FCC 47 CFR PART 15 SUBPART E

UNII

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n and NFC

MODEL NUMBER : SM-G390Y

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Prepared for
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ACCREDITED
TL-637

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n and NFC
MODEL NUMBER:	SM-G390Y
SERIAL NUMBER:	R38J10TM59M, R38J10TM95J (RADIATED); (CONDUCTED)
DATE TESTED:	FEB 28, 2017 – MAR 17, 2017

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
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Suwon Lab Engineer
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Tested By:

Junwhan Lee
Suwon Lab Engineer
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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 v01r03
4. KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
5. KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02
6. 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

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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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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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	4.14 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

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]
5180 - 5240	802.11a	13.433	22.04
	802.11n HT20	13.311	21.43
5190 - 5230	802.11n HT40	12.842	19.24
5260 - 5320	802.11a	13.420	21.98
	802.11n HT20	13.248	21.13
5270 - 5310	802.11n HT40	12.278	16.90
5500 - 5720	802.11a	13.322	21.49
	802.11n HT20	13.095	20.39
5510 - 5710	802.11n HT40	12.224	16.69
5745 - 5825	802.11a	13.041	20.14
	802.11n HT20	12.924	19.61
5755 - 5795	802.11n HT40	12.131	16.33

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5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

Frequency Range [MHz]	Antenna Gain [dBi]
UNII 1 5150 – 5250	-4.75
UNII 2A 5250 – 5350	-0.25
UNII 2C 5470 – 5725	-2.76
UNII 3 5725 – 5850	-2.88

5.4. 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,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 HT20 mode: MCS0
802.11n HT40 mode: MCS0

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5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA50HWE	DK4H630HS/A -E	N/A
Data Cable	SAMSUNG	ECB-DU68WE	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	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	Mini-USB	Shielded	0.8m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.0m	N/A

TEST SETUP

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

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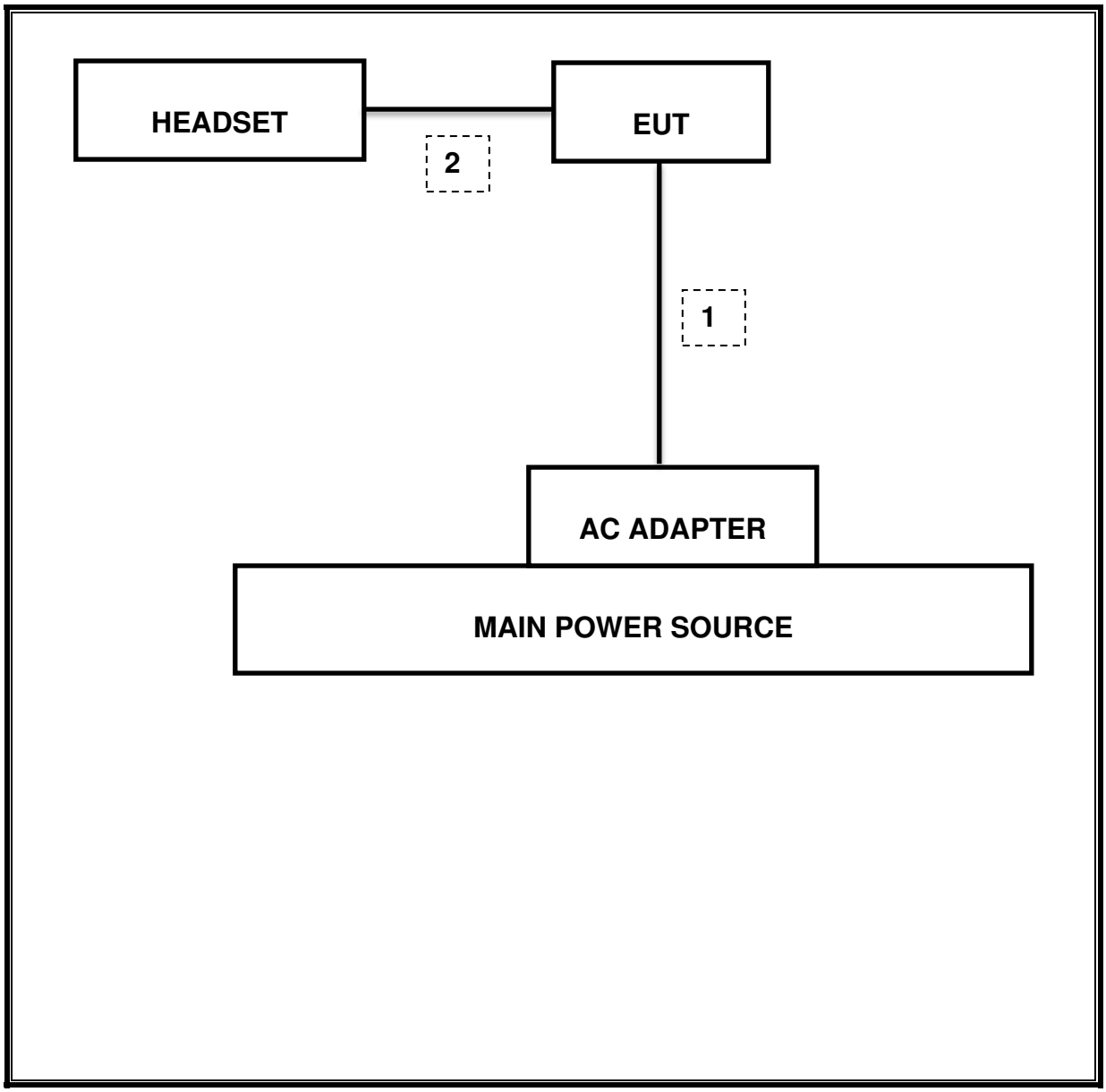
SETUP DIAGRAM FOR TESTS



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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**	**Cal Due**
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	10-14-18
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-25-17
Antenna, Horn, 18 GHz	ETS	3115	00167211	10-14-18
Antenna, Horn, 18 GHz	ETS	3117	00168724	06-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168717	06-17-17
Antenna, Horn, 40 GHz	ETS	3116C	00166155	11-30-17
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	12-15-17
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-17-17
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-16-17
Preamplifier	ETS	3115-PA	00167475	08-17-17
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-16-17
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-17-17
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	11-25-17
Average Power Sensor	R&S	NRP-Z91	102681	08-16-17
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-17-17
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-17-17
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-16-17
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-16-17
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-17-17
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-16-17
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-17-17
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-16-17
High Pass Filter 6GHz	Micro-Tronics	HPM17542	009	08-17-17
High Pass Filter 6GHz	Micro-Tronics	HPM17542	016	08-16-17
LISN	R&S	ENV-216	101836	08-16-17
LISN	R&S	ENV-216	101837	08-16-17
Attenuator	PASTERNACK	PE7087-10	A009	08-16-17
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

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7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.407	6dB Band width (5.8Ghz)	500KHz		1.41 MHz (Straddle Ch.)
15.407 (a)(2)	TX Cond. Power 5.15-2.25, 5.25-5.35 & 5.47-5.725	<24dBm or 11+10Log(OBW)		13.433 dBm
15.407 (a)(3)	TX Cond. Power 5.725-5.825	< 30dBm or 17+10Log(OBW)		13.041 dBm
15.407 (a)(5)	PSD (5.2,5.3,5.5GHz)	<11dBm		3.84 dBm
15.407 (a)(5)	PSD (5.8GHz)	30dBm per 500kHz		0.41 dBm
15.207 (a)	AC Power Line conducted emissions	Section 10	Radiated	54.77 dBuV (Qp)
15.407 (b) & 15.209	Radiated Spurious Emission	< 54dBuV/m		50.68 dBuV/m (Av)
15.407 (h)(2)	Dynamic Frequency Selection	N/A	Condcuted	Pass

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8. REFERENCE MEASUREMENTS RESULTS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 D02 v01r03 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	1.426	1.486	0.960	96.0%	0.18	0.701
802.11n HT20	1.334	1.386	0.962	96.2%	0.17	0.750
802.11n HT40	0.662	0.722	0.917	91.7%	0.38	1.510

8.2. DUTY CYCLE PLOTS

DUTY CYCLE 802.11a MODE

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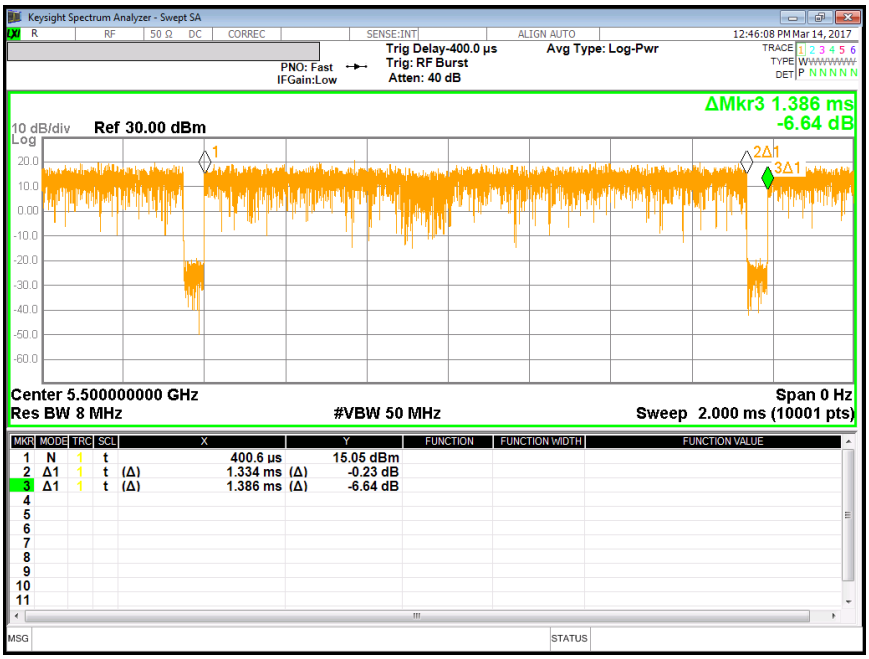
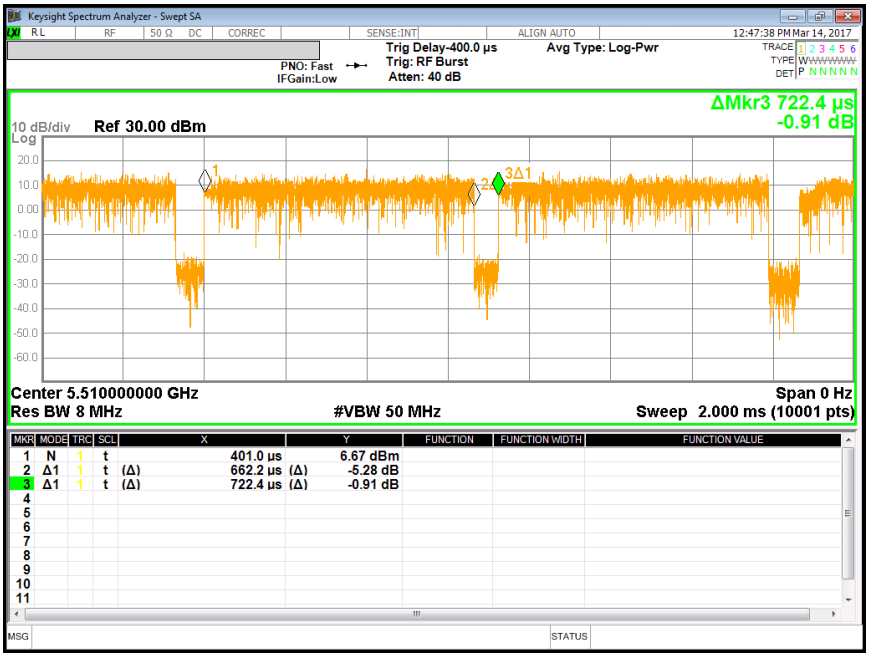
DUTY CYCLE 802.11n HT20 MODE



DUTY CYCLE 802.11n HT40 MODE



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8.3. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Reference to 789033 D02 General UNII Test Procedures New Rules v01r03: 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 : 21.00MHz
  - Turning Frequency : 5725MHz
  - 26dB Bandwidth of UNII-2C band Portion
    = (5725 – (5720 - (21.00 / 2)) = 15.50 MHz
  - 26dB Bandwidth of UNII-3 band Portion
    = (5720 + (21.00 / 2) -5725) = 5.50 MHz

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RESULTS

8.3.1. 802.11a MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5180	20.81
Mid	5200	20.94
High	5240	20.67
Worst		20.94

8.3.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5180	21.63
Mid	5200	21.60
High	5240	21.61
Worst		21.63

8.3.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5190	46.64
High	5230	49.71
Worst		49.71

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8.3.4. 802.11a MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5260	20.79
Mid	5300	20.90
High	5320	20.88
Worst		20.90

8.3.5. 802.11n HT20 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5260	22.41
Mid	5300	21.20
High	5320	22.04
Worst		22.41

8.3.6. 802.11n HT40 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5270	47.57
High	5310	47.96
Worst		47.96

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8.3.7. 802.11a MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5500	20.89
Mid	5580	20.60
High	5700	20.89
Straddle	5720	15.36
Worst		20.89

8.3.8. 802.11n HT20 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5500	21.12
Mid	5580	21.14
High	5700	21.77
Straddle	5720	15.67
Worst		21.77

8.3.9. 802.11n HT40 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5510	46.36
Mid	5590	48.17
High	5670	47.25
Straddle	5710	38.97
Worst		48.17

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8.3.10. 802.11a MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Straddle	5720	5.36
Low	5745	20.99
Mid	5785	20.66
High	5825	20.95
Worst		20.99

8.3.11. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Straddle	5720	5.67
Low	5745	21.23
Mid	5785	20.96
High	5825	21.04
Worst		21.23

8.3.12. 802.11n HT40 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Straddle	5710	8.97
Low	5755	45.97
High	5795	48.06
Worst		48.06

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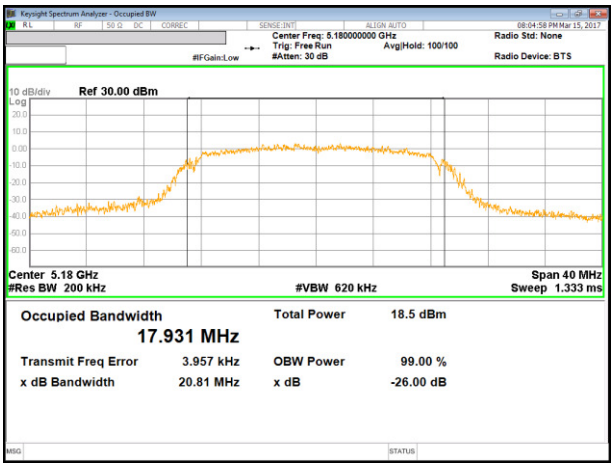
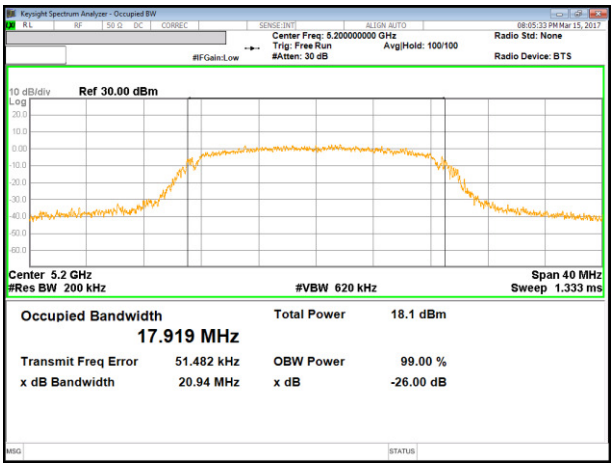
8.3.13. 26 dB BANDWIDTH PLOTS

UNII 5.2 GHz IEEE 802.11a mode

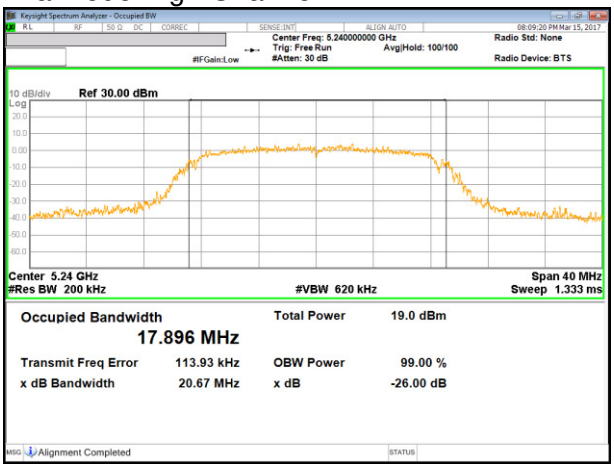
11a Mode Low Channel



11a Mode Middle Channel



11a Mode High Channel



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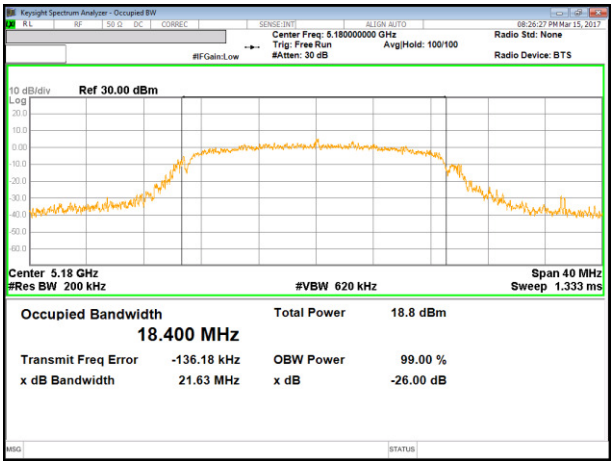
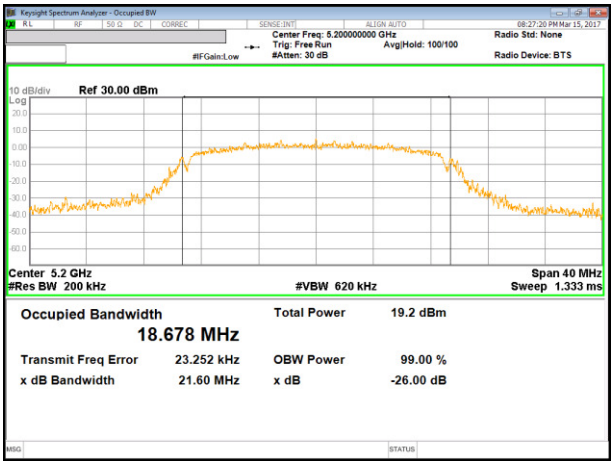
UNII 5.2 GHz IEEE 802.11n HT20 mode

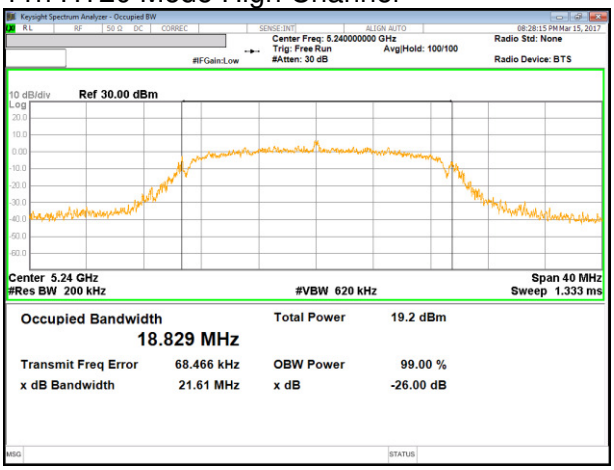
11n HT20 Mode Low Channel



11n HT20 Mode Middle Channel



11n HT20 Mode High Channel



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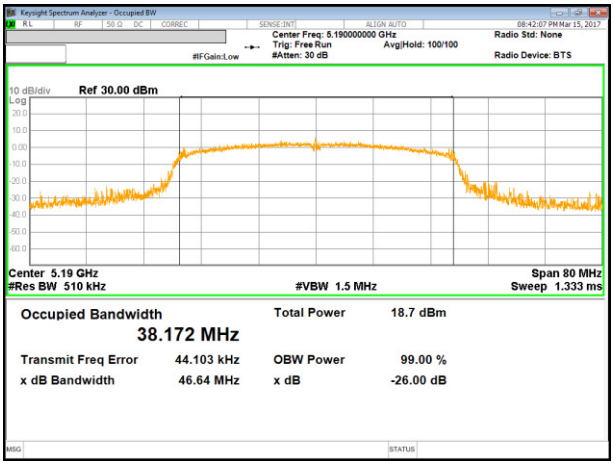
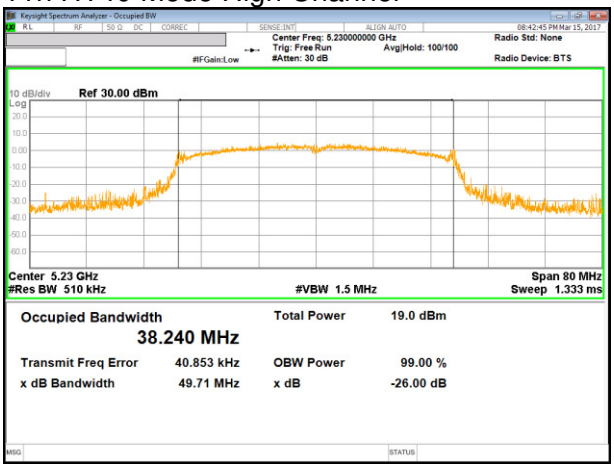
UNII 5.2 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel



11n HT40 Mode High Channel



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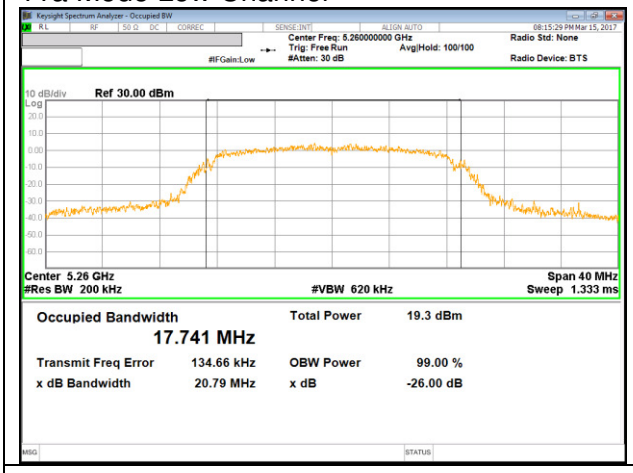
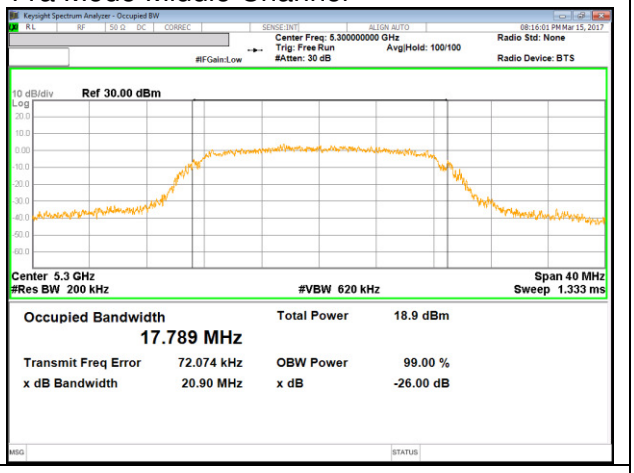
UNII 5.3 GHz IEEE 802.11a mode

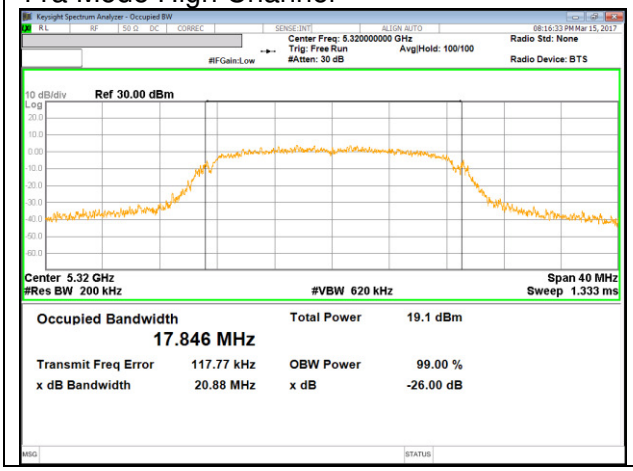
11a Mode Low Channel



11a Mode Middle Channel



11a Mode High Channel



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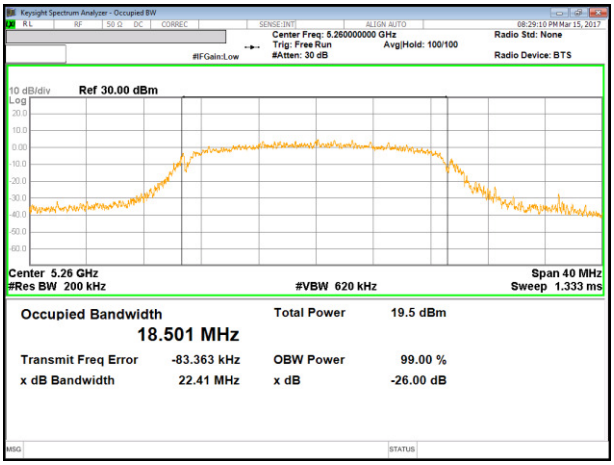
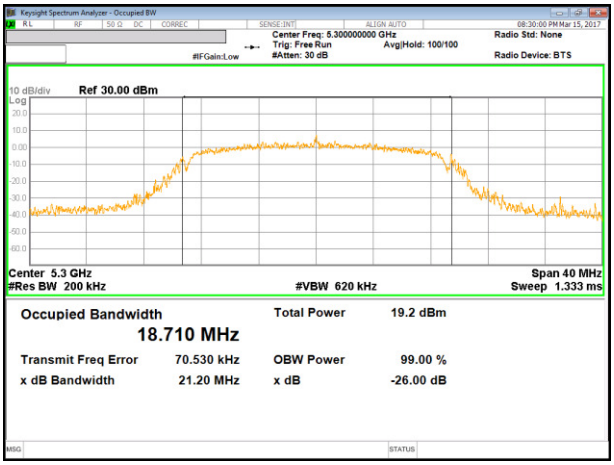
UNII 5.3 GHz IEEE 802.11n HT20 mode

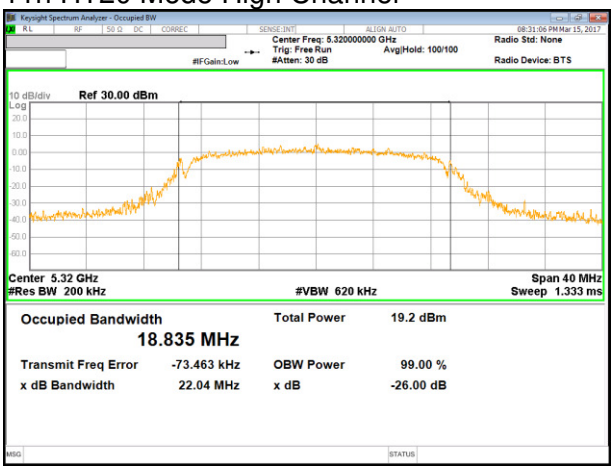
11n HT20 Mode Low Channel



11n HT20 Mode Middle Channel



11n HT20 Mode High Channel



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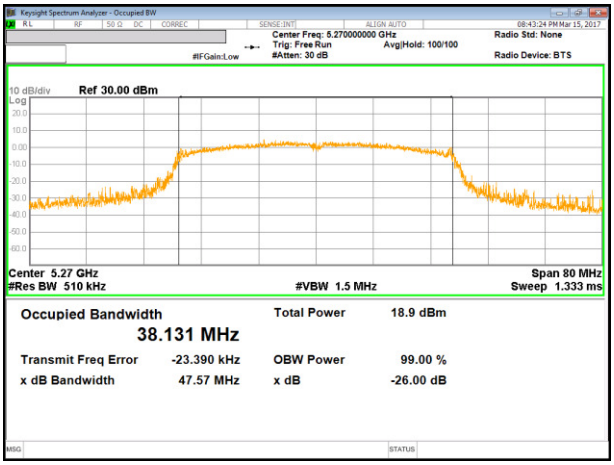
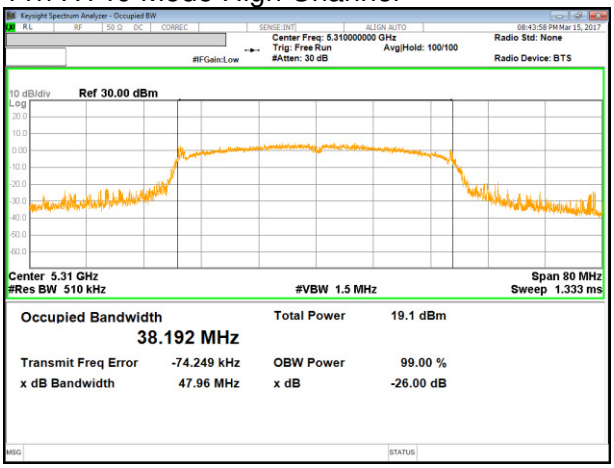
UNII 5.3 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel



11n HT40 Mode High Channel



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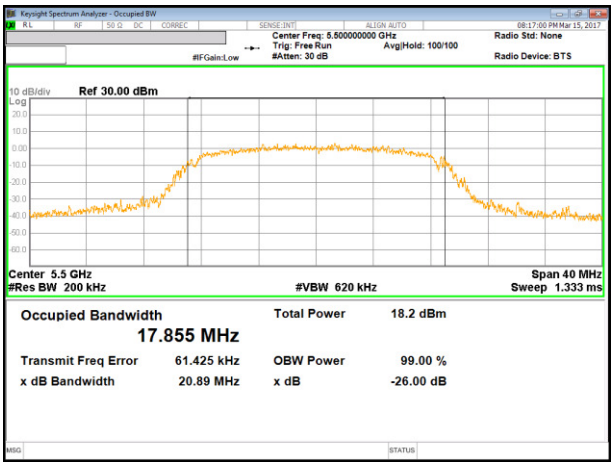
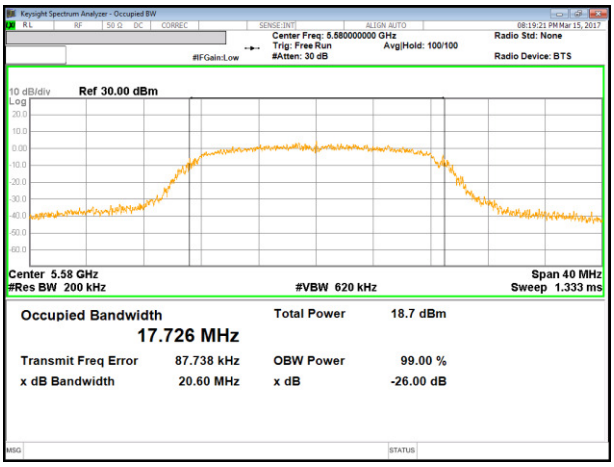
UNII 5.5 GHz IEEE 802.11a mode

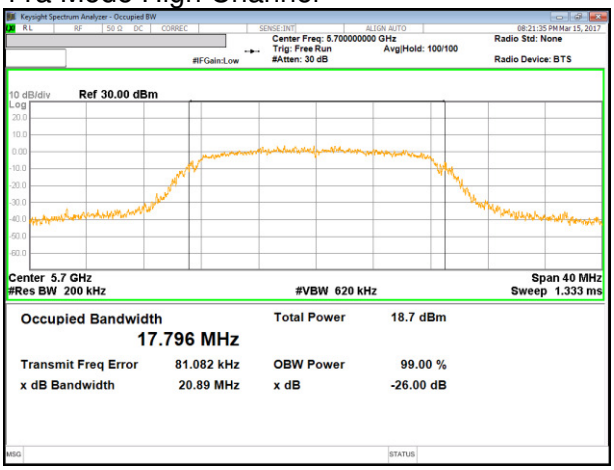
11a Mode Low Channel



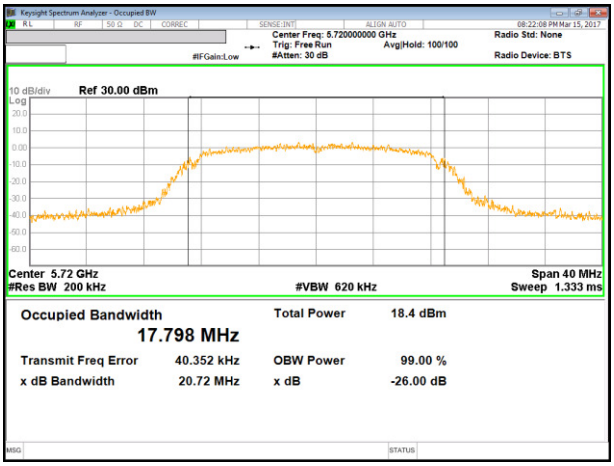
11a Mode Middle Channel



11a Mode High Channel



11a Mode Straddle Channel



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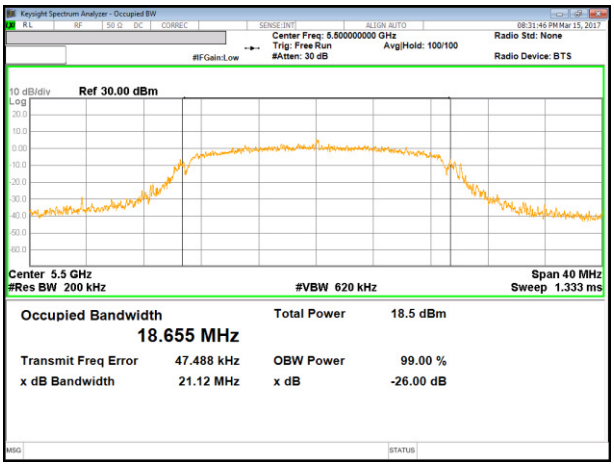
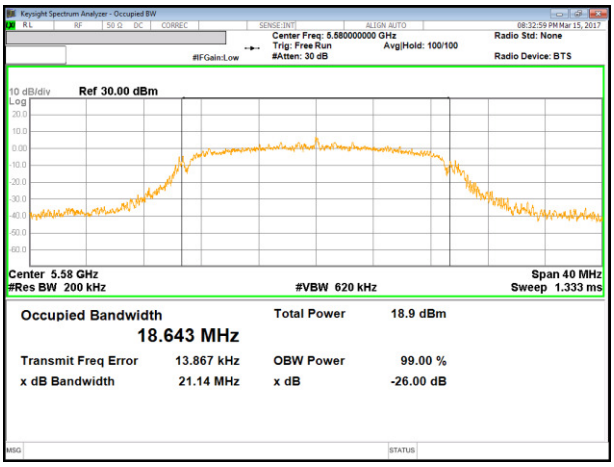
UNII 5.5 GHz IEEE 802.11n HT20 mode

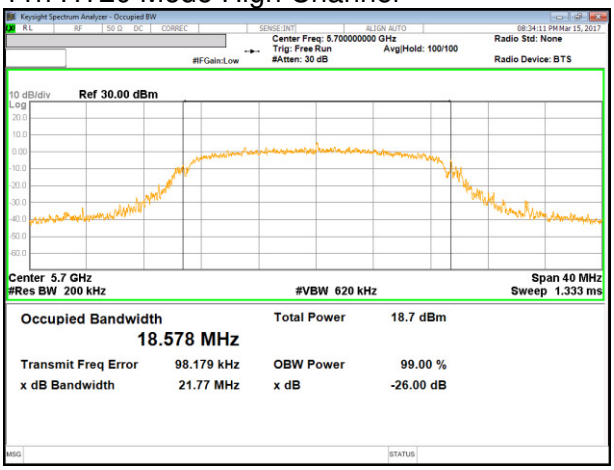
11n HT20 Mode Low Channel



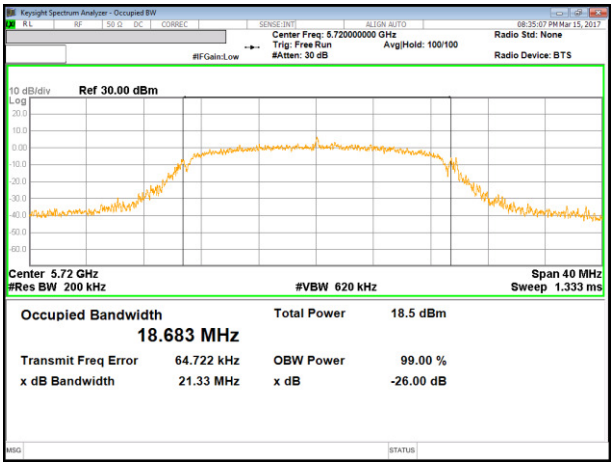
11n HT20 Mode Middle Channel



11n HT20 Mode High Channel



11n HT20 Mode Straddle Channel



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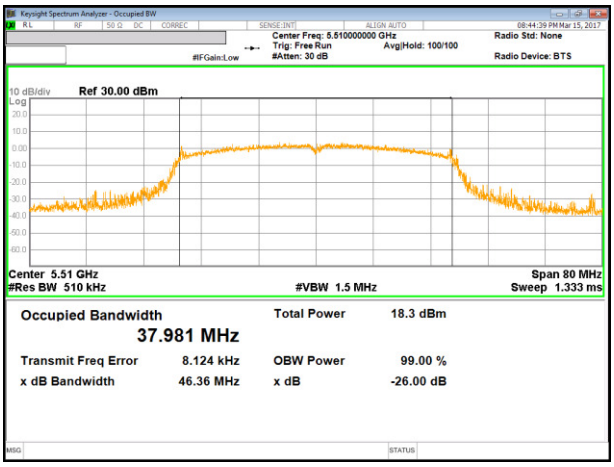
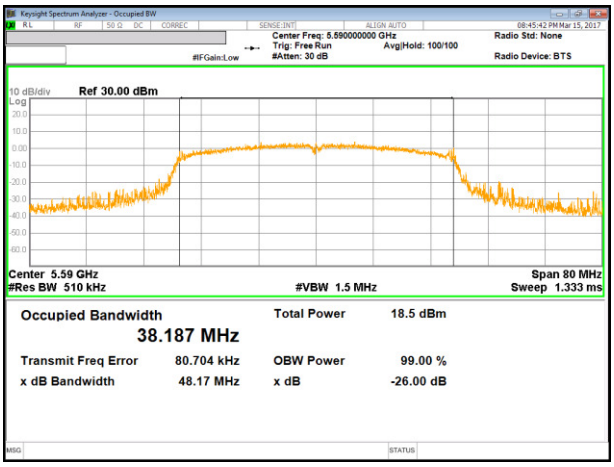
UNII 5.5 GHz IEEE 802.11n HT40 mode

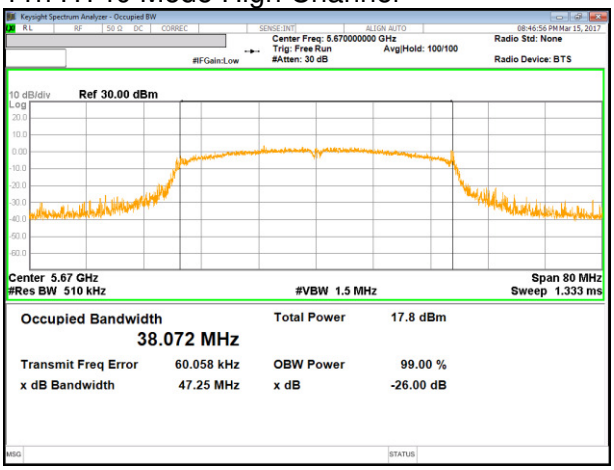
11n HT40 Mode Low Channel



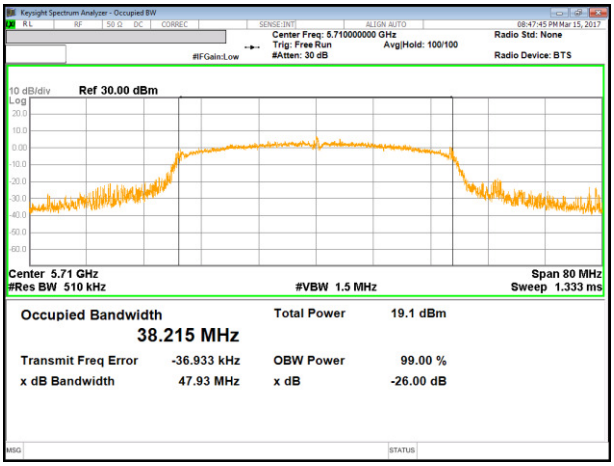
11n HT40 Mode Middle Channel



11n HT40 Mode High Channel



11n HT40 Mode Straddle Channel



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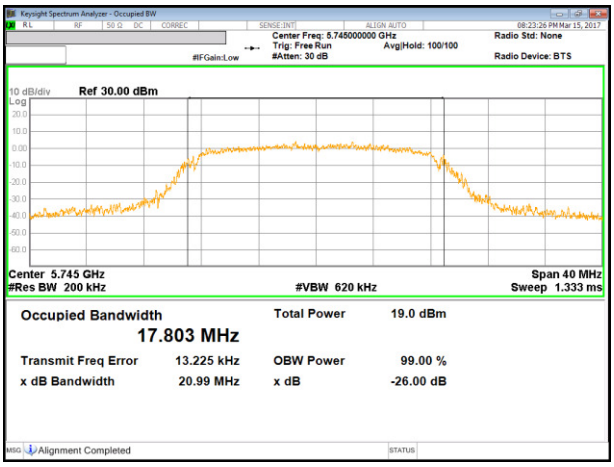
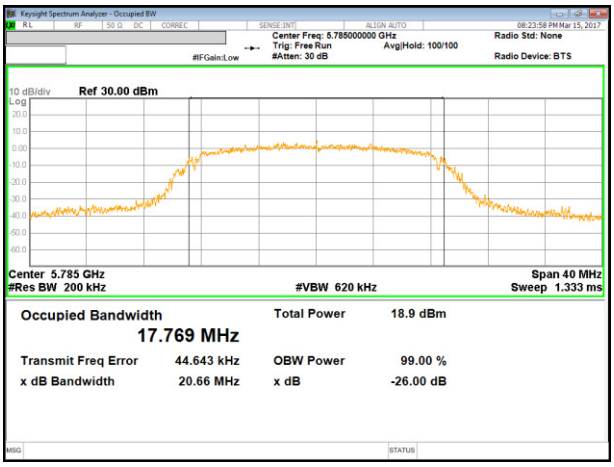
UNII 5.8 GHz IEEE 802.11a mode

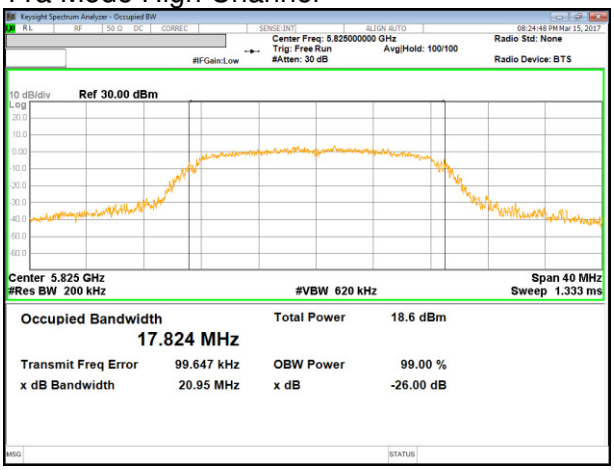
11a Mode Low Channel



11a Mode Middle Channel



11a Mode High Channel



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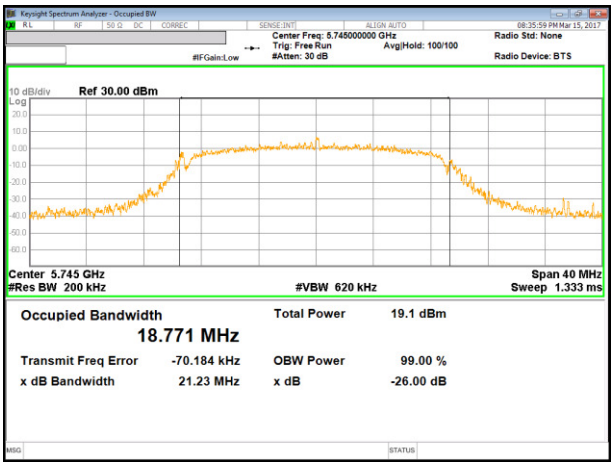
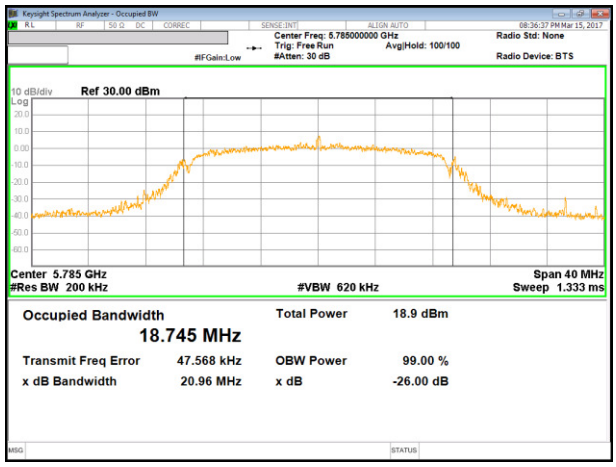
UNII 5.8 GHz IEEE 802.11n HT20 mode

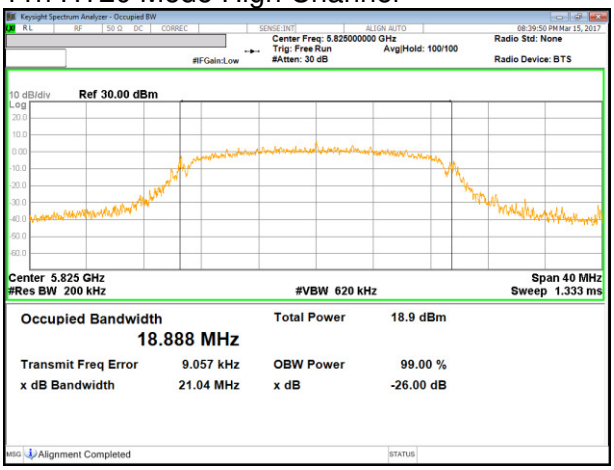
11n HT20 Mode Low Channel



11n HT20 Mode Middle Channel



11n HT20 Mode High Channel



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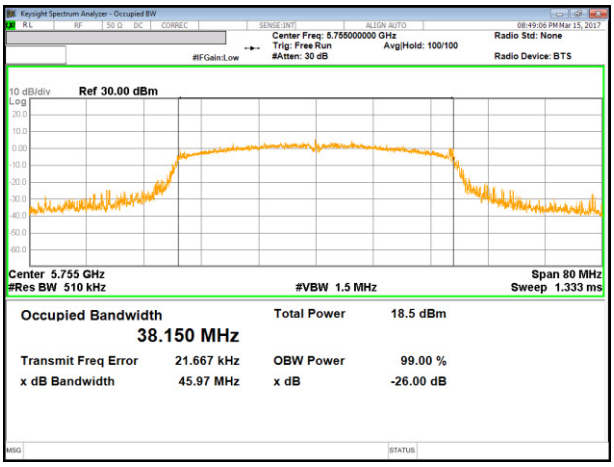
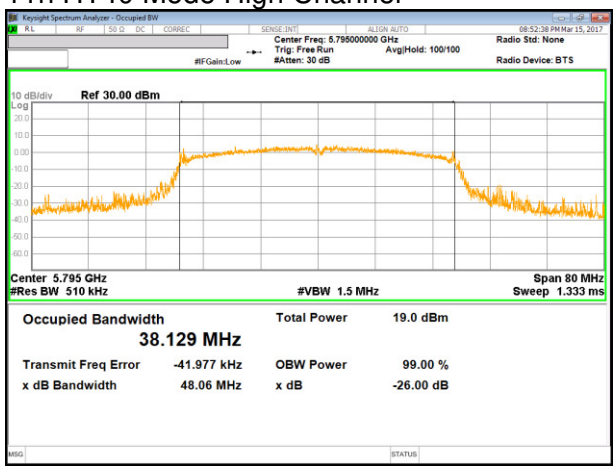
UNII 5.8 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel



11n HT40 Mode High Channel



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9. ANTENNA PORT TEST RESULTS

9.1. 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 v01r03: The transmitter output is connected to a spectrum analyzer with the RBW set to100KHz, the VBW >= 3 x RBW, peak detector and max hold.

NOTE

- Calculation for 6dB Bandwidth of UNII-3 Straddle Channel

ex) Fundamental frequency : 5720MHz
  - 6dB BW : 16.350MHz
  - Starting Frequency of UNII-3 band : 5725MHz
  - 6dB Bandwidth of UNII-3 band Portion
    = (5720 + (16.350 / 2) -5725) = 3.175 MHz

RESULTS

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9.1.1. 802.11a MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Straddle	5720	1.410	0.5
Low	5745	11.960	0.5
Mid	5785	15.090	0.5
High	5825	15.050	0.5
Worst		1.410	

9.1.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Straddle	5720	2.085	0.5
Low	5745	13.770	0.5
Mid	5785	12.600	0.5
High	5825	13.750	0.5
Worst		2.085	

9.1.3. 802.11n HT40 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Straddle	5710	2.975	0.5
Low	5755	34.730	0.5
High	5795	33.460	0.5
Worst		2.975	

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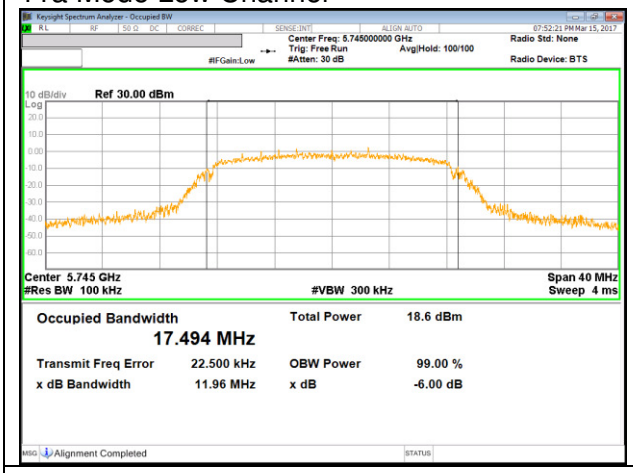
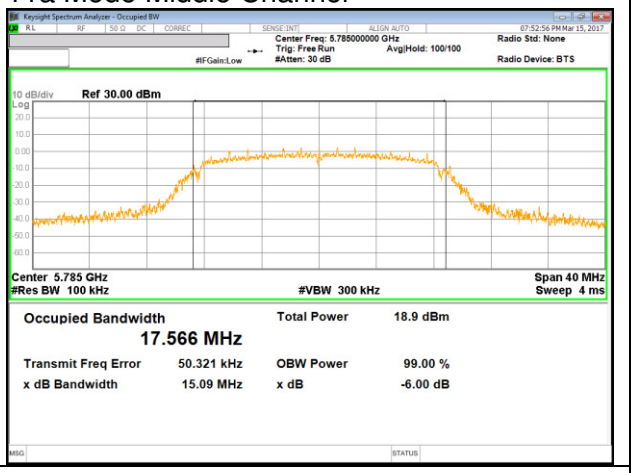
9.1.4. 6 dB BANDWIDTH PLOTS

IEEE 802.11a mode

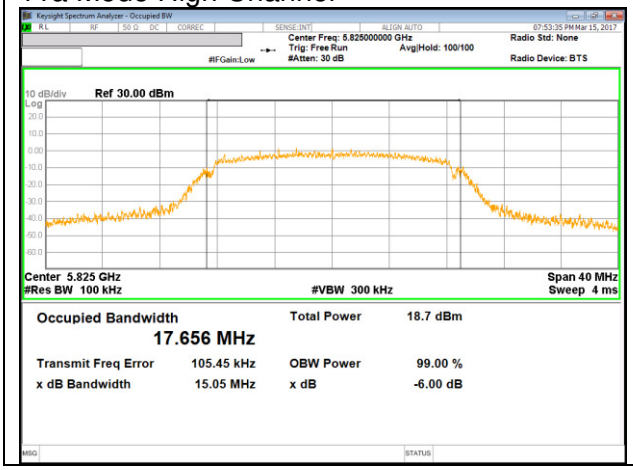
11a Mode Low Channel



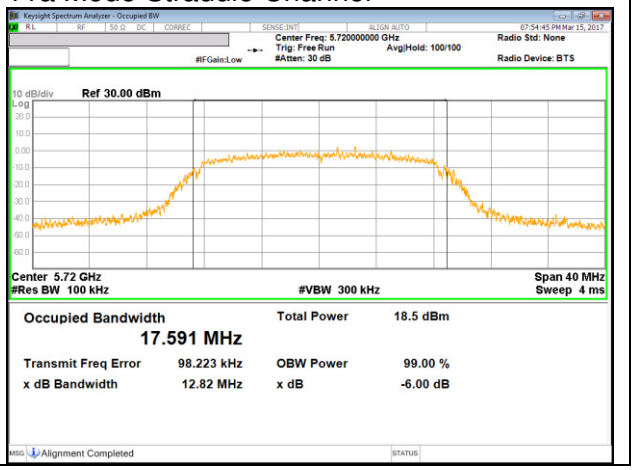
11a Mode Middle Channel



11a Mode High Channel



11a Mode Straddle Channel



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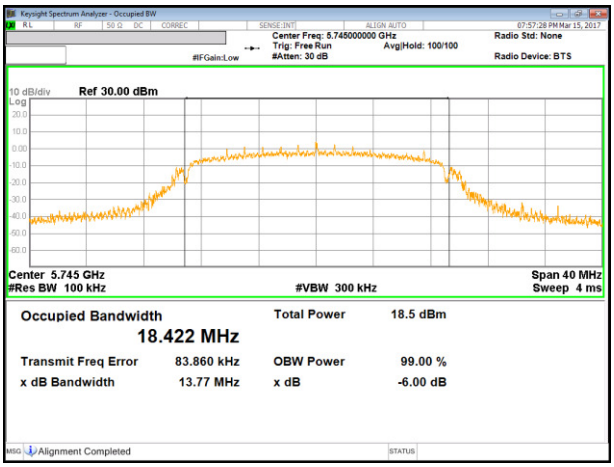
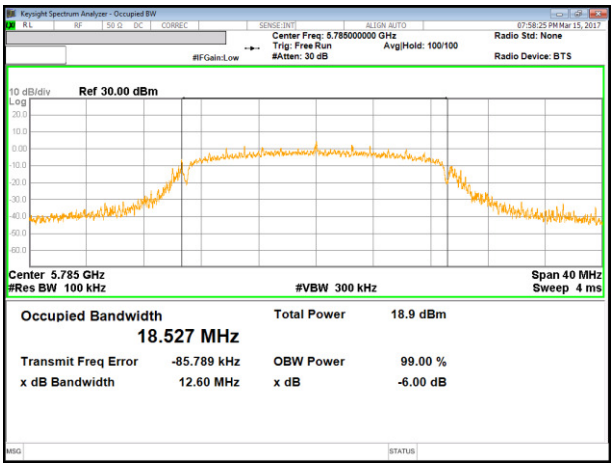
IEEE 802.11n HT20 mode

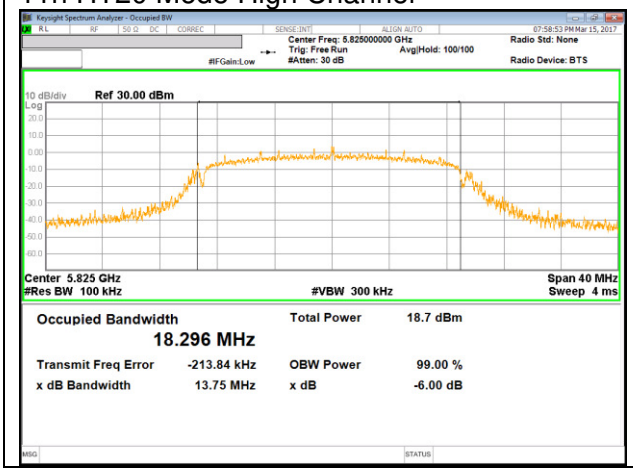
11n HT20 Mode Low Channel



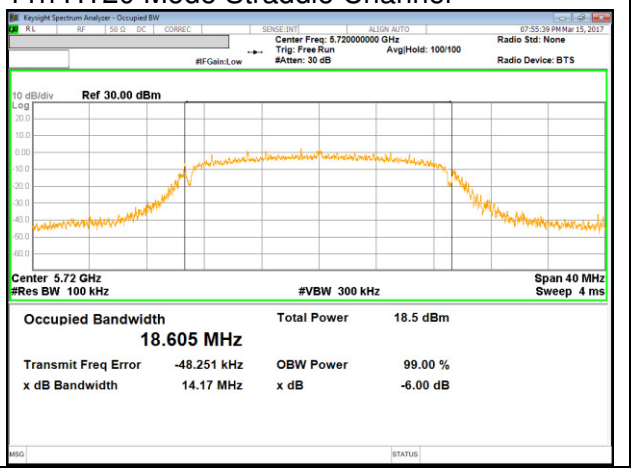
11n HT20 Mode Middle Channel



11n HT20 Mode High Channel



11n HT20 Mode Straddle Channel



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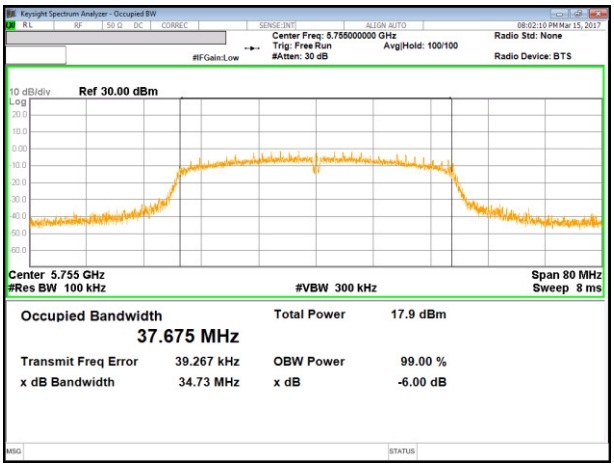
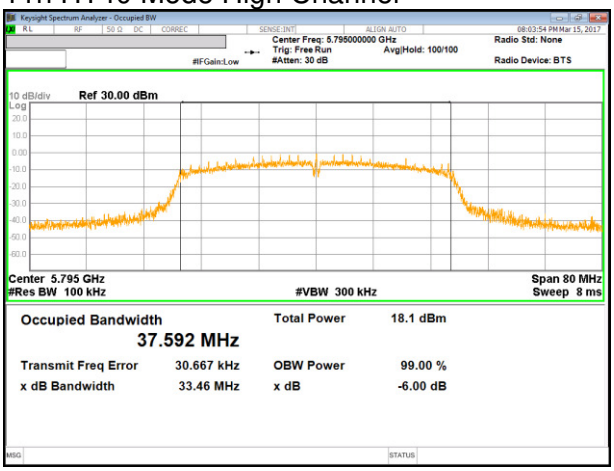
IEEE 802.11n HT40 mode

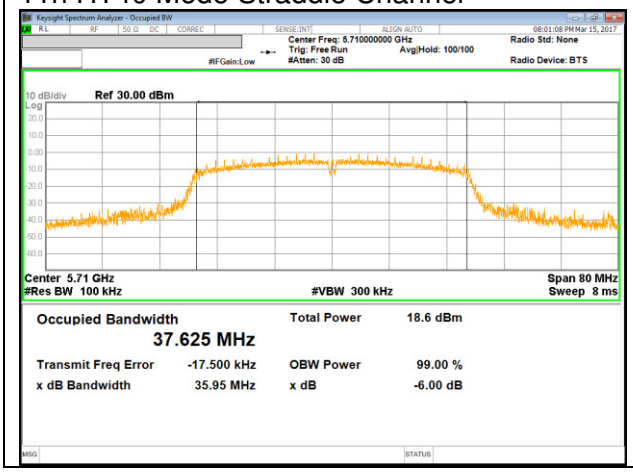
11n HT40 Mode Low Channel



11n HT40 Mode High Channel



11n HT40 Mode Straddle Channel



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9.2. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1) (2) (3)

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 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 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.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz 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.

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.

TEST PROCEDURE

The Duty Cycle is less than 98% and consistent therefore KDB 789033 Method SA-2 is used for power and PPSD. RBW set to1MHz(500kHz for the band 5.725-5.85 GHz, the VBW >= 3 x RBW, RMS detector and trace averaging). Band power function used for power and peak marker value of the spectrum is used for PSD. Add duty cycle correction factor.

DIRECTIONAL ANTENNA GAIN

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

5 GHz

Frequency Band [MHz]	Antenna Gain [dBi]
5150 - 5250	-4.75
5250 - 5350	-0.25
5470 - 5725	-2.76
5725 - 5850	-2.88

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RESULTS

9.2.1. 802.11a MODE IN THE 5.2 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5180	20.81	-4.75	-4.75
Mid	5200	20.94	-4.75	-4.75
High	5240	20.67	-4.75	-4.75

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5180	24.00	24.00	11.00
Mid	5200	24.00	24.00	11.00
High	5240	24.00	24.00	11.00

Duty Cycle CF [dB]	0.18	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5180	12.75	12.93	24.00	-11.07
Mid	5200	12.38	12.56	24.00	-11.44
High	5240	13.25	13.43	24.00	-10.57

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5180	3.04	3.22	11.00	-7.78
Mid	5200	2.72	2.89	11.00	-8.11
High	5240	3.61	3.79	11.00	-7.21

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9.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5180	21.63	-4.75	-4.75
Mid	5200	21.60	-4.75	-4.75
High	5240	21.61	-4.75	-4.75

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5180	24.00	24.00	11.00
Mid	5200	24.00	24.00	11.00
High	5240	24.00	24.00	11.00

Duty Cycle CF [dB]	0.17	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5180	12.75	12.91	24.00	-11.09
Mid	5200	13.15	13.31	24.00	-10.69
High	5240	13.04	13.20	24.00	-10.80

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5180	3.10	3.26	11.00	-7.74
Mid	5200	3.57	3.74	11.00	-7.26
High	5240	3.27	3.43	11.00	-7.57

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9.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5190	46.64	-4.75	-4.75
High	5230	49.71	-4.75	-4.75

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5190	24.00	24.00	11.00
High	5230	24.00	24.00	11.00

Duty Cycle CF [dB]	0.38	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5190	11.97	12.35	24.00	-11.65
High	5230	12.46	12.84	24.00	-11.16

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5190	-0.57	-0.20	11.00	-11.20
High	5230	-0.33	0.05	11.00	-10.95

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9.2.4. 802.11a MODE IN THE 5.3 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5260	20.79	-0.25	-0.25
Mid	5300	20.90	-0.25	-0.25
High	5320	20.88	-0.25	-0.25

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5260	24.00	24.00	11.00
Mid	5300	24.00	24.00	11.00
High	5320	24.00	24.00	11.00

Duty Cycle CF [dB]	0.18	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5260	13.24	13.42	24.00	-10.58
Mid	5300	13.11	13.29	24.00	-10.71
High	5320	13.07	13.24	24.00	-10.76

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5260	3.66	3.84	11.00	-7.16
Mid	5300	3.63	3.80	11.00	-7.20
High	5320	3.54	3.72	11.00	-7.28

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9.2.5. 802.11n HT20 MODE IN THE 5.3 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5260	22.41	-0.25	-0.25
Mid	5300	21.20	-0.25	-0.25
High	5320	22.04	-0.25	-0.25

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5260	24.00	24.00	11.00
Mid	5300	24.00	24.00	11.00
High	5320	24.00	24.00	11.00

Duty Cycle CF [dB]	0.17	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5260	12.96	13.13	24.00	-10.87
Mid	5300	13.08	13.25	24.00	-10.75
High	5320	12.95	13.12	24.00	-10.88

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5260	3.41	3.57	11.00	-7.43
Mid	5300	3.31	3.48	11.00	-7.52
High	5320	3.18	3.34	11.00	-7.66

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9.2.6. 802.11n HT40 MODE IN THE 5.3 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5270	47.57	-0.25	-0.25
High	5310	47.96	-0.25	-0.25

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5270	24.00	24.00	11.00
High	5310	24.00	24.00	11.00

Duty Cycle CF [dB]	0.38	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5270	11.62	11.99	24.00	-12.01
High	5310	11.90	12.28	24.00	-11.72

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5270	-0.98	-0.60	11.00	-11.60
High	5310	-0.91	-0.53	11.00	-11.53

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9.2.7. 802.11a MODE IN THE 5.5 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5500	20.89	-2.76	-2.76
Mid	5580	20.60	-2.76	-2.76
High	5700	20.89	-2.76	-2.76

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5500	24.00	24.00	11.00
Mid	5580	24.00	24.00	11.00
High	5700	24.00	24.00	11.00

Duty Cycle CF [dB]	0.18	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5500	12.83	13.01	24.00	-10.99
Mid	5580	12.95	13.13	24.00	-10.87
High	5700	13.04	13.22	24.00	-10.78

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5500	3.30	3.48	11.00	-7.52
Mid	5580	3.35	3.53	11.00	-7.47
High	5700	3.56	3.74	11.00	-7.26

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9.2.8. 802.11n HT20 MODE IN THE 5.5 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5500	21.12	-2.76	-2.76
Mid	5580	21.14	-2.76	-2.76
High	5700	21.77	-2.76	-2.76

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5500	24.00	24.00	11.00
Mid	5580	24.00	24.00	11.00
High	5700	24.00	24.00	11.00

Duty Cycle CF [dB]	0.17	**Included in Calculations of Corr'd Power & PPSD**

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5500	12.66	12.83	24.00	-11.17
Mid	5580	12.84	13.01	24.00	-10.99
High	5700	12.93	13.10	24.00	-10.90

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5500	2.62	2.79	11.00	-8.21
Mid	5580	3.35	3.52	11.00	-7.48
High	5700	3.26	3.43	11.00	-7.57

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9.2.9. 802.11n HT40 MODE IN THE 5.5 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5510	46.36	-2.76	-2.76
Mid	5550	48.17	-2.76	-2.76
High	5670	47.25	-2.76	-2.76

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5510	24.00	24.00	11.00
Mid	5550	24.00	24.00	11.00
High	5670	24.00	24.00	11.00

Duty Cycle CF [dB]	0.38	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5510	11.85	12.22	24.00	-11.78
Mid	5550	11.69	12.06	24.00	-11.94
High	5670	11.77	12.15	24.00	-11.85

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5510	-0.51	-0.13	11.00	-11.13
Mid	5550	-1.12	-0.75	11.00	-11.75
High	5670	-0.82	-0.44	11.00	-11.44

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9.2.10. 802.11a MODE IN THE 5.8 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5745	20.99	-2.88	-2.88
Mid	5785	20.66	-2.88	-2.88
High	5825	20.95	-2.88	-2.88

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5745	24.00	24.00	30.00
Mid	5785	24.00	24.00	30.00
High	5825	24.00	24.00	30.00

Duty Cycle CF [dB]	0.18	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5745	12.86	13.04	24.00	-10.96
Mid	5785	12.68	12.86	24.00	-11.14
High	5825	12.81	12.99	24.00	-11.01

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5745	0.23	0.41	30.00	-29.59
Mid	5785	-0.08	0.10	30.00	-29.90
High	5825	0.05	0.23	30.00	-29.77

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9.2.11. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5745	21.23	-2.88	-2.88
Mid	5785	20.96	-2.88	-2.88
High	5825	21.04	-2.88	-2.88

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5745	24.00	24.00	30.00
Mid	5785	24.00	24.00	30.00
High	5825	24.00	24.00	30.00

Duty Cycle CF [dB]	0.17	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5745	12.72	12.88	24.00	-11.12
Mid	5785	12.76	12.92	24.00	-11.08
High	5825	12.68	12.85	24.00	-11.15

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5745	-0.19	-0.02	30.00	-30.02
Mid	5785	0.12	0.28	30.00	-29.72
High	5825	-0.01	0.16	30.00	-29.84

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9.2.12. 802.11n HT40 MODE IN THE 5.8 GHz BAND

Bandwidth and Antenna Gain

Channel	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5755	45.97	-2.88	-2.88
High	5795	48.06	-2.88	-2.88

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5755	24.00	24.00	30.00
High	5795	24.00	24.00	30.00

Duty Cycle CF [dB]	0.38	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Channel	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5755	11.81	12.19	24.00	-11.81
High	5795	11.75	12.13	24.00	-11.87

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5755	-3.88	-3.50	30.00	-33.50
High	5795	-4.08	-3.70	30.00	-33.70

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9.2.13. 802.11a MODE AT STRADDLE CHANNEL

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
UNII-2C	5720	15.36	-2.76	-2.76
UNII-3	5720	5.36	-2.76	-2.76
Whole	5720	20.72	-2.76	-2.76

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
UNII-2C	5720	22.86	22.86	11.00
UNII-3	5720	18.29	18.29	11.00
Whole	5720	24.00	24.00	11.00

Duty Cycle CF [dB]	0.18	**Included in Calculations of Corr'd Power & PPSD**

Output Power Results

Portion	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
UNII-2C	5720	12.01	12.19	22.86	-10.68
UNII-3	5720	4.24	4.42	18.29	-13.87
Whole	5720	12.68	12.86	24.00	-11.14

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
144	5720	3.20	3.38	11.00	-7.62

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9.2.14. 802.11n HT20 MODE AT STRADDLE CHANNEL

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
UNII-2C	5720	15.67	-2.76	-2.76
UNII-3	5720	5.66	-2.76	-2.76
Whole	5720	21.33	-2.76	-2.76

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
UNII-2C	5720	22.95	22.95	11.00
UNII-3	5720	18.53	18.53	11.00
Whole	5720	24.00	24.00	11.00

Duty Cycle CF [dB]	0.17	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Portion	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
UNII-2C	5720	11.95	12.11	22.95	-10.84
UNII-3	5720	4.39	4.56	18.53	-13.97
Whole	5720	12.65	12.81	24.00	-11.19

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
144	5720	2.74	2.91	11.00	-8.09

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9.2.15. 802.11n HT40 MODE AT STRADDLE CHANNEL

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
UNII-2C	5710	38.97	-2.76	-2.76
UNII-3	5710	8.97	-2.76	-2.76
Whole	5710	47.93	-2.76	-2.76

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
UNII-2C	5710	24.00	24.00	11.00
UNII-3	5710	20.53	20.53	11.00
Whole	5710	24.00	24.00	11.00

Duty Cycle CF [dB]	0.38	Included in Calculations of Corr'd Power & PPSD

Output Power Results

Portion	Frequency [MHz]	Total Corr'd Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
UNII-2C	5710	12.13	12.50	24.00	-11.50
UNII-3	5710	-0.87	-0.49	20.53	-21.01
Whole	5710	12.34	12.72	24.00	-11.28

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
142	5710	-0.35	0.03	11.00	-10.97

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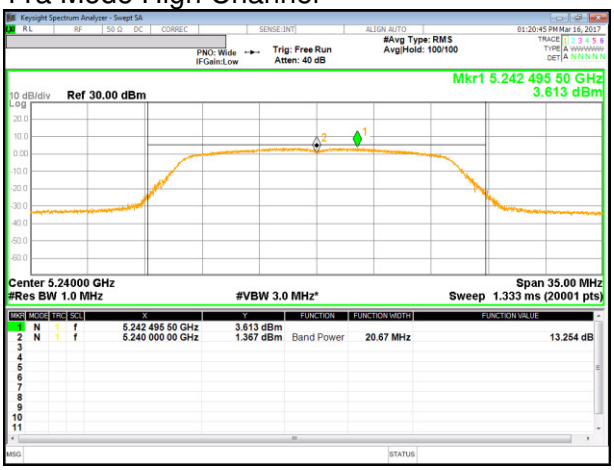
9.2.16. OUTPUT POWER AND PPSD PLOTS

UNII 5.2 GHz IEEE 802.11a mode

11a Mode Low Channel

11a Mode Middle Channel

11a Mode High Channel



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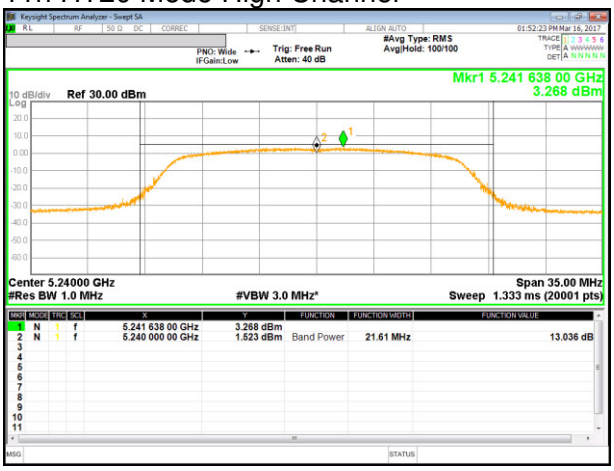
UNII 5.2 GHz IEEE 802.11n HT20 mode

11n HT20 Mode Low Channel

11n HT20 Mode Middle Channel

11n HT20 Mode High Channel



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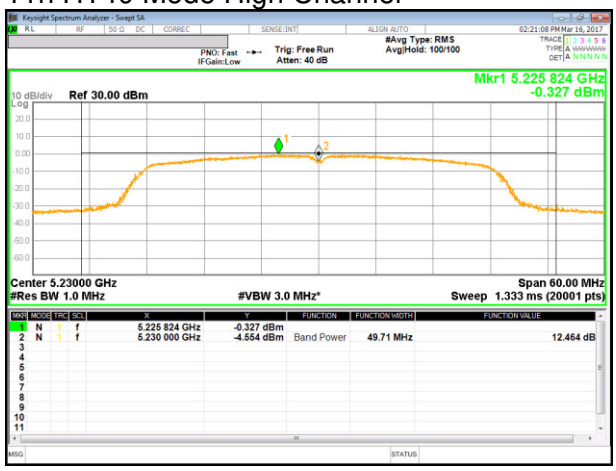
UNII 5.2 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel

11n HT40 Mode High Channel



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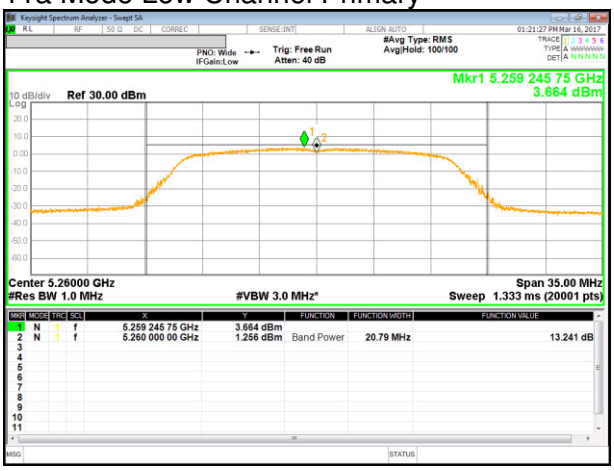
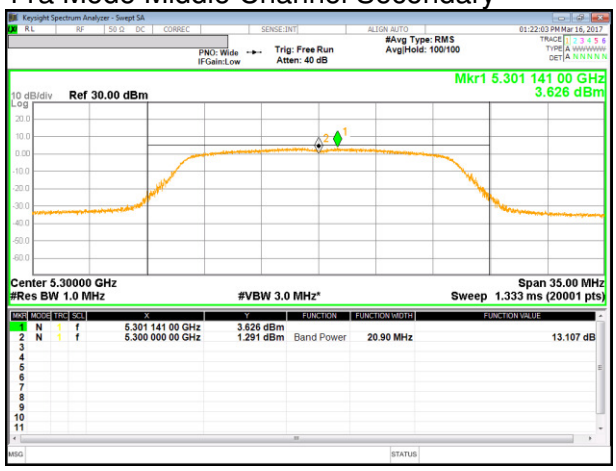
UNII 5.3 GHz IEEE 802.11a mode

11a Mode Low Channel Primary



11a Mode Middle Channel Secondary



11a Mode High Channel Primary

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UNII 5.3 GHz IEEE 802.11n HT20 mode

11n HT20 Mode Low Channel

11n HT20 Mode Middle Channel

11n HT20 Mode High Channel

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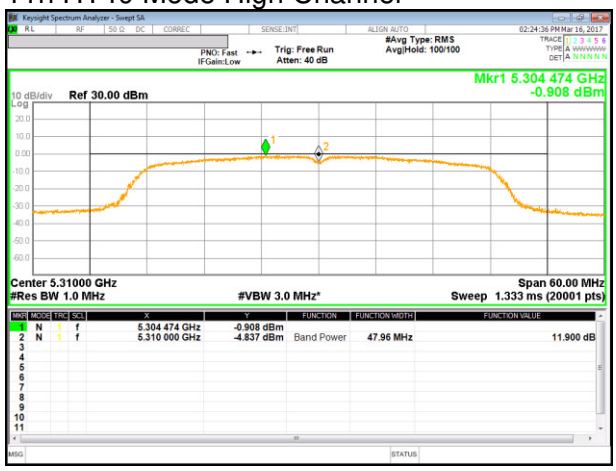
UNII 5.3 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel

11n HT40 Mode High Channel



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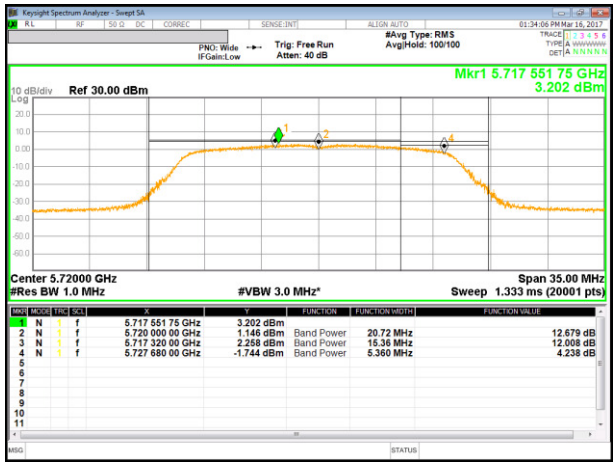
UNII 5.5 GHz IEEE 802.11a mode

11a Mode Low Channel

11a Mode Middle Channel

11a Mode High Channel

11a Mode Starddle Channel



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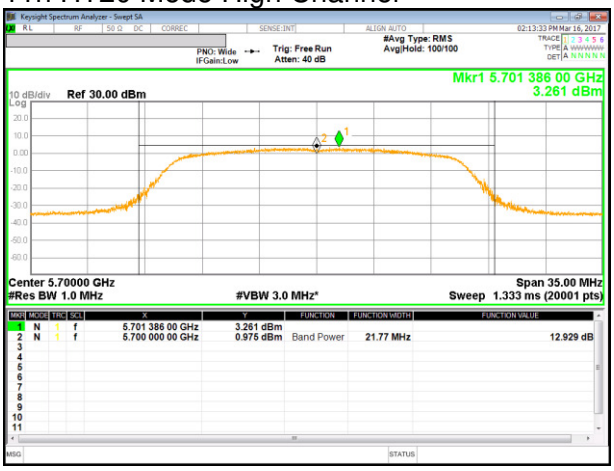
UNII 5.5 GHz IEEE 802.11n HT20 mode

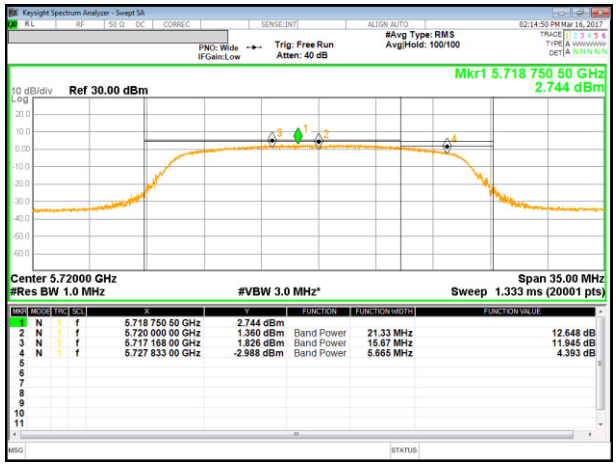
11n HT20 Mode Low Channel

11n HT20 Mode Middle Channel

11n HT20 Mode High Channel



11n HT20 Mode Starddle Channel



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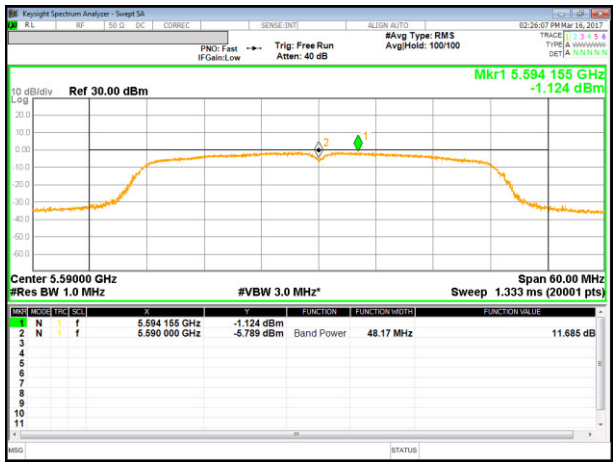
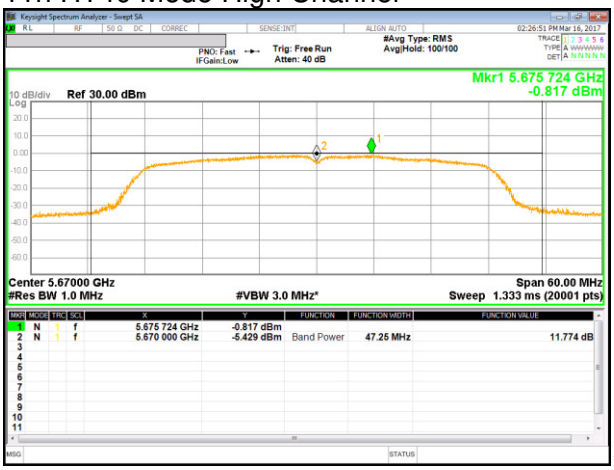
UNII 5.5 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel

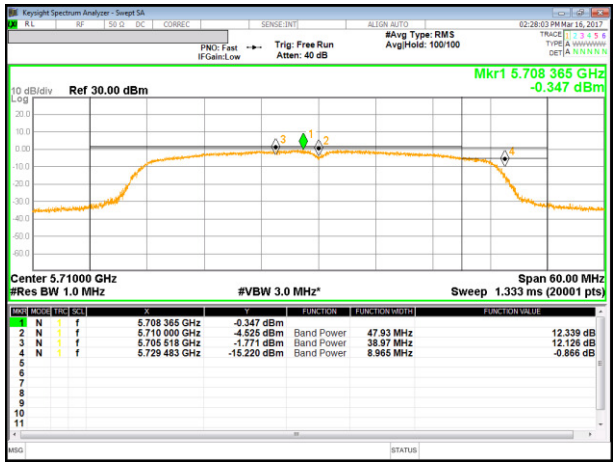
11n HT40 Mode Middle Channel



11n HT40 Mode High Channel



11n HT40 Mode Starddle Channel



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