FCC CO-LOCATION RADIO TEST REPORT

FCC ID	:	ACJFZA3A
Equipment	:	Tablet Computer
Brand Name	:	Panasonic
Model Name	:	FZ-A3
Marketing Name		FZ-A3
Applicant	:	Panasonic Corporation of North America Two Riverfront Plaza, 9th Floor, Newark, NJ 07102-5490
Manufacturer	:	Panasonic Mobile Communications Co., Ltd. 600 Saedo-cho, Tsuzuki-ku, Yokohama City 224-8539, Japan
Standard	:	FCC Part 15 Subpart E §15.407

The product was received on Nov. 26, 2019 and testing was started from Mar. 28, 2020 and completed on Apr. 13, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FR992410-04	01	Initial issue of report	Apr. 16, 2020

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 3.15 dB at 7660.000 MHz
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

Remark: This is a variant report by adding simultaneous transmission configurations analysis for 5GHz WLAN Ant 1 + 5GHz WLAN Ant 0 + Bluetooth Ant 0. All the test cases were performed on original report which can be referred to Sporton Report Number FR992410-01.

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: Yimin Ho

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac, Wi-Fi 5GHz 802.11a/n/ac, NFC, and GNSS.

Product Specification subjective to this standard	
Antenna Type	WLAN **<Ant. 0>**: Monopole Antenna **<Ant. 1>**: Monopole Antenna Bluetooth: Monopole Antenna GNSS: Monopole Antenna NFC: Loop Antenna

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. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH11-HY

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

FCC designation No.: TW0007

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 E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

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 (X plane) were recorded in this report.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz		5150-5250 MHz	
Bluetooth		802.11ac VHT20	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
78	2480	36	5180

2.2 Test Mode

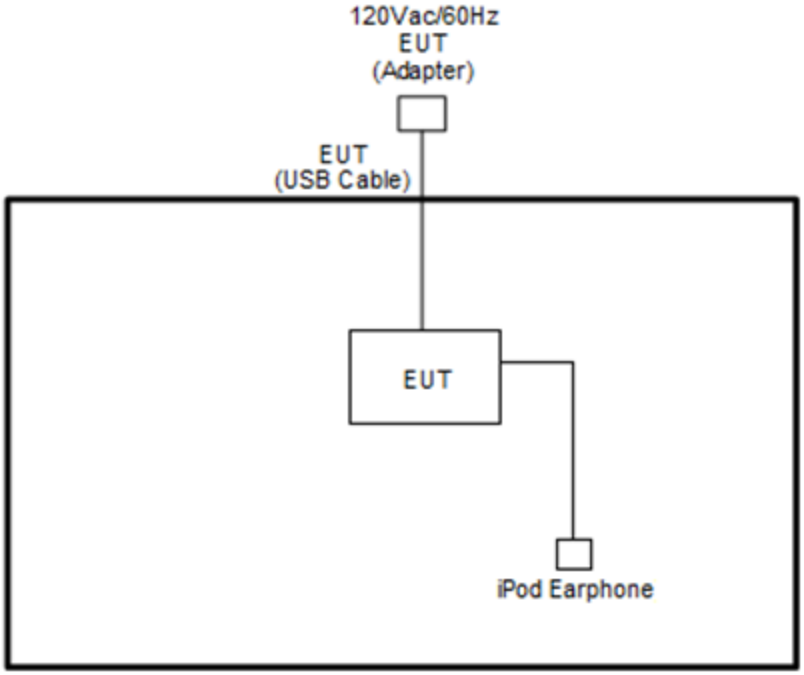
Final test modes are considering the modulation and worse data rates as below table.

<Co-Location>

Modulation	Data Rate
Bluetooth + 5GHz 802.11ac VHT20 for MIMO Ant. 0+1	1Mbps + 6Mbps

Remark: All the tests were performed with Battery 1 and USB Cable 1.

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “QRCT v4.0-00156” 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 Peak Unwanted Emissions Measurements Above 1000 MHz

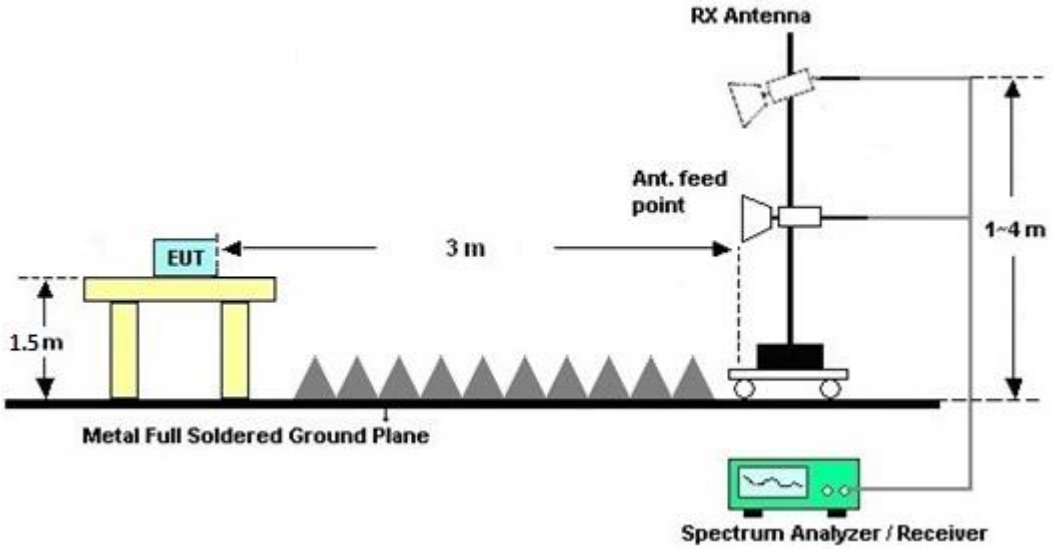
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

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

   - 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 1.5 meter for frequency above 1GHz 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 above 1GHz, the emission level of the EUT in peak mode was 20dB 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 above 1GHz



3.1.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.1.6 Duty Cycle

Please refer to Appendix C.

3.1.7 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	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Preamplifier	EMCE	EMC184045B	980192	18GHz ~ 40GHz	Aug. 01, 2019	Mar. 28, 2020~ Apr. 13, 2020	Jul. 31, 2020	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 13, 2019	Mar. 28, 2020~ Apr. 13, 2020	Nov. 12, 2020	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55 303K	171000180 0054002	1GHz~18GHz	Feb. 07, 2020	Mar. 28, 2020~ Apr. 13, 2020	Feb. 06, 2021	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 576	18GHz- 40GHz	May 14, 2019	Mar. 28, 2020~ Apr. 13, 2020	May 13, 2020	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-132 6	1GHz ~ 18GHz	Nov. 04, 2019	Mar. 28, 2020~ Apr. 13, 2020	Nov. 03, 2020	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz ~ 44GHz	Oct. 28, 2019	Mar. 28, 2020~ Apr. 13, 2020	Oct. 27, 2020	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Mar. 28, 2020~ Apr. 13, 2020	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Mar. 28, 2020~ Apr. 13, 2020	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Mar. 28, 2020~ Apr. 13, 2020	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Mar. 28, 2020~ Apr. 13, 2020	N/A	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz-30MHz	Mar. 12, 2020	Mar. 28, 2020~ Apr. 13, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 12, 2020	Mar. 28, 2020~ Apr. 13, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	30M-18G	Mar. 12, 2020	Mar. 28, 2020~ Apr. 13, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 12, 2020	Mar. 28, 2020~ Apr. 13, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN3	3GHz High Pass Filter	Sep. 15, 2019	Mar. 28, 2020~ Apr. 13, 2020	Sep. 14, 2020	Radiation (03CH11-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40SS	SN3	6.75GHz High Pass Filter	Sep. 16, 2019	Mar. 28, 2020~ Apr. 13, 2020	Sep. 15, 2020	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-1080-1200-15000-60SS	SN2	1.2GHz High Pass Filter	Sep. 15, 2019	Mar. 28, 2020~ Apr. 13, 2020	Sep. 14, 2020	Radiation (03CH11-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.20**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.12**

Appendix A. Radiated Spurious Emission

Test Engineer :	Cookie Ku, Fu Chen, Troye Hsieh and Quentin Liu	Temperature :	18.9 ~ 23.9°C
		Relative Humidity :	48.9 ~ 69.6%

BT_CH78_Tx Ant. 0 + WLAN 5G 11ac20_CH36_Tx_Ant. 0+1

2.4G 2400~2483.5MHz (Band Edge @ 3m) + 5G Band 1 5150~5250MHz(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)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT_CH78 Tx Ant. 0	*	2480	104.52	-	-	103.66	27.28	6.79	33.21	100	112	P	H
	*	2480	79.76	-	-	-	-	-	-	-	-	A	H
		2483.52	55.01	-18.99	74	54.16	27.27	6.79	33.21	100	112	P	H
		2483.52	30.25	-23.75	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	98.41	-	-	97.55	27.28	6.79	33.21	400	176	P	V
	*	2480	73.65	-	-	-	-	-	-	-	-	A	V
		2485.24	48.62	-25.38	74	47.78	27.26	6.79	33.21	400	176	P	V
		2485.24	23.86	-30.14	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI BT	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)
WLAN 5G 11ac_CH36 Tx_Ant 0+1		5141.18	52.18	-21.82	74	43.25	31.8	9.95	32.82	100	108	P	H
		5145.6	43.2	-10.8	54	34.26	31.8	9.96	32.82	100	108	A	H
	*	5180	113.2	-	-	104.36	31.62	10.01	32.79	100	108	P	H
	*	5180	105.41	-	-	96.57	31.62	10.01	32.79	100	108	A	H
												P	H
												A	H
		5149.76	50.42	-23.58	74	41.46	31.8	9.97	32.81	285	155	P	V
		5135.2	41.26	-12.74	54	32.33	31.8	9.95	32.82	285	155	A	V
	*	5180	103.74	-	-	94.9	31.62	10.01	32.79	285	155	P	V
	*	5180	97.08	-	-	88.24	31.62	10.01	32.79	285	155	A	V
												P	V
												A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Colocation (Harmonic @ 3m)

Colocation	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)
Colocation		4960	69.38	-4.62	74	61.37	31.14	9.74	32.87	100	107	P	H
		4960	44.62	-9.38	54	-	-	-	-	-	-	A	H
		7440	53.08	-20.92	74	61.67	36.38	13.62	58.59	100	0	P	H
		7440	28.32	-25.68	54	-	-	-	-	-	-	A	H
		7660	58.94	-15.06	74	67.6	36.02	13.8	58.48	100	87	P	H
		7660	50.85	-3.15	54	59.51	36.02	13.8	58.48	100	87	A	H
		10360	49.55	-18.65	68.2	52.7	39.8	17.44	60.39	100	0	P	H
		15540	44.11	-29.89	74	45.92	37.84	21.62	61.27	100	0	P	H
		4960	62.72	-11.28	74	54.71	31.14	9.74	32.87	100	114	P	V
		4960	37.96	-16.04	54	-	-	-	-	-	-	A	V
		7440	47.26	-26.74	74	55.85	36.38	13.62	58.59	100	0	P	V
		7440	-22.5	-31.5	54	-	-	-	-	-	-	A	V
		7660	48.56	-25.44	74	57.22	36.02	13.8	58.48	100	0	P	V
		10360	49.72	-18.48	68.2	52.87	39.8	17.44	60.39	100	0	P	V
		15540	44.07	-29.93	74	45.88	37.84	21.62	61.27	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
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	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(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)

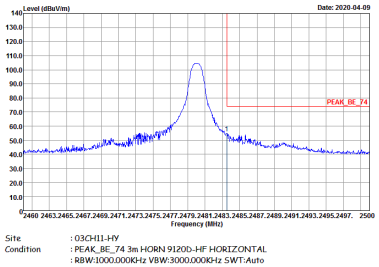
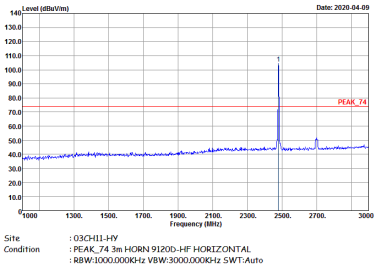
= -10.46(dB)

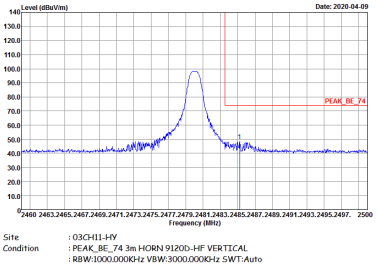
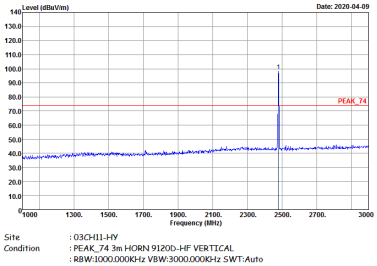
Both peak and average measured complies with the limit line, so test result is "PASS".

Appendix B. Radiated Spurious Emission Plots

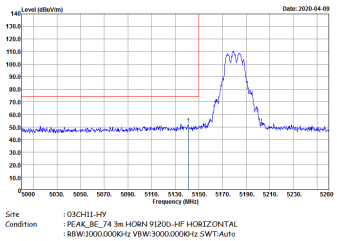
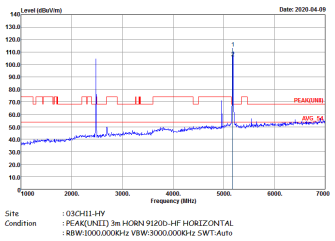
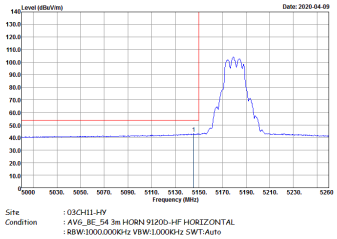
Test Engineer :	Cookie Ku, Fu Chen, Troye Hsieh and Quentin Liu	Temperature :	18.9 ~ 23.9°C
		Relative Humidity :	48.9 ~ 69.6%

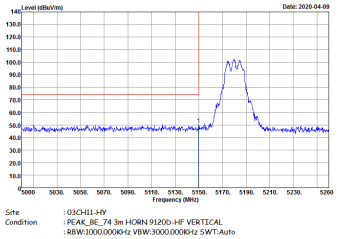
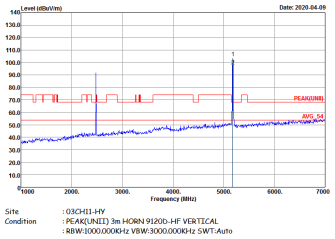
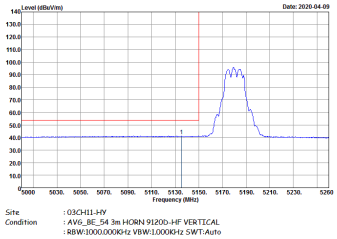
2400~2483.5MHz (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT_CH78 Tx Ant. 0	
0	Horizontal	Fundamental
Peak		

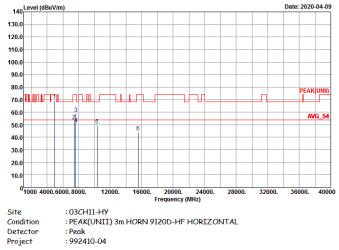
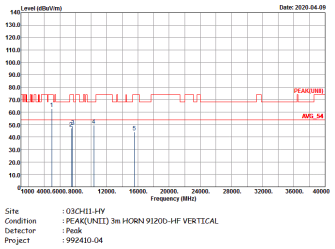
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT_CH78 Tx Ant. 0	
0	Vertical	Fundamental
Peak		

Band 1 5150~5250MHz (Band Edge @ 3m)

WIFI	Band 1–5150~5250MHz Band Edge @ 3m	
ANT	WLAN 5G 11ac_CH36 Tx_Ant 0+1	
0+1	Horizontal	Fundamental
Peak		
Avg.		Left blank

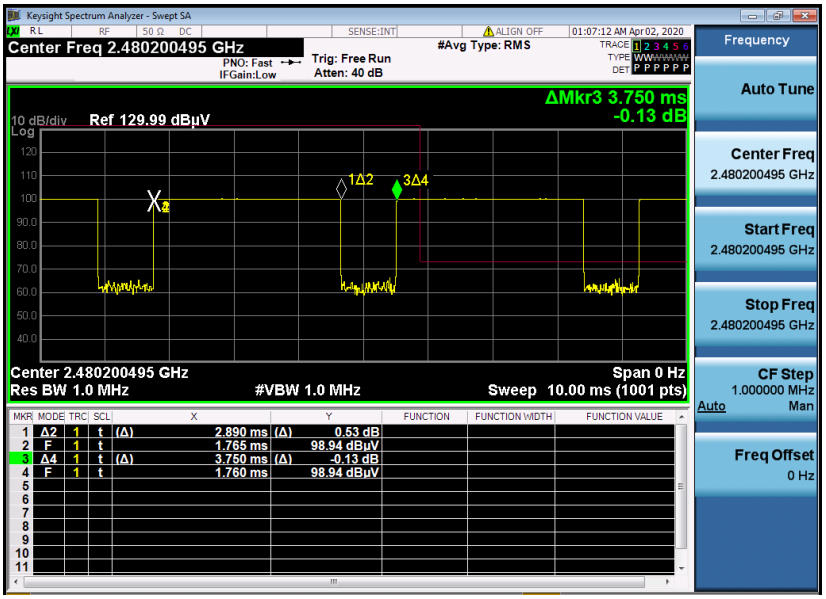
WIFI	Band 1–5150~5250MHz Band Edge @ 3m	
ANT	WLAN 5G 11ac20_CH36 Tx_Ant 0+1	
0+1	Vertical	Fundamental
Peak		
Avg.		Left blank

Co-location (Harmonic @ 3m)

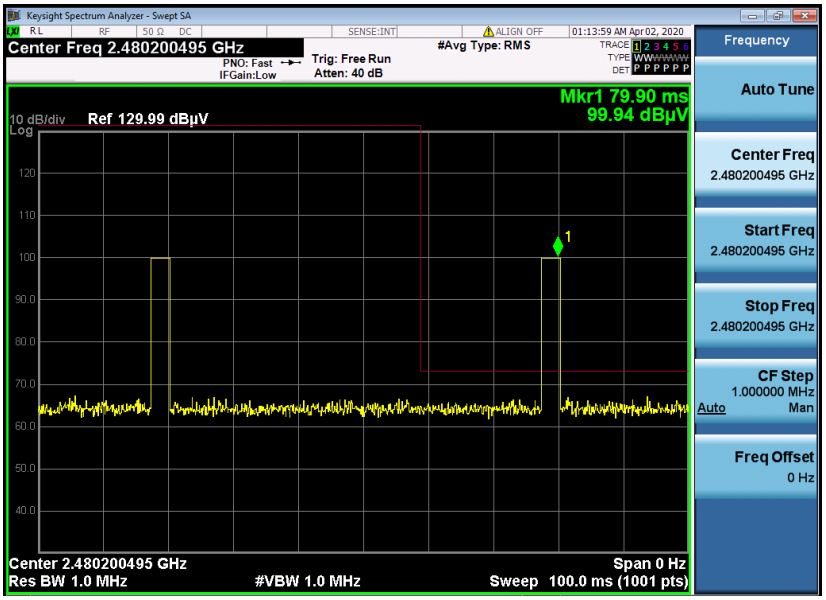
Co-location	BT_CH78 Tx + WLAN 5G 11ac20_CH36 Tx_Ant 0+1	
	Horizontal	Vertical
Peak Avg.	 	

Appendix C. Duty Cycle Plots

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 * 2.89 / 100 = 5.78 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 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

2.89 ms x 20 channels = 57.8 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. [100ms / 57.8ms] = 2 hops

Thus, the maximum possible ON time:

2.89 ms x 2 = 5.78 ms

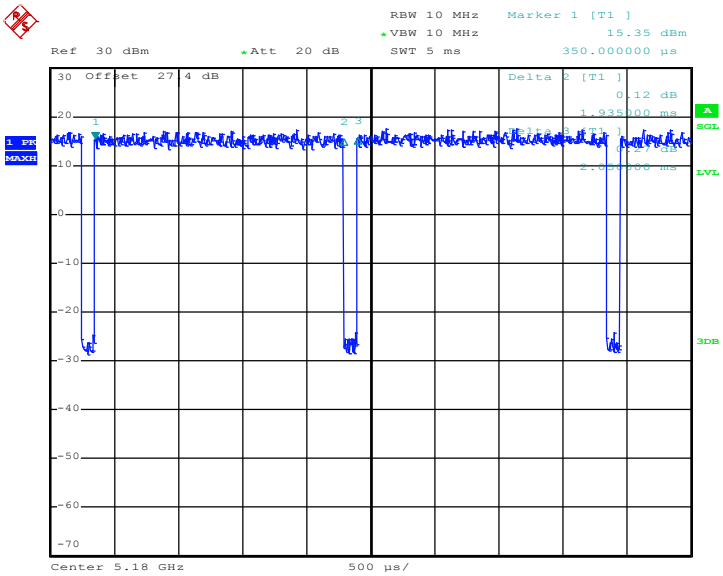
Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.78 ms/100ms) = -24.76 dB

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
0+1	5GHz 802.11ac VHT20 for Ant. 0	94.39	1935	0.52	1kHz	0.25
0+1	5GHz 802.11ac VHT20 for Ant. 1	94.62	1935	0.52	1kHz	0.24

MIMO <Ant. 0>

802.11ac VHT20



MIMO <Ant. 1>

802.11ac VHT20