

## FCC TEST REPORT

For

Shenzhen Afoundry Electronic Co., Ltd.

Wireless Router

Model No.: AF-EW1200

Prepared for : Shenzhen Afoundry Electronic Co., Ltd.  
Address : Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.  
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Date of receipt of test sample : March 18, 2016  
Number of tested samples : 1  
Serial number : Prototype  
Date of Test : March 18, 2016 - March 31, 2016  
Date of Report : March 31, 2016

**FCC TEST REPORT**  
**FCC CFR 47 PART 15 E(15.407): 2015**

**Report Reference No.** ..... : **LCS1603181541E**

**Date of Issue** ..... : **March 31, 2016**

**Testing Laboratory Name** ..... : **Shenzhen LCS Compliance Testing Laboratory Ltd.**

**Address** ..... : **1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd.,  
 Bao'an District, Shenzhen, Guangdong, China**

**Testing Location/ Procedure**..... : **Full application of Harmonised standards**   
 Partial application of Harmonised standards   
 Other standard testing method

**Applicant's Name**..... : **Shenzhen Afoundry Electronic Co., Ltd.**

**Address** ..... : **Longxin Industrial Park, Chuangye Road, Fenghuang 3rd  
 industrial Zone, Fuyong Town, Baoan district, Shenzhen city,  
 China**

**Test Specification**

**Standard** ..... : **FCC CFR 47 PART 15 E(15.407): 2015**

**Test Report Form No.**..... : **LCSEMC-1.0**

**TRF Originator** ..... : **Shenzhen LCS Compliance Testing Laboratory Ltd.**

**Master TRF**..... : **Dated 2011-03**

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**EUT Description.** ..... : **Wireless Router**

**Trade Mark** ..... : **AFOUNDRY®**

**Model/ Type reference**..... : **AF-EW1200**

**Ratings** ..... : **DC 12.0V, 2.0A by AC Adapter**

**Result** ..... : **Positive**

**Compiled by:**



Jacky Li/ File administrators

**Supervised by:**



Glin Lu/ Technique principal

**Approved by:**



Gavin Liang/ Manager

# FCC -- TEST REPORT

<b>Test Report No. : LCS1603181541E</b>	<u>March 31, 2016</u> Date of issue
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EUT.....	: Wireless Router
Type / Model.....	: AF-EW1200
<b>Applicant.....</b>	<b>: Shenzhen Afoundry Electronic Co., Ltd.</b>
Address.....	: Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China
Telephone.....	: /
Fax.....	: /
<b>Manufacturer.....</b>	<b>: Shenzhen Afoundry Electronic Co., Ltd.</b>
Address.....	: Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China
Telephone.....	: /
Fax.....	: /
<b>Factory.....</b>	<b>: Shenzhen Afoundry Electronic Co., Ltd.</b>
Address.....	: Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China
Telephone.....	: /
Fax.....	: /

<b>Test Result:</b>	<b>Positive</b>
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

EUT	: Wireless Router
Model Number	: AF-EW1200
Power Supply	: DC 12.0V, 2.0A by AC Adapter
Frequency Range	: 2412.00~2462.00MHz/2422.00~2452.00MHz; 5180.00-5240.00MHz/5745.00-5805.00MHz
Channel Number	: 11 Channels for WIFI 20MHz Bandwidth(802.11b/g/n-HT20) 7 Channels for WIFI 40MHz Bandwidth(802.11n-HT40) 4 Channels for 5180.00-5240.00MHz(802.11a/n-HT20/ac20) 5 Channels for 5745.00-5825.00MHz(802.11a/n-HT20/ac20) 2 Channels for 5190.00-5230.00MHz(802.11n-HT40/ac40) 2 Channels for 5755.00-5795.00MHz(802.11n-HT40/ac40) 1 Channels for 5210.00MHz(802.11ac80) 1 Channels for 5775.00MHz(802.11ac80)
Modulation Technology	: IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM,QPSK,BPSK) IEEE 802.11ac: OFDM (64QAM, 16QAM,QPSK,BPSK)
Data Rates	: IEEE 802.11b: 1-11Mbps IEEE 802.11g: 6-54Mbps IEEE 802.11n: MCS0-MCS15 IEEE 802.11a: 6-54Mbps IEEE 802.11ac: MCS0-MCS15
Antenna Type And Gain	: Integral antenna, 4.0dBi(Max.) for 2412~2462MHz, 7.01dBi for MIMO; 7.0dBi(Max.) for 5180.00~5240.00MHz/5745.00~5805.00MHz, 10.01dBi for MIMO

## 1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
--	AC ADAPTER	LY024SPS-120 200UH	--	Voc

## 1.3. External I/O Port

I/O Port Description	Quantity	Cable
DC	1	1.2m, Unshielded
USB	1	N/A
RJ45	5	0.8m, Shielded

## 1.4. Description of Test Facility

CNAS Registration Number. is L4595.

FCC Registration Number. is 899208.

Industry Canada Registration Number. is 9642A-1.

VCCI Registration Number. is C-4260 and R-3804.

ESMD Registration Number. is ARCB0108.

UL Registration Number. is 100571-492.

TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

## 1.5. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

## 1.6. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiation Uncertainty	9KHz~30MHz	$\pm 3.10\text{dB}$	(1)
	30MHz~200MHz	$\pm 2.96\text{dB}$	(1)
	200MHz~1000MHz	$\pm 3.10\text{dB}$	(1)
	1GHz~26.5GHz	$\pm 3.80\text{dB}$	(1)
	26.5GHz~40GHz	$\pm 3.90\text{dB}$	(1)
Conduction Uncertainty	150kHz~30MHz	$\pm 1.63\text{dB}$	(1)
Power disturbance	30MHz~300MHz	$\pm 1.60\text{dB}$	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

### 1.7. Description Of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

802.11a Mode : 6 Mbps, OFDM.

802.11n-HT20 Mode: MCS0, OFDM.

802.11n-HT40 Mode: MCS8, OFDM.

#### Antenna & Bandwidth

Antenna Bandwidth Mode	Single (Port.1)			Two (Port.1 + Port.2)		
	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
802.11a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
802.11n	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
802.11ac	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

## 2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd..

### 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### 2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure 789033 D02 General UNII Test Procedures New Rules v01r01 and KDB 6622911 are required to be used for this kind of FCC 15.407 UII device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E

### 2.3. General Test Procedures

#### 2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

#### 2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013



### **3. SYSTEM TEST CONFIGURATION**

#### **3.1. Justification**

The system was configured for testing in a continuous transmit condition.

#### **3.2. EUT Exercise Software**

N/A

#### **3.3. Special Accessories**

N/A

#### **3.4. Block Diagram/Schematics**

Please refer to the related document

#### **3.5. Equipment Modifications**

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

#### **3.6. Test Setup**

Please refer to the test setup photo.

## 4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart E		
FCC Rules	Description of Test	Result
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.407(e)	6dB Bandwidth	Compliant
§15.407(b)	Radiated Emissions	Compliant
§15.407(b)	Band edge Emissions	Compliant
§15.407(g)	Frequency Stability	Note
§15.207(a)	Line Conducted Emissions	Compliant
§15.203	Antenna Requirements	Compliant
§2.1093	RF Exposure	Compliant

Note: The customer declared frequency stability is better than 20ppm which ensures that the signal remains in the allocated bands under all operational conditions stated in the user manual.

## 5. TEST RESULT

### 5.1. Maximum Conducted Output Power Measurement

#### 5.1.1. Standard Applicable

##### For 5725~5850MHz

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

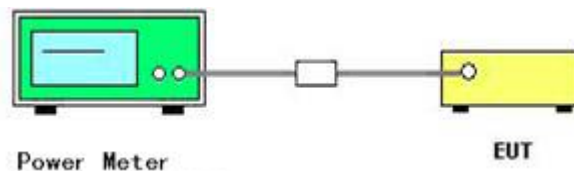
#### 5.1.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the power meter.

#### 5.1.3. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

#### 5.1.4. Test Setup Layout



#### 5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.1.6. Test Result of Maximum Conducted Output Power

Temperature	25°C	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11a	149	5745	13.96	13.76	/	30	Complies
	157	5785	13.28	13.16	/	30	Complies
	165	5825	13.13	13.06	/	30	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11n-HT20	149	5745	12.64	12.55	15.61	25.99	Complies
	157	5785	12.73	12.52	15.64	25.99	Complies
	165	5825	12.57	12.62	15.61	25.99	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11n-HT40	151	5755	13.50	13.15	16.34	25.99	Complies
	159	5795	12.78	12.64	15.72	25.99	Complies

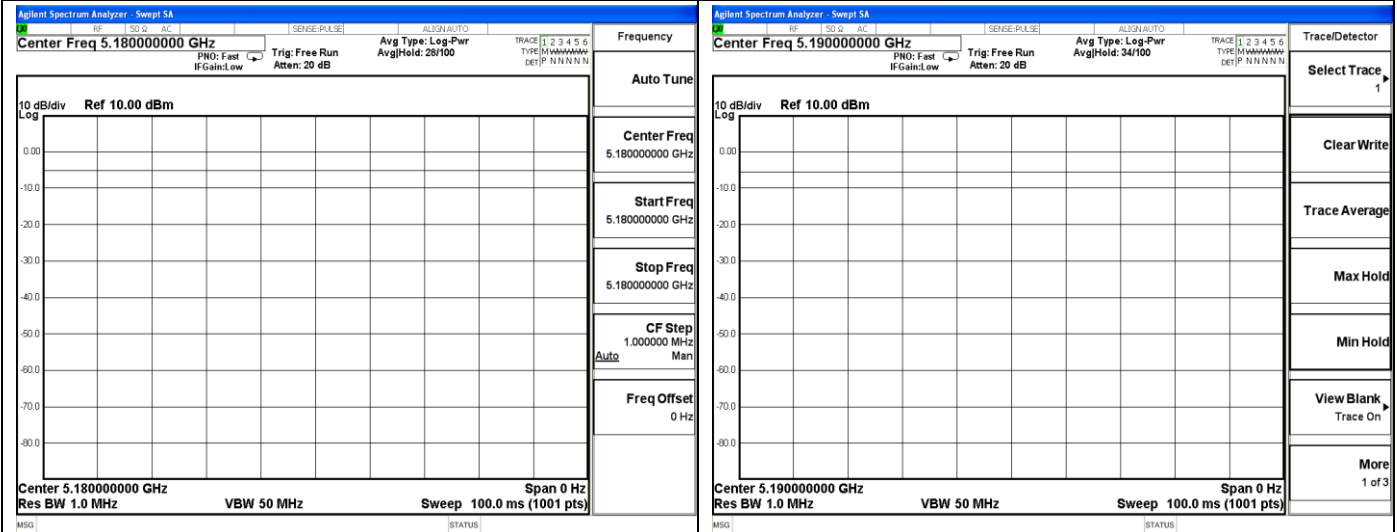
Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11ac20	149	5745	12.42	12.39	15.42	25.99	Complies
	157	5785	12.69	12.63	15.67	25.99	Complies
	165	5825	12.60	12.43	15.53	25.99	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11ac20	151	5755	13.19	13.10	16.16	25.99	Complies
	159	5795	12.73	12.71	15.73	25.99	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11ac80	155	5775	13.09	13.25	16.18	25.99	Complies

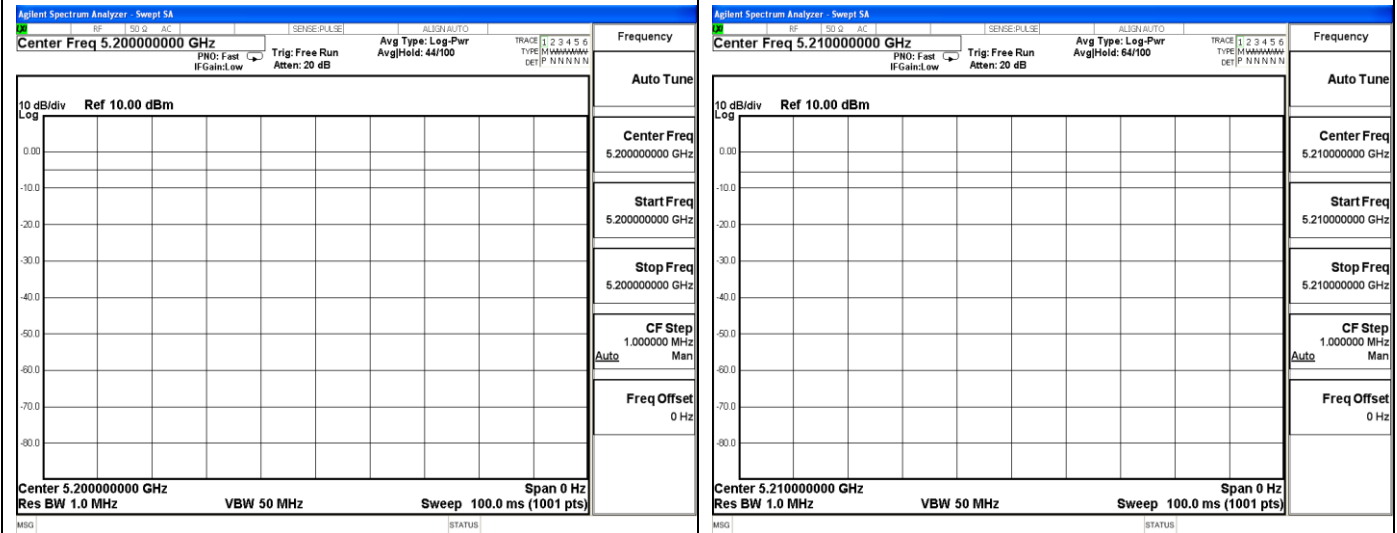
Correct Limit=Limit-(Directional Gain-6dBi)

Tet plot of Duty Cycle:



5180MHz

5190MHz



5200MHz

5210MHz



5230MHz

5240MHz

Note: The duty cycle is 100%

## 5.2. Power Spectral Density Measurement

### 5.2.1. Standard Applicable

The power spectral density is defined as the highest level of power in dBm per MHz generated by the transmitter within the power envelope. The power spectral density limits as show follow.

Frequency range(MHz)	Power Spectral Density Limit
5725~5850	30 dBm/500kHz

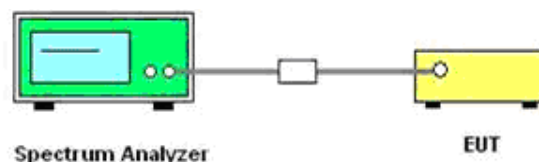
### 5.2.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of Spectrum Analyzer.

### 5.2.3. Test Procedures

1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 500 kHz.
4. Set the VBW  $\geq 3 \times$  RBW
5. Span=Encompass the entire emissions bandwidth (EBW) of the signal
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum power level in any 1MHz band segment within the fundamental EBW.

### 5.2.4. Test Setup Layout



### 5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Test Result of Power Spectral Density

Temperature	25°C	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a/n/ac

802.11a

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/510kHz)		10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	PSD (dBm/500kHz)		Max. Limit (dBm/500kHz)	Result
			Chain0	Chain1			Chain0	Chain1		
802.11a	149	5745	2.570	2.531	-0.09	0	2.480	2.441	30	Complies
	157	5785	1.834	1.525	-0.09	0	1.744	1.435	30	Complies
	165	5825	1.406	1.223	-0.09	0	1.316	1.133	30	Complies

Note: PSD(dBm/500kHz)= PSD(dBm/510kHz)+ Duty cycle factor+10log(500kHz/RBW) Factor

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/510kHz)		10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
			Chain0	Chain1					
802.11n-HT 20	149	5745	1.148	0.854	-0.09	0	3.924	25.99	Complies
	157	5785	1.179	1.104	-0.09	0	4.062	25.99	Complies
	165	5825	0.960	1.089	-0.09	0	3.945	25.99	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/1000kHz)		10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
			Chain0	Chain1					
802.11n-HT 40	151	5755	1.906	1.854	-3.01	0	1.880	25.99	Complies
	159	5795	1.784	1.478	-3.01	0	1.634	25.99	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/510kHz)		10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
			Chain0	Chain1					
802.11ac20	149	5745	0.920	1.030	-0.09	0	3.896	25.99	Complies
	157	5785	1.197	1.107	-0.09	0	4.073	25.99	Complies
	165	5825	0.922	1.004	-0.09	0	3.883	25.99	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/1000kHz)		10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
			Chain0	Chain1					
802.11ac40	151	5755	1.724	1.874	-3.01	0	1.800	25.99	Complies
	159	5795	1.678	1.609	-3.01	0	1.644	25.99	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/1000kHz)		10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
			Chain0	Chain1					
802.11ac80	155	5775	0.031	-0.141	-3.01	0	-0.054	25.99	Complies

## Note:

Duty cycle factor =  $10\log(T_{on}/T_{period}) = 0$

PSD(dBm/500kHz) = PSD(dBm/500kHz) + Duty cycle factor +  $10\log(500\text{kHz}/\text{RBW})$  Factor

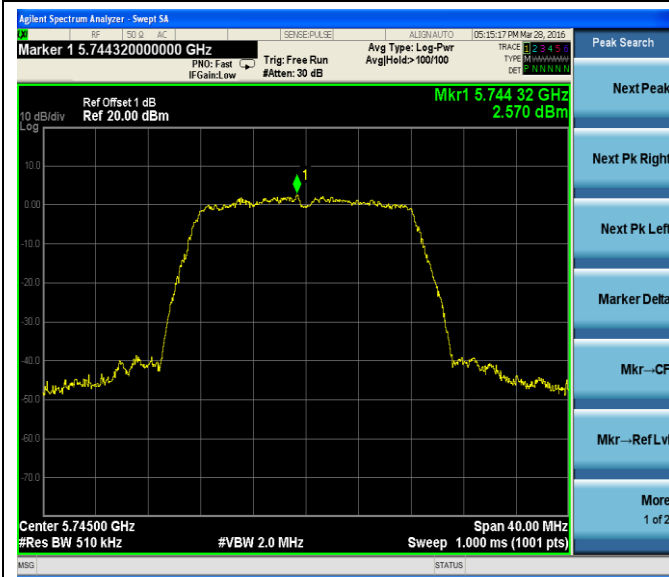
SumPSD(dBm/500kHz) = Chain0(dBm/500kHz) + Chain1(dBm/500kHz)

Correct Limit = Limit - (Directional Gain - 6dBi)

The measured power density for 5745~5825MHz Band has the offset with cable loss already.



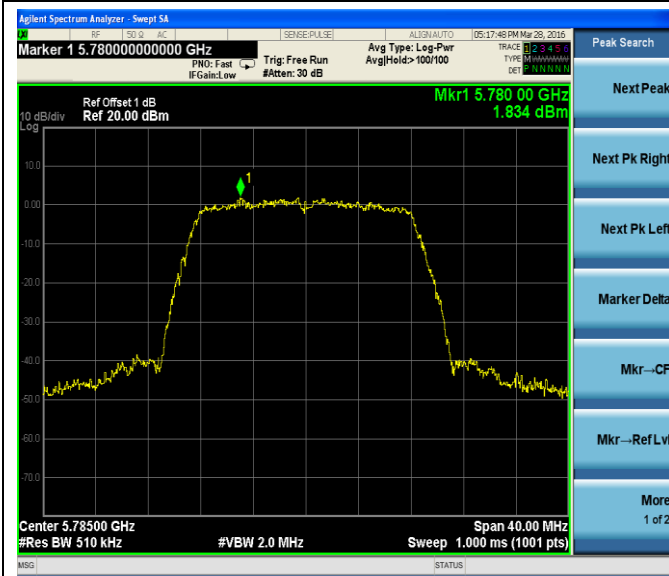
Test plot of Power Spectral Density:



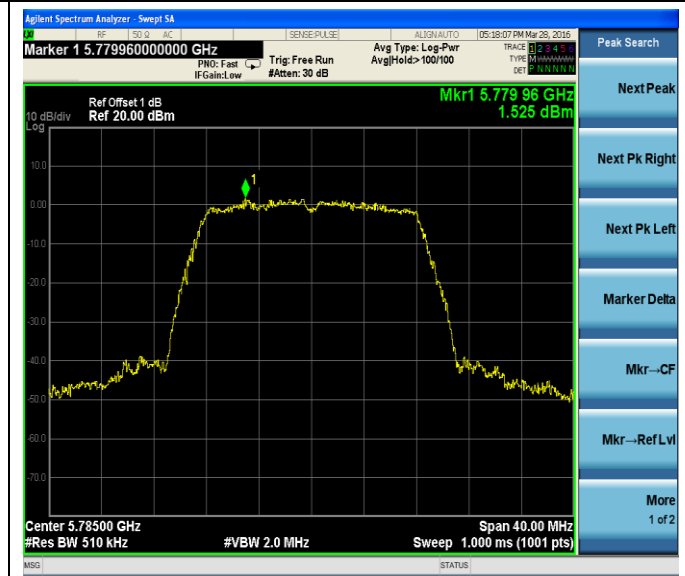
802.11a Chain 0-5745MHz



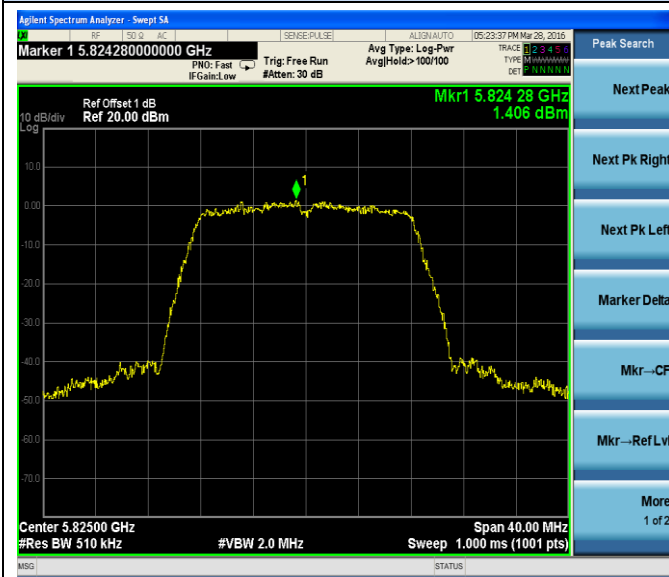
802.11a Chain 1-5745MHz



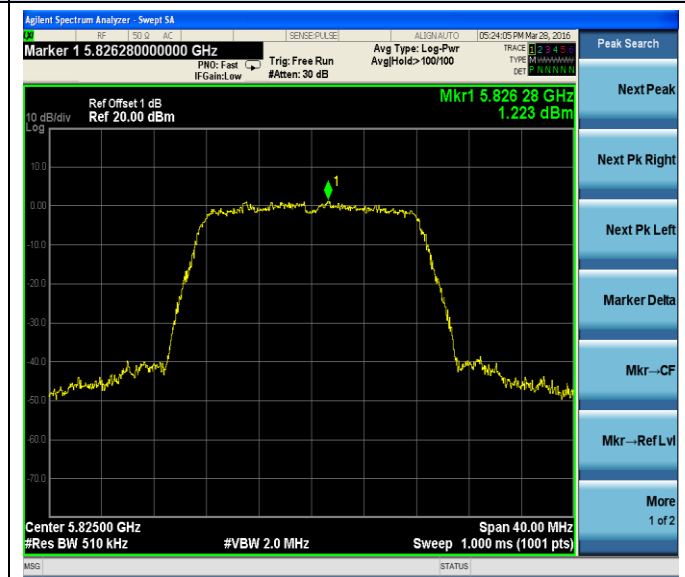
802.11a Chain 0-5785MHz



802.11a Chain 1-5785MHz



802.11a Chain 0-5825MHz



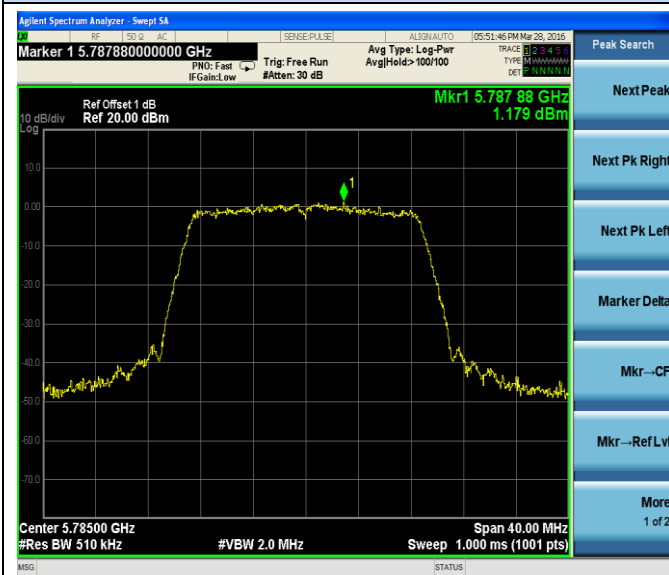
802.11a Chain 1-5825MHz



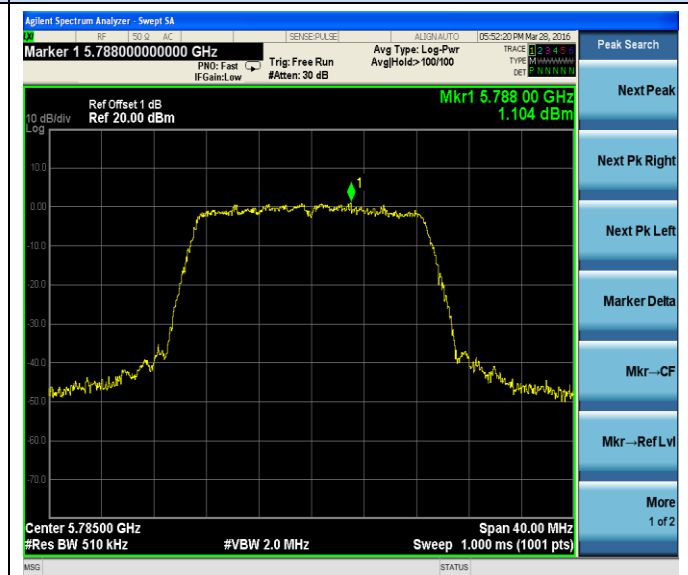
802.11n-HT20 Chain 0-5745MHz



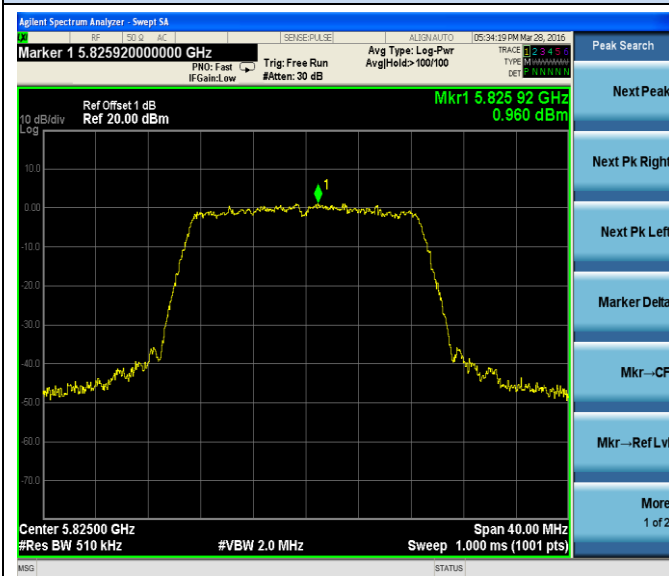
802.11n-HT20 Chain 1-5745MHz



802.11n-HT20 Chain 0-5785MHz



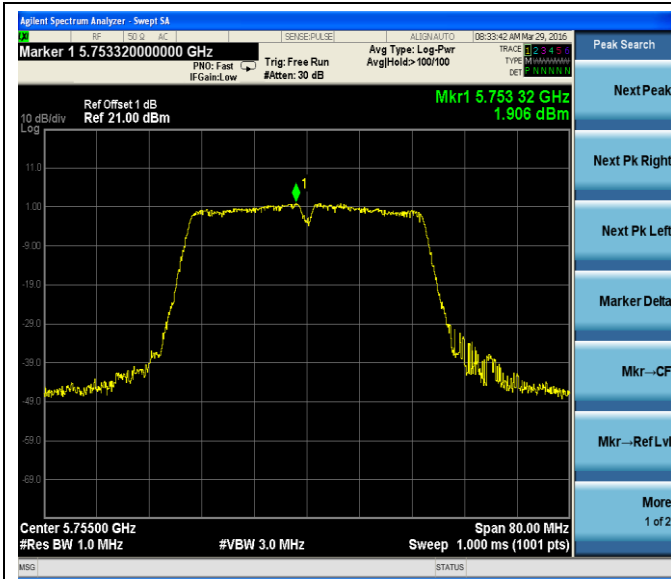
802.11n-HT20 Chain 1-5785MHz



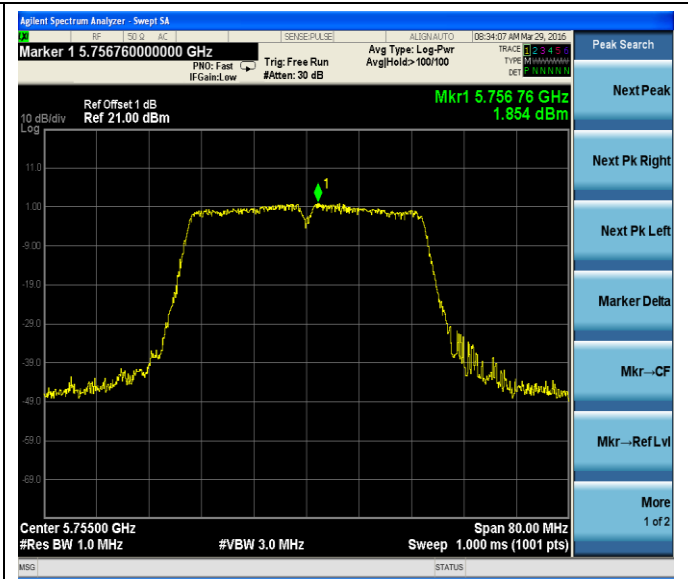
802.11n-HT20 Chain 0-5825MHz



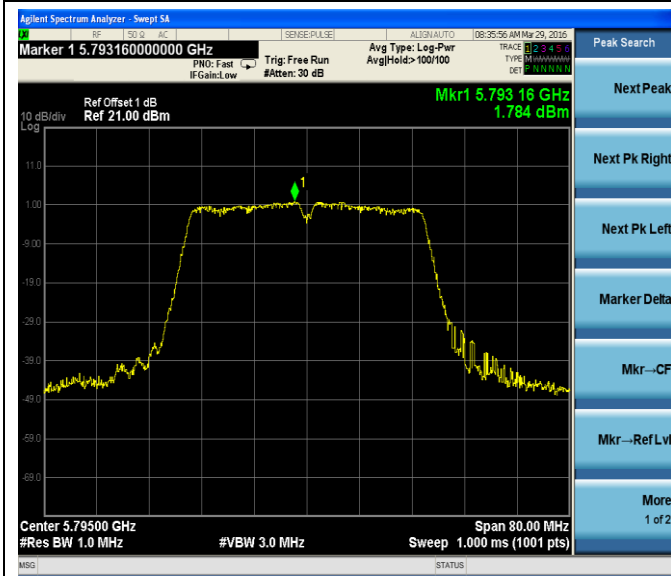
802.11n-HT20 Chain 1-5825MHz



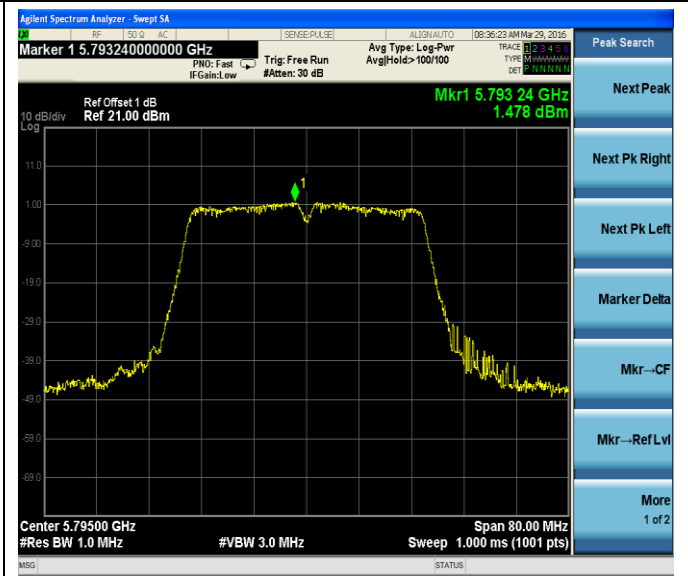
802.11n-HT40 Chain 0-5755MHz



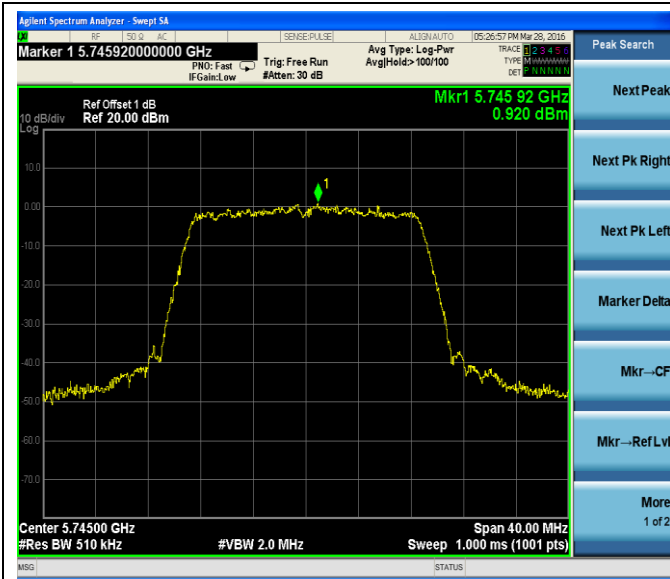
802.11n-HT40 Chain 1-5755MHz



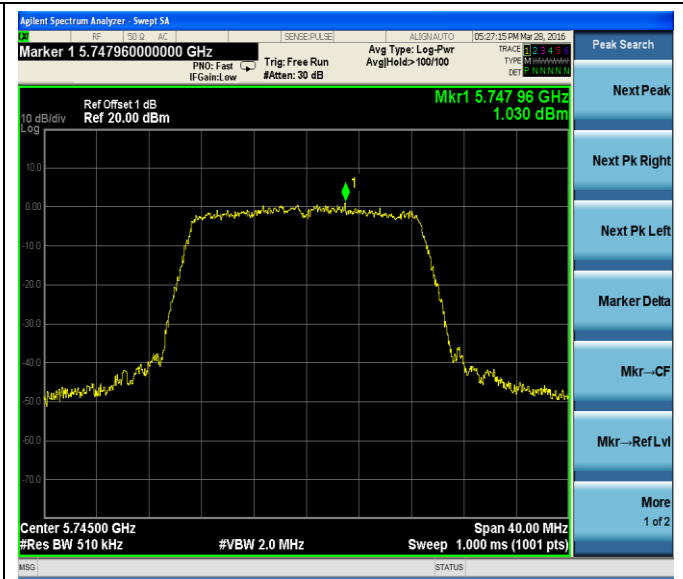
802.11n-HT40 Chain 0-5795MHz



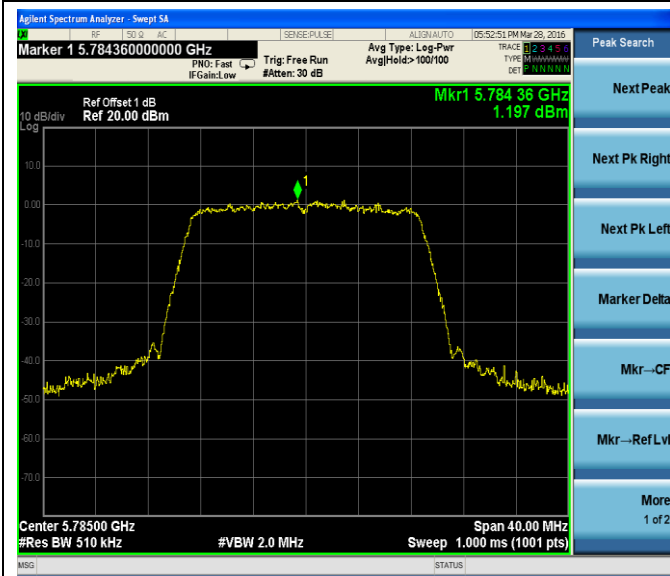
802.11n-HT40 Chain 1-5795MHz



802.11ac20 Chain 0-5745MHz



802.11ac20 Chain 1-5745MHz



802.11ac20 Chain 0-5785MHz



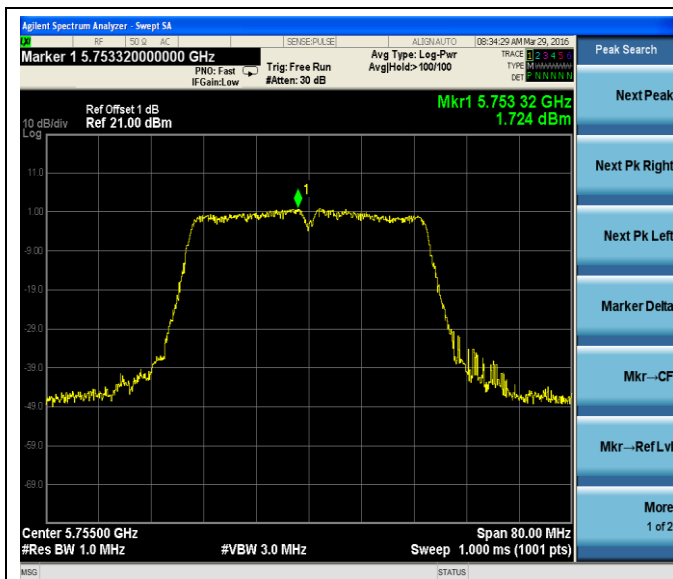
802.11ac20 Chain 1-5785MHz



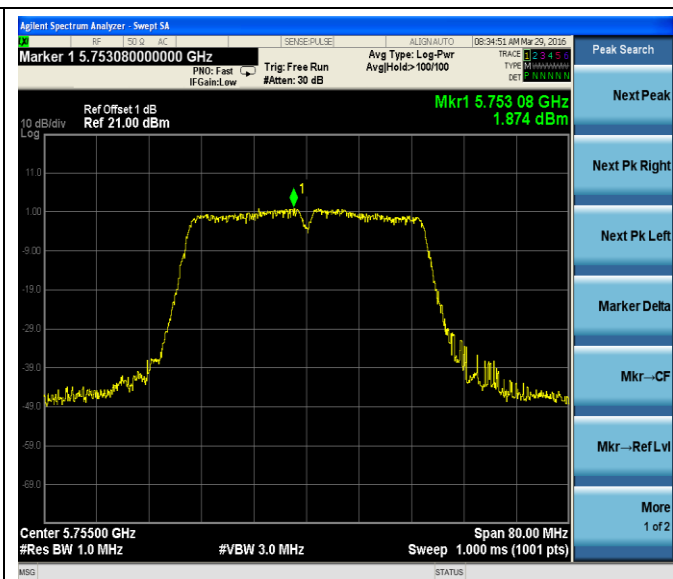
802.11ac20 Chain 0-5825MHz



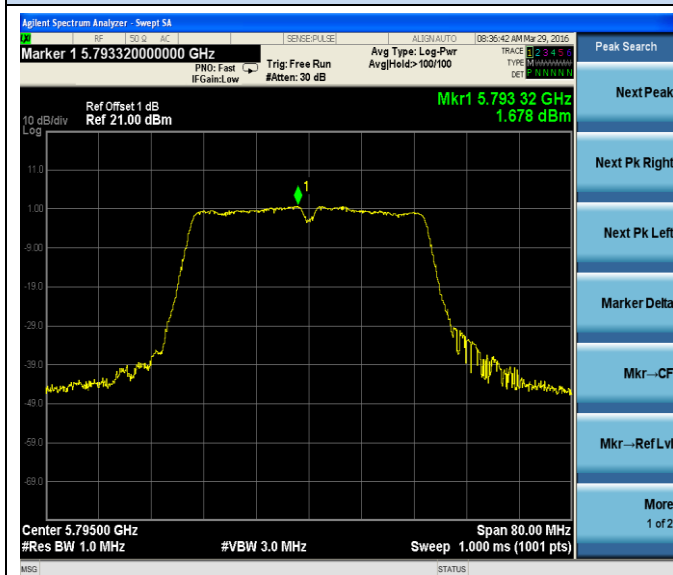
802.11ac20 Chain 1-5825MHz



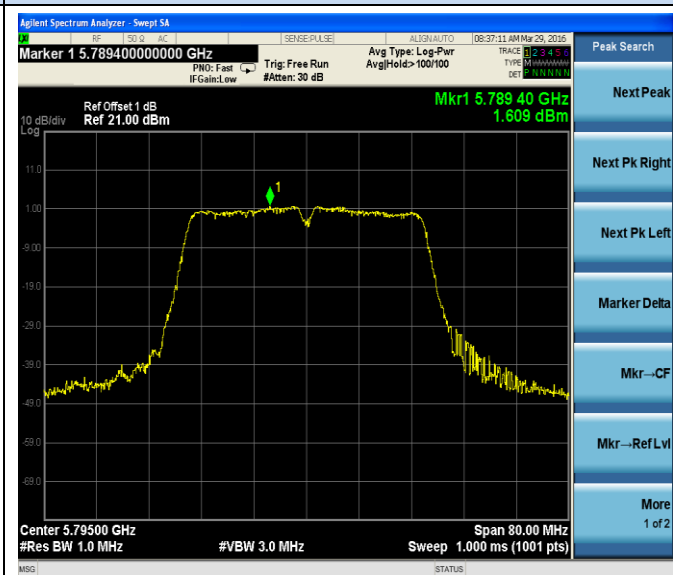
802.11ac40 Chain 0-5755MHz



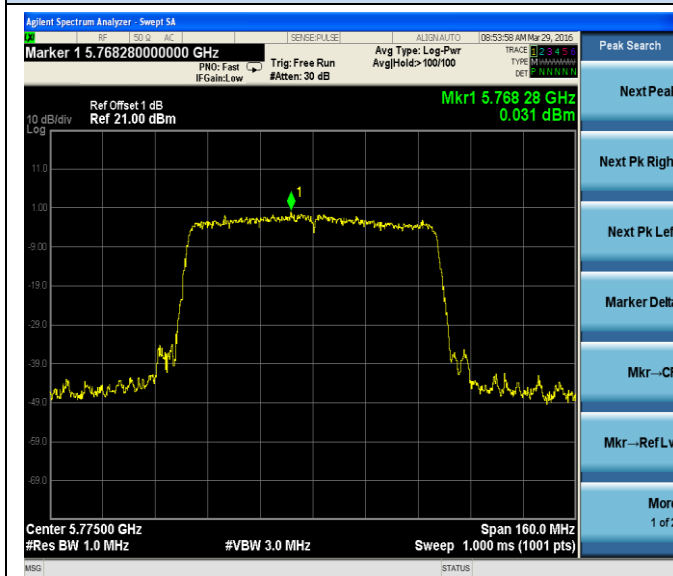
802.11ac40 Chain 1-5755MHz



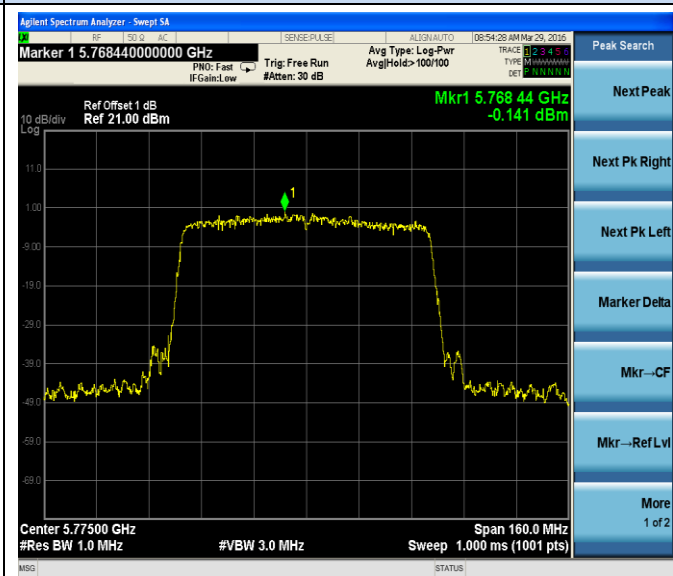
802.11ac40 Chain 0-5795MHz



802.11ac40 Chain 1-5795MHz



802.11ac80 Chain 0-5775MHz



802.11ac80 Chain 1-5775MHz

### 5.3. 6dB Occupied Bandwidth Measurement

#### 5.3.1. Standard Applicable

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

#### 5.3.2. Measuring Instruments and Setting

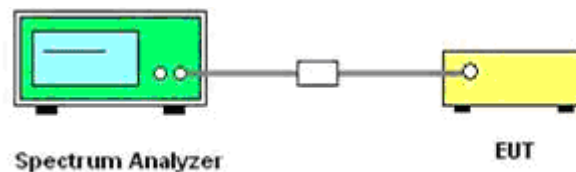
Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span	> 26dB Bandwidth
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

#### 5.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.

#### 5.3.4. Test Setup Layout



#### 5.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.3.6. Test Result of 6dB Occupied Bandwidth

Temperature	25°C	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	
			Chain 0	Chain 1
802.11a	149	5745	16.31	16.31
	157	5785	16.36	16.33
	163	5825	16.34	16.30

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	
			Chain 0	Chain 1
802.11n-HT20	149	5745	17.03	17.05
	157	5785	17.24	17.24
	163	5825	16.98	16.97

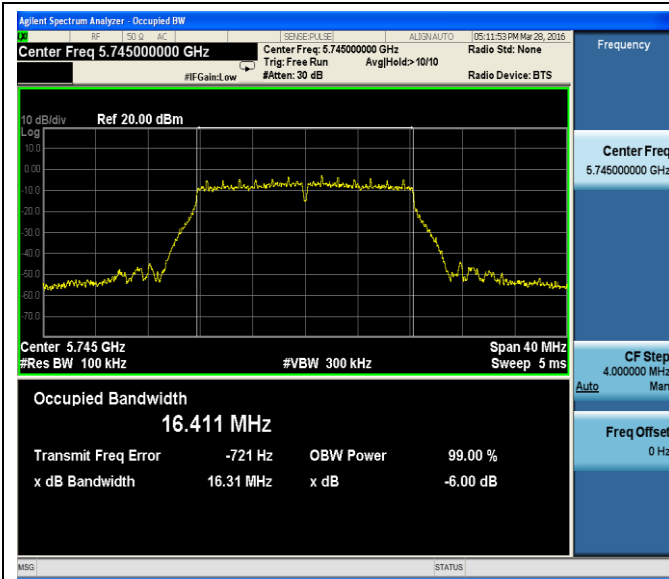
Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	
			Chain 0	Chain 1
802.11n-HT40	151	5755	35.20	35.20
	159	5795	35.53	35.53

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	
			Chain 0	Chain 1
802.11ac20	149	5745	16.96	16.96
	157	5785	17.29	17.29
	163	5825	16.97	16.97

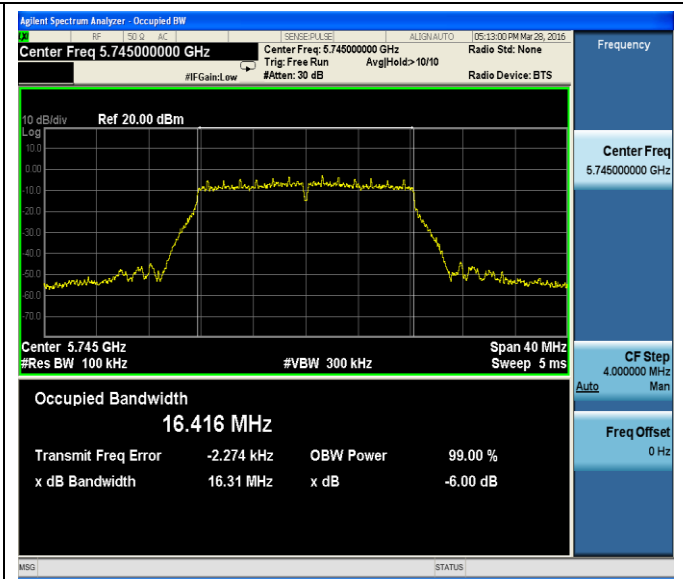
Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	
			Chain 0	Chain 1
802.11ac40	151	5755	35.15	35.19
	159	5795	35.46	35.52

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	
			Chain 0	Chain 1
802.11ac80	155	5775	75.13	75.15

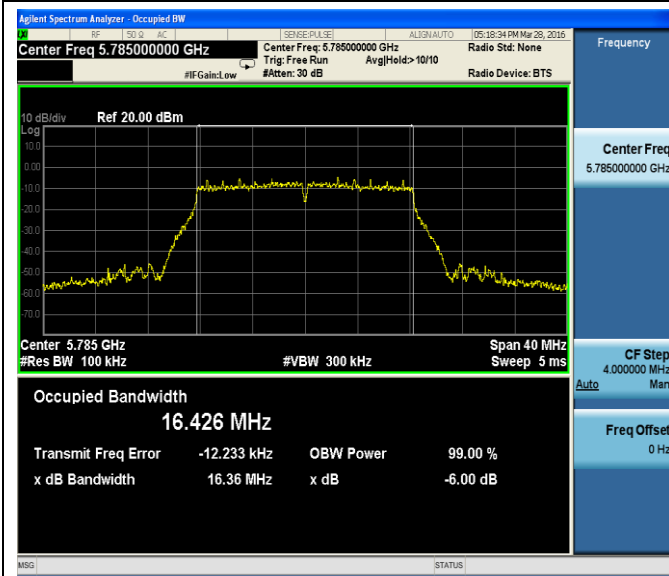
Test plot of 6dB Occupied Bandwidth:



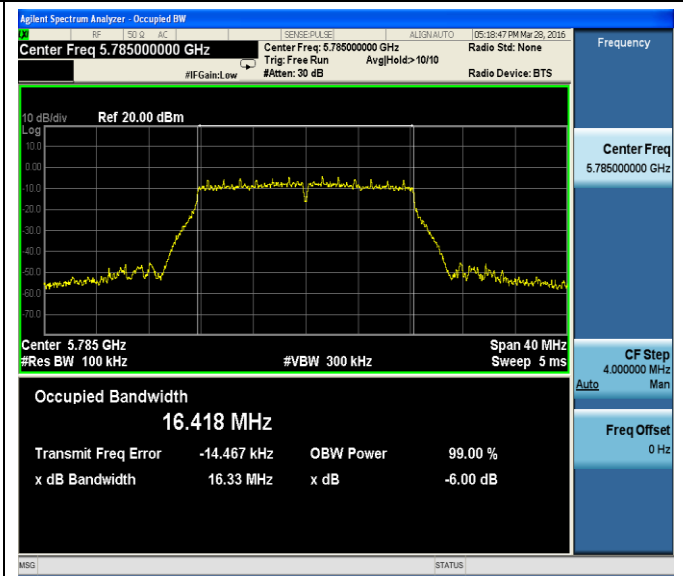
802.11a Chain 0-5745MHz



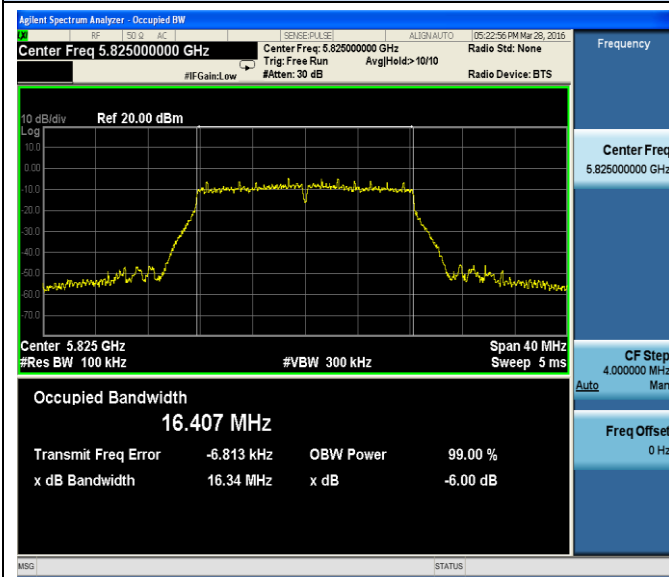
802.11a Chain 1-5745MHz



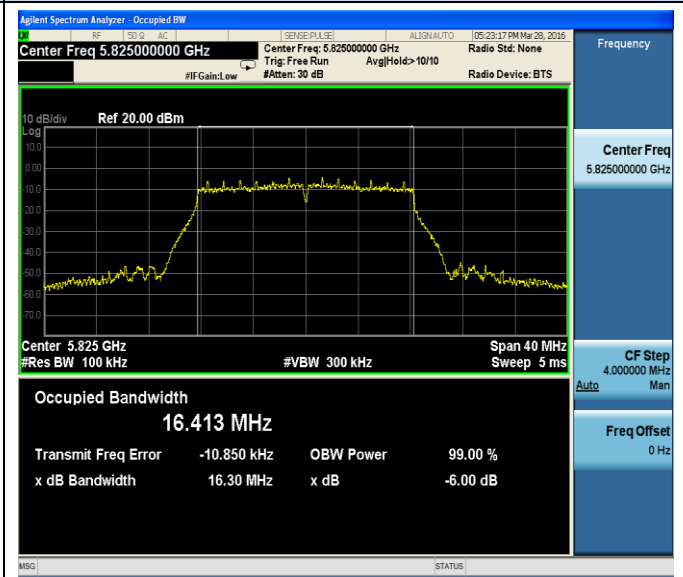
802.11a Chain 0-5785MHz



802.11a Chain 1-5785MHz

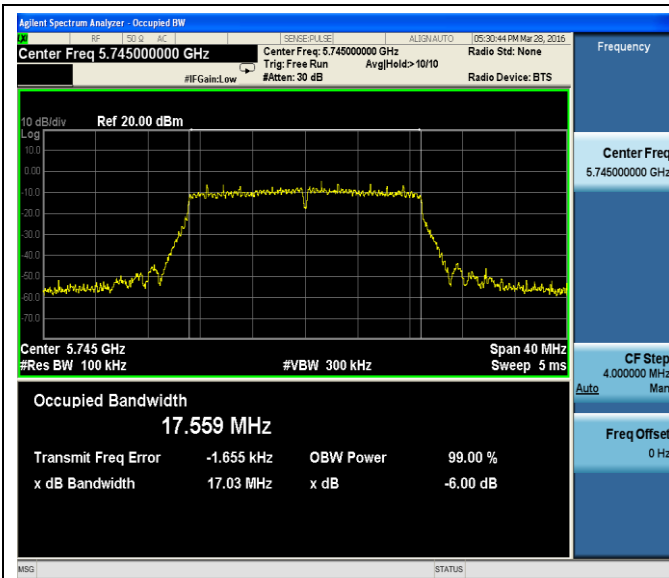


802.11a Chain 0-5825MHz

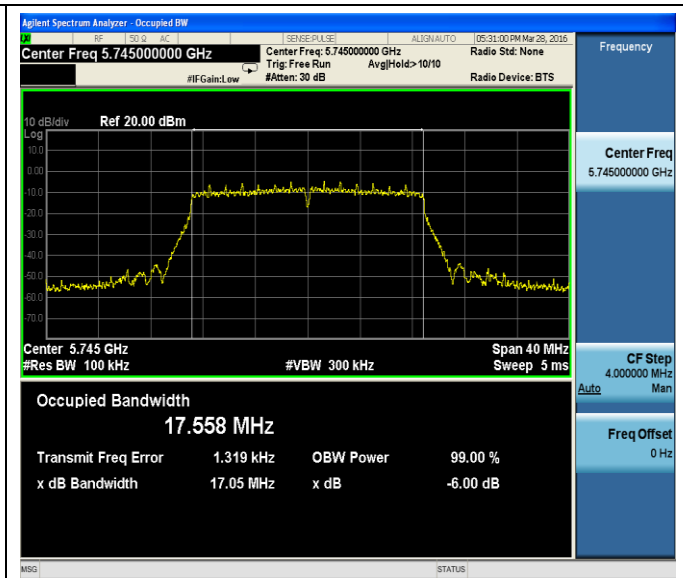


802.11a Chain 1-5825MHz

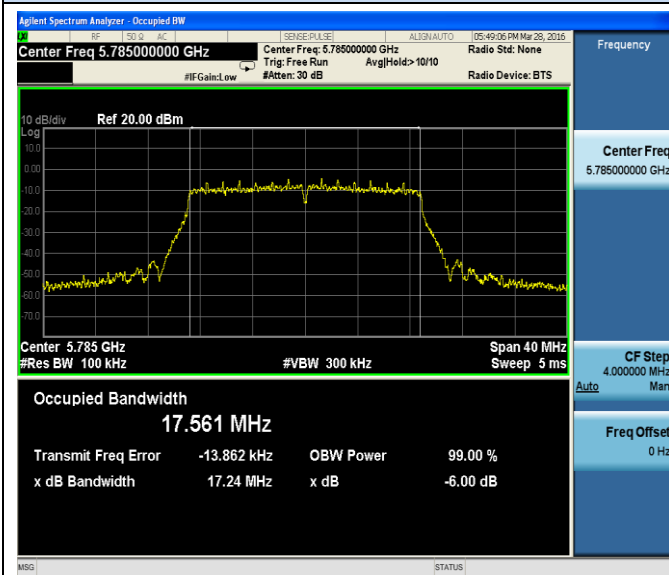




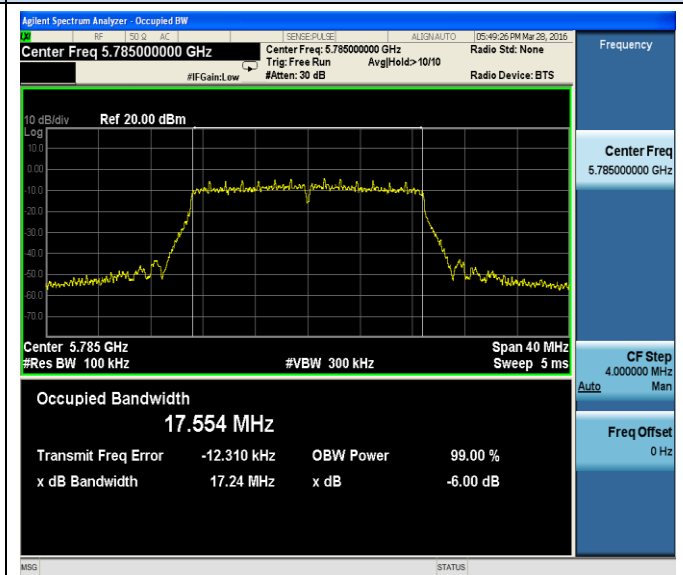
802.11n-HT20 Chain 0-5745MHz



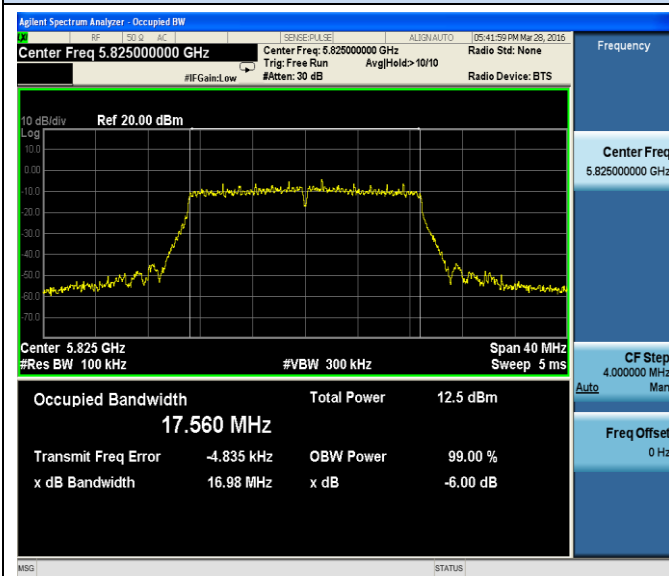
802.11n-HT20 Chain 1-5745MHz



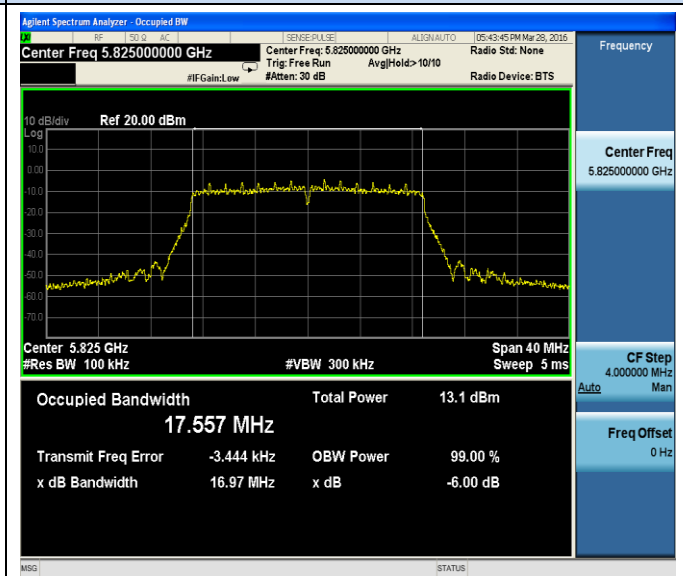
802.11n-HT20 Chain 0-5785MHz



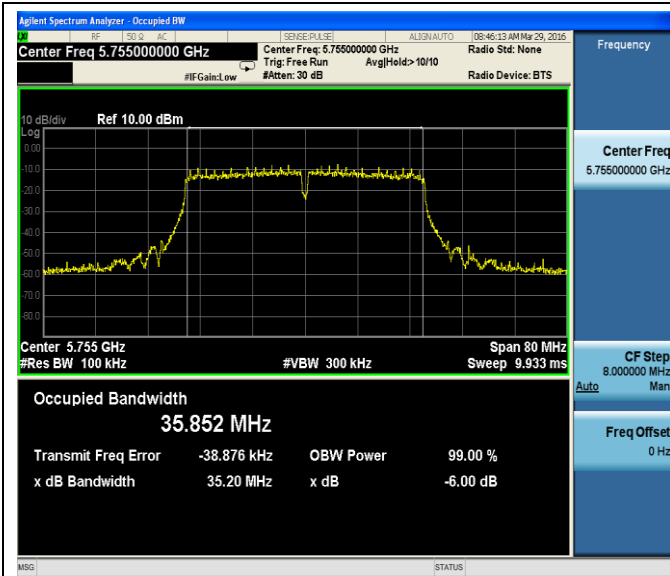
802.11n-HT20 Chain 1-5785MHz



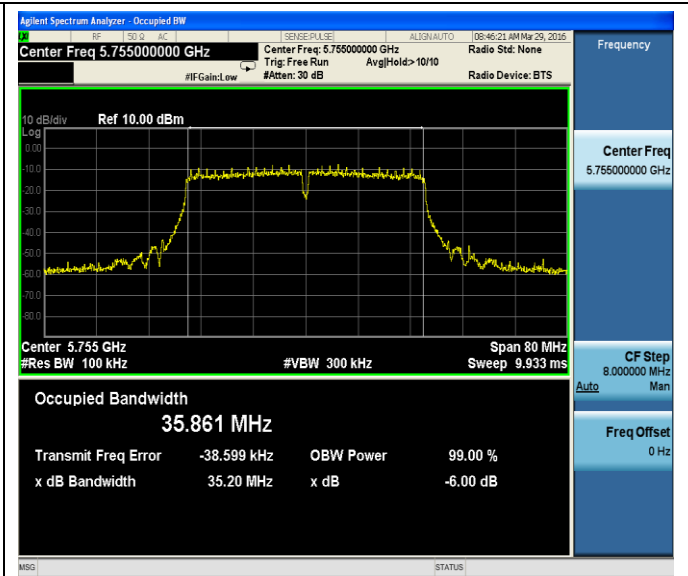
802.11n-HT20 Chain 0-5825MHz



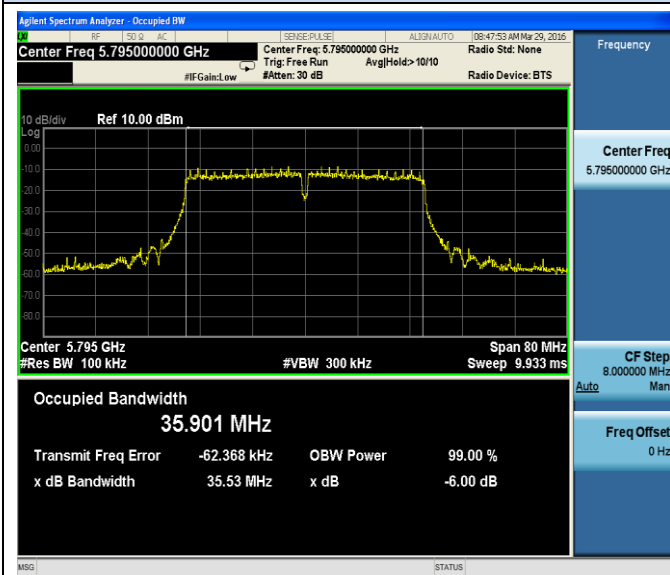
802.11n-HT20 Chain 1-5825MHz



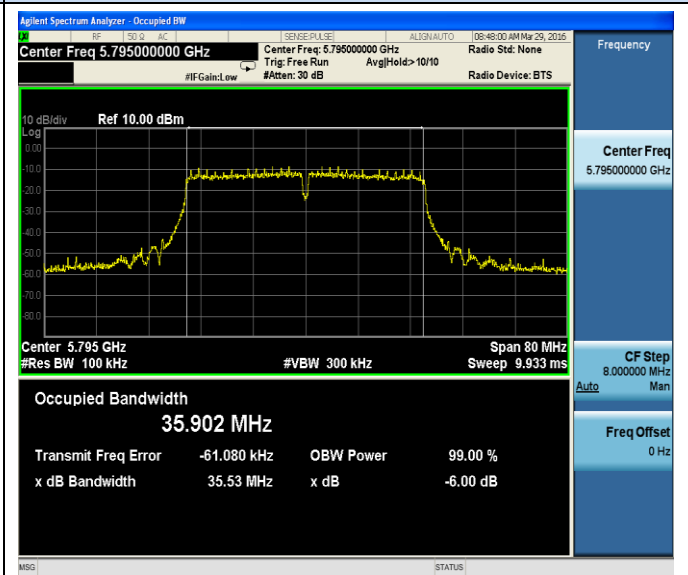
802.11n-HT40 Chain 0-5755MHz



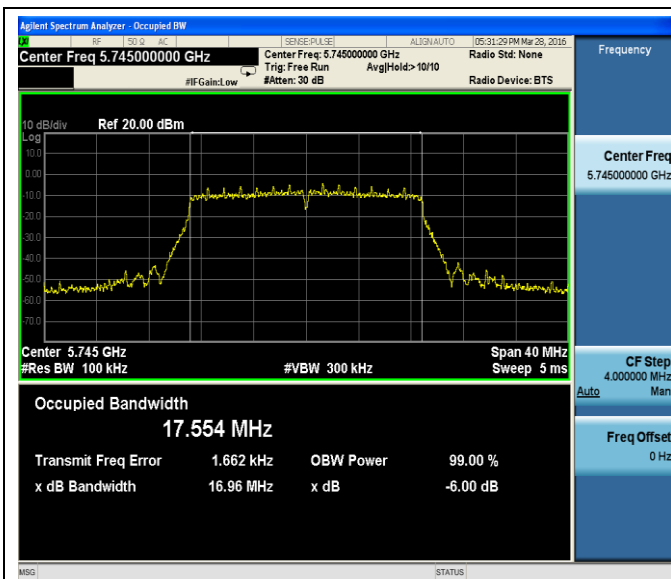
802.11n-HT40 Chain 1-5755MHz



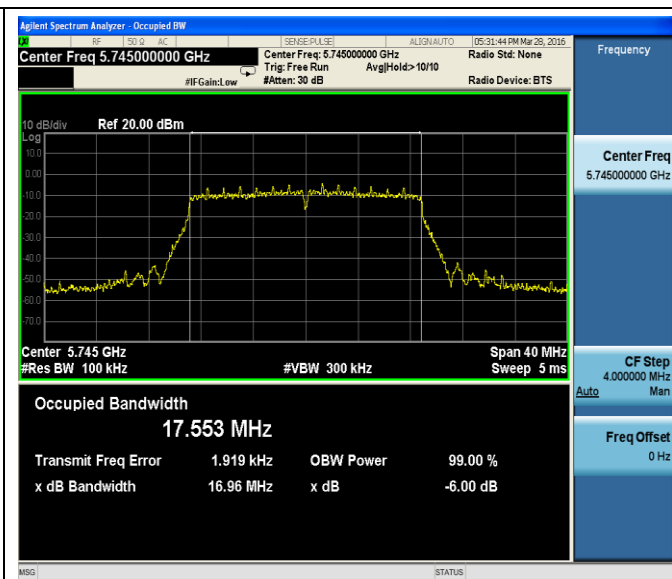
802.11n-HT40 Chain 0-5795MHz



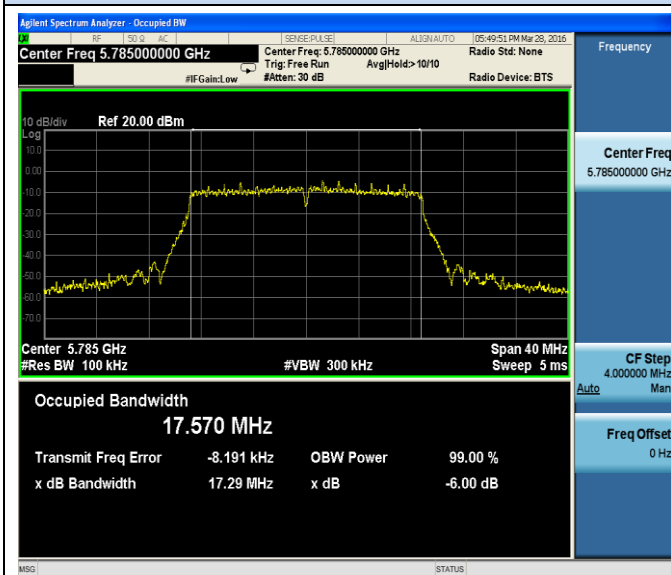
802.11n-HT40 Chain 1-5795MHz



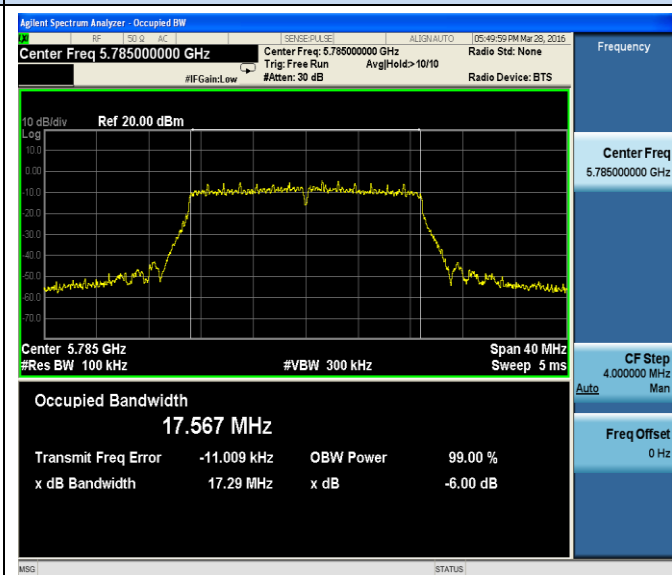
802.11ac20 Chain 0-5745MHz



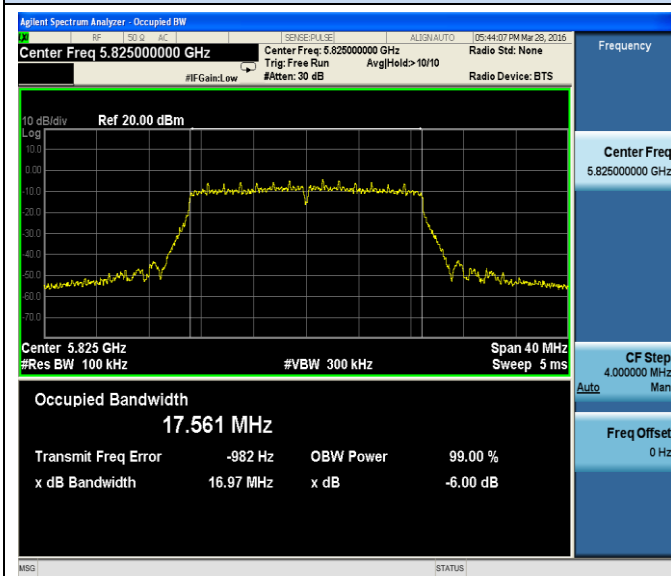
802.11ac20 Chain 1-5745MHz



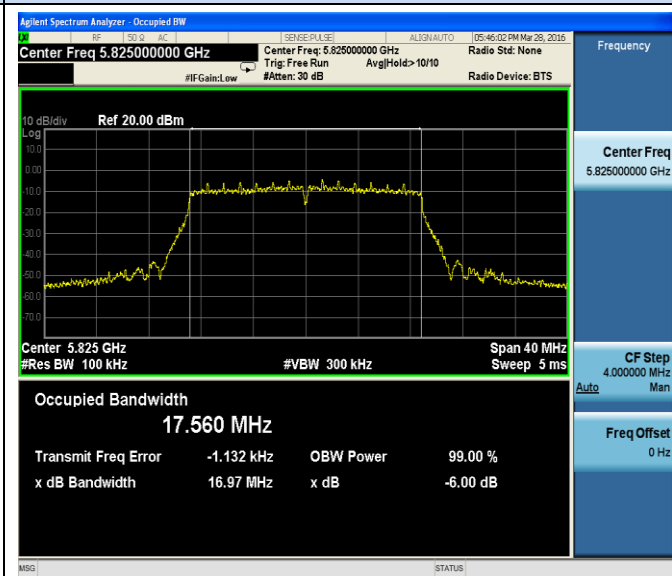
802.11ac20 Chain 0-5785MHz



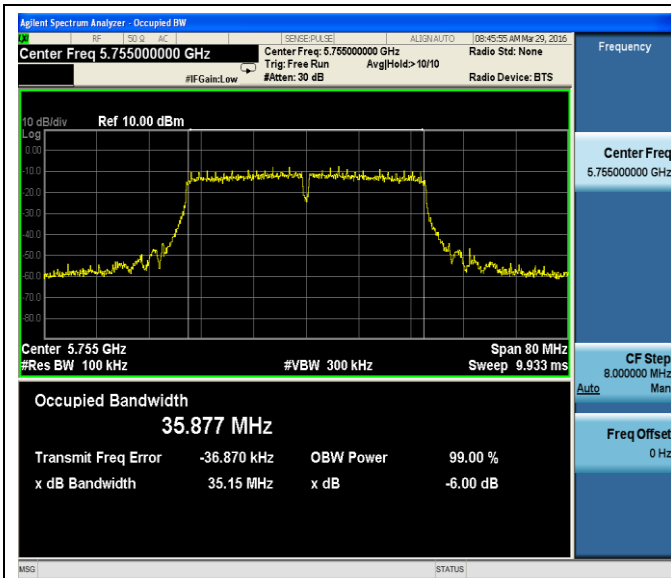
802.11ac20 Chain 1-5785MHz



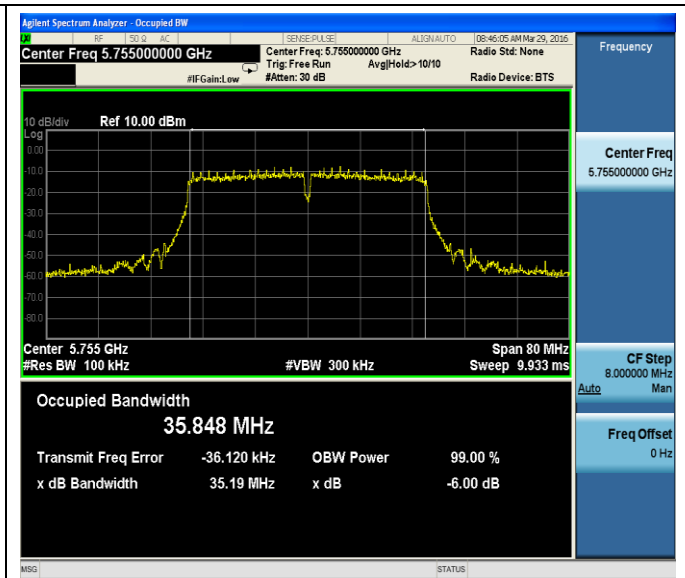
802.11ac20 Chain 0-5825MHz



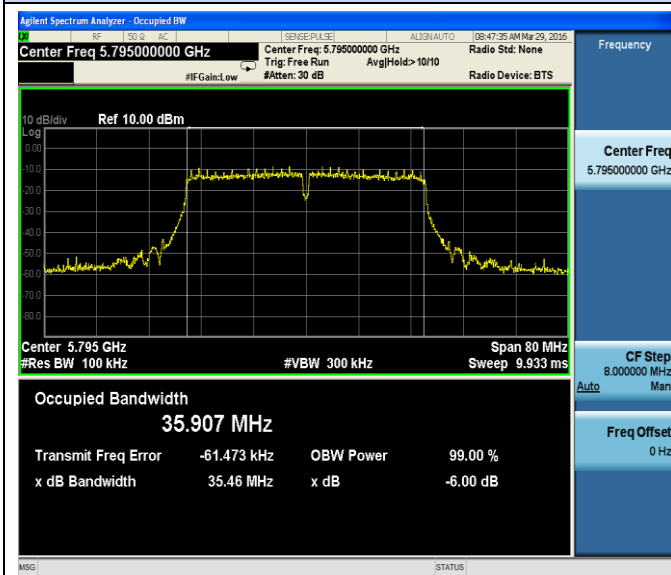
802.11ac20 Chain 1-5825MHz



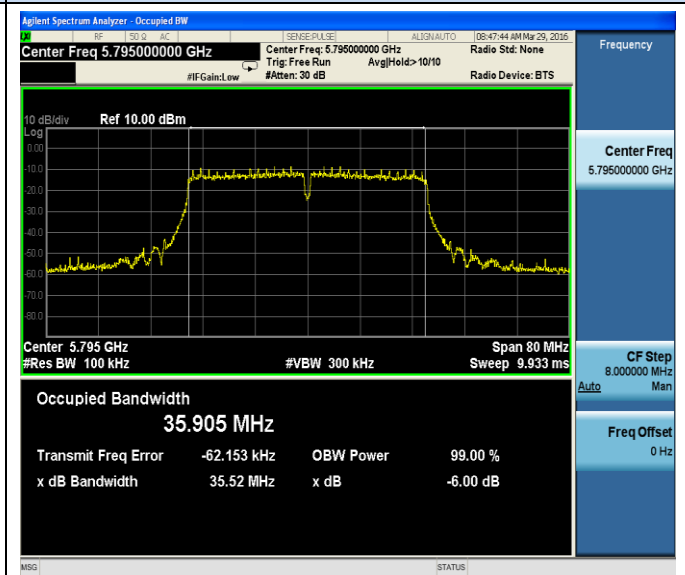
802.11ac40 Chain 0-5755MHz



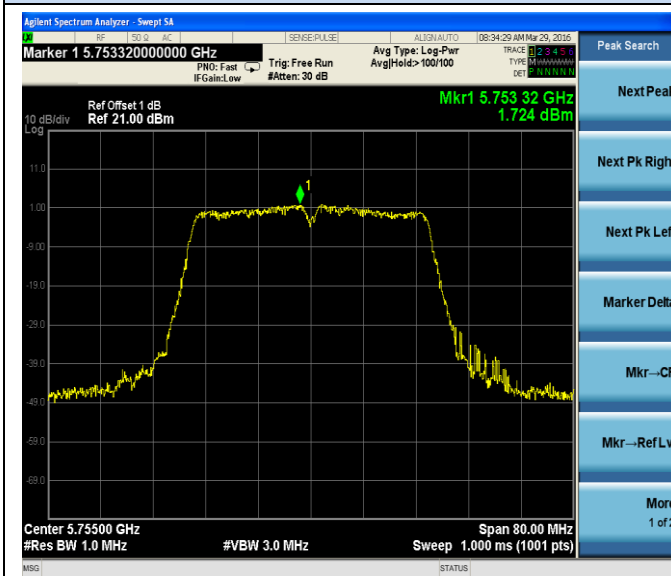
802.11ac40 Chain 1-5755MHz



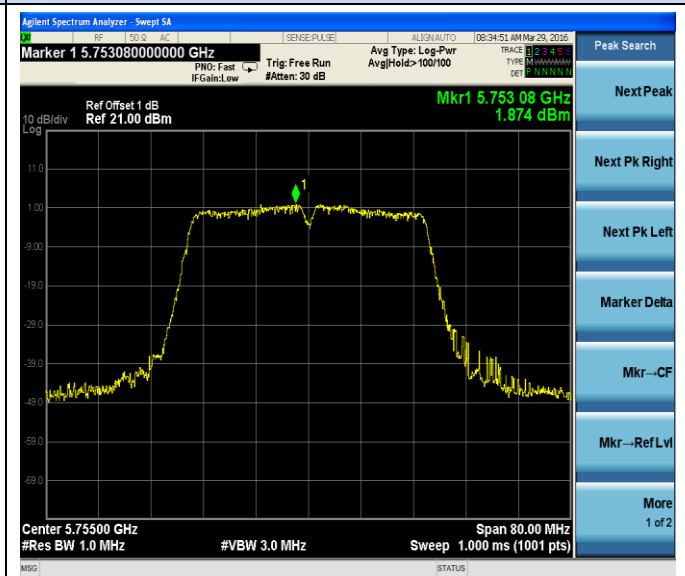
802.11ac40 Chain 0-5795MHz



802.11ac40 Chain 1-5795MHz



802.11ac80 Chain 0-5775MHz



802.11ac80 Chain 1-5775MHz

## 5.4. Radiated Emissions Measurement

### 5.4.1. Standard Applicable

For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.470-5.725 GHz band: all emissions outside of the 5.470-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz (78.3dBuV/m at 3m); for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies(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

### 5.4.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

### 5.4.3. Test Procedures

#### 1) Sequence of testing 9 kHz to 30 MHz

##### **Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

##### **Premeasurement:**

- The turntable rotates from 0 ° to 315 ° using 45 ° steps.
- The antenna height is 1.5 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

##### **Final measurement:**

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0 ° to 360 °) and by rotating the elevation axes (0 ° to 360 °).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

## 2) Sequence of testing 30 MHz to 1 GHz

### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

### Premeasurement:

- The turntable rotates from 0 ° to 315 ° using 45 ° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

### Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

### 3) Sequence of testing 1 GHz to 18 GHz

#### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

#### Premeasurement:

- The turntable rotates from 0 ° to 315 ° using 45 ° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

#### Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.



#### 4) Sequence of testing above 18 GHz

##### **Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

##### **Premeasurement:**

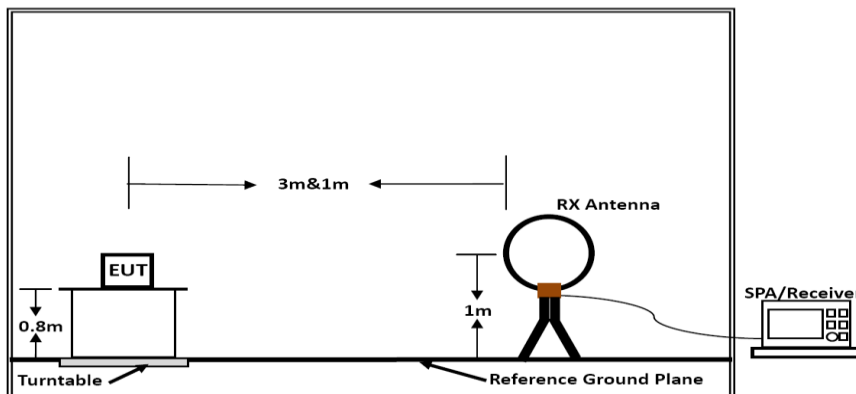
- The antenna is moved spherical over the EUT in different polarisations of the antenna.

##### **Final measurement:**

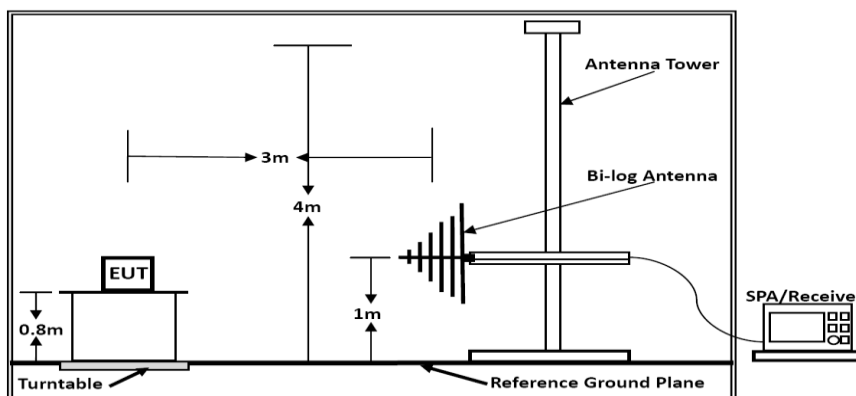
- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

5.4.4. Test Setup Layout

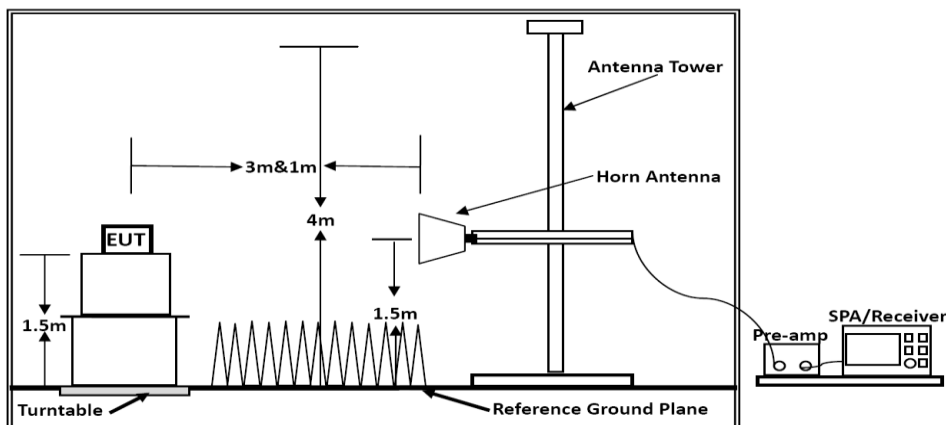
For radiated emissions below 30MHz



Below 30MHz



Below 1GHz



Above 1GHz

Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1.5m.

Distance extrapolation factor =  $20 \log (\text{specific distance [3m]} / \text{test distance [1.5m]})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.4.6. Results of Radiated Emissions (9kHz~30MHz)

Temperature	25°C	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a/n

Freq. (MHz)	Level (dBUV)	Over Limit (dB)	Over Limit (dBUV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

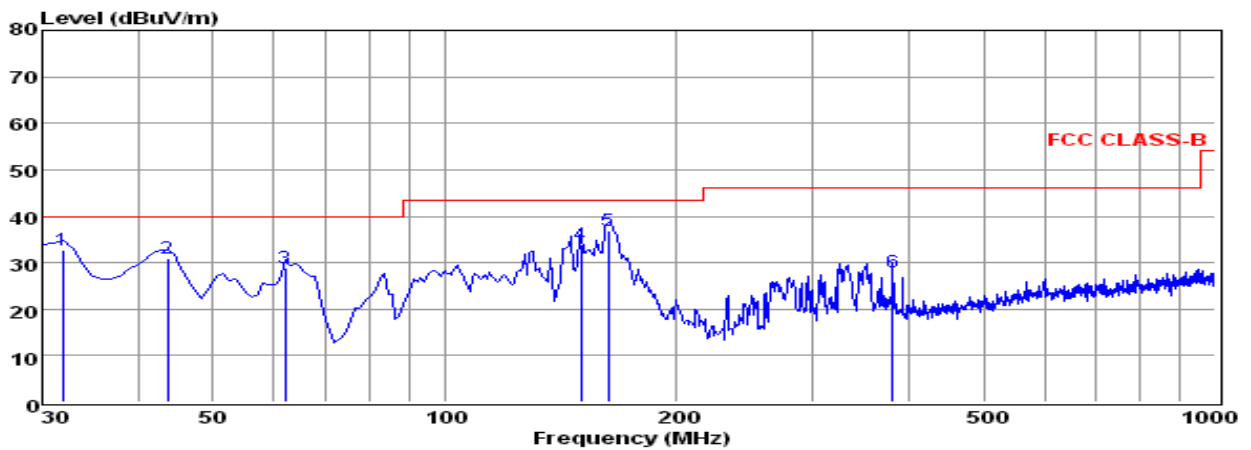
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBUV) + distance extrapolation factor.

5.4.7. Results of Radiated Emissions (30MHz~1GHz)

Temperature	25°C	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a, 5825MHz

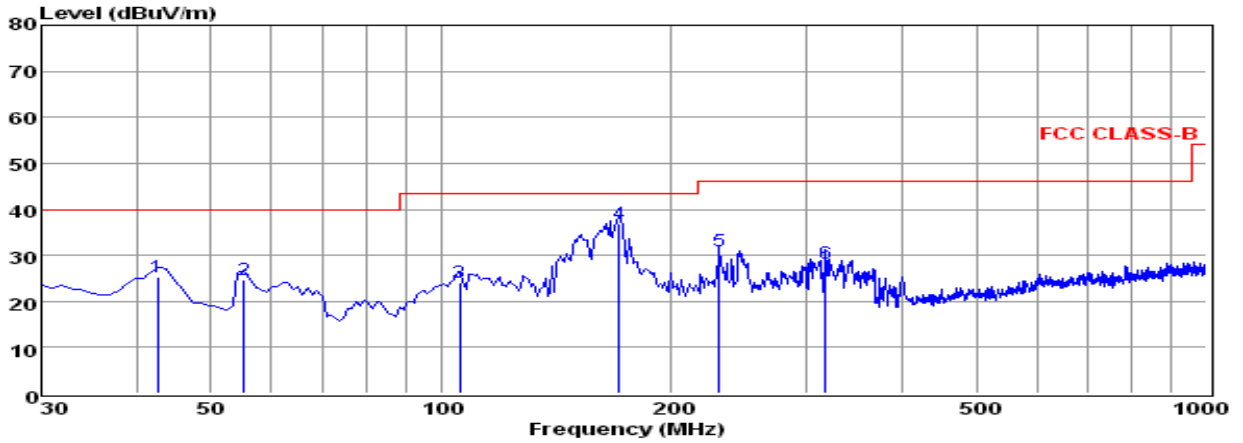
Test result for 802.11a-5825MHz



Env./Ins: 24°C/56%  
 pol: VERTICAL

	Freq MHz	Reading dBUV	CabLos dB	Antfac dB/m	Measured dBUV/m	Limit dBUV/m	Over dB	Remark
1	31.94	20.15	0.37	12.32	32.84	40.00	-7.16	QP
2	43.58	16.88	0.41	13.56	30.85	40.00	-9.15	QP
3	62.01	16.33	0.48	11.89	28.70	40.00	-11.30	QP
4	150.28	24.86	0.86	8.27	33.99	43.50	-9.51	QP
5	162.89	27.17	0.86	8.76	36.79	43.50	-6.71	QP
6	381.14	12.23	1.18	14.62	28.03	46.00	-17.97	QP

- Note: 1. All readings are Quasi-peak values.
- 2. Measured= Reading + Antenna Factor + Cable Loss
- 3. The emission that are 20db below the official limit are not reported



Env./Ins: 24 °C / 56%  
 pol: HORIZONTAL

	Freq MHz	Reading dBuV	CabLos dB	Antfac dB/m	Measured dBuV/m	Limit dBuV/m	Over dB	Remark
1	42.61	11.32	0.50	13.56	25.38	40.00	-14.62	QP
2	55.22	11.33	0.46	13.01	24.80	40.00	-15.20	QP
3	105.66	10.92	0.61	12.64	24.17	43.50	-19.33	QP
4	170.65	26.94	0.80	9.02	36.76	43.50	-6.74	QP
5	230.79	18.16	0.98	11.68	30.82	46.00	-15.18	QP
6	318.09	13.91	1.01	13.30	28.22	46.00	-17.78	QP

Note: 1. All readings are Quasi-peak values.  
 2. Measured= Reading + Antenna Factor + Cable Loss  
 3. The emission that are 20db below the official limit are not reported

Note:

Pre-scan all mode and recorded the worst case results in this report (802.11a-5825MHz).

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

## 5.4.8. Results for Radiated Emissions (Above 1GHz)

802.11a/Chain 0+Chain 1

Channel 149

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.235	56.92	33.23	35.04	3.91	59.02	74	-14.98	Peak	Horizontal
17.235	42.68	33.23	35.04	3.91	44.78	54	-9.22	Average	Horizontal
17.235	55.97	33.23	35.04	3.91	58.07	74	-15.93	Peak	Vertical
17.235	41.56	33.23	35.04	3.91	43.66	54	-10.34	Average	Vertical

Channel 157

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.355	57.47	33.27	35.15	3.93	59.52	74	-14.48	Peak	Horizontal
17.355	42.38	33.27	35.15	3.93	44.43	54	-9.57	Average	Horizontal
17.355	57.04	33.27	35.15	3.93	59.09	74	-14.91	Peak	Vertical
17.355	42.68	33.27	35.15	3.93	44.73	54	-9.27	Average	Vertical

Channel 163

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.475	56.92	33.32	35.14	3.97	59.07	74	-14.93	Peak	Horizontal
17.475	42.26	33.32	35.14	3.97	44.41	54	-9.59	Average	Horizontal
17.475	56.07	33.32	35.14	3.97	58.22	74	-15.78	Peak	Vertical
17.475	41.73	33.32	35.14	3.97	43.88	54	-10.12	Average	Vertical

## 802.11n-HT20/Chain 0+Chain 1

## Channel 149

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.235	57.94	33.23	35.04	3.91	60.04	74	-13.96	Peak	Horizontal
17.235	42.95	33.23	35.04	3.91	45.05	54	-8.95	Average	Horizontal
17.235	58.36	33.23	35.04	3.91	60.46	74	-13.54	Peak	Vertical
17.235	42.31	33.23	35.04	3.91	44.41	54	-9.59	Average	Vertical

## Channel 157

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.355	58.72	33.27	35.15	3.93	60.77	74	-13.23	Peak	Horizontal
17.355	42.97	33.27	35.15	3.93	45.02	54	-8.98	Average	Horizontal
17.355	58.73	33.27	35.15	3.93	60.78	74	-13.22	Peak	Vertical
17.355	43.21	33.27	35.15	3.93	45.26	54	-8.74	Average	Vertical

## Channel 163

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.475	57.89	33.32	35.14	3.97	60.04	74	-13.96	Peak	Horizontal
17.475	42.87	33.32	35.14	3.97	45.02	54	-8.98	Average	Horizontal
17.475	57.63	33.32	35.14	3.97	59.78	74	-14.22	Peak	Vertical
17.475	43.18	33.32	35.14	3.97	45.33	54	-8.67	Average	Vertical

## 802.11n-HT40/Chain 0+Chain 1

## Channel 151

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.265	57.94	33.23	35.04	3.91	60.04	74	-13.96	Peak	Horizontal
17.265	43.00	33.23	35.04	3.91	45.10	54	-8.90	Average	Horizontal
17.265	57.68	33.23	35.04	3.91	59.78	74	-14.22	Peak	Vertical
17.265	42.93	33.23	35.04	3.91	45.03	54	-8.97	Average	Vertical

## Channel 159

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.385	57.97	33.27	35.15	3.93	60.02	74	-13.98	Peak	Horizontal
17.385	43.73	33.27	35.15	3.93	45.78	54	-8.22	Average	Horizontal
17.385	57.96	33.27	35.15	3.93	60.01	74	-13.99	Peak	Vertical
17.385	42.76	33.27	35.15	3.93	44.81	54	-9.19	Average	Vertical

## 802.11ac20/Chain 0+Chain 1

## Channel 149

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.235	58.16	33.23	35.04	3.91	60.26	74	-13.74	Peak	Horizontal
17.235	43.69	33.23	35.04	3.91	45.79	54	-8.21	Average	Horizontal
17.235	58.18	33.23	35.04	3.91	60.28	74	-13.72	Peak	Vertical
17.235	41.92	33.23	35.04	3.91	44.02	54	-9.98	Average	Vertical

## Channel 157

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.355	58.42	33.27	35.15	3.93	60.47	74	-13.53	Peak	Horizontal
17.355	43.23	33.27	35.15	3.93	45.28	54	-8.72	Average	Horizontal
17.355	58.28	33.27	35.15	3.93	60.33	74	-13.67	Peak	Vertical
17.355	43.73	33.27	35.15	3.93	45.78	54	-8.22	Average	Vertical

## Channel 163

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.475	58.00	33.32	35.14	3.97	60.15	74	-13.85	Peak	Horizontal
17.475	42.89	33.32	35.14	3.97	45.04	54	-8.96	Average	Horizontal
17.475	57.63	33.32	35.14	3.97	59.78	74	-14.22	Peak	Vertical
17.475	43.21	33.32	35.14	3.97	45.36	54	-8.64	Average	Vertical



## 802.11ac40/Chain 0+Chain 1

## Channel 151

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.265	58.06	33.23	35.04	3.91	60.16	74	-13.84	Peak	Horizontal
17.265	43.15	33.23	35.04	3.91	45.25	54	-8.75	Average	Horizontal
17.265	57.23	33.23	35.04	3.91	59.33	74	-14.67	Peak	Vertical
17.265	43.68	33.23	35.04	3.91	45.78	54	-8.22	Average	Vertical

## Channel 159

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.385	57.98	33.27	35.15	3.93	60.03	74	-13.97	Peak	Horizontal
17.385	43.42	33.27	35.15	3.93	45.47	54	-8.53	Average	Horizontal
17.385	58.83	33.27	35.15	3.93	60.88	74	-13.12	Peak	Vertical
17.385	42.62	33.27	35.15	3.93	44.67	54	-9.33	Average	Vertical

## 802.11ac80/Chain 0+Chain 1

## Channel 155

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
17.325	58.71	33.27	35.15	3.93	60.76	74	-13.24	Peak	Horizontal
17.325	43.39	33.27	35.15	3.93	45.44	54	-8.56	Average	Horizontal
17.325	57.96	33.27	35.15	3.93	60.01	74	-13.99	Peak	Vertical
17.325	43.73	33.27	35.15	3.93	45.78	54	-8.22	Average	Vertical

**Notes:**

1. Measuring frequencies from 9k~40GHz, No emission found between lowest internal used/generated frequency to 30MHz.
2. Radiated emissions measured in frequency range from 9k~40GHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

## 5.4.9. Results for Band Edge Emissions

802.11a/Chain 0+Chain 1

Channel 149

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5725.00	51.24	33.26	35.14	3.98	53.34	74	-20.66	Peak	Horizontal
5725.00	35.12	33.26	35.14	3.98	37.22	54	-16.78	Average	Horizontal
5725.00	50.31	33.26	35.14	3.98	52.41	74	-21.59	Peak	Vertical
5725.00	35.68	33.26	35.14	3.98	37.78	54	-16.22	Average	Vertical

Channel 163

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5850.00	51.25	33.26	35.16	3.98	53.33	74	-20.67	Peak	Horizontal
5850.00	34.94	33.26	35.16	3.98	37.02	54	-16.98	Average	Horizontal
5850.00	50.06	33.26	35.16	3.98	52.14	74	-21.86	Peak	Vertical
5850.00	35.7	33.26	35.16	3.98	37.78	54	-16.22	Average	Vertical

802.11n-HT20/Chain 0+Chain 1

Channel 149

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5725.00	51.59	33.26	35.14	3.98	53.69	74	-20.31	Peak	Horizontal
5725.00	35.01	33.26	35.14	3.98	37.11	54	-16.89	Average	Horizontal
5725.00	50.47	33.26	35.14	3.98	52.57	74	-21.43	Peak	Vertical
5725.00	34.92	33.26	35.14	3.98	37.02	54	-16.98	Average	Vertical

Channel 163

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5850.00	51.33	33.26	35.16	3.98	53.41	74	-20.59	Peak	Horizontal
5850.00	35.53	33.26	35.16	3.98	37.61	54	-16.39	Average	Horizontal
5850.00	50.14	33.26	35.16	3.98	52.22	74	-21.78	Peak	Vertical
5850.00	35.71	33.26	35.16	3.98	37.79	54	-16.21	Average	Vertical

## 802.11n-HT40/Chain 0+Chain 1

## Channel 151

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5725.00	50.92	33.26	35.14	3.98	53.02	74	-20.98	Peak	Horizontal
5725.00	35.04	33.26	35.14	3.98	37.14	54	-16.86	Average	Horizontal
5725.00	50.62	33.26	35.14	3.98	52.72	74	-21.28	Peak	Vertical
5725.00	35.59	33.26	35.14	3.98	37.69	54	-16.31	Average	Vertical

## Channel 159

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5850.00	51.06	33.26	35.16	3.98	53.14	74	-20.86	Peak	Horizontal
5850.00	35.37	33.26	35.16	3.98	37.45	54	-16.55	Average	Horizontal
5850.00	50.60	33.26	35.16	3.98	52.68	74	-21.32	Peak	Vertical
5850.00	35.28	33.26	35.16	3.98	37.36	54	-16.64	Average	Vertical

## 802.11ac20/Chain 0+Chain 1

## Channel 149

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5725.00	50.91	33.26	35.14	3.98	53.01	74	-20.99	Peak	Horizontal
5725.00	35.04	33.26	35.14	3.98	37.14	54	-16.86	Average	Horizontal
5725.00	50.68	33.26	35.14	3.98	52.78	74	-21.22	Peak	Vertical
5725.00	35.13	33.26	35.14	3.98	37.23	54	-16.77	Average	Vertical

## Channel 163

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5850.00	51.37	33.26	35.16	3.98	53.45	74	-20.55	Peak	Horizontal
5850.00	34.93	33.26	35.16	3.98	37.01	54	-16.99	Average	Horizontal
5850.00	50.34	33.26	35.16	3.98	52.42	74	-21.58	Peak	Vertical
5850.00	35.61	33.26	35.16	3.98	37.69	54	-16.31	Average	Vertical

## 802.11ac40/Chain 0+Chain 1

## Channel 151

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5725.00	51.36	33.26	35.14	3.98	53.46	74	-20.54	Peak	Horizontal
5725.00	35.04	33.26	35.14	3.98	37.14	54	-16.86	Average	Horizontal
5725.00	50.16	33.26	35.14	3.98	52.26	74	-21.74	Peak	Vertical
5725.00	35.77	33.26	35.14	3.98	37.87	54	-16.13	Average	Vertical

## Channel 159

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5850.00	51.08	33.26	35.16	3.98	53.16	74	-20.84	Peak	Horizontal
5850.00	35.14	33.26	35.16	3.98	37.22	54	-16.78	Average	Horizontal
5850.00	50.38	33.26	35.16	3.98	52.46	74	-21.54	Peak	Vertical
5850.00	34.93	33.26	35.16	3.98	37.01	54	-16.99	Average	Vertical

## 802.11ac80/Chain 0+Chain 1

## Channel 155

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5725.00	51.22	33.26	35.14	3.98	53.32	74	-20.68	Peak	Horizontal
5725.00	35.69	33.26	35.14	3.98	37.79	54	-16.21	Average	Horizontal
5725.00	50.63	33.26	35.14	3.98	52.73	74	-21.27	Peak	Vertical
5725.00	34.91	33.26	35.14	3.98	37.01	54	-16.99	Average	Vertical

## Channel 155

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5850.00	50.94	33.26	35.16	3.98	53.02	74	-20.98	Peak	Horizontal
5850.00	35.67	33.26	35.16	3.98	37.75	54	-16.25	Average	Horizontal
5850.00	50.14	33.26	35.16	3.98	52.22	74	-21.78	Peak	Vertical
5850.00	35.69	33.26	35.16	3.98	37.77	54	-16.23	Average	Vertical

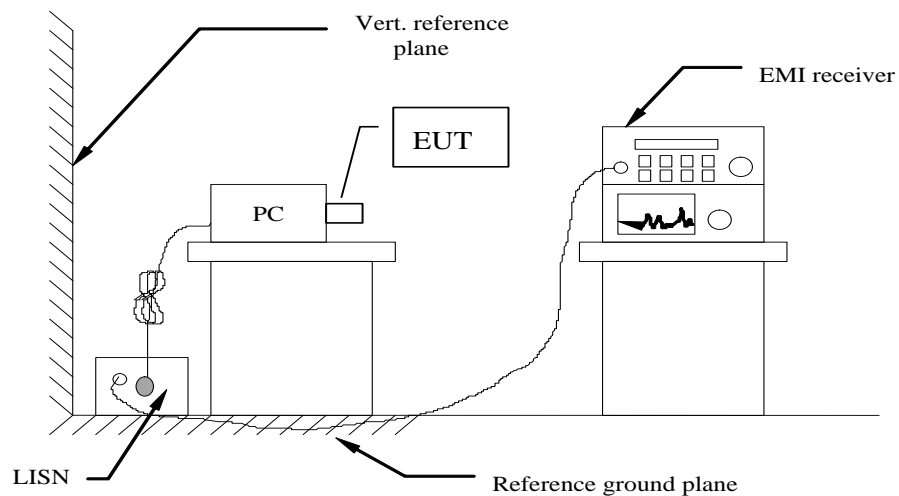
## 5.5. Power line conducted emissions

### 5.5.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

### 5.5.2 Block Diagram of Test Setup

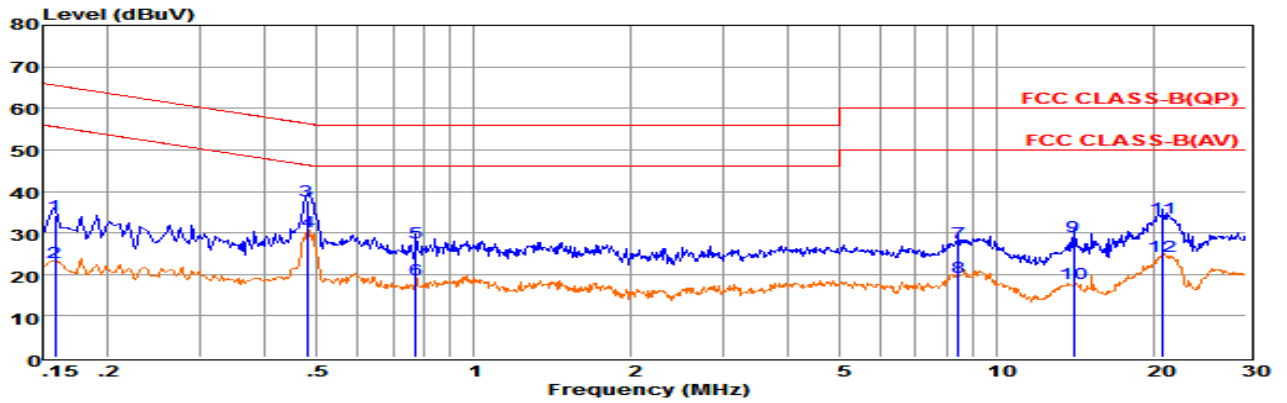


### 5.5.3 Test Results

PASS.

The test data please refer to following page.

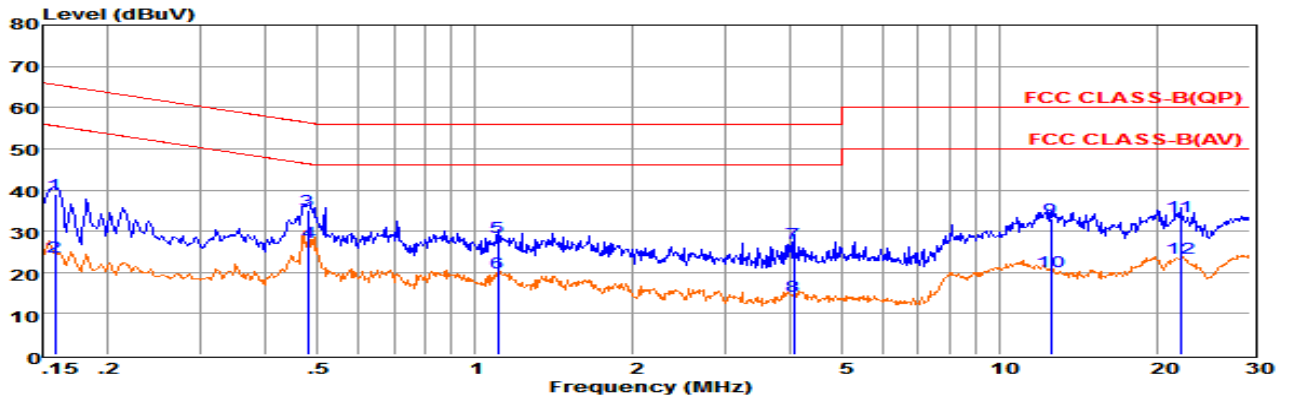
Test result for 802.11a(AC 120V)



Env. Ins: 24\*/56%  
 Pol: NEUTRAL

Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1 0.15816	14.59	9.68	0.02	10.00	34.29	65.56	-31.27	QP
2 0.15826	3.30	9.68	0.02	10.00	23.00	55.55	-32.55	Average
3 0.48119	17.97	9.62	0.04	10.00	37.63	56.32	-18.69	QP
4 0.48129	10.81	9.62	0.04	10.00	30.47	46.32	-15.85	Average
5 0.77519	8.14	9.63	0.04	10.00	27.81	56.00	-28.19	QP
6 0.77529	-0.80	9.63	0.04	10.00	18.87	46.00	-27.13	Average
7 8.45620	7.81	9.71	0.08	10.00	27.60	60.00	-32.40	QP
8 8.45720	-0.38	9.71	0.08	10.00	19.41	50.00	-30.59	Average
913.98856	9.23	9.74	0.10	10.00	29.07	60.00	-30.93	QP
1013.98956	-2.01	9.74	0.10	10.00	17.83	50.00	-32.17	Average
1120.81374	13.71	9.86	0.12	10.00	33.69	60.00	-26.31	QP
1220.81474	4.27	9.86	0.12	10.00	24.25	50.00	-25.75	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten\_Fac.  
 2. The emission levels that are 20dB below the official limit are not reported.

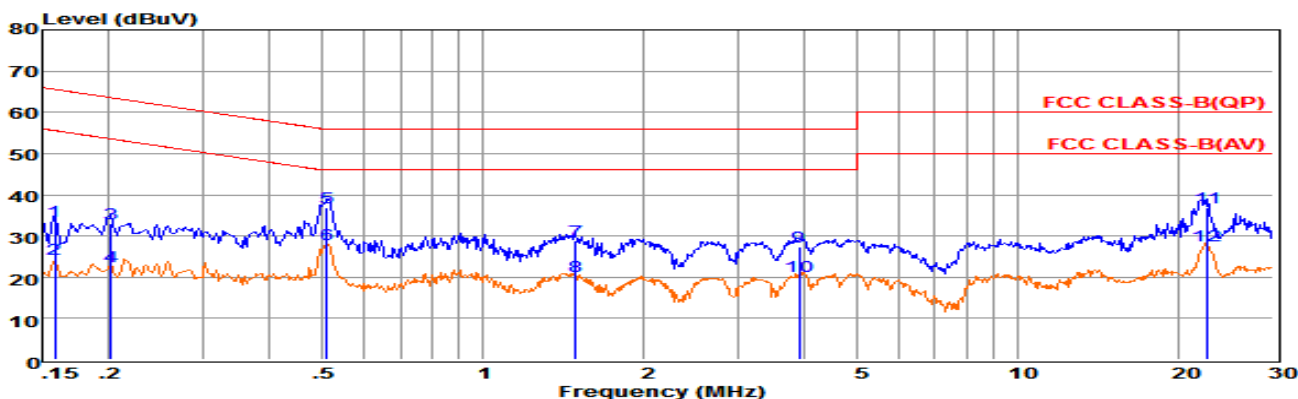


Env. Ins: 24\*/56%  
 Pol: LINE

Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1 0.15816	19.41	9.58	0.02	10.00	39.01	65.56	-26.55	QP
2 0.15826	4.26	9.58	0.02	10.00	23.86	55.55	-31.69	Average
3 0.48119	15.30	9.62	0.04	10.00	34.96	56.32	-21.36	QP
4 0.48129	7.65	9.62	0.04	10.00	27.31	46.32	-19.01	Average
5 1.10555	8.75	9.63	0.05	10.00	28.43	56.00	-27.57	QP
6 1.10655	0.11	9.63	0.05	10.00	19.79	46.00	-26.21	Average
7 4.04885	7.29	9.65	0.06	10.00	27.00	56.00	-29.00	QP
8 4.04985	-5.42	9.65	0.06	10.00	14.29	46.00	-31.71	Average
912.51559	13.08	9.70	0.09	10.00	32.87	60.00	-27.13	QP
1012.51659	0.54	9.70	0.09	10.00	20.33	50.00	-29.67	Average
1122.06285	13.73	9.71	0.12	10.00	33.56	60.00	-26.44	QP
1222.06385	3.57	9.71	0.12	10.00	23.40	50.00	-26.60	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten\_Fac.  
 2. The emission levels that are 20dB below the official limit are not reported.

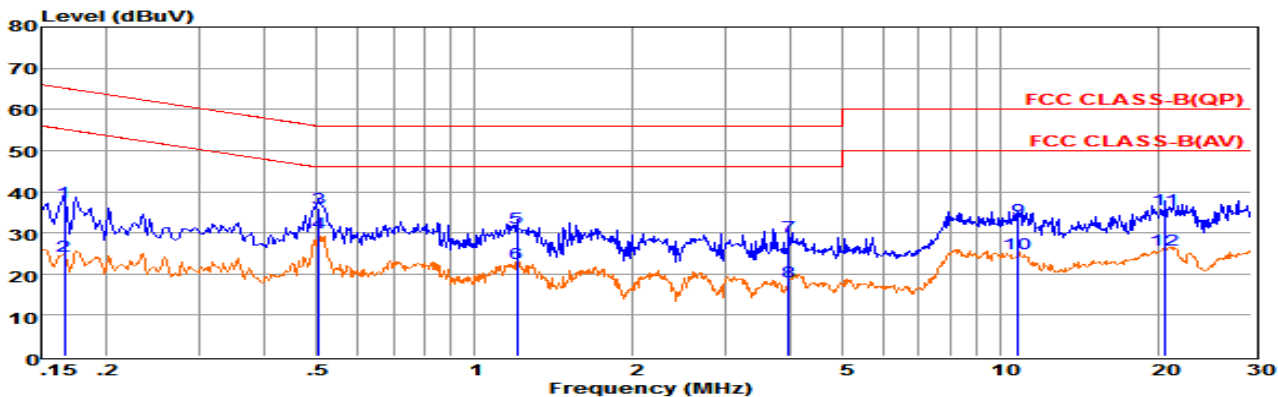
Test result for 802.11a(AC 240V)



Env. Ins: 24\*/56%  
 Pol: NEUTRAL

Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1 0.15816	13.88	9.68	0.02	10.00	33.58	65.56	-31.98	QP
2 0.15826	4.63	9.68	0.02	10.00	24.33	55.55	-31.22	Average
3 0.20181	13.53	9.59	0.02	10.00	33.14	63.54	-30.40	QP
4 0.20191	3.10	9.59	0.02	10.00	22.71	53.53	-30.82	Average
5 0.51007	17.22	9.62	0.04	10.00	36.88	56.00	-19.12	QP
6 0.51017	8.28	9.62	0.04	10.00	27.94	46.00	-18.06	Average
7 1.48743	9.11	9.63	0.05	10.00	28.79	56.00	-27.21	QP
8 1.48843	0.61	9.63	0.05	10.00	20.29	46.00	-25.71	Average
9 3.90144	7.57	9.65	0.06	10.00	27.28	56.00	-28.72	QP
10 3.90244	0.47	9.65	0.06	10.00	20.18	46.00	-25.82	Average
1122.65514	17.06	9.81	0.12	10.00	36.99	60.00	-23.01	QP
1222.65614	7.61	9.81	0.12	10.00	27.54	50.00	-22.46	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten\_Fac.  
 2. The emission levels that are 20dB below the official limit are not reported.



Env. Ins: 24\*/56%  
 Pol: LINE

Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1 0.16589	17.77	9.59	0.02	10.00	37.38	65.16	-27.78	QP
2 0.16599	4.78	9.59	0.02	10.00	24.39	55.16	-30.77	Average
3 0.50469	16.29	9.62	0.04	10.00	35.95	56.00	-20.05	QP
4 0.50479	10.24	9.62	0.04	10.00	29.90	46.00	-16.10	Average
5 1.20336	11.63	9.63	0.05	10.00	31.31	56.00	-24.69	QP
6 1.20436	2.89	9.63	0.05	10.00	22.57	46.00	-23.43	Average
7 3.96395	9.29	9.65	0.06	10.00	29.00	56.00	-27.00	QP
8 3.96495	-1.51	9.65	0.06	10.00	18.20	46.00	-27.80	Average
910.79003	13.55	9.69	0.08	10.00	33.32	60.00	-26.68	QP
1010.79103	5.13	9.69	0.08	10.00	24.90	50.00	-25.10	Average
1120.59435	15.93	9.74	0.12	10.00	35.79	60.00	-24.21	QP
1220.59535	6.02	9.74	0.12	10.00	25.88	50.00	-24.12	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten\_Fac.  
 2. The emission levels that are 20dB below the official limit are not reported.

\*\*\*Note: Pre-scan all mode and recorded the worst case results in this report (802.11a).

## 5.6. Antenna Requirements

### 5.6.1. Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### 5.6.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 7.0dBi (For MIMO is 10.01dBi) which is a R-SMA antenna and no consideration of replacement. Please see EUT photo for details.

### 5.6.3. Results: Compliance.



## 6. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	June 18, 2015	June 17, 2016
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	July 16, 2015	July 15, 2016
Signal analyzer	Agilent	N9020A	MY50510140	9kHz~26.5GHz	October 27, 2015	October 27, 2016
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18, 2015	June 17, 2016
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18, 2015	June 17, 2016
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18, 2015	June 17, 2016
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18, 2015	June 17, 2016
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-18GHz 3m	June 18, 2015	June 17, 2016
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHz	June 18, 2015	June 17, 2016
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16, 2015	July 15, 2016
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16, 2015	July 15, 2016
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18, 2015	June 17, 2016
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	June 10, 2015	June 09, 2016
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10, 2015	June 09, 2016
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	June 10, 2015	June 09, 2016
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18, 2015	June 17, 2016
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18, 2015	June 17, 2016
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18, 2015	June 17, 2016
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	June 18, 2015	June 17, 2016
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18, 2015	June 17, 2016
AC Power Source	HPC	HPA-500E	HPA-9100024	AC 0~300V	June 18, 2015	June 17, 2016
DC power Soure	GW	GPC-6030D	C671845	DC 1V-60V	June 18, 2015	June 17, 2016
Temp. and Humidigy	Giant Force	GTH-225-20-S	MAB0103-00	N/A	June 18, 2015	June 17, 2016
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18, 2015	June 17, 2016
RF CABLE-2m	JYE Bao	RG142	CB)35-2m	20MHz-1GHz	June 18, 2015	June 17, 2016

Note: All equipment through GRGT EST calibration

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