



# FCC CO-LOCATION RADIO TEST REPORT

**FCC ID** : PY7-86211X  
**Equipment** : GSM/WCDMA/LTE/5G Phone with BT, DTS/UNII  
a/b/g/n/ac/ax, GPS, WPC and NFC  
**Brand Name** : Sony  
**Applicant** : Sony Corporation  
1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan  
**Manufacturer** : Sony Corporation  
1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan  
**Standard** : FCC Part 15 Subpart E §15.407

The product was received on Mar. 17, 2021 and testing was started from May 08, 2021 and completed on May 10, 2021. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

*Louis Wu*

Approved by: Louis Wu

**Sporton International Inc. Wensan Laboratory**

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



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### Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	Under limit 8.08 dB at 17725.000 MHz
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

**Declaration of Conformity:**  
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**  
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by: Wii Chang**  
**Report Producer: Lucy Wu**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

GSM/WCDMA/LTE/5G NR, Bluetooth, DTS/UNII a/b/g/n/ac/ax, NFC, WPC/WPT, and GNSS

Product Specification subjective to this standard	
<b>Antenna Type</b>	<b>Bluetooth:</b> <Ant. 0>: Loop Antenna <b>WLAN (2.4GHz)</b> <Chain 0>: Loop Antenna <Chain 1>: Loop Antenna <b>WLAN (5GHz)</b> <Chain 0>: Loop Antenna <Chain 1>: Monopole Antenna

**Remark:** The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

EUT Information List			
HW Version	SW Version	S/N	Performed Test Item
A	0.634	QV72007V6T	Radiated Spurious Emission

Accessory List	
<b>AC Adapter</b>	Model Name : XQZ-UC1
	S/N: 0020W51300105
<b>Earphone</b>	Model Name : MH750
	S/N : N/A
<b>USB Cable</b>	Model Name : XQZ-UB1
	S/N : N/A

**Note:**

- Above EUT list used are electrically identical per declared by manufacturer.
- Above the accessories list are used to exercise the EUT during test, and the serial number of each type of accessories is listed in each section of this report.
- For other wireless features of this EUT, test report will be issued separately.

## 1.2 Modification of EUT

No modifications are made to the EUT during all test items.



### 1.3 Testing Location

<b>Test Site</b>	Sporton International Inc. Wensan Laboratory
<b>Test Site Location</b>	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
<b>Test Site No.</b>	<b>Sporton Site No.</b> 03CH16-HY

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW3786

### 1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

## 2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases were recorded in this report.

### 2.1 Carrier Frequency and Channel

<Ant. 0>

2400-2483.5 MHz	
Bluetooth	
Channel	Freq. (MHz)
39	2441

MIMO <Chain 0+1>

2400-2483.5 MHz		5150-5350 MHz	
802.11g		802.11a	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
01	2412	36	5180

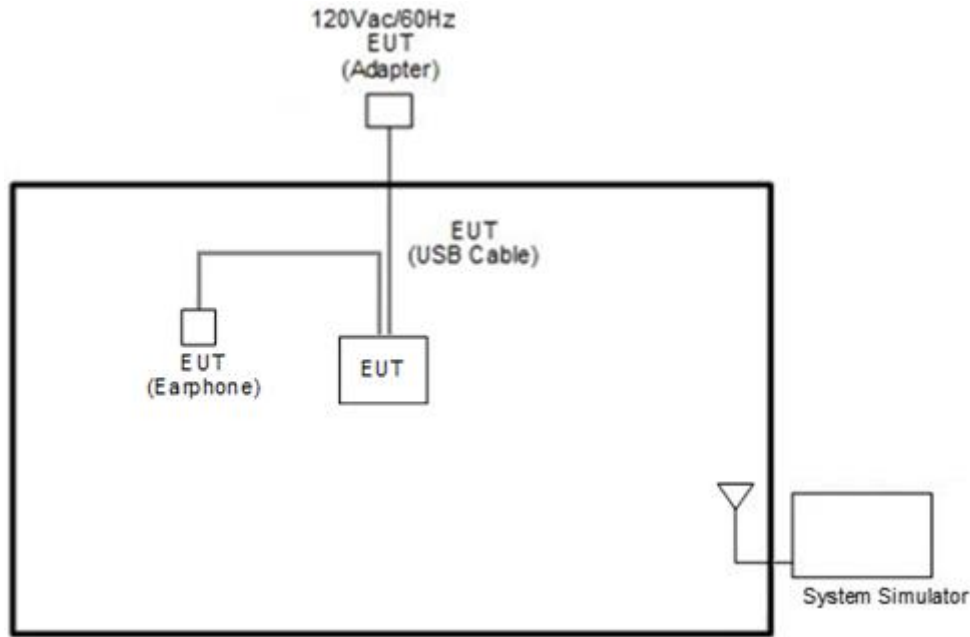
**Remark:** During the Radiated Spurious Emission test, the EUT turn on the WWAN functions simultaneously.

### 2.2 Test Mode

<Co-Location>

Modulation	Plane	Data Rate
2.4GHz 802.11g for MIMO Chain 0+1 + LTE Band 41	X	MCS0 + QPSK
5GHz 802.11a for MIMO Chain 0+1 + Bluetooth for Ant. 0 + LTE Band 41	X	MCS0 + GFSK + QPSK

### 2.3 Connection Diagram of Test System



### 2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m

### 2.5 EUT Operation Test Setup

The RF test items, utility “CMD Ver0.39” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.





### 3 Test Result

#### 3.1 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

##### 3.1.1 Limit of Unwanted Emissions

- (1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27dBm/MHz.
- (2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

**Note:** The following formula is used to convert the EIRP to field strength.

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts)}$$

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

- (3) KDB789033 D02 v02r01 G)2)c)
  - (i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.
  - (ii) Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are based on the use of a peak detector.

##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

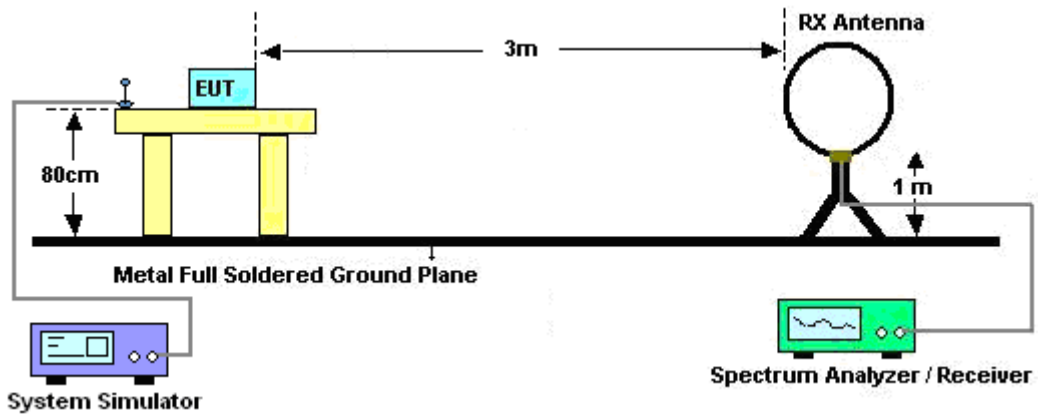


### 3.1.3 Test Procedures

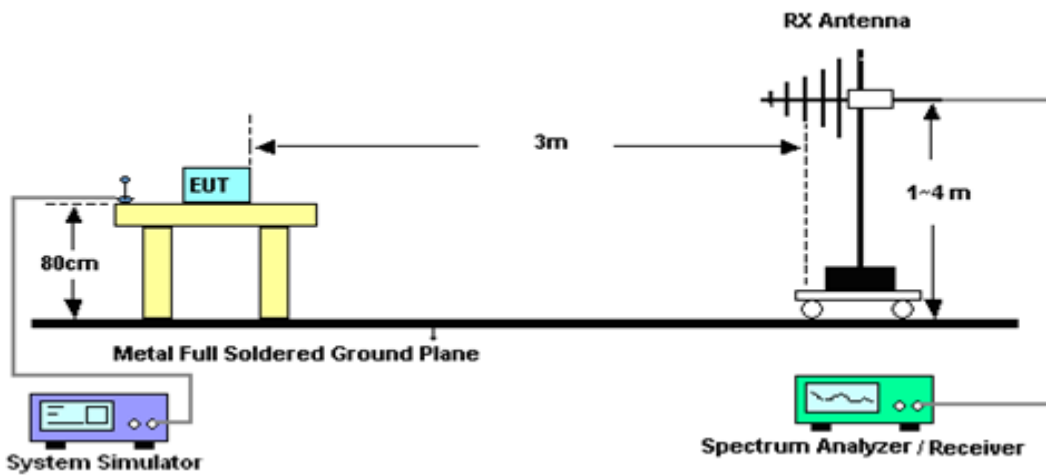
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.
  - (1) Procedure for Unwanted Emissions Measurements Below 1000 MHz
    - RBW = 120 kHz
    - VBW = 300 kHz
    - Detector = Peak
    - Trace mode = max hold
  - (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
    - RBW = 1 MHz
    - VBW  $\geq$  3 MHz
    - Detector = Peak
    - Sweep time = auto
    - Trace mode = max hold
  - (3) Procedures for Average Unwanted Emissions Measurements Above 1000 MHz
    - RBW = 1 MHz
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW  $\geq$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1 GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

### 3.1.4 Test Setup

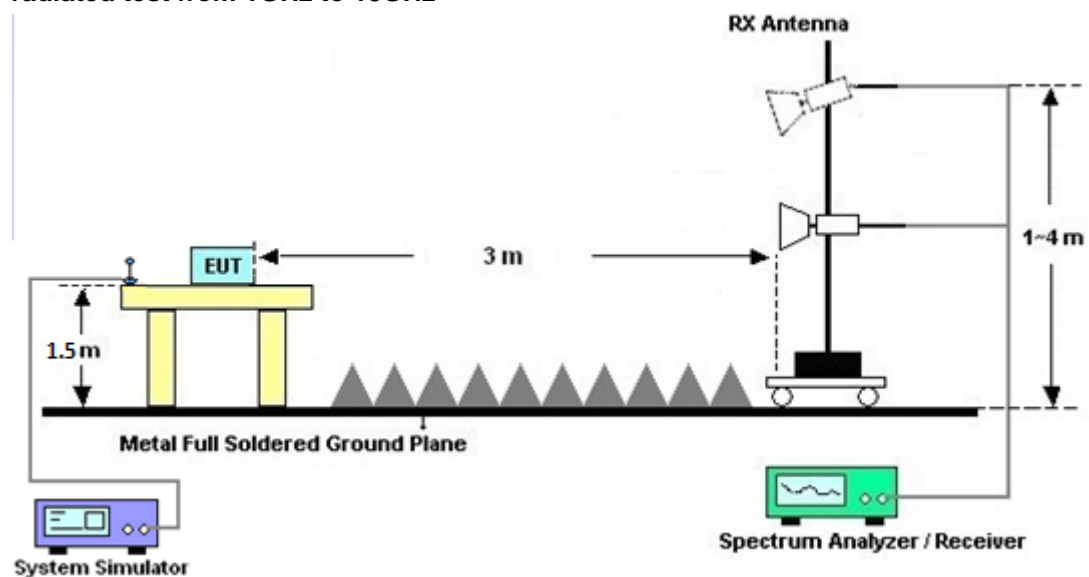
For radiated emissions below 30MHz



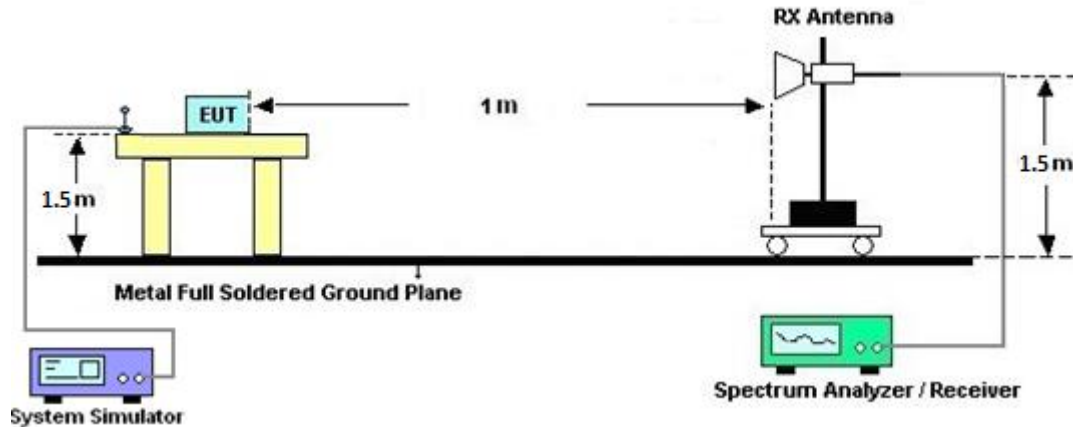
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated emissions above 18GHz



### 3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

### 3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

### 3.1.7 Duty Cycle

Please refer to Appendix C.

### 3.1.8 Test Result of Radiated Spurious Emissions

Please refer to Appendix A and B.



## **3.2 Antenna Requirements**

### **3.2.1 Standard Applicable**

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **3.2.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.2.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jul. 14, 2020	May 08, 2021 ~ May 10, 2021	Jul. 13, 2021	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz to 1GHz	Oct. 11, 2020	May 08, 2021 ~ May 10, 2021	Oct. 10, 2021	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1G	Sep. 30, 2020	May 08, 2021 ~ May 10, 2021	Sep. 29, 2021	Radiation (03CH16-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1G~18GHz	Sep. 29, 2020	May 08, 2021 ~ May 10, 2021	Sep. 28, 2021	Radiation (03CH16-HY)
Amplifier	EMCI	EMC051845SE	980729	1-18GHz	Jul. 10, 2020	May 08, 2021 ~ May 10, 2021	Jul. 09, 2021	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz ~40GHz	Dec. 11, 2020	May 08, 2021 ~ May 10, 2021	Dec. 10, 2021	Radiation (03CH16-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 11, 2020	May 08, 2021 ~ May 10, 2021	Dec. 10, 2021	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec.10,.2020	May 08, 2021 ~ May 10, 2021	Dec.09,.2021	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A	MY59053012	3Hz~26.5GHz	Nov.18,.2020	May 08, 2021 ~ May 10, 2021	Nov.17,.2021	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11680/4PE	NA	Aug. 29, 2020	May 08, 2021 ~ May 10, 2021	Aug. 28, 2021	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11688/4PE	NA	Aug. 29, 2020	May 08, 2021 ~ May 10, 2021	Aug. 28, 2021	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-5757	NA	Aug. 29, 2020	May 08, 2021 ~ May 10, 2021	Aug. 28, 2021	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	May 08, 2021 ~ May 10, 2021	N/A	Radiation (03CH16-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	May 08, 2021 ~ May 10, 2021	N/A	Radiation (03CH16-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	May 08, 2021 ~ May 10, 2021	N/A	Radiation (03CH16-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	May 08, 2021 ~ May 10, 2021	N/A	Radiation (03CH16-HY)



## 5 Uncertainty of Evaluation

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.5
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	6.3
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.7
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## Appendix A. Radiated Spurious Emission

Test Engineer :	Karl Hou, CR Liro, and Andy Yang	Temperature :	20 ~ 25°C
		Relative Humidity :	50 ~ 60%

WLAN 802.11g\_Tx\_Ch01+ WWAN LTE B41 BW:20MHz CH 40620 Link

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Band Edge @ 3m)

WIFI Chain 0+1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
802.11g CH 01 2412MHz		2342.76	56.92	-17.08	74	41.01	27.81	18.39	30.29	109	331	P	H	
		2390	45.26	-8.74	54	29.5	27.56	18.48	30.28	109	331	A	H	
	*	2412	104.29	-	-	88.56	27.48	18.52	30.27	109	331	P	H	
	*	2412	96.41	-	-	80.68	27.48	18.52	30.27	109	331	A	H	
														H
														H
			2329.53	56.89	-17.11	74	40.98	27.84	18.37	30.3	291	126	P	V
			2389.695	44.77	-9.23	54	29.01	27.56	18.48	30.28	291	126	A	V
	*		2412	103.33	-	-	87.6	27.48	18.52	30.27	291	126	P	V
	*		2412	95.8	-	-	80.07	27.48	18.52	30.27	291	126	A	V
														V
														V





WLAN 802.11g\_Tx\_Ch01+ WWAN LTE B41 BW:20MHz CH 40620 Link

WIFI 802.11g (Harmonic @ 3m)

WLAN Chain 0+1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)	
11g_Ch01		4824	40.23	-33.77	74	51.08	31.15	13.36	55.36	100	0	P	H	
		17820	56.19	-17.81	74	42.13	45.68	25.61	57.23	100	0	P	H	
		17820	45.63	-8.37	54	31.57	45.68	25.61	57.23	100	0	A	H	
													H	
													H	
													H	
			4824	40.84	-33.16	74	51.69	31.15	13.36	55.36	100	0	P	V
			17820	56.96	-17.04	74	42.9	45.68	25.61	57.23	100	0	P	V
			17820	45.64	-8.36	54	31.58	45.68	25.61	57.23	100	0	A	V
														V
														V
														V



Emission above 18GHz

WLAN 802.11g\_Tx\_Ch01+ WWAN LTE B41 BW:20MHz CH 40620 Link

WIFI Chain 0+1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)	
802.11g SHF		21983	39.55	-34.45	74	43.45	37.65	12.14	53.69	150	0	P	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
			19855	38.96	-35.04	74	43.67	37.97	11.18	53.86	150	0	P	V
														V
														V
														V
														V
														V
	<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.												





WLAN 802.11a\_Tx\_Ch36+BT (1M) CH 39\_Tx+ WWAN LTE B41 BW:20MHz CH 40620 Link

Band 1 - 5150~5250MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI Chain 0+1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)	
802.11a CH 36 5180MHz		5032.76	58.66	-15.34	74	43.85	31.57	12.9	29.66	100	57	P	H	
		5033.02	45.62	-8.38	54	30.81	31.57	12.9	29.66	100	57	A	H	
	*	5180	104.76	-	-	89.67	31.68	13.09	29.68	100	57	P	H	
	*	5180	96.51	-	-	81.42	31.68	13.09	29.68	100	57	A	H	
													H	
													H	
													V	
			5033.28	53.33	-20.67	74	38.52	31.57	12.9	29.66	100	7	P	V
			5105.82	41.76	-12.24	54	26.64	31.8	12.99	29.67	100	7	A	V
	*		5180	103.65	-	-	88.56	31.68	13.09	29.68	100	7	P	V
	*		5180	96.07	-	-	80.98	31.68	13.09	29.68	100	7	A	V
														V



**2.4GHz 2400~2483.5MHz**

**BT (Band Edge @ 3m)**

BT Chain 0	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)	
BT CH 39 2441MHz		2345.84	46.66	-27.34	74	40.66	27.81	8.48	30.29	354	62	P	H	
		2345.84	21.87	-32.13	54	-	-	-	-	-	-	A	H	
	*	2441	98.55	-	-	92.74	27.42	8.66	30.27	354	62	P	H	
	*	2441	73.76	-	-	-	-	-	-	-	-	A	H	
		2492.51	46.05	-27.95	74	40.14	27.4	8.76	30.25	354	62	P	H	
		2492.51	21.26	-32.74	54	-	-	-	-	-	-	-	A	H
		2356.48	45.91	-28.09	74	39.94	27.76	8.5	30.29	138	273	P	V	
		2356.48	21.12	-32.88	54	-	-	-	-	-	-	-	A	V
	*	2441	92.23	-	-	86.42	27.42	8.66	30.27	138	273	P	V	
	*	2441	67.44	-	-	-	-	-	-	-	-	-	A	V
		2483.69	45.94	-28.06	74	40.05	27.4	8.74	30.25	138	273	P	V	
		2483.69	21.15	-32.85	54	-	-	-	-	-	-	-	A	V



WLAN 802.11a\_Tx\_Ch36+BT (1M) CH 39\_Tx+ WWAN LTE B41 BW:20MHz CH 40620 Link  
(Harmonic @ 3m)

BT Chain 0	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
11a_Ch36+ BT_Ch39+ LTE B41 Link		4882	55.52	-18.48	74	39.45	31.14	12.87	29.63	100	0	P	H
		4882	30.73	-23.27	54	-	-	-	-	-	-	A	H
		7323	46.05	-27.95	74	49.24	36.45	15.77	56.26	100	0	P	H
		7323	21.26	-32.74	54	-	-	-	-	-	-	A	H
		10360	50.22	-17.98	68.2	47.62	39.44	18.93	56.23	100	0	P	H
		15540	47.34	-26.66	74	41.55	37.98	22.66	55.41	100	0	P	H
		17758	55.56	-18.44	74	42.52	44.88	24.84	57.2	100	0	P	H
		17758	45.18	-8.82	54	32.14	44.88	24.84	57.2	100	0	A	H
		4882	56.24	-17.76	74	40.17	31.14	12.87	29.63	100	0	P	V
		4882	31.45	-22.55	54	-	-	-	-	-	-	A	V
		7323	45.36	-28.64	74	48.55	36.45	15.77	56.26	100	0	P	V
		7323	20.57	-33.43	54	-	-	-	-	-	-	A	V
		10360	56.73	-11.47	68.2	54.13	39.44	18.93	56.23	100	0	P	V
		15540	48.35	-25.65	74	42.56	37.98	22.66	55.41	100	0	P	V
		17725	55.93	-18.07	74	43.22	44.55	24.83	57.19	100	0	P	V
	17725	45.92	-8.08	54	33.21	44.55	24.83	57.19	100	0	A	V	



Emission above 18GHz

WLAN 802.11a\_Tx\_Ch36+BT (1M) CH 39\_Tx+ WWAN LTE B41 BW:20MHz CH 40620 Link

WIFI Chain 0+1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)	
11a_Ch36+ BT_Ch39+ LTE B41 Link		23852	40.61	-33.39	74	41.87	39.61	12.63	53.5	150	0	P	H	
		33312	44.02	-24.18	68.2	39.89	40.6	17.79	54.26	150	0	P	H	
													H	
													H	
													H	
														H
														H
														H
			24182	41.33	-26.87	68.2	42.14	39.84	12.81	53.46	150	0	P	V
			32718	43.37	-24.83	68.2	39.65	40.59	17.5	54.37	150	0	P	V
														V
														V
														V
														V
														V
	<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.												



Emission below 1GHz

WLAN 802.11a\_Tx\_Ch36+BT (1M) CH 39\_Tx+ WWAN LTE B41 BW:20MHz CH 40620 Link

WIFI Chain 0+1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level (dBμV)	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)	
11a_Ch36+ BT_Ch39+ LTE B41 Link		186.17	28.09	-15.41	43.5	43.66	15.06	2.24	32.87	-	-	P	H	
		312.27	20.05	-25.95	46	30.18	19.43	2.97	32.53	-	-	P	H	
		388.9	22.18	-23.82	46	29.58	21.65	3.34	32.39	-	-	P	H	
		617.82	27.85	-18.15	46	30.24	25.95	4.28	32.62	-	-	P	H	
		729.37	34.46	-11.54	46	34.61	27.74	4.65	32.54	100	0	P	H	
		879.72	32.47	-13.53	46	30.64	29.13	5.21	32.51	-	-	P	H	
														H
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														H
			63.95	29.6	-10.4	40	49.27	11.94	1.17	32.78	-	-	P	V
			183.26	31.96	-11.54	43.5	47.54	15.05	2.23	32.86	-	-	P	V
			463.59	25.38	-20.62	46	30.75	23.53	3.65	32.55	-	-	P	V
			598.42	27.07	-18.93	46	29.87	25.66	4.21	32.67	-	-	P	V
			729.37	36.74	-9.26	46	36.89	27.74	4.65	32.54	100	0	P	V
			886.51	32.18	-13.82	46	30.33	29.09	5.24	32.48	-	-	P	V
														V
														V
													V	
													V	
													V	
													V	
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.													





**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
-	The signal is <b>Unintentional Radiators</b> .
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)  
 = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
 = 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)  
 = 55.45 (dBμV/m)
2. Over Limit(dB)  
 = Level(dBμV/m) – Limit Line(dBμV/m)  
 = 55.45(dBμV/m) – 74(dBμV/m)  
 = -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)  
 = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
 = 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
 = 43.54 (dBμV/m)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)  
 = 43.54(dBμV/m) – 54(dBμV/m)  
 = -10.46(dB)

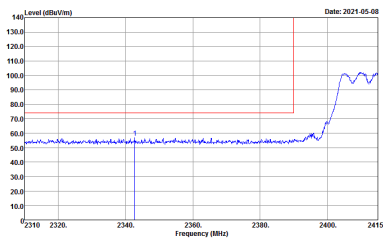
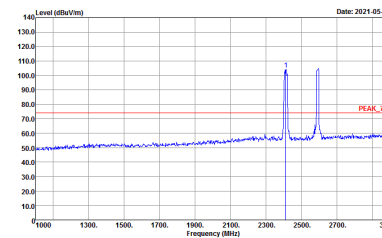
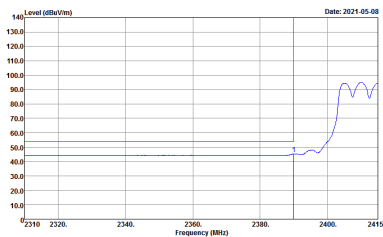
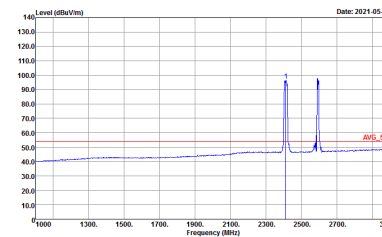
Both peak and average measured complies with the limit line, so test result is “PASS”.



## Appendix B. Radiated Spurious Emission Plots

Test Engineer :	Karl Hou, CR Liro, and Andy Yang	Temperature :	20 ~ 25°C
		Relative Humidity :	50 ~ 60%

**WLAN 802.11g\_Tx\_Ch01+ WWAN LTE B41 BW: 20MHz CH 40620 Link**  
**2.4GHz 2400~2483.5MHz**  
**WIFI 802.11g (Band Edge @ 3m)**

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Chain	802.11g CH01 2412MHz	
0+1	Horizontal	Fundamental
<b>Peak</b>	 <p>Site Condition : 03CH16-HY : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>Site Condition : 03CH16-HY : PEAK_74 3m 91200_1522 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
<b>Avg.</b>	 <p>Site Condition : 03CH16-HY : AVG_BE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto</p>	 <p>Site Condition : 03CH16-HY : AVG_54 3m 91200_1522 HORIZONTAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Chain	802.11g CH01 2412MHz	
0+1	Vertical	Fundamental
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	<p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : AVG_54 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>



WLAN 802.11g\_Tx\_Ch01+ WWAN LTE B41 BW: 20MHz CH 40620 Link  
(Harmonic @ 3m)

Chain	802.11g CH01 2412MHz	
0+1	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522 HORIZONTAL</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522 VERTICAL</p>



Emission above 18GHz

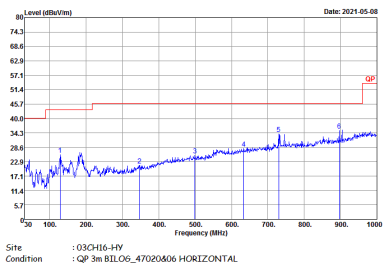
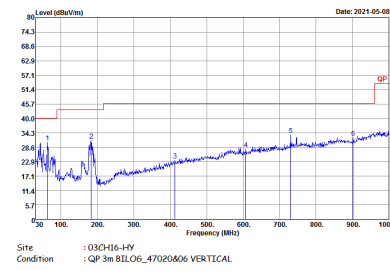
WLAN 802.11g\_Tx\_Ch01+ WWAN LTE B41 BW: 20MHz CH 40620 Link

WIFI	WLAN 2.4GHz WIFI 802.11g + WWAN LTE Band 41 CH40620 Link	
Chain	SHF	
0+1	Horizontal	Vertical
QP / Peak		



Emission below 1GHz

WLAN 802.11g\_Tx\_Ch01+ WWAN LTE B41 BW: 20MHz CH 40620 Link

WIFI	WLAN 2.4GHz WIFI 802.11g + WWAN LTE Band 41 CH40620 Link	
ANT	LF	
0+1	Horizontal	Vertical
QP / Peak	 <p>Site : 03CH16-HY Condition : QP 3m BIL06_47020606 HORIZONTAL</p>	 <p>Site : 03CH16-HY Condition : QP 3m BIL06_47020606 VERTICAL</p>



WLAN 802.11a\_Tx\_Ch36+BT (1M) CH 39\_Tx+ WWAN LTE B41 BW:20MHz CH 40620 Link  
 Band 1 - 5150~5250MHz  
 WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
Chain	802.11a CH36 5180MHz	
0+1	Horizontal	Fundamental
Peak	<p>Site : 03CH16-HY            Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY            Condition : PEAK(LINE) 3m 91200_1522 HORIZONTAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	<p>Site : 03CH16-HY            Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL            : RBW:1000.000KHz VBW:0.030KHz SWT:Auto</p>	Left blank





WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
Chain	802.11a CH36 5180MHz	
0+1	Vertical	Fundamental
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : PEAK(UNIT) 3m 9120D_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	<p>Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank



2.4GHz 2400~2483.5MHz  
BT (Band Edge @ 3m)

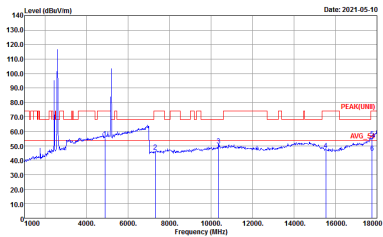
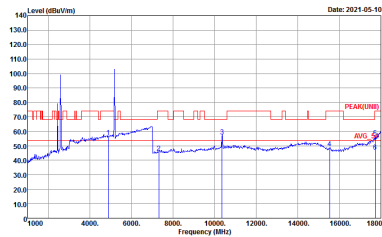
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Chain	BT CH39 2441MHz	
0+1	Horizontal	Fundamental
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Chain	BT CH39 2441MHz	
0+1	Vertical	Fundamental
Peak	<p>Date: 2021-05-10</p> <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Date: 2021-05-10</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Peak	<p>Date: 2021-05-10</p> <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank

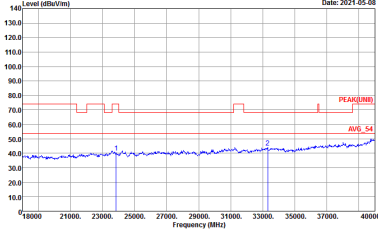
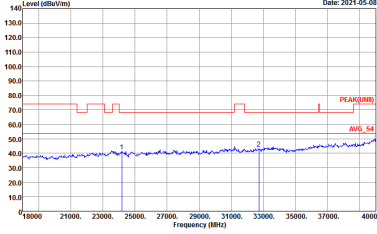


WLAN 802.11a\_Tx\_Ch36+BT (1M) CH 39\_Tx+ WWAN LTE B41 BW:20MHz CH 40620 Link  
(Harmonic @ 3m)

Chain	WLAN 802.11a_Tx_Ch36+BT (1M) CH 39_Tx+ WWAN LTE B41 BW:20MHz CH 40620 Link	
0+1	Horizontal	Vertical
Peak Avg.	 <p>Site : 03CH16-HY Condition : PEAK(UNII) 3m 91200_1522 HORIZONTAL</p>	 <p>Site : 03CH16-HY Condition : PEAK(UNII) 3m 91200_1522 VERTICAL</p>

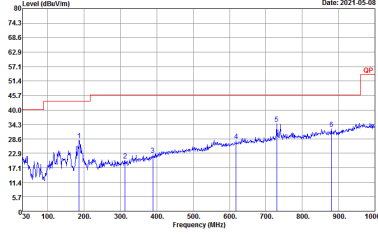
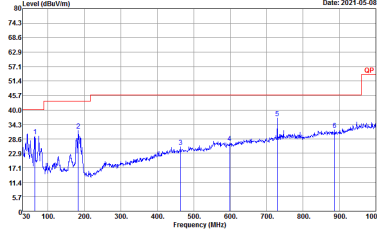


Emission above 18GHz

Chain	WLAN 802.11a_Tx_Ch36+BT (1M) CH 39_Tx+ WWAN LTE B41 BW:20MHz CH 40620 Link	
0+1	Horizontal	Vertical
QP / Peak	 <p>Date: 2021-05-08</p> <p>Site : 03CH16-HY Condition : PEAK(LINE) 1m SHF HORN 88HA9170584 HORIZONTAL</p>	 <p>Date: 2021-05-08</p> <p>Site : 03CH16-HY Condition : PEAK(LINE) 1m SHF HORN 88HA9170584 VERTICAL</p>



Emission below 1GHz

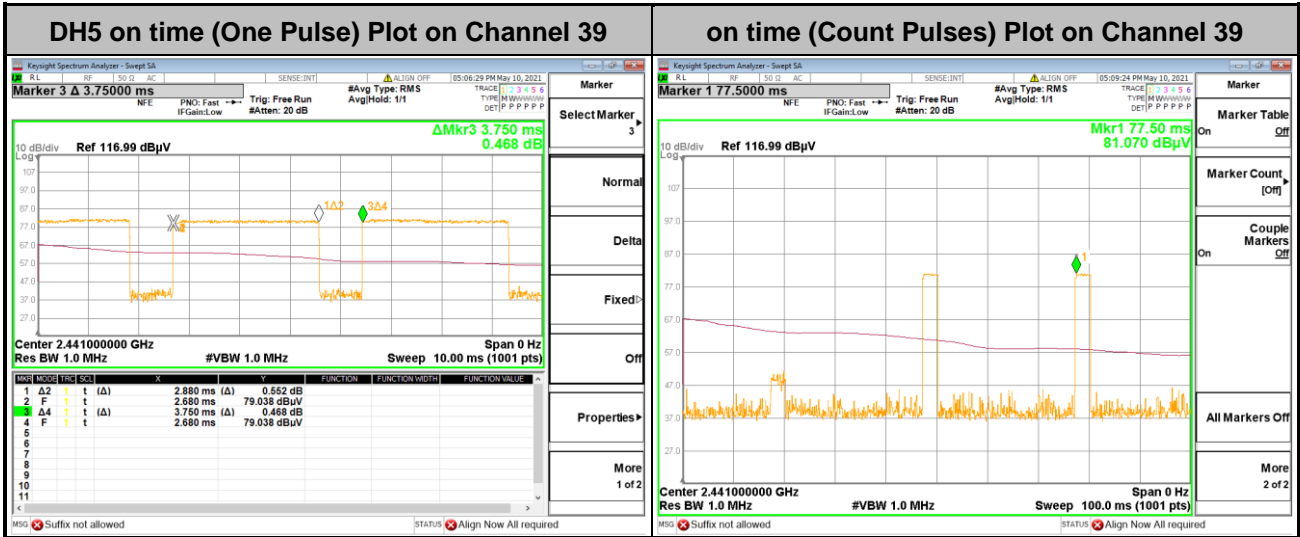
ANT	WLAN 802.11a_Tx_Ch36+BT (1M) CH 39_Tx+ LTE Band 41	
0+1	Horizontal	Vertical
QP / Peak	 <p>Site : 03CH16-HY Condition : QP 3m BILDG_47020406 HORIZONTAL</p>	 <p>Site : 03CH16-HY Condition : QP 3m BILDG_47020406 VERTICAL</p>



# Appendix C. Duty Cycle Plots

<Ant. 0>

<1Mbps>



**Note:**

1. Worst case Duty cycle = on time/100 milliseconds =  $2 * 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor =  $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.

### Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

$$2.88 \text{ ms} \times 20 \text{ channels} = 57.6 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period.  $[100 \text{ ms} / 57.6 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

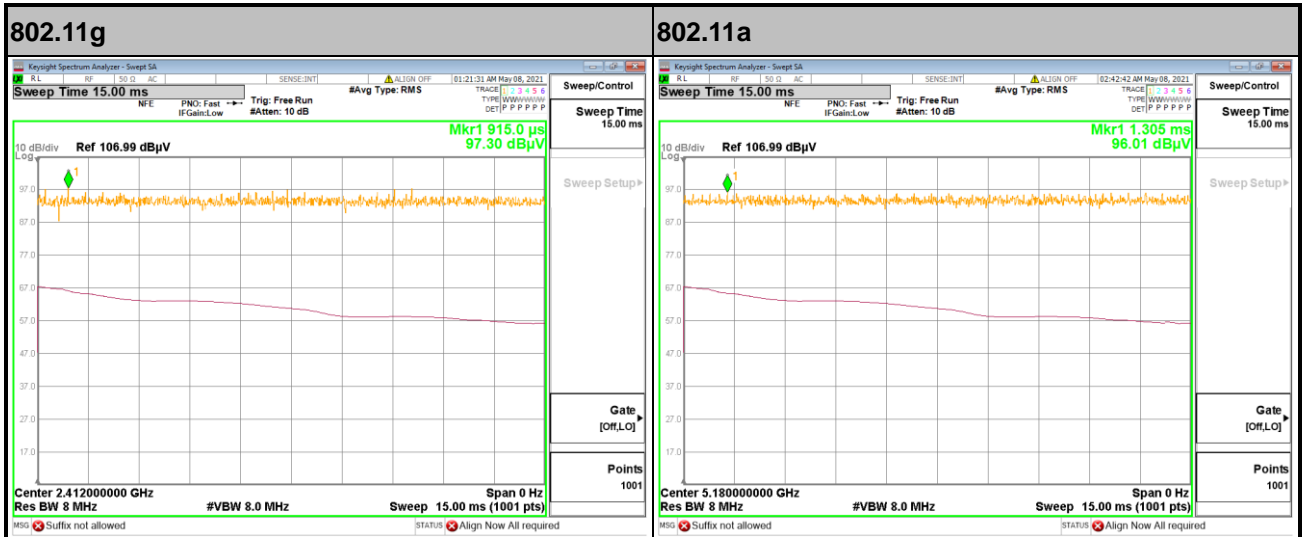
$$2.88 \text{ ms} \times 2 = 5.76 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.76 \text{ ms}/100 \text{ ms}) = -24.79 \text{ dB}$$



Band	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor dB
802.11g	100	-	-	10Hz	0.00
802.11a	100	-	-	10Hz	0.00



— THE END —