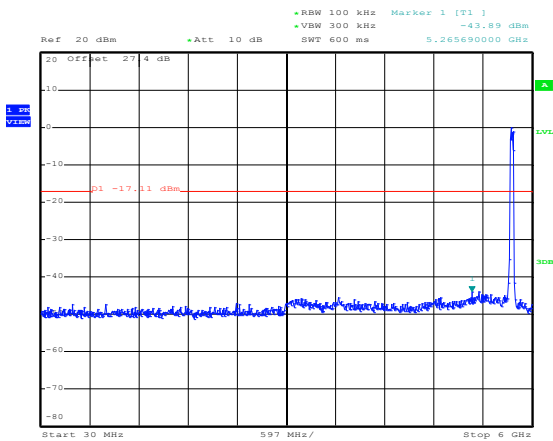
Date: 4.MAR.2014 23:44:36

Low Channel Plot



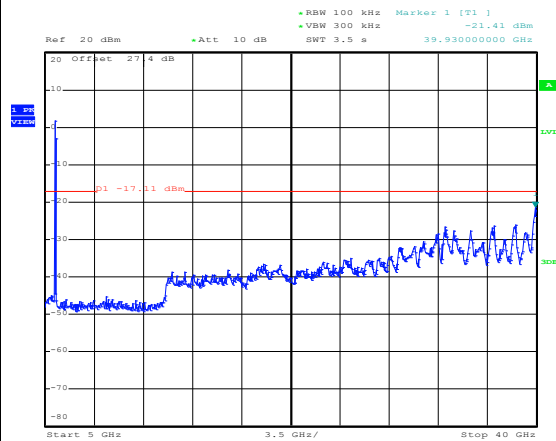
Date: 4.MAR.2014 23:47:04

Spurious Emission 30MHz~6GHz



Date: 5.MAR.2014 03:12:06

Spurious Emission 5GHz~40GHz



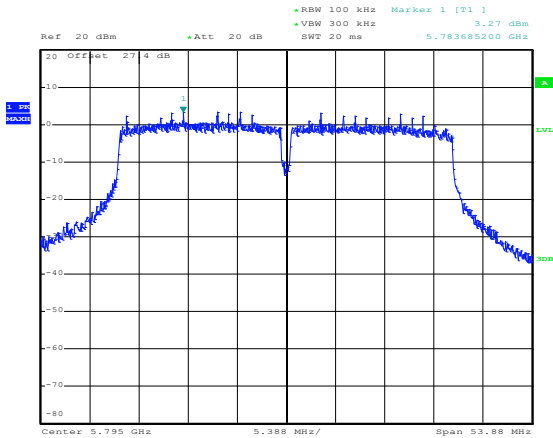
Date: 5.MAR.2014 03:12:24



Test Mode :	802.11n HT40	Temperature :	21~26°C
Test Band :	5GHz High	Relative Humidity :	45~54%
Test Channel :	159	Test Engineer :	Osolemio Chang

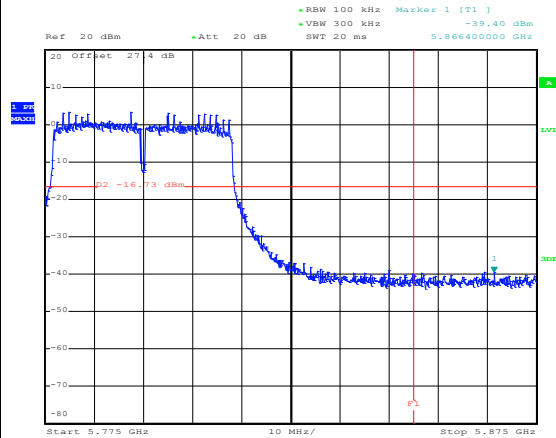
WLAN 802.11n HT40 Channel 159

100kHz PSD reference Level



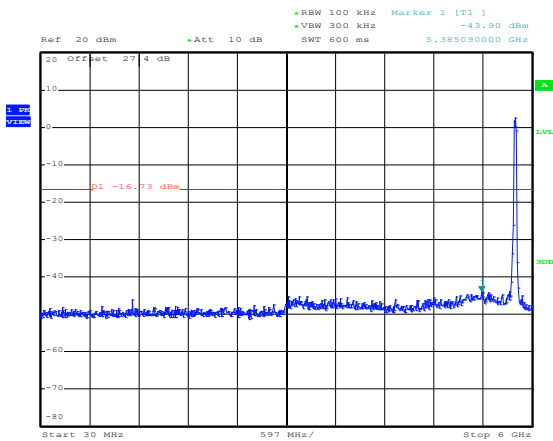
Date: 4.MAR.2014 23:50:05

High Channel Plot



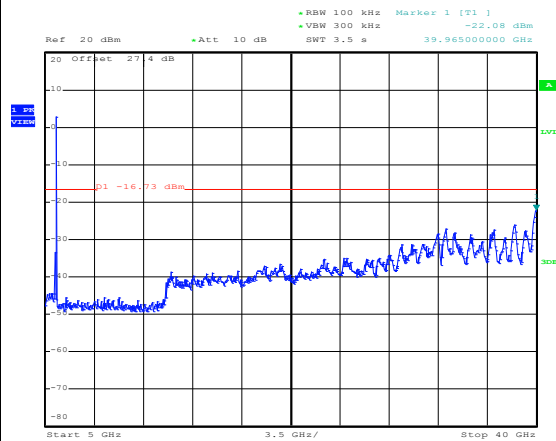
Date: 4.MAR.2014 23:50:19

Spurious Emission 30MHz~6GHz



Date: 5.MAR.2014 03:14:06

Spurious Emission 5GHz~40GHz



Date: 5.MAR.2014 03:14:24



### 3.5 Radiated Band Edges and Spurious Emission Measurement

#### 3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 30 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

#### 3.5.2 Measuring Instruments

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



3.5.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r01.
2. 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. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
 

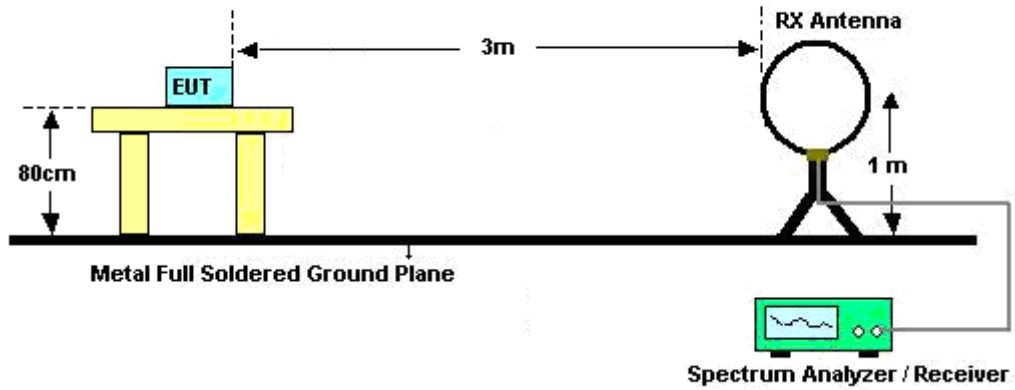
For average measurement:

    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

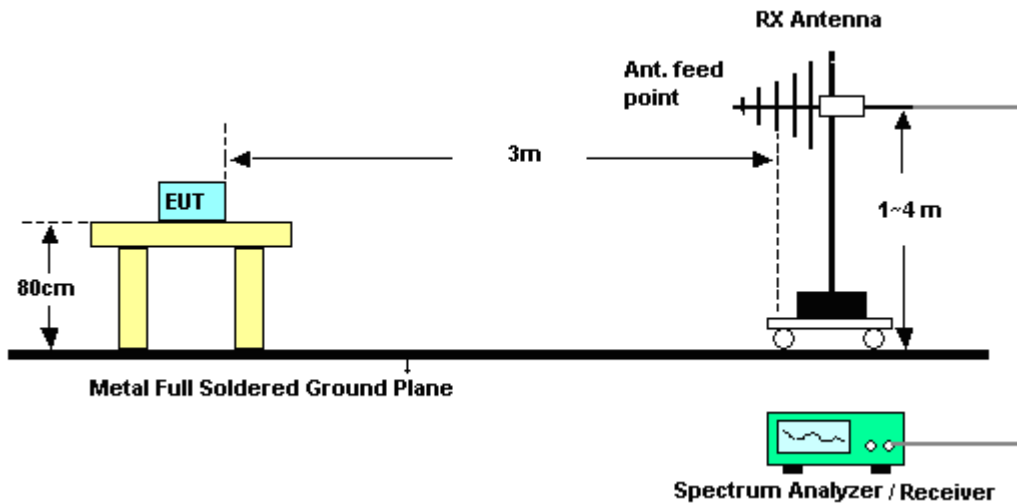
Band	Duty Cycle(%)	T(μs)	1/T(kHz)	VBW Setting
802.11a	98.60	-	-	10Hz
5GHz 802.11n HT20	98.50	-	-	10Hz
5GHz 802.11n HT40	97.96	2396.000	0.417	1kHz

### 3.5.4 Test Setup

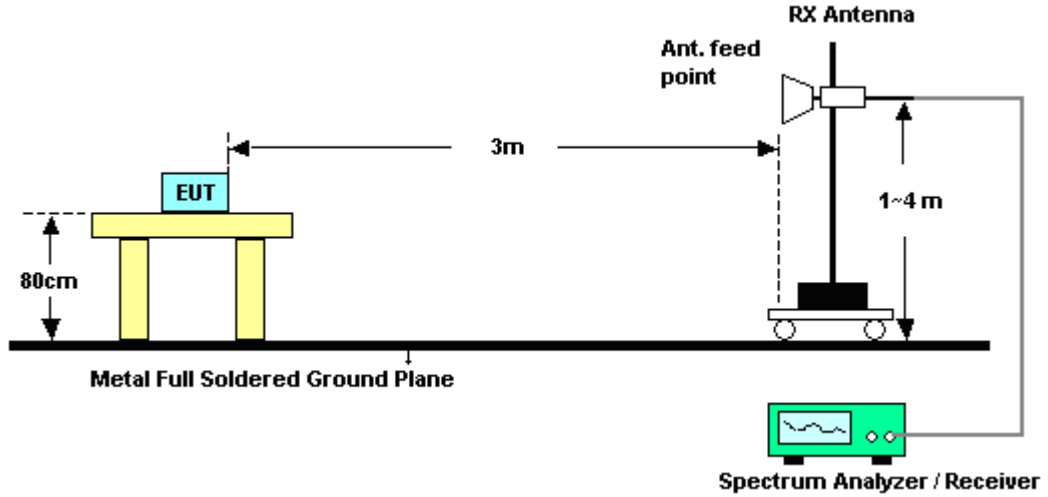
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.5.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.



**3.5.6 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> Harmonic)**

**Note:** Pre-scanned all test modes and only choose the worst case mode recorded in the test report for radiated spurious emission below 1GHz.

<b>Test Mode :</b>	802.11a	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	149	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	5746 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5746	93.46	-	-	82.23	35.34	10.06	34.17	102	164	Average
5746	104.6	-	-	93.37	35.34	10.06	34.17	102	164	Peak
11490	49.83	-4.17	54	54.09	38.38	14.33	56.97	137	163	Average
11490	59.3	-14.7	74	63.56	38.38	14.33	56.97	137	163	Peak

<b>Test Mode :</b>	802.11a	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	149	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	5744 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5744	109.39	-	-	98.16	35.34	10.06	34.17	115	207	Average
5744	120.44	-	-	109.21	35.34	10.06	34.17	115	207	Peak
11490	53.41	-0.59	54	57.67	38.38	14.33	56.97	114	183	Average
11490	65.84	-8.16	74	70.1	38.38	14.33	56.97	114	183	Peak





<b>Test Mode :</b>	802.11a	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	157	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	5783 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
47.28	18.6	-21.4	40	39.68	9.45	0.67	31.2	-	-	Peak
135.03	28.91	-14.59	43.5	47.34	11.5	1.17	31.1	-	-	Peak
200.1	37.39	-6.11	43.5	58.07	9.1	1.32	31.1	105	332	Peak
399.4	28.92	-17.08	46	41.78	15.9	2.14	30.9	-	-	Peak
600.3	31.13	-14.87	46	39.44	19.6	2.69	30.6	-	-	Peak
705.3	32.48	-13.52	46	39.13	20.8	2.95	30.4	-	-	Peak
5783	96.65	-	-	85.44	35.37	10.07	34.23	200	161	Average
5783	107.57	-	-	96.36	35.37	10.07	34.23	200	161	Peak
11570	47.05	-6.95	54	50.96	38.46	14.41	56.78	112	133	Average
11570	61.61	-12.39	74	65.52	38.46	14.41	56.78	112	133	Peak



<b>Test Mode :</b>	802.11a	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	157	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	5783 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
59.97	29.23	-10.77	40	53.77	6	0.76	31.3	114	145	Peak
139.89	25.98	-17.52	43.5	44.38	11.5	1.2	31.1	-	-	Peak
200.1	31.47	-12.03	43.5	52.15	9.1	1.32	31.1	-	-	Peak
400.1	27.54	-18.46	46	40.37	15.93	2.14	30.9	-	-	Peak
654.9	30.31	-15.69	46	37.6	20.35	2.85	30.49	-	-	Peak
720	28.54	-17.46	46	34.55	21.4	2.99	30.4	-	-	Peak
5783	110.25	-	-	99.04	35.37	10.07	34.23	101	208	Average
5783	120.79	-	-	109.58	35.37	10.07	34.23	101	208	Peak
11570	53.54	-0.46	54	57.45	38.46	14.41	56.78	110	199	Average
11570	66.33	-7.67	74	70.24	38.46	14.41	56.78	110	199	Peak



<b>Test Mode :</b>	802.11a	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	165	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	5823 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5823	96.47	-	-	85.23	35.4	10.11	34.27	197	160	Average
5823	107.14	-	-	95.9	35.4	10.11	34.27	197	160	Peak
11652	46.01	-7.99	54	49.54	38.52	14.52	56.57	100	360	Average
11652	58.82	-15.18	74	62.35	38.52	14.52	56.57	100	360	Peak

<b>Test Mode :</b>	802.11a	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	165	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	5823 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5823	109.17	-	-	97.93	35.4	10.11	34.27	100	208	Average
5823	120.56	-	-	109.32	35.4	10.11	34.27	100	208	Peak
11650	53.36	-0.64	54	56.94	38.51	14.52	56.61	111	196	Average
11650	66.95	-7.05	74	70.53	38.51	14.52	56.61	111	196	Peak



<b>Test Mode :</b>	5GHz 802.11n HT20	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	149	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	5747 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5747	95.79	-	-	84.56	35.34	10.06	34.17	199	163	Average
5747	106.6	-	-	95.37	35.34	10.06	34.17	199	163	Peak
11490	48.09	-5.91	54	52.35	38.38	14.33	56.97	100	360	Average
11490	60.73	-13.27	74	64.99	38.38	14.33	56.97	100	360	Peak

<b>Test Mode :</b>	5GHz 802.11n HT20	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	149	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	5743 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5743	109.66	-	-	98.43	35.34	10.06	34.17	106	208	Average
5743	120.53	-	-	109.3	35.34	10.06	34.17	106	208	Peak
11490	53.26	-0.74	54	57.52	38.38	14.33	56.97	100	182	Average
11490	66.44	-7.56	74	70.7	38.38	14.33	56.97	100	182	Peak



<b>Test Mode :</b>	5GHz 802.11n HT20	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	157	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	5783 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5783	99.37	-	-	88.16	35.37	10.07	34.23	196	207	Average
5783	109.89	-	-	98.68	35.37	10.07	34.23	196	207	Peak
11568	47.83	-6.17	54	51.74	38.46	14.41	56.78	113	132	Average
11568	60.5	-13.5	74	64.41	38.46	14.41	56.78	113	132	Peak

<b>Test Mode :</b>	5GHz 802.11n HT20	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	157	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	5784 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5784	110.09	-	-	98.88	35.37	10.07	34.23	100	209	Average
5784	120.75	-	-	109.54	35.37	10.07	34.23	100	209	Peak
11571	53.48	-0.52	54	57.39	38.46	14.41	56.78	100	165	Average
11571	67.35	-6.65	74	71.26	38.46	14.41	56.78	100	165	Peak



<b>Test Mode :</b>	5GHz 802.11n HT20	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	165	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	5823 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBµV/m )	Over Limit ( dB )	Limit Line ( dBµV/m )	Read Level (dBµV)	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5823	98.14	-	-	86.9	35.4	10.11	34.27	187	207	Average
5823	108.59	-	-	97.35	35.4	10.11	34.27	187	207	Peak
11650	45.98	-8.02	54	49.56	38.51	14.52	56.61	100	2	Average
11650	60.37	-13.63	74	63.95	38.51	14.52	56.61	100	2	Peak

<b>Test Mode :</b>	5GHz 802.11n HT20	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	165	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	5823 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBµV/m )	Over Limit ( dB )	Limit Line ( dBµV/m )	Read Level (dBµV)	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5823	109.18	-	-	97.94	35.4	10.11	34.27	100	208	Average
5823	120.6	-	-	109.36	35.4	10.11	34.27	100	208	Peak
11649	53.52	-0.48	54	57.1	38.51	14.52	56.61	111	195	Average
11649	66.3	-7.7	74	69.88	38.51	14.52	56.61	111	195	Peak



<b>Test Mode :</b>	5GHz 802.11n HT40	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	151	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	5757 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5757	96.49	-	-	85.27	35.36	10.06	34.2	197	207	Average
5757	105.93	-	-	94.71	35.36	10.06	34.2	197	207	Peak
11511	47.24	-6.76	54	51.44	38.4	14.35	56.95	100	1	Average
11511	58.64	-15.36	74	62.84	38.4	14.35	56.95	100	1	Peak

<b>Test Mode :</b>	5GHz 802.11n HT40	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	151	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	5753 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5753	108.04	-	-	96.79	35.36	10.06	34.17	103	208	Average
5753	118.31	-	-	107.06	35.36	10.06	34.17	103	208	Peak
11512	53.45	-0.55	54	57.65	38.4	14.35	56.95	105	182	Average
11512	65.71	-8.29	74	69.91	38.4	14.35	56.95	105	182	Peak



<b>Test Mode :</b>	5GHz 802.11n HT40	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	159	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	5793 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5793	96.99	-	-	85.75	35.38	10.09	34.23	197	207	Average
5793	106.4	-	-	95.16	35.38	10.09	34.23	197	207	Peak
11592	47.4	-6.6	54	51.23	38.47	14.44	56.74	101	2	Average
11592	59.01	-14.99	74	62.84	38.47	14.44	56.74	101	2	Peak

<b>Test Mode :</b>	5GHz 802.11n HT40	<b>Temperature :</b>	21~23°C
<b>Test Channel :</b>	159	<b>Relative Humidity :</b>	53~54%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	5793 MHz is fundamental signal which can be ignored.		

Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
5793	108.46	-	-	97.22	35.38	10.09	34.23	100	208	Average
5793	117.9	-	-	106.66	35.38	10.09	34.23	100	208	Peak
11592	52.97	-1.03	54	56.8	38.47	14.44	56.74	101	200	Average
11592	64.59	-9.41	74	68.42	38.47	14.44	56.74	101	200	Peak



### 3.6 AC Conducted Emission Measurement

#### 3.6.1 Limit 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 (dB $\mu$ V)	
	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.

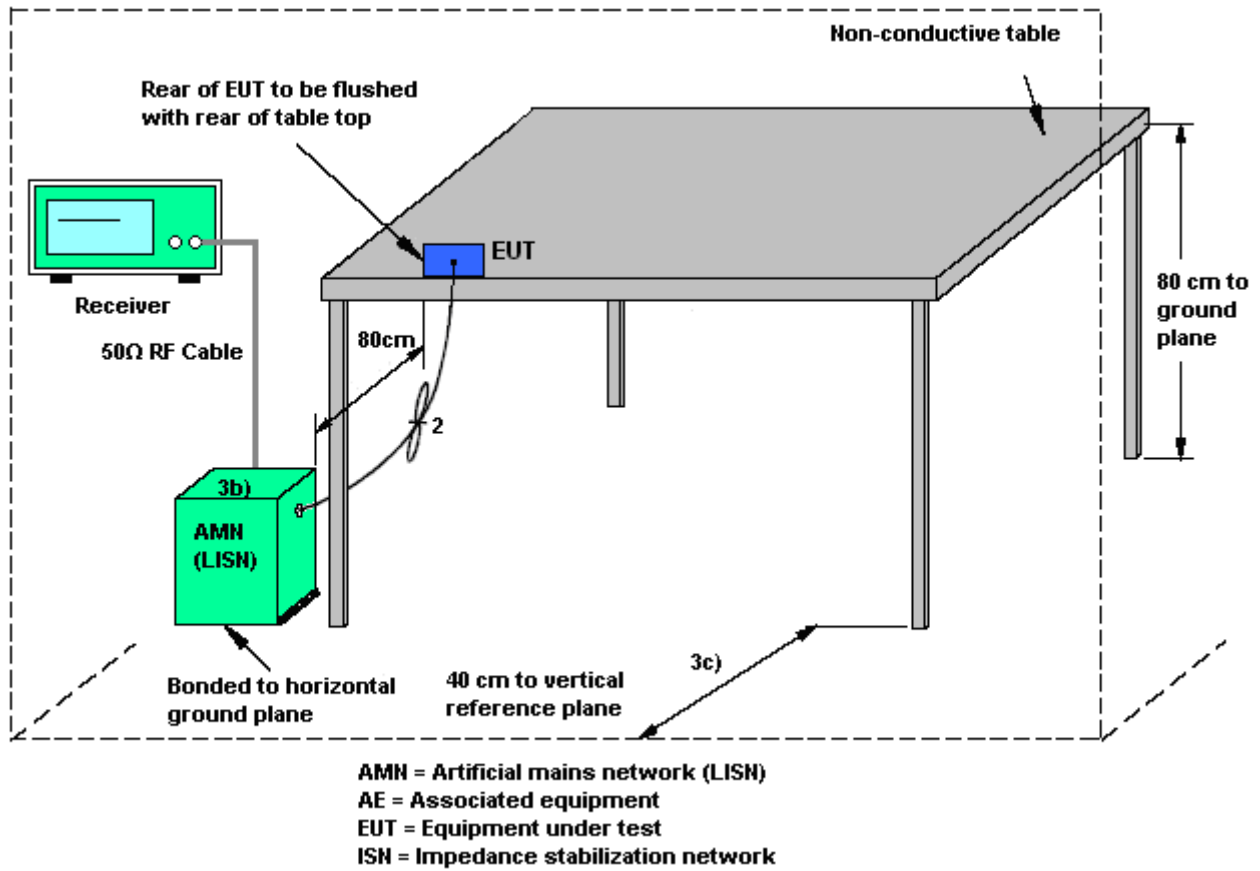
#### 3.6.2 Measuring Instruments

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

#### 3.6.3 Test Procedures

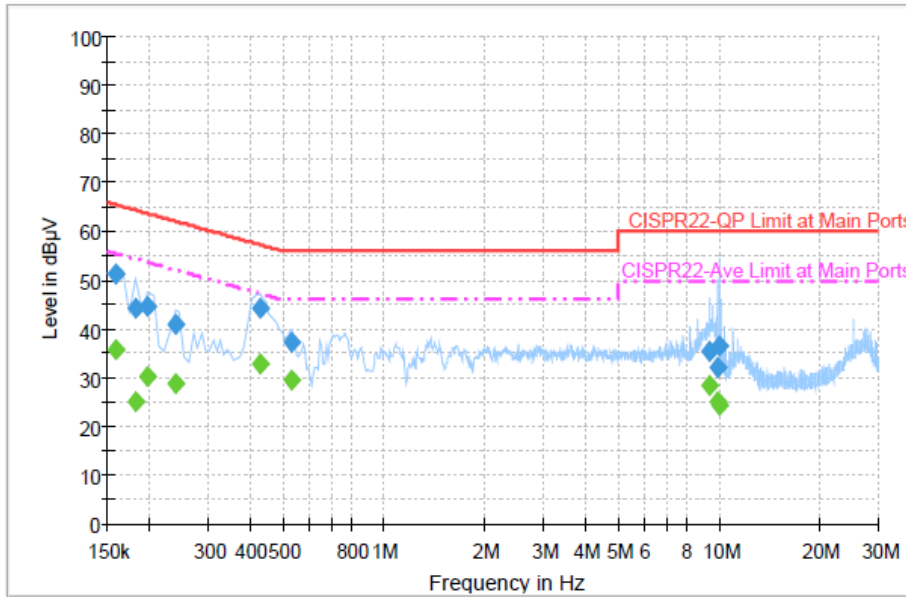
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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 with Maximum Hold Mode.

### 3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	46~48%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN Link + POE + LAN Link		



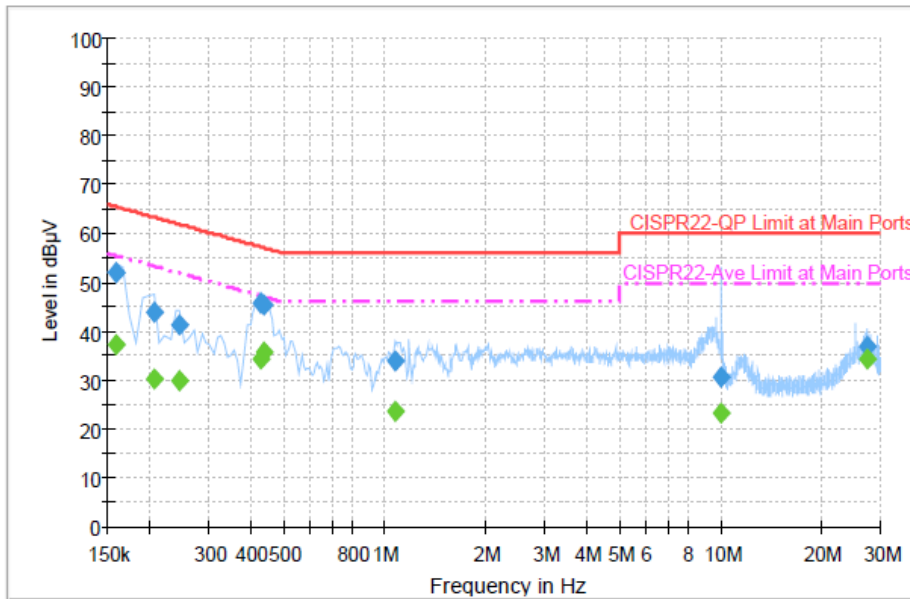
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	51.2	Off	L1	19.3	14.4	65.6
0.182000	44.1	Off	L1	19.4	20.3	64.4
0.198000	44.8	Off	L1	19.3	18.9	63.7
0.238000	40.9	Off	L1	19.5	21.3	62.2
0.430000	44.4	Off	L1	19.4	12.9	57.3
0.534000	37.1	Off	L1	19.4	18.9	56.0
9.414000	35.3	Off	L1	19.7	24.7	60.0
9.966000	32.2	Off	L1	19.7	27.8	60.0
10.006000	36.6	Off	L1	19.7	23.4	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	35.8	Off	L1	19.3	19.8	55.6
0.182000	25.0	Off	L1	19.4	29.4	54.4
0.198000	30.3	Off	L1	19.3	23.4	53.7
0.238000	28.7	Off	L1	19.5	23.5	52.2
0.430000	32.8	Off	L1	19.4	14.5	47.3
0.534000	29.6	Off	L1	19.4	16.4	46.0
9.414000	28.3	Off	L1	19.7	21.7	50.0
9.966000	25.0	Off	L1	19.7	25.0	50.0
10.006000	24.3	Off	L1	19.7	25.7	50.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cosmo Xu	Relative Humidity :	46~48%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN Link + POE + LAN Link		



**Final Result : Quasi-Peak**

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	52.0	Off	N	19.3	13.6	65.6
0.206000	44.0	Off	N	19.4	19.4	63.4
0.246000	41.2	Off	N	19.4	20.7	61.9
0.430000	45.6	Off	N	19.4	11.7	57.3
0.438000	45.4	Off	N	19.4	11.7	57.1
1.078000	33.8	Off	N	19.5	22.2	56.0
10.014000	30.8	Off	N	19.7	29.2	60.0
27.398000	36.8	Off	N	20.1	23.2	60.0

**Final Result : Average**

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	37.4	Off	N	19.3	18.2	55.6
0.206000	30.3	Off	N	19.4	23.1	53.4
0.246000	29.9	Off	N	19.4	22.0	51.9
0.430000	34.4	Off	N	19.4	12.9	47.3
0.438000	35.7	Off	N	19.4	11.4	47.1
1.078000	23.8	Off	N	19.5	22.2	46.0
10.014000	23.3	Off	N	19.7	26.7	50.0
27.398000	34.3	Off	N	20.1	15.7	50.0

## **3.7 Antenna Requirements**

### **3.7.1 Standard Applicable**

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For systems using digital modulation in the 5725-5850MHz, used exclusively for fixed point-to-point operation, may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

### **3.7.2 Antenna Anti-Replacement Construction**

Non-standard antenna connector is used.

### **3.7.3 Antenna Gain**

The antenna peak gain of EUT is 28dBi. For systems using digital modulation in the 5725-5850MHz, used exclusively for fixed point-to-point operation, may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power. It is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 07, 2013	Feb. 19, 2014 ~ Mar. 05, 2014	Jun. 06, 2014	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Aug. 17, 2013	Feb. 19, 2014 ~ Mar. 05, 2014	Aug. 16, 2014	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 17, 2013	Feb. 19, 2014 ~ Mar. 05, 2014	Aug. 16, 2014	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 13, 2012	Oct. 22, 2013	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2012	Oct. 22, 2013	Dec. 11, 2013	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 06, 2012	Oct. 22, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Oct. 22, 2013	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9 kHz~7 GHz	Sep. 06, 2013	Feb. 26, 2014	Sep. 05, 2014	Radiation (03CH07-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9 kHz ~ 30 GHz	Nov. 20, 2013	Feb. 26, 2014	Nov. 19, 2014	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	860004/0001	9 kHz~30 MHz	Jul. 03, 2012	Feb. 26, 2014	Jul. 03, 2014	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30 MHz ~ 1 GHz	Oct. 10, 2013	Feb. 26, 2014	Oct. 09, 2014	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1 GHz~18 GHz	Aug. 22, 2013	Feb. 26, 2014	Aug. 21, 2014	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15 GHz- 40 GHz	Oct. 03, 2013	Feb. 26, 2014	Oct. 02, 2014	Radiation (03CH07-HY)
Preamplifier	SONOMA	310N	187231	9kHz~1GHz	May 15, 2013	Feb. 26, 2014	May 14, 2014	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1 GHz~26.5 GHz	Nov. 29, 2013	Feb. 26, 2014	Nov. 28, 2014	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	Jul. 09, 2013	Feb. 26, 2014	Jul. 08, 2014	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Feb. 26, 2014	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Feb. 26, 2014	N/A	Radiation (03CH07-HY)



## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.26
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.50
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