

TEST REPORT

Reference No...... : WTD18S07118403-2W
FCC ID..... : N3ITFDG2684
Applicant..... : Teamforce Company Limited
Address..... : 6FL, No. 190, Section 2, Chung Hsin Road, Hsin Tien District, New Taipei City 23146, Taiwan
Manufacturer..... : Teamforce Company Limited
Address..... : 6FL, No. 190, Section 2, Chung Hsin Road, Hsin Tien District, New Taipei City 23146, Taiwan
Product..... : DMG MORI serviceCAM
Model(s)..... : DG-2684
Standards..... : FCC CFR47 Part 15 C Section 15.407:2018
Date of Receipt sample.... : 2018-07-18
Date of Test..... : 2018-07-19 to 2018-10-18
Date of Issue..... : 2018-10-19
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.
The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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1 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation, the certification number is 4243.01) of USA, CNAS (China National Accreditation Service for Conformity Assessment, the registration number is L3110) of China. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), ISED Canada (Innovation, Science and Economic Development Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

1.1 Test Facility

A. Accreditations for Conformity Assessment (International)

Country/Region	Scope Covered By	Scope	Note	
USA	ISO/IEC 17025	FCC ID \ SDoC(VOC/DOC)	1	
Canada		IC ID \ VOC	2	
Japan		MIC-T \ MIC-R	-	
Europe		EMCD \ RED	-	
Taiwan		NCC	-	
Hong Kong		OFCA	-	
Australia		RCM	-	
India		WPC	-	
Thailand		NTC	-	
Singapore		IDA	-	
Note:				
1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.				
2. ISED Canada Registration No.: 7760A				

B.TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of ...	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd.	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD18S07118403-2W	2018-07-18	2018-07-19 to 2018-10-18	2018-10-19	original	-	Valid

4 General Information

4.1 General Description of E.U.T

Product:	DMG MORI serviceCAM
Model(s):	DG-2684
Operation Frequency:	IEEE 802.11a/ n(HT20/40)/ac(VHT20/40/80): 5180MHz to 5240MHz IEEE 802.11a/ n(HT20/40)/ac(VHT20/40/80): 5745MHz to 5825MHz
Antenna Gain:	2.0 dBi
Type of modulation:	IEEE for 802.11a: OFDM(BPSK/QPSK/16QAM/64QAM) IEEE for 802.11n : OFDM(BPSK/QPSK/16QAM/64QAM) IEEE for 802.11ac : OFDM (BPSK/QPSK/16QAM/64QAM/256QAM)

4.2 Details of E.U.T

Ratings:	DC 3.7V, 2600mAh, 9.62Wh by Battery; Charging: DC 5V by Charging station or DC 5V by SWITCH-MODE POWER SUPPLY SWITCH-MODE POWER SUPPLY: (Model: 6A-104WP05B, Output: DC 5V, 2.0A, Input: 100-240V~, 50-60Hz, 0.3A, Manufacturer: ENG ELECTRONIC COMPANY)
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4.3 Channel List

U-NII-1 (5.15-5.25GHz)		U-NII-3 (5.725-5.85GHz)	
channel	Frequency(MHz)	channel	Frequency(MHz)
36	5180	149	5745
38	5190	151	5755
40	5200	153	5765
42	5210	155	5775
44	5220	157	5785
46	5230	159	5795
48	5240	161	5805
		165	5825

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11a/n(HT20)/ac(VHT20):

channel	Frequency(MHz)	channel	Frequency(MHz)
36	5180	149	5745

40	5200	157	5785
48	5240	165	5825

For 802.11 n(HT40)/ac(VHT40):

channel	Frequency(MHz)	channel	Frequency(MHz)
38	5190	151	5755
46	5230	159	5795

For 802.11 ac(VHT80):

channel	Frequency(MHz)	channel	Frequency(MHz)
42	5210	155	5775

Test Mode Description:

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Transmitting duty cycle is no less 98%.

Test Items	Mode	Data Rate	Channel	TX/RX
Radiated Emissions	802.11a	6 Mbps	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11ac(VHT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT80)	MCS0	U-NII-1 42 U-NII-3 155	TX
Duty Cycle	802.11a	6 Mbps	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX

	802.11n(HT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11ac(VHT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT80)	MCS0	U-NII-1 42 U-NII-3 155	TX
Band Edge	802.11a	6 Mbps	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11ac(VHT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT80)	MCS0	U-NII-1 42 U-NII-3 155	TX
6dB Bandwidth	802.11a	6 Mbps	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11ac(VHT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT80)	MCS0	U-NII-1 42 U-NII-3 155	TX
26dB Bandwidth and 99% Occupied Bandwidth	802.11a	6 Mbps	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11ac(VHT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT80)	MCS0	U-NII-1 42 U-NII-3 155	TX
Conducted Output Power	802.11a	6 Mbps	U-NII-1 36/40/48 U-NII-3 149/155/165	TX

	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11ac(VHT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT80)	MCS0	U-NII-1 42 U-NII-3 155	TX
Power Spectral Density	802.11a	6 Mbps	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11n(HT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11ac(VHT40)	MCS0	U-NII-1 38/46 U-NII-3 151/159	TX
	802.11ac(VHT80)	MCS0	U-NII-1 42 U-NII-3 155	TX
Frequency Stability	Un-modulation	/	U-NII-1 36/40/48 U-NII-3 149/155/165	TX

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions Test Site						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	2018-09-15	2019-09-14
2.	LISN	SCHWARZBECK	NSLK 8128	8128-259	2018-09-15	2019-09-14
3.	Limiter	CYBERTEK	EM5010	261115-001-0024	2018-09-15	2019-09-14
4.	Cable	Laplace	RF300	-	2018-07-18	2019-07-17
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2018-04-20	2019-04-19
2	Broad-band Horn Antenna(1-18GHz)	SCHWARZBECK	BBHA 9120 D	667	2018-05-18	2019-05-17
3	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2018-04-07	2019-04-06
4	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2018-04-07	2019-04-06
5	Spectrum Analyzer	R&S	FSP40	100501	2017-10-20	2018-10-19
6	Broad-band Horn Antenna(18-40GHz)	SCHWARZBECK	BBHA 9170	335	2017-10-25	2018-10-24
7	Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	100472	2017-10-25	2018-10-24
8	Cable	Top	18-40GHz	-	2017-10-25	2018-10-24
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2018-04-20	2019-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2018-04-19	2019-04-18
3	Active Loop Antenna	Com-power	AL-130R	10160007	2018-04-17	2019-04-16
4	Amplifier	ANRITSU	MH648A	M43381	2018-04-20	2019-04-19
5	Cable	HUBER+SUHNER	CBL2	525178	2018-04-20	2019-04-19
6	Coaxial Cable (below 1GHz)	Top	TYPE16 (13M)	-	2018-04-20	2019-04-19
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date

1.	Spectrum Analyzer	R&S	FSP40	100501	2017-10-20	2018-10-19
2.	Coaxial Cable	Top	10Hz-30GHz	-	2018-09-12	2019-09-11
3	Antenna Connector*	Realacc	45RSm	-	2018-09-12	2019-09-11
4	DC Block	Gwave	GDCB-3G-N-SMA	140307001	2018-09-12	2019-09-11

“*”: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (30M~1000MHz)
	± 5.47 dB (1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (A mains 150KHz~30MHz)

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

6 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207(a)	PASS
Radiated Emissions	15.407(a) 15.205(a) 15.209(a)	PASS
Duty Cycle	KDB 789033	PASS
6dB Bandwidth	15.407(a)	PASS
26 dB Emission Bandwidth & 99% Occupied Bandwidth	15.407(a)	PASS
Maximum Conducted Output Power	15.407(a)	PASS
Power Spectral Density	15.407(a)	PASS
Restricted bands around fundamental frequency	15.407(a)	PASS
Antenna Requirement	15.203	PASS
SAR Evaluation	1.1307(b)(1)	PASS
Note: Pass=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

7 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Class/Severity: Class B

Limit:

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

7.1 E.U.T. Operation

Operating Environment :

Temperature: 21.5 °C

Humidity: 51.9 % RH

Atmospheric Pressure: 101.2kPa

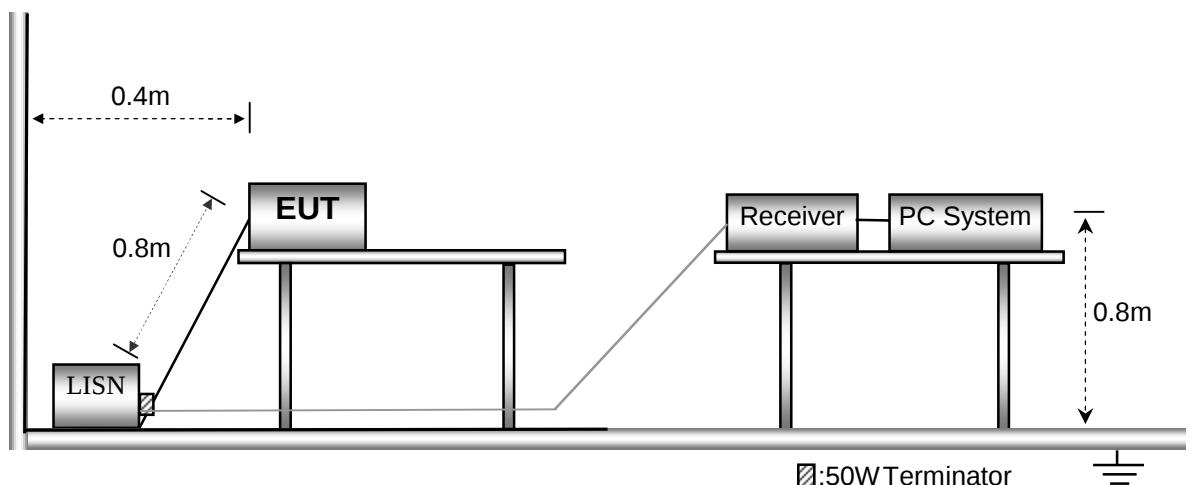
Test Voltage: AC 120V

EUT Operation :

The test was performed in Wi-Fi Transmitting mode, the worst test data (Wi-Fi a mode U-NII-1 low channel) were record in the report.

7.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



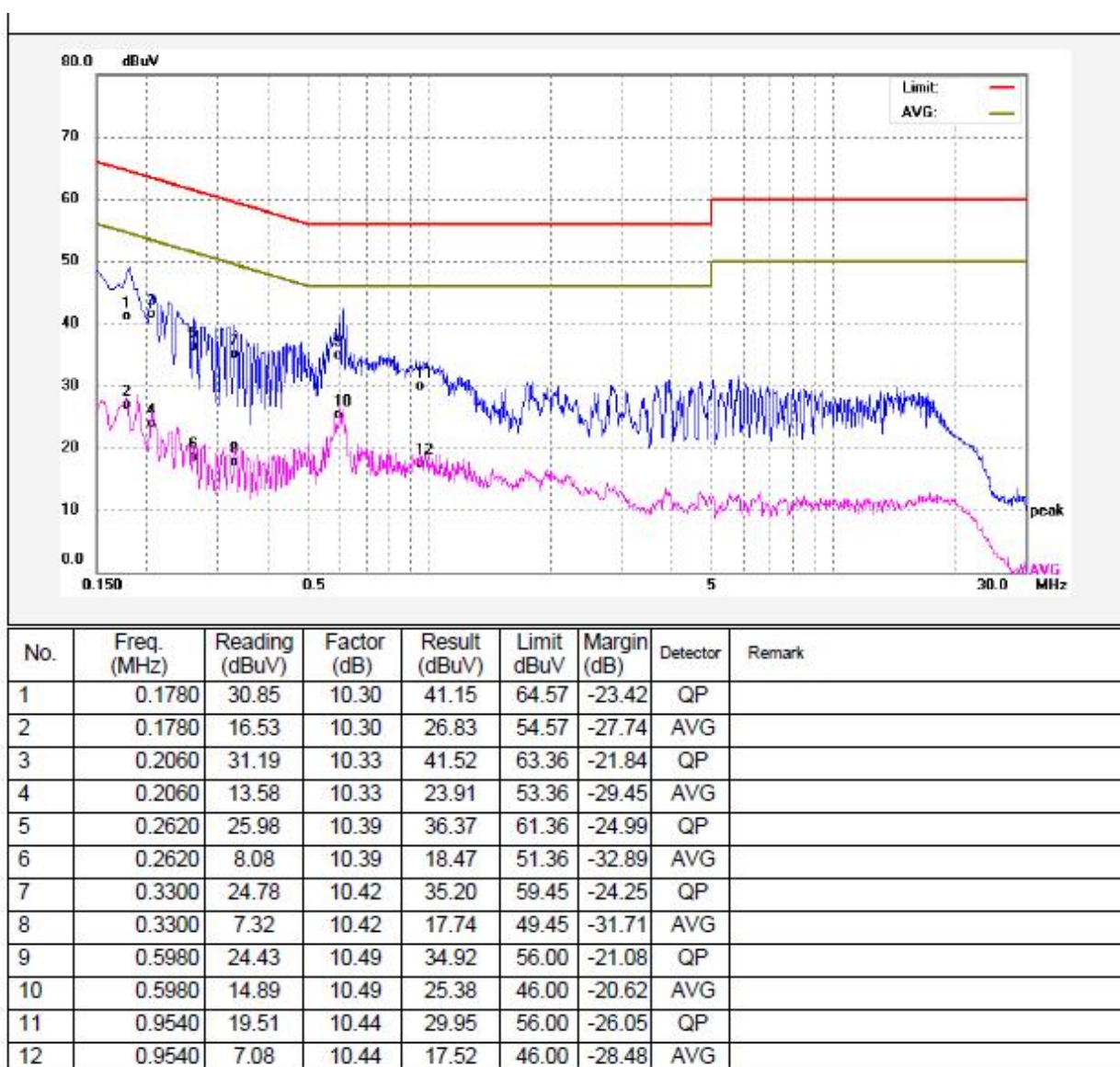
7.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

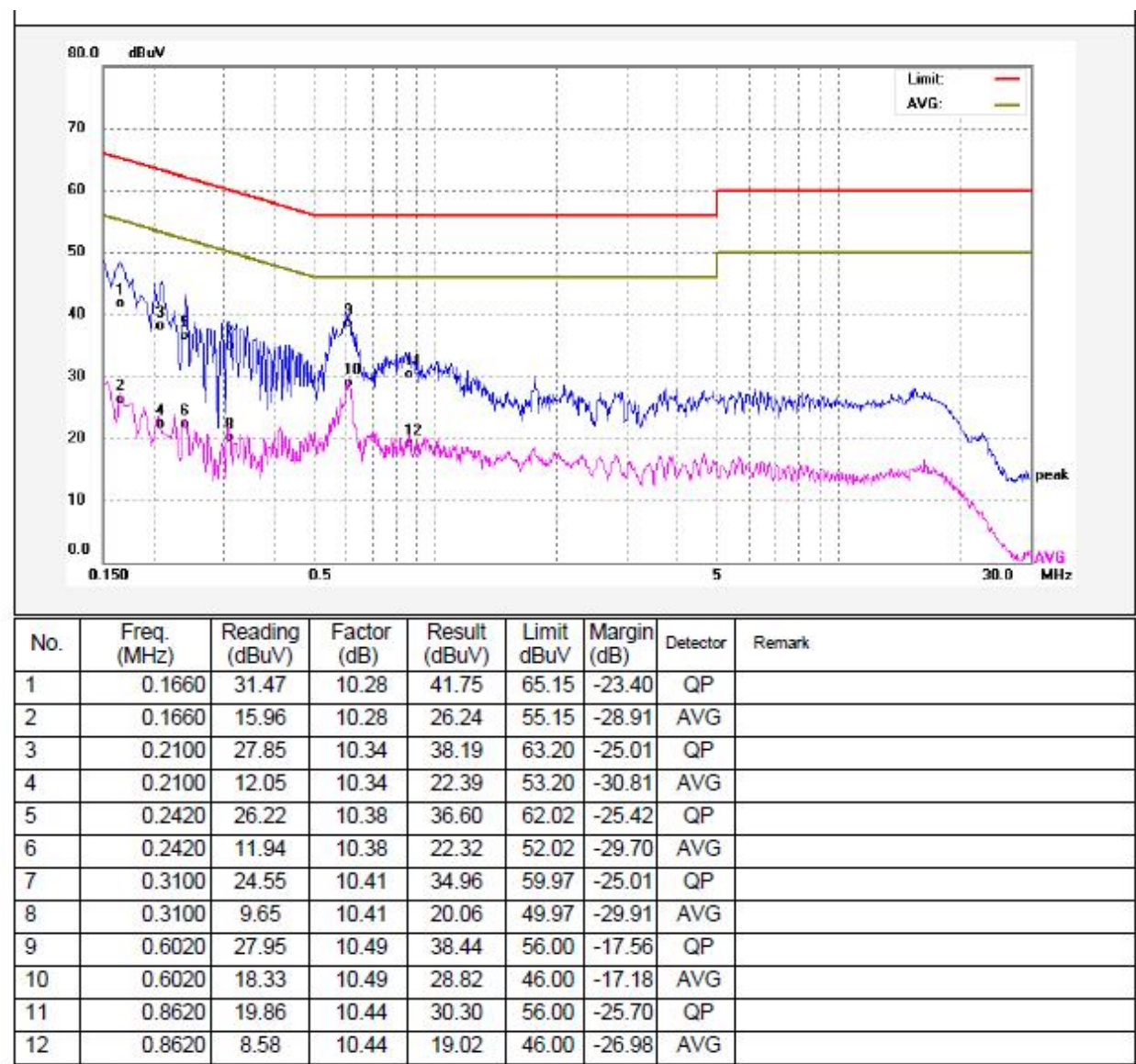
7.4 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

Live line:



Neutral line:



8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.407

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Distance	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

8.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

Test Voltage: DC 3.7V

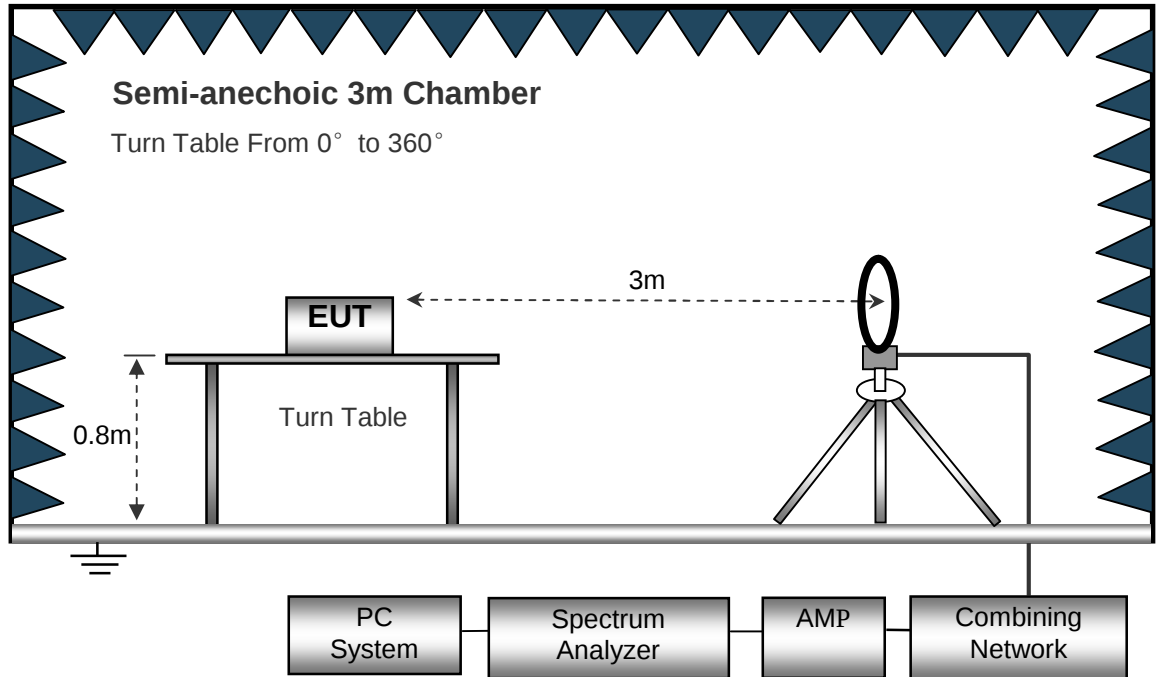
EUT Operation :

The test was performed in Wi-Fi Transmitting mode, the test data were shown in the report.

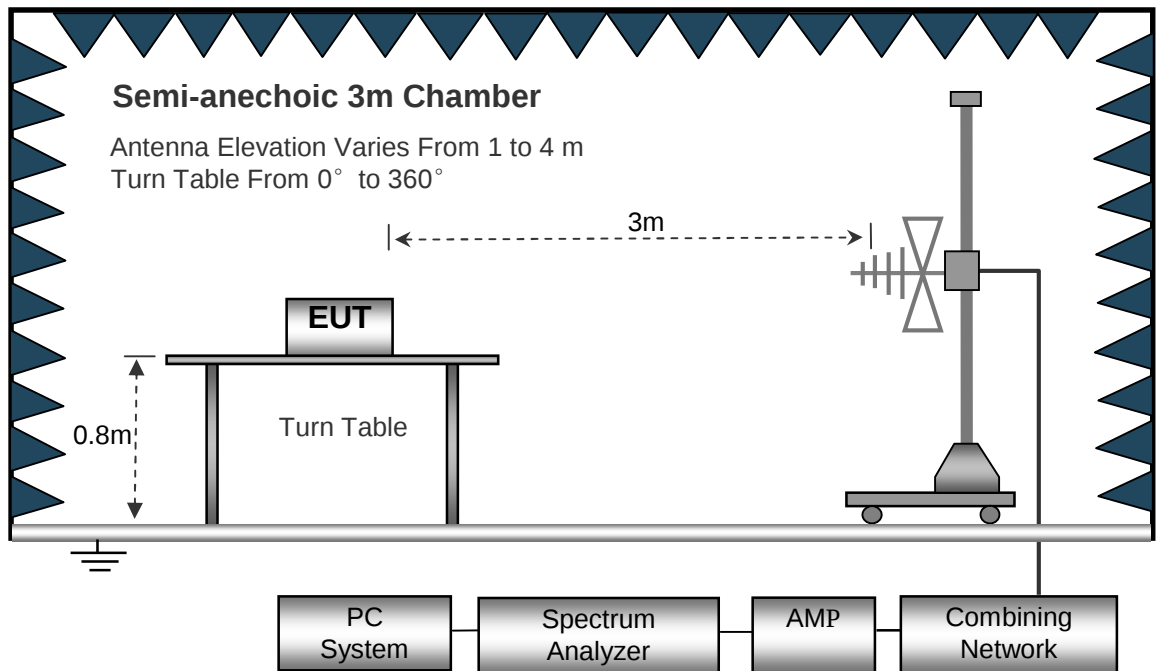
8.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

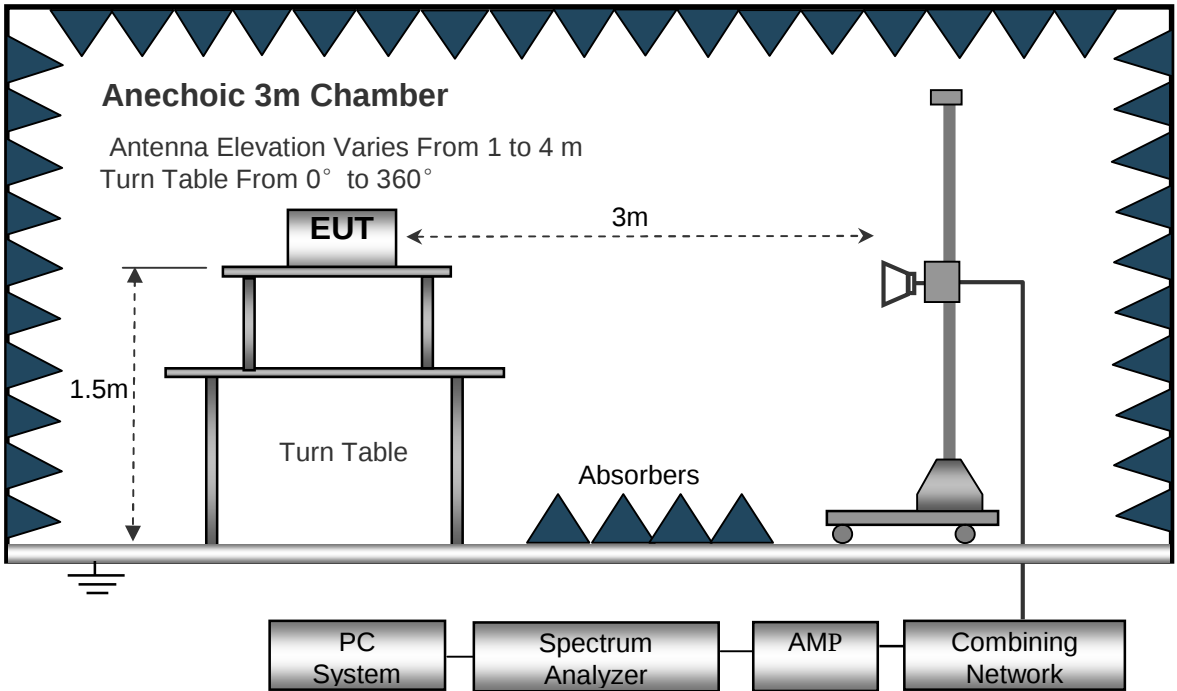
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed..... Auto
IF Bandwidth 10kHz
Video Bandwidth 10kHz
Resolution Bandwidth 10kHz

30MHz ~ 1GHz

Sweep Speed..... Auto
Detector..... PK
Resolution Bandwidth 100kHz
Video Bandwidth 300kHz

Above 1GHz

Sweep Speed..... Auto
Detector..... PK
Resolution Bandwidth 1MHz
Video Bandwidth 3MHz
Detector..... Ave.
Resolution Bandwidth 1MHz
Video Bandwidth 10Hz

8.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.
8. A 2.4GHz high-pass filter is used during radiated emissions above 1GHz measurement.
9. FCC Part15.33: For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph: If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

8.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

8.6 Summary of Test Results

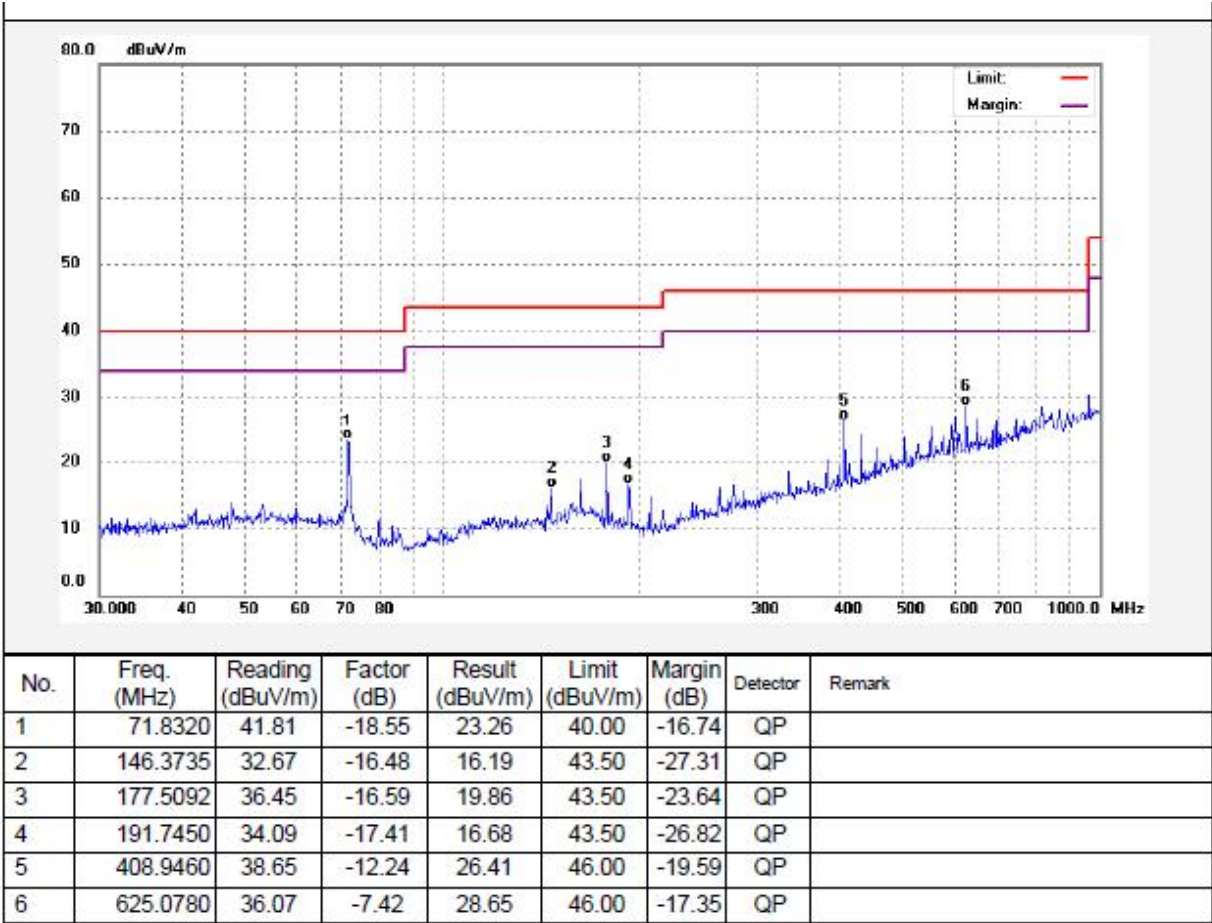
Test Frequency: 9 kHz ~ 30 MHz

The measurements were more than 20 dB below the limit and not reported.

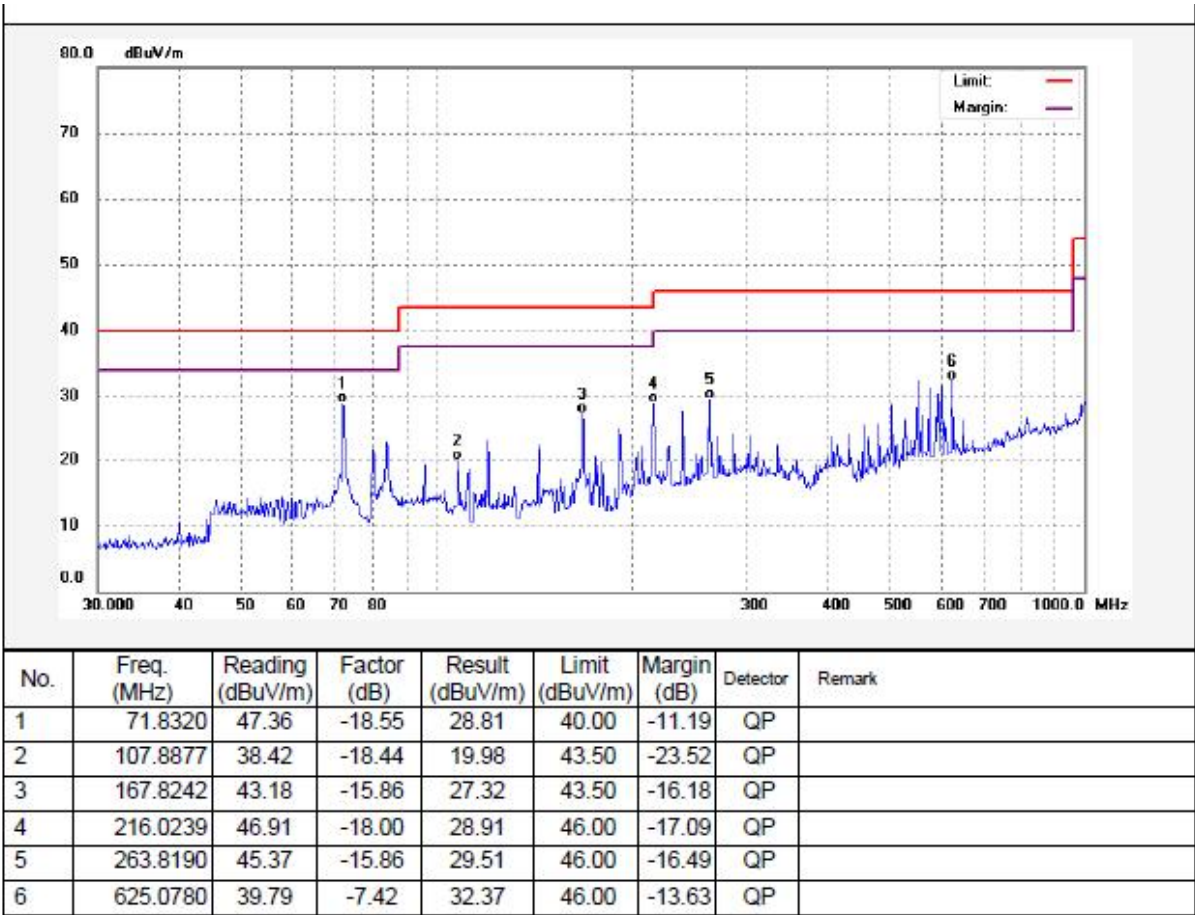
Test Frequency : 30MHz ~ 1GHz

Note: the worst test data (Wi-Fi a mode U-NII-1 low channel) were shown in the report.

Antenna Polarization: Vertical



Antenna Polarization: Horizontal



Test Frequency : 30MHz ~ 18GHz

Note: the worst test data (Wi-Fi a mode U-NII-1) were shown in the report

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11a U-NII-1: Low Channel 5180MHz									
4516.11	54.37	PK	31	1.3	H	-2.03	52.34	74.00	-21.66
4516.11	46.81	Ave	31	1.3	H	-2.03	44.78	54.00	-9.22
5131.52	52.65	PK	35	1.2	H	-1.02	51.63	74.00	-22.37
5131.52	46.17	Ave	35	1.2	H	-1.02	45.15	54.00	-8.85
10360.00	42.49	PK	165	1.7	H	5.33	47.82	74.00	-26.18
10360.00	37.88	Ave	165	1.7	H	5.33	43.21	54.00	-10.79
5354.56	43.61	PK	71	1.8	H	-1.21	42.40	74.00	-31.60
5354.56	37.94	Ave	71	1.8	H	-1.21	36.73	54.00	-17.27

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11a U-NII-1: Middle Channel 5200MHz									
4528.60	54.49	PK	231	1.8	H	-1.94	52.55	74.00	-21.45
4528.60	47.82	Ave	231	1.8	H	-1.94	45.88	54.00	-8.12
5148.51	51.86	PK	38	1.4	H	-1.06	50.80	74.00	-23.20
5148.51	46.73	Ave	38	1.4	H	-1.06	45.67	54.00	-8.33
10400.00	43.92	PK	191	1.9	H	5.21	49.13	74.00	-24.87
10400.00	38.09	Ave	191	1.9	H	5.21	43.30	54.00	-10.70
5377.33	45.04	PK	20	1.2	H	-1.37	43.67	74.00	-30.33
5377.33	37.28	Ave	20	1.2	H	-1.37	35.91	54.00	-18.09

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.407/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11a U-NII-1: High Channel 5240MHz									
4505.65	53.28	PK	80	1.4	H	-2.24	51.04	74.00	-22.96
4505.65	47.85	Ave	80	1.4	H	-2.24	45.61	54.00	-8.39
5112.76	51.71	PK	353	1.2	H	-1.09	50.62	74.00	-23.38
5112.76	46.27	Ave	353	1.2	H	-1.09	45.18	54.00	-8.82
10480.00	43.26	PK	346	1.9	H	5.14	48.40	74.00	-25.60
10480.00	38.51	Ave	346	1.9	H	5.14	43.65	54.00	-10.35
5371.51	45.46	PK	311	1.7	H	-1.38	44.08	74.00	-29.92
5371.51	37.04	Ave	311	1.7	H	-1.38	35.66	54.00	-18.34

Test Frequency: 18GHz~40GHz

The measurements were more than 20 dB below the limit and not reported.

9 Duty cycle

Test Requirement:	47 CFR Part 15C 15.407 and 789033 D02 General UNII Test Procedures New Rules v02r01 , Section (B)
Test Method:	ANSI C63.10: 2013
Test Limit:	N/A
Test Result:	PASS
Remark:	Only the worst case is recorded in the report.

9.1 Summary of Test Results

802.11a mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
36	100	100	100
149	100	100	100
802.11n(HT20) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
36	100	100	100
149	100	100	100
802.11n(HT40) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
38	100	100	100
151	100	100	100
802.11ac(VHT20) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
36	100	100	100
149	100	100	100
802.11ac(VHT40) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
38	100	100	100
151	100	100	100
802.11ac(VHT80) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
42	100	100	100
155	100	100	100

Test result plots shown as follows:

802.11a U-NII-1 Low channel



802.11n(HT20) U-NII-1 Low channel



802.11n(HT40) U-NII-1 Low channel



802.11ac(VHT20) U-NII-1 Low channel



802.11ac(VHT40) U-NII-1 Low channel



802.11ac(VHT80) U-NII-1 Low channel



802.11a U-NII-3 Low channel



802.11n(HT20) U-NII-3 Low channel



802.11n(HT40) U-NII-3 Low channel



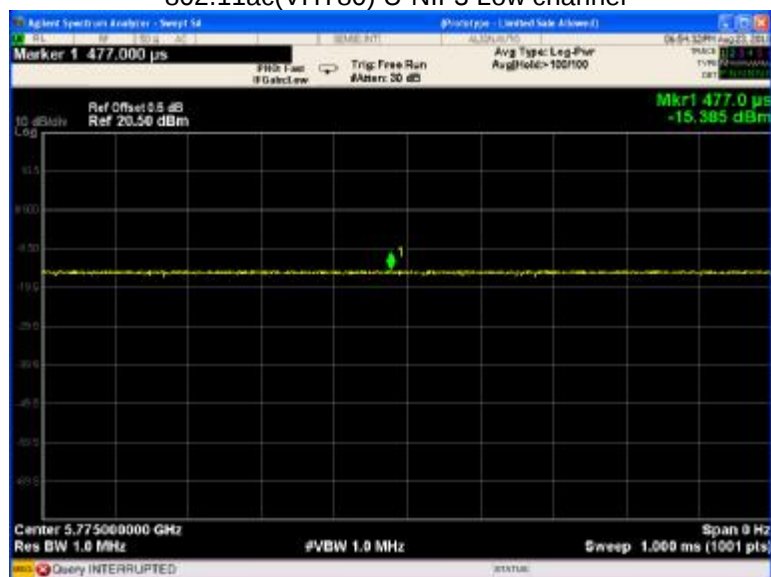
802.11ac(VHT20) U-NII-3 Low channel



802.11ac(VHT40) U-NII-3 Low channel



802.11ac(VHT80) U-NII-3 Low channel



10 Band Edge

Test Requirement:	FCC CFR47 Part 15 Section 15.407
Test Method:	ANSI C63.10 2013
Test Limit:	(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27dBm/MHz. (2) For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
Test Result:	PASS

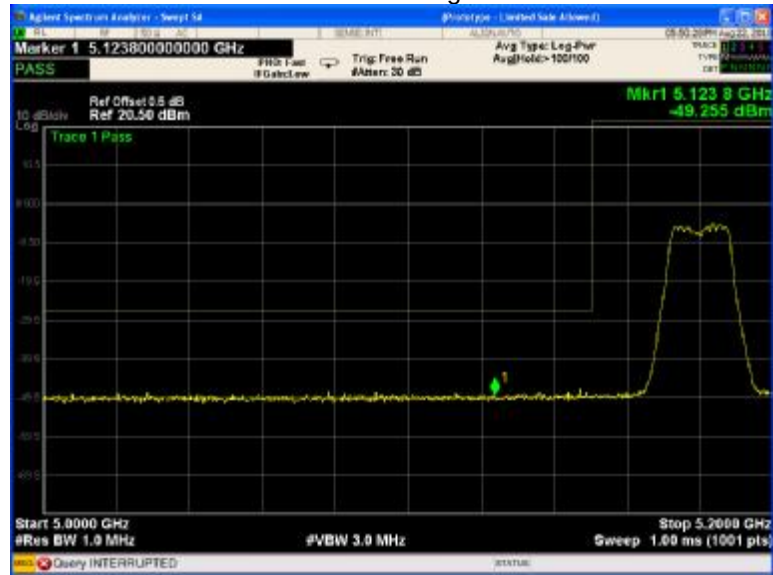
10.1 Test Produce

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

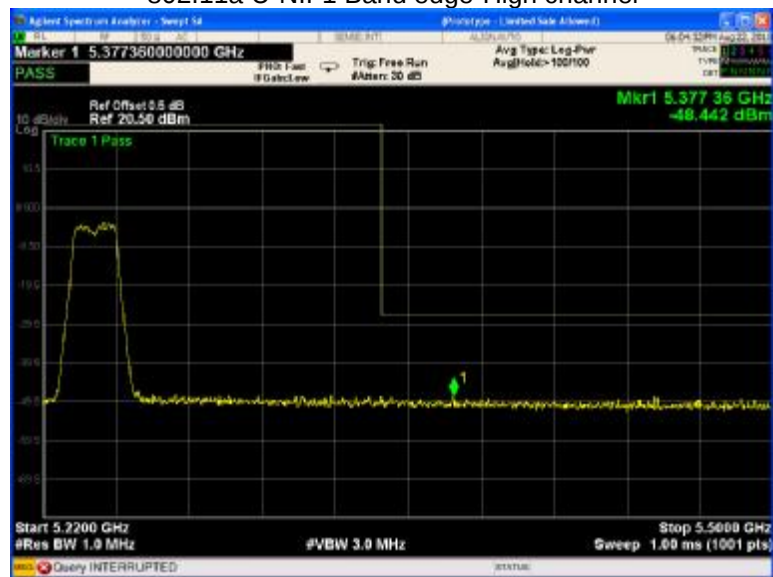
10.2 Test Result

Test result plots shown as follows:

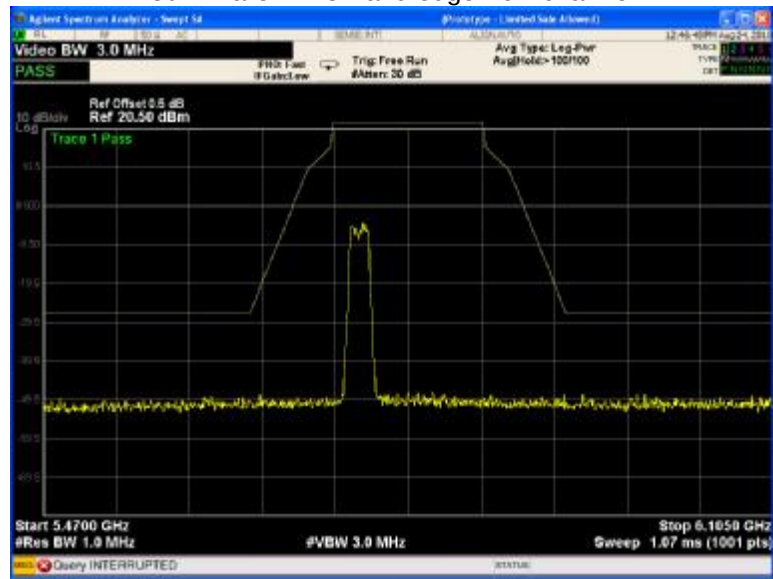
802.11a U-NII-1 Band edge-Low channel



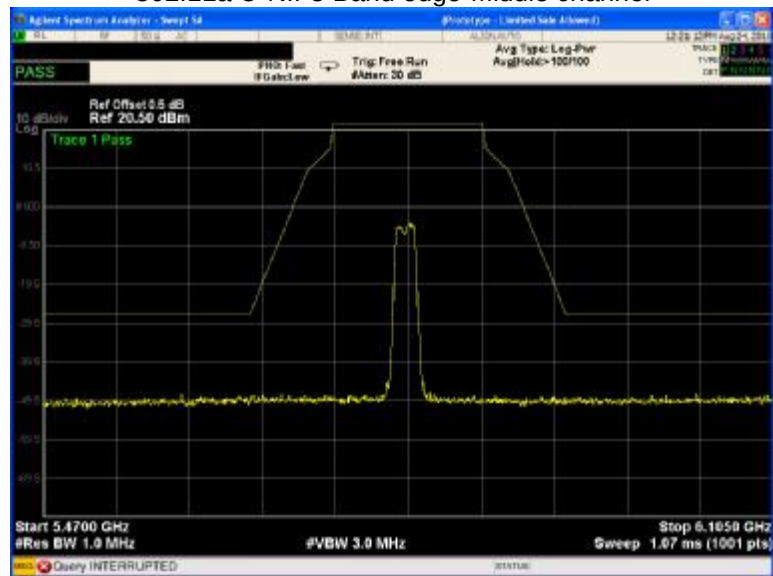
802.11a U-NII-1 Band edge-High channel



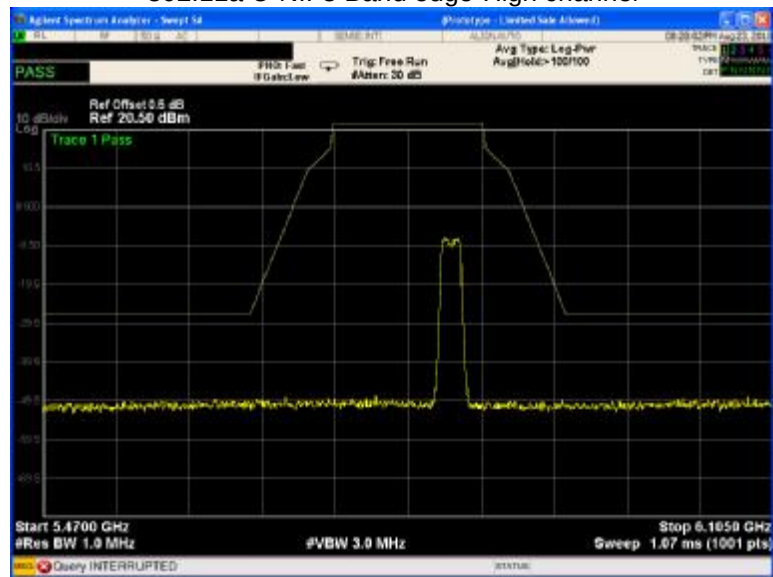
802.11a U-NII-3 Band edge-Low channel



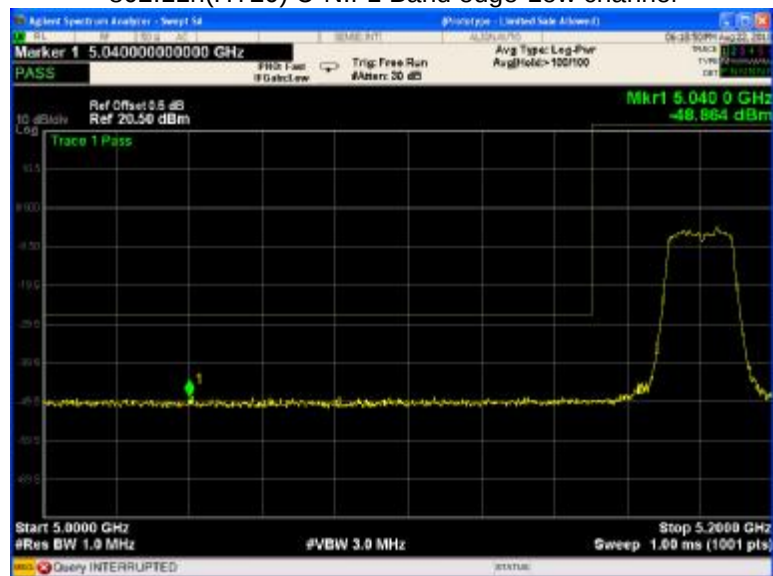
802.11a U-NII-3 Band edge-Middle channel



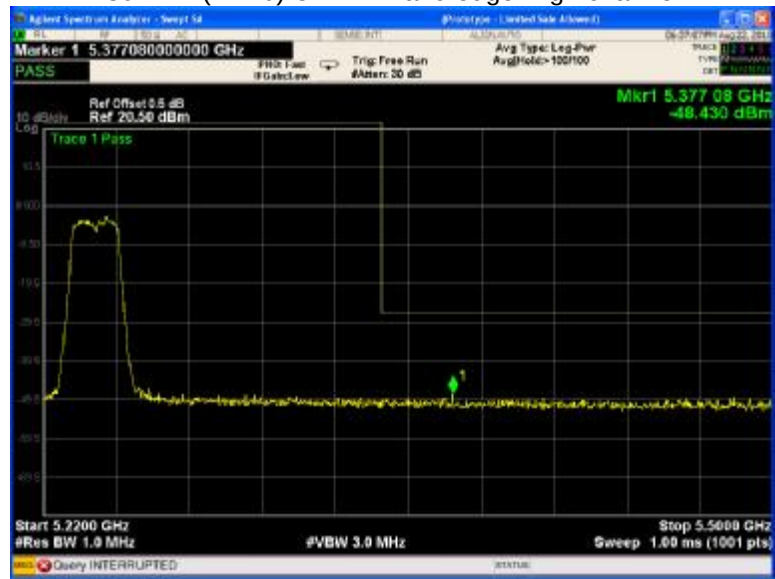
802.11a U-NII-3 Band edge-High channel



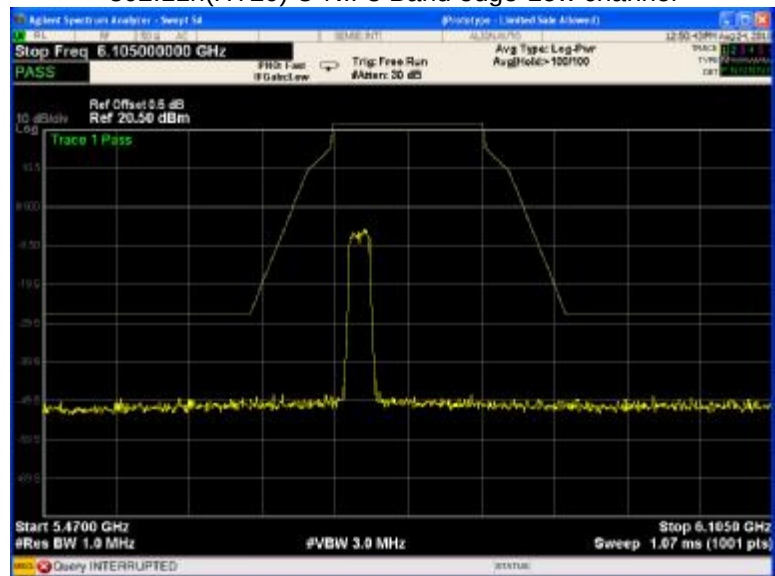
802.11n(HT20) U-NII-1 Band edge-Low channel



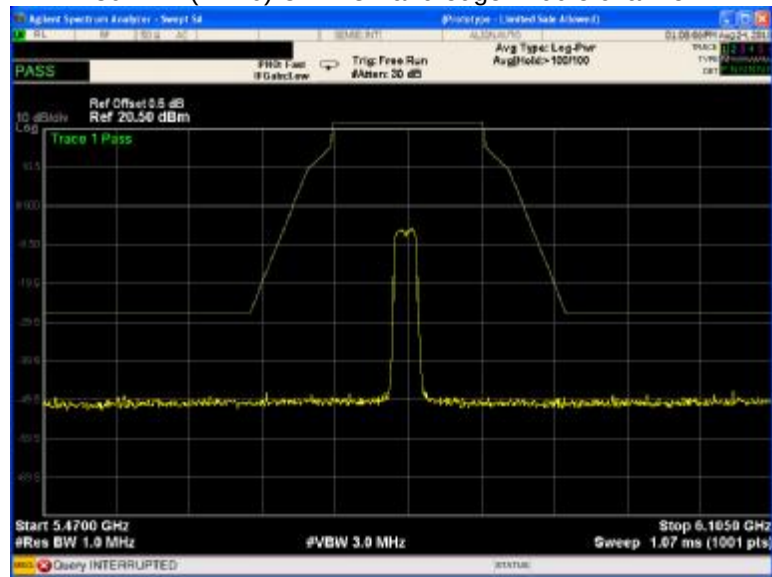
802.11n(HT20) U-NII-1 Band edge-High channel



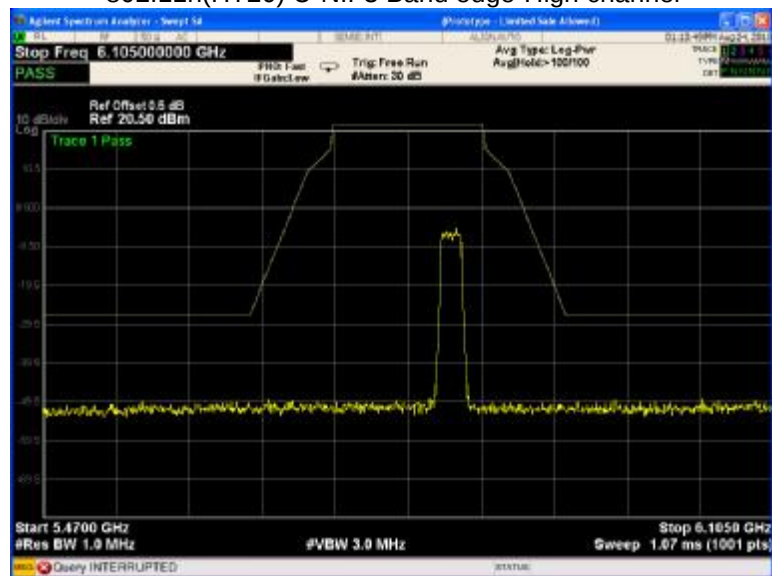
802.11n(HT20) U-NII-3 Band edge-Low channel



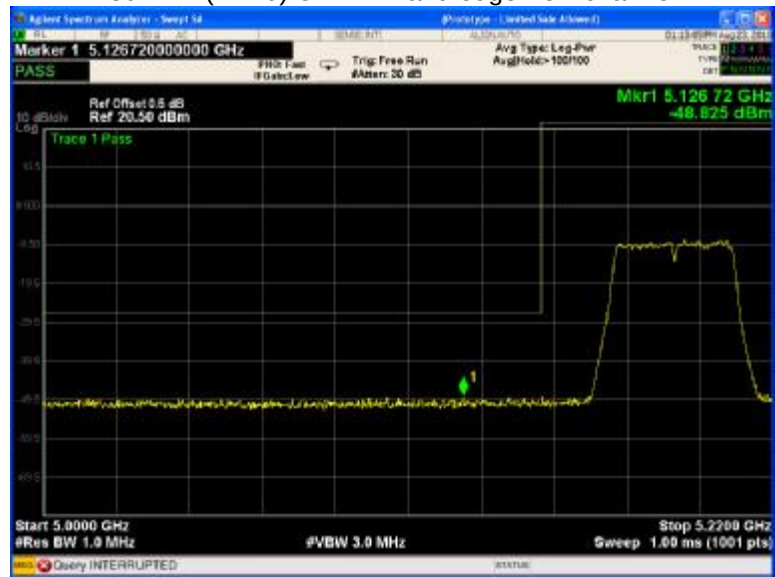
802.11n(HT20) U-NII-3 Band edge-Middle channel



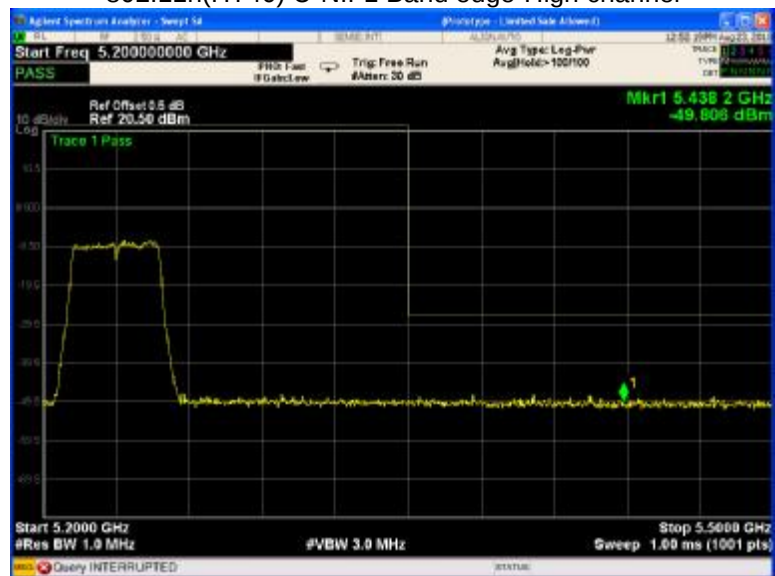
802.11n(HT20) U-NII-3 Band edge-High channel



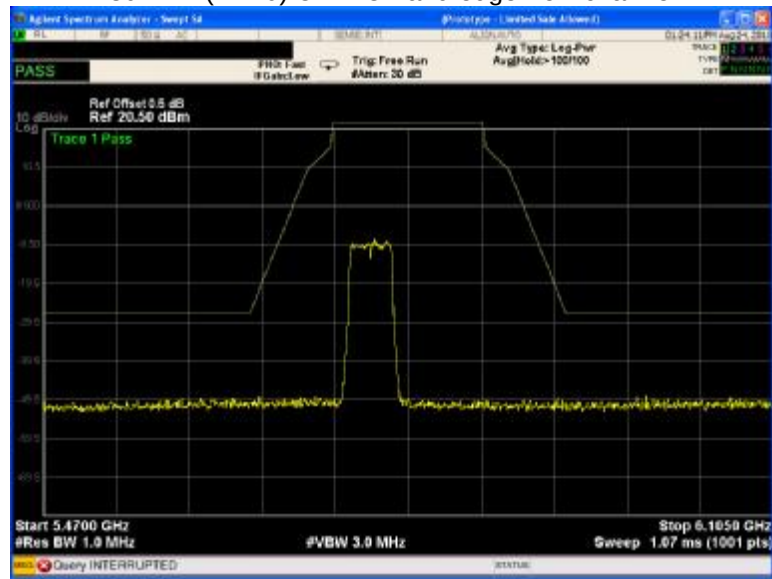
802.11n(HT40) U-NII-1 Band edge-Low channel



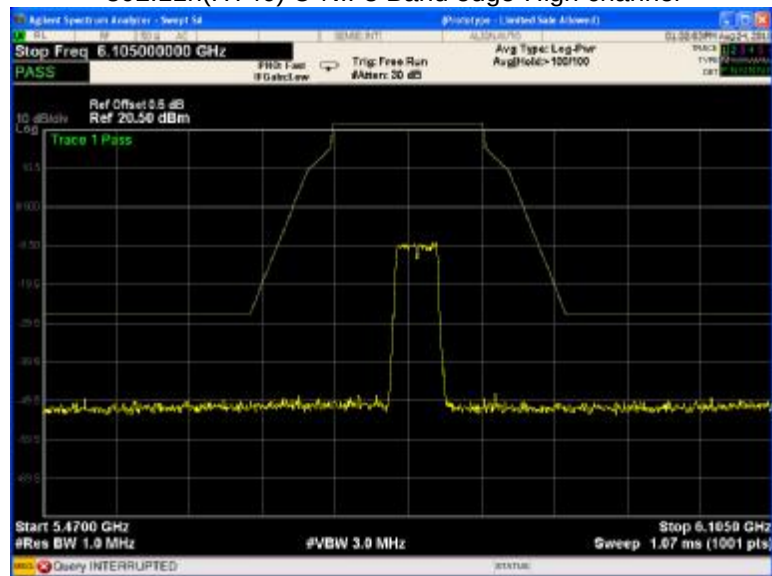
802.11n(HT40) U-NII-1 Band edge-High channel



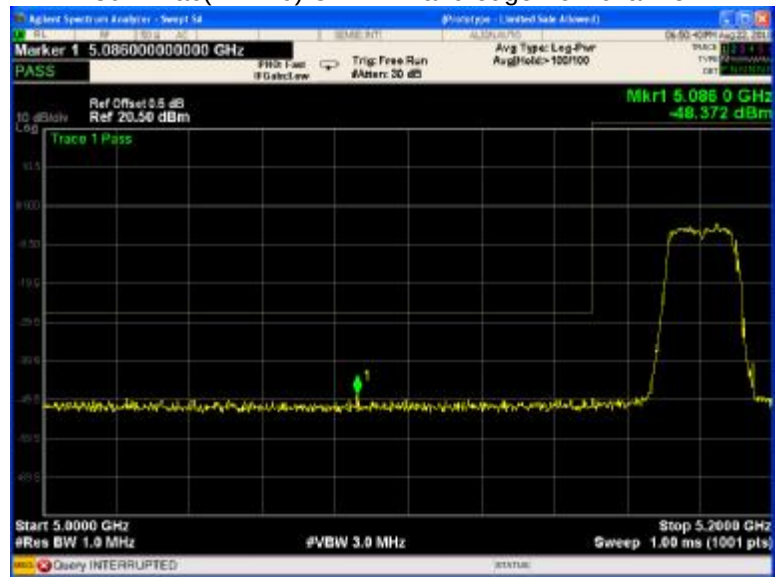
802.11n(HT40) U-NII-3 Band edge-Low channel



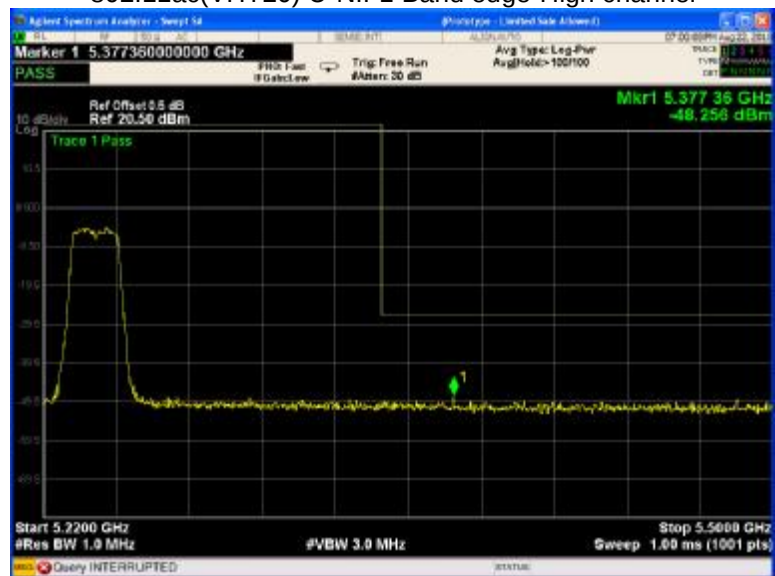
802.11n(HT40) U-NII-3 Band edge-High channel



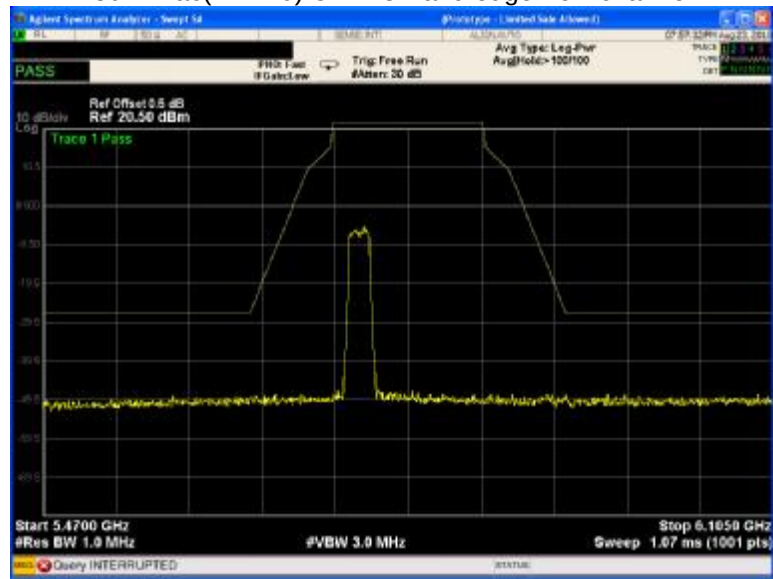
802.11ac(VHT20) U-NII-1 Band edge-Low channel



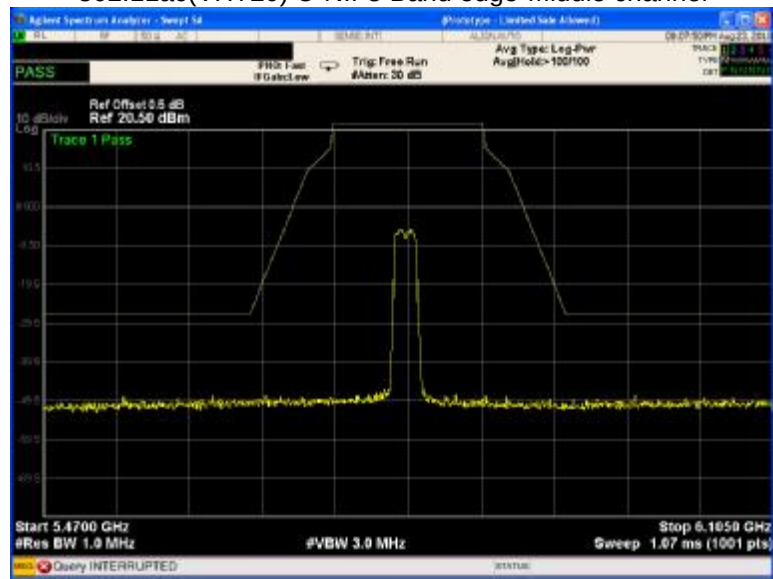
802.11ac(VHT20) U-NII-1 Band edge-High channel



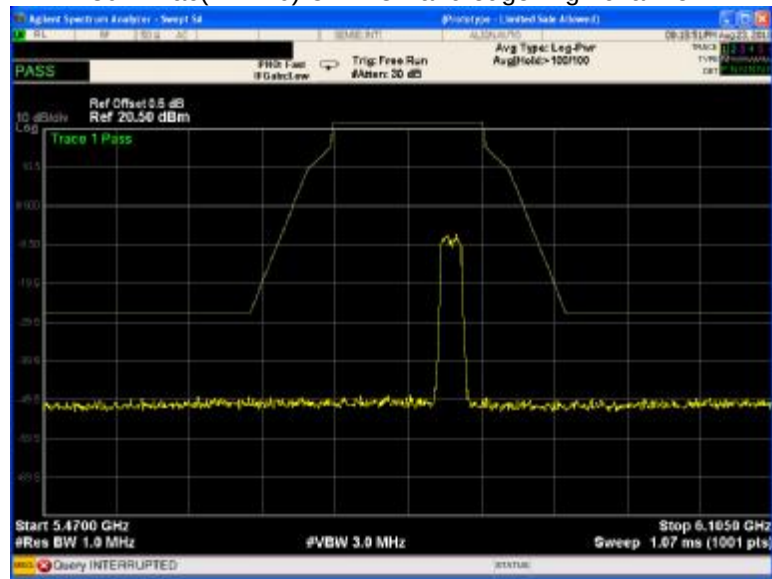
802.11ac(VHT20) U-NII-3 Band edge-Low channel



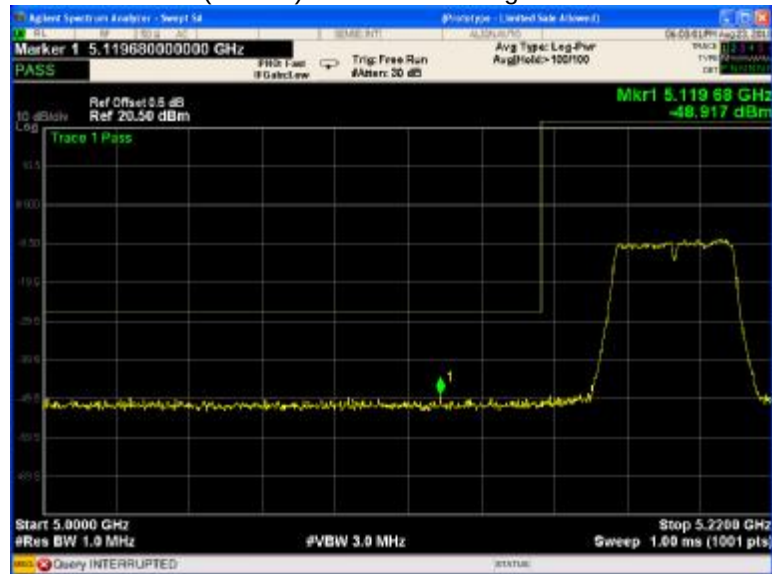
802.11ac(VHT20) U-NII-3 Band edge-Middle channel



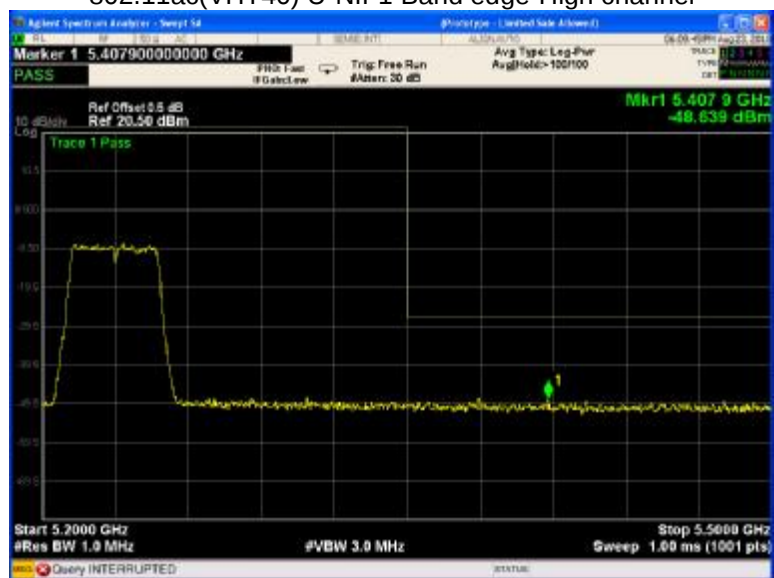
802.11ac(VHT20) U-NII-3 Band edge-High channel



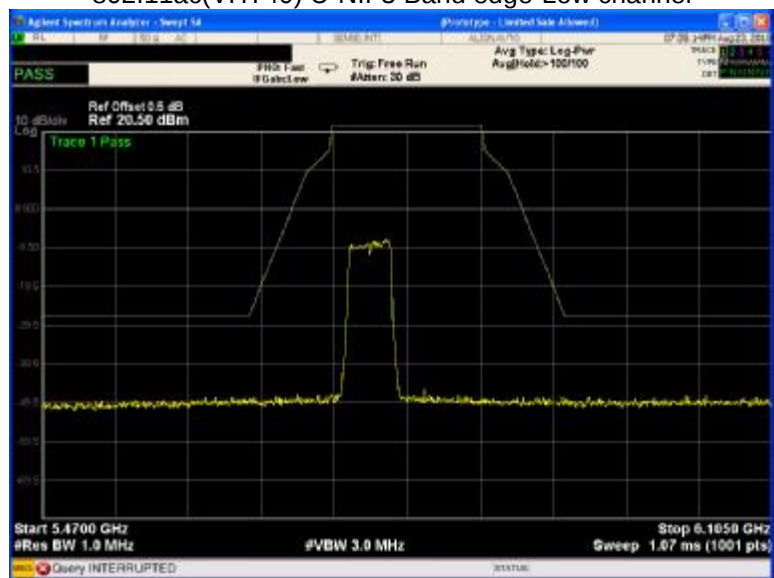
802.11ac(VHT40) U-NII-1 Band edge-Low channel



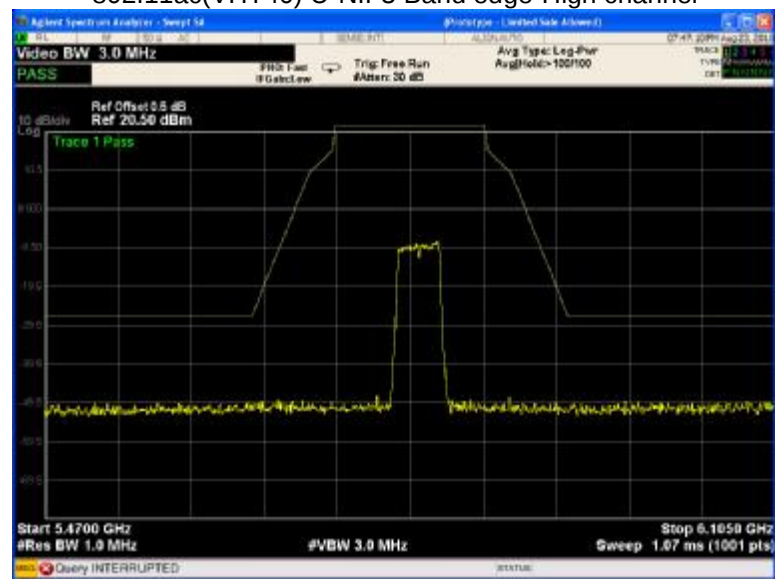
802.11ac(VHT40) U-NII-1 Band edge-High channel



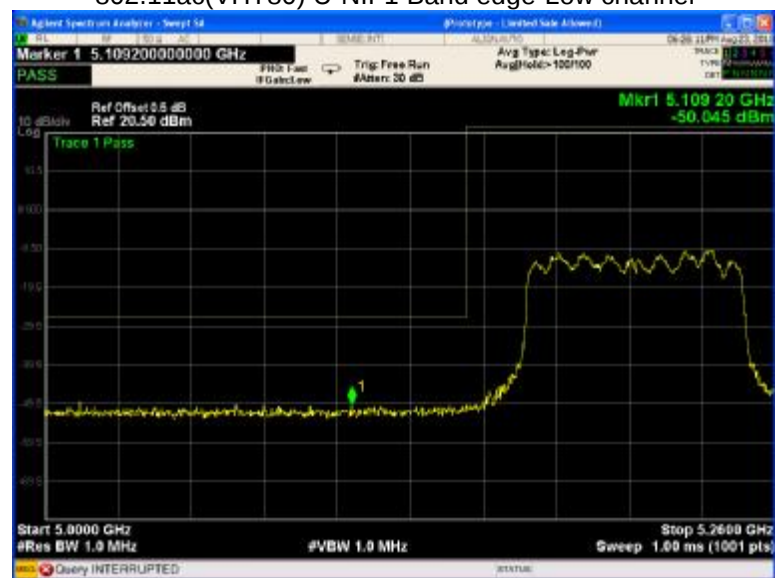
802.11ac(VHT40) U-NII-3 Band edge-Low channel



802.11ac(VHT40) U-NII-3 Band edge-High channel



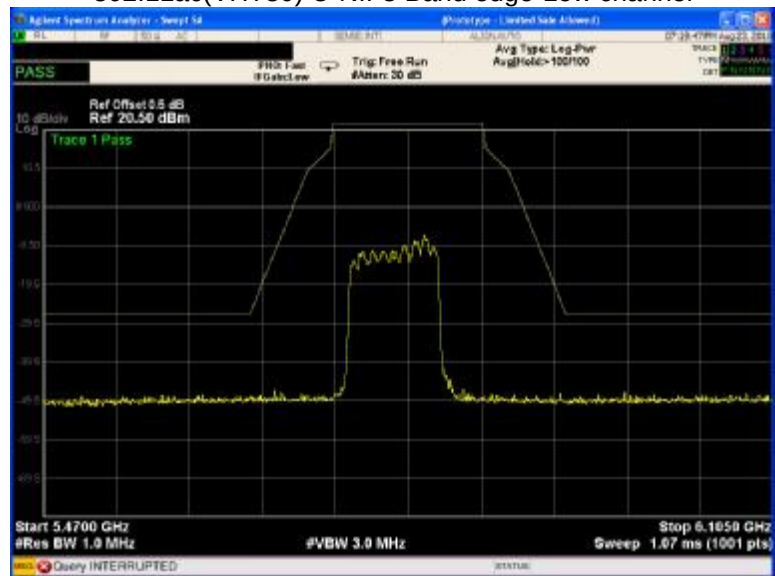
802.11ac(VHT80) U-NII-1 Band edge-Low channel



802.11ac(VHT80) U-NII-1 Band edge-High channel



802.11ac(VHT80) U-NII-3 Band edge-Low channel



11 6 dB Bandwidth

Test Requirement: FCC CFR47 Part 15 Section 15.407(e)
 KDB789033 D02 General UNII Test Procedures New Rules
 Test Method: v02r01 Section C
 Test Limit: ≥ 500 kHz
 Test Result: PASS

11.1 Test Procedure:

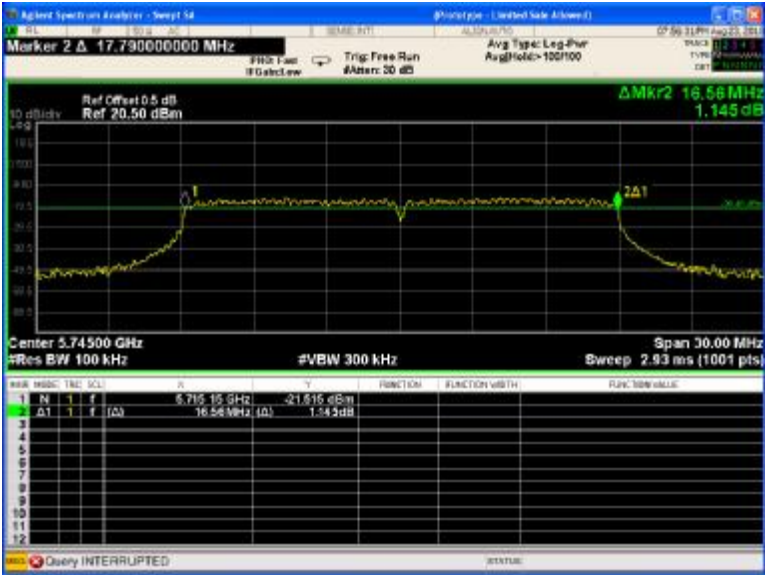
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

11.2 Test Result:

Band	Operation mode	6 dB Bandwidth (MHz)		
		Low	Middle	High
U-NII-3	802.11a	16.56	16.56	16.50
	802.11n(HT20)	17.79	17.79	17.79
	802.11n(HT40)	36.48	/	36.48
	802.11ac(VHT20)	17.79	17.76	17.76
	802.11ac(VHT40)	36.24	/	36.48
	802.11ac(VHT80)	75.36	/	/

Test result plots shown as follows:

802.11a U-NII-3 Low channel



802.11a U-NII-3 Middle channel



802.11a U-NII-3 High channel



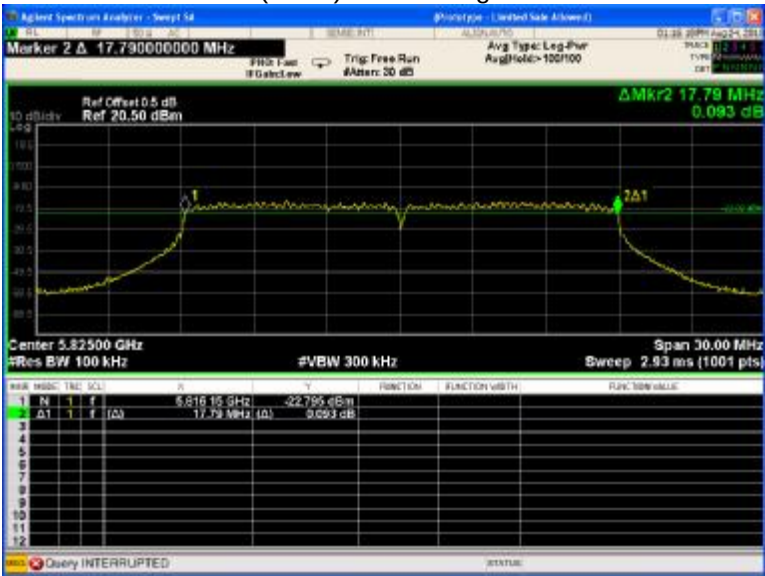
802.11n(HT20) U-NII-3 Low channel



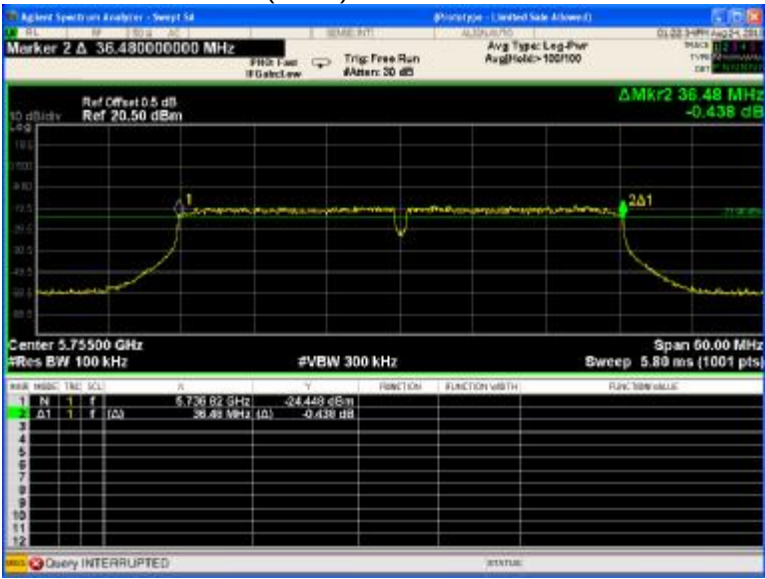
802.11n(HT20) U-NII-3 Middle channel



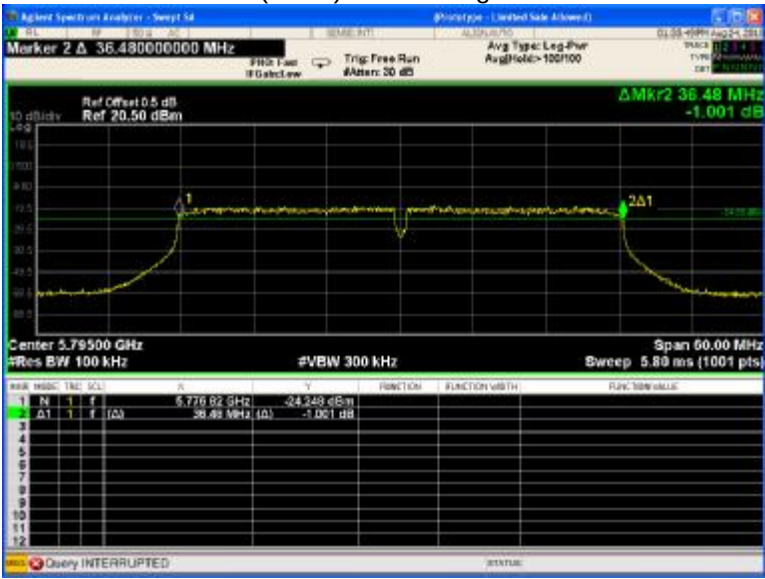
802.11n(HT20) U-NII-3 High channel



802.11n(HT40) U-NII-3 Low channel



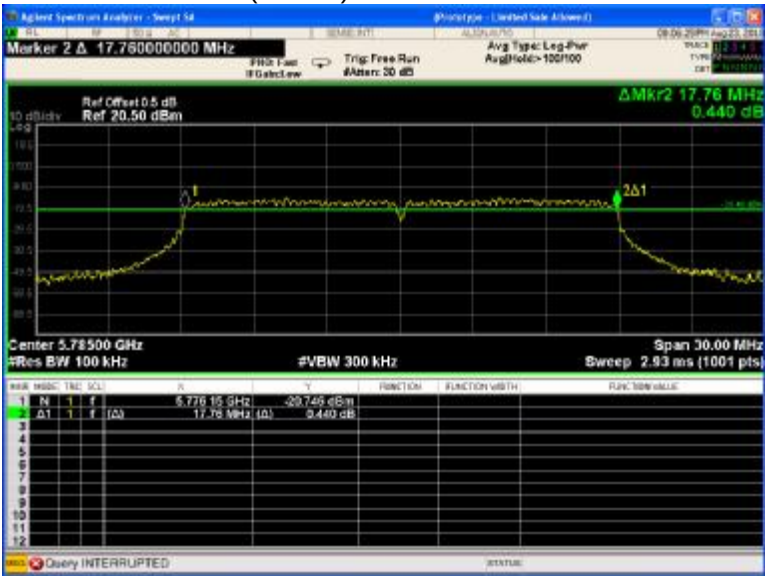
802.11n(HT40) U-NII-3 High channel



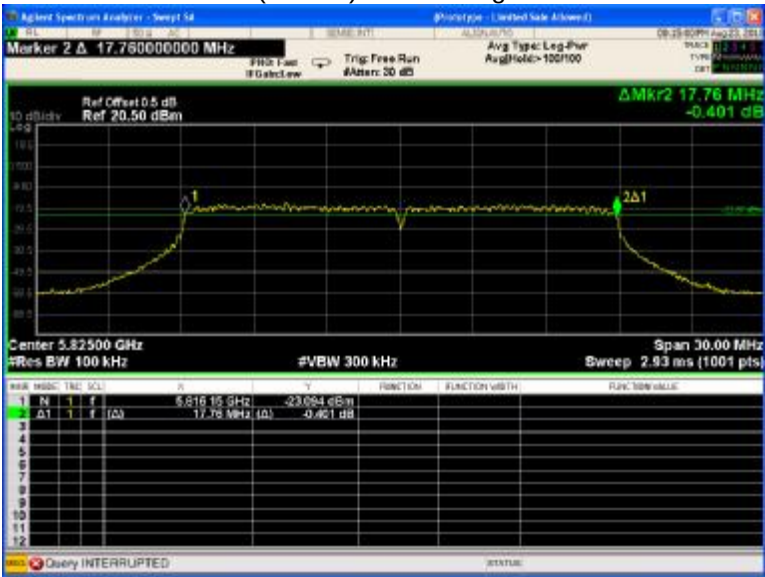
802.11ac(VHT20) U-NII-3 Low channel



802.11ac(VHT20) U-NII-3 Middle channel



802.11ac(VHT20) U-NII-3 High channel



802.11ac(VHT40) U-NII-3 Low channel



802.11ac(VHT40) U-NII-3 High channel



802.11ac(VHT80) U-NII-3 Low channel



12 26 dB Bandwidth and 99% Occupied Bandwidth

Test Requirement: 47 CFR Part 15C Section 15.407 (a)
 KDB789033 D02 General UNII Test Procedures New Rules
 Test Method: v02r01 Section D
 Test Limit: No restriction limits
 Test Result: PASS

12.1 Test Procedure:

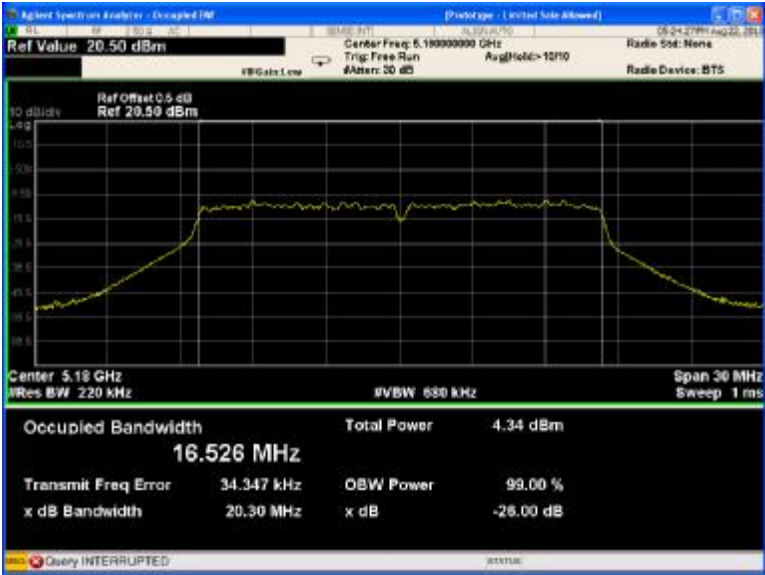
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
 RBW = approximately 1% of the emission bandwidth,
 VBW $\geq 3 \times$ RBW

12.2 Test Result:

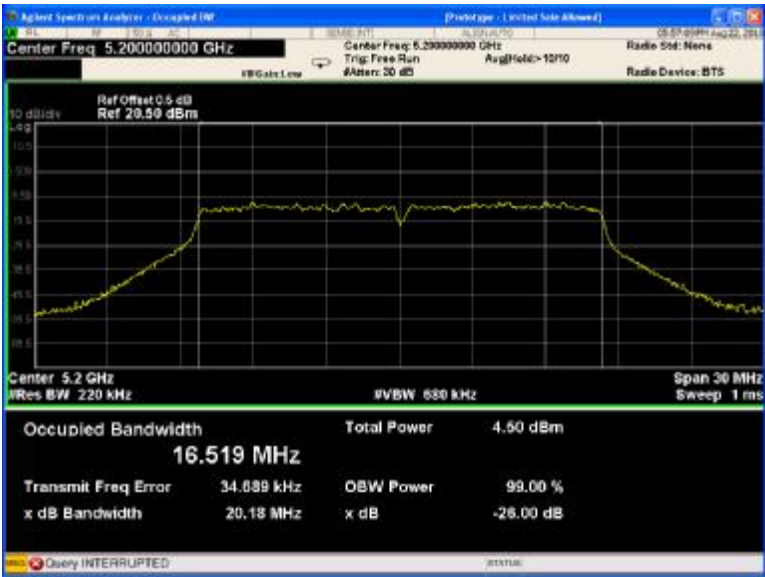
Band	Operation mode	26 dB Bandwidth (MHz)			99% Bandwidth (MHz)		
		Low	Middle	High	Low	Middle	High
U-NII-1	802.11a	20.30	20.18	20.20	16.526	16.519	16.518
	802.11n(HT20)	20.43	20.38	20.39	17.628	17.635	17.648
	802.11n(HT40)	41.09	/	41.00	36.117	/	36.133
	802.11ac(VHT20)	20.23	20.45	20.32	17.631	17.617	17.633
	802.11ac(VHT40)	40.70	/	41.22	36.114	/	36.131
	802.11ac(VHT80)	80.44	/	/	75.033	/	/
U-NII-3	802.11a	20.18	20.17	20.24	16.515	16.520	16.523
	802.11n(HT20)	20.45	20.35	20.42	17.634	17.637	17.625
	802.11n(HT40)	41.27	/	41.25	36.124	/	36.133
	802.11ac(VHT20)	20.27	20.45	20.56	17.634	17.624	17.626
	802.11ac(VHT40)	40.97	/	40.88	36.133	/	36.130
	802.11ac(VHT80)	80.40	/	/	75.087	/	/

Test result plots shown as follows:

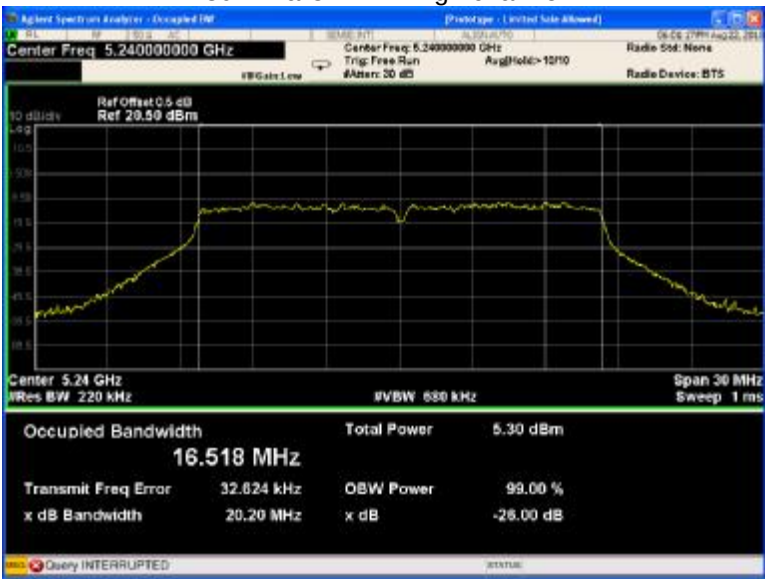
802.11a U-NII-1 Low channel



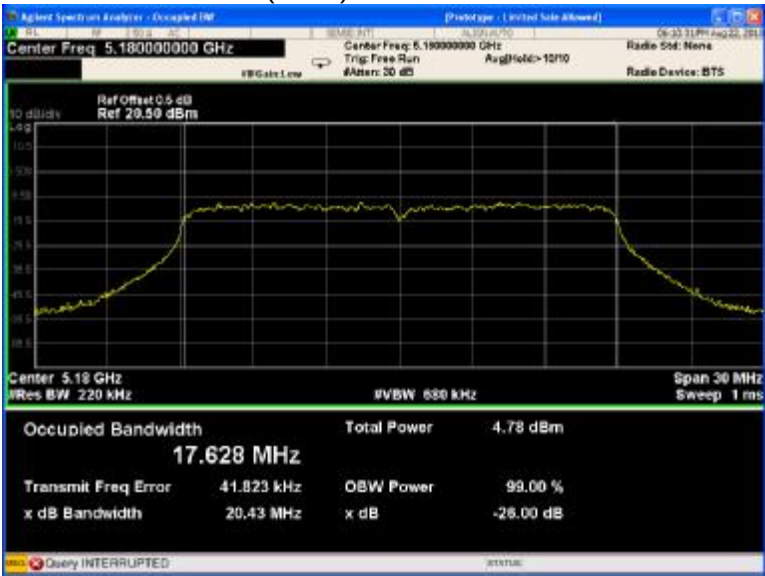
802.11a U-NII-1 Middle channel



802.11a U-NII-1 High channel



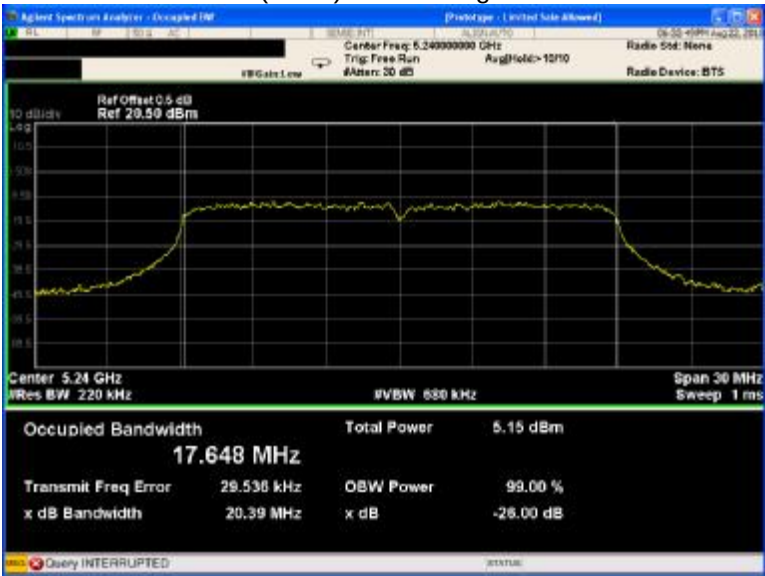
802.11n(HT20) U-NII-1 Low channel



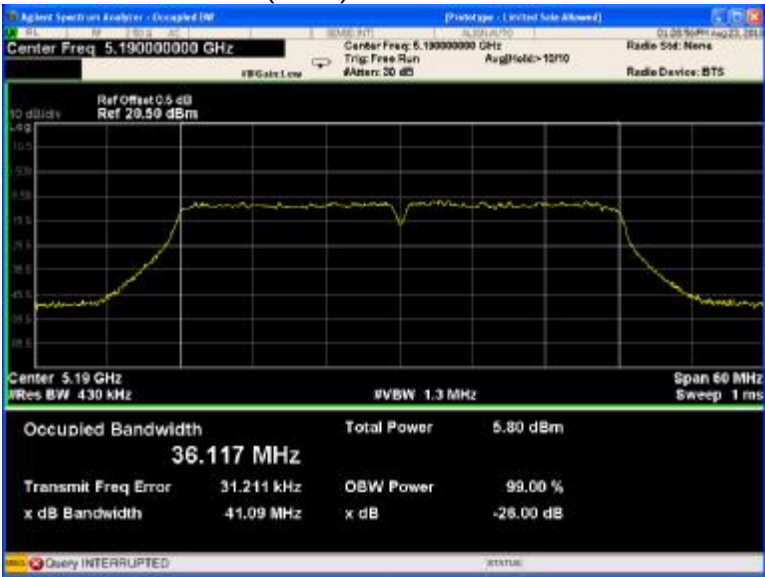
802.11n(HT20) U-NII-1 Middle channel



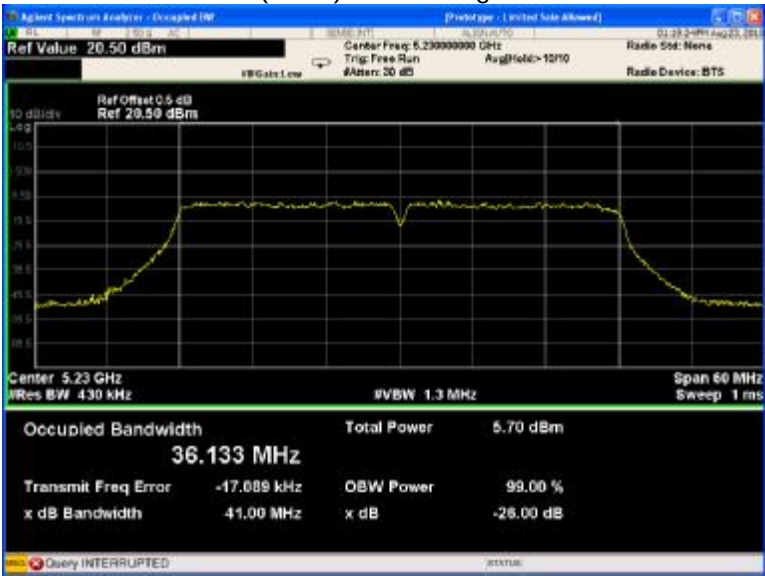
802.11n(HT20) U-NII-1 High channel



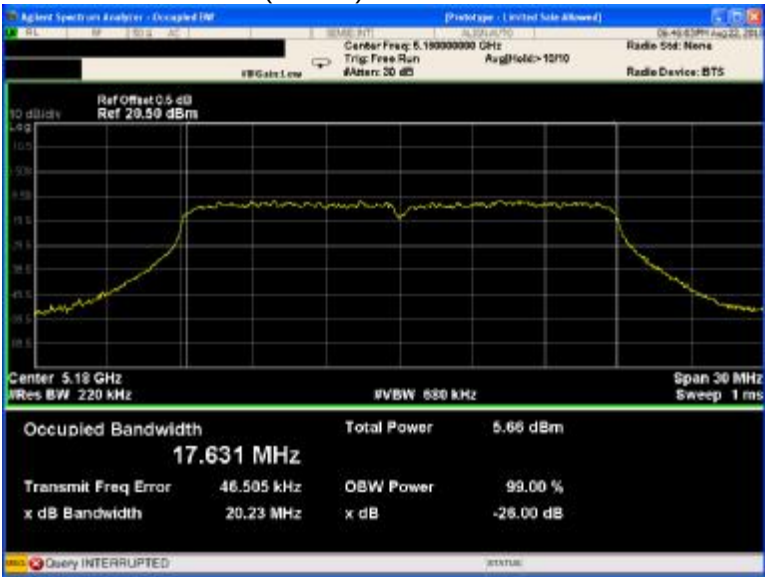
802.11n(HT40) U-NII-1 Low channel



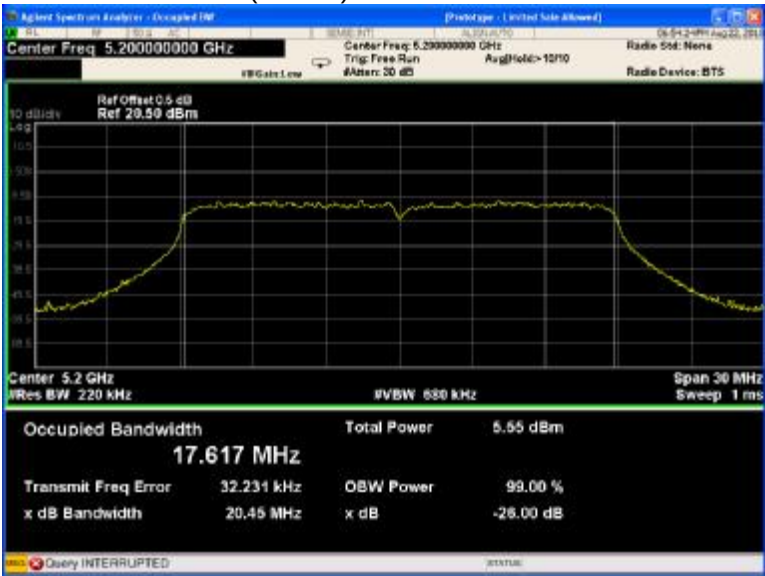
802.11n(HT40) U-NII-1 High channel



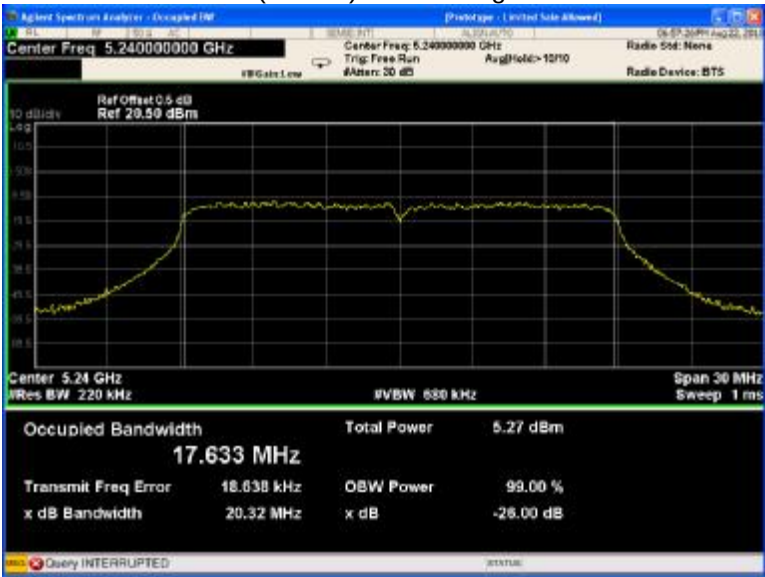
802.11ac(VHT20) U-NII-1 Low channel



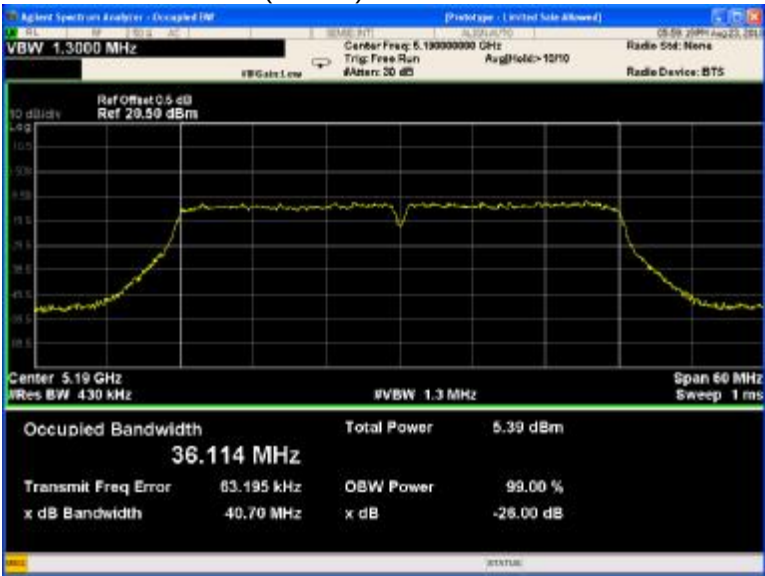
802.11ac(VHT20) U-NII-1 Middle channel



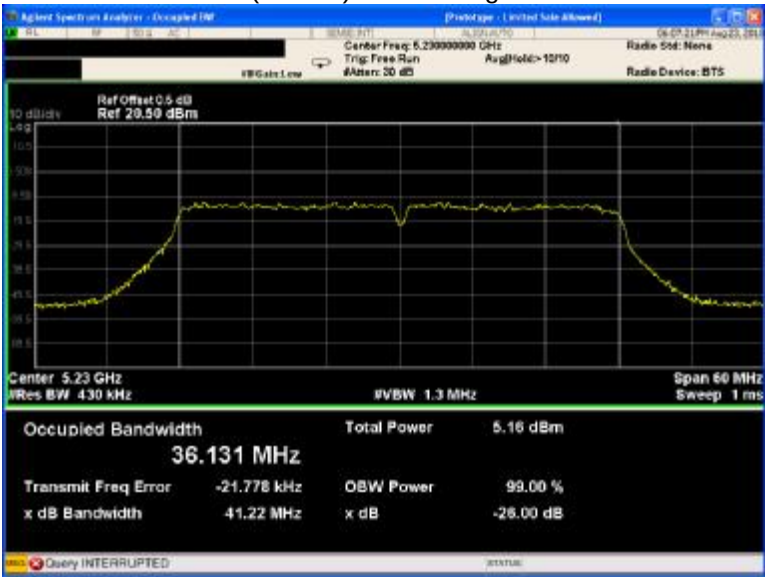
802.11ac(VHT20) U-NII-1 High channel



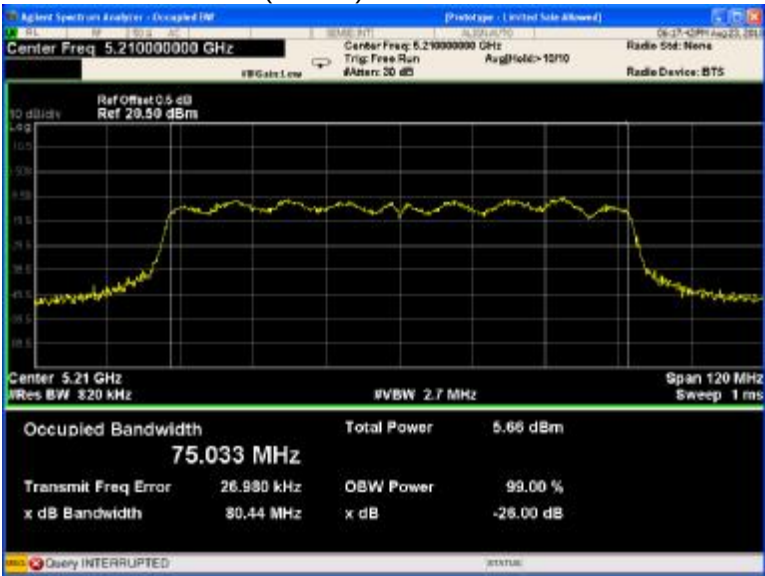
802.11ac(VHT40) U-NII-1 Low channel



802.11n(VHT40) U-NII-1 High channel



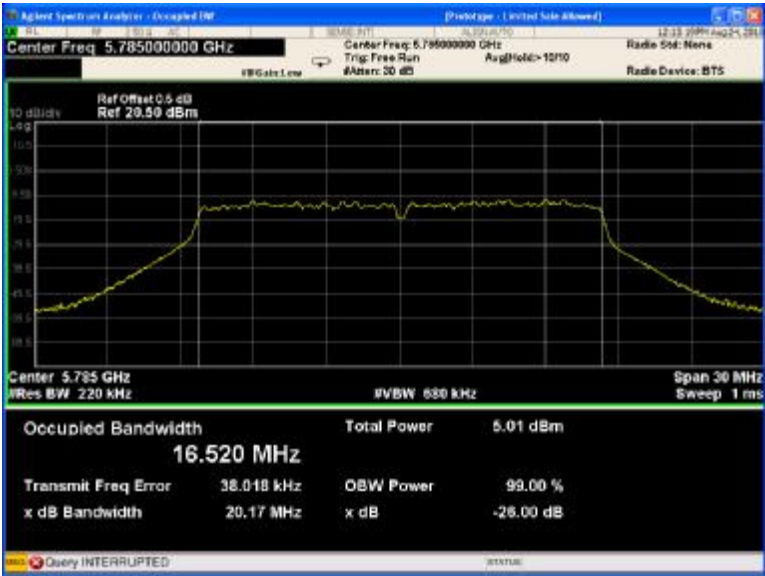
802.11ac(VHT80) U-NII-1 Low channel



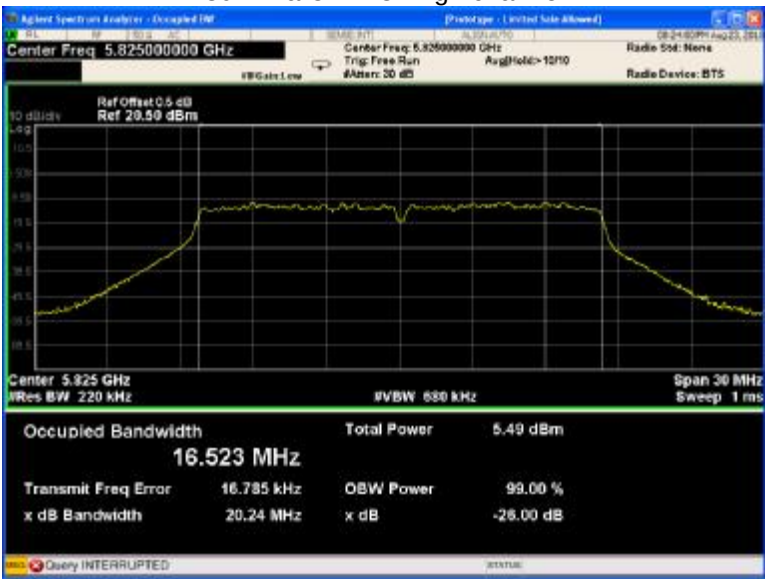
802.11a U-NII-3 Low channel



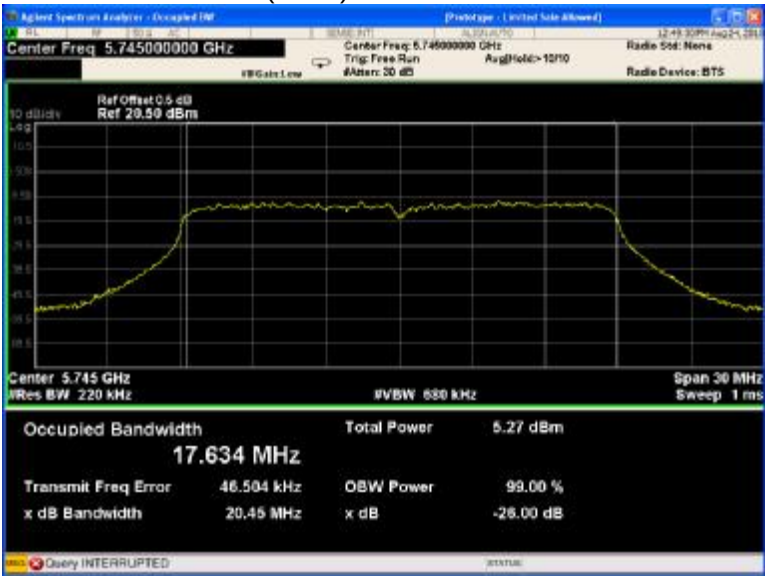
802.11a U-NII-3 Middle channel



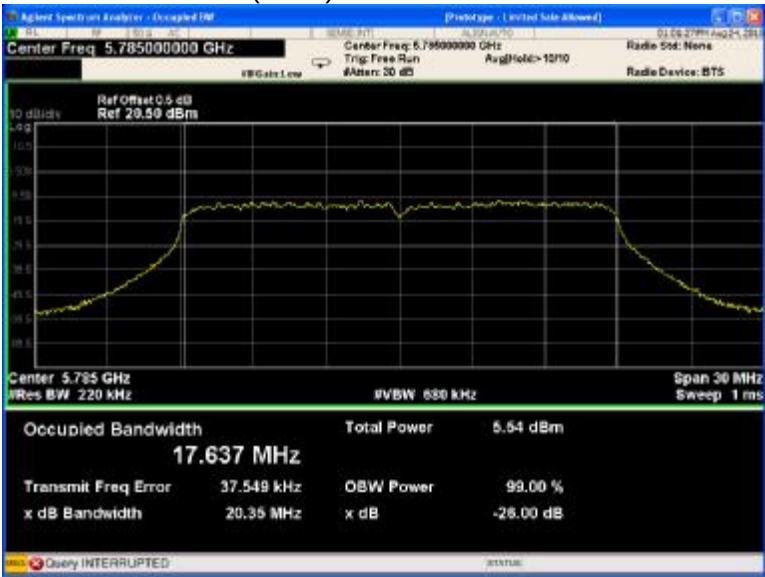
802.11a U-NII-3 High channel



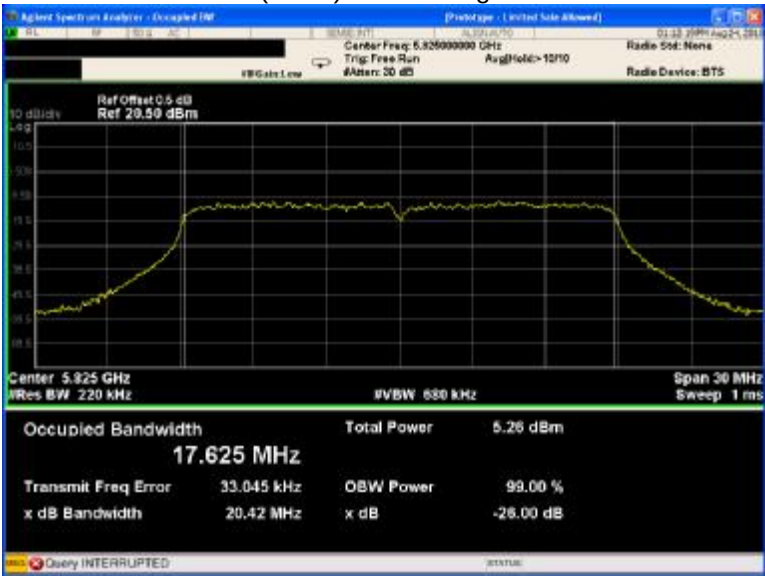
802.11n(HT20) U-NII-3 Low channel



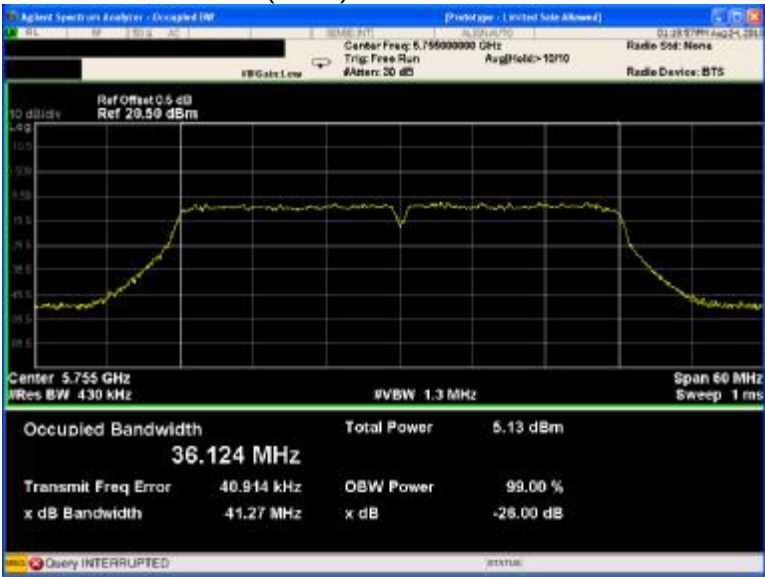
802.11n(HT20) U-NII-3 Middle channel



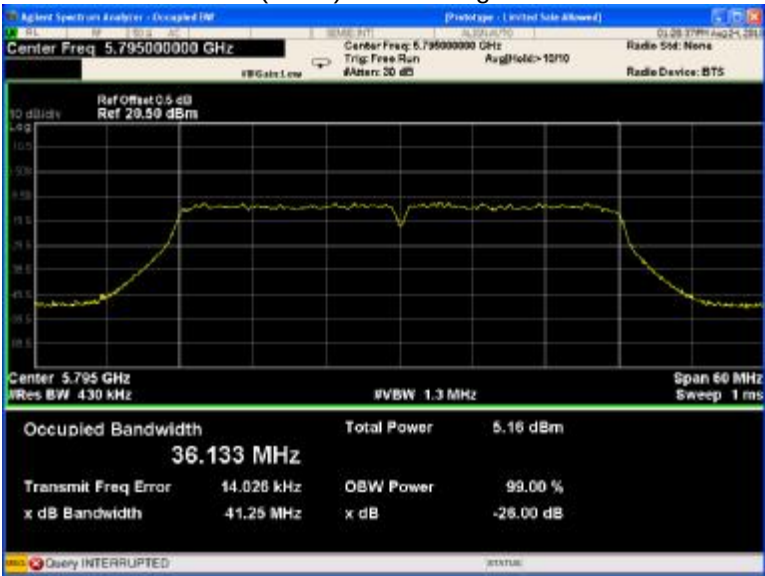
802.11n(HT20) U-NII-3 High channel



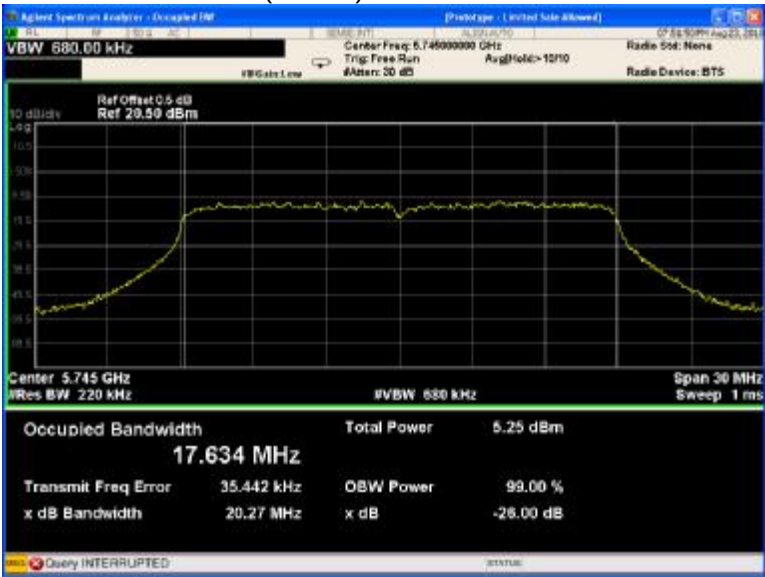
802.11n(HT40) U-NII-3 Low channel



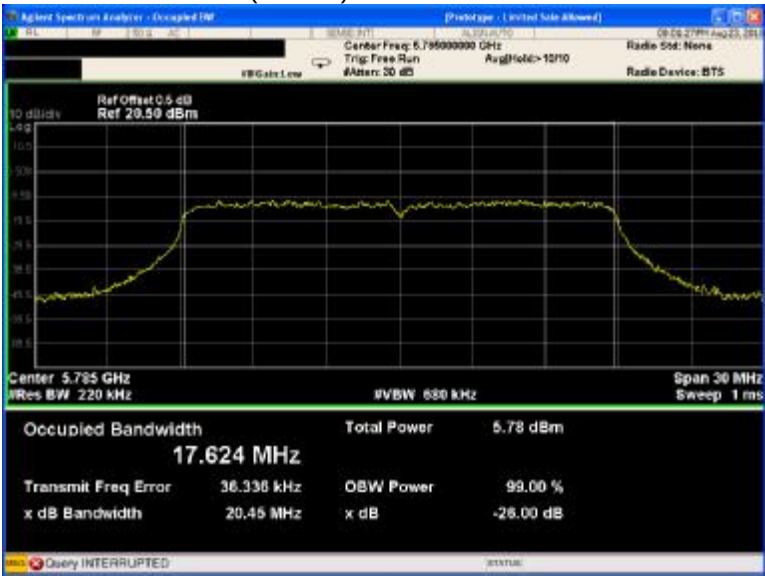
802.11n(HT40) U-NII-3 High channel



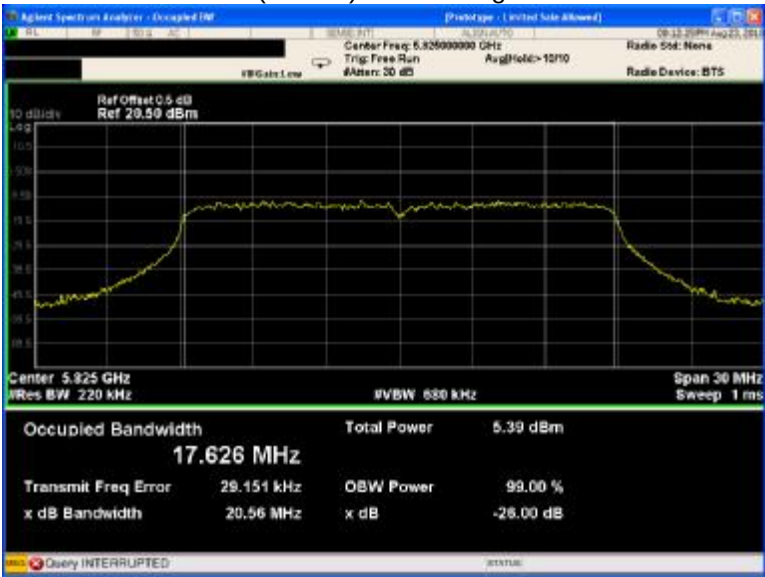
802.11ac(VHT20) U-NII-3 Low channel



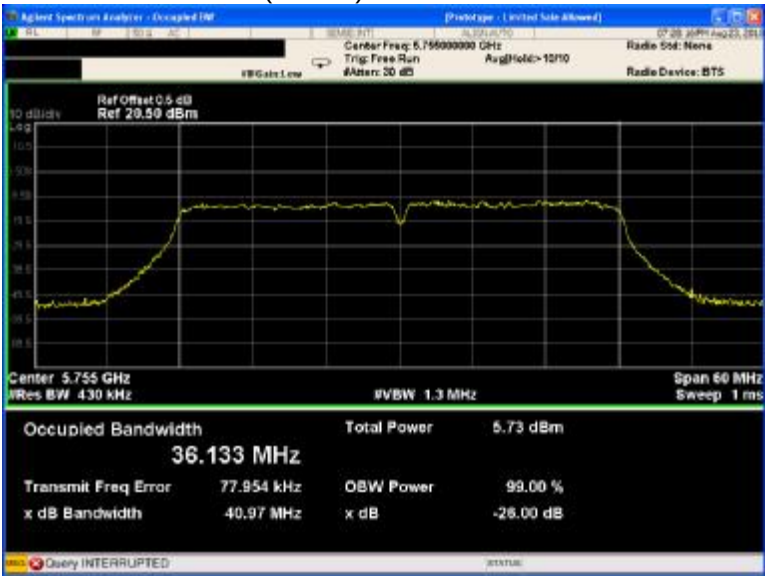
802.11ac(VHT20) U-NII-3 Middle channel



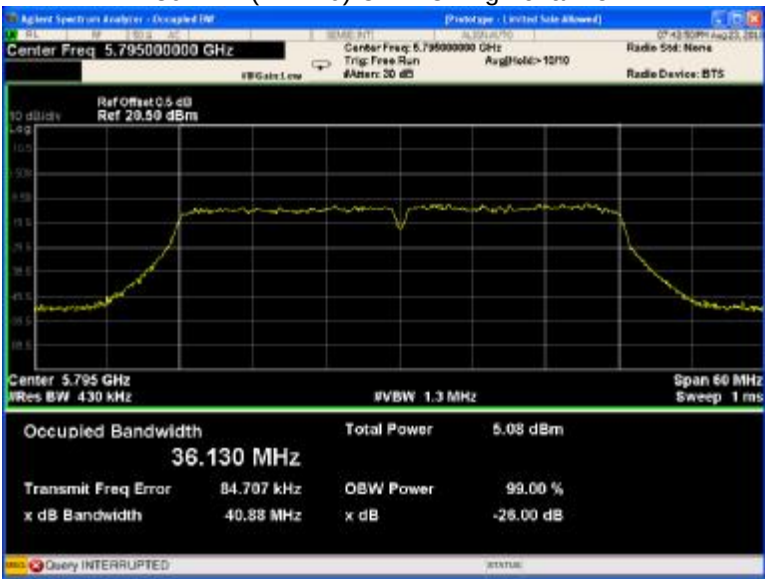
802.11ac(VHT20) U-NII-3 High channel



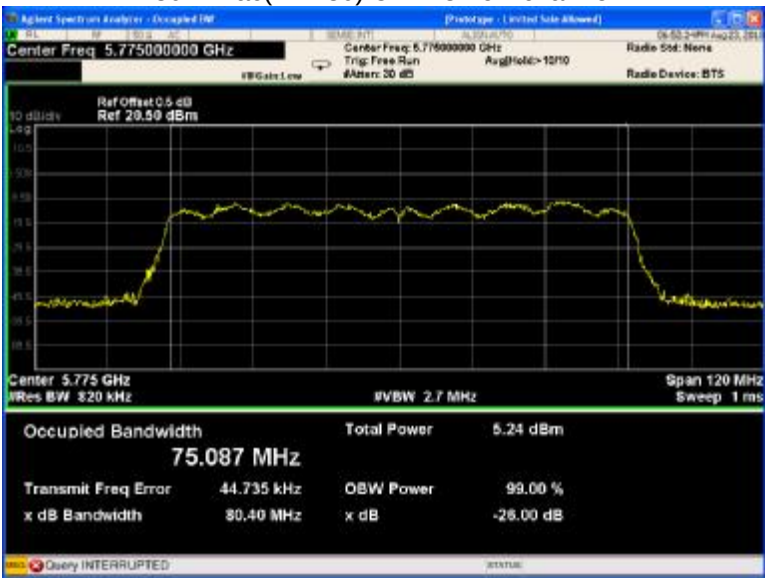
802.11ac(VHT40) U-NII-3 Low channel



802.11n(VHT40) U-NII-3 High channel



802.11ac(VHT80) U-NII-3 Low channel



13 Conducted Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.407(a) KDB789033 D02 General UNII Test Procedures New Rules
Test Method:	v02r01 Section E
Test Limit:	U-NII-1 250mW(24dBm) U-NII-3 1W(30dBm)
Test Result:	PASS Conducted output power= measurement power+10log(1/x)
Remark:	X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power

13.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

13.2 Test Result :

Band	Operation mode	CH	Conducted Output Power (dBm)
U-NII-1	802.11a	Low	5.52
		Middle	5.57
		High	5.40
	802.11n(HT20)	Low	5.11
		Middle	5.48
		High	5.10
	802.11n(HT40)	Low	5.24
		Middle	/
		High	5.10
	802.11ac(VHT20)	Low	5.29
		Middle	5.59
		High	5.31
	802.11ac(VHT40)	Low	5.29
		Middle	/
		High	5.12
	802.11ac(VHT80)	Low	5.57
		Middle	/
		High	/
U-NII-3	802.11a	Low	5.31
		Middle	5.48
		High	5.66
	802.11n(HT20)	Low	5.30
		Middle	5.88
		High	5.45
	802.11n(HT40)	Low	5.11
		Middle	/
		High	5.54
	802.11ac(VHT20)	Low	5.36
		Middle	5.59
		High	5.58
	802.11ac(VHT40)	Low	5.22
		Middle	/
		High	5.18
	802.11ac(VHT80)	Low	5.22
		Middle	/
		High	/

14 Power Spectral density

Test Requirement:	FCC CFR47 Part 15 Section 15.407(a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 , Section F
Test Limit:	$\leq 11.00\text{dBm/MHz}$ for Operation in the U-NII-1(5150MHz-5250MHz)of mobile device $\leq 30.00\text{dBm/500KHz}$ for Operation in the U-NII-3(5725MHz- 5850MHz)of device
Test Result:	PASS

14.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer:
U-NII-1
RBW = 1MHz, VBW $\geq 3 \times$ RBW Sweep = auto; Detector Function = Peak. Trae = Max hold.
U-NII-3
RBW = 510KHz, VBW $\geq 3 \times$ RBW Sweep = auto; Detector Function = Peak. Trae = Max hold.
3. Allow the trae to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjaent channels. The limit is specified in one of the subparagraphs of this Section
Submit this plot.

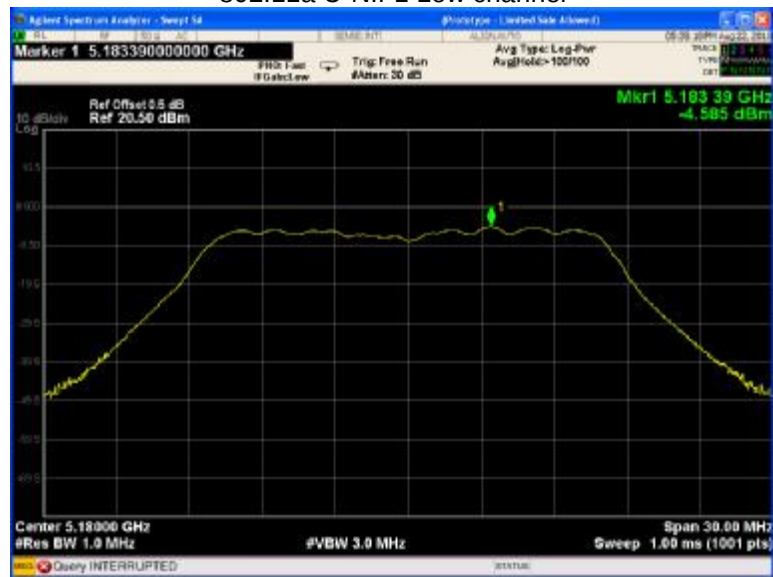
14.2 Test Result:

Band	Operation mode	CH	Power Spectral Density (dBm/MHz)
U-NII-1	802.11a	Low	-4.585
		Middle	-4.418
		High	-4.020
	802.11n(HT20)	Low	-4.724
		Middle	-4.103
		High	-4.896
	802.11n(HT40)	Low	-8.251
		Middle	/
		High	-8.020
	802.11ac(VHT20)	Low	-3.885
		Middle	-4.028
		High	-4.610
	802.11ac(VHT40)	Low	-8.076
		Middle	/
		High	-8.228
	802.11ac(VHT80)	Low	-9.083
		Middle	/
		High	/
	Limit	$\leq 11.00\text{dBm/MHz}$	

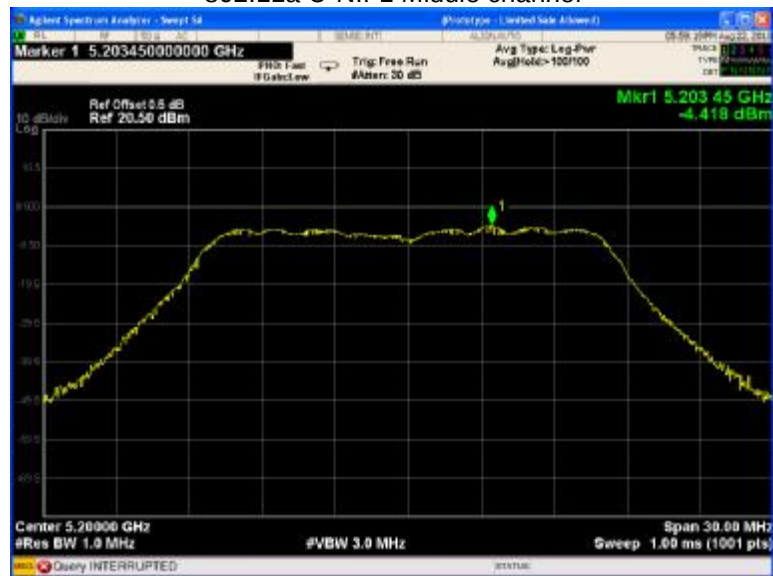
Band	Operation mode	CH	Power Spectral Density (dBm/MHz)
U-NII-3	802.11a	Low	-7.936
		Middle	-7.852
		High	-7.645
	802.11n(HT20)	Low	-7.755
		Middle	-7.336
		High	-8.424
	802.11n(HT40)	Low	-11.537
		Middle	/
		High	-11.121
	802.11ac(VHT20)	Low	-7.349
		Middle	-6.837
		High	-9.596
	802.11ac(VHT40)	Low	-11.186
		Middle	/
		High	-11.133
	802.11ac(VHT80)	Low	-11.473
		Middle	/
		High	/
	Limit	≤30.00dBm/500KHz	

Test result plots shown as follows:

802.11a U-NII-1 Low channel



802.11a U-NII-1 Middle channel



802.11a U-NII-1 High channel



802.11n(HT20) U-NII-1 Low channel



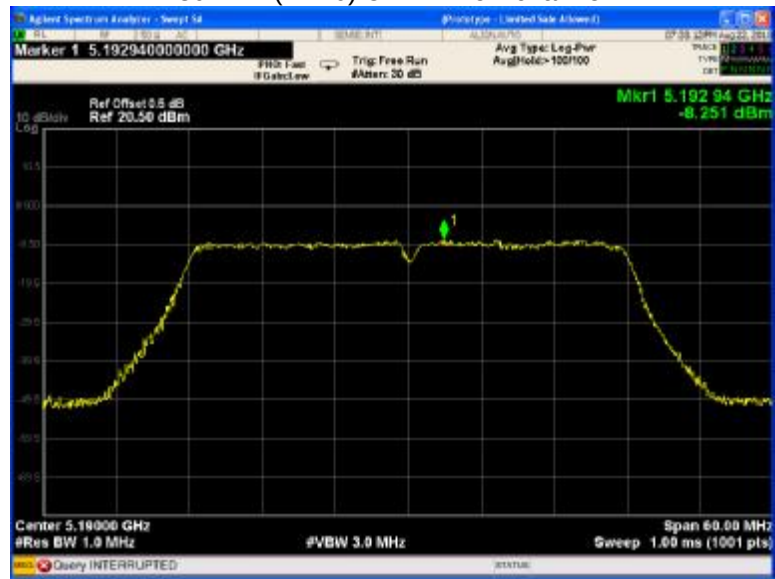
802.11n(HT20) U-NII-1 Middle channel



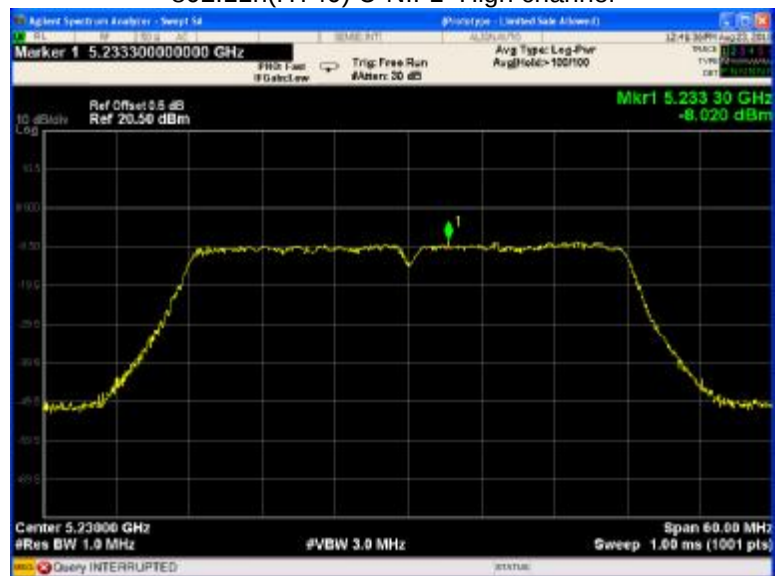
802.11n(HT20) U-NII-1 High channel



802.11n(HT40) U-NII-1 Low channel



802.11n(HT40) U-NII-1 High channel



802.11ac(VHT20) U-NII-1 Low channel



802.11ac(VHT20) U-NII-1 Middle channel



802.11ac(VHT20) U-NII-1 High channel



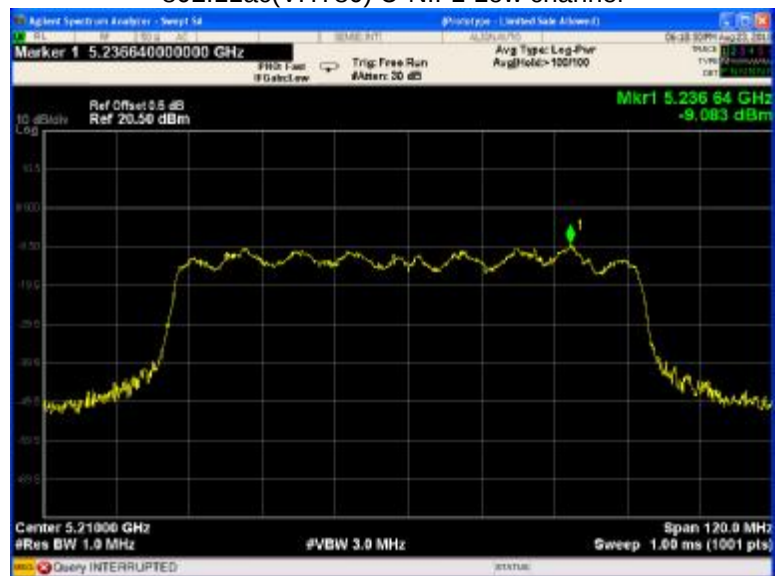
802.11ac(VHT40) U-NII-1 Low channel



802.11n(VHT40) U-NII-1 High channel



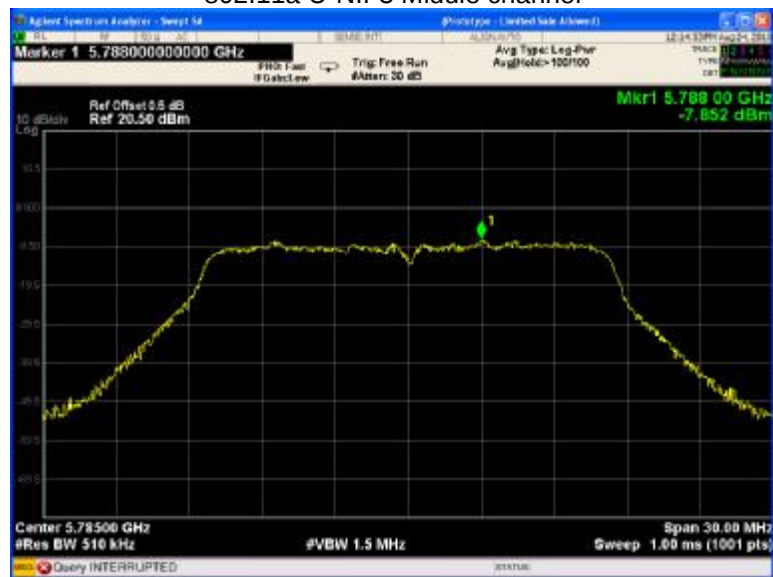
802.11ac(VHT80) U-NII-1 Low channel



802.11a U-NII-3 Low channel



802.11a U-NII-3 Middle channel



802.11a U-NII-3 High channel



802.11n(HT20) U-NII-3 Low channel



802.11n(HT20) U-NII-3 Middle channel



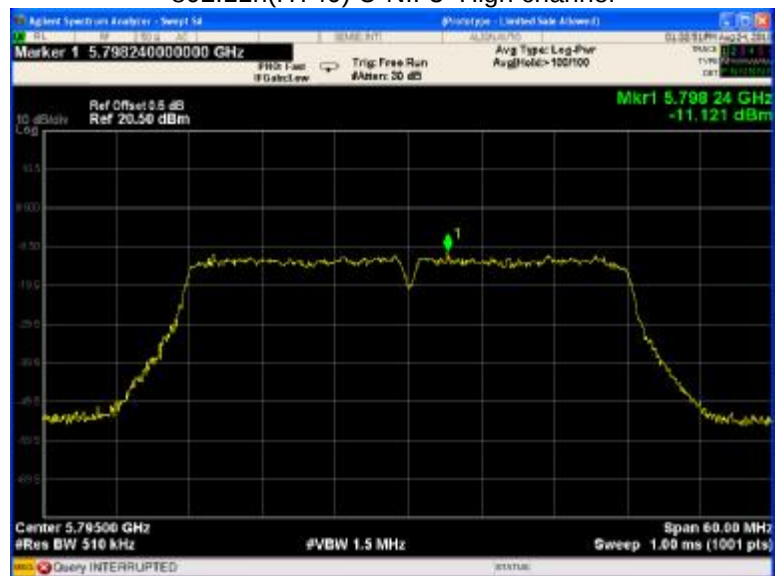
802.11n(HT20) U-NII-3 High channel



802.11n(HT40) U-NII-3 Low channel



802.11n(HT40) U-NII-3 High channel



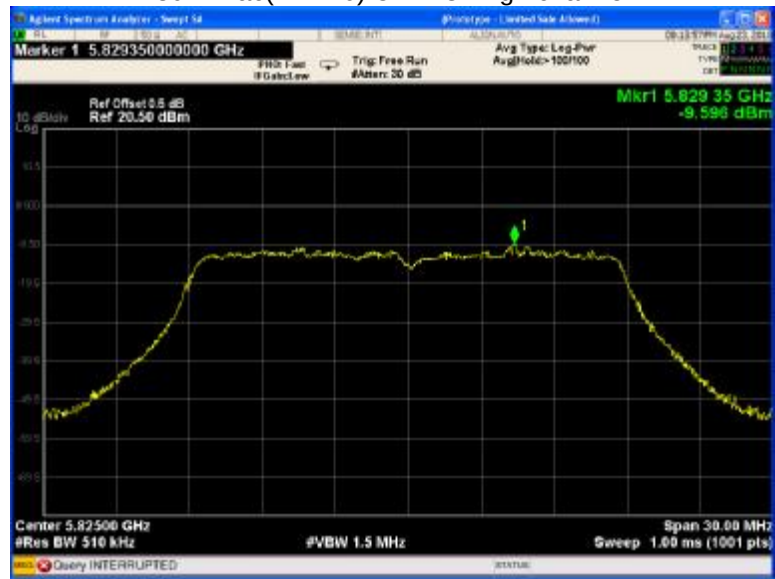
802.11ac(VHT20) U-NII-3 Low channel



802.11ac(VHT20) U-NII-3 Middle channel



802.11ac(VHT20) U-NII-3 High channel



802.11ac(VHT40) U-NII-3 Low channel



802.11n(VHT40) U-NII-3 High channel



802.11ac(VHT80) U-NII-3 Low channel



15 Frequency Stability

Test Requirement:	FCC CFR47 Part 15 Section 15.407(g)
Test Method:	ANSI C63.10:2013
Test Limit:	Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual or 20ppm.
Test Result:	PASS

15.1 Test Procedure:

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
EUT have transmitted absence of unmodulation signal and fixed channelise. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings. f_c is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 10^6$ ppm and the limit is less than ± 20 ppm The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
2. Extreme temperature rule is 0°C~ 40°C.

15.2 Test Result:

U-NII-1 Test Frequency:5180MHz				
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
40	3.7	1853	0.3577	20
30		1857	0.3585	20
25		1858	0.3586	20
20		1859	0.3590	20
15		1860	0.3590	20
10		1861	0.3592	20
5		1861	0.3593	20
0		1863	0.3596	20
20	3.2	1864	0.3599	20
20	4.3	1865	0.3600	20

U-NII-3 Test Frequency:5785MHz				
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
40	3.7	1765	0.3051	20
30		1765	0.3051	20
25		1767	0.3054	20
20		1767	0.3055	20
15		1770	0.3060	20
10		1773	0.3065	20
5		1773	0.3065	20
0		1774	0.3067	20
20	3.2	1777	0.3072	20
20	4.3	1781	0.3079	20

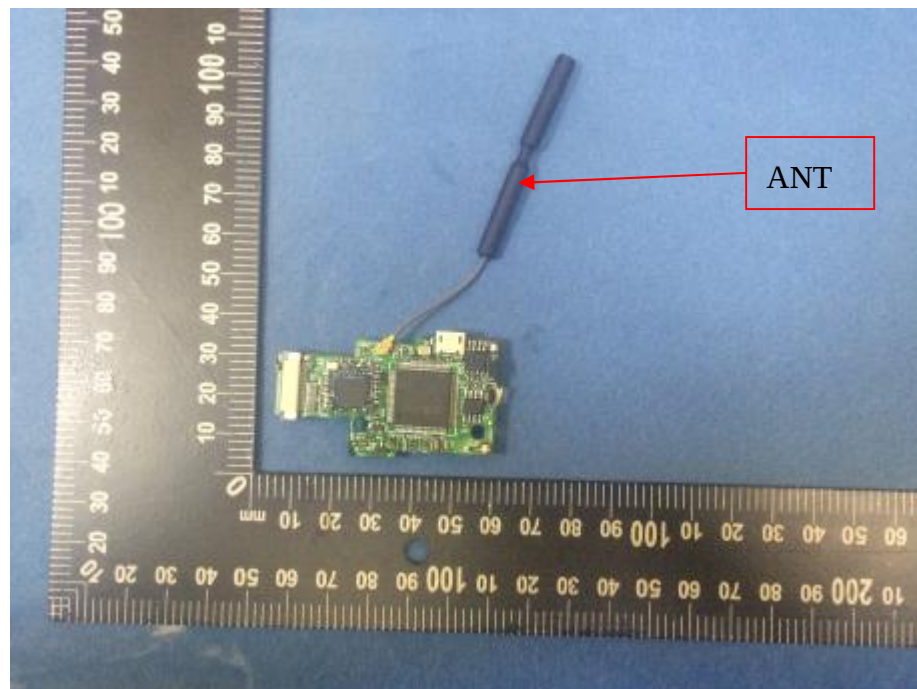
16 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

This device uses two antennas that use a specified coupling to the intentional radiator. Antenna connectors comply with the requirement.

Result:

The EUT has one Internal Integrated Antenna, antenna gain 2.0dBi, meets the requirements of FCC 15.203.



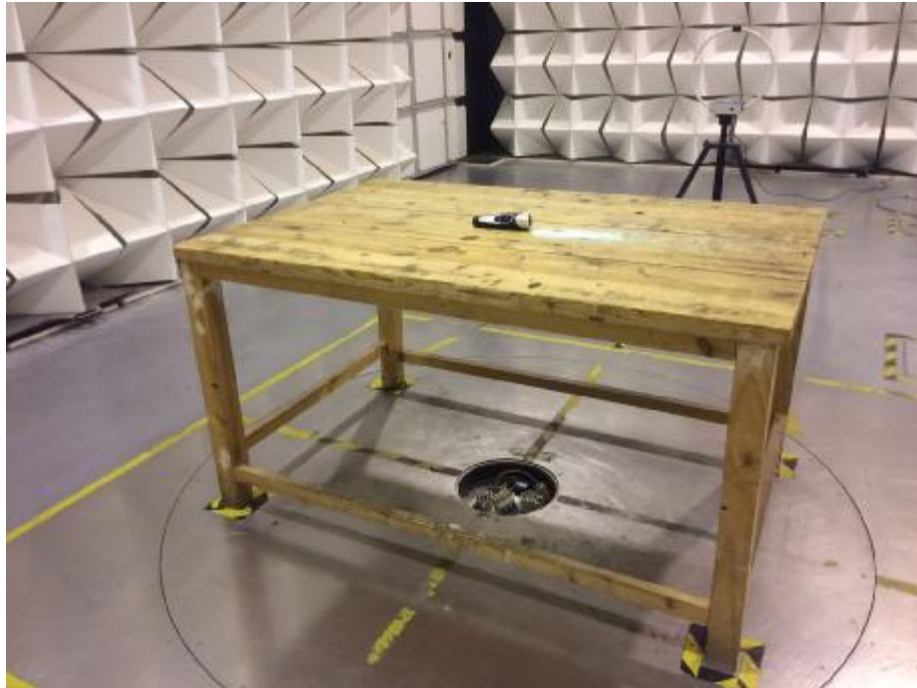
17 SAR Evaluation

Note: Please refer to SAR test report: WTD18S07118405W.

18 Photographs – Model DG-2684 Test Setup

18.1 Radiated Emission

Test frequency 9kHz to 30MHz



Test frequency from 30MHz to 1GHz



Test frequency above 1GHz



18.2 Conducted Emission

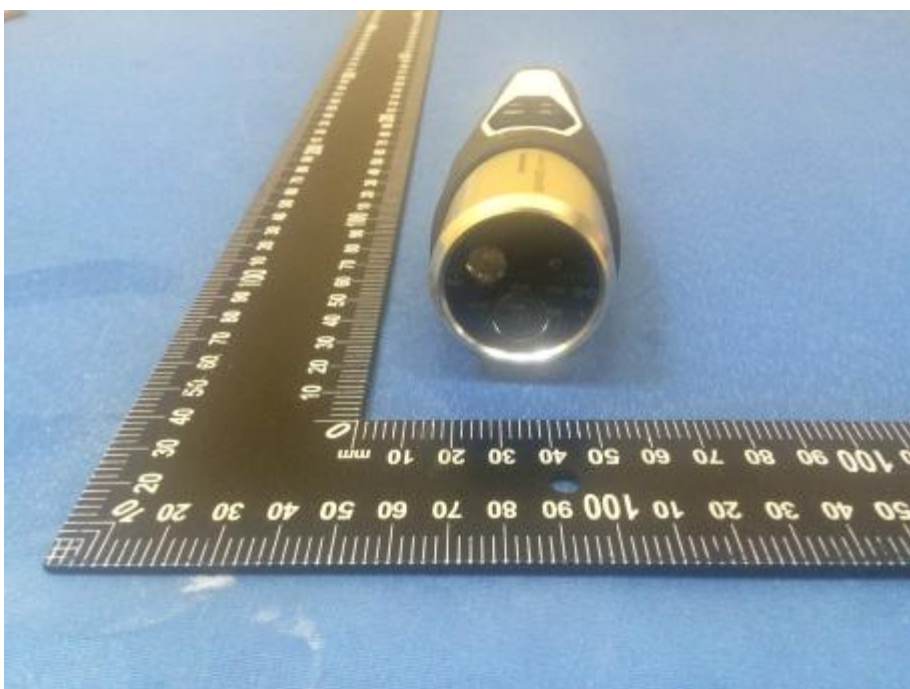


19 Photographs - Constructional Details

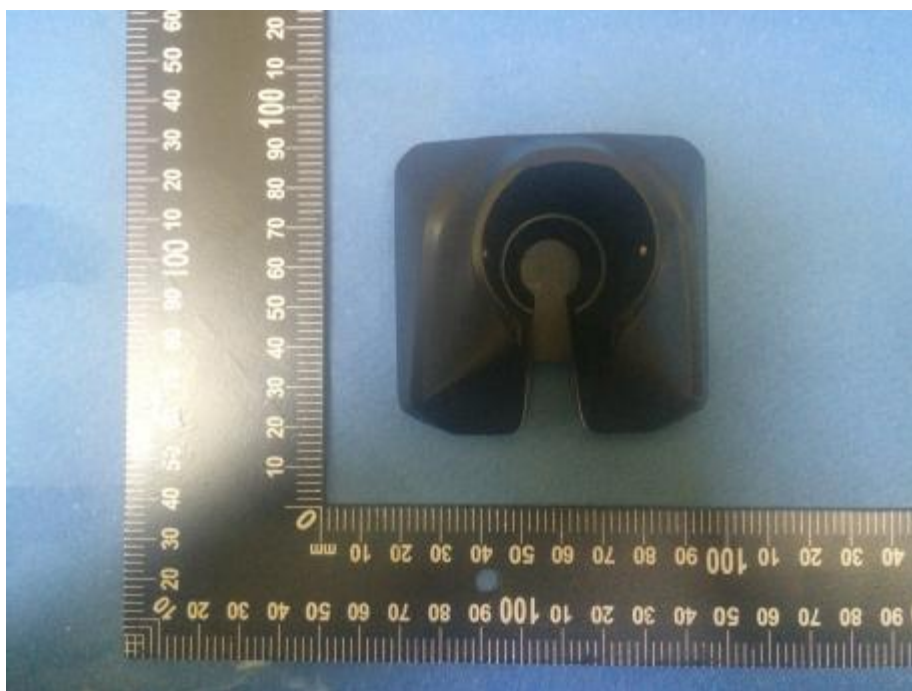
19.1 Model DG-2684-External Photos









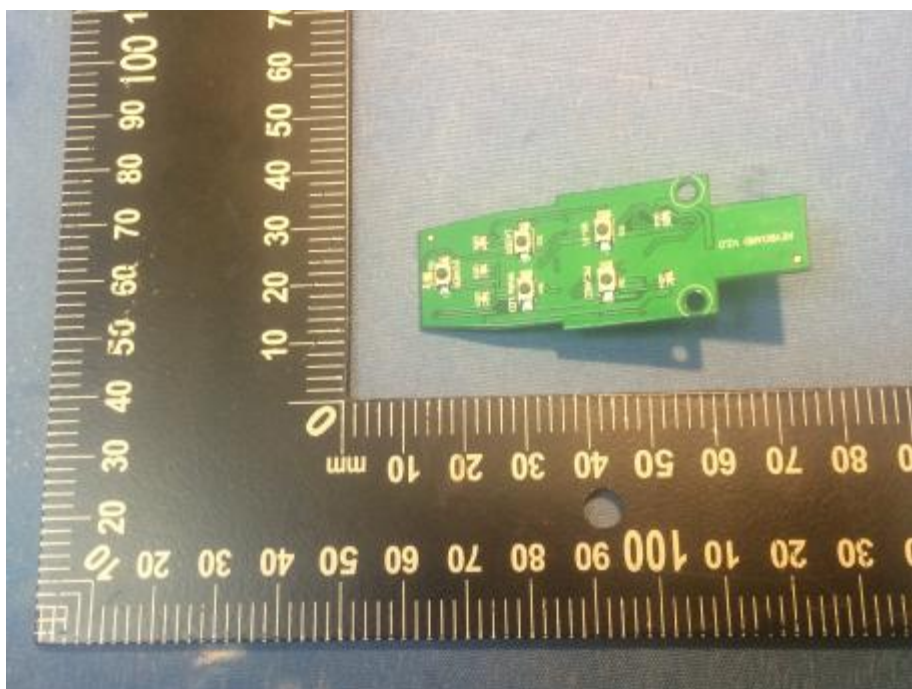
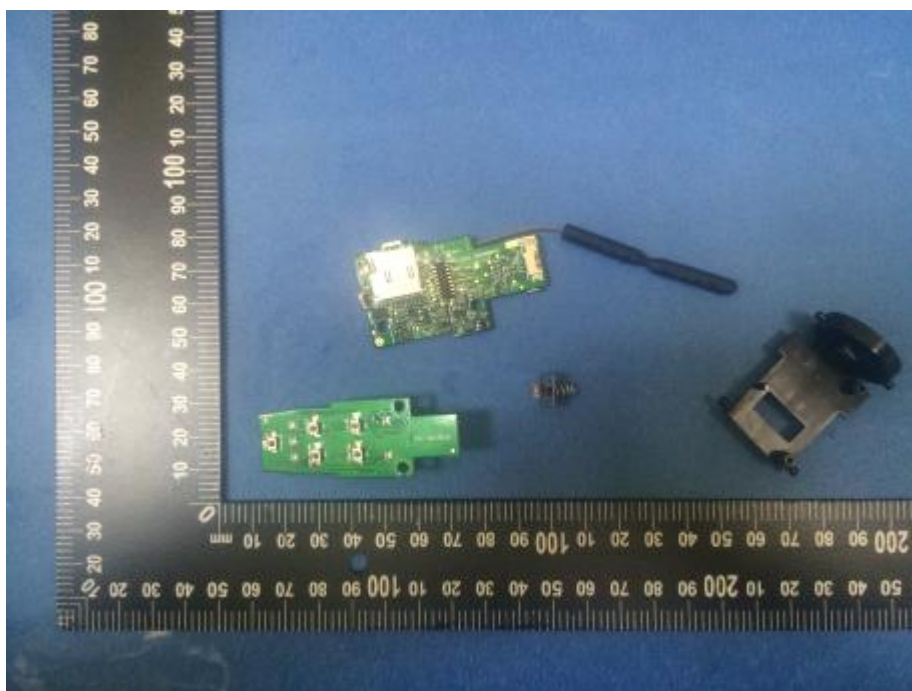


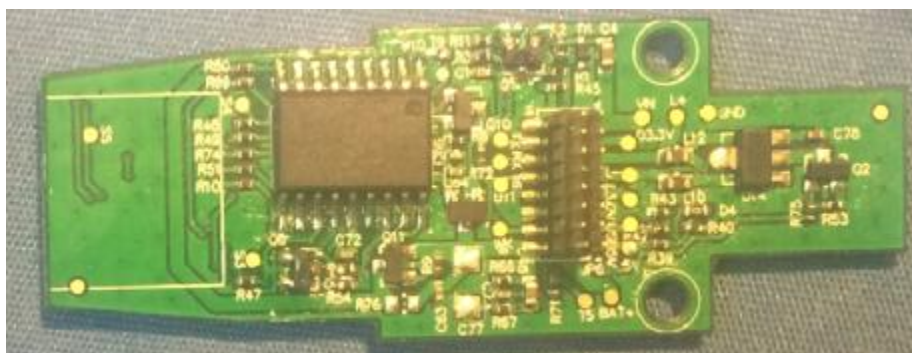
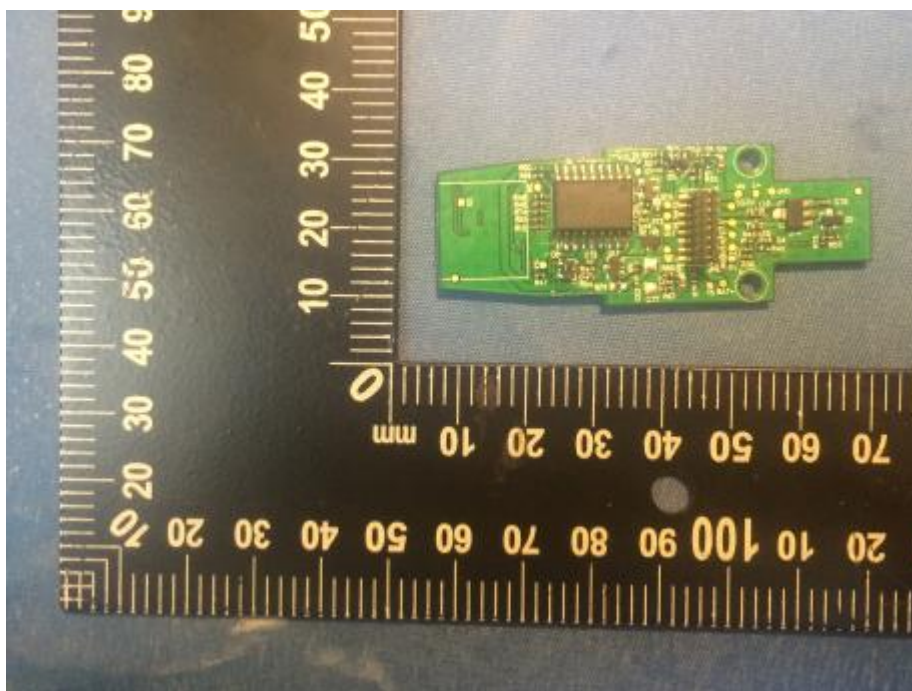


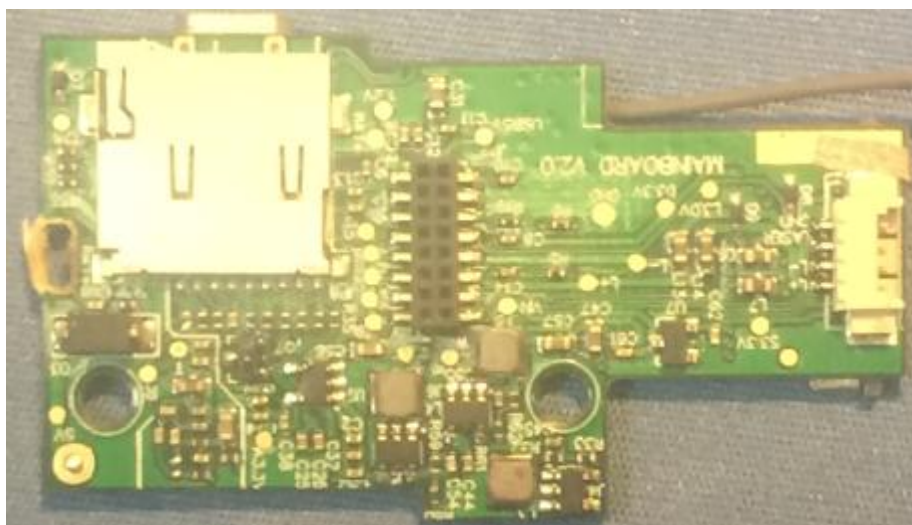
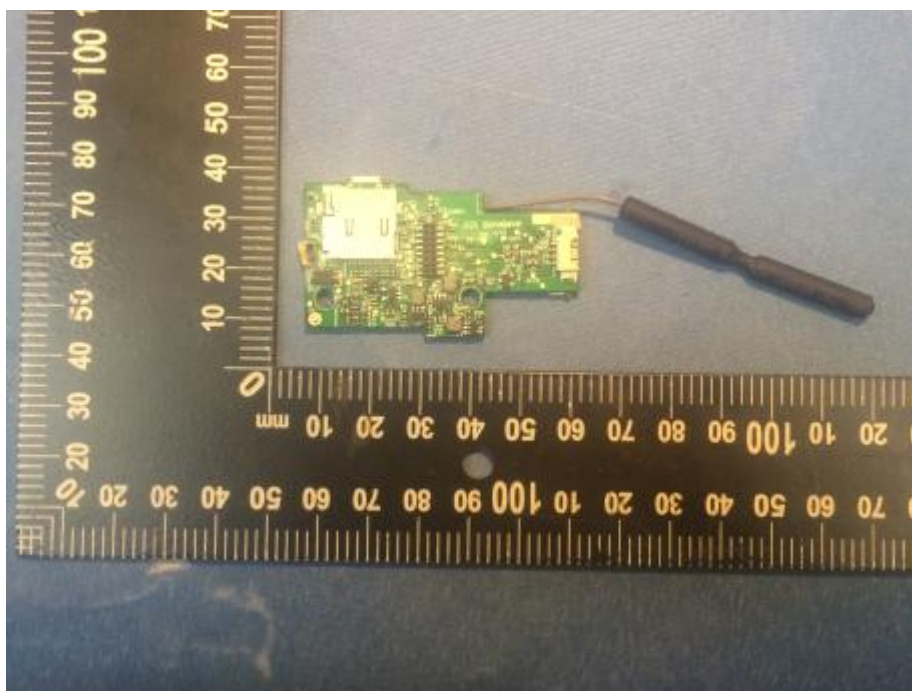
19.2 Model DG-2684 – Internal Photos

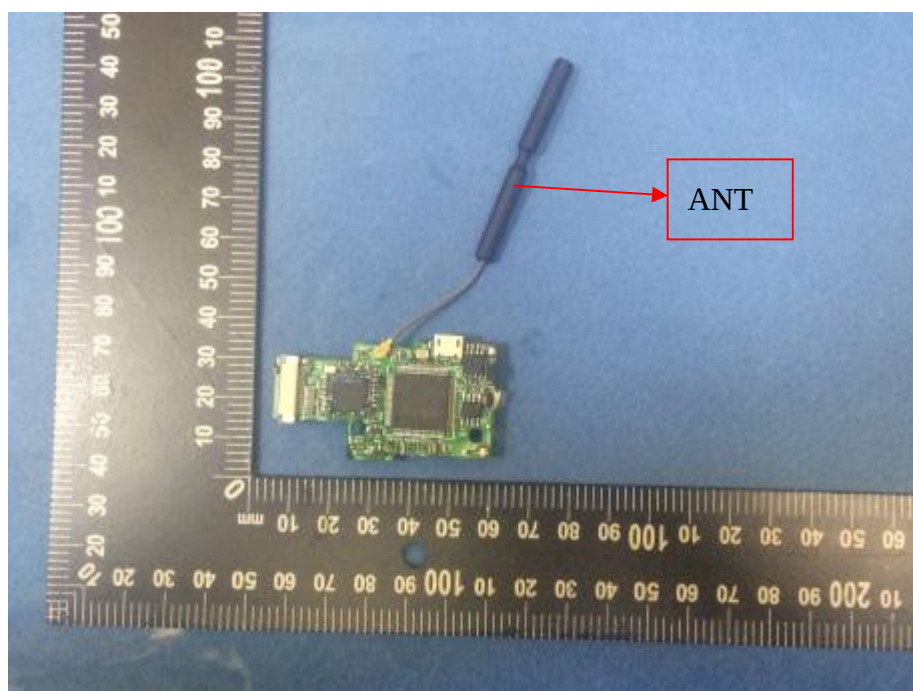


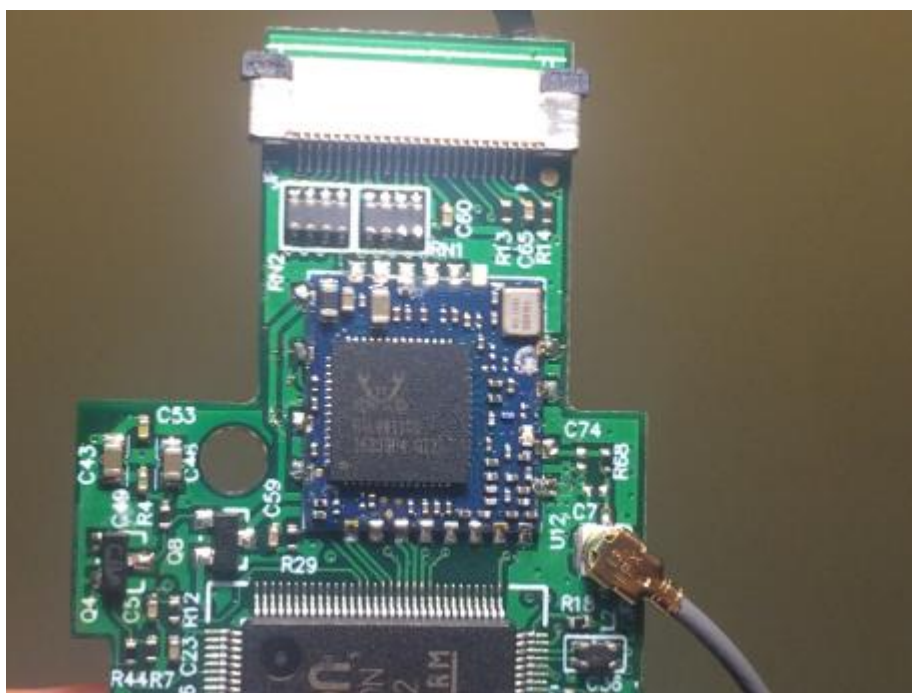












=====End of Report=====