



FCC 47 CFR PART 15 SUBPART E

CERTIFICATION TEST REPORT

FOR

PORTABLE GAMING DEVICE

MODEL NUMBER: P2523

FCC ID: VOB-P2523

REPORT NUMBER: 14U19497-E8V2

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Revision History

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V1	6/20/16	Initial Issue	D. Corona
V2	7/12/16	Updated Section 6, added note on Section 11.5.1-11.5.4	D. Corona

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	6
2. TEST METHODOLOGY	7
3. FACILITIES AND ACCREDITATION	7
4. CALIBRATION AND UNCERTAINTY	7
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	7
4.2. <i>SAMPLE CALCULATION</i>	7
4.3. <i>MEASUREMENT UNCERTAINTY</i>	8
5. EQUIPMENT UNDER TEST	9
5.1. <i>DESCRIPTION OF EUT</i>	9
5.2. <i>MAXIMUM OUTPUT POWER</i>	9
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	9
5.4. <i>WORST-CASE CONFIGURATION AND MODE</i>	11
5.5. <i>DESCRIPTION OF TEST SETUP</i>	12
6. TEST AND MEASUREMENT EQUIPMENT	14
7. SUMMARY TABLE	15
8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS	16
8.1. <i>ON TIME AND DUTY CYCLE RESULTS</i>	16
8.2. <i>DUTY CYCLE PLOTS</i>	17
9. MEASUREMENT METHOD.....	21
10. ANTENNA PORT TEST RESULTS SISO Chain 0 and 1.....	22
10.1. <i>6 dB BANDWIDTH</i>	22
10.1.1. <i>6 dB BANDWIDTH PLOTS AND TABLE</i>	23
10.2. <i>26 dB BANDWIDTH</i>	25
10.2.1. <i>26 dB BANDWIDTH PLOTS AND TABLE</i>	26
10.3. <i>99% BANDWIDTH</i>	30
10.3.1. <i>99% BANDWIDTH PLOTS AND TABLE</i>	31
10.4. <i>AVERAGE POWER</i>	35
10.4.1. <i>802.11a MODE IN THE 5.2 GHz BAND</i>	36
10.4.2. <i>802.11a MODE IN THE 5.8 GHz BAND</i>	36
10.5. <i>OUTPUT POWER AND PPSD</i>	37
10.5.1. <i>802.11a MODE IN THE 5.2 GHz BAND (Chain 0)</i>	38
10.5.2. <i>802.11a MODE IN THE 5.2 GHz BAND (Chain 1)</i>	39
10.5.3. <i>802.11a MODE IN THE 5.8 GHz BAND (Chain 0)</i>	40
10.5.4. <i>802.11a MODE IN THE 5.8 GHz BAND (Chain 1)</i>	41
11. ANTENNA PORT TEST RESULTS MIMO	43

11.1.	<i>6 dB BANDWIDTH</i>	43
11.1.1.	6 dB BANDWIDTH PLOTS AND TABLE.....	44
11.1.2.	6 dB BANDWIDTH MID CH PLOTS.....	47
11.2.	<i>26 dB BANDWIDTH</i>	48
11.2.1.	802.11n HT20 MODE IN THE 5.2 GHz BAND	49
11.2.2.	802.11n HT40 MODE IN THE 5.2 GHz BAND	49
11.2.3.	802.11ac HT80 MODE IN THE 5.2 GHz BAND	49
11.2.4.	802.11n HT20 MODE IN THE 5.8 GHz BAND	50
11.2.5.	802.11n HT40 MODE IN THE 5.8 GHz BAND	50
11.2.6.	802.11ac HT80 MODE IN THE 5.8 GHz BAND	50
11.2.7.	26 dB BANDWIDTH PLOTS	51
11.3.	<i>99% BANDWIDTH</i>	53
11.3.1.	802.11n HT20 MODE IN THE 5.2 GHz BAND	54
11.3.2.	802.11n HT40 MODE IN THE 5.2 GHz BAND	54
11.3.3.	802.11ac HT80 MODE IN THE 5.2 GHz BAND	54
11.3.4.	802.11n HT20 MODE IN THE 5.8 GHz BAND	55
11.3.5.	802.11n HT40 MODE IN THE 5.8 GHz BAND	55
11.3.6.	802.11ac HT80 MODE IN THE 5.8 GHz BAND	55
11.3.7.	99% BANDWIDTH PLOTS	56
11.4.	<i>AVERAGE POWER</i>	58
11.4.1.	802.11n HT20 MODE IN THE 5.2 GHz BAND	59
11.4.2.	802.11n HT40 MODE IN THE 5.2 GHz BAND	59
11.4.3.	802.11ac HT80 MODE IN THE 5.2 GHz BAND	59
11.4.1.	802.11n HT20 MODE IN THE 5.8 GHz BAND	60
11.4.2.	802.11n HT40 MODE IN THE 5.8 GHz BAND	60
11.4.3.	802.11ac HT80 MODE IN THE 5.8 GHz BAND	60
11.5.	<i>OUTPUT POWER AND PPSD</i>	61
11.5.1.	802.11n HT20 MODE IN THE 5.2 GHz BAND	63
11.5.2.	802.11n HT40 MODE IN THE 5.2 GHz BAND	64
11.5.3.	802.11ac HT80 MODE IN THE 5.2 GHz BAND	65
11.5.1.	802.11n HT20 MODE IN THE 5.8 GHz BAND	66
11.5.2.	802.11n HT40 MODE IN THE 5.8 GHz BAND	67
11.5.3.	802.11ac HT80 MODE IN THE 5.8 GHz BAND	68
11.5.4.	OUTPUT POWER AND PPSD PLOTS	69
12.	TRANSMITTER ABOVE 1 GHz SISO Chain 0	71
12.1.	<i>5.2 GHz</i>	72
12.1.1.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.2 GHz BAND	72
12.2.	<i>5.8 GHz</i>	83
12.2.1.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.8 GHz BAND	83
13.	TRANSMITTER ABOVE 1 GHz SISO Chain 1	96
13.1.	<i>5.2 GHz</i>	97
13.1.1.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.2 GHz BAND	97
13.2.	<i>5.8 GHz</i>	108
13.2.1.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.8 GHz BAND	108

14. TRANSMITTER ABOVE 1 GHz MIMO Chain 1	121
14.1. 5.2 GHz.....	122
14.1.1. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND.....	122
14.1.2. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.2 GHz BAND.....	133
14.1.3. TX ABOVE 1 GHz 802.11ac HT80 MODE IN THE 5.2 GHz BAND.....	141
14.2. 5.8 GHz.....	146
14.2.1. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.8 GHz BAND.....	146
14.2.2. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.8 GHz BAND.....	159
14.2.3. TX ABOVE 1 GHz 802.11ac HT80 MODE IN THE 5.8 GHz BAND.....	169
15. WORST-CASE BELOW 1 GHz (in the 5.3 GHz Band).....	176
16. AC POWER LINE CONDUCTED EMISSIONS.....	179
17. SETUP PHOTOS.....	184

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: NVIDIA
EUT DESCRIPTION: Portable Gaming Device
MODEL: P2523
SERIAL NUMBER: P2523-E02-S0929
DATE TESTED: NOVEMBER 21-DECEMBER 15, 2014

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

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15 Subpart E, FCC KDB 662911, ANSI C63.10 2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 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.

47173 Benicia Street	47266 Benicia Street
<input checked="" type="checkbox"/> Chamber A(IC: 2324B-1)	<input type="checkbox"/> Chamber D(IC: 2324B-4)
<input checked="" type="checkbox"/> Chamber B(IC: 2324B-2)	<input type="checkbox"/> Chamber E(IC: 2324B-5)
<input checked="" type="checkbox"/> Chamber C(IC: 2324B-3)	<input type="checkbox"/> Chamber F(IC: 2324B-6)
	<input type="checkbox"/> Chamber G(IC: 2324B-7)
	<input type="checkbox"/> Chamber H(IC: 2324B-8)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

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:

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

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	3.52 dB
Radiated Disturbance, 9KHz to 30 MHz	2.14 dB
Radiated Disturbance, 30 to 1000 MHz	4.98 dB
Radiated Disturbance,1000 to 6000 MHz	3.86 dB
Radiated Disturbance,6000 to 18000 MHz	4.23 dB
Radiated Disturbance,18000 to 26000 MHz	5.30 dB
Radiated Disturbance,26000 to 40000 MHz	5.23 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Portable Gaming Device.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Total Output Power (dBm)	Total Output Power (mW)
5180 - 5240	802.11a	14.9	30.90
5745 - 5825	802.11a	14.8	30.20
5180 - 5240	802.11n HT20	15.05	31.99
5745 - 5825	802.11n HT20	15.9	38.46
5180 - 5240	802.11n HT40	14.57	28.64
5755 - 5795	802.11n HT40	18.42	69.50
5210 - 5210	802.11ac HT80	15.95	39.36
5775 - 5775	802.11ac HT80	16.68	46.56

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna for the 802.11a, 802.11n/ac HT20, 802.11n/ac HT40, 802.11n/ac HT80 modes with maximum peak gains as described below:

Frequency (MHz)	Antenna Gain (dBi)	
	Core0	Core1
5180-5320	3.21	4.2
5745-5825	4.44	5.17

List of test reduction and modes covering other modes:

Authorized Frequency Band (Antenna port & Radiated Testing)		
Frequency Range (MHz)	Mode	Covered by
5180 - 5240	802.11a legacy 1TX	802.11a 2TX CDD
5180 - 5240	802.11HT20 1TX	802.11n HT20 2TX CDD
5180 - 5240	802.11HT20 2TX STBC	802.11n HT20 2TX CDD
5180 - 5240	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5180 - 5240	802.11ac VHT20 2TX STBC	802.11n HT20 2TX CDD
5180 - 5240	802.11ac VHT20 2TX CDD	802.11n HT20 2TX CDD
5190 - 5230	802.11n HT40 1TX	802.11n HT40 2TX CDD
5190 - 5230	802.11n HT40 2TX STBC	802.11n HT40 2TX CDD
5190 - 5230	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5190 - 5230	802.11ac VHT40 2TX STBC	802.11n HT40 2TX CDD
5190 - 5230	802.11ac VHT40 2TX CDD	802.11n HT40 2TX CDD
5210	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5210	802.11ac VHT80 2TX STBC	802.11ac VHT80 2TX CDD

Authorized Frequency Band (Antenna Port & Radiated Testing)		
Frequency Range (MHz)	Mode	Covered by
5745 - 5825	802.11a Legacy 1TX	802.11a CDD 2TX
5745 - 5825	802.11n HT20 1TX	802.11n HT20 CDD 2TX
5745 - 5825	802.11n HT20 STBC 2TX	802.11n HT20 CDD 2TX
5745 - 5825	802.11ac VHT20 1TX	802.11n HT20 CDD 2TX
5745 - 5825	802.11ac VHT20 STBC 2TX	802.11n HT20 CDD 2TX
5755 - 5795	802.11n HT40 1TX	802.11n HT40 CDD 2TX
5755 - 5795	802.11n HT40 STBC 2TX	802.11n HT40 CDD 2TX
5755 - 5795	802.11ac VHT40 1TX	802.11n HT40 CDD 2TX
5755 - 5795	802.11ac VHT40 STBC 2TX	802.11n HT40 CDD 2TX
5775	802.11ac VHT80 1TX	802.11ac VHT80 CDD 2TX
5775	802.11ac VHT80 STBC 2TX	802.11ac VHT80 CDD 2TX

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

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

802.11a mode: 6 Mbps

802.11n HT20mode: MCS0

802.11n HT40mode: MCS0

802.11ac VHT80mode: MCS0

All conducted testing was performed in n-mode only for HT20/40, which covers ac-mode testing.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	NVIDIA	SPA011AU5W	R43001	N/A

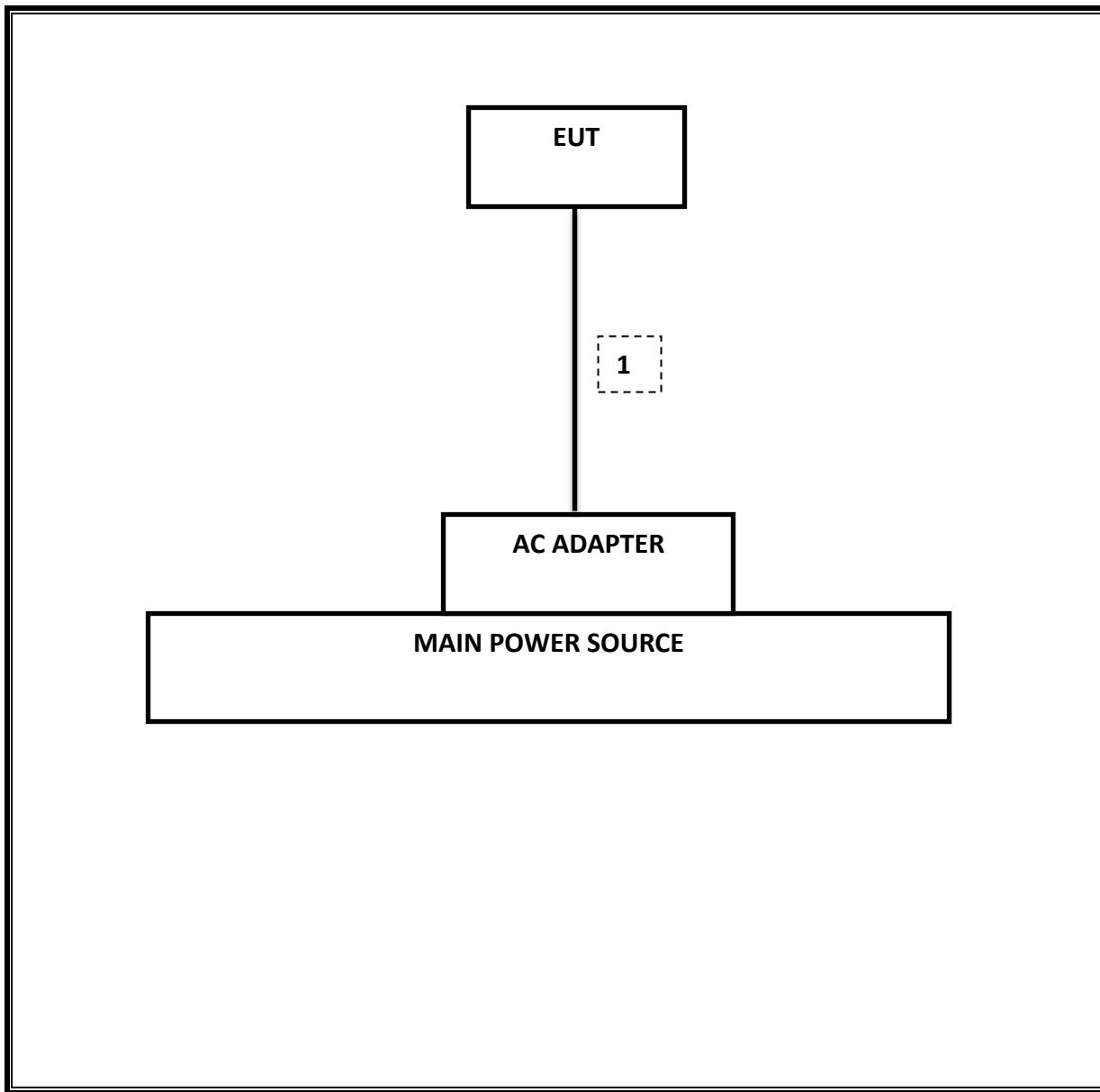
I/O CABLES

Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini USB	Shielded	1.2m	N/A

TEST SETUP

The EUT is setup as a stand-alone device.

SETUP DIAGRAM FOR TESTS



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	Asset	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	02/26/15
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/15
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/15
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/02/15
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	N/A	03/06/15
Antenna, Horn, 18 GHz	ETS	3117	C01022	02/21/15
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	06/28/15
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	12/17/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02676	CNR
NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NIST USA.				

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Version 9.5, 07/22/14
Conducted Software	UL	UL EMC	Version 9.5, 05/17/14
Antenna Port Software	UL	UL RF	Version 2.1.1.1, 1/20/15

7. SUMMARY TABLE

FCC Part Section	RSS Section	Test Description	Test Limit	Test Condition	Test Result
§15.407 (a)	RSS-247	Occupied Band width (26dB)	N/A	Conducted	Pass
§15.407	RSS-247 6.2.4	6dB Band width (5.8Ghz)	>500KHz		Pass
§15.407 (a)(1)	RSS-247 6.2	TX Cond. Power 5.15-5.25	<24dBm (FCC) / <23 dBm or <10+10Log(99% BW) (IC)		Pass
§15.407 (a)(3)	RSS-247 6.2.4	TX Cond. Power 5.725-5.850	<30dBm		Pass
§15.407 (a)(1)	RSS-247 6.2	PSD (5.15-5.25)	PSD (5.15-5.25)		Pass
§15.407 (a)(3)	RSS-247 6.2.4	PSD (5.8GHz)	<30dBm per 500kHz		Pass
§15.207(a) §15.407(b)(6)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10		Pass
§15.407(b) & 15.209	RSS-GEN 8.9/7	Radiated Spurious Emission	<54dBuV/m	Radiated	Pass
§15.407 (h)(2)	RSS-247 6.3	Dynamic Frequency Selection	N/A	Radiated / Conducted	Pass

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

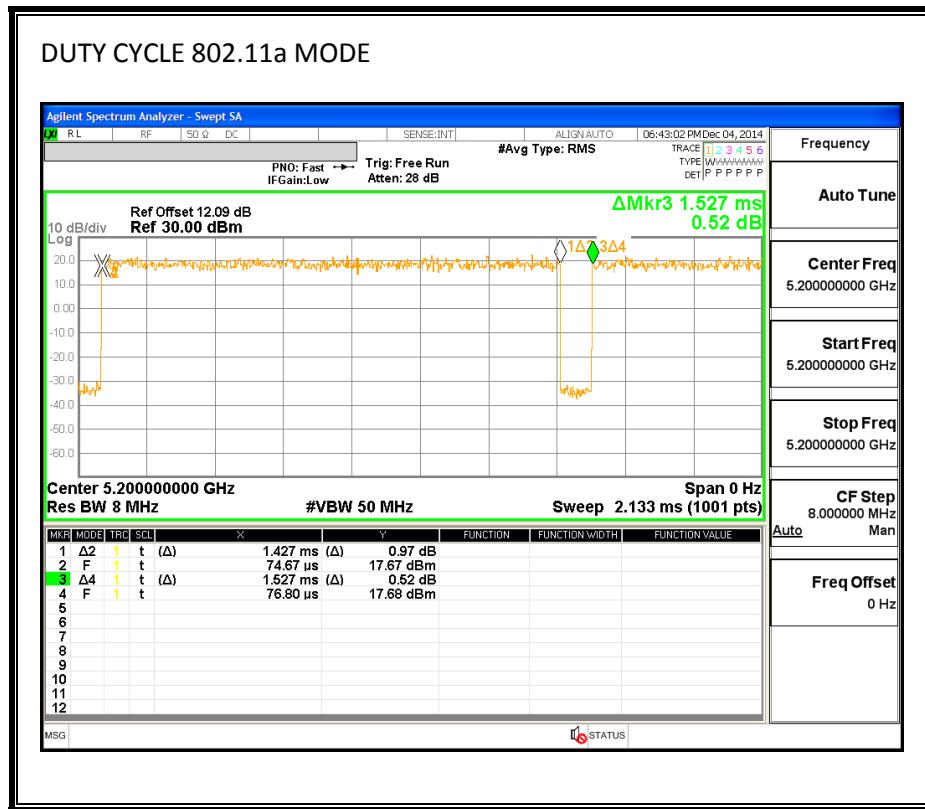
PROCEDURE

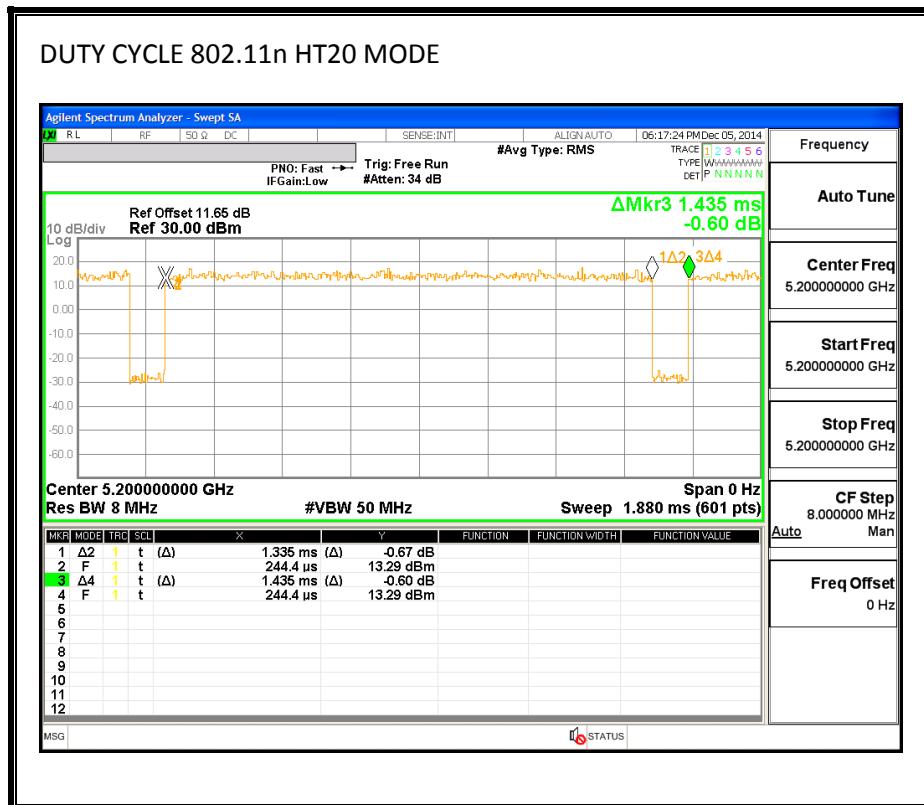
KDB 789033 Zero-Span Spectrum Analyzer Method.

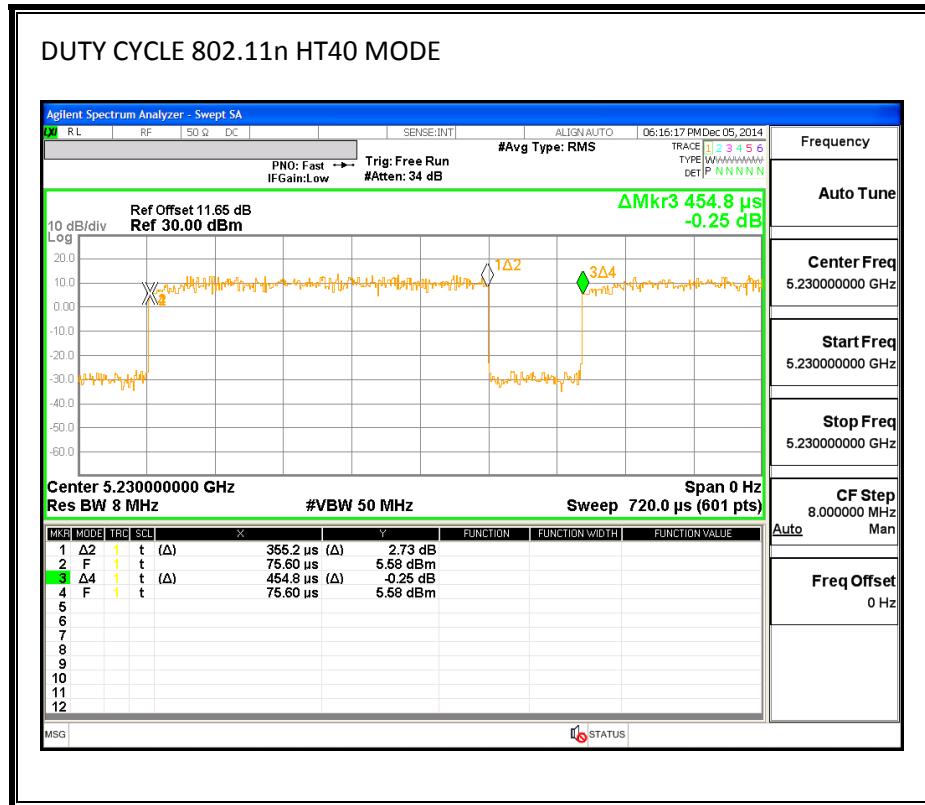
8.1. ON TIME AND DUTY CYCLE RESULTS

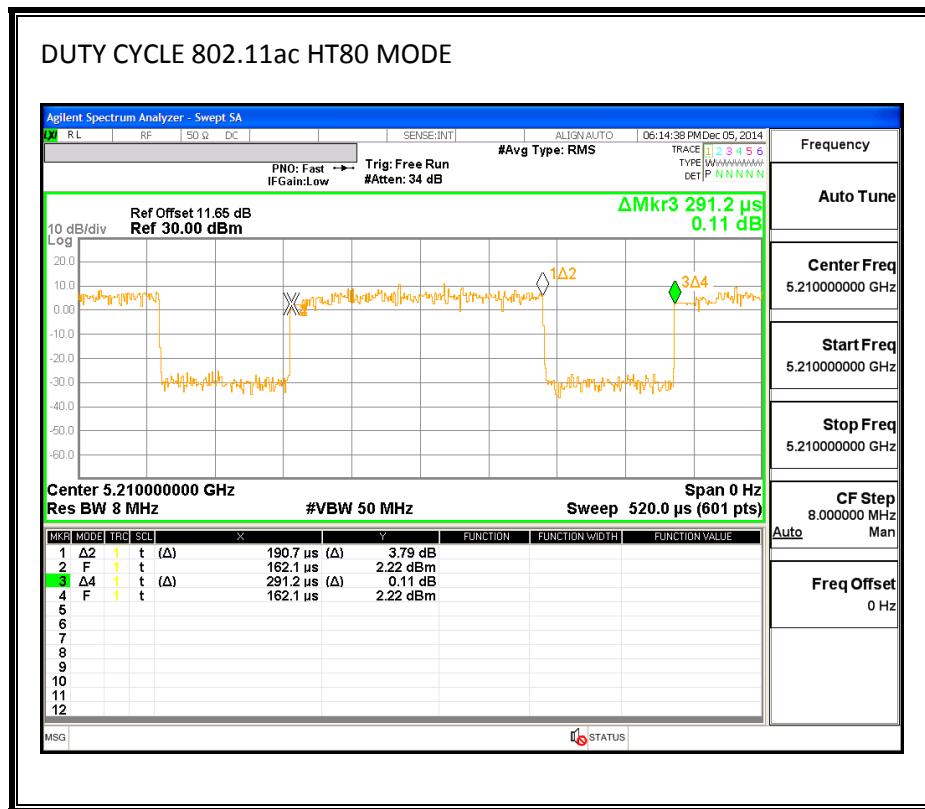
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
802.11a	1.427	1.527	0.935	93.5%	0.29	0.701
802.11n HT20	1.335	1.435	0.930	93.0%	0.31	0.749
802.11n HT40	0.355	0.455	0.781	78.1%	1.07	2.815
802.11ac HT80	0.191	0.291	0.655	65.5%	1.84	5.244

8.2. DUTY CYCLE PLOTS









9. MEASUREMENT METHOD

789033 D02 General UNII Test Procedures New Rules v01

The Duty Cycle is less than 98% and consistent therefore KDB 789033 Method SA-2 is used for power and PPSD

The Duty Cycle is less than 98% and consistent, KDB 789033 Method AD with Power RMS Averaging and duty cycle correction is used.

26 dB and 6dB Emission BW: KDB 789033 D02 v01, Section C.

99% Occupied BW: KDB 789033 D02 v01, Section D.

Conducted Output Power: KDB 789033 D02 v01, Section E.2.d and E.3.b (Method PM-G).

Power Spectral Density: KDB 789033 D02 v01, Section F.

Unwanted emissions in restricted bands: KDB 789033 D02 v01, Sections G and H.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v01, Sections G and H.

10. ANTENNA PORT TEST RESULTS SISO Chain 0 and 1

10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.407

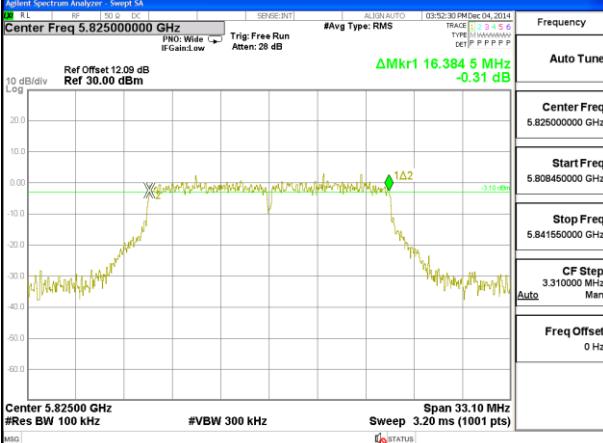
The minimum 6 dB bandwidth shall be at least 500 kHz.

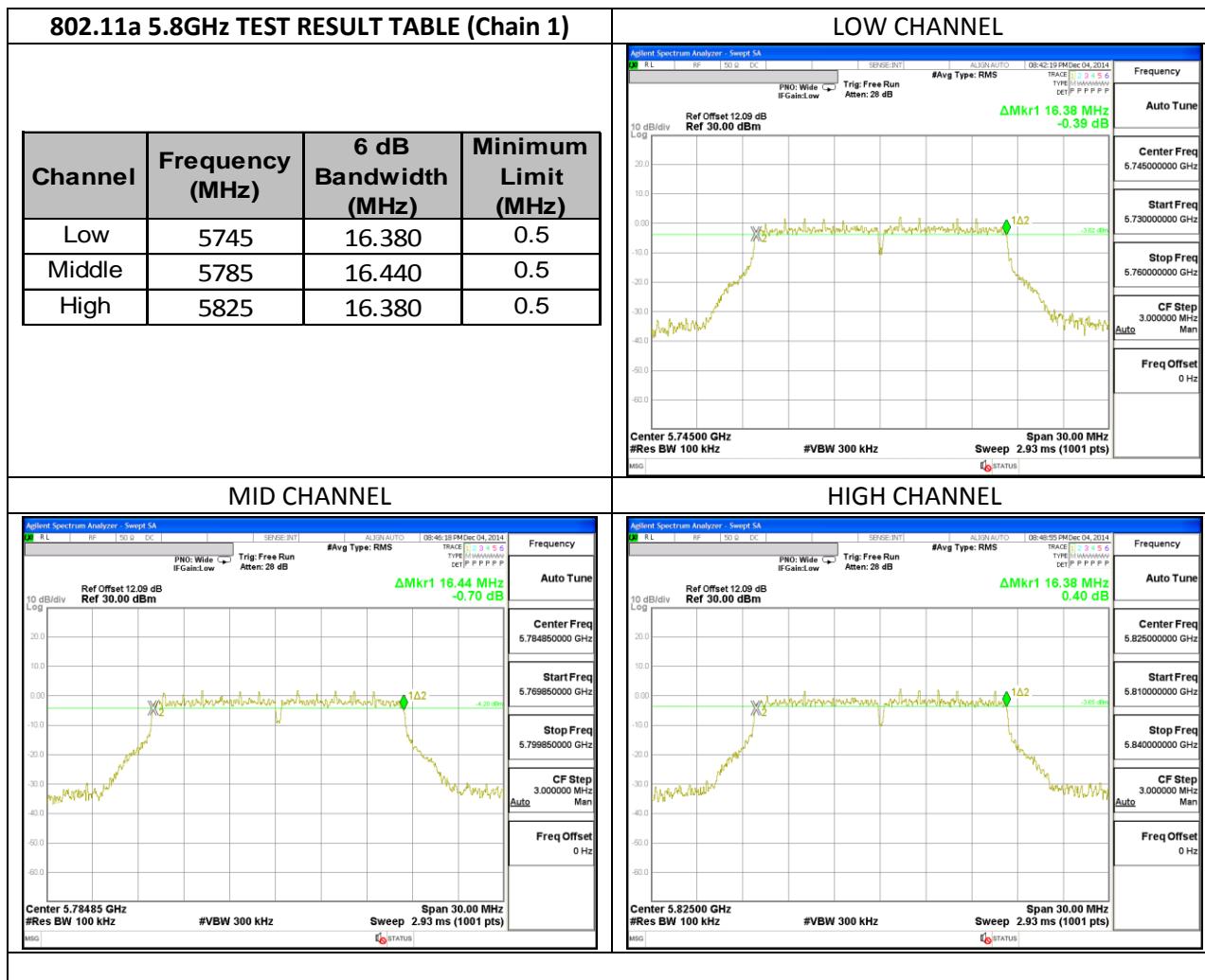
TEST PROCEDURE

Reference to 789033 D02 General UNII Test Procedures New Rules v01: The transmitter output is connected to a spectrum analyzer with the RBW set to 100KHz, the VBW \geq 3 x RBW, peak detector and max hold.

RESULTS

10.1.1. 6 dB BANDWIDTH PLOTS AND TABLE

802.11a 5.8GHz TEST RESULT TABLE (Chain 0)				LOW CHANNEL
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	MID CHANNEL
Low	5745	16.480	0.5	 <p>Agilent Spectrum Analyzer - Swept SA Center Freq 5.745000000 GHz Ref Offset 12.09 dB Ref 30.00 dBm #Avg Type: RMS Sweep 3.13 ms (1001 pts) Span 32.70 MHz #Res BW 100 kHz Start Freq 5.728650000 GHz Stop Freq 5.761350000 GHz CF Step 3.270000 MHz Freq Offset 0 Hz</p>
Middle	5785	16.351	0.5	 <p>Agilent Spectrum Analyzer - Swept SA Center Freq 5.785000000 GHz Ref Offset 12.09 dB Ref 30.00 dBm #Avg Type: RMS Sweep 3.20 ms (1001 pts) Span 33.10 MHz #Res BW 100 kHz Start Freq 5.768450000 GHz Stop Freq 5.801550000 GHz CF Step 3.310000 MHz Freq Offset 0 Hz</p>
High	5825	16.384	0.5	 <p>Agilent Spectrum Analyzer - Swept SA Center Freq 5.825000000 GHz Ref Offset 12.09 dB Ref 30.00 dBm #Avg Type: RMS Sweep 3.20 ms (1001 pts) Span 33.10 MHz #Res BW 100 kHz Start Freq 5.808450000 GHz Stop Freq 5.841550000 GHz CF Step 3.310000 MHz Freq Offset 0 Hz</p>



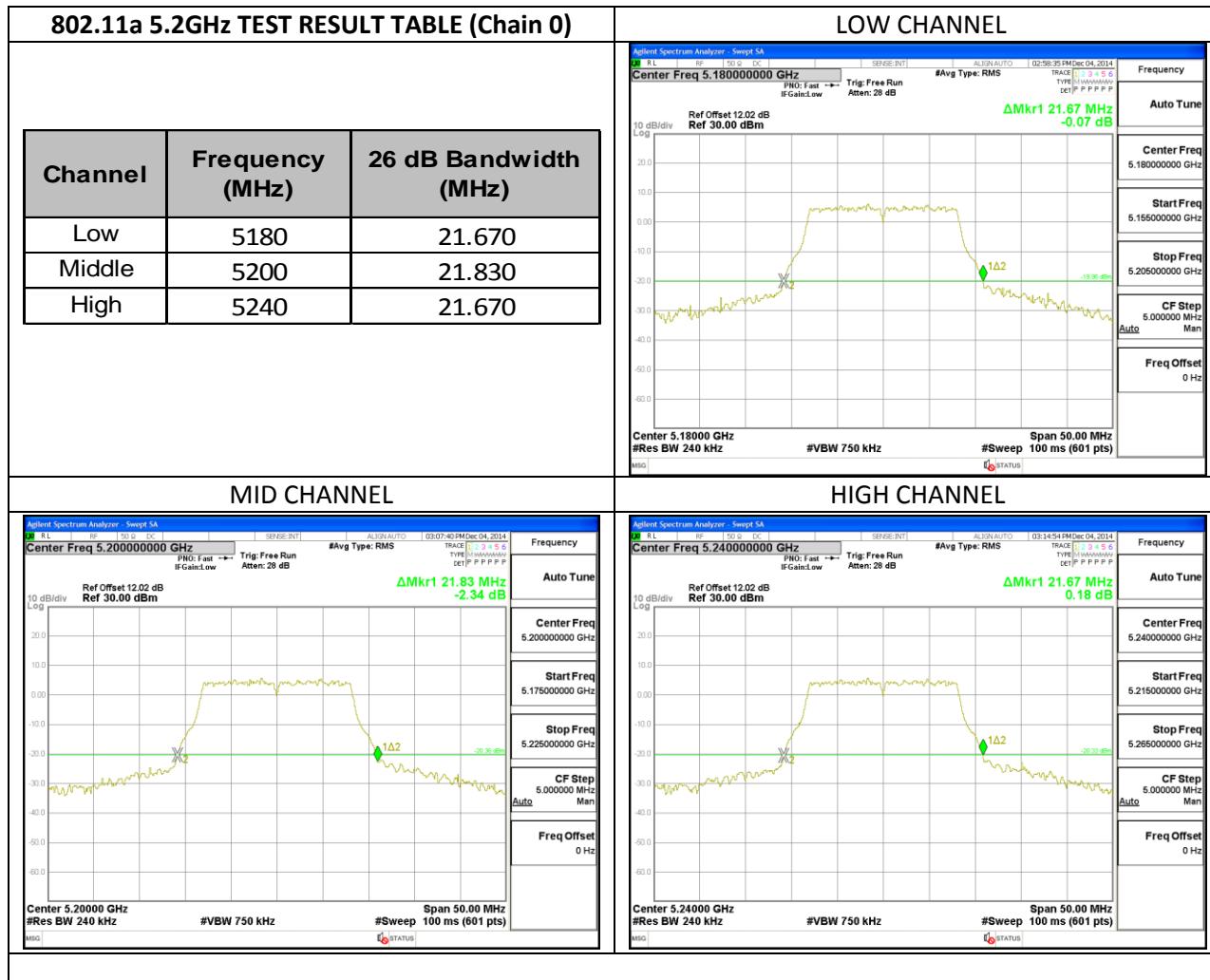
10.2. 26 dB BANDWIDTH

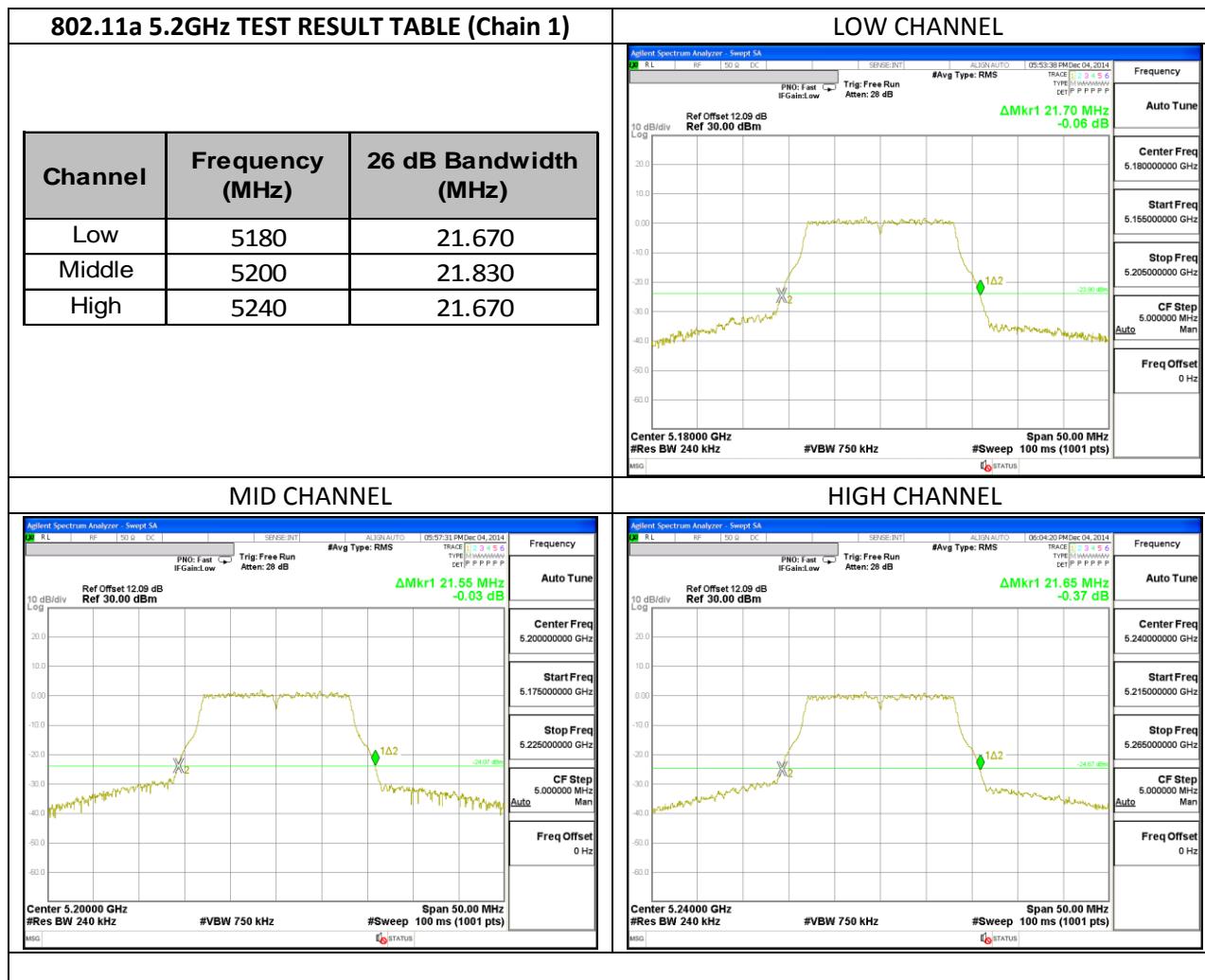
LIMITS

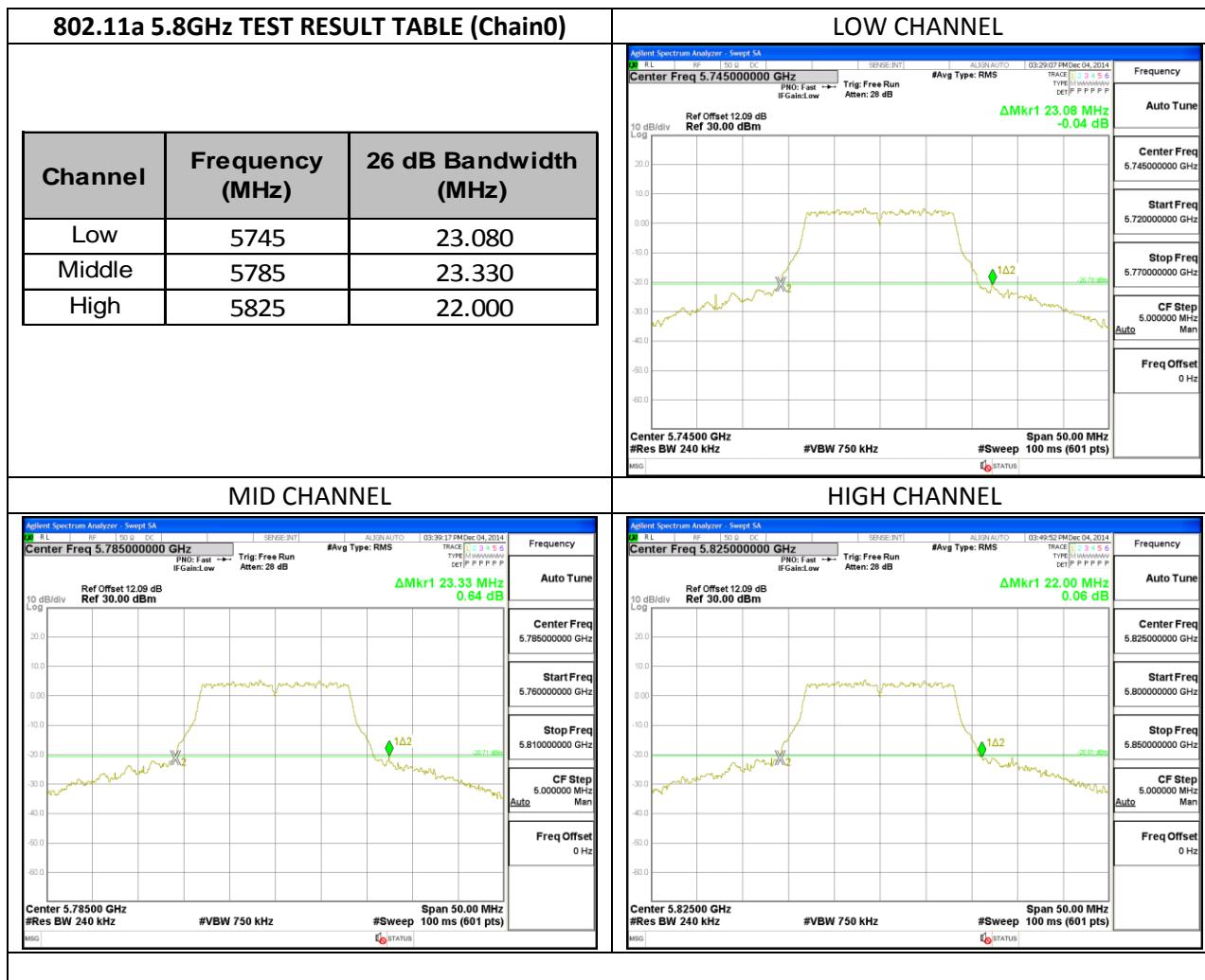
None; for reporting purposes only.

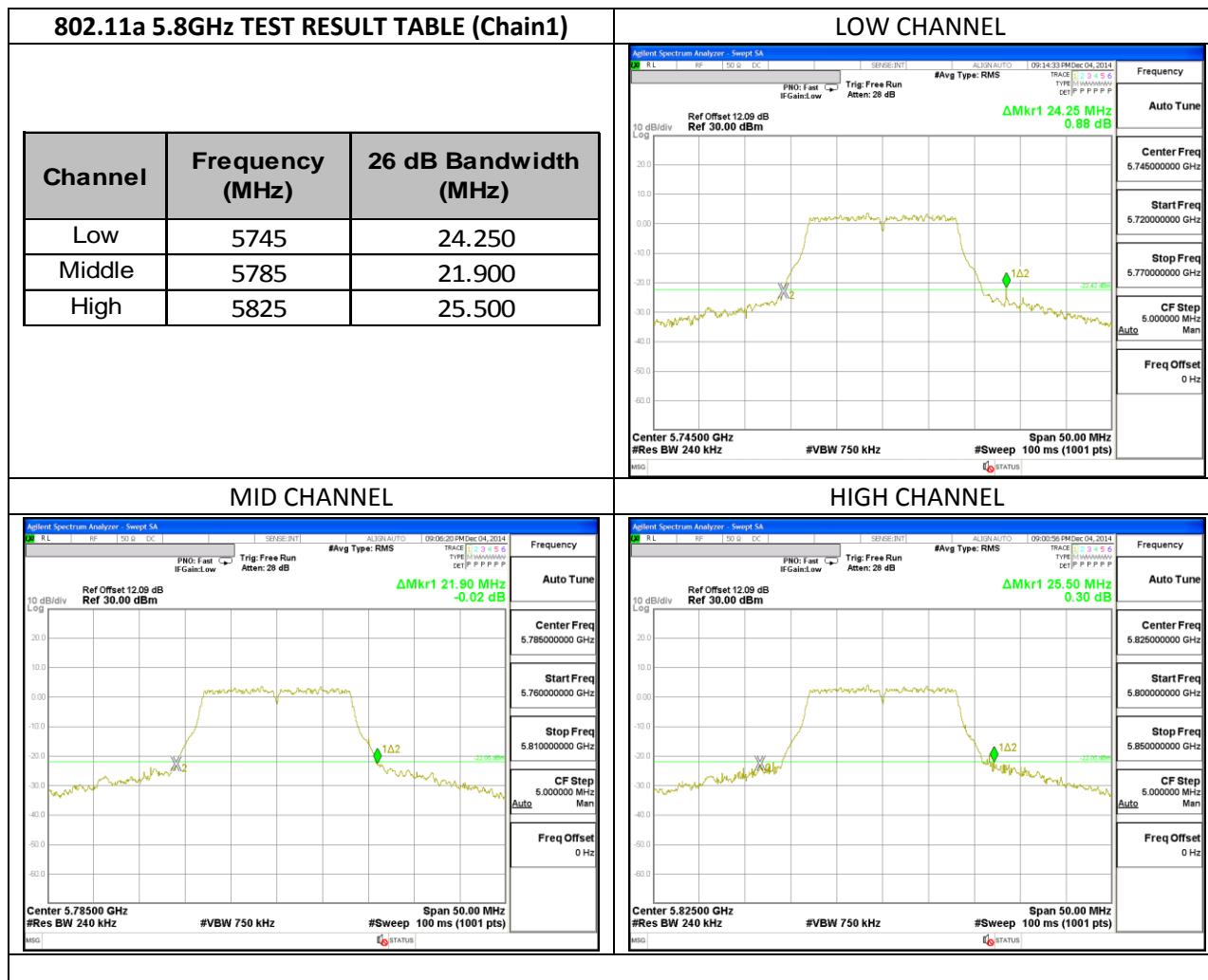
RESULTS

10.2.1. 26 dB BANDWIDTH PLOTS AND TABLE









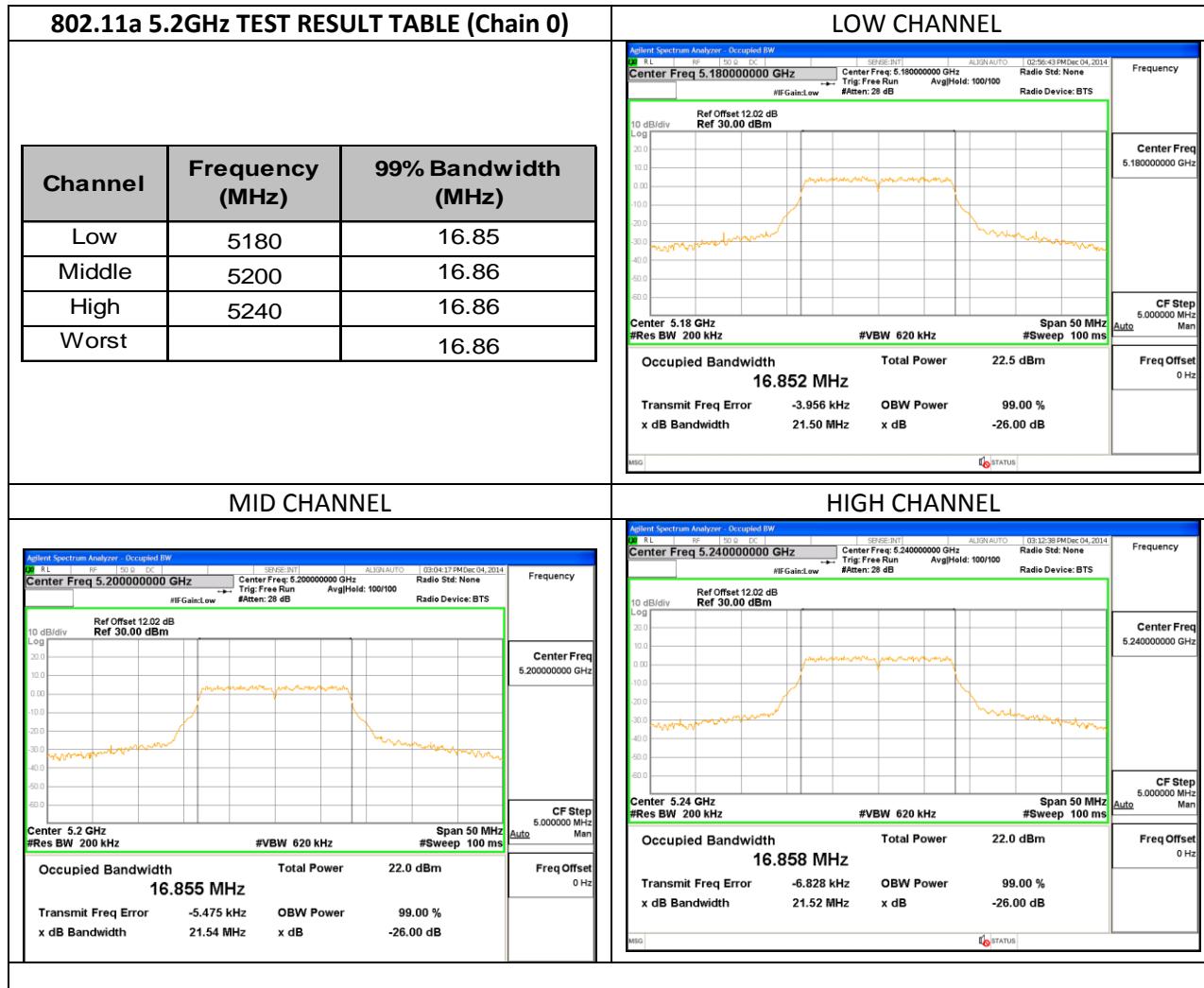
10.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

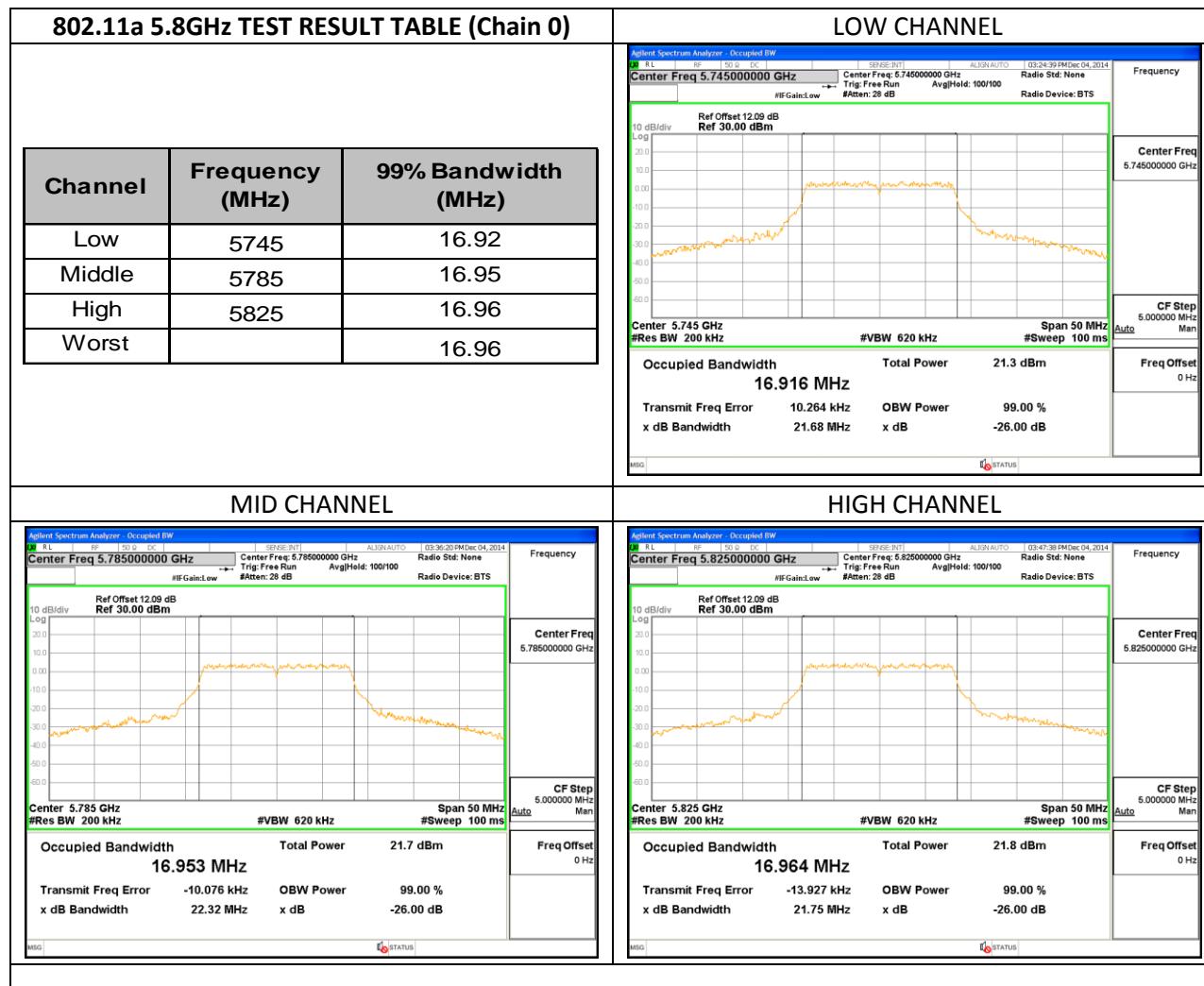
RESULTS

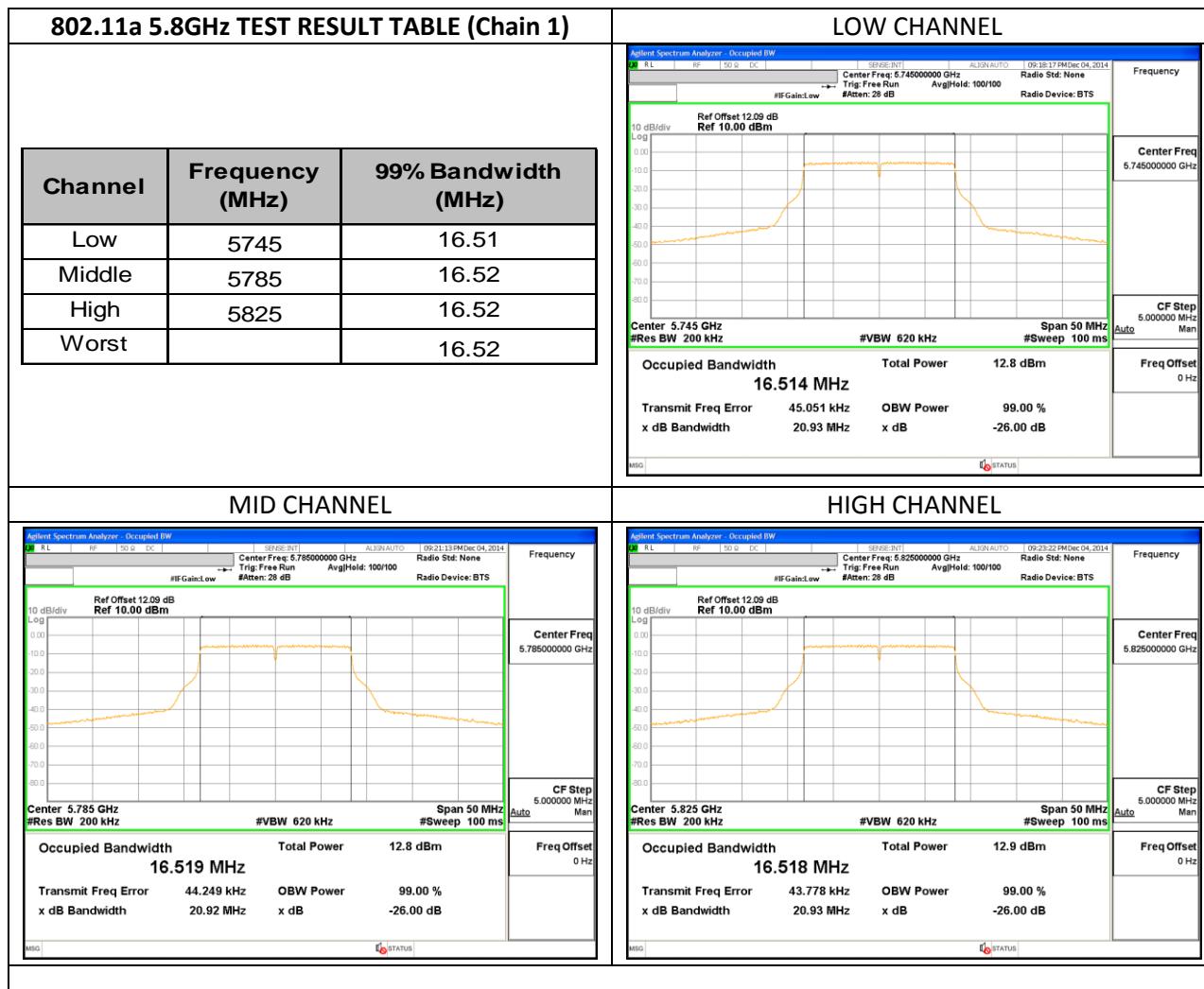
10.3.1. 99% BANDWIDTH PLOTS AND TABLE



802.11a 5.2GHz TEST RESULT TABLE (Chain 1)			LOW CHANNEL		
Channel	Frequency (MHz)	99% Bandwidth (MHz)			
Low	5180	16.51			
Middle	5200	16.51			
High	5240	16.51			
Worst		16.86			

MID CHANNEL			HIGH CHANNEL		
Ref Offset 12.09 dB Ref 10.00 dBm	Center Freq 5.20000000 GHz #Res BW 200 kHz	Span 50 MHz #VBW 620 kHz #Sweep 100 ms	Ref Offset 12.08 dB Ref 10.00 dBm	Center Freq 5.24000000 GHz #Res BW 200 kHz	Span 50 MHz #VBW 620 kHz #Sweep 100 ms
Occupied Bandwidth 16.510 MHz	Total Power 11.2 dBm	Freq Offset 0 Hz	Occupied Bandwidth 16.508 MHz	Total Power 10.4 dBm	Freq Offset 0 Hz
Transmit Freq Error 42.850 kHz	OBW Power 99.00 %		Transmit Freq Error 40.664 kHz	OBW Power 99.00 %	
x dB Bandwidth 20.90 MHz	x dB -26.00 dB		x dB Bandwidth 20.89 MHz	x dB -26.00 dB	





10.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

10.4.1. 802.11a MODE IN THE 5.2 GHz BAND

Chain0

Channel	Frequency (MHz)	Avg Power (dBm)
Low	5180	14.50
Mid	5200	14.20
High	5240	14.10
Worst		14.50

Chain1

Channel	Frequency (MHz)	Avg Power (dBm)
Low	5180	14.80
Mid	5200	14.90
High	5240	14.50
Worst		14.90

10.4.2. 802.11a MODE IN THE 5.8 GHz BAND

Chain0

Channel	Frequency (MHz)	Avg Power (dBm)
Low	5745	14.80
Mid	5785	14.70
High	5825	14.60
Worst		14.80

Chain1

Channel	Frequency (MHz)	Avg Power (dBm)
Low	5745	13.00
Mid	5785	13.00
High	5825	13.00
Worst		13.00

10.5. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

10.5.1. 802.11a MODE IN THE 5.2 GHz BAND (Chain 0)

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5180	21.67	16.9	3.21
Mid	5200	21.83	16.9	3.21
High	5240	21.67	16.9	3.21

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	24.00	22.27	19.06	24.00	11.00	10.00	11.00
Mid	5200	24.00	22.27	19.06	24.00	11.00	10.00	11.00
High	5240	24.00	22.27	19.06	24.00	11.00	10.00	11.00

Duty Cycle CF (dB)	0.29	Included in Calculations of Corr'd Power & PPSD
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Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	14.50	14.79	24.00	-9.21
Mid	5200	14.20	14.49	24.00	-9.51
High	5240	14.10	14.39	24.00	-9.61

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	4.972	5.26	11.00	-5.74
Mid	5200	5.322	5.61	11.00	-5.39
High	5240	5.468	5.76	11.00	-5.24

10.5.2. 802.11a MODE IN THE 5.2 GHz BAND (Chain 1)

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5180	21.7	16.5	4.20
Mid	5200	21.55	16.5	4.20
High	5240	21.65	16.5	4.20

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	24.00	22.18	17.98	24.00	11.00	10.00	11.00
Mid	5200	24.00	22.18	17.98	24.00	11.00	10.00	11.00
High	5240	24.00	22.18	17.98	24.00	11.00	10.00	11.00

Duty Cycle CF (dB)	0.29	Included in Calculations of Corr'd Power & PPSD
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Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	14.80	15.09	24.00	-8.91
Mid	5200	14.90	15.19	24.00	-8.81
High	5240	14.50	14.79	24.00	-9.21

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	5.470	5.76	11.00	-5.24
Mid	5200	5.299	5.59	11.00	-5.41
High	5240	4.948	5.24	11.00	-5.76

10.5.3. 802.11a MODE IN THE 5.8 GHz BAND (Chain 0)

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min BW (MHz)	Min BW (MHz)	Directional Gain (dBi)
Low	5745	23.1	16.9	4.44
Mid	5785	23.3	17.0	4.44
High	5825	22.0	17.0	4.44

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5745	30.00	29.27	35.27	29.27	30.00	30.00	30.00
Mid	5785	30.00	29.27	35.27	29.27	30.00	30.00	30.00
High	5825	30.00	29.27	35.27	29.27	30.00	30.00	30.00

Duty Cycle CF (dB) | 0.29 | Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	14.80	15.09	29.27	-14.18
Mid	5785	14.70	14.99	29.27	-14.28
High	5825	14.60	14.89	29.27	-14.38

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5745	5.18	5.47	30.00	-24.54
Mid	5785	5.14	5.43	30.00	-24.57
High	5825	5.22	5.51	30.00	-24.49

10.5.4. 802.11a MODE IN THE 5.8 GHz BAND (Chain 1)

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5745	24.5	16.5	5.17
Mid	5785	21.9	16.5	5.17
High	5825	25.5	16.5	5.17

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC PSD Limit (dBm)	PPSD Limit (dBm)
Low	5745	30.00	29.27	35.27	29.27	30.00	30.00	30.00
Mid	5785	30.00	29.27	35.27	29.27	30.00	30.00	30.00
High	5825	30.00	29.27	35.27	29.27	30.00	30.00	30.00

Duty Cycle CF (dB)	0.29	Included in Calculations of Corr'd Power & PPSD
--------------------	------	---

Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	13.00	13.29	29.27	-15.98
Mid	5785	13.00	13.29	29.27	-15.98
High	5825	13.00	13.29	29.27	-15.98

PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5745	5.20	5.49	30.00	-24.51
Mid	5785	4.93	5.22	30.00	-24.78
High	5825	5.02	5.31	30.00	-24.69



11. ANTENNA PORT TEST RESULTS MIMO

11.1. 6 dB BANDWIDTH

LIMITS

FCC §15.407

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

Reference to 789033 D02 General UNII Test Procedures New Rules v01: The transmitter output is connected to a spectrum analyzer with the RBW set to 100KHz, the VBW \geq 3 x RBW, peak detector and max hold.

KDB Reference

662911 D01 Multiple Transmitter Output v02r01

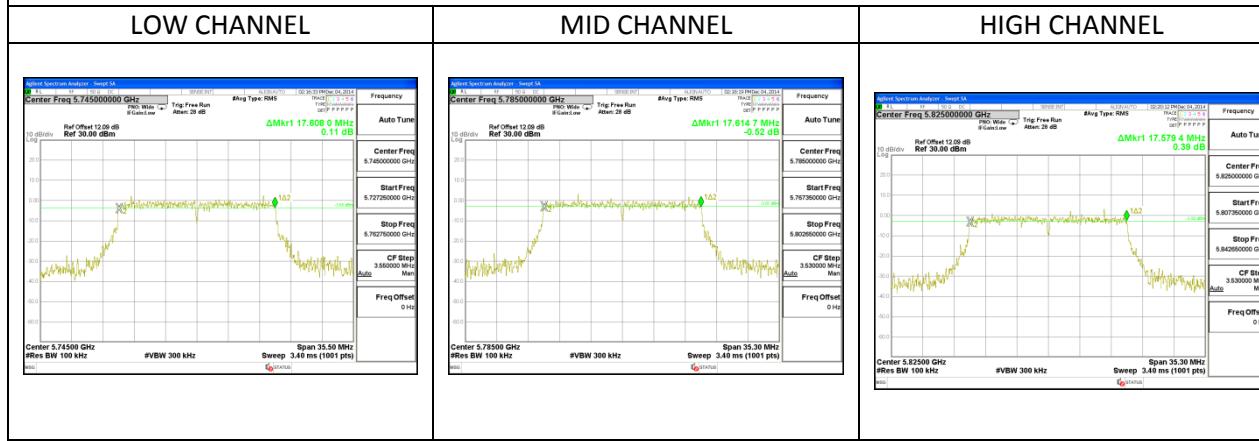
RESULTS

11.1.1. 6 dB BANDWIDTH PLOTS AND TABLE

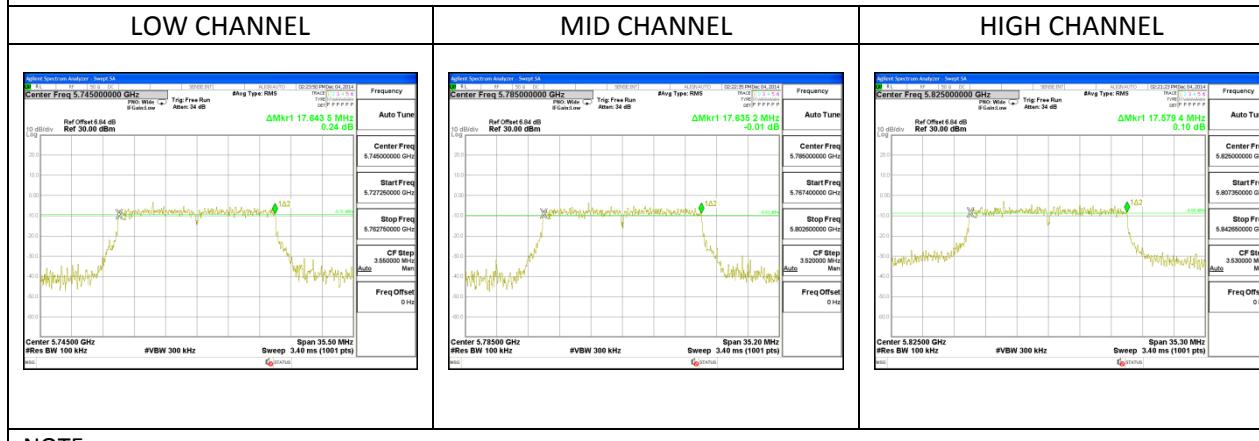
802.11n 5.8GHz HT20 TEST RESULT TABLE

Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
5745	17.608	17.643	0.5
5785	17.615	17.635	0.5
5825	27.330	17.579	0.5

CHAIN 0



CHAIN 1



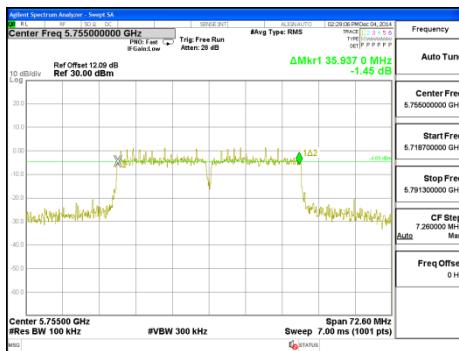
NOTE:

802.11n 5.8GHz HT40 TEST RESULT TABLE

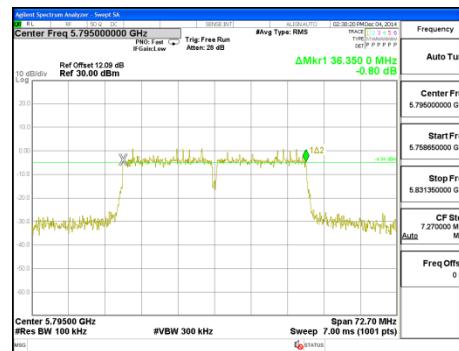
Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
5755	35.937	36.059	0.5
5795	36.350	36.158	0.5

CHAIN 0

LOW CHANNEL

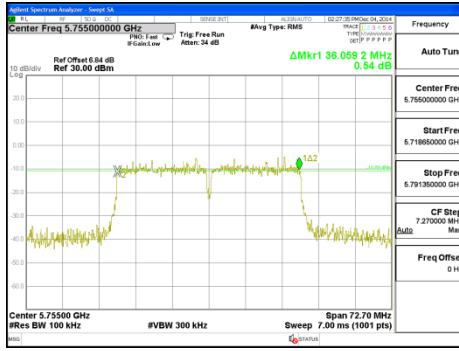


HIGH CHANNEL

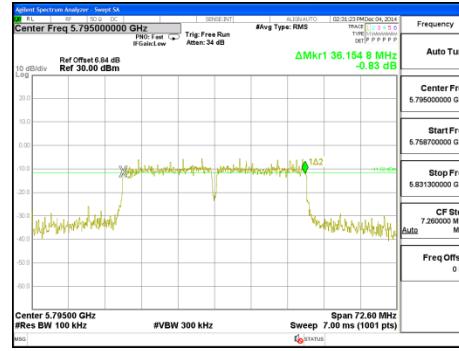


CHAIN 1

LOW CHANNEL



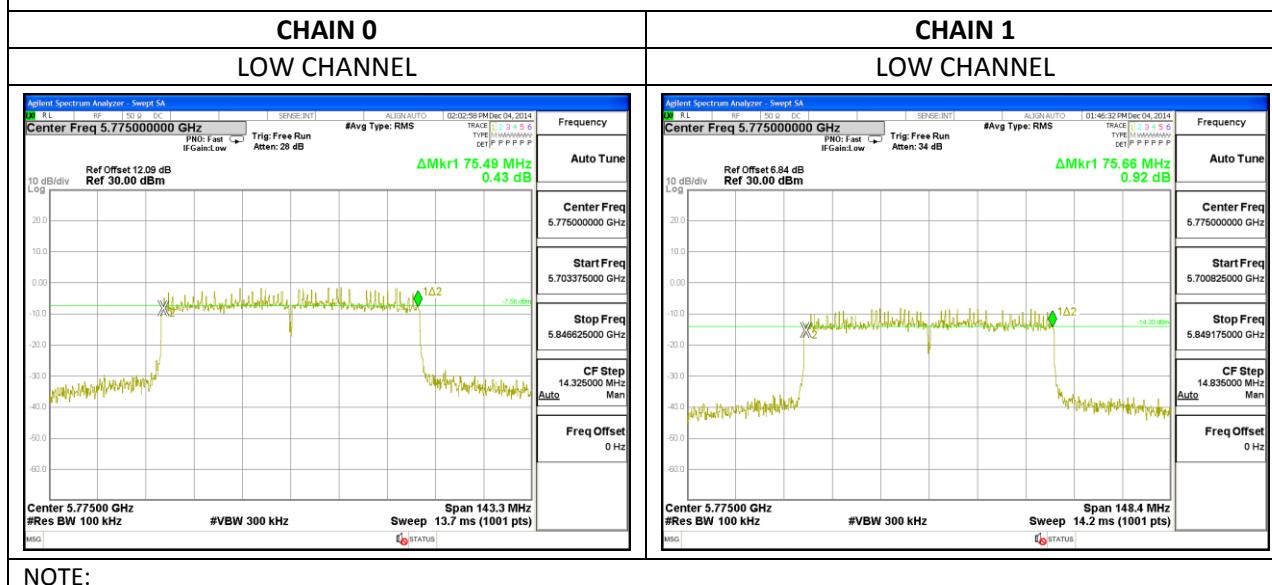
HIGH CHANNEL



NOTE:

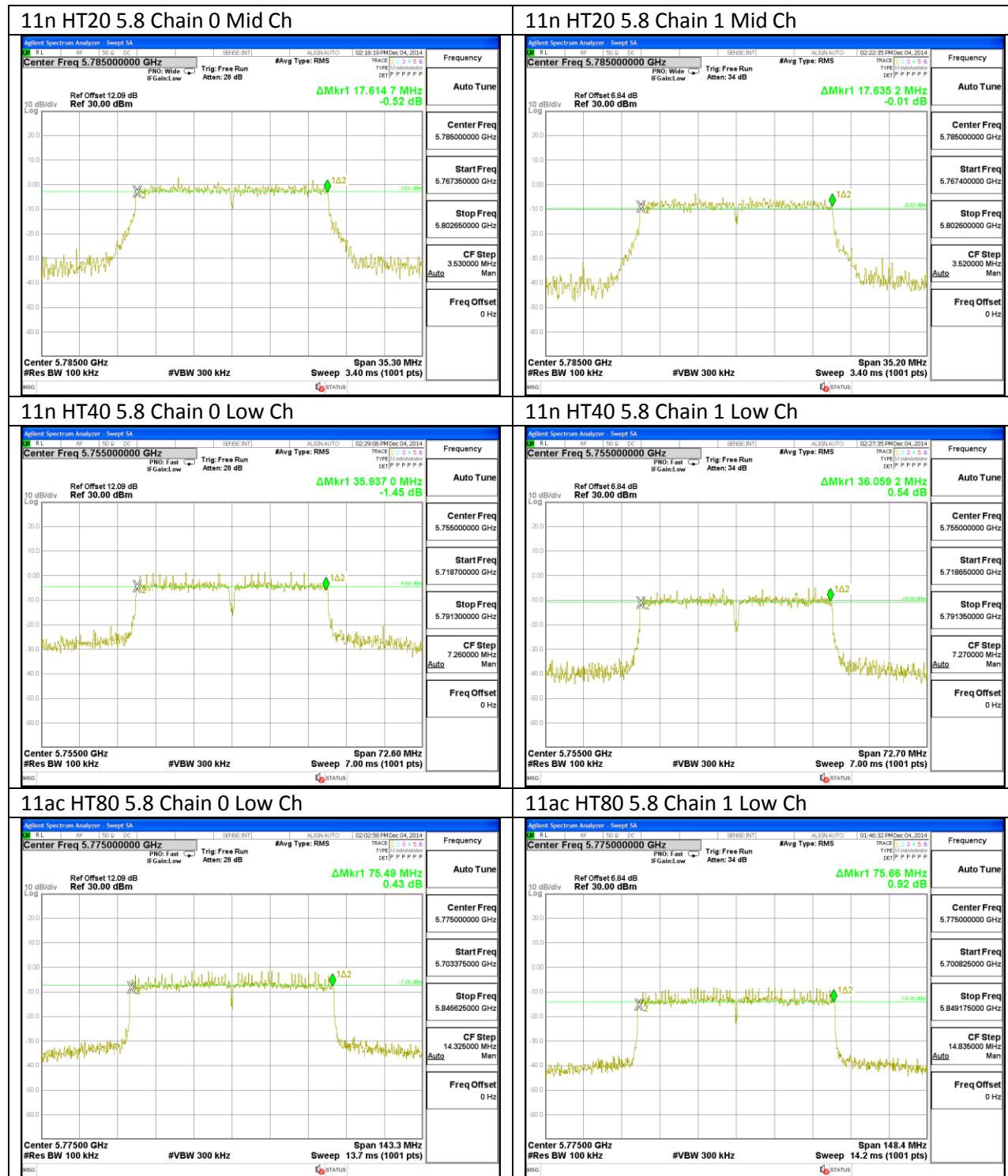
802.11ac HT80 5.8GHz HT40 TEST RESULT TABLE

Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
5775	75.49	75.66	0.5



NOTE:

11.1.2. 6 dB BANDWIDTH MID CH PLOTS



11.2. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

11.2.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5180	25.4	22.7
Mid	5200	25.9	28.4
High	5240	27.3	27.5

11.2.2. 802.11n HT40 MODE IN THE 5.2 GHz BAND

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5190	57.4	40.3
High	5230	58.1	40.5

11.2.3. 802.11ac HT80 MODE IN THE 5.2 GHz BAND

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5210	104.5	106.0

11.2.4. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5745	36.8	22.6
Mid	5785	35.6	21.9
High	5825	36.3	27.3

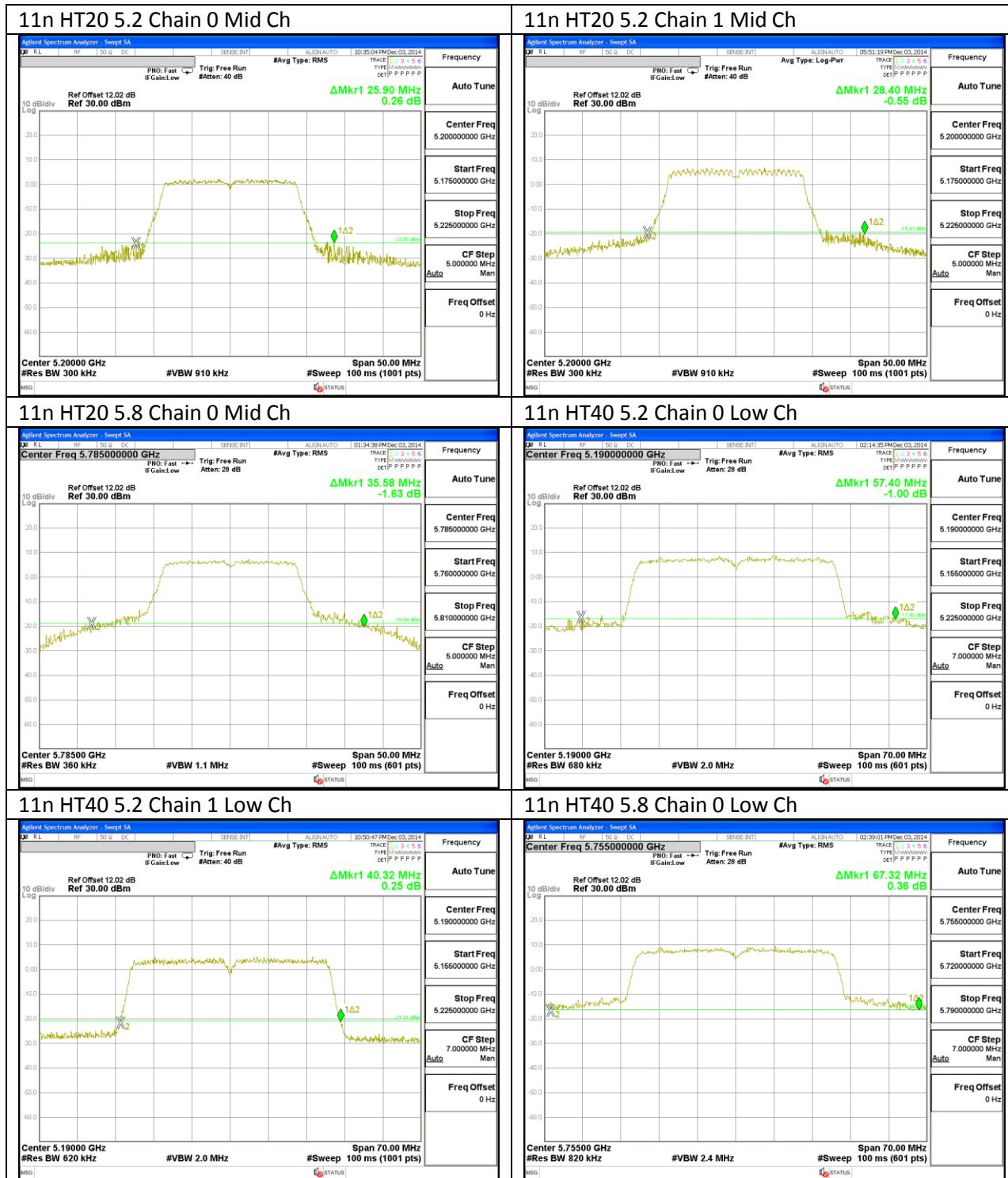
11.2.5. 802.11n HT40 MODE IN THE 5.8 GHz BAND

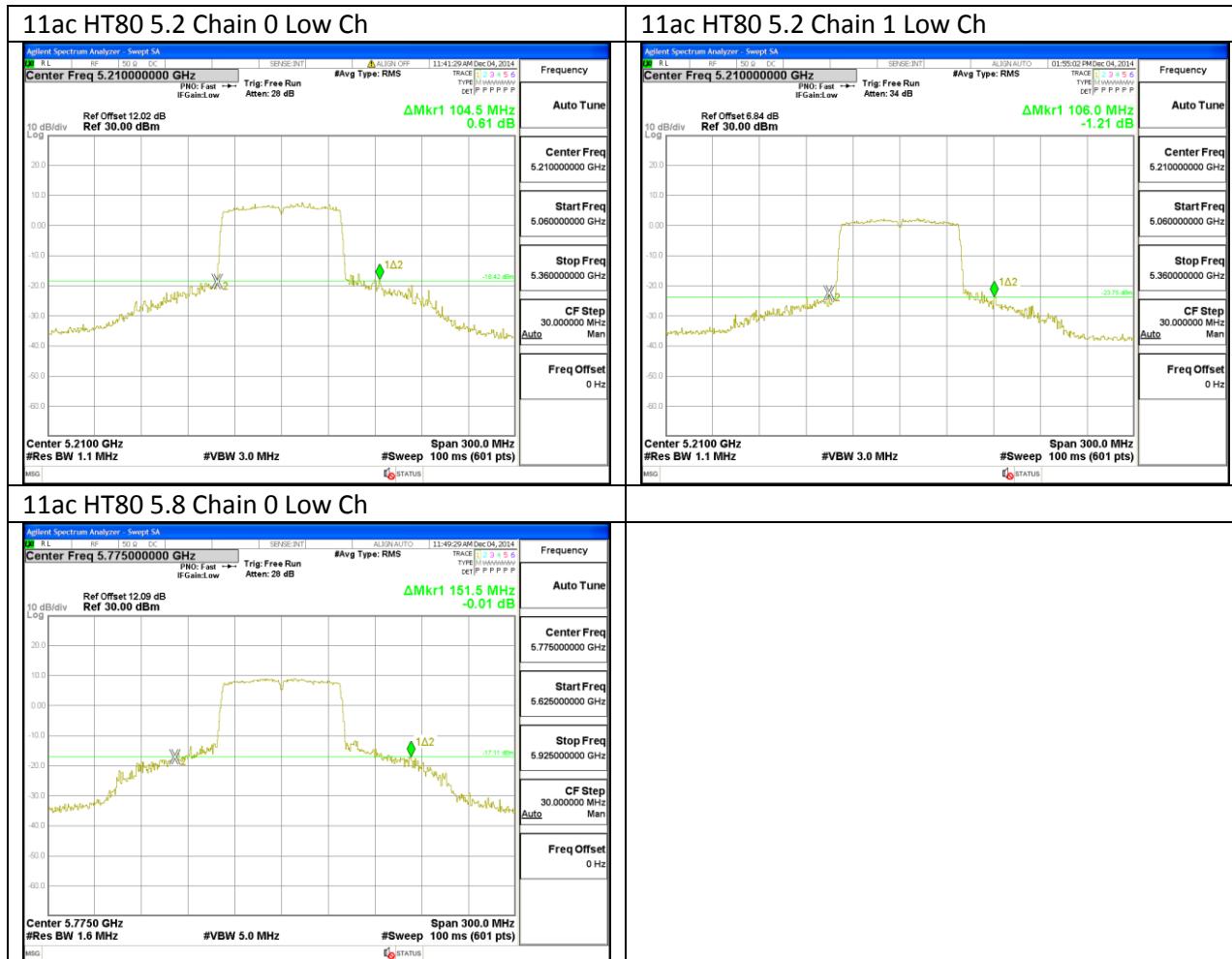
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5755	67.3	72.1
High	5795	92.0	65.9

11.2.6. 802.11ac HT80 MODE IN THE 5.8 GHz BAND

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5775	151.5	144.0

11.2.7. 26 dB BANDWIDTH PLOTS





11.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

11.3.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5180	18.0	17.7
Mid	5200	18.1	17.7
High	5240	18.1	17.7

11.3.2. 802.11n HT40 MODE IN THE 5.2 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5190	36.6	36.3
High	5230	36.5	36.3

11.3.3. 802.11ac HT80 MODE IN THE 5.2 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5210	76.1	75.9

11.3.4. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5745	18.3	17.7
Mid	5785	18.4	17.7
High	5825	18.5	17.2

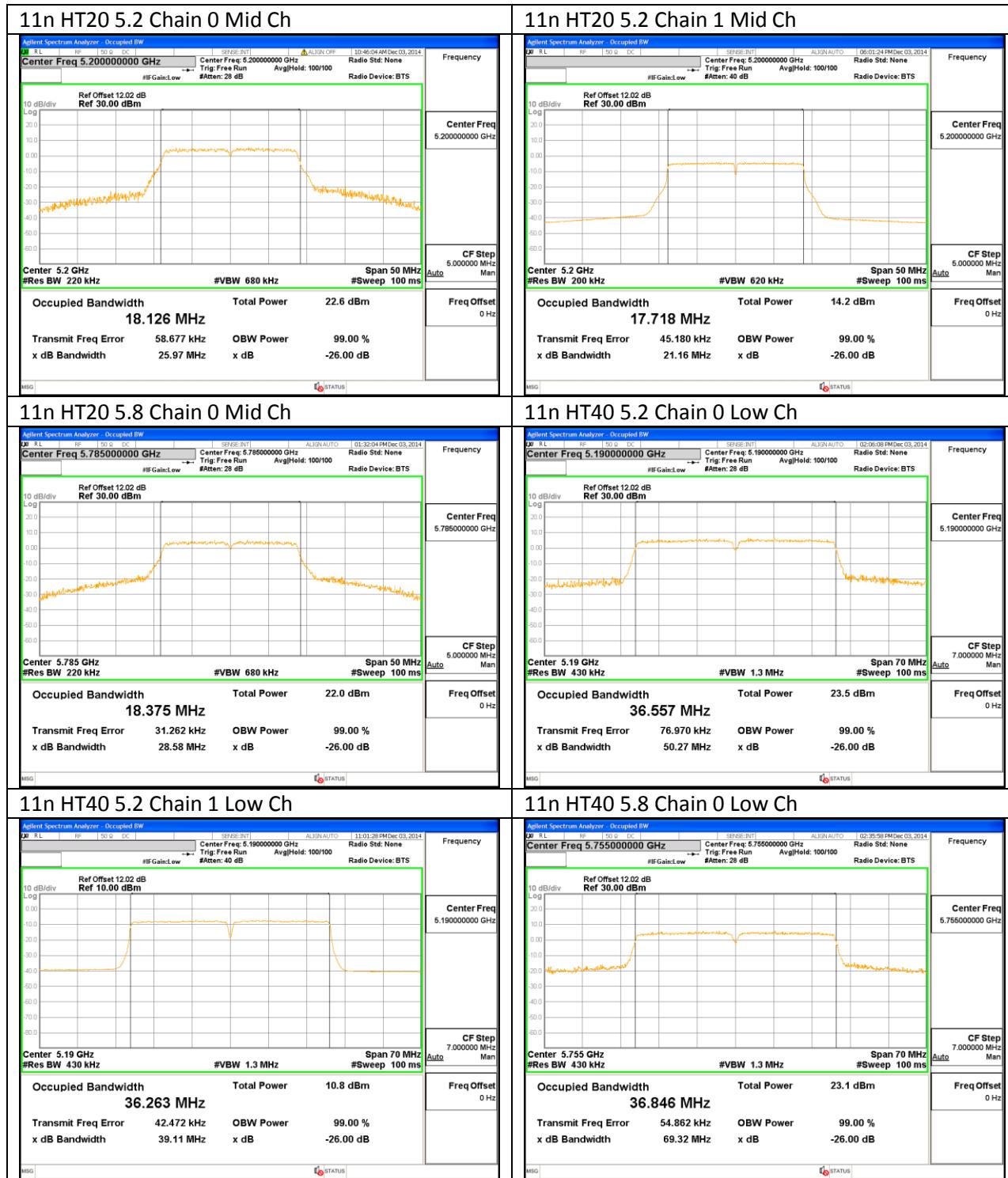
11.3.5. 802.11n HT40 MODE IN THE 5.8 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5755	36.8	36.3
High	5795	36.9	36.3

11.3.6. 802.11ac HT80 MODE IN THE 5.8 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5775	76.4	76.1

11.3.7. 99% BANDWIDTH PLOTS





11.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

11.4.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5180	10.80	10.80	13.81
Mid	5200	10.80	12.40	14.68
High	5240	10.80	12.50	14.74

11.4.2. 802.11n HT40 MODE IN THE 5.2 GHz BAND

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5190	11.40	12.50	15.00
High	5230	11.40	12.30	14.88

11.4.3. 802.11ac HT80 MODE IN THE 5.2 GHz BAND

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5210	11.20	11.00	14.11

11.4.1. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5745	10.50	9.60	13.08
Mid	5785	13.00	12.00	15.54
High	5825	13.00	12.00	15.54

11.4.2. 802.11n HT40 MODE IN THE 5.8 GHz BAND

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5755	10.80	9.60	13.25
High	5795	14.90	13.70	17.35

11.4.3. 802.11ac HT80 MODE IN THE 5.8 GHz BAND

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5775	12.30	11.30	14.84