Shenzhen Global Test Service Co.,Ltd.
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road,
Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.407

Report Reference No.:	**GTSR18050082-WLAN02**
FCC ID:	**2AGN7-X20**
Compiled by (position+printed name+signature)..:	File administrators Jimmy Wang
Supervised by (position+printed name+signature)..:	Test Engineer Aaron Tan
Approved by (position+printed name+signature)..:	Manager Jason Hu
Date of issue:	May.25, 2018
Representative Laboratory Name:	**Shenzhen Global Test Service Co.,Ltd.**
Address:	No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong
Applicant's name:	**Shenzhen Zidoo Technology Co.,Ltd.**
Address:	**Room 12 D, Block A CENTRAL GREAT SEARCHINGS, Xixiang Avenue, BaoAn District, Shenzhen, P.R.C**
Test specification:	
Standard:	**FCC Part 15.407**
TRF Originator:	Shenzhen Global Test Service Co.,Ltd.
Master TRF:	Dated 2014-12

Test item description:	**Media Player**
Trade Mark:	**/**
Manufacturer:	**Shenzhen Zidoo Technology Co.,Ltd.**
Model/Type reference:	**X20**
Listed Models:	**X20 PRO**
Difference:	All the same except the model number
Modulation Type:	IEEE 802.11a /802.11ac /802.11b/802.11g/802.11n
Operation Frequency:	From 2412 - 2462MHz &5180 - 5240MHz & 5745-5825 MHz
Hardware Version:	V1.0
Software Version:	Rev 1.1
Rating:	AC 120V~ 60Hz
Result:	**PASS**

T E S T R E P O R T

Test Report No. :	**GTSR18050082-WLAN02**	May . 25, 2018 Date of issue

Equipment under Test	:	**Media Player**
Model /Type	:	**X20**
Listed Models	:	**X20 PRO**
Applicant	:	**Shenzhen Zidoo Technology Co.,Ltd.**
Address	:	**Room 12 D, Block A CENTRAL GREAT SEARCHINGS, Xixiang Avenue, BaoAn District, Shenzhen, P.R.C**
Manufacturer	:	**Shenzhen Zidoo Technology Co.,Ltd.**
Address	:	**Room 12 D, Block A CENTRAL GREAT SEARCHINGS, Xixiang Avenue, BaoAn District, Shenzhen, P.R.C**

Test Result:	**PASS**

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.407: UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE DEVICES.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices
KDB 789033 D02: GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORAMTION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E
KDB 662911 D01 Multiple Transmitter Output v02r01: Emissions Testing of Transmitters with Multiple Outputs in the Same Band

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	May. 14, 2018
Testing commenced on	:	May. 15, 2018
Testing concluded on	:	May. 25, 2018

2.2. Product Description

Name of EUT	**Media Player**
Trade Mark:	/
Model Number	**X20**
Listed Models	AC 120V/60Hz
Power Supply	**Media Player**
WLAN	Supported 802.11a/ 802.11ac/802.11b/802.11g/802.11n
Modulation Type	IEEE 802.11ac: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Operation frequency	IEEE 802.11a/ac VHT20: 5180 - 5240MHz /5745MHz-5825MHz IEEE 802.11ac VHT 80: 5210MHz / 5775MHz IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz/5180 - 5240MHz /5745MHz-5825MHz IEEE 802.11n HT40 /ac CHT 40:2422-2452MHz/5190-5230MHz/5755-5795 MHz
Directional gain	@2.4G GANT +10log(N)dbi =0.83+10log2=3.84dbi ＜ 6 dbi @5G GANT +10log(N)dbi =2.17+10log2=5.18dbi ＜ 6 dbi
Antenna Type	external antenna
Antenna gain	0.83 dBi@2.4G , 2.17 dBi@5G
Bluetooth	Supported BT4.0
BT Modulation Type	GFSK
BT Operation frequency	2402MHz-2480MHz
Antenna Type	external antenna
Antenna gain	0.83 dBi@2.4G

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	●	120V / 60Hz
		○	12 V DC	○	24 V DC
		○	Other (specified in blank below)		

/

2.4. Short description of the Equipment under Test (EUT)

This is a Media Player.

For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

The application provider specific test software to control sample in continuous TX and RX.

IEEE 802.11a/IEEE 802.11ac(20MHz)/IEEE 802.11n(20MHz):

UNII-1	
Channel	Frequency (MHz)
36	**5180**
40	**5200**
44	5220
48	**5240**

UNII-3	
Channel	Frequency (MHz)
149	**5745**
153	5765
157	**5785**
161	5805
165	**5825**

IEEE 802.11ac(40MHz)/IEEE 802.11n(40MHz):

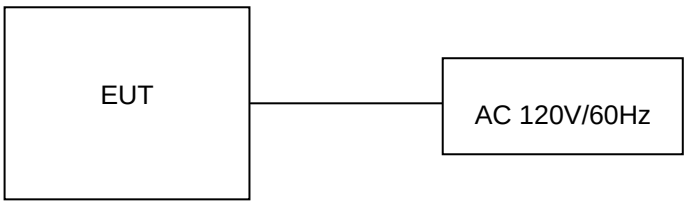
UNII-1	
Channel	Frequency (MHz)
38	**5190**
46	**5230**

UNII-3	
Channel	Frequency (MHz)
151	**5755**
159	5795

IEEE 802.11ac(80MHz)

UNII-3	
Channel	Frequency (MHz)
42	**5210**
155	**5775**

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AGN7-X20** filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

2.8. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.
1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 165725

Shenzhen Global Test Service Co.,Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

A2LA-Lab Cert. No.: 4758.01

Shenzhen Global Test Service Co.,Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

CNAS-Lab Code: L8169

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2018.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Test Description

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.203	Antenna gain	802.11ac	☒ Lowest ☒ Middle ☒ Highest	802.11a	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.407(a)	Power spectral density	802.11ac 802.11n HT20	☒ Lowest ☒ Middle ☒ Highest	802.11a 802.11ac 802.11n	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.407(a)	Spectrum bandwidth – 26 dB bandwidth	802.11ac 802.11n HT20	☒ Lowest ☒ Middle ☒ Highest	802.11a 802.11ac 802.11n	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.407(e)	Spectrum bandwidth – 6 dB bandwidth	802.11ac 802.11n HT20	☒ Lowest ☒ Middle ☒ Highest	802.11a 802.11ac 802.11n	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.407(a)	Maximum output power	802.11ac 802.11n HT20	☒ Lowest ☒ Middle ☒ Highest	802.11a 802.11ac 802.11n	☒ Lowest ☒ Middle ☒ Highest	☒ ☒ ☒	☐	☐	☐	complies
§15.407(b)	Band edge compliance conducted	802.11ac 802.11n HT20	☒ Lowest ☒ Highest	802.11a 802.11ac 802.11n	☒ Lowest ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.407(b)	Band edge compliance radiated	802.11a 802.11ac 802.11n	☒ Lowest ☒ Highest	802.11a	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.407(a)	TX spurious emissions conducted	-/-	-/-	-/-	-/-	☐	☐	☒	☐	complies
§15.407(a)	TX spurious emissions radiated	802.11a 802.11ac 802.11n	☒ Lowest ☒ Middle ☒ Highest	802.11a	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.407(g)	Frequency Stability	802.11a 802.11ac 802.11n	☒ Lowest ☒ Highest	802.11a	☒ Lowest	☒	☐	☐	☐	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	☐	☐	☒	☐	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	802.11a 802.11ac 802.11n	-/-	802.11a	-/-	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	802.11a 802.11ac 802.11n	-/-	802.11a	-/-	☒	☐	☐	☐	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate
Maximum Peak Conducted Output Power Power Spectral Density 6dB Bandwidth 26dB Bandwidth Spurious RF conducted emission Radiated Emission 9kHz~1GHz& Radiated Emission 1GHz~10th Harmonic	11ac/OFDM	6 Mbps
	11n/OFDM	6.5 Mbps
Band Edge	11ac/OFDM	6 Mbps
	11n/OFDM	6.5 Mbps

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service Co.,Ltd 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.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

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

3.6. Equipments Used during the Test

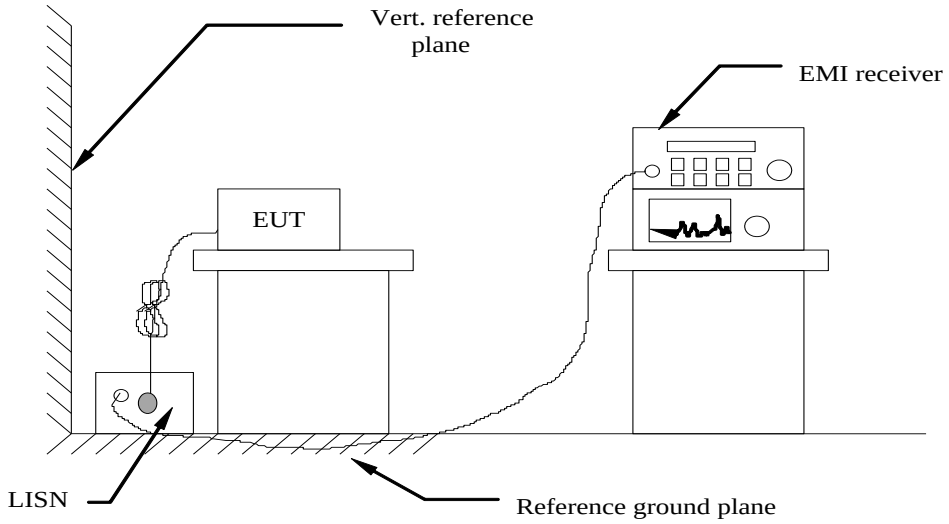
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2017/09/20	2018/09/19
LISN	R&S	ESH2-Z5	893606/008	2017/09/20	2018/09/19
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2017/09/20	2018/09/19
EMI Test Receiver	R&S	ESCI	101102	2017/09/20	2018/09/19
Spectrum Analyzer	Agilent	N9020A	MY48010425	2017/09/20	2018/09/19
Spectrum Analyzer	R&S	FSP40	1164.4391.32	2017/09/20	2018/09/19
Controller	EM Electronics	Controller EM 1000	N/A	2017/09/20	2018/09/19
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2017/09/20	2018/09/19
Double Ridged Horn Antenna	Rohde&Schwarz	HF907	100265	2017/09/20	2018/09/19
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2017/09/20	2018/09/19
Amplifier	Agilent	8349B	3008A02306	2017/09/20	2018/09/19
Amplifier	Agilent	8447D	2944A10176	2017/09/20	2018/09/19
Amplifer	A.H.	PAM-1840VH	562	2017/09/20	2018/09/19
Temperature/Humidity Meter	Gangxing	CTH-608	02	2017/09/20	2018/09/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2017/09/20	2018/09/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2017/09/20	2018/09/19
Data acquisition card	Agilent	U2531A	TW53323507	2017/09/20	2018/09/19
Power Sensor	Agilent	U2021XA	MY5365004	2017/09/20	2018/09/19
RF Cable	HUBER+SUHNER	RG214	N/A	2017/09/20	2018/09/19

Note: The Cal.Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received DC 5V power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT.The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

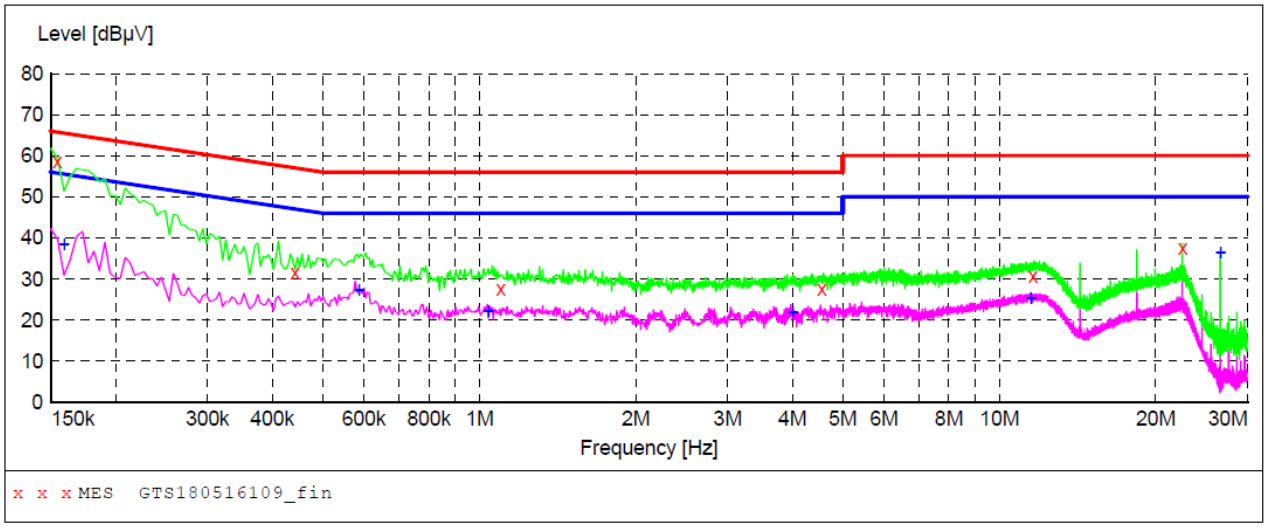
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

TEST RESULTS

Remark: We measured Conducted Emission all modes in AC 120V/60Hz, the worst case was recorded .

Power supply:	AC 120V/60Hz	Polarization	L



MEASUREMENT RESULT: "GTS180516109_fin"

5/16/2018 10:44AM

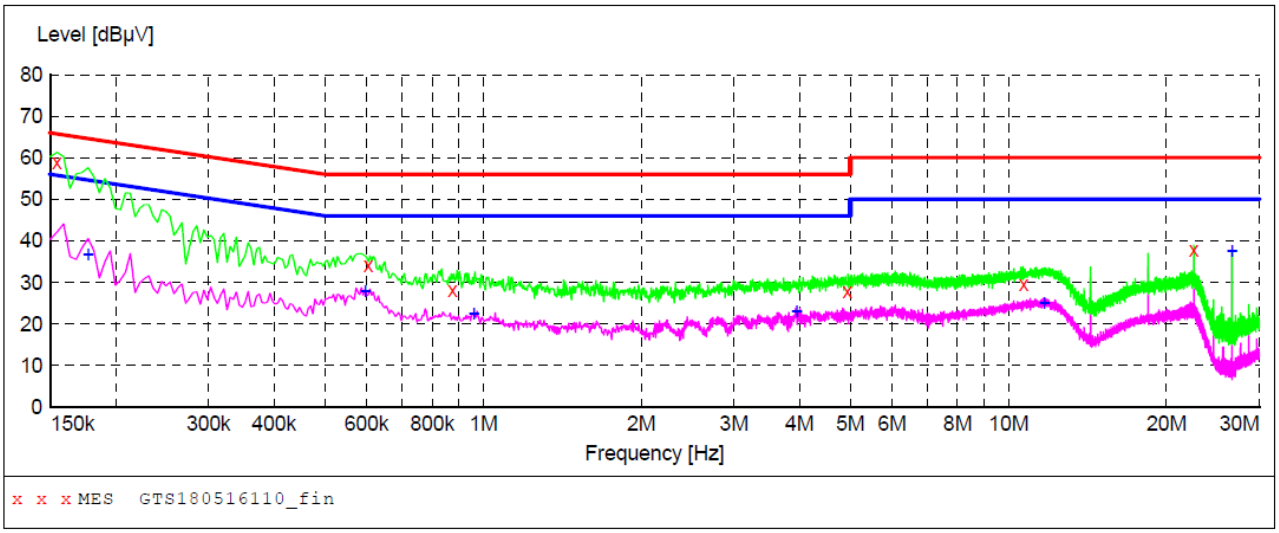
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	58.70	10.1	66	7.1	QP	N	GND
0.442500	31.50	9.8	57	25.5	QP	N	GND
1.099500	27.70	9.6	56	28.3	QP	N	GND
4.555500	27.50	9.3	56	28.5	QP	N	GND
11.611500	30.70	8.6	60	29.3	QP	N	GND
22.528500	37.60	9.0	60	22.4	QP	N	GND

MEASUREMENT RESULT: "GTS180516109_fin2"

5/16/2018 10:44AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.159000	38.30	10.0	56	17.2	AV	N	GND
0.586500	27.30	9.7	46	18.7	AV	N	GND
1.041000	22.20	9.6	46	23.8	AV	N	GND
4.006500	21.90	9.4	46	24.1	AV	N	GND
11.485500	25.40	8.7	50	24.6	AV	N	GND
26.623500	36.50	9.0	50	13.5	AV	N	GND

Power supply:	AC 120V/60Hz	Polarization	N



MEASUREMENT RESULT: "GTS180516110_fin"

5/16/2018 10:47AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	58.80	10.1	66	7.0	QP	L1	GND
0.604500	34.20	9.7	56	21.8	QP	L1	GND
0.874500	28.10	9.6	56	27.9	QP	L1	GND
4.933500	27.90	9.3	56	28.1	QP	L1	GND
10.689000	29.50	8.8	60	30.5	QP	L1	GND
22.528500	37.80	9.0	60	22.2	QP	L1	GND

MEASUREMENT RESULT: "GTS180516110_fin2"

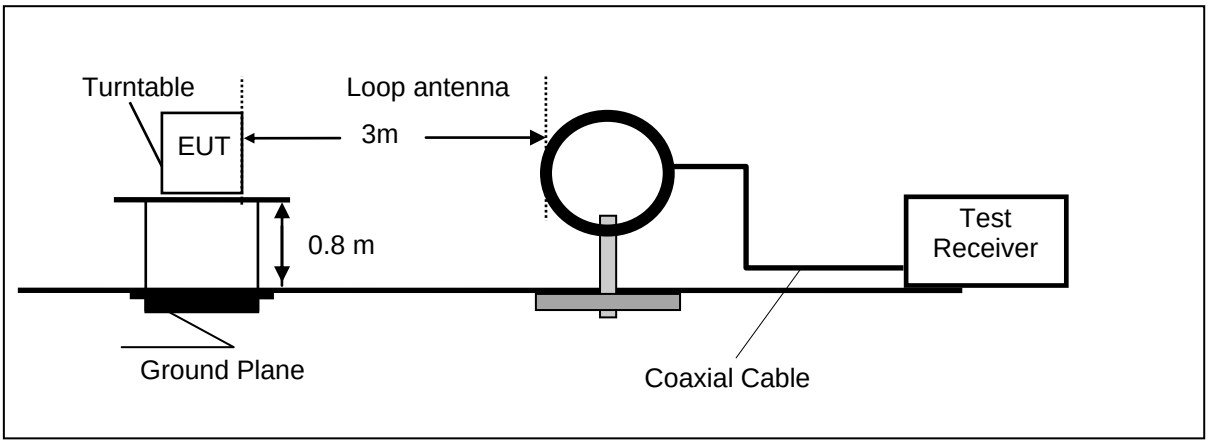
5/16/2018 10:47AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.177000	36.70	10.0	55	17.9	AV	L1	GND
0.595500	27.90	9.7	46	18.1	AV	L1	GND
0.960000	22.50	9.6	46	23.5	AV	L1	GND
3.952500	23.00	9.4	46	23.0	AV	L1	GND
11.683500	25.00	8.6	50	25.0	AV	L1	GND
26.623500	37.40	9.0	50	12.6	AV	L1	GND

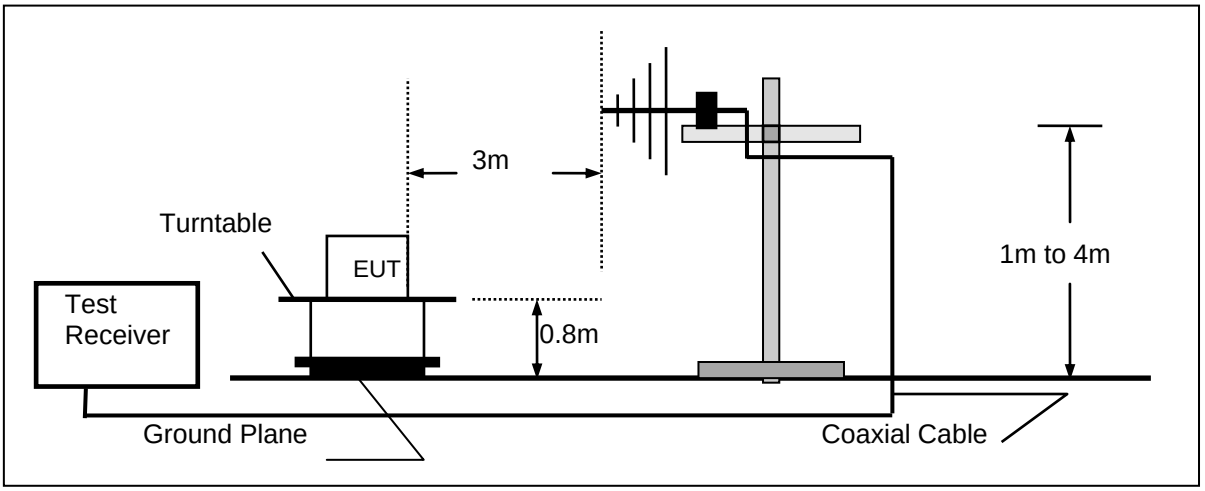
4.2. Radiated Emission

TEST CONFIGURATION

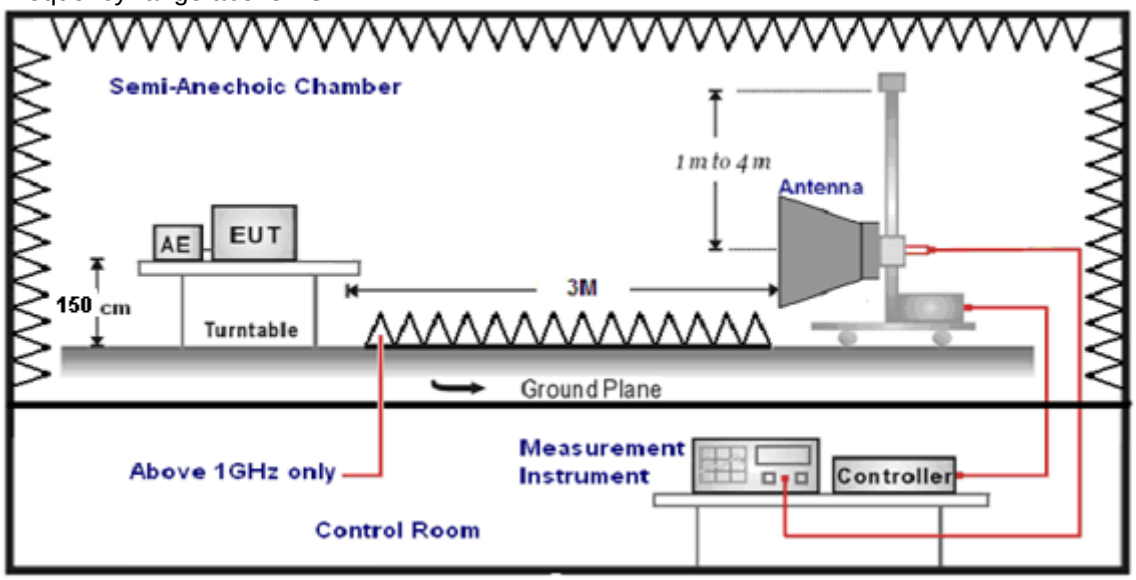
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing above 1GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 24MHz and maximum operation frequency was 5825MHz.so radiated emission test frequency band from 9KHz to 40GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

According to §15.407 (b): 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

Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBμV/m)
5150-5250	-27	68.3
5250-5350	-27	68.3
5470-5725	-27	68.3
5725-5850	-27 (beyond 10MHz of the bandedge)	68.3
	-17 (within 10 MHz of band edge)	78.3

Frequency (MHz)	**Distance (Meters)**	**Radiated (dBμV/m)**	**Radiated (μV/m)**
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

Remark: We tested at 802.11ac/802.11ac/802.11n mode at the antenna single transmitting mode and the Mimo mode in AC 120V/60Hz, and recored the worst data at the Mimo mode of the 802.11a Mode.

For 9 KHz-30MHz

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

Note:

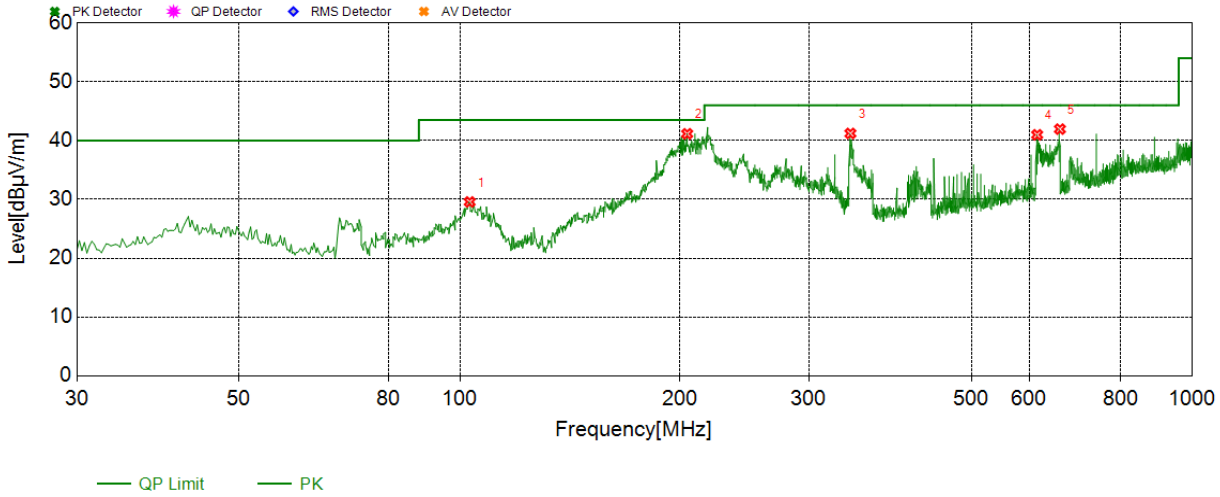
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

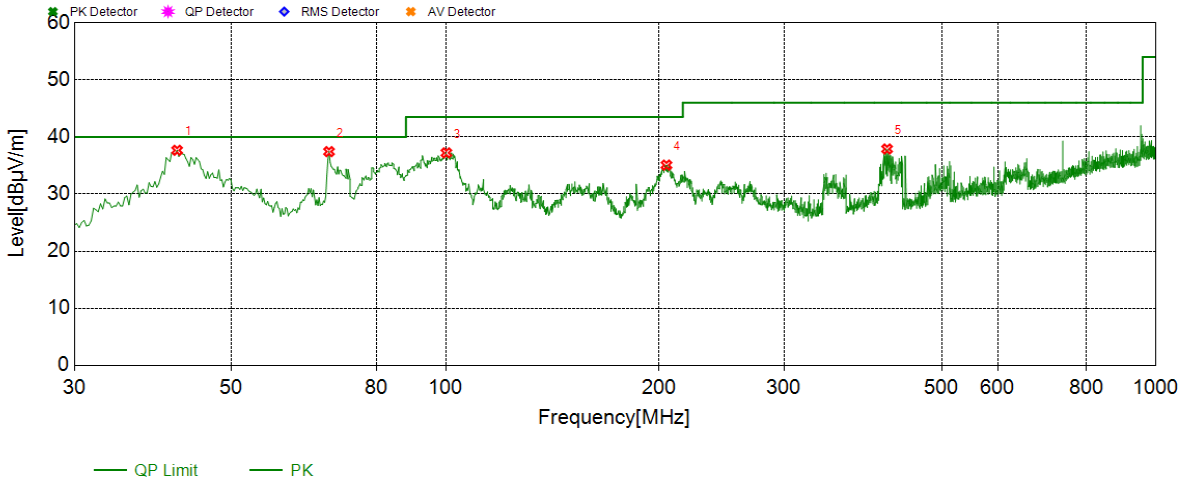
For 30MHz-1GHz

Horizontal



NO.	Freq. [MHz]	Reading [dBµV/m]	Result Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle[°]	Polarity
1	103.235	46.58	29.56	-17.02	43.50	13.94	128	315	Horizontal
2	204.600	57.48	41.14	-16.34	43.50	2.36	113	204	Horizontal
3	341.855	53.77	41.2	-12.57	46.00	4.80	135	190	Horizontal
4	615.153	48.35	40.97	-7.38	46.00	5.03	159	218	Horizontal
5	660.743	48.96	41.94	-7.02	46.00	4.06	124	204	Horizontal

Vertical



NO.	Freq. [MHz]	Reading [dBµV/m]	Result Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle[°]	Polarity
1	41.883	51.16	36.66	-14.50	40.00	3.34	105	266	Vertical
2	68.558	54.74	36.43	-18.31	40.00	3.57	112	266	Vertical
3	100.325	54.22	37.21	-17.01	43.50	6.29	121	36	Vertical
4	204.843	51.40	35.07	-16.33	43.50	8.43	108	215	Vertical
5	418.970	48.94	37.89	-11.05	46.00	8.11	100	207	Vertical

For 1GHz to 40GHz

802.11a Mode_Channel 36 _5180 MHz

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	10360	36.56	38.55	33.64	11.24	52.71	74	-21.29	Peak	Horizontal
2	10360	26.57	38.55	33.64	11.24	42.72	54	-11.28	AV	Horizontal
3	15540	31.47	36.49	36.53	13.72	45.15	74	-28.85	Peak	Horizontal
4	15540	22.84	36.49	36.53	13.72	36.52	54	-17.48	AV	Horizontal

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	10360	33.96	38.55	33.64	11.24	50.11	74	-23.89	Peak	Vertical
2	10360	24.74	38.55	33.64	11.24	40.89	54	-13.11	AV	Vertical
3	15540	31.29	36.49	36.53	13.72	44.97	74	-29.03	Peak	Vertical
4	15540	22.48	36.49	36.53	13.72	36.16	54	-17.84	AV	Vertical

802.11a Mode_Channel 40 _ 5200 MHz

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	10400	32.25	38.57	33.66	11.36	48.52	74	-25.48	Peak	Horizontal
2	10400	22.76	38.57	33.66	11.36	39.03	54	-14.97	AV	Horizontal
3	15600	30.74	36.51	36.55	13.91	44.61	74	-29.39	Peak	Horizontal
4	15600	21.58	36.51	36.55	13.91	35.45	54	-18.55	AV	Horizontal

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	10400	32.66	38.57	33.66	11.36	48.93	74	-25.07	Peak	Vertical
2	10400	22.75	38.57	33.66	11.36	39.02	54	-14.98	AV	Vertical
3	15600	29.69	36.51	36.55	13.91	43.56	74	-30.44	Peak	Vertical
4	15600	20.43	36.51	36.55	13.91	34.3	54	-19.7	AV	Vertical

802.11a Mode_ Channel 48_ 5240 MHz

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	10480	31.81	38.56	33.7	11.41	48.08	74	-25.92	Peak	Horizontal
2	10480	19.86	38.56	33.7	11.41	36.13	54	-17.87	AV	Horizontal
3	15720	29.46	36.54	36.57	13.98	43.41	74	-30.59	Peak	Horizontal
4	15720	20.08	36.54	36.57	13.98	34.03	54	-19.97	AV	Horizontal

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	10480	31.16	38.56	33.7	11.41	47.43	74	-26.57	Peak	Vertical
2	10480	19.57	38.56	33.7	11.41	35.84	54	-18.16	AV	Vertical
3	15720	28.81	36.54	36.57	13.98	42.76	74	-31.24	Peak	Vertical
4	15720	19.83	36.54	36.57	13.98	33.78	54	-20.22	AV	Vertical

802.11a Mode_Channel 149_ 5745 MHz

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	11490	33.38	38.46	33.92	11.59	49.51	74	-24.49	Peak	Horizontal
2	11490	23.49	38.46	33.92	11.59	39.62	54	-14.38	AV	Horizontal
3	17235	29.86	43.11	37.11	13.94	49.8	74	-24.2	Peak	Horizontal
4	17235	19.64	43.11	37.11	13.94	39.58	54	-14.42	AV	Horizontal

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	11490	33.85	38.46	33.92	11.59	49.98	74	-24.02	Peak	Vertical
2	11490	21.58	38.46	33.92	11.59	37.71	54	-16.29	AV	Vertical
3	17235	28.69	43.11	37.11	13.94	48.63	74	-25.37	Peak	Vertical
4	17235	19.61	43.11	37.11	13.94	39.55	54	-14.45	AV	Vertical

802.11a Mode_Channel 157_5785 MHz

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	11570	31.47	38.53	33.86	11.66	47.8	74	-26.2	Peak	Horizontal
2	11570	21.25	38.53	33.86	11.66	37.58	54	-16.42	AV	Horizontal
3	17355	26.59	43.2	37.15	14.02	46.66	74	-27.34	Peak	Horizontal
4	17355	19.97	43.2	37.15	14.02	40.04	54	-13.96	AV	Horizontal

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	11570	32.09	38.53	33.86	11.66	48.42	74	-25.58	Peak	Vertical
2	11570	22.15	38.53	33.86	11.66	38.48	54	-15.52	AV	Vertical
3	17355	28.63	43.2	37.15	14.02	48.7	74	-25.3	Peak	Vertical
4	17355	19.48	43.2	37.15	14.02	39.55	54	-14.45	AV	Vertical

802.11a Mode_Channel 165_5825 MHz

Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	11650	30.57	38.56	33.84	11.71	47	74	-27	Peak	Horizontal
2	11650	21.46	38.56	33.84	11.71	37.89	54	-16.11	AV	Horizontal
3	17475	29.53	43.23	37.17	14.18	49.77	74	-24.23	Peak	Horizontal
4	17475	20.49	43.23	37.17	14.18	40.73	54	-13.27	AV	Horizontal

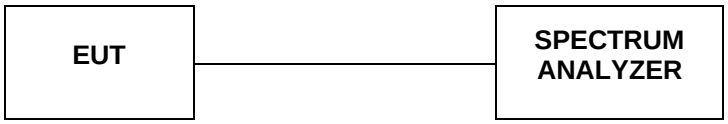
Item	Freq	Read Level	Antenna Factor	PRM	Cable Loss	Result Level	Limit Line	Margin	Detector	Polarization
(Mark)	(MHz)	(dBμV)	(dB/m)	Factor	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1	11650	33.14	38.56	33.84	11.71	49.57	74	-24.43	Peak	Vertical
2	11650	21.08	38.56	33.84	11.71	37.51	54	-16.49	AV	Vertical
3	17475	27.78	43.23	37.17	14.18	48.02	74	-25.98	Peak	Vertical
4	17475	18.65	43.23	37.17	14.18	38.89	54	-15.11	AV	Vertical

REMARKS:

1. Result Level = Read Level + Antenna Factor + Cable loss - Preamp Factor.
2. The other emission levels were very low against the limit.
3. Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=10Hz/Sweep time=Auto/Detector=Peak;

4.3. Duty Cycle

TEST CONFIGURATION



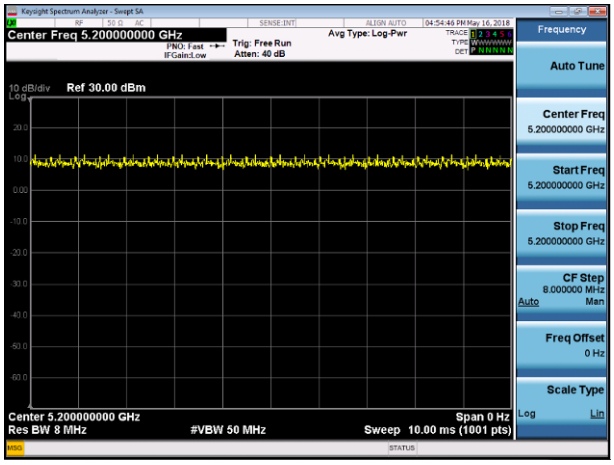
TEST PROCEDURE

According to KDB789033 D02 General UNII Test Procedures New Rules v01 B Duty Cycle (x), Transmission Duration (T):

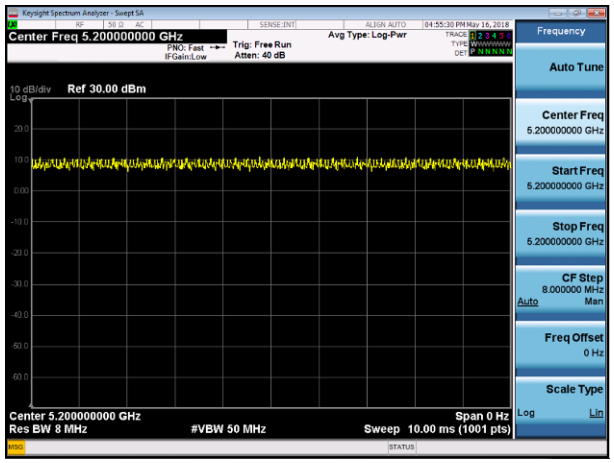
a. A diode detector and an oscilloscope that together have sufficiently short response time to permit accurate measurements of the on and off times of the transmitted signal
b. The zero-span mode on a spectrum analyzer or EMI receiver, if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zerospan measurement method shall not be used unless both RBW and VBW are > 50/T, where T is defined in section II.B.1.a), and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = Zero Span
RBW = 1MHz
VBW = 1MHz
Number of points in Sweep >100
Detector function = peak
Trace = Clear writeMeasure Ttotal and Ton
Calculate Duty Cycle = Ton / Ttotal and Duty Cycle Factor=10*log(1/Duty Cycle)

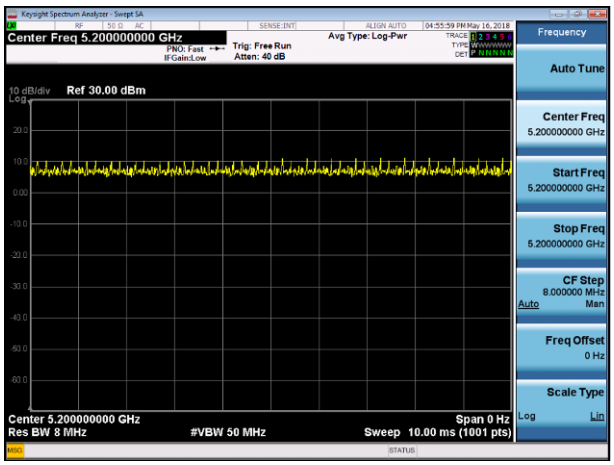
TEST RESULTS



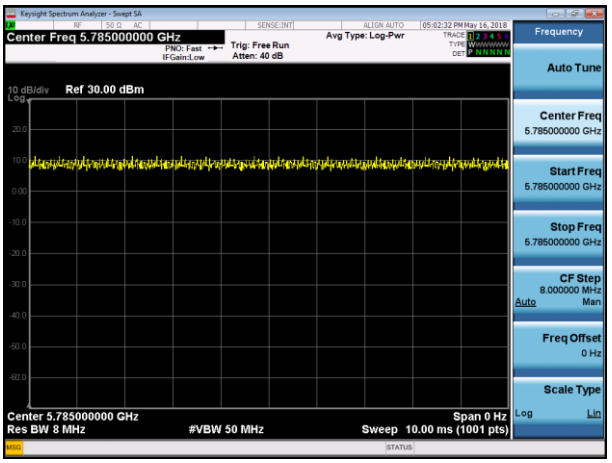
802.11a 5200MHz



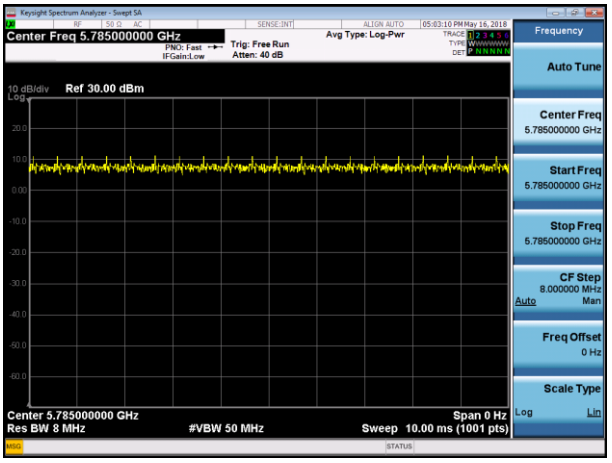
802.11n(HT20) 5200MHz



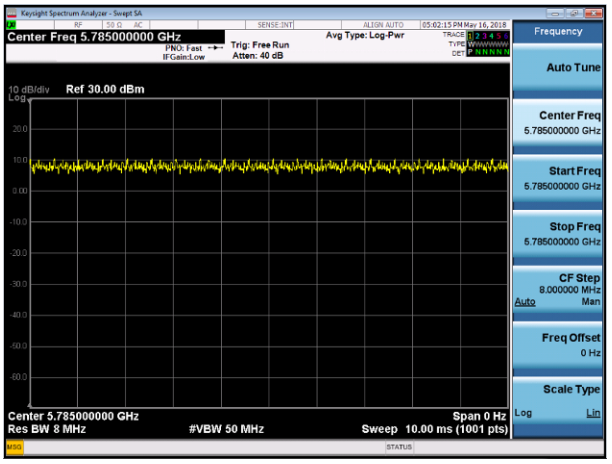
802.11ac(VHT20) 5200MHz



802.11a 5785MHz



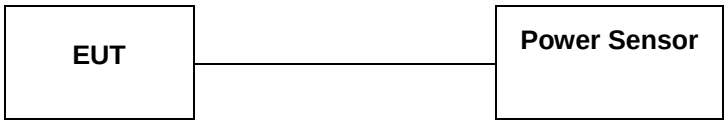
802.11n(HT20) 5785MHz



802.11ac(VHT20) 5785MHz

4.4. Maximum Average Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB789033 D02 General UNII Test Procedures New Rules v01 Section E3 Measurement using a Power Meter (PM):

a. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied
   1. The EUT is configured to transmit continuously or to transmit with a constant duty cycle
   2. At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
   3. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

b. If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B

c. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

Adjust the measurement in dBm by adding 10 log(1/x) where x is the duty cycle (e.g., 10 log(1/0.25) if the duty cycle is 25 percent).

LIMIT

According to §15.407(a): The maximum output power should be not exceed follow:

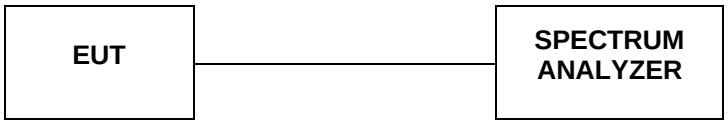
Frequency Range (MHz)	Limit
5150-5250	Fixed:1 Watt (30dBm) Mobile and portable: 250mW (24dBm)
5250-5350	250mW (24dBm)
5470-5725	250mW (24dBm)
5725-5850	1 Watt (30dBm)
Note: The maximum e.i.r.p at anyelevation angle above 30 degrees as measured from the horizon must not exceed 125mW(21dBm)	

TEST RESULTS

	Frequency (MHz)	ANT 1 Average Output Power (dBm)	ANT 2 Average Output Power (dBm)	Total Average Output Power (dBm)	FCC Limit (dBm)	Result
802.11a	5180	13.586	13.859	/	24	Pass
	5200	12.841	13.647	/	24	Pass
	5240	12.268	13.485	/	24	Pass
	5745	11.262	11.049	/	30	Pass
	5785	12.326	12.685	/	30	Pass
	5825	10.651	10.986	/	30	Pass
802.11n (HT20)	5180	13.429	12.763	16.119	24	Pass
	5200	12.638	12.899	15.781	24	Pass
	5240	12.424	12.952	15.706	24	Pass
	5745	10.483	10.658	13.582	30	Pass
	5785	12.285	12.635	15.474	30	Pass
	5825	10.451	10.946	13.716	30	Pass
802.11ac (VHT20)	5180	13.045	13.124	16.095	24	Pass
	5200	13.247	12.461	15.882	24	Pass
	5240	12.084	11.475	14.800	24	Pass
	5745	10.552	10.624	13.598	30	Pass
	5785	10.475	11.054	13.784	30	Pass
	5825	9.548	10.357	12.982	30	Pass
802.11n (HT40)	5190	10.579	10.877	13.741	24	Pass
	5230	10.359	10.962	13.681	24	Pass
	5755	9.157	9.248	12.213	30	Pass
	5795	9.963	9.742	12.864	30	Pass
802.11ac (VHT40)	5190	10.024	10.384	13.218	24	Pass
	5230	10.837	10.954	13.906	24	Pass
	5755	9.018	9.124	12.082	30	Pass
	5795	9.907	9.864	12.896	30	Pass
802.11ac (VHT80)	5210	9.342	9.359	12.361	24	Pass
	5755	8.359	8.984	11.693	30	Pass

4.5. Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

According to KDB 789033 D02 General UNII Test Procedures New Rules v01 F: The rules requires "maximum power spectral density" measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission

a. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power…". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
b. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
c. Make the following adjustments to the peak value of the spectrum, if applicable:
    1. If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.
    2.) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
d. The result is the Maximum PSD over 1 MHz reference bandwidth.
e. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:
    1. Set RBW ≥ 1/T, where T is defined in section II.B.I.a).
    2. Set VBW ≥ 3 RBW.
    3. If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
    4. If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
    5. Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

    Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since RBW=100 KHz is available on nearly all spectrum analyzers.
f. Adjust the measurement in dBm by adding 10 log(1/x) where x is the duty cycle (e.g., 10 log(1/0.25) if the duty cycle is 25 percent).

LIMIT

According to §15.407(a): The maximum output power should be not exceed follow:

Frequency Range (MHz)	Limit
5150-5250	Other then Mobile and portable:17dBm/MHz Mobile and portable:11dBm/MHz
5250-5350	11dBm/MHz
5470-5725	11dBm/MHz
5725-5850	30dBm/500kHz

TEST RESULTS

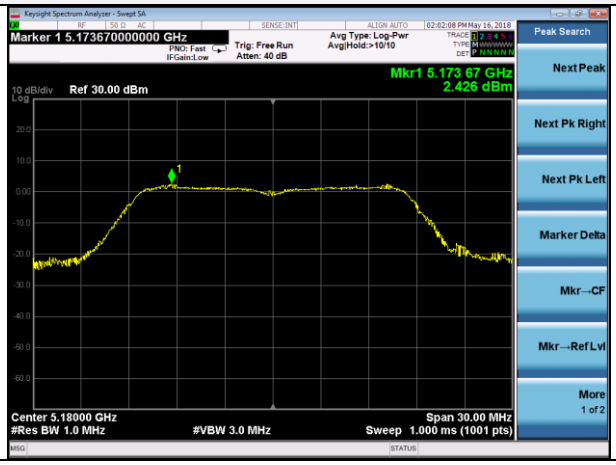
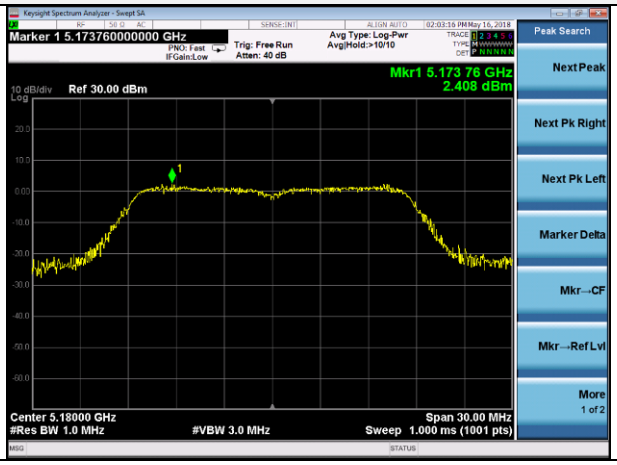
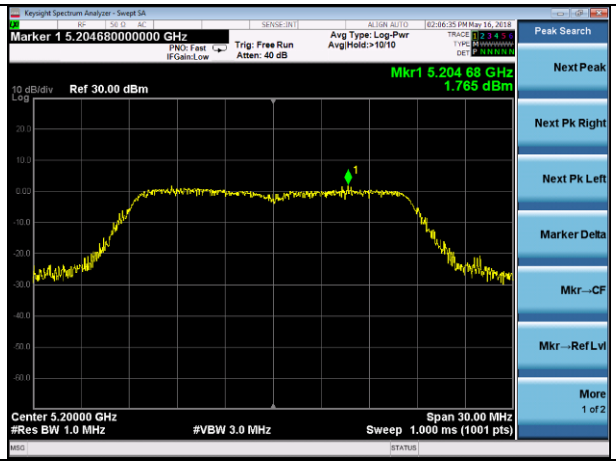
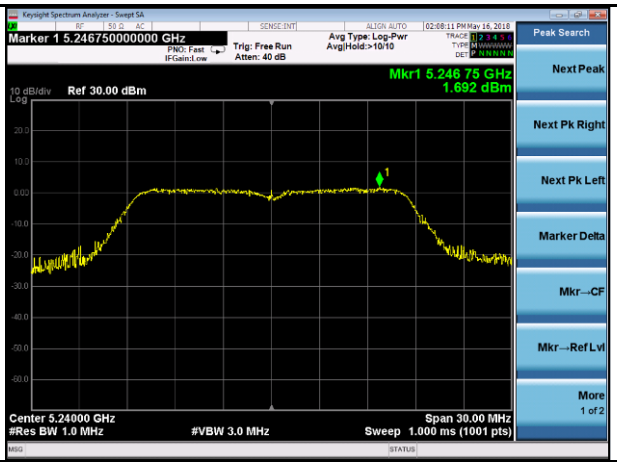
5.2G

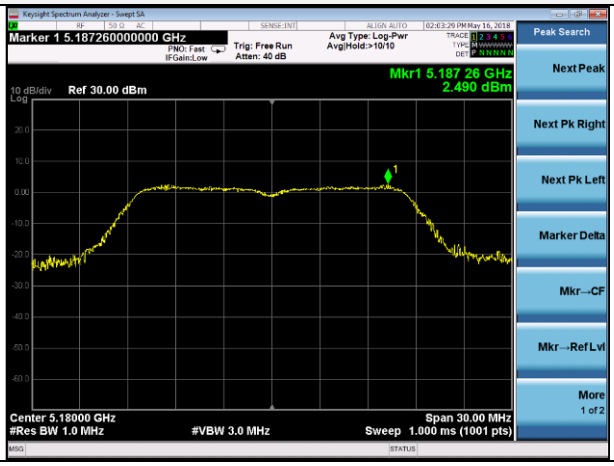
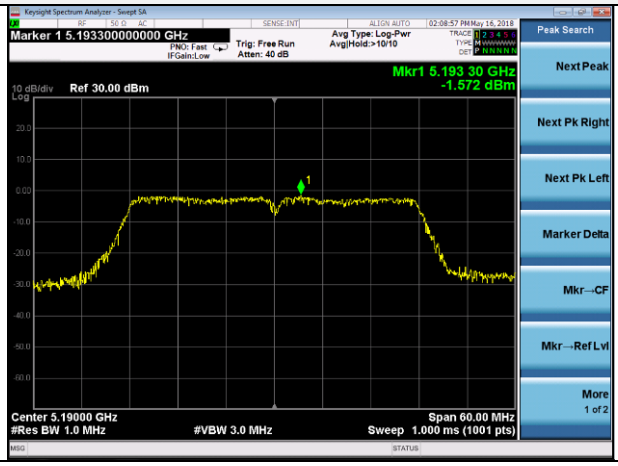
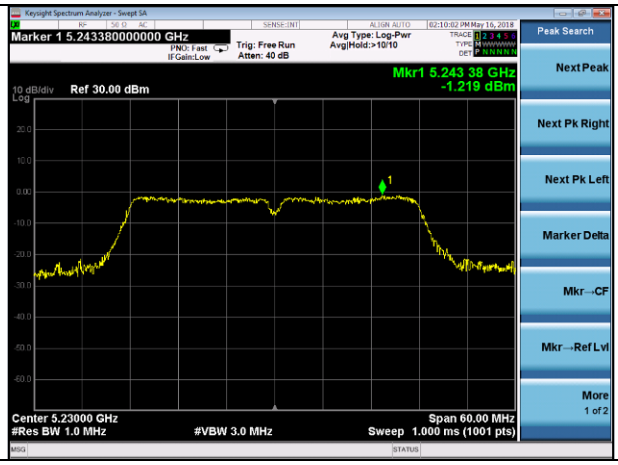
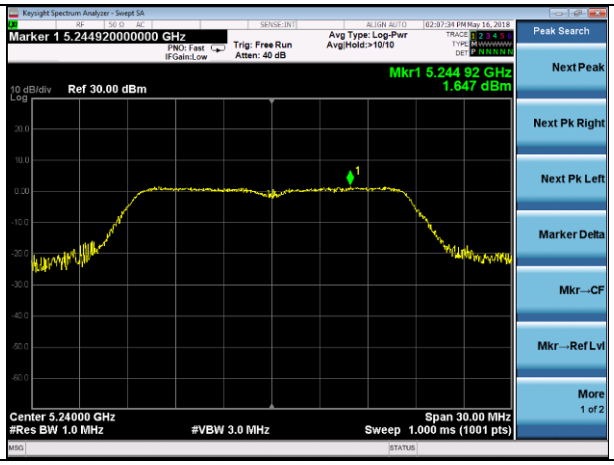
Mode	Frequency (MHz)	Power Density (dBm/MHz)		Total	FCC Limit (dBm)
		Antenna 1	Antenna 2		
802.11a	5180	2.426	2.683	/	11
	5200	1.765	2.584	/	11
	5240	1.083	2.472	/	11
802.11n (HT20)	5180	2.408	1.765	5.109	11
	5200	1.753	2.606	5.211	11
	5240	1.692	1.955	4.836	11
802.11n (HT40)	5190	-1.572	-1.048	1.708	11
	5230	-1.219	-1.406	1.699	11
802.11ac (VHT20)	5180	2.49	2.492	5.501	11
	5200	2.459	1.869	5.184	11
	5240	1.647	0.25	4.015	11
802.11ac (VHT40)	5190	-1.339	-1.228	1.727	11
	5230	-0.768	-0.88	2.187	11
802.11ac (VHT80)	5210	-3.156	-3.809	-0.460	11

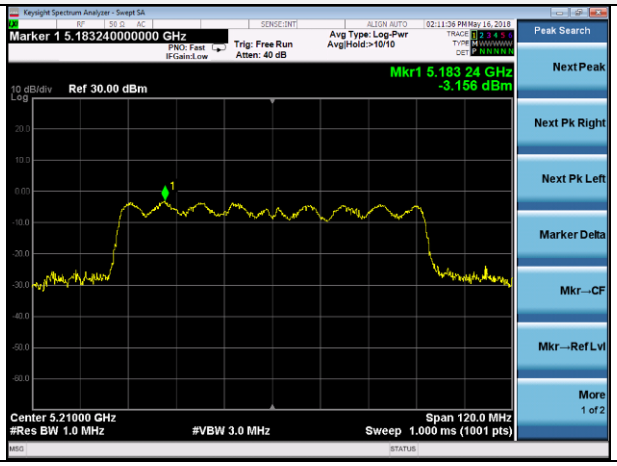
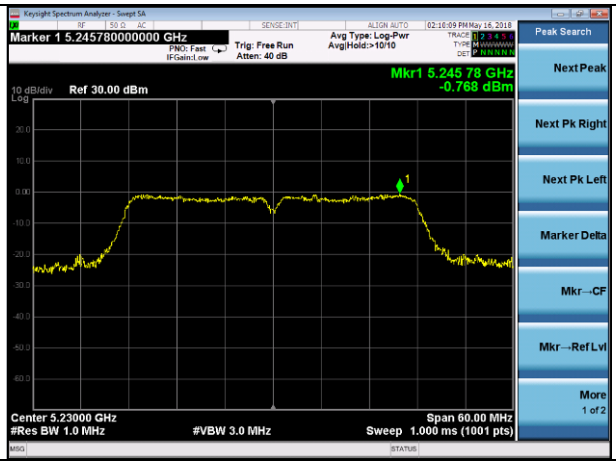
5.8G

Mode	Frequency (MHz)	Power Density(dBm/500KHz)		Total	FCC Limit (dBm/500KHz)
		Antenna 1	Antenna 2		
802.11a	5745	-0.446	-1.761	/	30
	5785	0.262	0.796	/	30
	5825	-2.033	-1.626	/	30
802.11n (HT20)	5745	-1.544	-1.463	1.507	30
	5785	1.121	0.944	4.044	30
	5825	-1.626	-1.654	1.370	30
802.11n (HT40)	5755	-3.881	-3.016	-0.417	30
	5795	-2.341	-2.565	0.559	30
802.11ac (VHT20)	5745	-1.197	-0.994	1.916	30
	5785	0.726	1.81	4.312	30
	5825	-2.658	-1.113	1.193	30
802.11ac (VHT40)	5755	-3.717	-2.963	-0.313	30
	5795	-2.363	-2.867	0.403	30
802.11ac (VHT80)	5775	-6.751	-5.496	-3.068	30

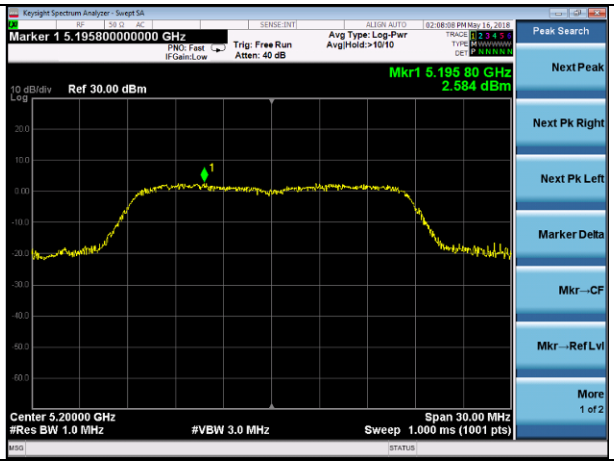
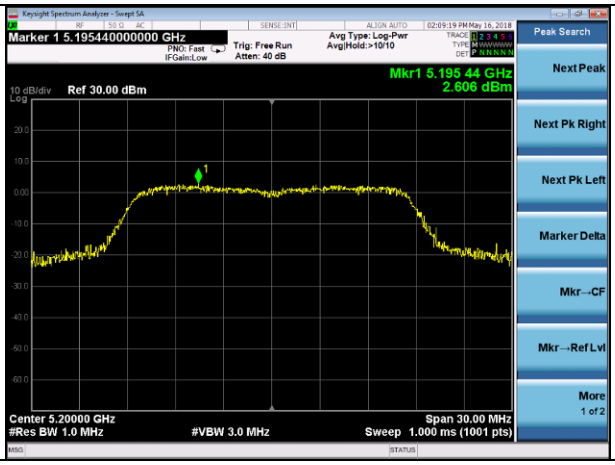
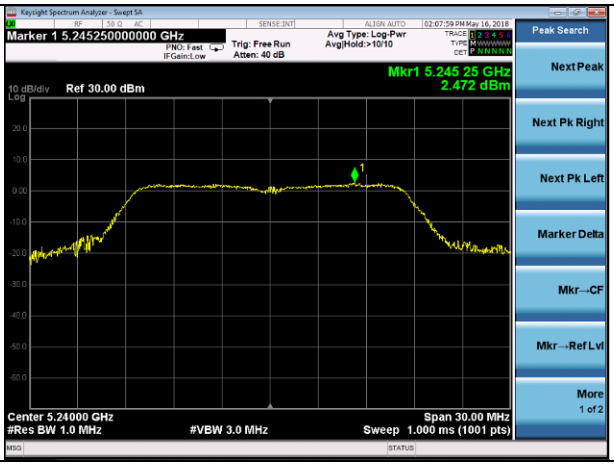
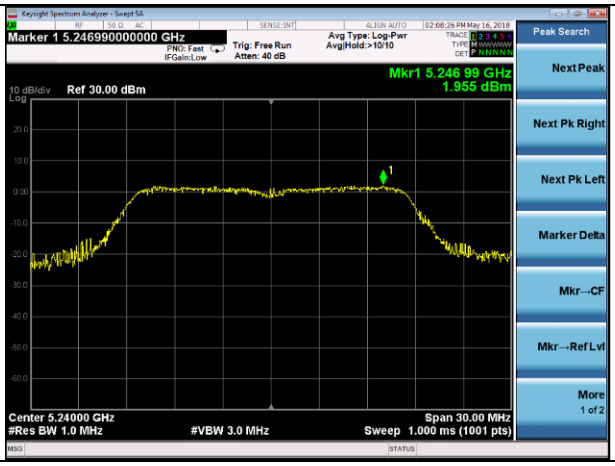
5.2G Antenna 1

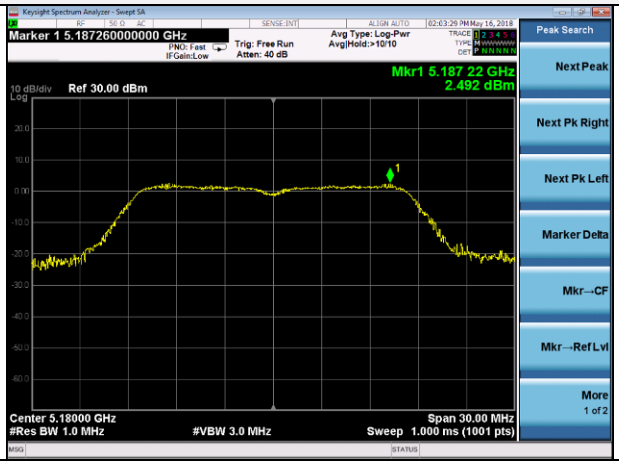
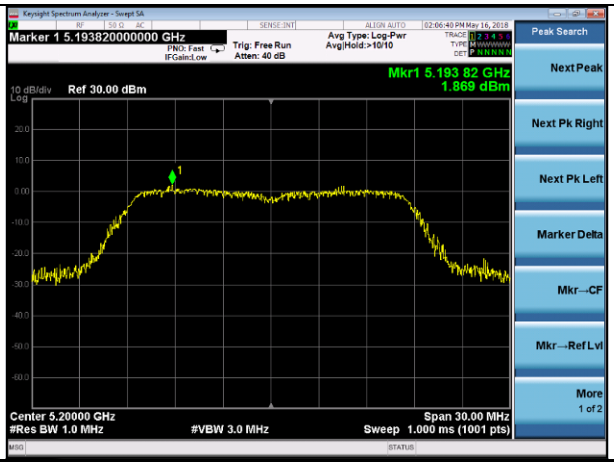
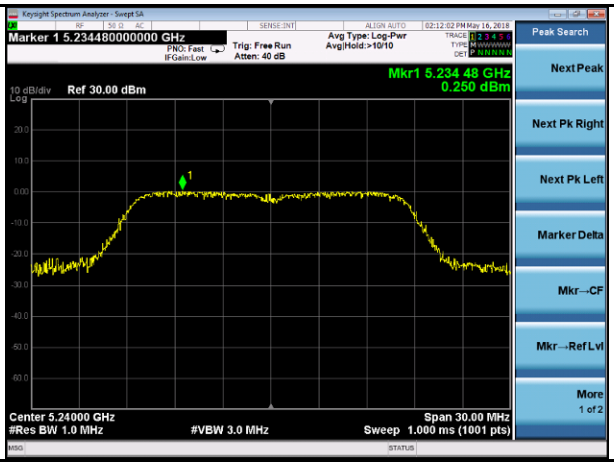
802.11a	802.11n HT20
	
CH 36	*CH 36*
	
CH 40	*CH 40*
	
CH 48	*CH 48*

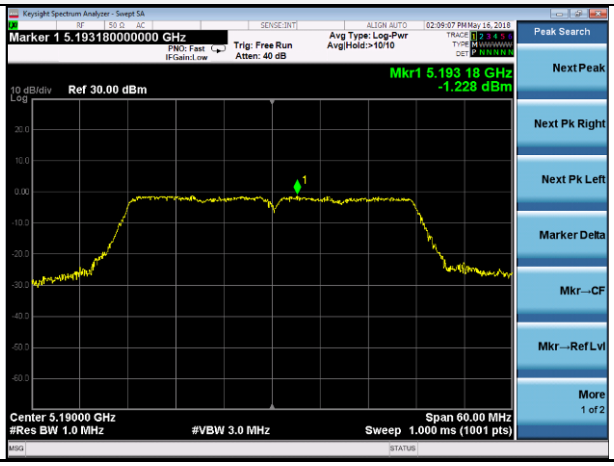
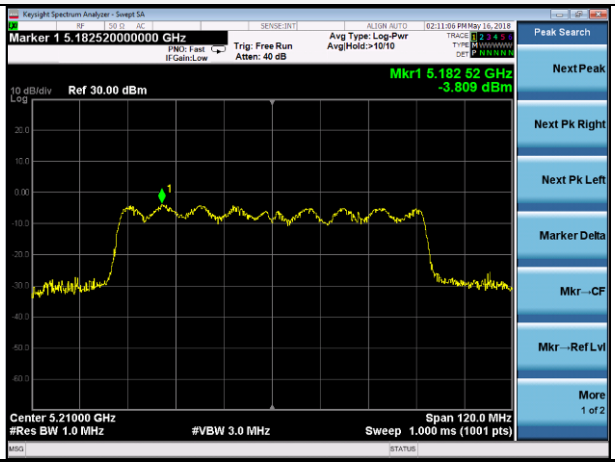
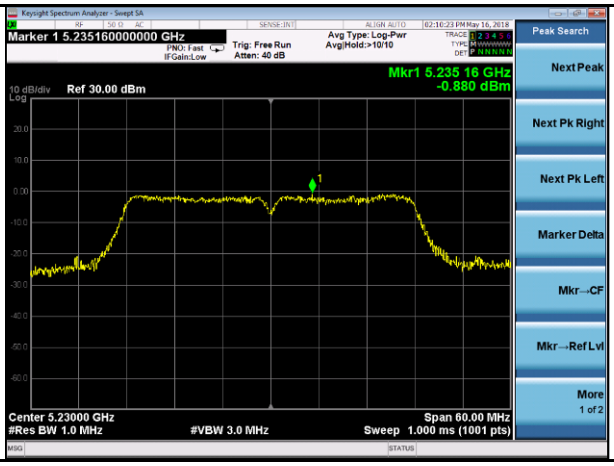
802.11ac VHT20	802.11n HT40
	
CH 36	*CH 38*
	
CH 40	*CH 46*
	
CH 48	

802.11ac VHT40	802.11ac VHT80
	
CH 38	*CH 42*
	
CH 46	

5.2G Antenna 2

802.11a	802.11n HT20
	
CH 36	*CH 36*
	
CH 40	*CH 40*
	
CH 48	*CH 48*

802.11ac VHT20	802.11n HT40
	
CH 36	*CH 38*
	
CH 40	*CH 46*
	
CH 48	

802.11ac VHT40	802.11ac VHT80
	
CH 38	*CH 42*
	
CH 46	