



FCC 47 CFR PART 15 SUBPART E

UNII

CERTIFICATION TEST REPORT

FOR

WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac

MODEL NUMBER : SM-W737Y

FCC ID: A3LSMW737Y

REPORT NUMBER: 4788715722-E4V1

ISSUE DATE: DEC 05, 2018

Prepared for
SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Prepared by
UL Korea, Ltd.
26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea

Suwon Test Site: UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433



ACCREDITED*

Testing
Laboratory

TL-637

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	12/05/18	Initial issue	Junwhan Lee

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	7
1.1. INTRODUCTION OF TEST DATA REUSE	8
1.2. DIFFERENCE	8
1.3. SPOT CHECK VERIFICATION DATA	8
1.4. REFERENCE DETAIL	9
2. TEST METHODOLOGY	10
3. FACILITIES AND ACCREDITATION	10
4. CALIBRATION AND UNCERTAINTY	10
4.1. MEASURING INSTRUMENT CALIBRATION	10
4.2. SAMPLE CALCULATION	10
4.3. MEASUREMENT UNCERTAINTY	11
5. EQUIPMENT UNDER TEST	12
5.1. DESCRIPTION OF EUT	12
5.2. MAXIMUM OUTPUT POWER	13
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	14
5.4. List of test reduction and modes covering other modes:	14
5.5. WORST-CASE CONFIGURATION AND MODE	16
5.6. DESCRIPTION OF TEST SETUP	17
6. TEST AND MEASUREMENT EQUIPMENT	19
7. SUMMARY TABLE	20
8. MEASUREMENT METHODS	21
9. REFERENCE MEASUREMENTS RESULTS	22
9.1. ON TIME AND DUTY CYCLE RESULTS	22
9.2. DUTY CYCLE PLOTS	22
9.3. 26 dB BANDWIDTH	25
9.3.1. 802.11a MODE IN THE 5.2 GHz BAND	26
9.3.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND	26
9.3.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND	26
9.3.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND	26
9.3.5. 802.11a MODE IN THE 5.3 GHz BAND	27
9.3.6. 802.11n HT20 MODE IN THE 5.3 GHz BAND	27
9.3.7. 802.11n HT40 MODE IN THE 5.3 GHz BAND	27
9.3.8. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND	27
9.3.9. 802.11a MODE IN THE 5.5 GHz BAND	28

9.3.10.	802.11n HT20 MODE IN THE 5.5 GHz BAND	28
9.3.11.	802.11n HT40 MODE IN THE 5.5 GHz BAND	28
9.3.12.	802.11ac VHT80 MODE IN THE 5.5 GHz BAND	28
9.3.13.	802.11a MODE IN THE 5.8 GHz BAND	29
9.3.14.	802.11n HT20 MODE IN THE 5.8 GHz BAND	29
9.3.15.	802.11n HT40 MODE IN THE 5.8 GHz BAND	29
9.3.16.	802.11ac VHT80 MODE IN THE 5.8 GHz BAND	29
9.3.17.	26 dB BANDWIDTH PLOTS	30
9.4.	99% BANDWIDTH	43
9.4.1.	802.11a MODE IN THE 5.2 GHz BAND	43
9.4.2.	802.11n HT20 MODE IN THE 5.2 GHz BAND	44
9.4.3.	802.11n HT40 MODE IN THE 5.2 GHz BAND	44
9.4.4.	802.11ac VHT80 MODE IN THE 5.2 GHz BAND	44
9.4.5.	802.11a MODE IN THE 5.3 GHz BAND	44
9.4.6.	802.11n HT20 MODE IN THE 5.3 GHz BAND	45
9.4.7.	802.11n HT40 MODE IN THE 5.3 GHz BAND	45
9.4.8.	802.11ac VHT80 MODE IN THE 5.3 GHz BAND	45
9.4.9.	802.11a MODE IN THE 5.5 GHz BAND	46
9.4.10.	802.11n HT20 MODE IN THE 5.5 GHz BAND	46
9.4.11.	802.11n HT40 MODE IN THE 5.5 GHz BAND	46
9.4.12.	802.11ac VHT80 MODE IN THE 5.5 GHz BAND	46
9.4.13.	802.11a MODE IN THE 5.8 GHz BAND	47
9.4.14.	802.11n HT20 MODE IN THE 5.8 GHz BAND	47
9.4.15.	802.11n HT40 MODE IN THE 5.8 GHz BAND	47
9.4.16.	802.11ac VHT80 MODE IN THE 5.8 GHz BAND	47
9.4.17.	99% BANDWIDTH PLOTS	48
10.	ANTENNA PORT TEST RESULTS	61
10.1.	6 dB BANDWIDTH	61
10.1.1.	802.11a MODE IN THE 5.8 GHz BAND	62
10.1.2.	802.11n HT20 MODE IN THE 5.8 GHz BAND	62
10.1.3.	802.11n HT40 MODE IN THE 5.8 GHz BAND	62
10.1.4.	802.11n VHT80 MODE IN THE 5.8 GHz BAND	62
10.1.5.	6 dB BANDWIDTH PLOTS	63
10.2.	OUTPUT POWER AND PPSD	67
10.2.1.	802.11a MODE IN THE 5.2 GHz BAND	68
10.2.2.	802.11n HT20 MODE IN THE 5.2 GHz BAND	69
10.2.3.	802.11n HT40 MODE IN THE 5.2 GHz BAND	70
10.2.4.	802.11ac VHT80 MODE IN THE 5.2 GHz BAND	71
10.2.5.	802.11a MODE IN THE 5.3 GHz BAND	72
10.2.6.	802.11n HT20 MODE IN THE 5.3 GHz BAND	73
10.2.7.	802.11n HT40 MODE IN THE 5.3 GHz BAND	74
10.2.8.	802.11ac VHT80 MODE IN THE 5.3 GHz BAND	75
10.2.9.	802.11a MODE IN THE 5.5 GHz BAND	76
10.2.10.	802.11n HT20 MODE IN THE 5.5 GHz BAND	77
10.2.11.	802.11n HT40 MODE IN THE 5.5 GHz BAND	78
10.2.12.	802.11ac VHT80 MODE IN THE 5.5 GHz BAND	79
10.2.13.	802.11a MODE IN THE 5.8 GHz BAND	80
10.2.14.	802.11n HT20 MODE IN THE 5.8 GHz BAND	81
10.2.15.	802.11n HT40 MODE IN THE 5.8 GHz BAND	82

10.2.16.	802.11ac VHT80 MODE IN THE 5.8 GHz BAND	83
10.2.17.	802.11a MODE IN THE STRADDLE CHANNEL	84
10.2.18.	802.11n HT20 MODE IN THE STRADDLE CHANNEL	85
10.2.19.	802.11n HT40 MODE IN THE STRADDLE CHANNEL	86
10.2.20.	802.11ac VHT80 MODE IN THE STRADDLE CHANNEL	87
10.2.21.	OUTPUT POWER AND PPSD PLOTS	88
11.	TRANSMITTER ABOVE 1 GHz.....	105
11.1.	5.2 GHz	108
11.1.1.	TX Above 1GHz 802.11a 2Tx CDD MODE IN THE 5.2GHz BAND	108
11.1.2.	TX Above 1GHz 802.11n HT20 2Tx CDD MODE IN THE 5.2GHz BAND.....	116
11.1.3.	TX Above 1GHz 802.11n HT40 2Tx CDD MODE IN THE 5.2GHz BAND.....	124
11.1.4.	TX ABOVE 1GHz 802.11ac VHT80 2Tx CDD MODE IN THE 5.2GHz BAND.....	130
11.2.	5.3 GHz	134
11.2.1.	TX ABOVE 1 GHz 802.11a 2Tx CDD MODE IN THE 5.3 GHz BAND	134
11.2.2.	TX ABOVE 1GHz 802.11n HT20 2Tx CDD MODE IN THE 5.3GHz BAND	142
11.2.3.	TX ABOVE 1GHz 802.11n HT40 2Tx CDD MODE IN THE 5.3GHz BAND	150
11.2.4.	TX ABOVE 1GHz 802.11ac VHT80 2Tx CDD MODE IN THE 5.3GHz BAND	156
	RESTRICTED BANDEDGE (High CHANNEL).....	156
11.3.	5.5-5.6 GHz	160
11.3.1.	TX ABOVE 1 GHz 802.11a 2Tx CDD MODE IN THE 5.5 GHz BAND	160
11.3.2.	TX ABOVE 1GHz 802.11n HT20 2Tx CDD MODE IN THE 5.5GHz BAND	170
11.3.3.	TX ABOVE 1GHz 802.11n HT40 2Tx CDD MODE IN THE 5.5GHz BAND	180
11.3.4.	TX ABOVE 1GHz 802.11ac VHT80 2Tx CDD MODE IN THE 5.5GHz BAND.....	190
11.3.5.	TX ABOVE 1GHz 802.11a 2Tx CDD MODE IN THE STRADDLE CHANNEL	198
11.3.6.	TX ABOVE 1GHz 802.11n HT20 2Tx CDD MODE IN THE STRADDLE CHANNEL	200
11.3.7.	TX ABOVE 1GHz 802.11n HT40 2Tx CDD MODE IN THE STRADDLE CHANNEL	202
11.3.8.	TX ABOVE 1GHz 802.11ac VHT80 2Tx CDD MODE IN THE STRADDLE CHANNEL	204
11.4.	5.8 GHz	206
11.4.1.	TX ABOVE 1GHz 802.11a 2Tx CDD MODE IN THE 5.8GHz BAND	206
11.4.2.	TX ABOVE 1GHz 802.11n HT20 2Tx CDD MODE IN THE 5.8GHz BAND	216
11.4.3.	TX ABOVE 1GHz 802.11n HT40 2Tx CDD MODE IN THE 5.8GHz BAND	226
11.4.4.	TX ABOVE 1GHz 802.11ac VHT80 2Tx CDD MODE IN THE 5.8GHz BAND.....	234
11.5.	<i>Spurious Emissions for Simultaneous Transmission</i>	240
11.5.1.	Worst test case condition	240
12.	WORST-CASE BELOW 1 GHz	247
13.	AC POWER LINE CONDUCTED EMISSIONS	251
14.	DYNAMIC FREQUENCY SELECTION.....	260
14.1.	OVERVIEW.....	260
14.1.1.	LIMITS.....	260
14.1.1.	TEST AND MEASUREMENT SYSTEM	264
14.1.2.	SETUP OF EUT.....	267
14.1.3.	DESCRIPTION OF EUT	268
14.2.	RESULTS FOR 20 MHz BANDWIDTH.....	269

14.2.1.	TEST CHANNEL	269
14.2.2.	RADAR WAVEFORM AND TRAFFIC	269
14.2.3.	OVERLAPPING CHANNEL TESTS	271
14.2.4.	MOVE AND CLOSING TIME	271
14.3.	RESULTS FOR 40 MHz BANDWIDTH	274
14.3.1.	TEST CHANNEL	274
14.3.2.	RADAR WAVEFORM AND TRAFFIC	274
14.3.3.	OVERLAPPING CHANNEL TESTS	276
14.3.4.	MOVE AND CLOSING TIME	276
14.4.	RESULTS FOR 80 MHz BANDWIDTH	279
14.4.1.	TEST CHANNEL	279
14.4.2.	RADAR WAVEFORM AND TRAFFIC	279
14.4.3.	OVERLAPPING CHANNEL TESTS	281
14.4.4.	MOVE AND CLOSING TIME	281
15.	SETUP PHOTOS	284

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac

MODEL NUMBER: SM-W737Y

SERIAL NUMBER: BBMGR34K500613H (RADIATED, Original);
BBMGR34K50061VZ (CONDUCTED, Original);
BNZ3R32KA0005XF (RADIATED, Spot check)

DATE TESTED: JUL 11, 2018 - SEP 03, 2018 (Original);
OCT 26, 2018 (Spot check)

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

Tested By:



SungGil Park
Suwon Lab Engineer
UL Korea, Ltd.

Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMW737N0 UNII WLAN(FCC CFR 47 Part 15E). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMW737Y shares the same enclosure and circuit board as FCC ID: A3LSMW737N0. The UNII antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMW737N0 remains representative of FCC ID: A3LSMW737Y. The test data of FCC ID: A3LSMW737N0 being submitted for this application to cover UNII features.

1.3. SPOT CHECK VERIFICATION DATA (Worst case of the radiated spurious and band edge emissions)

Band	Test Item	Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-W737N0 Results	SM-W737Y Results		
					FCC ID : A3LSMW737N0	FCC ID : A3LSMW737Y		
UNII WLAN (5GHz)	Band Edge	5.2n HT40	5190 MHz	54 dBuV/m	46.15 dBuV/m	47.85 dBuV/m	1.70 dB	
	RSE	5.2n HT20	5200 MHz	68.2 dBuV/m	46.78 dBuV/m	44.68 dBuV/m	-2.10 dB	Noise Floor
	Band Edge	5.3ac VHT80	5290 MHz	54 dBuV/m	47.24 dBuV/m	48.50 dBuV/m	1.26 dB	
	RSE	5.3n HT40	5270 MHz	68.2 dBuV/m	40.60 dBuV/m	40.53 dBuV/m	-0.07 dB	Noise Floor
	Band Edge	5.5n HT20	5500 MHz	68.2 dBuV/m	47.15 dBuV/m	45.42 dBuV/m	-1.73 dB	
	RSE	5.5n HT40	5670 MHz	54 dBuV/m	47.74 dBuV/m	47.58 dBuV/m	-0.16 dB	Noise Floor
	Band Edge	5.8ac VHT80	5775 MHz	-27 dBm	-31.96 dBm	-31.95 dBm	0.01 dB	
	RSE	5.8n HT20	5785 MHz	54 dBuV/m	47.45 dBuV/m	46.50 dBuV/m	-0.95 dB	Noise Floor

Comparison of two models, upper deviation is within 3dB range and all test results are under FCC Technical Limits.

1.4. REFERENCE DETAIL

Reference application that contains the reused reference data.

Equipment Class	Reference FCC ID	Type Grant/Permissive Change	Reference Application	Folder Test/RF Exposure	Report Title / Section
DTS	A3LSMW737N0	Grant	4788556585-E1V2	Test	FCC Report DTS WLAN / All sections
			4788556585-E2V2	Test	FCC Report BLE / All sections
DSS	A3LSMW737N0	Grant	4788556585-E3V1	Test	FCC Report BT / All sections
NII	A3LSMW737N0	Grant	4788556585-E4V1	Test	FCC Report UNII WLAN / All sections

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 789033 D02 General UNII Test Procedures New Rules v02r01
4. KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
5. KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02
6. KDB 662911 D01 v02r01
7. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
☒	Chamber 1
☒	Chamber 2
☐	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, Below 1GHz	3.86 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac.
This test report addresses the NII (UNII) operational mode.

WiFi MIMO Condition

Frequency	Mode	Antenna 1	Antenna 2
2.4 GHz	802.11b	TX / RX	TX / RX
	802.11g	TX / RX	TX / RX
	802.11g MIMO	TX / RX	TX / RX
	802.11n	TX / RX	TX / RX
	802.11n MIMO	TX / RX	TX / RX
5 GHz	802.11a	TX / RX	TX / RX
	802.11a MIMO	TX / RX	TX / RX
	802.11n	TX / RX	TX / RX
	802.11n MIMO	TX / RX	TX / RX
	802.11ac	TX / RX	TX / RX
	802.11ac MIMO	TX / RX	TX / RX

Simultaneous TX Condition

Frequency	Supported
2.4 GHz Antenna 1 + 5 GHz Antenna 2	Yes
2.4 GHz Antenna 2 + 5 GHz Antenna 1	No
2.4 GHz Antenna 1 + 5 GHz Antenna 1	No
2.4 GHz Antenna 2 + 5 GHz Antenna 2	No

Spurious Emissions for Simultaneous Transmission were reported on the section 11.5.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted average output power as follows:

Frequency Range [MHz]	Mode	Output Power [dBm]		Output Power [mW]	
		Antenna1	Antenna2	Antenna1	Antenna2
5180 - 5240	802.11a MIMO	15.36		34.36	
	802.11n HT20 MIMO	14.10		25.70	
5190 - 5230	802.11n HT40 MIMO	14.58		28.71	
5210	802.11ac VHT80 MIMO	13.19		20.84	
5260 - 5320	802.11a MIMO	15.34		34.20	
	802.11n HT20 MIMO	14.08		25.59	
5270 - 5310	802.11n HT40 MIMO	14.66		29.24	
5290	802.11ac VHT80 MIMO	13.16		20.70	
5500 - 5720	802.11a MIMO	15.21		33.19	
	802.11n HT20 MIMO	13.92		24.66	
5510 - 5710	802.11n HT40 MIMO	14.62		28.97	
5530 - 5690	802.11ac VHT80 MIMO	13.16		20.70	
5745 - 5825	802.11a MIMO	15.38		34.51	
	802.11n HT20 MIMO	14.08		25.59	
5755 - 5795	802.11n HT40 MIMO	14.53		28.38	
5775	802.11ac VHT80 MIMO	13.13		20.56	

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a internal antenna, with a maximum gain of:

Frequency Range [MHz]	Antenna Gain [dBi]	
	Antenna 1	Antenna 2
UNII 1 5150 – 5250	-0.2	-0.1
UNII 2A 5250 – 5350	-0.4	-0.3
UNII 2C 5470 – 5725	-0.3	-2.9
UNII 3 5725 – 5850	-2.7	-4.3

5.4. List of test reduction and modes covering other modes:

The output power on covered modes is equal to or less than one referenced.

UNII 1

5150 - 5250 MHz Authorized Frequency Band (Radiated Testing)		
Frequency Range [MHz]	Mode	Covered by
5180 - 5240	802.11a legacy 1TX/CDD 2TX	802.11a 2TX CDD
5180 - 5240	802.11HT20 1TX	802.11n HT20 2TX CDD
5180 - 5240	802.11HT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5180 - 5240	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5180 - 5240	802.11ac VHT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5190 - 5230	802.11n HT40 1TX	802.11n HT40 2TX CDD
5190 - 5230	802.11n HT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5190 - 5230	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5190 - 5230	802.11ac VHT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5210	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5210	802.11ac VHT80 2TX SDM/CDD	802.11ac VHT80 2TX CDD

UNII 2A

5250 - 5350 MHz Authorized Frequency Band (Radiated Testing)		
Frequency Range [MHz]	Mode	Covered by
5260 - 5320	802.11a legacy 1TX/CDD 2TX	802.11a 2TX CDD
5260 - 5320	802.11HT20 1TX	802.11n HT20 2TX CDD
5260 - 5320	802.11HT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5260 - 5320	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5260 - 5320	802.11ac VHT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5270 - 5310	802.11n HT40 1TX	802.11n HT40 2TX CDD
5270 - 5310	802.11n HT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5270 - 5310	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5270 - 5310	802.11ac VHT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5290	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5290	802.11ac VHT80 2TX SDM/CDD	802.11ac VHT80 2TX CDD

UNII 2C

5470 - 5725 MHz Authorized Frequency Band (Radiated Testing)		
Frequency Range [MHz]	Mode	Covered by
5500 - 5720	802.11a legacy 1TX/CDD 2TX	802.11a 2TX CDD
5500 - 5720	802.11HT20 1TX	802.11n HT20 2TX CDD
5500 - 5720	802.11HT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5500 - 5720	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5500 - 5720	802.11ac VHT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5510 - 5710	802.11n HT40 1TX	802.11n HT40 2TX CDD
5510 - 5710	802.11n HT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5510 - 5710	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5510 - 5710	802.11ac VHT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5530 - 5690	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5530 - 5690	802.11ac VHT80 2TX SDM/CDD	802.11ac VHT80 2TX CDD

UNII 3

5725 - 5850 MHz Authorized Frequency Band (Radiated Testing)		
Frequency Range [MHz]	Mode	Covered by
5745 - 5825	802.11a legacy 1TX/CDD 2TX	802.11a 2TX CDD
5745 - 5825	802.11HT20 1TX	802.11n HT20 2TX CDD
5745 - 5825	802.11HT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5745 - 5825	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5745 - 5825	802.11ac VHT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5755 - 5795	802.11n HT40 1TX	802.11n HT40 2TX CDD
5755 - 5795	802.11n HT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5755 - 5795	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5755 - 5795	802.11ac VHT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5775	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5775	802.11ac VHT80 2TX SDM/CDD	802.11ac VHT80 2TX CDD

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

The fundamental level of the EUT was investigated on the condition of equipped with keyboard configuration also, but stand-alone configuration is more worse. So only below 1GHz and AC line conducted test were performed on the condition of equipped with keyboard configuration.

Based on the baseline scan, the worst-case data rates were:

802.11a mode: 6 Mbps (2Tx CDD)
802.11n HT20mode: MCS0 (2Tx CDD)
802.11n HT40mode: MCS0 (2Tx CDD)
802.11ac VHT80mode: MCS0 (2Tx CDD)

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA3000	R37K5J20EF3SE3	N/A
Data Cable	SAMSUNG	EP-DW720CWE	N/A	N/A
Earphone	SAMSUNG	EO-EG920BW	N/A	N/A
Keyboard	SAMSUNG	EJ-CW730	N/A	N/A

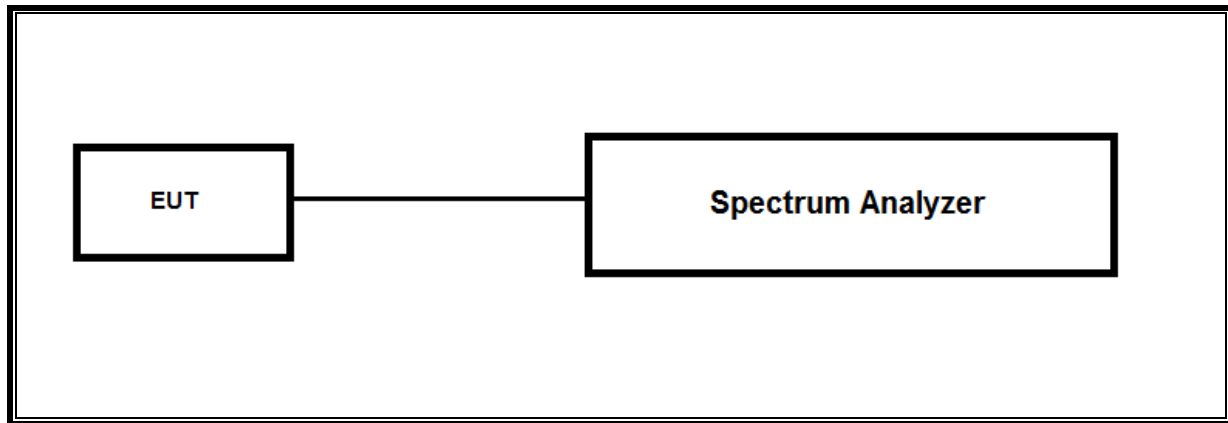
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.1m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.2m	N/A

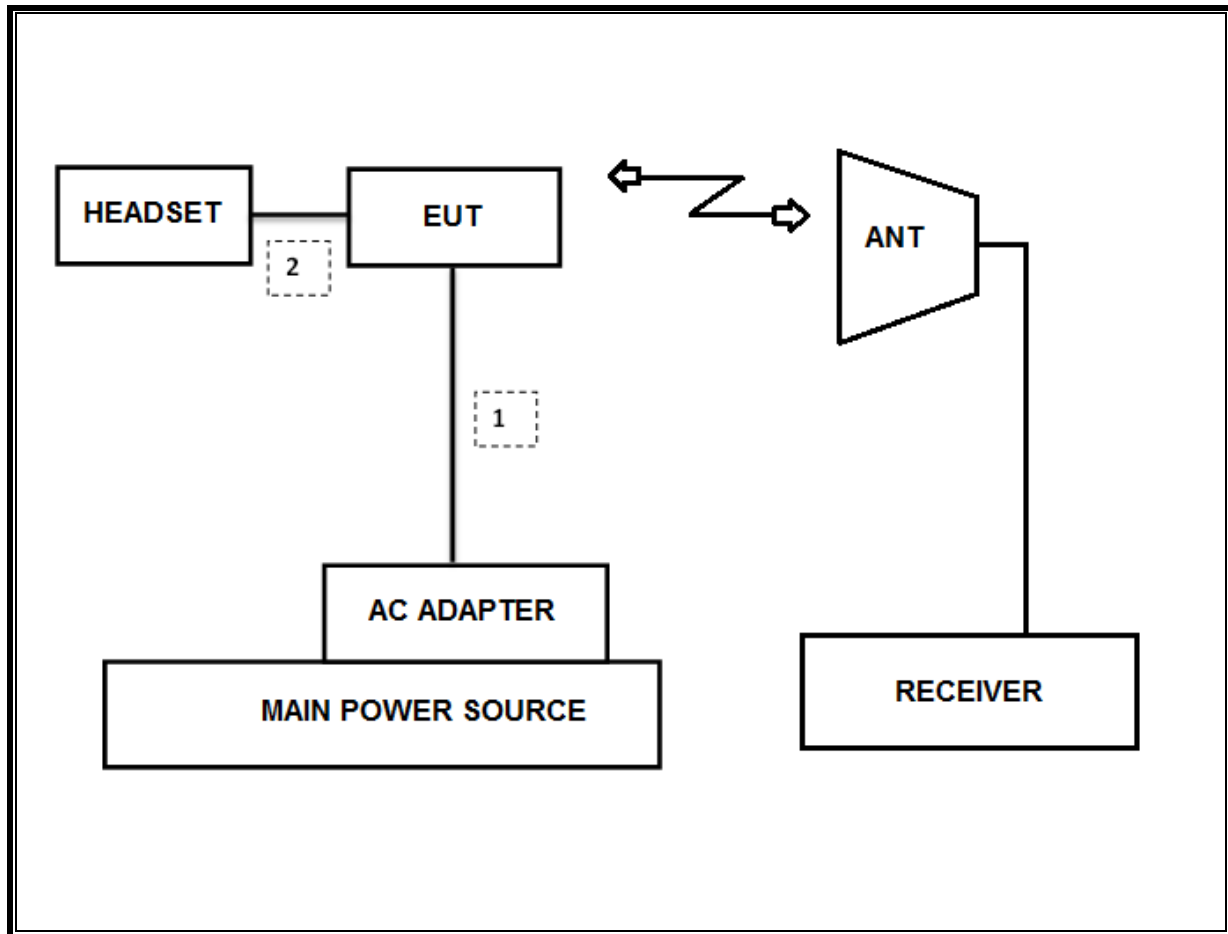
TEST SETUP

The EUT is a stand-alone unit during the tests.
Test software exercised the EUT to enable NII mode.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List					
Description	Manufacturer	Model	S/N	Old Cal Due	New Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-31-19	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	09-14-19	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-31-19	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	10-14-18	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	03-10-19	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	05-31-19	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	05-31-19	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	11-29-18	08-04-20
Antenna, Horn, 40 GHz	ETS	3116C	00166155	12-04-19	
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19	
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	11-13-18	08-09-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-09-18	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-18	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-10-18	08-06-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-08-18	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-08-18	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-11-18	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-08-18	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-08-18	08-06-19
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-11-18	08-06-19
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-08-18	08-07-19
Attenuator	PASTERNAK	PE7087-10	A001	08-08-18	08-08-19
Attenuator	PASTERNAK	PE7087-10	A008	08-08-18	08-08-19
Attenuator	PASTERNAK	PE7004-10	2	08-10-18	08-07-19
Attenuator	PASTERNAK	PE7087-10	A009	08-08-18	08-08-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-08-18	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-08-18	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-09-18	08-06-19
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-07-18	08-06-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-08-18	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-08-18	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-11-18	08-06-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-08-18	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-08-18	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-11-18	08-06-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-08-18	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-08-18	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-11-18	08-06-19
LISN	R&S	ENV-216	101837	08-09-18	08-09-19
UL Software					
Description	Manufacturer	Model	Version		
Radiated software	UL	UL EMC	Ver 9.5		
AC Line Conducted software	UL	UL EMC	Ver 9.5		

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.407(e)	6dB Band width (5.8Ghz)	500KHz	Condcuted	PASS
15.407 (a)(2)	TX Cond. Power 5.15-2.25, 5.25-5.35 & 5.47-5.725	<24dBm or 11+10Log(OBW)		PASS
15.407 (a)(3)	TX Cond. Power 5.725-5.825	< 30dBm or 17+10Log(OBW)		PASS
15.407 (a)(5)	PSD (5.2,5.3,5.5GHz)	<11dBm		PASS
15.407 (a)(5)	PSD (5.8GHz)	30dBm per 500kHz		PASS
15.207 (a)	AC Power Line conducted emissions	Section 10	Radiated	PASS
15.407 (b) & 15.209	Radiated Spurious Emission	< 54dBuV/m		PASS
15.407 (h)(2)	Dynamic Frequency Selection	N/A	Condcuted	PASS

8. MEASUREMENT METHODS

On-Time and Duty Cycle : KDB 789033 D02 v02r01, Section B.

6dB Emission BW : KDB 789033 D02 v02r01, Section C.2.

26dB Emission BW : KDB 789033 D02 v02r01, Section C.1.

99% Occupied BW : KDB 789033 D02 v02r01, Section D.

Conducted Output Power : KDB 789033 D02 v02r01, Section E.3.a(Method PM)

Conducted Output Power for Straddle Channel (ch144/142/138 for 20/40/80MHz BW):

KDB 789033 D02 v02r01, Section E.2.d(Method SA-2)

Power Spectral Density : KDB 789033 D02 v02r01, Section F.

Unwanted emissions in restricted bands : KDB 789033 D02 v02r01, Section G.

Unwanted emissions in non-restricted bands : KDB 789033 D02 v02r01, Section G.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

9. REFERENCE MEASUREMENTS RESULTS

9.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B [msec]	Period [msec]	Duty Cycle x [linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
802.11a	3.1	3.137	0.988	98.8%	0.00	0.010
802.11n HT20	5.483	5.521	0.993	99.3%	0.00	0.010
802.11n HT40	5.483	5.52	0.993	99.3%	0.00	0.010
802.11ac VHT80	4.523	4.561	0.992	99.2%	0.00	0.010

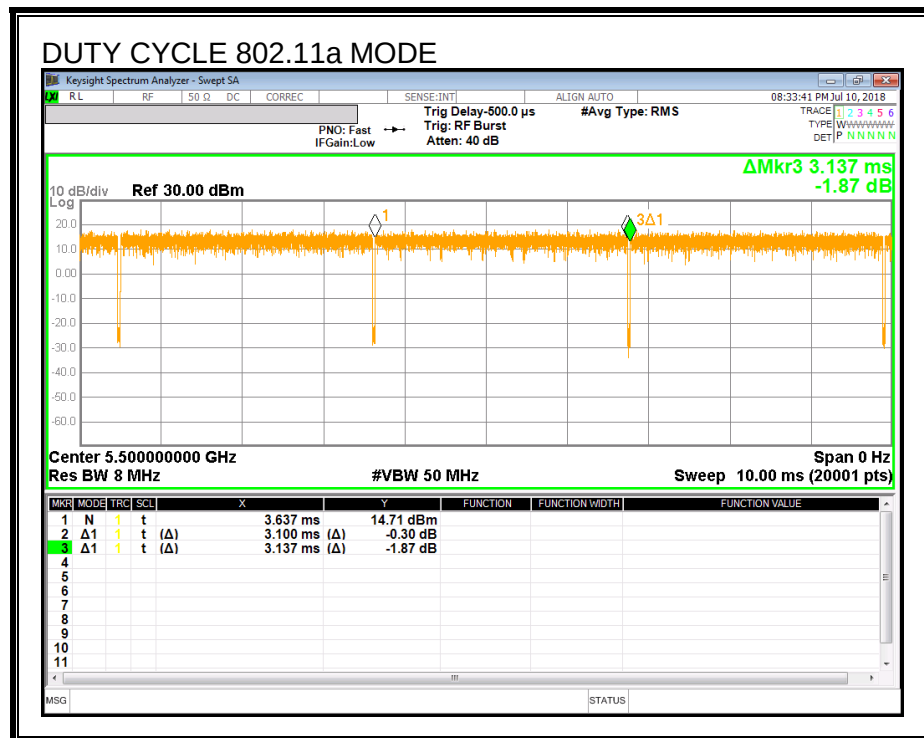
LIMITS

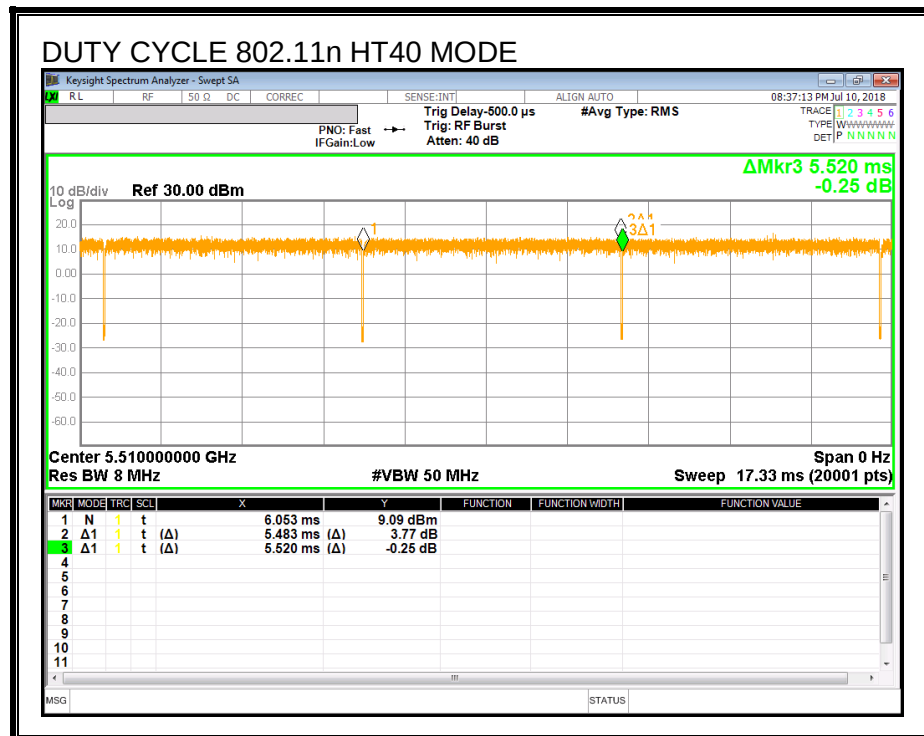
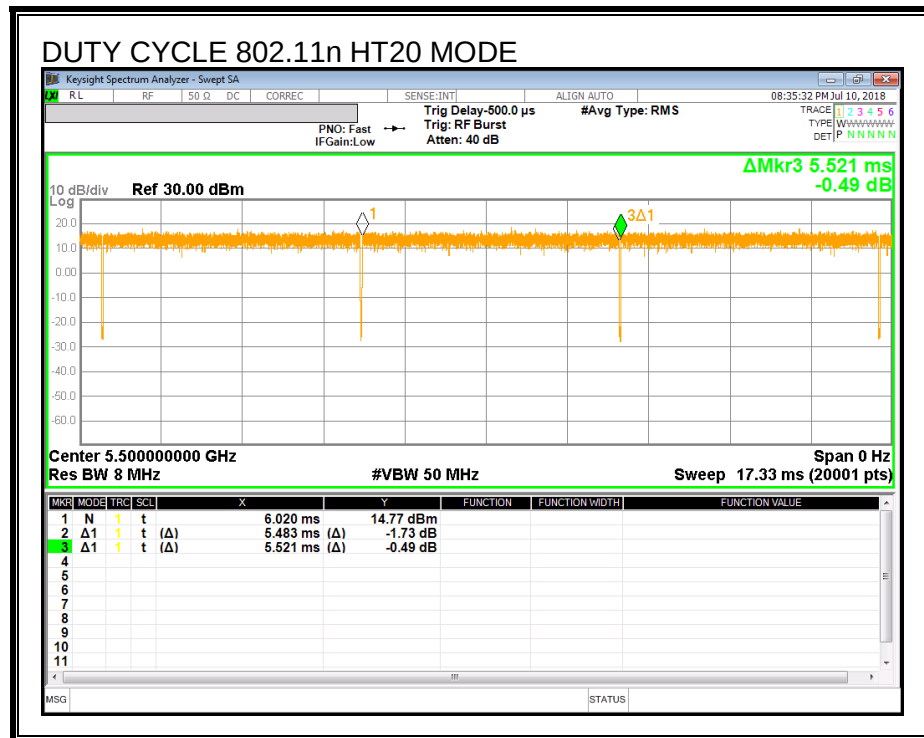
None; for reporting purposes only.

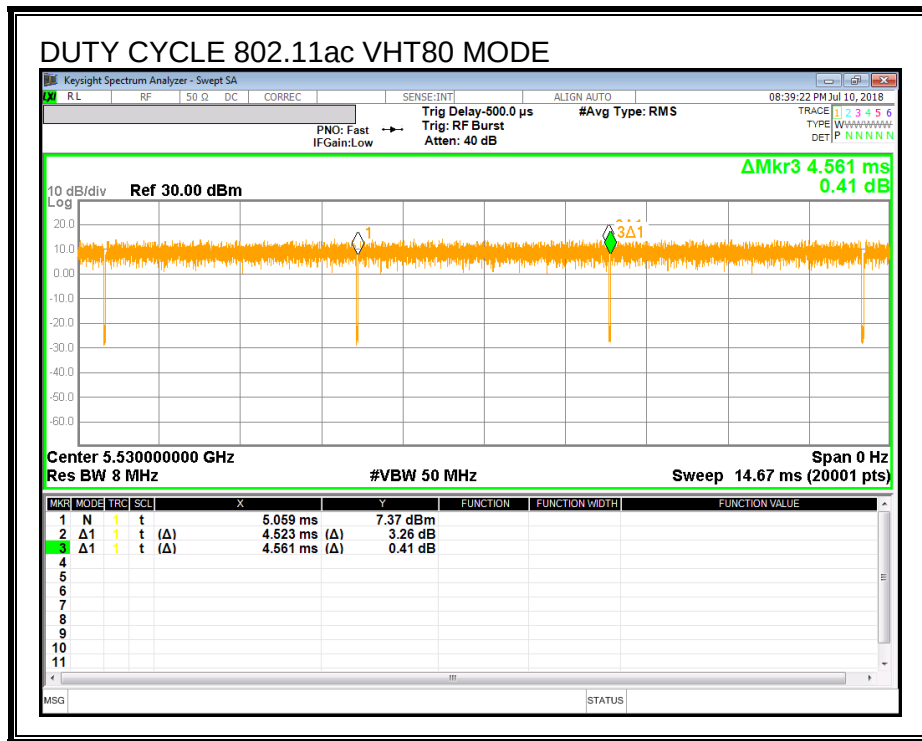
PROCEDURE

KDB 789033 D02 v02r01 Zero-Span Spectrum Analyzer Method.

9.2. DUTY CYCLE PLOTS







9.3. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Reference to 789033 D02 General UNII Test Procedures New Rules v02r01: The transmitter output is connected to a spectrum analyzer with the RBW set to approximately 1% of EBW, the VBW > RBW, peak detector and max hold.

NOTE

- Calculation for 26dB Bandwidth of UNII-2C and UNII-3 Straddle Channel

ex) Fundamental frequency : 5720MHz

- 26dB BW : 20.58MHz
- Turning Frequency : 5725MHz
- 26dB Bandwidth of UNII-2C band Portion
 $= (5725 - (5720 - (20.58 / 2))) = 15.29 \text{ MHz}$
- 26dB Bandwidth of UNII-3 band Portion
 $= (5720 + (20.58 / 2) - 5725) = 5.29 \text{ MHz}$

RESULTS

9.3.1.802.11a MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5180	20.69	20.56
Mid	5200	20.81	20.45
High	5240	21.00	20.72
Worst		21.00	

9.3.2.802.11n HT20 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5180	21.37	21.16
Mid	5200	21.28	20.48
High	5240	22.15	21.61
Worst		22.15	

9.3.3.802.11n HT40 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5190	39.79	39.51
High	5230	39.92	39.61
Worst		39.92	

9.3.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Middle	5210	81.24	81.64
Worst		81.64	

9.3.5.802.11a MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5260	20.49	20.65
Mid	5300	20.64	20.67
High	5320	20.65	20.84
Worst		20.84	

9.3.6.802.11n HT20 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5260	21.10	21.70
Mid	5300	21.56	20.86
High	5320	20.63	21.13
Worst		21.70	

9.3.7.802.11n HT40 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5270	40.09	40.16
High	5310	39.46	40.00
Worst		40.16	

9.3.8. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Middle	5290	81.01	81.76
Worst		81.76	

9.3.9. 802.11a MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5500	20.96	20.76
Mid	5580	21.57	20.41
High	5700	21.99	21.01
Straddle	5720	15.51	15.49
Worst		21.99	

9.3.10. 802.11n HT20 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5500	21.67	21.45
Mid	5580	20.99	21.03
High	5700	21.56	21.23
Straddle	5720	15.78	16.01
Worst		21.67	

9.3.11. 802.11n HT40 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5510	40.17	40.18
Mid	5590	39.80	39.71
High	5670	40.21	39.98
Straddle	5710	34.99	34.81
Worst		40.21	

9.3.12. 802.11ac VHT80 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5530	81.40	80.68
High	5610	81.68	81.13
Staddle	5690	75.80	75.33
Worst		81.68	

9.3.13. 802.11a MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Straddle	5720	5.51	5.49
Low	5745	21.55	21.00
Mid	5785	21.06	20.15
High	5825	21.22	20.25
Worst		21.55	

9.3.14. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Straddle	5720	5.78	6.01
Low	5745	21.38	21.96
Mid	5785	20.62	21.86
High	5825	22.11	21.30
Worst		22.11	

9.3.15. 802.11n HT40 MODE IN THE 5.8 GHz BAND

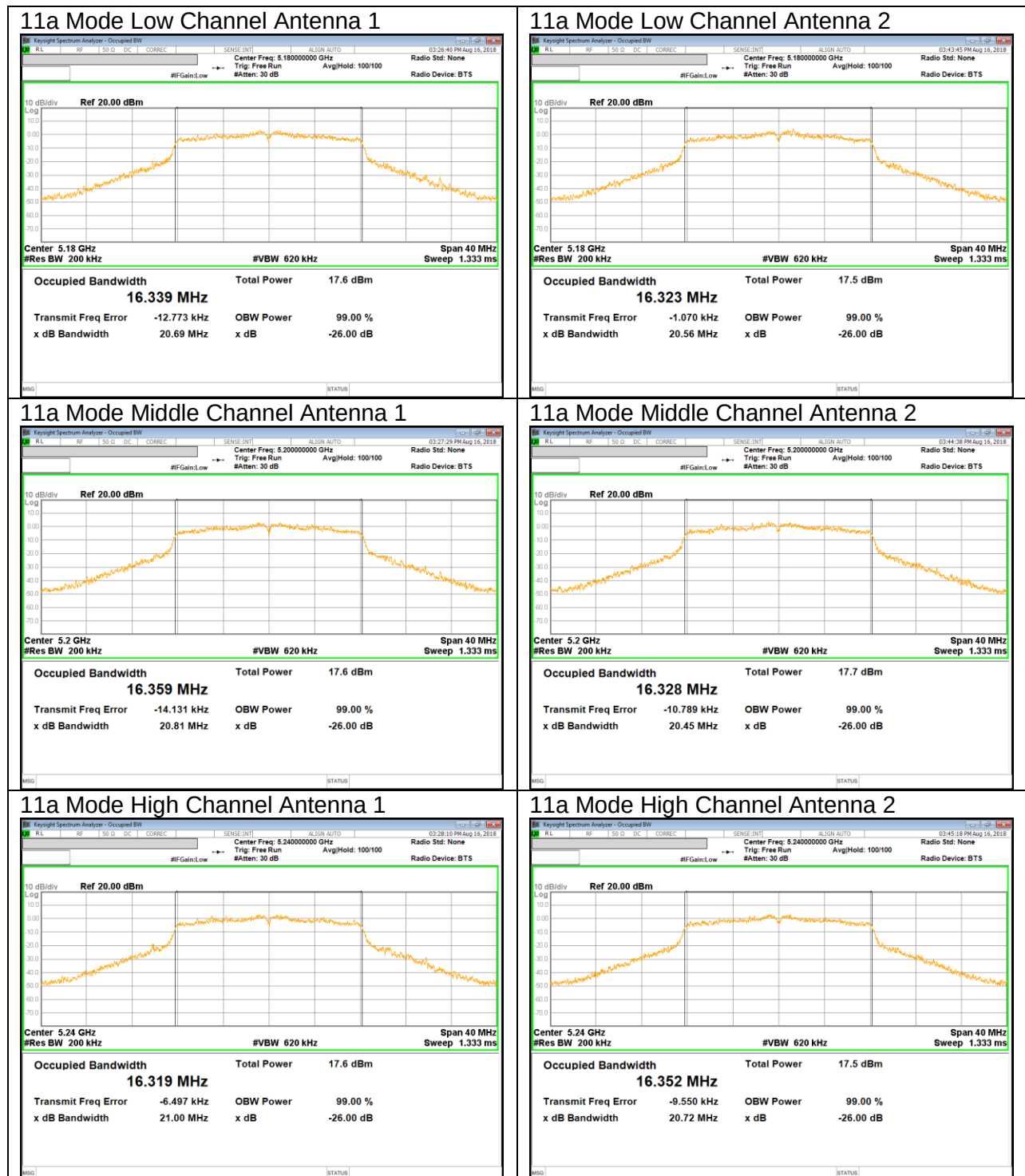
Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Straddle	5710	4.99	4.81
Low	5755	40.12	39.85
High	5795	39.70	39.89
Worst		40.12	

9.3.16. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Straddle	5690	5.80	5.33
Middle	5775	81.25	81.14
Worst		81.25	

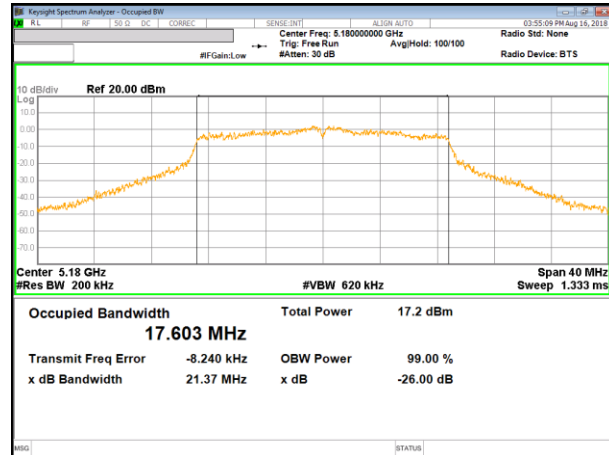
9.3.17. 26 dB BANDWIDTH PLOTS

UNII 5.2 GHz IEEE 802.11a mode

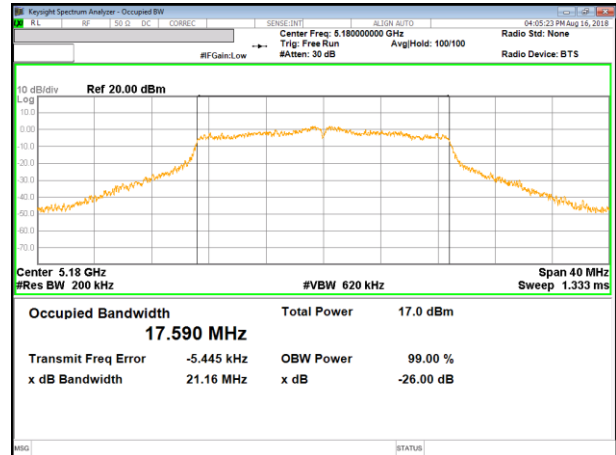


UNII 5.2 GHz IEEE 802.11n HT20 mode

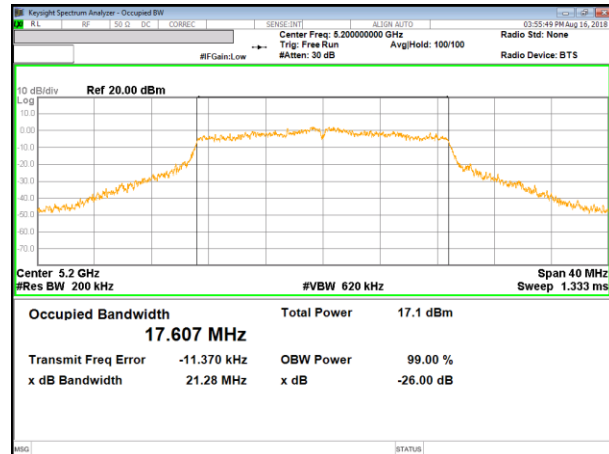
11n HT20 Mode Low Channel Antenna 1



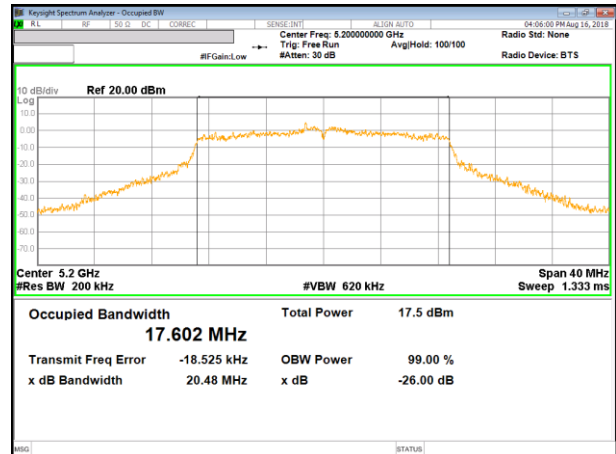
11n HT20 Mode Low Channel Antenna 2



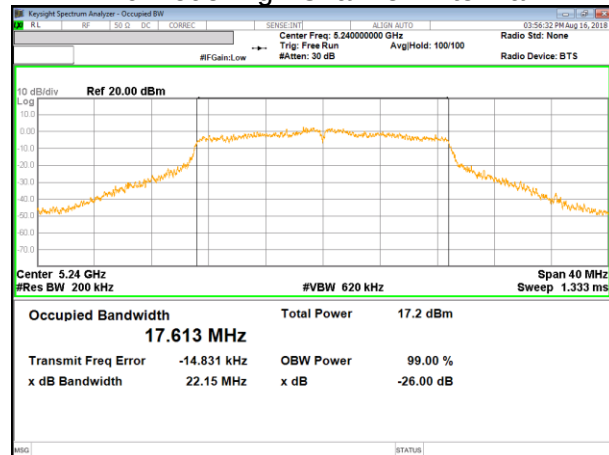
11n HT20 Mode Middle Channel Antenna 1



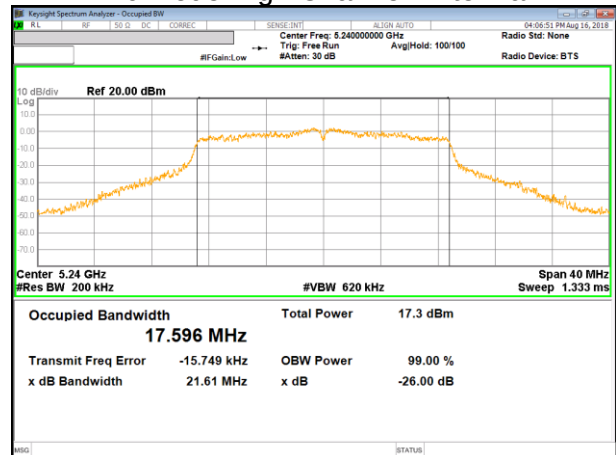
11n HT20 Mode Middle Channel Antenna 2



11n HT20 Mode High Channel Antenna 1

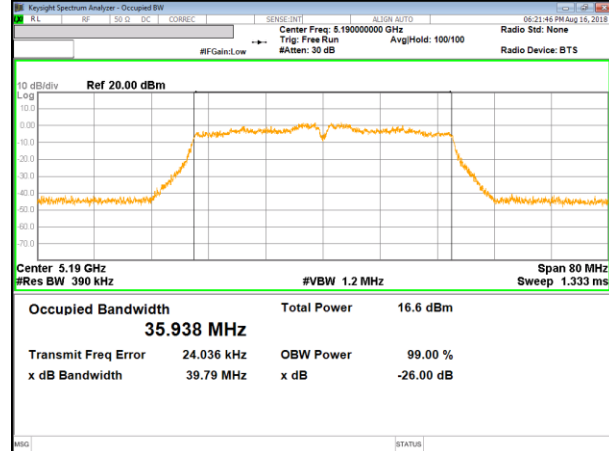


11n HT20 Mode High Channel Antenna 2

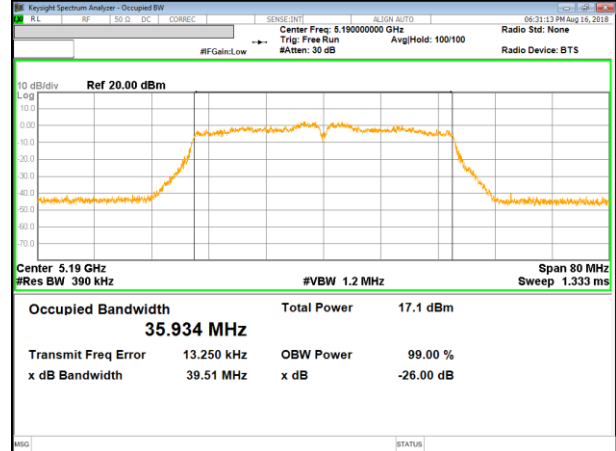


UNII 5.2 GHz IEEE 802.11n HT40 mode

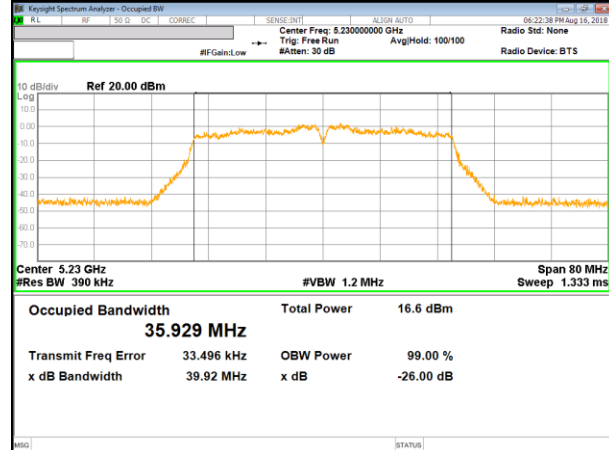
11n HT40 Mode Low Channel Antenna 1



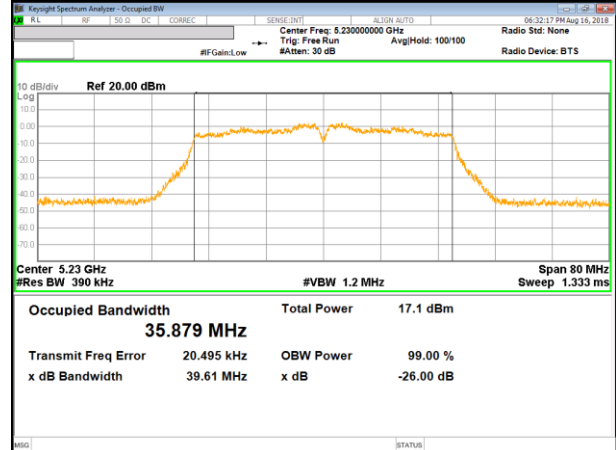
11n HT40 Mode Low Channel Antenna 2



11n HT40 Mode High Channel Antenna 1

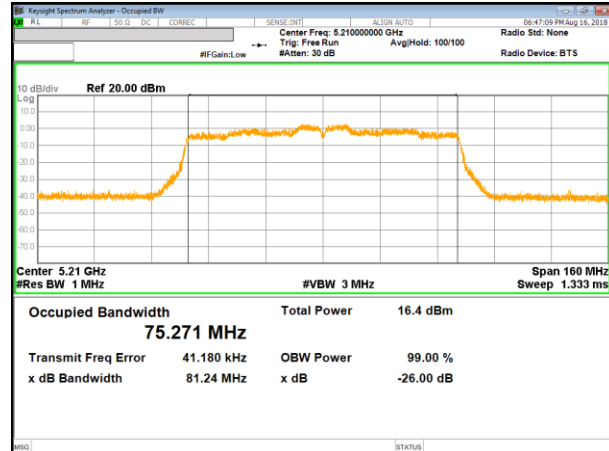


11n HT40 Mode High Channel Antenna 2

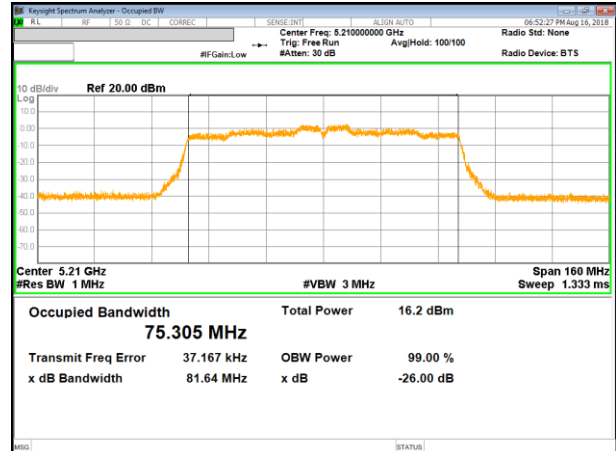


UNII 5.2 GHz IEEE 802.11ac VHT80 mode

11ac VHT80 Mode Middle Channel Antenna 1

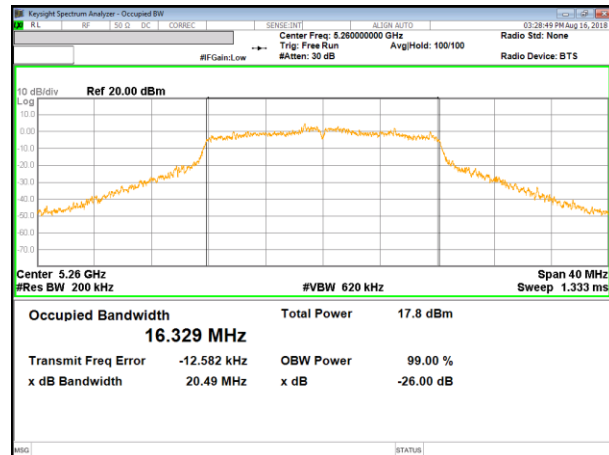


11ac VHT80 Mode Middle Channel Antenna 2

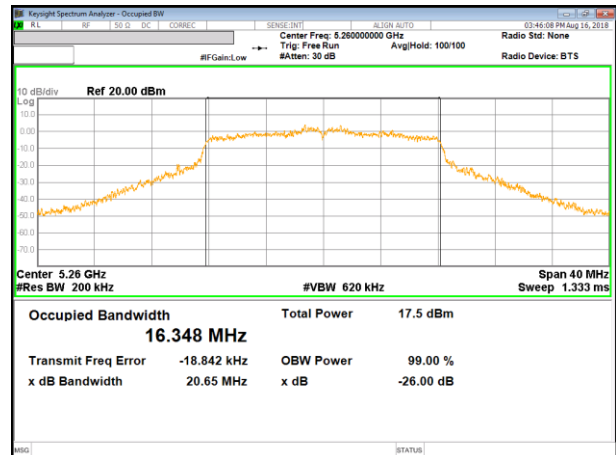


UNII 5.3 GHz IEEE 802.11a mode

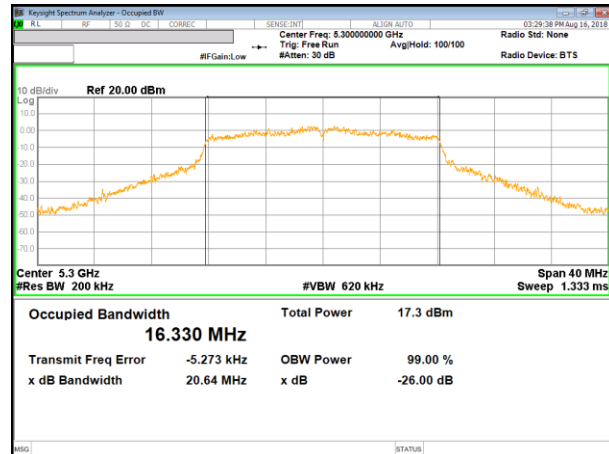
11a Mode Low Channel Antenna 1



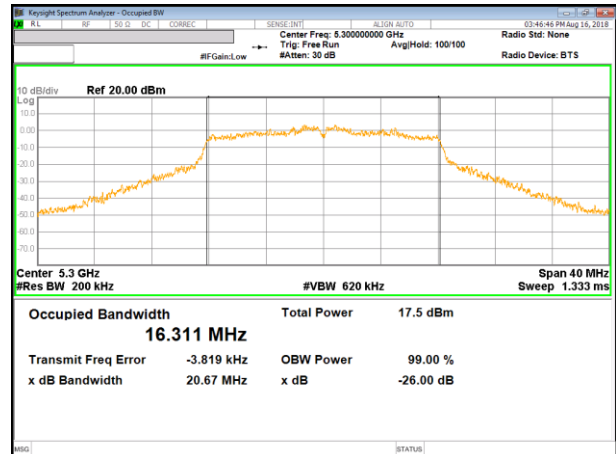
11a Mode Low Channel Antenna 2



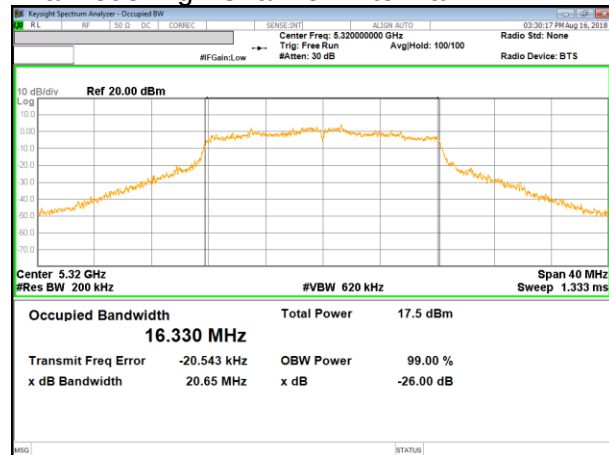
11a Mode Middle Channel Antenna 1



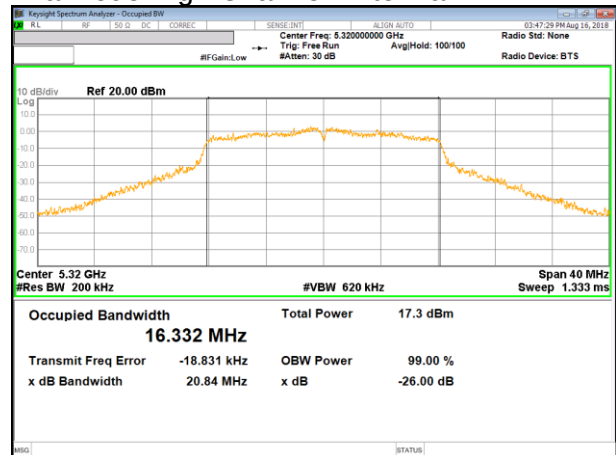
11a Mode Middle Channel Antenna 2



11a Mode High Channel Antenna 1

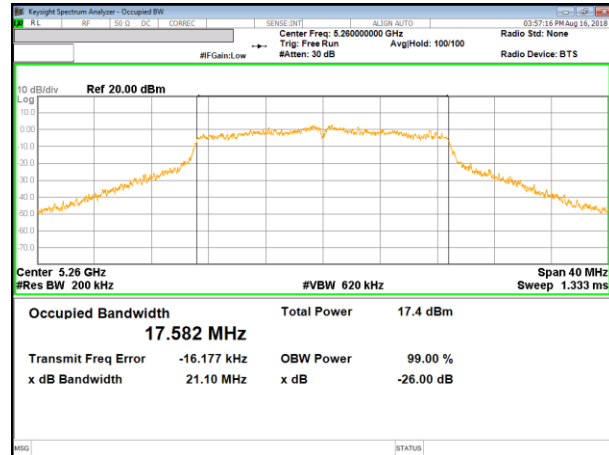


11a Mode High Channel Antenna 2

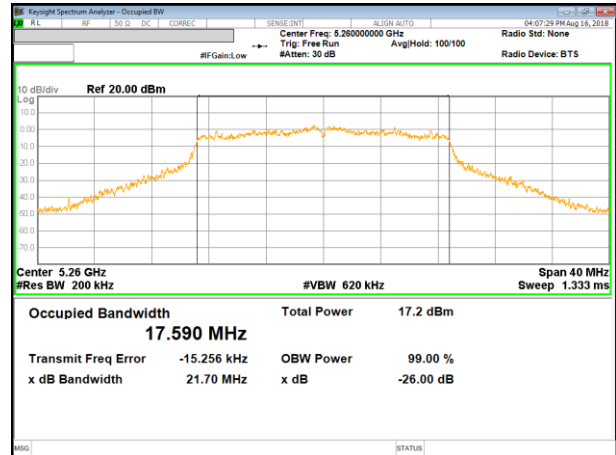


UNII 5.3 GHz IEEE 802.11n HT20 mode

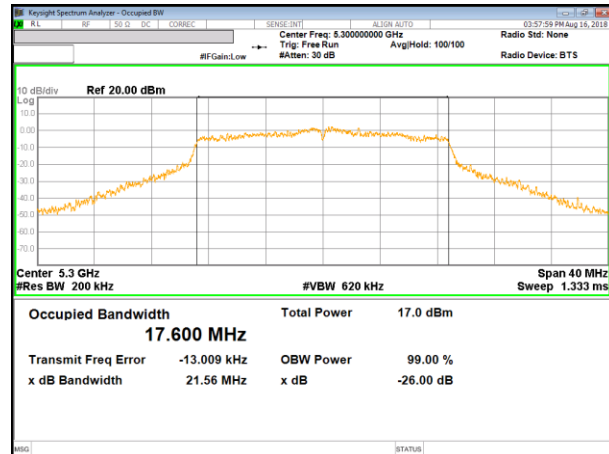
11n HT20 Mode Low Channel Antenna 1



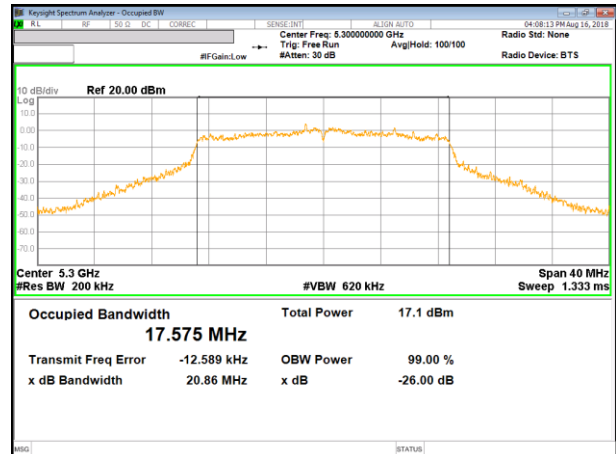
11n HT20 Mode Low Channel Antenna 2



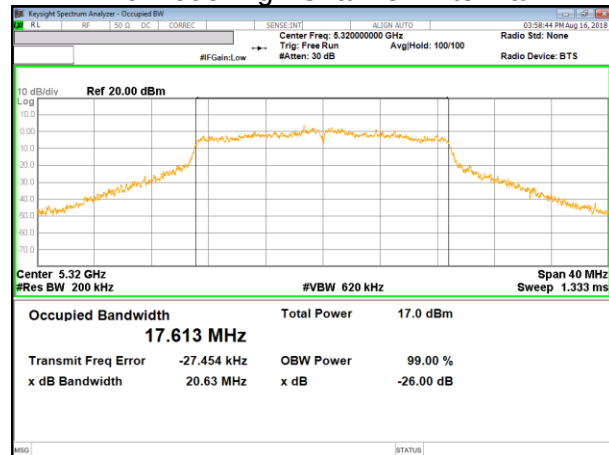
11n HT20 Mode Middle Channel Antenna 1



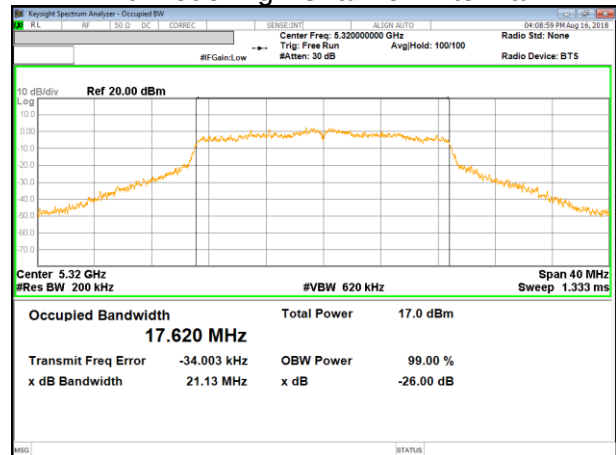
11n HT20 Mode Middle Channel Antenna 2



11n HT20 Mode High Channel Antenna 1

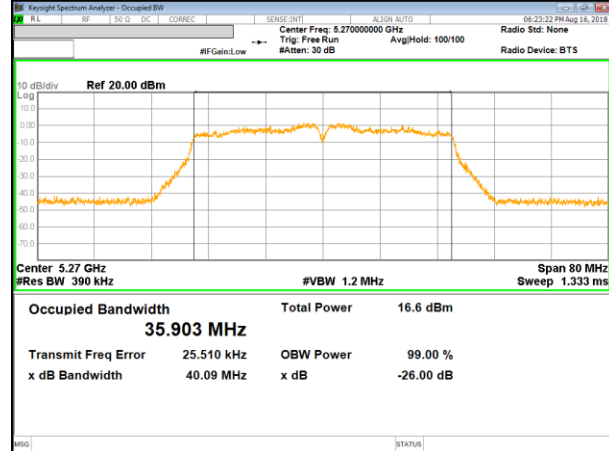


11n HT20 Mode High Channel Antenna 2

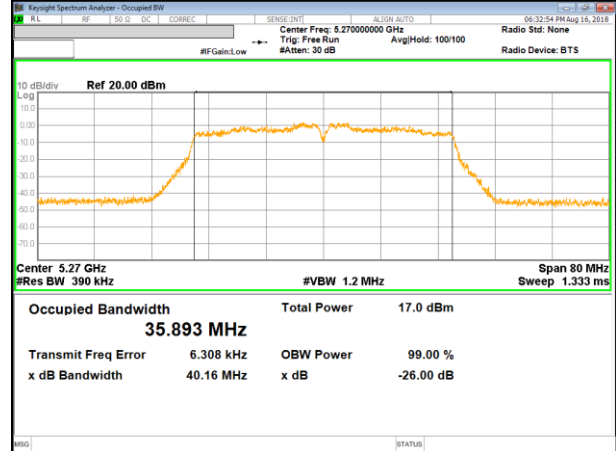


UNII 5.3 GHz IEEE 802.11n HT40 mode

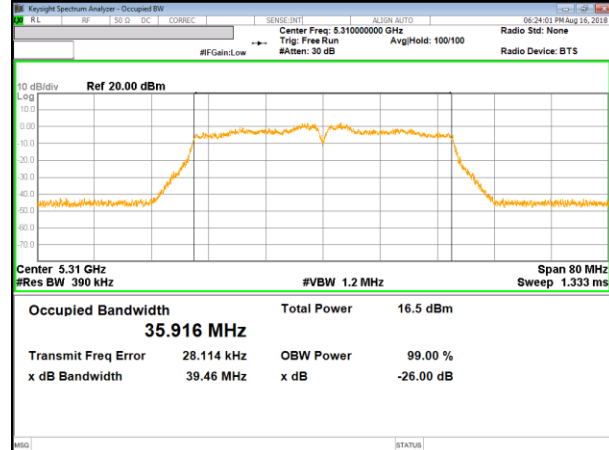
11n HT40 Mode Low Channel Antenna 1



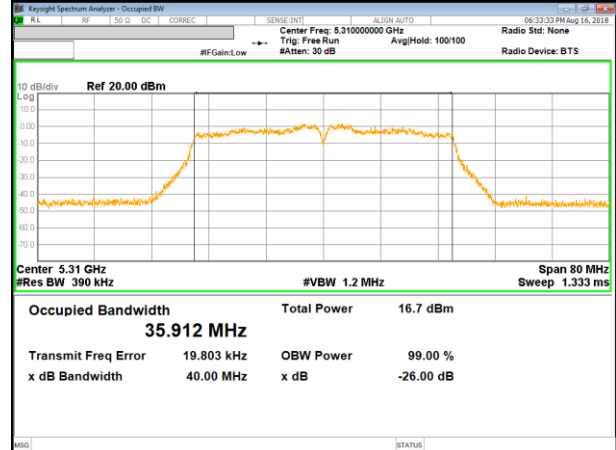
11n HT40 Mode Low Channel Antenna 2



11n HT40 Mode High Channel Antenna 1

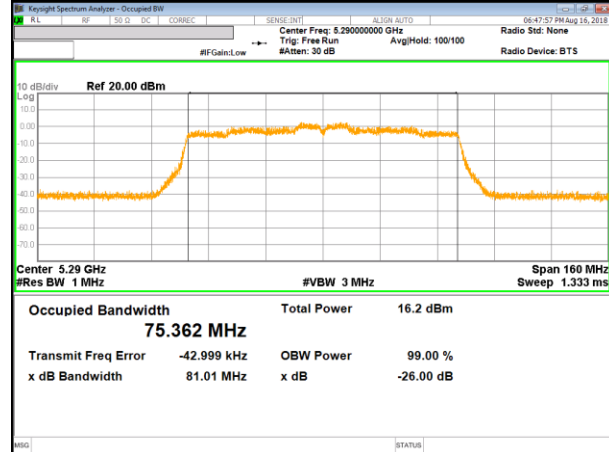


11n HT40 Mode High Channel Antenna 2

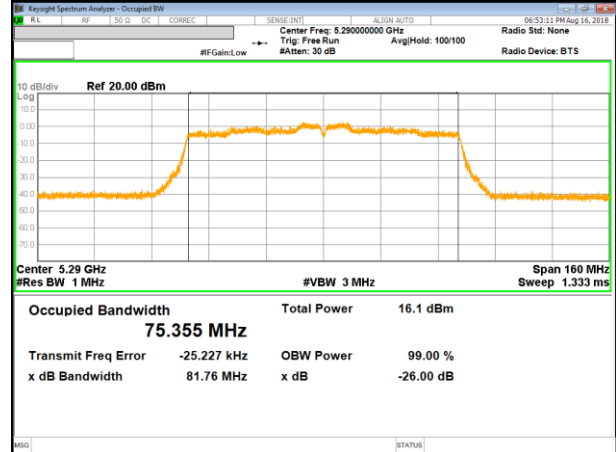


UNII 5.3 GHz IEEE 802.11ac VHT80 mode

11ac VHT80 Mode Middle Channel Antenna 1

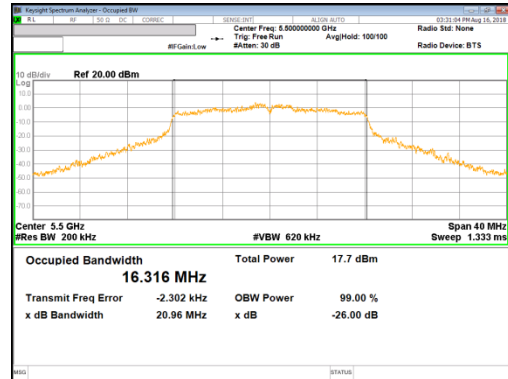


11ac VHT80 Mode Middle Channel Antenna 2

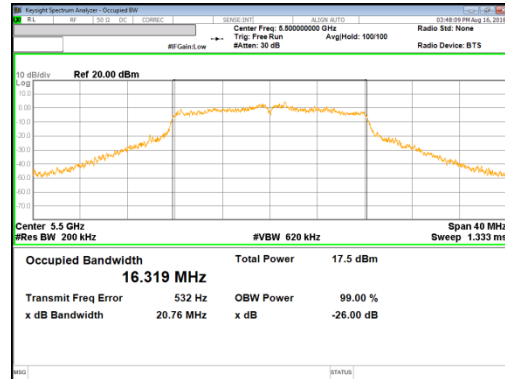


UNII 5.5 GHz IEEE 802.11a mode

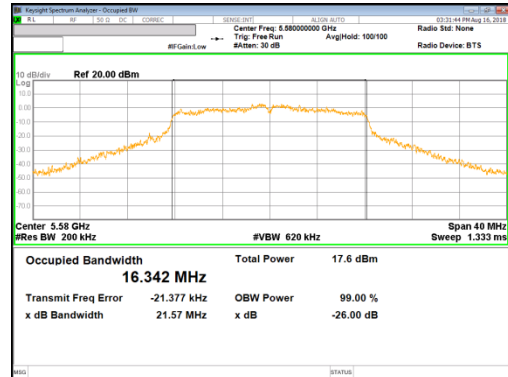
11a Mode Low Channel Antenna 1



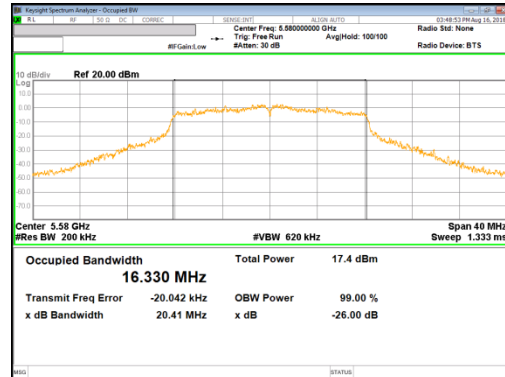
11a Mode Low Channel Antenna 2



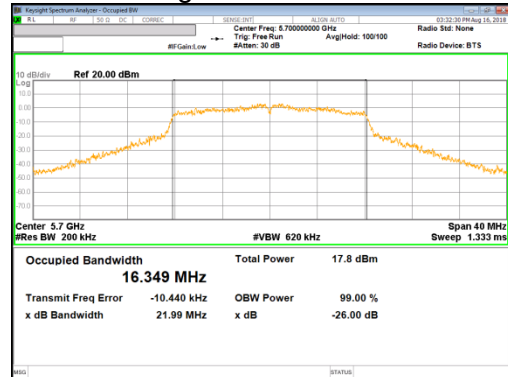
11a Mode Middle Channel Antenna 1



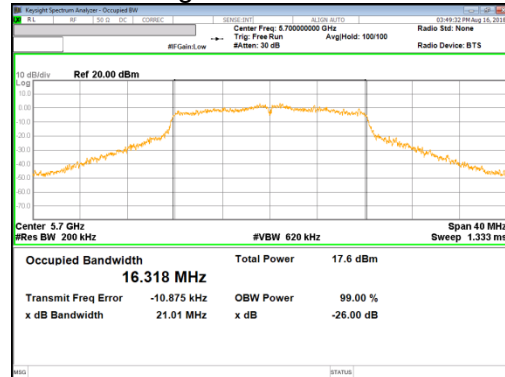
11a Mode Middle Channel Antenna 2



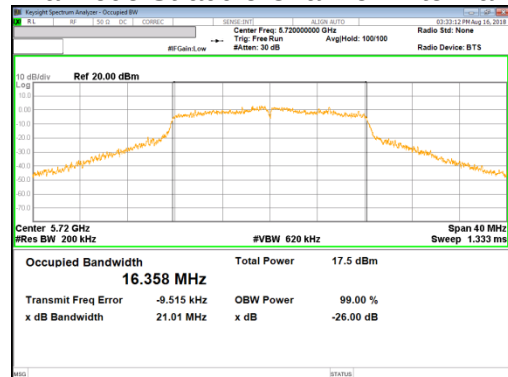
11a Mode High Channel Antenna 1



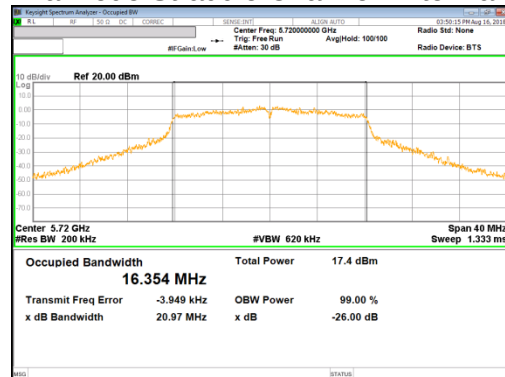
11a Mode High Channel Antenna 2



11a Mode Straddle Channel Antenna 1



11a Mode Straddle Channel Antenna 2



UNII 5.5 GHz IEEE 802.11n HT20 mode

