



# CERTIFICATION TEST REPORT

**Report Number.** : 4790379967-E6V2

**Applicant** : SAMSUNG ELECTRONICS CO., LTD.  
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,  
GYEONGGI-DO, 16677, KOREA

**Model** : SM-A236U, SM-A236U1/DS, SM-S236DL

**FCC ID** : A3LSMA236U

**EUT Description** : GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and  
NFC

**Test Standard(s)** : FCC 47 CFR PART 15 SUBPART E

**Date Of Issue:**  
2022-06-30

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**Testing Laboratory**  
**TL-637**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2022-06-24	Initial issue	Sungeun Lee
V2	2022-06-30	Updated to address TCB's question	Sungeun Lee

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>5</b>
<b>2. TEST METHODOLOGY .....</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>6</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>6</b>
4.1. <i>MEASURING INSTRUMENT CALIBRATION .....</i>	<i>6</i>
4.2. <i>SAMPLE CALCULATION .....</i>	<i>6</i>
4.3. <i>MEASUREMENT UNCERTAINTY.....</i>	<i>7</i>
4.4. <i>DECISION RULE.....</i>	<i>7</i>
<b>5. EQUIPMENT UNDER TEST.....</b>	<b>8</b>
5.1. <i>DESCRIPTION OF EUT .....</i>	<i>8</i>
5.2. <i>DESCRIPTION OF AVAILABLE ANTENNAS .....</i>	<i>9</i>
5.3. <i>List of test reduction and modes covering other modes: .....</i>	<i>9</i>
5.4. <i>WORST-CASE CONFIGURATION AND MODE.....</i>	<i>10</i>
5.5. <i>DESCRIPTION OF TEST SETUP.....</i>	<i>12</i>
<b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>14</b>
<b>7. SUMMARY TABLE .....</b>	<b>15</b>
<b>8. MEASUREMENT METHODS .....</b>	<b>16</b>
<b>9. REFERENCE MEASUREMENTS RESULTS .....</b>	<b>17</b>
9.1. <i>ON TIME AND DUTY CYCLE RESULTS.....</i>	<i>17</i>
9.2. <i>DUTY CYCLE PLOTS .....</i>	<i>17</i>
9.3. <i>26 dB BANDWIDTH.....</i>	<i>18</i>
9.3.1. <i>802.11a.....</i>	<i>19</i>
9.3.2. <i>802.11n HT20.....</i>	<i>19</i>
9.3.3. <i>802.11n HT40.....</i>	<i>19</i>
9.3.4. <i>802.11ac VHT80.....</i>	<i>20</i>
9.3.5. <i>STRADDLE CHANNEL.....</i>	<i>20</i>
<b>10. ANTENNA PORT TEST RESULTS.....</b>	<b>21</b>
10.1. <i>6 dB BANDWIDTH .....</i>	<i>21</i>
10.1.1. <i>UNII-3 BAND.....</i>	<i>22</i>
10.2. <i>OUTPUT POWER AND PPSD .....</i>	<i>23</i>
10.2.1. <i>802.11a MODE .....</i>	<i>25</i>
10.2.2. <i>802.11n HT20 MODE .....</i>	<i>26</i>

10.2.3.	802.11n HT40 MODE .....	27
10.2.4.	802.11ac VHT80 MODE .....	28
10.2.5.	STRADDLE CHANNEL.....	29
10.2.6.	OUTPUT POWER AND PPSD PLOTS (WORST CASE).....	30
<b>11.</b>	<b>TRANSMITTER ABOVE 1 GHz.....</b>	<b>35</b>
11.1.	TX ABOVE 1GHz 1Tx MODE IN THE 5.2GHz BAND.....	38
11.2.	TX ABOVE 1GHz 1Tx MODE IN THE 5.3GHz BAND.....	42
11.3.	TX ABOVE 1GHz 1Tx MODE IN THE 5.5 GHz BAND.....	46
11.4.	TX ABOVE 1GHz 1Tx MODE IN THE 5.8 GHz BAND.....	50
<b>12.</b>	<b>WORST-CASE BELOW 1 GHz .....</b>	<b>54</b>
<b>13.</b>	<b>AC POWER LINE CONDUCTED EMISSIONS .....</b>	<b>55</b>
<b>14.</b>	<b>DYNAMIC FREQUENCY SELECTION.....</b>	<b>58</b>
14.1.	OVERVIEW.....	58
14.1.1.	LIMITS.....	58
14.1.2.	TEST AND MEASUREMENT SYSTEM.....	61
14.1.3.	SETUP OF EUT.....	64
14.1.4.	DESCRIPTION OF EUT .....	65
14.2.	RESULTS FOR 80 MHz BANDWIDTH (UNII-2A BAND).....	66
14.2.1.	TEST CHANNEL .....	66
14.2.2.	RADAR WAVEFORM AND TRAFFIC.....	66
14.2.3.	OVERLAPPING CHANNEL TESTS.....	67
14.2.4.	MOVE AND CLOSING TIME .....	67
14.3.	RESULTS FOR 80 MHz BANDWIDTH (UNII-2C BAND).....	70
14.3.1.	TEST CHANNEL .....	70
14.3.2.	RADAR WAVEFORM AND TRAFFIC.....	70
14.3.3.	OVERLAPPING CHANNEL TESTS.....	71
14.3.4.	MOVE AND CLOSING TIME .....	71

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC  
**MODEL NUMBER:** SM-A236U, SM-A236U1/DS, SM-S236DL  
**SERIAL NUMBER:** R3CT40ETG0V, R3CT40ETHWJ (CONDUCTED);  
6224a6bc82197ece, R3CT50DASKA (RADIATED);  
**DATE TESTED:** 2022-04-18 ~ 2022-06-24;

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

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:



Seokhwan Hong  
Suwon Lab Engineer  
UL Korea, Ltd.

Tested By:



Sungeun 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 v02r01
4. KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
5. KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02
6. KDB 291071 DR01-44460(Sept 21, 2021)
7. ANSI C63.10-2013.

## 3. FACILITIES AND ACCREDITATION

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

218 Maeyeong-ro	
<input checked="" type="checkbox"/>	Chamber 1(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 2(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 3(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 4(3m Full-anechoic chamber)
<input type="checkbox"/>	Chamber 5(3m Full-anechoic chamber)

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.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	3.02 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.78 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.58 dB

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

### 4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2007.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC.  
 This test report addresses the NII (WLAN) operational mode.

This report covers the Samsung models SM-A236U, SM-A236U1/DS, SM-S236DL.  
 These models are identical in hardware except SM-A236U1/DS is supported dual SIM tray and SM-A236U has single SIM tray, SM-S236DL is same hardware.

All series model was same hardware thus, SM-A236U was set for final test.

#### WiFi operating mode

Frequency rage	Mode	Ant.
5GHz (5180 MHz ~ 5825 MHz)	802.11a SISO	TX/RX
	802.11n SISO	TX/RX
	802.11ac SISO	TX/RX

#### MAXIMUM OUTPUT POWER

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

Band	Frequency Range [MHz]	Mode	Output Power [dBm]	Output Power [mW]
UNII-1	5180 - 5240	802.11a	15.38	34.51
		802.11n(HT20)	15.79	37.93
	5190 - 5230	802.11n(HT40)	14.56	28.58
	5210	802.11ac(VHT80)	12.57	18.07
UNII-2A	5260 - 5320	802.11a	15.60	36.31
		802.11n(HT20)	15.46	35.16
	5190 - 5230	802.11n(HT40)	14.73	29.72
	5270 - 5310	802.11ac(VHT80)	12.32	17.06
UNII-2C	5500 - 5720	802.11a	15.56	35.97
		802.11n(HT20)	15.52	35.65
	5510 - 5710	802.11n(HT40)	14.40	27.54
	5530 - 5690	802.11ac(VHT80)	12.38	17.30
UNII-3	5745 - 5825	802.11a	15.48	35.32
		802.11n(HT20)	15.51	35.56
	5755 - 5795	802.11n(HT40)	14.60	28.84
	5775	802.11ac(VHT80)	12.41	17.42



## 5.2. DESCRIPTION OF AVAILABLE ANTENNAS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**The internal antenna was Permanently attached.  
 Therefore this E.U.T Complies with the requirement of §15.203.**

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

Frequency Band [MHz]	ANT Gain [dBi]
UNII 1 5150 - 5250	-3.90
UNII 2A 5250 - 5350	-3.90
UNII 2C 5470 - 5725	-3.90
UNII 3 5725 - 5850	-3.90

## 5.3. List of test reduction and modes covering other modes:

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

Authorized Frequency Band			
Mode	Antenna Stream	Mode	Covered by
802.11a	SISO	802.11a 1TX	
802.11n HT20		802.11n HT20 1TX	
802.11ac VHT20		802.11ac VHT20 1TX	802.11n HT20 1TX
802.11n HT40		802.11n HT40 1TX	
802.11ac VHT40		802.11ac VHT40 1TX	802.11n HT40 1TX
802.11ac VHT80		802.11ac VHT80 1TX	

Note. The target power is the same, and there is no difference in 11ac(VHT20,40) mode and 11n(HT20,40) spot-check data. Test data was reported in 11n(HT20, 40) modes.



**Test case configuration for 802.11a, 802.11n HT20 & 40, 802.11ac VHT20 & 40 & 80 modes :**

Mode	Band	SISO Target[dBm]		
		802.11a	802.11n	802.11ac
5GHz (20 MHz)	UNII-1	15	15	15
	UNII-2A	15	15	15
	UNII-2C	15	15	15
	UNII-3	15	15	15
5GHz (40 MHz)	UNII-1		14	14
	UNII-2A		14	14
	UNII-2C		14	14
	UNII-3		14	14
5GHz (80 MHz)	UNII-1			12
	UNII-2A			12
	UNII-2C			12
	UNII-3			12

	Band-Edge & Spurious Emission
	Band-Edge & Spurious Emission Spot-Check
	Band-Edge Spot-Check

Note. Compared to the 802.11a mode, target power is the same or lower and the density is low, so only the spot-check test was performed in the 802.11n & 802.11ac mode. Spot check test was performed in the worst tested band of 802.11a mode.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37MANQ1E72SE3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02115A BWE	N/A
Earphone	SAMSUNG	GH59-15055A	EHS64AVFWE	N/A

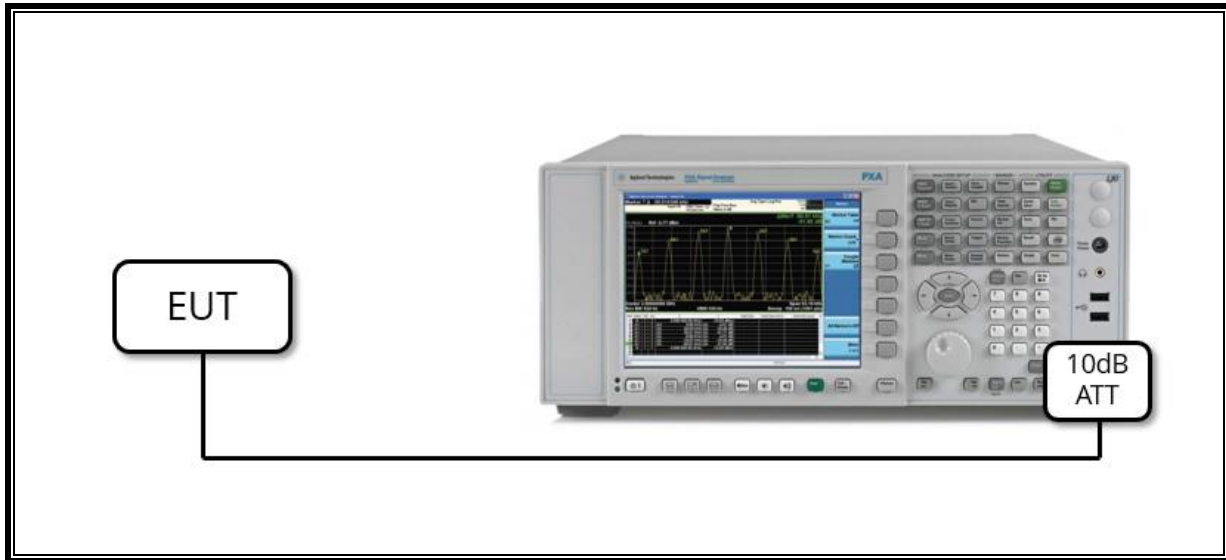
### I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.0 m	N/A
2	Audio	2	Mini-Jack	Unshielded	0.7 m	N/A

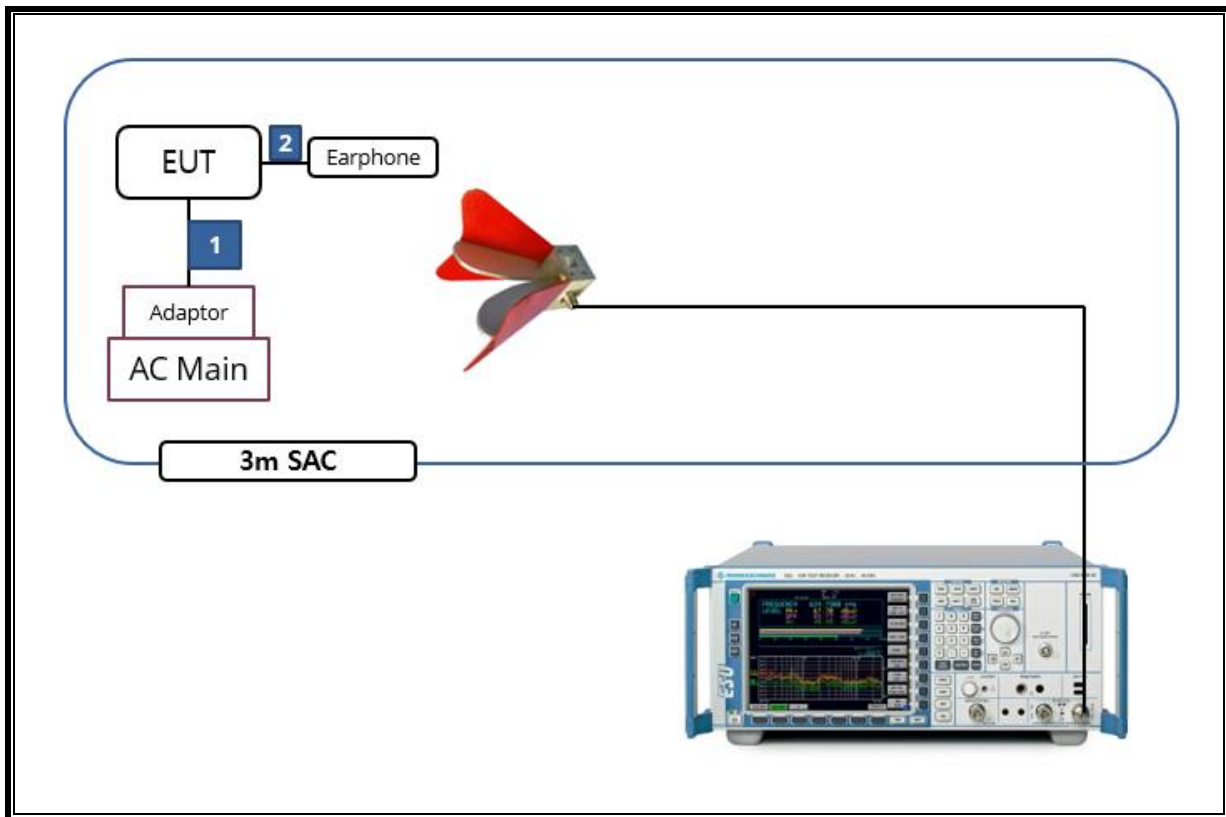
### TEST SETUP

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

**SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)**



**SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)**



## 6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2022-08-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022-08-13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2022-08-13
Antenna, Horn, 18 GHz	ETS	3115	00167211	2022-07-27
Antenna, Horn, 18 GHz	ETS	3115	00161451	2022-08-15
Antenna, Horn, 18 GHz	ETS	3117	00168724	2022-07-27
Antenna, Horn, 18 GHz	ETS	3117	00168717	2022-08-15
Antenna, Horn, 18 GHz	ETS	3117	00218957	2023-01-15
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2023-01-15
Antenna, Horn, 40 GHz	ETS	3116C	00168645	2023-10-13
Preamplifier	ETS	3116C-PA	00168841	2022-08-04
Preamplifier, 1000 MHz	Sonoma	310N	341282	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	370599	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029168	2022-08-02
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2022-08-04
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2022-08-04
Average Power Sensor	Agilent / HP	U2000	MY54270007	2022-08-04
Average Power Sensor	Agilent / HP	U2000	MY54260010	2022-08-04
Attenuator	PASTERNAK	PE7087-10	A001	2022-08-03
Attenuator	PASTERNAK	PE7087-10	A008	2022-08-03
Attenuator	PASTERNAK	PE7004-10	2	2022-08-02
Attenuator	PASTERNAK	PE7087-10	A009	2022-08-03
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2022-08-02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2022-08-02
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2022-08-02
Notch Filter	Micro-Tronics	BRM50702-02	G037	2022-08-03
Notch Filter	Micro-Tronics	BRM50716-2	006	2022-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2022-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	2022-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	019	2022-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2022-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	2022-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	2022-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2022-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	2022-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	020	2022-08-02
LISN	R&S	ENV-216	101837	2022-08-05
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
Termination	WEINSCHTEL	M1406A	T09	2022-08-03
Attenuator	WEINSCHTEL	WA76-30-21	A015	2022-08-03
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

## 7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.407(e)	6dB Band width (5.8GHz)	> 500kHz	Conducted	Complies
15.407 (a)(1)(iv)	TX Cond. Power (5.150-5.250)	< 24dBm		Complies
15.407 (a)(2)	TX Cond. Power (5.250-5.350 & 5.470-5.725)	< 24dBm or 11+10Log(26dB BW)		Complies
15.407 (a)(3)(i)	TX Cond. Power (5.725-5.850)	< 30dBm		Complies
15.407 (a)(1)(iv) & (a)(2)	PSD (5.150-5.250 & 5.250-5.350 & 5.470-5.725)	< 11dBm/MHz		Complies
15.407 (a)(3)	PSD (5.725-5.850)	< 30dBm/500kHz		Complies
15.207 (a)	AC Power Line conducted emissions	Section 13	Radiated	Complies
15.407 (b) & 15.209	Radiated Spurious Emission	< 74dBuV/m PK < 54dBuV/m AV		Complies
15.407 (h)(2)	Dynamic Frequency Selection	N/A	Condcuted	Complies <sup>Note</sup>

Note. This EUT does not support channel puncturing.

## 8. MEASUREMENT METHODS

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

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

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

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

Conducted Output Power : KDB 789033 D02 v02r01, Section II.E.3.b(Method PM-G)

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

KDB 789033 D02 v02r01, Section II.E.2.b(Method SA-1)

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

Unwanted emissions in restricted bands : KDB 789033 D02 v02r01, Section II.G.3 – II.G.6.

Unwanted emissions in non-restricted bands : KDB 789033 D02 v02r01, Section II.G.3 – II.G.6.

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



## 9. REFERENCE MEASUREMENTS RESULTS

### 9.1. ON TIME AND DUTY CYCLE RESULTS

Mode	On Time [ms]	Period [ms]	Duty Cycle X [Linear]	Duty Cycle X [%]	Duty Cycle Correction Factor[dB]
802.11a	2.795	2.833	0.987	98.659	-
802.11n(HT20)	2.600	2.637	0.986	98.597	-
802.11n(HT40)	2.483	2.520	0.985	98.532	-
802.11ac(VHT80)	2.238	2.274	0.984	98.417	-

Note. If the duty cycle is over 98%, compensation is not included in average measurement.

#### LIMITS

None; for reporting purposes only.

#### PROCEDURE

KDB 789033 D02 v02r01 Zero-Span Spectrum Analyzer Method.

### 9.2. DUTY CYCLE PLOTS



### 9.3. 26 dB BANDWIDTH

#### LIMITS

None; for reporting purposes only.

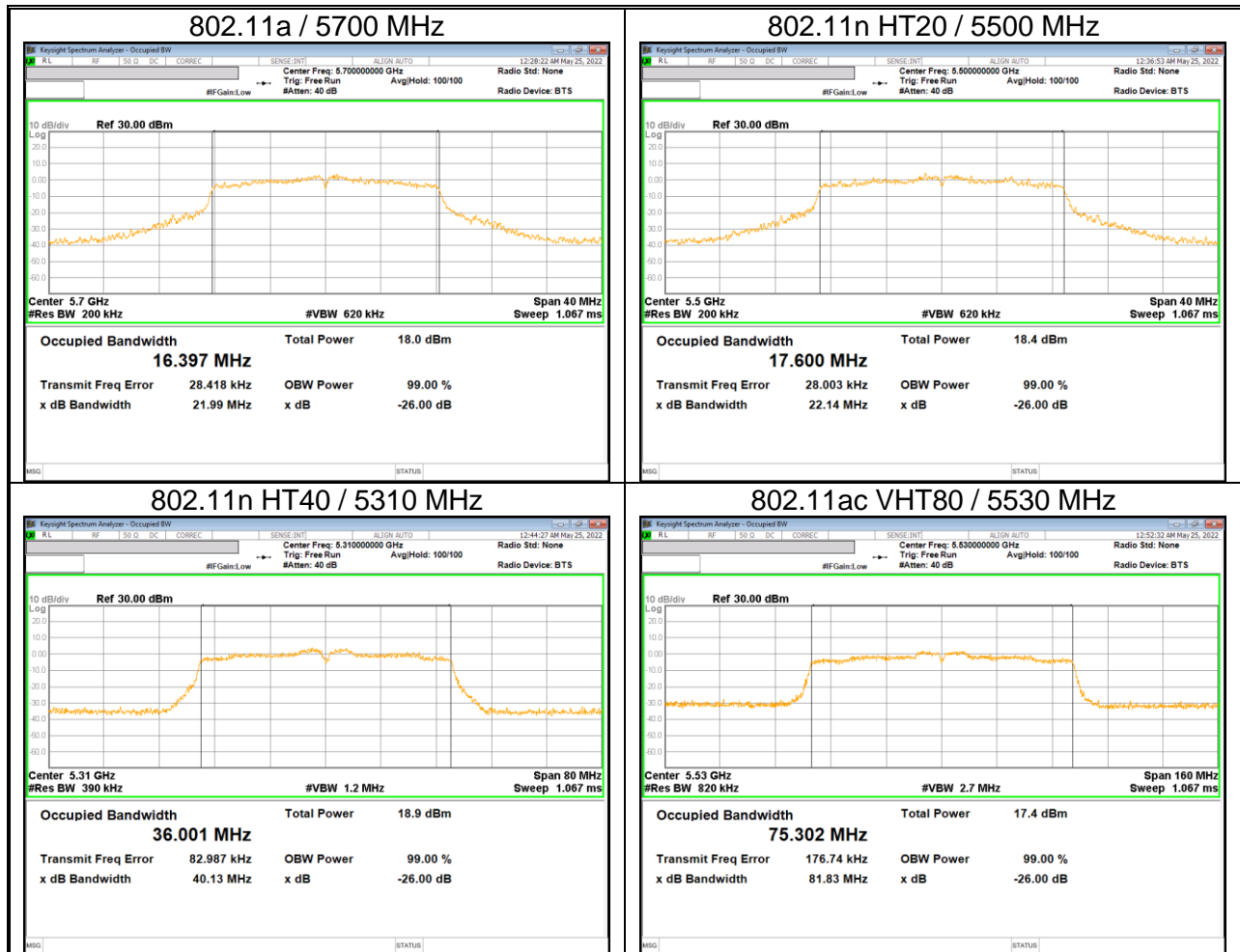
#### TEST PROCEDURE

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

#### RESULTS

- Please refer to the next page

#### WORST CASE TEST PLOTS



**9.3.1. 802.11a**

Band	Channel	Center Freq. [MHz]	26 dB BW [MHz]	Worst	99% BW [MHz]
UNII-1 <small>Note</small>	36	5180	19.940	20.080	16.404
	40	5200	20.080		16.403
	48	5240	19.640		16.388
UNII-2A <small>Note</small>	52	5260	21.670	21.670	16.377
	60	5300	20.480		16.382
	64	5320	21.070		16.379
UNII-2C	100	5500	20.960	<b>21.990</b>	
	116	5580	20.740		
	<b>140</b>	<b>5700</b>	<b>21.990</b>		

Note. As a result of 99% bandwidth test, the bandwidth of UNII-1 does not interfere with UNII-2A.

**9.3.2. 802.11n HT20**

Band	Channel	Center Freq. [MHz]	26 dB BW [MHz]	Worst	99% BW [MHz]
UNII-1 <small>Note</small>	36	5180	21.450	21.450	17.577
	40	5200	20.750		17.558
	48	5240	20.120		17.574
UNII-2A <small>Note</small>	52	5260	21.700	21.800	17.599
	60	5300	21.800		17.585
	64	5320	21.560		17.593
UNII-2C	<b>100</b>	<b>5500</b>	<b>22.140</b>	<b>22.140</b>	
	116	5580	21.800		
	140	5700	21.600		

Note. As a result of 99% bandwidth test, the bandwidth of UNII-1 does not interfere with UNII-2A.

**9.3.3. 802.11n HT40**

Band	Channel	Center Freq. [MHz]	26 dB BW [MHz]	Worst	99% BW [MHz]
UNII-1 <small>Note</small>	38	5190	39.730	39.910	35.967
	46	5230	39.910		35.965
UNII-2A <small>Note</small>	54	5270	39.950	<b>40.130</b>	35.968
	<b>62</b>	<b>5310</b>	<b>40.130</b>		36.001
UNII-2C	102	5510	40.000	40.060	
	118	5590	40.060		
	134	5670	40.000		

Note. As a result of 99% bandwidth test, the bandwidth of UNII-1 does not interfere with UNII-2A.

**9.3.4. 802.11ac VHT80**

Band	Channel	Center Freq. [MHz]	26 dB BW [MHz]	Worst	99% BW [MHz]
UNII-1 <sup>Note</sup>	42	5210	81.330	81.330	75.250
UNII-2A <sup>Note</sup>	58	5290	81.550	81.550	75.247
UNII-2C	106	5530	81.830	81.830	
	122	5610	81.130		

Note. As a result of 99% bandwidth test, the bandwidth of UNII-1 does not interfere with UNII-2A.

**9.3.5. STRADDLE CHANNEL**

Mode	Channel	Center Freq. [MHz]	26 dB BW [MHz]	
			UNII-2C	UNII-3
802.11a	Straddle	5720	15.060	5.320
802.11n HT20	Straddle	5720	14.940	5.280
802.11n HT40	Straddle	5710	35.140	5.040
802.11ac VHT80	Straddle	5690	74.980	5.280

# 10. ANTENNA PORT TEST RESULTS

## 10.1. 6 dB BANDWIDTH

### LIMITS

FCC §15.407

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

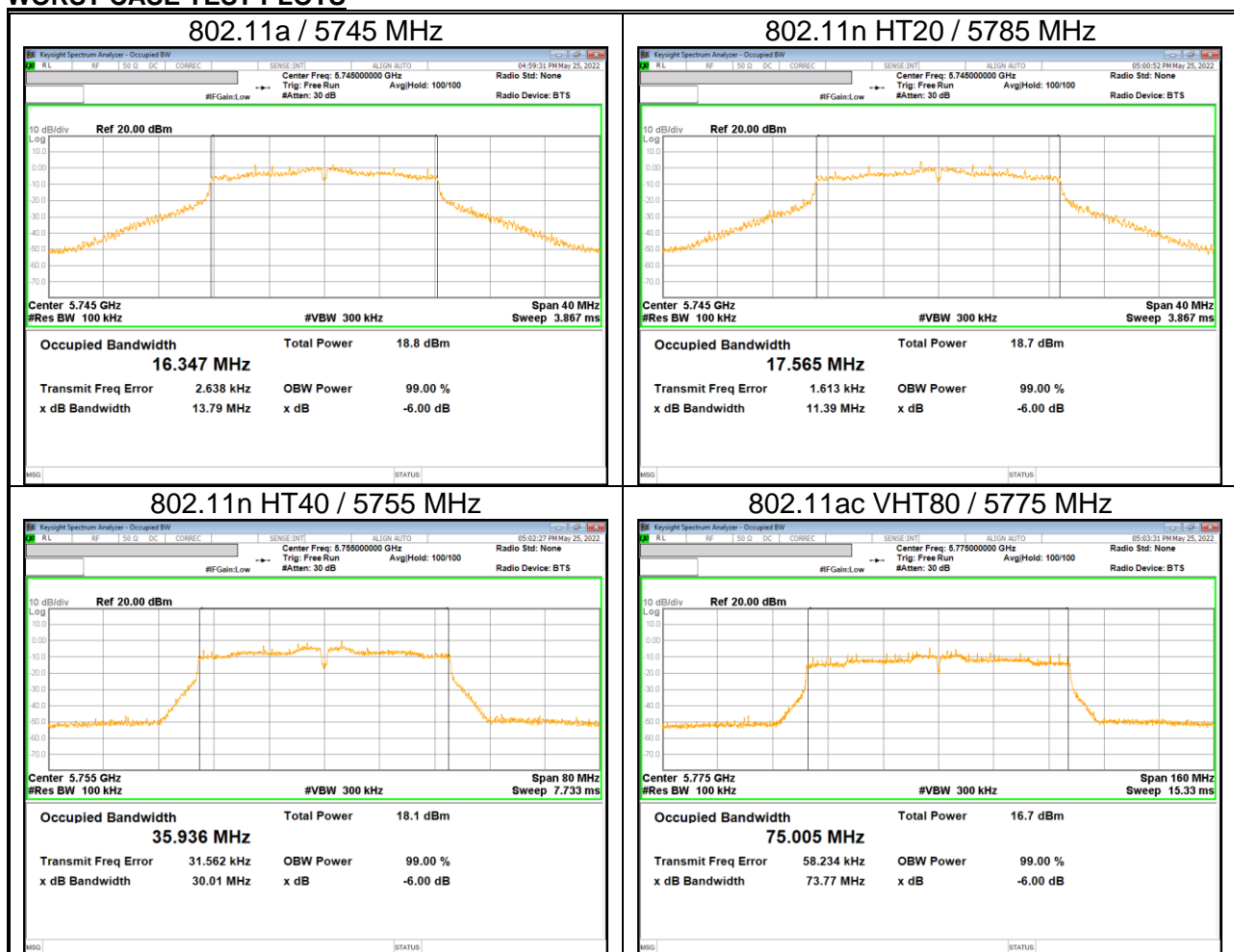
### TEST PROCEDURE

Reference to 789033 D02 General UNII Test Procedures New Rules v02r01: 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

- Please refer to the next page

### WORST CASE TEST PLOTS



**10.1.1. UNII-3 BAND**

Mode	Channel	Center Freq. [MHz]	6 dB BW [MHz]	Worst	Minimum Limit [MHz]
802.11a	149	5745	13.790	13.790	0.5
	157	5785	15.220		
	165	5825	15.010		
802.11n HT20	149	5745	11.390	11.390	
	157	5785	16.630		
	165	5825	17.160		
802.11n HT40	151	5755	30.010	30.010	
	159	5795	33.800		
802.11ac VHT80	155	5775	73.770	73.770	

## 10.2. OUTPUT POWER AND PPSD

### LIMITS

FCC §15.407 (a)(1)(iv), (a)(2), (a)(3)(i), (a)(3)(iii)

### FCC

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. 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 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 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**TEST PROCEDURE**

KDB 789033 Method PM is used for output power.

KDB 789033 Method SA-2 is used for only power of straddle Ch. and 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). Band power function used for power and peak marker value of the spectrum is used for PSD. For the band 5.850-5.895 GHz, The correlated gain is added to the result to convert e.i.r.p.

**DIRECTIONAL ANTENNA GAIN**

For OUTPUT POWER and PSD: The TX chains are correlated and the antenna gains are unequal among the chains. The directional gain is:

Frequency Band [MHz]	ANT Gain [dBi]
UNII 1 5150 - 5250	-3.90
UNII 2A 5250 - 5350	-3.90
UNII 2C 5470 - 5725	-3.90
UNII 3 5725 - 5850	-3.90



**10.2.1. 802.11a MODE**

**Output Power Results**

Band	Channel	Center Freq. [MHz]	Average Power [dBm]	Corr'd Power [dBm]	Limit [dBm]
UNII-1	36	5180	15.11	15.11	23.98
	40	5200	15.38	15.38	
	48	5240	15.32	15.32	
UNII-2A	52	5260	15.42	15.42	23.98
	60	5300	15.60	15.60	
	64	5320	15.45	15.45	
UNII-2C	100	5500	15.56	15.56	23.98
	116	5580	15.41	15.41	
	140	5700	15.29	15.29	
UNII-3	149	5745	15.43	15.43	30.00
	157	5785	15.43	15.43	
	165	5825	15.48	15.48	

\* Calculation of Output Power : Average Power = Meas Power + Duty CF[dB]

**PSD Results**

Band	Channel	Center Freq. [MHz]	Meas PSD [dBm/MHz]	DCCF.	Corr'd PSD [dBm]	Limit [dBm/MHz]
UNII-1	36	5180	5.907	-	5.907	11.00
	40	5200	6.014	-	6.014	
	<b>48</b>	<b>5240</b>	<b>6.094</b>	-	<b>6.094</b>	
UNII-2A	52	5260	5.491	-	5.491	11.00
	60	5300	5.263	-	5.263	
	64	5320	5.612	-	5.612	
UNII-2C	100	5500	4.980	-	4.980	11.00
	116	5580	4.878	-	4.878	
	140	5700	4.806	-	4.806	
UNII-3	149	5745	1.843	-	1.843	30.00/500kHz
	157	5785	2.264	-	2.264	
	165	5825	1.741	-	1.741	

\* Calculation of PSD: Corr'd PSD = Meas PSD + Duty CF [dB]

**10.2.2. 802.11n HT20 MODE**

**Output Power Results**

Band	Channel	Center Freq. [MHz]	Average Power [dBm]	Corr'd Power [dBm]	Limit [dBm]
UNII-1	36	5180	15.41	15.41	23.98
	40	5200	15.79	15.79	
	48	5240	15.64	15.64	
UNII-2A	52	5260	15.31	15.31	23.98
	60	5300	15.46	15.46	
	64	5320	15.32	15.32	
UNII-2C	100	5500	15.52	15.52	23.98
	116	5580	15.40	15.40	
	140	5700	15.30	15.30	
UNII-3	149	5745	15.27	15.27	30.00
	157	5785	15.45	15.45	
	165	5825	15.51	15.51	

\* Calculation of Output Power : Average Power = Meas Power + Duty CF[dB]

**PSD Results**

Band	Channel	Center Freq. [MHz]	Meas PSD [dBm/MHz]	DCCF.	Corr'd PSD [dBm]	Limit [dBm/MHz]
UNII-1	36	5180	5.981	-	5.981	11.00
	40	5200	5.875	-	5.875	
	<b>48</b>	<b>5240</b>	<b>6.179</b>	-	<b>6.179</b>	
UNII-2A	52	5260	5.334	-	5.334	11.00
	60	5300	5.248	-	5.248	
	64	5320	5.150	-	5.150	
UNII-2C	100	5500	4.790	-	4.790	11.00
	116	5580	4.750	-	4.750	
	140	5700	4.343	-	4.343	
UNII-3	149	5745	1.878	-	1.878	30.00/500kHz
	157	5785	1.806	-	1.806	
	165	5825	1.387	-	1.387	

\* Calculation of PSD: Corr'd PSD = Meas PSD + Duty CF [dB]

**10.2.3. 802.11n HT40 MODE**

**Output Power Results**

Band	Channel	Center Freq. [MHz]	Average Power [dBm]	Corr'd Power [dBm]	Limit [dBm]
UNII-1	38	5190	14.47	14.47	23.98
	46	5230	14.56	14.56	
UNII-2A	54	5270	14.70	14.70	23.98
	62	5310	14.73	14.73	
UNII-2C	102	5510	14.40	14.40	23.98
	118	5590	14.32	14.32	
	134	5670	14.14	14.14	
UNII-3	151	5755	14.60	14.60	30.00
	159	5795	14.45	14.45	

\* Calculation of Output Power : Average Power = Meas Power + Duty CF[dB]

**PSD Results**

Band	Channel	Center Freq. [MHz]	Meas PSD [dBm/MHz]	DCCF.	Corr'd PSD [dBm]	Limit [dBm/MHz]
UNII-1	38	5190	2.253	-	2.253	11.00
	46	5230	1.971	-	1.971	
UNII-2A	54	5270	1.526	-	1.526	11.00
	62	5310	1.499	-	1.499	
UNII-2C	102	5510	0.544	-	0.544	11.00
	118	5590	0.658	-	0.658	
	134	5670	0.188	-	0.188	
UNII-3	151	5755	-2.311	-	-2.311	30.00/500kHz
	159	5795	-1.816	-	-1.816	

\* Calculation of PSD: Corr'd PSD = Meas PSD + Duty CF [dB]

**10.2.4. 802.11ac VHT80 MODE**

**Output Power Results**

Band	Channel	Center Freq. [MHz]	Average Power [dBm]	Corr'd Power [dBm]	Limit [dBm]
UNII-1	42	5210	12.57	12.57	23.98
UNII-2A	58	5290	12.32	12.32	23.98
UNII-2C	106	5530	12.28	12.28	23.98
	122	5610	12.38	12.38	
UNII-3	155	5775	12.41	12.41	30.00

\* Calculation of Output Power : Average Power = Meas Power + Duty CF[dB]

**PSD Results**

Band	Channel	Center Freq. [MHz]	Meas PSD [dBm/MHz]	DCCF.	Corr'd PSD [dBm]	Limit [dBm/MHz]
UNII-1	42	5210	-2.458	-	-2.458	11.00
UNII-2A	58	5290	-3.727	-	-3.727	11.00
UNII-2C	106	5530	-4.334	-	-4.334	11.00
	122	5610	-4.595	-	-4.595	
UNII-3	155	5775	-7.728	-	-7.728	30.00/500kHz

\* Calculation of PSD: Corr'd PSD = Meas PSD + Duty CF [dB]

### 10.2.5. STRADDLE CHANNEL

#### Output Power Results

Mode	Band	Center Freq. [MHz]	Meas Power [dBm]	DCCF.	Corr'd Power [dBm]	Limit [dBm]
802.11a	UNII-2C	5720	14.676	-	14.676	22.78
	UNII-3		6.465	-	6.465	30.00
802.11n HT20	UNII-2C	5720	14.404	-	14.404	22.74
	UNII-3		6.725	-	6.725	30.00
802.11n HT40	UNII-2C	5710	13.751	-	13.751	23.98
	UNII-3		1.394	-	1.394	30.00
802.11ac VHT80	UNII-2C	5690	13.286	-	13.286	23.98
	UNII-3		-2.354	-	-2.354	30.00

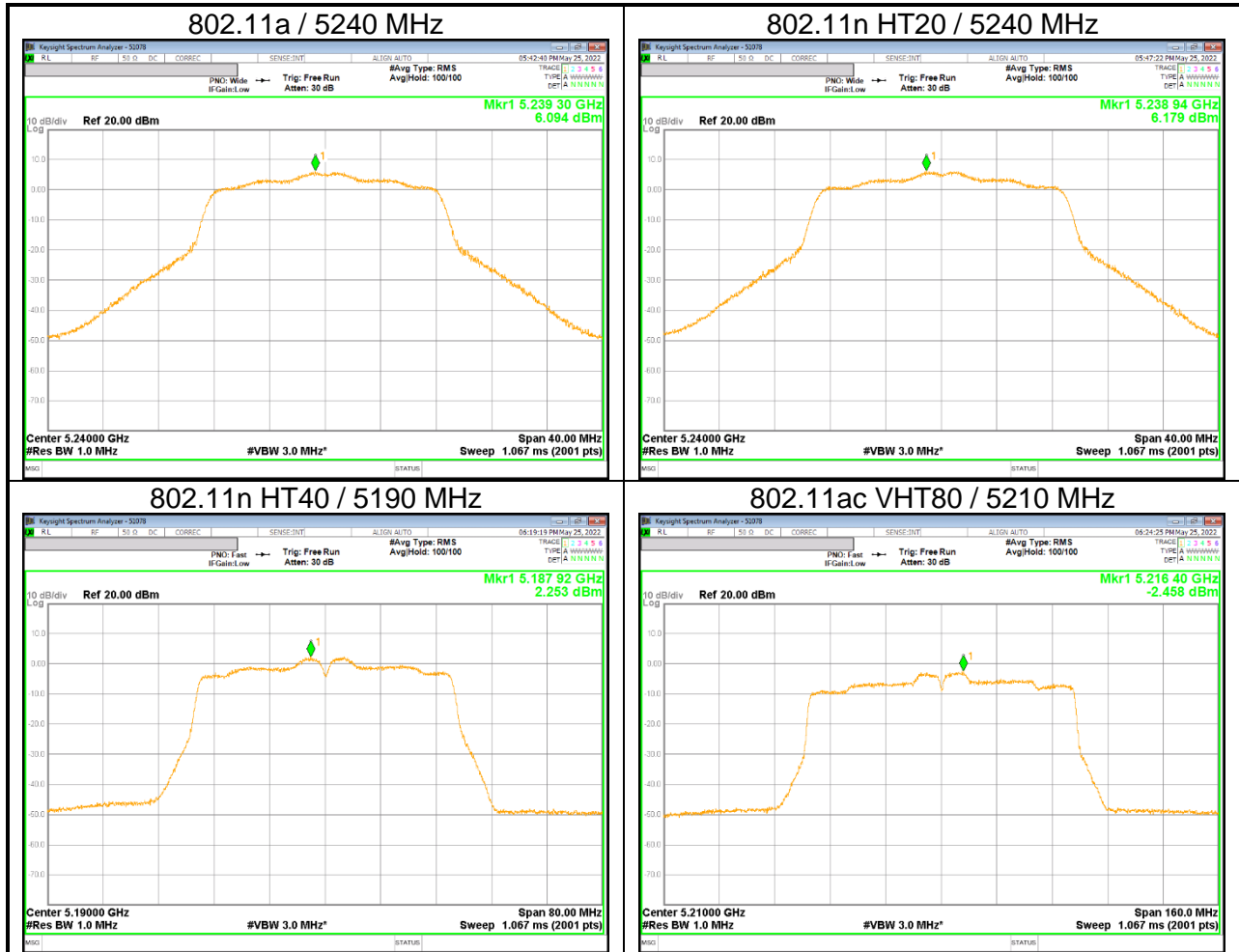
\* Calculation of Output Power : Corr'd Power = Meas. Power + Duty CF [dB]

#### PSD Results

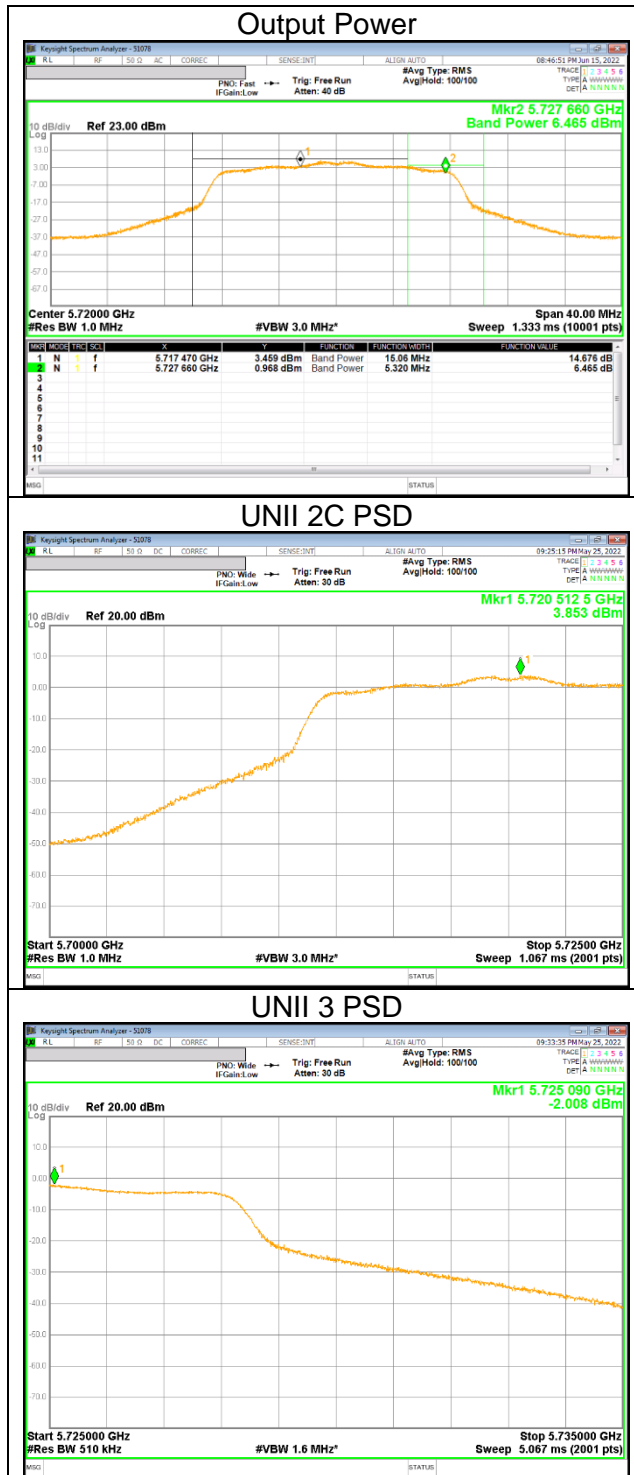
Mode	Band	Center Freq. [MHz]	Meas PSD [dBm/MHz]	DCCF.	Corr'd PSD [dBm]	Limit [dBm/MHz]
802.11a	UNII-2C	5720	3.853	-	3.853	11.00
	UNII-3		-2.008	-	-2.008	30.00/500kHz
802.11n HT20	UNII-2C	5720	3.576	-	3.576	11.00
	UNII-3		-2.395	-	-2.395	30.00/500kHz
802.11n HT40	UNII-2C	5710	-0.445	-	-0.445	11.00
	UNII-3		-8.518	-	-8.518	30.00/500kHz
802.11ac VHT80	UNII-2C	5690	-5.545	-	-5.545	11.00
	UNII-3		-13.457	-	-13.457	30.00/500kHz

\* Calculation of PSD: Corr'd PSD = Meas PSD + Duty CF [dB]

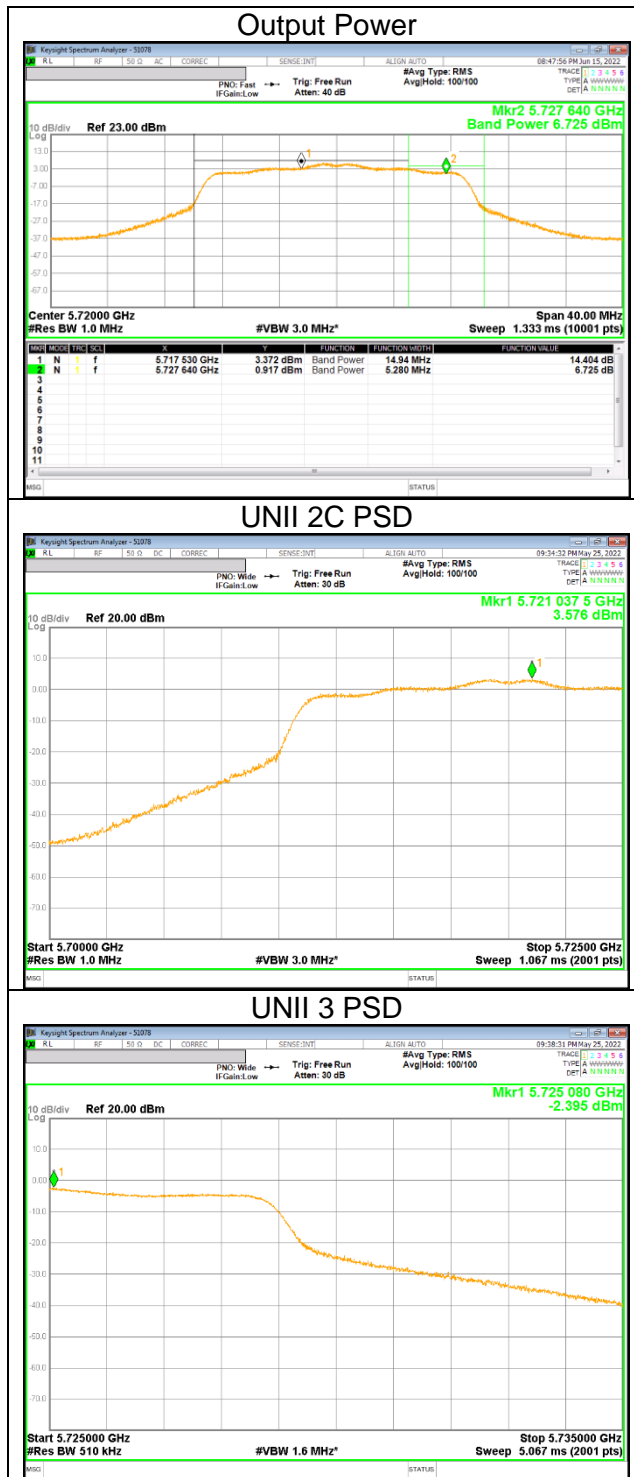
### 10.2.6. OUTPUT POWER AND PPSD PLOTS (WORST CASE)



**UNII Straddle Ch. IEEE 802.11a mode Output Power and PSD**

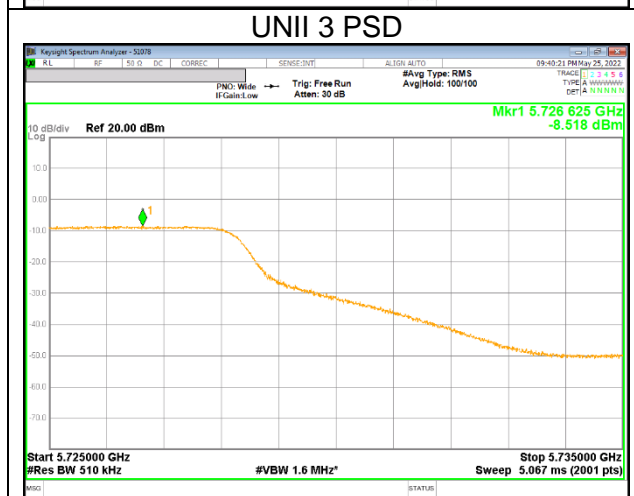
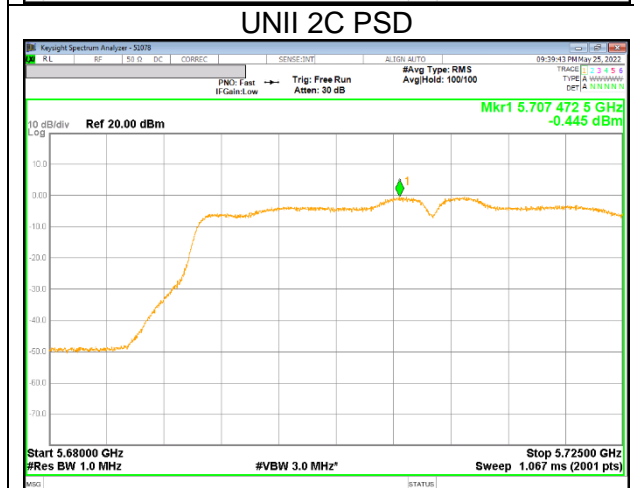
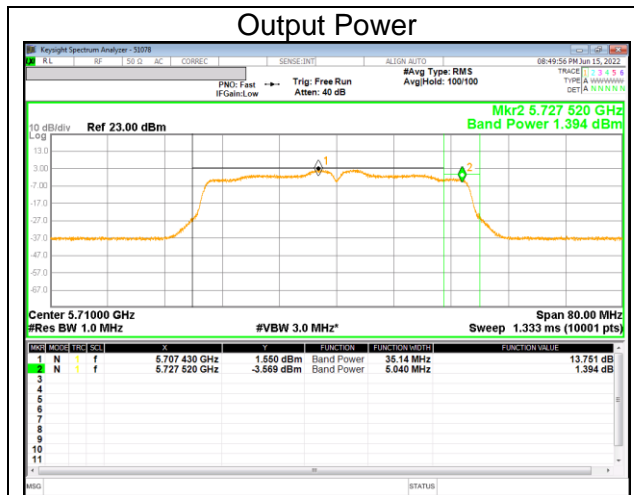


**UNII Straddle Ch. IEEE 802.11n HT20 mode Output Power and PSD**

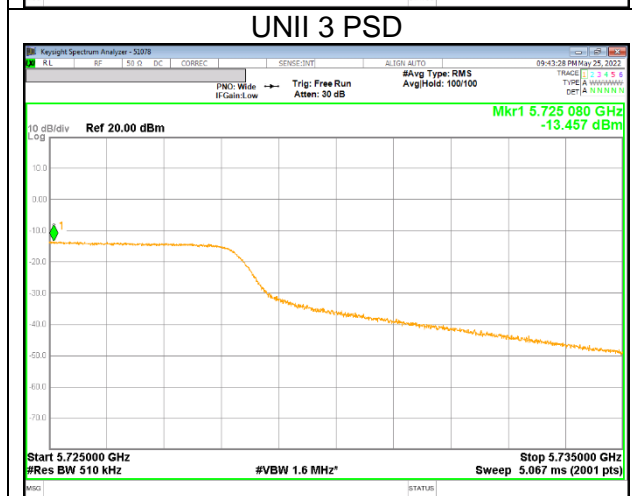
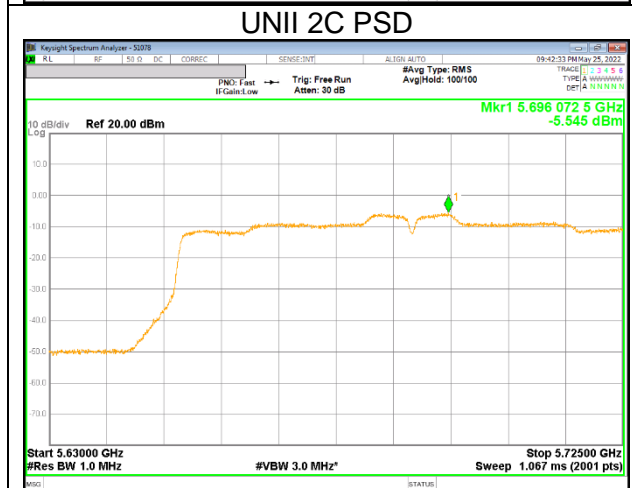
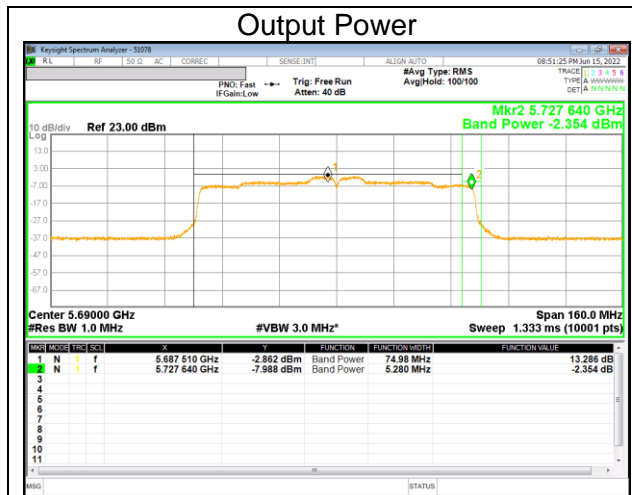




**UNII Straddle Ch. IEEE 802.11n HT40 mode Output Power and PSD**



**UNII Straddle Ch. IEEE 802.11ac VHT80 mode Output Power and PSD**



# 11. 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 Part 15.205 (a) : Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358 3600 ~ 4400		

▪ FCC Part 15.205(b) : The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

**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.
  - (iii) For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz
- (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 100 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 v02r01 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. In UNII-4, unwanted emissions outside of restricted bands are measured with an RMS detector.

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 1GHz 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.

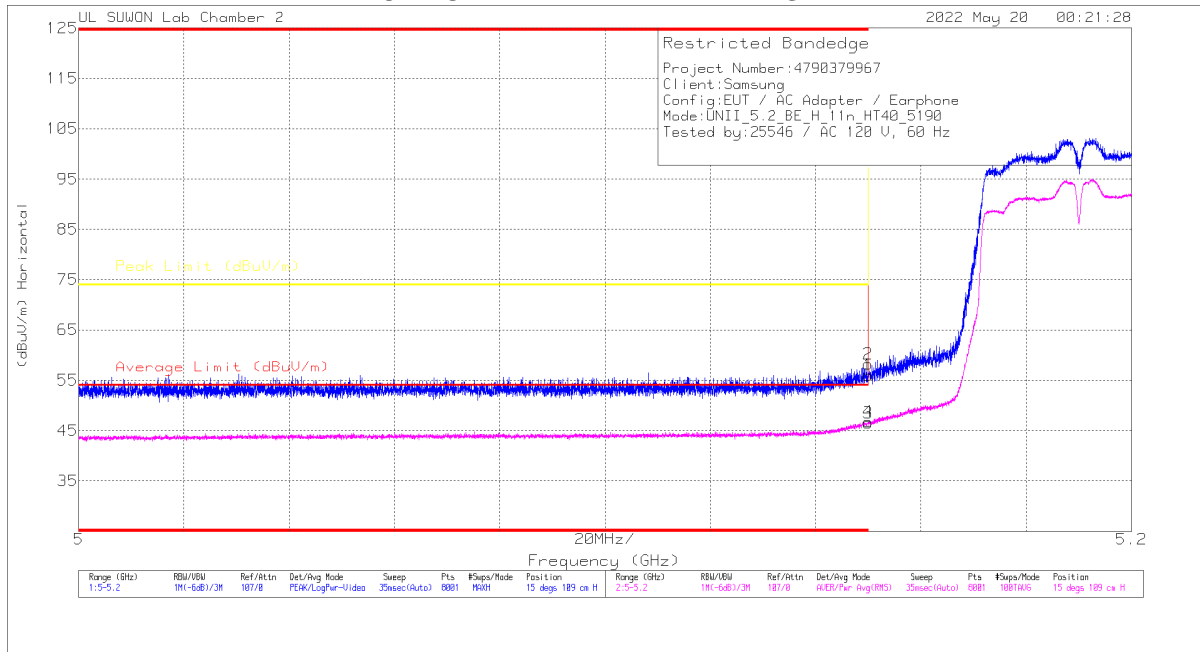
Note : Emission was pre-scanned from 9kHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).  
Per FCC part 15.31(o), test results were not reported.

Although these tests were performed other than open field 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 414788.

### 11.1. TX ABOVE 1GHz 1Tx MODE IN THE 5.2GHz BAND

#### BANDEDGE (WORST CASE: 802.11n HT40 / 5190 MHz)

#### HORIZONTAL PEAK AND AVERAGE DATA



#### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Acimath (Degs)	Height (cm)	Polarity
1	* 5.15	38.85	Pk	34.4	-17.2	0	56.05	-	-	74	-17.95	15	109	H
2	* 5.14998	41.02	Pk	34.4	-17.2	0	58.22	-	-	74	-15.78	15	109	H
3	* 5.15	29.3	RMS	34.4	-17.2	0	46.5	54	-7.5	-	-	15	109	H
4	* 5.14998	29.53	RMS	34.4	-17.2	0	46.73	54	-7.27	-	-	15	109	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK - Peak detector  
 RMS - RMS detection

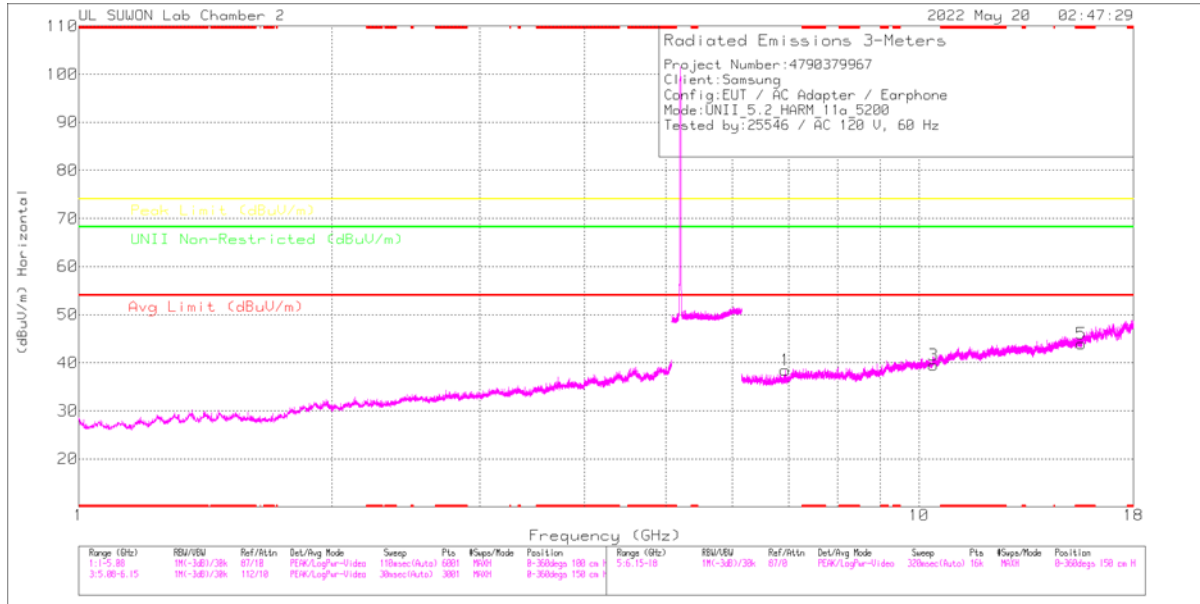
**BANDEDGE TEST DATA**

Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity	
5180	ANT1	* 5.15	36.04	Pk	34.40	-17.20	0.00	53.24	-	-	74.00	-20.76	17	109	H	
		* 5.1407	40.52	Pk	34.30	-17.10	0.00	57.72	-	-	74.00	-16.28	17	109	H	
		* 5.15	27.22	RMS	34.40	-17.20	0.00	44.42	54.00	-9.58	-	-	-	17	109	H
		* 5.14223	27.78	RMS	34.40	-17.10	0.00	45.08	54.00	-8.92	-	-	-	17	109	H
		* 5.15	36.12	Pk	34.40	-17.20	0.00	53.32	-	-	74.00	-20.68	52	100	V	
		* 5.0157	40.47	Pk	34.20	-17.40	0.00	57.27	-	-	74.00	-16.73	52	100	V	
		* 5.15	26.81	RMS	34.40	-17.20	0.00	44.01	54.00	-9.99	-	-	-	52	100	V
		* 5.13125	27.39	RMS	34.30	-17.10	0.00	44.59	54.00	-9.41	-	-	-	52	100	V
5180	ANT1	* 5.15	36.44	Pk	34.40	-17.20	0.00	53.64	-	-	74.00	-20.36	16	109	H	
		* 5.02158	40.13	Pk	34.20	-17.40	0.00	56.93	-	-	74.00	-17.07	16	109	H	
		* 5.15	26.85	RMS	34.40	-17.20	0.00	44.05	54.00	-9.95	-	-	-	16	109	H
		* 5.14873	27.62	RMS	34.40	-17.20	0.00	44.82	54.00	-9.18	-	-	-	16	109	H
		* 5.15	36.30	Pk	34.40	-17.20	0.00	53.50	-	-	74.00	-20.50	48	100	V	
		* 5.13065	38.93	Pk	34.30	-17.10	0.00	56.13	-	-	74.00	-17.87	48	100	V	
		* 5.15	26.50	RMS	34.40	-17.20	0.00	43.70	54.00	-10.30	-	-	-	48	100	V
		* 5.13098	27.16	RMS	34.30	-17.10	0.00	44.36	54.00	-9.64	-	-	-	48	100	V
5190	ANT1	* 5.15	38.85	Pk	34.40	-17.20	0.00	56.05	-	-	74.00	-17.95	15	109	H	
		* 5.14998	41.02	Pk	34.40	-17.20	0.00	58.22	-	-	74.00	-15.78	15	109	H	
		* 5.15	29.30	RMS	34.40	-17.20	0.00	46.50	54.00	-7.50	-	-	-	15	109	H
		* 5.14998	29.53	RMS	34.40	-17.20	0.00	46.73	54.00	-7.27	-	-	-	15	109	H
		* 5.15	35.97	Pk	34.40	-17.20	0.00	53.17	-	-	74.00	-20.83	51	100	V	
		* 5.0823	39.34	Pk	34.30	-17.30	0.00	56.34	-	-	74.00	-17.66	51	100	V	
		* 5.15	27.20	RMS	34.40	-17.20	0.00	44.40	54.00	-9.60	-	-	-	51	100	V
		* 5.1466	27.60	RMS	34.40	-17.20	0.00	44.80	54.00	-9.20	-	-	-	51	100	V
5210	ANT1	* 5.15	39.22	Pk	34.40	-17.20	0.00	56.42	-	-	74.00	-17.58	17	110	H	
		* 5.1476	41.16	Pk	34.40	-17.20	0.00	58.36	-	-	74.00	-15.64	17	110	H	
		* 5.15	29.11	RMS	34.40	-17.20	0.00	46.31	54.00	-7.69	-	-	-	17	110	H
		* 5.14908	29.49	RMS	34.40	-17.20	0.00	46.69	54.00	-7.31	-	-	-	17	110	H
		* 5.15	38.23	Pk	34.40	-17.20	0.00	55.43	-	-	74.00	-18.57	51	100	V	
		* 5.13708	39.88	Pk	34.30	-17.20	0.00	56.98	-	-	74.00	-17.02	51	100	V	
		* 5.15	26.61	RMS	34.40	-17.20	0.00	43.81	54.00	-10.19	-	-	-	51	100	V
		* 5.14973	27.23	RMS	34.40	-17.20	0.00	44.43	54.00	-9.57	-	-	-	51	100	V

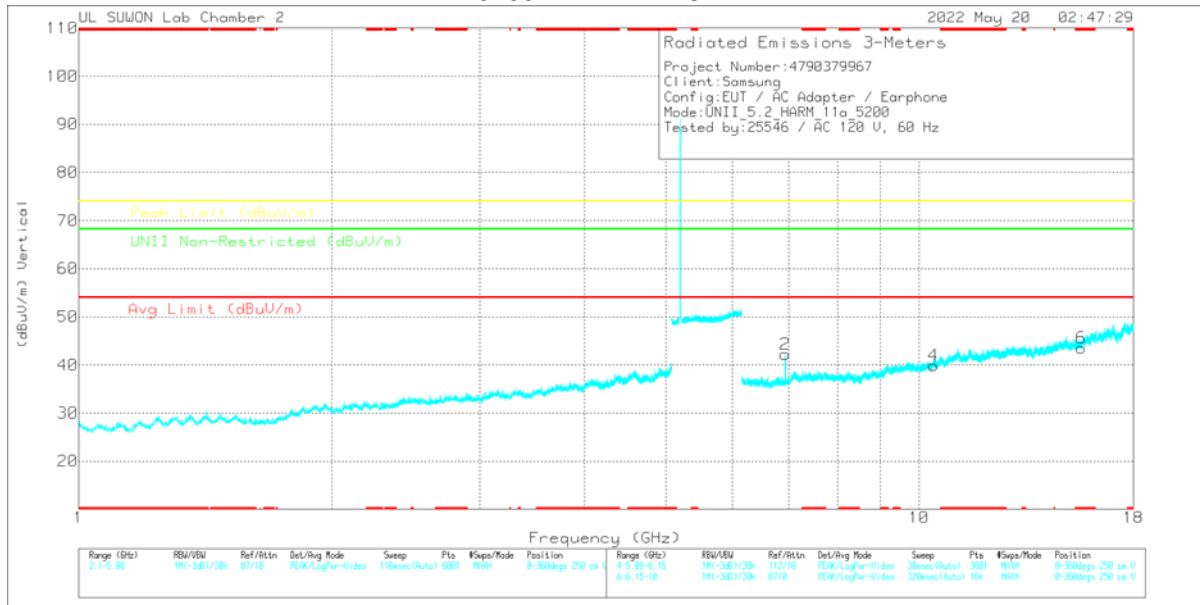
Note1. Pk - Peak detector, RMS - RMS detector

Note2. \* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

**HARMONICS AND SPURIOUS EMISSIONS(WORST CASE: 802.11a / 5200 MHz)**  
**5200 MHz HORIZONTAL**



**5200 MHz 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.

**Radiated Emissions**

Frequency (GHz)	Meas Reading (dBuV/m)	Det	3177_00168724	60Hz_HF(dB)	DC Cor (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
6.93329	37.96	PK-U	35.8	-25.1	0	48.66	-	-	-	-	68.2	-19.64	269	355	H
6.93323	39.13	PK-U	35.8	-25.1	0	49.83	-	-	-	-	68.2	-18.37	262	103	V
10.39922	33.95	PK-U	37.7	-20.6	0	51.05	-	-	-	-	68.2	-17.14	0	100	H
10.39508	33.51	PK-U	37.7	-20.6	0	50.61	-	-	-	-	68.2	-17.59	360	100	V
*15.60048	34.21	PK-U	40	-19.8	0	54.41	-	-	74	-19.59	-	-	0	100	H
*15.60048	22.41	ADR	40	-19.8	0	42.61	54	-11.39	-	-	-	-	0	100	H
*15.59191	35.33	PK-U	40	-19.0	0	55.53	-	-	74	-18.47	-	-	360	100	V
*15.59191	23.47	ADR	40	-19.8	0	43.67	54	-10.33	-	-	-	-	360	100	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK-U - U-NII: Maximum Peak



**HARMONICS AND SPURIOUS EMISSIONS TEST DATA**

Mode	Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Non-Restricted [dBuV/m]	Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity	
802.11a	5180	ANT1	7.771	35.52	PK-U	36.00	-23.20	0.00	48.32	-	-	-	-	68.20	-19.88	360	100	H	
			6.906	39.06	PK-U	35.80	-24.90	0.00	49.96	-	-	-	-	-	68.20	-18.24	348	113	V
			10.369	33.83	PK-U	37.70	-20.70	0.00	50.83	-	-	-	-	-	68.20	-17.37	360	100	H
			10.361	33.49	PK-U	37.70	-20.70	0.00	50.49	-	-	-	-	-	68.20	-17.71	360	100	V
			* 15.54537	34.50	PK-U	40.00	-19.40	0.00	55.10	-	-	-	74.00	-18.90	-	-	360	100	H
			* 15.54537	22.48	ADR	40.00	-19.40	0.00	43.08	54.00	-10.92	-	-	-	-	-	360	100	H
			* 15.54649	34.42	PK-U	40.00	-19.40	0.00	55.02	-	-	-	74.00	-18.98	-	-	360	100	V
			* 15.54649	22.84	ADR	40.00	-19.40	0.00	43.44	54.00	-10.56	-	-	-	-	-	360	100	V
			6.933	37.96	PK-U	35.80	-25.10	0.00	48.66	-	-	-	-	-	-	68.20	-19.54	289	355
	6.933	39.13	PK-U	35.80	-25.10	0.00	49.83	-	-	-	-	-	-	68.20	-18.37	342	103	V	
	10.399	33.96	PK-U	37.70	-20.60	0.00	51.06	-	-	-	-	-	-	68.20	-17.14	0	100	H	
	10.395	33.51	PK-U	37.70	-20.60	0.00	50.61	-	-	-	-	-	-	68.20	-17.59	360	100	V	
	* 15.60048	34.21	PK-U	40.00	-19.80	0.00	54.41	-	-	-	74.00	-19.59	-	-	0	100	H		
	* 15.60048	22.41	ADR	40.00	-19.80	0.00	42.61	54.00	-11.39	-	-	-	-	-	0	100	H		
	* 15.59191	35.33	PK-U	40.00	-19.80	0.00	55.53	-	-	-	74.00	-18.47	-	-	360	100	V		
	* 15.59191	23.47	ADR	40.00	-19.80	0.00	43.67	54.00	-10.33	-	-	-	-	-	360	100	V		
	7.863	37.34	PK-U	36.00	-24.10	0.00	49.24	-	-	-	-	-	-	68.20	-18.96	360	100	H	
	6.987	39.22	PK-U	35.90	-25.40	0.00	49.72	-	-	-	-	-	-	68.20	-18.48	340	112	V	
	10.473	33.35	PK-U	37.80	-20.30	0.00	50.85	-	-	-	-	-	-	68.20	-17.35	360	100	H	
	10.473	33.52	PK-U	37.80	-20.30	0.00	51.02	-	-	-	-	-	-	68.20	-17.18	360	100	V	
	* 15.72754	34.16	PK-U	40.20	-18.70	0.00	55.66	-	-	-	74.00	-18.34	-	-	360	100	H		
	* 15.72754	22.06	ADR	40.20	-18.70	0.00	43.56	54.00	-10.44	-	-	-	-	-	360	100	H		
	* 15.71206	34.49	PK-U	40.20	-18.80	0.00	55.89	-	-	-	74.00	-18.11	-	-	360	100	V		
	* 15.71206	22.17	ADR	40.20	-18.80	0.00	43.57	54.00	-10.43	-	-	-	-	-	360	100	V		

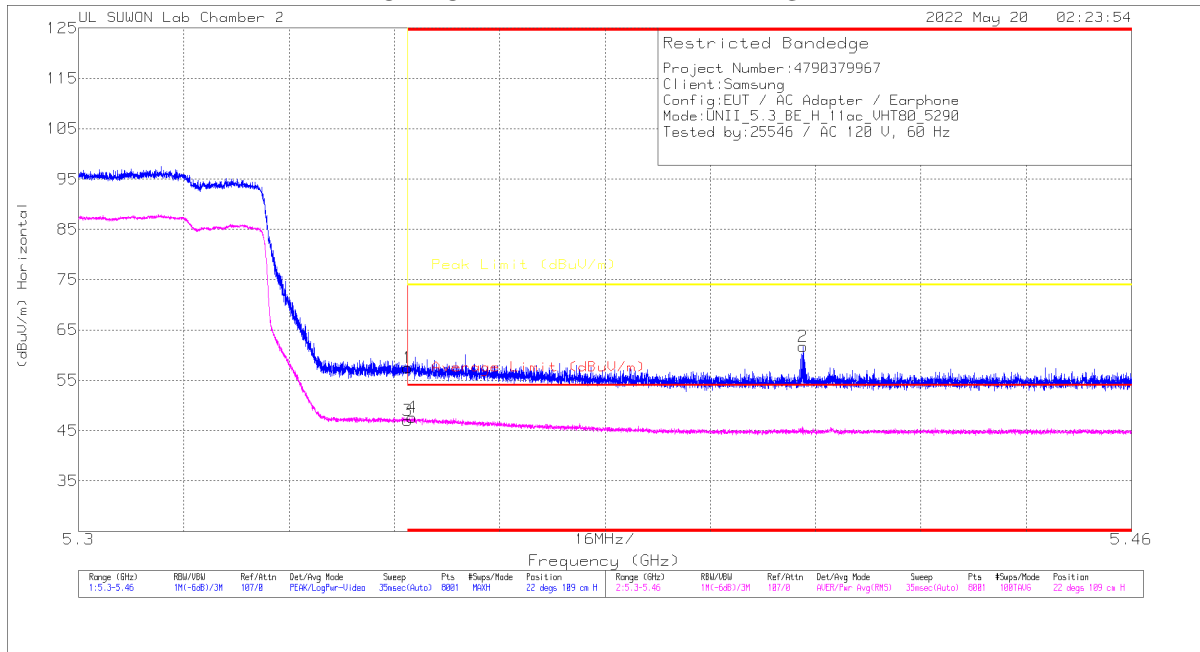
Note1. PK-U - U-NII: Maximum Peak

Note2. \* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

## 11.2. TX ABOVE 1GHz 1Tx MODE IN THE 5.3GHz BAND

### BANDEDGE (WORST CASE: 802.11ac VHT80 / 5290 MHz)

#### HORIZONTAL PEAK AND AVERAGE DATA



#### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Acimsh (Degs)	Height (cm)	Polarity
1	* 5.35002	39.84	Pk		-16.8	0	57.54	-	-	74	-16.46	22	109	H
2	* 5.41012	44	Pk		-16.9	0	61.7	-	-	74	-12.3	22	109	H
3	* 5.35002	29.33	RMS		-16.8	0	47.03	54	-6.97	-	-	22	109	H
4	* 5.35064	29.9	RMS		-16.8	0	47.6	54	-6.4	-	-	22	109	H

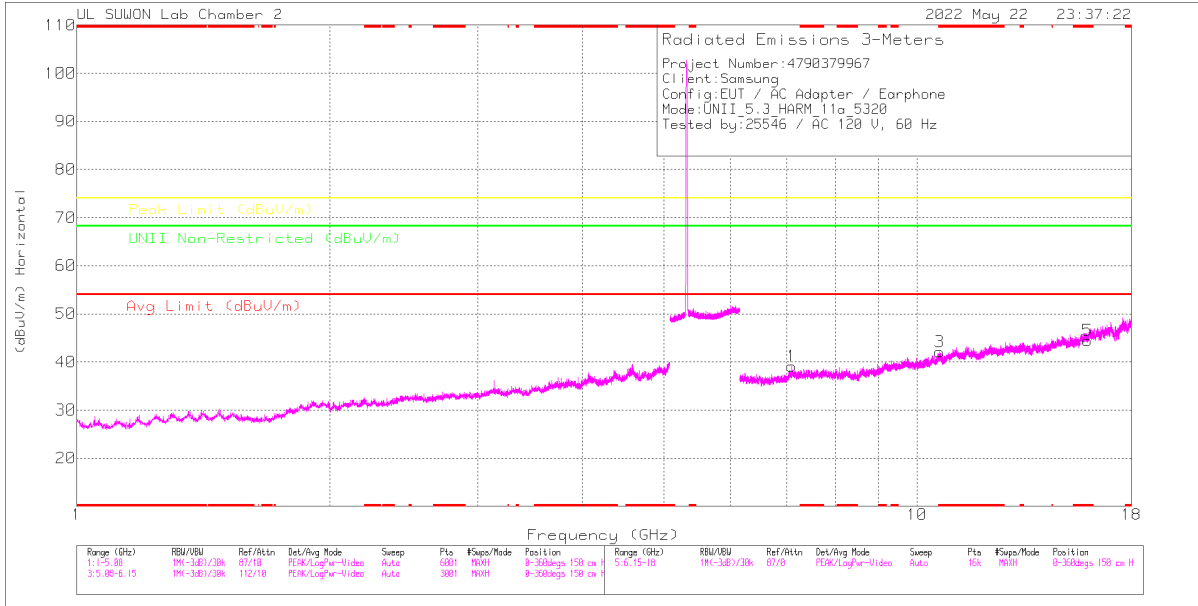
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK - Peak detector  
 RMS - RMS detection

**BANDEDGE TEST DATA**

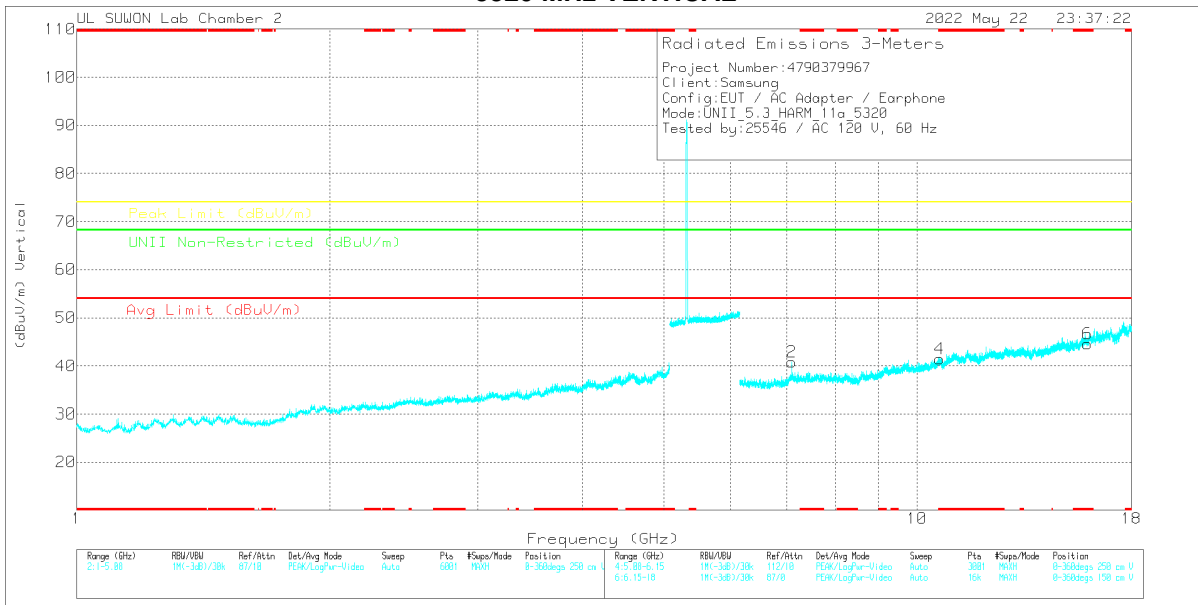
Mode	Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity
802.11a	5320	ANT1	* 5.35002	37.48	Pk	34.50	-16.80	0.00	55.18	-	-	74.00	-18.82	24	108	H
			* 5.35512	42.85	Pk	34.50	-16.90	0.00	60.45	-	-	74.00	-13.55	24	108	H
			* 5.35002	28.05	RMS	34.50	-16.80	0.00	45.75	54.00	-8.25	-	24	108	H	
			* 5.35132	28.64	RMS	34.50	-16.80	0.00	46.34	54.00	-7.66	-	24	108	H	
			* 5.35002	36.33	Pk	34.50	-16.80	0.00	54.03	-	-	74.00	-19.97	86	100	V
			* 5.42338	39.74	Pk	34.60	-17.00	0.00	57.34	-	-	74.00	-16.66	86	100	V
			* 5.35002	26.54	RMS	34.50	-16.80	0.00	44.24	54.00	-9.76	-	86	100	V	
802.11n (HT20)	5320	ANT1	* 5.43005	27.40	RMS	34.60	-16.90	0.00	45.10	54.00	-8.90	-	-	86	100	V
			* 5.35002	39.46	Pk	34.50	-16.80	0.00	57.16	-	-	74.00	-16.84	24	110	H
			* 5.35028	43.94	Pk	34.50	-16.80	0.00	61.64	-	-	74.00	-12.36	24	110	H
			* 5.35002	28.51	RMS	34.50	-16.80	0.00	46.21	54.00	-7.79	-	24	110	H	
			* 5.3512	29.12	RMS	34.50	-16.80	0.00	46.82	54.00	-7.18	-	24	110	H	
			* 5.35002	37.48	Pk	34.50	-16.80	0.00	55.18	-	-	74.00	-18.82	86	103	V
			* 5.42888	40.31	Pk	34.60	-16.90	0.00	58.01	-	-	74.00	-15.99	86	103	V
802.11n (HT40)	5310	ANT1	* 5.35002	26.62	RMS	34.50	-16.80	0.00	44.32	54.00	-9.68	-	-	86	103	V
			* 5.3575	27.77	RMS	34.50	-16.90	0.00	45.37	54.00	-8.63	-	86	103	V	
			* 5.35002	38.86	Pk	34.50	-16.80	0.00	56.56	-	-	74.00	-17.44	24	109	H
			* 5.43002	45.91	Pk	34.60	-16.90	0.00	63.61	-	-	74.00	-10.39	24	109	H
			* 5.35002	29.05	RMS	34.50	-16.90	0.00	46.75	54.00	-7.25	-	24	109	H	
			* 5.35062	29.56	RMS	34.50	-16.80	0.00	47.26	54.00	-6.74	-	24	109	H	
			* 5.35002	35.67	Pk	34.50	-16.80	0.00	53.37	-	-	74.00	-20.63	83	100	V
802.11ac (VHT80)	5290	ANT1	* 5.35124	39.68	Pk	34.50	-16.80	0.00	57.38	-	-	74.00	-16.62	83	100	V
			* 5.35002	26.72	RMS	34.50	-16.80	0.00	44.42	54.00	-9.58	-	83	100	V	
			* 5.42486	27.61	RMS	34.60	-17.00	0.00	45.21	54.00	-8.79	-	83	100	V	
			* 5.35002	39.84	Pk	34.50	-16.80	0.00	57.54	-	-	74.00	-16.46	22	109	H
			* 5.41012	44.00	Pk	34.60	-16.90	0.00	61.70	-	-	74.00	-12.30	22	109	H
			* 5.35002	29.33	RMS	34.50	-16.80	0.00	47.03	54.00	-6.97	-	22	109	H	
			* 5.35064	29.90	RMS	34.50	-16.80	0.00	47.60	54.00	-6.40	-	22	109	H	
802.11ac (VHT80)	5290	ANT1	* 5.35002	37.12	Pk	34.50	-16.80	0.00	54.82	-	-	74.00	-19.18	86	100	V
			* 5.36936	40.22	Pk	34.50	-16.90	0.00	57.82	-	-	74.00	-16.18	86	100	V
			* 5.35002	27.29	RMS	34.50	-16.80	0.00	44.99	54.00	-9.01	-	86	100	V	
			* 5.35666	27.63	RMS	34.50	-16.90	0.00	45.23	54.00	-8.77	-	86	100	V	

Note1. Pk - Peak detector, RMS - RMS detector  
 Note2. \* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

**HARMONICS AND SPURIOUS EMISSIONS(WORST CASE: 802.11a / 5320 MHz)**  
**5320 MHz HORIZONTAL**



**5320 MHz 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.

**Radiated Emissions**

Frequency (GHz)	Meas Reading (dBuV/m)	Det	317_00168724	60Hz_HPI(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 (Deg)	Height (cm)	Polarity
7.09357	36.51	PK-U	36.1	-23.5	0	49.11	-	-	-	-	68.2	-19.09	71	102	H
7.09314	37.48	PK-U	36.1	-23.5	0	50.08	-	-	-	-	68.2	-18.12	337	100	V
* 10.63949	33.27	PK-U	37.9	-19.3	0	51.87	-	74	-22.13	-	-	-	0	100	H
* 10.64627	33.04	PK-U	37.9	-19.3	0	51.64	-	74	-22.36	-	-	-	0	100	V
* 15.68841	35.16	PK-U	40.2	-19.1	0	56.26	-	74.00	-17.74	-	-	-	0	100	H
* 15.68841	23.37	ADR	40.2	-19.1	0	44.47	54.00	-9.53	-	-	-	-	0	100	H
* 15.68943	34.89	PK-U	40.2	-19.1	0	55.99	-	74.00	-18.01	-	-	-	0	100	V
* 15.68943	22.45	ADR	40.2	-19.1	0	43.35	54.00	-10.45	-	-	-	-	0	100	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK-U - U-NII: Maximum Peak

**HARMONICS AND SPURIOUS EMISSIONS TEST DATA**

Mode	Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Non-Restricted [dBuV/m]	Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity		
802.11a	5260	ANT1	7.014	36.78	PK-U	36.00	-25.20	0.00	47.58	-	-	-	-	68.20	-20.62	0	100	H		
			7.014	38.39	PK-U	36.00	-25.20	0.00	49.19	-	-	-	-	-	68.20	-19.01	340	100	V	
			10.520	32.97	PK-U	37.80	-20.30	0.00	50.47	-	-	-	-	-	68.20	-17.73	0	100	H	
			10.527	33.61	PK-U	37.80	-20.20	0.00	51.21	-	-	-	-	-	68.20	-16.99	360	100	V	
			* 15.782	34.09	PK-U	40.30	-19.00	0.00	55.39	-	-	-	74.00	-18.61	-	-	0	100	H	
			* 15.782	22.13	ADR	40.30	-19.00	0.00	43.43	54.00	-10.57	-	-	-	-	-	0	100	H	
			14.697	34.73	PK-U	39.50	-19.50	0.00	54.73	-	-	-	-	-	-	68.20	-13.47	0	100	V
			7.067	37.17	PK-U	36.00	-23.90	0.00	49.27	-	-	-	-	-	-	68.20	-18.93	58	102	H
			7.067	37.75	PK-U	36.00	-23.90	0.00	49.85	-	-	-	-	-	-	68.20	-18.35	338	100	V
	10.599	33.00	PK-U	37.90	-19.10	0.00	51.80	-	-	-	-	-	-	68.20	-16.40	0	100	H		
	10.592	33.17	PK-U	37.90	-19.30	0.00	51.77	-	-	-	-	-	-	68.20	-16.43	360	100	V		
	14.911	35.19	PK-U	39.70	-19.30	0.00	55.59	-	-	-	-	-	-	68.20	-12.61	138	176	H		
	* 15.89778	33.99	PK-U	40.50	-18.80	0.00	55.69	-	-	-	74.00	-18.31	-	-	-	360	100	V		
	* 15.89778	21.86	ADR	40.50	-18.80	0.00	43.56	54.00	-10.44	-	-	-	-	-	-	360	100	V		
	7.094	36.51	PK-U	36.10	-23.50	0.00	49.11	-	-	-	-	-	-	68.20	-19.09	71	102	H		
	7.093	37.48	PK-U	36.10	-23.50	0.00	50.08	-	-	-	-	-	-	68.20	-18.12	337	100	V		
	* 10.63949	33.27	PK-U	37.90	-19.30	0.00	51.87	-	-	-	74.00	-22.13	-	-	-	0	100	H		
	* 10.64627	33.04	PK-U	37.90	-19.30	0.00	51.64	-	-	-	74.00	-22.36	-	-	-	0	100	V		
	* 15.68841	35.16	PK-U	40.20	-19.10	0.00	56.26	-	-	-	74.00	-17.74	-	-	-	0	100	H		
	* 15.68841	23.37	ADR	40.20	-19.10	0.00	44.47	54.00	-9.53	-	-	-	-	-	-	0	100	H		
	* 15.68943	34.89	PK-U	40.20	-19.10	0.00	55.99	-	-	-	74.00	-18.01	-	-	-	0	100	V		
	* 15.68943	22.45	ADR	40.20	-19.10	0.00	43.55	54.00	-10.45	-	-	-	-	-	-	0	100	V		

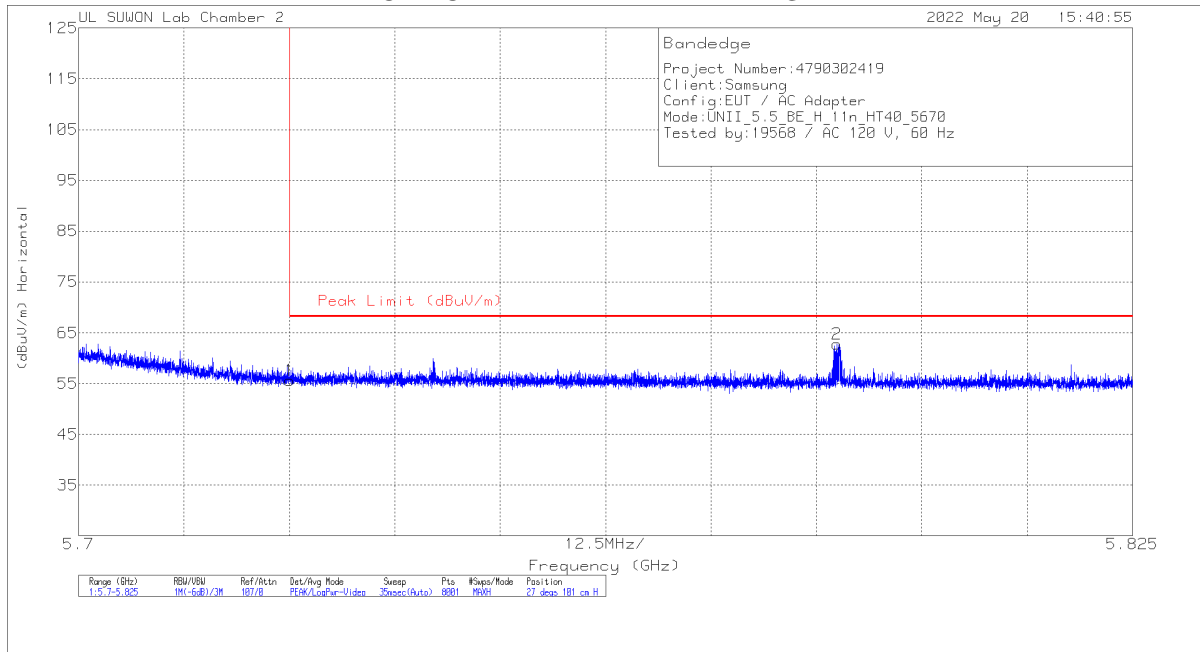
Note1. PK-U - U-NII: Maximum Peak / ADR - U-NII AD primary method, RMS average

Note2. \* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

### 11.3. TX ABOVE 1GHz 1Tx MODE IN THE 5.5 GHz BAND

#### BANDEDGE (WORST CASE: 802.11n HT40 / 5670 MHz)

#### HORIZONTAL PEAK AND AVERAGE DATA



#### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.72502	37.74	Pk	34.7	-16.8	0	55.64	68.2	-12.56	27	101	H
2	5.78997	44.7	Pk	34.8	-16.7	0	62.8	68.2	-5.4	27	101	H

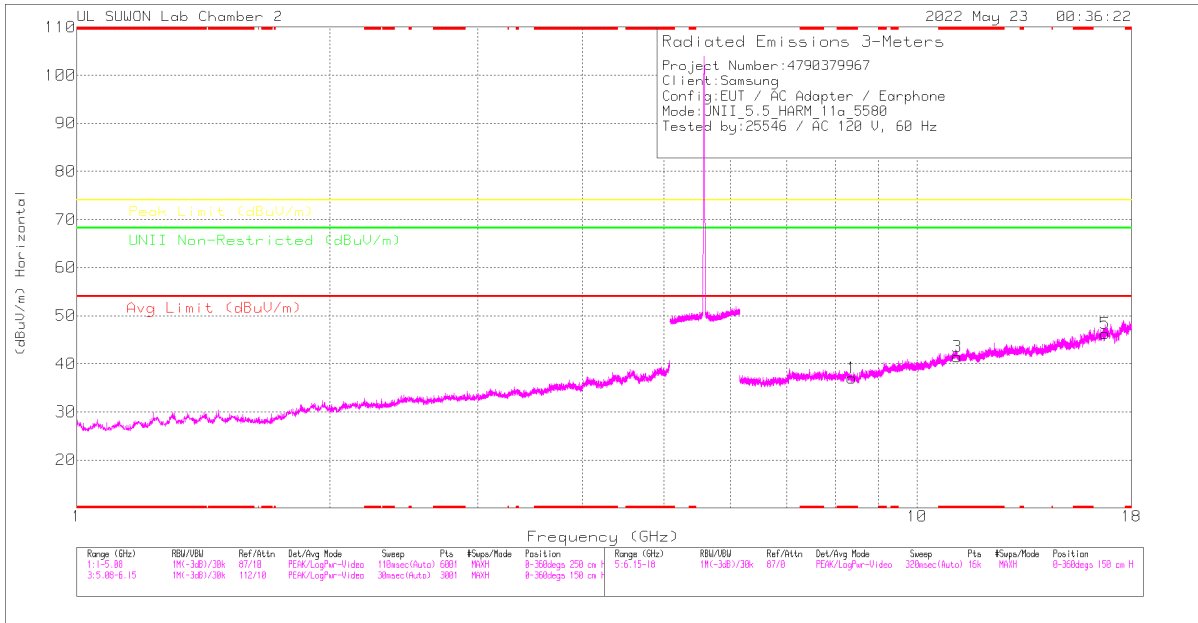
Pk - Peak detector

**BANDEDGE TEST DATA**

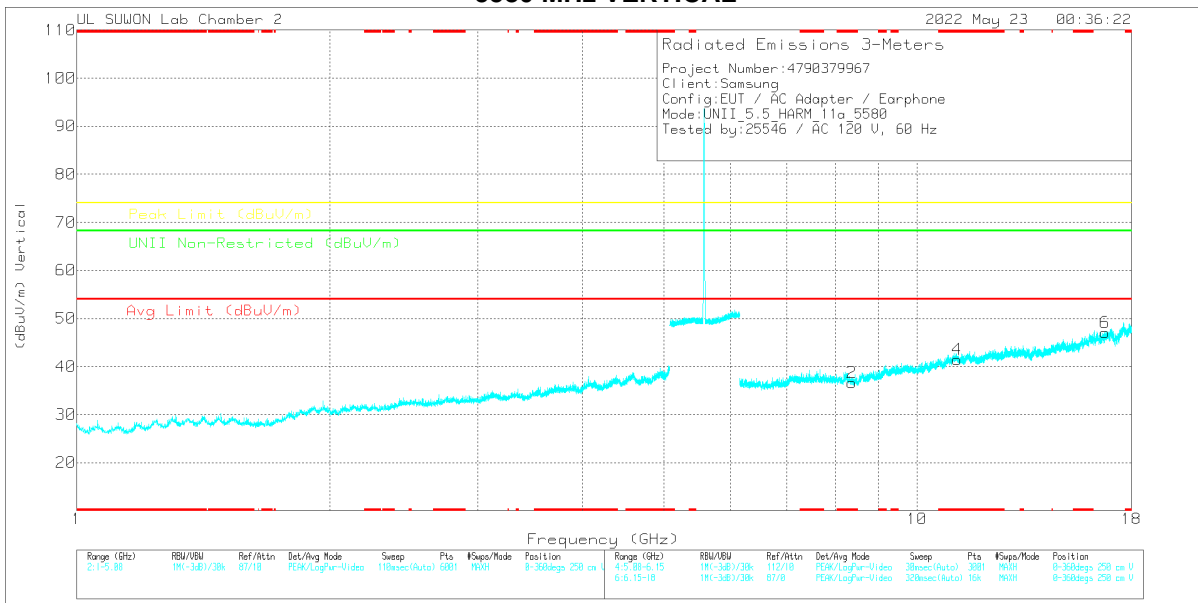
Mode	Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity	
802.11a	5500	ANT1	* 5.45999	37.17	Pk	34.60	-17.10	0.00	54.67	-	-	74.00	-19.33	22	102	H	
			* 5.44083	40.86	Pk	34.60	-17.00	0.00	58.46	-	-	74.00	-15.54	22	102	H	
			5.46998	38.53	Pk	34.60	-17.00	0.00	56.13	-	-	68.20	-12.07	22	102	H	
			5.46837	41.28	Pk	34.60	-17.10	0.00	58.78	-	-	68.20	-9.42	22	102	H	
			* 5.45999	28.40	RMS	34.60	-17.10	0.00	45.90	54.00	-8.10	-	-	-	22	102	H
			* 5.45555	28.85	RMS	34.60	-17.00	0.00	46.45	54.00	-7.55	-	-	-	22	102	H
			5.46998	28.22	RMS	34.60	-17.00	0.00	45.82	-	-	-	-	-	22	102	H
			5.46611	26.72	RMS	34.60	-17.00	0.00	46.32	-	-	-	-	-	22	102	H
			* 5.45999	36.57	Pk	34.60	-17.10	0.00	54.07	-	-	-	74.00	-19.93	121	118	V
			* 5.44065	39.97	Pk	34.60	-17.00	0.00	57.57	-	-	-	74.00	-16.43	121	118	V
			5.46998	38.56	Pk	34.60	-17.00	0.00	56.16	-	-	-	68.20	-12.04	121	118	V
			5.46086	38.86	Pk	34.60	-17.00	0.00	56.46	-	-	-	68.20	-11.74	121	118	V
	* 5.45999	26.83	RMS	34.60	-17.10	0.00	44.33	54.00	-9.67	-	-	-	121	118	V		
	* 5.35055	27.59	RMS	34.50	-16.80	0.00	45.29	54.00	-8.71	-	-	-	121	118	V		
	5.46998	26.90	RMS	34.60	-17.00	0.00	44.50	-	-	-	-	-	121	118	V		
	5.46745	27.73	RMS	34.60	-17.10	0.00	45.23	-	-	-	-	-	121	118	V		
	5700	ANT1	5.72502	38.88	Pk	34.70	-16.80	0.00	56.78	-	-	68.20	-11.42	37	100	H	
			5.72806	43.43	Pk	34.70	-16.80	0.00	61.33	-	-	68.20	-6.87	37	100	H	
			5.72502	37.16	Pk	34.70	-16.80	0.00	55.06	-	-	68.20	-13.14	82	383	V	
			5.75370	39.96	Pk	34.70	-16.80	0.00	57.86	-	-	68.20	-10.34	82	383	V	
	802.11n (HT20)	5500	ANT1	* 5.45999	38.30	Pk	34.60	-17.10	0.00	55.80	-	-	74.00	-18.20	23	101	H
				* 5.37997	40.77	Pk	34.50	-16.90	0.00	58.37	-	-	74.00	-15.63	23	101	H
				5.46998	41.33	Pk	34.60	-17.00	0.00	58.93	-	-	68.20	-9.27	23	101	H
				5.46839	41.66	Pk	34.60	-17.10	0.00	59.16	-	-	68.20	-9.04	23	101	H
* 5.45999				28.06	RMS	34.60	-17.10	0.00	45.56	54.00	-8.44	-	-	23	100	H	
* 5.45966				28.85	RMS	34.60	-17.10	0.00	46.35	54.00	-7.65	-	-	23	100	H	
5.46998				28.33	RMS	34.60	-17.00	0.00	45.93	-	-	-	-	23	100	H	
5.46603				28.86	RMS	34.60	-17.00	0.00	46.46	-	-	-	-	23	100	H	
* 5.45999				35.69	Pk	34.60	-17.10	0.00	53.18	-	-	74.00	-20.82	237	398	V	
* 5.35179				39.45	Pk	34.50	-16.80	0.00	57.15	-	-	74.00	-16.85	237	398	V	
5.46998				35.85	Pk	34.60	-17.00	0.00	53.45	-	-	68.20	-14.75	237	398	V	
5.46312				38.74	Pk	34.60	-17.00	0.00	56.34	-	-	68.20	-11.86	237	398	V	
* 5.45999		27.20	RMS	34.60	-17.10	0.00	44.70	54.00	-9.30	-	-	237	398	V			
* 5.45658		27.54	RMS	34.60	-17.00	0.00	45.14	54.00	-8.86	-	-	237	398	V			
5.46998		26.89	RMS	34.60	-17.00	0.00	44.49	-	-	-	-	237	398	V			
5.46377		27.54	RMS	34.60	-17.00	0.00	45.14	-	-	-	-	237	398	V			
5700		ANT1	5.72502	38.11	Pk	34.70	-16.80	0.00	56.01	-	-	68.20	-12.19	37	118	H	
			5.73000	42.30	Pk	34.70	-16.80	0.00	60.20	-	-	68.20	-8.00	37	118	H	
			5.72502	36.36	Pk	34.70	-16.80	0.00	54.26	-	-	68.20	-13.94	148	382	V	
			5.78275	39.82	Pk	34.80	-16.80	0.00	57.82	-	-	68.20	-10.38	148	382	V	
802.11n (HT40)		5510	ANT1	* 5.45999	38.37	Pk	34.60	-17.10	0.00	55.87	-	-	74.00	-18.13	22	101	H
				* 5.38994	46.48	Pk	34.50	-16.90	0.00	64.08	-	-	74.00	-9.92	22	101	H
				5.46998	37.14	Pk	34.60	-17.00	0.00	54.74	-	-	68.20	-13.46	22	101	H
				* 5.38994	46.48	Pk	34.50	-16.90	0.00	64.08	-	-	74.00	-9.92	22	101	H
	* 5.45999			27.81	RMS	34.60	-17.10	0.00	45.31	54.00	-8.69	-	-	22	101	H	
	* 5.38994			29.66	RMS	34.50	-16.90	0.00	47.26	54.00	-6.74	-	-	22	101	H	
	5.46998			28.39	RMS	34.60	-17.00	0.00	45.99	-	-	-	-	22	101	H	
	5.46915			28.80	RMS	34.60	-17.00	0.00	46.40	-	-	-	-	22	101	H	
	* 5.45999			35.56	Pk	34.60	-17.10	0.00	53.06	-	-	74.00	-20.94	114	109	V	
	* 5.45189			40.29	Pk	34.60	-17.10	0.00	57.79	-	-	74.00	-16.21	114	109	V	
	5.46998			35.75	Pk	34.60	-17.00	0.00	53.35	-	-	68.20	-14.85	114	109	V	
	5.46084			38.92	Pk	34.60	-17.00	0.00	56.52	-	-	68.20	-11.68	114	109	V	
	* 5.45999	27.05	RMS	34.60	-17.10	0.00	44.55	54.00	-9.45	-	-	114	109	V			
	* 5.42333	27.82	RMS	34.60	-17.00	0.00	45.42	54.00	-8.58	-	-	114	109	V			
	5.46998	27.08	RMS	34.60	-17.00	0.00	44.68	-	-	-	-	114	109	V			
	5.46926	27.60	RMS	34.60	-17.00	0.00	45.20	-	-	-	-	114	109	V			
	5670	ANT1	5.72502	37.74	Pk	34.70	-16.80	0.00	55.64	-	-	68.20	-12.56	27	101	H	
			5.78997	44.70	Pk	34.80	-16.70	0.00	62.80	-	-	68.20	-5.40	27	101	H	
			5.72502	37.25	Pk	34.70	-16.80	0.00	55.15	-	-	68.20	-13.05	81	395	V	
			5.79013	42.26	Pk	34.80	-16.70	0.00	60.36	-	-	68.20	-7.84	81	395	V	
	802.11ac (VHT80)	5530	ANT1	* 5.45999	37.46	Pk	34.60	-17.10	0.00	54.96	-	-	74.00	-19.04	22	118	H
				* 5.40989	43.59	Pk	34.60	-16.90	0.00	61.29	-	-	74.00	-12.71	22	118	H
				5.46998	36.74	Pk	34.60	-17.00	0.00	54.34	-	-	68.20	-13.86	22	118	H
				5.46110	40.71	Pk	34.60	-17.00	0.00	58.31	-	-	68.20	-9.89	22	118	H
* 5.45999				28.66	RMS	34.60	-17.10	0.00	46.16	54.00	-7.84	-	-	22	118	H	
* 5.45397				28.84	RMS	34.60	-17.00	0.00	46.44	54.00	-7.56	-	-	22	118	H	
5.46998				28.99	RMS	34.60	-17.00	0.00	46.59	-	-	-	-	22	118	H	
5.46664				29.39	RMS	34.60	-17.00	0.00	46.99	-	-	-	-	22	118	H	
* 5.45999				36.57	Pk	34.60	-17.10	0.00	54.07	-	-	74.00	-19.93	117	118	V	
* 5.43376				40.07	Pk	34.60	-17.00	0.00	57.67	-	-	74.00	-16.33	117	118	V	
5.46998				36.76	Pk	34.60	-17.00	0.00	54.36	-	-	68.20	-13.84	117	118	V	
5.46867				39.15	Pk	34.60	-17.10	0.00	56.65	-	-	68.20	-11.55	117	118	V	
* 5.45999		26.90	RMS	34.60	-17.10	0.00	44.40	54.00	-9.60	-	-	117	118	V			
* 5.40541		27.64	RMS	34.60	-16.90	0.00	45.34	54.00	-8.66	-	-	117	118	V			
5.46998		26.96	RMS	34.60	-17.00	0.00	44.56	-	-	-	-	117	118	V			
5.46130		27.65	RMS	34.60	-17.00	0.00	45.25	-	-	-	-	117	118	V			
5610		ANT1	5.72502	36.68	Pk	34.70	-16.80	0.00	54.58	-	-	68.20	-13.62	22	120	H	
			5.72995	43.81	Pk	34.70	-16.80	0.00	61.71	-	-	68.20	-6.49	22	120	H	
			5.72502	36.67	Pk	34.70	-16.80	0.00	54.57	-	-	68.20	-13.63	81	341	V	
			5.78781	39.44	Pk	34.80	-16.70	0.00	57.54	-	-	68.20	-10.66	81	341	V	

Note1. Pk - Peak detector, RMS - RMS detector  
Note2. \* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

**HARMONICS AND SPURIOUS EMISSIONS(WORST CASE: 802.11a / 5580 MHz)**  
**5580 MHz HORIZONTAL**



**5580 MHz 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.

**Radiated Emissions**

Frequency (GHz)	Max Reading (dBuV)	Det	317_00168724	6GHz_HPSDR	DC Corr (dB)	Corrected Reading (dBuV)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Altitude (m)	Height (m)	Polarity
* 8.36915	36.1	PK-U	36	-23.3	0	48.8	-	-	74	-25.2	-	-	360	100	H
* 8.37213	35.33	PK-U	36	-23.3	0	48.03	-	-	74	-25.97	-	-	360	100	V
* 11.15961	33.8	PK-U	38.3	-19.4	0	52.7	-	-	74	-21.3	-	-	360	100	H
* 11.16189	33.83	PK-U	38.3	-19.5	0	52.43	-	-	74	-21.57	-	-	360	100	V
16.74026	34.57	PK-U	41.1	-18.1	0	57.57	-	-	-	-	68.2	-10.63	360	100	H
16.74225	35.17	PK-U	41.1	-18.1	0	58.17	-	-	-	-	68.2	-10.03	360	100	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK-U - U-NII: Maximum Peak



**HARMONICS AND SPURIOUS EMISSIONS TEST DATA**

Mode	Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Non-Restricted [dBuV/m]	Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity	
802.11a	5500	ANT1	* 8.25028	26.99	PK	35.90	-22.80	0.00	40.09	-	-	74.00	-33.91	-	-	360	100	H	
			* 8.25025	35.37	PK-U	35.90	-22.80	0.00	48.47	-	-	74.00	-25.53	-	-	360	100	V	
			* 11.00437	34.10	PK-U	38.20	-20.30	0.00	52.00	-	-	74.00	-22.00	-	-	360	100	H	
			* 10.99067	34.07	PK-U	38.20	-20.30	0.00	51.97	-	-	74.00	-22.03	-	-	360	100	V	
			16.498	34.55	PK-U	40.80	-19.00	0.00	56.35	-	-	-	-	-	68.20	-11.85	360	100	H
			16.492	34.40	PK-U	40.80	-19.00	0.00	56.20	-	-	-	-	-	68.20	-12.00	360	100	V
	5580	ANT1	* 8.36915	36.10	PK-U	36.00	-23.30	0.00	48.80	-	-	74.00	-25.20	-	-	360	100	H	
			* 8.37213	35.33	PK-U	36.00	-23.30	0.00	48.03	-	-	74.00	-25.97	-	-	360	100	V	
			* 11.15961	33.80	PK-U	38.30	-19.40	0.00	52.70	-	-	74.00	-21.30	-	-	360	100	H	
			* 11.16189	33.63	PK-U	38.30	-19.50	0.00	52.43	-	-	74.00	-21.57	-	-	360	100	V	
			16.740	34.57	PK-U	41.10	-18.10	0.00	57.57	-	-	-	-	-	68.20	-10.63	360	100	H
			16.742	35.17	PK-U	41.10	-18.10	0.00	58.17	-	-	-	-	-	68.20	-10.03	360	100	V
	5700	ANT1	* 7.60009	35.76	PK-U	35.90	-23.70	0.00	47.96	-	-	74.00	-26.04	-	-	360	100	H	
			* 7.59981	37.56	PK-U	36.00	-23.70	0.00	49.86	-	-	74.00	-24.14	-	-	302	100	V	
			* 7.59997	28.03	ADR	36.00	-23.70	0.00	40.33	54.00	-13.67	-	-	-	-	302	100	V	
			* 11.40041	34.08	PK-U	38.30	-20.10	0.00	52.28	-	-	74.00	-21.72	-	-	360	100	H	
			* 11.40122	34.48	PK-U	38.30	-20.10	0.00	52.68	-	-	74.00	-21.32	-	-	360	100	V	
			17.100	34.62	PK-U	41.00	-18.30	0.00	57.32	-	-	-	-	-	68.20	-10.88	360	100	H
		17.099	34.09	PK-U	41.00	-18.30	0.00	56.79	-	-	-	-	-	68.20	-11.41	360	100	V	

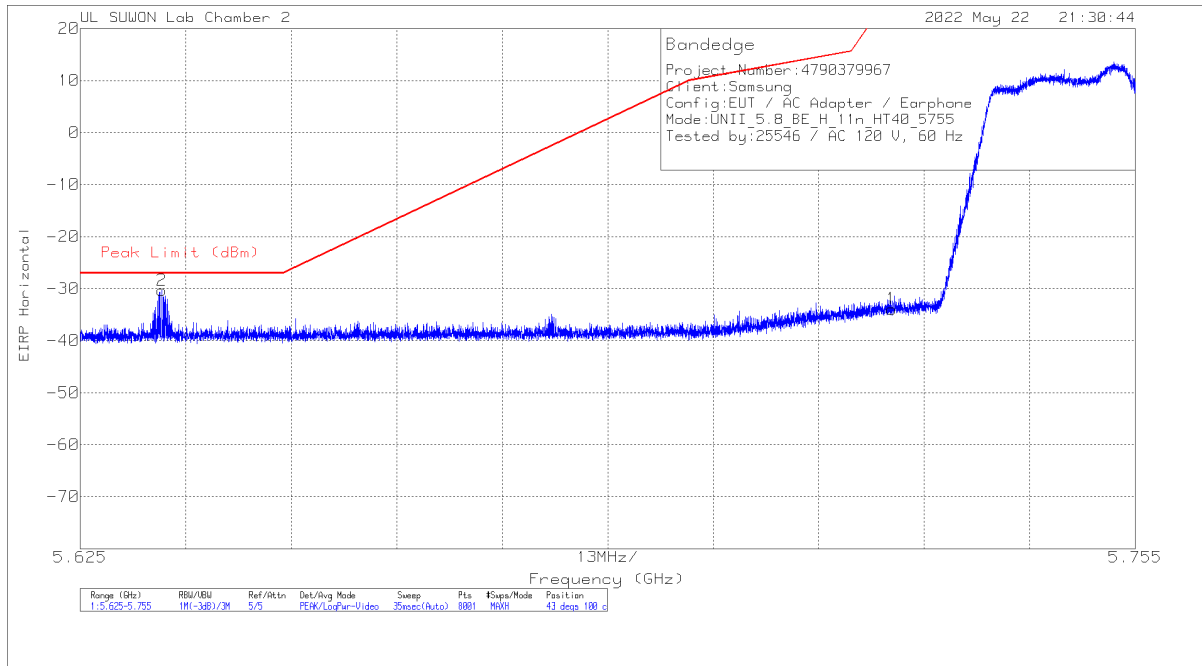
Note1. PK-U - U-NII: Maximum Peak / ADR - U-NII AD primary method, RMS average

Note2. \* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

# 11.4. TX ABOVE 1GHz 1Tx MODE IN THE 5.8 GHz BAND

## BANDEDGE (WORST CASE: 802.11n HT40 / 5755 MHz)

### HORIZONTAL PEAK DATA



### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	3117_00168724	10dB_ATT[dB]	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.72499	-63.6	Pk	34.7	-16.8	11.8	0	-33.9	26.97	-60.87	43	100	H
2	5.63506	-59.82	Pk	34.6	-16.9	11.8	0	-30.32	-27	-3.32	43	100	H

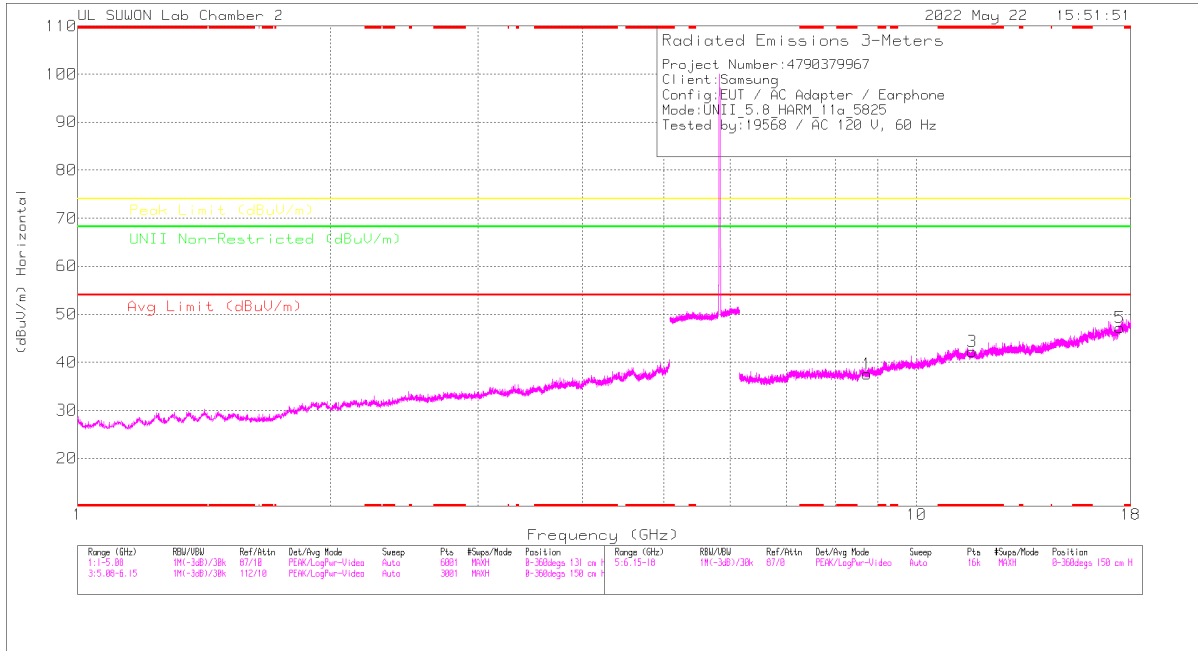
Pk - Peak detector

**BANDEDGE TEST DATA**

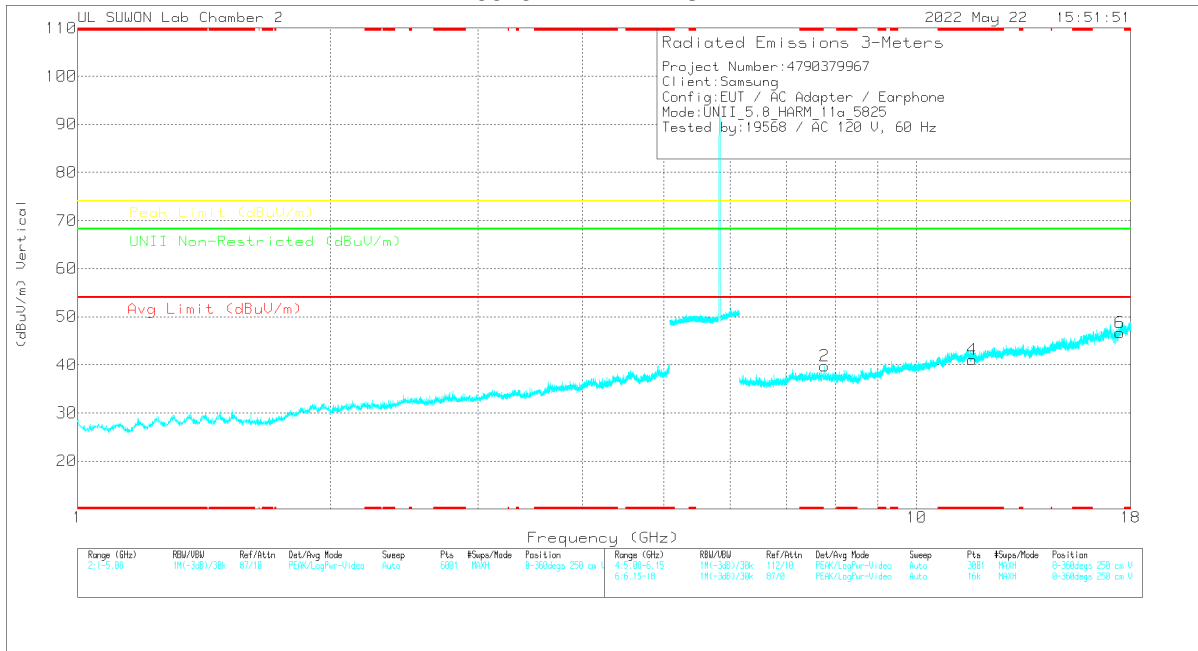
Mode	Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBm]	Detector Mode	ANT Factor	Loss [dB]	Conv. F [dB]	DC Corr [dB]	Result [dBm]	PK Limit [dBm]	PK Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity
802.11a	5745	ANT1	5.72499	-61.55	Pk	34.70	-16.80	11.80	0.00	-31.85	26.97	-58.82	37	114	H
			5.62508	-64.26	Pk	34.60	-16.90	11.80	0.00	-34.76	-27.00	-7.76	37	114	H
			5.72499	-68.79	Pk	34.70	-16.80	11.80	0.00	-39.09	26.97	-66.06	131	400	V
			5.64060	-67.16	Pk	34.60	-16.90	11.80	0.00	-37.66	-27.00	-10.66	131	400	V
	5825	ANT1	5.85003	-70.00	Pk	34.90	-16.60	11.80	0.00	-39.90	26.94	-66.84	33	265	H
			5.98405	-67.16	Pk	35.10	-16.30	11.80	0.00	-36.56	-27.00	-9.56	33	265	H
			5.85003	-71.09	Pk	34.90	-16.60	11.80	0.00	-40.99	26.94	-67.93	213	102	V
			5.98460	-67.00	Pk	35.10	-16.30	11.80	0.00	-36.40	-27.00	-9.40	213	102	V
			5.72499	-60.82	Pk	34.70	-16.80	11.80	0.00	-31.12	26.97	-58.09	40	104	H
802.11n (HT20)	5745	ANT1	5.62511	-63.30	Pk	34.60	-16.90	11.80	0.00	-33.80	-27.00	-6.80	40	104	H
			5.72499	-68.70	Pk	34.70	-16.80	11.80	0.00	-39.00	26.97	-65.97	131	400	V
			5.64715	-66.69	Pk	34.60	-16.90	11.80	0.00	-37.19	-27.00	-10.19	131	400	V
			5.85003	-68.82	Pk	34.90	-16.60	11.80	0.00	-38.72	26.94	-65.66	38	100	H
	5825	ANT1	5.93075	-67.42	Pk	35.10	-16.40	11.80	0.00	-36.92	-27.00	-9.92	38	100	H
			5.85003	-71.06	Pk	34.90	-16.60	11.80	0.00	-40.96	26.94	-67.90	218	100	V
			5.94578	-66.86	Pk	35.10	-16.40	11.80	0.00	-36.36	-27.00	-9.36	218	100	V
			5.72499	-63.60	Pk	34.70	-16.80	11.80	0.00	-33.90	26.97	-60.87	43	100	H
			5.63506	-59.82	Pk	34.60	-16.90	11.80	0.00	-30.32	-27.00	-3.32	43	100	H
802.11n (HT40)	5755	ANT1	5.72499	-68.57	Pk	34.70	-16.80	11.80	0.00	-38.87	26.97	-65.84	232	400	V
			5.63519	-66.69	Pk	34.60	-16.90	11.80	0.00	-37.19	-27.00	-10.19	232	400	V
			5.85003	-70.43	Pk	34.90	-16.60	11.80	0.00	-40.33	26.94	-67.27	41	100	H
			5.98040	-67.61	Pk	35.10	-16.30	11.80	0.00	-37.01	-27.00	-10.01	41	100	H
	5795	ANT1	5.85003	-71.31	Pk	34.90	-16.60	11.80	0.00	-41.21	26.94	-68.15	218	101	V
			5.99020	-67.51	Pk	35.10	-16.30	11.80	0.00	-36.91	-27.00	-9.91	218	101	V
			5.72499	-64.74	Pk	34.70	-16.80	11.80	0.00	-35.04	26.97	-62.01	42	102	H
			5.65474	-61.60	Pk	34.60	-16.90	11.80	0.00	-32.10	-23.49	-8.61	42	102	H
			5.72499	-69.22	Pk	34.70	-16.80	11.80	0.00	-39.52	26.97	-66.49	121	399	V
802.11ac (VHT80)	5775 (Lower side)	ANT1	5.62879	-66.72	Pk	34.60	-16.90	11.80	0.00	-37.22	-27.00	-10.22	121	399	V
			5.85003	-67.71	Pk	34.90	-16.60	11.80	0.00	-37.61	26.94	-64.55	40	100	H
			5.99728	-67.54	Pk	35.20	-16.20	11.80	0.00	-36.74	-27.00	-9.74	40	100	H
	5775 (Upper Side)	ANT1	5.85003	-70.59	Pk	34.90	-16.60	11.80	0.00	-40.49	26.94	-67.43	129	388	V
			5.99610	-67.85	Pk	35.20	-16.20	11.80	0.00	-37.05	-27.00	-10.05	129	388	V

Note. Pk - Peak detector

**HARMONICS AND SPURIOUS EMISSIONS(WORST CASE: 802.11a / 5825 MHz)**  
**5825 MHz HORIZONTAL**



**5825 MHz 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.

**Radiated Emissions**

Frequency (GHz)	Max Reading (dBuV)	Det	317_00168724	6GHz_H(FdB)	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)	Altitude (Degs)	Height (cm)	Polarity
8.74351	35.02	PK-U	36.3	-23	0	48.32	-	-	-	-	68.2	-19.88	360	100	H
7.76548	37.02	PK-U	36	-23.3	0	49.72	-	-	-	-	68.2	-18.48	295	104	V
*11.54698	33.41	PK-U	38.4	-19.6	0	52.21	-	-	74	-21.79	-	-	360	100	H
*11.6542	33.82	PK-U	38.4	-19.5	0	52.72	-	-	74	-21.28	-	-	360	100	V
17.47194	34.91	PK-U	41.1	-17.7	0	58.31	-	-	-	-	68.2	-9.89	360	100	H
17.4834	33.99	PK-U	41.2	-17.8	0	57.39	-	-	-	-	68.2	-10.81	360	100	V

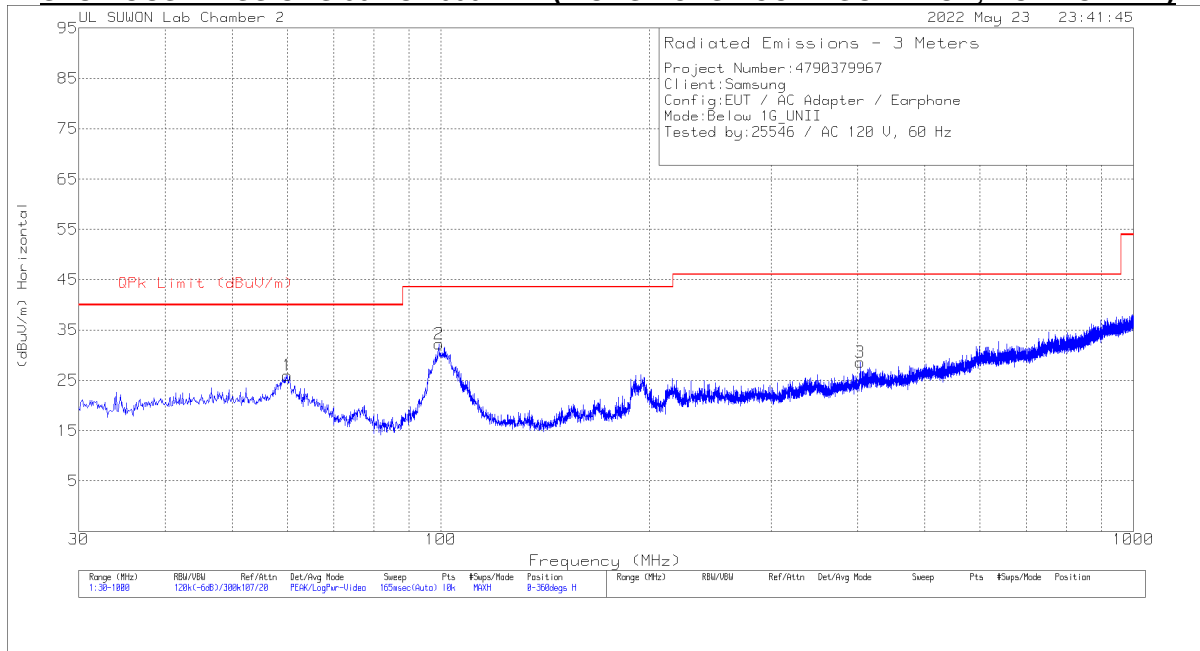
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK-U - U-NII: Maximum Peak

**HARMONICS AND SPURIOUS EMISSIONS TEST DATA**

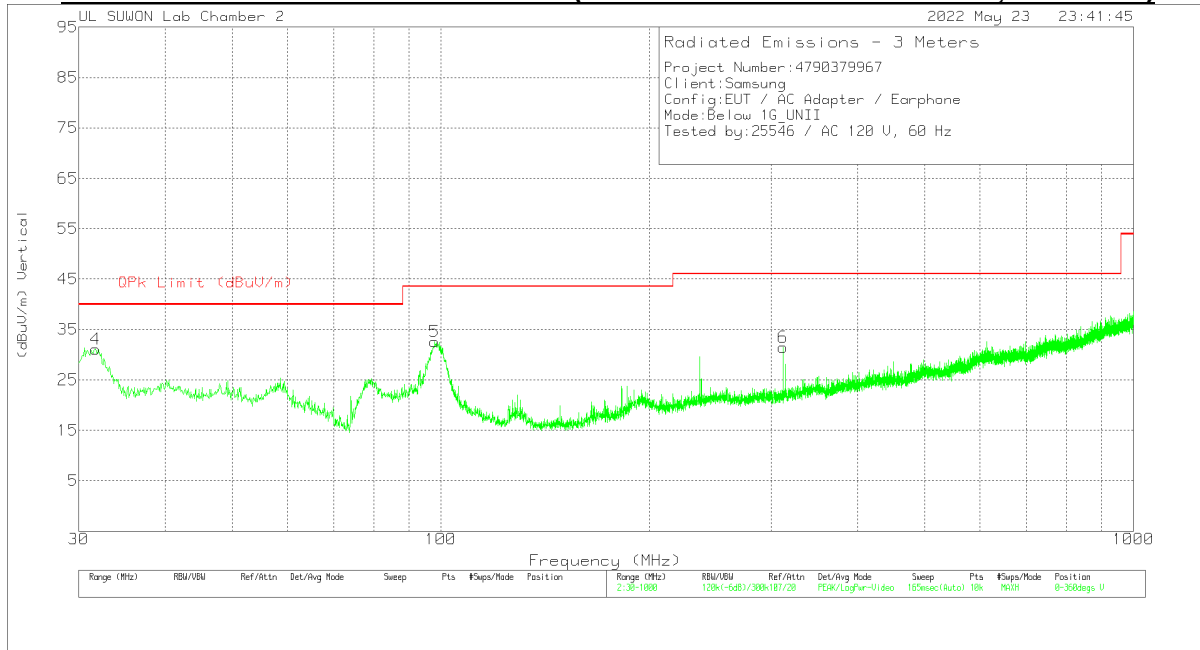
Mode	Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Non-Restricted [dBuV/m]	Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity		
802.11a	5745	ANT1	* 7.66021	36.28	PK-U	35.90	-24.10	0.00	48.08	-	-	74.00	-25.92	-	-	360	100	H		
			* 7.6601	38.09	PK-U	35.90	-24.10	0.00	49.89	-	-	74.00	-24.11	-	-	-	335	106	V	
			* 7.66	28.39	ADR	35.90	-24.10	0.00	40.19	54.00	-13.81	-	-	-	-	-	335	106	V	
			* 11.49197	33.26	PK-U	38.30	-19.50	0.00	52.06	-	-	74.00	-21.94	-	-	-	360	100	H	
			* 11.4916	34.61	PK-U	38.30	-19.50	0.00	53.41	-	-	74.00	-20.59	-	-	-	360	100	V	
			* 17.234	33.78	PK-U	40.90	-17.60	0.00	57.08	-	-	-	-	-	68.20	-11.12	360	100	H	
				* 17.237	33.77	PK-U	40.90	-17.60	0.00	57.07	-	-	-	-	68.20	-11.13	360	100	V	
		5785	ANT1	* 7.71378	36.37	PK-U	36.00	-23.40	0.00	48.97	-	-	74.00	-25.03	-	-	360	100	H	
	* 7.71313			37.22	PK-U	36.00	-23.40	0.00	49.82	-	-	74.00	-24.18	-	-	-	298	100	V	
	* 7.71321			28.35	ADR	36.00	-23.40	0.00	40.95	54.00	-13.05	-	-	-	-	-	298	100	V	
	* 11.59102			33.73	PK-U	38.40	-19.80	0.00	52.33	-	-	74.00	-21.67	-	-	-	360	100	H	
	* 11.59			34.17	PK-U	38.40	-19.70	0.00	52.87	-	-	74.00	-21.13	-	-	-	360	100	V	
	* 17.386			34.49	PK-U	41.00	-18.50	0.00	56.99	-	-	-	-	-	68.20	-11.21	360	100	H	
				* 17.384	34.71	PK-U	41.00	-18.50	0.00	57.21	-	-	-	-	68.20	-10.99	360	100	V	
		5825	ANT1	* 8.744	35.02	PK-U	36.30	-23.00	0.00	48.32	-	-	-	-	68.20	-19.88	360	100	H	
	* 7.766			37.02	PK-U	36.00	-23.30	0.00	49.72	-	-	-	-	68.20	-18.48	295	104	V		
	* 11.64698			33.41	PK-U	38.40	-19.60	0.00	52.21	-	-	74.00	-21.79	-	-	-	360	100	H	
	* 11.6542			33.82	PK-U	38.40	-19.50	0.00	52.72	-	-	74.00	-21.28	-	-	-	360	100	V	
	* 17.472			34.91	PK-U	41.10	-17.70	0.00	58.31	-	-	-	-	-	68.20	-9.89	360	100	H	
	* 17.483			33.99	PK-U	41.20	-17.80	0.00	57.39	-	-	-	-	-	68.20	-10.81	360	100	V	
	802.11n (HT20) Spot-Check	5785	ANT1	* 7.71313	37.10	PK-U	36.00	-23.40	0.00	49.70	-	-	74.00	-24.30	-	-	265	109	H	
				* 7.7133	26.74	ADR	36.00	-23.40	0.00	39.34	54.00	-14.66	-	-	-	-	265	109	H	
				* 7.71322	38.21	PK-U	36.00	-23.40	0.00	50.81	-	-	74.00	-23.19	-	-	-	297	100	V
				* 7.71328	29.14	ADR	36.00	-23.40	0.00	41.74	54.00	-12.26	-	-	-	-	-	297	100	V
* 11.57129				34.08	PK-U	38.30	-19.70	0.00	52.68	-	-	74.00	-21.32	-	-	-	360	100	H	
* 11.57804				33.76	PK-U	38.30	-19.70	0.00	52.36	-	-	74.00	-21.64	-	-	-	360	100	V	
			* 17.356	33.78	PK-U	41.00	-17.80	0.00	56.98	-	-	-	-	68.20	-11.22	360	100	H		
			* 17.361	34.35	PK-U	41.00	-18.00	0.00	57.35	-	-	-	-	68.20	-10.85	360	100	V		
802.11n (HT40) Spot-Check	5795	ANT1	* 7.72682	37.89	PK-U	36.00	-23.30	0.00	50.59	-	-	74.00	-23.41	-	-	254	106	H		
			* 7.72664	27.05	ADR	36.00	-23.30	0.00	39.75	54.00	-14.25	-	-	-	-	254	106	H		
			* 7.7266	38.20	PK-U	36.00	-23.30	0.00	50.90	-	-	74.00	-23.10	-	-	-	296	100	V	
			* 7.72663	29.39	ADR	36.00	-23.30	0.00	42.09	54.00	-11.91	-	-	-	-	-	296	100	V	
			* 11.59237	33.67	PK-U	38.40	-19.80	0.00	52.27	-	-	74.00	-21.73	-	-	-	360	100	H	
			* 11.59659	33.90	PK-U	38.40	-19.80	0.00	52.50	-	-	74.00	-21.50	-	-	-	360	100	V	
			* 17.379	34.51	PK-U	41.00	-18.70	0.00	56.81	-	-	-	-	68.20	-11.39	360	100	H		
			* 17.377	34.23	PK-U	41.00	-18.70	0.00	56.53	-	-	-	-	68.20	-11.67	360	100	V		
802.11ac (VHT80) Spot-Check	5775	ANT1	* 7.69964	36.95	PK-U	35.90	-23.60	0.00	49.25	-	-	74.00	-24.75	-	-	256	104	H		
			* 7.70002	26.52	ADR	36.00	-23.60	0.00	38.92	54.00	-15.08	-	-	-	-	256	104	H		
			* 7.69974	38.11	PK-U	35.90	-23.60	0.00	50.41	-	-	74.00	-23.59	-	-	-	296	100	V	
			* 7.69987	28.81	ADR	35.90	-23.60	0.00	41.21	54.00	-12.79	-	-	-	-	-	296	100	V	
			* 11.65214	33.61	PK-U	38.30	-19.60	0.00	52.31	-	-	74.00	-21.69	-	-	-	360	100	H	
			* 11.5444	33.69	PK-U	38.30	-19.60	0.00	52.39	-	-	74.00	-21.61	-	-	-	360	100	V	
			* 17.315	33.95	PK-U	40.90	-18.10	0.00	56.75	-	-	-	-	68.20	-11.45	360	100	H		
			* 17.330	34.06	PK-U	40.90	-17.90	0.00	57.06	-	-	-	-	68.20	-11.14	360	100	V		

Note1. PK-U - U-NII: Maximum Peak / ADR - U-NII AD primary method, RMS average  
 Note2. \* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

## 12. WORST-CASE BELOW 1 GHz SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



## SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)



### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	59.973	39.12	Pk	18.5	-31.6	26.02	40	-13.98	0-360	100	H
2	99.355	45.87	Pk	17.7	-31.3	32.27	43.52	-11.25	0-360	200	H
3	403.353	37.09	Pk	21.4	-29.9	28.59	46.02	-17.43	0-360	100	H
4	31.746	47.52	Pk	15.5	-31.9	31.12	40	-8.88	0-360	100	V
5	97.997	46.26	Pk	17.6	-31.3	32.56	43.52	-10.96	0-360	100	V
6	312.076	42.29	Pk	19.5	-30.3	31.49	46.02	-14.53	0-360	100	V

Pk - Peak detector

### 13. AC POWER LINE CONDUCTED EMISSIONS

#### LIMITS

FCC §15.207 (a)  
IC RSS-GEN Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 <sup>*</sup>	56 to 46 <sup>*</sup>
0.5-5	56	46
5-30	60	50

<sup>\*</sup>Decreases with the logarithm of the frequency.

#### TEST PROCEDURE

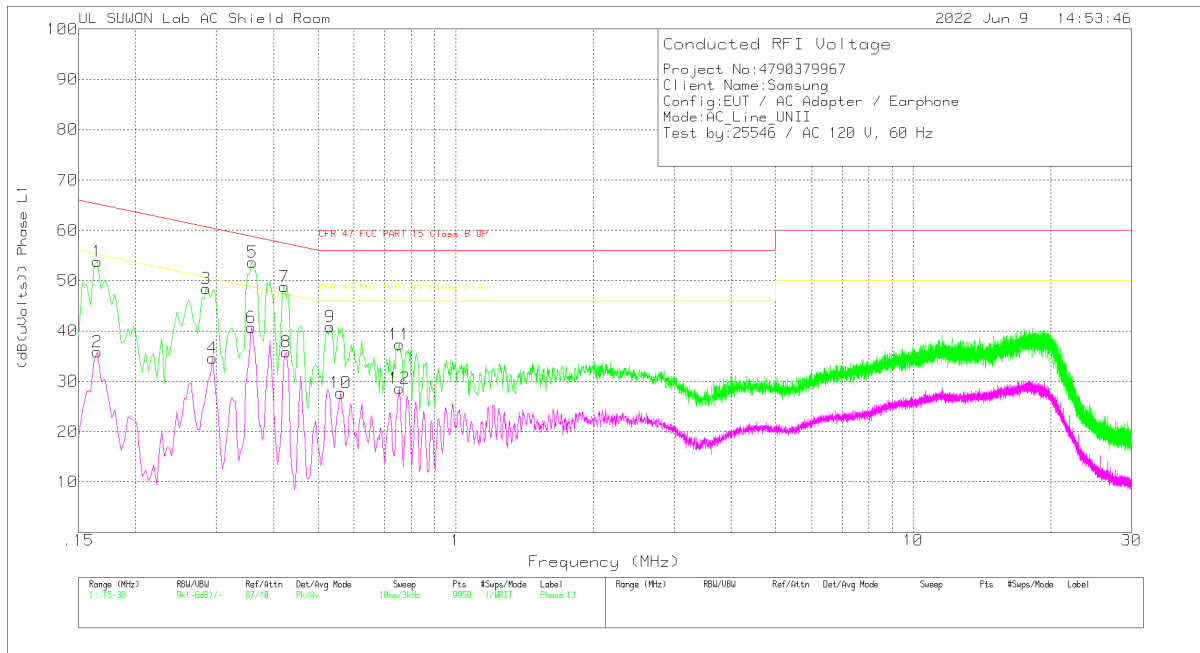
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

#### RESULTS

### LINE 1 DATA



#### Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
1	.165	43.78	Pk	9.9	.1	53.78	65.21	-11.43	-	-
2	.165	25.85	Av	9.9	.1	35.85	-	-	55.21	-19.36
3	.285	38.51	Pk	9.7	.2	48.41	60.67	-12.26	-	-
4	.294	24.69	Av	9.7	.2	34.59	-	-	50.41	-15.82
5	.36	43.68	Pk	9.8	.2	53.68	58.73	-5.05	-	-
6	.357	30.67	Av	9.8	.2	40.67	-	-	48.8	-8.13
7	.423	38.82	Pk	9.8	.2	48.82	57.39	-8.57	-	-
8	.426	25.8	Av	9.8	.2	35.8	-	-	47.33	-11.53
9	.531	30.77	Pk	9.9	.2	40.87	56	-15.13	-	-
10	.561	17.69	Av	9.8	.2	27.69	-	-	46	-18.31
11	.753	27.37	Pk	9.8	.2	37.37	56	-18.63	-	-
12	.753	18.67	Av	9.8	.2	28.67	-	-	46	-17.33

#### Quasi-Peak Emissions

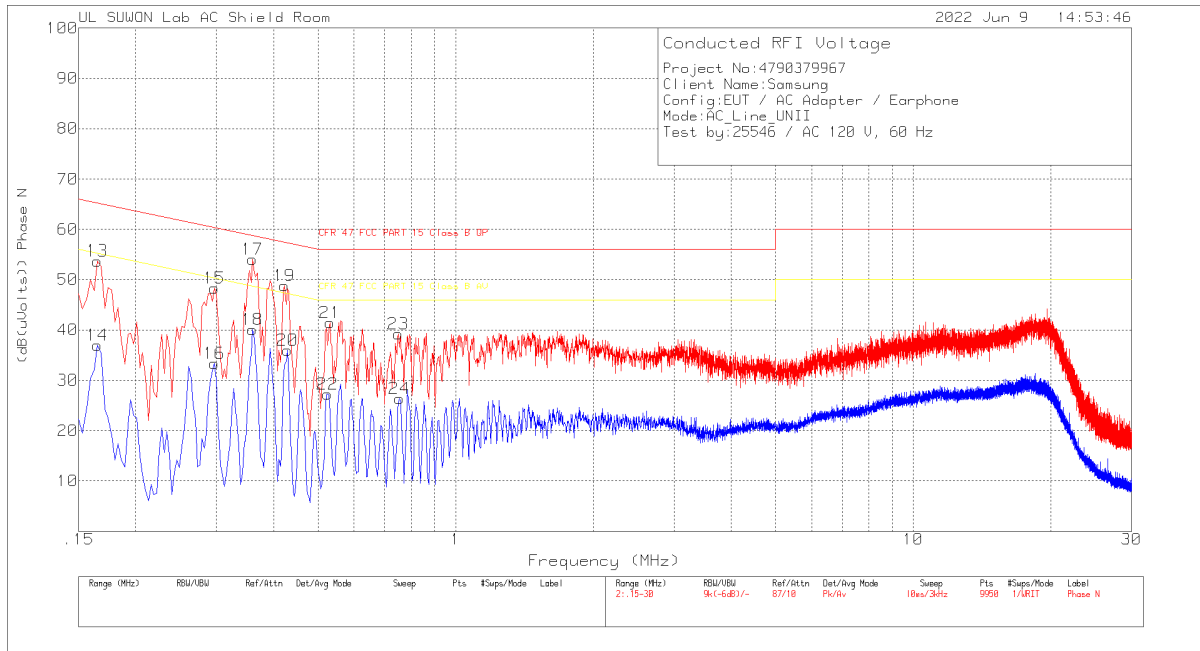
Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
.36075	24.86	Qp	9.8	.2	34.86	58.71	-23.85	-	-
.42225	26.27	Qp	9.8	.2	36.27	57.4	-21.13	-	-

Qp - Quasi-Peak detector



### LINE 2 DATA



#### Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.165	43.73	Pk	9.9	.1	53.73	65.21	-11.48	-	-
14	.165	27	Av	9.9	.1	37	-	-	55.21	-18.21
15	.297	38.43	Pk	9.7	.2	48.33	60.33	-12	-	-
16	.297	23.4	Av	9.7	.2	33.3	-	-	50.33	-17.03
17	.36	44.02	Pk	9.8	.2	54.02	58.73	-4.71	-	-
18	.36	30.1	Av	9.8	.2	40.1	-	-	48.73	-8.63
19	.423	38.78	Pk	9.8	.2	48.78	57.39	-8.61	-	-
20	.429	25.99	Av	9.8	.2	35.99	-	-	47.27	-11.28
21	.531	31.35	Pk	9.9	.2	41.45	56	-14.55	-	-
22	.525	17.2	Av	9.9	.2	27.3	-	-	46	-18.7
23	.75	29.21	Pk	9.8	.2	39.21	56	-16.79	-	-
24	.753	16.4	Av	9.8	.2	26.4	-	-	46	-19.6

Pk - Peak detector

Av - Average detection

#### Quasi-Peak Emissions

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
.36015	25.07	Qp	9.8	.2	35.07	58.73	-23.66	-	-
.42225	25.48	Qp	9.8	.2	35.48	57.4	-21.92	-	-

Qp - Quasi-Peak detector

## 14. DYNAMIC FREQUENCY SELECTION

### 14.1. OVERVIEW

#### 14.1.1. LIMITS

#### FCC

§15.407 (h), FCC KDB 905462 D02 “COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION” and KDB 905462 D03 “U-NII CLIENT DEVICES WITHOUT RADAR DETECTION CAPABILITY”.

**Table 1: Applicability of DFS requirements prior to use of a channel**

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client (with radar detection)
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

**Table 2: Applicability of DFS requirements during normal operation**

Requirement	Operational Mode		
	Master	Client (without DFS)	Client (with DFS)
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar DFS	Client (without DFS)
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required

**Note:** Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in all 20 MHz channel blocks and a null frequency between the bonded 20 MHz channel blocks.

**Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring**

Maximum Transmit Power	Value (see notes)
E.I.R.P. $\geq$ 200 mill watt	-64 dBm
E.I.R.P. < 200 mill watt and power spectral density < 10 dBm/MHz	-62 dBm
E.I.R.P. < 200 mill watt that do not meet power spectral density requirement	-64 dBm
<p><b>Note 1:</b> This is the level at the input of the receiver assuming a 0 dBi receive antenna  <b>Note 2:</b> Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.  <b>Note 3:</b> E.I.R.P. is based on the highest antenna gain. For MIMO devices refer to KDB publication 662911 D01.</p>	

**Table 4: DFS Response requirement values**

Parameter	Value
<i>Non-occupancy period</i>	30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds (See Note 1)
<i>Channel Closing Transmission Time</i>	200 milliseconds + approx. 60 milliseconds over remaining 10 second period. (See Notes 1 and 2)
<i>U-NII Detection Bandwidth</i>	Minimum 100% of the U- NII 99% transmission power bandwidth. (See Note 3)
<p><b>Note 1:</b> <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.  <b>Note 2:</b> The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.  <b>Note 3:</b> During the <i>U-NII Detection Bandwidth</i> detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.</p>	

**Table 5 – Short Pulse Radar Test Waveforms**

Radar Type	Pulse Width (usec)	PRI (usec)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in table 5a	Roundup: $\{(1/360) \times (19 \times 10^6 \text{ PRI}_{\text{usec}})\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 usec. With a minimum increment of 1 usec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
<b>Note 1:</b> Short Pulse Radar Type 0 should be used for the <i>Detection Bandwidth</i> test, <i>Channel Move Time</i> , and <i>Channel Closing Time</i> tests.					

**Table 6 – Long Pulse Radar Test Signal**

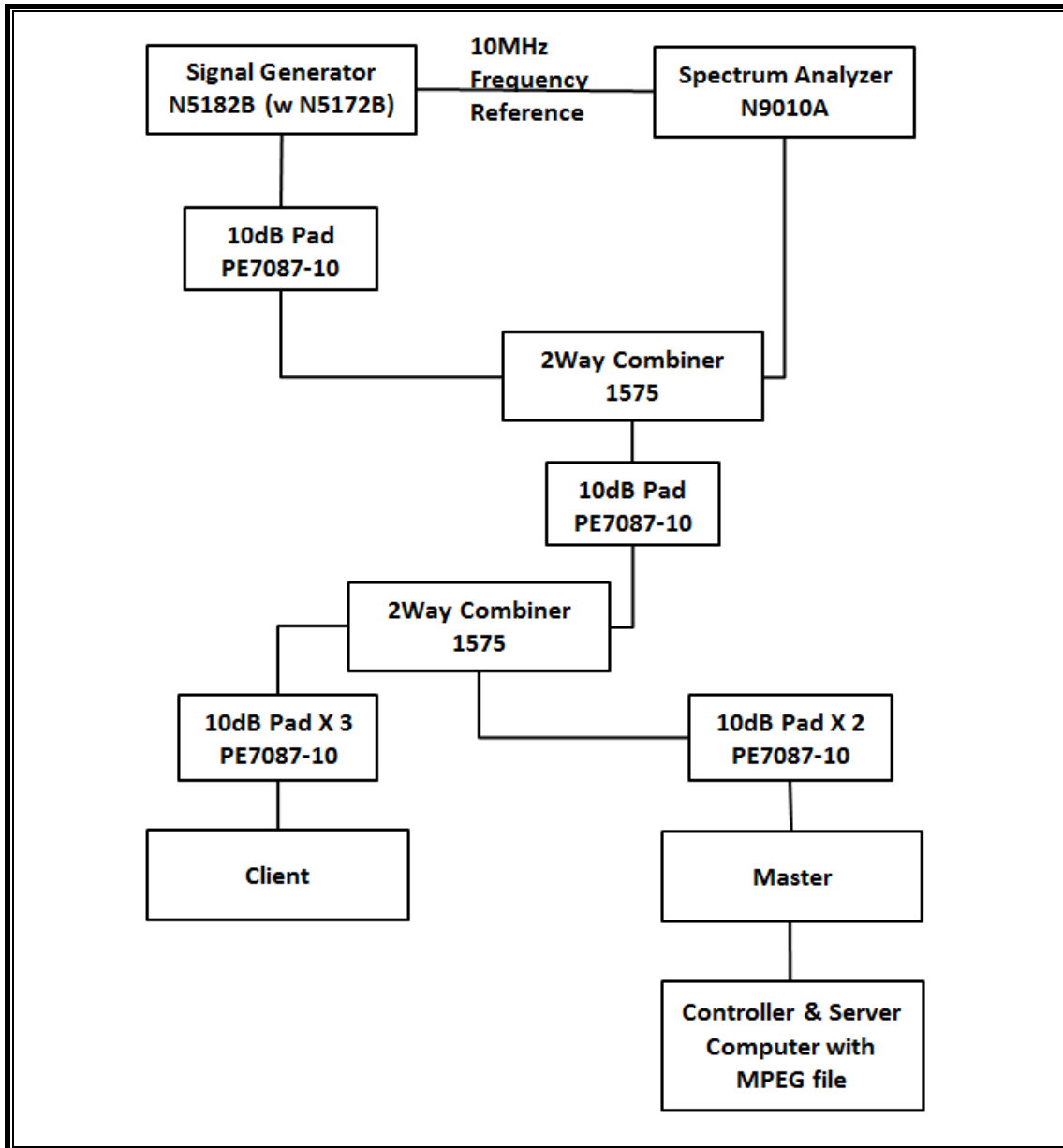
Radar Waveform Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

**Table 7 – Frequency Hopping Radar Test Signal**

Radar Waveform Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	0.333	300	70%	30

### 14.1.2. TEST AND MEASUREMENT SYSTEM

#### CONDUCTED METHOD SYSTEM BLOCK DIAGRAM



## **SYSTEM OVERVIEW**

The short pulse and long pulse signal generating system utilizes the Keysite Signal Studio for Pulse Building as N5172B. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 1, 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of KDB 905462 D02. The frequency of the signal generator is incremented in 1 MHz steps from  $F_L$  to  $F_H$  for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

## **SYSTEM CALIBRATION**

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

**ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL**

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

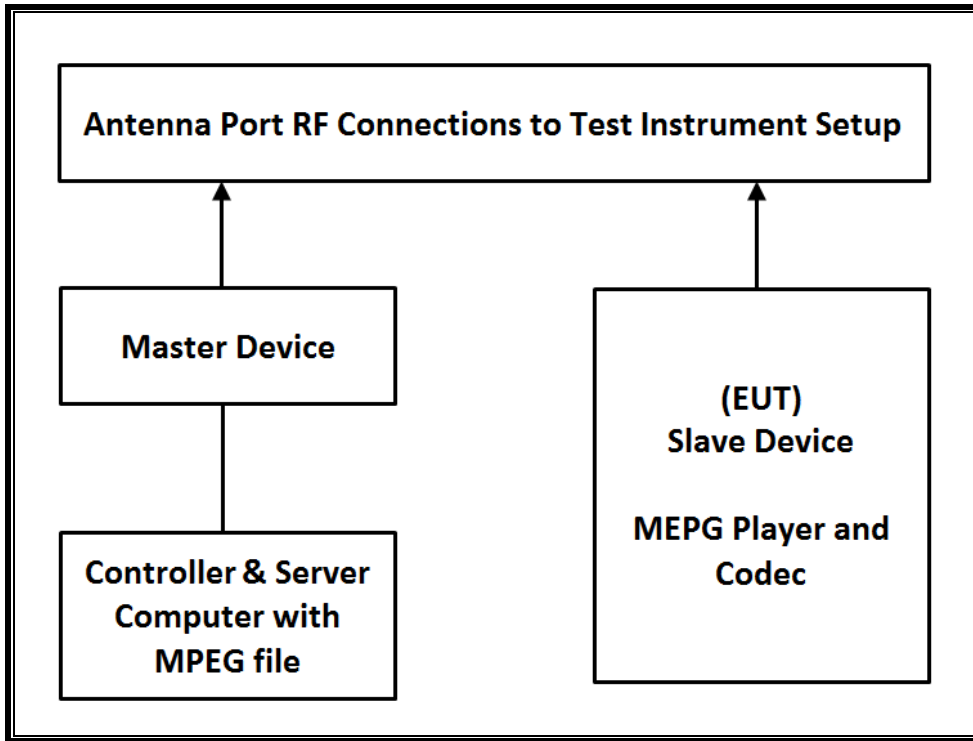
**TEST AND MEASUREMENT EQUIPMENT**

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	S/N	Next Cal Due
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	08-02-22
Vector Signal Generator, 6GHz	Agilent / HP	N5182B	MY53051241	08-02-22
Combiner	WEINSCHTEL	WA1534	UL003	01-11-23
Combiner	WEINSCHTEL	WA1535	UL004	01-11-23

### 14.1.3. SETUP OF EUT

#### CONDUCTED METHOD EUT TEST SETUP



#### SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Wireless Access Point	Cisco	AIR-CAP3702E-A-K9	FTX182276QX	LDK102087
Notebook PC (Controller/Server)	HP	HP EliteDesk 800 G1 TWR	CZC4125J25	DoC



#### **14.1.4. DESCRIPTION OF EUT**

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

The EUT is a Slave Device without Radar Detection.

The highest power level of the widest bandwidth (802.11ac VHT80) within these bands is 12.32 dBm in the 5250-5350 MHz band and 12.38 dBm in the 5470-5725 MHz band.

The antenna assembly utilized two antenna.

Gain of ANT: -3.90 dBi for UNII 2A and -3.90 dBi for UNII 2C.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm. After correction for procedural adjustments, the required conducted threshold at the antenna port is  $-64 + 1 = -63$  dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

The EUT uses one transmitter/receiver chain connected to an antenna to perform radiated tests. WLAN traffic that meets or exceeds the minimum required loading was generated by transferring a data stream from the controller/server PC to the EUT using iPerf version 2.0.5 software package.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes the 802.11 architecture. Three nominal channel bandwidths are implemented: 20 MHz, 40 MHz and 80 MHz.

The software installed in the access point is 12.4(25d)JA1.

#### **UNIFORM CHANNEL SPREADING**

This requirement is not applicable to Slave radio devices.

#### **OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS**

The Master Device is a Cisco Access Point, FCC ID: LDK102087. The minimum antenna gain for the Master Device is 6 dBi.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is  $-64 + 1 = -63$  dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

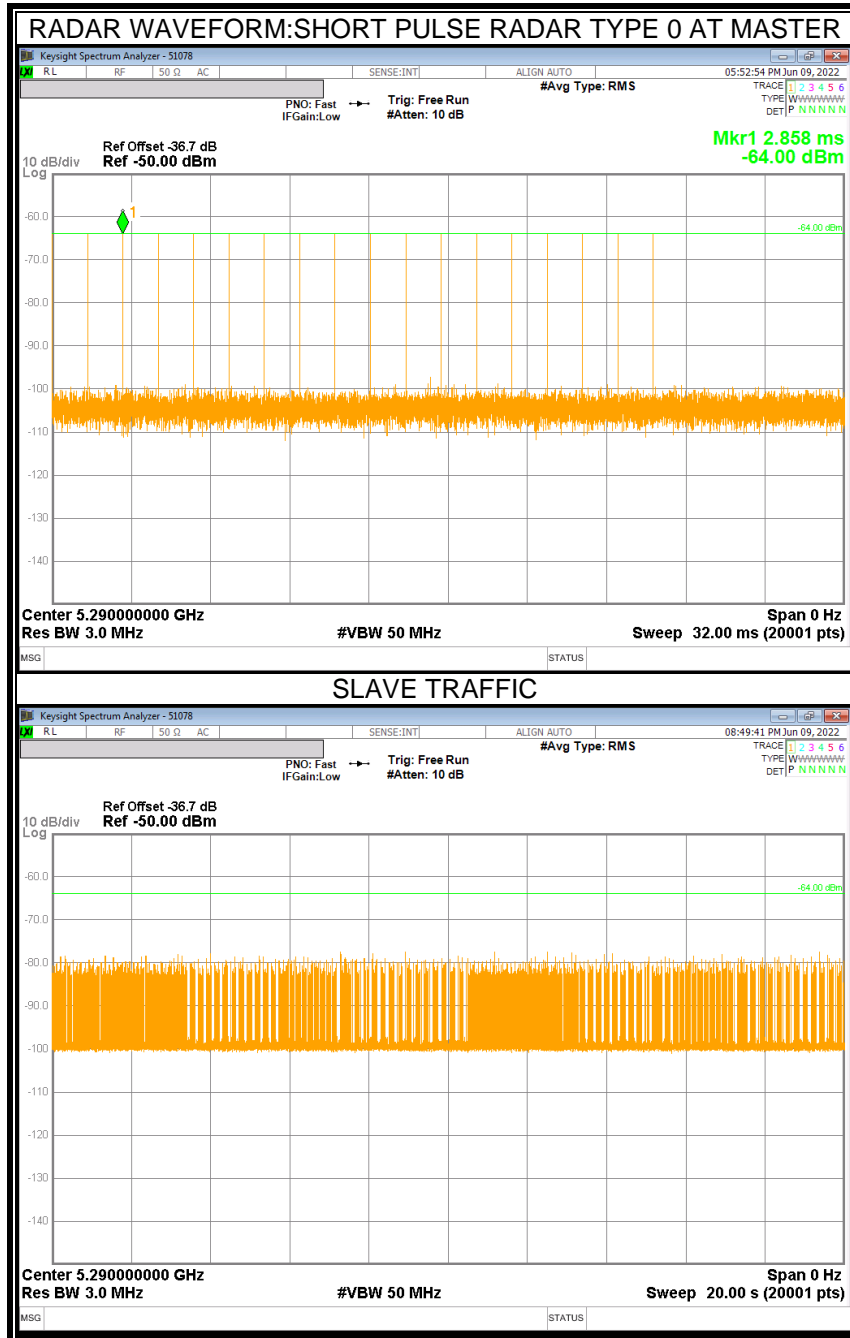
## 14.2. RESULTS FOR 80 MHz BANDWIDTH (UNII-2A BAND)

### 14.2.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5290 MHz.

### 14.2.2. RADAR WAVEFORM AND TRAFFIC

#### RADAR WAVEFORM



### 14.2.3. OVERLAPPING CHANNEL TESTS

#### RESULTS

These tests are not applicable.

### 14.2.4. MOVE AND CLOSING TIME

#### REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =  
(Number of analyzer bins showing transmission) \* (dwell time per bin)

The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

#### RESULTS

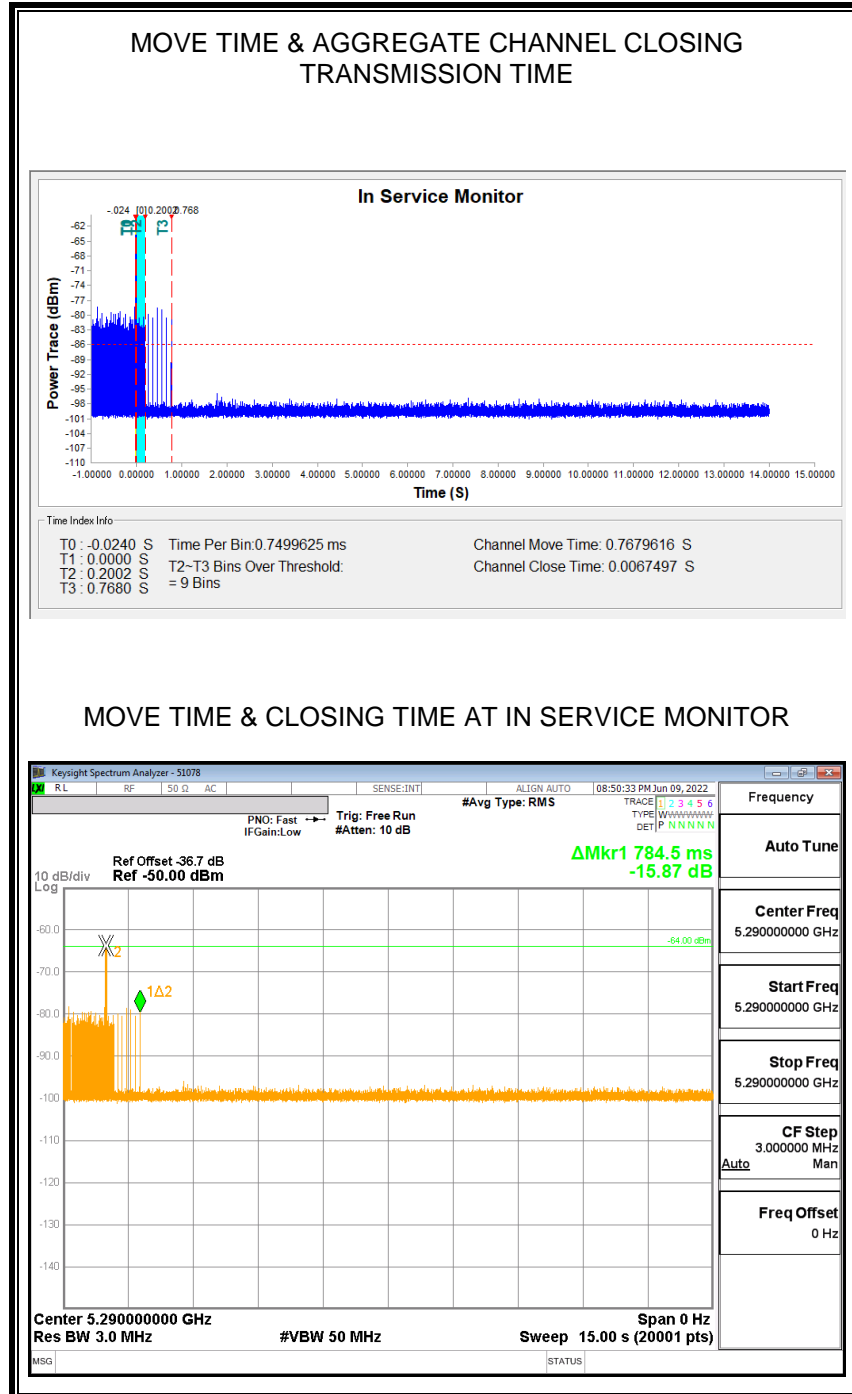
Channel Move Time (sec)	Limit (sec)
0.768	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
6.750	60

**MOVE TIME & CHANNEL CLOSING TIME**

**AGGREGATE CHANNEL CLOSING TRANSMISSION TIME**

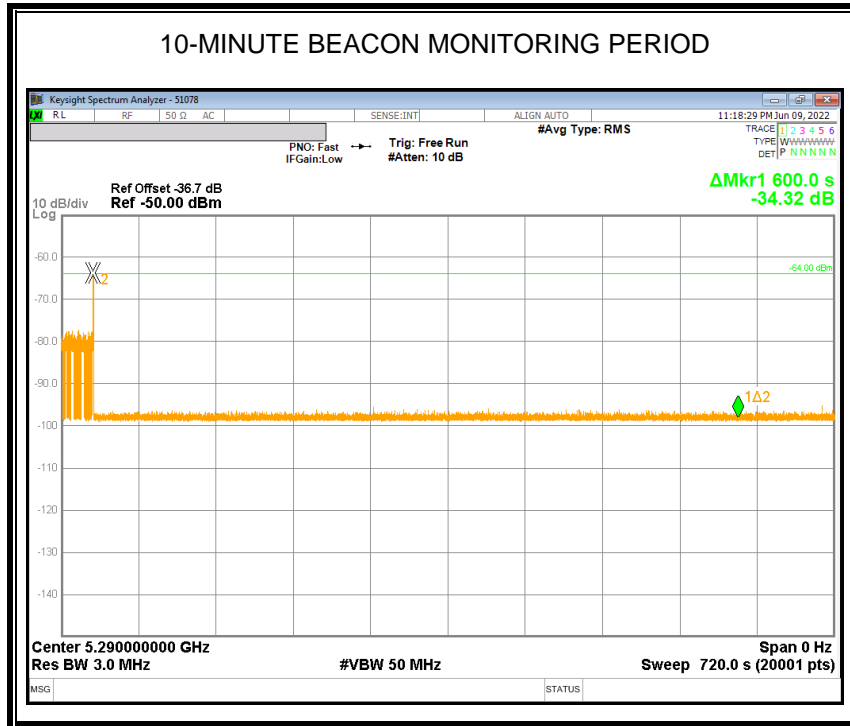
No transmissions are observed during the aggregate monitoring period.



**NON-OCCUPANCY PERIOD**

**RESULTS**

No EUT transmissions were observed on the test channel during the 10-minute observation time.



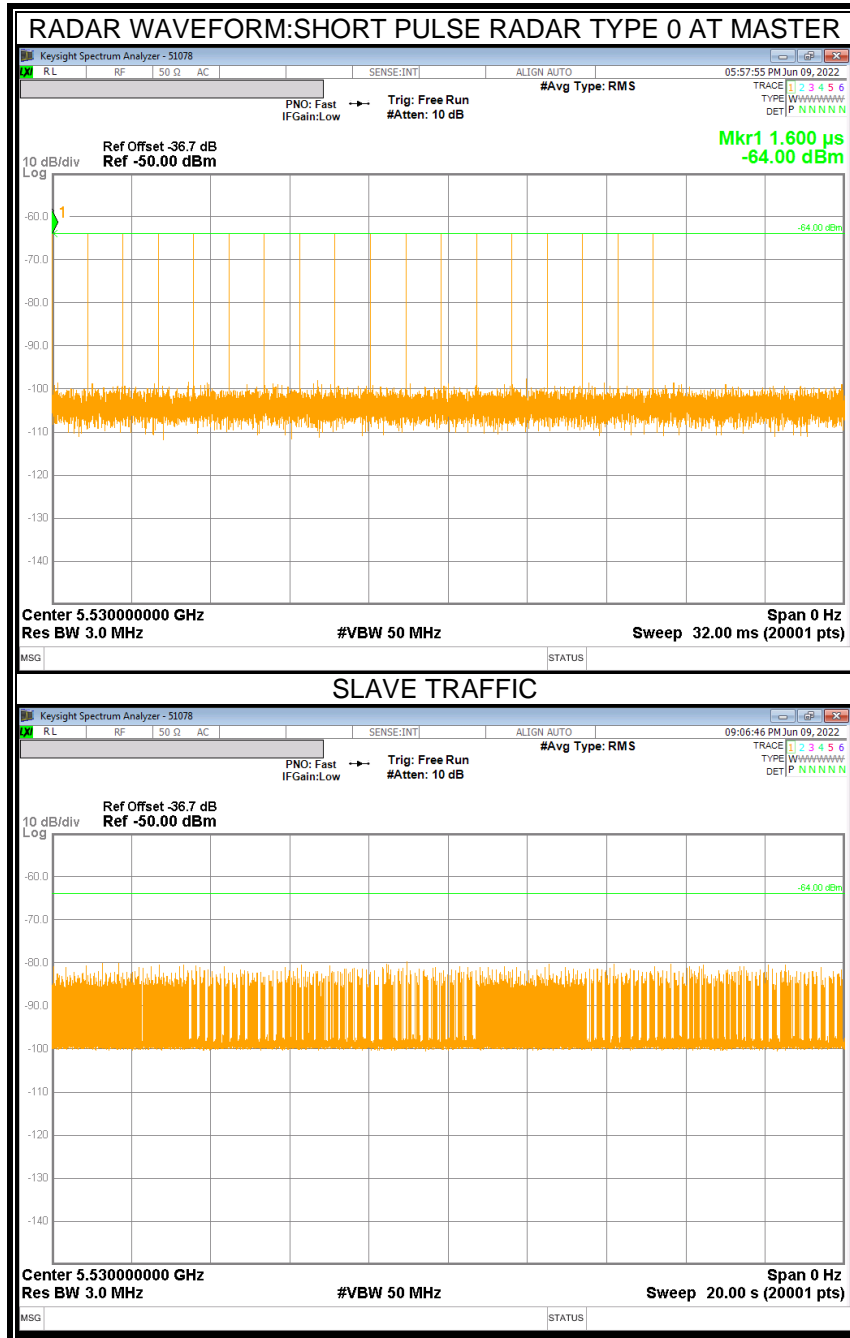
### 14.3. RESULTS FOR 80 MHz BANDWIDTH (UNII-2C BAND)

#### 14.3.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5530 MHz.

#### 14.3.2. RADAR WAVEFORM AND TRAFFIC

##### RADAR WAVEFORM



### 14.3.3. OVERLAPPING CHANNEL TESTS

#### RESULTS

These tests are not applicable.

### 14.3.4. MOVE AND CLOSING TIME

#### REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =  
(Number of analyzer bins showing transmission) \* (dwell time per bin)

The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

#### RESULTS

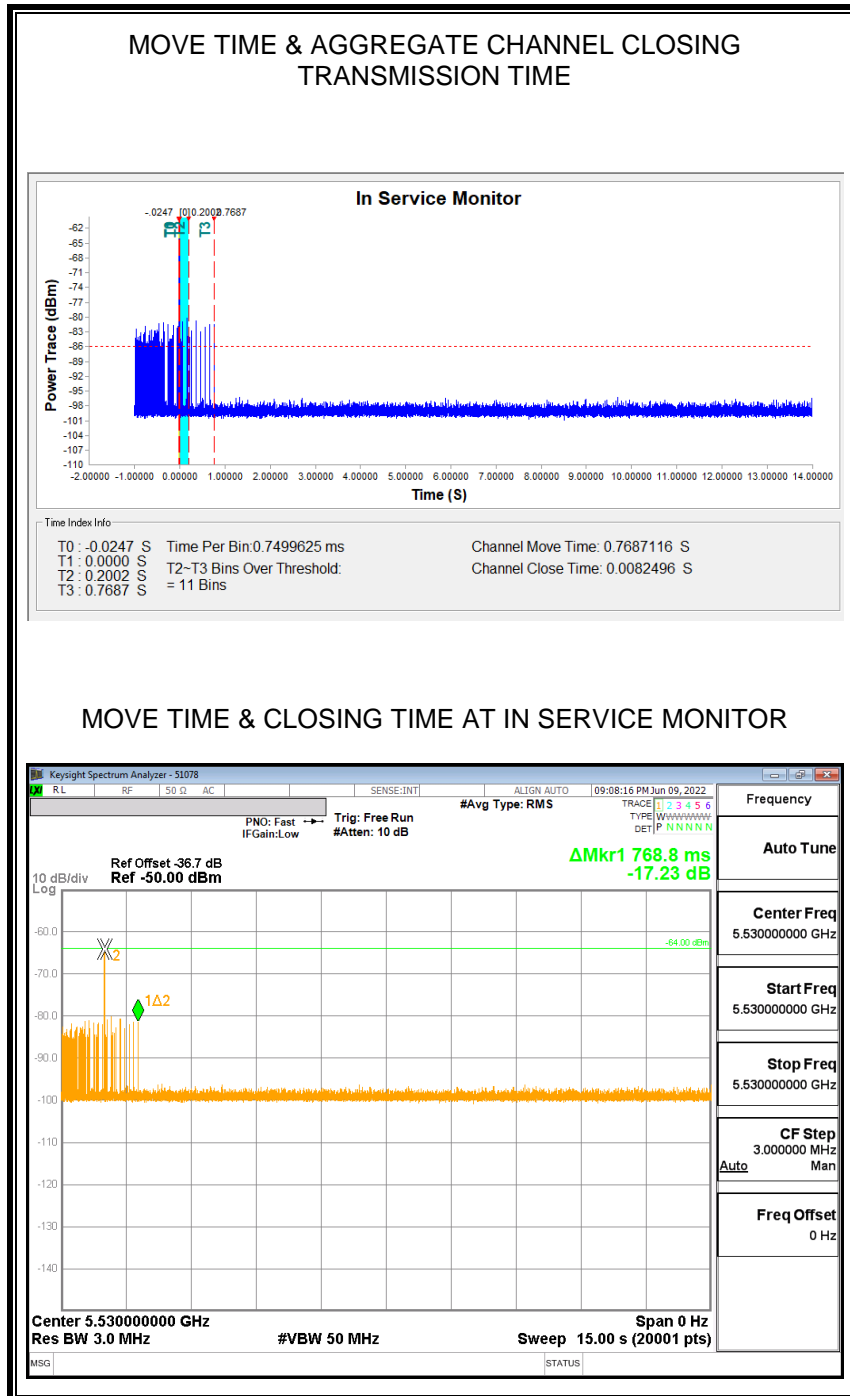
Channel Move Time (sec)	Limit (sec)
0.769	10

Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
8.250	60

**MOVE TIME & CHANNEL CLOSING TIME**

**AGGREGATE CHANNEL CLOSING TRANSMISSION TIME**

No transmissions are observed during the aggregate monitoring period.

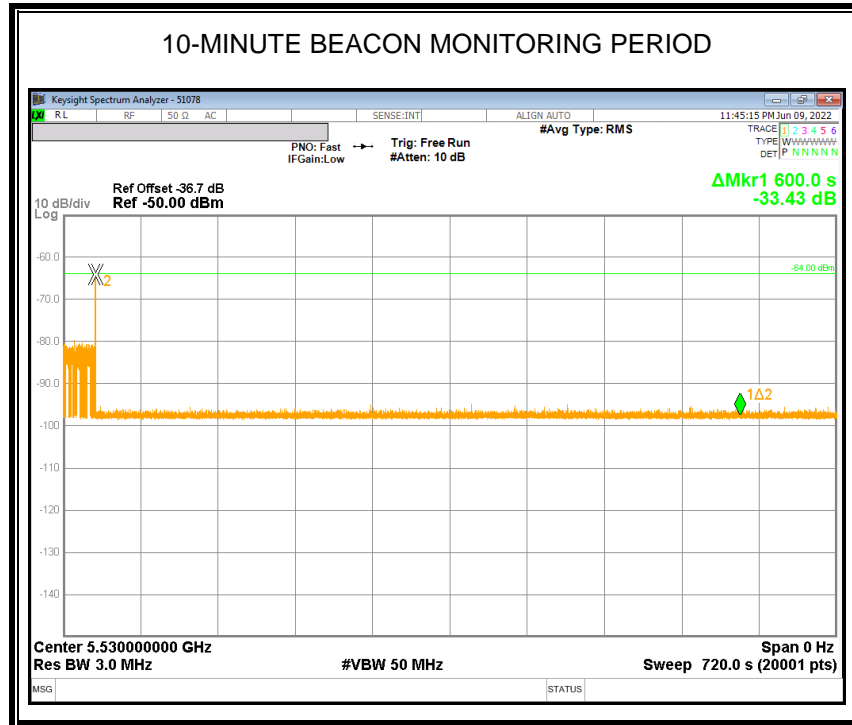




**NON-OCCUPANCY PERIOD**

**RESULTS**

No EUT transmissions were observed on the test channel during the 10-minute observation time.



**END OF TEST REPORT**