FCC TEST REPORT

For

SUNTOR ELECTRONICS CO., Limited

Digital Wireless Bridge

Test Model: ST58T8G

Prepared for	:	SUNTOR ELECTRONICS CO., Limited
Address	:	3F/A17 Building, Silicon Valley Power Industrial Qinghu Park, Longhua New District, Shenzhen, China

Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	Jul 11, 2016
Number of tested samples	:	1
Sample number	:	Prototype
Date of Test	:	Jul 11, 2016~Oct 25, 2016
Date of Report	:	Oct 25, 2016

FCC TEST REPORT

FCC CFR 47 PART 15 E(15.407): 2015

Report Reference No.	**:**	**LCS1607110873E**
Date of Issue.....	:	Oct 25, 2016
Testing Laboratory Name ..... :		**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, 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..... :		**SUNTOR ELECTRONICS CO., Limited**
Address.....	:	3F/A17 Building, Silicon Valley Power Industrial Qinghu Park, Longhua New District, Shenzhen, China
Test Specification		
Standard	:	FCC CFR 47 PART 15 E(15.407): 2015 / ANSI C63.10: 2013
Test Report Form No.. :		LCSEMC-1.0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2011-03

Test Item Description..... :		**Digital Wireless Bridge**
Trade Mark.....	:	SUNTOR
Test Model	:	ST58T8G
Ratings	:	DC 12V/24V by adapter
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Calvin Weng		
Calvin Weng/ Administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS1607110873E	Oct 25, 2016 Date of issue

Test Model.....	: ST58T8G
EUT.....	: Digital Wireless Bridge
Applicant.....	**: SUNTOR ELECTRONICS CO., Limited**
Address.....	: 3F/A17 Building, Silicon Valley Power Industrial Qinghu Park, Longhua New District, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: SUNTOR ELECTRONICS CO., Limited**
Address.....	: 3F/A17 Building, Silicon Valley Power Industrial Qinghu Park, Longhua New District, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Factory.....	**: SUNTOR ELECTRONICS CO., Limited**
Address.....	: 3F/A17 Building, Silicon Valley Power Industrial Qinghu Park, Longhua New District, Shenzhen, China
Telephone.....	: /
Fax.....	: /

Test Result	Positive

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.

Revision History

Revision	Issue Date	Revisions	Revised By
00	2016-10-25	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	: Digital Wireless Bridge
Test Model	: ST58T8G
Hardware Version	: REV:01
Software Version	: V1.0.10
Power Supply	: DC 12V/24V by adapter
EUT Supports Radios Application	: 5GHz WIFI
WIFI(5G Band)	:
Frequency Range	: 5180-5240MHz, 5745-5825MHz
Channel Number	: 9 Channels for 20MHz Bandwidth 4 channels for 40MHz Bandwidth
Modulation Type	: 802.11a/n: OFDM
Antenna Description	: Internal Antenna, 18dBi(Max.)

1.2. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Small Ears Co., Ltd	Adapter	ST58T8G	--	VOC

1.3. External I/O

I/O Port Description	Quantity	Cable
RJ45 Port	1	N/A

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

There is one 3m semi-anechoic chamber and one line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10: 2013, CISPR 22/EN 55022 and CISPR16-1-4 SVSWR requirements.

1.5. List Of Measuring Equipment

Instrument	Manufacture	Model No.	Serial No.	Characteristics	Cal Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Jun 17, 2017
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	Jul 15, 2017
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	Jun 17, 2017
LISN	EMCO	3819/2NM	9703-1839	9KHz-30MHz	Jun 17, 2017
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	Jun 17, 2017
ISN	SCHAFFNE	ISN ST08	21653	9KHz-30MHz	Jun 17, 2017
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-18GHz	Jun 17, 2017
Amplifier	SCHAFFNE	COA9231A	18667	9kHz-2GHzz	Apr 17, 2017
Amplifier	Agilent	8449B	3008A021	1GHz-26.5GHz	Apr 17, 2017
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	Apr 17, 2017
Loop Antenna	R&S	HFH2-Z2	860004/00	9k-30MHz	Apr 17, 2017
By-log Antenna	SCHWARZB	VULB9163	9163-470	30MHz-1GHz	Apr 17, 2017
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	Apr 17, 2017
Horn Antenna	SCHWARZB	BBHA9170	BBHA9170	15GHz-40GHz	Apr 17, 2017
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	Jun 17, 2017
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-H	1GHz-40GHz	Jun 17, 2017
Power Meter	R&S	NRVS	100444	DC-40GHz	Jun 17, 2017
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	Jun 17, 2017
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	Jun 17, 2017
AC Power Source	HPC	HPA-500E	HPA-9100	AC 0~300V	Jun 17, 2017
DC power Soure	GW	GPC-6030D	C671845	DC 1V-60V	Jun 17, 2017
Temp. and Humidigy Chamber	Giant Force	GTH-225-20-S	MAB0103-00	N/A	Jun 17, 2017
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	Jun 17, 2017
RF CABLE-2m	JYE Bao	RG142	CB035-2m	20MHz-1GHz	Jun 17, 2017
Signal Generator	R&S	SMR40	10016	10MHz~40GHz	Jul 15, 2017
Universal Radio Communication Tester	R&S	CMU200	112012	N/A	Oct 26, 2016
Wideband Radia Communication Tester	R&S	CMW500	1201.0002K50	N/A	Nov 18, 2016
MXG Vector Signal Generator	Agilent	N5182A	MY47071151	250KHz~6GHz	Oct 26, 2016
MXG Vector Signal Generator	Agilent	E4438C	MY42081396	250KHz~6GHz	Oct 26, 2016
PSG Analog Signal Generator	Agilent	N8257D	MY46520521	250KHz~20GHz	Nov 18, 2016
MXA Signal Analyzer	Agilent	N9020A	MY50510140	10Hz~26.5GHz	Oct 26, 2016
DC Power Supply	Agilent	E3642A	/	0-8V,5A/0-20V,2	May 19, 2017
RF Control Unit	Tonscend	JS0806-1	/	/	Nov 18, 2016
LTE Test Software	Tonscend	JS1120-1	/	Version: 2.5.7.0	N/A

X-series USB Peak and Average Power Sensor Agilent	Agilent	U2021XA	MY54080022	/	Oct 26, 2016
4 Ch.Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	MY54080016	/	Oct 26, 2016
Test Software	Ascentest	AT890-SW	20141230	Version:	N/A
Splitter/Combiner(Qty: 2)	Mini-Circuits	ZAPD-50W 4.2-6.0 GHz	NN256400424	/	Oct 26, 2016
Splitter/Combine(Qty: 2)	MCLI	PS3-7	4463/4464	/	Oct 26, 2016
ATT (Qty: 1)	Mini-Circuits	VAT-30+	30912	/	Oct 26, 2016

1.6. 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.

1.7. Measurement Uncertainty

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

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

1.8. Description Of Test Modes

The EUT has been tested under operating condition.

The EUT was set to transmit at 100% duty cycle. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in Y position.

For pre-testing, when performed power line conducted emission measurement, the input Voltage/Frequency AC 120V/60Hz and AC 240V/60Hz were used. Only recorded the worst case in this report.

Worst-case mode and channel used for 150kHz-30 MHz power line conducted emissions was determined to be 802.11a mode(Middle Channel, 5180-5240MHz Band).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was determined to be 802.11a mode(Middle Channel, 5180-5240MHz Band).

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: MCS8, OFDM.
802.11n(HT40) Mode: MCS8, OFDM.

Support Bandwidth For 5G WIFI Part:

Antenna	Ant 1			Ant 2		
Bandwidth Mode	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
802.11a	☑	☐	☐	☑	☐	☐
802.11n(HT20)	☑	☐	☐	☑	☐	☐
802.11n(HT40)	☐	☑	☐	☐	☑	☐

Channel & Frequency:

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
5180~5240MHz	36	5180	44	5220
	38	5190	46	5230
	40	5200	48	5240
	42	5210	/	/
For 802.11a/n(HT20), Channel 36, 44 and 48 were tested. For 802.11n(HT40), Channel 38 and 46 were tested.				
5745~5825MHz	149	5745	155	5775
	151	5755	159	5795
	153	5765	161	5805
	157	5785	165	5825
For 802.11a/n(HT20), Channel 149, 157 and 165 were tested. For 802.11n(HT40), Channel 151 and 159 were tested.				

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10: 2013, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

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 v01r02 is 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

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be 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 and 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 & 26dB Bandwidth	Compliant
§15.205, §15.407(b)	Radiated Spurious Emissions and Band Edge	Compliant
§15.407(g)	Frequency Stability	N/A
§15.407(h)	Transmit Power Control (TPC)	N/A
§15.207(a)	Line Conducted Emissions	Compliant
§15.203	Antenna Requirements	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

According to §15.407(a)(1)(i), For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. 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.

According to §15.407(a)(1)(ii), For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

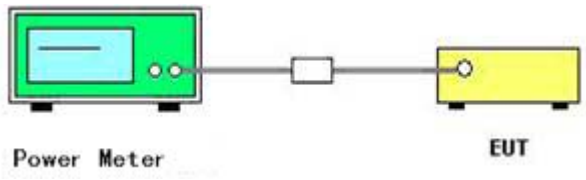
According to §15.407(a)(1)(iv), For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

According to §15.407(a)(3), For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. 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.

5.1.2. Test Procedures

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

5.1.3. Test Setup Layout



5.1.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.5. Test Result of Maximum Conducted Output Power

Temperature	25℃	Humidity	60%
Test Engineer	Chaz	Configurations	802.11a/n

Maximum Conducted Output Power Measurement Result For 5180~5240MHz Band

Mode	Channel	Frequency (MHz)	Conducted Power (dBm, Average)			Max. Limit (dBm)	Result
			Ant 1	Ant 2	Ant 1 +Ant 2		
802.11a	36	5180	13.95	13.57	/	18	Complies
	44	5220	14.01	13.90	/	18	Complies
	48	5240	13.82	13.45	/	18	Complies
802.11n(HT20)	36	5180	10.48	10.58	13.54	18	Complies
	44	5220	10.83	10.95	13.90	18	Complies
	48	5240	10.78	11.05	13.93	18	Complies
802.11n(HT40)	38	5190	10.54	11.13	13.85	18	Complies
	46	5230	10.82	11.06	13.95	18	Complies

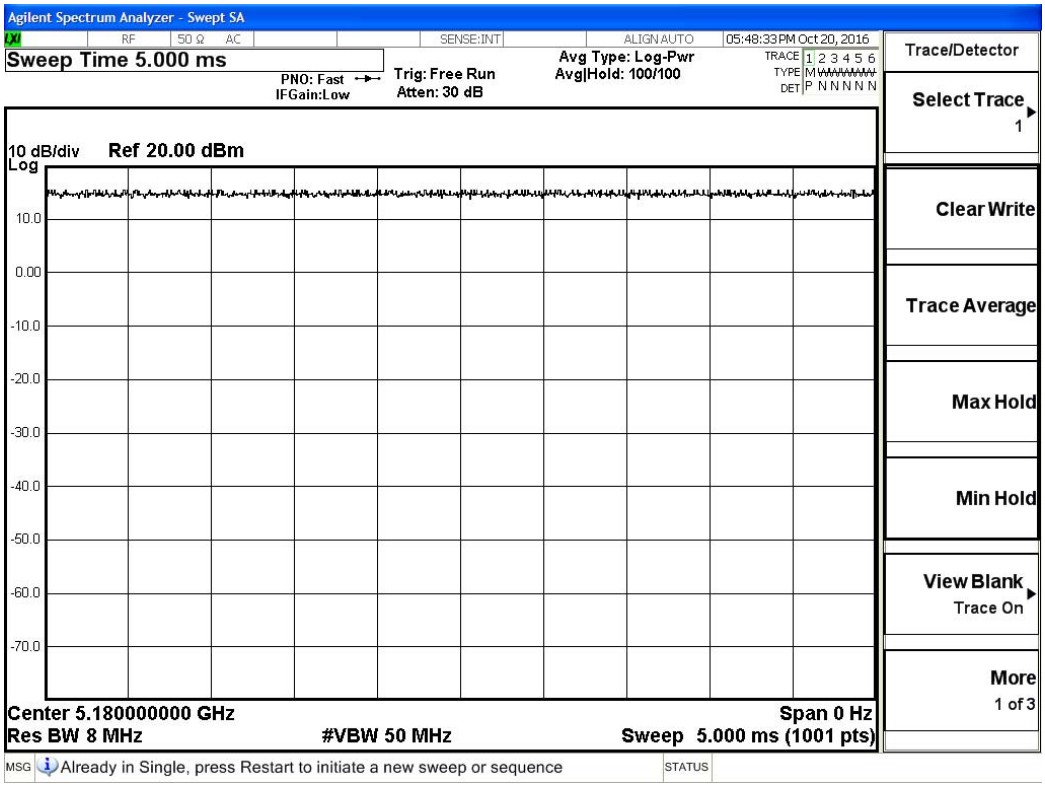
Maximum Conducted Output Power Measurement Result For 5745~5825MHz Band

Mode	Channel	Frequency (MHz)	Conducted Power (dBm, Average)			Max. Limit (dBm)	Result
			Ant 1	Ant 2	Ant 1 +Ant 2		
802.11a	149	5745	13.79	14.16	/	18	Complies
	157	5785	13.86	13.82	/	18	Complies
	165	5825	13.73	14.19	/	18	Complies
802.11n(HT20)	149	5745	10.61	10.63	13.63	18	Complies
	157	5785	10.73	10.69	13.72	18	Complies
	165	5825	10.89	11.13	14.02	18	Complies
802.11n(HT40)	151	5755	10.94	11.02	13.99	18	Complies
	159	5795	10.67	10.91	13.80	18	Complies

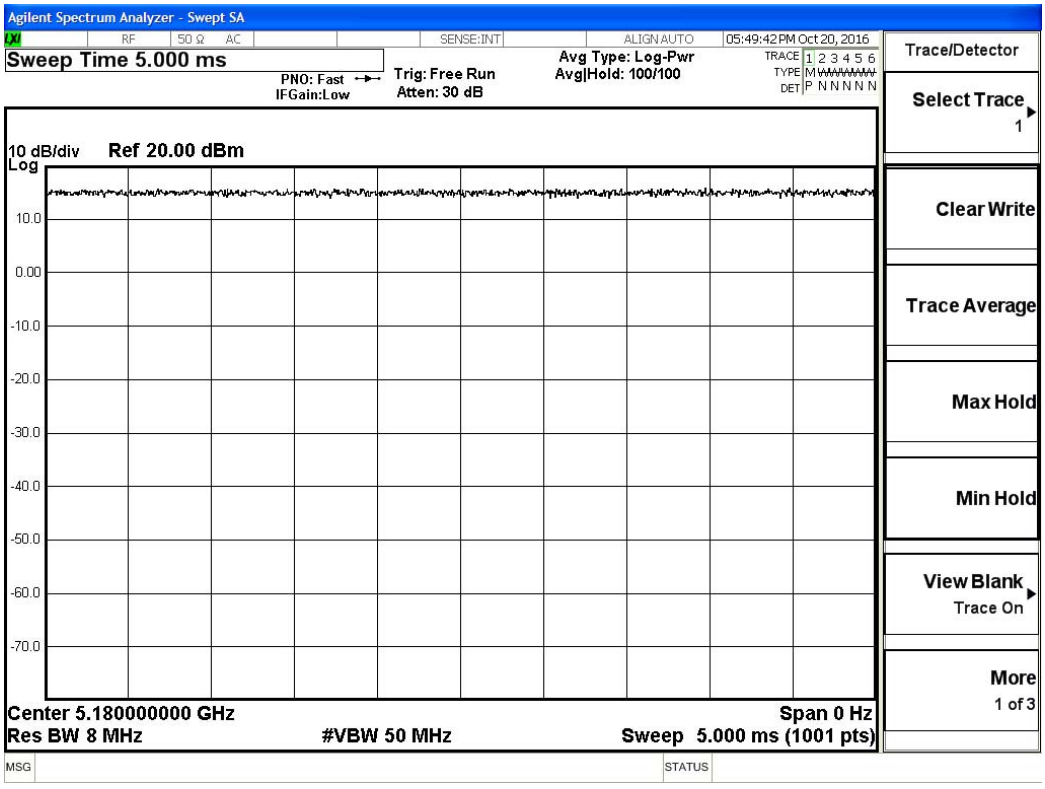
Directional gain = GANT; Directional gain=18dBi > 6 dBi, so the limit=30-INT(18-6)=18

duty cycle plot:

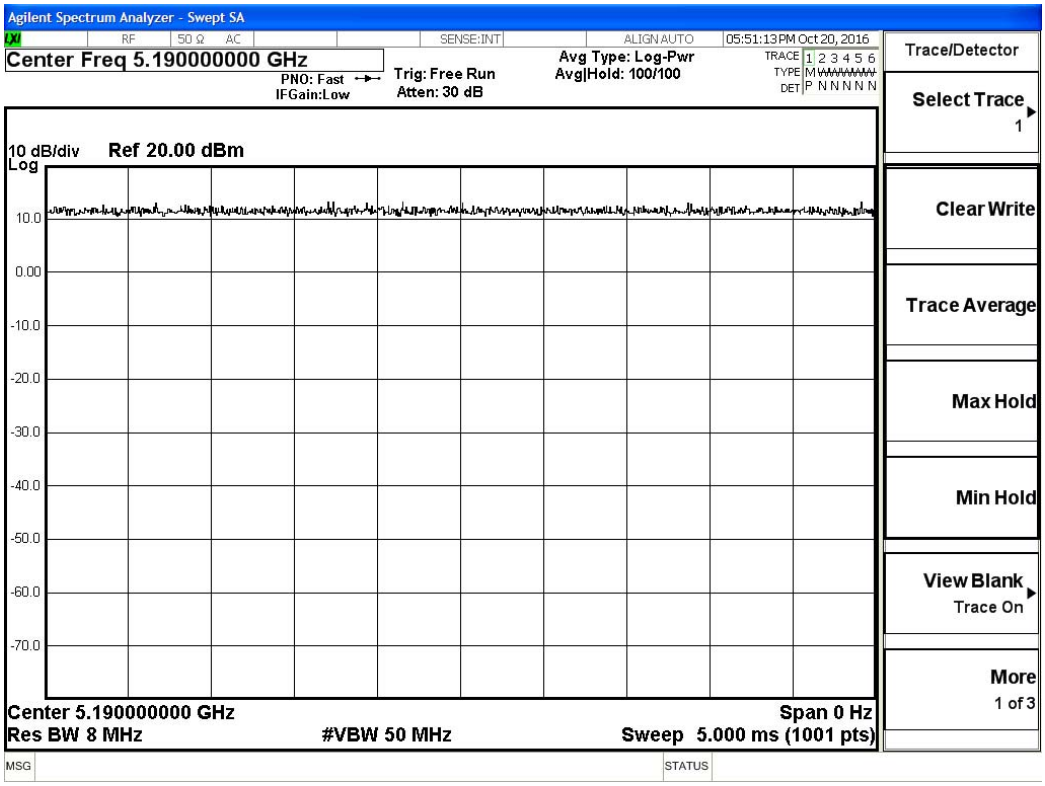
5.2GHz band



802.11 a

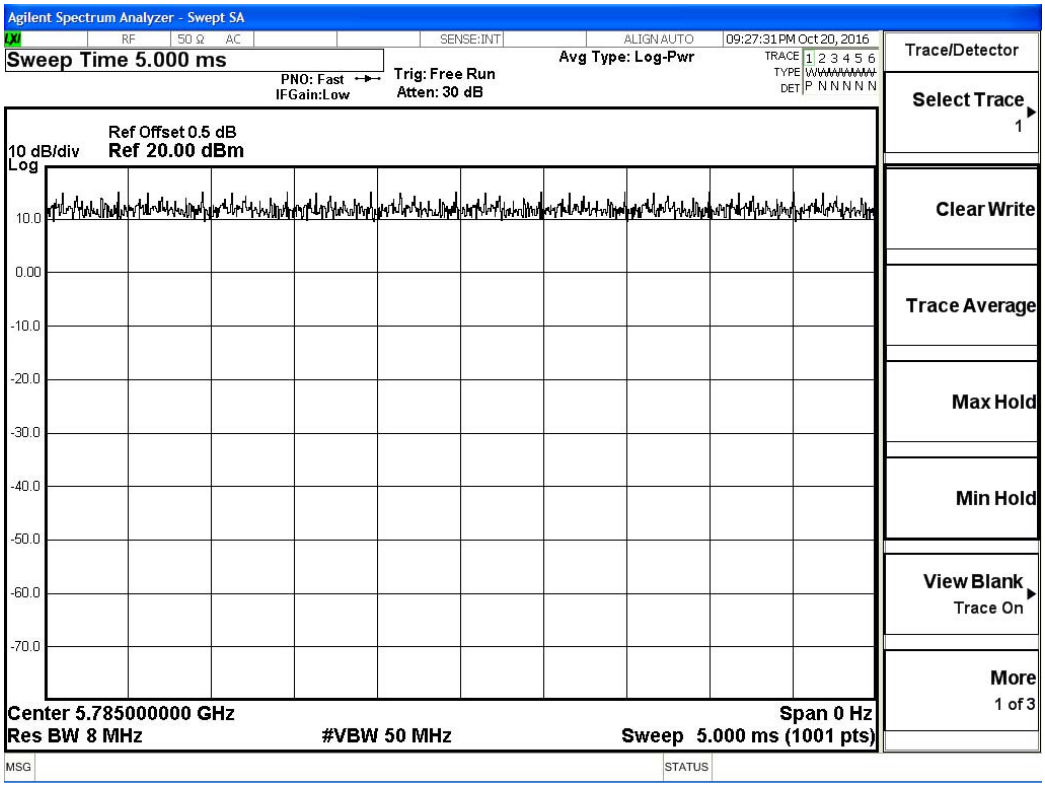


802.11 n20

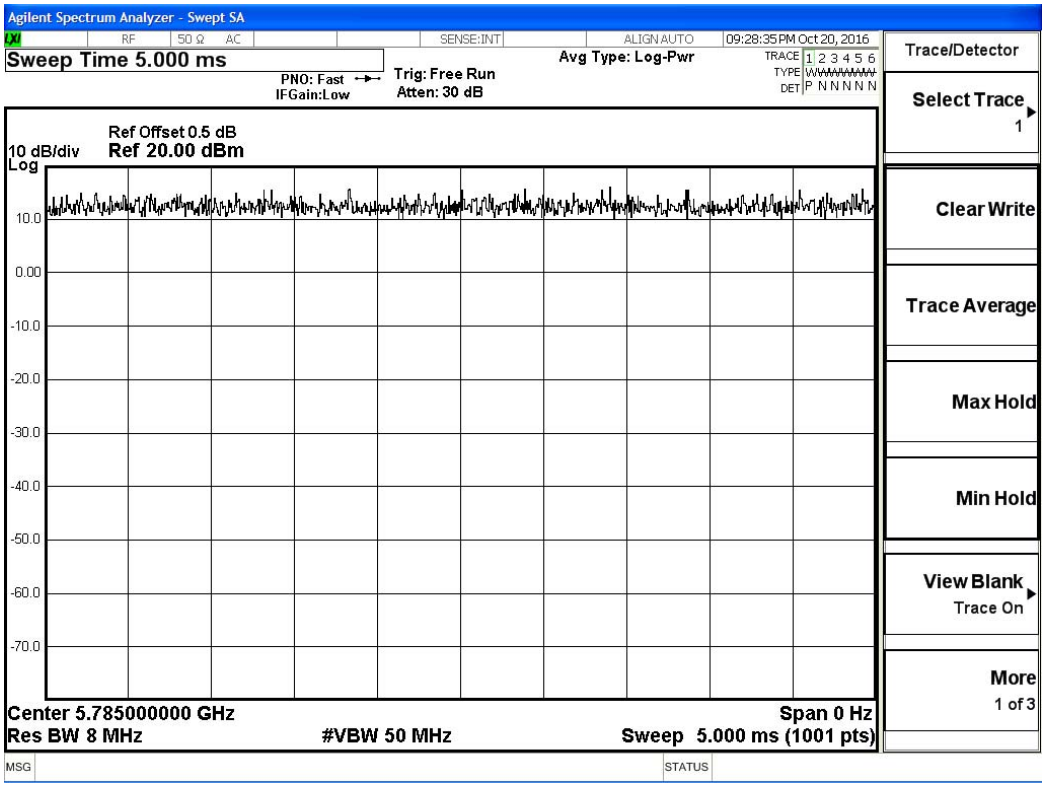


802.11 n40

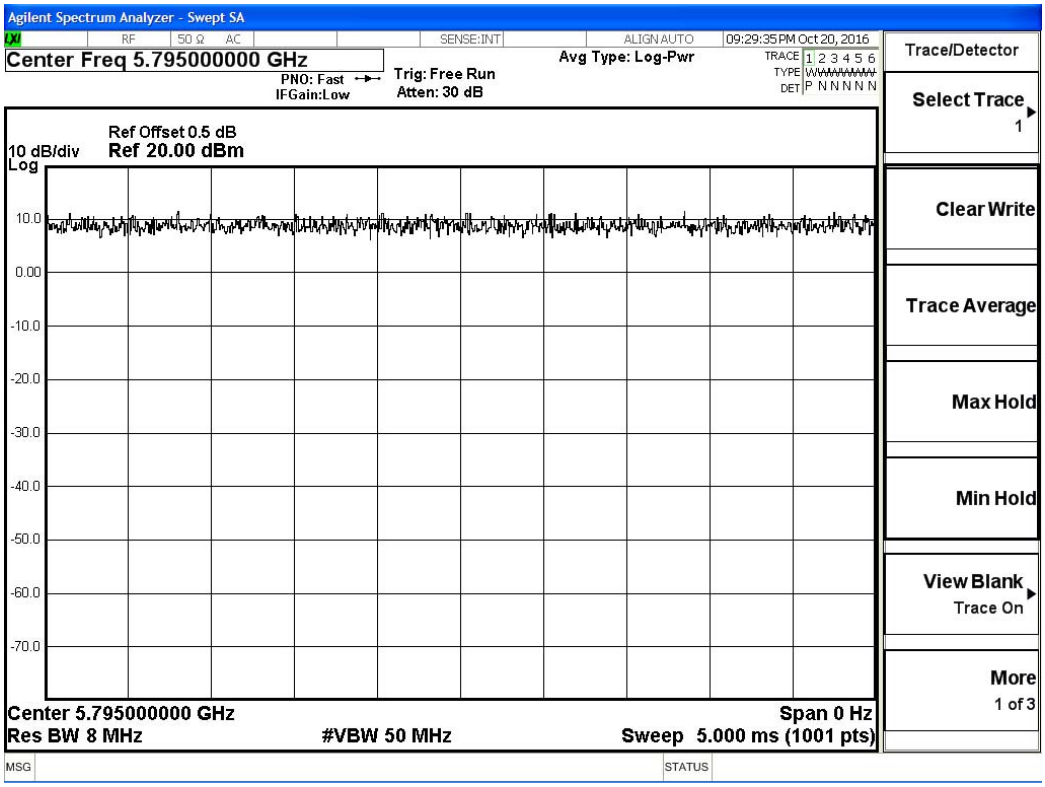
5.8GHz band



802.11 a



802.11 n20



802.11 n40

5.2. Power Spectral Density Measurement

5.2.1. Standard Applicable

According to §15.407(a)(1)(i), For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz 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.

According to §15.407(a)(1)(ii), For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.

According to §15.407(a)(1)(iv), For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

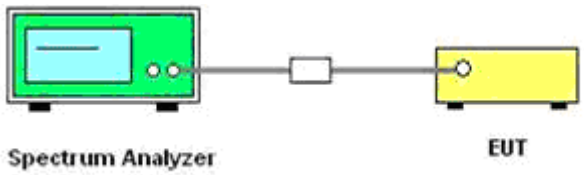
According to §15.407(a)(3), For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz(or a narrower bandwidth) band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2. 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/VBW = 1MHz/3MHz For the 5.15-5.25GHz band;

   Set the RBW/VBW = 300KHz/1MHz For the 5.725-5.85GHz band.
4) Set the span to encompass the entire emission bandwidth of the signal.
5) Detector = RMS.
6) Sweep time = auto couple.
7) Trace mode = max hold.
8) Allow trace to fully stabilize.
9) Use the peak marker function to determine the maximum amplitude level.

5.2.3. Test Setup Layout



5.2.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.5. Test Result of Power Spectral Density

Temperature	25℃	Humidity	60%
Test Engineer	Chaz	Configurations	802.11a/n

Power Spectral Density Measurement Result For 5180~5240MHz Band

Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)			Max. Limit (dBm/MHz)	Result
			Ant 1	Ant 2	Ant1+ant2		
802.11a	36	5180	0.983	0.371	/	2	Complies
	44	5220	0.526	0.863	/	2	Complies
	48	5240	0.743	1.050	/	2	Complies
802.11n(HT20)	36	5180	-5.569	-4.704	-2.105	2	Complies
	44	5220	-5.296	-4.781	-2.021	2	Complies
	48	5240	-5.417	-4.520	-1.935	2	Complies
802.11n(HT40)	38	5190	-7.817	-7.762	-4.779	2	Complies
	46	5230	-7.264	-7.503	-4.372	2	Complies

1)Directional gain = Log(N)+GANT; Directional gain=21dBi > 6 dBi, so the limit=17-INT(21-6)=2

2)The measured power density (dBm) has the offset with cable loss already.

Power Spectral Density Measurement Result For 5745~5825MHz Band

Mode	Channel	Frequen (MHz)	Power Density (dBm/300kHz)			Correction Factor	Max Power Density (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
			Ant 1	Ant 2	Ant1 + ant2				
802.11a	149	5745	0.215	-0.655	/	2.22	2.435	15	Complies
	157	5785	0.317	-0.119	/	2.22	2.537	15	Complies
	165	5825	0.224	-0.124	/	2.22	2.444	15	Complies
802.11n(HT20)	149	5745	-10.419	-9.727	-7.049	2.22	-4.829	15	Complies
	157	5785	-10.194	-9.961	-7.066	2.22	-4.846	15	Complies
	165	5825	-10.684	-9.726	-7.168	2.22	-4.948	15	Complies
802.11n(HT40)	151	5755	-11.272	-11.663	-8.453	2.22	-6.233	15	Complies
	159	5795	-12.951	-11.323	-9.051	2.22	-6.831	15	Complies

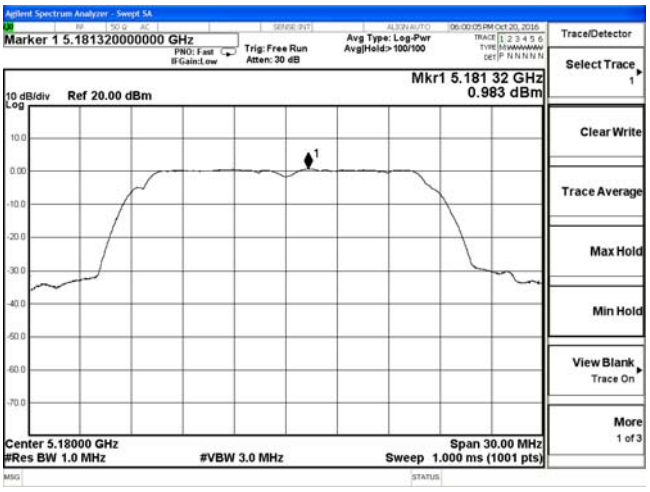
Note:

1) BW correction factor = 10log(500kHz/RBW) = 10 log(500kHz/300KHz)=2.22

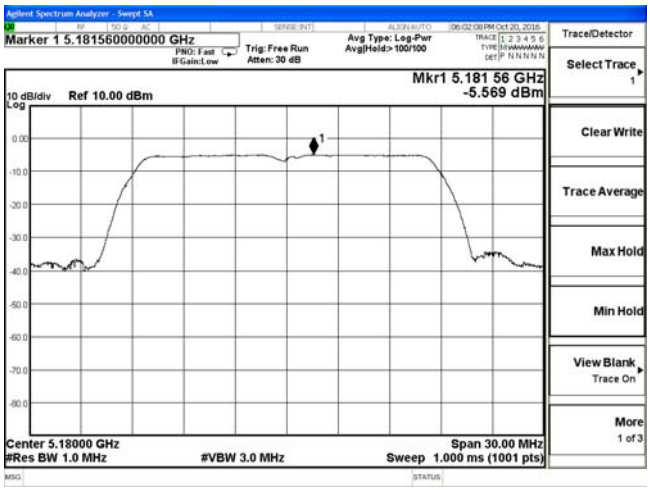
2)Directional gain = Log(N)+GANT; Directional gain=21dBi > 6 dBi, so the limit=30-INT(21-6)=15

3)The measured power density (dBm) has the offset with cable loss already.

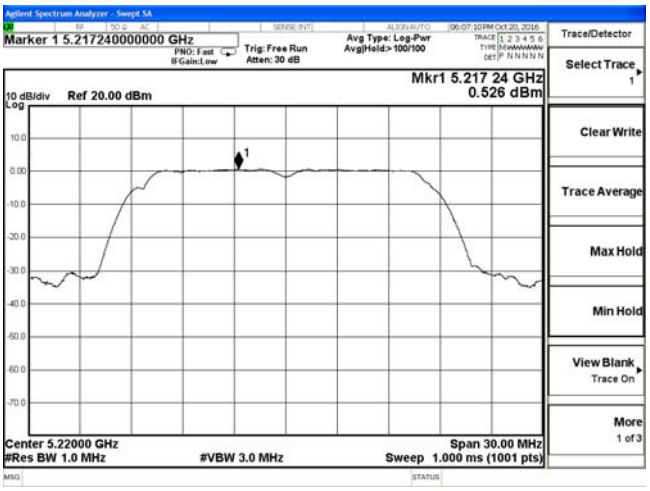
Test Result of Power Spectral Density-ant 1



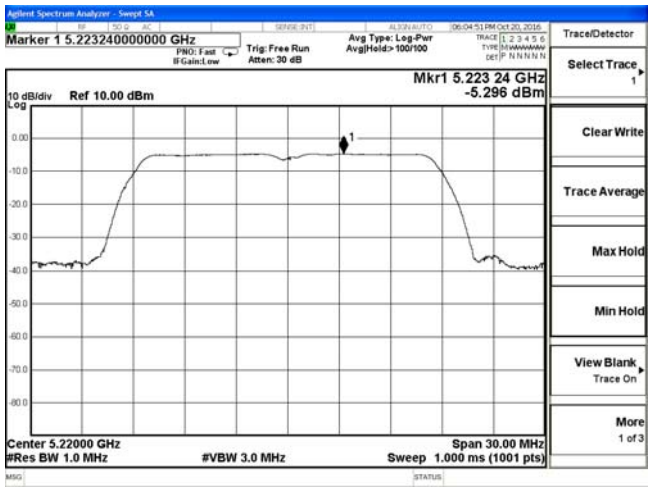
802.11a_Low Channel / 5180MHz



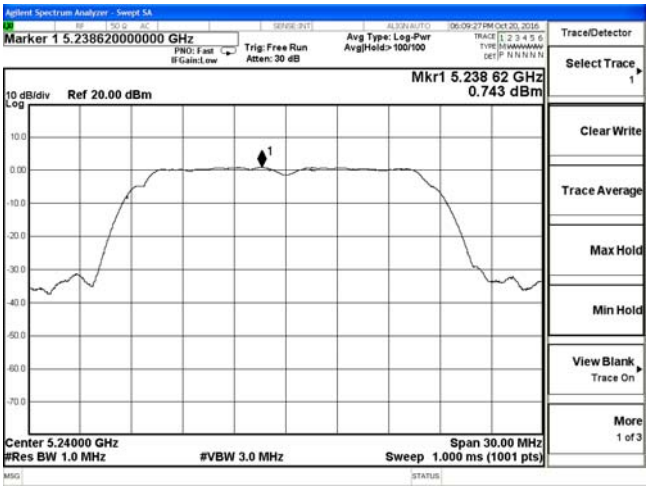
802.11n HT20_Low Channel / 5180MHz



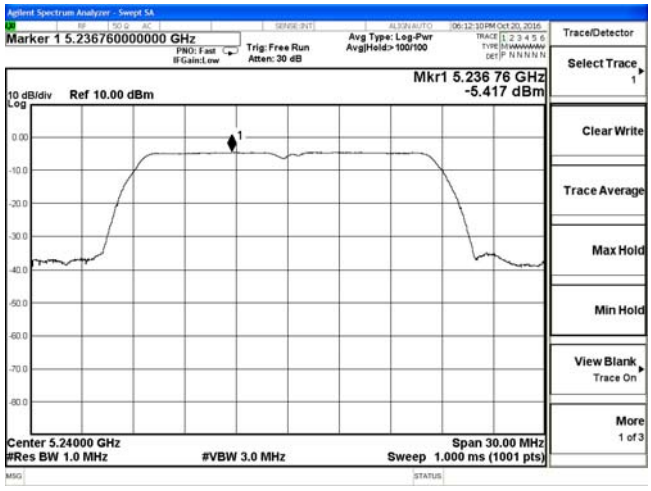
802.11a_Middle Channel / 5220MHz



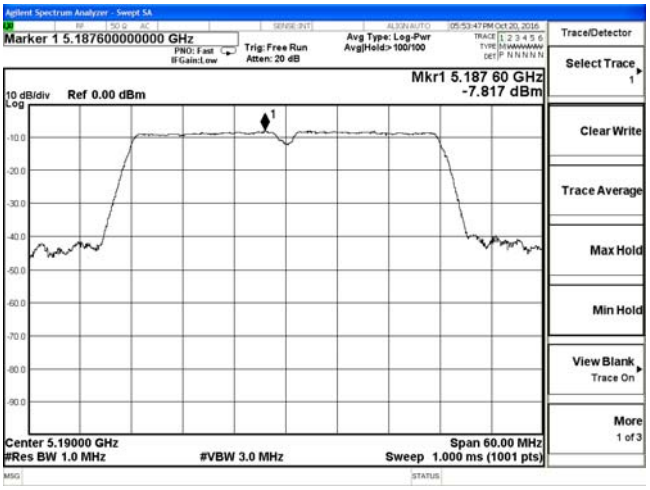
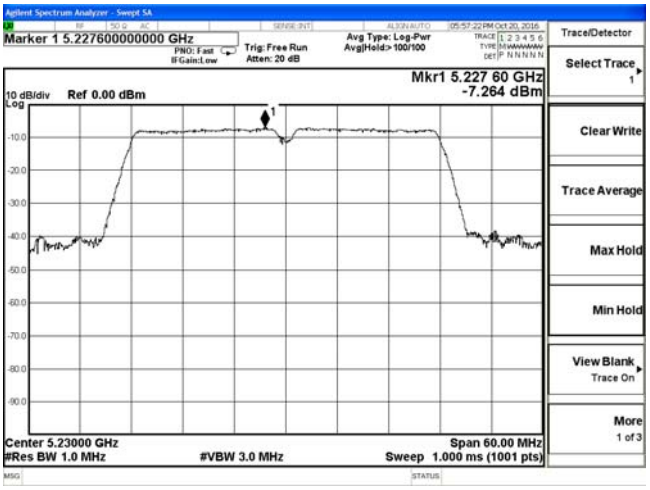
802.11n HT20_Middle Channel / 5220MHz



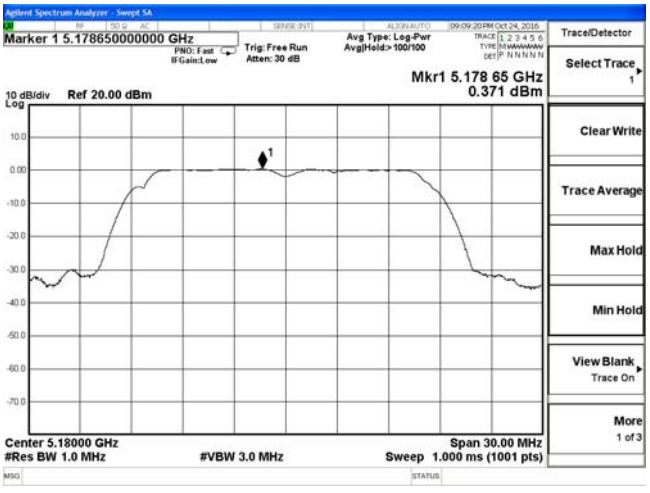
802.11a_High Channel / 5240MHz



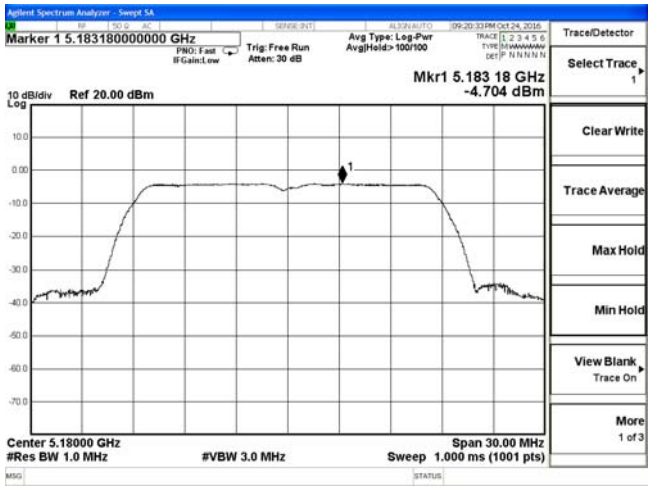
802.11n HT20_High Channel / 5240MHz

Test Result of Power Spectral Density-ant 1	
	
802.11n HT40_Low Channel / 5190MHz	
	
802.11n HT40_ High Channel / 5230MHz	

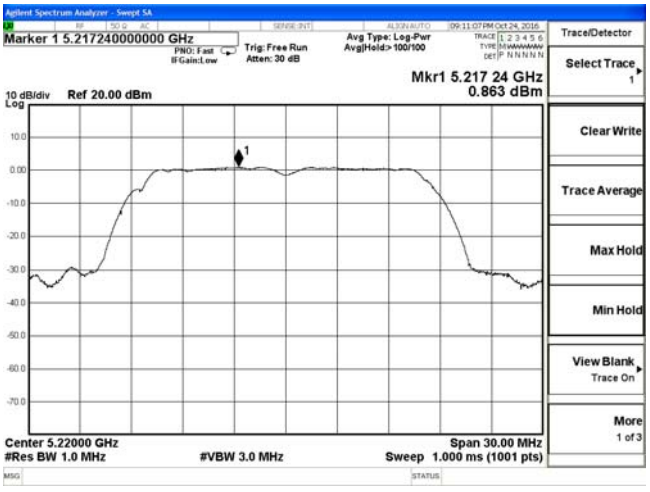
Test Result of Power Spectral Density-ant 2



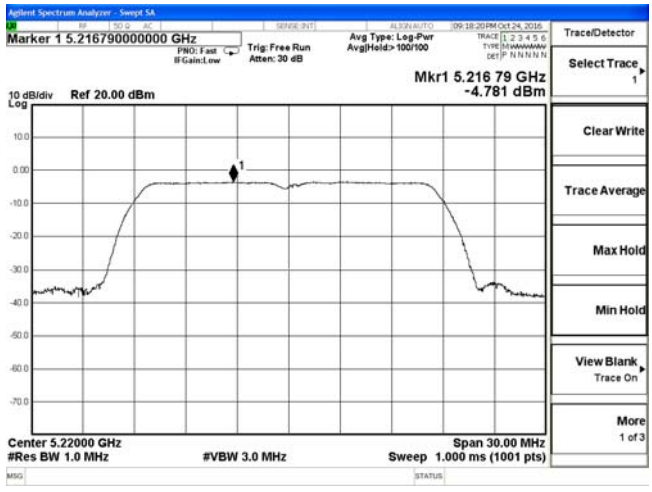
802.11a_Low Channel / 5180MHz



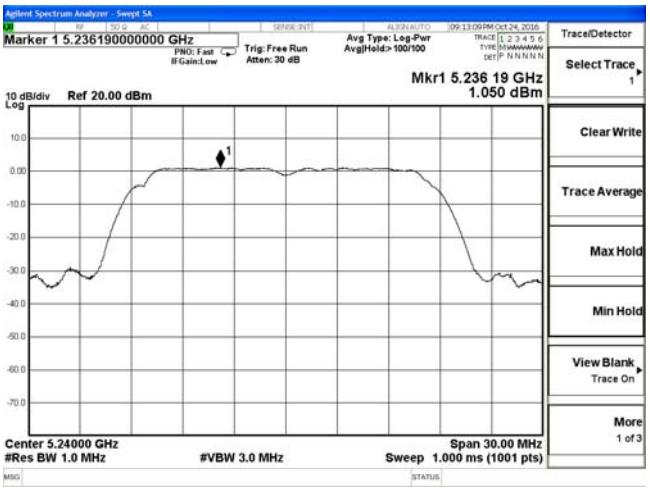
802.11n HT20_Low Channel / 5180MHz



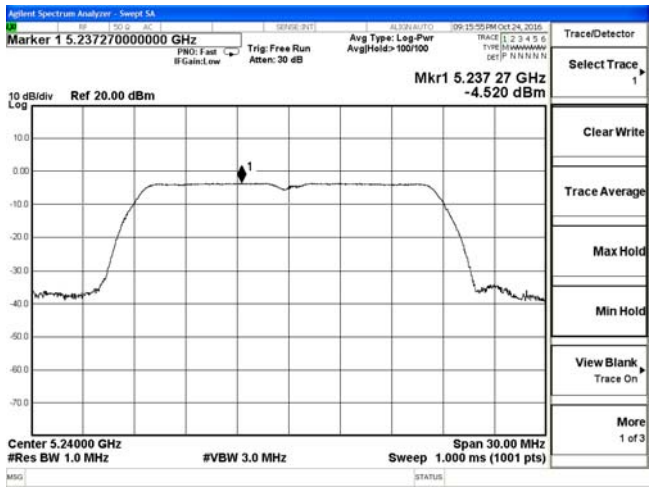
802.11a_Middle Channel / 5220MHz



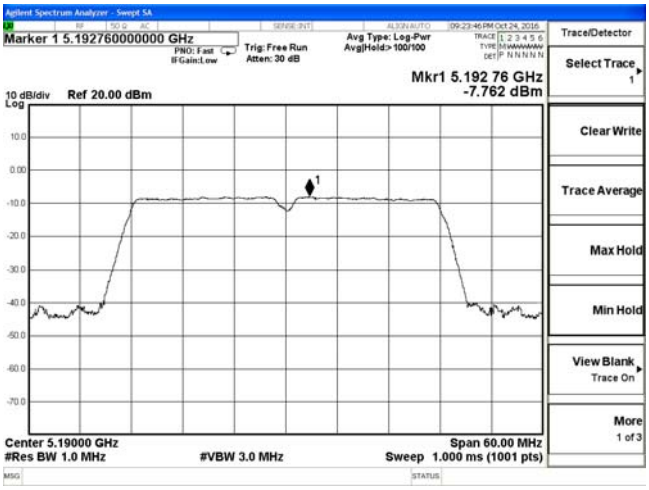
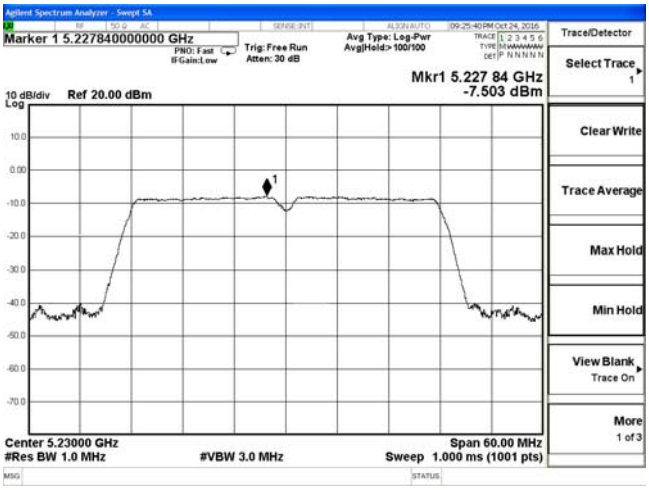
802.11n HT20_Middle Channel / 5220MHz



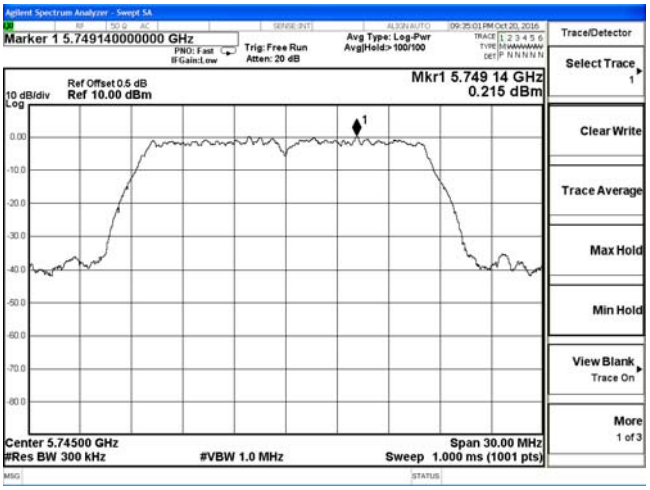
802.11a_High Channel / 5240MHz



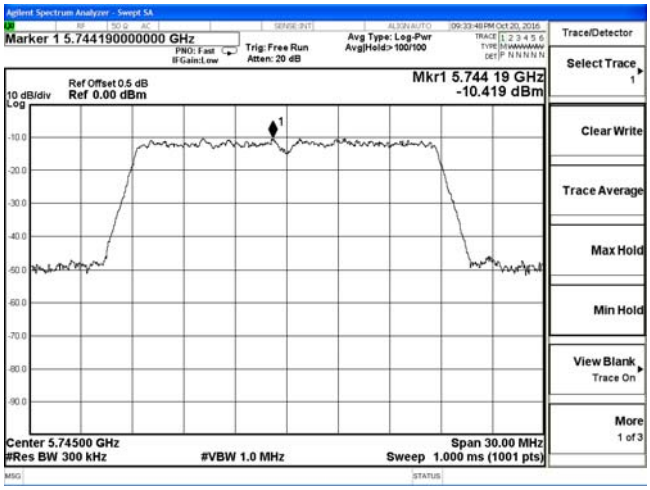
802.11n HT20_High Channel / 5240MHz

Test Result of Power Spectral Density-ant 2	
	
802.11n HT40_Low Channel / 5190MHz	
	
802.11n HT40_ High Channel / 5230MHz	

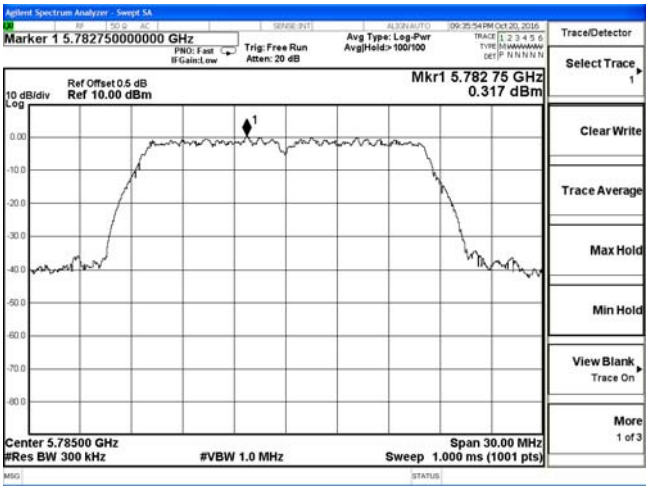
Test Result of Power Spectral Density-ant 1



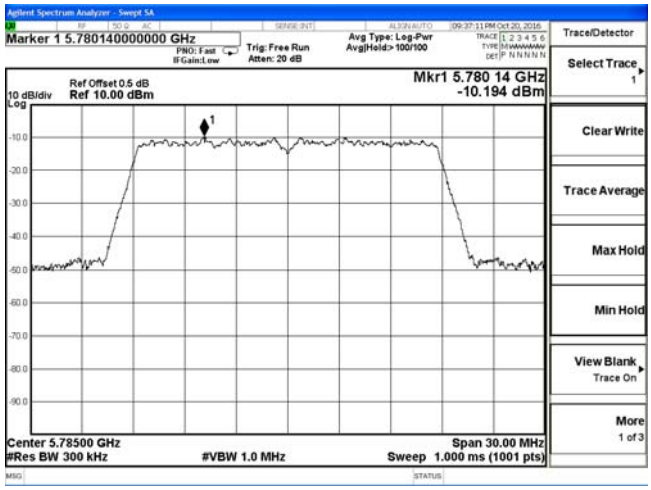
802.11a_Low Channel / 5745MHz



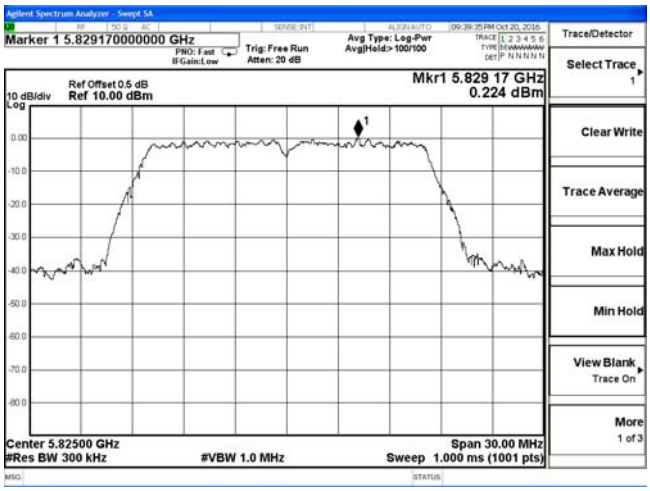
802.11n HT20_Low Channel / 5745MHz



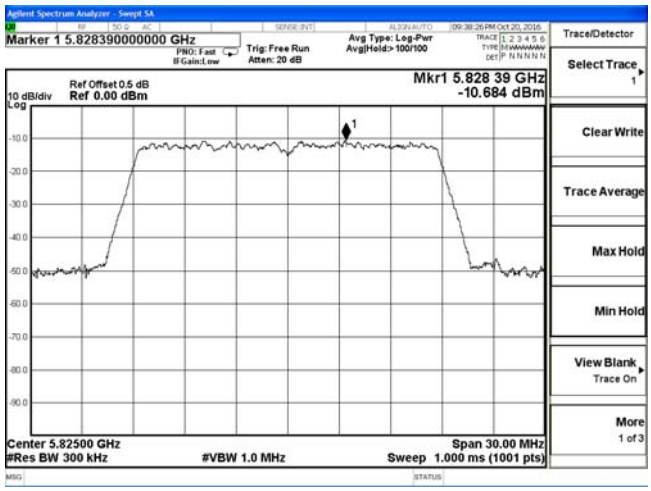
802.11a_Middle Channel / 5785MHz



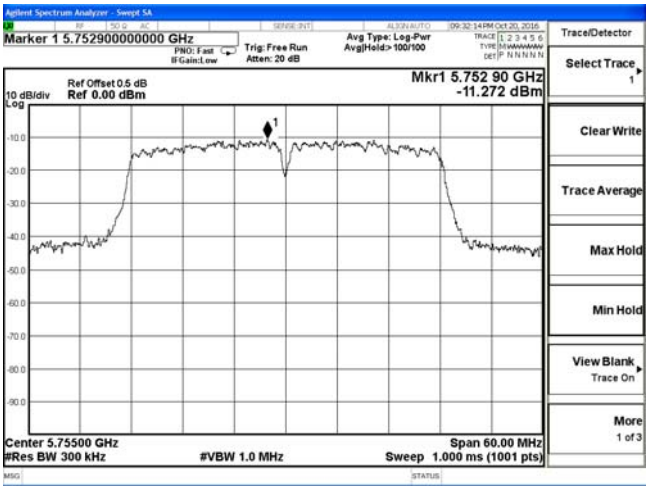
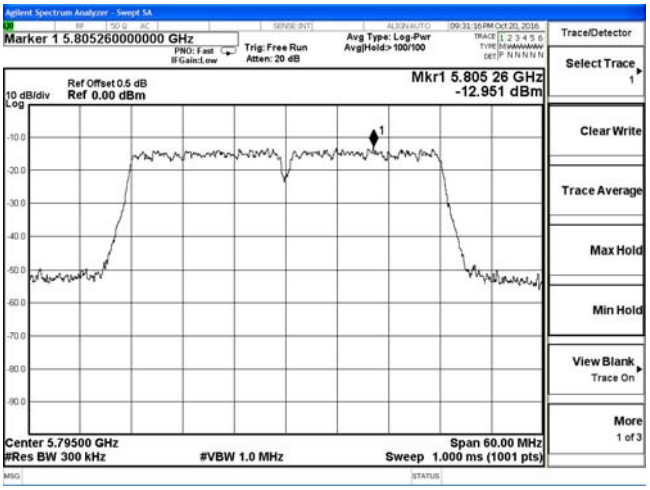
802.11n HT20_Middle Channel / 5785MHz



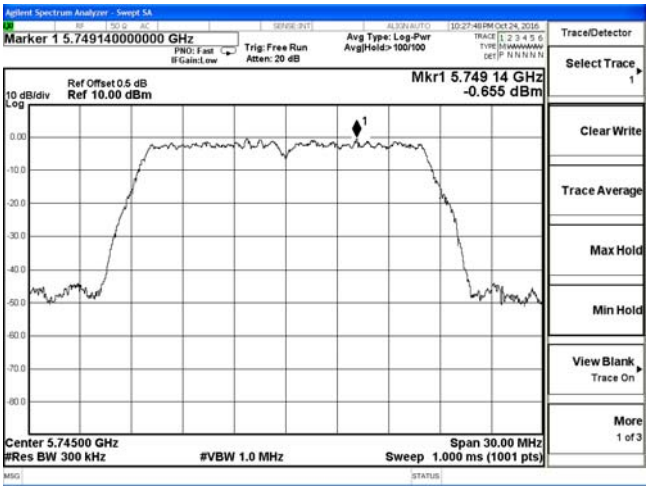
802.11a_High Channel / 5825MHz



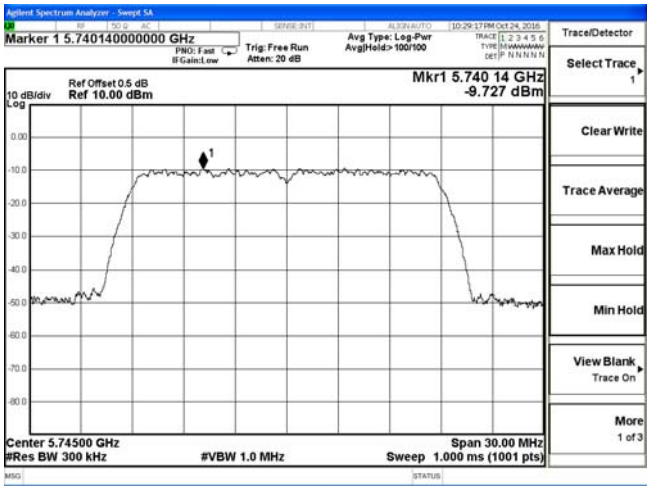
802.11n HT20_High Channel / 5825MHz

Test Result of Power Spectral Density-ant 1	
	
802.11n HT40_Low Channel / 5755MHz	
	
802.11n HT40_ High Channel / 5795MHz	

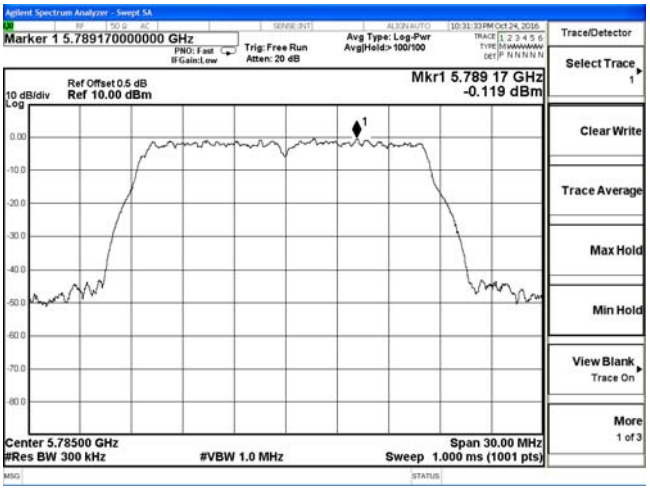
Test Result of Power Spectral Density-ant 2



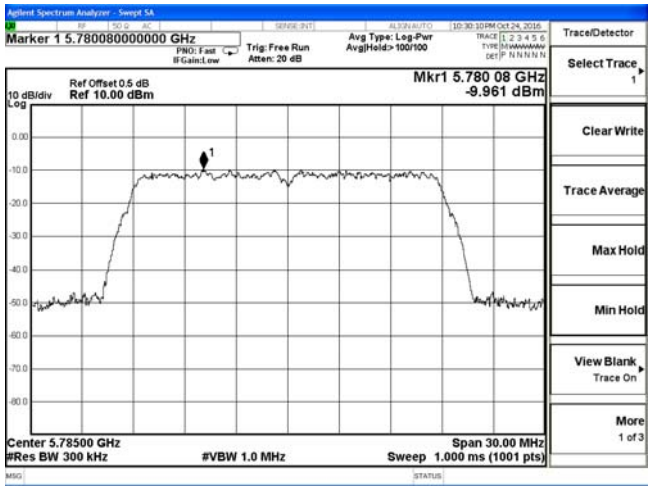
802.11a_Low Channel / 5745MHz



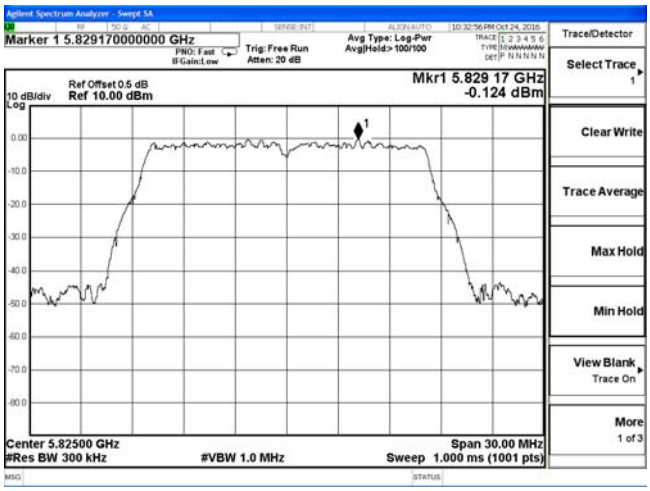
802.11n HT20_Low Channel / 5745MHz



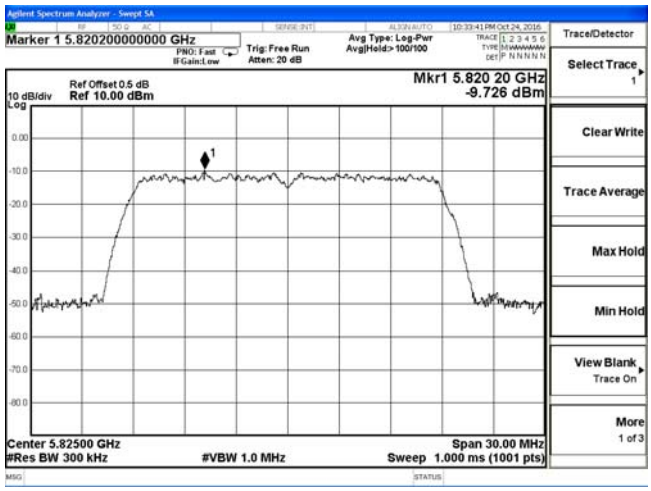
802.11a_Middle Channel / 5785MHz



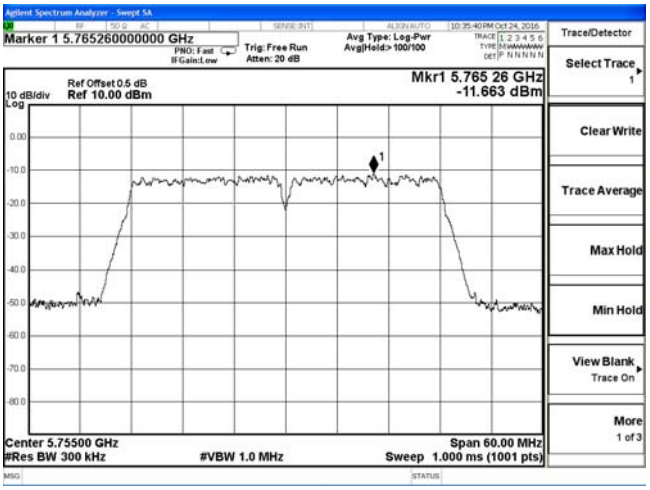
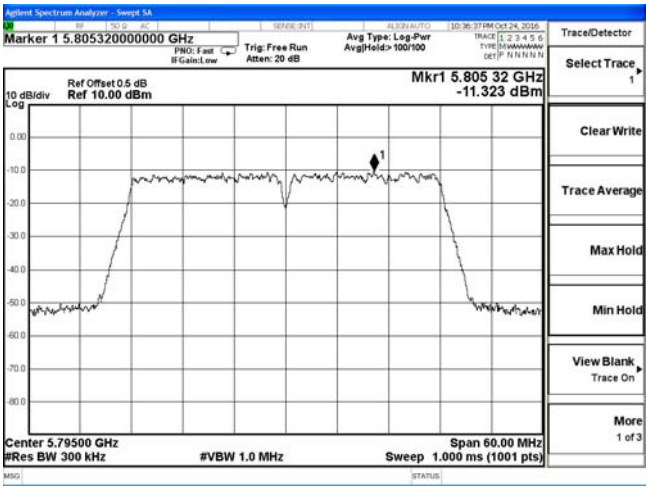
802.11n HT20_Middle Channel / 5785MHz



802.11a_High Channel / 5825MHz



802.11n HT20_High Channel / 5825MHz

Test Result of Power Spectral Density-ant 2	
	
802.11n HT40_Low Channel / 5755MHz	
	
802.11n HT40_ High Channel / 5795MHz	

5.3. 6dB & 26dB Bandwidth Measurement

5.3.1. Standard Applicable

According to §15.407(e): Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

There is no restriction limits for 26dB & 99% occupied bandwidth, report only for reference.

5.3.2. Instruments Setting

The following table is the setting of the Spectrum Analyzer.

6dB Bandwidth Measurement (Only For 5745~5825MHz Band)	
Spectrum Parameter	Setting
Attenuation	Auto
RBW	100KHz
VBW	⩾ 3 x RBW
Detector	Peak
Trace	Max Hold

26dB & 99%Bandwidth Measurement (Only For 5180~5240MHz Band)	
Spectrum Parameter	Setting
Attenuation	Auto
RBW	approximately 1% of the emission bandwidth
VBW	⩾ RBW
Detector	Peak
Trace	Max Hold

5

5.3.3. Test Procedures

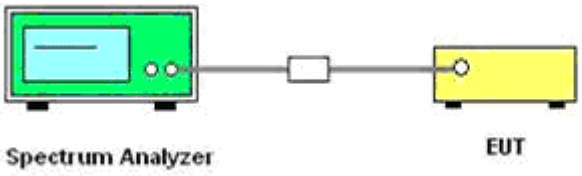
1) The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

2) The resolution bandwidth and the video bandwidth were set according to KDB 789033 D02 General UNII Test Procedures New Rules v01r02

3) For 5745~5825MHz Band, Measured the maximum width of the emission that is 6dB down from the peak of the emission.

4) For 5180~5240MHz Band, Measured the maximum width of the emission that is 26dB down from the peak of the emission. Record the 26dB & 99% Bandwidth.

5.3.4. Test Setup Layout



5.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

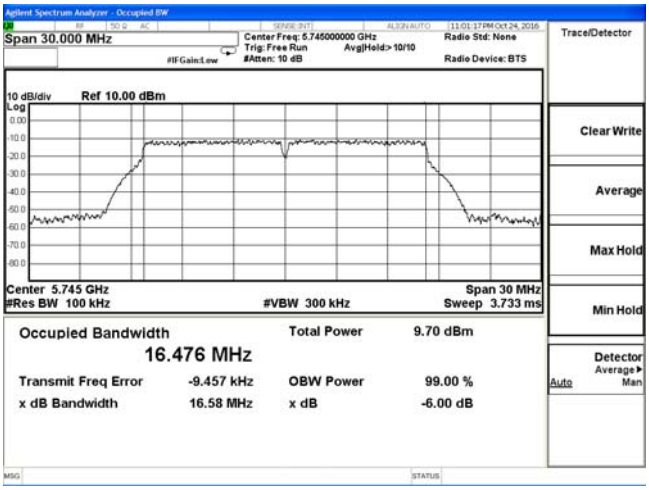
5.3.6. Test Result of Spectrum Bandwidth

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

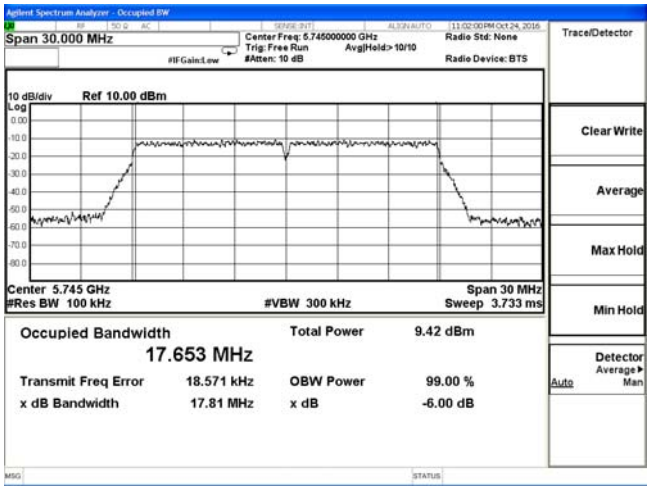
Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Max. Limit (kHz)	Result
802.11a	149	5745	16.58	500	Complies
	157	5785	16.58	500	Complies
	165	5825	16.58	500	Complies
802.11n(HT20)	149	5745	17.81	500	Complies
	157	5785	17.77	500	Complies
	165	5825	17.80	500	Complies
802.11n(HT40)	151	5755	36.50	500	Complies
	159	5795	36.49	500	Complies

Note: only record the worst case data, antenna 2.

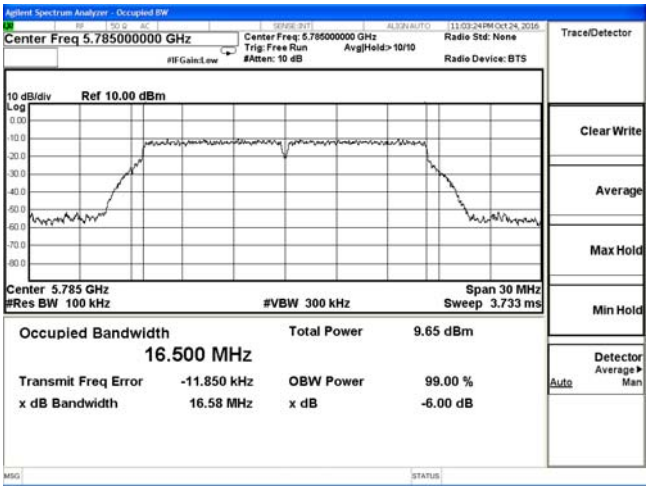
Test Result of 6dB Bandwidth



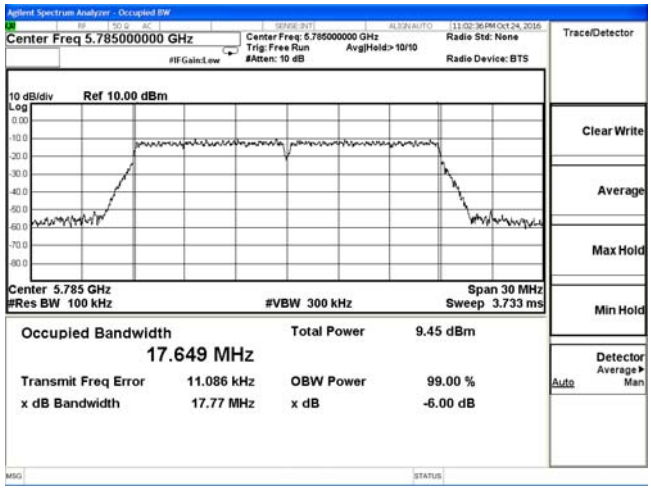
802.11a_Low Channel / 5745MHz



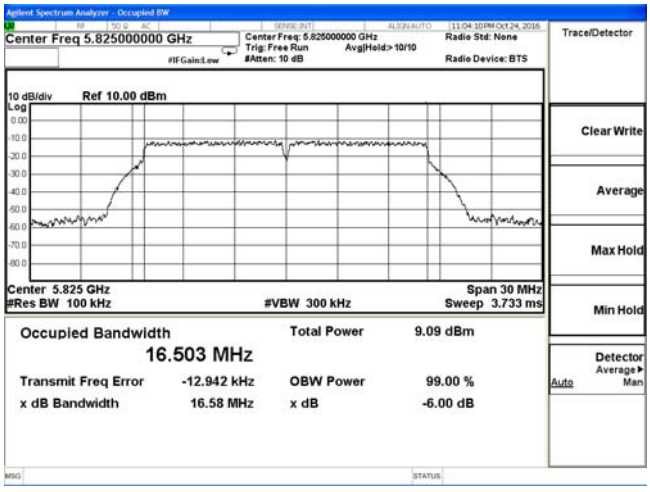
802.11n HT20_Low Channel / 5745MHz



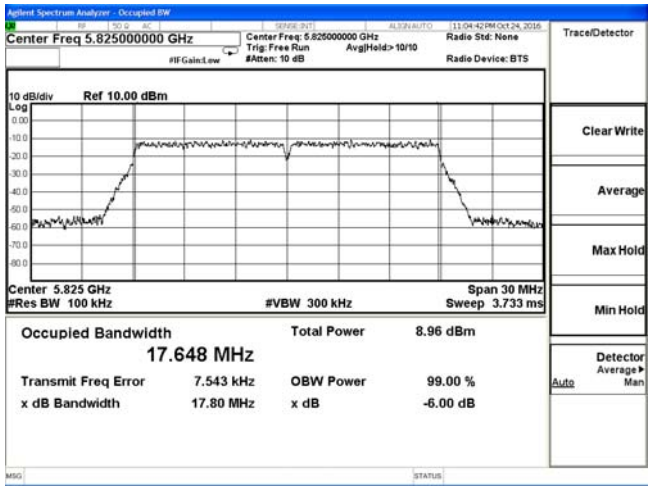
802.11a_Middle Channel / 5785MHz



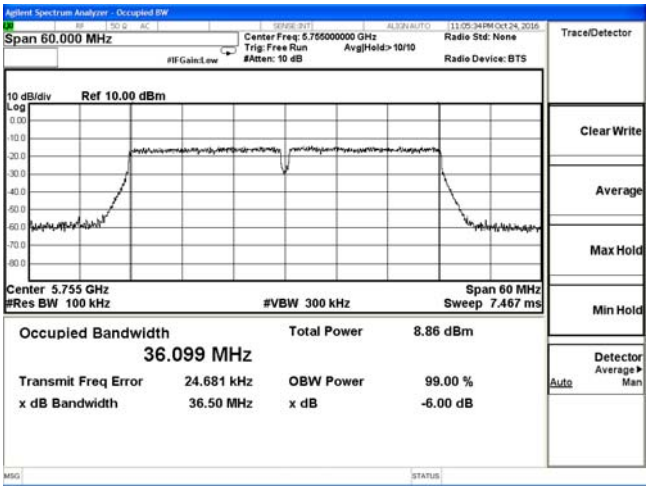
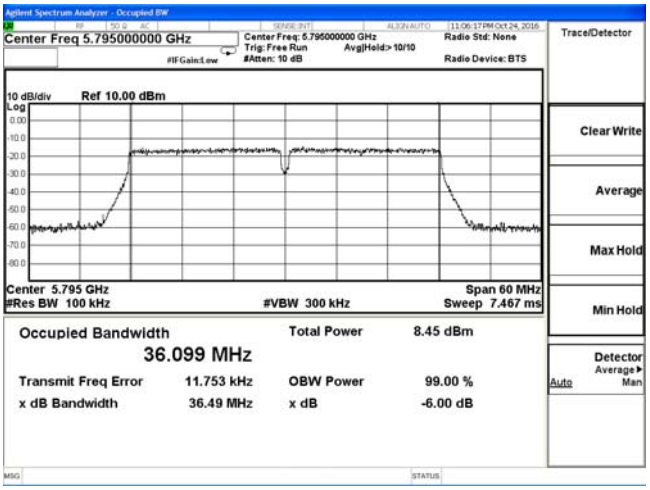
802.11n HT20_Middle Channel / 5785MHz



802.11a_High Channel / 5825MHz

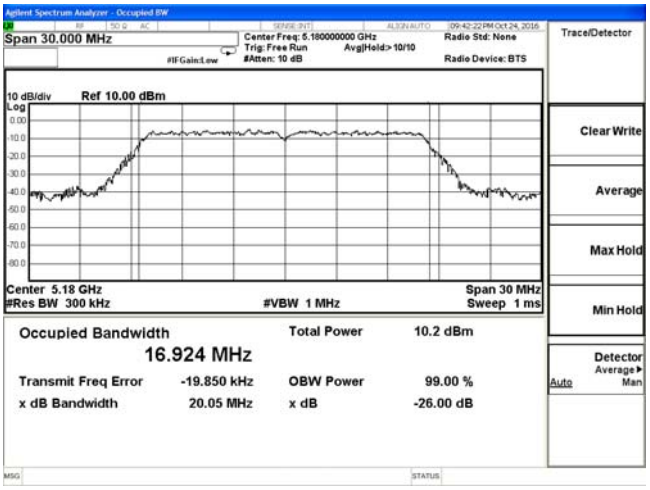


802.11n HT20_High Channel / 5825MHz

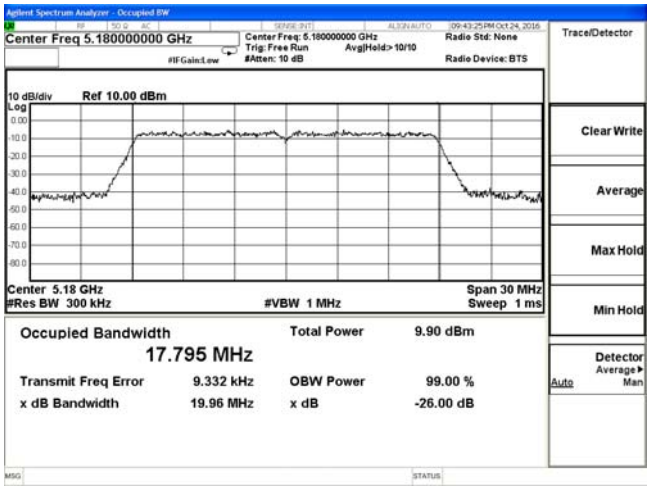
Test Result of 6dB Bandwidth	
	
802.11n HT40_Low Channel / 5755MHz	
	
802.11n HT40_ High Channel / 5795MHz	

Mode	Channel	Frequency	26dB BW (MHz)	99% BW (MHz)	Limit
802.11a	36	5180	20.05	16.924	Non-specified
	44	5220	20.03	17.011	
	48	5240	20.00	16.955	
802.11n(HT20)	36	5180	19.96	17.795	
	44	5220	20.01	17.783	
	48	5240	20.02	17.777	
802.11n(HT40)	38	5190	39.90	36.155	
	46	5230	39.98	36.179	

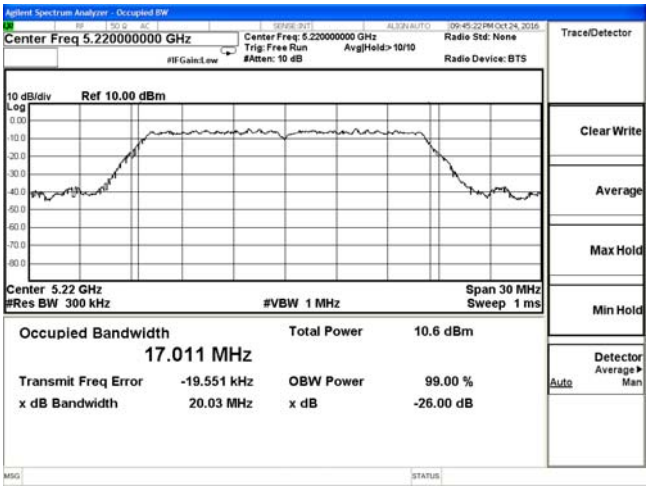
Test Result of 26dB Bandwidth & 99% Bandwidth



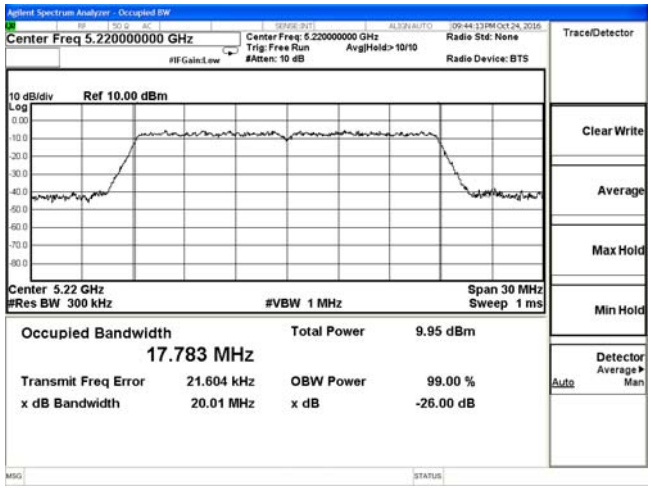
802.11a_Low Channel / 5180MHz



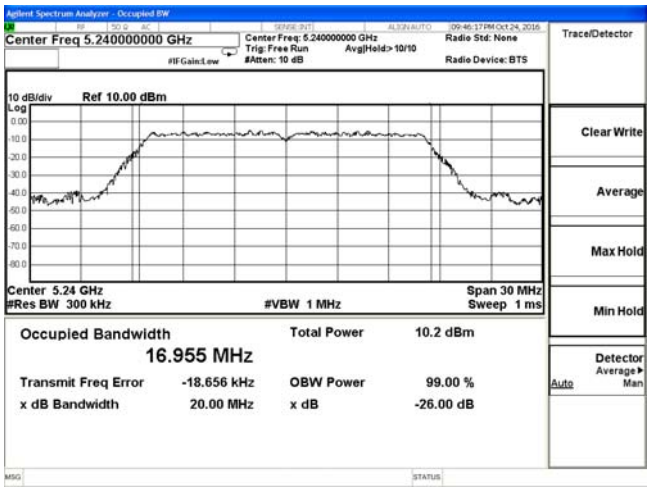
802.11n HT20_Low Channel / 5180MHz



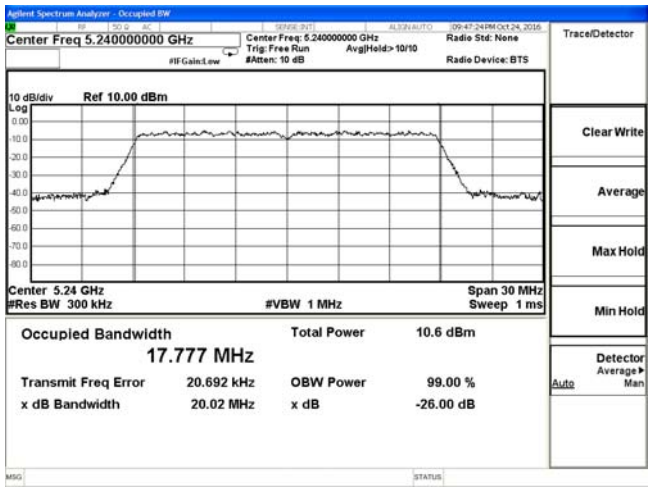
802.11a_Middle Channel / 5220MHz



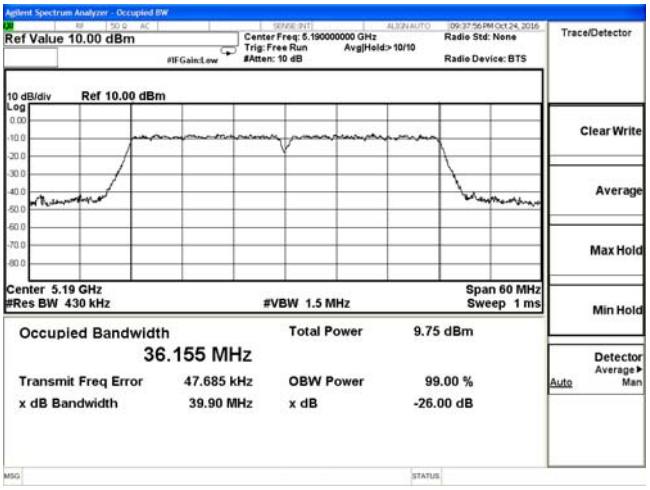
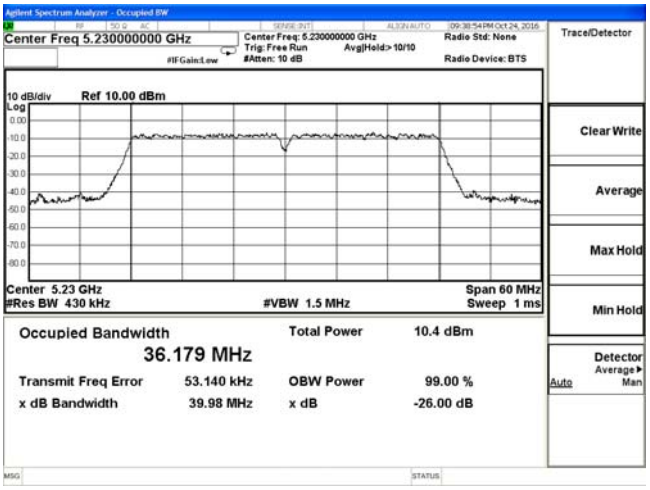
802.11n HT20_Middle Channel / 5220MHz



802.11a_High Channel / 5240MHz



802.11n HT20_High Channel / 5240MHz

Test Result of 26dB Bandwidth & 99% Bandwidth	
	
802.11n HT40_Low Channel / 5190MHz	
	
802.11n HT40_ High Channel / 5230MHz	

Note: only record the worst case data, ant 2.

5.4. Radiated Emissions Measurement

5.4.1. Standard Applicable

According to §15.407 (b)(1) to (6):

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz (68.3dBuV/m at 3m).

For transmitters operating in the 5.725-5.85 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 e.i.r.p. 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 e.i.r.p. of −27 dBm/MHz (68.3dBuV/m at 3m).

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. Instruments Setting

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 0.8 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 (± 45°) 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 (± 45°) 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:

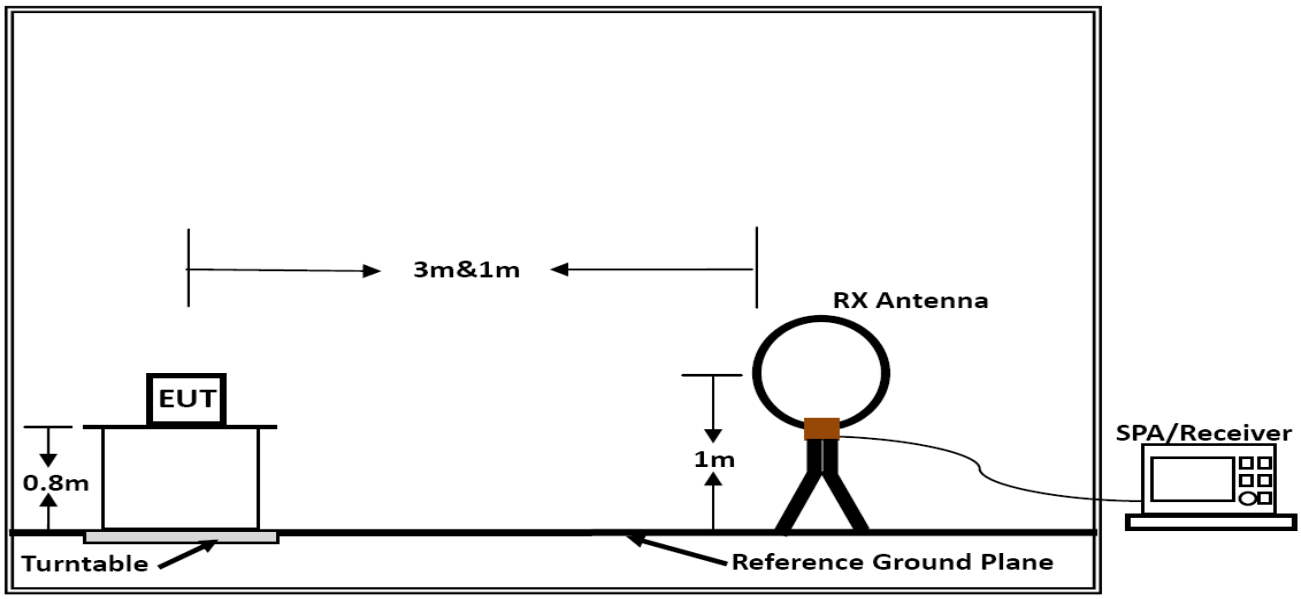
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

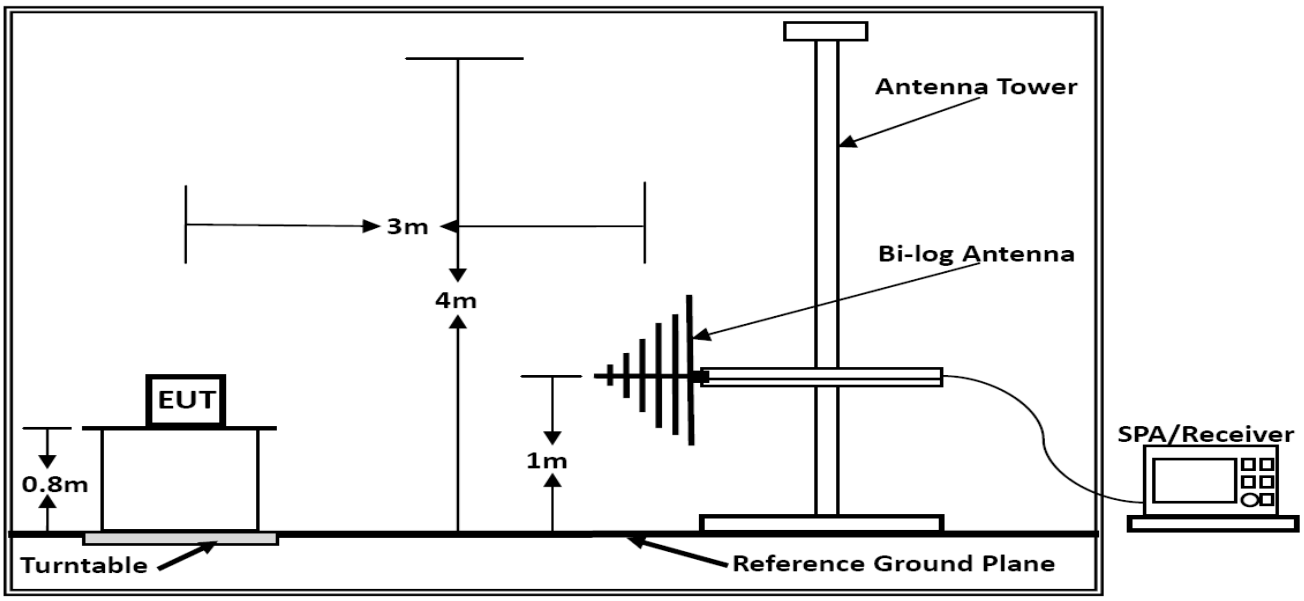
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- 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.

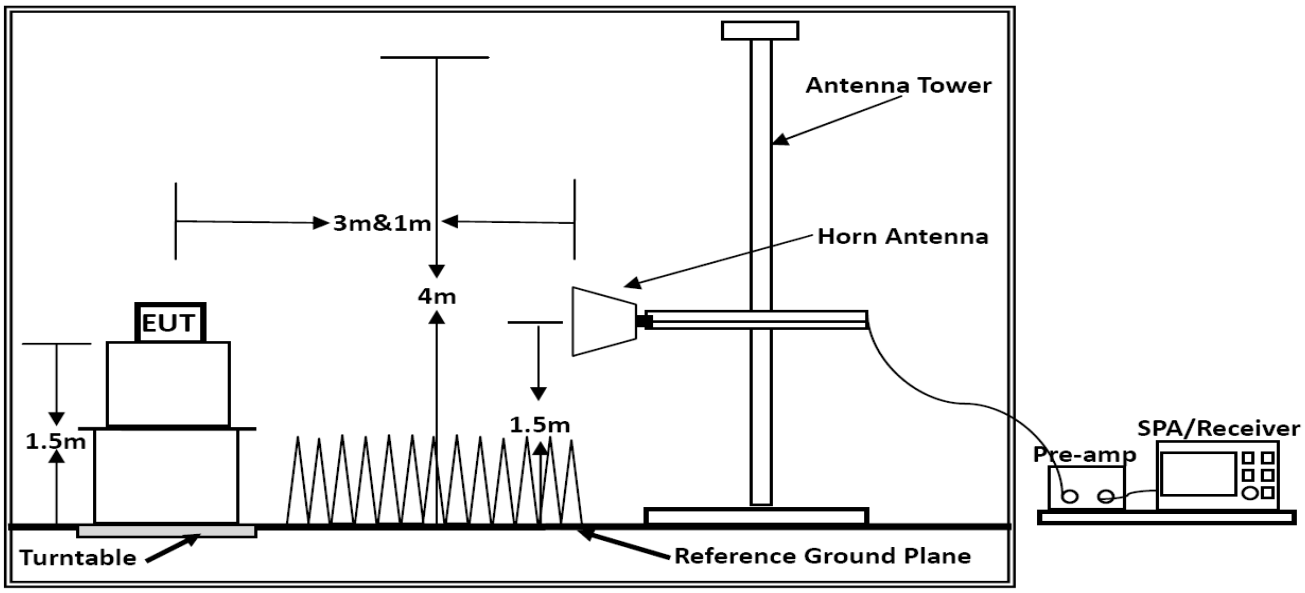
5.4.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

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

Distance extrapolation factor = 20 log (specific distance [3m] / 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℃	Humidity	60%
Test Engineer	Chaz	Configurations	802.11a/n

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

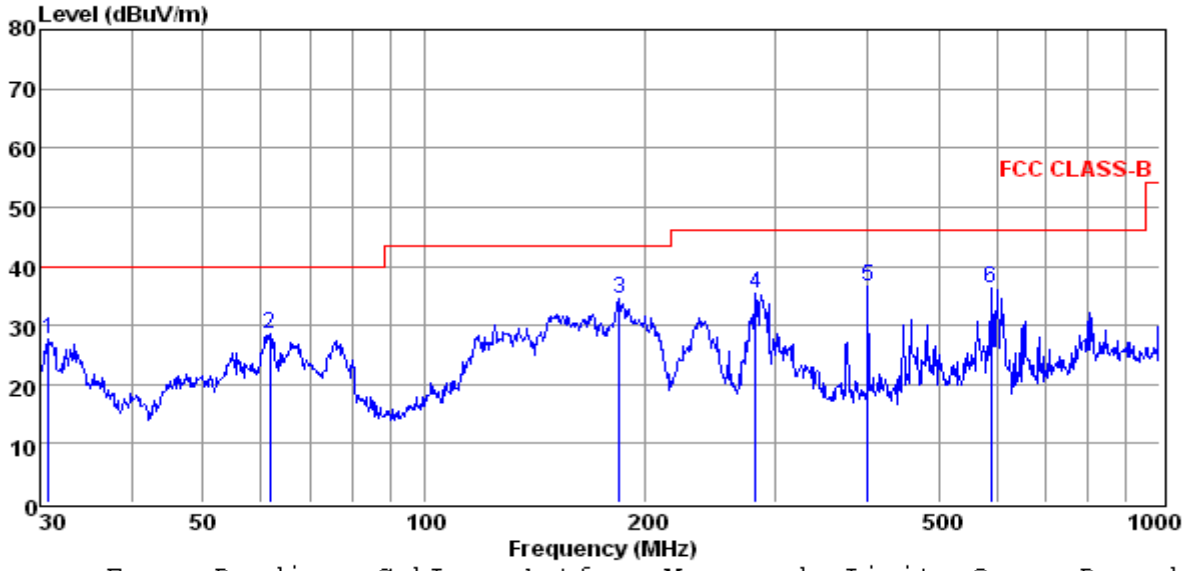
Note:

The radiated emissions from 9kHz to 30MHz are at least 20dB below the official limit and no need to report.

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

Note: Only record the worst test result(TX at 802.11a:5785MHz) in this report.

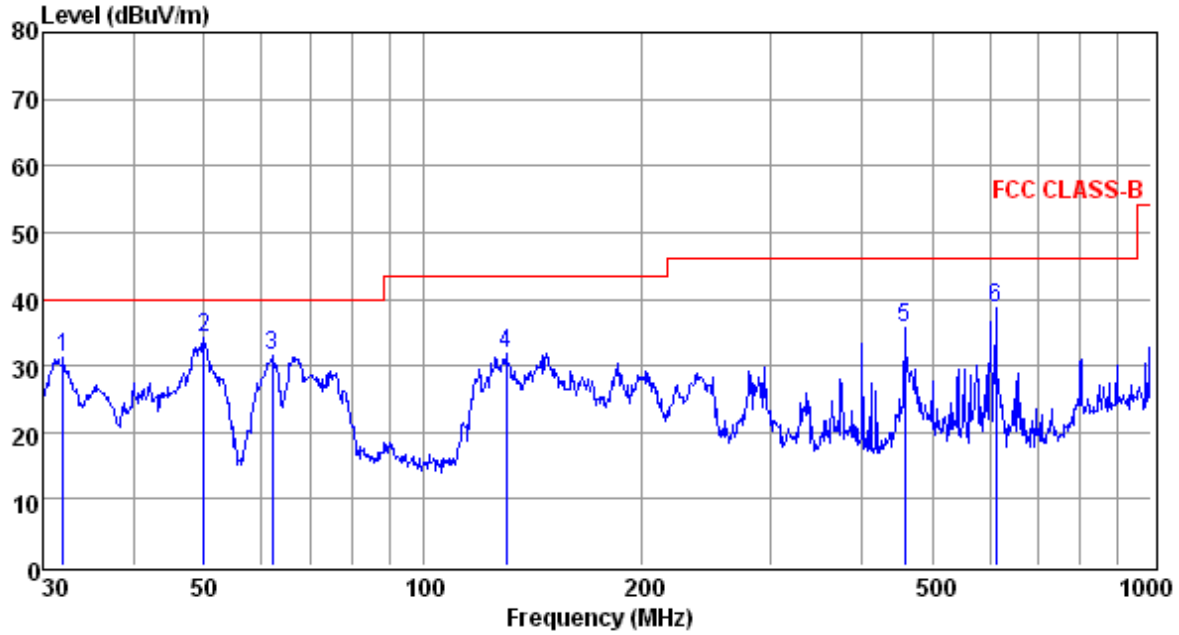
Horizontal:



	Freq MHz	Reading dBuV	CabLos dB	Antfac dB/m	Measured dBuV/m	Limit dBuV/m	Over dB	Remark
1	30.85	15.02	0.39	12.32	27.73	40.00	-12.27	QP
2	61.56	15.98	0.48	12.07	28.53	40.00	-11.47	QP
3	183.84	23.84	0.70	10.02	34.56	43.50	-8.94	QP
4	281.99	21.59	1.06	12.71	35.36	46.00	-10.64	QP
5	400.43	20.16	1.20	15.07	36.43	46.00	-9.57	QP
6	588.91	16.63	1.40	18.24	36.27	46.00	-9.73	QP

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

Vertical:



	Freq MHz	Reading dBuV	CabLos dB	Antfac dB/m	Measured dBuV/m	Limit dBuV/m	Over dB	Remark
1	31.95	18.52	0.37	12.32	31.21	40.00	-8.79	QP
2	49.88	20.54	0.54	13.26	34.34	40.00	-5.66	QP
3	62.00	19.06	0.48	11.90	31.44	40.00	-8.56	QP
4	129.92	22.09	0.76	8.94	31.79	43.50	-11.71	QP
5	459.11	18.72	1.26	15.59	35.57	46.00	-10.43	QP
6	612.06	18.53	1.59	18.49	38.61	46.00	-7.39	QP

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

****Note:*
Pre-scan all mode and recorded the worst case results in this report (802.11a mode(5785MHz)).
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.
Only recorded the worst test case in this report.

5.4.8. Results for Radiated Emissions (Above 1GHz)

Note: Only recorded the worst test result in this report.

The Worst Test Result For 5180~5240MHz Band.

802.11a / Channel 36

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
10.36	45.45	33.21	35.82	9.52	52.36	74	-21.64	Peak	Horizontal
10.36	34.69	33.21	35.82	9.52	41.60	54	-12.40	Average	Horizontal
10.36	46.73	32.82	35.82	9.52	53.25	74	-20.75	Peak	Vertical
10.36	35.39	32.82	35.82	9.52	41.91	54	-12.09	Average	Vertical

802.11a / Channel 44

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
10.44	45.99	33.21	35.82	9.52	52.90	74	-21.10	Peak	Horizontal
10.44	35.30	33.21	35.82	9.52	42.21	54	-11.79	Average	Horizontal
10.44	47.22	32.82	35.82	9.52	53.74	74	-20.26	Peak	Vertical
10.44	35.73	32.82	35.82	9.52	42.25	54	-11.75	Average	Vertical

802.11a / Channel 48

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
10.48	46.46	33.21	35.82	9.52	53.37	74	-20.63	Peak	Horizontal
10.48	35.86	33.21	35.82	9.52	42.77	54	-11.23	Average	Horizontal
10.48	47.71	32.82	35.82	9.52	54.23	74	-19.77	Peak	Vertical
10.48	36.31	32.82	35.82	9.52	42.83	54	-11.17	Average	Vertical

802.11n(HT20) / Channel 36

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
10.36	45.34	33.21	35.82	9.52	52.25	74	-21.75	Peak	Horizontal
10.36	34.32	33.21	35.82	9.52	41.23	54	-12.77	Average	Horizontal
10.36	46.35	32.82	35.82	9.52	52.87	74	-21.13	Peak	Vertical
10.36	34.82	32.82	35.82	9.52	41.34	54	-12.66	Average	Vertical

802.11n(HT20) / Channel 44

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
10.44	45.86	33.21	35.82	9.52	52.77	74	-21.23	Peak	Horizontal
10.44	34.79	33.21	35.82	9.52	41.70	54	-12.30	Average	Horizontal
10.44	47.07	32.82	35.82	9.52	53.59	74	-20.41	Peak	Vertical
10.44	35.29	32.82	35.82	9.52	41.81	54	-12.19	Average	Vertical

802.11n(HT20) / Channel 48

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
10.48	46.43	33.21	35.82	9.52	53.34	74	-20.66	Peak	Horizontal
10.48	35.59	33.21	35.82	9.52	42.50	54	-11.50	Average	Horizontal
10.48	47.35	32.82	35.82	9.52	53.87	74	-20.13	Peak	Vertical
10.48	35.85	32.82	35.82	9.52	42.37	54	-11.63	Average	Vertical

802.11n(HT40) / Channel 38

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
10.38	45.92	33.21	35.82	9.52	52.83	74	-21.17	Peak	Horizontal
10.38	34.95	33.21	35.82	9.52	41.86	54	-12.14	Average	Horizontal
10.38	47.17	32.82	35.82	9.52	53.69	74	-20.31	Peak	Vertical
10.38	35.61	32.82	35.82	9.52	42.13	54	-11.87	Average	Vertical

802.11n(HT40) / Channel 46

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
10.46	46.16	33.21	35.82	9.52	53.07	74	-20.93	Peak	Horizontal
10.46	35.56	33.21	35.82	9.52	42.47	54	-11.53	Average	Horizontal
10.46	47.35	32.82	35.82	9.52	53.87	74	-20.13	Peak	Vertical
10.46	35.74	32.82	35.82	9.52	42.26	54	-11.74	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 30MHz~40GHz were made with an instrument using Peak detector mode.*
3. *The radiated emissions from 18GHz to 40GHz are at least 20dB below the official limit and no need to report.*

The Worst Test Result For 5745~5825MHz Band.

802.11a / Channel 149

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
11.490	46.94	33.92	36.09	10.26	55.03	74	-18.97	Peak	Horizontal
11.490	36.41	33.92	36.09	10.26	44.50	54	-9.50	Average	Horizontal
11.490	48.29	33.99	35.99	10.26	56.55	74	-17.45	Peak	Vertical
11.490	36.79	33.99	35.99	10.26	45.05	54	-8.95	Average	Vertical

802.11a / Channel 157

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
11.570	46.75	33.92	36.09	10.26	54.84	74	-19.16	Peak	Horizontal
11.570	35.96	33.92	36.09	10.26	44.05	54	-9.95	Average	Horizontal
11.570	47.66	33.99	35.99	10.26	55.92	74	-18.08	Peak	Vertical
11.570	36.29	33.99	35.99	10.26	44.55	54	-9.45	Average	Vertical

802.11a / Channel 165

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
11.650	46.40	33.92	36.09	10.26	54.49	74	-19.51	Peak	Horizontal
11.650	35.66	33.92	36.09	10.26	43.75	54	-10.25	Average	Horizontal
11.650	47.28	33.99	35.99	10.26	55.54	74	-18.46	Peak	Vertical
11.650	36.17	33.99	35.99	10.26	44.43	54	-9.57	Average	Vertical

802.11n(HT20) / Channel 149

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
11.490	46.87	33.92	36.09	10.26	54.96	74	-19.04	Peak	Horizontal
11.490	36.07	33.92	36.09	10.26	44.16	54	-9.84	Average	Horizontal
11.490	48.05	33.99	35.99	10.26	56.31	74	-17.69	Peak	Vertical
11.490	36.69	33.99	35.99	10.26	44.95	54	-9.05	Average	Vertical

802.11n(HT20) / Channel 157

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
11.570	46.86	33.92	36.09	10.26	54.95	74	-19.05	Peak	Horizontal
11.570	36.50	33.92	36.09	10.26	44.59	54	-9.41	Average	Horizontal
11.570	48.06	33.99	35.99	10.26	56.32	74	-17.68	Peak	Vertical
11.570	36.67	33.99	35.99	10.26	44.93	54	-9.07	Average	Vertical

802.11n(HT20) / Channel 165

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
11.650	46.69	33.92	36.09	10.26	54.78	74	-19.22	Peak	Horizontal
11.650	35.86	33.92	36.09	10.26	43.95	54	-10.05	Average	Horizontal
11.650	47.63	33.99	35.99	10.26	55.89	74	-18.11	Peak	Vertical
11.650	36.33	33.99	35.99	10.26	44.59	54	-9.41	Average	Vertical

802.11n(HT40) / Channel 151

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
11.510	50.11	33.92	36.09	10.26	58.20	74	-15.80	Peak	Horizontal
11.510	39.01	33.92	36.09	10.26	47.10	54	-6.90	Average	Horizontal
11.510	50.77	33.99	35.99	10.26	59.03	74	-14.97	Peak	Vertical
11.510	39.49	33.99	35.99	10.26	47.75	54	-6.25	Average	Vertical

802.11n(HT40) / Channel 159

Freq. GHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
11.590	49.68	33.92	36.09	10.26	57.77	74	-16.23	Peak	Horizontal
11.590	38.80	33.92	36.09	10.26	46.89	54	-7.11	Average	Horizontal
11.590	50.60	33.99	35.99	10.26	58.86	74	-15.14	Peak	Vertical
11.590	39.33	33.99	35.99	10.26	47.59	54	-6.41	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 30MHz~40GHz were made with an instrument using Peak detector mode.*
3. *The radiated emissions from 18GHz to 40GHz are at least 20dB below the official limit and no need to report.*

5.4.9. Results of Band Edges Test

(Conducted)

802.11a								
Channel	Freq. MHz	Reading Level dBm		Antenna Gain dBi	Max Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
		Chain 0	Chain 1					
5180	5150.0000	-56.09	-59.21	18.00	57.11	74.0	-16.89	Peak
	5150.0000	-67.07	-70.12	18.00	46.13	54.0	-7.87	Average
5240	5350.0000	-59.86	-60.25	18.00	53.34	74.0	-20.66	Peak
	5350.0000	-68.59	-68.96	18.00	44.61	54.0	-9.39	Average

802.11n20								
Channel	Freq. MHz	Reading Level dBm		Antenna Gain dBi	Sum Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
		Chain 0	Chain 1					
5180	5150.0000	-57.39	-59.26	18.00	57.99	74.0	-16.01	Peak
	5150.0000	-66.99	-69.25	18.00	48.24	54.0	-5.76	Average
5240	5350.0000	-59.67	-62.13	18.00	55.48	74.0	-18.52	Peak
	5350.0000	-68.78	-69.23	18.00	47.21	54.0	-6.79	Average

802.11n40								
Channel	Freq. MHz	Reading Level dBm		Antenna Gain dBi	Sum Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
		Chain 0	Chain 1					
5190	5150.0000	-47.71	-49.02	18.00	67.89	74.0	-6.11	Peak
	5150.0000	-62.93	-64.01	18.00	52.77	54.0	-1.23	Average
5230	5350.0000	-58.49	-60.23	18.00	56.94	74.0	-17.06	Peak
	5350.0000	-68.84	-70.21	18.00	46.74	54.0	-7.26	Average

802.11a								
Channel	Freq. MHz	Reading Level dBm		Antenna Gain dBi	Max Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
		Chain 0	Chain 1					
5745	5650.0000	-59.01	-60.23	18.00	54.19	68.2	-14.01	Peak
	5700.0000	-56.05	-58.91	18.00	57.15	105.2	-48.05	Peak
	5720.0000	-55.23	-56.01	18.00	57.97	110.8	-52.83	Peak
	5725.0000	-47.32	-47.55	18.00	65.88	122.2	-56.32	Peak
5825	5850.0000	-54.75	-54.75	18.00	58.45	122.2	-63.75	Peak
	5855.0000	-55.51	-58.23	18.00	57.69	110.8	-53.11	Peak
	5875.0000	-56.25	-59.01	18.00	56.95	105.2	-48.25	Peak
	5925.0000	-59.89	-59.97	18.00	53.31	68.2	-14.89	Peak

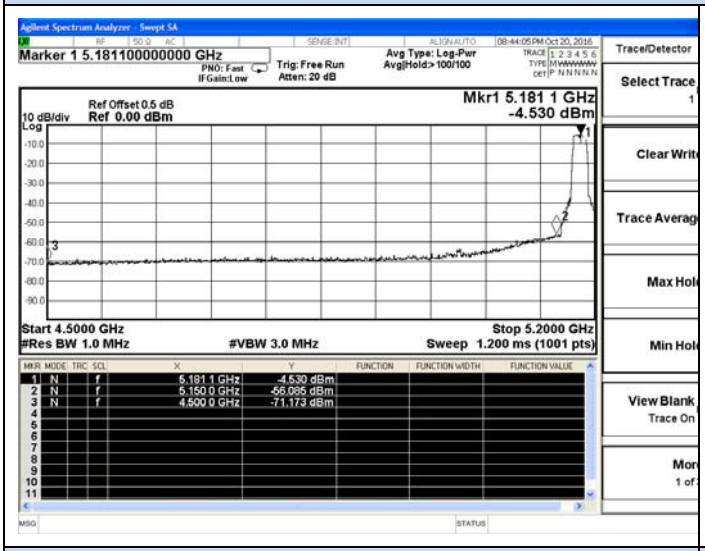
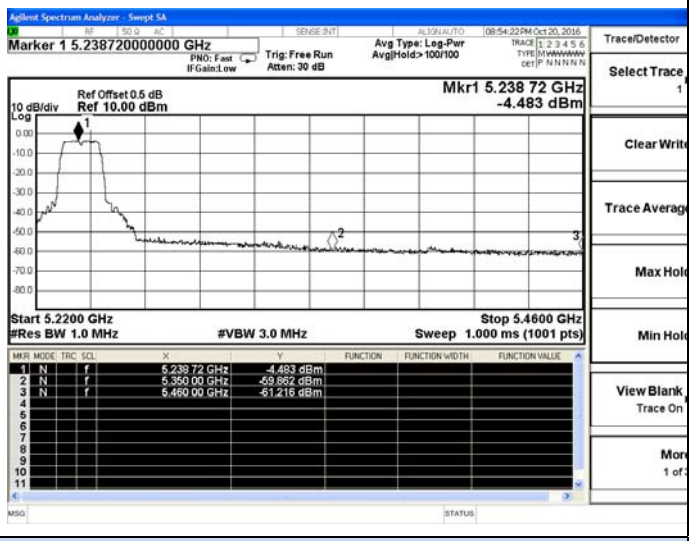
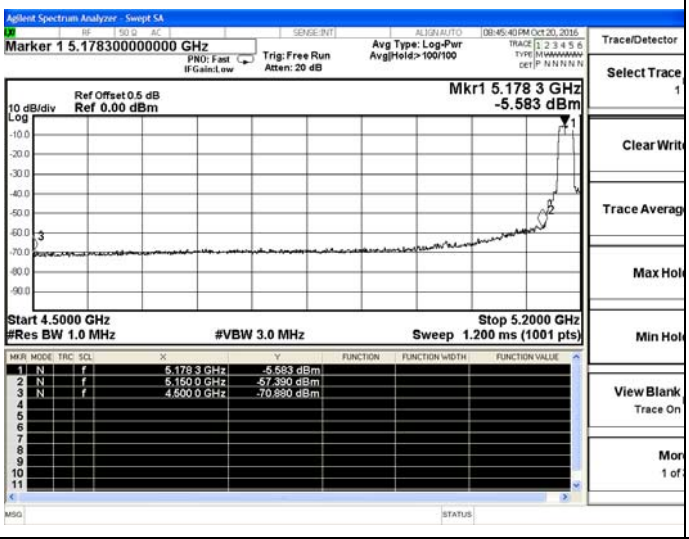
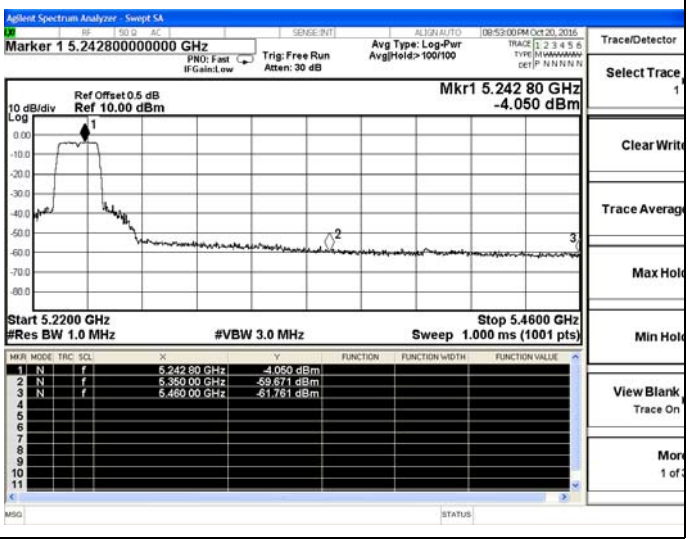
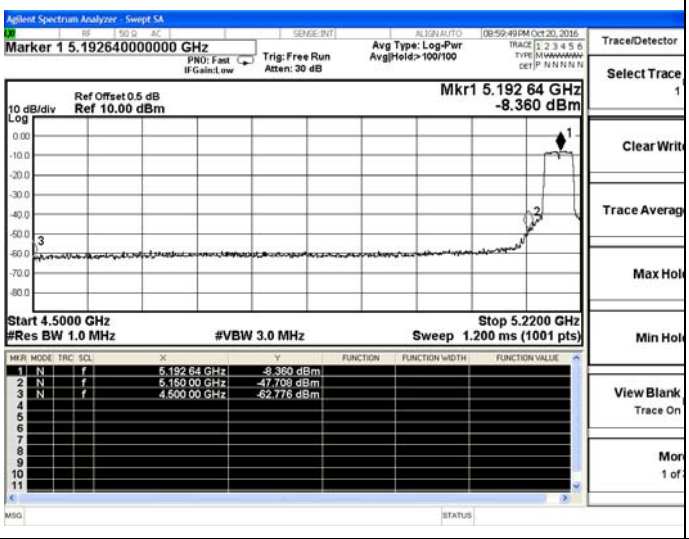
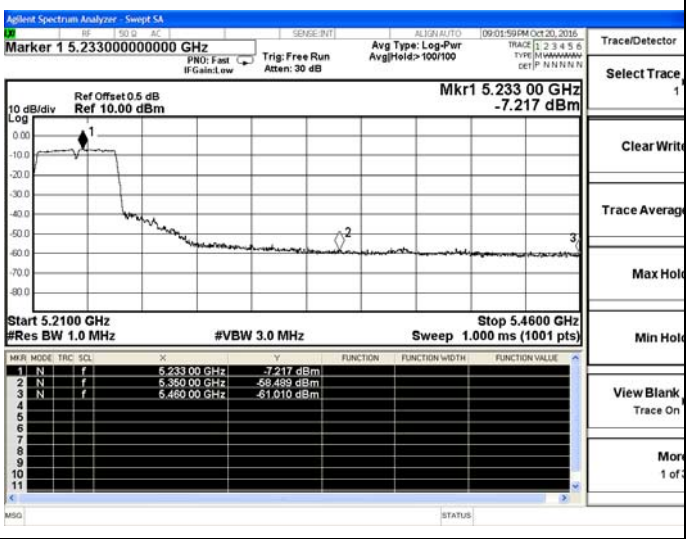
802.11n20								
Channel	Freq. MHz	Reading Level dBm		Antenna Gain dBi	Sum Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
		Chain 0	Chain 1					
5745	5650.0000	-57.69	-58.23	18.00	58.26	68.2	-9.94	Peak
	5700.0000	-56.67	-59.02	18.00	58.52	105.2	-46.68	Peak
	5720.0000	-52.62	-57.07	18.00	61.91	110.8	-48.89	Peak
	5725.0000	-46.08	-47.01	18.00	69.69	122.2	-52.51	Peak
5825	5850.0000	-52.48	-53.85	18.00	63.10	122.2	-59.10	Peak
	5855.0000	-55.12	-59.25	18.00	59.50	110.8	-51.30	Peak
	5875.0000	-55.56	-60.92	18.00	58.75	105.2	-46.45	Peak
	5925.0000	-59.27	-59.33	18.00	57.01	68.2	-11.19	Peak

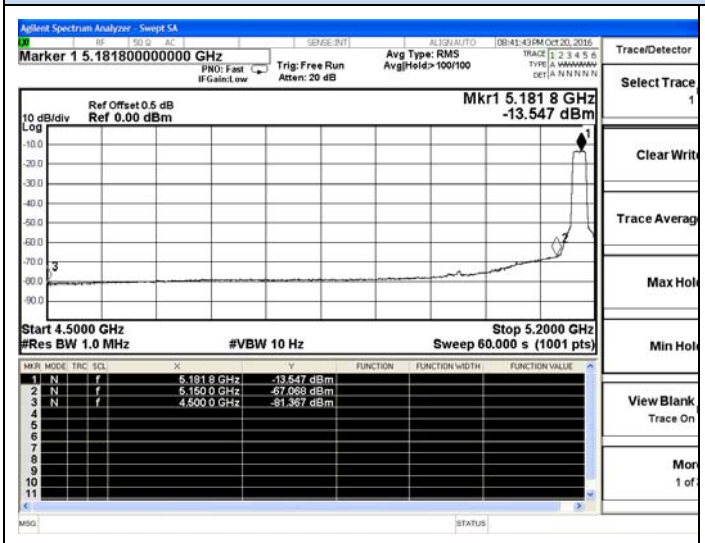
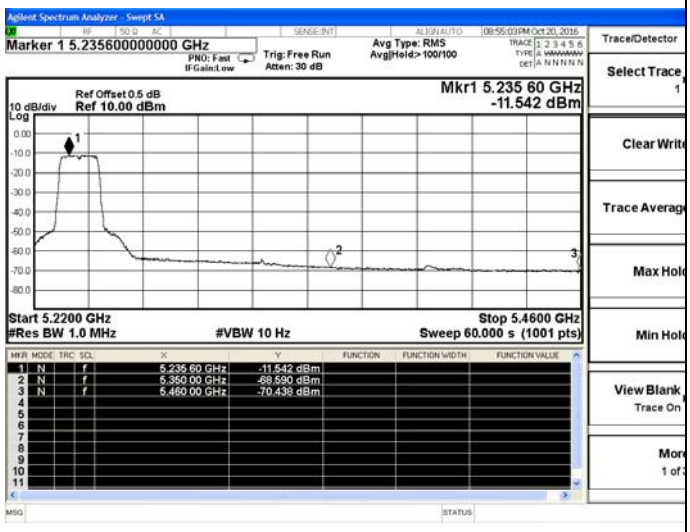
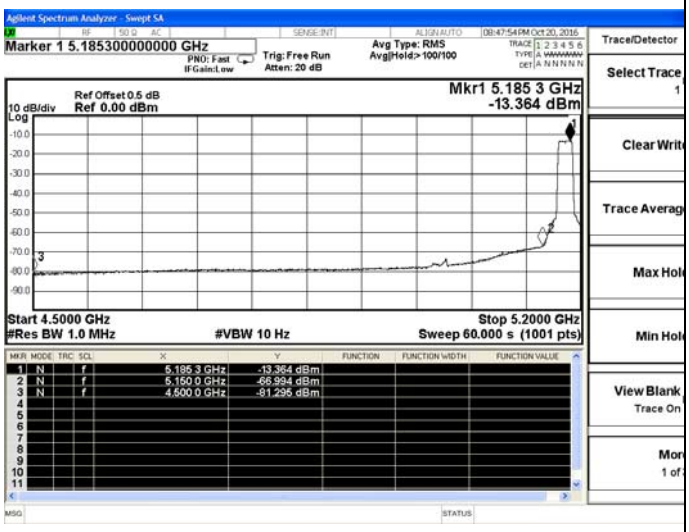
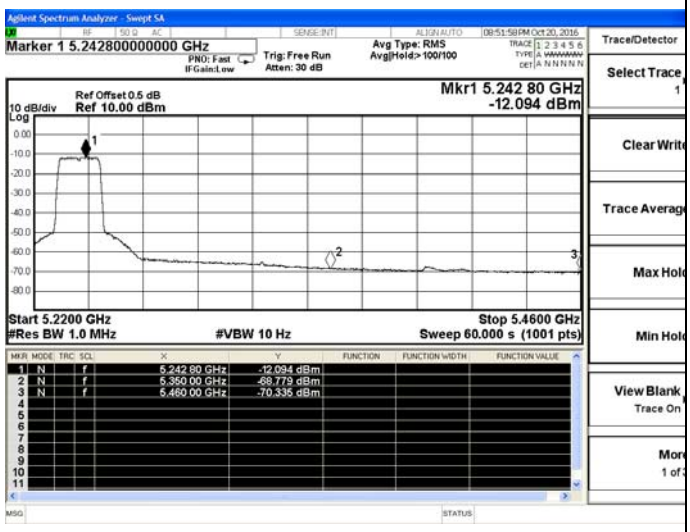
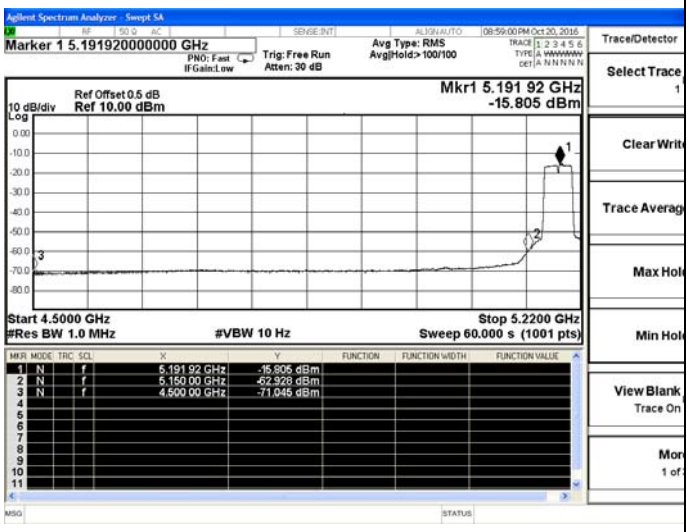
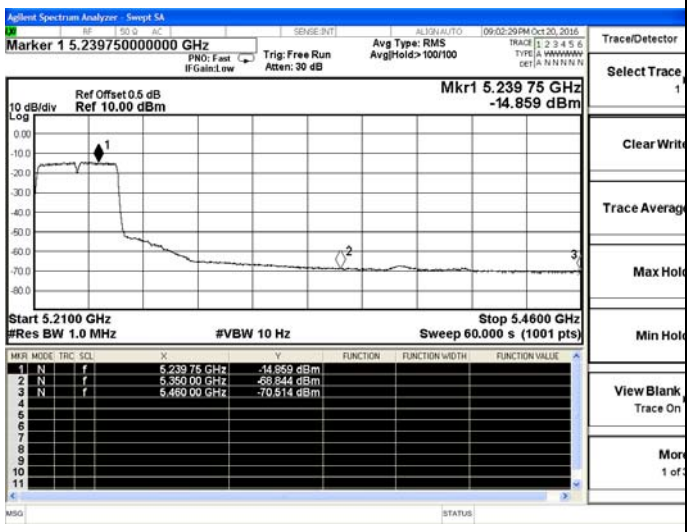
802.11n40								
Channel	Freq. MHz	Reading Level dBm		Antenna Gain dBi	Sum Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
		Chain 0	Chain 1					
5755	5650.0000	-58.66	-59.10	18.00	57.34	68.2	-10.86	Peak
	5700.0000	-56.59	-60.61	18.00	58.06	105.2	-47.14	Peak
	5720.0000	-46.57	-47.43	18.00	69.23	110.8	-41.57	Peak
	5725.0000	-44.51	-44.61	18.00	71.65	122.2	-50.55	Peak
5795	5850.0000	-56.13	-58.43	18.00	59.08	122.2	-63.12	Peak
	5855.0000	-55.78	-60.36	18.00	58.72	110.8	-52.08	Peak
	5875.0000	-57.10	-59.95	18.00	57.92	105.2	-47.28	Peak
	5925.0000	-58.10	-58.56	18.00	57.89	68.2	-10.31	Peak

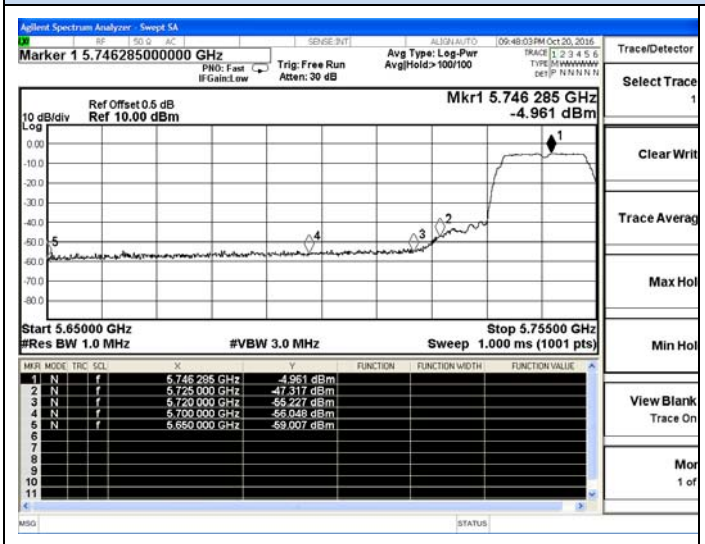
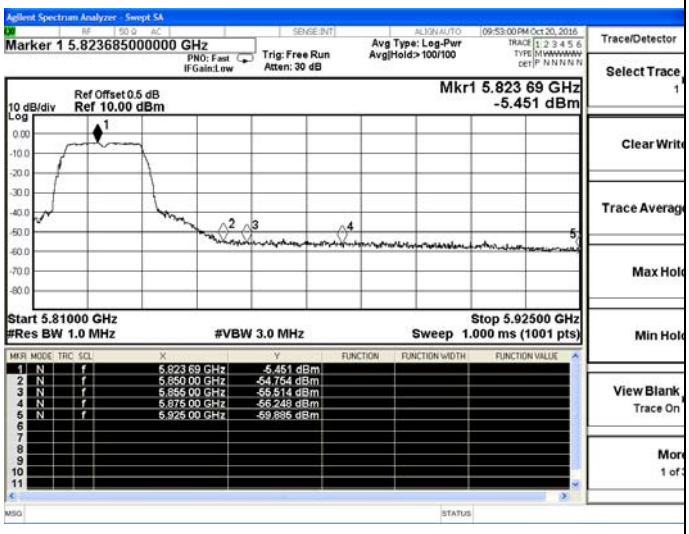
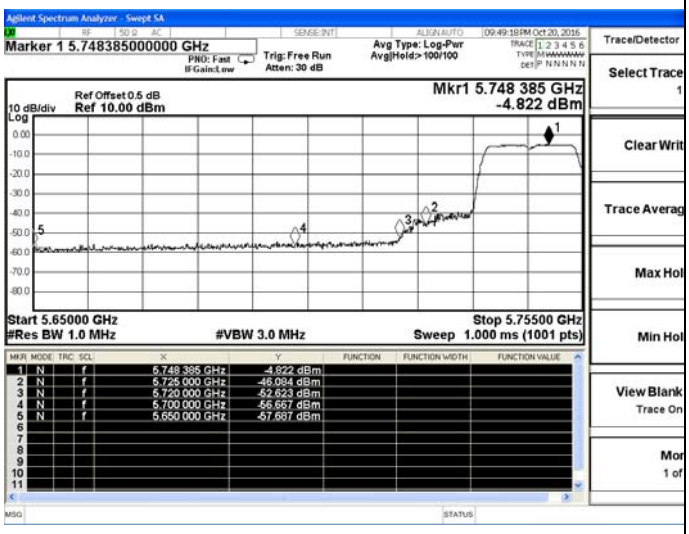
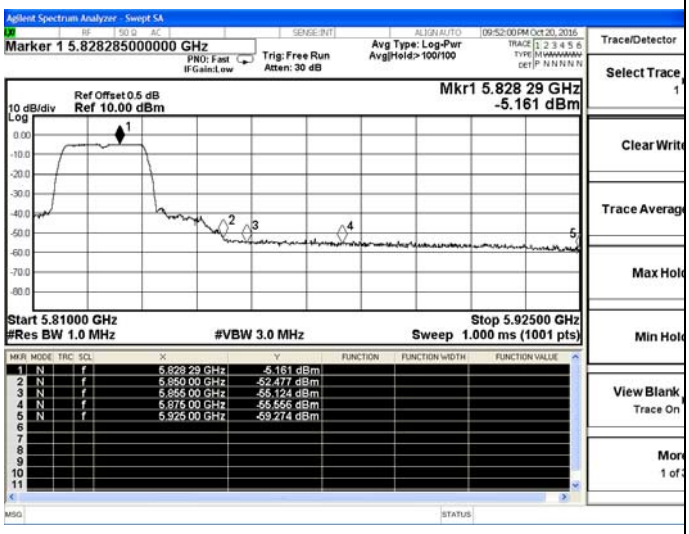
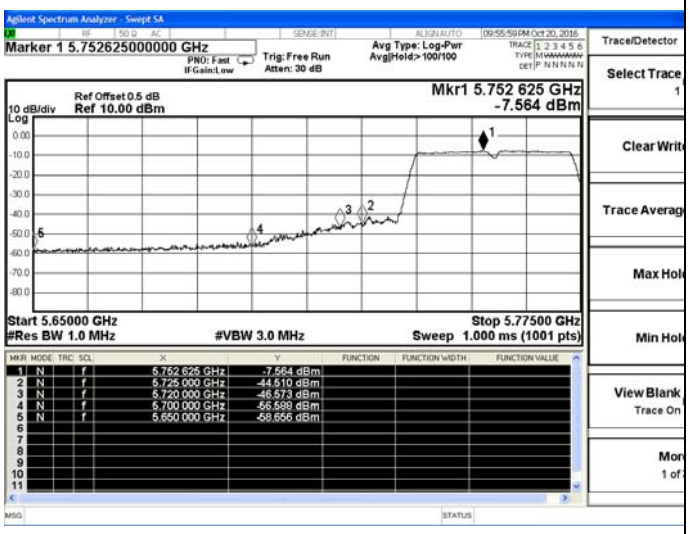
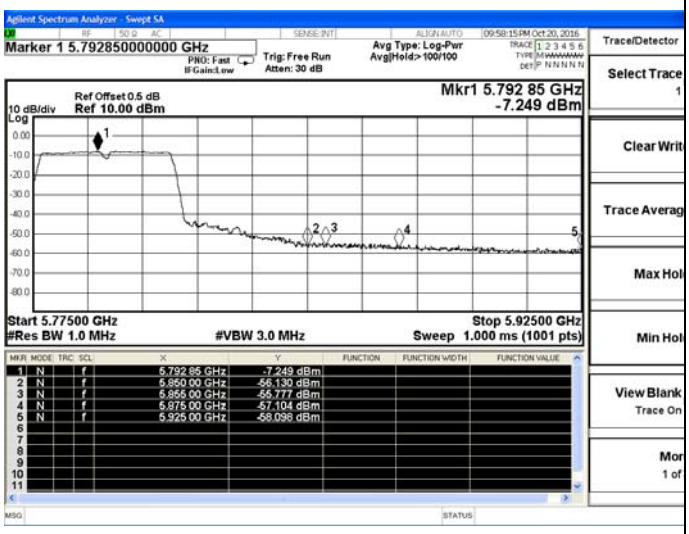
Note:

1). All modes have been tested and we only record the worst test result;
2). Measured E=Reading Level+Antenna Gain+95.2
3). For 802.11a mode, only the higher value of transmitter chain was used to determined the worst case, For 802.11n mode, both the value of transmitter china 0 & 1 was used to calculate to determine the worst case.

Note: Chain 0 was the worst case and recorded.

Test plot of Band Edge and Restricted band Emissions	
	
802.11a-5180MHz-Lower(Peak)	802.11a-5240MHz-Upper(Peak)
	
802.11n20-5180MHz-Lower(Peak)	802.11n20-5240MHz-Upper(Peak)
	
802.11n40-5190MHz-Lower(Peak)	802.11n40-5230MHz-Upper(Peak)

Test plot of Band Edge and Restricted band Emissions	
	
802.11a-5180MHz-Lower(Average)	802.11a-5240MHz-Upper(Average)
	
802.11n20-5180MHz-Lower(Average)	802.11n20-5240MHz-Upper(Average)
	
802.11n40-5190MHz-Lower(Average)	802.11n40-5230MHz-Upper(Average)

Test plot of Band Edge and Restricted band Emissions	
	
802.11a-5745MHz-Lower(Peak)	802.11a-5825MHz-Upper(Peak)
	
802.11n20-5745MHz-Lower(Peak)	802.11n20-5825MHz-Upper(Peak)
	
802.11n40-5755MHz-Lower(Peak)	802.11n40-5795MHz-Upper(Peak)

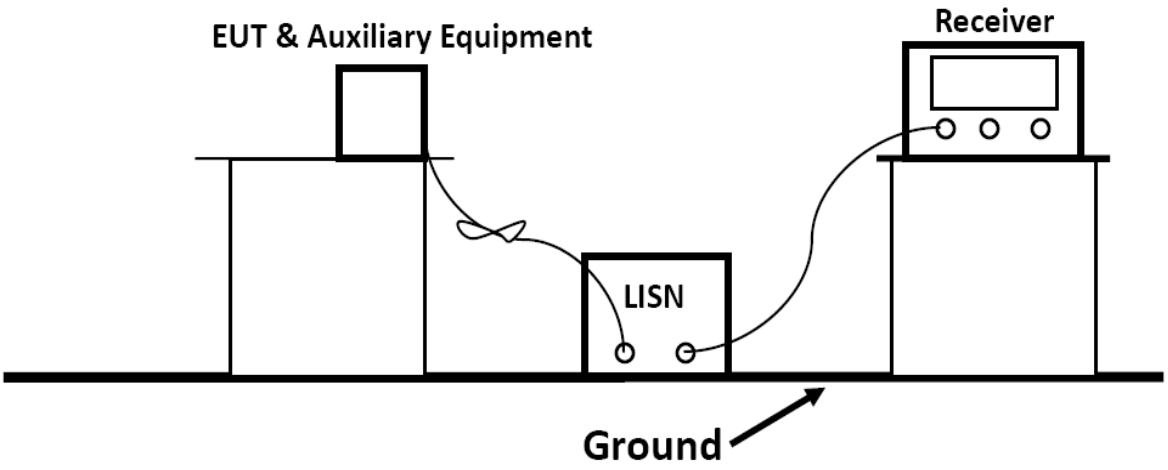
5.5. Power line conducted emissions

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 (dBμV)	
	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

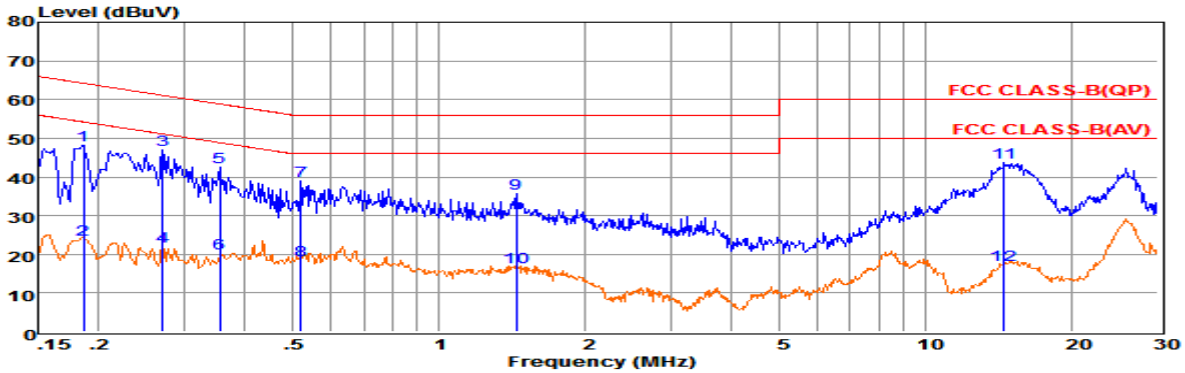
PASS.

Only recorded the worst test case in this report.

The test data please refer to following page.

Test Result For Line Power Input AC 120V/60Hz (Worst Case)

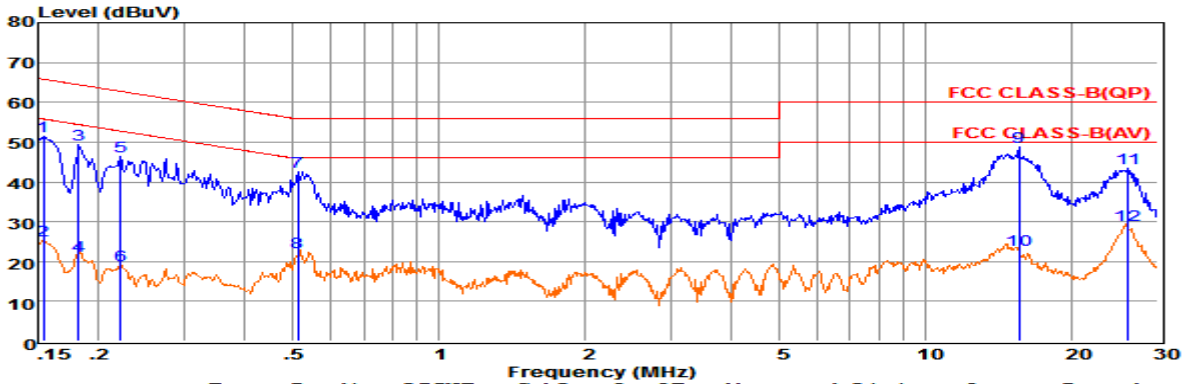
Line:



	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.19	28.65	9.62	0.02	10.00	48.29	64.20	-15.91	QP
2	0.19	4.03	9.62	0.02	10.00	23.67	54.19	-30.52	Average
3	0.27	27.20	9.63	0.03	10.00	46.86	61.12	-14.26	QP
4	0.27	2.26	9.63	0.03	10.00	21.92	51.11	-29.19	Average
5	0.35	22.74	9.62	0.03	10.00	42.39	58.87	-16.48	QP
6	0.35	0.57	9.62	0.03	10.00	20.22	48.87	-28.65	Average
7	0.52	19.36	9.62	0.04	10.00	39.02	56.00	-16.98	QP
8	0.52	-1.14	9.62	0.04	10.00	18.52	46.00	-27.48	Average
9	1.44	15.98	9.64	0.05	10.00	35.67	56.00	-20.33	QP
10	1.44	-2.89	9.64	0.05	10.00	16.80	46.00	-29.20	Average
11	14.52	23.76	9.71	0.10	10.00	43.57	60.00	-16.43	QP
12	14.52	-2.45	9.71	0.10	10.00	17.36	50.00	-32.64	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

Neutral:



	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.15	31.73	9.69	0.02	10.00	51.44	65.78	-14.34	QP
2	0.15	5.55	9.69	0.02	10.00	25.26	55.77	-30.51	Average
3	0.18	29.72	9.63	0.02	10.00	49.37	64.42	-15.05	QP
4	0.18	1.80	9.63	0.02	10.00	21.45	54.41	-32.96	Average
5	0.22	26.77	9.59	0.03	10.00	46.39	62.74	-16.35	QP
6	0.22	-0.48	9.59	0.03	10.00	19.14	52.74	-33.60	Average
7	0.51	23.00	9.62	0.04	10.00	42.66	56.00	-13.34	QP
8	0.51	2.55	9.62	0.04	10.00	22.21	46.00	-23.79	Average
9	15.55	28.89	9.75	0.10	10.00	48.74	60.00	-11.26	QP
10	15.55	3.08	9.75	0.10	10.00	22.93	50.00	-27.07	Average
11	26.14	23.55	9.83	0.13	10.00	43.51	60.00	-16.49	QP
12	26.14	9.14	9.83	0.13	10.00	29.10	50.00	-20.90	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

Note: Pre-scan all modes and recorded the worst case(TX at 802.11a 5.785GHz) results in this report.

5.6. Antenna Requirements

5.6.1. Standard Applicable

According to antenna requirement of §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. 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 provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

5.6.2. Antenna Connector Construction

The antenna used for transmitting is permanently attached and no consideration of replacement. Please see EUT photo for details.

This device has two antenna ports, they share the same antenna, the maximum gain is 18dBi for 5.2G & 5.8G WLAN.

5.6.3. Results: Compliance.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.
Conducted power refers ANSI C63.10:2013 Output power test procedure for UNII devices.
Radiated power refers to ANSI C63.10:2013 Radiated emissions tests.

Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep Time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

Limits

FCC	IC
Antenna Gain	
6 dBi	

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For WLAN devices, the 802.11a mode is used;

Chain 0							
Tnom	Vnom	5.2G			5.8G		
		Lowest Channel 5180 MHz	Middle Channel 5220 MHz	Highest Channel 5240 MHz	Lowest Channel 5745 MHz	Middle Channel 5785 MHz	Highest Channel 5825 MHz
Conducted power [dBm] Measured with 802.11a modulation		13.95	14.01	13.82	13.79	13.86	13.73
Radiated power [dBm] Measured with 802.11a modulation		30.90	31.13	29.11	29.75	30.71	28.75
Gain [dBi] Calculated		16.95	17.12	15.29	15.96	16.85	15.02
Measurement uncertainty		± 1.6 dB (cond.) / ± 3.8 dB (rad.)					

Chain 1							
Tnom	Vnom	5.2G			5.8G		
		Lowest Channel 5180 MHz	Middle Channel 5220 MHz	Highest Channel 5240 MHz	Lowest Channel 5745 MHz	Middle Channel 5785 MHz	Highest Channel 5825 MHz
Conducted power [dBm] Measured with 802.11a modulation		13.57	13.90	13.45	14.16	13.82	14.19
Radiated power [dBm] Measured with 802.11a modulation		30.58	31.83	29.34	30.39	30.39	31.12
Gain [dBi] Calculated		17.01	17.93	15.89	16.23	16.57	16.93
Measurement uncertainty		± 1.6 dB (cond.) / ± 3.8 dB (rad.)					

Result: -/-

6. PHOTOGRAPHS OF TEST SETUP

Please refer to the photographs of test setup document.

7. PHOTOGRAPHS OF EUT

Please refer to the photographs of eut document.

----------THE END OF REPORT----------