

TEST REPORT

Reference No. : WTD17S0271945-3E
FCC ID..... : 2AMNG-TG100
Applicant..... : Toast, Incorporated
Address : 401 Park Drive, Suite 801, Boston, MA 02215.
Manufacturer : Finance Metadata Information Solution (Shen Zhen) Co.,Ltd.
Address : Longhom Hi-tech Estate, Gongyeyuan Road, Dalang Street, Longhua
New District, Shenzhen, China
Product..... : Tablet PC
Model(s) : TG100
Standards..... : FCC CFR47 Part 15 C Section 15.407:2016
Date of Receipt sample..... : 2017-02-27
Date of Test..... : 2017-07-29 to 2017-09-16
Date of Issue : 2017-09-19
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 Test Group Ltd. is one of the largest and the most comprehensive third party testing organizations in China, our headquarter located in Shenzhen (CNAS Registration No. L3110, A2LA Certificate Number: 4243.01) and have branches in Foshan (CNAS Registration No. L6478), Dongguan (CNAS Registration No. L9950), Zhongshan, Suzhou (CNAS Registration No. L7754), Ningbo and Hong Kong, Our test capability covered four large fields: safety test. Electronic Magnetic Compatibility(EMC), reliability and energy performance, Chemical test. 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), CPSC(Consumer Product Safety Commission), CEC(California energy efficiency), IC(Industry Canada) and ELI(Efficient Lighting Initiative). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as UL, Intertek(ETL-SEMKO), CSA, TÜV Rheinland, TÜV SÜD, etc. 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.

Waltek Services (Shenzhen) Co., Ltd.

A. Accreditations for Conformity Assessment (International)

Country/Region	Accreditation Body	Scope	Note
USA	CNAS (Registration No.: L3110) A2LA (Certificate No.: 4243.01)	FCC ID \ DOC \ VOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		International Services	WPC
Thailand	NTC		-
Singapore	IDA		-
Note: 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. 2. IC 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

2 Revision History

Test report #	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD17S0271945-3E	2017-02-27	2017-07-29 to 2017-09-16	2017-09-19	original	-	Valid

2 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
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

3 Contents

	Page
COVER PAGE.....	1
1 LABORATORIES INTRODUCTION.....	2
2 REVISION HISTORY	3
2 TEST SUMMARY	4
3 CONTENTS	5
4 GENERAL INFORMATION.....	7
4.1 GENERAL DESCRIPTION OF E.U.T.	7
4.2 DETAILS OF E.U.T.	7
4.3 CHANNEL LIST.....	8
5 EQUIPMENT USED DURING TEST	10
5.1 EQUIPMENTS LIST	10
5.2 DESCRIPTION OF SUPPORT UNITS	11
5.3 MEASUREMENT UNCERTAINTY	11
5.4 TEST EQUIPMENT CALIBRATION	11
6 CONDUCTED EMISSION	12
6.1 E.U.T. OPERATION	12
6.2 EUT SETUP.....	12
6.3 MEASUREMENT DESCRIPTION	12
6.4 CONDUCTED EMISSION TEST RESULT	13
7 RADIATED EMISSIONS.....	15
7.1 EUT OPERATION.....	15
7.2 TEST SETUP	16
7.3 SPECTRUM ANALYZER SETUP	17
7.4 TEST PROCEDURE	18
7.5 CORRECTED AMPLITUDE & MARGIN CALCULATION	18
7.6 SUMMARY OF TEST RESULTS	19
8 DUTY CYCLE.....	25
8.1 SUMMARY OF TEST RESULTS	25
9 BAND EDGE	28
9.1 TEST PRODUCE.....	28
9.2 TEST RESULT	29
10 6 DB BANDWIDTH.....	33
10.1 TEST PROCEDURE:.....	33
10.2 TEST RESULT:	33
11 26 DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH	40
11.1 TEST PROCEDURE:.....	40
11.2 TEST RESULT:	41
12 CONDUCTED OUTPUT POWER	48
12.1 TEST PROCEDURE:.....	48
12.2 TEST RESULT :	49
13 POWER SPECTRAL DENSITY	57
13.1 TEST PROCEDURE:.....	57
13.2 TEST RESULT:	58
14 FREQUENCY STABILITY.....	65
14.1 TEST PROCEDURE:.....	65

14.2 TEST RESULT:66

15 ANTENNA REQUIREMENT67

16 SAR EVALUATION68

4 General Information

4.1 General Description of E.U.T.

Product:	Tablet PC
Model(s):	TG100
Model Description:	N/A
Operation Frequency:	IEEE 802.11a/ n(HT20): 5150MHz to 5250MHz(20MHz bandwidth only) IEEE 802.11a/ n(HT20): 5725MHz to 5850MHz(20MHz bandwidth only)
Type of modulation:	IEEE for 802.11n : OFDM(BPSK/QPSK/16QAM/64QAM) IEEE for 802.11a : OFDM (BPSK/QPSK/16QAM/64QAM/256QAM)
The Lowest Oscillator:	19.2MHz
Antenna installation:	Integrated Antenna
Antenna Gain:	2.8 dBi

4.2 Details of E.U.T.

Ratings:	DC 3.7V, 4100mAh, power by battery (Adapter: Input:100-240V~50/60 Hz, 0.35A MAX Output:5.0V  2.0A)
Adapter	Model: HNEM050200UU

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	5785
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)/a(HT20):

channel	Frequency(MHz)	channel	Frequency(MHz)
36	5180	149	5745
40	5200	157	5785
48	5240	165	5825

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%.

The software is installed in operation system, named "RFTestTool.apk", Version 1, date 20160518.

Test Items	Mode	Data Rate	Channel	TX/RX
Radiated Emissions	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11a(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
Duty Cycle	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11a(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
Band Edge	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11a(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
6dB Bandwidth	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11a(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
26dB Bandwidth and 99% Occupied Bandwidth	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11a(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
Conducted Output Power	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11a(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
Power Spectral Density	802.11n(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	TX
	802.11a(HT20)	MCS0	U-NII-1 36/40/48 U-NII-3 149/155/165	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 1#						
Item	Equipment	Manufaturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	100947	2017-09-12	2018-09-11
2.	LISN	R&S	ENV216	101215	2017-09-12	2018-09-11
3.	Cable	Top	TYPE16(3.5M)	-	2017-09-12	2018-09-11
Conducted Emissions Test Site 2#						
Item	Equipment	Manufaturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	2017-09-12	2018-09-11
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2017-09-12	2018-09-11
3.	Limiter	York	MTS-IMP-136	261115-001-0024	2017-09-12	2018-09-11
4.	Cable	LARGE	RF300	-	2017-09-12	2018-09-11
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufaturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMC Analyzer	Agilent	E7405A	MY45114943	2017-09-14	2018-09-13
2	Ative Loop Antenna	Beijing Dazhi	ZN30900A	-	2016-10-17	2017-10-16
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2017-04-09	2018-04-08
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2017-09-12	2018-09-11
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2017-04-09	2018-04-08
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2017-09-14	2018-09-13
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2017-04-13	2018-04-12
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2017-04-13	2018-04-12
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufaturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2017-04-13	2018-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Apr.09, 2016	Apr.08, 2017
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	2017-04-13	2018-04-12
4	Cable	HUBER+SUHNER	CBL2	525178	2017-04-13	2018-04-12
RF Conducted Testing						

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2017-09-14	2018-09-13
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2017-09-12	2018-09-11
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2017-09-12	2018-09-11

5.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

5.3 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)

5.4 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 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:	66-56 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)

6.1 E.U.T. Operation

Operating Environment :

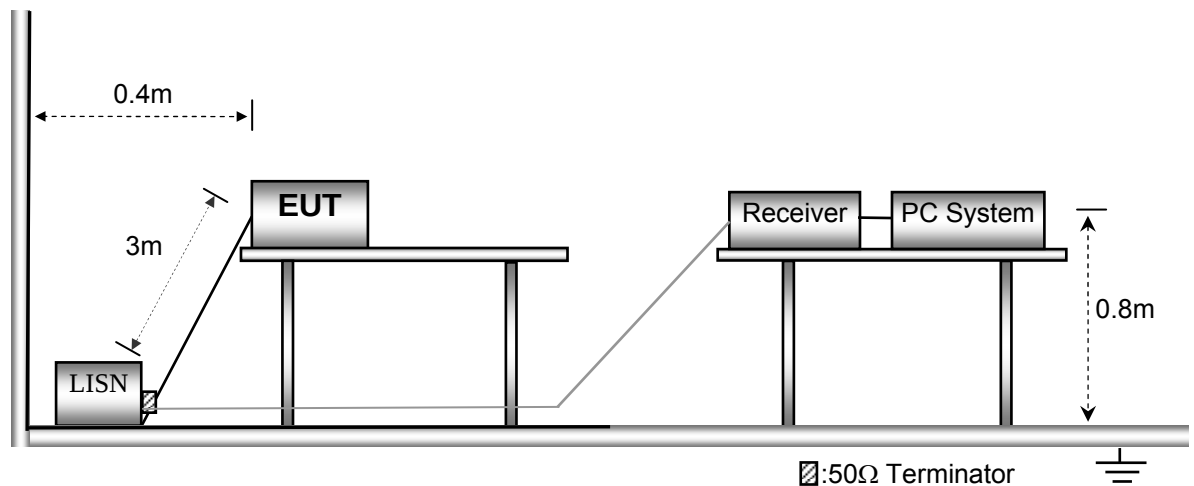
Temperature:	21.5 °C
Humidity:	51.9 % RH
Atmospheric Pressure:	101.2kPa

EUT Operation :

The test was performed in transmitting mode, the test data were shown in the report.

6.2 EUT Setup

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



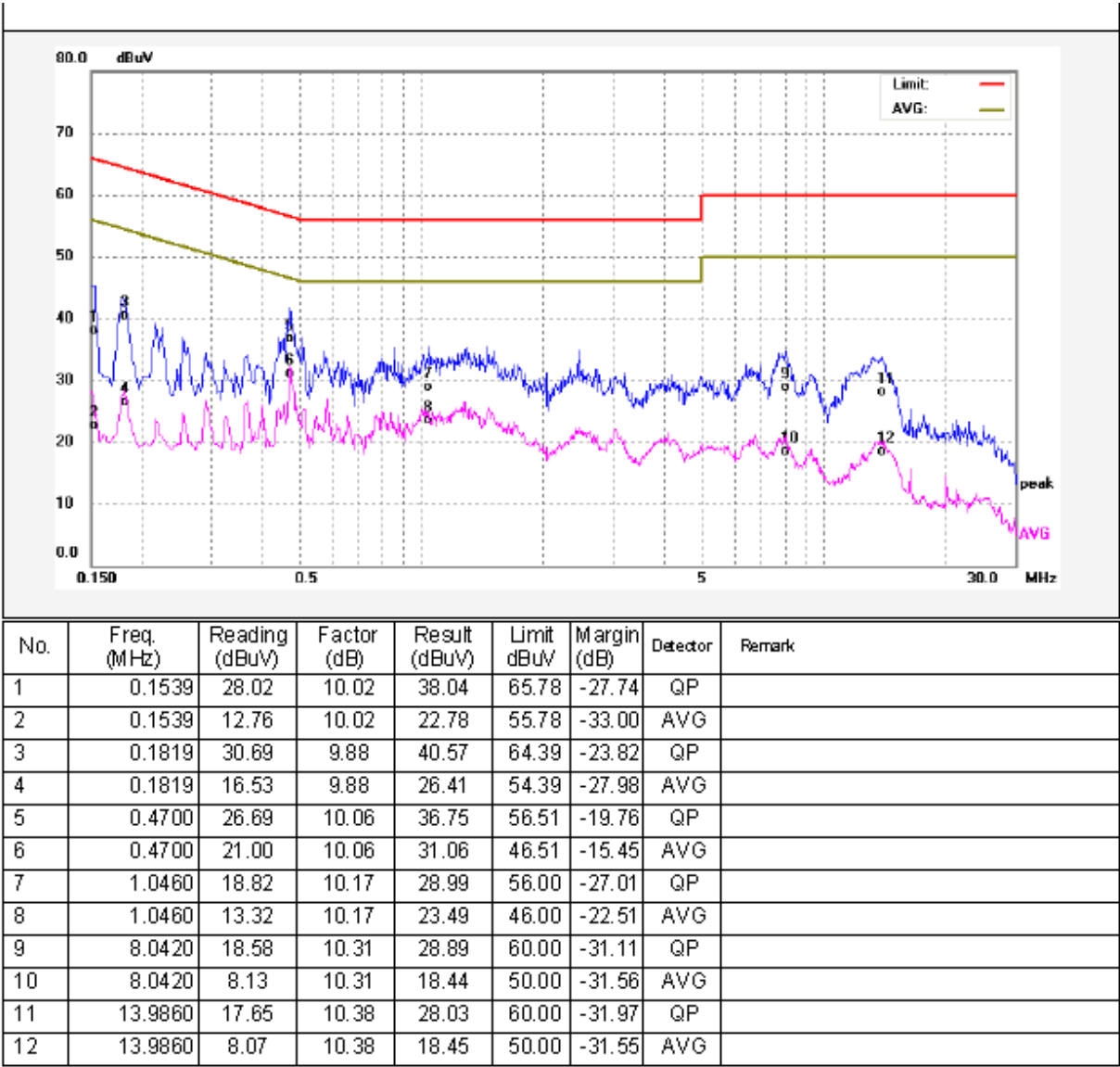
6.3 Measurement Description

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.

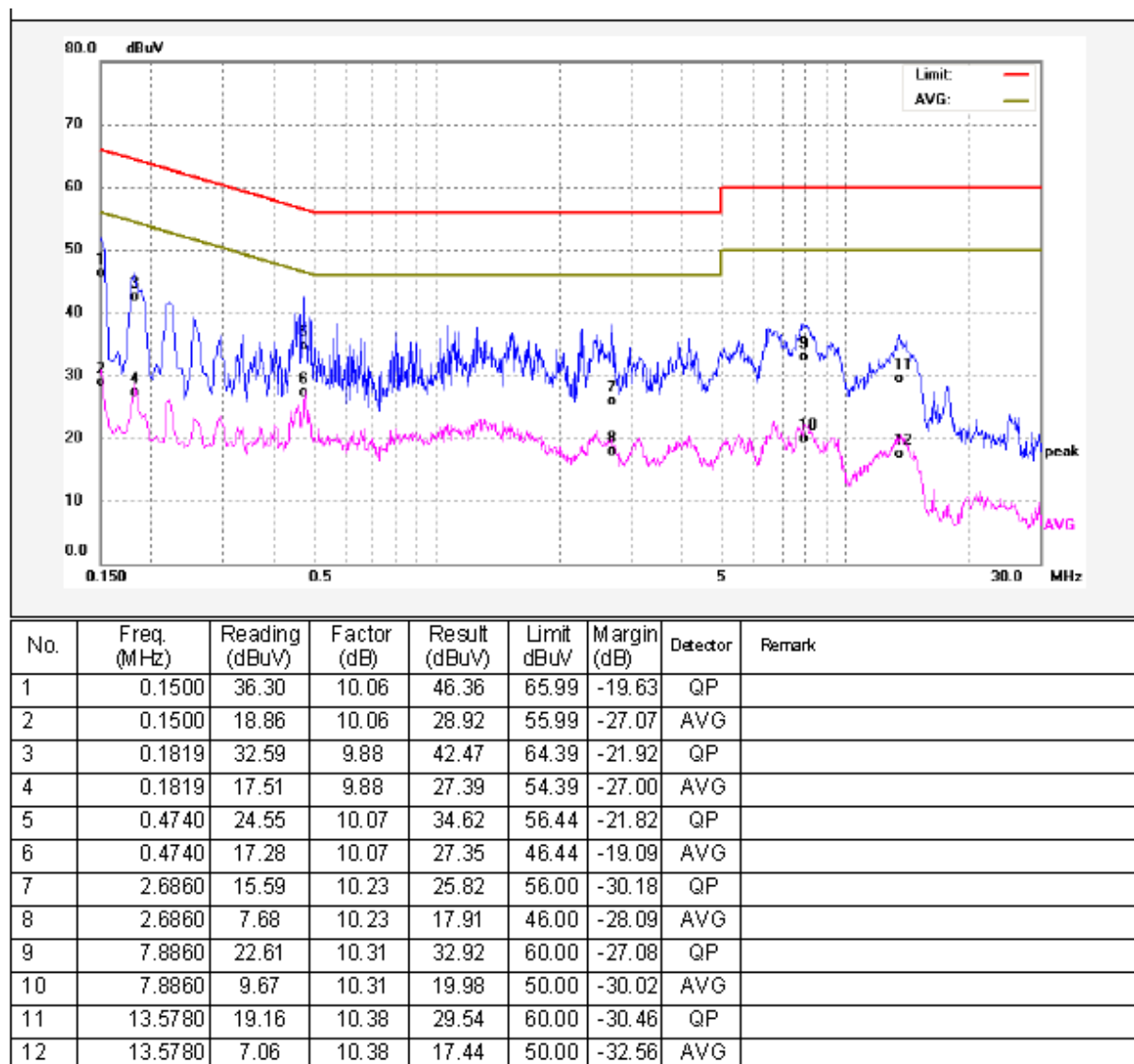
6.4 Conducted Emission Test Result

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

Live line:



Neutral line:



7 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	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

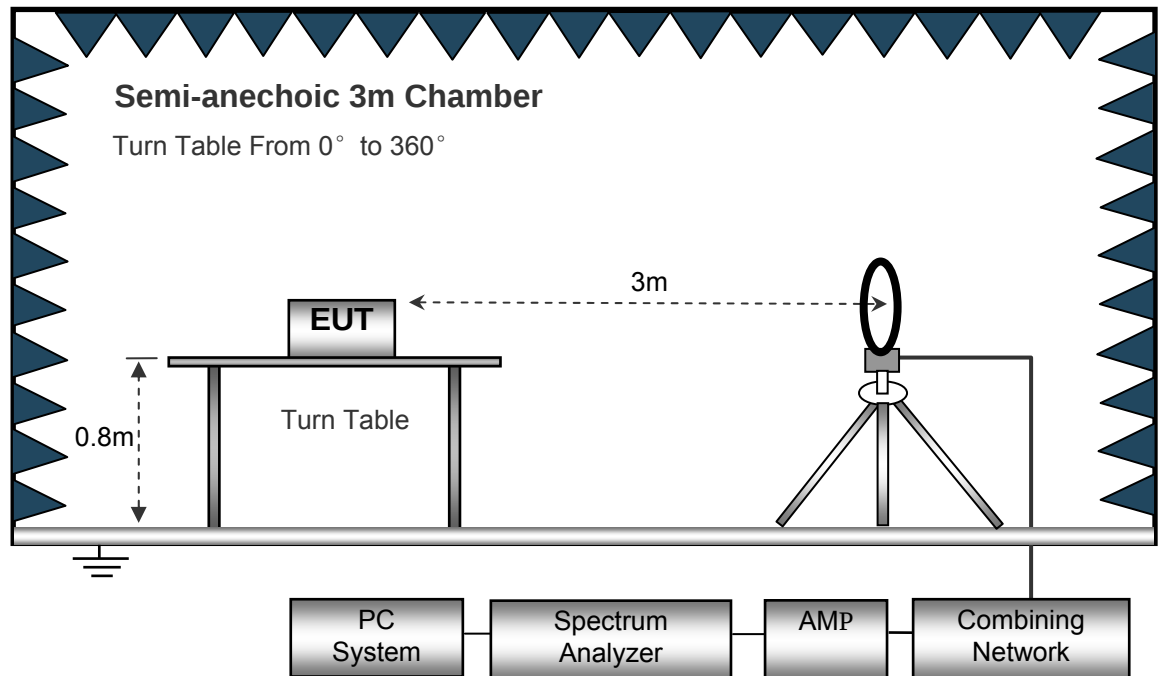
EUT Operation :

The test was performed in transmitting mode, the test data were shown in the report.

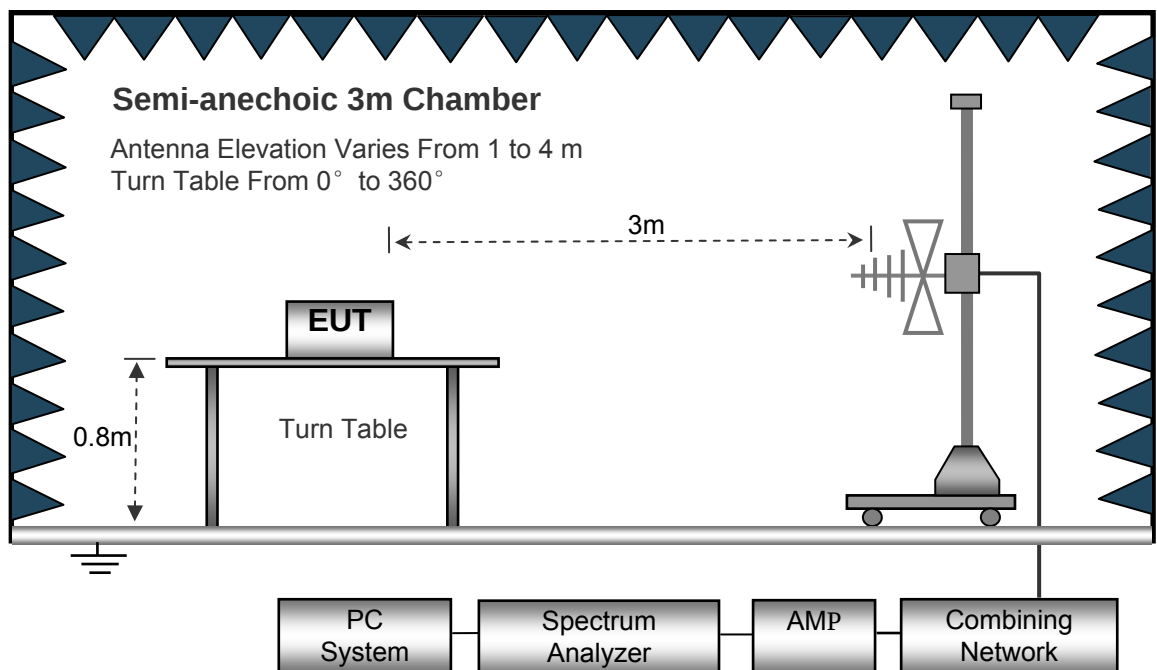
7.2 Test Setup

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

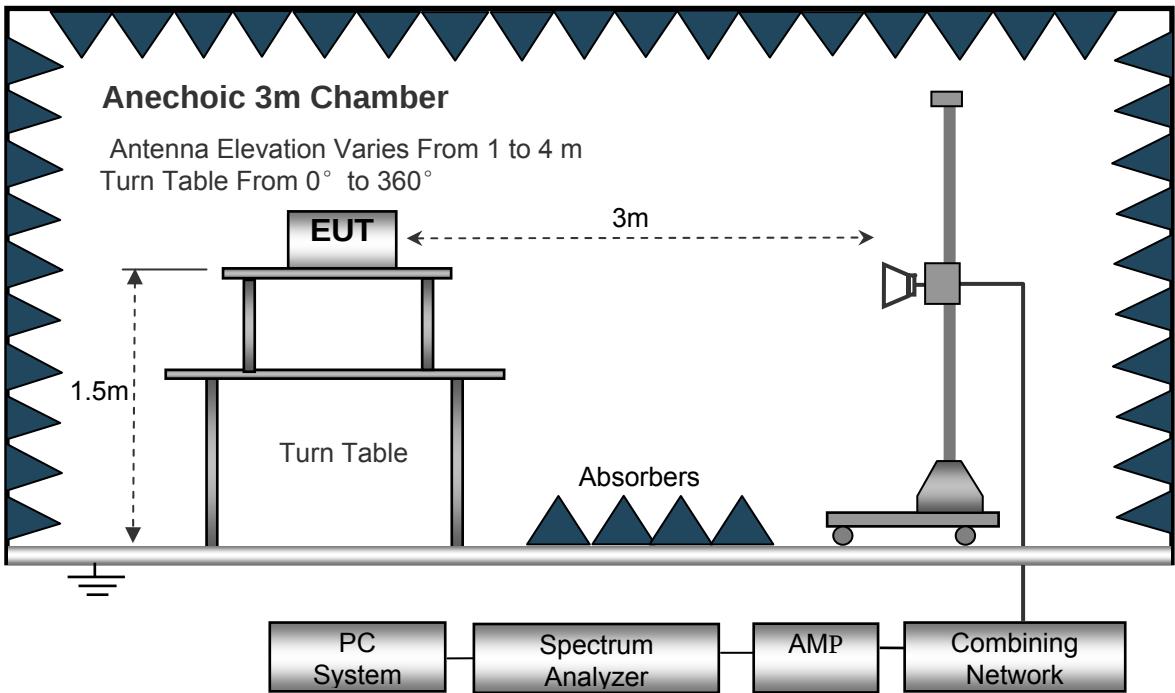
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

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

30MHz ~ 1GHz

Sweep Speed Auto
DetectorPK
Resolution Bandwidth.....100kHz
Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed Auto
DetectorPK
Resolution Bandwidth.....1MHz
Video Bandwidth.....3MHz
DetectorAve.
Resolution Bandwidth.....1MHz
Video Bandwidth.....10Hz

7.4 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.

7.5 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:

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

7.6 Summary of Test Results

Test Frequency: 19.2MHz ~ 30MHz

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

Test Frequency : 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Fator	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)
802.11n(HT20) U-NII-1 low Channel 5180MHz									
226.30	39.49	QP	215	1.8	H	-11.62	27.87	46.00	-18.13
226.30	29.33	QP	232	1.2	V	-11.62	17.71	46.00	-28.29
4512.30	48.17	PK	230	1.3	H	-2.14	46.03	74.00	-27.97
4512.30	48.08	Ave	230	1.3	H	-2.14	45.94	54.00	-8.06
5137.39	46.79	PK	178	1.0	H	-1.06	45.73	74.00	-28.27
5137.39	39.19	Ave	178	1.0	H	-1.06	38.13	54.00	-15.87
10360.00	39.33	PK	201	1.0	H	5.33	44.66	74.00	-29.34
10360.00	36.84	Ave	201	1.0	H	5.33	42.17	54.00	-11.83
802.11n(HT20) U-NII-1 middle channel 5200MHz									
226.30	38.14	QP	156	1.0	H	-11.62	26.52	46.00	-19.48
226.30	29.96	QP	173	1.9	V	-11.62	18.34	46.00	-27.66
4508.09	48.24	PK	242	1.4	H	-2.12	46.12	74.00	-27.88
4508.09	47.05	Ave	242	1.4	H	-2.12	44.93	54.00	-9.07
5115.58	47.61	PK	265	1.2	H	-1.06	46.55	74.00	-27.45
5115.58	40.45	Ave	265	1.2	H	-1.06	39.39	54.00	-14.61
10400.00	39.89	PK	185	1.9	H	5.21	45.10	74.00	-28.90
10400.00	38.07	Ave	185	1.9	H	5.21	43.28	54.00	-10.72

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Fator	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)
802.11n(HT20) U-NII-1 High channel 5240MHz									
226.30	39.05	QP	166	1.2	H	-11.62	27.43	46.00	-18.57
226.30	30.46	QP	325	1.2	V	-11.62	18.84	46.00	-27.16
4533.02	48.04	PK	310	1.7	H	-1.96	46.08	74.00	-27.92
4533.02	46.22	Ave	310	1.7	H	-1.96	44.26	54.00	-9.74
5127.51	46.87	PK	330	1.3	H	-1.06	45.81	74.00	-28.19
5127.51	42.18	Ave	330	1.3	H	-1.06	41.12	54.00	-12.88
10480.00	39.07	PK	342	1.3	H	5.14	44.21	74.00	-29.79
10480.00	38.93	Ave	342	1.3	H	5.14	44.07	54.00	-9.93
802.11n(HT20) U-NII-3 low Channel 5745MHz									
226.30	38.90	QP	29	1.2	H	-11.62	27.28	46.00	-18.72
226.30	30.04	QP	54	1.8	V	-11.62	18.42	46.00	-27.58
4518.10	46.70	PK	147	2.0	H	-1.85	44.85	74.00	-29.15
4518.10	43.54	Ave	147	2.0	H	-1.85	41.69	54.00	-12.31
11490.00	37.42	PK	41	1.5	H	5.93	43.35	74.00	-30.65
11490.00	36.08	Ave	41	1.5	H	5.93	42.01	54.00	-11.99
5362.51	45.40	PK	161	1.2	H	-1.01	44.39	74.00	-29.61
5362.51	37.12	Ave	161	1.2	H	-1.01	36.11	54.00	-17.89

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Fator	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)
802.11n(HT20) U-NII-3 middle channel 5785MHz									
226.30	38.10	QP	331	1.4	H	-11.62	26.48	46.00	-19.52
226.30	29.21	QP	212	1.6	V	-11.62	17.59	46.00	-28.41
4518.71	47.07	PK	154	1.4	H	-1.89	45.18	74.00	-28.82
4518.71	43.02	Ave	154	1.4	H	-1.89	41.13	54.00	-12.87
11570.00	39.33	PK	267	1.6	H	5.81	45.14	74.00	-28.86
11570.00	39.06	Ave	267	1.6	H	5.81	44.87	54.00	-9.13
5377.38	46.83	PK	173	1.8	H	-1.04	45.79	74.00	-28.21
5377.38	38.52	Ave	173	1.8	H	-1.04	37.48	54.00	-16.52
802.11n(HT20) U-NII-3 High channel 5825MHz									
226.30	37.15	QP	114	1.5	H	-11.62	25.53	46.00	-20.47
226.30	28.55	QP	320	1.9	V	-11.62	16.93	46.00	-29.07
4500.27	47.02	PK	175	1.3	H	-1.97	45.05	74.00	-28.95
4500.27	43.24	Ave	175	1.3	H	-1.97	41.27	54.00	-12.73
11650.00	39.45	PK	111	1.9	H	5.84	45.29	74.00	-28.71
11650.00	37.37	Ave	111	1.9	H	5.84	43.21	54.00	-10.79
5364.19	46.18	PK	232	1.1	H	-1.12	45.06	74.00	-28.94
5364.19	37.54	Ave	232	1.1	H	-1.12	36.42	54.00	-17.58

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Fator	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)
802.11a(HT20) U-NII-1 low Channel 5180MHz									
226.30	38.29	QP	177	2.0	H	-11.62	26.67	46.00	-19.33
226.30	28.83	QP	15	1.6	V	-11.62	17.21	46.00	-28.79
4524.42	44.40	PK	10	1.2	H	-1.86	42.54	74.00	-31.46
4524.42	40.73	Ave	10	1.2	H	-1.86	38.87	54.00	-15.13
5142.15	46.73	PK	335	1.1	H	-1.06	45.67	74.00	-28.33
5142.15	39.37	Ave	335	1.1	H	-1.06	38.31	54.00	-15.69
10360.00	39.04	PK	243	1.1	H	5.33	44.37	74.00	-29.63
10360.00	36.99	Ave	243	1.1	H	5.33	42.32	54.00	-11.68
802.11a(HT20) U-NII-1 middle channel 5200MHz									
226.30	38.06	QP	239	1.8	H	-11.62	26.44	46.00	-19.56
226.30	29.77	QP	47	1.9	V	-11.62	18.15	46.00	-27.85
4510.18	44.72	PK	338	1.1	H	-1.82	42.90	74.00	-31.10
4510.18	41.50	Ave	338	1.1	H	-1.82	39.68	54.00	-14.32
5135.95	47.23	PK	302	1.2	H	-1.06	46.17	74.00	-27.83
5135.95	38.79	Ave	302	1.2	H	-1.06	37.73	54.00	-16.27
10400.00	40.85	PK	343	1.4	H	5.21	46.06	74.00	-27.94
10400.00	38.19	Ave	343	1.4	H	5.21	43.40	54.00	-10.60

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Fator	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)
802.11a(HT20) U-NII-1 High channel 5240MHz									
226.30	38.04	QP	28	1.5	H	-11.62	26.42	46.00	-19.58
226.30	30.06	QP	193	1.6	V	-11.62	18.44	46.00	-27.56
4512.66	45.64	PK	229	1.9	H	-1.81	43.83	74.00	-30.17
4512.66	42.11	Ave	229	1.9	H	-1.81	40.30	54.00	-13.70
5146.16	46.45	PK	359	1.6	H	-1.06	45.39	74.00	-28.61
5146.16	40.42	Ave	359	1.6	H	-1.06	39.36	54.00	-14.64
10480.00	40.05	PK	280	1.5	H	5.14	45.19	74.00	-28.81
10480.00	38.92	Ave	280	1.5	H	5.14	44.06	54.00	-9.94
802.11a(HT20) U-NII-3 low Channel 5745MHz									
226.30	38.76	QP	120	1.7	H	-11.62	27.14	46.00	-18.86
226.30	29.81	QP	178	1.6	V	-11.62	18.19	46.00	-27.81
4511.61	44.46	PK	0	1.9	H	-1.92	42.54	74.00	-31.46
4511.61	39.44	Ave	0	1.9	H	-1.92	37.52	54.00	-16.48
11490.00	37.80	PK	359	1.6	H	5.93	43.73	74.00	-30.27
11490.00	36.48	Ave	359	1.6	H	5.93	42.41	54.00	-11.59
5358.51	46.76	PK	50	2.0	H	-1.03	45.73	74.00	-28.27
5358.51	39.67	Ave	50	2.0	H	-1.03	38.64	54.00	-15.36

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Fator	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)
802.11a(HT20) U-NII-3 middle channel 5785MHz									
226.30	39.38	QP	119	2.0	H	-11.62	27.76	46.00	-18.24
226.30	29.47	QP	313	1.3	V	-11.62	17.85	46.00	-28.15
4522.53	44.89	PK	135	1.6	H	-1.97	42.92	74.00	-31.08
4522.53	38.77	Ave	135	1.6	H	-1.97	36.80	54.00	-17.20
11570.00	41.17	PK	218	1.6	H	5.81	46.98	74.00	-27.02
11570.00	38.47	Ave	218	1.6	H	5.81	44.28	54.00	-9.72
5382.14	46.22	PK	338	1.7	H	-1.05	45.17	74.00	-28.83
5382.14	37.83	Ave	338	1.7	H	-1.05	36.78	54.00	-17.22
802.11a(HT20) U-NII-3 High channel 5825MHz									
226.30	38.92	QP	145	1.3	H	-11.62	27.30	46.00	-18.70
226.30	30.34	QP	289	1.6	V	-11.62	18.72	46.00	-27.28
4539.56	44.47	PK	350	1.7	H	-1.88	42.59	74.00	-31.41
4539.56	38.18	Ave	350	1.7	H	-1.88	36.30	54.00	-17.70
11650.00	39.31	PK	209	1.2	H	5.84	45.15	74.00	-28.85
11650.00	37.68	Ave	209	1.2	H	5.84	43.52	54.00	-10.48
5370.99	46.88	PK	294	1.6	H	-1.06	45.82	74.00	-28.18
5370.99	39.28	Ave	294	1.6	H	-1.06	38.22	54.00	-15.78

8 Duty cycle

Test Requirement: 47 CFR Part 15C 15.407 and 789033 D02 General UNII Test Procedures New Rules v01, Section (B)

Test Method: ANSI C63.10: 2013

Test Limit: N/A

Test Result: PASS

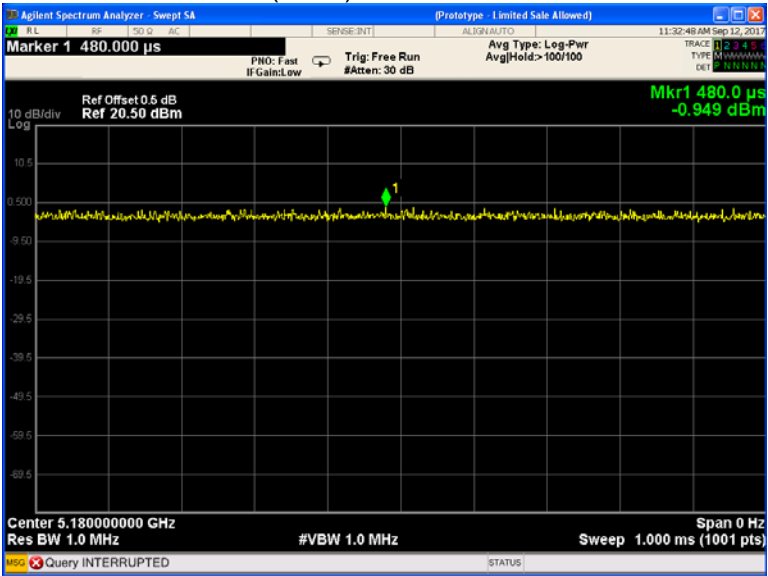
Remark: Through Pre-scan, and found 802.11a at lowest channel is the worst case. Only the worst case is recorded in the report.

8.1 Summary of Test Results

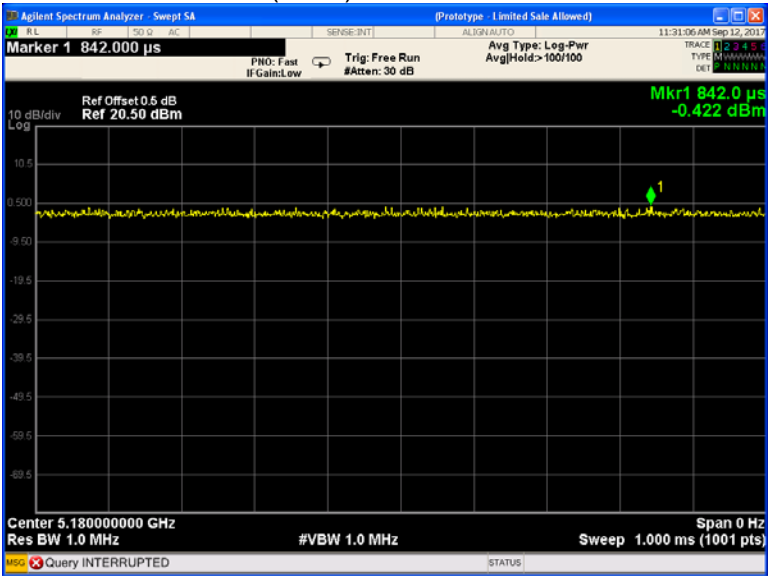
802.11n(HT20) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
36	100	100	100
149	100	100	100
802.11a(HT20) mode			
channel	On time(ms)	Period(ms)	Duty Cycle(%)
36	100	100	100
149	100	100	100

Test result plots shown as follows:

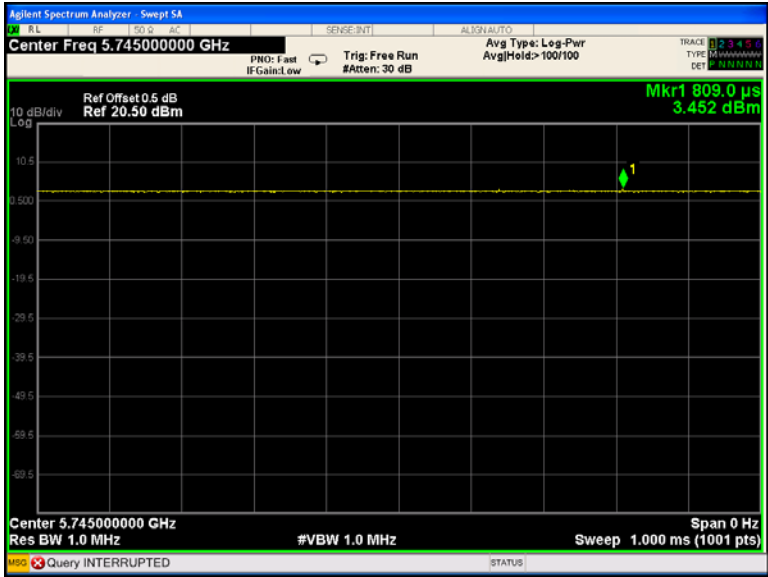
802.11n(HT20) U-NII-1 Low channel



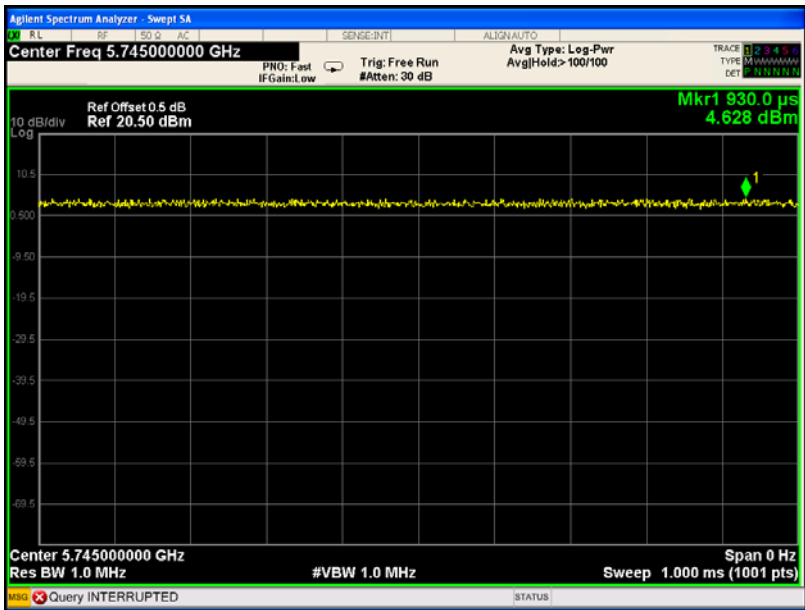
802.11a(HT20) U-NII-1 Low channel



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



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



9 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 within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.
Test Result:	PASS

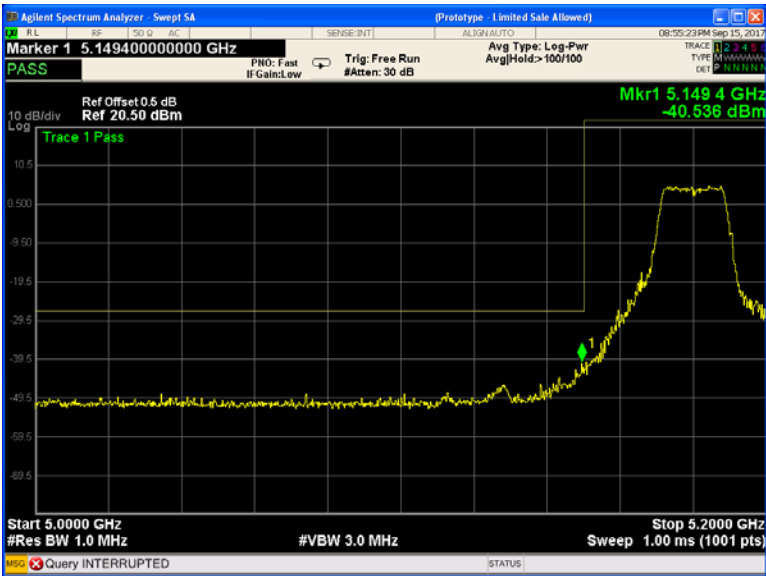
9.1 Test Produce

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.

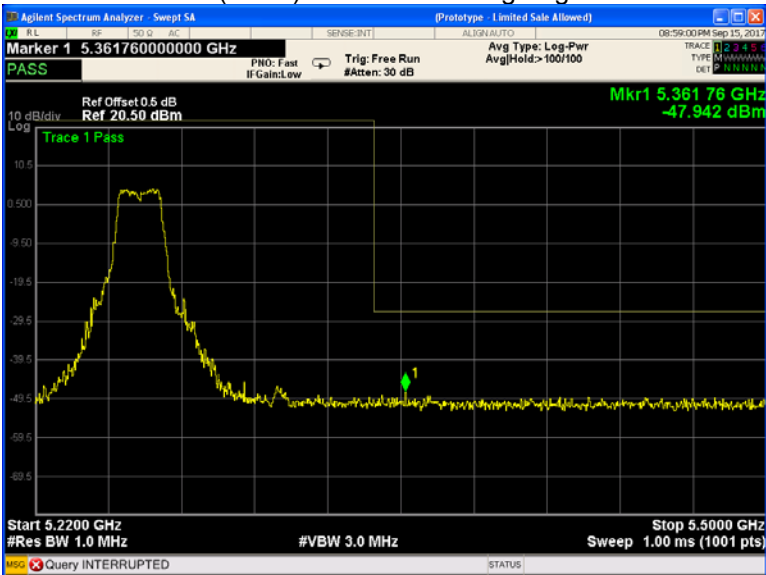
9.2 Test Result

Test result plots shown as follows:

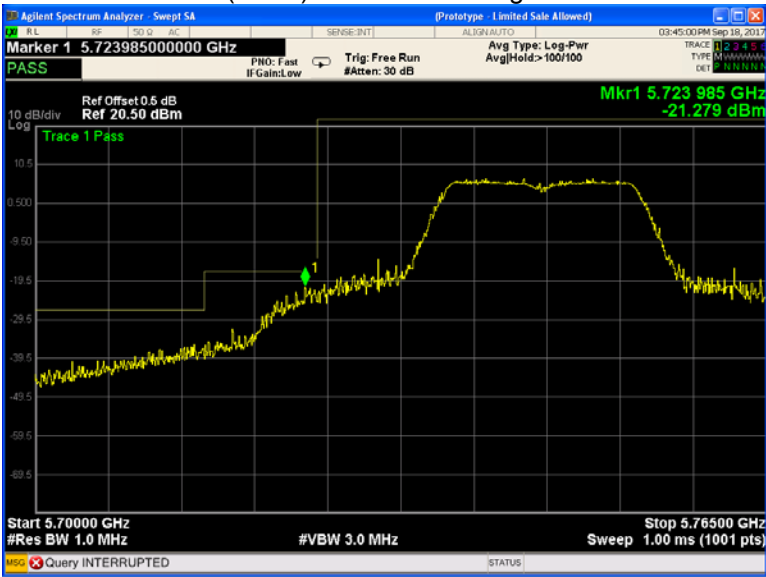
802.11n(HT20) U-NII-1 Band edge-left side



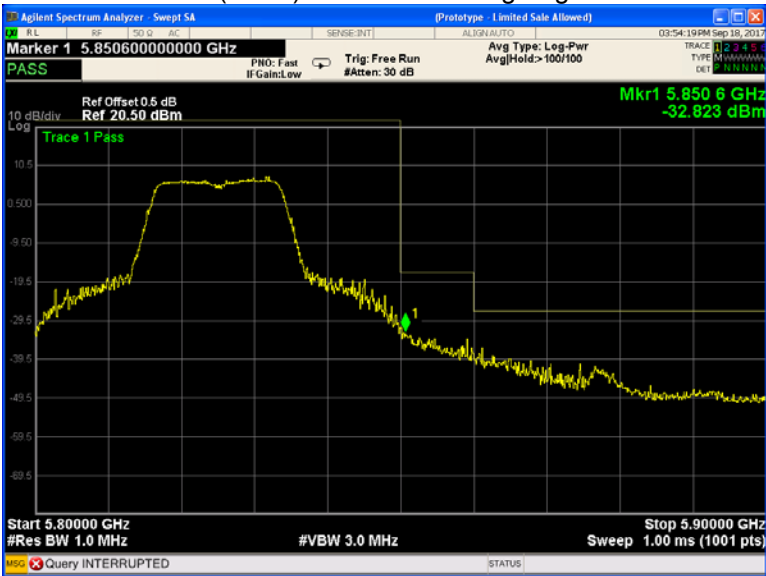
802.11n(HT20) U-NII-1 Band edge-right side



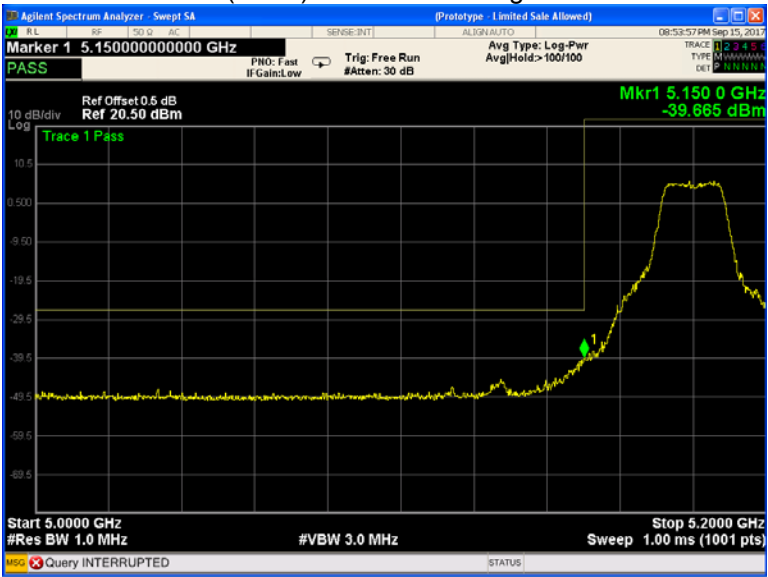
802.11n(HT20) U-NII-3 Band edge-left side



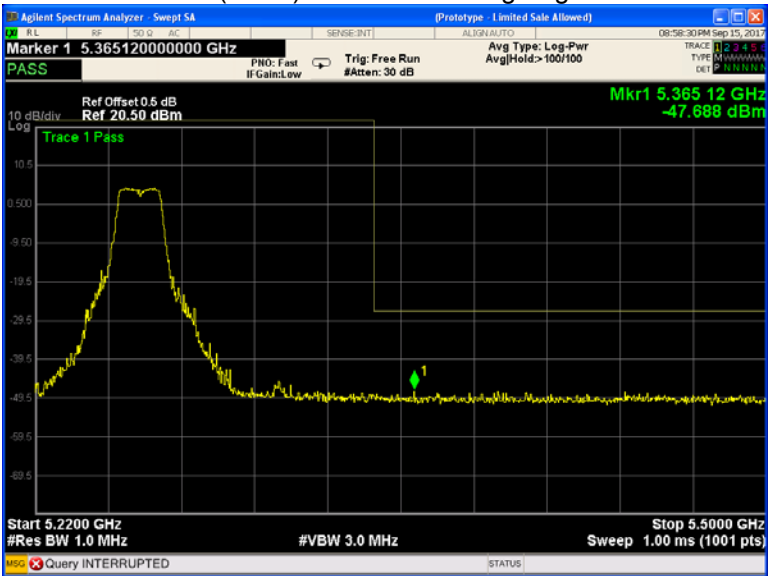
802.11n(HT20) U-NII-3 Band edge-right side



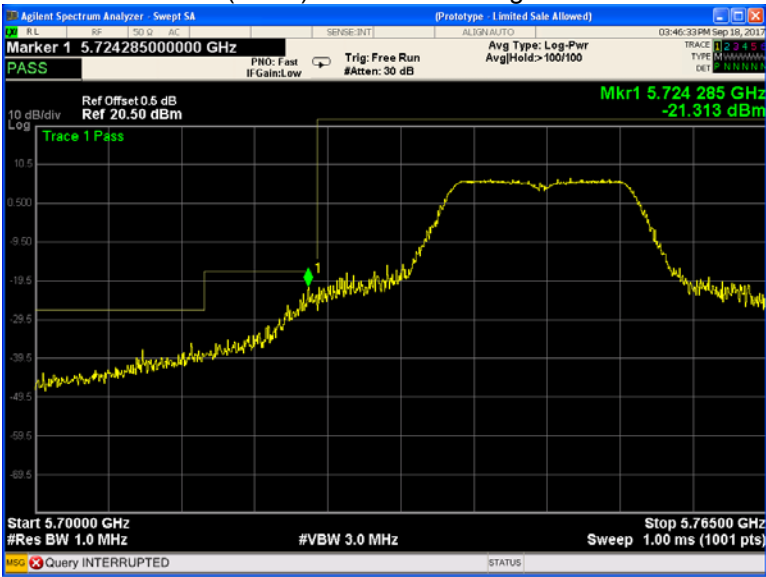
802.11a(HT20) U-NII-1 Band edge-left side



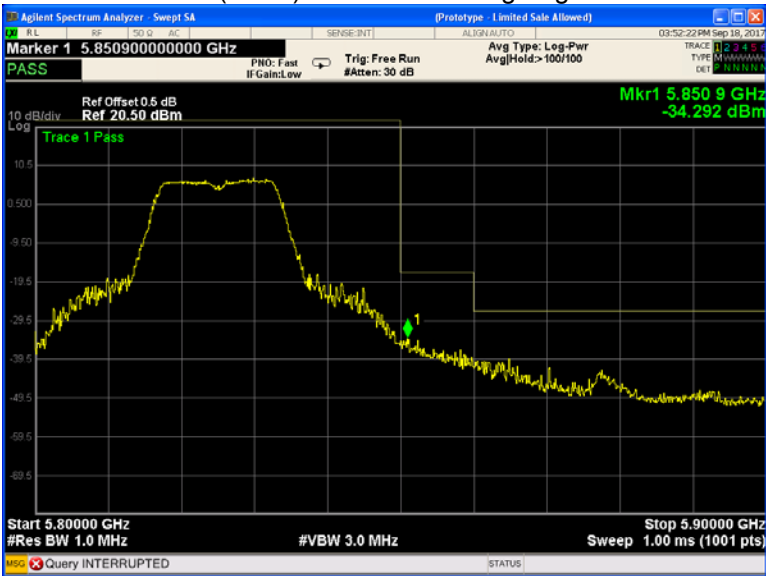
802.11a(HT20) U-NII-1 Band edge-right side



802.11a(HT20) U-NII-3 Band edge-left side



802.11a(HT20) U-NII-3 Band edge-right side



10 6 dB Bandwidth

Test Requirement: FCC CFR47 Part 15 Section 15.407(e)
 KDB662911 D01 Multiple Transmitter Output v02r01
 Test Method: KDB789033 D02 General UNII Test Procedures New Rules v01
 Section C
 Test Limit: ≥ 500 kHz
 Test Result: PASS

10.1 Test Procedure:

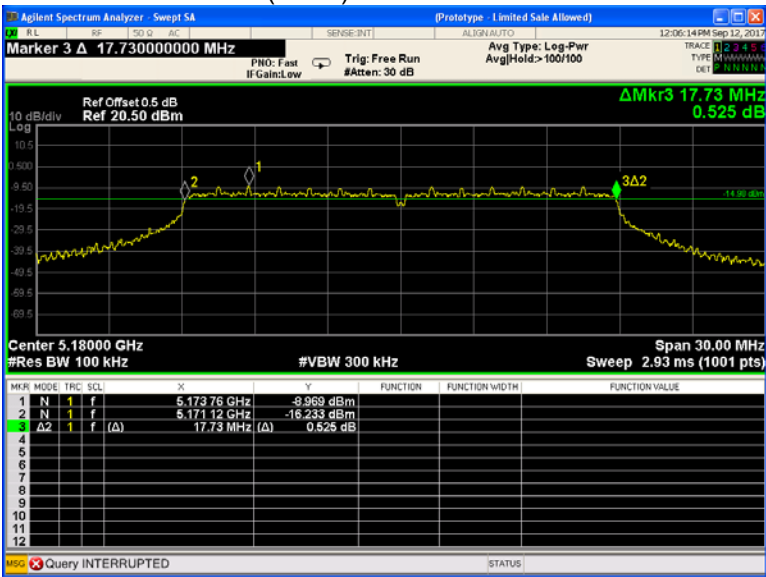
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

10.2 Test Result:

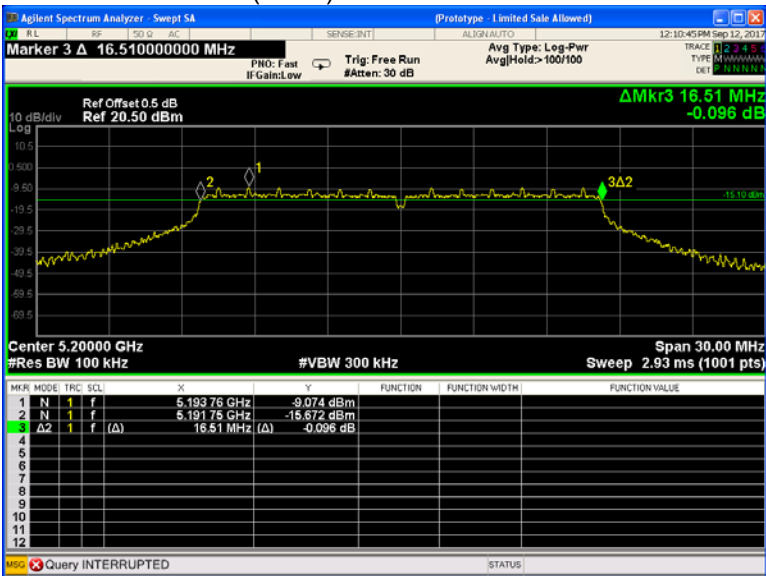
Band	Operation mode	6 dB Bandwidth (MHz)		
		Low	Middle	High
U-NII-1	802.11n(HT20)	17.73	16.51	16.47
	802.11a(HT20)	17.70	16.54	16.41
U-NII-3	802.11n(HT20)	17.72	17.68	17.72
	802.11a(HT20)	16.52	16.32	16.52

Test result plots shown as follows:

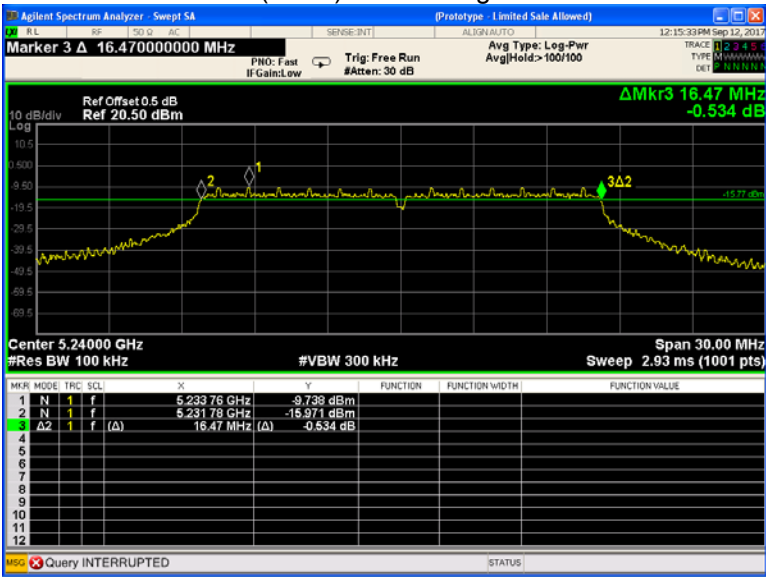
802.11n(HT20) U-NII-1 Low channel



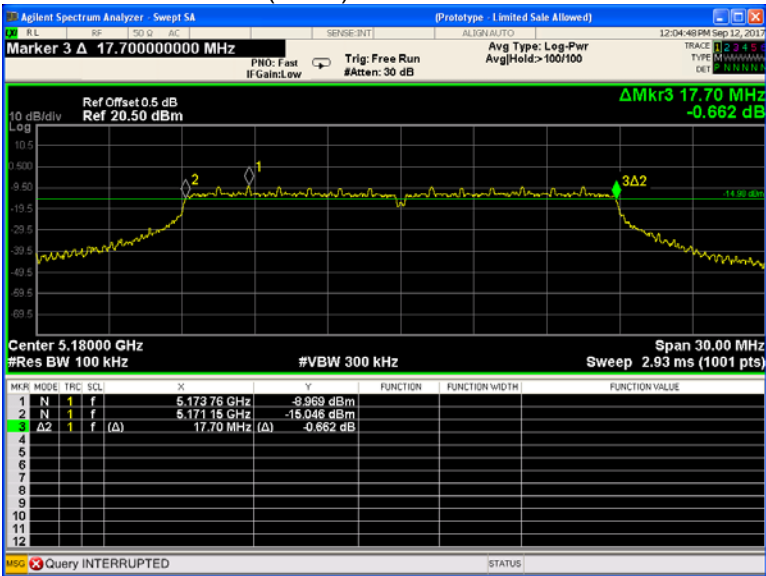
802.11n(HT20) U-NII-1 Middle channel



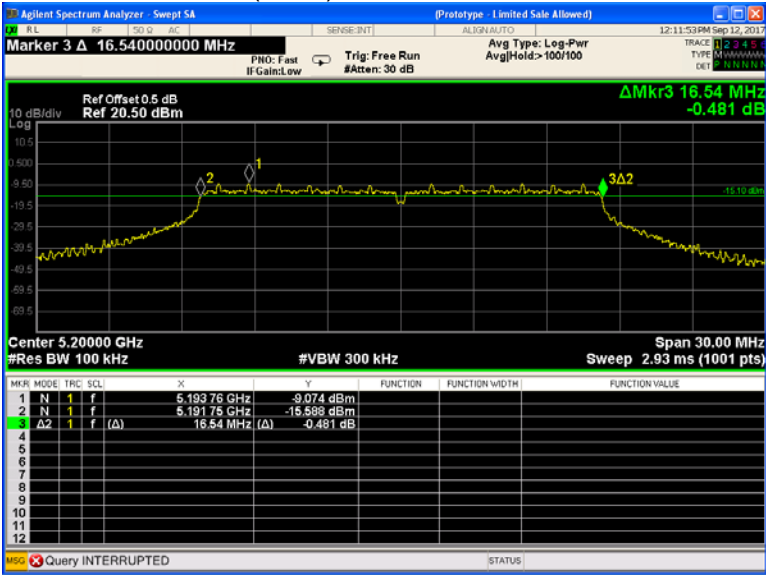
802.11n(HT20) U-NII-1 High channel



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



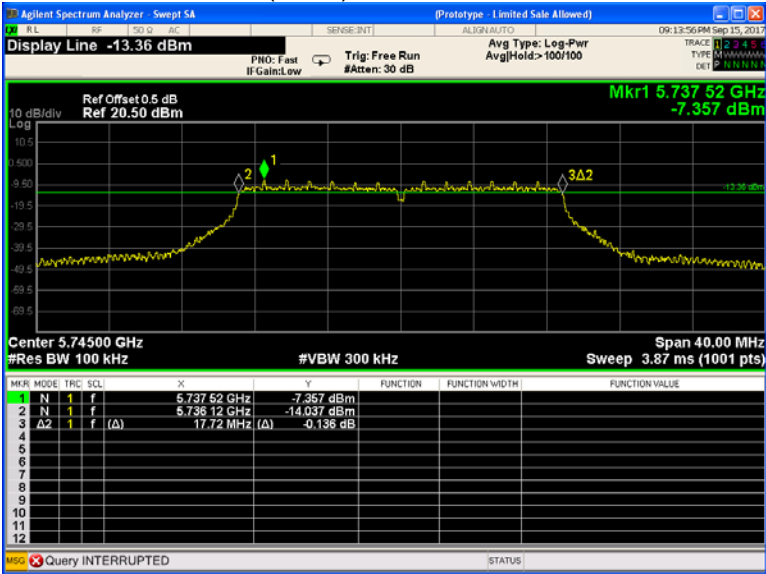
802.11a(HT20) U-NII-1 Middle channel



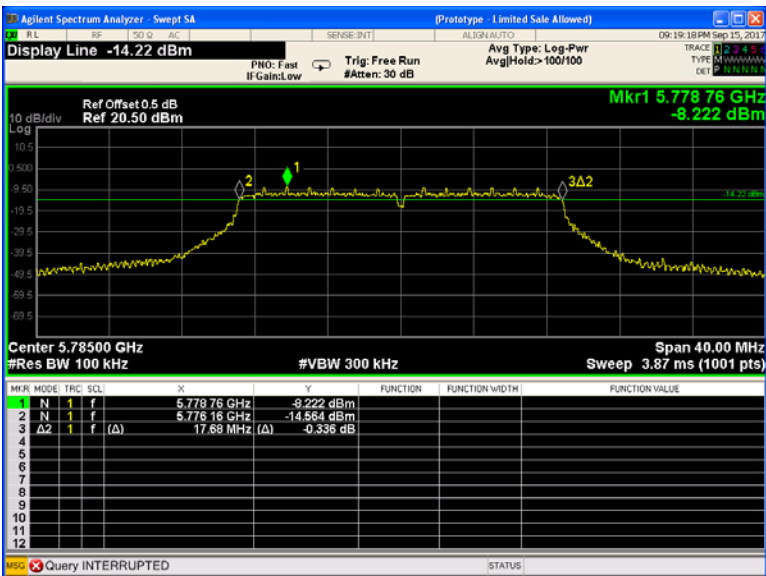
802.11a(HT20) U-NII-1 High channel



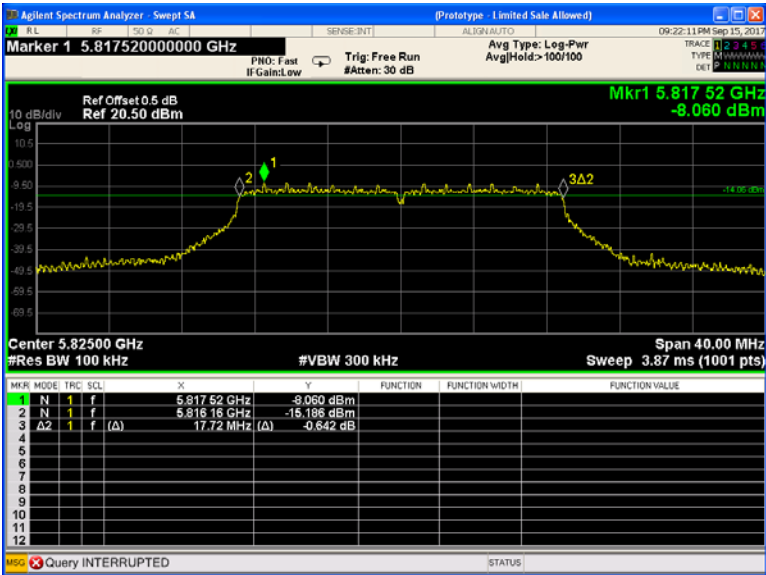
802.11n(HT20) U-NII-3 Low channel



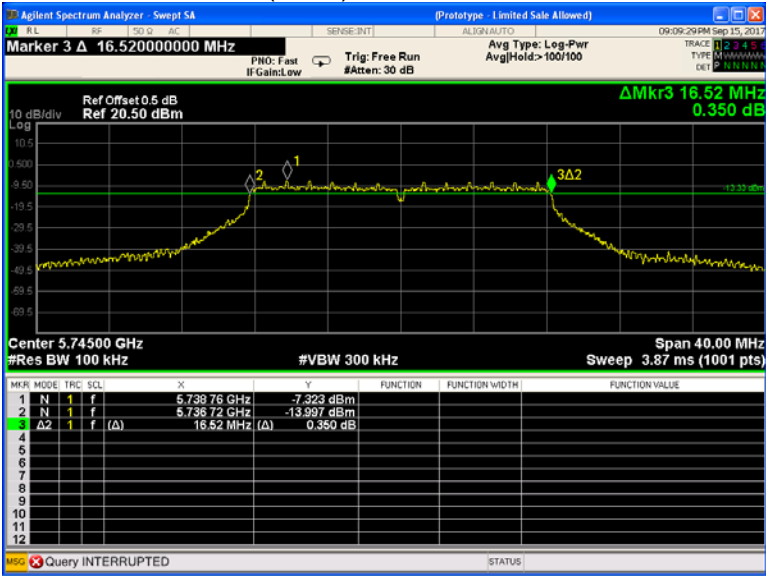
802.11n(HT20) U-NII-3 Middle channel



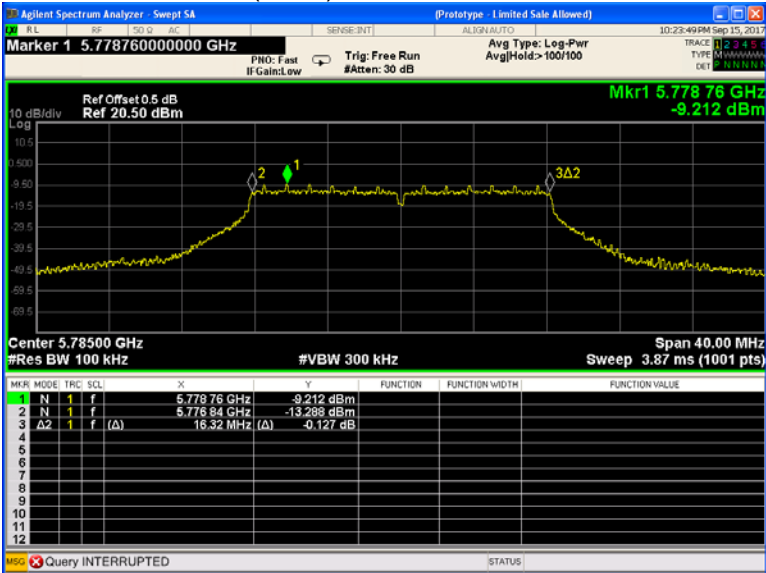
802.11n(HT20) U-NII-3 High channel



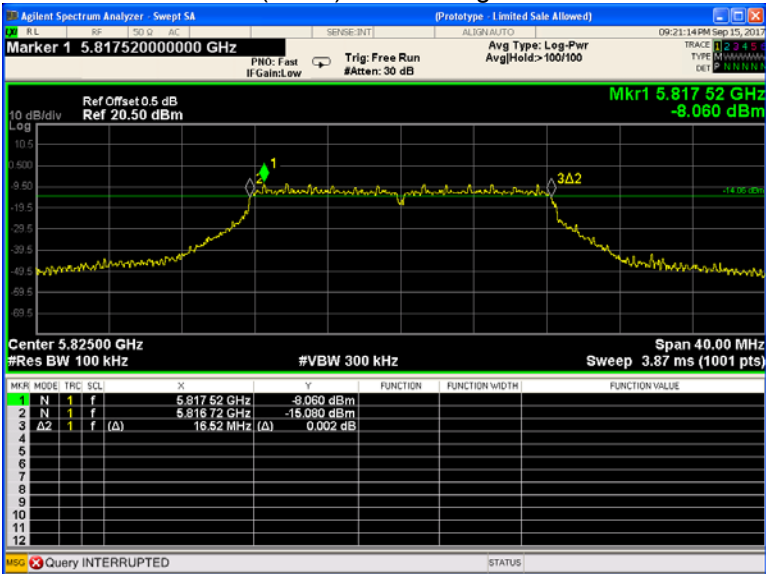
802.11a(HT20) U-NII-3 Low channel



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



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



11 26 dB Bandwidth and 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.407 (a) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v01 Section D
Test Limit:	No restriction limits
Test Result:	PASS

11.1 Test Procedure:

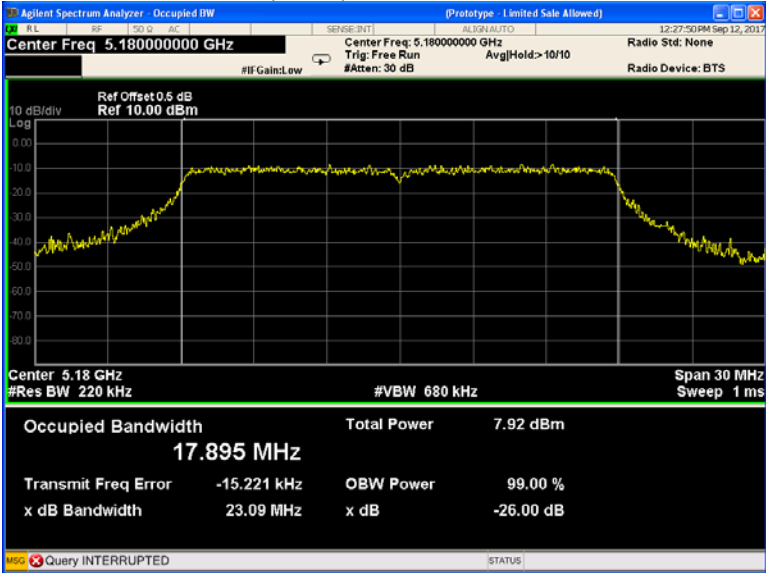
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

11.2 Test Result:

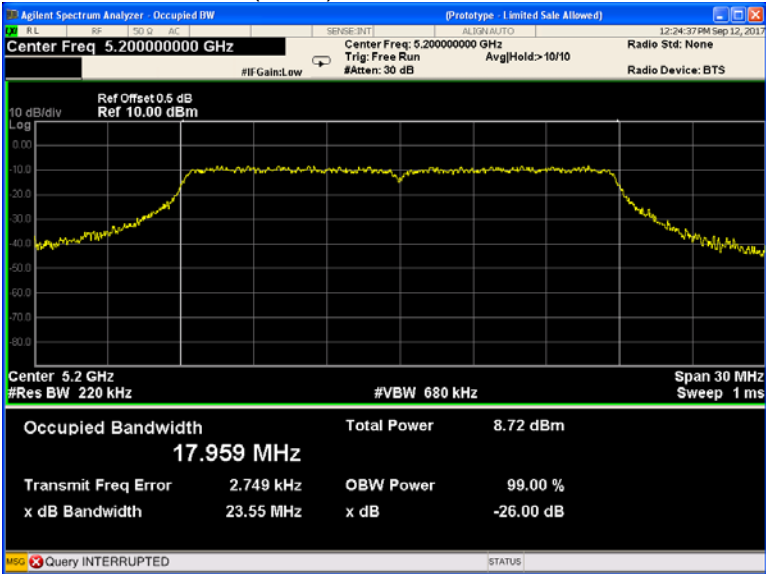
Band	Operation mode	26 dB Bandwidth (MHz)			99% Bandwidth (MHz)		
		Low	Middle	High	Low	Middle	High
U-NII-1	802.11n(HT20)	23.09	23.55	23.10	17.895	17.959	17.893
	802.11a(HT20)	22.80	23.52	22.53	16.878	16.827	16.835
U-NII-3	802.11n(HT20)	20.99	21.840	21.800	17.634	17.948	17.935
	802.11a(HT20)	21.920	20.94	20.79	17.941	17.677	17.701

Test result plots shown as follows:

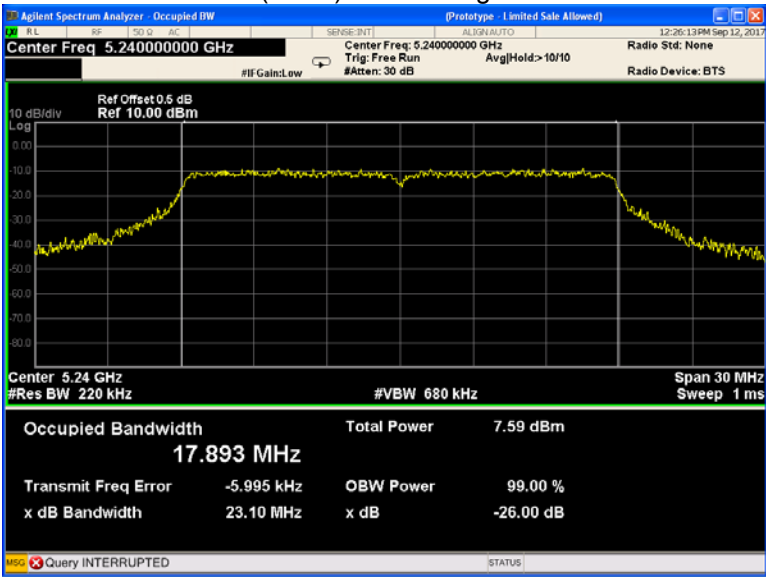
802.11n(HT20) U-NII-1 Low channel



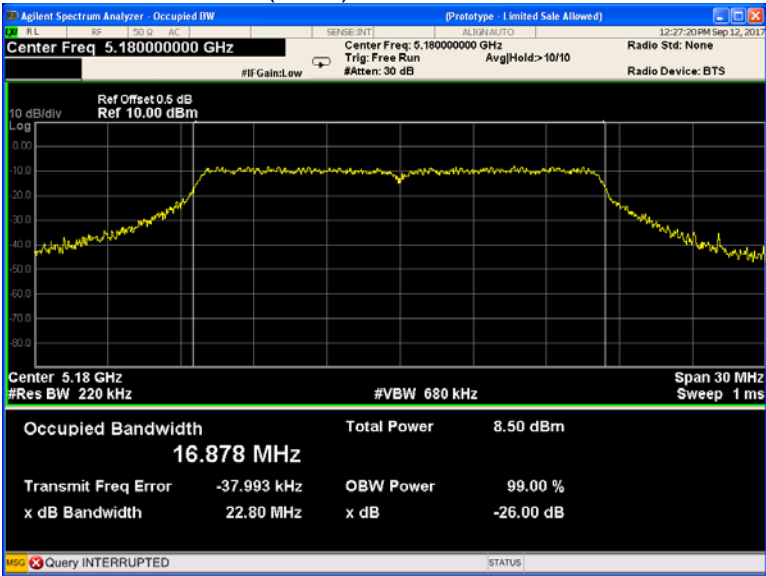
802.11n(HT20) U-NII-1 Middle channel



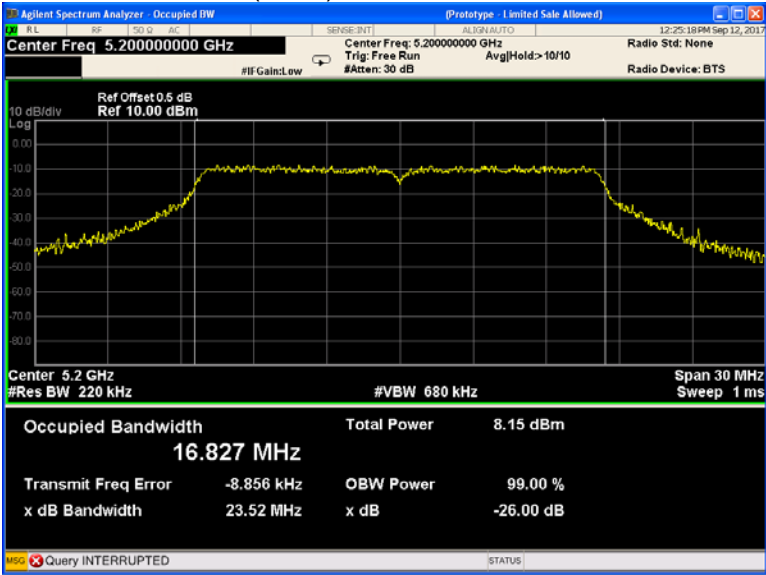
802.11n(HT20) U-NII-1 High channel



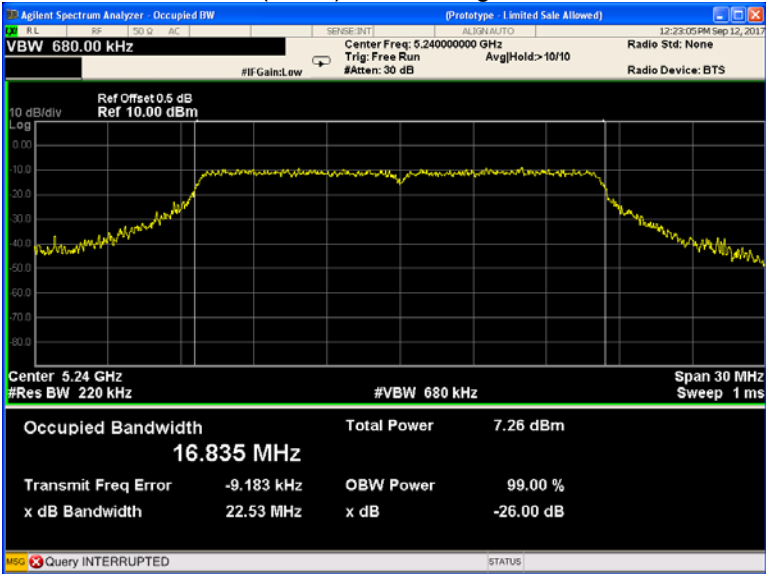
802.11a(HT20) U-NII-1 Low channel



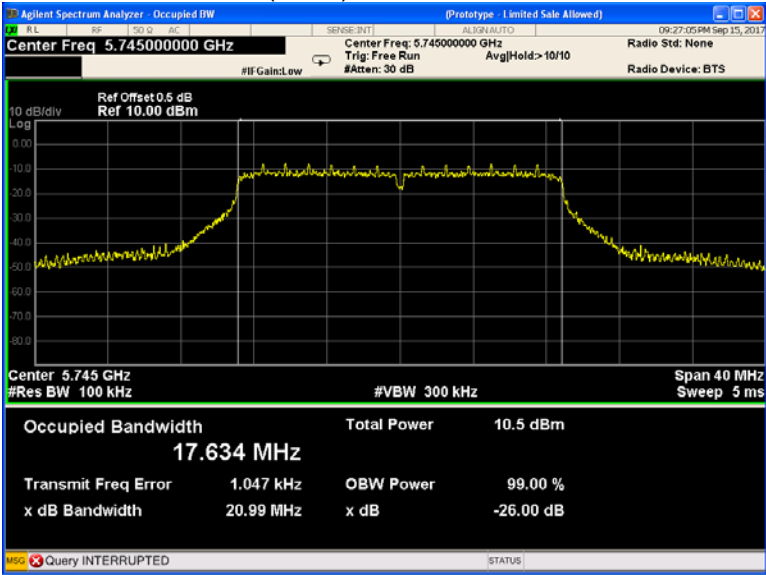
802.11a(HT20) U-NII-1 Middle channel



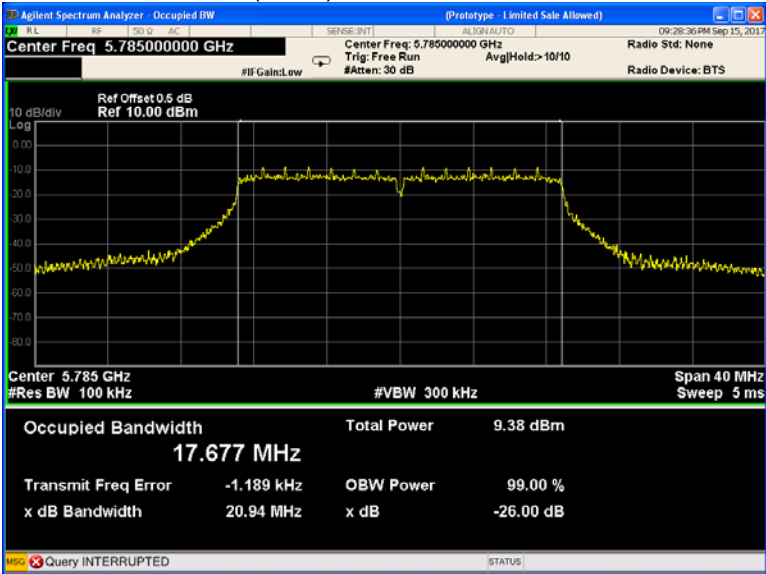
802.11a(HT20) U-NII-1 High channel



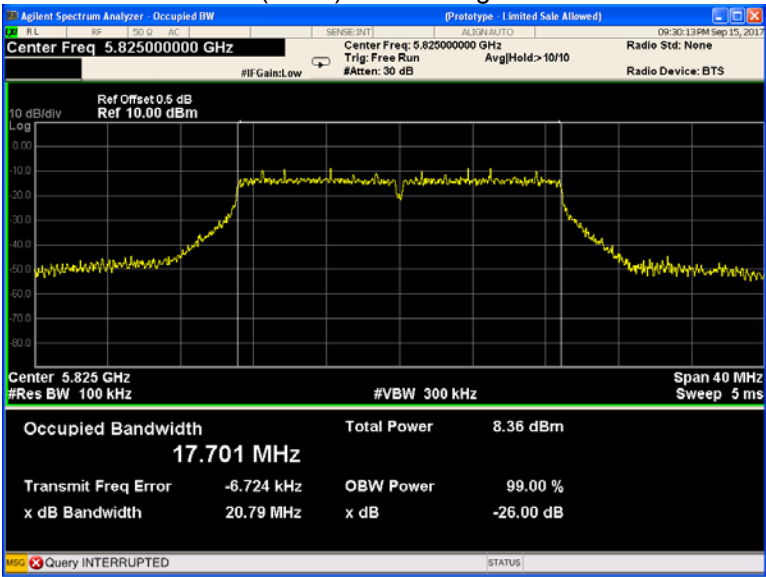
802.11n(HT20) U-NII-3 Low channel



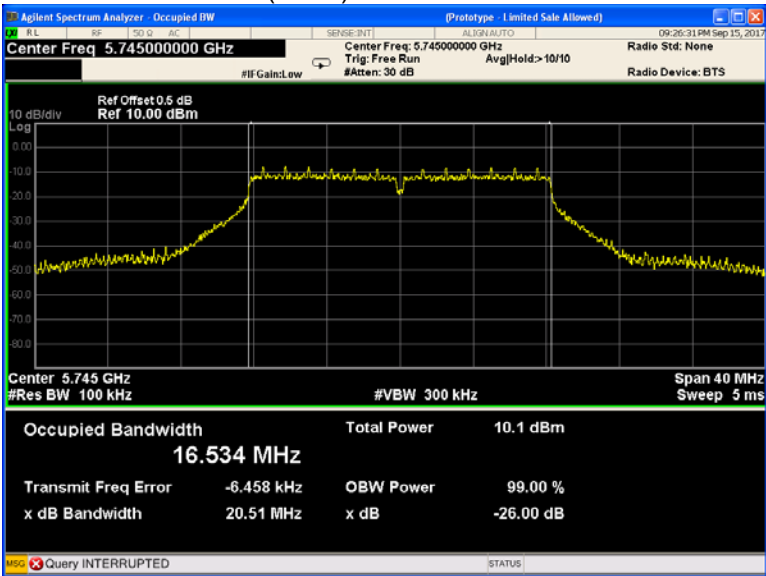
802.11n(HT20) U-NII-3 Middle channel



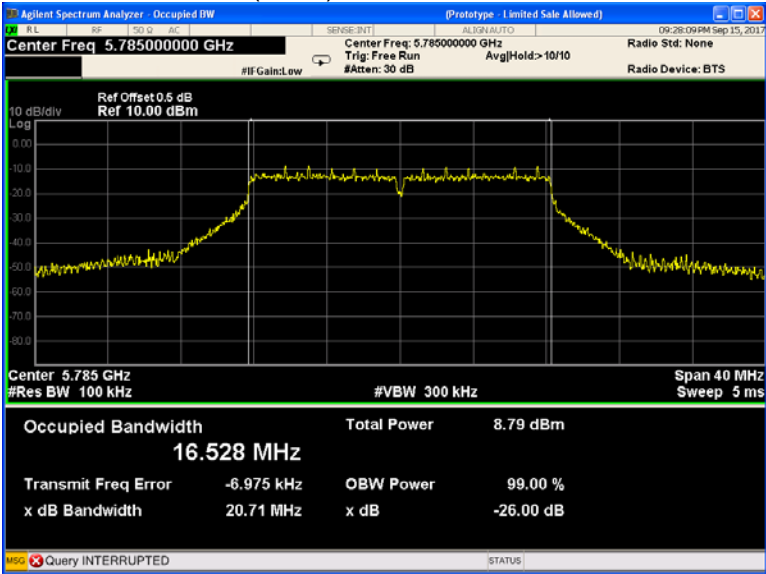
802.11n(HT20) U-NII-3 High channel



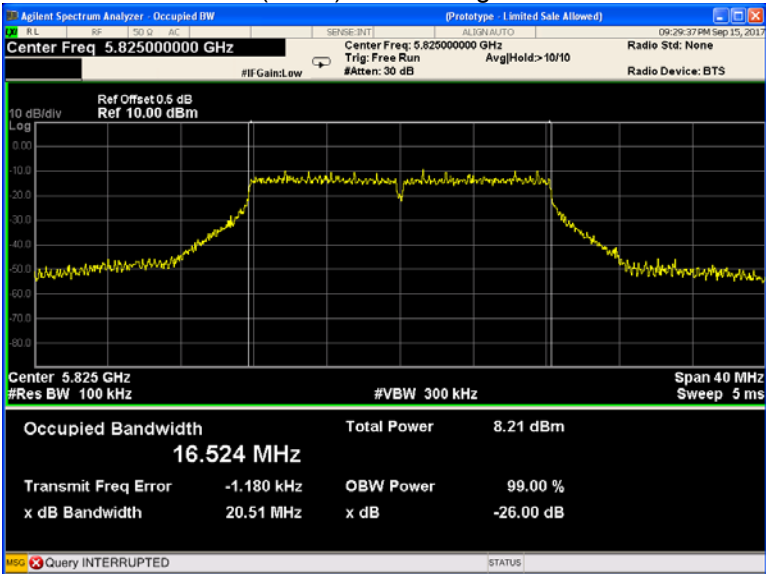
802.11a(HT20) U-NII-3 Low channel



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



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



12 Conducted Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.407(a) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v01 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

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 = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

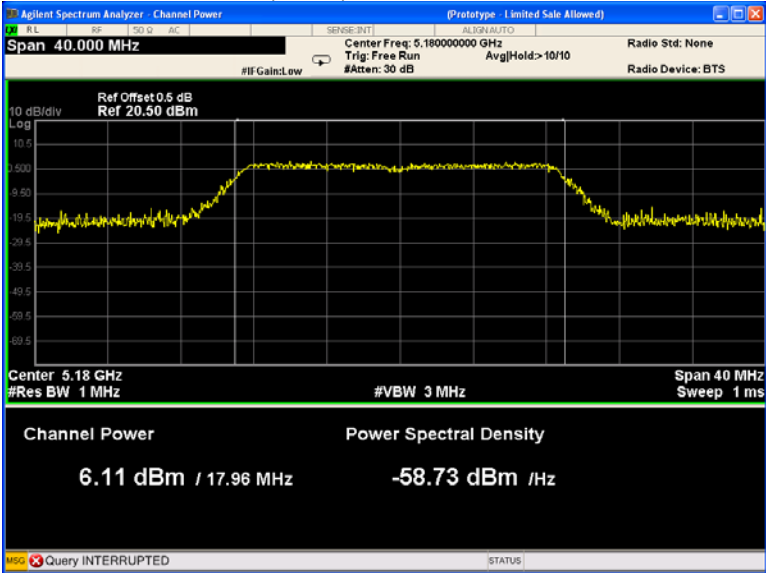
12.2 Test Result :

Band	Operation mode	channel	Conducted Output Power (dBm)		
			ANT0	/	/
U-NII-1	802.11n(HT20)	Low	6.11	/	/
		Middle	6.25	/	/
		High	6.15	/	/
	802.11a(HT20)	Low	6.14	/	/
		Middle	6.01	/	/
		High	6.07	/	/
U-NII-3	802.11n(HT20)	Low	6.03	/	/
		Middle	6.07	/	/
		High	6.36	/	/
	802.11a(HT20)	Low	6.38	/	/
		Middle	6.01	/	/
		High	6.00	/	/

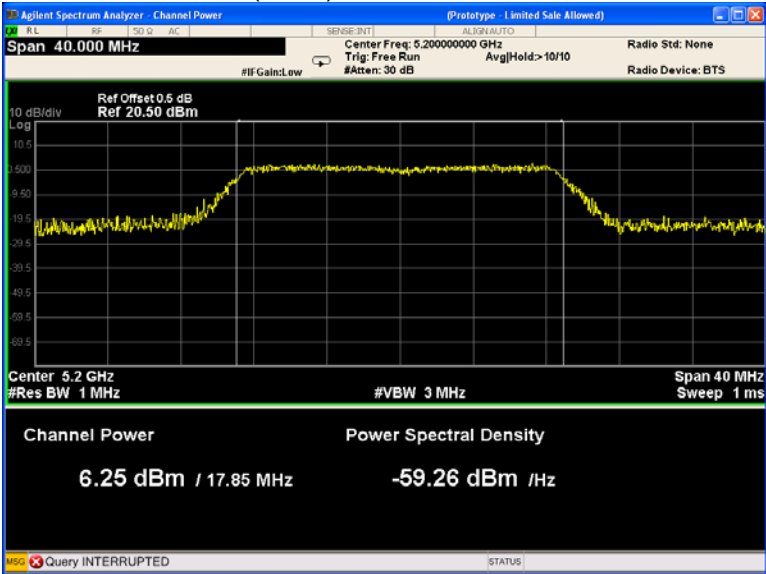
* All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.

Test result plots shown as follows:

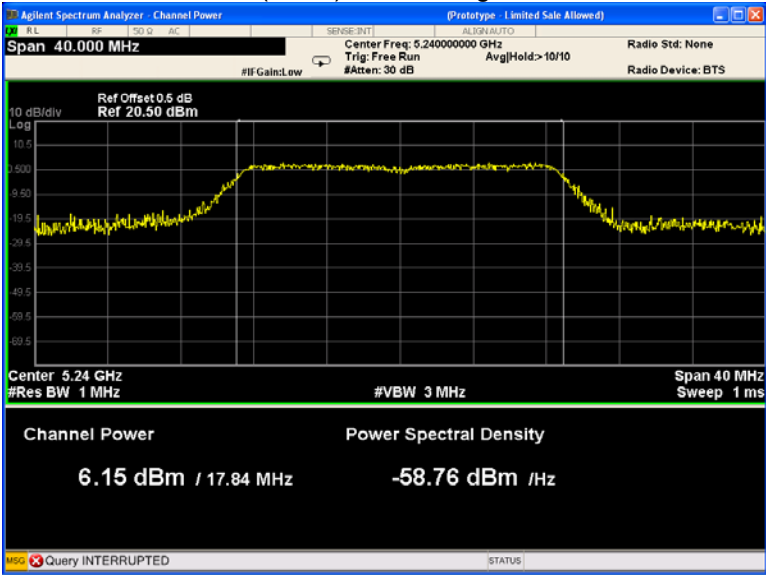
802.11n(HT20) U-NII-1 Low channel



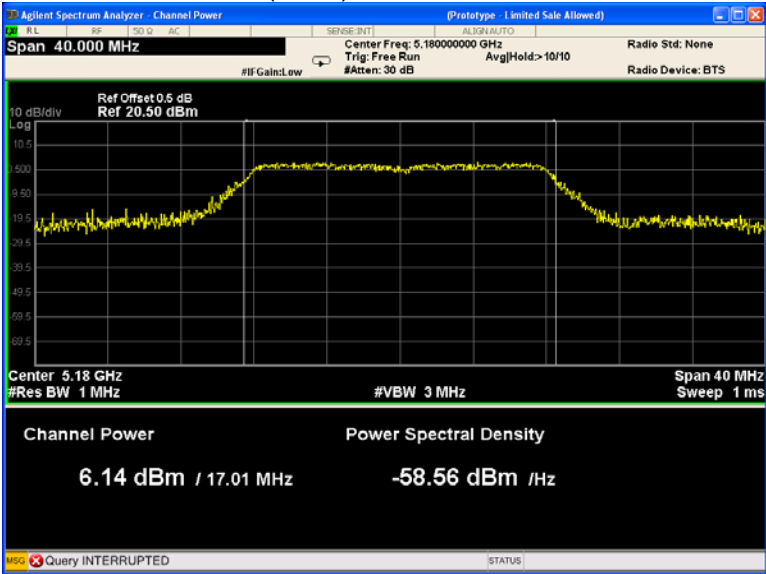
802.11n(HT20) U-NII-1 Middle channel



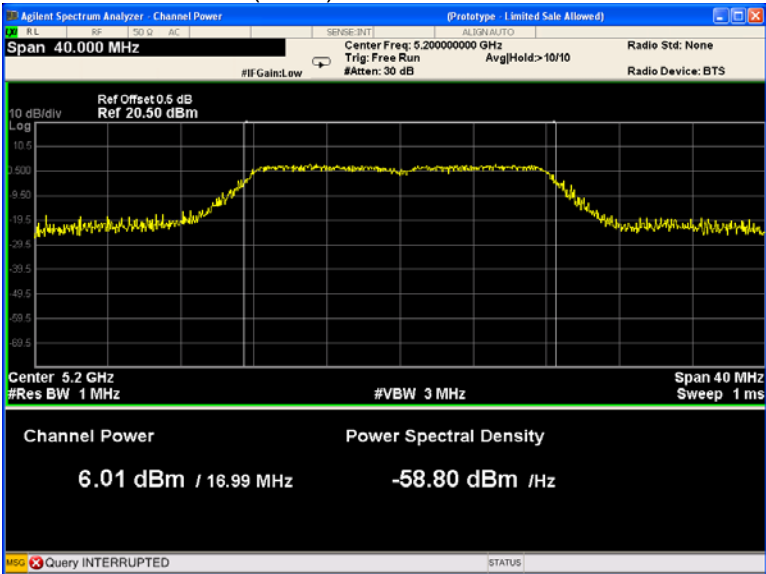
802.11n(HT20) U-NII-1 High channel



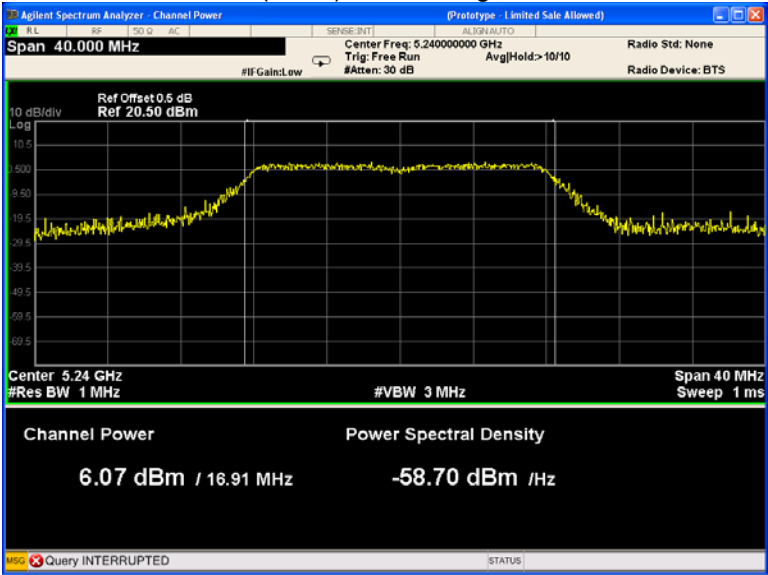
802.11a(HT20) U-NII-1 Low channel



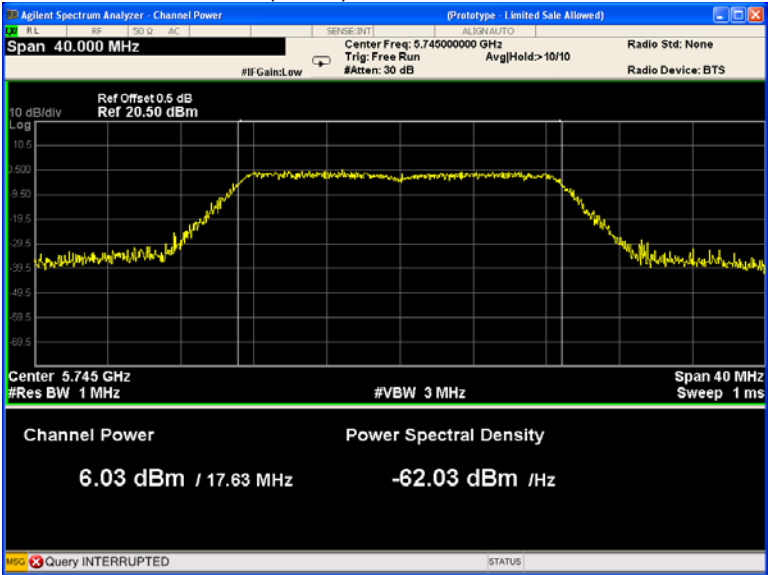
802.11a(HT20) U-NII-1 Middle channel



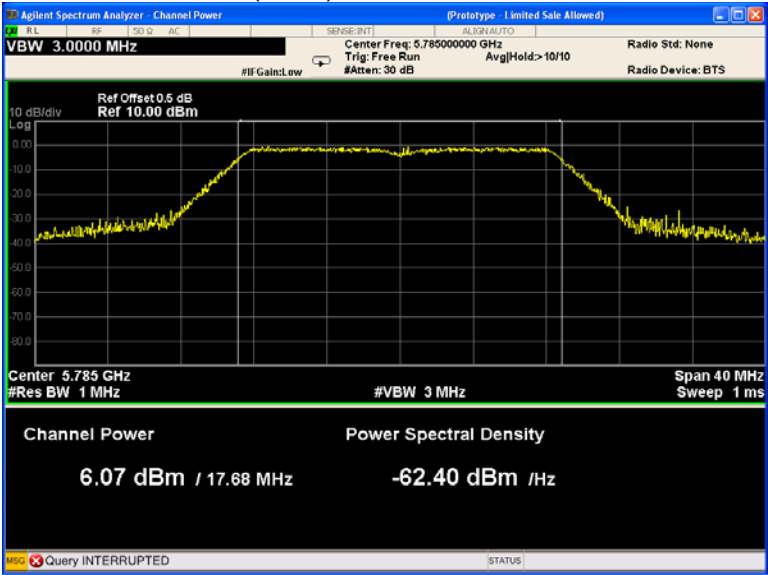
802.11a(HT20) U-NII-1 High channel



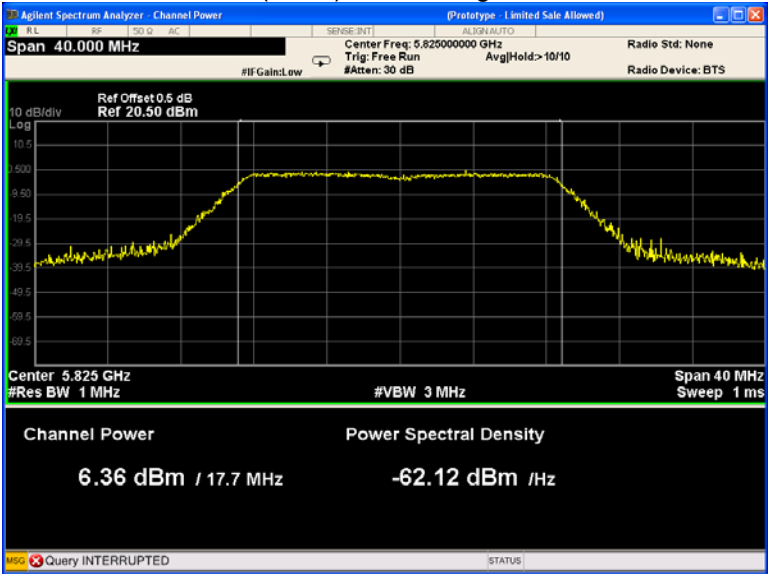
802.11n(HT20) U-NII-3 Low channel



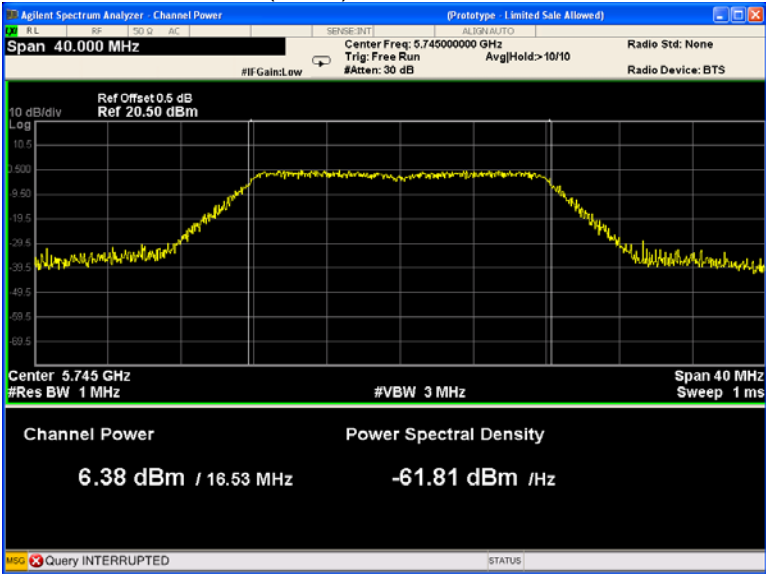
802.11n(HT20) U-NII-3 Middle channel



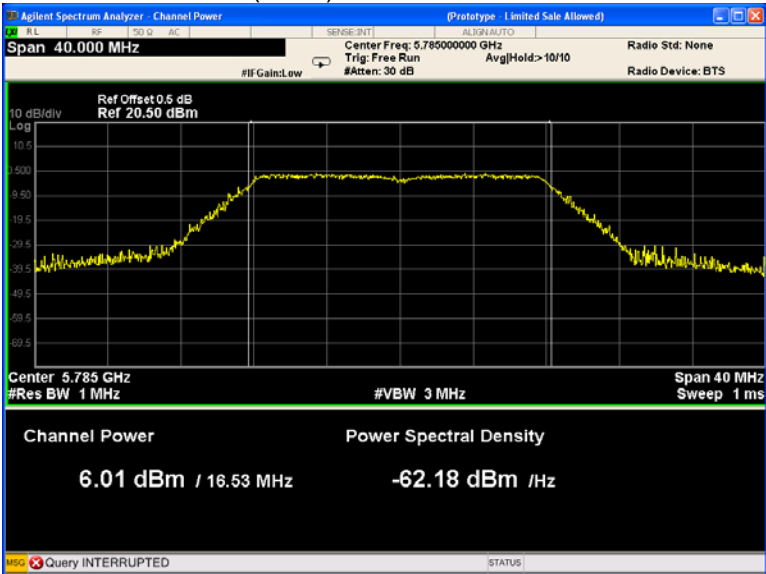
802.11n(HT20) U-NII-3 High channel



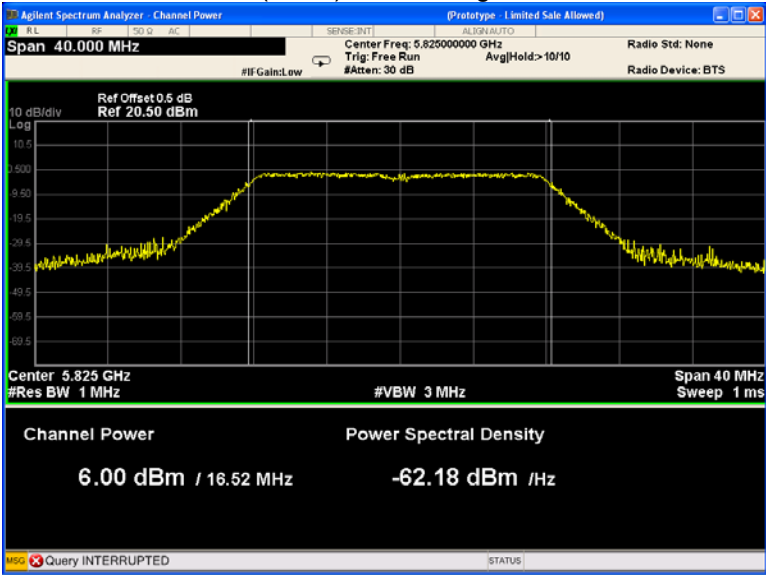
802.11a(HT20) U-NII-3 Low channel



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



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



13 Power Spectral density

Test Requirement:	FCC CFR47 Part 15 Section 15.407(a) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v01, 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

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:
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.

13.2 Test Result:

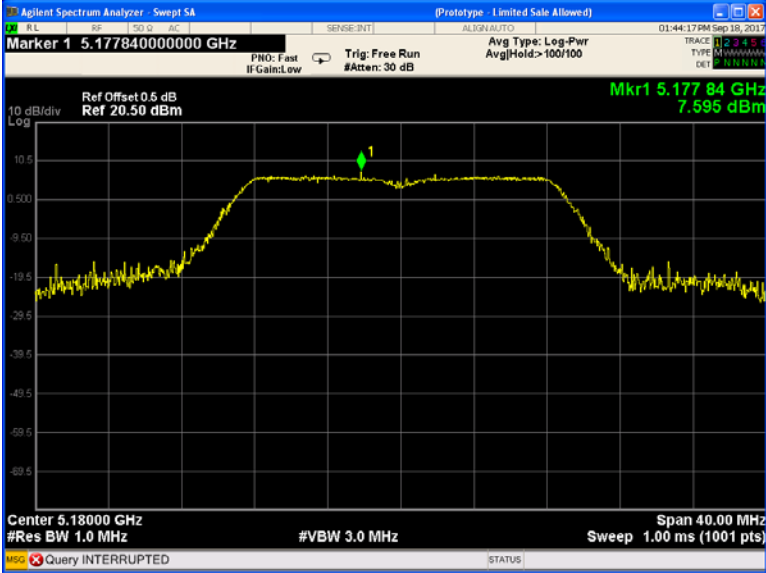
Band	Operation mode	CH	Power Spectral Density (dBm/MHz)		
			ANT0	/	/
U-NII-1	802.11n(HT20)	Low	7.595	/	/
		Middle	7.475	/	/
		High	6.917	/	/
	802.11a(HT20)	Low	8.694	/	/
		Middle	7.475	/	/
		High	6.917	/	/
	Limit		$\leq 11.00\text{dBm/MHz}$		

Band	Operation mode	CH	Power Spectral Density (dBm/500KHz)		
			ANT0	/	/
U-NII-3	802.11n(HT20)	Low	3.082	/	/
		Middle	2.991	/	/
		High	3.441	/	/
	802.11a(HT20)	Low	3.393	/	/
		Middle	3.498	/	/
		High	3.584	/	/
	Limit		$\leq 30.00\text{dBm/500KHz}$		

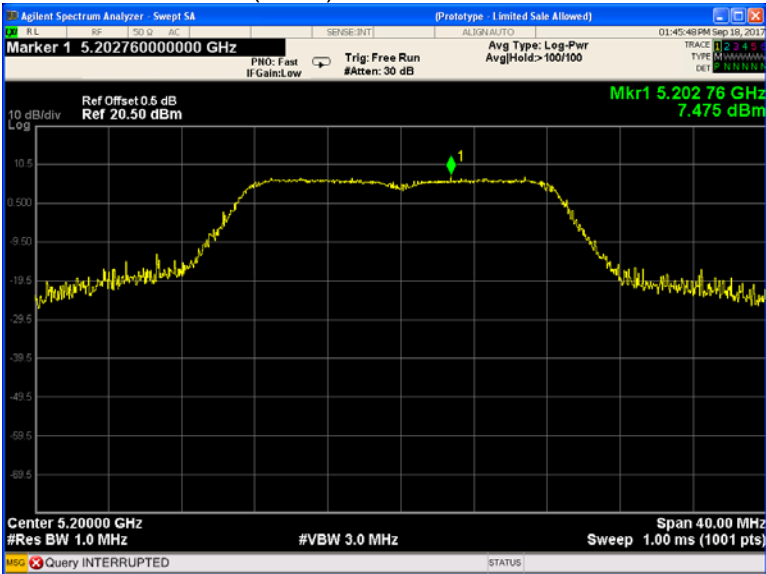
* All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.

Test result plots shown as follows:

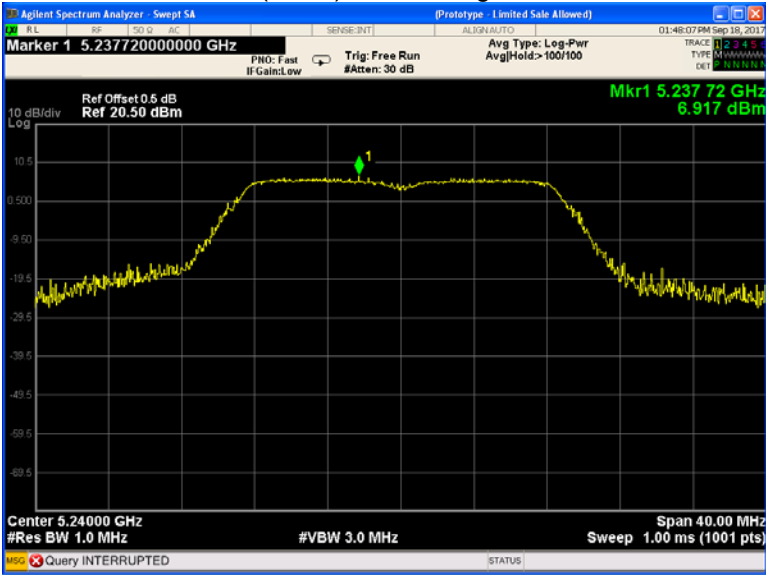
802.11n(HT20) U-NII-1 Low channel



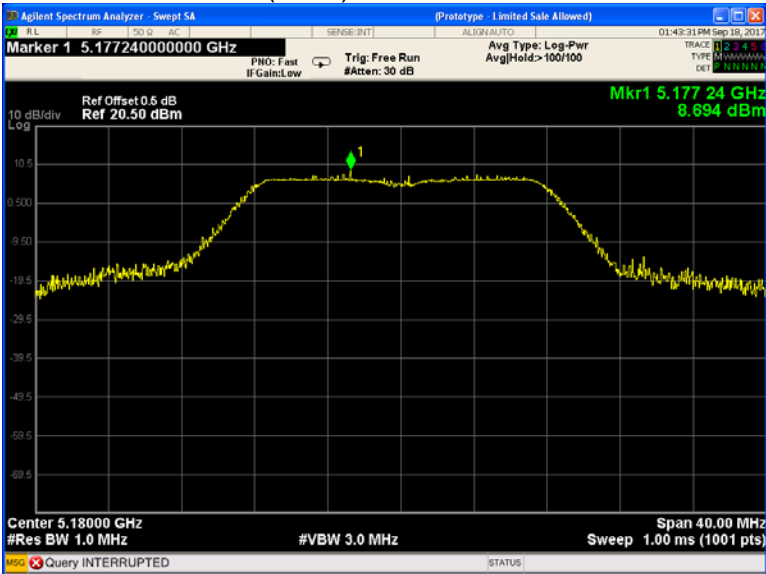
802.11n(HT20) U-NII-1 Middle channel



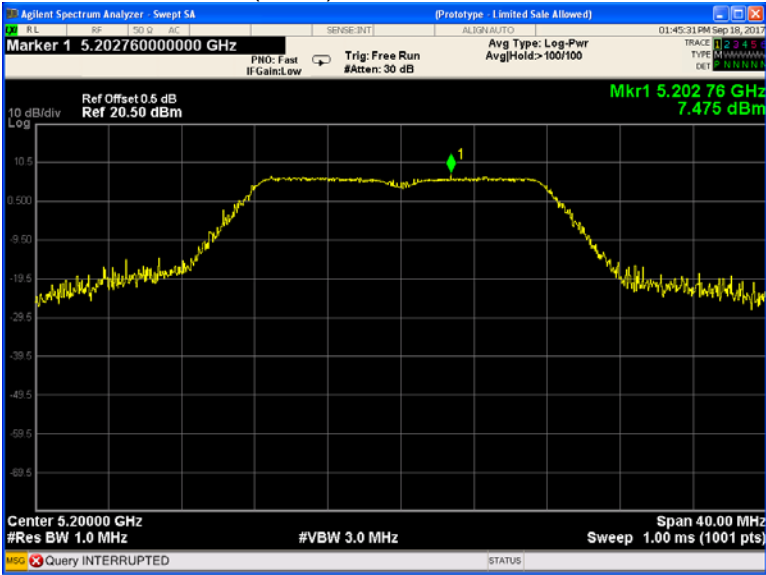
802.11n(HT20) U-NII-1 High channel



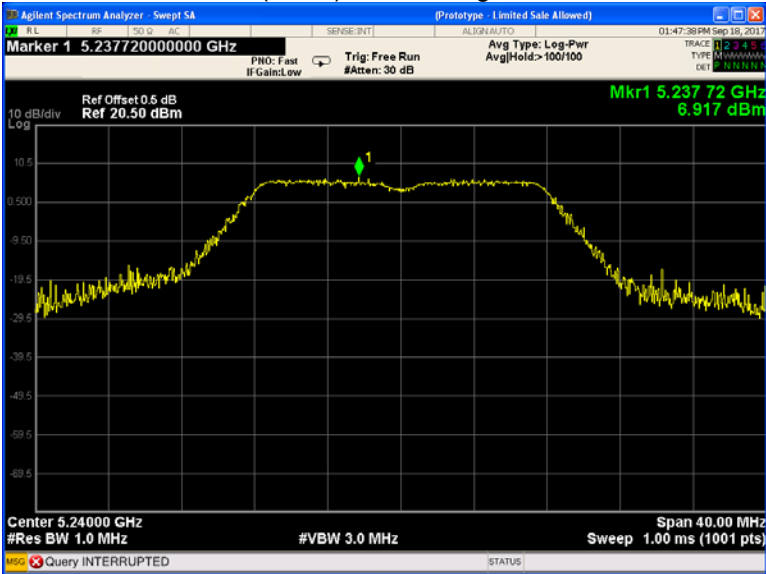
802.11a(HT20) U-NII-1 Low channel



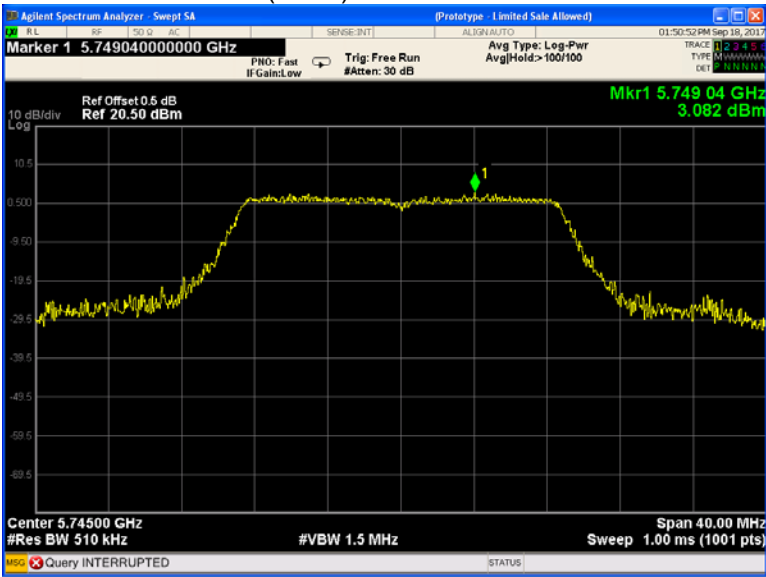
802.11a(HT20) U-NII-1 Middle channel



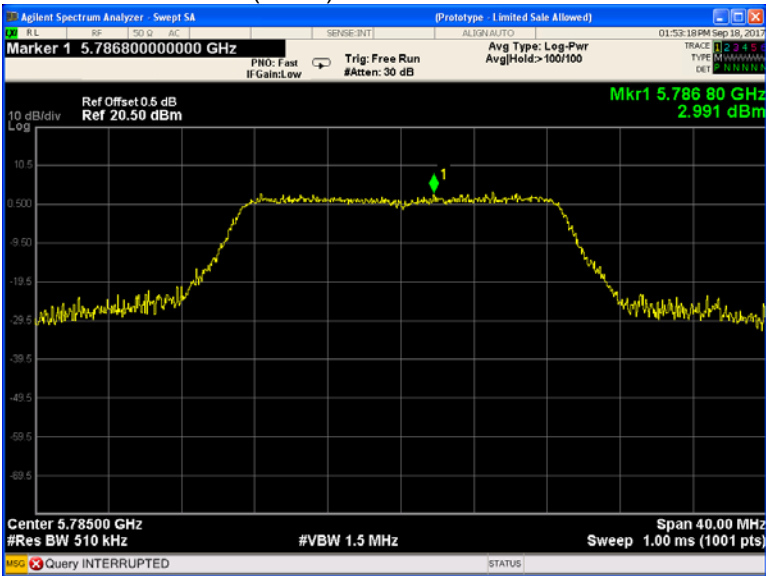
802.11a(HT20) U-NII-1 High channel



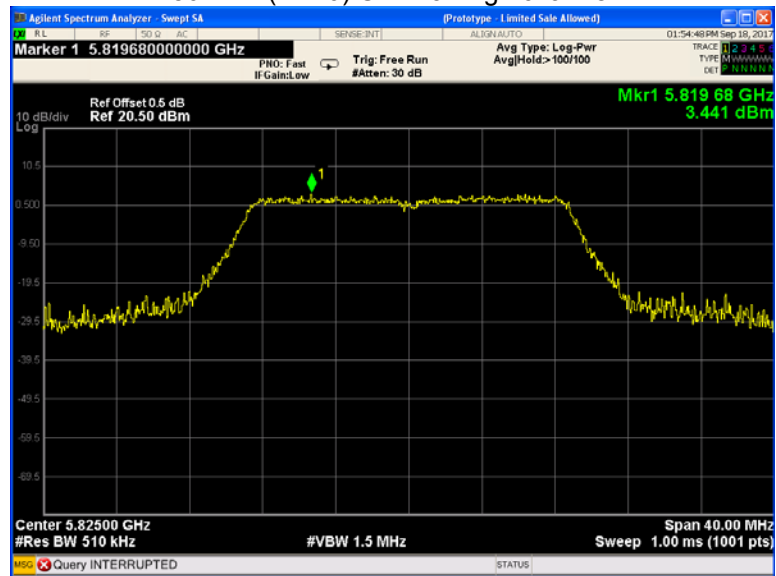
802.11n(HT20) U-NII-3 Low channel



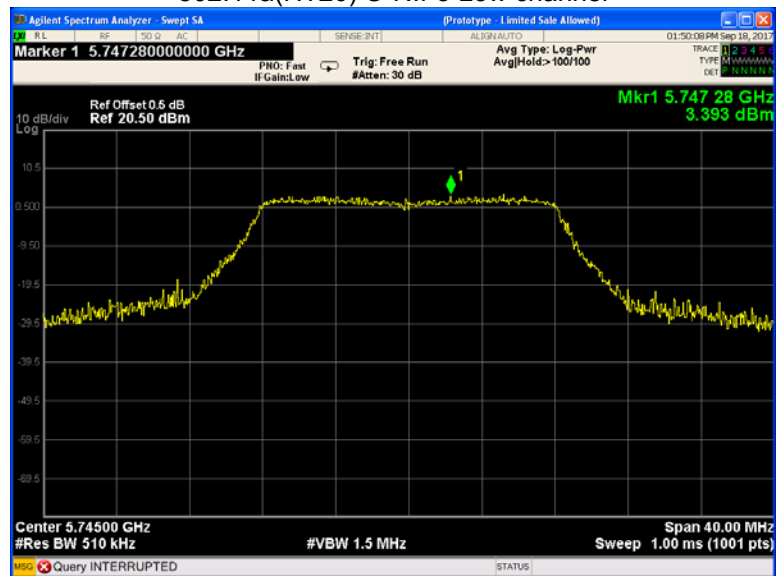
802.11n(HT20) U-NII-3 Middle channel



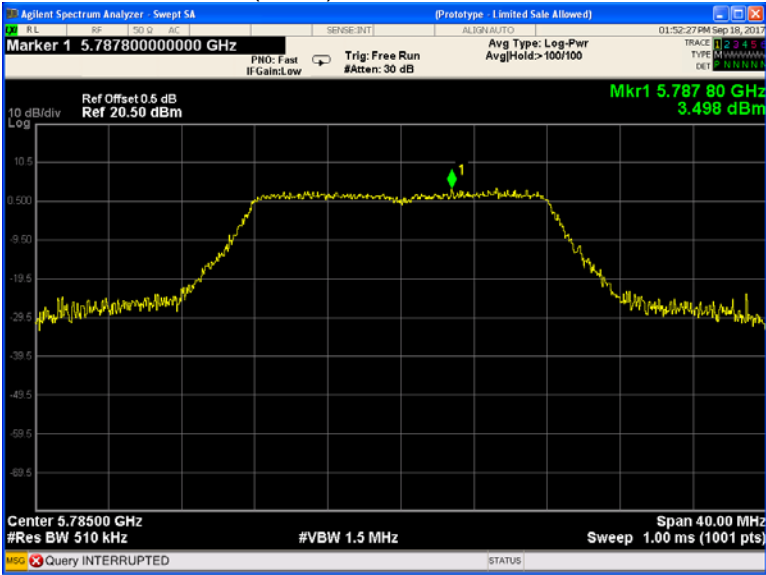
802.11n(HT20) U-NII-3 High channel



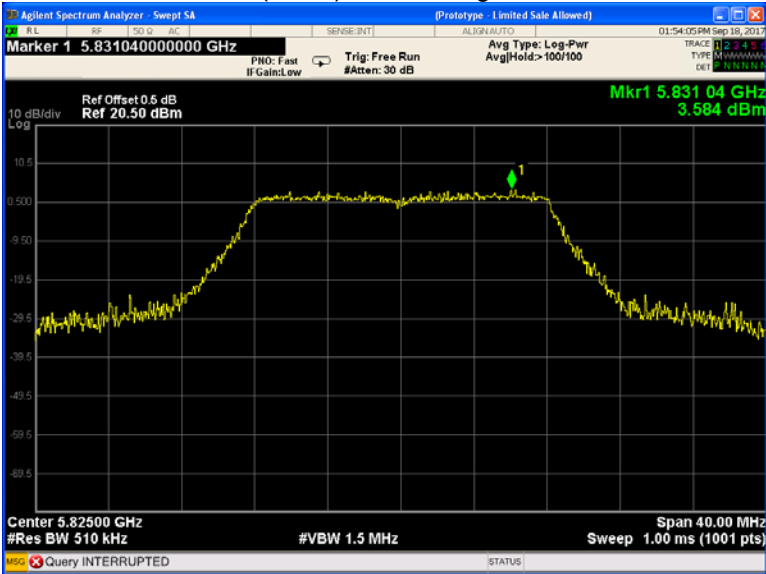
802.11a(HT20) U-NII-3 Low channel



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



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



14 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

14.1 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~ 35°C.

14.2 Test Result:

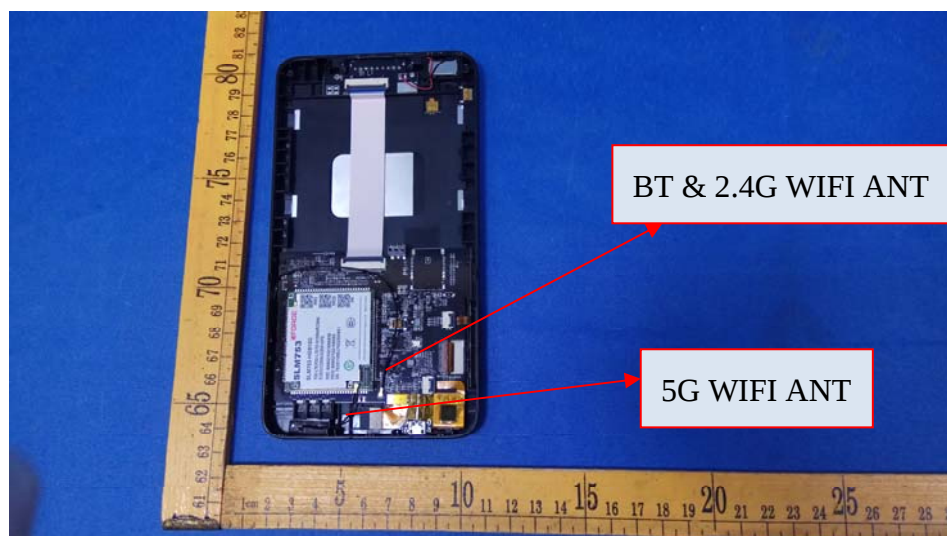
U-NII-1 Test Frequency:5180MHz				
Temperature (°C)	Power Supply (VA)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
35	120	8.25	1.592	20
20		8.26	1.595	20
10		8.28	1.598	20
0		8.30	1.602	20
20	108	8.29	1.600	20
20	132	8.26	1.595	20

U-NII-3 Test Frequency:5785MHz				
Temperature (°C)	Power Supply (VA)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
35	120	9.03	1.561	20
20		9.04	1.563	20
10		8.99	1.554	20
0		9.03	1.561	20
20	108	9.05	1.564	20
20	132	8.97	1.551	20

15 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 of two antennas that uses a specified coupling to the intentional radiator. Antenna connectors complied with the requirement.



16 SAR Evaluation

Please refer to SAR report.

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