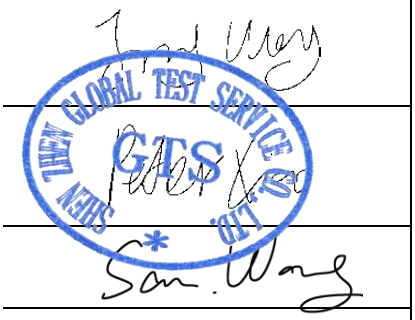
Shenzhen Global Test Service Co.,Ltd.
1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.407

Report Reference No.....:	**GTS20190321004-1-3**
FCC ID..... :	**2ALGI-INV02**
Compiled by (position+printed name+signature)..:	File administrators Jimmy Wang
Supervised by (position+printed name+signature)..:	Test Engineer Peter Xiao
Approved by (position+printed name+signature)..:	Manager Sam Wang
Date of issue.....:	May. 15, 2019



Representative Laboratory Name .:	**Shenzhen Global Test Service Co.,Ltd.**
Address.....:	1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong
Applicant's name.....:	**InvizBox Limited**
Address .....:	LINC Centre, IT Blanchardstown, Blanchardstown, Dublin 15, D15 VPT3, Ireland, Republic of
Test specification .....**:**	
Standard .....:	**FCC Part 15.407: UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE DEVICES**
TRF Originator.....:	Shenzhen Global Test Service Co.,Ltd.
Master TRF.....:	Dated 2014-12

Test item description .....:	Router
Trade Mark .....:	N/A
Manufacturer .....:	**InvizBox Limited**
Model/Type reference.....:	InvizBox 2
Listed Models .....:	N/A
Operation Frequency.....:	From 5180MHz to 5240MHz/ 5745MHz to 5825MHz
Rating .....:	Input: AC 100-240V~50/60Hz
Result.....:	**PASS**

TEST REPORT

Test Report No. :	GTS20190321004-1-3	May. 15, 2019 Date of issue

Equipment under Test	:	Router
Model /Type	:	InvizBox 2
Listed Models	:	N/A
Applicant	:	**InvizBox Limited**
Address	:	LINC Centre, IT Blanchardstown, Blanchardstown, Dublin 15, D15 VPT3, Ireland, Republic of
Manufacturer	:	**InvizBox Limited**
Address	:	LINC Centre, IT Blanchardstown, Blanchardstown, Dublin 15, D15 VPT3, Ireland, Republic of

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 v02r01: GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORAMTION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E
KDB 662911 v02r01: Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)

2 . SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Apr.1 , 2019
Testing commenced on	:	May. 15, 2019
Testing concluded on	:	May. 15, 2019

2.2. Product Description

Name of EUT	Router
Trade Mark	N/A
Model Number	InvizBox 2
Listed Models	N/A
FCC ID	2ALGI-INV02
Power Supply	DC 5V from adapter
Power Supply	Model: MX15Z-0502500VU Input: AC 100-240V～50/60Hz 0.4A Output:DC 5V/2.5A
Supported type:	802.11b/802.11g/802.11n HT20/802.11n HT40/802.11 a /802.11ac 20/802.11ac40//802.11ac80
WLAN	Supported:802.11ac20/802.11ac40/802.11ac80/802.11b/802.11g /802.11n HT20/802.11n HT40/802.11a
Modulation Type	CCK OFDM
Operation frequency	2412-2472/5180-5240/5745-5825MHz
Antenna Type	Internal Antennas
Antenna gain	2.4G WLAN Antenna Antenna 0, 2.0 dBi (Max.) 5G WLAN Antenna Antenna 1, 2.0 dBi (Max.) Antenna 2, 2.0 dBi (Max.) Drectional Gain：5.0 dBi (Max.)
Remark: The products are identical in interior structure, electrical circuits and components, just model names and antenna numbers are different.	

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	●	120V / 60Hz
		○	12 V DC	○	24 V DC
		○	Other		

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

This is a Router.

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

2.5. EUT operation mode

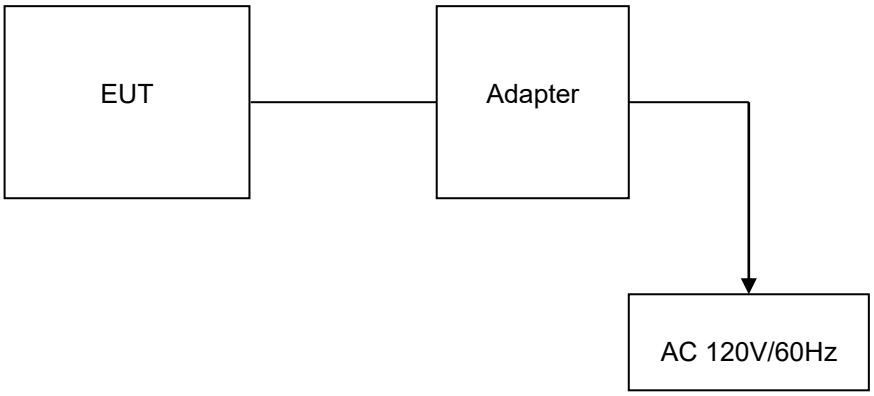
The application provider specific test software to control sample in continuous TX and RX.

IEEE 802.11a/ac20/ac40/ac80/n20/n40:

UNII-1		UNII-1		UNII-1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	**5180**	38	5190	42	5210
40	**5200**	46	5230		
44	5220				
48	**5240**				

UNII-3		UNII-3		UNII-3	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	**5745**	151	5755	155	5775
153	5765	159	5795		
157	**5785**				
161	5805				
165	**5825**				

2.6. Block Diagram of Test Setup



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

This submittal(s) (test report) is intended for **FCC ID: 2ALGI-INV02** 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:

CNAS (No. CNAS 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: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)
Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

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	802.11ac	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.407(a)	Power spectral density	802.11a/ac20/ ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.407(a)	Spectrum bandwidth – 26 dB bandwidth	802.11a/ac20/ ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.407(e)	Spectrum bandwidth – 6 dB bandwidth	802.11a/ac20/ ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.407(a)	Maximum output power	802.11a/ac20/ ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒ ☒	☐	☐	☐	complies
§15.407(b)	Band edge compliance conducted	802.11a/ac20/ ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Highest	802.11a/ac20/ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.407(b)	Band edge compliance radiated	802.11a/ac20/ ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Highest	802.11a/ac20/ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.407(a)	TX spurious emissions conducted	-/-	-/-	-/-	-/-	☐	☐	☒	☐	complies
§15.407(a)	TX spurious emissions radiated	802.11a/ac20/ ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ac40/ac80 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.407(g)	Frequency Stability	-/-	-/-	-/-	-/-	☒	☐	☐	☐	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	☐	☐	☒	☐	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	802.11a/ac20/ ac40/ac80 802.11n HT20/40	-/-	802.11ac	-/-	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	802.11a/ac20/ ac40/ac80 802.11n HT20/40	-/-	802.11ac	-/-	☒	☐	☐	☐	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 Radiated Emission30M~1GHz& Radiated Emission 1GHz~10th Harmonic	802.11a	6 Mbps
	802.11ac20/ac40/ac80 802.11n HT20/40	MCS0
Band Edge	802.11a	6 Mbps
	802.11ac20/ac40/ac80 802.11n HT20/40	MCS0

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

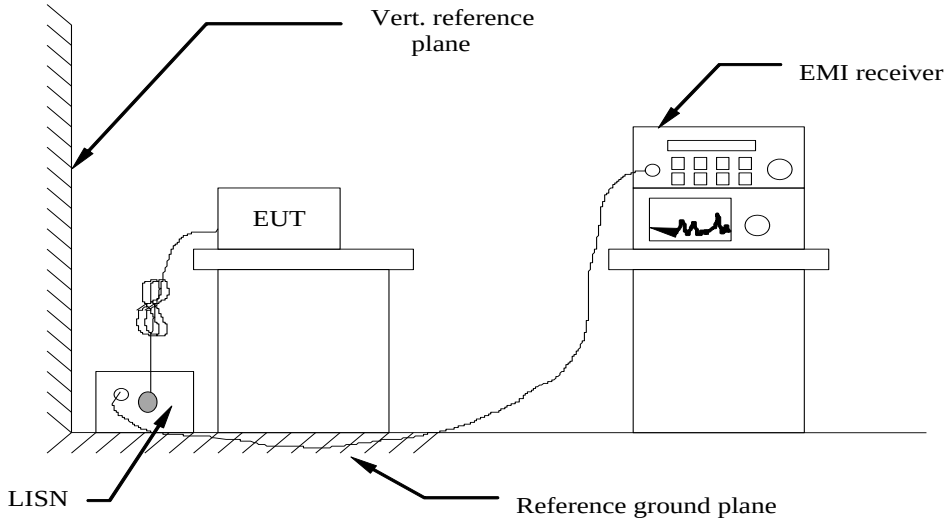
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2018/09/28	2019/09/27
LISN	R&S	ESH2-Z5	893606/008	2018/09/27	2019/09/26
By-log Antenna	SCHWARZBECK	VULB9163	000976	2018/09/29	2019/09/28
EMI Test Receiver	R&S	ESCI	101102	2018/09/26	2019/09/25
Spectrum Analyzer	Agilent	N9020A	MY48010425	2018/09/17	2019/09/16
Spectrum Analyzer	R&S	FSV40-N	101800	2018/09/17	2019/09/16
Controller	EM Electronics	Controller EM 1000	N/A	2018/09/21	2019/09/20
Double Ridged Horn Antenna (1~18GHz)	SCHWARZBECK	BBHA 9120D	01622	2018/09/19	2019/09/18
Double Ridged Horn Antenna	Rohde&Schwarz	HF907	100265	2018/09/19	2019/09/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2018/09/19	2019/09/18
Horn Antenna (18GHz~40GHz)	ETS	3116	00086467	2018/12/29	2019/12/28
Amplifier (26.5GHz~40GHz)	EMCI	EMC2654045	980028	2018/09/18	2019/09/17
Amplifier (0.1GHz~26.5GHz)	EMCI	EMC012645SE	980355	2018/09/19	2019/09/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2018/09/20	2019/09/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2018/09/20	2019/09/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2018/09/20	2019/09/19
Data acquisition card	Agilent	U2531A	TW53323507	2018/09/20	2019/09/19
Power Sensor	Agilent	U2021XA	MY5365004	2018/09/20	2019/09/19
RF Cable	HUBER+SUHNER	RG214	N/A	2018/09/20	2019/09/19
Broadband Antenna	SCHWARZBECK	VULB 9163	00976	2018//9/29	2018//9/28
Conducted Emission	ES-K1	V1.71	N/A	N/A	N/A
Radiated Emission	JS32-RE	V2.5.0.9	N/A	N/A	N/A

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：

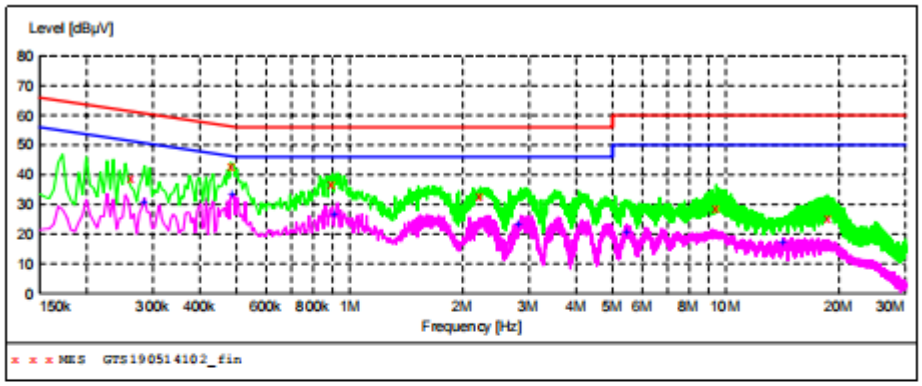
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

TEST RESULTS

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

Power supply:	DC 12V from Adapter AC 120V/60Hz	Polarization	L

SCAN TABLE: "Voltage (9K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "GTS190514102_fin"

5/14/2019 10:30AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.262500	38.70	9.9	61	22.7	QP	L1	GND
0.487500	43.10	9.8	56	13.1	QP	L1	GND
0.892500	36.90	9.6	56	19.1	QP	L1	GND
2.220000	32.90	9.5	56	23.1	QP	L1	GND
9.438000	28.40	8.9	60	31.6	QP	L1	GND
18.622500	25.60	7.3	60	34.4	QP	L1	GND

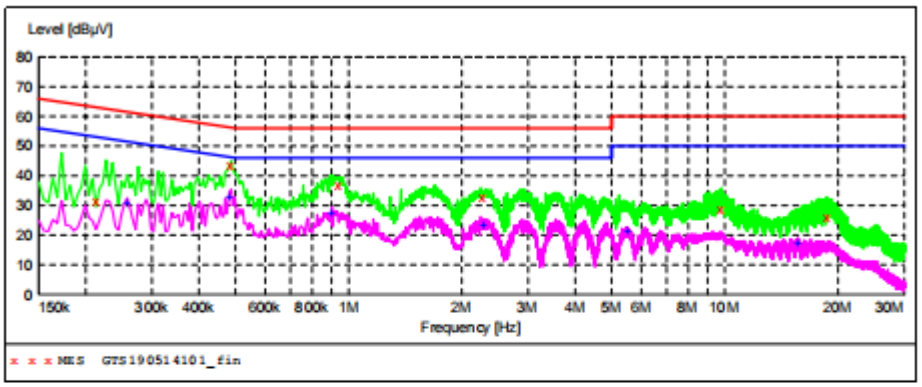
MEASUREMENT RESULT: "GTS190514102_fin2"

5/14/2019 10:30AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.285000	30.60	9.9	51	20.1	AV	L1	GND
0.487500	33.70	9.8	46	12.5	AV	L1	GND
0.915000	26.50	9.6	46	19.5	AV	L1	GND
2.827500	23.20	9.5	46	22.8	AV	L1	GND
5.428500	20.90	9.3	50	29.1	AV	L1	GND
14.271000	17.20	8.3	50	32.8	AV	L1	GND

Power supply:	DC 12V from Adapter AC 120V/60Hz	Polarization	N

SCAN TABLE: "Voltage (9K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "GTS190514101_fin"

5/14/2019 10:27AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.213000	31.50	10.0	63	31.6	QP	N	GND
0.487500	43.40	9.8	56	12.8	QP	N	GND
0.946500	37.10	9.6	56	18.9	QP	N	GND
2.265000	32.70	9.5	56	23.3	QP	N	GND
9.820500	28.80	8.9	60	31.2	QP	N	GND
18.640500	25.90	7.3	60	34.1	QP	N	GND

MEASUREMENT RESULT: "GTS190514101_fin2"

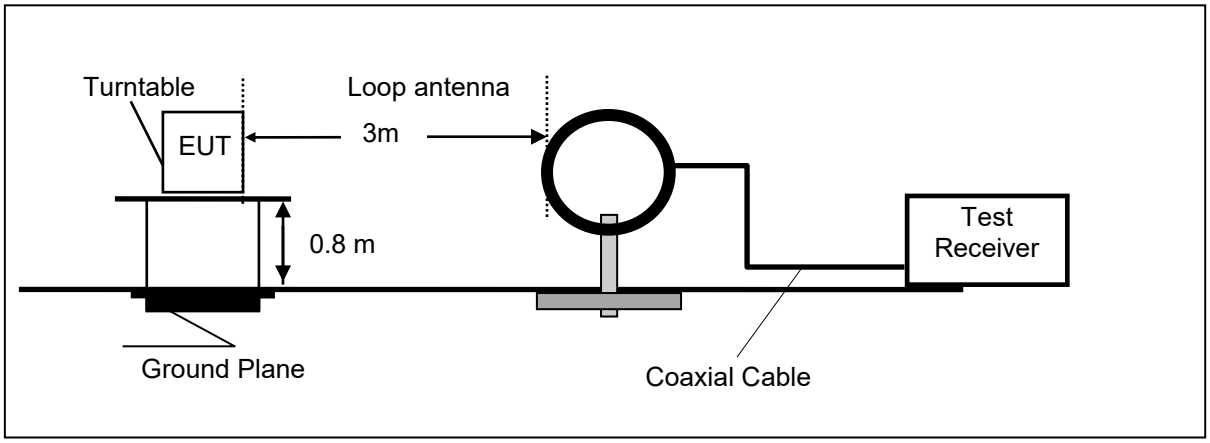
5/14/2019 10:27AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.258000	31.00	9.9	52	20.5	AV	N	GND
0.483000	33.00	9.8	46	13.3	AV	N	GND
0.897000	27.10	9.6	46	18.9	AV	N	GND
2.283000	23.50	9.5	46	22.5	AV	N	GND
5.500500	21.50	9.3	50	28.5	AV	N	GND
15.580500	17.30	8.0	50	32.7	AV	N	GND

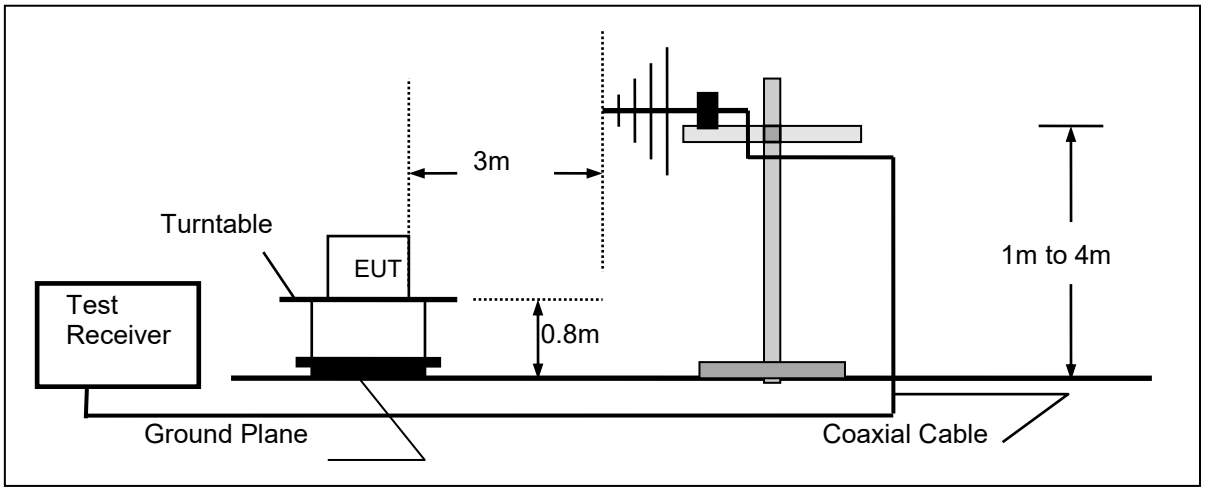
4.2. Radiated Emission

TEST CONFIGURATION

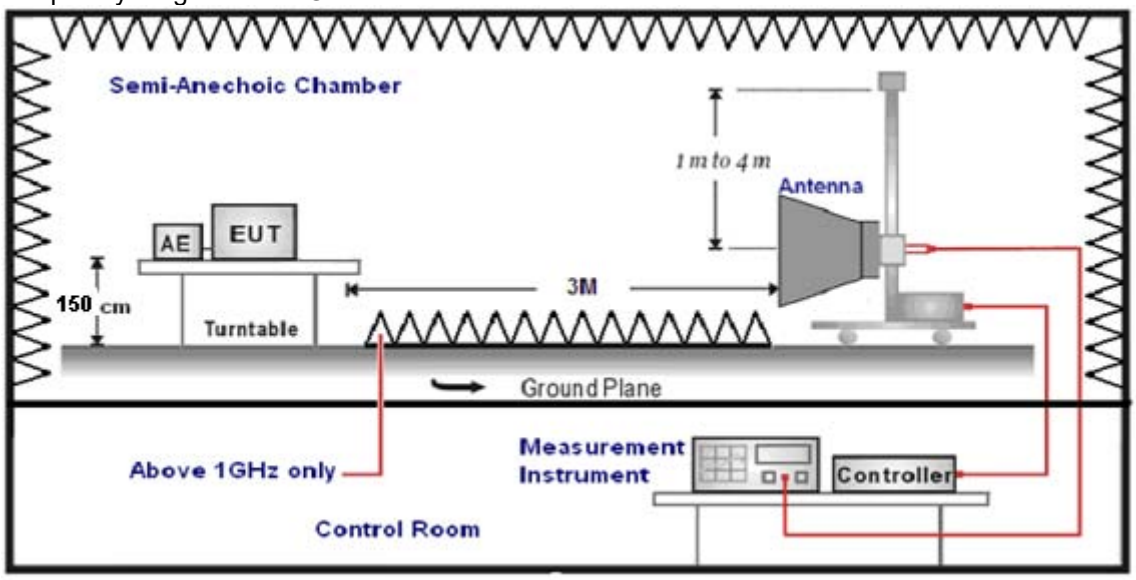
Frequency range 9 KHz – 30MHz



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

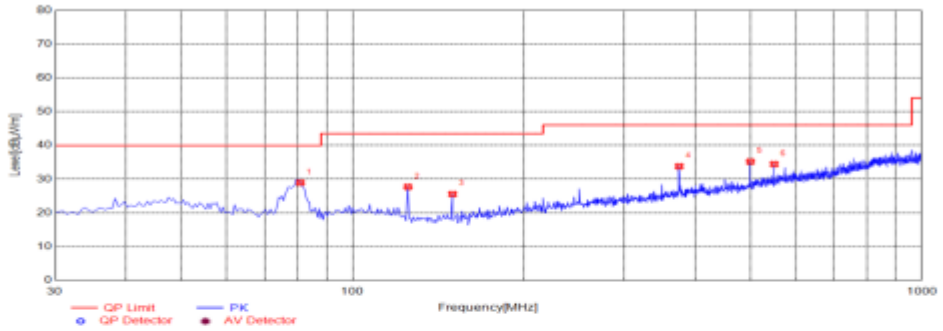
TEST RESULTS

Remark: We measured Radiated Emission at all mode from30MHz to 25GHz in AC 120V/60Hz and the worst case was recorded.

For 30MHz-1GHz

Horizontal

Test Graph

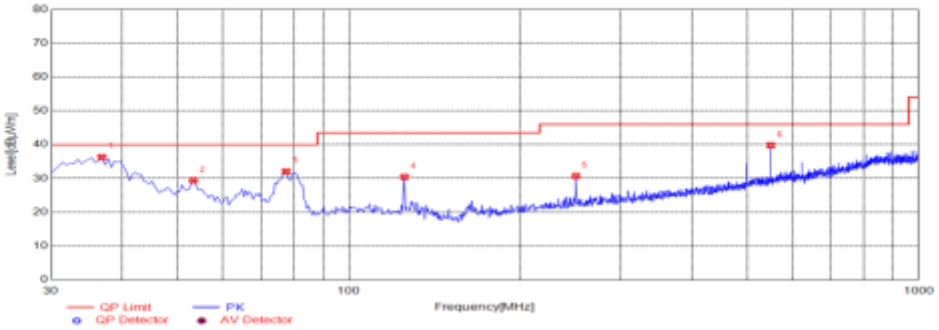


Suspected List

NO.	Freq. [MHz]	Polarity	Height [cm]	Angle [°]	Limit [dBµV/m]	Level [dBµV/m]	Factor [dB]	Readin d[dBµV /m]	Margin [dB]
1	80.9250	Horizontal	100	30	40.00	28.93	-20.69	49.62	11.07
2	125.060	Horizontal	100	290	43.50	27.69	-19.57	47.26	15.81
3	149.795	Horizontal	100	120	43.50	25.57	-19.69	45.26	17.93
4	374.835	Horizontal	100	310	46.00	33.78	-12.36	46.14	12.22
5	499.965	Horizontal	100	200	46.00	35.19	-9.72	44.91	10.81
6	550.405	Horizontal	100	10	46.00	34.44	-8.99	43.43	11.56

Vertical

Test Graph



Suspected List

NO.	Freq. [MHz]	Polarity	Height [cm]	Angle [°]	Limit [dBµV/m]	Level [dBµV/m]	Factor [dB]	Readin d[dBµV /m]	Margin [dB]
1	36.7900	Vertical	100	10	40.00	36.30	-16.68	52.98	3.70
2	53.2800	Vertical	100	310	40.00	29.42	-15.48	44.90	10.58
3	77.5300	Vertical	100	270	40.00	32.05	-20.41	52.46	7.95
4	125.060	Vertical	100	120	43.50	30.45	-19.57	50.02	13.05
5	250.190	Vertical	100	300	46.00	30.67	-15.12	45.79	15.33
6	549.920	Vertical	100	10	46.00	39.80	-9.00	48.80	6.20

For 1GHz to 40GHz

Remark: Measured all modes and recorded worst case;

5150-5250MHz:

IEEE 802.11a/ Antenna Chain 1

802.11a Mode_Channel 36 _5180 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10360	36.29	38.55	33.64	11.24	52.44	68.2	15.76	Peak	Horizontal
1	10360	34.58	38.55	33.64	11.24	50.73	68.2	17.47	Peak	Vertical

802.11a Mode_Channel 40 _ 5200 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10400	37.22	38.55	33.64	11.24	53.37	68.2	14.83	Peak	Horizontal
1	10400	36.94	38.55	33.64	11.24	53.09	68.2	15.11	Peak	Vertical

802.11a Mode_ Channel 48_ 5240 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10480	36.51	38.55	33.64	11.24	52.66	68.2	15.54	Peak	Horizontal
1	10480	35.47	38.55	33.64	11.24	51.62	68.2	16.58	Peak	Vertical

IEEE 802.11n-HT20/Combined Antenna Chain 1 and Antenna Chain 2

802.11n20 Mode_Channel 36 _5180 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10360	35.94	38.55	33.64	11.24	52.09	68.2	16.11	Peak	Horizontal
1	10360	35.49	38.55	33.64	11.24	51.64	68.2	16.56	Peak	Vertical

802.11n20 Mode_Channel 40 _ 5200 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10400	35.73	38.55	33.64	11.24	51.88	68.2	16.32	Peak	Horizontal
1	10400	34.26	38.55	33.64	11.24	50.41	68.2	17.79	Peak	Vertical

802.11n20 Mode_ Channel 48_ 5240 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10480	35.59	38.55	33.64	11.24	51.74	68.2	16.46	Peak	Horizontal
1	10480	34.29	38.55	33.64	11.24	50.44	68.2	17.76	Peak	Vertical

IEEE 802.11n-HT40/Combined Antenna Chain 1 and Antenna Chain 2

802.11n40 Mode_Channel 38 _5190 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10380	35.96	38.55	33.64	11.24	52.11	68.2	16.09	Peak	Horizontal
1	10380	34.87	38.55	33.64	11.24	51.02	68.2	17.18	Peak	Vertical

802.11n40 Mode_Channel 46 _ 5230 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10460	36.51	38.55	33.64	11.24	52.66	68.2	15.54	Peak	Horizontal
1	10460	34.16	38.55	33.64	11.24	50.31	68.2	17.89	Peak	Vertical

IEEE 802.11ac-VHT20/Combined Antenna Chain 1 and Antenna Chain 2

802.11ac20 Mode_Channel 36 _5180 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10360	35.19	38.55	33.64	11.24	51.34	68.2	16.86	Peak	Horizontal
1	10360	34.19	38.55	33.64	11.24	50.34	68.2	17.86	Peak	Vertical

802.11ac20 Mode_Channel 40 _ 5200 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10400	36.23	38.55	33.64	11.24	52.38	68.2	15.82	Peak	Horizontal
1	10400	35.04	38.55	33.64	11.24	51.19	68.2	17.01	Peak	Vertical

802.11ac20 Mode_ Channel 48_ 5240 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10480	35.47	38.55	33.64	11.24	51.62	68.2	16.58	Peak	Horizontal
1	10480	34.61	38.55	33.64	11.24	50.76	68.2	17.44	Peak	Vertical

IEEE 802.11ac-VHT40/Combined Antenna Chain 1 and Antenna Chain 2

802.11ac40 Mode_Channel 38 _5190 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10380	36.21	38.55	33.64	11.24	52.36	68.2	15.84	Peak	Horizontal
1	10380	35.07	38.55	33.64	11.24	51.22	68.2	16.98	Peak	Vertical

802.11ac40 Mode_Channel 46 _ 5230 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10460	35.62	38.55	33.64	11.24	51.77	68.2	16.43	Peak	Horizontal
1	10460	35.13	38.55	33.64	11.24	51.28	68.2	16.92	Peak	Vertical

IEEE 802.11ac-VHT80/Combined Antenna Chain 1 and Antenna Chain 2

802.11ac80 Mode_Channel 42 _5210 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	10420	36.27	38.55	33.64	11.24	52.42	68.2	15.78	Peak	Horizontal
1	10420	35.42	38.55	33.64	11.24	51.57	68.2	16.63	Peak	Vertical

5725-5850MHz:

IEEE 802.11a/ Antenna Chain 1
802.11a Mode_Channel 149 _5745 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11490	35.31	38.41	33.13	11.26	51.85	74	22.15	Peak	Horizontal
1	11490	24.93	38.41	33.13	11.26	41.47	54	12.53	av	Horizontal

802.11a Mode_Channel 157 _ 5785 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11570	35.22	38.41	33.13	11.26	51.76	74	22.24	Peak	Horizontal
1	11570	25.39	38.41	33.13	11.26	41.93	54	12.07	AV	Horizontal

802.11a Mode_ Channel 165_ 5825 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11650	35.13	38.41	33.13	11.26	51.67	74	22.33	Peak	Horizontal
1	11650	25.65	38.41	33.13	11.26	42.19	54	11.81	AV	Horizontal

IEEE 802.11n-HT20/Combined Antenna Chain 1 and Antenna Chain 2
802.11n20 Mode_Channel 149 _5745 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11490	35.26	38.41	33.13	11.26	51.8	74	22.2	Peak	Horizontal
1	11490	24.32	38.41	33.13	11.26	40.86	54	13.14	AV	Horizontal

802.11n20 Mode_Channel 157 _ 5785 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11570	35.32	38.41	33.13	11.26	51.86	74	22.14	35.32	Horizontal
1	11570	25.09	38.41	33.13	11.26	41.63	54	12.37	25.09	Horizontal

802.11n20 Mode_ Channel 165_ 5825 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11650	35.37	38.41	33.13	11.26	51.91	74	22.09	35.37	Horizontal
1	11650	23.91	38.41	33.13	11.26	40.45	54	13.55	23.91	Horizontal

IEEE 802.11n-HT40/Combined Antenna Chain 1 and Antenna Chain 2
802.11n40 Mode_Channel 151 _5755 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11510	34.65	38.41	33.13	11.26	51.19	74	22.81	34.65	Horizontal
1	11510	25.77	38.41	33.13	11.26	42.31	54	11.69	25.77	Horizontal

802.11n40 Mode_Channel 159 _ 5795MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11590	35.14	38.41	33.13	11.26	51.68	74	22.32	Peak	Horizontal
1	11590	25.66	38.41	33.13	11.26	42.2	54	11.8	AV	Horizontal

IEEE 802.11ac-VHT20/Combined Antenna Chain 1 and Antenna Chain 2

802.11ac20 Mode_Channel 149 _5745 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11490	34.61	38.41	33.13	11.26	51.15	74	22.85	Peak	Horizontal
1	11490	25.27	38.41	33.13	11.26	41.81	54	12.19	AV	Horizontal

802.11ac20 Mode_Channel 157 _ 5785 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11570	34.76	38.41	33.13	11.26	51.3	74	22.7	Peak	Horizontal
1	11570	24.86	38.41	33.13	11.26	41.4	54	12.6	AV	Horizontal

802.11ac20 Mode_ Channel 165_ 5825 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11650	34.42	38.41	33.13	11.26	50.96	74	23.04	Peak	Horizontal
1	11650	25.59	38.41	33.13	11.26	42.13	54	11.87	AV	Horizontal

IEEE 802.11ac-VHT40/Combined Antenna Chain 1 and Antenna Chain 2

802.11ac40 Mode_Channel 151 _5755 MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11510	35.25	38.41	33.13	11.26	51.79	74	22.21	Peak	Horizontal
1	11510	25.11	38.41	33.13	11.26	41.65	54	12.35	AV	Horizontal

802.11ac40 Mode_Channel 159 _ 5795MHz

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11590	34.14	38.41	33.13	11.26	50.68	74	23.32	Peak	Horizontal
1	11590	25.33	38.41	33.13	11.26	41.87	54	12.13	AV	Horizontal

IEEE 802.11ac-VHT80/Combined Antenna Chain 1 and Antenna Chain 2

802.11ac80 Mode_Channel 155 _5775 MHz

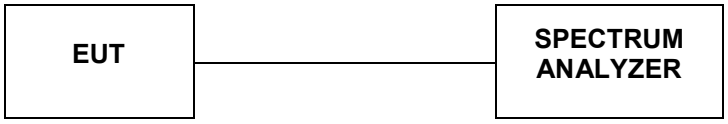
Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector	Polarization
1	11550	35.71	38.41	33.13	11.26	52.25	74	21.75	Peak	Horizontal
1	11550	24.22	38.41	33.13	11.26	40.76	54	13.24	AV	Horizontal

REMARKS:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM 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.)

TEST RESULTS

Antenna 1

802.11a Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
40	5200	1.00	0

802.11n HT20 Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
40	5200	1.00	0

802.11ac20 Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
40	5200	1.00	0

802.11n HT40 Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
38	5190	1.00	0

802.11ac40 Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
38	5190	1.00	0

802.11ac80 Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
42	5210	1.00	0

Antenna 2

802.11a Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
40	5200	1.00	0

802.11n HT20 Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
40	5200	1.00	0

802.11ac20 Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
40	5200	1.00	0

802.11n HT40 Test Mode

Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
38	5190	1.00	0

802.11ac40 Test Mode

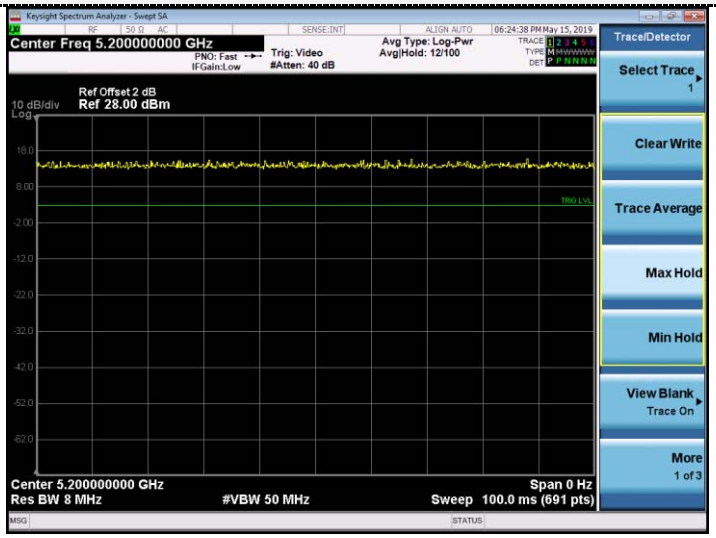
Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
38	5190	1.00	0

802.11ac80 Test Mode

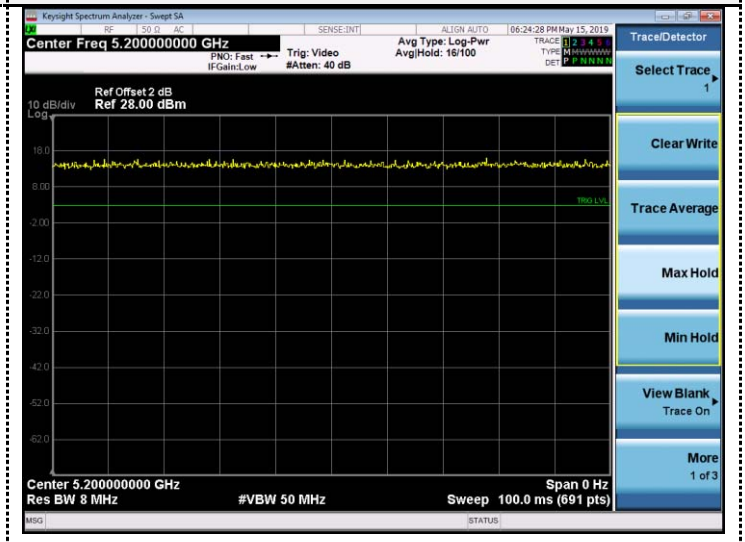
Channel	Frequency (MHz)	Duty Cycle	Duty factor (dB)
42	5210	1.00	0

Antenna 1

802.11a



802.11n HT20



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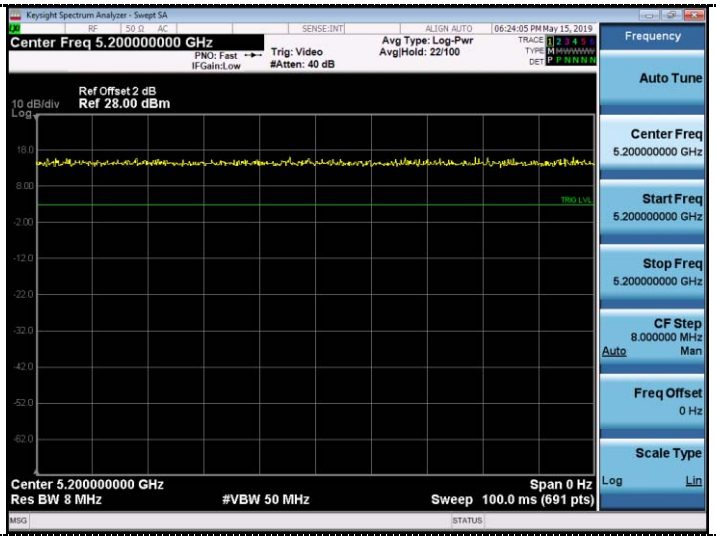
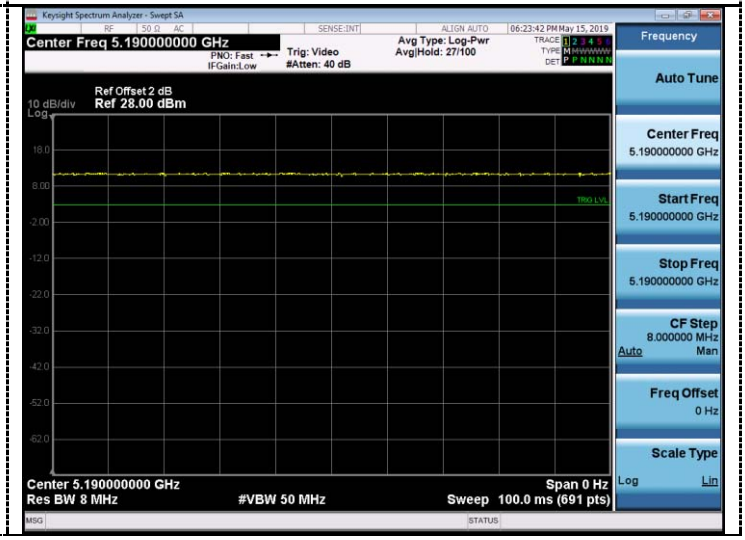
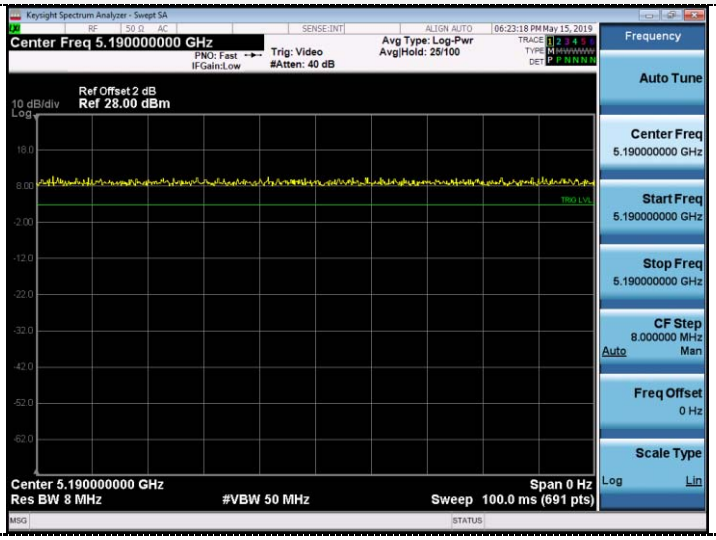


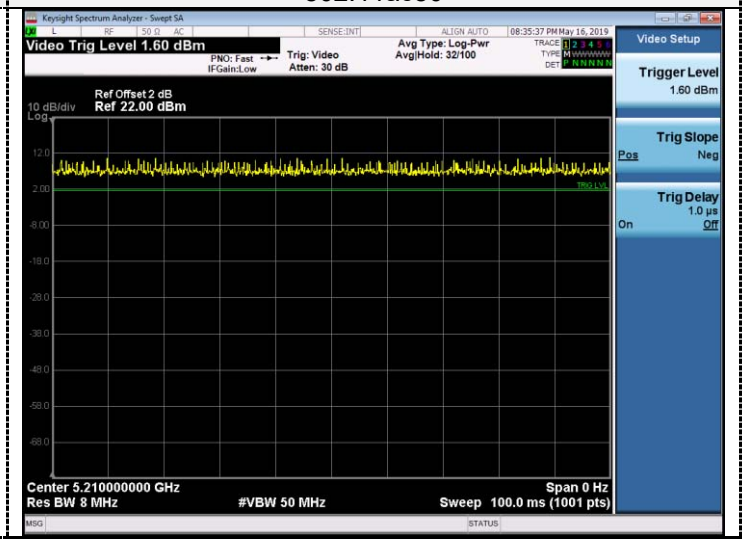
802.11n HT40



802.11ac40

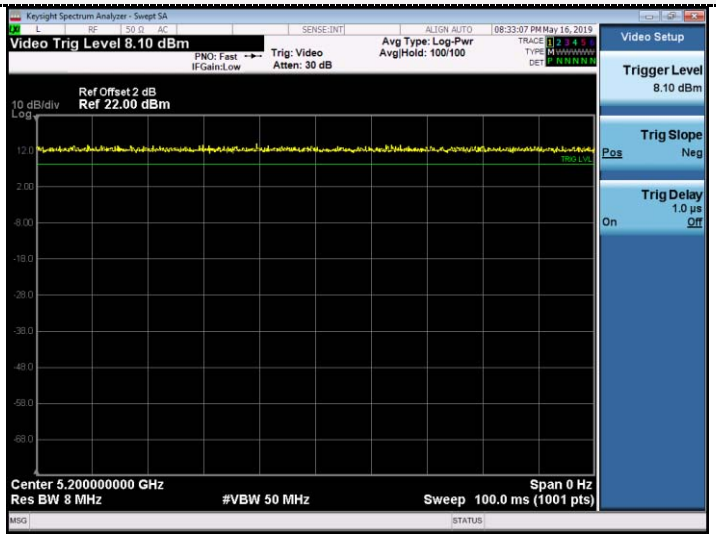


802.11ac80

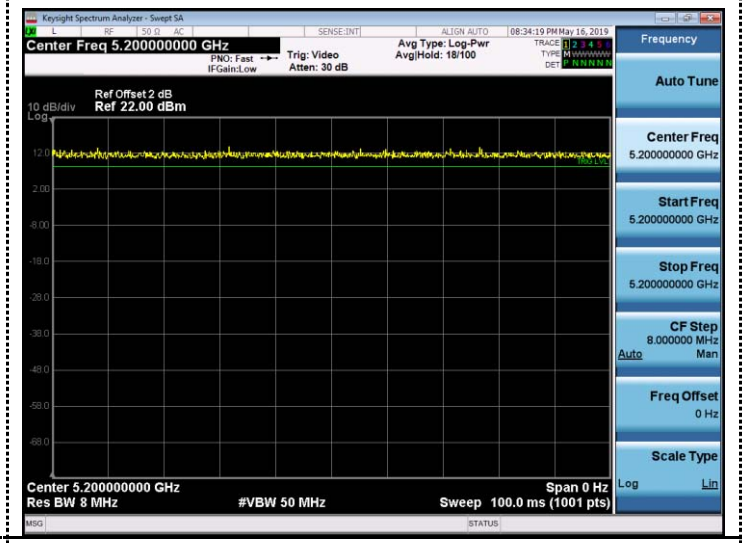


Antenna 1

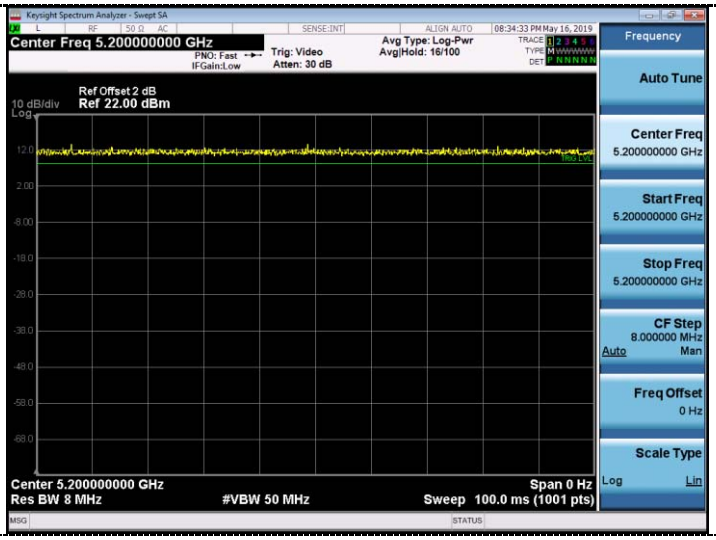
802.11a



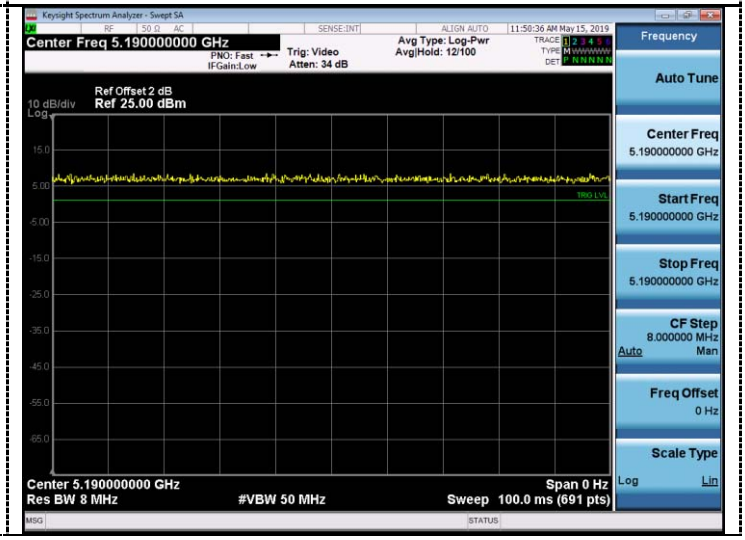
802.11n HT20



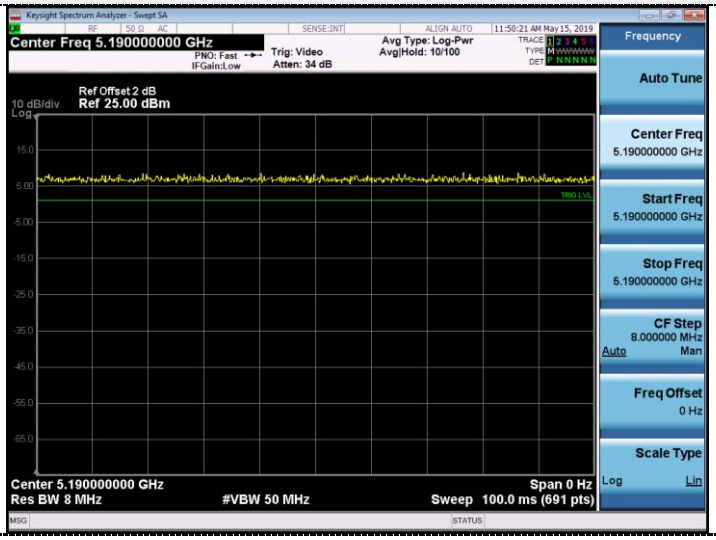
802.11ac20



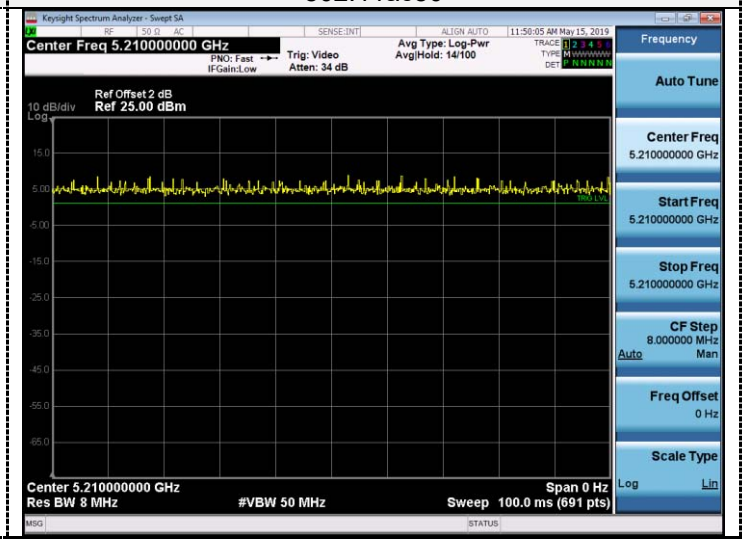
802.11n HT40



802.11ac40

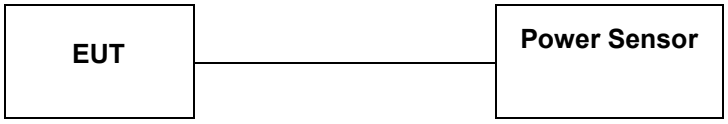


802.11ac80



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

Antenna 1

5150-5250MHz:

Channel	Frequency (MHz)	Output Power AV (dBm)	Duty factor (dB)	Output Power AV + Duty factor (dBm)	Limits (dBm)	Verdict
802.11a						
36	5180	11.89	0	11.89	30.00	PASS
40	5200	11.11	0	11.11	30.00	PASS
48	5240	11.16	0	11.16	30.00	PASS
802.11n20						
36	5180	9.91	0	9.91	30.00	PASS
40	5200	10.33	0	10.33	30.00	PASS
48	5240	10.48	0	10.48	30.00	PASS
802.11ac20						
36	5180	9.12	0	9.12	30.00	PASS
40	5200	9.16	0	9.16	30.00	PASS
48	5240	9.14	0	9.14	30.00	PASS
802.11n40						
38	5190	10.02	0	10.02	30.00	PASS
46	5230	10.12	0	10.12	30.00	PASS
802.11ac40						
38	5190	9.22	0	9.22	30.00	PASS
46	5230	9.17	0	9.17	30.00	PASS
802.11ac80						
42	5210	9.04	0	9.04	30.00	PASS

5725-5850MHz:

Channel	Frequency (MHz)	Output Power AV (dBm)	Duty factor (dB)	Output Power AV + Duty factor (dBm)	Limits (dBm)	Verdict
802.11a						
149	5745	9.21	0	9.21	30.00	PASS
157	5785	9.36	0	9.36	30.00	PASS
165	5825	9.19	0	9.19	30.00	PASS
802.11n20						
149	5745	9.58	0	9.58	30.00	PASS
157	5785	9.32	0	9.32	30.00	PASS
165	5825	9.15	0	9.15	30.00	PASS
802.11ac20						
149	5745	9.31	0	9.31	30.00	PASS
157	5785	9.16	0	9.16	30.00	PASS
165	5825	9.16	0	9.16	30.00	PASS
802.11n40						
151	5755	9.36	0	9.36	30.00	PASS
159	5795	9.33	0	9.33	30.00	PASS
802.11ac40						
151	5755	9.05	0	9.05	30.00	PASS
159	5795	9.07	0	9.07	30.00	PASS
802.11ac80						
155	5775	9.47	0	9.47	30.00	PASS

Antenna 2

5150-5250MHz:

Channel	Frequency (MHz)	Output Power AV (dBm)	Duty factor (dB)	Output Power AV + Duty factor (dBm)	Limits (dBm)	Verdict
802.11a						
36	5180	11.27	0	11.27	30.00	PASS
40	5200	10.95	0	10.95	30.00	PASS
48	5240	11.31	0	11.31	30.00	PASS
802.11n20						
36	5180	10.18	0	10.18	30.00	PASS
40	5200	10.35	0	10.35	30.00	PASS
48	5240	10.24	0	10.24	30.00	PASS
802.11ac20						
36	5180	9.78	0	9.78	30.00	PASS
40	5200	9.56	0	9.56	30.00	PASS
48	5240	10.03	0	10.03	30.00	PASS
802.11n40						
38	5190	10.16	0	10.16	30.00	PASS
46	5230	10.13	0	10.13	30.00	PASS
802.11ac40						
38	5190	9.44	0	9.44	30.00	PASS
46	5230	9.43	0	9.43	30.00	PASS
802.11ac80						
42	5210	9.47	0	9.47	30.00	PASS

5725-5850MHz:

Channel	Frequency (MHz)	Output Power AV (dBm)	Duty factor (dB)	Output Power AV + Duty factor (dBm)	Limits (dBm)	Verdict
802.11a						
149	5745	9.38	0	9.38	30.00	PASS
157	5785	9.54	0	9.54	30.00	PASS
165	5825	9.61	0	9.61	30.00	PASS
802.11n20						
149	5745	9.58	0	9.58	30.00	PASS
157	5785	9.52	0	9.52	30.00	PASS
165	5825	9.81	0	9.81	30.00	PASS
802.11ac20						
149	5745	9.68	0	9.68	30.00	PASS
157	5785	9.28	0	9.28	30.00	PASS
165	5825	9.57	0	9.57	30.00	PASS
802.11n40						
151	5755	9.65	0	9.65	30.00	PASS
159	5795	9.56	0	9.56	30.00	PASS
802.11ac40						
151	5755	9.51	0	9.51	30.00	PASS
159	5795	9.46	0	9.46	30.00	PASS
802.11ac80						
155	5775	9.41	0	9.41	30.00	PASS

MIMO*2

5150-5250MHz:

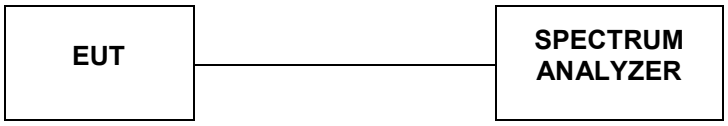
Type	Channel	Power (dBm) ANT1	Power (dBm) ANT2	Total (dBm)	Limit (dBm)	Result
802.11n HT20	36	9.91	10.18	13.06	30.00	Pass
	40	10.33	10.35	13.35		
	48	10.48	10.24	13.37		
802.11ac20	36	9.12	9.78	12.47	30.00	Pass
	40	9.16	9.56	12.37		
	48	9.14	10.03	12.62		
802.11ac40	38	9.22	9.44	12.34	30.00	Pass
	46	9.17	9.43	12.31		
802.11n HT40	38	9.36	10.16	12.79	30.00	Pass
	46	9.33	10.13	12.76		
802.11ac80	42	9.04	9.47	12.27	30.00	Pass

5725-5850MHz:

Type	Channel	Power (dBm) ANT1	Power (dBm) ANT2	Total (dBm)	Limit (dBm)	Result
802.11n HT20	36	9.58	9.58	12.59	30.00	Pass
	40	9.32	9.52	12.43		
	48	9.15	9.81	12.50		
802.11ac20	36	9.31	9.68	12.51	30.00	Pass
	40	9.16	9.28	12.23		
	48	9.16	9.57	12.38		
802.11ac40	38	9.05	9.51	12.30	30.00	Pass
	46	9.07	9.46	12.28		
802.11n HT40	38	10.02	9.65	12.85	30.00	Pass
	46	10.12	9.56	12.86		
802.11ac80	42	9.47	9.41	12.45	30.00	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

Antenna 1

5150-5250MHz:

802.11a Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
36	5180	1.522	0	0	1.522	17	PASS
40	5200	1.121	0	0	1.121	17	PASS
48	5240	1.331	0	0	1.331	17	PASS

802.11n HT20 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
36	5180	0.926	0	0	0.926	17	PASS
40	5200	0.955	0	0	0.955	17	PASS
48	5240	0.691	0	0	0.691	17	PASS

802.11ac20 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
36	5180	0.605	0	0	0.605	17	PASS
40	5200	0.951	0	0	0.951	17	PASS
48	5240	1.217	0	0	1.217	17	PASS

802.11n40 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
38	5190	-1.851	0	0	-1.851	17	PASS
46	5230	-2.584	0	0	-2.584	17	PASS

802.11ac40 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
38	5190	-1.656	0	0	-1.656	17	PASS
46	5230	-1.983	0	0	-1.983	17	PASS

802.11ac80 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
42	5210	-6.238	0	0	-6.238	17	PASS

5725-5850MHz:

802.11a Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5745	-2.327	0	2.2	-0.127	30	PASS
157	5785	-2.287	0	2.2	-0.087	30	PASS
165	5825	-2.231	0	2.2	-0.031	30	PASS

802.11n HT20 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5745	-3.095	0	2.2	-0.895	30	PASS
157	5785	-2.925	0	2.2	-0.725	30	PASS
165	5825	-2.787	0	2.2	-0.587	30	PASS

802.11ac20 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5745	-3.199	0	2.2	-0.999	30	PASS
157	5785	-2.546	0	2.2	-0.346	30	PASS
165	5825	-2.995	0	2.2	-0.795	30	PASS

802.11n40Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5755	-6.854	0	2.2	-4.654	30	PASS
157	5795	-6.586	0	2.2	-4.386	30	PASS

802.11ac40 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5755	-6.585	0	2.2	-4.385	30	PASS
157	5795	-6.241	0	2.2	-4.041	30	PASS

802.11ac80 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
155	5775	-9.432	0	2.2	-7.232	30	PASS

Antenna 2

5150-5250MHz:

802.11a Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
36	5180	1.156	0	0	1.156	17	PASS
40	5200	1.168	0	0	1.168	17	PASS
48	5240	1.242	0	0	1.242	17	PASS

802.11n HT20 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
36	5180	1.623	0	0	1.623	17	PASS
40	5200	1.214	0	0	1.214	17	PASS
48	5240	0.874	0	0	0.874	17	PASS

802.11ac20 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
36	5180	1.389	0	0	1.389	17	PASS
40	5200	0.627	0	0	0.627	17	PASS
48	5240	0.636	0	0	0.636	17	PASS

802.11n40 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
38	5190	-1.930	0	0	-2.175	17	PASS
46	5230	-2.434	0	0	-1.983	17	PASS

802.11ac40 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
38	5190	-2.175	0	0	-2.175	17	PASS
46	5230	-1.983	0	0	-1.983	17	PASS

802.11ac80 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/1MHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/1MHz)	Limits (dBm/1MHz)	Verdict
42	5210	-5.459	0	0	-5.459	17	PASS

5725-5850MHz:

802.11a Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5745	-2.229	0	2.2	-0.029	30	PASS
157	5785	-2.571	0	2.2	-0.371	30	PASS
165	5825	-2.727	0	2.2	-0.527	30	PASS

802.11n HT20 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5745	-3.477	0	2.2	-1.277	30	PASS
157	5785	-2.943	0	2.2	-0.743	30	PASS
165	5825	-3.105	0	2.2	-0.905	30	PASS

802.11ac20 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5745	-2.743	0	2.2	-0.543	30	PASS
157	5785	-3.023	0	2.2	-0.823	30	PASS
165	5825	-3.045	0	2.2	-0.845	30	PASS

802.11n40Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5755	-6.502	0	2.2	-4.302	30	PASS
157	5795	-6.863	0	2.2	-4.663	30	PASS

802.11ac40 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
149	5755	-6.547	0	2.2	-4.347	30	PASS
157	5795	-6.189	0	2.2	-3.989	30	PASS

802.11ac80 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/300KHz)	Duty factor (dB)	RBW factor (dB)	Report PSD+ Duty factor+ RBW factor (dBm/500kHz)	Limits (dBm/500kHz)	Verdict
155	5775	-9.324	0	2.2	-7.124	30	PASS

MIMO*2

5150-5250MHz:

Type	Channel	PSD (dBm/MHz) ANT1	PSD (dBm/MHz) ANT2	Total (dBm/MHz)	Limit (dBm/MHz)	Result
802.11n HT20	36	0.926	1.623	4.30	17	Pass
	40	0.955	1.214	4.10		
	48	0.691	0.874	3.79		
802.11ac20	36	0.605	1.389	4.02	17	Pass
	40	0.951	0.627	3.80		
	48	1.217	0.636	3.95		
802.11ac40	38	-1.656	-2.175	1.10	17	Pass
	46	-1.983	-1.983	1.03		
802.11n HT40	38	-1.851	-1.930	1.12	17	Pass
	46	-2.584	-2.434	0.50		
802.11ac80	42	-6.238	-5.459	-2.82	17	Pass

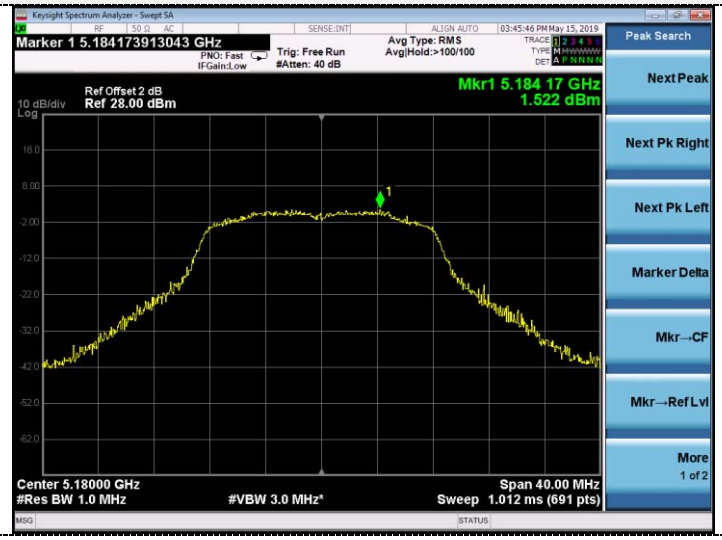
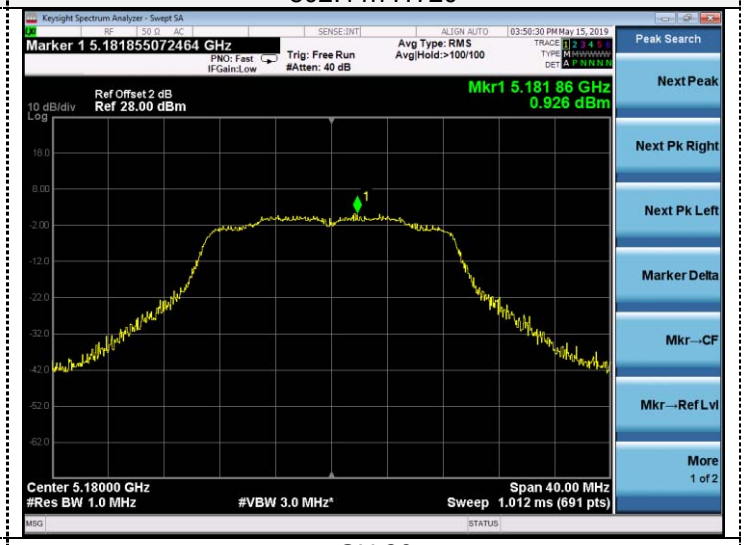
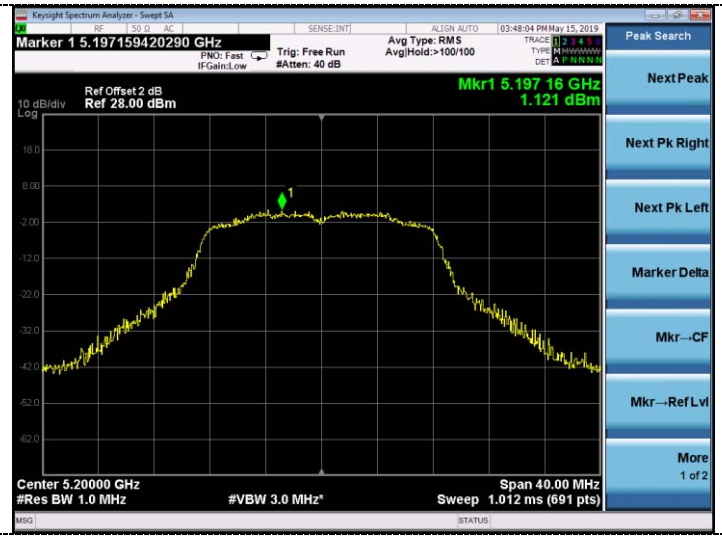
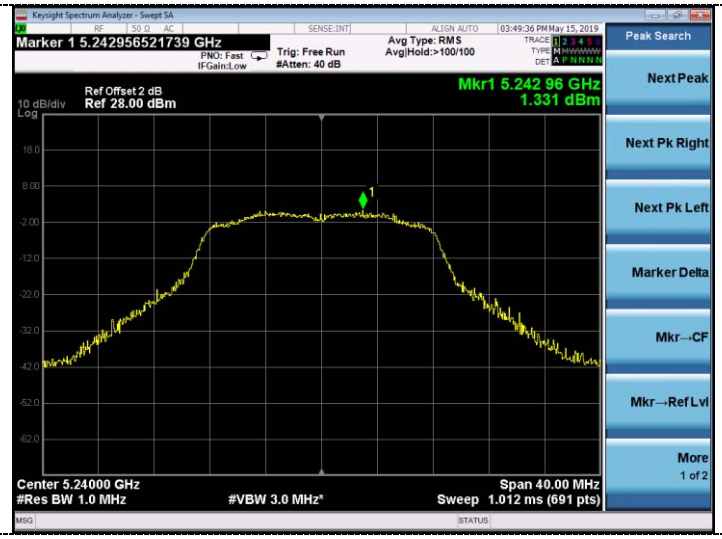
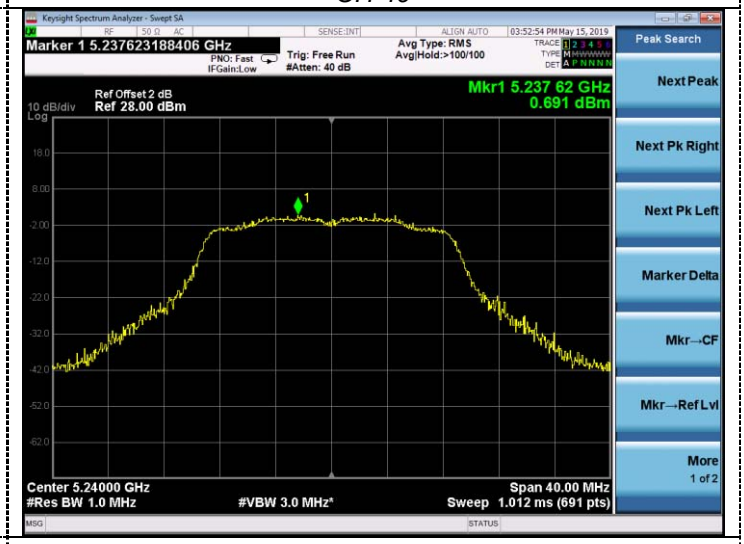
5725-5850MHz:

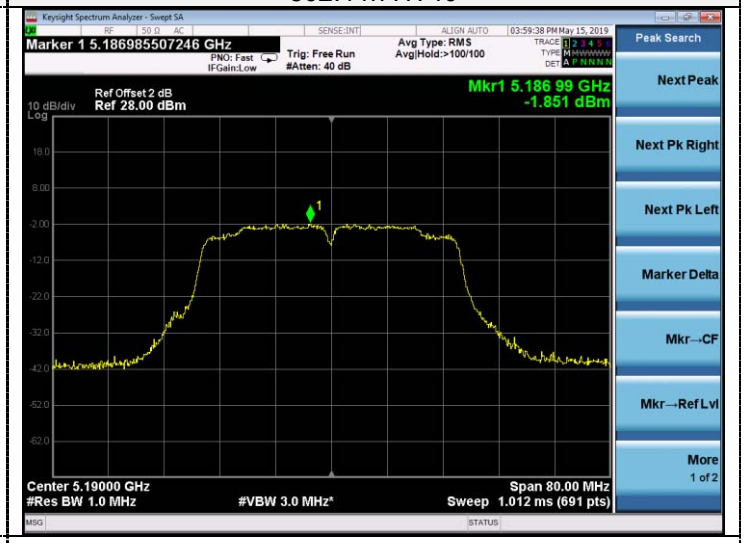
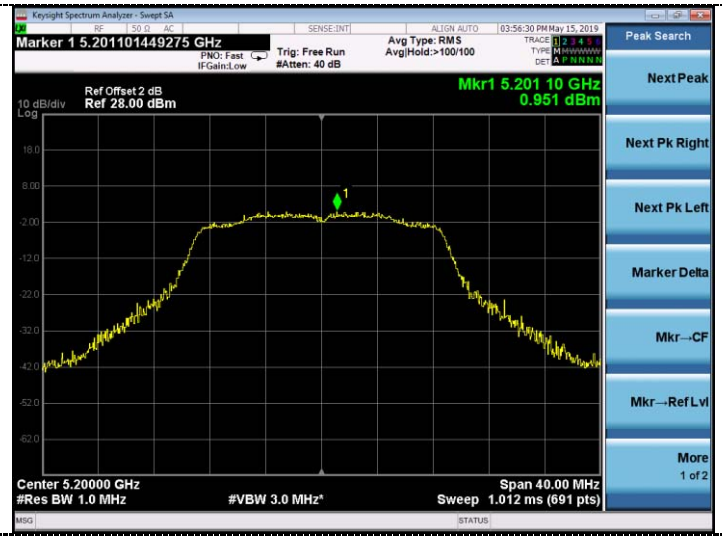
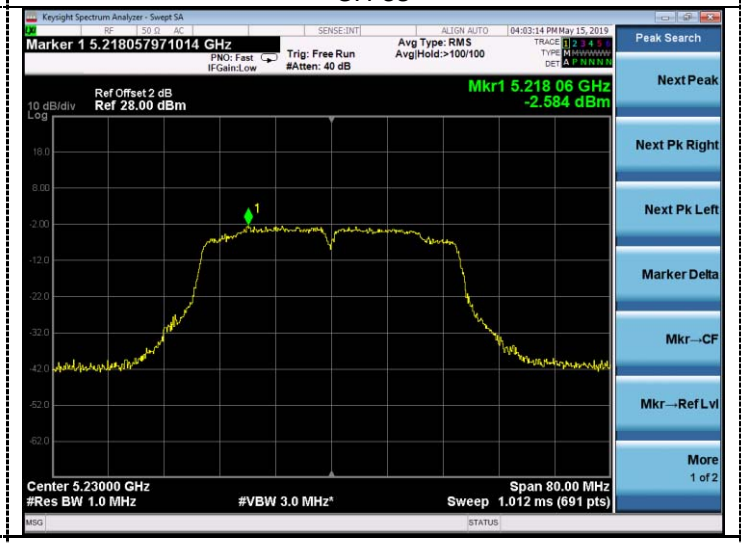
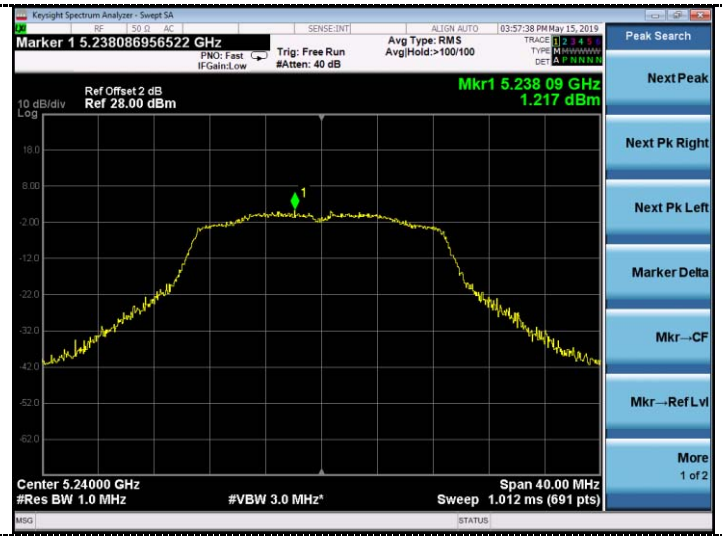
Type	Channel	PSD (dBm/500KHz) ANT1	PSD (dBm/500KHz) ANT2	Total (dBm/500KHz)	Limit (dBm/500KHz)	Result
802.11n HT20	36	-0.895	-1.277	1.93	30	Pass
	40	-0.725	-0.743	2.28		
	48	-0.587	-0.905	2.27		
802.11ac20	36	-0.999	-0.543	2.25	30	Pass
	40	-0.346	-0.823	2.43		
	48	-0.795	-0.845	2.19		
802.11ac40	38	-4.385	-4.347	-1.36	30	Pass
	46	-4.041	-3.989	-1.00		
802.11n HT40	38	-4.654	-4.302	-1.46	30	Pass
	46	-4.386	-4.663	-1.51		
802.11ac80	42	-7.232	-7.124	-4.17	30	Pass

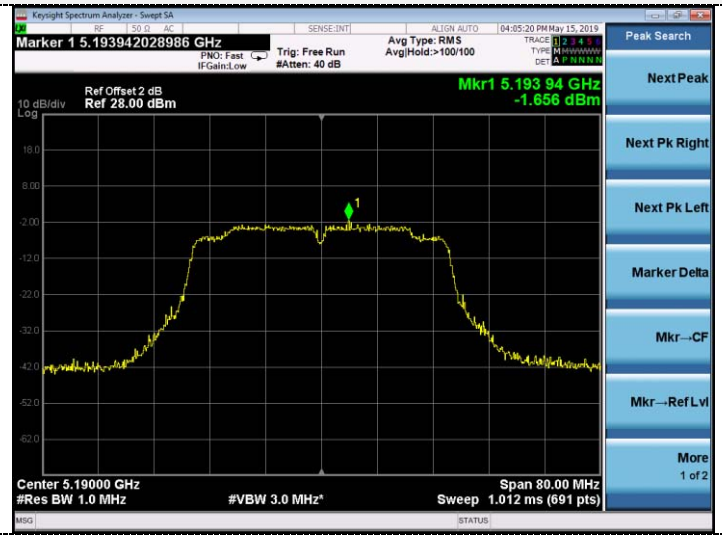
Note:
1. The test results including the cable lose.

Antenna 1

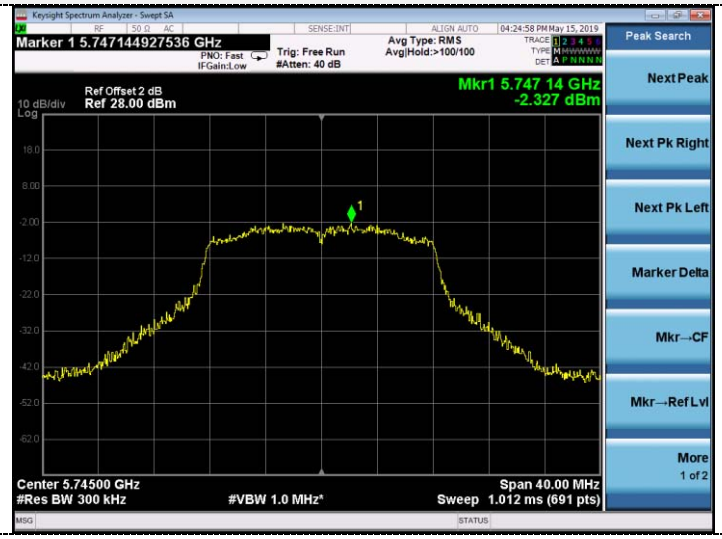
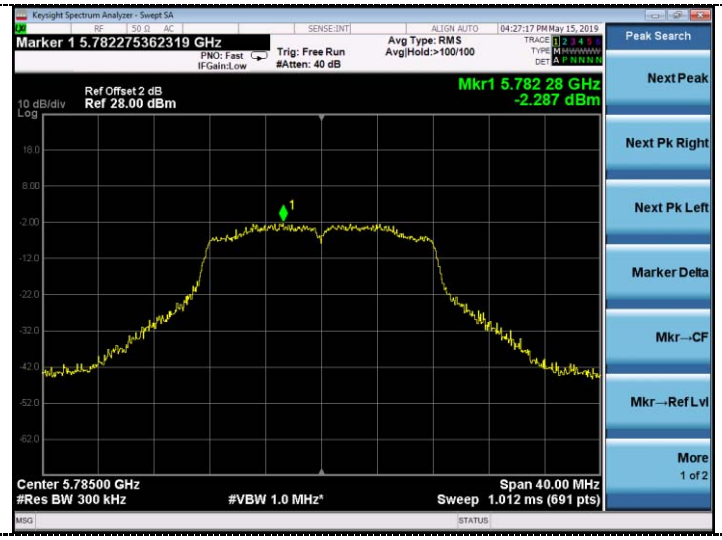
5150-5250MHz:

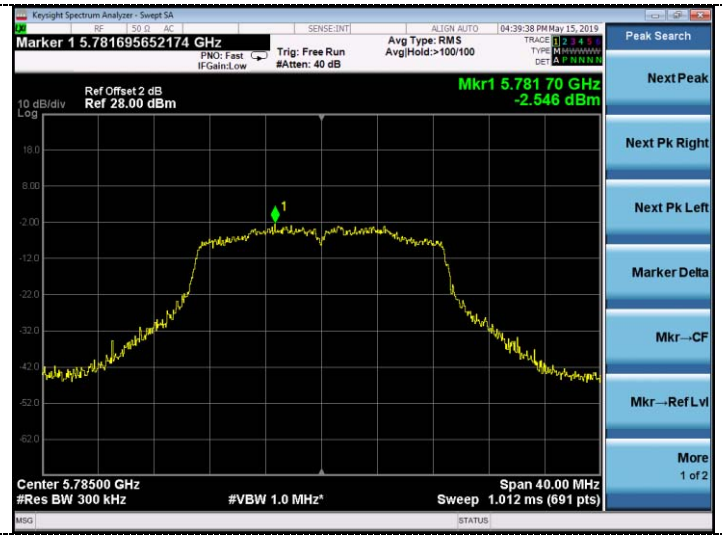
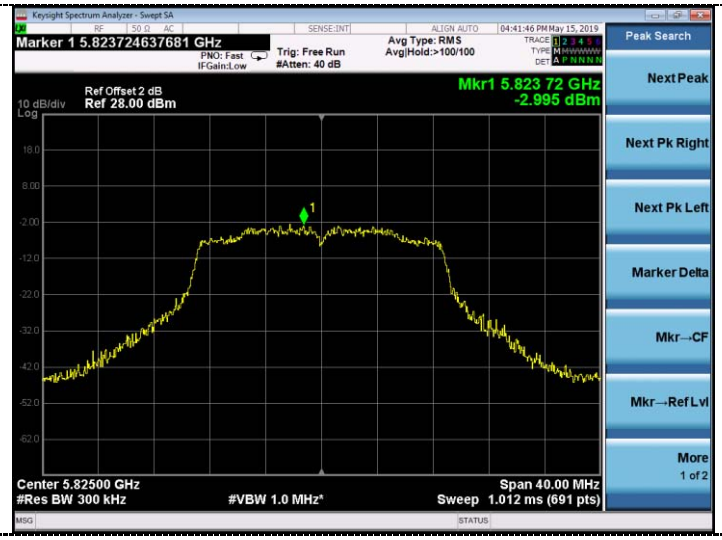
802.11a	802.11n HT20
	
CH 36	*CH 36*
	
CH 40	*CH 40*
	
CH 48	*CH 48*

802.11ac20	802.11n HT40
	
CH 36	CH 38
	
CH 40	CH 46
	
CH 48	CH 48

802.11ac40	802.11ac80
	
CH 38	*CH 149*
	
CH 46	*CH 157*

5725-5850MHz:

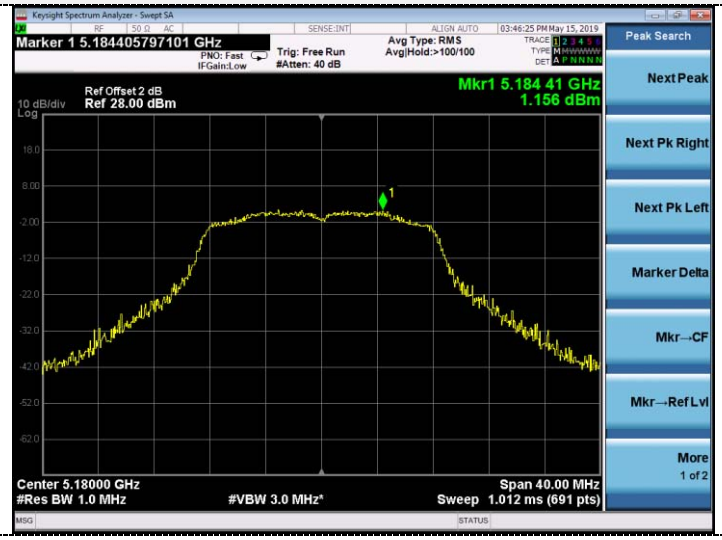
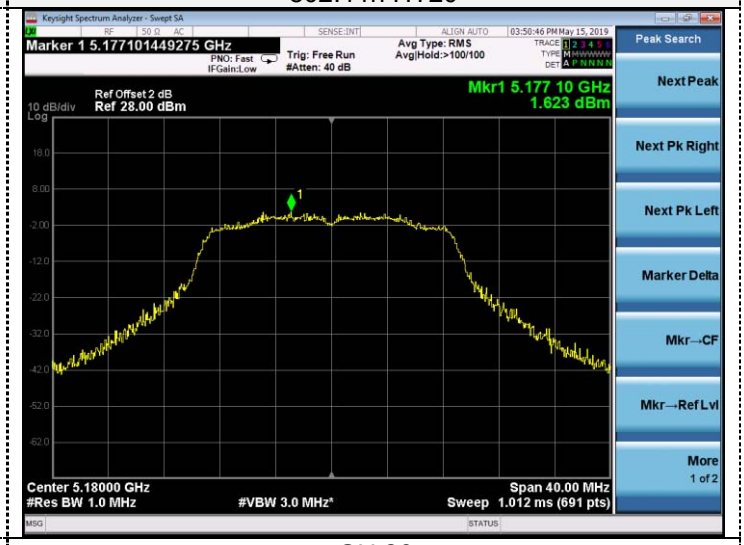
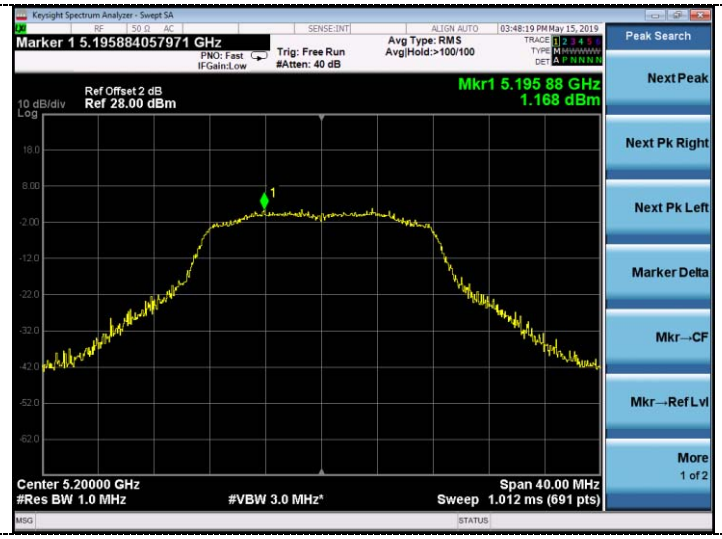
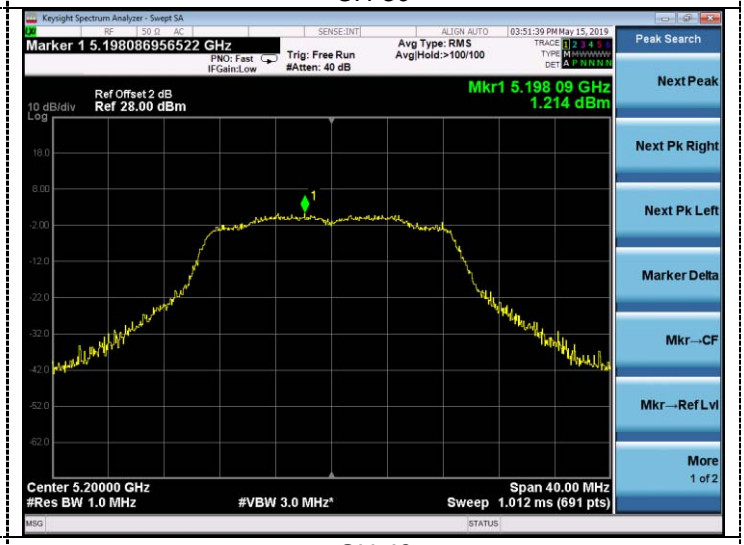
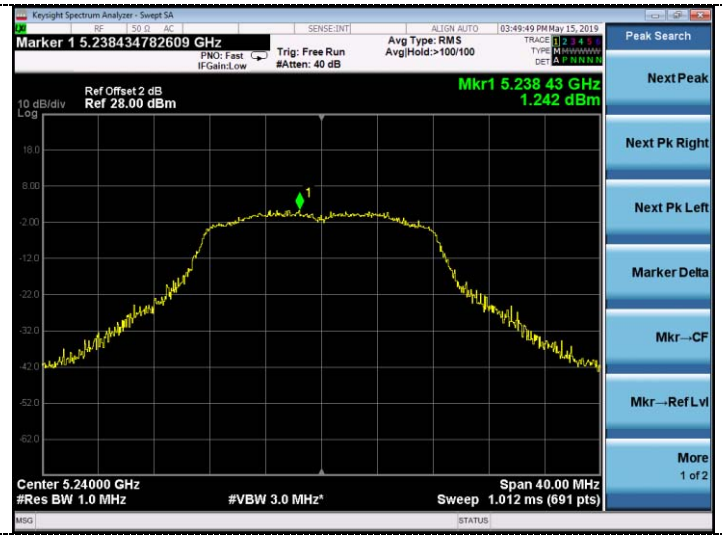
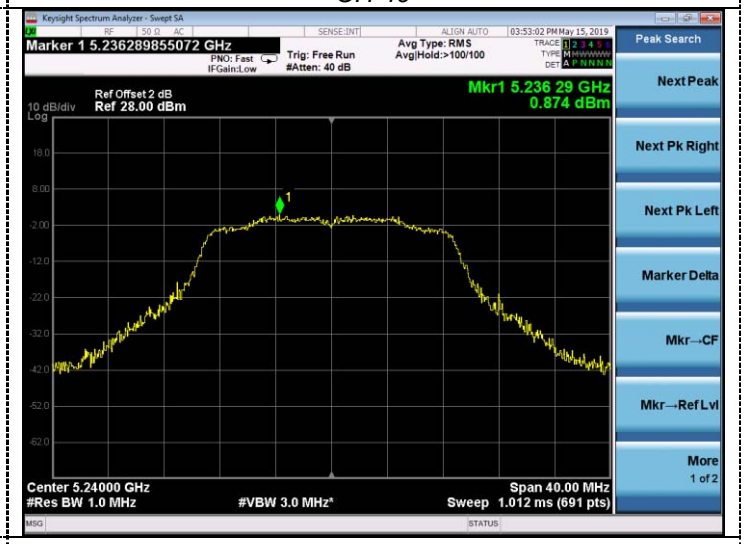
802.11a	802.11n HT20
	
CH 149	*CH 149*
	
CH 157	*CH 157*
	
CH 165	*CH 165*

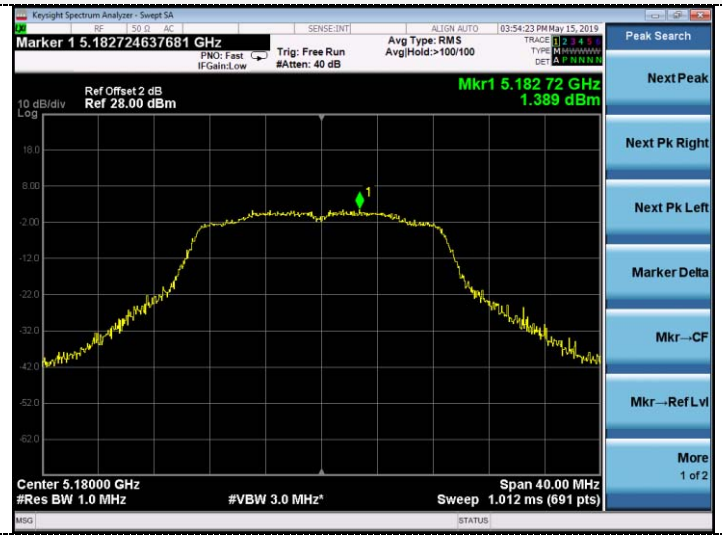
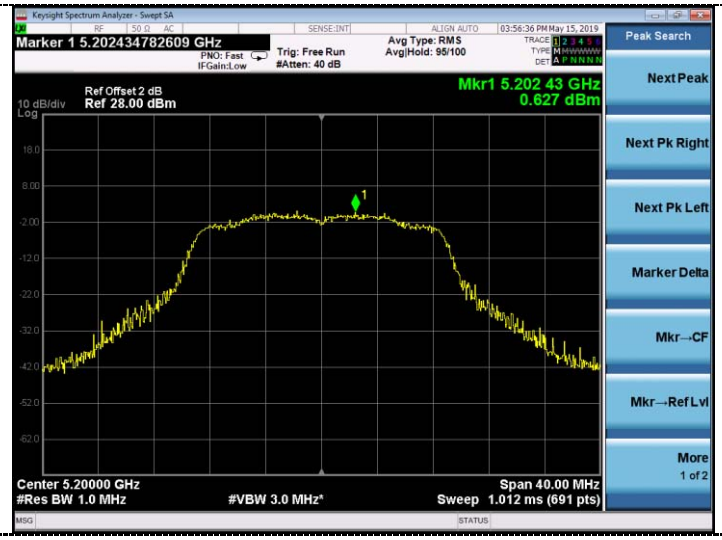
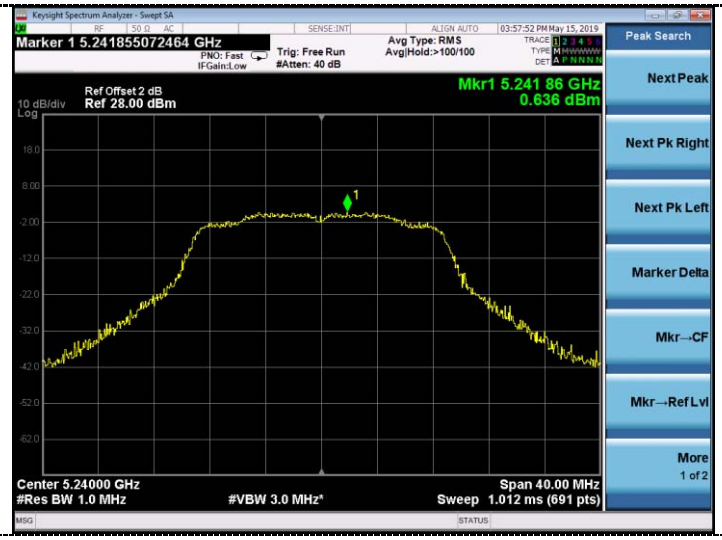
802.11ac20	802.11n HT40
	
CH 149	CH 151
	
CH 157	CH 159
	
CH 165	CH 48

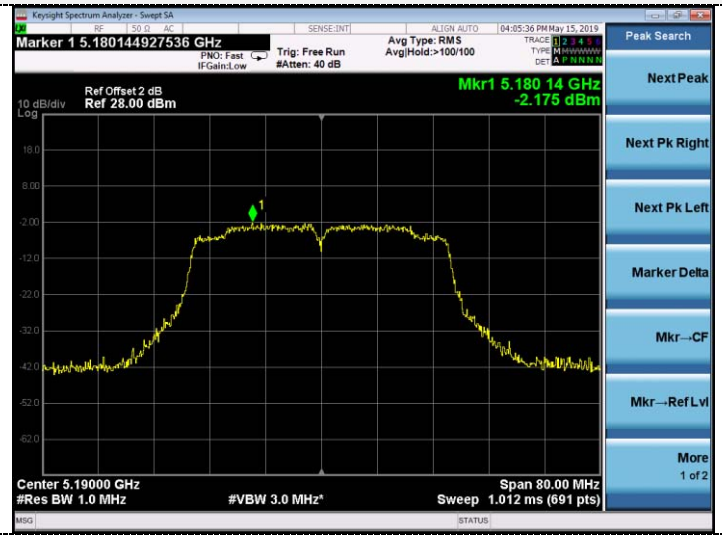
802.11ac40	802.11ac80
	
CH 151	CH 155
	
CH 159	

Antenna 2

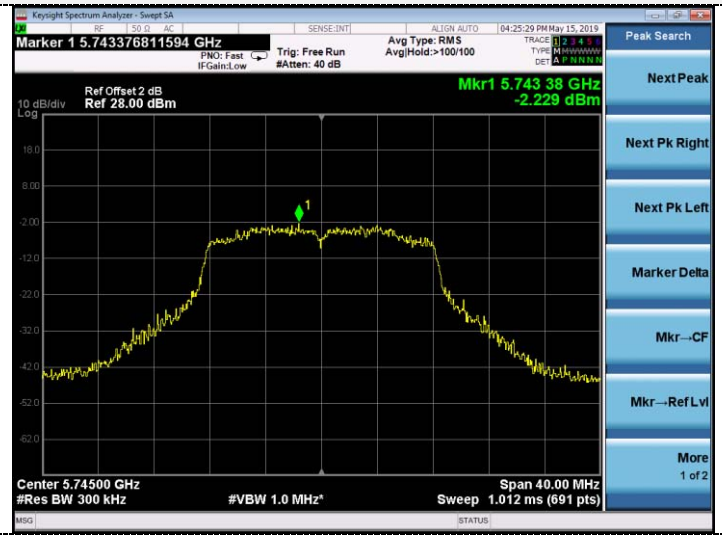
5150-5250MHz:

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

802.11ac20	802.11n HT40
	
CH 36	CH 38
	
CH 40	CH 46
	
CH 48	CH 48

802.11ac40	802.11ac80
	
CH 38	*CH 149*
	
CH 46	*CH 157*

5725-5850MHz:

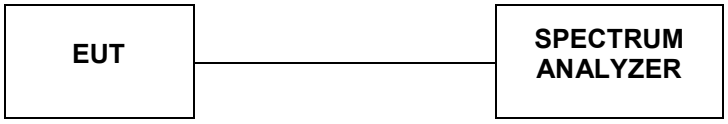
802.11a	802.11n HT20
	
CH 149	*CH 149*
	
CH 157	*CH 157*
	
CH 165	*CH 165*

802.11ac20	802.11n HT40
	
CH 149	CH 151
	
CH 157	CH 159
	
CH 165	

802.11ac40	802.11ac80
	
CH 151	CH 155
	
CH 159	

4.6. 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

According to KDB789033 D02 General UNII Test Procedures New Rules v01 for one of the following procedures may be used for section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

a. Set RBW = 100 kHz.
b. Set the video bandwidth (VBW) ≥ 3 × RBW
c. Detector = Peak.
d. Trace mode = max hold.
e. Sweep = auto couple.
f. Allow the trace to stabilize
g. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

LIMIT

For Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz

TEST RESULTS

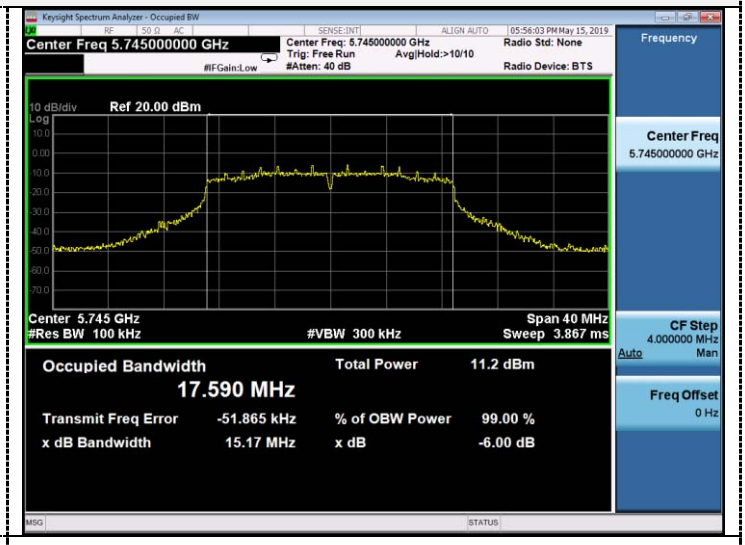
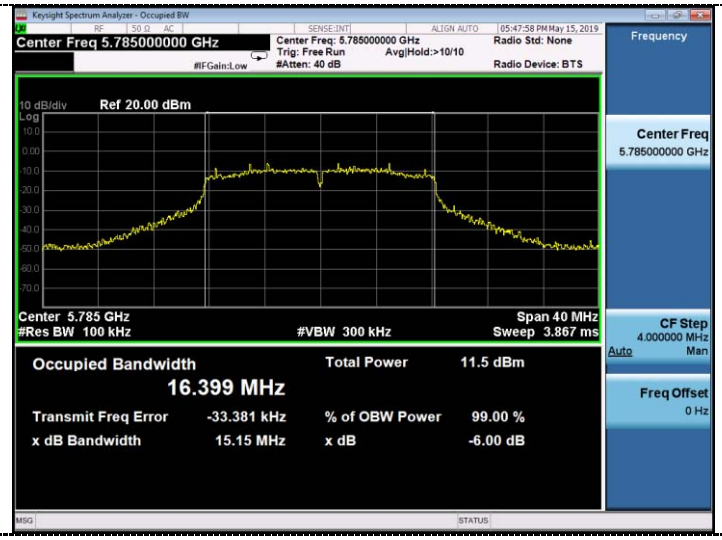
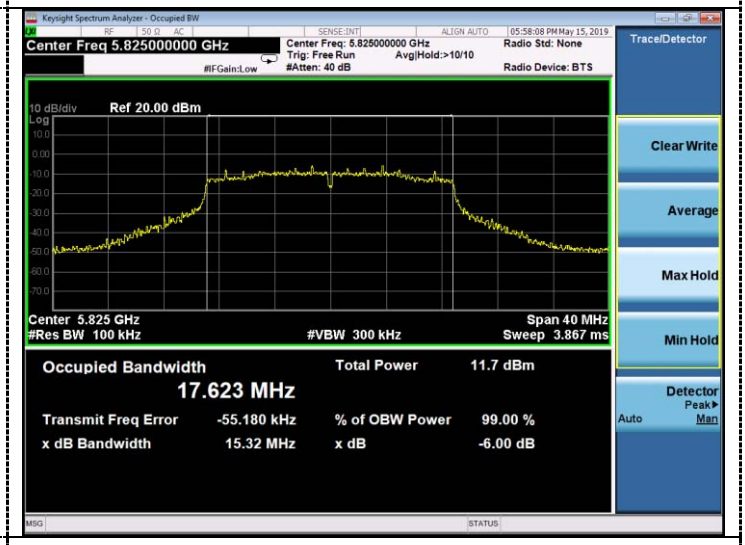
Antenna 1

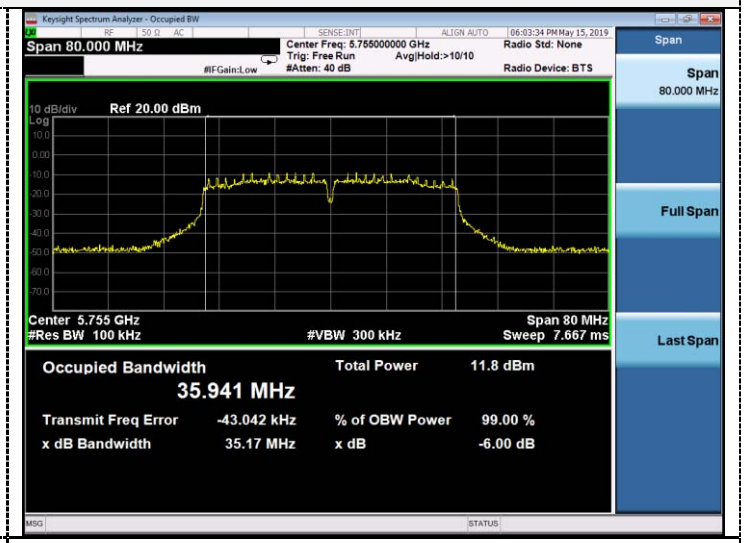
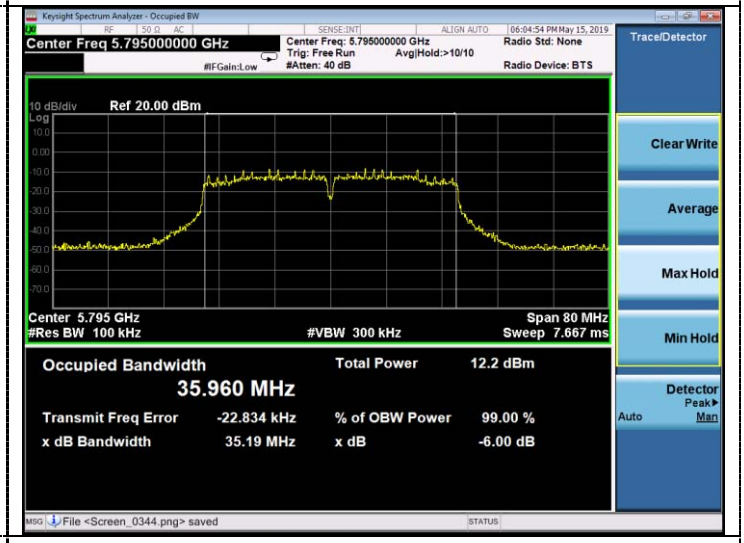
Type	Channel	99%Bandwidth (MHz)	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11a	149	16.388	15.17	≥500	Pass
	157	16.399	15.15		
	165	16.394	15.09		
802.11nHT20	149	17.590	15.17	≥500	Pass
	157	17.589	15.16		
	165	17.623	15.32		
802.11ac20	149	17.595	15.11	≥500	Pass
	157	17.590	15.09		
	165	17.605	15.17		
802.11n40	151	35.941	35.17	≥500	Pass
	159	35.96	35.19		
802.11ac40	151	35.97	35.05	≥500	Pass
	159	35.912	35.21		
802.11ac80	155	78.258	75.35	≥500	Pass

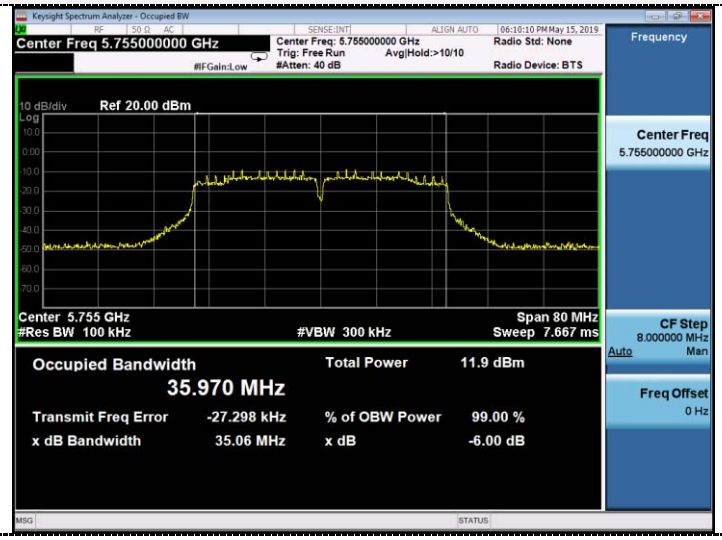
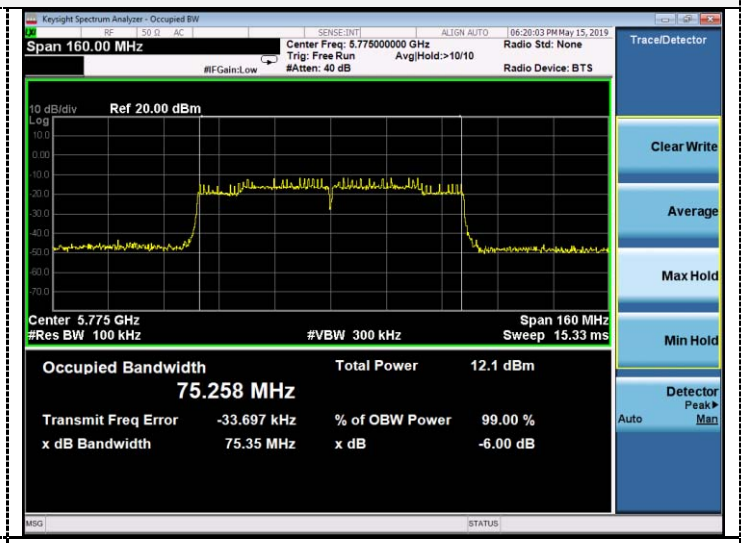
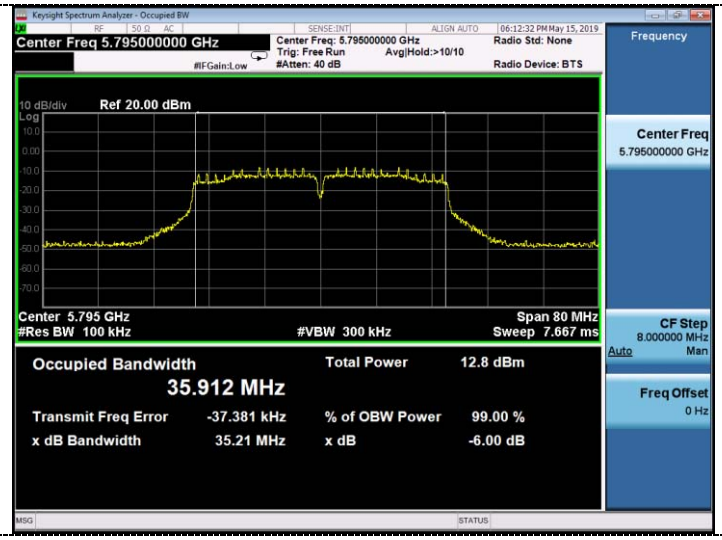
Antenna 2

Type	Channel	99%Bandwidth (MHz)	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11a	149	16.394	14.08	≥500	Pass
	157	16.395	13.56		
	165	16.384	15.15		
802.11nHT20	149	17.589	15.34	≥500	Pass
	157	17.612	15.35		
	165	17.613	15.13		
802.11ac20	149	17.616	15.38	≥500	Pass
	157	17.586	15.13		
	165	17.595	15.43		
802.11n40	151	35.959	33.96	≥500	Pass
	159	35.907	35.13		
802.11ac40	151	35.946	35.20	≥500	Pass
	159	35.911	35.12		
802.11ac80	155	75.254	75.38	≥500	Pass

Antenna 1

802.11a	*802.11n HT20*
	
CH149	*CH149*
	
CH157	*CH157*
	
CH165	*CH165*

802.11ac20	*802.11n HT40*
	
CH149	*CH151*
	
CH157	*CH159*
	
CH165	*CH165*

802.11ac40	802.11ac80
	
CH151	CH155
	
CH159	