FCC CO-LOCATION RADIO TEST REPORT

FCC ID	:	**PY7-45256F**
Equipment	:	**GSM/WCDMA/LTE/5G Phone with BT, DTS/UNII a/b/g/n/ac/ax, GPS 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. 31, 2021 and testing was started from Apr. 19, 2021 and completed on Apr. 21, 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.)

TEL : 886-3-327-0868
FAX : 886-3-327-0855

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History of this test report

Report No.	Version	Description	Issued Date
FR132425G	01	Initial issue of report	Apr. 30, 2021

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 3.23 dB at 18000.000 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: Vivian Hsu

1 General Description

1.1 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, DTS/UNII a/b/g/n/ac/ax, NFC, and GNSS.

Product Specification subjective to this standard	
Antenna Type	**Bluetooth:** **<Ant. 0>:** Loop Antenna **WLAN (2.4GHz)** **<Chain 0>:** Loop Antenna **<Chain 1>:** Loop Antenna **WLAN (5GHz)** **<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	0.747	QV72001C7E	Radiated Spurious Emission

Accessory List	
AC Adapter	Model Name : XQZ-UC1
	S/N: 0020W51300039
Earphone	Model Name.: MH750
	S/N : N/A
USB Cable	Model Name : XQZ-UB1
	S/N : N/A

Note:

1. Above EUT list used are electrically identical per declared by manufacturer.
2. 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.
3. 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

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	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
Test Site No.	**Sporton Site No.**
	03CH15-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 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- 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

a. 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>

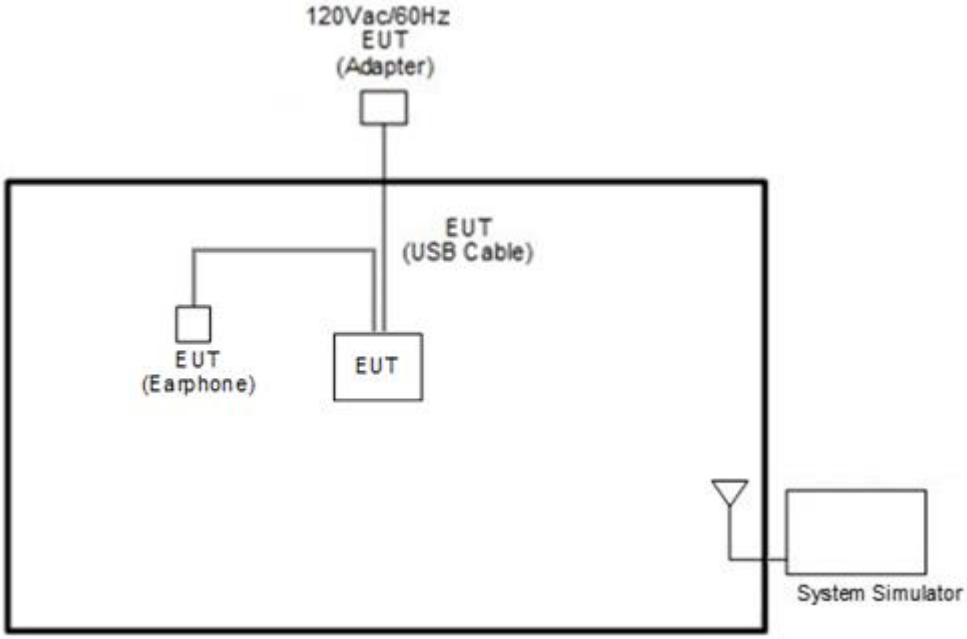
2400-2483.5 MHz		5150-5350 MHz	
802.11g		**802.11a**	
Channel	**Freq. (MHz)**	**Channel**	**Freq. (MHz)**
01	2412	36	5180

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

<Co-Location>

Modulation	Plane	Data Rate
2.4GHz 802.11g for MIMO Chain 0+1 + GSM850	**Z**	**MCS0 + GMSK**
5GHz 802.11a for MIMO Chain 0+1 + Bluetooth for Ant. 0 + GSM850	**X**	**MCS0 + GFSK + GMSK**
2.4GHz 802.11g for MIMO Chain 0+1 + 5GHz 802.11a for MIMO Chain 0+1 + GSM850	**X**	**MCS0 + MCS0 + GMSK**

2.2 Connection Diagram of Test System



2.3 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

2.4 EUT Operation Test Setup

The RF test items, utility “FTMC_V0.39” 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) 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.

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

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

(2) 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 ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

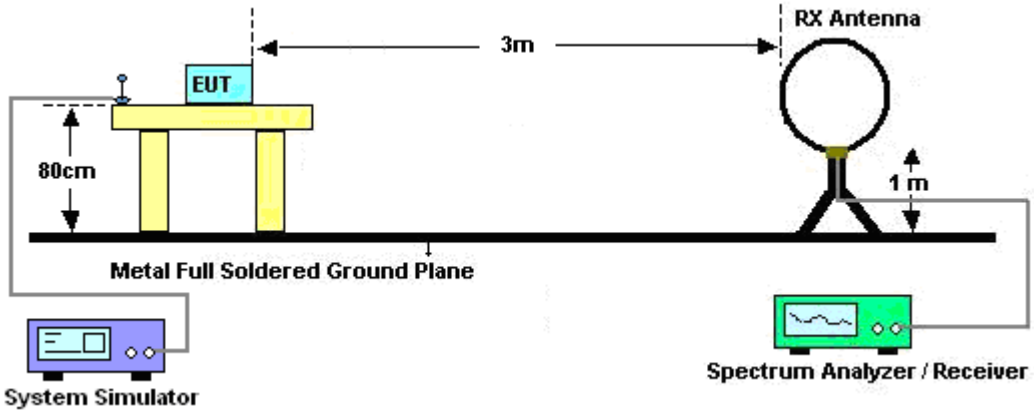
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 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.

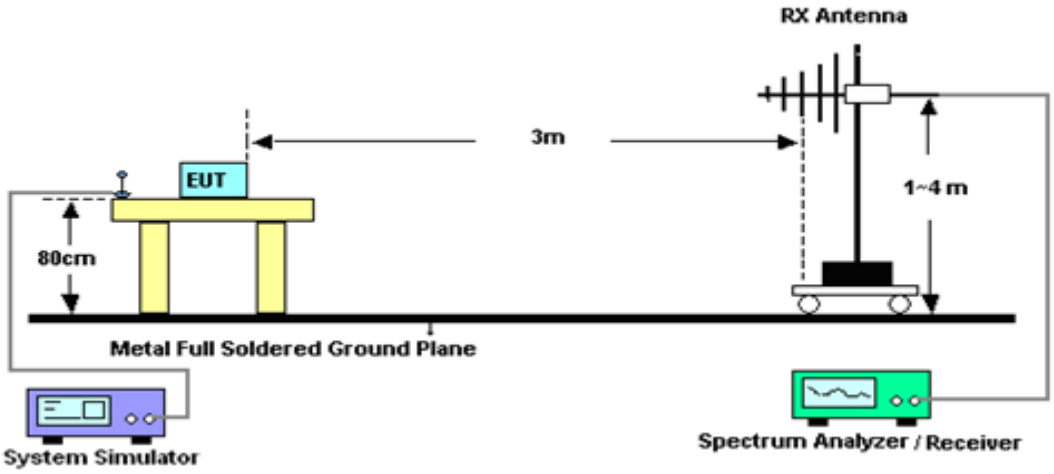
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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

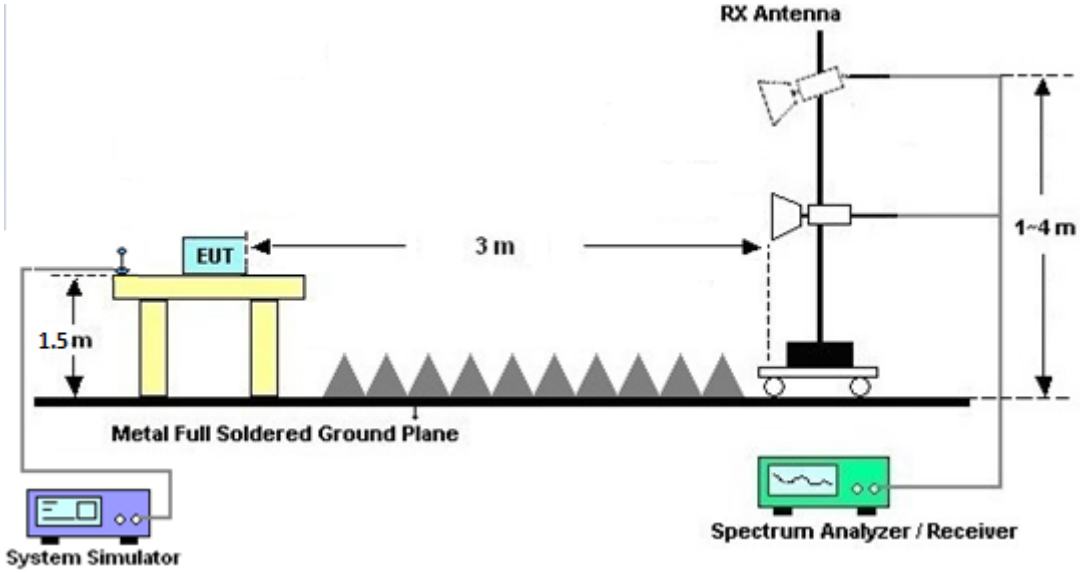
For radiated emissions below 30MHz



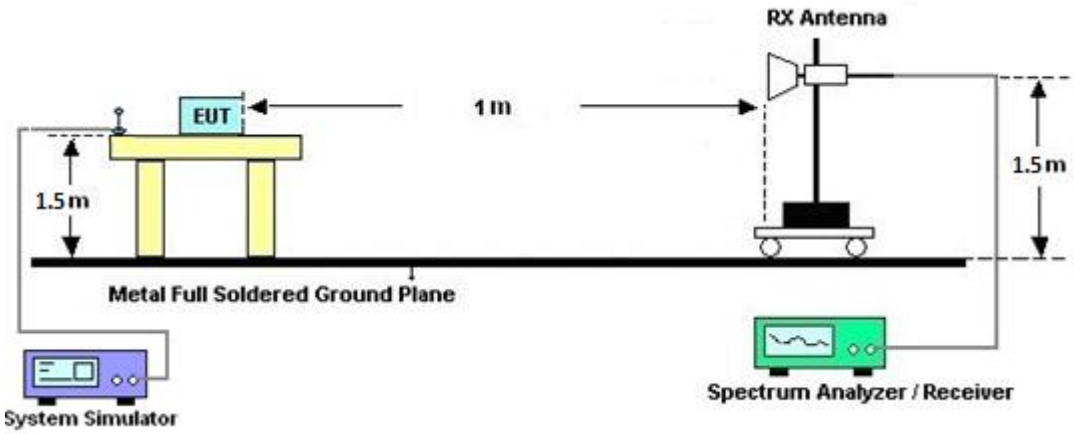
For radiated emissions from 30MHz to 1GHz



For radiated emissions 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	Apr. 19, 2021~ Apr. 21, 2021	Jul. 13, 2021	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	41912 & 05	30MHz~1GHz	Feb. 08, 2021	Apr. 19, 2021~ Apr. 21, 2021	Feb. 07, 2022	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 28, 2020	Apr. 19, 2021~ Apr. 21, 2021	Dec. 27, 2021	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-01620	1GHz~18GHz	Nov. 03, 2020	Apr. 19, 2021~ Apr. 21, 2021	Nov. 02, 2021	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Dec. 02, 2020	Apr. 19, 2021~ Apr. 21, 2021	Dec. 01, 2021	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055006	1GHz~18GHz	May 07, 2020	Apr. 19, 2021~ Apr. 21, 2021	May 06, 2021	Radiation (03CH15-HY)
Preamplifier	Keysight	83017A	MY53270195	1GHz~26.5GHz	Aug. 21, 2020	Apr. 19, 2021~ Apr. 21, 2021	Aug. 20, 2021	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Oct. 27, 2020	Apr. 19, 2021~ Apr. 21, 2021	Oct. 26, 2021	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Nov. 02, 2020	Apr. 19, 2021~ Apr. 21, 2021	Nov. 01, 2021	Radiation (03CH15-HY
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	May 04, 2020	Apr. 19, 2021~ Apr. 21, 2021	May 03, 2021	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Apr. 19, 2021~ Apr. 21, 2021	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Apr. 19, 2021~ Apr. 21, 2021	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24(k5)	RK-000451	N/A	N/A	Apr. 19, 2021~ Apr. 21, 2021	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104, 102E	MY36980/4, MY9838/4PE ,508405/2E	30MHz~18G	Nov. 16, 2020	Apr. 19, 2021~ Apr. 21, 2021	Nov. 15, 2021	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz-40GHz	Feb. 22, 2021	Apr. 19, 2021~ Apr. 21, 2021	Feb. 21, 2022	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz-40GHz	Feb. 22, 2021	Apr. 19, 2021~ Apr. 21, 2021	Feb. 21, 2022	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 11, 2021	Apr. 19, 2021~ Apr. 21, 2021	Mar. 10, 2022	Radiation (03CH15-HY)
Filter	Wainwright	WLJ4-1000-1530-6000-40ST	SN4	1.53GHz Low Pass Filter	Jul. 03, 2020	Apr. 19, 2021~ Apr. 21, 2021	Jul. 02, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN4	3GHz High Pass Filter	Sep. 16, 2020	Apr. 19, 2021~ Apr. 21, 2021	Sep. 15, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WHKX12-1080-1200-15000-60ST	SN5	1.2GHz High Pass Filter	Jul. 01, 2020	Apr. 19, 2021~ Apr. 21, 2021	Jun. 30, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN6	6.75GHz High Pass Filter	Jul. 01, 2020	Apr. 19, 2021~ Apr. 21, 2021	Jun. 30, 2021	Radiation (03CH15-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))	**4.7**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.3**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.9**

Appendix A. Radiated Spurious Emission

Test Engineer :	Leo Lee, Mancy Chou and Bigshow Wang	**Temperature :**	22.5~23.5°C
		Relative Humidity :	47~54%

WLAN 802.11g_Tx_Ch01 + WWAN GSM850 CH189 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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2312.205	55.54	-18.46	74	42.27	27.78	16.44	30.95	144	304	P	H
		2389.695	44.29	-9.71	54	31.11	27.54	16.56	30.92	144	304	A	H
	*	2412	105.51	-	-	91.97	27.5	16.95	30.91	144	304	P	H
	*	2412	98.17	-	-	84.63	27.5	16.95	30.91	144	304	A	H
													H
													H
		2388.015	55.37	-18.63	74	42.18	27.55	16.56	30.92	106	246	P	V
		2388.54	44.32	-9.68	54	31.13	27.55	16.56	30.92	106	246	A	V
	*	2412	105.89	-	-	92.35	27.5	16.95	30.91	106	246	P	V
	*	2412	99.85	-	-	86.31	27.5	16.95	30.91	106	246	A	V
													V
													V

WLAN 802.11g_Tx_Ch01 + WWAN GSM850 CH189 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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	39.24	-34.76	74	57.16	31.1	10.07	59.09	100	0	P	H
		18000	58.83	-15.17	74	48.84	49	18.89	57.9	100	212	P	H
		18000	49.99	-4.01	54	40	49	18.89	57.9	100	212	A	H
													H
													H
													H
		4824	38.55	-35.45	74	56.47	31.1	10.07	59.09	100	0	P	V
		18000	58.95	-15.05	74	48.96	49	18.89	57.9	100	151	P	V
		18000	49.88	-4.12	54	39.89	49	18.89	57.9	100	151	A	V
													V
													V
													V

WLAN 802.11a_Tx_Ch36 + BT (1M) CH 39_Tx + WWAN GSM850 Ch189 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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 36 5180MHz		5125.58	52.52	-21.48	74	40.27	31.8	10.46	30.01	100	239	P	H
		5149.76	41.36	-12.64	54	29.06	31.8	10.51	30.01	100	239	A	H
	*	5180	105.64	-	-	93.46	31.62	10.57	30.01	100	239	P	H
	*	5180	97.66	-	-	85.48	31.62	10.57	30.01	100	239	A	H
													H
													H
													V
		5138.06	52.2	-21.8	74	39.93	31.8	10.48	30.01	346	290	P	V
		5148.98	41.17	-12.83	54	28.87	31.8	10.51	30.01	346	290	A	V
	*	5180	102.32	-	-	90.14	31.62	10.57	30.01	346	290	P	V
	*	5180	94.23	-	-	82.05	31.62	10.57	30.01	346	290	A	V
													V

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT Ant. 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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		2369.36	46.03	-27.97	74	42.3	27.62	7.03	30.92	100	222	P	H
		2369.36	21.24	-32.76	54	-	-	-	-	-	-	A	H
	*	2441	108.57	-	-	104.89	27.5	7.07	30.89	100	222	P	H
	*	2441	83.78	-	-	-	-	-	-	-	-	A	H
Bluetooth		2486.35	45.28	-28.72	74	41.53	27.43	7.2	30.88	100	222	P	H
(1Mbps)		2486.35	20.49	-33.51	54	-	-	-	-	-	-	A	H
CH 39		2345.7	45.77	-28.23	74	42.01	27.71	6.98	30.93	324	280	P	V
2441MHz		2345.7	20.98	-33.02	54	-	-	-	-	-	-	A	V
	*	2441	105.13	-	-	101.45	27.5	7.07	30.89	324	280	P	V
	*	2441	80.34	-	-	-	-	-	-	-	-	A	V
		2486.84	45.43	-28.57	74	41.68	27.43	7.2	30.88	324	280	P	V
		2486.84	20.64	-33.36	54	-	-	-	-	-	-	A	V

WLAN 802.11a_Tx_Ch36 + BT (1M) CH 39_Tx + WWAN GSM850 Ch189 Link

(Harmonic @ 3m)

BT Ant. 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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		4882	50.91	-23.09	74	39.81	31.04	10.11	30.05	100	0	P	H
		4882	26.12	-27.88	54	-	-	-	-	-	-	A	H
		7323	42.82	-31.18	74	52.44	36.3	12.63	58.55	100	0	P	H
		7323	18.03	-35.97	54	-	-	-	-	-	-	A	H
		10360	47.7	-20.5	68.2	54.7	39.44	14.46	60.9	100	0	P	H
		15540	46.86	-27.14	74	54.46	37.82	17.29	62.71	100	0	P	H
11a_Ch36+		17988.9	60.05	-13.95	74	50.13	48.8	19.03	57.91	100	142	P	H
BT_Ch39+		17988.9	50.23	-3.77	54	40.31	48.8	19.03	57.91	100	142	A	H
GSM850		4882	51.45	-22.55	74	40.35	31.04	10.11	30.05	100	0	P	V
Link		4882	26.66	-27.34	54	-	-	-	-	-	-	A	V
		7323	42.74	-31.26	74	52.36	36.3	12.63	58.55	100	0	P	V
		7323	17.95	-36.05	54	-	-	-	-	-	-	A	V
		10360	46.89	-21.31	68.2	53.89	39.44	14.46	60.9	100	0	P	V
		15540	46.48	-27.52	74	54.08	37.82	17.29	62.71	100	0	P	V
		17988.9	60.14	-13.86	74	50.22	48.8	19.03	57.91	300	235	P	V
		17988.9	50.05	-3.95	54	40.13	48.8	19.03	57.91	300	235	A	V

WLAN 802.11a_Tx_Ch36 + 802.11g_Tx_Ch01 + WWAN GSM850 Ch189 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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2344.335	56.39	-17.61	74	42.72	27.71	16.9	30.94	143	215	P	H
		2389.065	44.41	-9.59	54	30.81	27.54	16.98	30.92	143	215	A	H
	*	2412	105.72	-	-	92.18	27.5	16.95	30.91	143	215	P	H
	*	2412	98.52	-	-	84.98	27.5	16.95	30.91	143	215	A	H
													H
													H
		2321.655	55.95	-18.05	74	42.27	27.76	16.86	30.94	379	280	P	V
		2331.42	44.29	-9.71	54	30.61	27.74	16.88	30.94	379	280	A	V
	*	2412	101.35	-	-	87.81	27.5	16.95	30.91	379	280	P	V
	*	2412	94.03	-	-	80.49	27.5	16.95	30.91	379	280	A	V
													V
													V

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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 36 5180MHz		5121.68	52.45	-21.55	74	40.21	31.8	10.45	30.01	100	238	P	H
		5148.2	41.47	-12.53	54	29.17	31.8	10.51	30.01	100	238	A	H
	*	5180	105.96	-	-	93.78	31.62	10.57	30.01	100	238	P	H
	*	5180	98.44	-	-	86.26	31.62	10.57	30.01	100	238	A	H
													H
													H
													V
		5098.02	52.33	-21.67	74	40.14	31.8	10.4	30.01	346	289	P	V
		5123.5	41.23	-12.77	54	28.99	31.8	10.45	30.01	346	289	A	V
	*	5180	102.82	-	-	90.64	31.62	10.57	30.01	346	289	P	V
	*	5180	94.71	-	-	82.53	31.62	10.57	30.01	346	289	A	V
													V

WLAN 802.11a_Tx_Ch36 + 802.11g_Tx_Ch01 + WWAN GSM850 Ch189 Link

(Harmonic @ 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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		4824	51.96	-22.04	74	40.86	31.1	10.07	30.07	100	228	P	H
		4824	43.98	-10.02	54	32.88	31.1	10.07	30.07	100	228	A	H
		10360	46.96	-21.24	68.2	53.96	39.44	14.46	60.9	100	0	P	H
		15540	46.62	-27.38	74	54.22	37.82	17.29	62.71	100	0	P	H
		18000	60.66	-13.34	74	50.52	49	19.04	57.9	100	126	P	H
		18000	50.55	-3.45	54	40.41	49	19.04	57.9	100	126	A	H
													H
													H
11g_Ch01+													H
11a_Ch36+													H
GSM 850		4824	52.01	-21.99	74	40.91	31.1	10.07	30.07	100	228	P	V
Link		4824	43.76	-10.24	54	32.66	31.1	10.07	30.07	100	229	A	V
		10360	47.21	-20.99	68.2	54.21	39.44	14.46	60.9	100	0	P	V
		15540	47.08	-26.92	74	54.68	37.82	17.29	62.71	100	0	P	V
		18000	60.95	-13.05	74	50.81	49	19.04	57.9	300	241	P	V
		18000	50.54	-3.46	54	40.4	49	19.04	57.9	300	241	A	V
													V
													V
													V
													V

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
-	The signal is **Unintentional Radiators**.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

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

WIFI Chain. Simultaneously	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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		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".

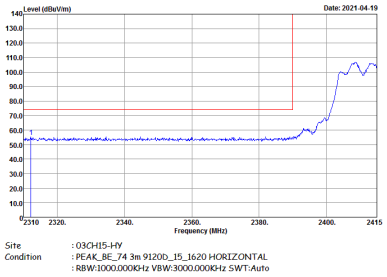
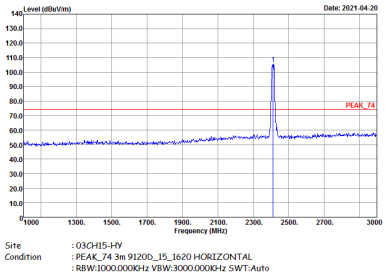
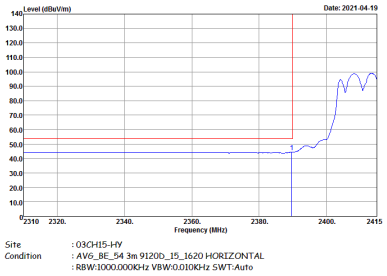
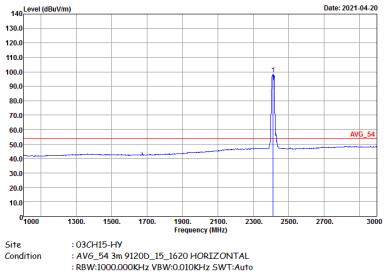
Appendix B. Radiated Spurious Emission

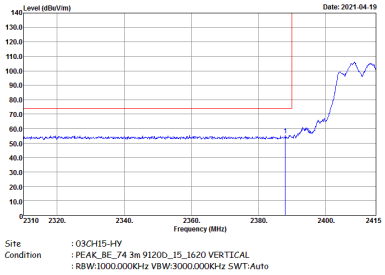
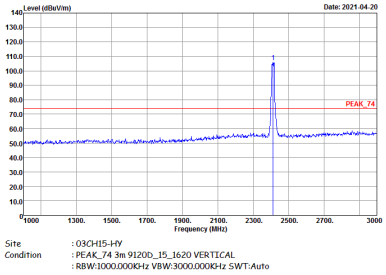
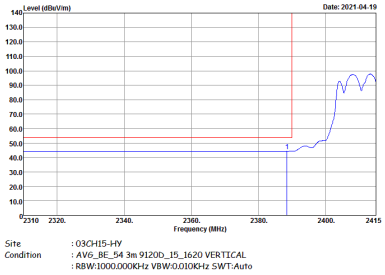
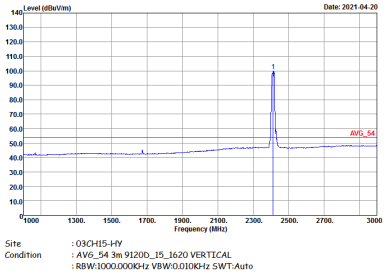
Test Engineer :	Leo Lee, Mancy Chou and Bigshow Wang	**Temperature :**	22.5~23.5°C
		Relative Humidity :	47~54%

WLAN 802.11g_Tx_Ch01 + WWAN GSM850 CH189 Link

2.4GHz 2400~2483.5MHz

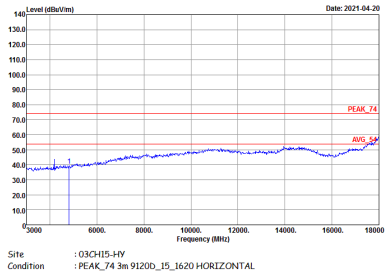
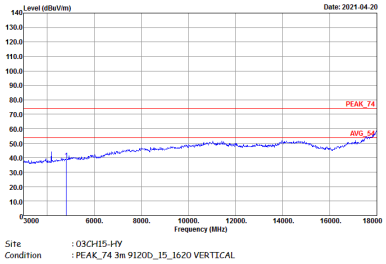
WIFI 802.11g (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Chain	802.11g CH01 2412MHz	
0+1	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Chain	802.11g CH01 2412MHz	
0+1	Vertical	Fundamental
Peak		
Avg.		

WLAN 802.11g_Tx_Ch01 + WWAN GSM850 CH189 Link

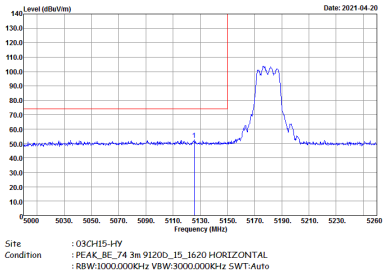
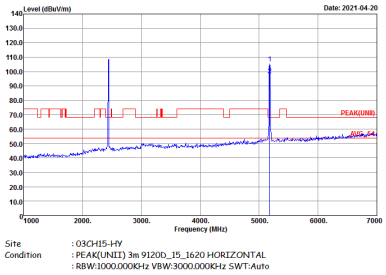
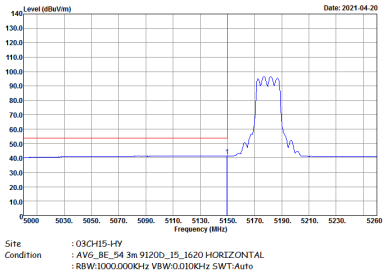
(Harmonic @ 3m)

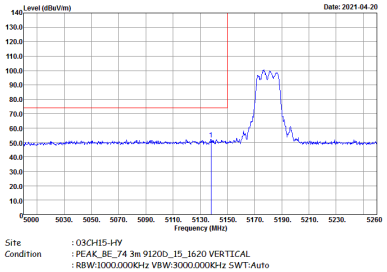
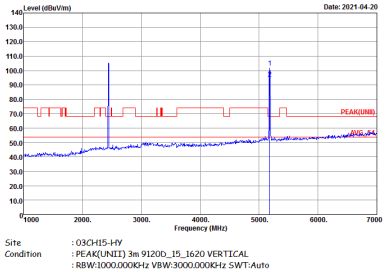
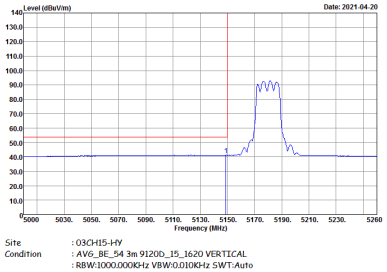
Chain	WLAN 802.11g_Tx_Ch01+ WWAN GSM850 CH 189 Link	
0+1	Horizontal	Vertical
Peak Avg.		

WLAN 802.11a_Tx_Ch36 + BT (1M) CH 39_Tx + WWAN GSM850 Ch189 Link

Band 1 - 5150~5250MHz

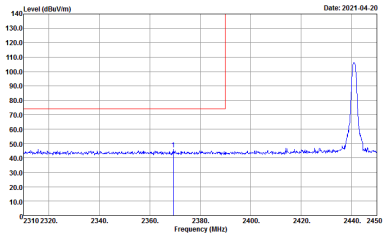
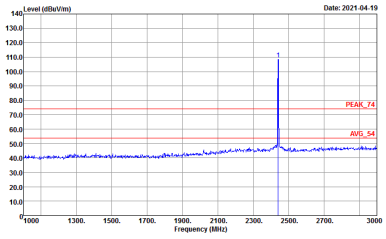
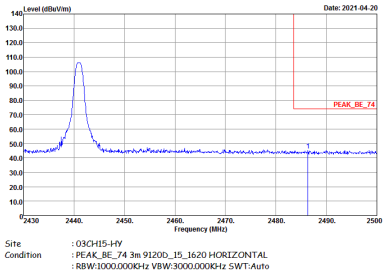
WIFI 802.11a (Band Edge @ 3m)

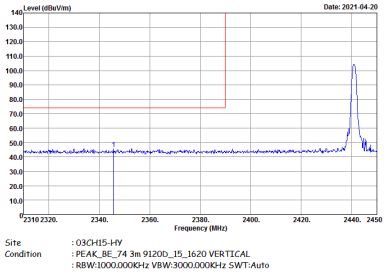
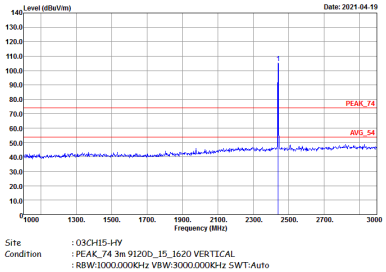
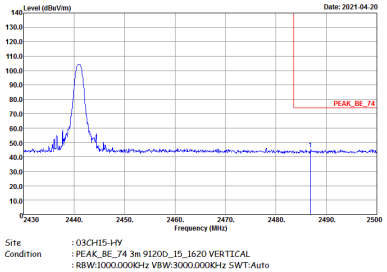
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
Chain	802.11a CH36 5180MHz	
0+1	Horizontal	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
Chain	802.11a CH36 5180MHz	
0+1	Vertical	Fundamental
Peak		
Avg.		Left blank

2.4GHz 2400~2483.5MHz

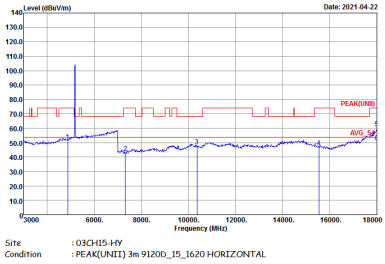
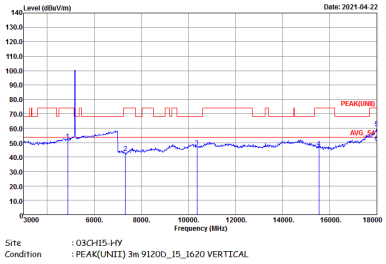
BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH39 2441MHz	
0	Horizontal	Fundamental
Peak		
Peak		Left blank

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH39 2441MHz	
0	Vertical	Fundamental
Peak		
Peak		Left blank

WLAN 802.11a_Tx_Ch36 + BT (1M) CH 39_Tx + WWAN GSM850 CH189 Link

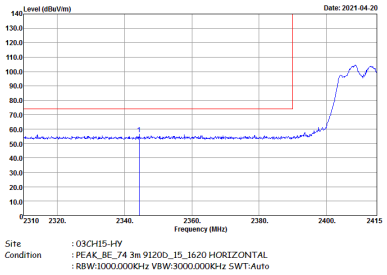
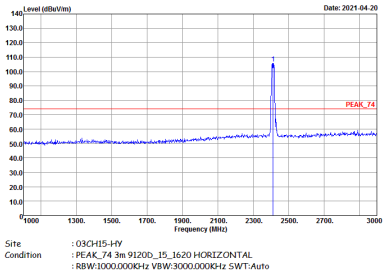
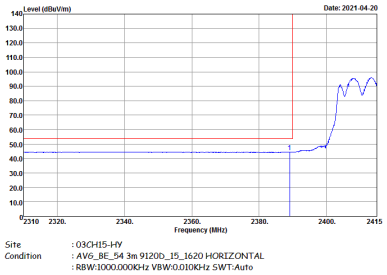
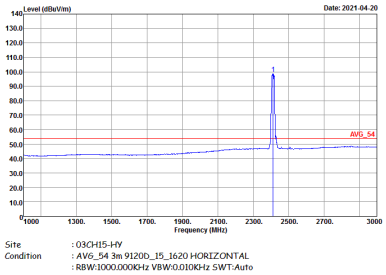
(Harmonic @ 3m)

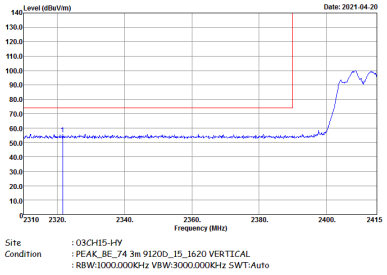
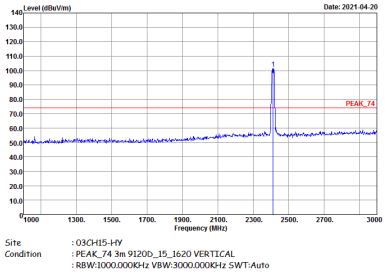
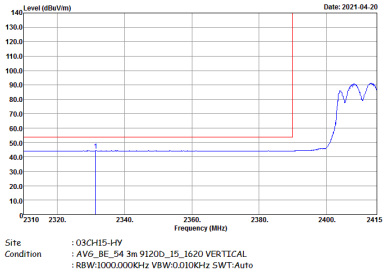
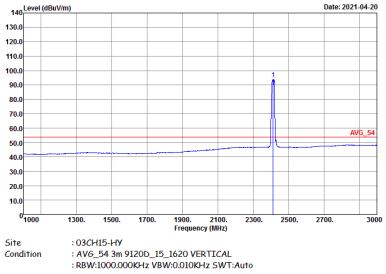
Chain	WLAN 802.11a_Tx_Ch36 + BT (1M) CH 39_Tx + WWAN GSM850 Ch189 Link	
0+1	Horizontal	Vertical
Peak Avg.		

WLAN 802.11a_Tx_Ch36 + 802.11g_Tx_Ch01 + WWAN GSM850 Ch189 Link

2.4GHz 2400~2483.5MHz

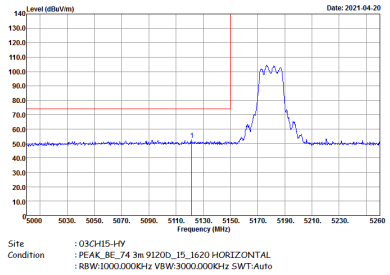
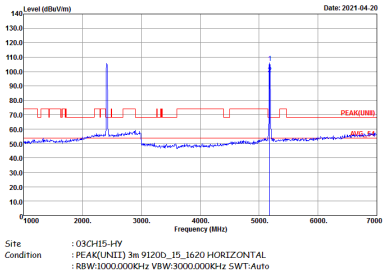
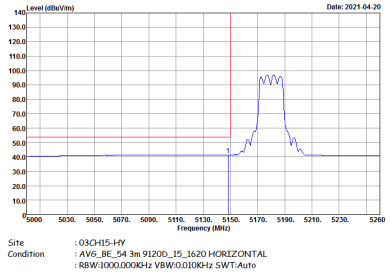
WIFI 802.11g (Band Edge @ 3m)

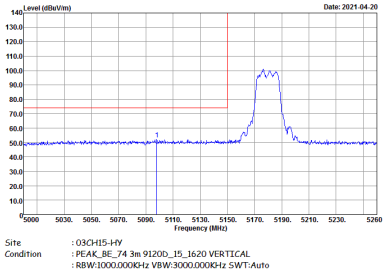
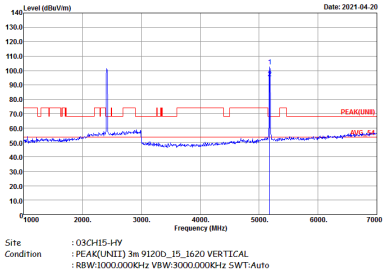
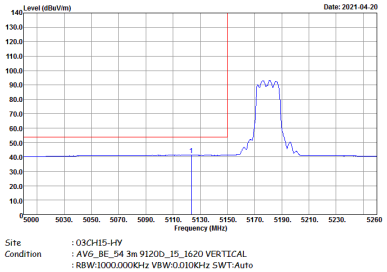
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Chain	802.11g CH01 2412MHz	
0+1	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
Chain	802.11g CH01 2412MHz	
0+1	Vertical	Fundamental
Peak		
Avg.		

Band 1 - 5150~5250MHz

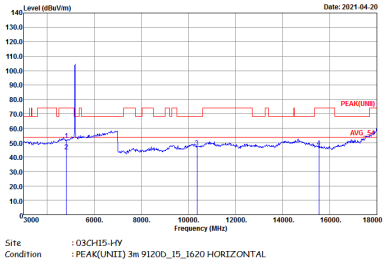
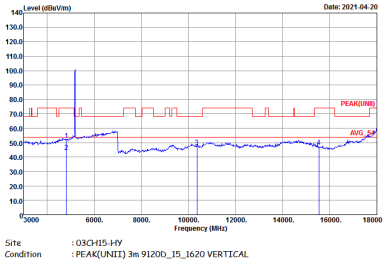
WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
Chain	802.11a CH36 5180MHz	
0+1	Horizontal	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
Chain	802.11a CH36 5180MHz	
0+1	Vertical	Fundamental
Peak		
Avg.		Left blank

WLAN 802.11a_Tx_Ch36 + 802.11g_Tx_Ch01 + WWAN GSM850 Ch189 Link

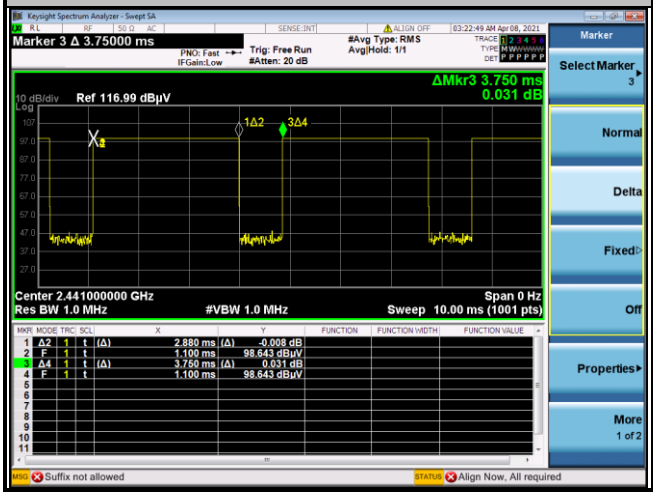
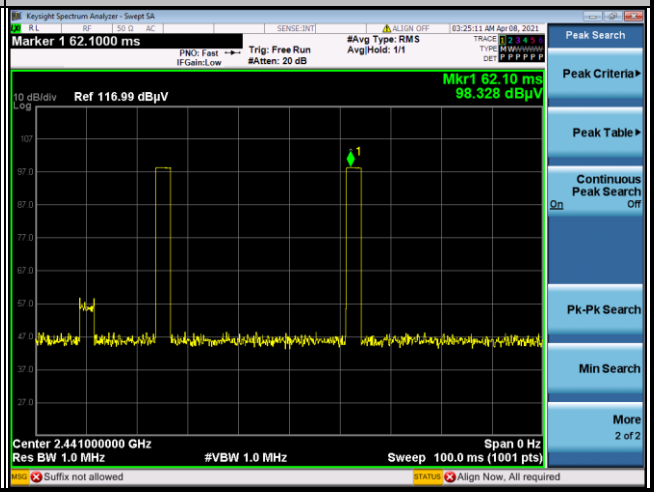
(Harmonic @ 3m)

Chain	WLAN 802.11a_Tx_Ch36 + 802.11g_Tx_Ch01 + WWAN GSM850 Ch189 Link	
0+1	Horizontal	Vertical
Peak Avg.		

Appendix C. Duty Cycle Plots

<Ant. 0>

<1Mbps>

DH5 on time (One Pulse) Plot on Channel 39	on time (Count Pulses) Plot on Channel 39
	

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(Duty cycle) = -24.79 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 ms x 20 channels = 57.6 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 ms / 57.6 ms] = 2 hops

Thus, the maximum possible ON time:

2.88 ms x 2 = 5.76 ms

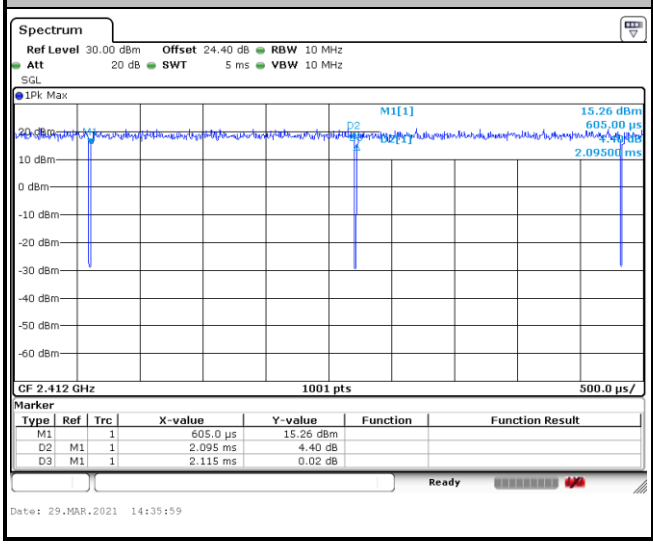
Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.76 ms/100 ms) = -24.79 dB

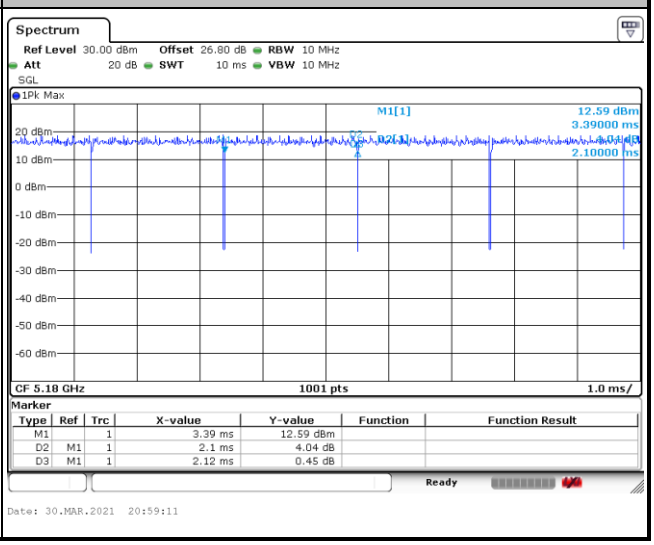
Chain	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
0+1	2.4GHz 802.11g for Chain 0	99.05	-	-	10Hz	0.04
0+1	2.4GHz 802.11g for Chain 1	99.29	-	-	10Hz	0.03
0+1	5GHz 802.11a for Chain 0	99.06	-	-	10Hz	0.04
0+1	5GHz 802.11a for Chain 1	99.05	-	-	10Hz	0.04

MIMO <Chain 0>

802.11g

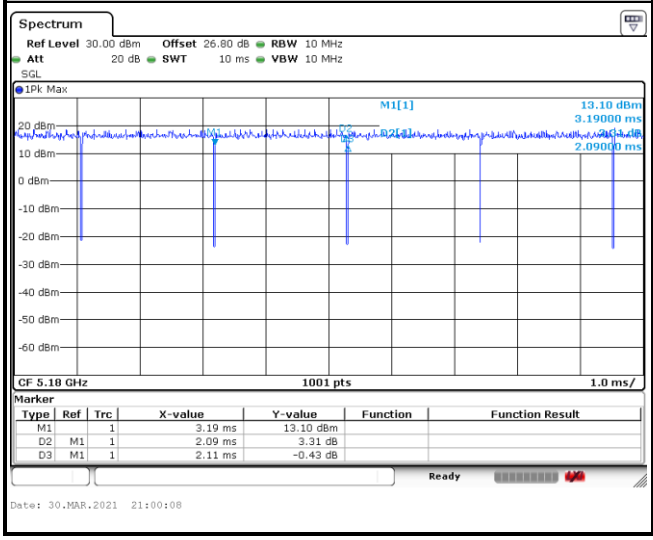


802.11a

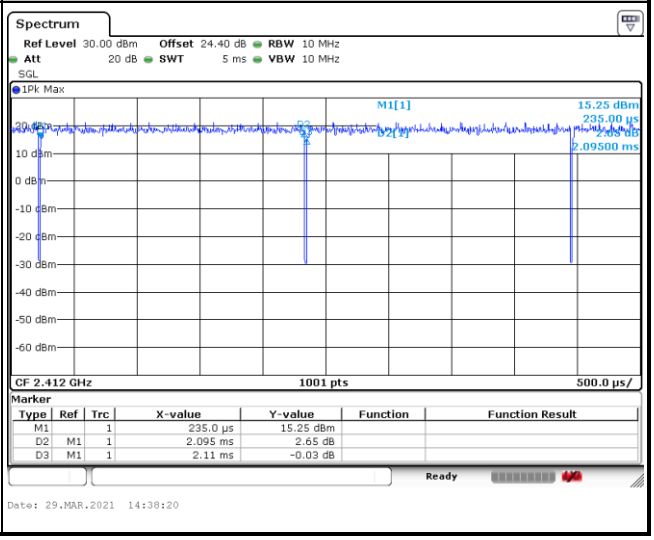


MIMO <Chain 1>

802.11a



802.11g



———THE END———