



FCC 47 CFR PART 15 SUBPART E

UNII

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-C701F/DS

FCC ID: A3LSMC701F

REPORT NUMBER: 4787871150-E4V1

ISSUE DATE: 3/10/2017

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

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



Revision History

Rev.	Issue Date	Revisions	Revised By
V1	03/10/17	Initial issue	Junwhan Lee

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. MEASURING INSTRUMENT CALIBRATION	7
4.2. SAMPLE CALCULATION	7
4.3. MEASUREMENT UNCERTAINTY	8
5. EQUIPMENT UNDER TEST	9
5.1. DESCRIPTION OF EUT	9
5.2. MAXIMUM OUTPUT POWER	9
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	10
5.4. WORST-CASE CONFIGURATION AND MODE	10
5.5. DESCRIPTION OF TEST SETUP	11
6. TEST AND MEASUREMENT EQUIPMENT	13
7. SUMMARY TABLE	14
8. REFERENCE MEASUREMENTS RESULTS	15
8.1. ON TIME AND DUTY CYCLE RESULTS	15
8.2. DUTY CYCLE PLOTS	15
8.3. 26 dB BANDWIDTH	17
8.3.1. 802.11a MODE IN THE 5.2 GHz BAND	18
8.3.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND	18
8.3.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND	18
8.3.4. 802.11a MODE IN THE 5.3 GHz BAND	19
8.3.5. 802.11n HT20 MODE IN THE 5.3 GHz BAND	19
8.3.6. 802.11n HT40 MODE IN THE 5.3 GHz BAND	19
8.3.7. 802.11a MODE IN THE 5.5 GHz BAND	20
8.3.8. 802.11n HT20 MODE IN THE 5.5 GHz BAND	20
8.3.9. 802.11n HT40 MODE IN THE 5.5 GHz BAND	20
8.3.10. 802.11a MODE IN THE 5.8 GHz BAND	21
8.3.11. 802.11n HT20 MODE IN THE 5.8 GHz BAND	21
8.3.12. 802.11n HT40 MODE IN THE 5.8 GHz BAND	21
8.3.13. 26 dB BANDWIDTH PLOTS	22
9. ANTENNA PORT TEST RESULTS	34
9.1. 6 dB BANDWIDTH	34

9.1.1.	802.11a MODE IN THE 5.8 GHz BAND	35
9.1.2.	802.11n HT20 MODE IN THE 5.8 GHz BAND	35
9.1.3.	802.11n HT40 MODE IN THE 5.8 GHz BAND	35
9.1.4.	6 dB BANDWIDTH PLOTS	36
9.2.	<i>OUTPUT POWER AND PPSD</i>	39
9.2.1.	802.11a MODE IN THE 5.2 GHz BAND	41
9.2.2.	802.11n HT20 MODE IN THE 5.2 GHz BAND	42
9.2.3.	802.11n HT40 MODE IN THE 5.2 GHz BAND	43
9.2.4.	802.11a MODE IN THE 5.3 GHz BAND	44
9.2.5.	802.11n HT20 MODE IN THE 5.3 GHz BAND	45
9.2.6.	802.11n HT40 MODE IN THE 5.3 GHz BAND	46
9.2.7.	802.11a MODE IN THE 5.5 GHz BAND	47
9.2.8.	802.11n HT20 MODE IN THE 5.5 GHz BAND	48
9.2.9.	802.11n HT40 MODE IN THE 5.5 GHz BAND	49
9.2.10.	802.11a MODE IN THE 5.8 GHz BAND	50
9.2.11.	802.11n HT20 MODE IN THE 5.8 GHz BAND	51
9.2.12.	802.11n HT40 MODE IN THE 5.8 GHz BAND	52
9.2.13.	PPSD PLOTS	53
10.	TRANSMITTER ABOVE 1 GHz	65
10.1.	<i>5.2 GHz</i>	67
10.1.1.	TX Above 1GHz 802.11a MODE IN THE 5.2GHz BAND	67
10.1.2.	TX Above 1GHz 802.11n HT20 MODE IN THE 5.2GHz BAND	75
10.1.3.	TX Above 1GHz 802.11n HT40 MODE IN THE 5.2GHz BAND	83
10.2.	<i>5.3 GHz</i>	89
10.2.1.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.3 GHz BAND	89
10.2.2.	TX ABOVE 1GHz 802.11n HT20 MODE IN THE 5.3GHz BAND	97
10.2.3.	TX ABOVE 1GHz 802.11n HT40 MODE IN THE 5.3GHz BAND	105
10.3.	<i>5.5-5.6 GHz</i>	111
10.3.1.	TX ABOVE 1 GHz 802.11a MODE IN THE 5.5 GHz BAND	111
10.3.2.	TX ABOVE 1GHz 802.11n HT20 MODE IN THE 5.5GHz BAND	121
10.3.3.	TX ABOVE 1GHz 802.11n HT40 MODE IN THE 5.5GHz BAND	131
10.4.	<i>5.8 GHz</i>	141
10.4.1.	TX ABOVE 1GHz 802.11a MODE IN THE 5.8GHz BAND	141
10.4.2.	TX ABOVE 1GHz 802.11n HT20 MODE IN THE 5.8GHz BAND	151
10.4.3.	TX ABOVE 1GHz 802.11n HT40 MODE IN THE 5.8GHz BAND	161
11.	WORST-CASE BELOW 1 GHz (in the 5.3 GHz Band)	169
12.	AC POWER LINE CONDUCTED EMISSIONS	171
13.	DYNAMIC FREQUENCY SELECTION	176
13.1.	<i>OVERVIEW</i>	176
13.1.1.	LIMITS	176
13.1.1.	TEST AND MEASUREMENT SYSTEM	180
13.1.2.	SETUP OF EUT	183
13.1.3.	DESCRIPTION OF EUT	184
13.2.	<i>RESULTS FOR 20 MHz BANDWIDTH</i>	185

13.2.1. TEST CHANNEL	185
13.2.2. RADAR WAVEFORM AND TRAFFIC	185
13.2.3. OVERLAPPING CHANNEL TESTS	187
13.2.4. MOVE AND CLOSING TIME	187
13.3. RESULTS FOR 40 MHz BANDWIDTH.....	190
13.3.1. TEST CHANNEL	190
13.3.2. RADAR WAVEFORM AND TRAFFIC	190
13.3.3. OVERLAPPING CHANNEL TESTS	192
13.3.4. MOVE AND CLOSING TIME	192
14. SETUP PHOTOS.....	195

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, ANT+ and NFC
MODEL NUMBER: SM-C701F/DS
SERIAL NUMBER: R38J10TDQXT (RADIATED);
R38J10TDQ7J (CONDUCTED)
DATE TESTED: FEB 28, 2017 – MAR 09, 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
UL Korea, Ltd. By:



CY Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

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

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	4.14 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 GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n, ANT+ 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	14.23	26.49
	802.11n HT20	13.76	23.77
5190 - 5230	802.11n HT40	13.12	20.51
5260 - 5320	802.11a	14.21	26.36
	802.11n HT20	14.04	25.35
5270 - 5310	802.11n HT40	12.97	19.82
5500 - 5700	802.11a	14.24	26.55
	802.11n HT20	14.12	25.82
5510 - 5690	802.11n HT40	13.03	20.09
5745 - 5825	802.11a	14.01	25.18
	802.11n HT20	14.01	25.18
5755 - 5795	802.11n HT40	12.90	19.50

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	-3.35
UNII 2A 5250 – 5350	-3.43
UNII 2C 5470 – 5725	-3.01
UNII 3 5725 – 5850	-3.96

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 X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in the X 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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA20IWE	R37H7JNHYW1SE3	N/A
Data Cable	SAMSUNG	EP-DN930CWE	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	N/A	N/A

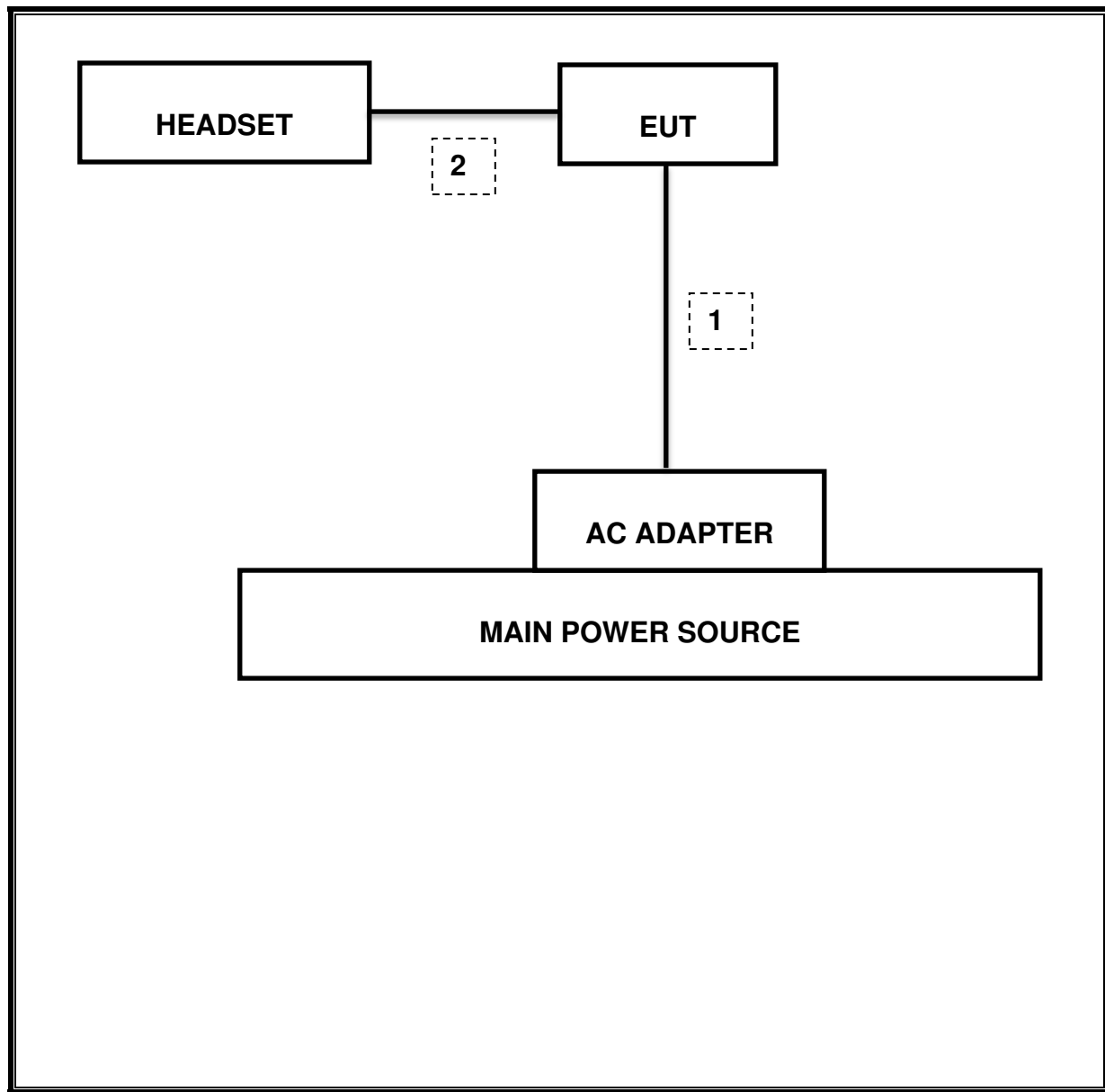
I/O CABLES

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	1.0m	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.

SETUP DIAGRAM FOR TESTS



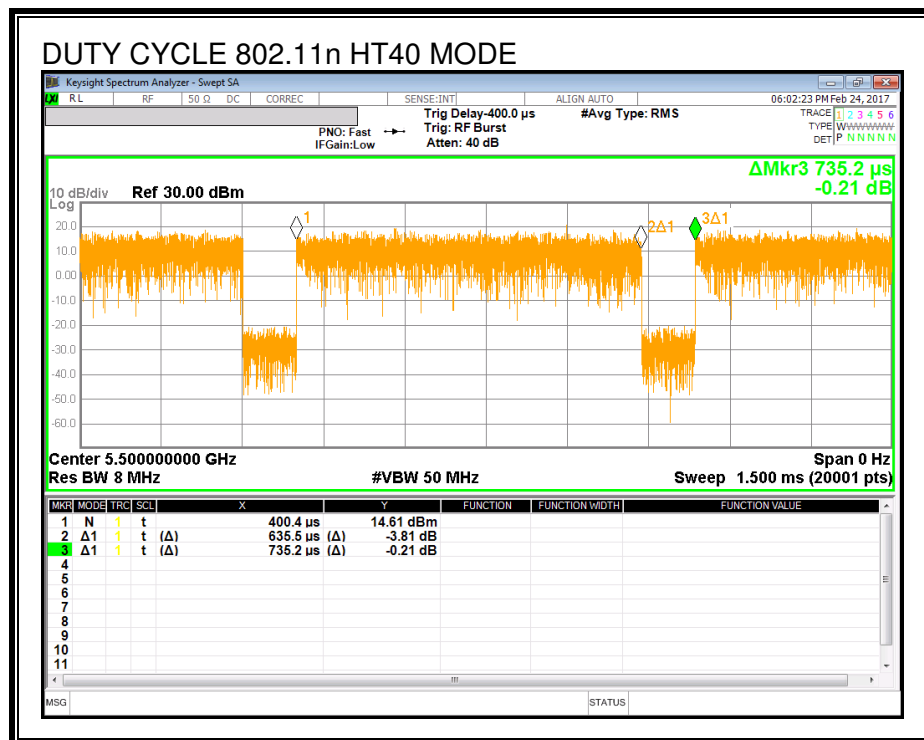
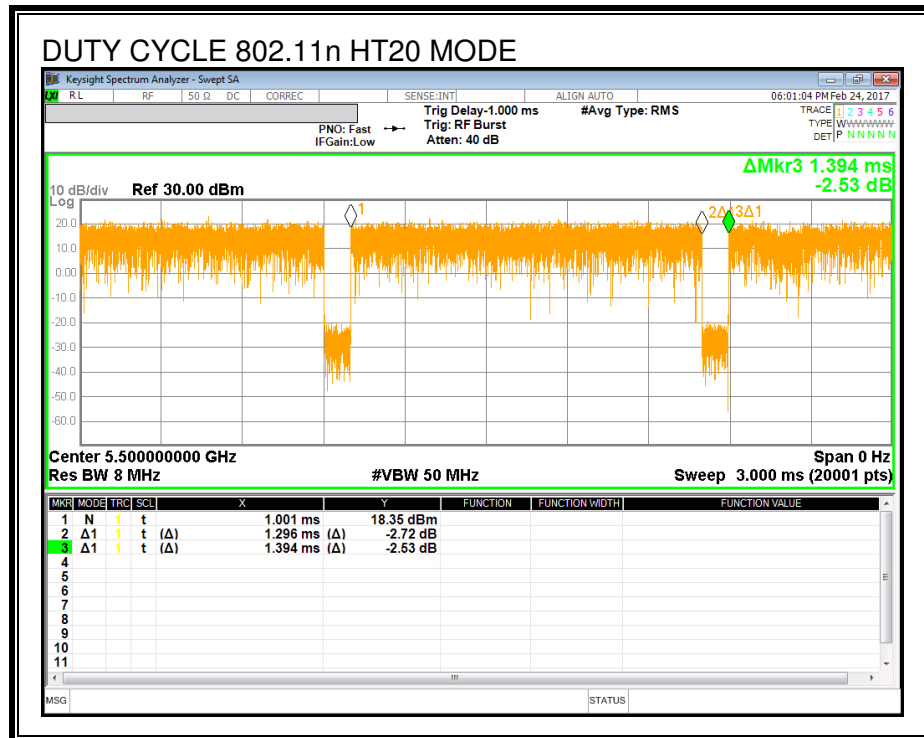
6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	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	PASTERNAK	PE7087-10	A007	08-17-17
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.407	6dB Band width (5.8Ghz)	500KHz		16.34 MHz
15.407 (a)(2)	TX Cond. Power 5.15-2.25, 5.25-5.35 & 5.47-5.725	<24dBm or 11+10Log(OBW)		14.24 dBm
15.407 (a)(3)	TX Cond. Power 5.725-5.825	< 30dBm or 17+10Log(OBW)		14.01 dBm
15.407 (a)(5)	PSD (5.2,5.3,5.5GHz)	<11dBm		3.983 dBm
15.407 (a)(5)	PSD (5.8GHz)	30dBm per 500kHz		0.697 dBm
15.207 (a)	AC Power Line conducted emissions	Section 10	Radiated	46.81 dBuV (Pq)
15.407 (b) & 15.209	Radiated Spurious Emission	< 54dBuV/m		51.77 dBuV/m (Av)
15.407 (h)(2)	Dynamic Frequency Selection	N/A	Condcuted	Pass



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.

RESULTS

8.3.1. 802.11a MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5180	21.35
Mid	5200	21.36
High	5240	21.28
Worst		21.36

8.3.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5180	21.98
Mid	5200	22.57
High	5240	22.16
Worst		22.57

8.3.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5190	42.65
High	5230	42.51
Worst		42.65

8.3.4. 802.11a MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5260	21.40
Mid	5300	21.30
High	5320	21.45
Worst		21.45

8.3.5. 802.11n HT20 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5260	22.06
Mid	5300	22.26
High	5320	21.83
Worst		22.26

8.3.6. 802.11n HT40 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5270	42.49
High	5310	42.84
Worst		42.84

8.3.7. 802.11a MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5500	22.11
Mid	5580	21.67
High	5700	21.89
Worst		22.11

8.3.8. 802.11n HT20 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5500	22.22
Mid	5580	21.98
High	5700	22.06
Worst		22.22

8.3.9. 802.11n HT40 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5510	43.06
Mid	5590	43.37
High	5670	42.88
Worst		43.37

8.3.10. 802.11a MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5745	21.56
Mid	5785	21.54
High	5825	21.38
Worst		21.56

8.3.11. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5745	21.98
Mid	5785	22.27
High	5825	21.86
Worst		22.27

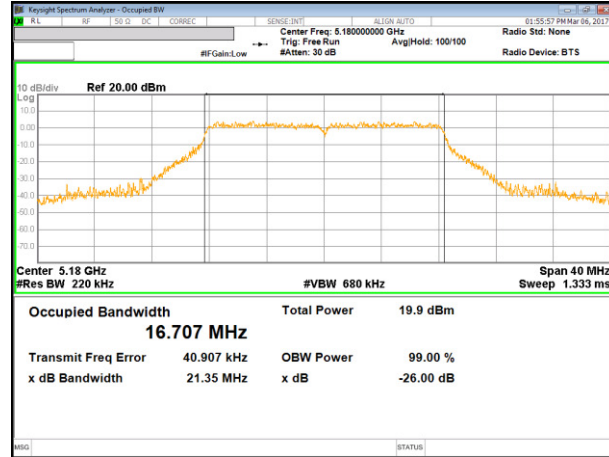
8.3.12. 802.11n HT40 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]
Low	5755	42.29
High	5795	42.54
Worst		42.54

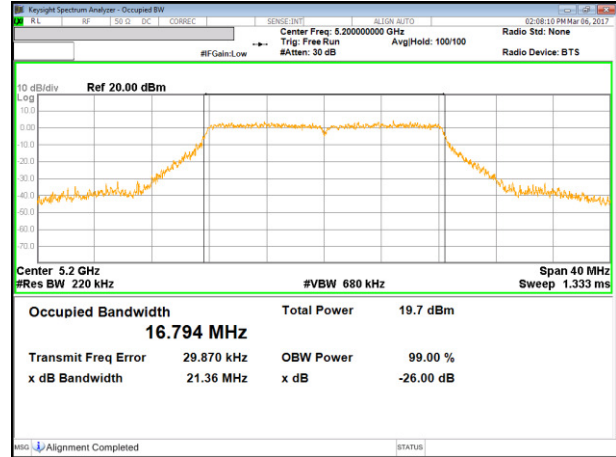
8.3.13. 26 dB BANDWIDTH PLOTS

UNII 5.2 GHz IEEE 802.11a mode

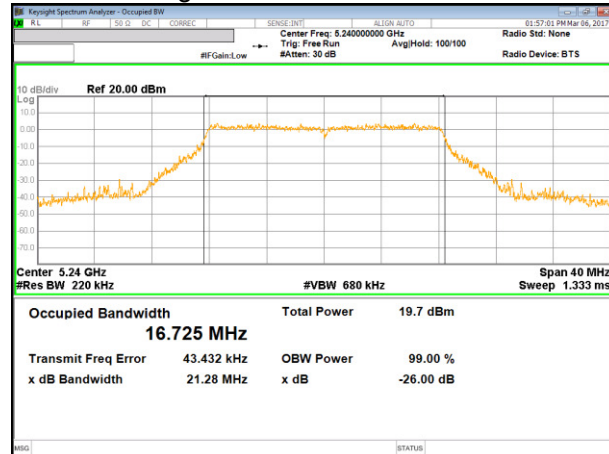
11a Mode Low Channel



11a Mode Middle Channel

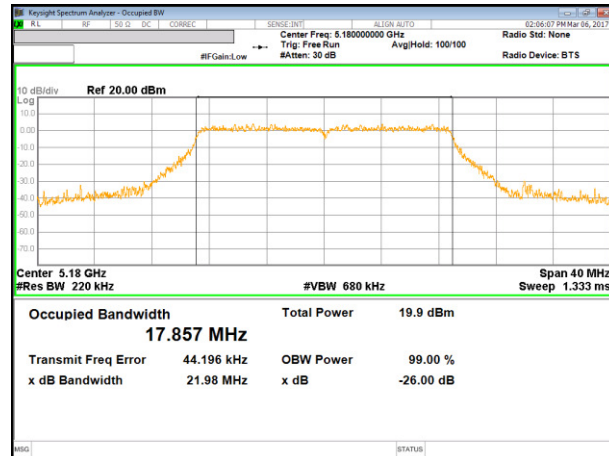


11a Mode High Channel

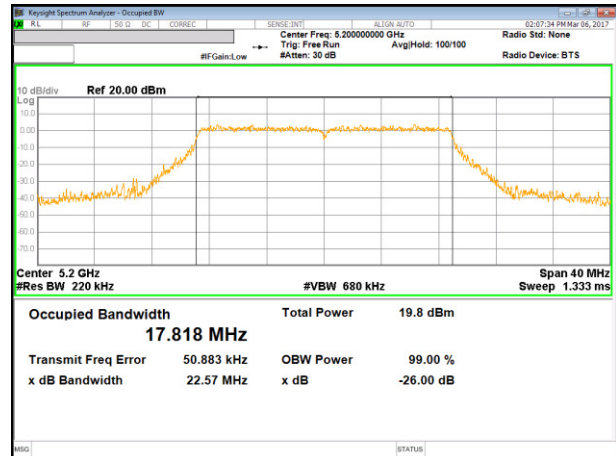


UNII 5.2 GHz IEEE 802.11n HT20 mode

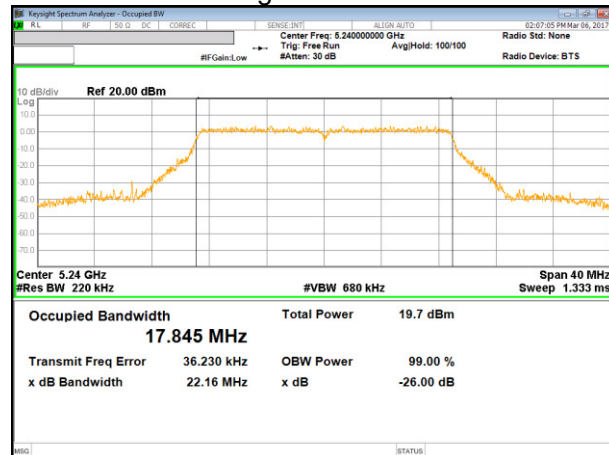
11n HT20 Mode Low Channel



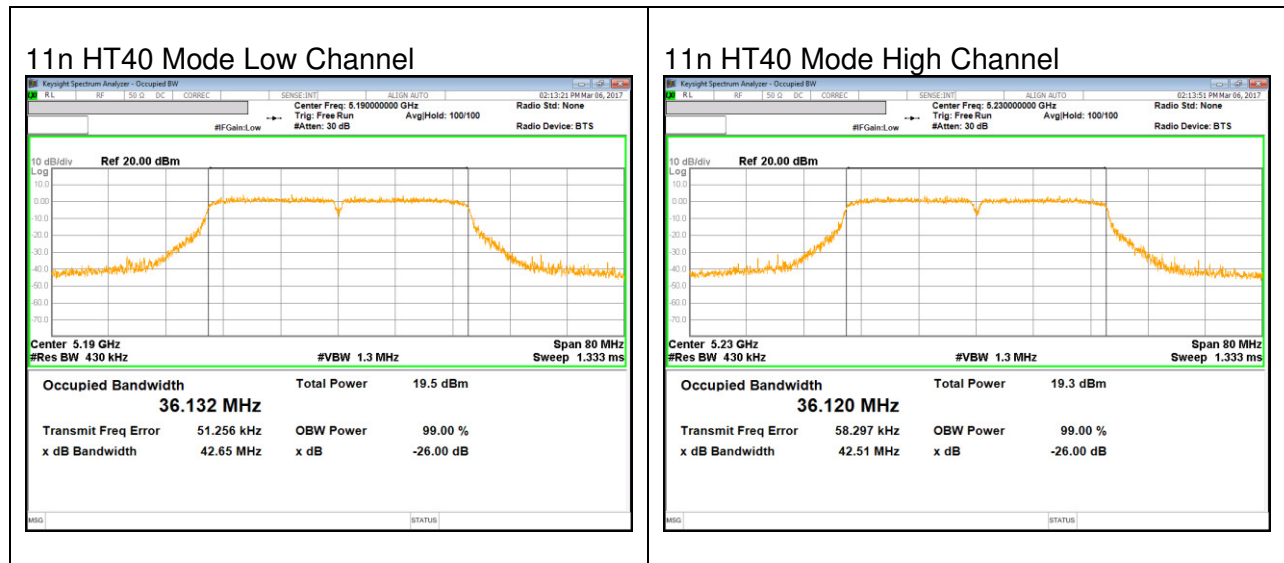
11n HT20 Mode Middle Channel



11n HT20 Mode High Channel

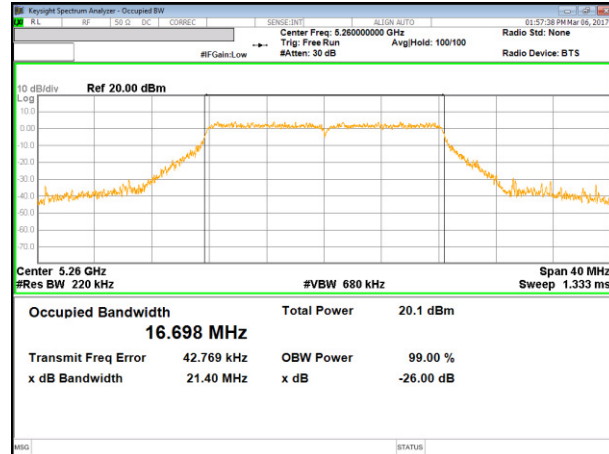


UNII 5.2 GHz IEEE 802.11n HT40 mode

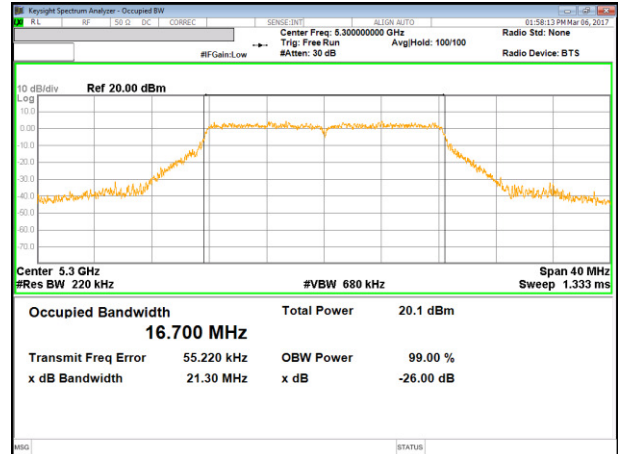


UNII 5.3 GHz IEEE 802.11a mode

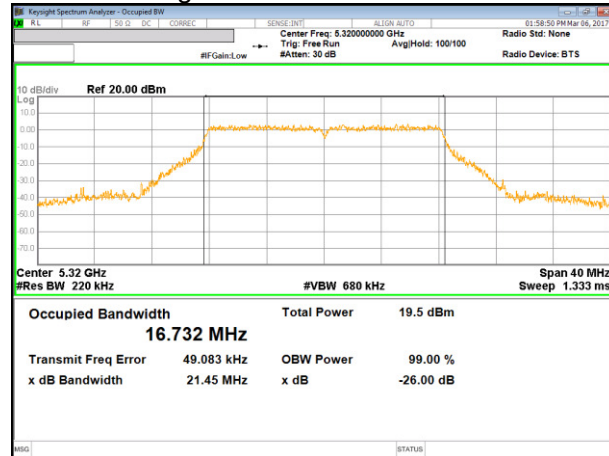
11a Mode Low Channel



11a Mode Middle Channel

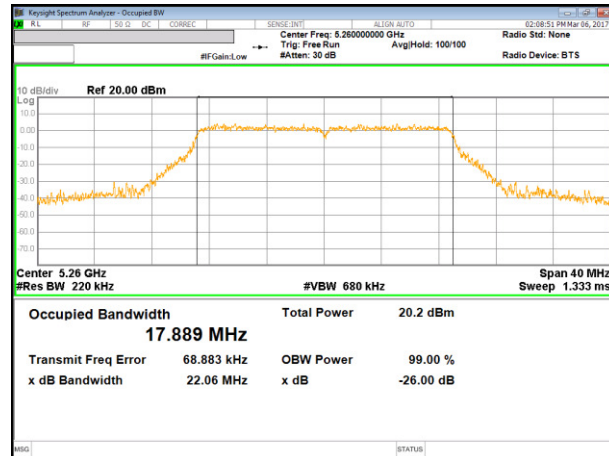


11a Mode High Channel

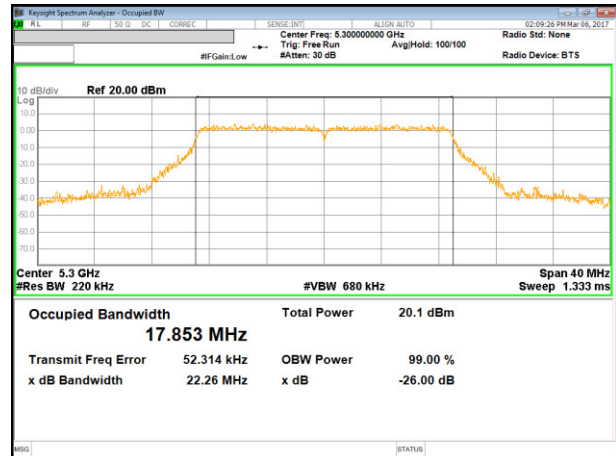


UNII 5.3 GHz IEEE 802.11n HT20 mode

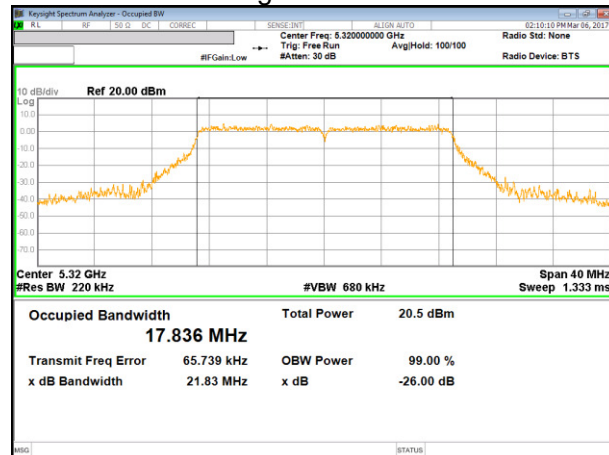
11n HT20 Mode Low Channel



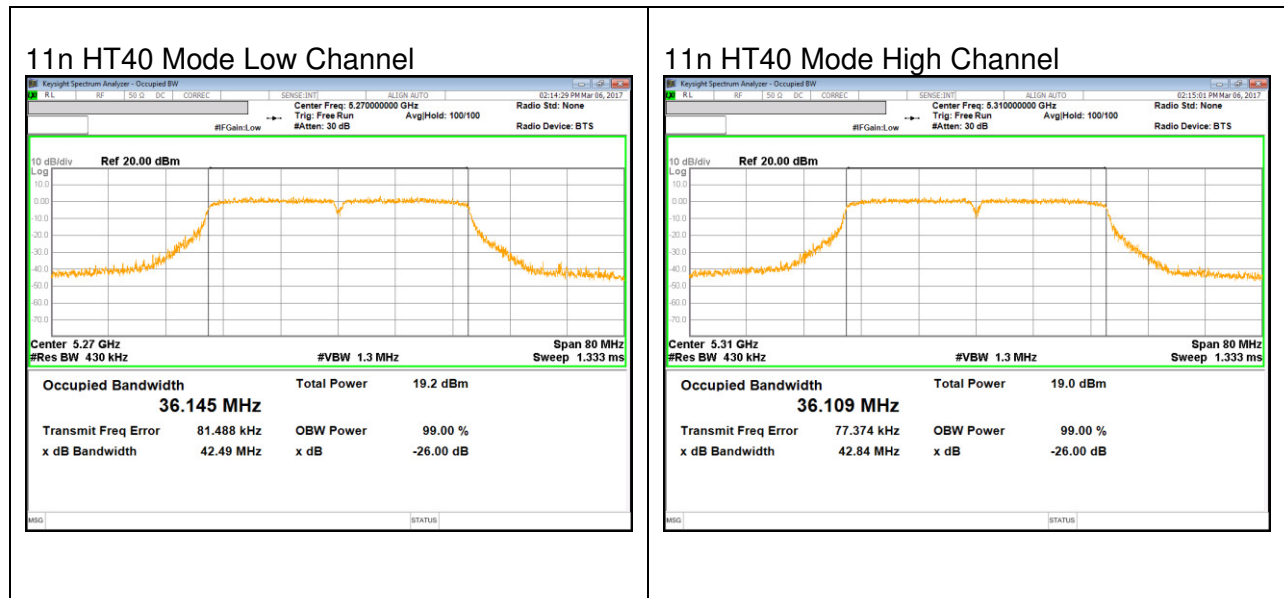
11n HT20 Mode Middle Channel



11n HT20 Mode High Channel

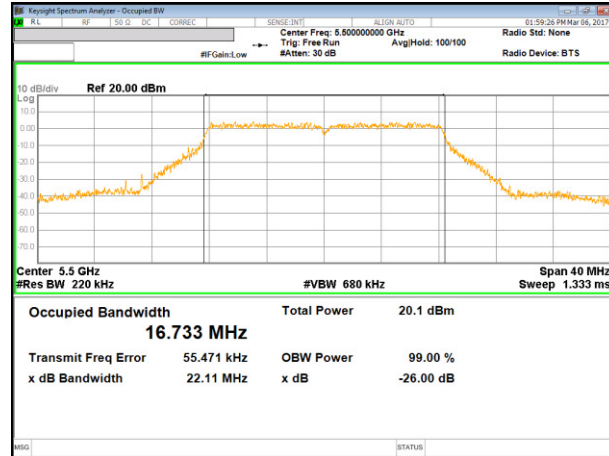


UNII 5.3 GHz IEEE 802.11n HT40 mode

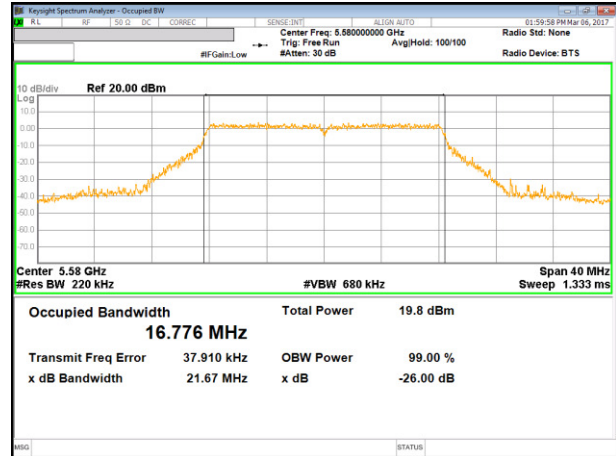


UNII 5.5 GHz IEEE 802.11a mode

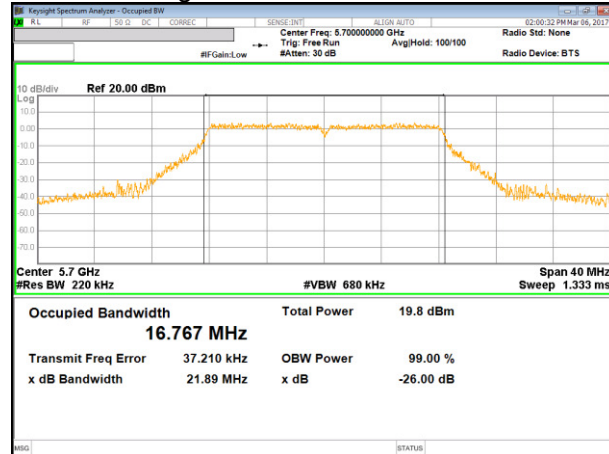
11a Mode Low Channel



11a Mode Middle Channel

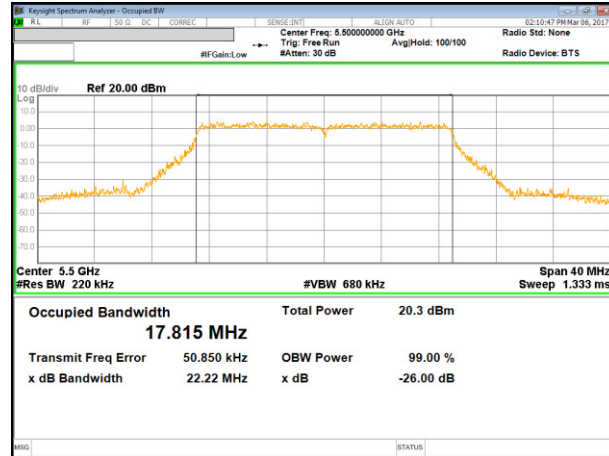


11a Mode High Channel

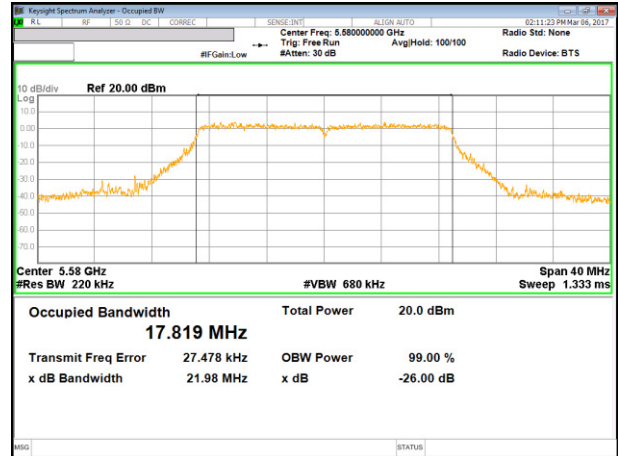


UNII 5.5 GHz IEEE 802.11n HT20 mode

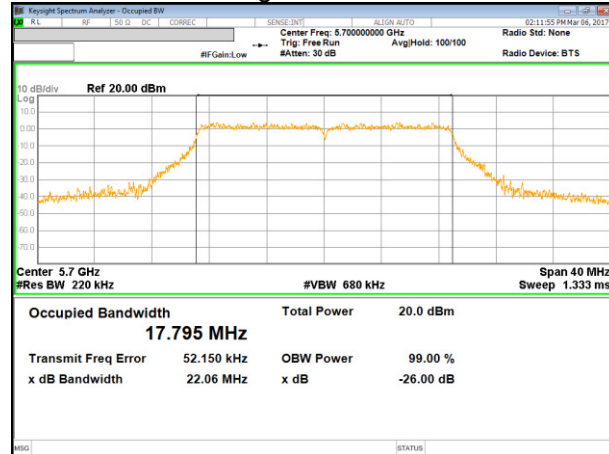
11n HT20 Mode Low Channel



11n HT20 Mode Middle Channel

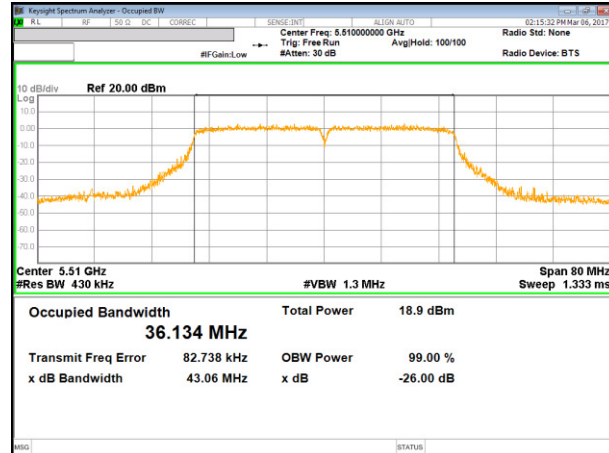


11n HT20 Mode High Channel

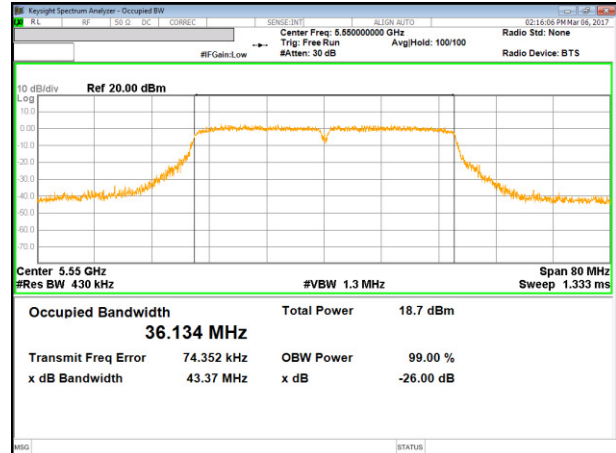


UNII 5.5 GHz IEEE 802.11n HT40 mode

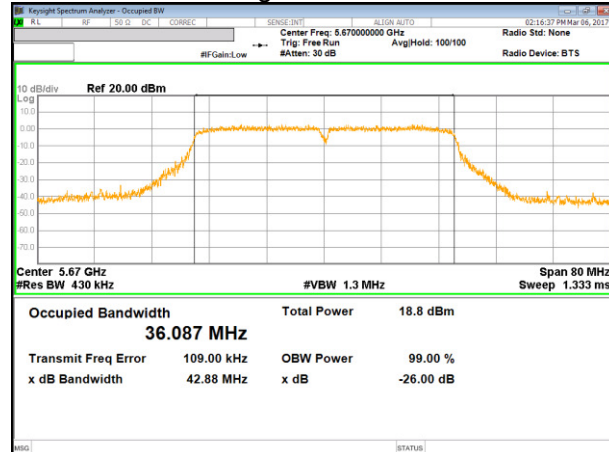
11n HT40 Mode Low Channel



11n HT40 Mode Middle Channel

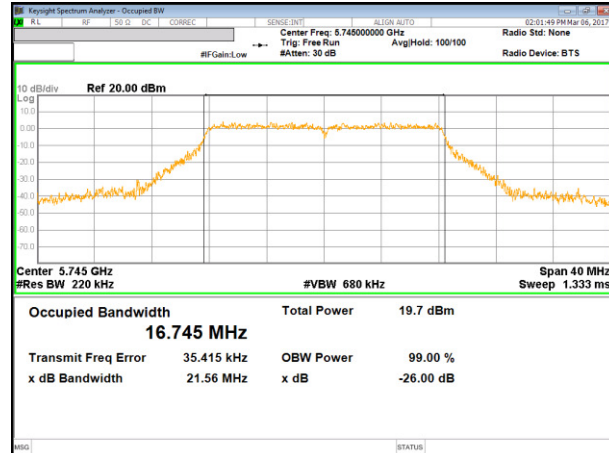


11n HT40 Mode High Channel

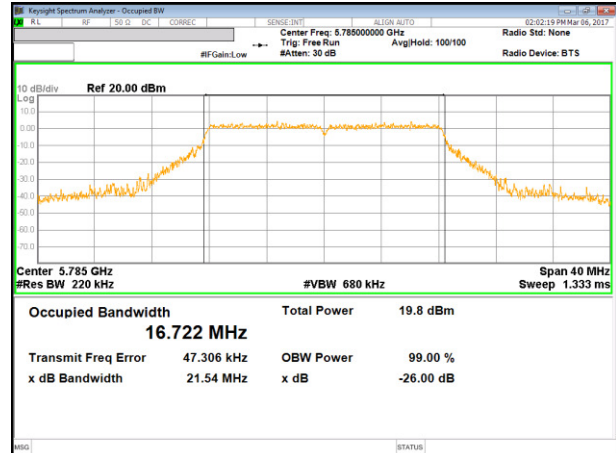


UNII 5.8 GHz IEEE 802.11a mode

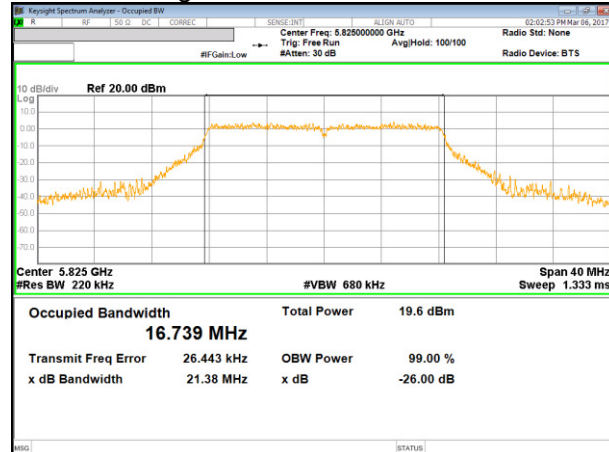
11a Mode Low Channel



11a Mode Middle Channel

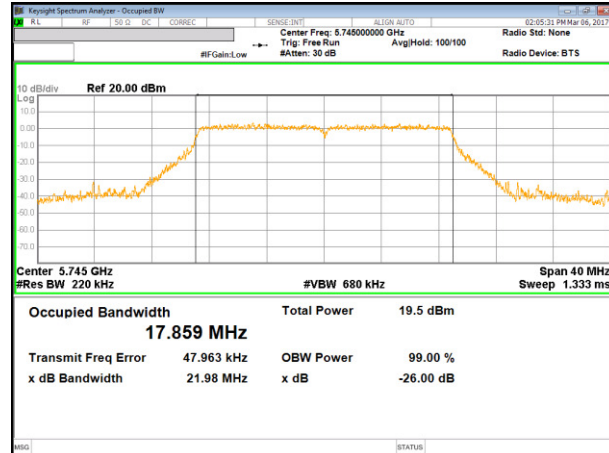


11a Mode High Channel

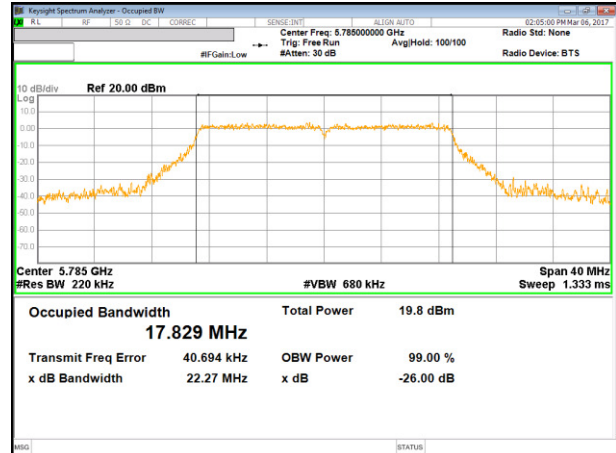


UNII 5.8 GHz IEEE 802.11n HT20 mode

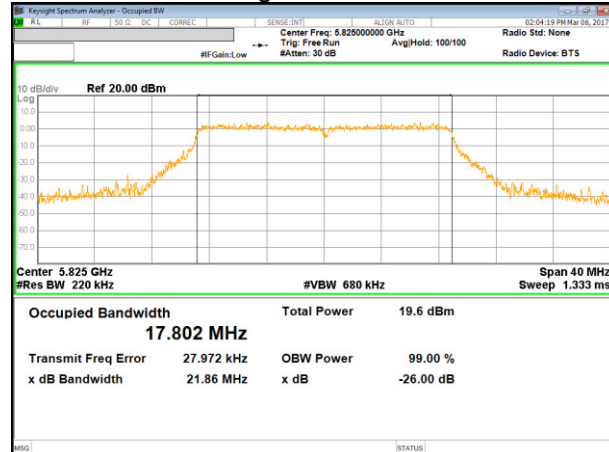
11n HT20 Mode Low Channel



11n HT20 Mode Middle Channel

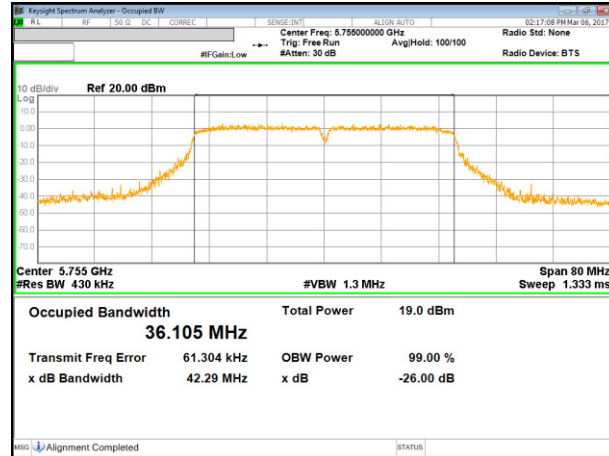


11n HT20 Mode High Channel

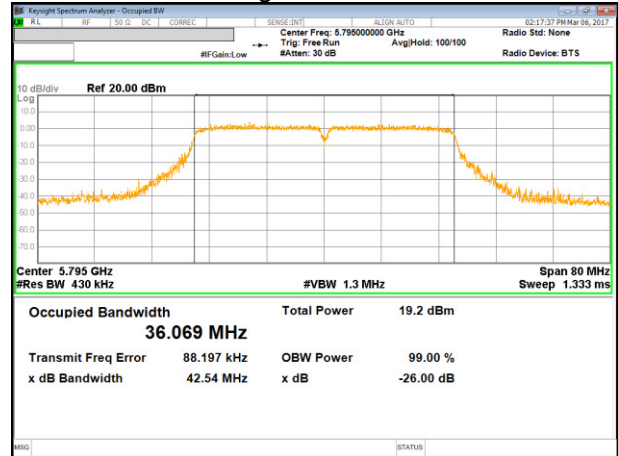


UNII 5.8 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel



11n HT40 Mode High Channel



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 to 100KHz, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

9.1.1. 802.11a MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	5745	16.340	0.5
Mid	5785	16.340	0.5
High	5825	16.370	0.5
Worst		16.340	

9.1.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	5745	17.580	0.5
Mid	5785	17.570	0.5
High	5825	17.580	0.5
Worst		17.570	

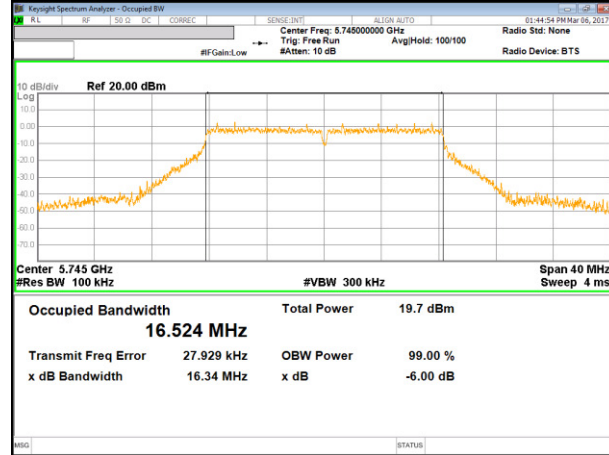
9.1.3. 802.11n HT40 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	5755	35.510	0.5
High	5795	35.090	0.5
Worst		35.090	

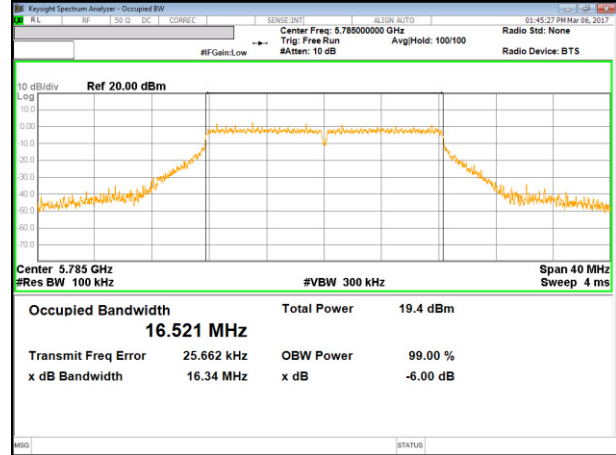
9.1.4. 6 dB BANDWIDTH PLOTS

IEEE 802.11a mode

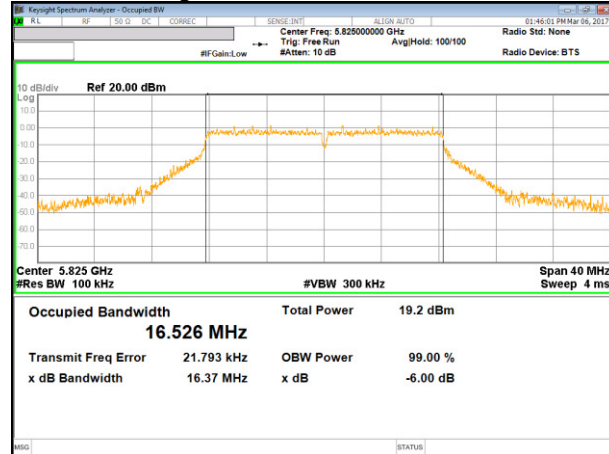
11a Mode Low Channel



11a Mode Middle Channel

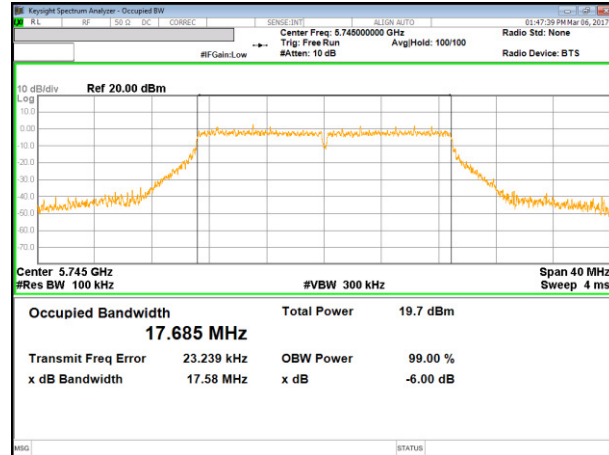


11a Mode High Channel

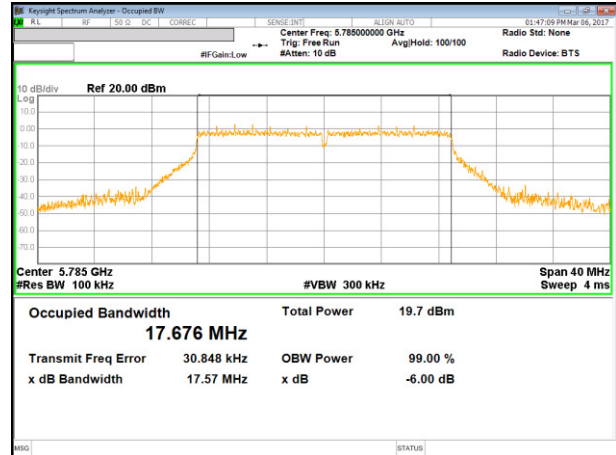


IEEE 802.11n HT20 mode

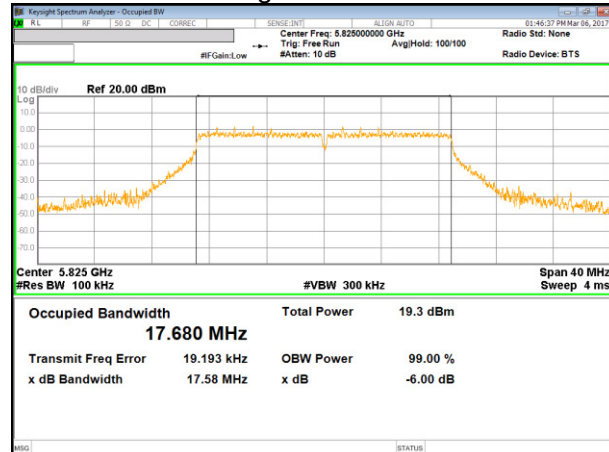
11n HT20 Mode Low Channel



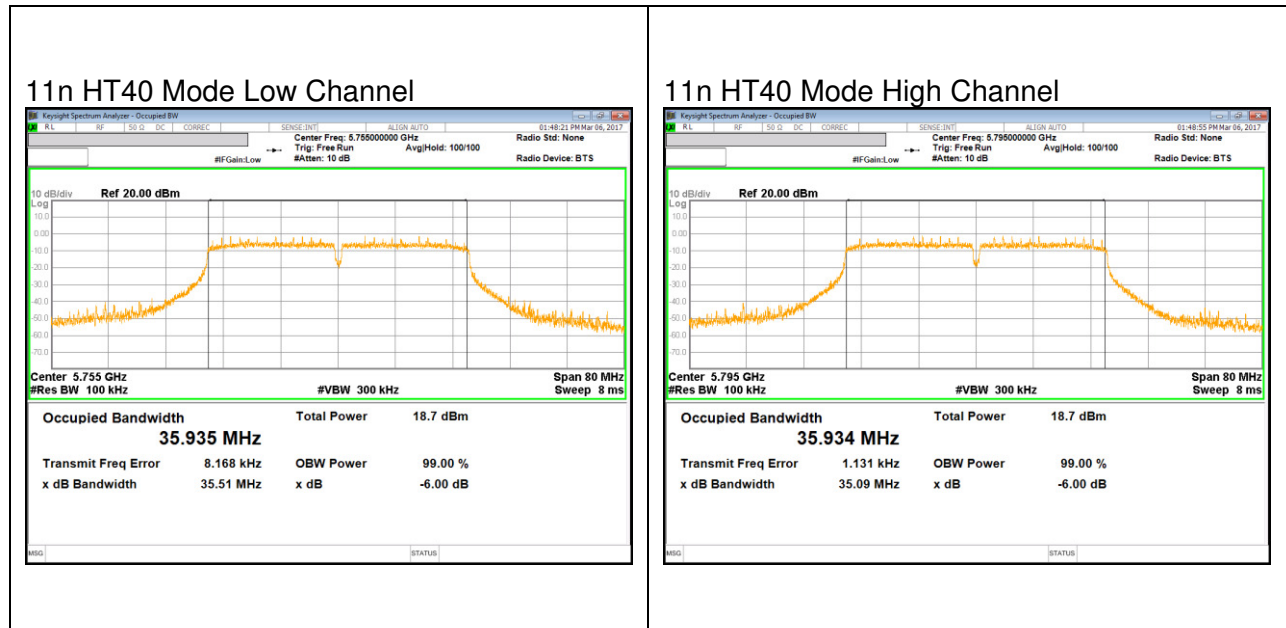
11n HT20 Mode Middle Channel



11n HT20 Mode High Channel



IEEE 802.11n HT40 mode



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 $11 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 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 $11 \text{ dBm} + 10 \log B$, 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

KDB 789033 Method SA-2 is used for PPSD. RBW set to 1MHz (500kHz for the band 5.725-5.85 GHz, the VBW $\geq 3 \times$ RBW, RMS detector and trace averaging). Peak marker value of the spectrum is used for PSD. Add duty cycle correction factor.

KDB 789033 Method PM is used for output power. Duty cycle correction factor is already added to the average output power results.

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	-3.35
5250 - 5350	-3.43
5470 - 5725	-3.01
5725 - 5850	-3.96

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	21.35	-3.35	-3.35
Mid	5200	21.36	-3.35	-3.35
High	5240	21.28	-3.35	-3.35

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]	0.30	Included in Calculations of PPSD
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5180	14.23	24.00	-9.77
Mid	5200	14.04	24.00	-9.96
High	5240	13.81	24.00	-10.19

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5180	3.91	4.21	11.00	-6.79
Mid	5200	3.73	4.03	11.00	-6.97
High	5240	3.76	4.05	11.00	-6.95

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	21.98	-3.35	-3.35
Mid	5200	22.57	-3.35	-3.35
High	5240	22.16	-3.35	-3.35

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]	0.32	Included in Calculations of PPSP
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5180	13.76	24.00	-10.24
Mid	5200	13.72	24.00	-10.28
High	5240	13.66	24.00	-10.34

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5180	3.49	3.81	11.00	-7.19
Mid	5200	3.60	3.91	11.00	-7.09
High	5240	3.40	3.71	11.00	-7.29

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	42.65	-3.35	-3.35
High	5230	42.51	-3.35	-3.35

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]	0.63	Included in Calculations of PPSD
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5190	13.12	24.00	-10.88
High	5230	13.11	24.00	-10.89

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5190	-0.03	0.61	11.00	-10.39
High	5230	-0.26	0.37	11.00	-10.63

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	21.40	-3.43	-3.43
Mid	5300	21.30	-3.43	-3.43
High	5320	21.45	-3.43	-3.43

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]	0.30	Included in Calculations of PPSD
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5260	14.21	24.00	-9.79
Mid	5300	14.12	24.00	-9.88
High	5320	13.64	24.00	-10.36

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5260	3.91	4.21	11.00	-6.79
Mid	5300	3.76	4.06	11.00	-6.94
High	5320	3.37	3.66	11.00	-7.34

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	22.06	-3.43	-3.43
Mid	5300	22.26	-3.43	-3.43
High	5320	21.83	-3.43	-3.43

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]	0.32	Included in Calculations of PPSP
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5260	14.04	24.00	-9.96
Mid	5300	13.96	24.00	-10.04
High	5320	14.42	24.00	-9.58

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5260	3.92	4.24	11.00	-6.76
Mid	5300	3.58	3.90	11.00	-7.10
High	5320	3.94	4.26	11.00	-6.74

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	42.49	-3.43	-3.43
High	5310	42.84	-3.43	-3.43

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]	0.63	Included in Calculations of PPSD
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5270	12.96	24.00	-11.04
High	5310	12.97	24.00	-11.03

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5270	-0.38	0.26	11.00	-10.74
High	5310	-0.85	-0.21	11.00	-11.21

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	22.11	-3.01	-3.01
Mid	5580	21.67	-3.01	-3.01
High	5700	21.89	-3.01	-3.01

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]	0.30	Included in Calculations of PPSP
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5500	14.24	24.00	-9.76
Mid	5580	14.00	24.00	-10.00
High	5700	13.82	24.00	-10.18

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5500	3.98	4.28	11.00	-6.72
Mid	5580	3.67	3.97	11.00	-7.03
High	5700	3.49	3.79	11.00	-7.21

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	22.22	-3.01	-3.01
Mid	5580	21.98	-3.01	-3.01
High	5700	22.06	-3.01	-3.01

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]	0.32	Included in Calculations of PPSP
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5500	14.12	24.00	-9.88
Mid	5580	13.85	24.00	-10.15
High	5700	13.84	24.00	-10.16

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5500	3.73	4.04	11.00	-6.96
Mid	5580	3.56	3.87	11.00	-7.13
High	5700	3.61	3.92	11.00	-7.08

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	43.06	-3.01	-3.01
Mid	5590	43.37	-3.01	-3.01
High	5670	42.88	-3.01	-3.01

Limits

Channel	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm]
Low	5510	24.00	24.00	11.00
Mid	5590	24.00	24.00	11.00
High	5670	24.00	24.00	11.00

Duty Cycle CF [dB]	0.63	Included in Calculations of PPSD
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5510	13.03	24.00	-10.97
Mid	5590	12.86	24.00	-11.14
High	5670	12.69	24.00	-11.31

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5510	-0.93	-0.30	11.00	-11.30
Mid	5590	-1.33	-0.70	11.00	-11.70
High	5670	-0.86	-0.23	11.00	-11.23

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	21.56	-3.96	-3.96
Mid	5785	21.54	-3.96	-3.96
High	5825	21.38	-3.96	-3.96

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]	0.30	Included in Calculations of PPSD
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5745	13.82	24.00	-10.18
Mid	5785	14.01	24.00	-9.99
High	5825	13.81	24.00	-10.19

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5745	0.42	0.72	30.00	-29.28
Mid	5785	0.70	0.99	30.00	-29.01
High	5825	0.63	0.92	30.00	-29.08

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	21.98	-3.96	-3.96
Mid	5785	22.27	-3.96	-3.96
High	5825	21.86	-3.96	-3.96

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]	0.32	Included in Calculations of PPSD
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5745	13.79	24.00	-10.21
Mid	5785	14.01	24.00	-9.99
High	5825	13.79	24.00	-10.21

PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5745	0.18	0.49	30.00	-29.51
Mid	5785	0.42	0.74	30.00	-29.26
High	5825	-0.08	0.24	30.00	-29.76

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	42.29	-3.96	-3.96
High	5795	42.54	-3.96	-3.96

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]	0.63	Included in Calculations of PPSD
--------------------	------	----------------------------------

Output Power Results

Channel	Frequency [MHz]	Meas Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5755	12.71	24.00	-11.29
High	5795	12.90	24.00	-11.10

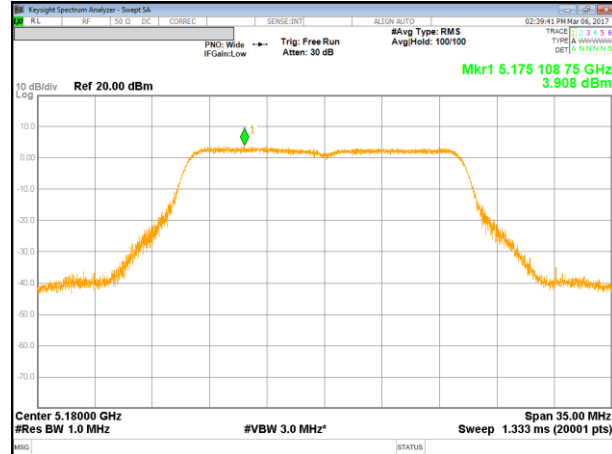
PPSD Results

Channel	Frequency [MHz]	Meas PPSD [dBm]	Total Corr'd PPSD [dBm]	PPSD Limit [dBm]	PPSD Margin [dB]
Low	5755	-3.82	-3.19	30.00	-33.19
High	5795	-3.79	-3.15	30.00	-33.15

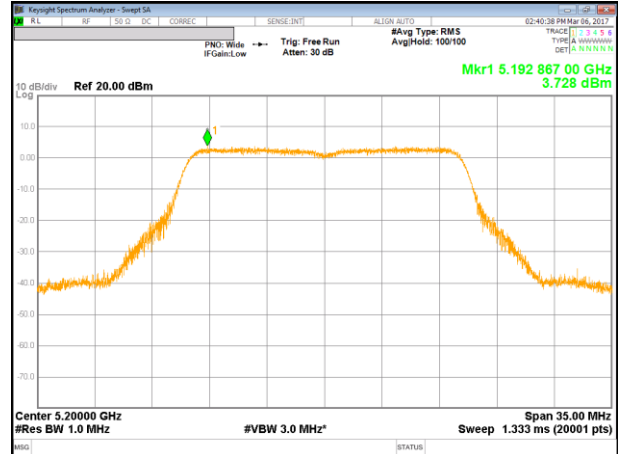
9.2.13. PPSD PLOTS

UNII 5.2 GHz IEEE 802.11a mode

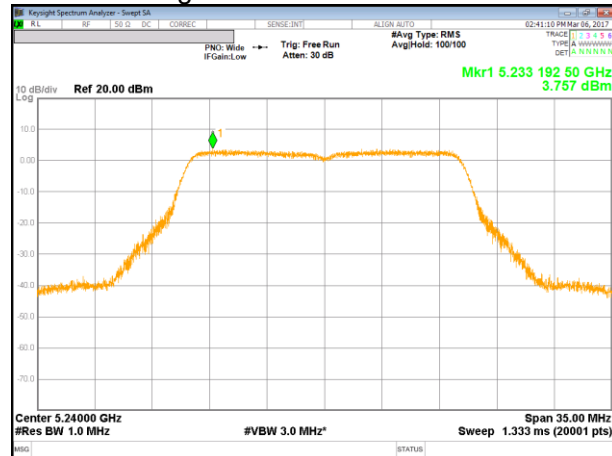
11a Mode Low Channel



11a Mode Middle Channel

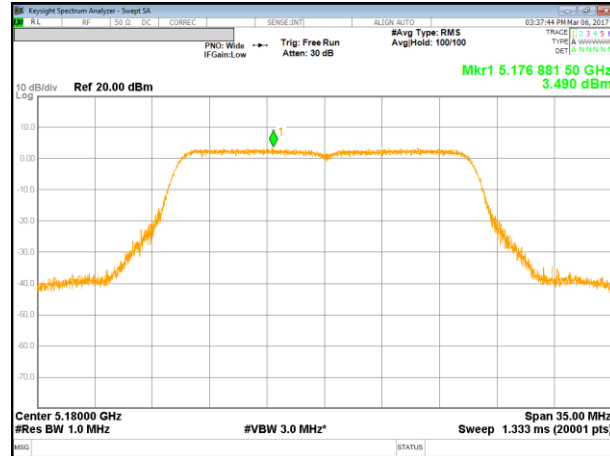


11a Mode High Channel

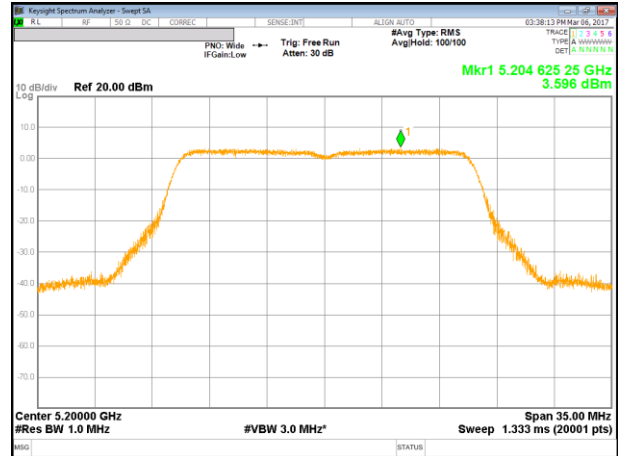


UNII 5.2 GHz IEEE 802.11n HT20 mode

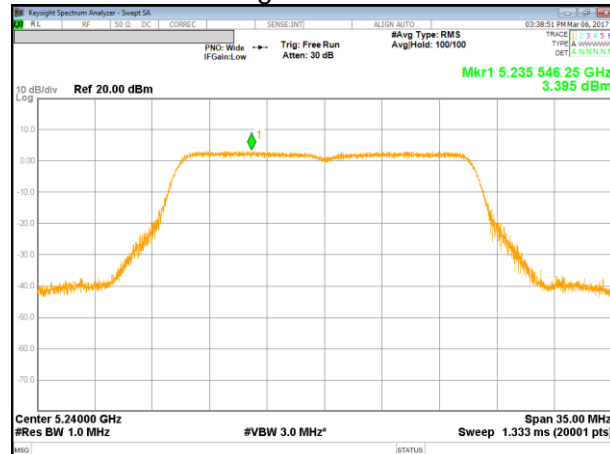
11n HT20 Mode Low Channel



11n HT20 Mode Middle Channel

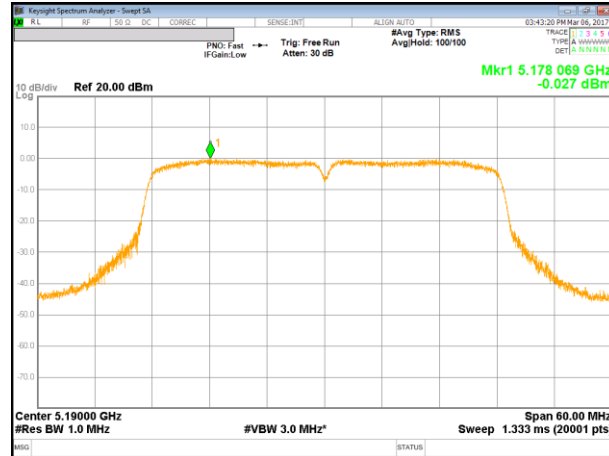


11n HT20 Mode High Channel

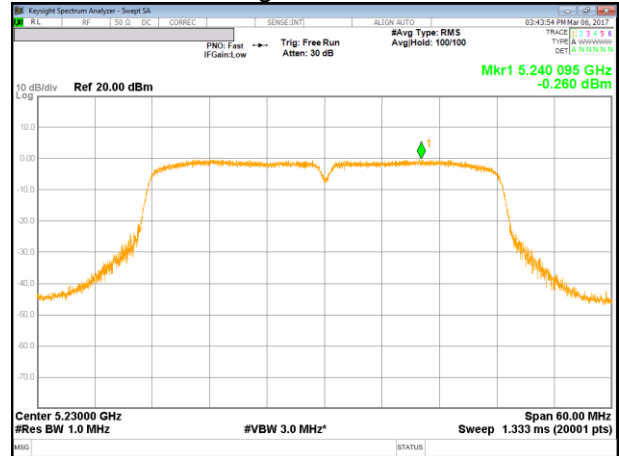


UNII 5.2 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel

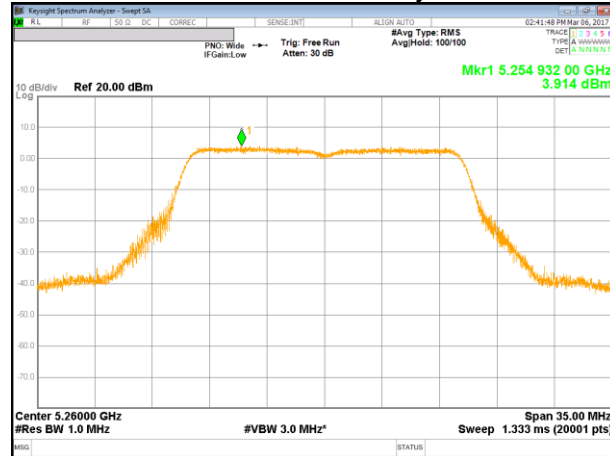


11n HT40 Mode High Channel

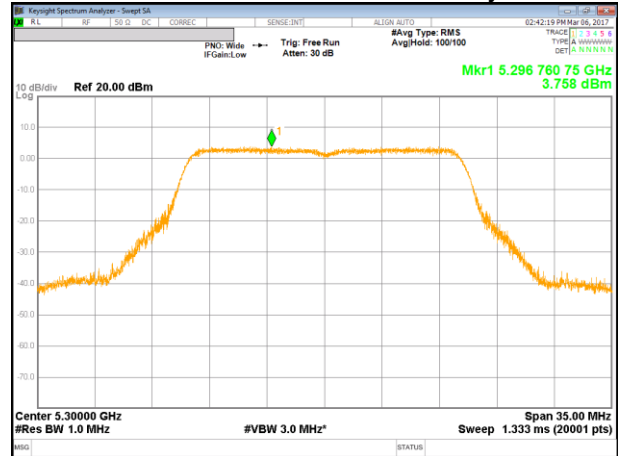


UNII 5.3 GHz IEEE 802.11a mode

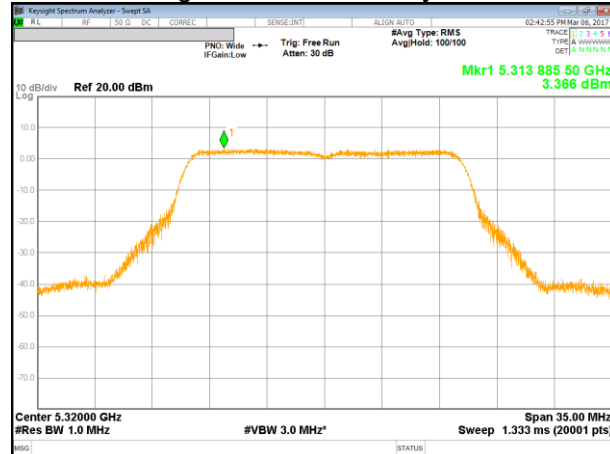
11a Mode Low Channel Primary



11a Mode Middle Channel Secondary

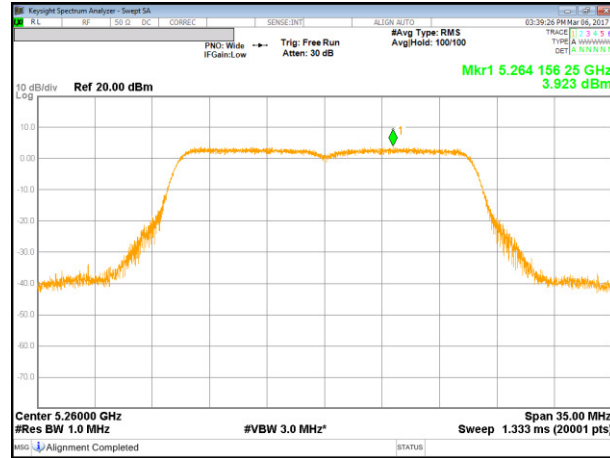


11a Mode High Channel Primary

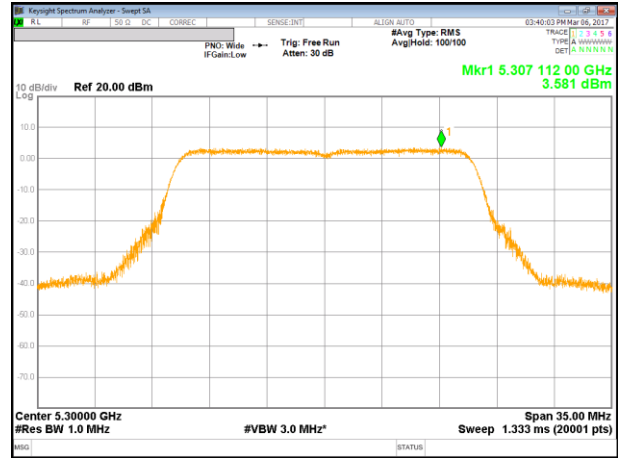


UNII 5.3 GHz IEEE 802.11n HT20 mode

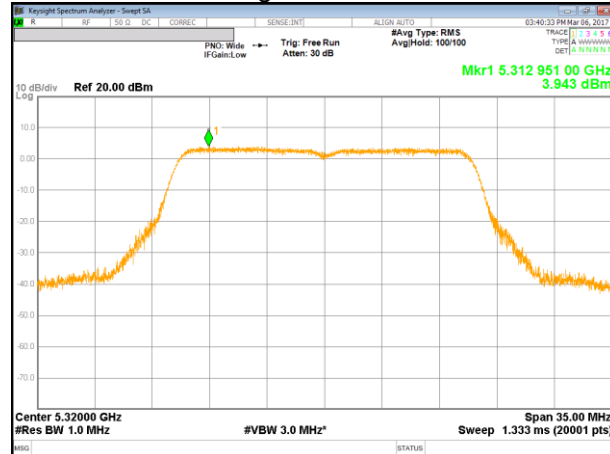
11n HT20 Mode Low Channel



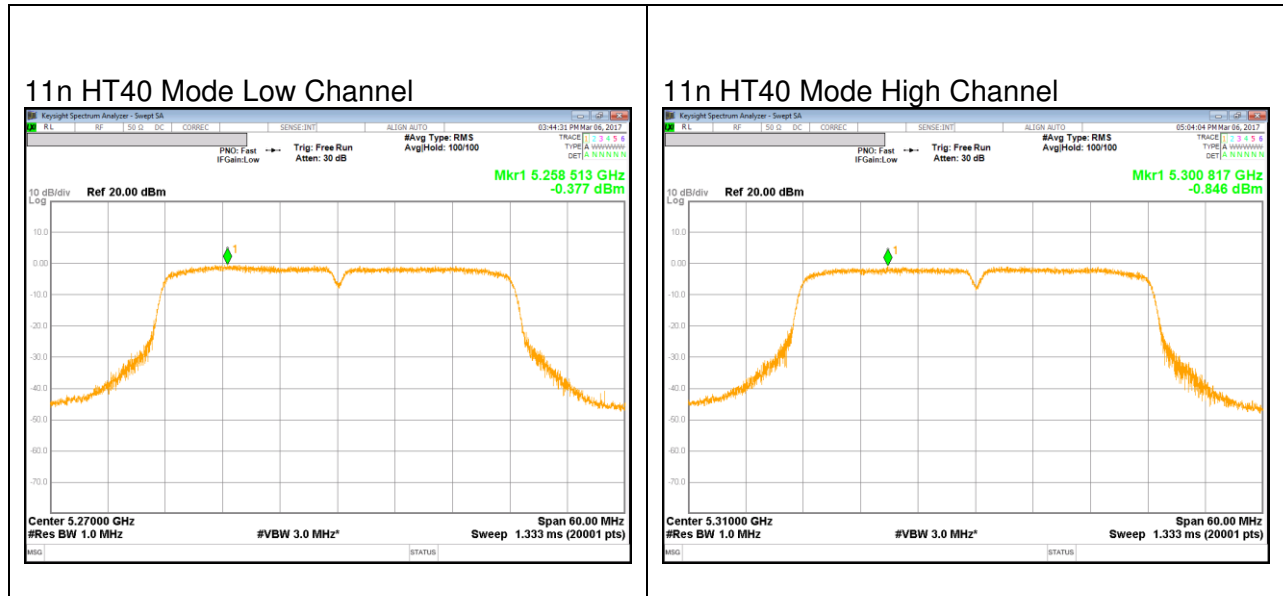
11n HT20 Mode Middle Channel



11n HT20 Mode High Channel

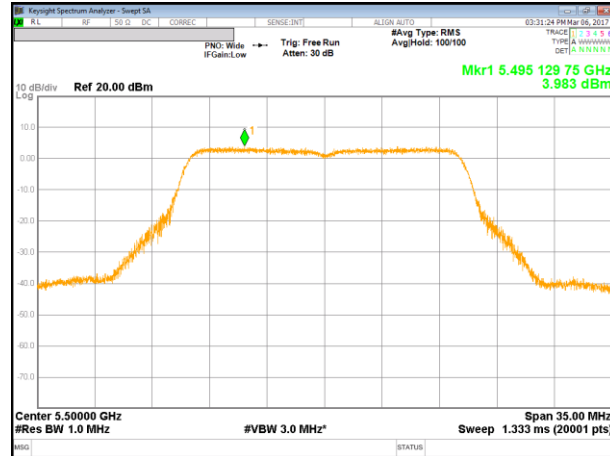


UNII 5.3 GHz IEEE 802.11n HT40 mode

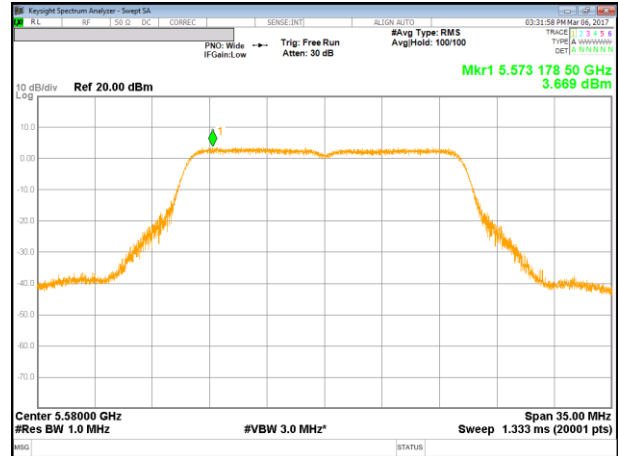


UNII 5.5 GHz IEEE 802.11a mode

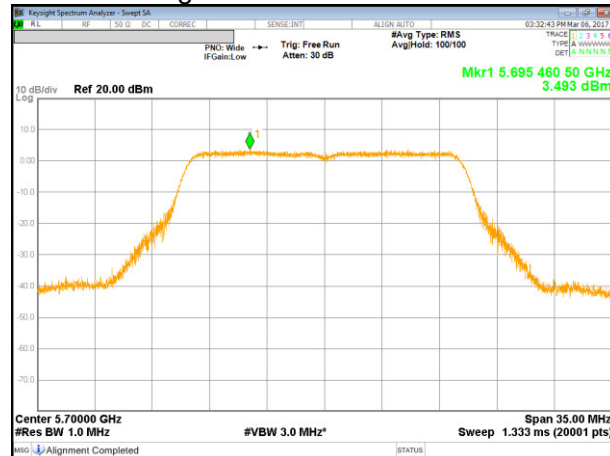
11a Mode Low Channel



11a Mode Middle Channel

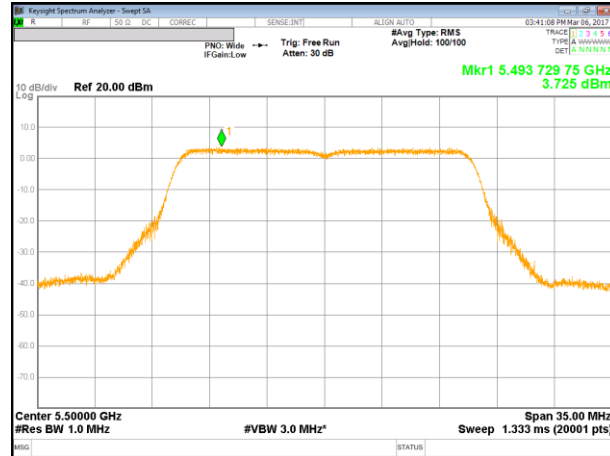


11a Mode High Channel

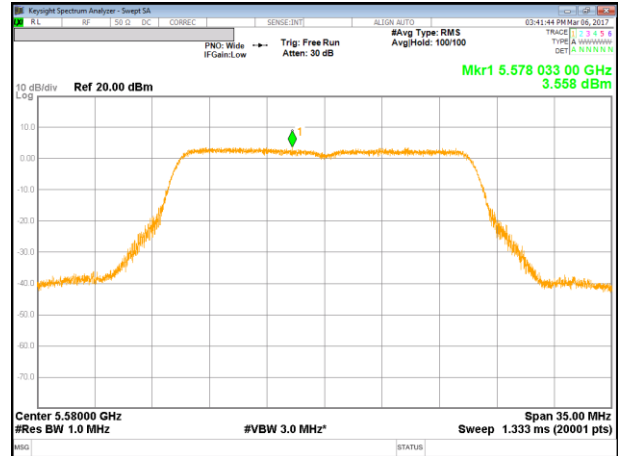


UNII 5.5 GHz IEEE 802.11n HT20 mode

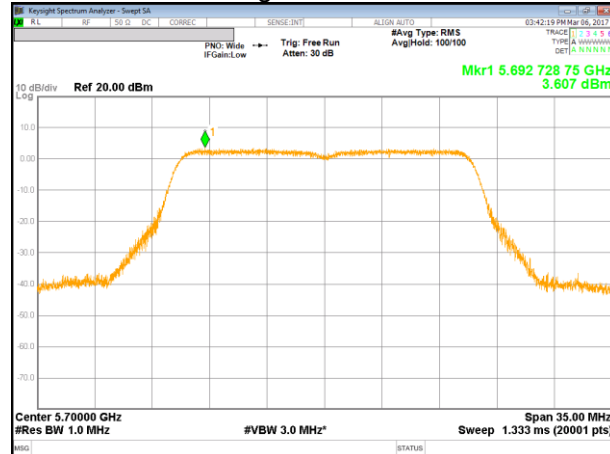
11n HT20 Mode Low Channel



11n HT20 Mode Middle Channel

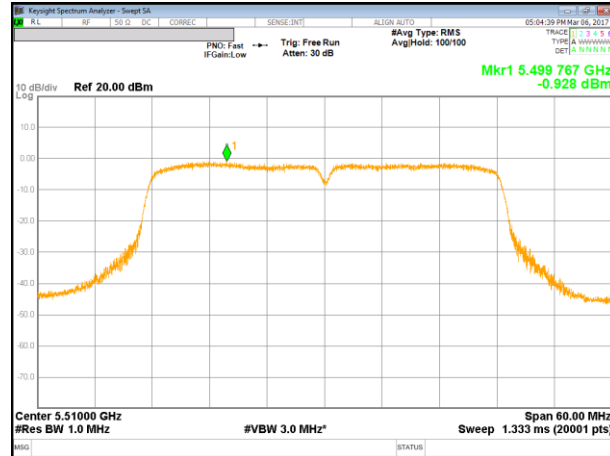


11n HT20 Mode High Channel

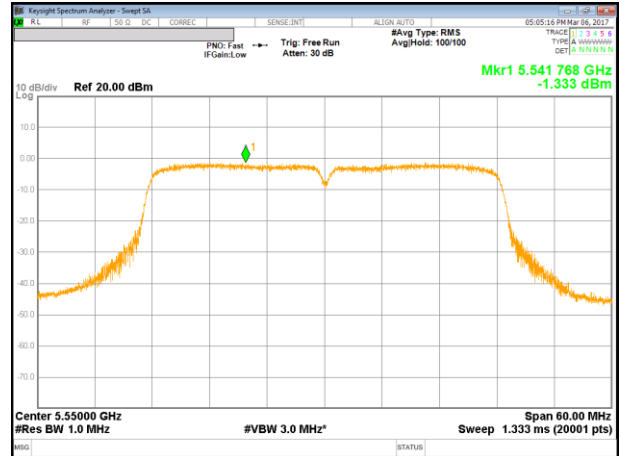


UNII 5.5 GHz IEEE 802.11n HT40 mode

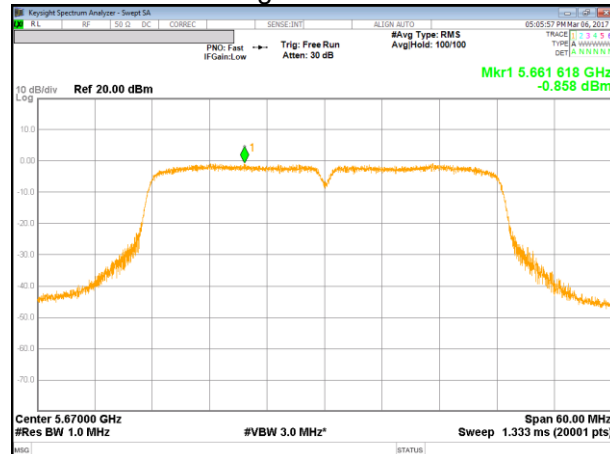
11n HT40 Mode Low Channel



11n HT40 Mode Middle Channel

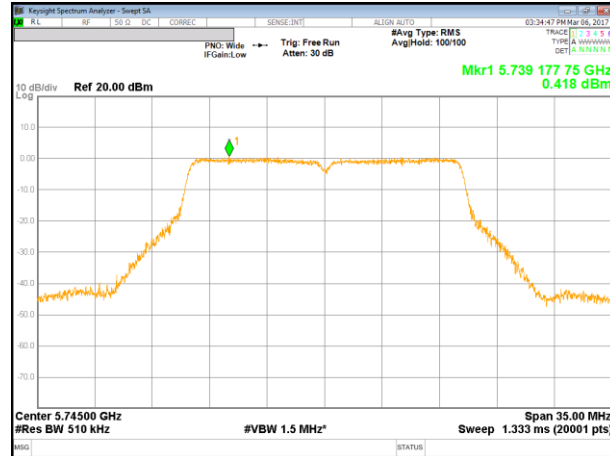


11n HT40 Mode High Channel

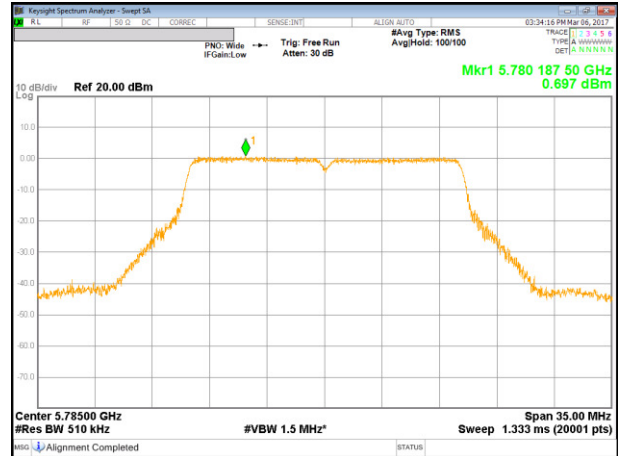


UNII 5.8 GHz IEEE 802.11a mode

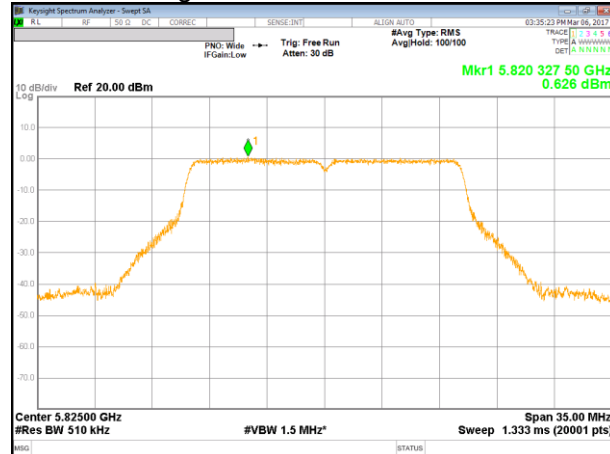
11a Mode Low Channel



11a Mode Middle Channel

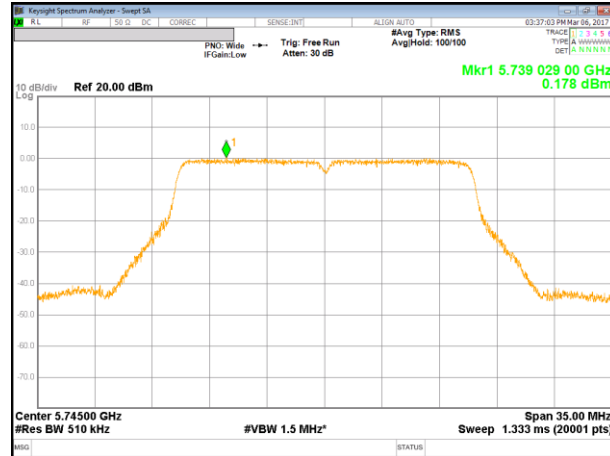


11a Mode High Channel

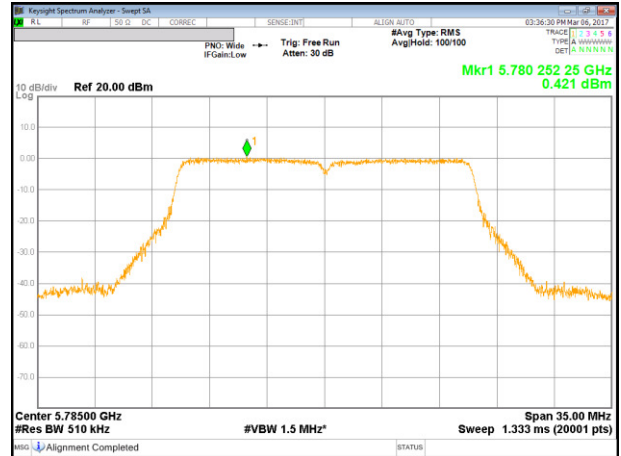


UNII 5.8 GHz IEEE 802.11n HT20 mode

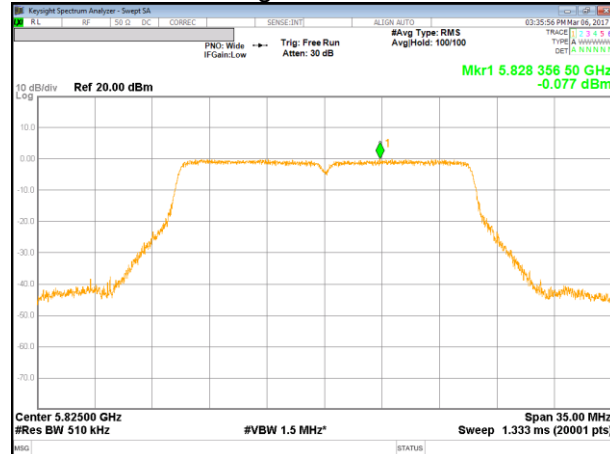
11n HT20 Mode Low Channel



11n HT20 Mode Middle Channel

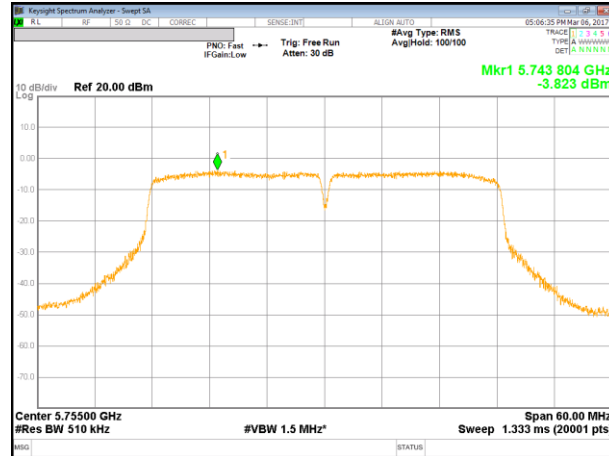


11n HT20 Mode High Channel

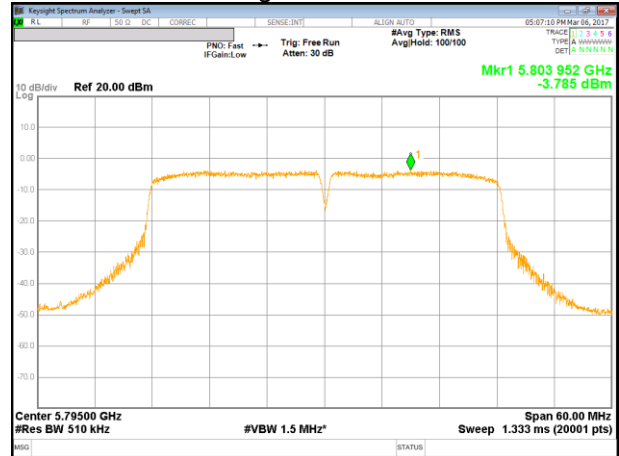


UNII 5.8 GHz IEEE 802.11n HT40 mode

11n HT40 Mode Low Channel



11n HT40 Mode High Channel



10. TRANSMITTER ABOVE 1 GHz

LIMITS

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

FCC §15.407 (b)

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth

in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

Note

- Limit translation to field strength level (FCC §15.407)

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2 = -27\text{dBm} + 95.2 = 68.2\text{dBuV/m}$$

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2 = -17\text{dBm} + 95.2 = 78.2\text{dBuV/m}$$

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Reference to KDB 789033 D02 v01r03 UNII part G) 6) c) Method AD:

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor to the reading offset for average measurements.

Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

The spectrum from 1 GHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Note : Emission was pre-scanned from 9KHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).

Per FCC part 15.31(o), test results were not reported.

Formula for converting the field strength from uV/m to dBuV/m is:

$$\text{Limit (dBuV/m)} = 20 \log \text{limit (uV/m)}$$

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site.

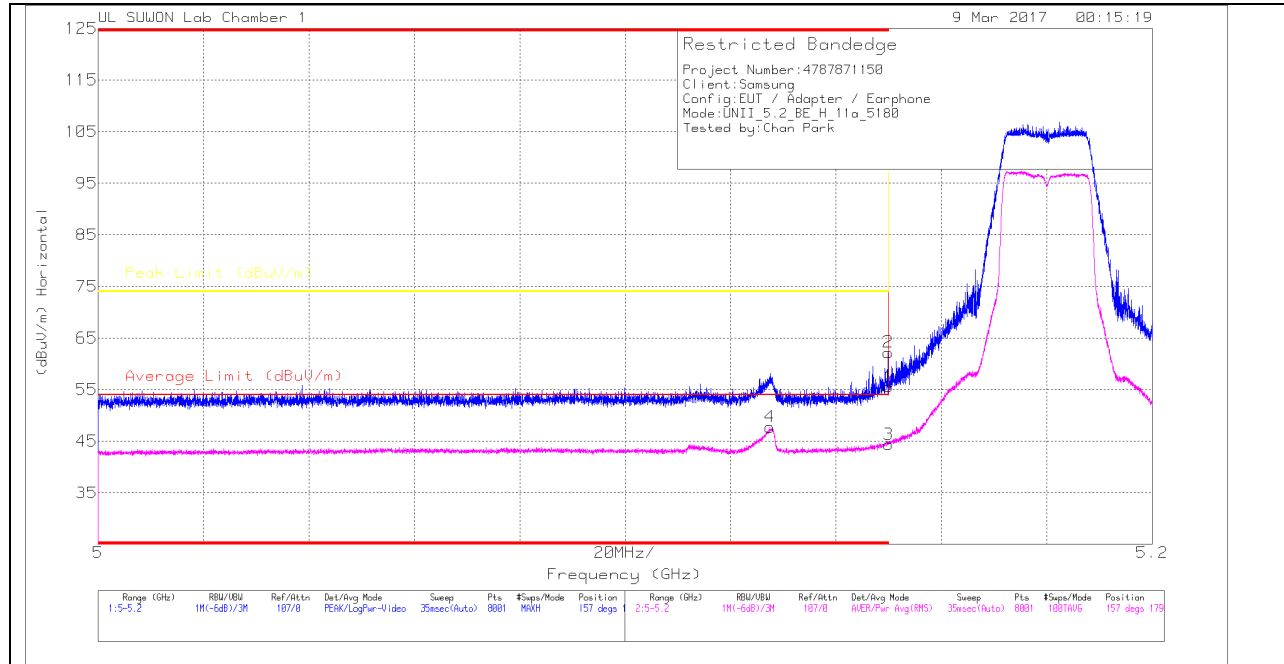
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 937606.

10.1. 5.2 GHz

10.1.1. TX Above 1GHz 802.11a MODE IN THE 5.2GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

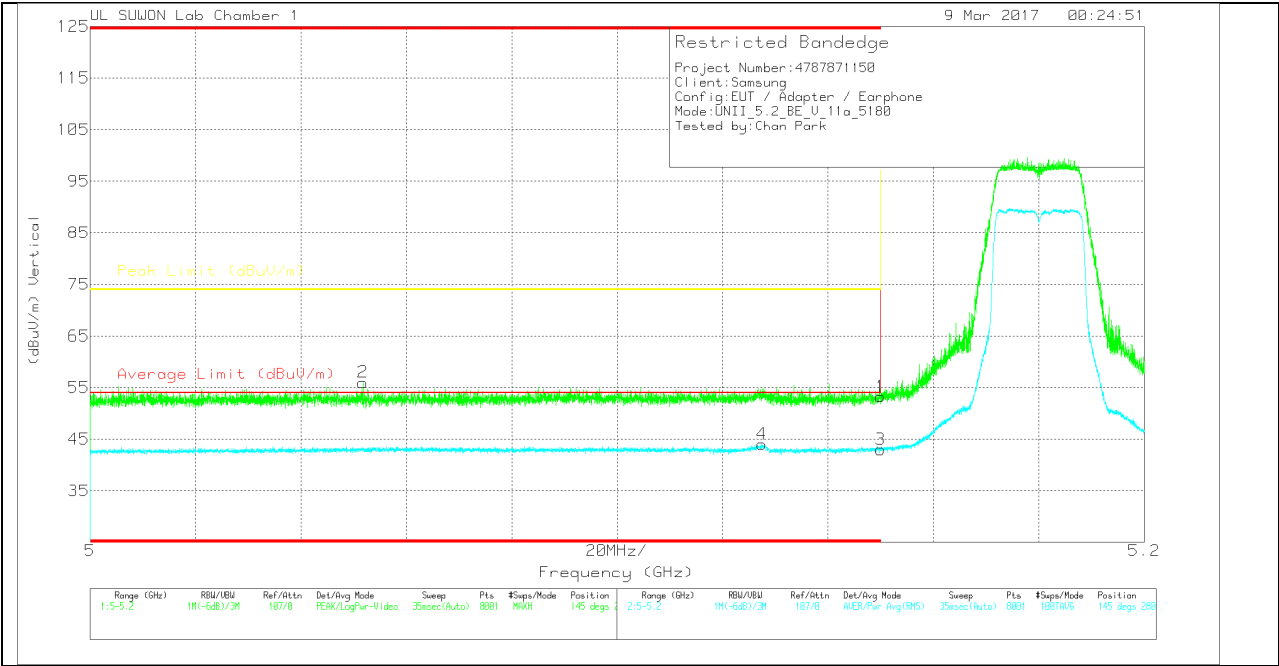
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117/001687 171_150619	10dB_Att(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	45.61	Pk		-24.2	0	55.61	-	-	74	-18.39	157	179	H
2	* 5.15	52.22	Pk		-24.2	0	62.22	-	-	74	-11.78	157	179	H
3	* 5.15	34	RMS		-24.1	.3	44.4	54	-9.6	-	-	157	179	H
4	* 5.127	37.35	RMS		-24.1	.3	47.75	54	-6.25	-	-	157	179	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 717)_15061 9	10dB_Att(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	43.25	Pk		-24.2	0	53.25	-	-	74	-20.75	145	280	V
2	* 5.052	46.32	Pk		-24.4	0	56.02	-	-	74	-17.98	145	280	V
3	* 5.15	32.62	RMS		-24.1	.3	43.02	54	-10.98	-	-	145	280	V
4	* 5.127	33.66	RMS		-24.1	.3	44.06	54	-9.94	-	-	145	280	V

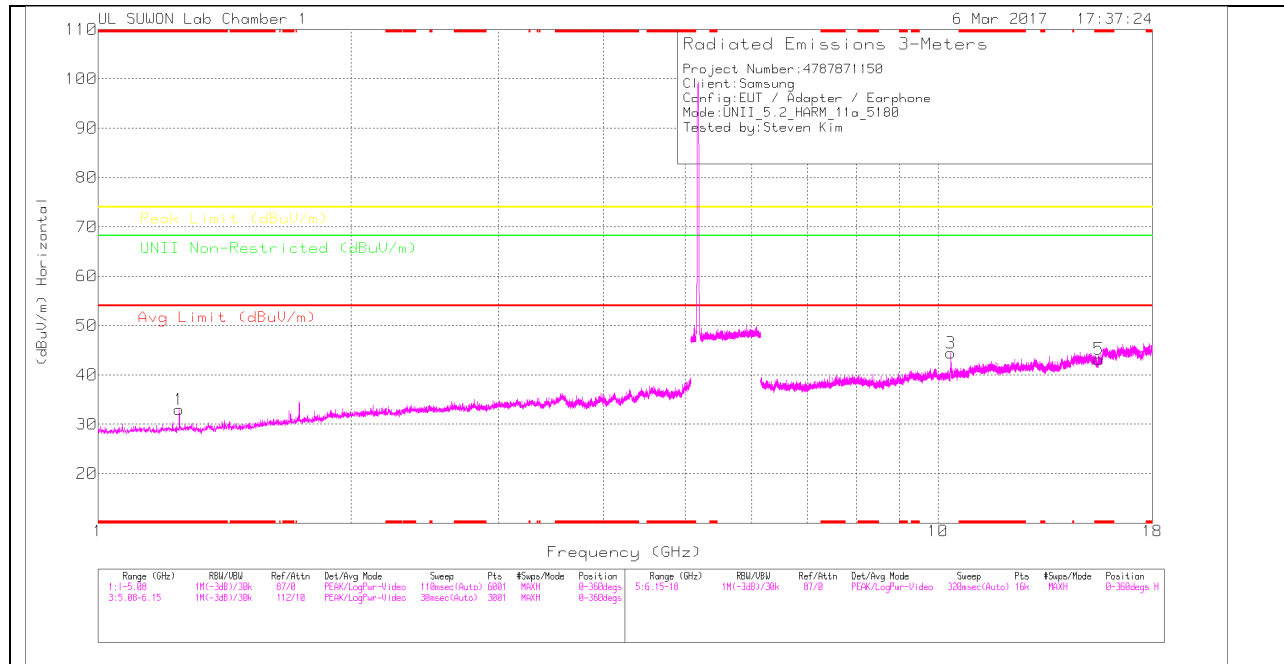
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

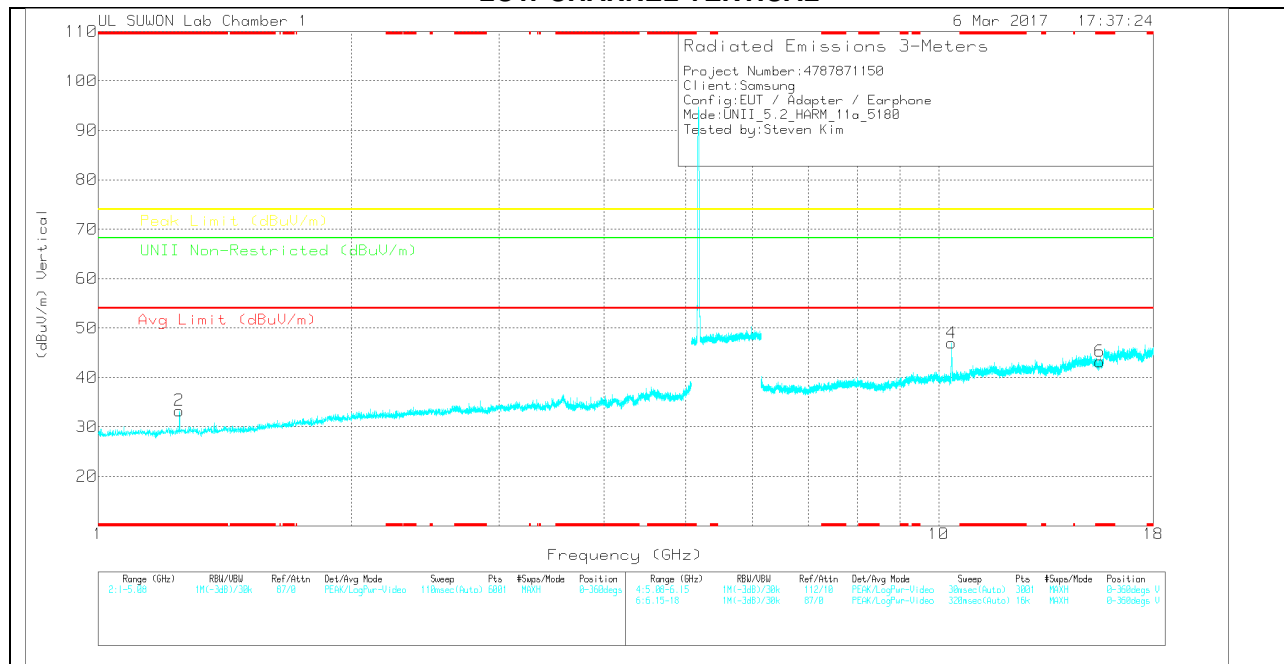
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	5Ghz_LP(d B)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.25	44.27	PK	28.3	-39.6	0	32.97	-	-	74	-41.03	-	-	0-360	150	H
2	* 1.25	44.6	PK	28.3	-39.6	0	33.3	-	-	74	-40.7	-	-	0-360	250	V
3	10.359	34.93	PK	37.8	-28.3	0	44.43	-	-	-	-	68.2	-23.77	0-360	250	H
5	* 15.541	23.09	PK	40.3	-20.2	0	43.19	-	-	74	-30.81	-	-	0-360	150	H
4	10.364	37.37	PK	37.8	-28.2	0	46.97	-	-	-	-	68.2	-21.23	0-360	250	V
6	* 15.538	23.43	PK	40.2	-20.4	0	43.23	-	-	74	-30.77	-	-	0-360	250	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

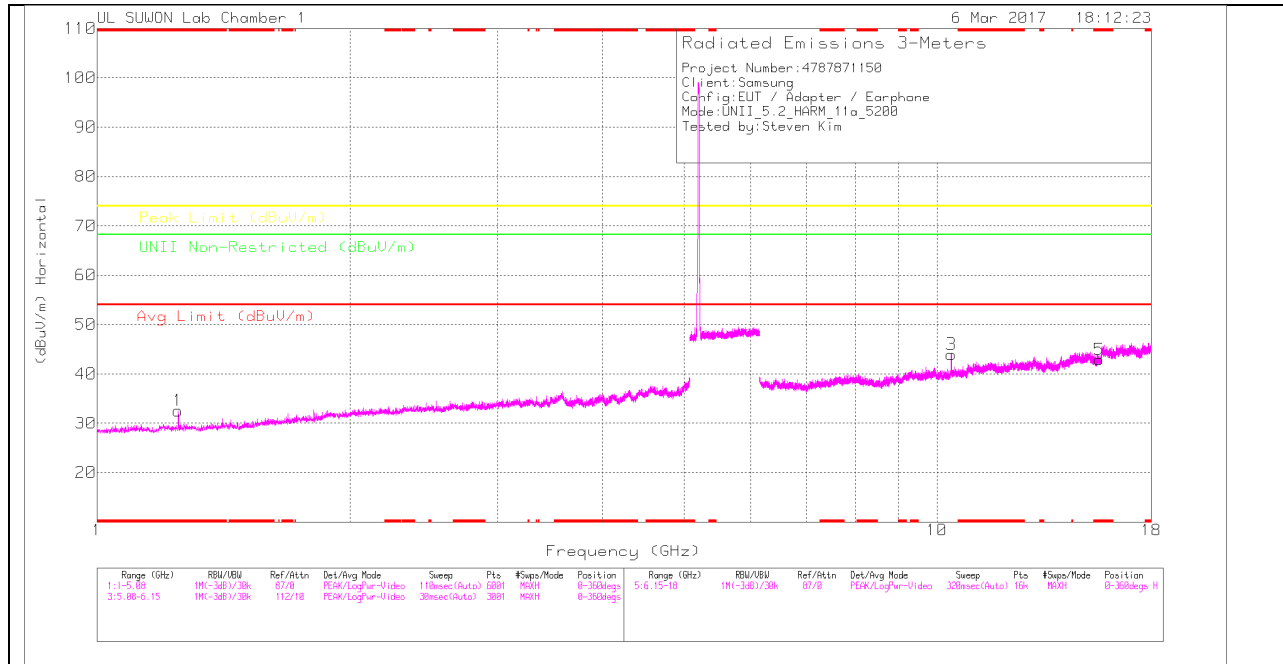
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	6Ghz_HP(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10.363	46.15	PK-U	37.8	-28.3	0	55.65	-	-	-	-	68.2	-12.55	347	260	H
10.36	46.1	PK-U	37.8	-28.3	0	55.6	-	-	-	-	68.2	-12.6	290	236	V

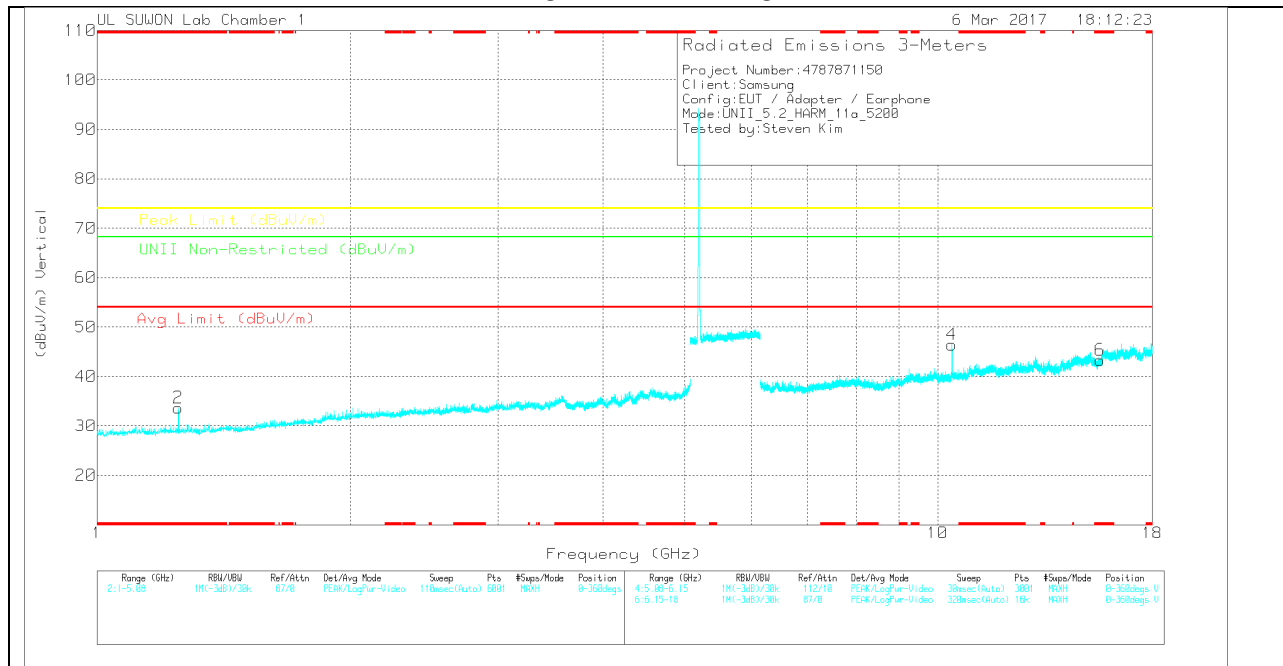
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK-U - U-NII: Maximum Peak

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	5Ghz_LP(d B)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.25	43.84	PK	28.3	-39.6	0	32.54	-	-	74	-41.46	-	-	0-360	150	H
2	* 1.25	44.96	PK	28.3	-39.6	0	33.66	-	-	74	-40.34	-	-	0-360	250	V
3	10.402	33.95	PK	37.8	-27.8	0	43.95	-	-	-	-	68.2	-24.25	0-360	250	H
5	* 15.601	20.98	PK	40.3	-18.4	0	42.88	-	-	74	-31.12	-	-	0-360	250	H
4	10.399	36.42	PK	37.8	-27.8	0	46.42	-	-	-	-	68.2	-21.78	0-360	250	V
6	* 15.603	21.41	PK	40.3	-18.4	0	43.31	-	-	74	-30.69	-	-	0-360	250	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

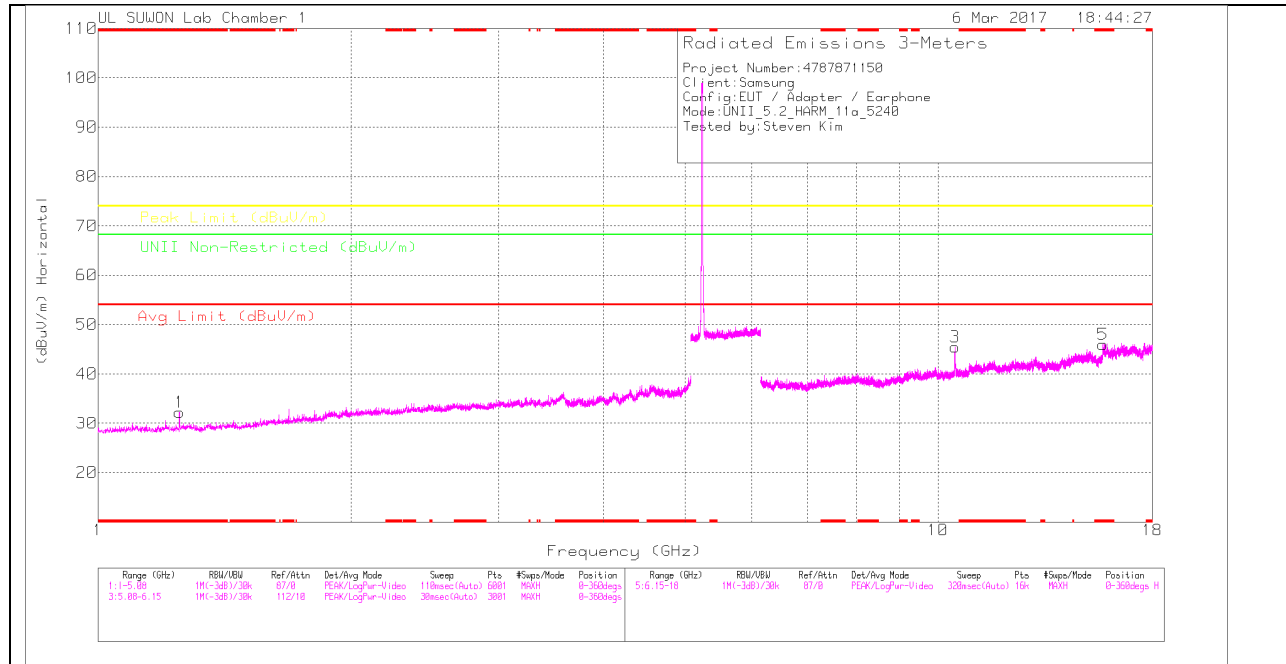
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	6Ghz_HP(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10.402	45.6	PK-U	37.8	-27.8	0	55.6	-	-	-	-	68.2	-12.6	342	287	H
10.4	47.79	PK-U	37.8	-27.8	0	57.79	-	-	-	-	68.2	-10.41	275	251	V

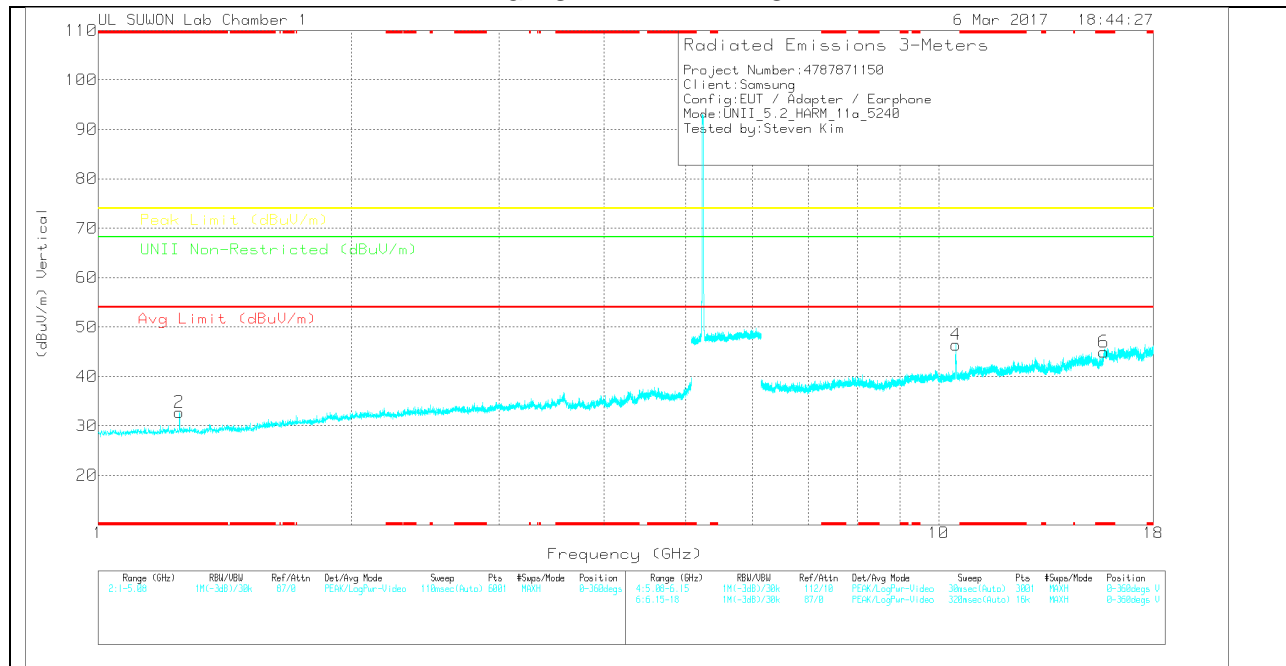
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK-U - U-NII: Maximum Peak

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	5Ghz_LP(d B)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.25	43.51	PK	28.3	-39.6	0	32.21	-	-	74	-41.79	-	-	0-360	150	H
2	* 1.25	44.06	PK	28.3	-39.6	0	32.76	-	-	74	-41.24	-	-	0-360	250	V
3	10.481	36.34	PK	37.8	-28.7	0	45.44	-	-	-	-	68.2	-22.76	0-360	150	H
5	* 15.721	23.37	PK	40.4	-17.8	0	45.97	-	-	74	-28.03	-	-	0-360	150	H
4	10.479	37.41	PK	37.8	-28.8	0	46.41	-	-	-	-	68.2	-21.79	0-360	250	V
6	* 15.724	22.17	PK	40.4	-17.6	0	44.97	-	-	74	-29.03	-	-	0-360	250	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

Radiated Emissions

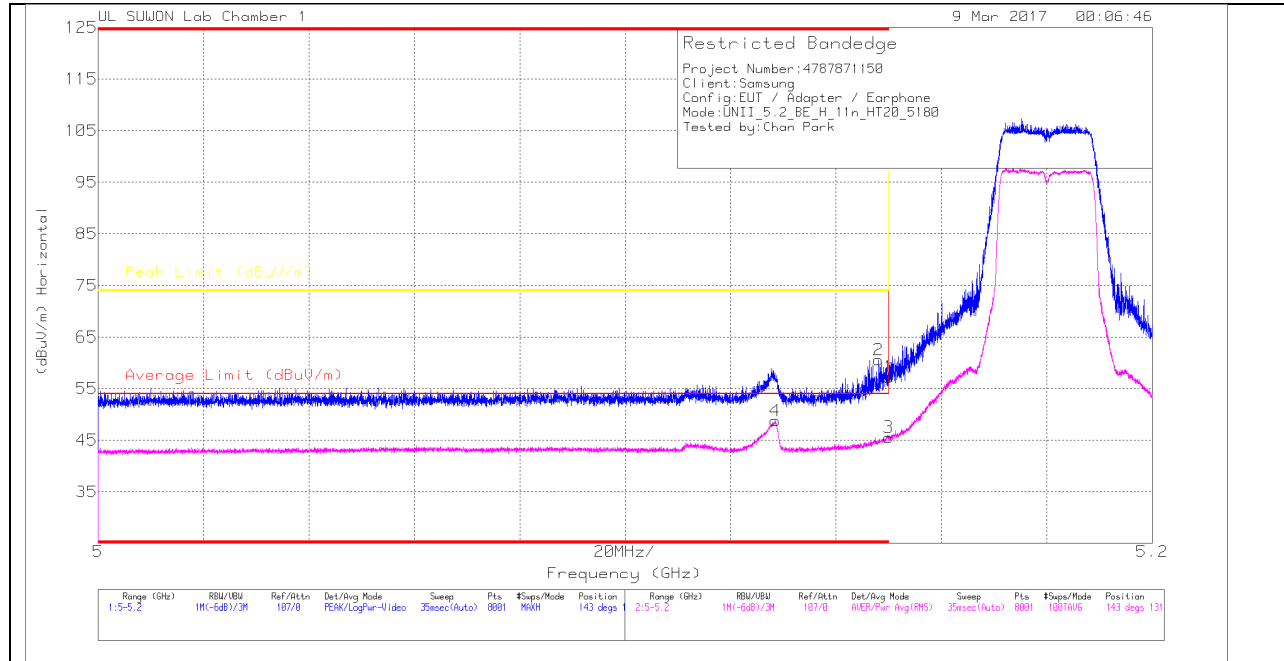
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	6Ghz_HP(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10.481	47.16	PK-U	37.8	-28.7	0	56.26	-	-	-	-	68.2	-11.94	339	256	H
10.485	47.27	PK-U	37.8	-28.6	0	56.47	-	-	-	-	68.2	-11.73	122	321	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK-U - U-NII: Maximum Peak

10.1.2. TX Above 1GHz 802.11n HT20 MODE IN THE 5.2GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

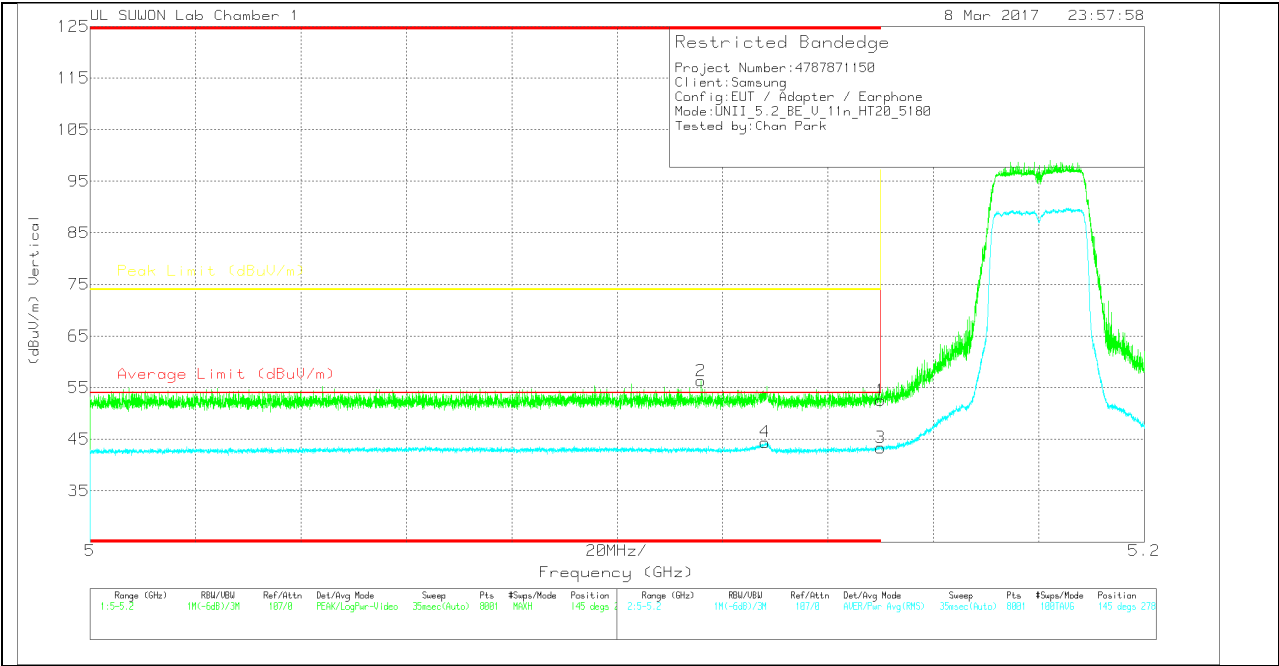
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117/001687 17_150619	10dB_Att(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	47.25	Pk	34.2	-24.2	0	57.25	-	-	74	-16.75	143	131	H
2	* 5.148	50.48	Pk	34.2	-24.1	0	60.58	-	-	74	-13.42	143	131	H
3	* 5.15	35.12	RMS	34.2	-24.1	.32	45.54	54	-8.46	-	-	143	131	H
4	* 5.128	38.37	RMS	34.2	-24.1	.32	48.79	54	-5.21	-	-	143	131	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 717)_15061 9	10dB_Att(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	42.56	Pk	34.2	-24.2	0	52.56	-	-	74	-21.44	145	278	V
2	* 5.116	46.22	Pk	34.2	-24.1	0	56.32	-	-	74	-17.68	145	278	V
3	* 5.15	32.95	RMS	34.2	-24.1	.32	43.37	54	-10.63	-	-	145	278	V
4	* 5.128	34.04	RMS	34.2	-24.1	.32	44.46	54	-9.54	-	-	145	278	V

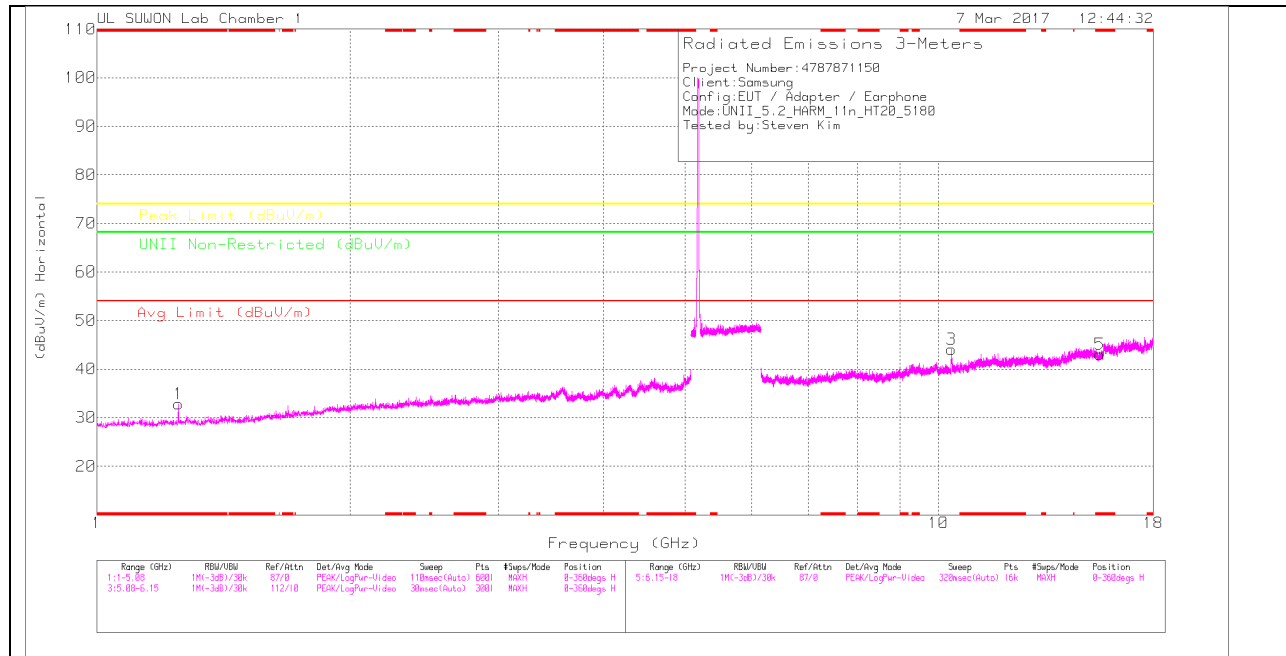
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

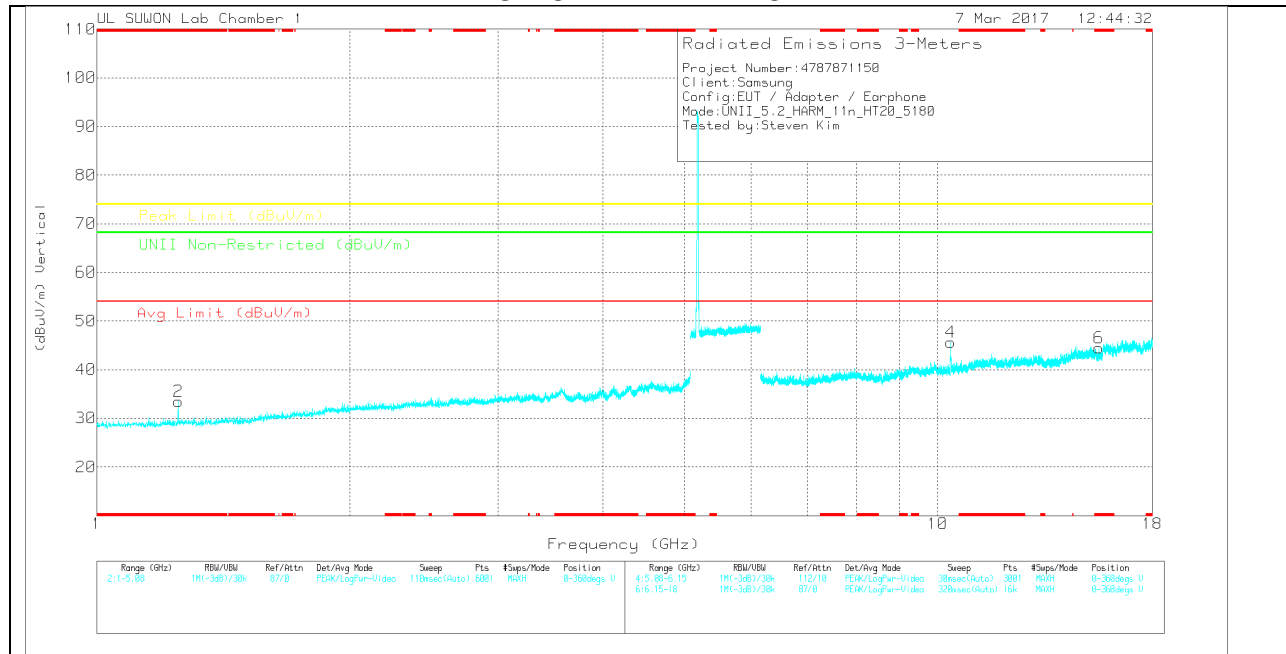
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	5Ghz_LP(d B)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.25	44.07	PK	28.3	-39.6	0	32.77	-	-	74	-41.23	-	-	0-360	150	H
2	* 1.25	44.72	PK	28.3	-39.6	0	33.42	-	-	74	-40.58	-	-	0-360	250	V
3	10.359	34.63	PK	37.8	-28.3	0	44.13	-	-	-	-	68.2	-24.07	0-360	250	H
5	* 15.539	22.99	PK	40.3	-20.3	0	42.99	-	-	74	-31.01	-	-	0-360	150	H
4	10.361	36.18	PK	37.8	-28.3	0	45.68	-	-	-	-	68.2	-22.52	0-360	250	V
6	* 15.541	24.35	PK	40.3	-20.2	0	44.45	-	-	74	-29.55	-	-	0-360	150	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

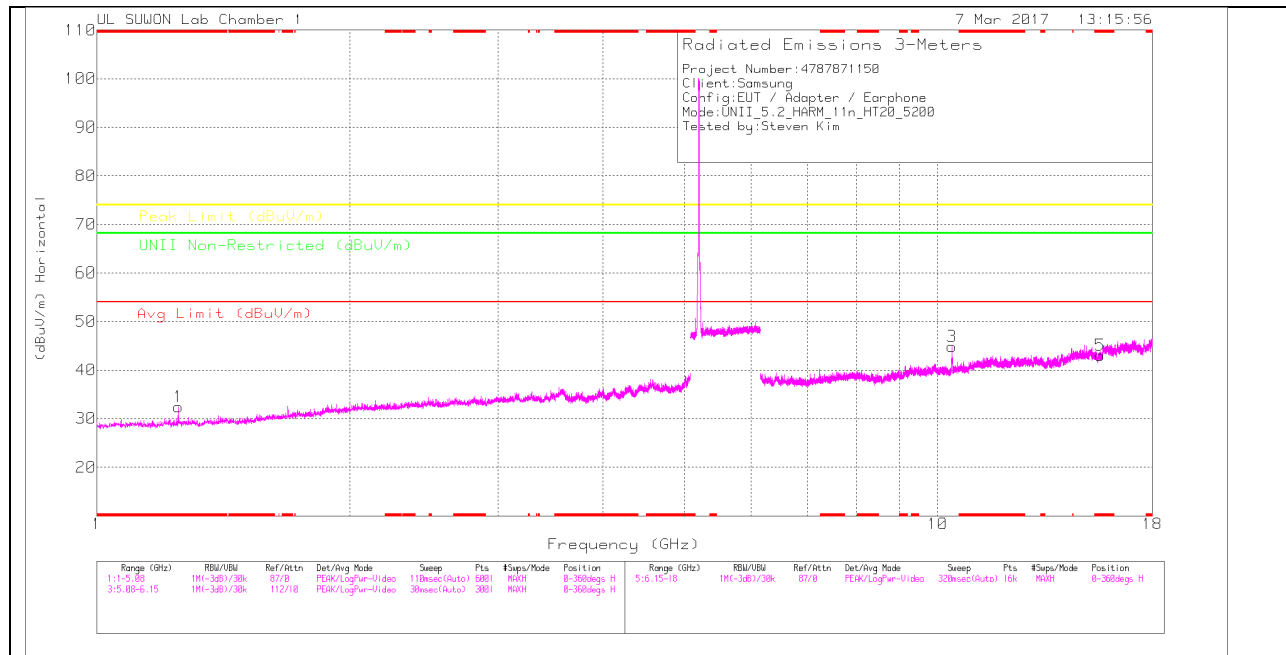
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	6Ghz_HP(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10.364	46.86	PK-U	37.8	-28.2	0	56.46	-	-	-	-	68.2	-11.74	5	198	H
10.359	48.32	PK-U	37.8	-28.3	0	57.82	-	-	-	-	68.2	-10.38	150	373	V

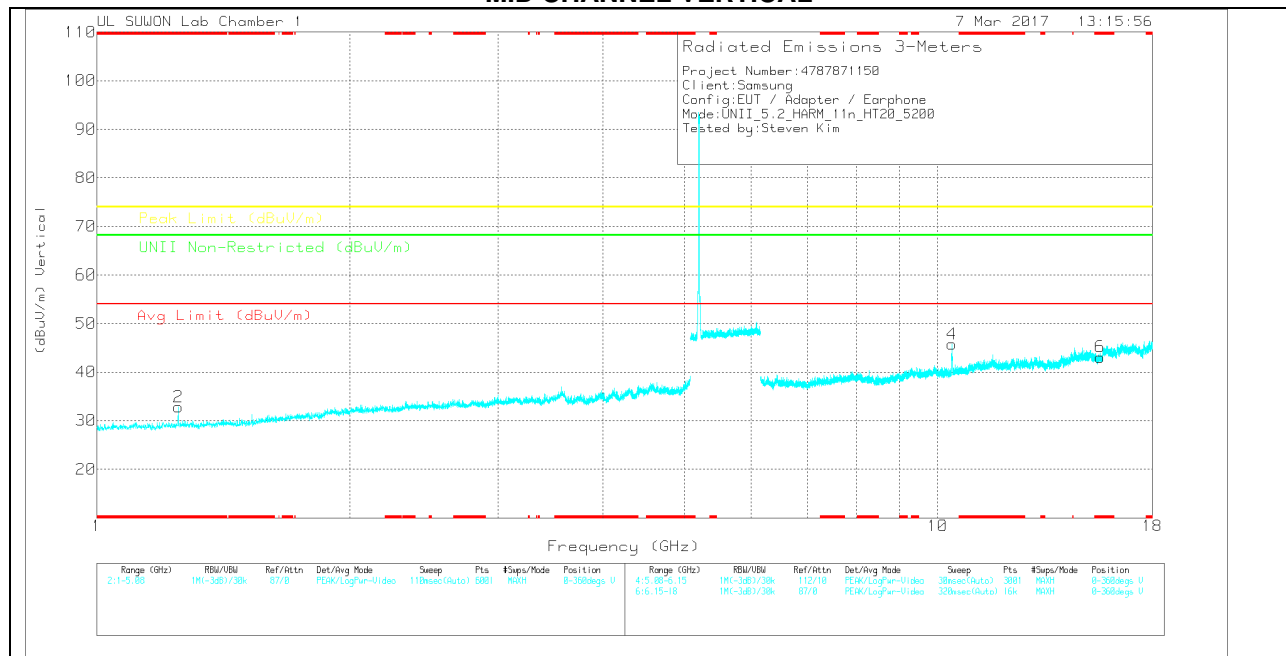
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK-U - U-NII: Maximum Peak

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	5Ghz_LP(d B)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.25	43.74	PK	28.3	-39.6	0	32.44	-	-	74	-41.56	-	-	0-360	150	H
2	* 1.25	44.11	PK	28.3	-39.6	0	32.81	-	-	74	-41.19	-	-	0-360	250	V
3	10.402	34.91	PK	37.8	-27.8	0	44.91	-	-	-	-	68.2	-23.29	0-360	150	H
5	* 15.602	21.11	PK	40.3	-18.4	0	43.01	-	-	74	-30.99	-	-	0-360	150	H
4	10.404	35.8	PK	37.8	-27.8	0	45.8	-	-	-	-	68.2	-22.4	0-360	250	V
6	* 15.604	21.21	PK	40.3	-18.4	0	43.11	-	-	74	-30.89	-	-	0-360	250	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

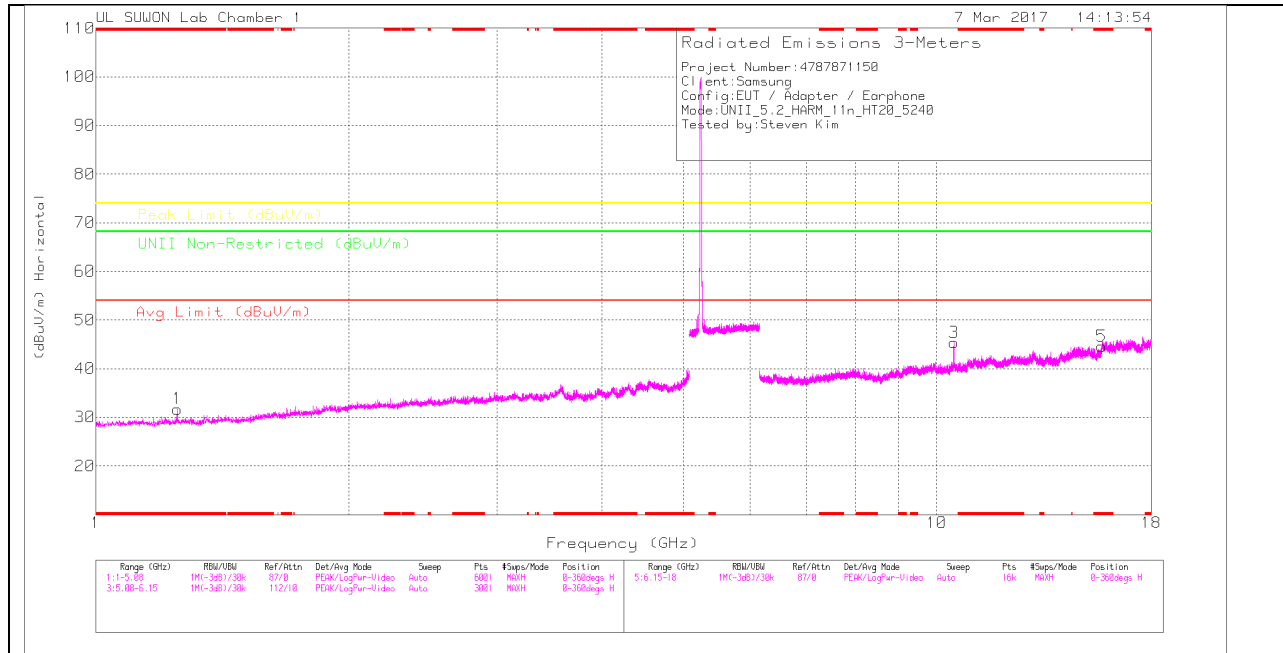
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	6Ghz_HP(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10.394	46.6	PK-U	37.8	-27.7	0	56.7	-	-	-	-	68.2	-11.5	338	392	H
10.404	45.62	PK-U	37.8	-27.7	0	55.72	-	-	-	-	68.2	-12.48	153	398	V

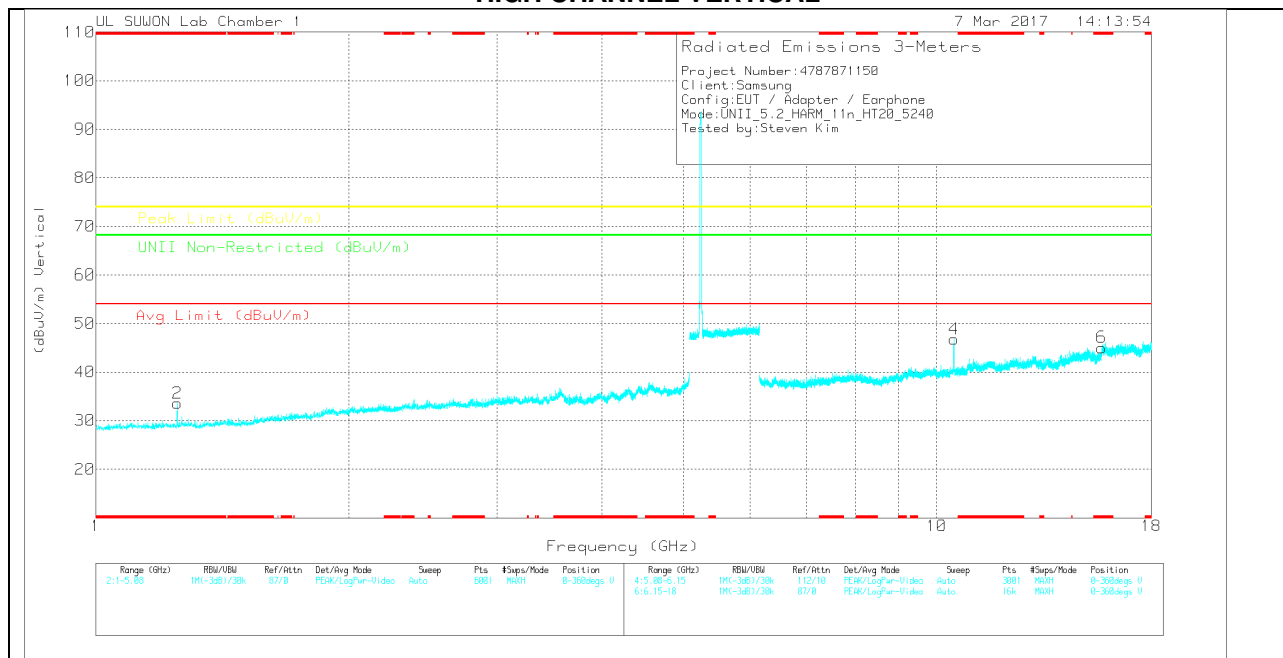
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK-U - U-NII: Maximum Peak

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(0016 8717)_150 619	5Ghz_LP(d B)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.25	43.03	PK	28.3	-39.6	0	31.73	-	-	74	-42.27	-	-	0-360	150	H
2	* 1.25	44.96	PK	28.3	-39.6	0	33.66	-	-	74	-40.34	-	-	0-360	250	V
3	10.48	36.41	PK	37.8	-28.8	0	45.41	-	-	-	-	68.2	-22.79	0-360	250	H
5	* 15.721	22	PK	40.4	-17.8	0	44.6	-	-	74	-29.4	-	-	0-360	250	H
4	10.48	37.81	PK	37.8	-28.8	0	46.81	-	-	-	-	68.2	-21.39	0-360	250	V
6	* 15.72	22.55	PK	40.4	-17.9	0	45.05	-	-	74	-28.95	-	-	0-360	150	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak Detector

Radiated Emissions

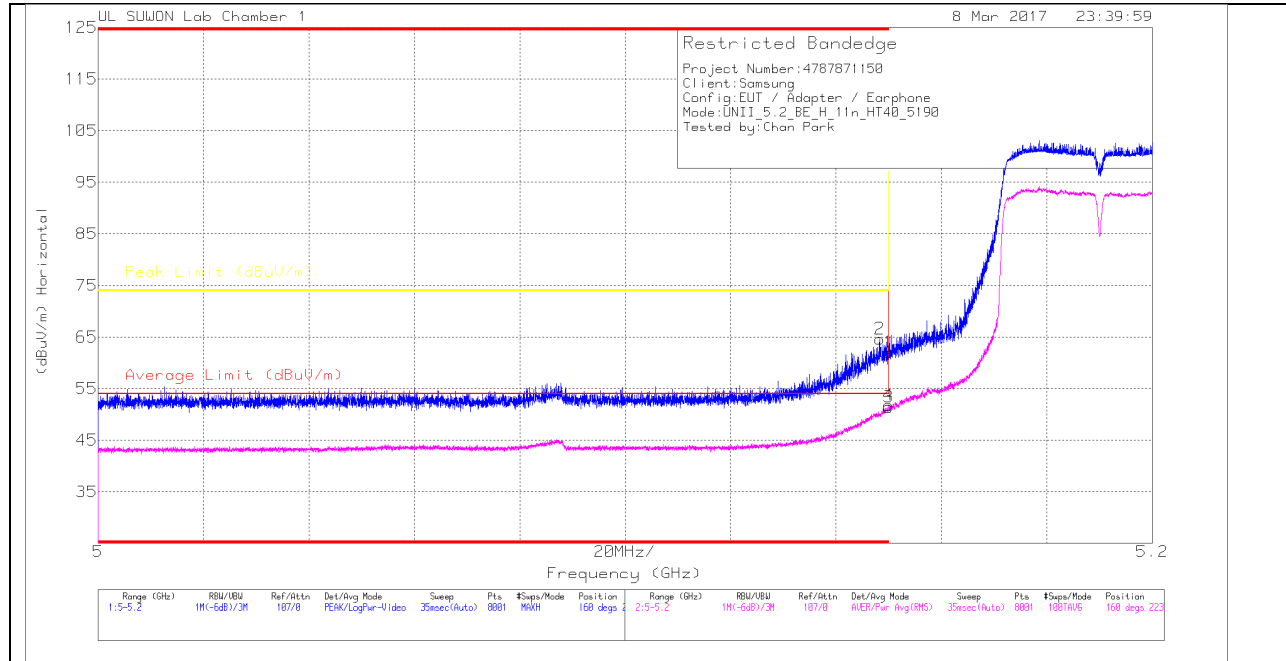
Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	6Ghz_HP(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10.481	46.01	PK-U	37.8	-28.7	0	55.11	-	-	-	-	68.2	-13.09	337	392	H
10.478	49.59	PK-U	37.8	-28.7	0	58.69	-	-	-	-	68.2	-9.51	272	292	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK-U - U-UNII: Maximum Peak

10.1.3. TX Above 1GHz 802.11n HT40 MODE IN THE 5.2GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

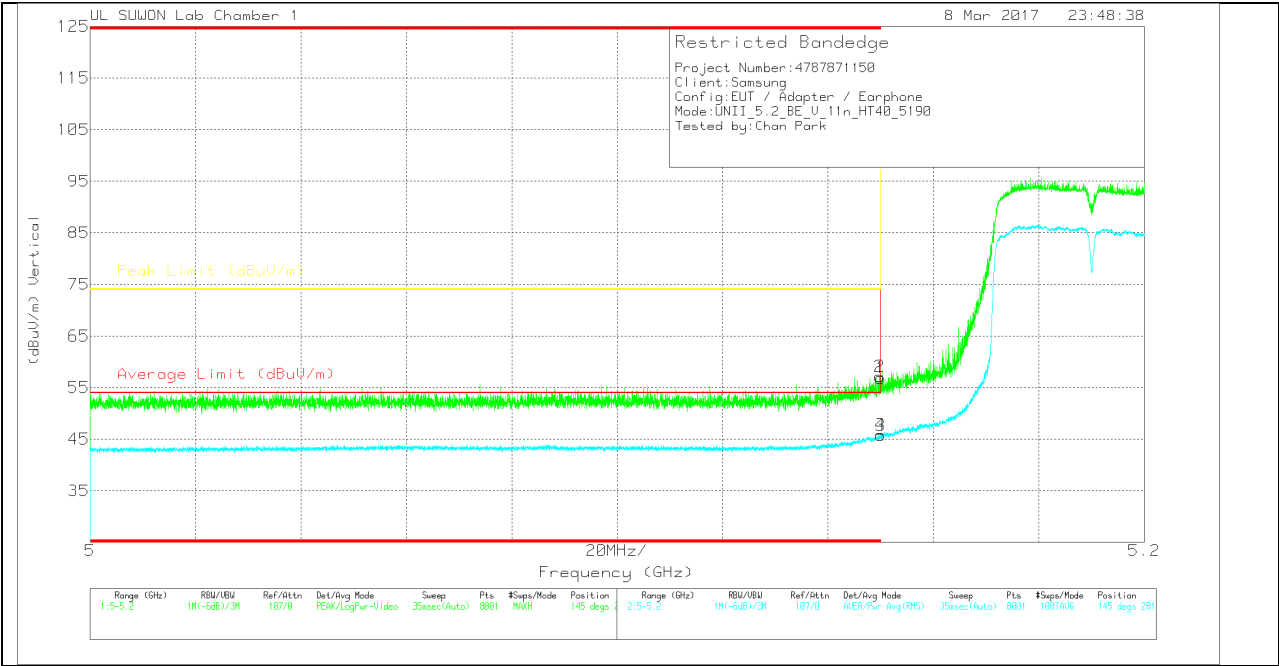
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117/001687 171_150619	10dB Att(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	52.02	Pk	34.2	-24.2	0	62.02	-	-	74	-11.98	160	223	H
2	* 5.148	54.53	Pk	34.2	-24.1	0	64.63	-	-	74	-9.37	160	223	H
3	* 5.15	40.69	RMS	34.2	-24.1	.63	51.42	54	-2.58	-	-	160	223	H
4	* 5.15	41.04	RMS	34.2	-24.1	.63	51.77	54	-2.23	-	-	160	223	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117/001687 17)_150619	10dB_Att(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	46.89	Pk	34.2	-24.2	0	56.89	-	-	74	-17.11	145	281	V
2	* 5.15	47.19	Pk	34.2	-24.2	0	57.19	-	-	74	-16.81	145	281	V
3	* 5.15	35.02	RMS	34.2	-24.1	.63	45.75	54	-8.25	-	-	145	281	V
4	* 5.15	35.08	RMS	34.2	-24.1	.63	45.81	54	-8.19	-	-	145	281	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection