FCC TEST REPORT

For

ATEN Technology, Inc., dba IOGEAR

Ultra Long Range Wireless Video Extender

Test Model: GWLRHDTX

Additional Model No. : GWLRHDRX, GWLRDVITX, GWLRDVIRX, GWLRVGATX, GWLRVGARX, GWHD4K3, GWLRHD4K3, GWHD4K6, GWLRHD4K6

Prepared for	:	ATEN Technology, Inc., dba IOGEAR
Address	:	15365 Barranca Pkwy Irvine, CA 92618, USA

Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Tel	:	(+86)755-82591330
Fax	:	(+86)755-82591332
Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com

Date of receipt of test sample	:	Jul 03, 2017
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	Jul 03, 2017~Jul 12, 2017
Date of Report	:	Jul 12, 2017

FCC TEST REPORT

FCC CFR 47 PART 15 E(15.407) / RSS-247 Issue 2 / RSS-Gen Issue 4

Report Reference No.	**:**	**LCS170814002E**
Date of Issue.....	:	Jul 12, 2017
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.....	**:**	**ATEN Technology, Inc., dba IOGEAR**
Address.....	:	15365 Barranca Pkwy Irvine, CA 92618, USA
Test Specification		
Standard	:	FCC CFR 47 PART 15 E(15.407) / 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.....	**:**	**Ultra Long Range Wireless Video Extender**
Trade Mark.....	:	IOGEAR
Test Model	:	GWLRHDTX
Ratings	:	DC 5V/3A by adapter Adapter input: 100~240VAC, 50/60Hz, 0.6A
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Calvin Weng	Dick Su	Gavin Liang
Calvin Weng/ Administrators	Dick Su/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS170814002E	Jul 12, 2017 Date of issue

Test Model.....	: GWLRHDTX
EUT.....	: Ultra Long Range Wireless Video Extender
Applicant.....	**: ATEN Technology, Inc., dba IOGEAR**
Address.....	: 15365 Barranca Pkwy Irvine, CA 92618, USA
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: ATEN Technology, Inc., dba IOGEAR**
Address.....	: 15365 Barranca Pkwy Irvine, CA 92618, USA
Telephone.....	: /
Fax.....	: /
Factory.....	**: ATEN Technology, Inc., dba IOGEAR**
Address.....	: 15365 Barranca Pkwy Irvine, CA 92618, USA
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
000	Jul 12, 2017	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Ultra Long Range Wireless Video Extender
Test Model	:	GWLRHDTX
Power Supply	:	DC 5V/3A by adapter Adapter input: 100~240VAC, 50/60Hz, 0.6A
Hardware Version	:	TX VER2.1
Software Version	:	TX VER2.1
WIFI(5G Band)	:	
Frequency Range	:	5745-5825MHz
Channel Number	:	5 Channels
Modulation Type	:	802.11a/n20/n40: OFDM
Antenna Description	:	External Antenna, 5dBi(Max.)

1.2. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Mass Power Electronic Limited	Power Adapter	NBS24J050300HU	---	FCC VoC

1.3. External I/O

I/O Port Description	Quantity	Cable
IR IN	1	1m unshielded cable
HDMI	1	N/A
DC in Port	1	1.2m unshielded cable

1.4. Description of Test Facility

CNAS Registration Number. is L4595.

FCC Registration Number. is 899208.

Industry Canada Registration Number. is 9642A-1.

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 C63.4: 2014, CISPR 32/EN 55032 and CISPR16-1-4 SVSWR requirements.

1.5. List Of Measuring Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Sensor	R&S	NRV-Z81	100458	2017-06-18	2018-06-17
2	Power Sensor	R&S	NRV-Z32	10057	2017-06-18	2018-06-17
3	Power Meter	R&S	NRVS	100444	2017-06-18	2018-06-17
4	DC Filter	MPE	23872C	N/A	2017-06-18	2018-06-17
5	RF Cable	Harbour Industries	1452	N/A	2017-06-18	2018-06-17
6	SMA Connector	Harbour Industries	9625	N/A	2017-06-18	2018-06-17
7	Spectrum Analyzer	Agilent	N9020A	MY50510140	2016-10-27	2017-10-26
8	Signal analyzer	Agilent	E4448A(External	US44300469	2017-06-16	2018-06-15
9	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2017-06-18	2018-06-17
10	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-18	2018-06-17
11	Amplifier	SCHAFFNER	COA9231A	18667	2017-04-18	2018-04-17
12	Amplifier	Agilent	8449B	3008A02120	2017-04-18	2018-04-17
13	Amplifier	MITEQ	AMF-6F-260400	9121372	2017-04-18	2018-04-17
14	Loop Antenna	R&S	HFH2-Z2	860004/001	2017-04-18	2018-04-17
15	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2017-04-18	2018-04-17
16	Horn Antenna	EMCO	3115	6741	2017-04-18	2018-04-17
17	Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	2017-04-18	2018-04-17
18	RF Cable-R03m	Jye Bao	RG142	CB021	2017-06-18	2018-06-17
19	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2017-06-18	2018-06-17
20	EMI Test Receiver	R&S	ESCI	101142	2017-06-18	2018-06-17
21	Artificial Mains	R&S	ENV216	101288	2017-06-18	2018-06-17
22	EMI Test Software	AUDIX	E3	N/A	2017-06-18	2018-06-17

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(Low Channel, 57450-5825MHz Band).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was determined to be 802.11a mode(Low Channel, 57450-5825MHz 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: MCS0, OFDM.
802.11n(HT40) Mode: MCS0, OFDM.

Support Bandwidth For 5G WIFI Part:

Bandwidth Mode	20MHz	40MHz	80MHz
802.11a	☑	☐	☐
802.11n(HT20)	☑	☐	☐
802.11n(HT40)	☐	☑	☐

Channel & Frequency:

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
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 v01 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 transmitting condition.

3.2. EUT Exercise Software

ARTGUI.exe

3.3. Special Accessories

No.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/ unshielded	Notes
1	PC	Lenovo	Ideapad	A131101550	/	/	DOC
2	Power adapter	Lenovo	CPA-A090	36200414	1.00m	unshielded	DOC

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/ RSS-247 Issue 2 / RSS-Gen Issue 4			
FCC Rules	**IC Rules**	**Description of Test**	**Result**
§15.407(a)	RSS-247 6.2.1.1 & 6.2.4.1	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 6.2.1.1 & 6.2.4.1	Power Spectral Density	Compliant
§15.407(e)	RSS-247 6.2.1.1 & 6.2.4.1	6dB & 26dB Bandwidth	Compliant
§15.205, §15.407(b)	RSS-247 6.2.1.2 & 6.2.4.2	Radiated Spurious Emissions and Band Edge	Compliant
§15.407(g)	RSS-Gen 6.11	Frequency Stability	N/A
§15.407(h)	RSS-247 6.2.1.1&6.2.2.1	Transmit Power Control (TPC)	N/A
§15.207(a)	RSS-Gen 8.8	Line Conducted Emissions	Compliant
§15.203	RSS-Gen 6.7	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. On Time and Duty Cycle

5.1.1. Standard Applicable

None; for reporting purpose only.

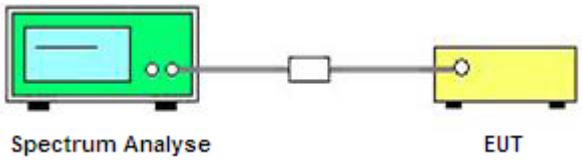
5.1.2. Measuring Instruments and Setting

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

5.1.3. Test Procedures

1. Set the Centre frequency of the spectrum analyzer to the transmitting frequency;
2. Set the span=0MHz, RBW=8MHz, VBW=50MHz, Sweep time=5ms;
3. Detector = peak;
4. Trace mode = Single hold.

5.1.4. Test Setup Layout



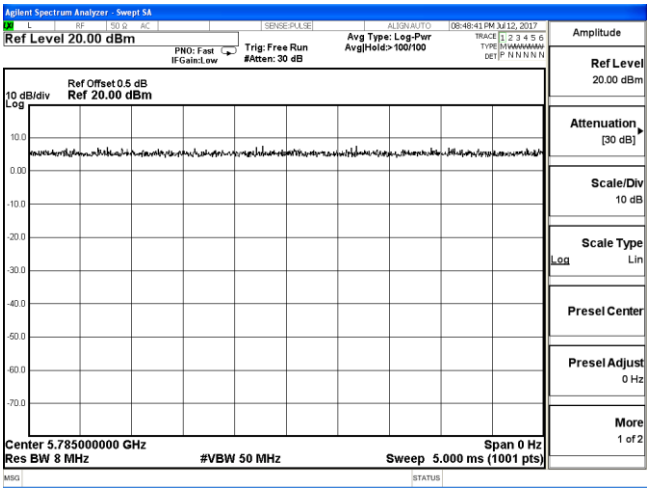
5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

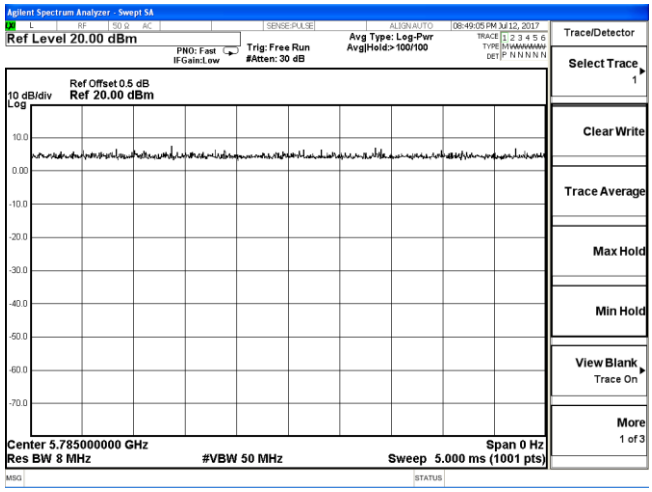
5.1.6. Test result

Mode	On Time B (ms)	Period (ms)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW(KHz)
IEEE 802.11a	5	5	1	100	0	0.010
IEEE 802.11n HT20	5	5	1	100	0	0.010
IEEE 802.11n HT40	5	5	1	100	0	0.010
Note: Duty Cycle Correction Factor=10log(1/Duty cycle)						

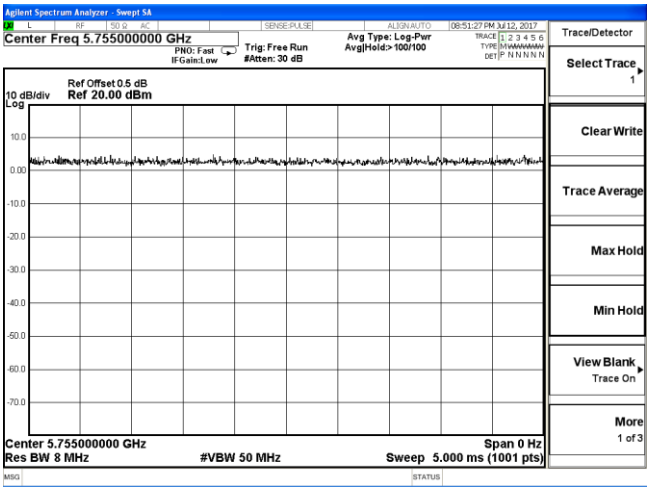
On Time and Duty Cycle



IEEE 802.11a



IEEE 802.11n-HT20



IEEE 802.11n-HT40

5.2. Maximum Conducted Output Power 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 conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

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.

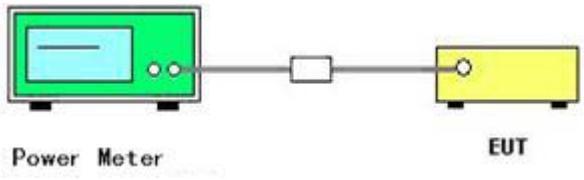
According to § 15.407(a)(1)(iv), For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

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.

5.2.2. Test Procedures

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

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 Maximum Conducted Output Power

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

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

Mode	Channel	Frequency (MHz)	Conducted Power (dBm, Average)		Duty cycle factor	Sum Power (dBm, Average)	Max. Limit (dBm)	Result
			Ant 0	Ant 1				
802.11a	149	5745	**12.22**	11.85	0.00	/	30.00	Complies
	157	5785	11.77	11.74	0.00	/	30.00	Complies
	165	5825	11.67	11.73	0.00	/	30.00	Complies
802.11n(HT20)	149	5745	8.25	8.14	0.00	11.21	27.99	Complies
	157	5785	8.11	8.53	0.00	11.34	27.99	Complies
	165	5825	8.46	8.21	0.00	11.35	27.99	Complies
802.11n(HT40)	151	5755	8.37	8.70	0.00	11.55	27.99	Complies
	159	5795	8.23	8.31	0.00	11.28	27.99	Complies

Note: As the antenna gain for each antenna is 5dBi(Max), two antennas are used for this device, the total gain for 802.11n mode should be 5+10*log(2)=8.01, so the power limit should be 30-(8.01-6)=27.99dBm.

5.3. Power Spectral Density Measurement

5.3.1. 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.

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 band.

5.3.2. 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 = 100KHz/300KHz For the 5.725-5.85GHz band.

4) Set the span to encompass the entire emission bandwidth of the signal.

5) Detector = RMS.

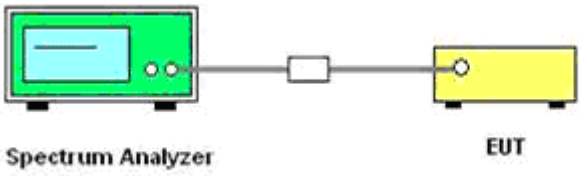
6) Sweep time = auto couple.

7) Trace mode = max hold.

8) Allow trace to fully stabilize.

9) Use the peak marker function to determine the maximum amplitude level.

5.3.3. Test Setup Layout



5.3.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.3.5. Test Result of Power Spectral Density

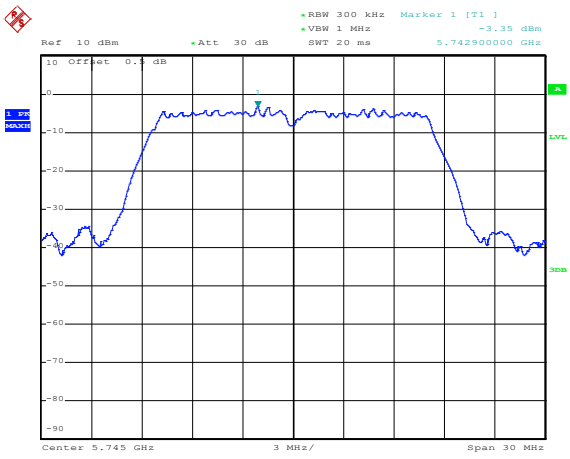
Temperature	25℃	Humidity	60%
Test Engineer	Jayden Zhuo	Configurations	802.11a/n

Power Spectral Density Measurement Result For 5745~5825MHz Band

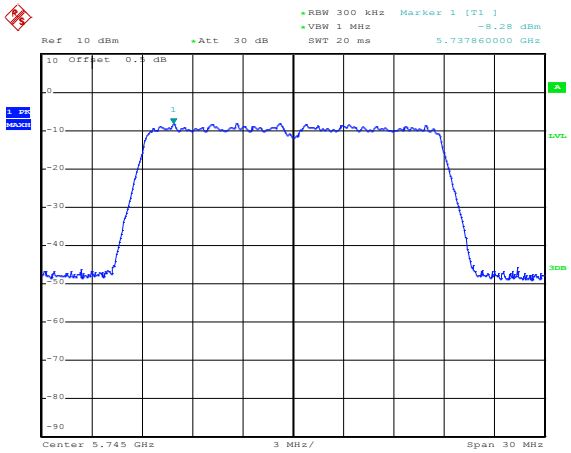
Mode	Channel	Frequency(MHz)	Power ensity (dBm/300KHz)		Power ensity Sum (dBm/300KHz)	BW correction factor	Power Density (dBm/500 KHz)	Max. Limit (dBm/500KHz)	Result
			Ant 0	Ant 1					
802.11a	149	5745	-3.35	-3.39	/	2.218	-1.132	30.00	Complies
	157	5785	-3.59	-3.66	/	2.218	-1.372	30.00	Complies
	165	5825	-4.14	-4.23	/	2.218	-1.922	30.00	Complies
802.11n(HT20)	149	5745	-8.28	-8.44	-5.35	2.218	-3.132	27.99	Complies
	157	5785	-8.42	-8.55	-5.47	2.218	-3.252	27.99	Complies
	165	5825	-8.23	-8.51	-5.36	2.218	-3.142	27.99	Complies
802.11n(HT40)	151	5755	-11.58	-11.42	-8.49	2.218	-6.272	27.99	Complies
	159	5795	-10.95	-11.69	-8.29	2.218	-6.072	27.99	Complies

Note: BW correction factor = 10log(500kHz/RBW) = 10 log(500kHz/300KHz)
The measured power density (dBm) has the offset with cable loss already.
As the antenna gain for each antenna is 5dBi(Max), two antennas are used for this device, the total gain for 802.11n mode, should be 5+10*log(2)=8.01, so the PSD limit should be 30-(8.01-6)=27.99dBm

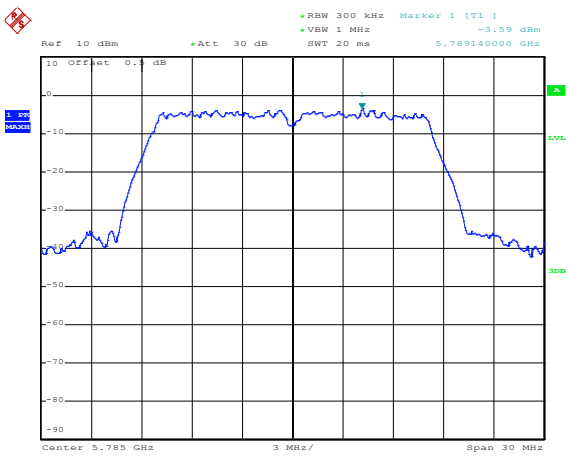
Test Result of Power Spectral Density-Ant 0



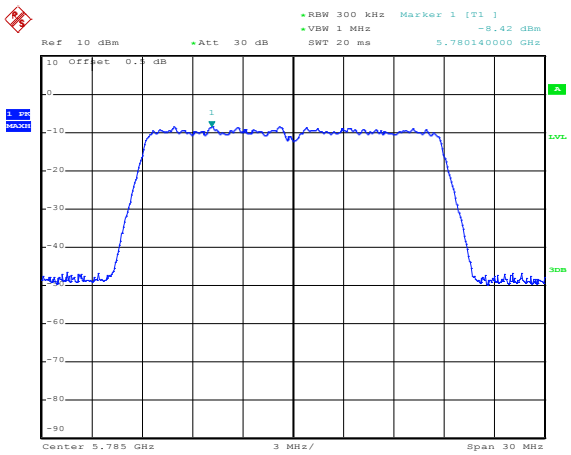
802.11a_Low Channel / 5745MHz



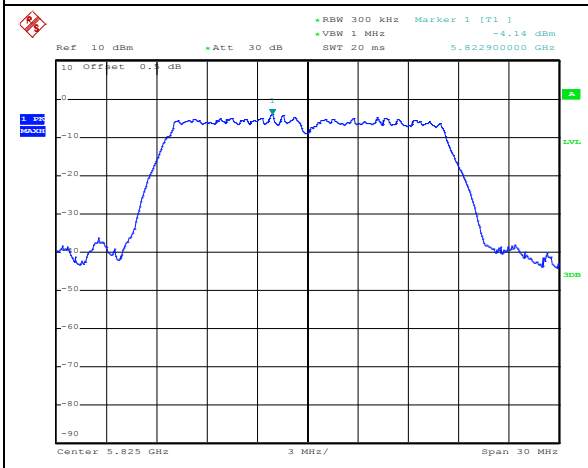
802.11n HT20_Low Channel / 5745MHz



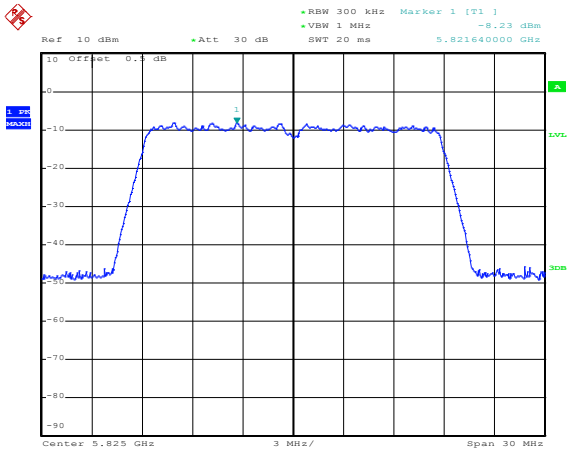
802.11a_Middle Channel / 5785MHz



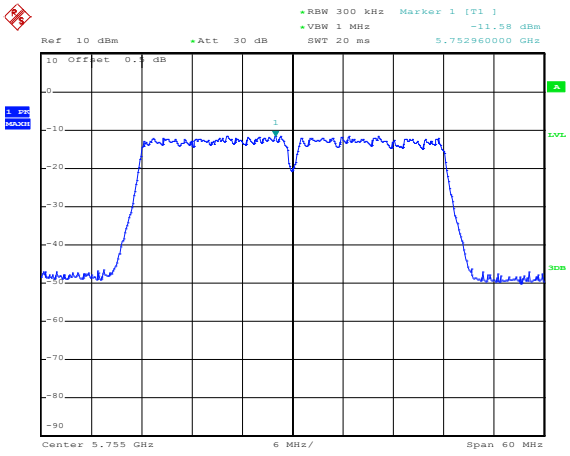
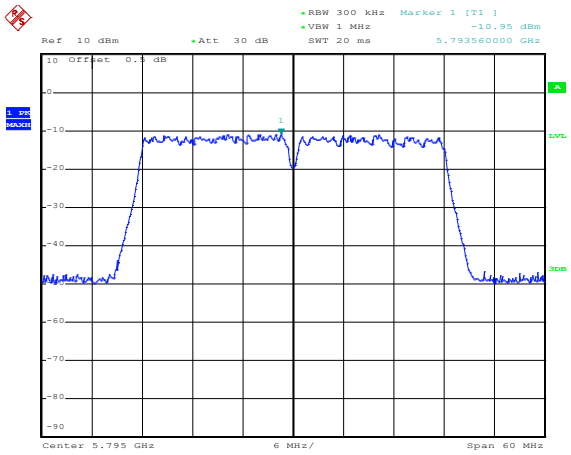
802.11n HT20_Middle Channel / 5785MHz



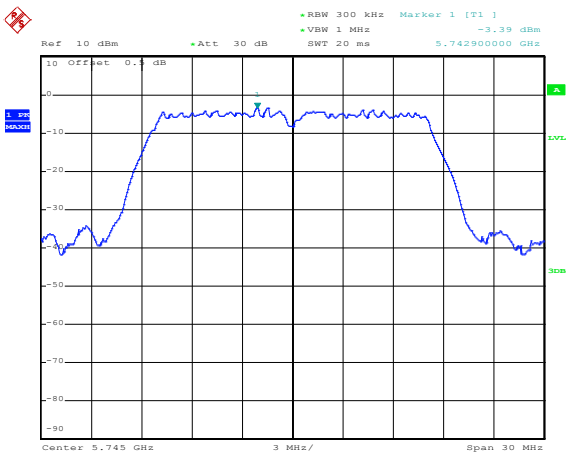
802.11a_High Channel / 5825MHz



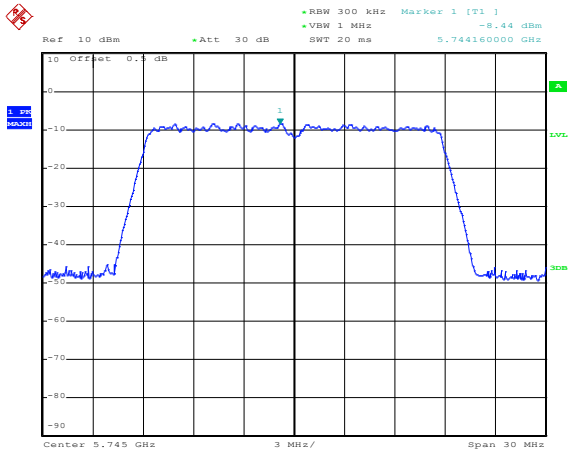
802.11n HT20_High Channel / 5825MHz

Test Result of Power Spectral Density-Ant 0	
	
802.11n HT40_Low Channel / 5755MHz	**802.11n HT40_High Channel / 5795MHz**

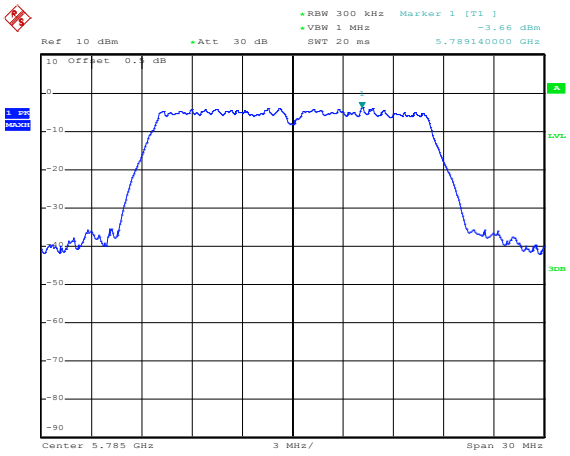
Test Result of Power Spectral Density-Ant 1



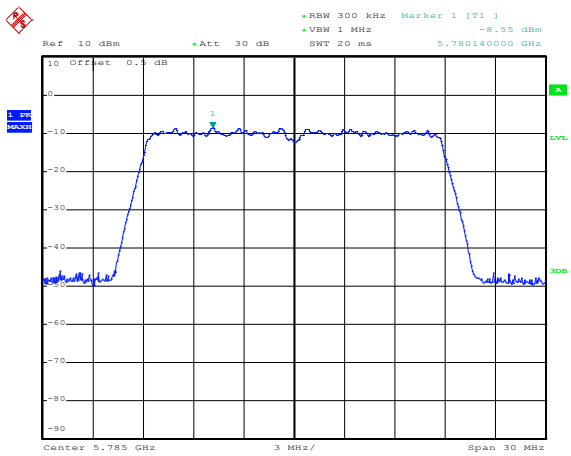
802.11a_Low Channel / 5745MHz



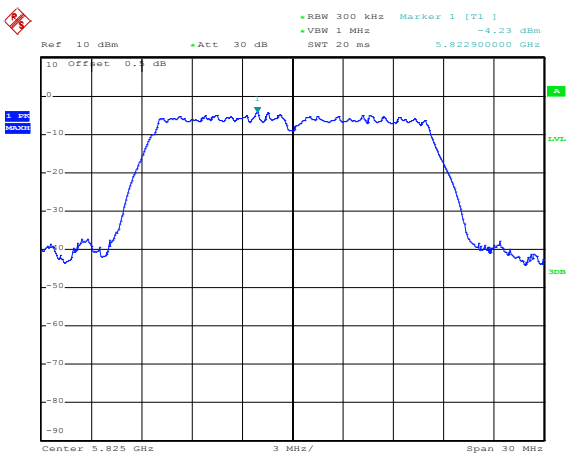
802.11n HT20_Low Channel / 5745MHz



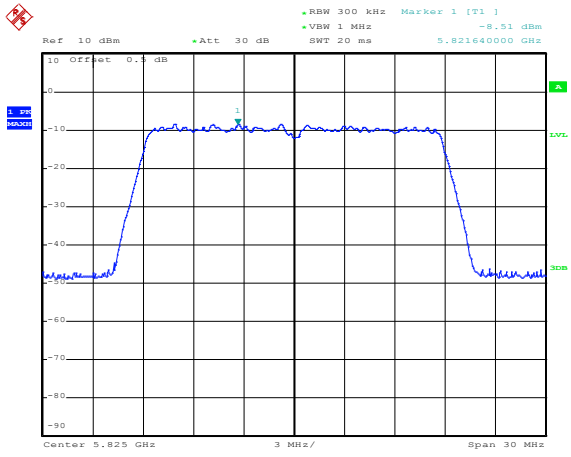
802.11a_Middle Channel / 5785MHz



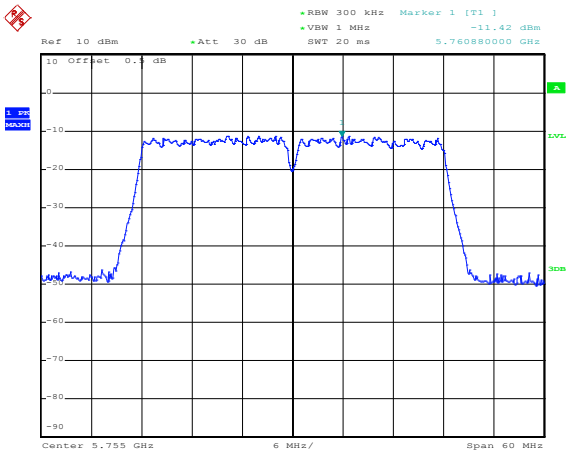
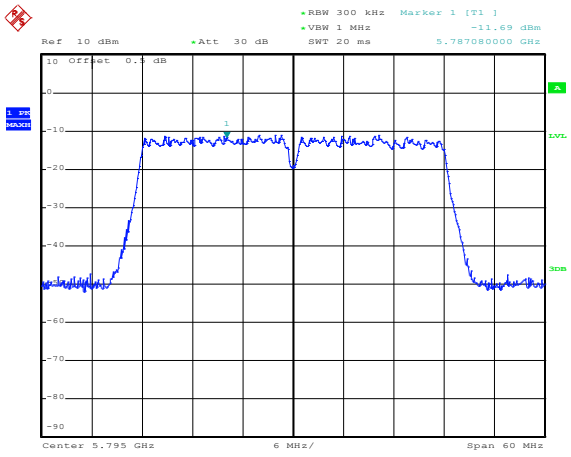
802.11n HT20_Middle Channel / 5785MHz



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**

5.4. 6dB & 26dB Bandwidth Measurement

5.4.1. 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.

5.4.2. 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

5.4.3. Test Procedures

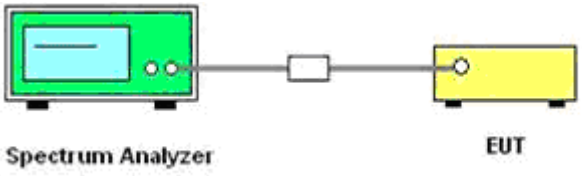
1) The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

2) The resolution bandwidth and the video bandwidth were set according to KDB 789033 D02 General UNII Test Procedures New Rules v01

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.

5.4.4. Test Setup Layout



5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

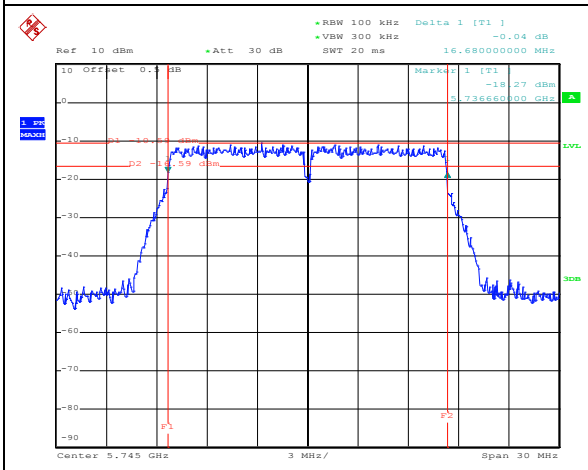
5.4.6. Test Result of Spectrum Bandwidth

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

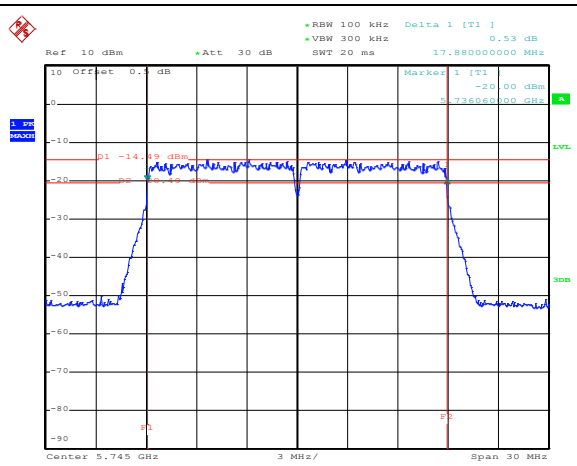
Mode	Channel	Frequency	6dB Bandwidth (MHz)		Min. Limit (kHz)	Result
			Ant 0	Ant 1		
802.11a	149	5745	16.68	16.68	500	Complies
	157	5785	16.68	16.68	500	Complies
	165	5825	16.62	16.68	500	Complies
802.11n(HT20)	149	5745	17.88	17.82	500	Complies
	157	5785	17.88	17.82	500	Complies
	165	5825	17.82	17.88	500	Complies
802.11n(HT40)	151	5755	36.72	36.72	500	Complies
	159	5795	36.60	36.60	500	Complies

Mode	Channel	Frequency	99% Occupied Bandwidth (MHz)		Min. Limit (kHz)	Result
			Ant 0	Ant 1		
802.11a	149	5745	17.10	17.20	500	Complies
	157	5785	17.00	17.20	500	Complies
	165	5825	17.00	17.30	500	Complies
802.11n(HT20)	149	5745	18.00	18.00	500	Complies
	157	5785	18.00	18.00	500	Complies
	165	5825	18.00	18.00	500	Complies
802.11n(HT40)	151	5755	36.80	37.20	500	Complies
	159	5795	37.20	37.20	500	Complies

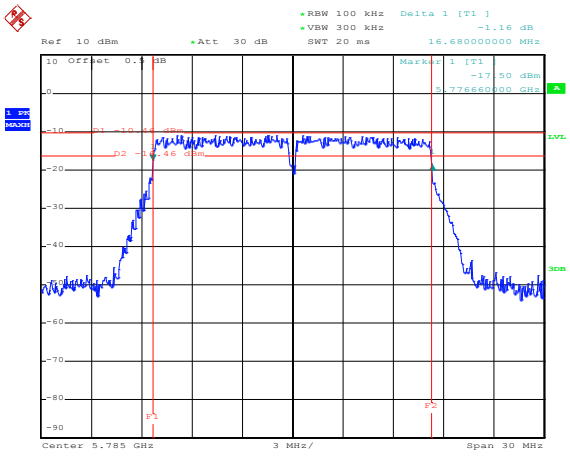
Test Result of 6dB Bandwidth-Ant 0



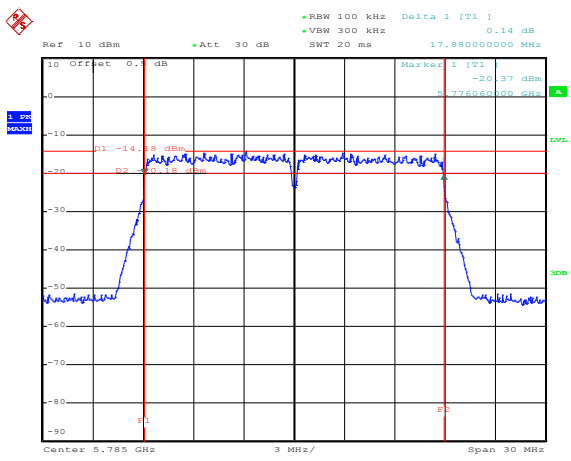
802.11a_Low Channel / 5745MHz



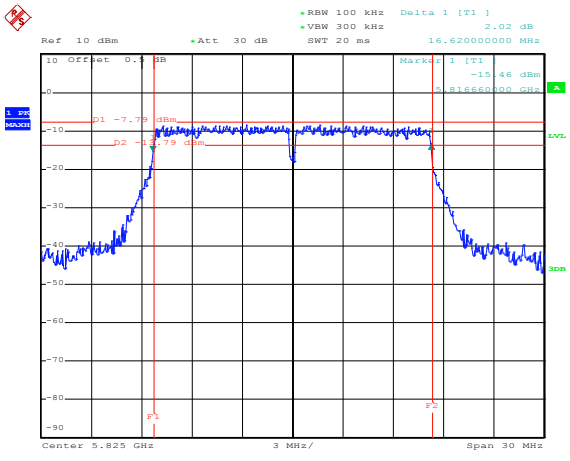
802.11n HT20_Low Channel / 5745MHz



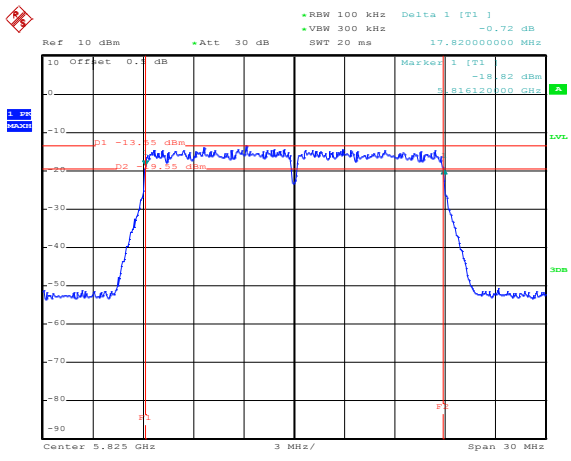
802.11a_Middle Channel / 5785MHz



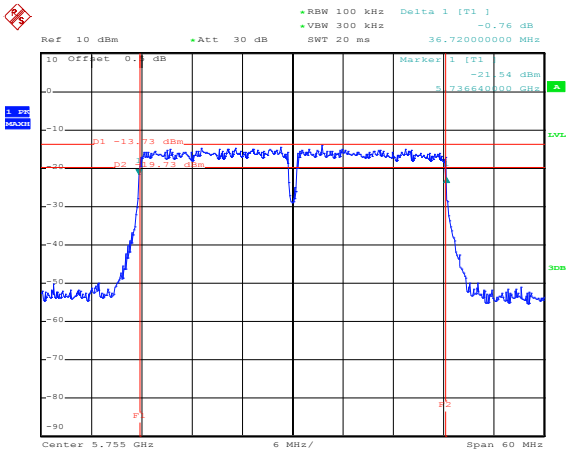
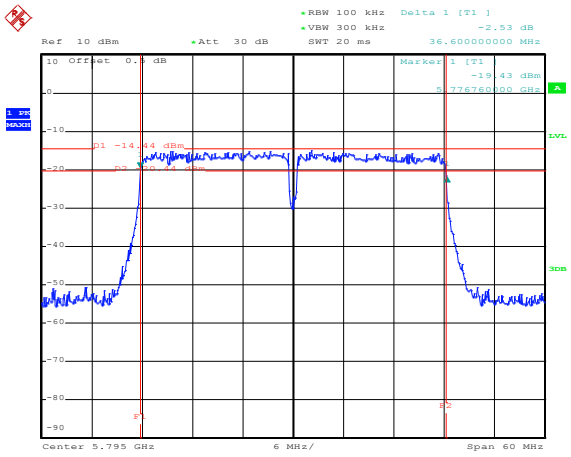
802.11n HT20_Middle Channel / 5785MHz



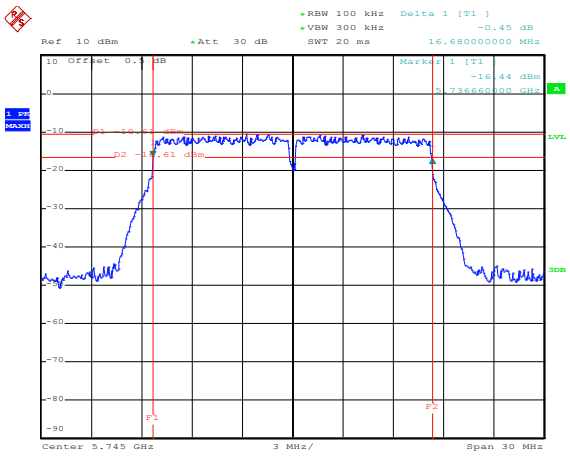
802.11a_High Channel / 5825MHz



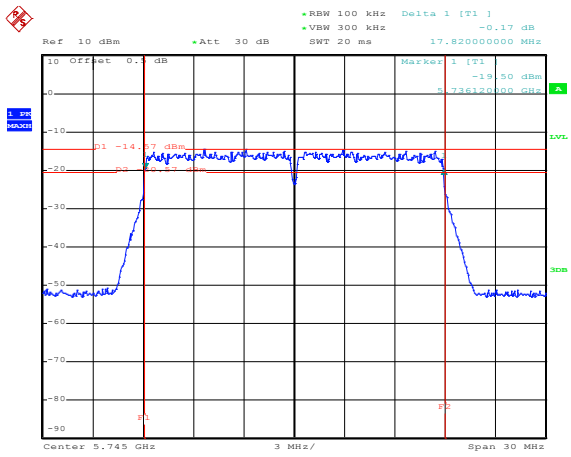
802.11n HT20_High Channel / 5825MHz

Test Result of 6dB Bandwidth-Ant 0	
	
802.11n HT40_Low Channel / 5755MHz	**802.11n HT40_High Channel / 5795MHz**

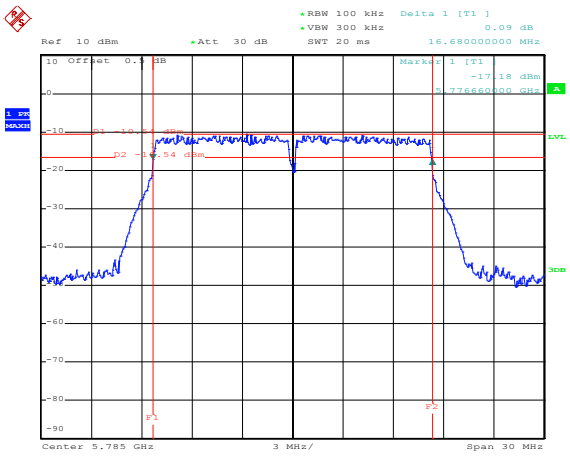
Test Result of 6dB Bandwidth-Ant 1



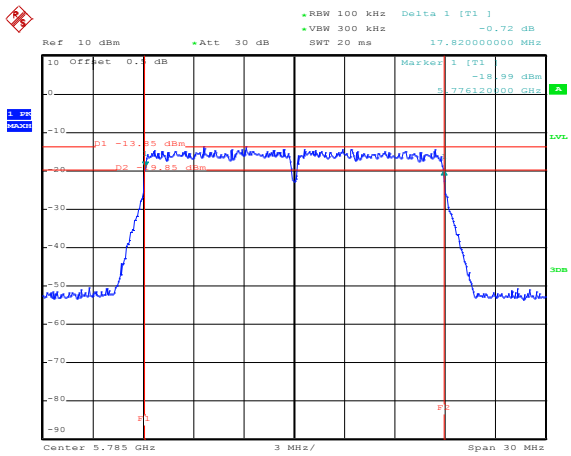
802.11a_Low Channel / 5745MHz



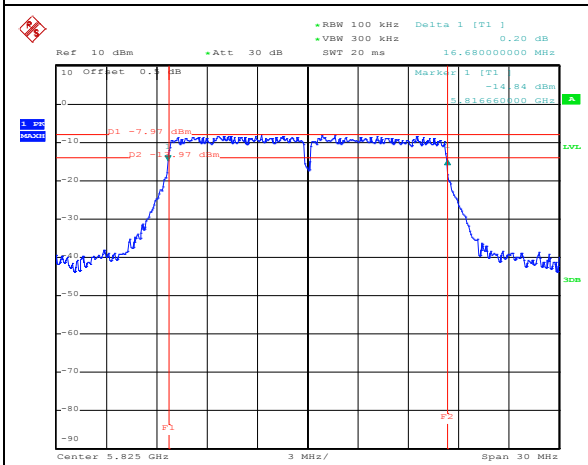
802.11n HT20_Low Channel / 5745MHz



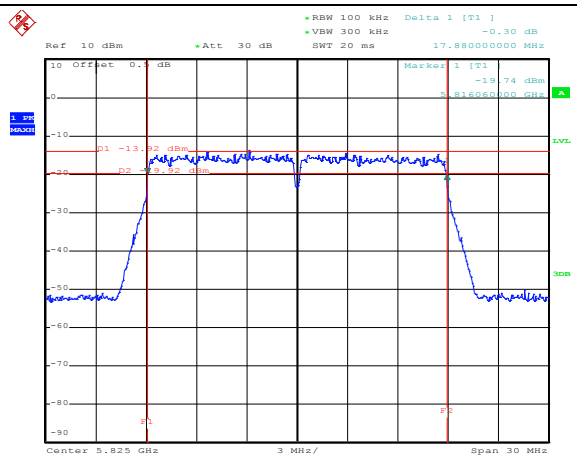
802.11a_Middle Channel / 5785MHz



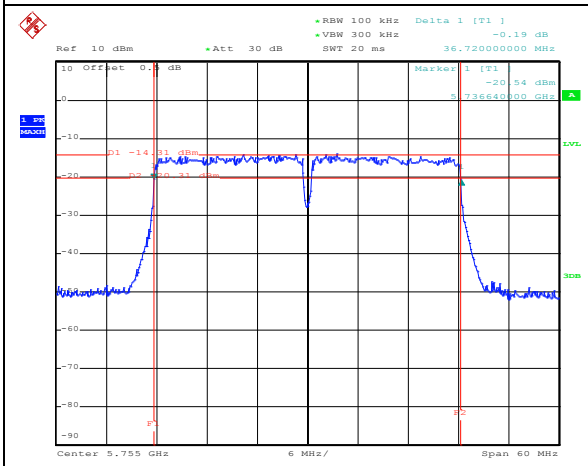
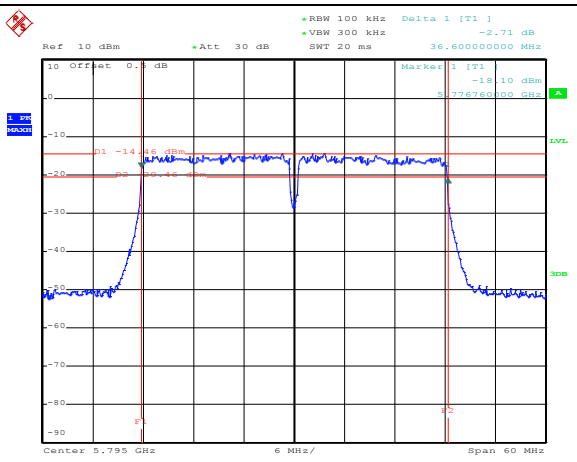
802.11n HT20_Middle Channel / 5785MHz



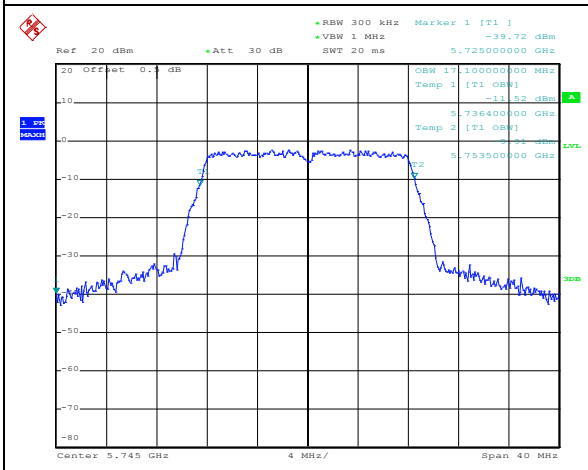
802.11a_High Channel / 5825MHz



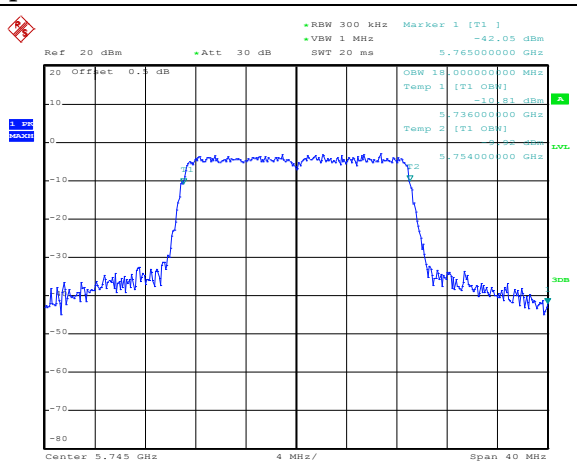
802.11n HT20_High Channel / 5825MHz

Test Result of 6dB Bandwidth-Ant 1	
	
802.11n HT40_Low Channel / 5755MHz	**802.11n HT40_High Channel / 5795MHz**

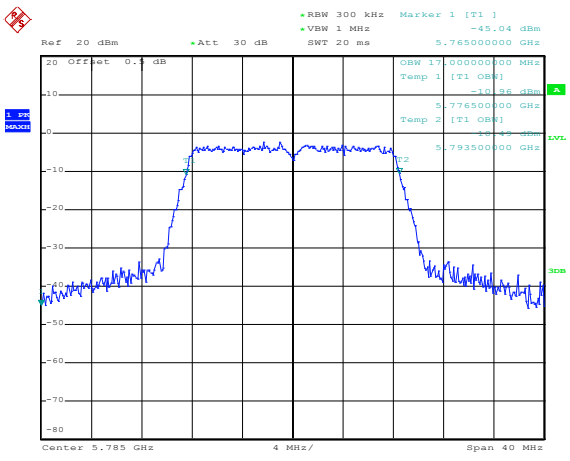
Test Result of 99% Occupied Bandwidth-Ant 0



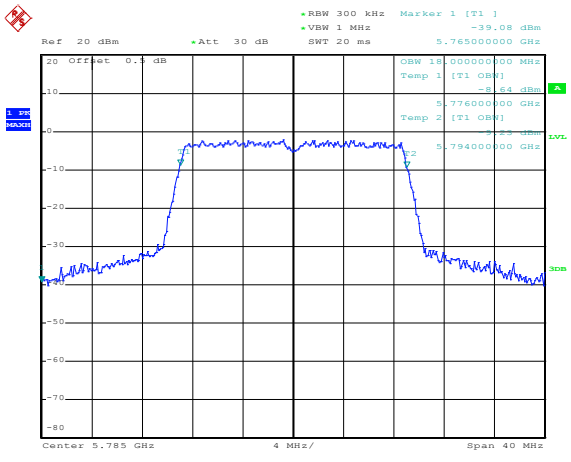
802.11a_Low Channel / 5745MHz



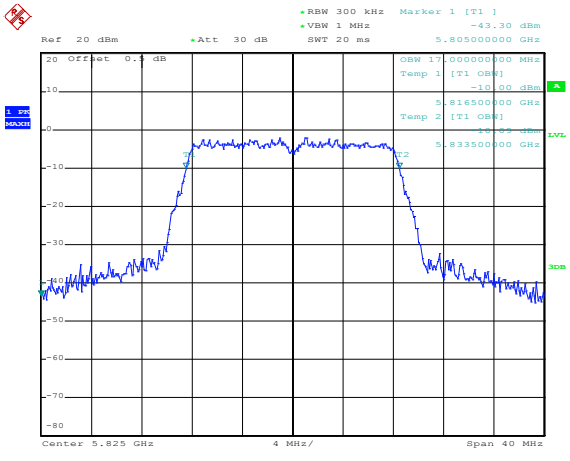
802.11n HT20_Low Channel / 5745MHz



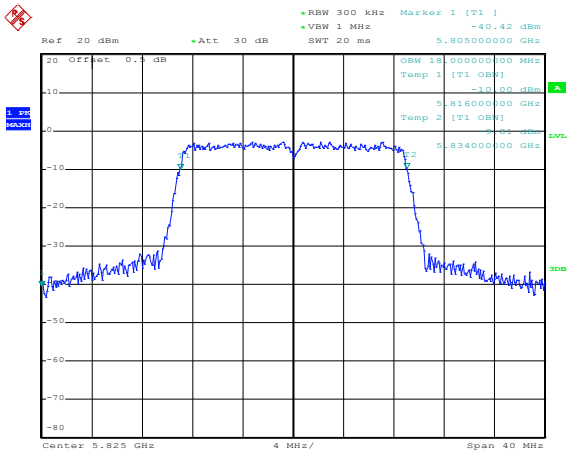
802.11a_Middle Channel / 5785MHz



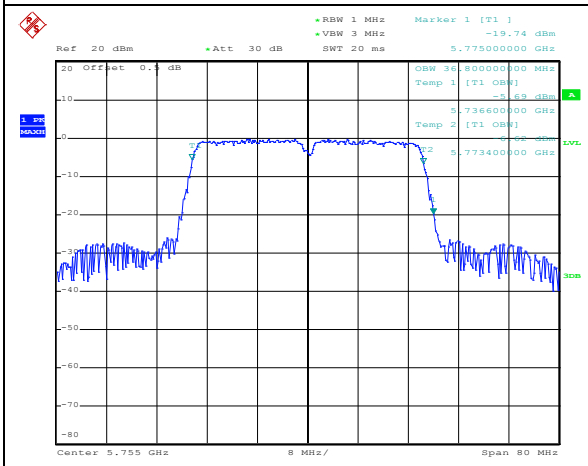
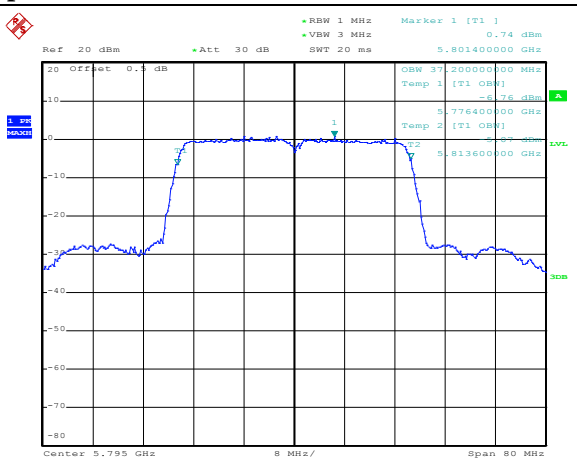
802.11n HT20_Middle Channel / 5785MHz



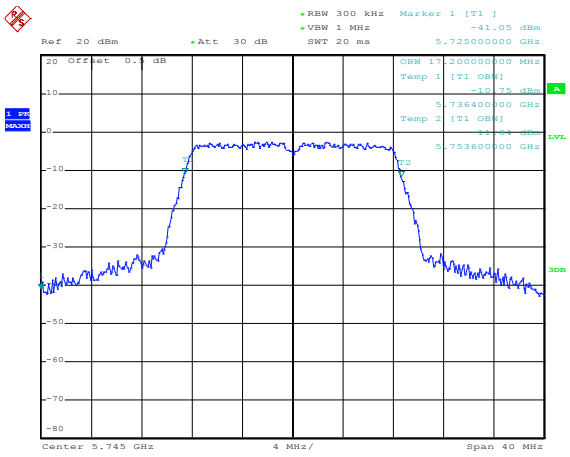
802.11a_High Channel / 5825MHz



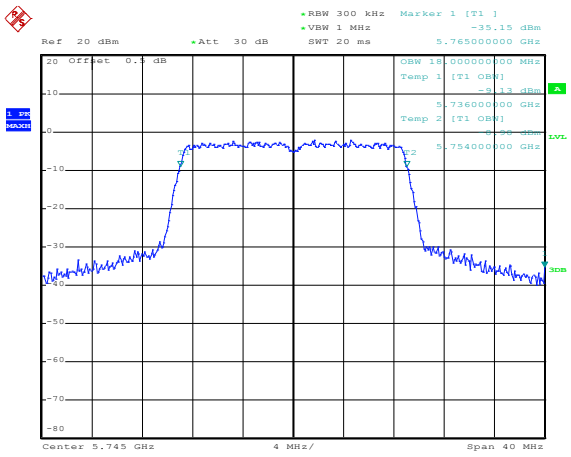
802.11n HT20_High Channel / 5825MHz

Test Result of 99% Occupied Bandwidth-Ant 0	
	
802.11n HT40_Low Channel / 5755MHz	**802.11n HT40_High Channel / 5795MHz**

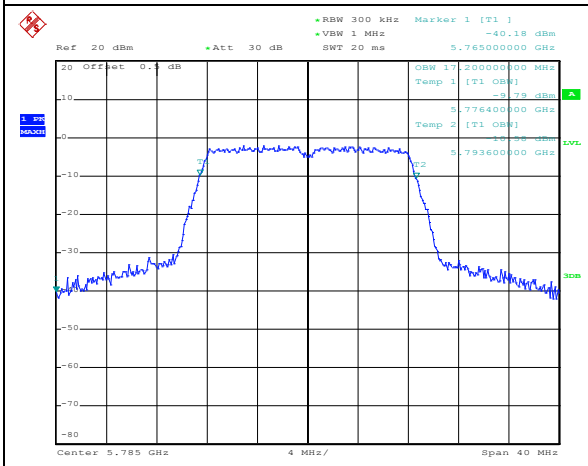
Test Result of 99% Occupied Bandwidth-Ant 1



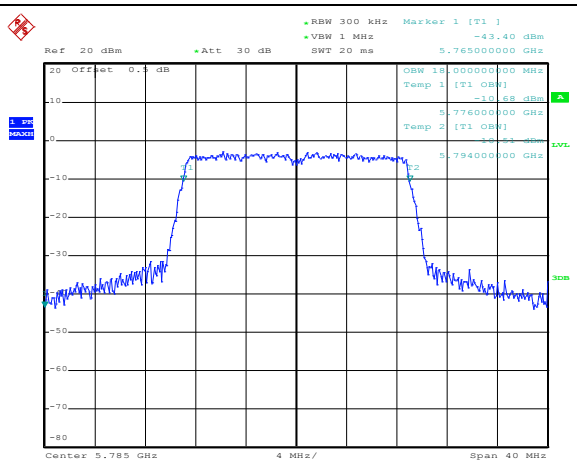
802.11a_Low Channel / 5745MHz



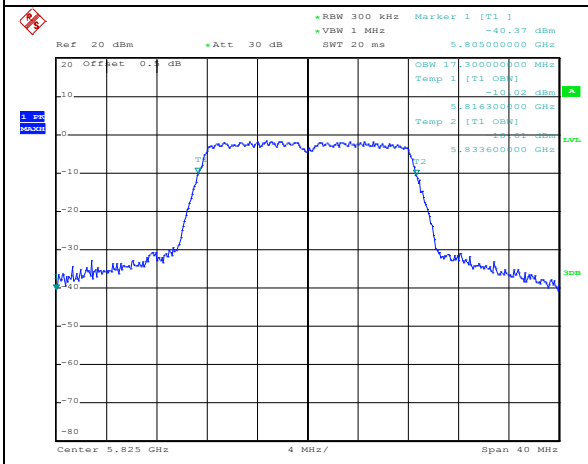
802.11n HT20_Low Channel / 5745MHz



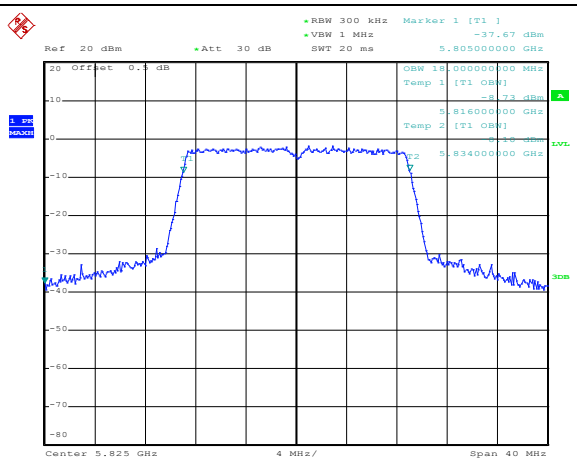
802.11a_Middle Channel / 5785MHz



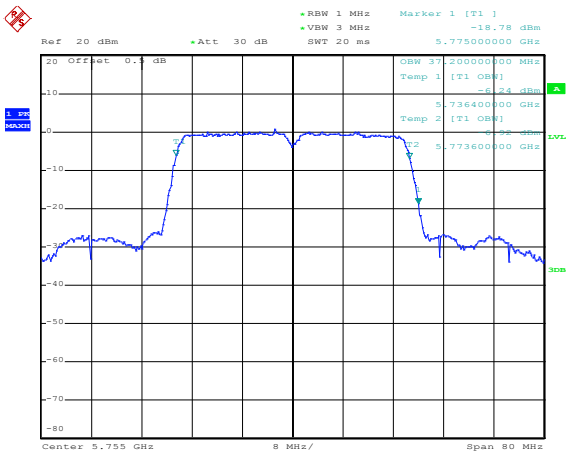
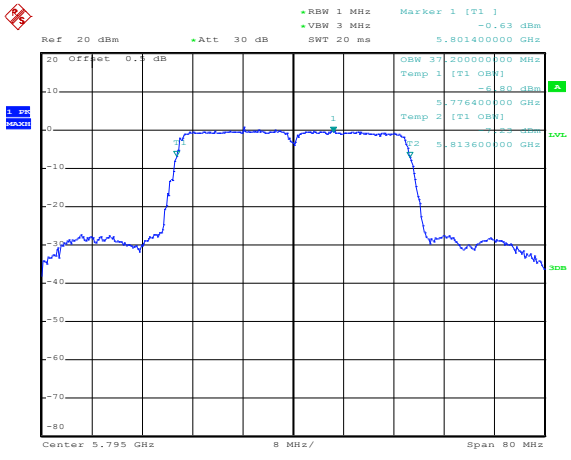
802.11n HT20_Middle Channel / 5785MHz



802.11a_High Channel / 5825MHz



802.11n HT20_High Channel / 5825MHz

Test Result of 99% Occupied Bandwidth-Ant 1	
	
802.11n HT40_Low Channel / 5755MHz	**802.11n HT40_High Channel / 5795MHz**

5.5. Radiated Emissions Measurement

5.5.1. 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

5.5.2. 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

5.5.3. 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:

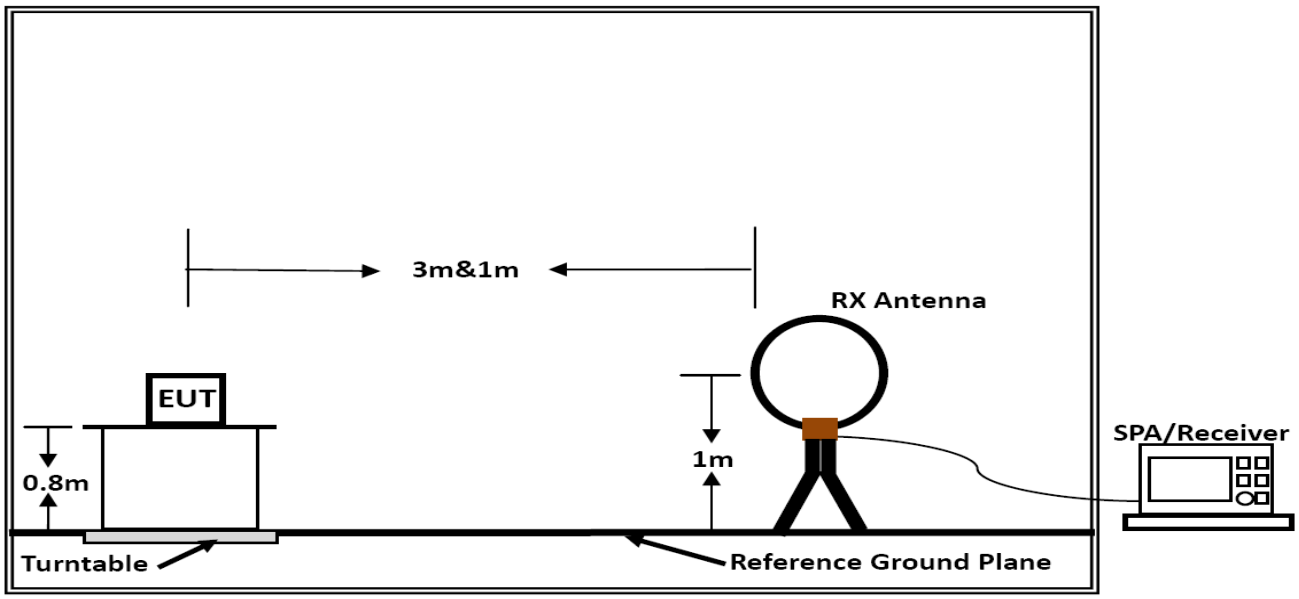
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

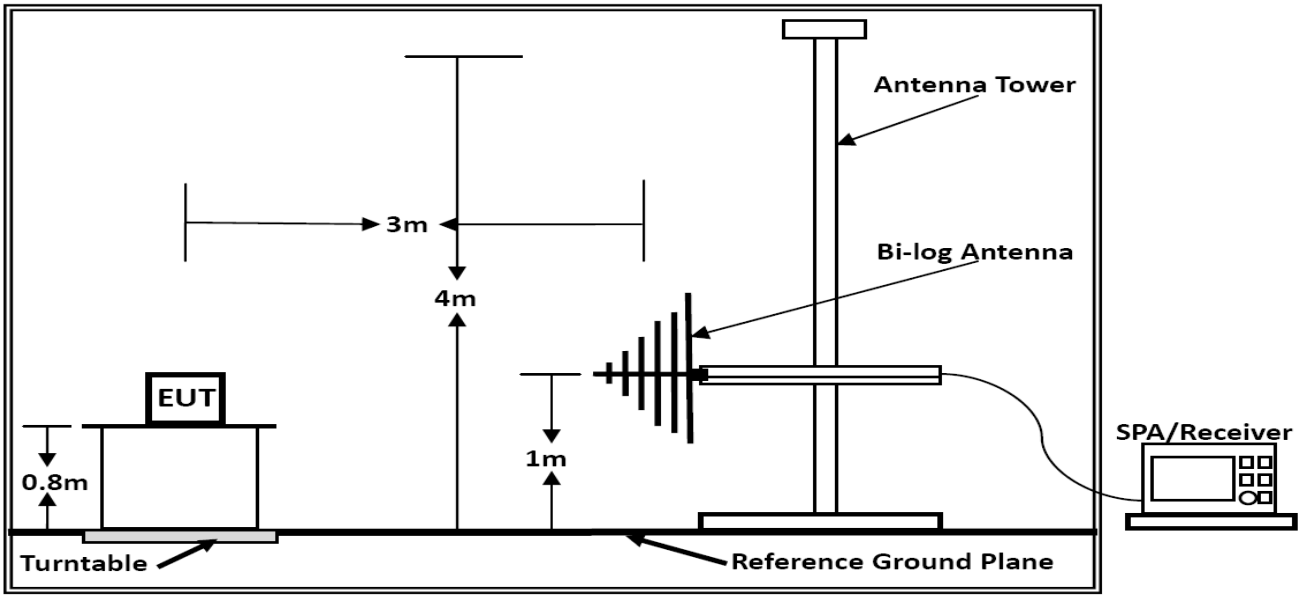
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- 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.

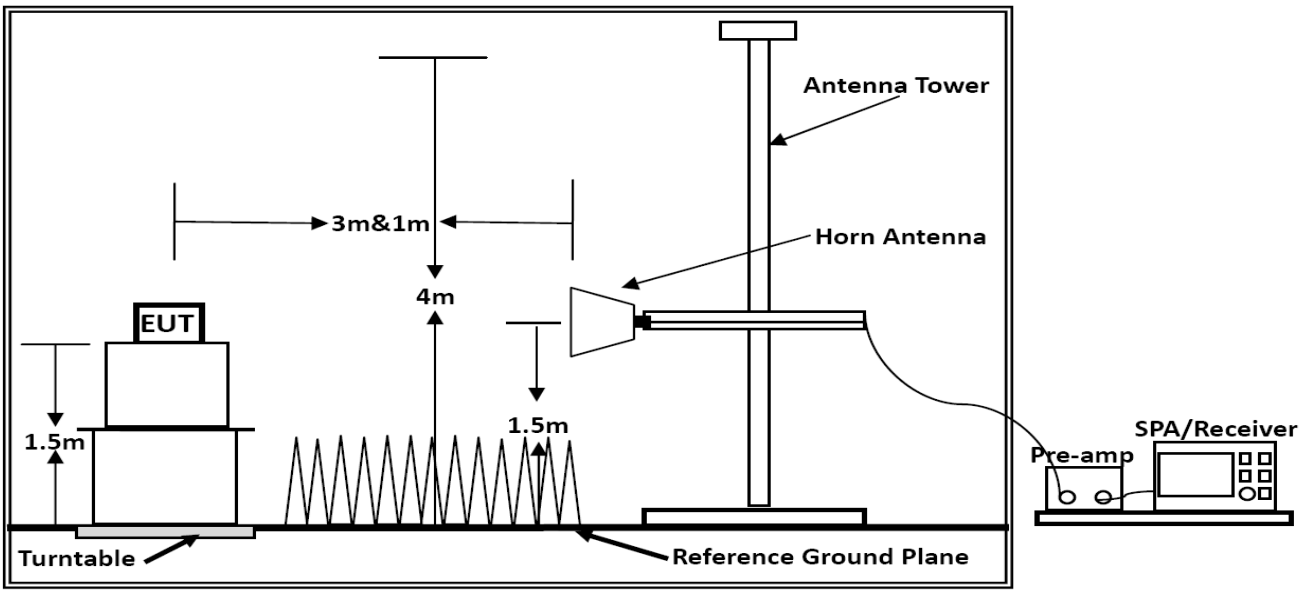
5.5.4. Test Setup Layout



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.

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

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

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

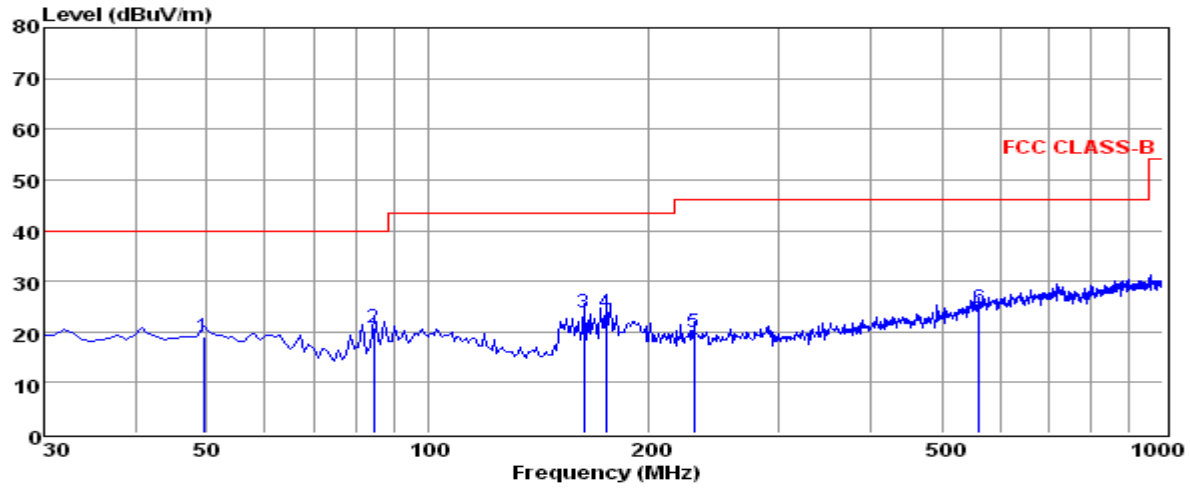
Note:

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

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

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

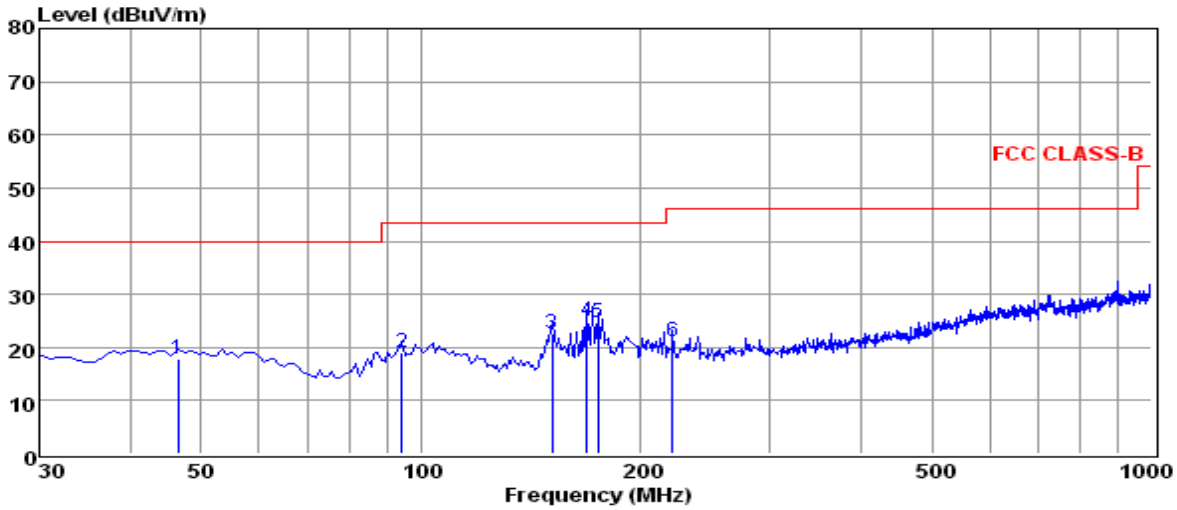
Vertical:



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	49.40	5.20	0.54	13.29	19.03	40.00	-20.97	QP
2	84.32	10.21	0.54	10.07	20.82	40.00	-19.18	QP
3	162.89	14.10	0.86	8.76	23.72	43.50	-19.78	QP
4	174.53	13.67	0.73	9.29	23.69	43.50	-19.81	QP
5	229.82	7.29	0.93	11.64	19.86	46.00	-26.14	QP
6	561.56	5.54	1.43	17.73	24.70	46.00	-21.30	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

Horizontal:



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	46.49	3.90	0.35	13.46	17.71	40.00	-22.29	QP
2	94.02	5.79	0.58	12.66	19.03	43.50	-24.47	QP
3	151.25	13.53	0.73	8.31	22.57	43.50	-20.93	QP
4	168.71	15.34	0.80	8.93	25.07	43.50	-18.43	QP
5	174.53	14.59	0.73	9.29	24.61	43.50	-18.89	QP
6	221.09	9.06	0.95	11.25	21.26	46.00	-24.74	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(Low Channel).

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 data in this report.

5.5.8. Results for Radiated Emissions (Above 1GHz)

Note: Only recorded the worst test result in this 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.
11.49	46.99	33.92	36.09	10.26	55.08	74.00	-18.92	Peak	Horizontal
11.49	36.50	33.92	36.09	10.26	44.59	54.00	-9.41	Average	Horizontal
11.49	48.11	33.99	35.99	10.26	56.37	74.00	-17.63	Peak	Vertical
11.49	36.69	33.99	35.99	10.26	44.95	54.00	-9.05	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.
11.57	46.58	33.92	36.09	10.26	54.67	74.00	-19.33	Peak	Horizontal
11.57	35.77	33.92	36.09	10.26	43.86	54.00	-10.14	Average	Horizontal
11.57	47.65	33.99	35.99	10.26	55.91	74.00	-18.09	Peak	Vertical
11.57	36.48	33.99	35.99	10.26	44.74	54.00	-9.26	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.
11.65	46.52	33.92	36.09	10.26	54.61	74.00	-19.39	Peak	Horizontal
11.65	35.64	33.92	36.09	10.26	43.73	54.00	-10.27	Average	Horizontal
11.65	47.34	33.99	35.99	10.26	55.60	74.00	-18.40	Peak	Vertical
11.65	36.13	33.99	35.99	10.26	44.39	54.00	-9.61	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.
11.49	46.77	33.92	36.09	10.26	54.86	74.00	-19.14	Peak	Horizontal
11.49	36.18	33.92	36.09	10.26	44.27	54.00	-9.73	Average	Horizontal
11.49	47.93	33.99	35.99	10.26	56.19	74.00	-17.81	Peak	Vertical
11.49	36.62	33.99	35.99	10.26	44.88	54.00	-9.12	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.
11.57	47.09	33.92	36.09	10.26	55.18	74.00	-18.82	Peak	Horizontal
11.57	36.30	33.92	36.09	10.26	44.39	54.00	-9.61	Average	Horizontal
11.57	47.89	33.99	35.99	10.26	56.15	74.00	-17.85	Peak	Vertical
11.57	36.80	33.99	35.99	10.26	45.06	54.00	-8.94	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.
11.65	46.59	33.92	36.09	10.26	54.68	74.00	-19.32	Peak	Horizontal
11.65	35.82	33.92	36.09	10.26	43.91	54.00	-10.09	Average	Horizontal
11.65	47.79	33.99	35.99	10.26	56.05	74.00	-17.95	Peak	Vertical
11.65	36.33	33.99	35.99	10.26	44.59	54.00	-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.
11.51	50.10	33.92	36.09	10.26	58.19	74.00	-15.81	Peak	Horizontal
11.51	39.21	33.92	36.09	10.26	47.30	54.00	-6.70	Average	Horizontal
11.51	50.81	33.99	35.99	10.26	59.07	74.00	-14.93	Peak	Vertical
11.51	39.59	33.99	35.99	10.26	47.85	54.00	-6.15	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.
11.59	49.56	33.92	36.09	10.26	57.65	74.00	-16.35	Peak	Horizontal
11.59	38.80	33.92	36.09	10.26	46.89	54.00	-7.11	Average	Horizontal
11.59	50.69	33.99	35.99	10.26	58.95	74.00	-15.05	Peak	Vertical
11.59	39.35	33.99	35.99	10.26	47.61	54.00	-6.39	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.

5.5.9. Results of Band Edges & undesired emission Test (Radiated)

5.5.9.1 Limit

According to ξ15.407 (b) Undesirable emission limits, except as shown in paragraph (b) (7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(a) 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.

(b) For transmitters operating in the 5.25-5.35 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.

(c) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(d) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

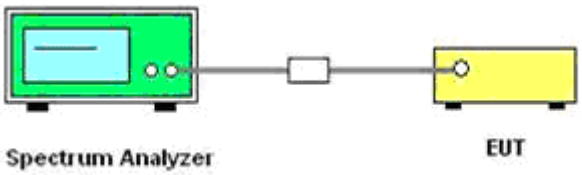
(e) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(f) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(g) The provisions of §15.205 apply to intentional radiators operating under this section.

(h) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

5.5.9.2 Test Configuration



5.5.9.3 Test Procedure

1. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
2. Set the RBW = 1MHz.
3. Set the VBW ≥ 3MHz
4. Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5. Manually set sweep time ≥ 10 × (number of points in sweep) × (total on/off period of the transmitted signal).
6. Set detector = power averaging (rms).
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.

5.5.9.4 Test Results

IEEE 802.11a-ant 1							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Margin (dB)	Verdict
5650.000	-43.55	5.000	-38.550	Peak	-27.000	-11.55	PASS
5700.000	-42.13	5.000	-37.130	Peak	10.000	-10.13	PASS
5720.000	-41.77	5.000	-36.770	Peak	15.600	-19.77	PASS
5725.000	-38.93	5.000	-33.930	Peak	27.000	-16.93	PASS
5850.000	-43.82	5.000	-38.820	Peak	27.000	-21.82	PASS
5855.000	-43.50	5.000	-38.500	Peak	15.600	-21.50	PASS
5875.000	-43.07	5.000	-38.070	Peak	10.000	-11.07	PASS
5925.000	-44.93	5.000	-39.930	Peak	-27.000	-12.93	PASS

IEEE 802.11n HT20-ant 1							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Margin (dB)	Verdict
5650.000	-41.67	5.000	-36.670	Peak	-27.000	-36.670	PASS
5700.000	-34.47	5.000	-29.470	Peak	10.000	-29.470	PASS
5720.000	-23.86	5.000	-18.860	Peak	15.600	-18.860	PASS
5725.000	-15.38	5.000	-10.380	Peak	27.000	-10.380	PASS
5850.000	-43.22	5.000	-38.220	Peak	27.000	-38.220	PASS
5855.000	-43.67	5.000	-38.670	Peak	15.600	-38.670	PASS
5875.000	-42.97	5.000	-37.970	Peak	10.000	-37.970	PASS
5925.000	-43.78	5.000	-38.780	Peak	-27.000	-38.780	PASS

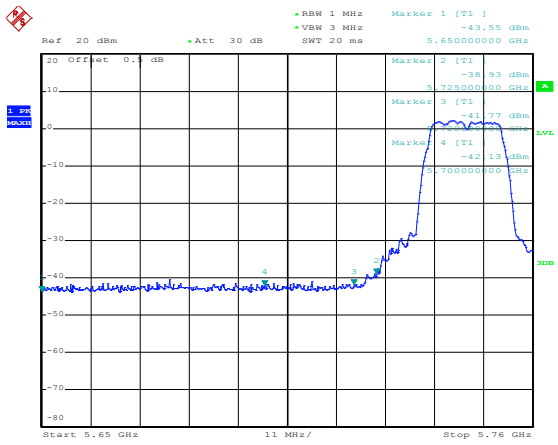
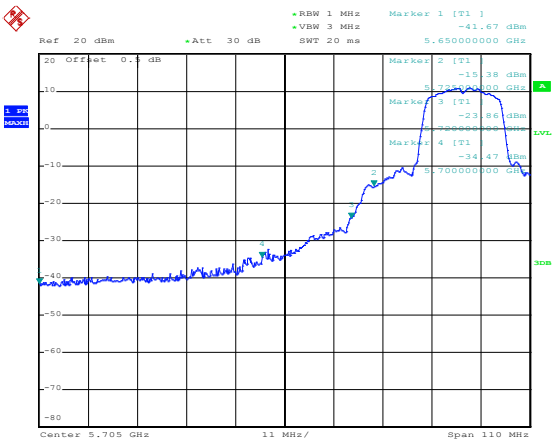
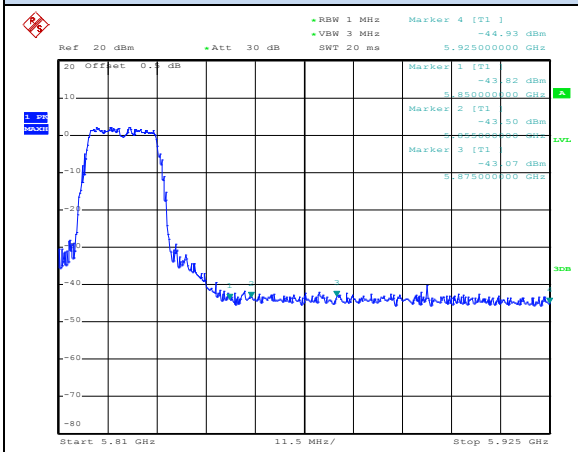
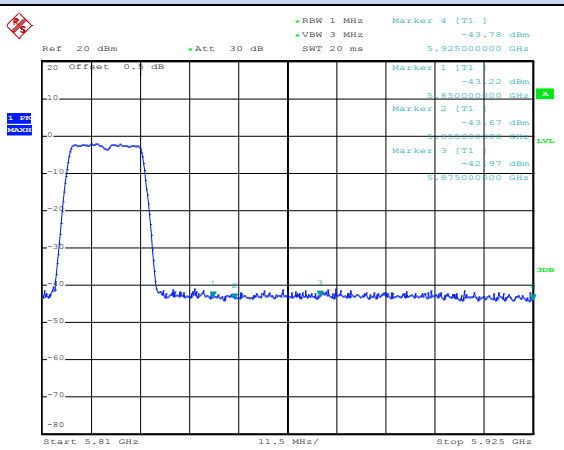
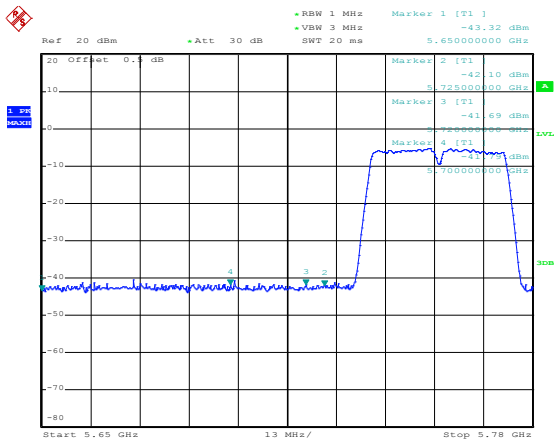
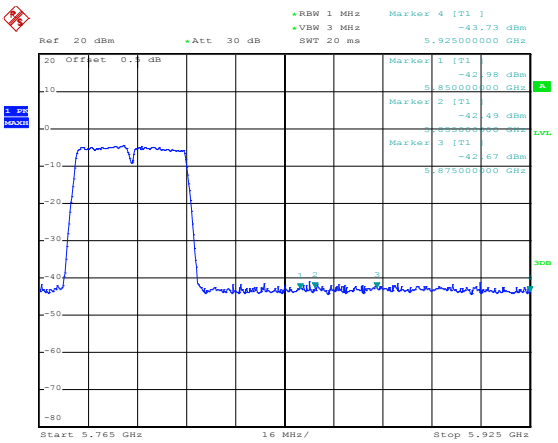
IEEE 802.11n HT40-ant 1							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Margin (dB)	Verdict
5650.000	-43.32	5.000	-38.320	Peak	-27.000	-11.320	PASS
5700.000	-41.79	5.000	-36.790	Peak	10.000	-46.790	PASS
5720.000	-41.69	5.000	-36.690	Peak	15.600	-52.290	PASS
5725.000	-42.10	5.000	-37.100	Peak	27.000	-64.100	PASS
5850.000	-42.98	5.000	-37.980	Peak	27.000	-64.980	PASS
5855.000	-42.49	5.000	-37.490	Peak	15.600	-53.090	PASS
5875.000	-42.67	5.000	-37.670	Peak	10.000	-47.670	PASS
5925.000	-43.73	5.000	-38.730	Peak	-27.000	-11.730	PASS

Remark:

1. *Measured unwanted emission at difference data rate for each mode and recorded worst case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40;*
4. *E.I.R.P = Conducted power + Directional Gain*
5. *EIRP calculation. A value representative of an upper bound on out-of-band antenna gain (in dBi) shall be added to the measured antenna-port conducted emission power to compute EIRP within the specified measurement bandwidth. (For emissions in the restricted bands, additional calculations are required to convert EIRP to field strength at the specified distance.) The upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands or 2 dBi, whichever is greater.3 However, for devices that operate in multiple bands using the same*

transmit antenna, the highest gain of the antenna within the operating band nearest to the out-of-band frequency being measured may be used in lieu of the overall highest gain when measuring emissions at frequencies within 20% of the absolute frequency at the nearest edge of that band, but in no case shall a value less than 2 dBi be selected.

6. *Over limit = EIRP - Limit*
7. *Please refer to following test plots;*

Unwanted emission(conducted)-ant 1	
IEEE 802.11a	IEEE 802.11n HT20
	
Channel 149 / 5745 MHz – Peak	Channel 149 / 5745 MHz – Peak
	
Channel 165 / 5825 MHz – Peak	Channel 165 / 5825 MHz – Peak
IEEE 802.11n HT40	IEEE 802.11n HT40
	
Channel 151 / 5755 MHz – Peak	Channel 159 / 5795 MHz – Peak

Note: only recorded the worst case of antenna 1.

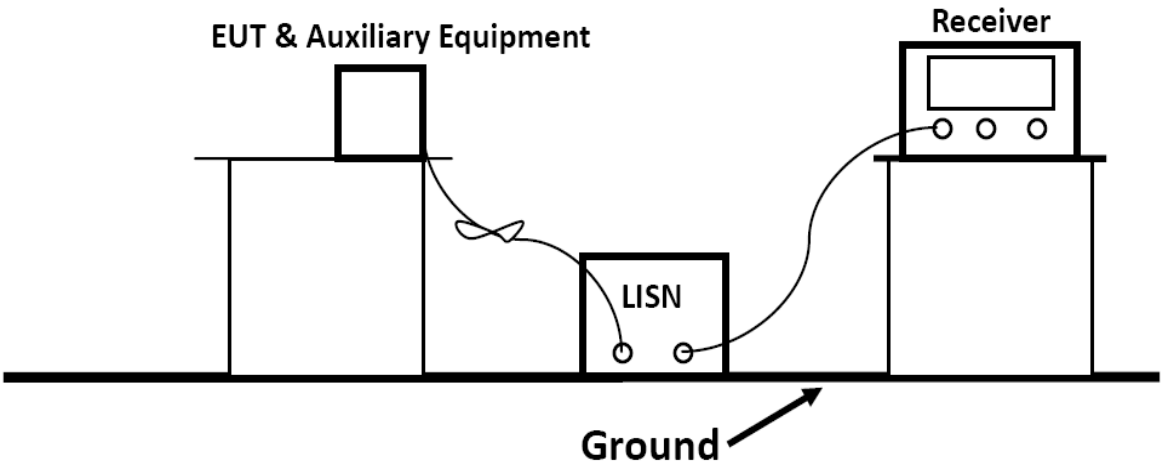
5.6. Power line conducted emissions

5.6.1 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 limit 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

5.6.2 Block Diagram of Test Setup



5.6.3 Test Results

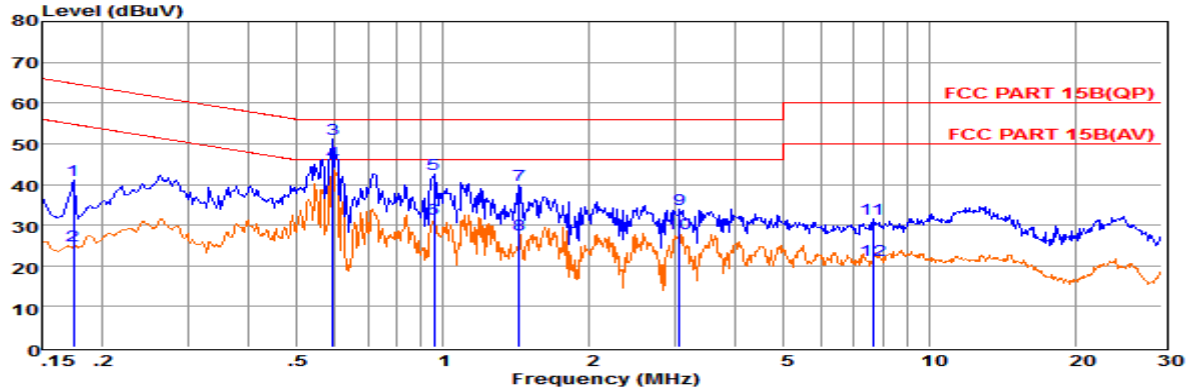
PASS.

Only recorded the worst test case data in this report.

The test data please refer to following page.

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

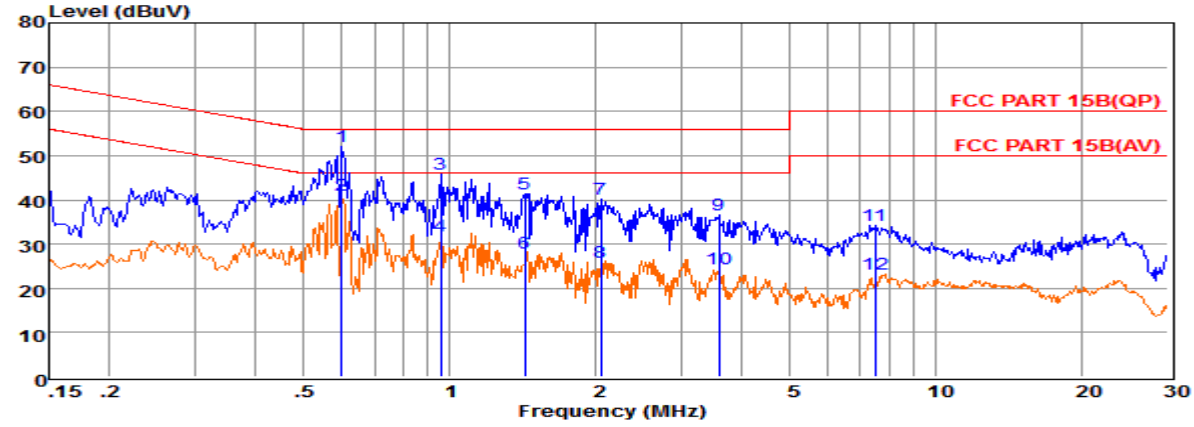
Line:



	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.17	21.47	9.60	0.02	10.00	41.09	64.77	-23.68	QP
2	0.17	5.27	9.60	0.02	10.00	24.89	64.76	-39.87	Average
3	0.59	31.54	9.63	0.04	10.00	51.21	56.00	-4.79	QP
4	0.59	25.94	9.63	0.04	10.00	45.61	56.00	-10.39	Average
5	0.96	22.76	9.63	0.05	10.00	42.44	56.00	-13.56	QP
6	0.96	11.73	9.63	0.05	10.00	31.41	56.00	-24.59	Average
7	1.43	20.19	9.64	0.05	10.00	39.88	56.00	-16.12	QP
8	1.43	8.00	9.64	0.05	10.00	27.69	56.00	-28.31	Average
9	3.06	14.32	9.64	0.06	10.00	34.02	56.00	-21.98	QP
10	3.06	8.32	9.64	0.06	10.00	28.02	56.00	-27.98	Average
11	7.65	11.87	9.68	0.07	10.00	31.62	60.00	-28.38	Average
12	7.65	1.67	9.68	0.07	10.00	21.42	60.00	-38.58	QP

Remarks: 1. Measured = Reading + LISNFac + 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	0.60	32.24	9.63	0.04	10.00	51.91	56.00	-4.09	QP
2	0.60	21.32	9.63	0.04	10.00	40.99	56.00	-15.01	Average
3	0.96	26.11	9.63	0.05	10.00	45.79	56.00	-10.21	QP
4	0.96	12.15	9.63	0.05	10.00	31.83	56.00	-24.17	Average
5	1.43	21.78	9.63	0.05	10.00	41.46	56.00	-14.54	QP
6	1.43	8.22	9.63	0.05	10.00	27.90	56.00	-28.10	Average
7	2.04	20.41	9.63	0.05	10.00	40.09	56.00	-15.91	QP
8	2.05	6.13	9.63	0.05	10.00	25.81	56.00	-30.19	Average
9	3.58	16.72	9.65	0.06	10.00	36.43	56.00	-19.57	QP
10	3.59	4.61	9.65	0.06	10.00	24.32	56.00	-31.68	Average
11	7.49	14.30	9.70	0.07	10.00	34.07	60.00	-25.93	QP
12	7.49	3.37	9.70	0.07	10.00	23.14	60.00	-36.86	Average

Remarks: 1. Measured = Reading + LISNFac + 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 results in this report.

5.7. Antenna Requirements

5.7.1. 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.

5.7.2. Antenna Connector Construction

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

The WLAN antenna is an External antenna, the maximum gain is 5dBi; more information as follows.

5.7.3. 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 to ANSI C63.10:2013 Output power test procedure for U-NII 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	ISED
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 5G WLAN devices, the 802.11a mode is used.

Ant 1:

T_{nom}	V_{nom}	Lowest Channel 5745 MHz	Middle Channel 5785 MHz	Highest Channel 5825 MHz
Conducted power [dBm] Measured with 802.11a modulation		**12.22**	11.77	11.67
Radiated power [dBm] Measured with 802.11a modulation		17.00	16.65	16.39
Gain [dBi] Calculated		4.78	4.88	4.72
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

Ant 2:

T_{nom}	V_{nom}	Lowest Channel 5745 MHz	Middle Channel 5785 MHz	Highest Channel 5825 MHz
Conducted power [dBm] Measured with 802.11a modulation		11.85	11.74	11.73
Radiated power [dBm] Measured with 802.11a modulation		16.68	16.66	16.57
Gain [dBi] Calculated		4.83	4.92	4.84
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

Result: -/-

6. PHOTOGRAPHS OF TEST SETUP

Please refer to separated files for Test Setup Photos of the EUT.

7. EXTERNAL PHOTOGRAPHS OF EUT

Please refer to separated files for external Photos of the EUT.

8. INTERNAL PHOTOGRAPHS OF EUT

Please refer to separated files for internal Photos of the EUT.

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

12.22	11.85
11.77	11.74
11.67	11.73