





Report No.: FR130215F

: 01

FCC CO-LOCATION RADIO TEST REPORT

FCC ID : 2AGOZ-K29W

Equipment : Media Receiver

Brand Name : FACEBOOK

Model Name : WT74BL

Applicant : Facebook Technologies, LLC

1 Hacker Way, Menlo Park, CA 94025, USA

Standard : FCC Part 15 Subpart E §15.407

The product was received on Mar. 30, 2021 and testing was started from Apr. 16, 2021 and completed on Apr. 17, 2021. 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 test results in this 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 333, Taiwan (R.O.C.)

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History of this test report

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Report No.	Version	Description	Issued Date
FR130215F	01	Initial issue of report	May 18, 2021

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Summary of Test Result

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Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	Under limit 1.37 dB at 5455.600 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: Danny Lee Report Producer: Dara Chiu

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1 General Description

1.1 Product Feature of Equipment Under Test

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

Product Specification subjective to this standard		
Antenna Type	WLAN <ant. 1="">: PIFA Antenna</ant.>	
Antonia Type	<ant. 2="">: PIFA Antenna Bluetooth: PIFA Antenna</ant.>	

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Antenna information			
	Peak Gain (dBi)	Bluetooth: 2.6	
2400 MHz ~ 2483.5 MHz		WLAN:	
2400 1911 12 ~ 2405.5 1911 12		<ant. 1="">: 4.9</ant.>	
		<ant. 2="">: 4.7</ant.>	
5470 MHz ~ 5725 MHz	Deals Cain (dDi)	<ant. 1="">: 5.9 dBi</ant.>	
3470 WH2 ~ 3723 WH2	Peak Gain (dBi)	<ant. 2="">: 5.8 dBi</ant.>	

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

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		
	No.52, Huaya 1st Rd., Guishan Dist.,		
Test Site Location	Taoyuan City 333, Taiwan (R.O.C.)		
rest Site Location	TEL: +886-3-327-3456		
	FAX: +886-3-328-4978		
Test Site No.	Sporton Site No.		
rest site NO.	03CH07-HY		

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

FCC designation No.: TW1190

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1.4 Applicable Standards

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

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- 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.
- 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.

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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 (1 GHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in two config (Panel Setting Tilt and Panel Setting Upright). The worst cases (Panel Setting Upright) were recorded in this report.

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2.1 Carrier Frequency and Channel

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

<Ant. 2>

2400-2483.5 MHz			
802.11b			
Channel	Freq. (MHz)		
11	2462		

MIMO <Ant. 0+1>

5470-5725 MHz			
802.11ac VHT80			
Channel Freq. (MHz)			
106	5530		

2.2 Test Mode

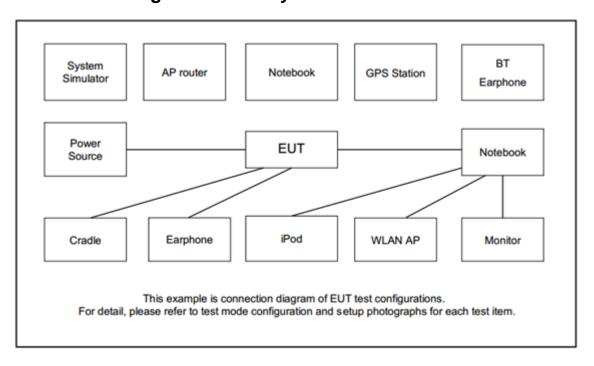
<Co-Location>

Modulation	Data Rate
Bluetooth-LE + 5GHz 802.11ac VHT80 for MIMO Ant. 0+1	GFSK + MCS0
Bluetooth-LE + 2.4GHz 802.11b for Ant. 2	GFSK + 1 Mbps

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2.3 Connection Diagram of Test System



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2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Phone	Samsung	SM-A730F/DS	NA	N/A	Unshielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility "QRCT 4 V4.0-00182" 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.

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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.

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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	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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.

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3.1.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.

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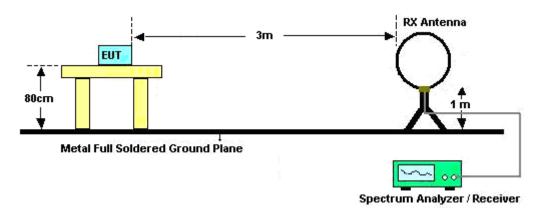
- (1) Procedure for Unwanted Emissions Measurements Below 1000 MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
- (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
 - RBW = 1 MHz
 - VBW ≥ 3 MHz
 - Detector = Peak
 - Sweep time = auto
 - Trace mode = 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.
- 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.

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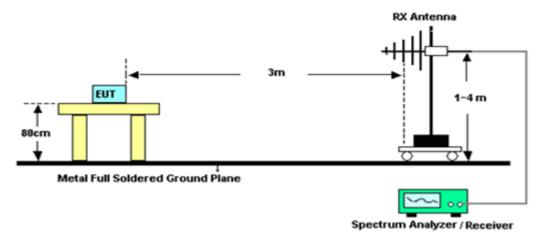
3.1.4 Test Setup

For radiated emissions below 30MHz

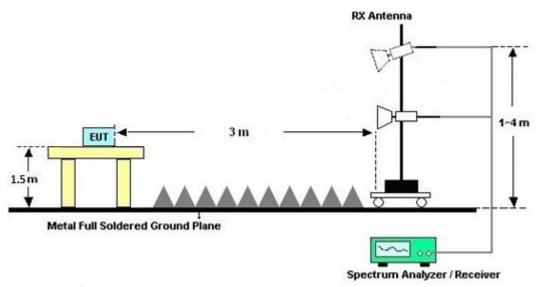


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For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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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.

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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.

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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.

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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.

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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	100315	9 kHz~30 MHz	Jan. 04, 2021	Apr. 16, 2021~ Apr. 17, 2021	Jan. 03, 2022	Radiation (03CH07-HY)	
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01 N-06	35419 & 03	30MHz~1GHz	Apr. 29, 2020	Apr. 16, 2021~ Apr. 17, 2021	Apr. 28, 2021	Radiation (03CH07-HY)	
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 01, 2020	Apr. 16, 2021~ Apr. 17, 2021	Nov. 30, 2021	Radiation (03CH07-HY)	
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 251	18GHz~40GHz	Dec. 02, 2020	Apr. 16, 2021~ Apr. 17, 2021	Dec. 01, 2021	Radiation (03CH07-HY)	
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	May 19, 2020	Apr. 16, 2021~ Apr. 17, 2021	May 18, 2021	Radiation (03CH07-HY)	
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz~18GHz	Apr. 23, 2020	Apr. 16, 2021~ Apr. 17, 2021	Apr. 22, 2021	Radiation (03CH07-HY)	
Preamplifier	Agilent	8449B	3008A023 62	1GHz~26.5GHz	Oct. 31, 2020	Apr. 16, 2021~ Apr. 17, 2021	Oct. 30, 2021	Radiation (03CH07-HY)	
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Jul. 31, 2020	Apr. 16, 2021~ Apr. 17, 2021	Jul. 30, 2021	Radiation (03CH07-HY)	
EMI Test Receiver	Agilent	N9038A (MXE)	MY532900 53	20Hz~26.5GHz	May 21, 2020	Apr. 16, 2021~ Apr. 17, 2021	May 20, 2021	Radiation (03CH07-HY)	
Spectrum Analyzer	Agilent	N9030A	MY523502 76	3Hz~44GHz	Jun. 09, 2020	Apr. 16, 2021~ Apr. 17, 2021	Jun. 08, 2021	Radiation (03CH07-HY)	
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682- 4	30MHz to 18GHz	Feb. 24, 2021	Apr. 16, 2021~ Apr. 17, 2021	Feb. 23, 2022	Radiation (03CH07-HY)	
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971- 4	9kHz to 18GHz	Feb. 24, 2021	Apr. 16, 2021~ Apr. 17, 2021	Feb. 23, 2022	Radiation (03CH07-HY)	
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655- 4	9kHz to 18GHz	Feb. 24, 2021	Apr. 16, 2021~ Apr. 17, 2021	Feb. 23, 2022	Radiation (03CH07-HY)	
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2, 801606/2	18GHz~40GHz	Feb. 24, 2021	Apr. 16, 2021~ Apr. 17, 2021	Feb. 23, 2022	Radiation (03CH07-HY)	
RF Cable	HUBER + SUHNER	SUCOFLEX 126	532078/12 6E	30MHz~18GHz	Sep. 18, 2020	Apr. 16, 2021~ Apr. 17, 2021	Sep. 17, 2021	Radiation (03CH07-HY)	
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Apr. 16, 2021~ Apr. 17, 2021	N/A	Radiation (03CH07-HY)	
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Apr. 16, 2021~ Apr. 17, 2021	N/A	Radiation (03CH07-HY)	
Software	Audix	E3 6.2009-8-24	N/A	N/A	N/A	Apr. 16, 2021~ Apr. 17, 2021	N/A	Radiation (03CH07-HY)	
USB Data Logger	TECPEL	TR-32	HE17XB24 95	N/A	N/A	Apr. 16, 2021~ Apr. 17, 2021	N/A	Radiation (03CH07-HY)	

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5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence	4.7
of 95% (U = 2Uc(y))	4.7

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

Measuring Uncertainty for a Level of Confidence	5.3
of 95% (U = 2Uc(y))	3.3

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

Measuring Uncertainty for a Level of Confidence	5.0
of 95% (U = 2Uc(y))	3.0

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Appendix A. Radiated Spurious Emission

Test Engineer :		Temperature :	22.7~24.6°C
rest Engineer .	Jesse Wang and Stan Hsieh	Relative Humidity :	51.6~57.5%

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2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz BLE 2Mbps_Tx_Ch39 + WIFI 802.11ac VHT80_Tx_Ch106_MIMO Ant 1+2 (Band Edge @ 3m)

	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
BLE+WIFI		, .		Limit	Line	Level	Factor	Loss	Factor	Pos	i	Avg.	
Simultaneously		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		2380.21	53.47	-20.53	74	38.94	31.87	18.07	35.41	373	66	Р	Н
		2384.46	45.96	-8.04	54	31.41	31.87	18.09	35.41	373	66	Α	Н
	*	2480	99.56		-	84.31	32.47	18.23	35.45	373	66	Р	Н
	*	2480	98.41	ı	-	83.16	32.47	18.23	35.45	373	66	Α	Н
BLE		2498.944	54.19	-19.81	74	38.8	32.6	18.25	35.46	373	66	Р	Н
2Mbps		2483.72	47.26	-6.74	54	32.01	32.47	18.23	35.45	373	66	Α	Н
Ch39		2354.54	53.68	-20.32	74	39.29	31.83	17.96	35.4	290	314	Р	V
2480MHz		2379.53	46.23	-7.77	54	31.7	31.87	18.07	35.41	290	314	Α	V
	*	2480	101.17	-	-	85.92	32.47	18.23	35.45	290	314	Р	V
	*	2480	99.85	ı	-	84.6	32.47	18.23	35.45	290	314	Α	V
		2499.472	54.39	-19.61	74	39	32.6	18.25	35.46	290	314	Р	V
		2492.96	47.1	-6.9	54	31.72	32.6	18.24	35.46	290	314	Α	V

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		5454.88	57.87	-16.13	74	46.34	34.6	12.06	35.13	307	334	Р	Н
		5466.16	60.23	-7.97	68.2	48.62	34.67	12.07	35.13	307	334	Р	Н
		5455.6	52.63	-1.37	54	41.1	34.6	12.06	35.13	307	334	Α	Н
	*	5530	103.89	-	-	92.08	34.77	12.17	35.13	307	334	Р	Н
802.11ac	*	5530	98.36	-	-	86.55	34.77	12.17	35.13	307	334	Α	Н
VHT80		5743.265	48.7	-19.5	68.2	36.75	34.7	12.42	35.17	307	334	Р	Н
Ch106		5452.96	57.23	-16.77	74	45.71	34.6	12.05	35.13	400	65	Р	V
5530MHz		5468.56	59.93	-8.27	68.2	48.31	34.67	12.08	35.13	400	65	Р	V
		5454.16	52.23	-1.77	54	40.71	34.6	12.05	35.13	400	65	Α	V
	*	5530	102.79	-	-	90.98	34.77	12.17	35.13	400	65	Р	V
	*	5530	96.73	-	-	84.92	34.77	12.17	35.13	400	65	Α	V
		5744.21	49.95	-18.25	68.2	38	34.7	12.42	35.17	400	65	Р	V
Remark	1. N	o other spuriou	is found.							•			
i\Giliai K	2. A	II results are PA	ASS against	Peak and	d Average li	mit line.							

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BLE 2Mbps_Tx_Ch39 + WIFI 802.11ac VHT80_Tx_Ch106_MIMO Ant 1+2 (Harmonic @ 3m)

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	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
BLE+WIFI				Limit	Line	Level	Factor	Loss	Factor	Pos		Avg.	
Simultaneously		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		4960	55.21	-18.79	74	44.18	34.2	12.16	35.33	285	283	Р	Н
		4960	48.49	-5.51	54	37.46	34.2	12.16	35.33	285	283	Α	Н
		7440	41.27	-32.73	74	47.96	35.6	15.3	57.59	100	0	Р	Н
		11060	43.86	-30.14	74	45.62	37.9	18.89	58.55	100	0	Р	Н
On Innerticu		16590	49.07	-19.13	68.2	39.38	41.85	24.23	56.39	100	0	Р	Н
													Н
Co-location		4960	55.72	-18.28	74	44.69	34.2	12.16	35.33	192	305	Р	V
		4960	50.04	-3.96	54	39.01	34.2	12.16	35.33	192	305	Α	V
		7440	41.85	-32.15	74	48.54	35.6	15.3	57.59	100	0	Р	V
		11060	45.07	-28.93	74	46.83	37.9	18.89	58.55	100	0	Р	V
		16590	48.25	-19.95	68.2	38.56	41.85	24.23	56.39	100	0	Р	V
													V
Pomark	1. N	lo other spuriou	us found.										
Remark	2. A	II results are P	ASS against	Peak an	d Average lii	mit line.							

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Emission below 1GHz

BLE 2Mbps_Tx_Ch39 + WIFI 802.11ac VHT80_Tx_Ch106_MIMO Ant 1+2 (LF @3m)

	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
BLE+WIFI				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos		
Simultaneously	1	(MHz)	(dBµV/m)		(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)		
		143.13	33.86	-9.64	43.5	44.25	17.38	2.18	29.95	-	-	Р	Н
		147.45	36.97	-6.53	43.5	47.44	17.27	2.21	29.95	100	0	Р	Н
		182.82	35.97	-7.53	43.5	48.62	14.79	2.5	29.94	-	-	Р	Н
		365.1	29.77	-16.23	46	35.63	20.75	3.28	29.89	-	-	Р	Н
		524.7	28.95	-17.05	46	31.13	23.91	3.77	29.86	-	-	Р	Н
		953.1	33.46	-12.54	46	26.47	30.42	5.25	28.68	-	-	Р	Н
													Н
													Н
													Н
													Н
													Н
Co-location													Н
LF		30	33.68	-6.32	40	38.43	24.32	0.94	30.01	100	0	Р	V
		66.99	28.99	-11.01	40	45.37	12.02	1.58	29.98	-	-	Р	V
		158.25	28.86	-14.64	43.5	39.81	16.7	2.3	29.95	-	-	Р	V
		442.8	28.54	-17.46	46	31.88	22.95	3.59	29.88	-	-	Р	V
		870.5	31.63	-14.37	46	26.93	28.9	4.93	29.13	-	-	Р	V
		951.7	34.01	-11.99	46	27.14	30.31	5.25	28.69	-	-	Р	V
													V
													V
													V
													V
													V
													V
Remark		o other spuriou I results are PA		imit line.									

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Report No.: FR130215F



2.4GHz 2400~2483.5MHz BLE 2Mbps_Tx_Ch39 + WIFI 802.11b_Tx_Ch11_Ant 2 (Band Edge @ 3m)

		-											
	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
BLE+WIFI				Limit	Line	Level	Factor	Loss	Factor	Pos		Avg.	
Simultaneously		(MHz)	(dBµV/m)	(dB)		(dBµV)	(dB/m)	(dB)	(dB)	(cm)			
		2370.69	53.86	-20.14	74	39.38	31.87	18.02	35.41	369	57	Р	Н
		2387.86	46.46	-7.54	54	31.87	31.9	18.1	35.41	369	57	Α	Н
	*	2480	100.68	-	-	85.43	32.47	18.23	35.45	369	57	Р	Н
	*	2480	99.41	-	-	84.16	32.47	18.23	35.45	369	57	Α	Н
BLE		2491.2	56.01	-17.99	74	40.62	32.6	18.24	35.45	369	57	Р	Н
2Mbps		2488.824	48.7	-5.3	54	33.32	32.6	18.23	35.45	369	57	Α	Н
Ch39		2375.45	53.91	-20.09	74	39.4	31.87	18.05	35.41	285	300	Р	V
2480MHz		2388.88	46.24	-7.76	54	31.64	31.9	18.11	35.41	285	300	Α	V
	*	2480	101.42	-	-	86.17	32.47	18.23	35.45	285	300	Р	V
	*	2480	100.11	-	-	84.86	32.47	18.23	35.45	285	300	Α	V
		2496.392	55.12	-18.88	74	39.74	32.6	18.24	35.46	285	300	Р	V
		2483.544	47.6	-6.4	54	32.35	32.47	18.23	35.45	285	300	Α	V
		2385.31	54.27	-19.73	74	39.72	31.87	18.09	35.41	153	20	Р	Н
		2387.01	44.63	-9.37	54	30.04	31.9	18.1	35.41	153	20	Α	Н
	*	2462	109.87	1	-	94.76	32.33	18.22	35.44	153	20	Р	Н
	*	2462	106.56	-	-	91.45	32.33	18.22	35.44	153	20	Α	Н
000 445		2488.436	57.02	-16.98	74	41.64	32.6	18.23	35.45	153	20	Р	Н
802.11b Ch11		2488.73	49.14	-4.86	54	33.76	32.6	18.23	35.45	153	20	Α	Н
2462MHz		2317.65	54.19	-19.81	74	40.01	31.77	17.8	35.39	386	2	Р	V
2402111112		2390	43.15	-10.85	54	28.56	31.9	18.11	35.42	386	2	Α	V
	*	2462	107.21	-	-	92.1	32.33	18.22	35.44	386	2	Р	V
•	*	2462	103.89		-	88.78	32.33	18.22	35.44	386	2	Α	V
		2487.554	55.01	-18.99	74	39.63	32.6	18.23	35.45	386	2	Р	V
		2487.652	46.22	-7.78	54	30.84	32.6	18.23	35.45	386	2	Α	V
Remark		o other spuriou		Peak and	d Average lin	nit line.							

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Report No.: FR130215F



BLE 2Mbps_Tx_Ch39 + WIFI 802.11b_Tx_Ch11_Ant 2 (Harmonic @ 3m)

Report No.: FR130215F

	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
BLE+WIFI Simultaneously		(MHz)	(dBµV/m)	Limit (dB)	Line (dBµV/m)	Level (dBµV)	Factor (dB/m)	Loss (dB)	Factor (dB)	Pos (cm)	Pos (deg)	_	
		4924	43.48	-30.52	74	55.49	34.17	12.46	58.64	100	0	Р	Н
		4960	52.67	-21.33	74	64.52	34.2	12.5	58.55	285	283	Р	Н
		4960	48.99	-5.01	54	60.84	34.2	12.5	58.55	285	283	Α	Н
		7386	40.23	-33.77	74	47.37	35.6	14.8	57.54	100	0	Р	Н
		7440	40.29	-33.71	74	47.38	35.6	14.9	57.59	100	0	Р	Н
On Innetten													Н
Co-location		4924	42.56	-31.44	74	54.57	34.17	12.46	58.64	100	0	Р	V
		4960	48.91	-25.09	74	60.76	34.2	12.5	58.55	100	0	Р	V
		7386	40.5	-33.5	74	47.64	35.6	14.8	57.54	100	0	Р	٧
		7440	40.43	-33.57	74	47.52	35.6	14.9	57.59	100	0	Р	V
													V
													٧
Remark		lo other spuriou		Peak an	d Average li	mit line.							

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Emission below 1GHz

BLE 2Mbps_Tx_Ch39 + WIFI 802.11b_Tx_Ch11_Ant 2 (LF @ 3m)

Report No.: FR130215F

	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp		Table	ļ	Pol.
BLE+WIFI Simultaneously		(MHz)	(dBµV/m)	Limit (dB)	Line (dBµV/m)	Level (dBµV)	Factor (dB/m)	Loss (dB)	Factor (dB)	Pos	Pos (deg)	_	(H/V)
		163.11	34.17	-9.33	43.5	45.49	16.28	2.34	29.94	-	-	P	Н
		180.66	36.92	-6.58	43.5	49.45	14.92	2.49	29.94	100	0	Р	Н
		183.63	35.79	-7.71	43.5	48.44	14.79	2.5	29.94	-	-	Р	Н
		461.7	32.96	-13.04	46	35.93	23.27	3.63	29.87	-	-	Р	Н
		893.6	32.73	-13.27	46	28.12	28.6	5.03	29.02	-	-	Р	Н
		953.8	33.24	-12.76	46	26.24	30.42	5.26	28.68	-	-	Р	Н
													Н
													Н
													Н
													Н
													Н
Co-location													Н
LF		30	33	-7	40	37.75	24.32	0.94	30.01	100	0	Р	V
		34.86	29.06	-10.94	40	35.81	22.13	1.13	30.01	-	-	Р	V
		158.52	29.12	-14.38	43.5	40.07	16.7	2.3	29.95	-	-	Р	V
		761.3	29.85	-16.15	46	27.07	27.8	4.51	29.53	-	-	Р	V
		850.2	31.71	-14.29	46	27.34	28.74	4.85	29.22	-	-	Р	V
		955.9	33.91	-12.09	46	26.82	30.5	5.26	28.67	-	-	Р	V
													V
													V
													V
													V
													V
													V
Remark		o other spuriou I results are PA		imit line.									

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Note symbol

Report No. : FR130215F

*	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	Peak or Average
H/V	Horizontal or Vertical

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

Report No.: FR130215F

	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	Р	Н
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	Α	Н

- 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(dB μ V/m) Limit Line(dB μ V/m)

For Peak Limit @ 2390MHz:

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

For Average Limit @ 2390MHz:

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

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

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Appendix B. Radiated Spurious Emission Plots

Toot Engineer	Jacob Wang and Stan Haigh	Temperature :	22.7~24.6°C
Test Engineer :	Jesse Wang and Stan Hsieh	Relative Humidity :	51.6~57.5%

Report No.: FR130215F

Note symbol

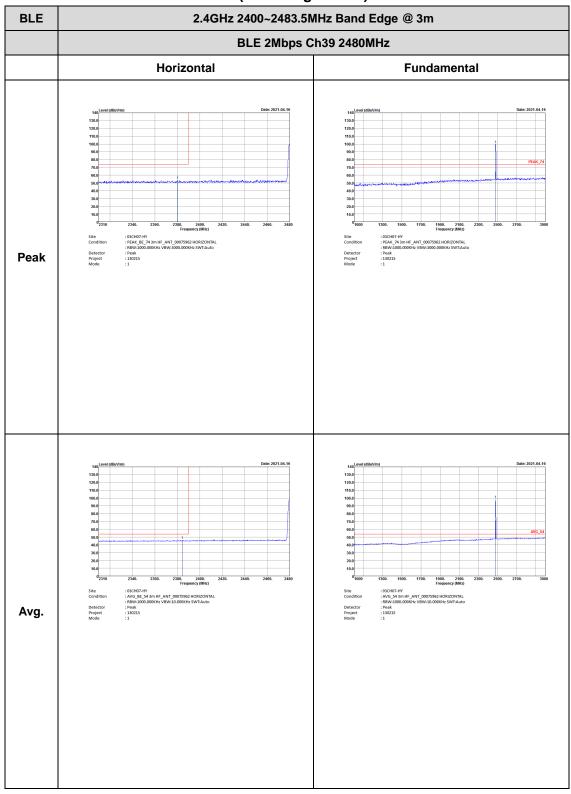
-L	Low channel location
-R	High channel location

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2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz BLE (Band Edge @ 3m)

Report No.: FR130215F



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BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m BLE 2Mbps Ch39 2480MHz Horizontal **Fundamental** Peak Left blank Avg. Left blank

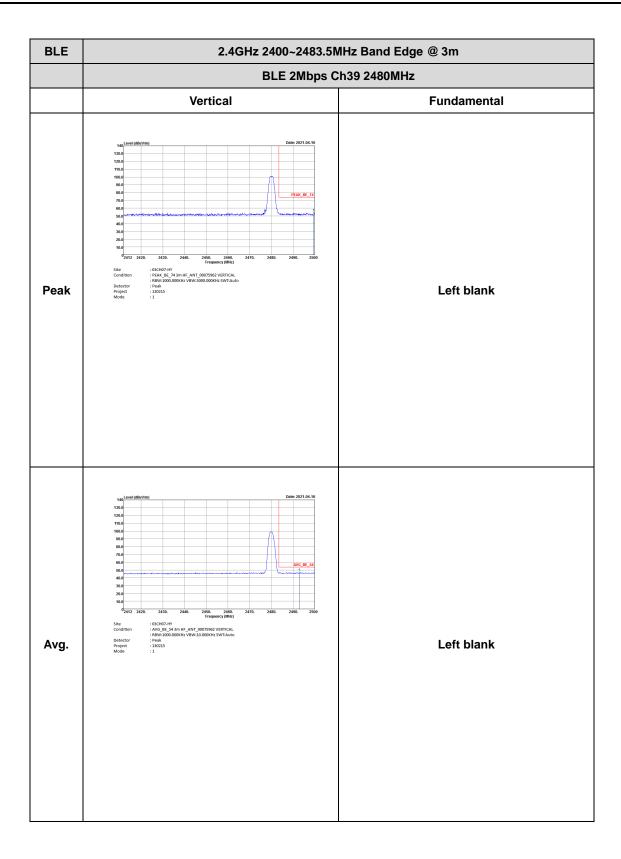
Report No.: FR130215F

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BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m BLE 2Mbps Ch39 2480MHz Vertical **Fundamental** Peak Avg.

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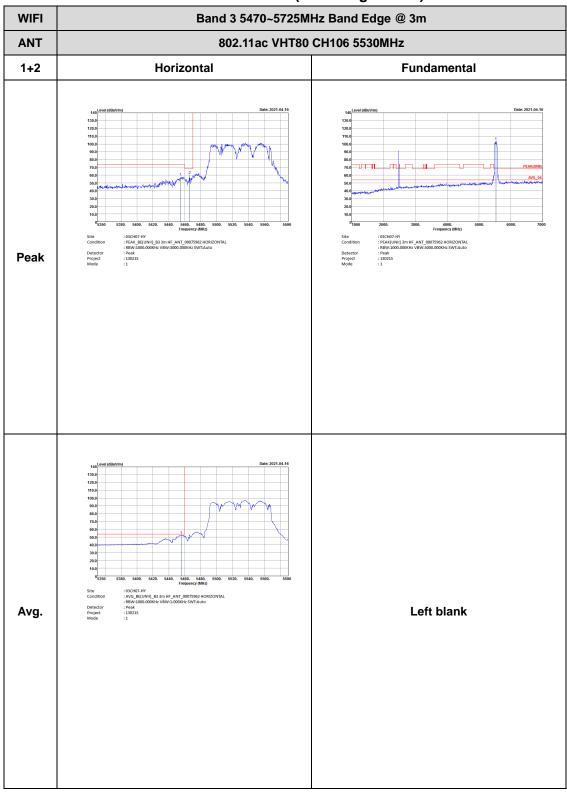
Report No.: FR130215F

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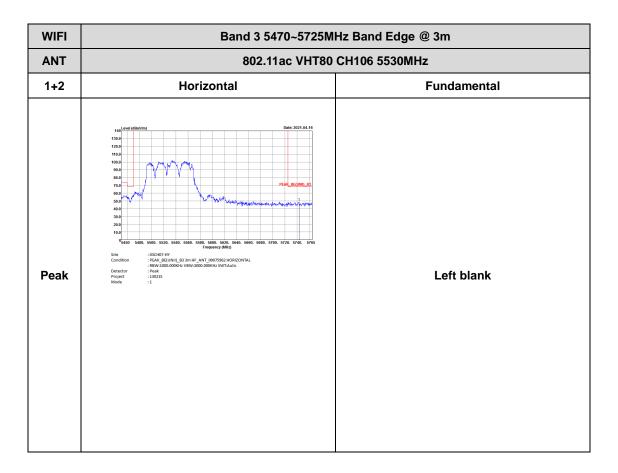


Band 3 - 5470~5725MHz WIFI 802.11ac VHT80 (Band Edge @ 3m)

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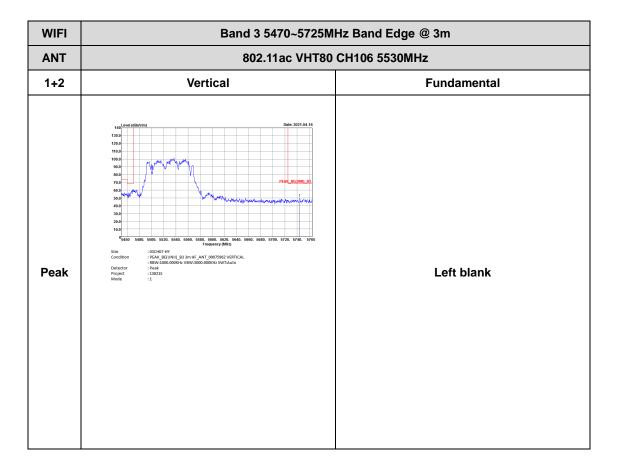
Report No.: FR130215F

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WIFI Band 3 5470~5725MHz Band Edge @ 3m ANT 802.11ac VHT80 CH106 5530MHz 1+2 Vertical **Fundamental** Peak Left blank Avg.

Report No.: FR130215F

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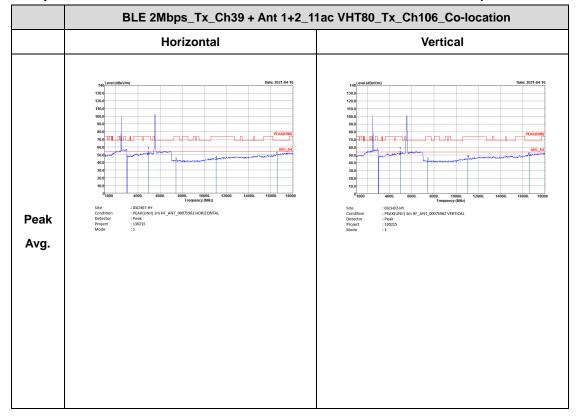


Report No.: FR130215F

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BLE 2Mbps_Tx_Ch39 + WIFI 802.11ac VHT80_Tx_Ch106_MIMO Ant 1+2 (Harmonic @ 3m)

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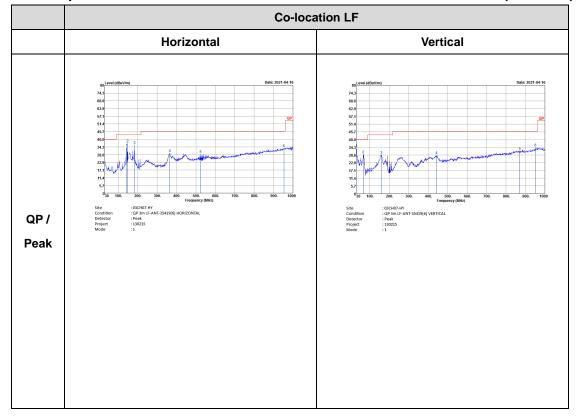
TEL: 886-3-327-3456 Page Number: B10 of B21



Emission below 1GHz

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BLE 2Mbps_Tx_Ch39 + WIFI 802.11ac VHT80_Tx_Ch106_MIMO Ant 1+2 (LF @ 3m)

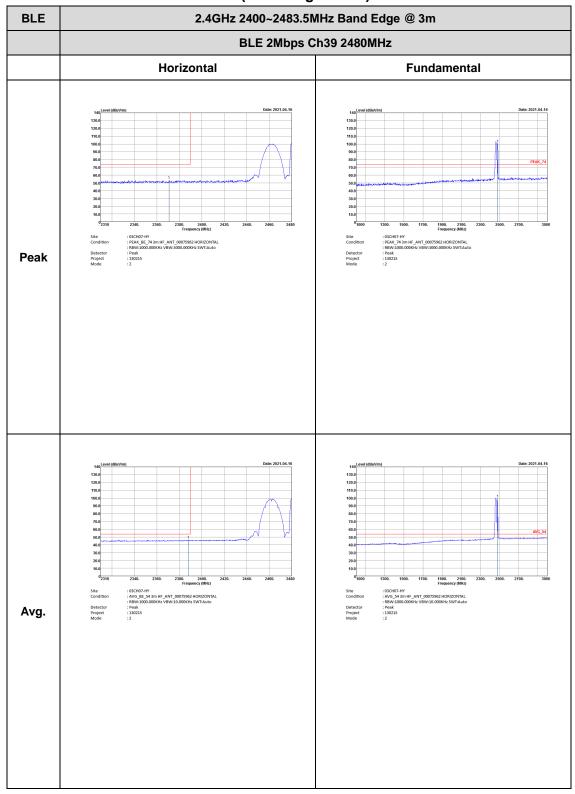


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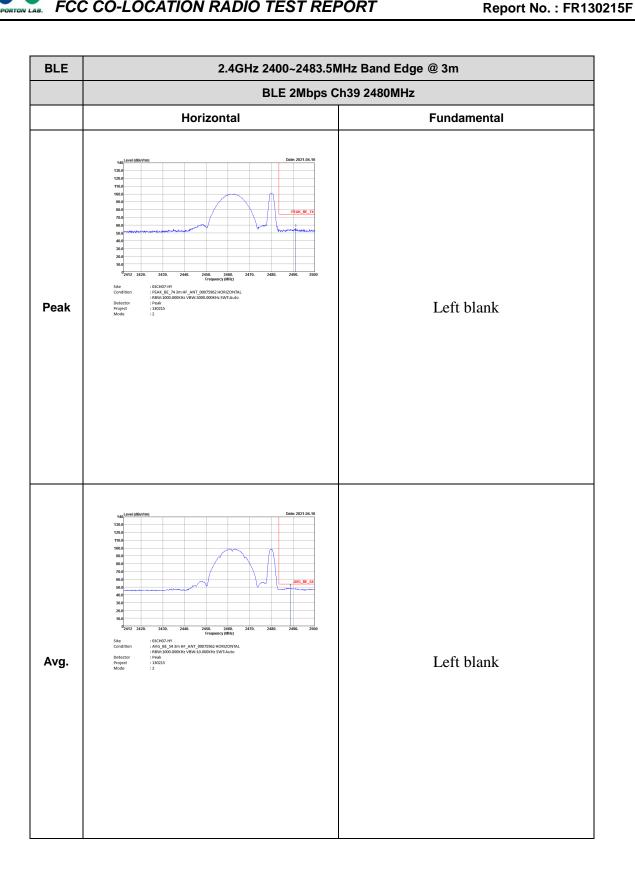


2.4GHz 2400~2483.5MHz BLE (Band Edge @ 3m)

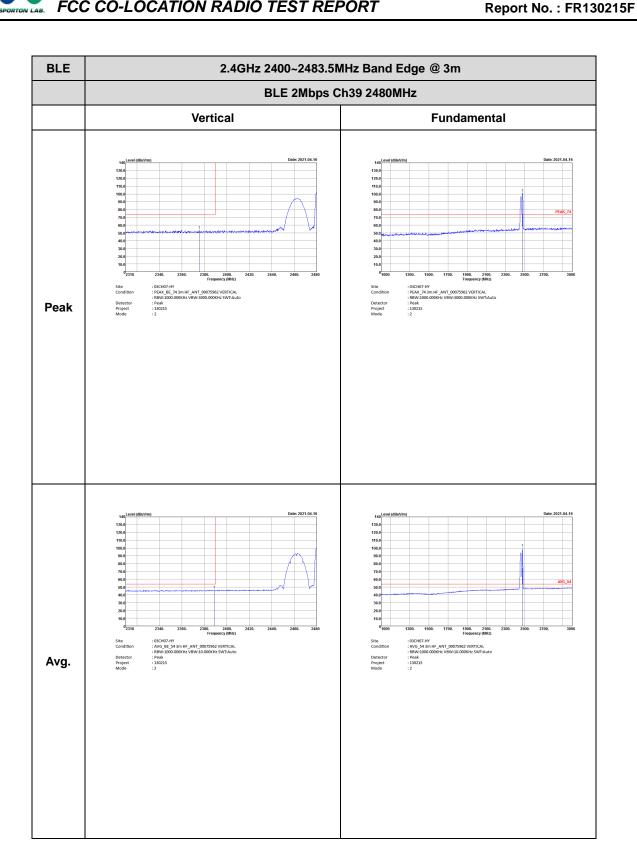
Report No.: FR130215F



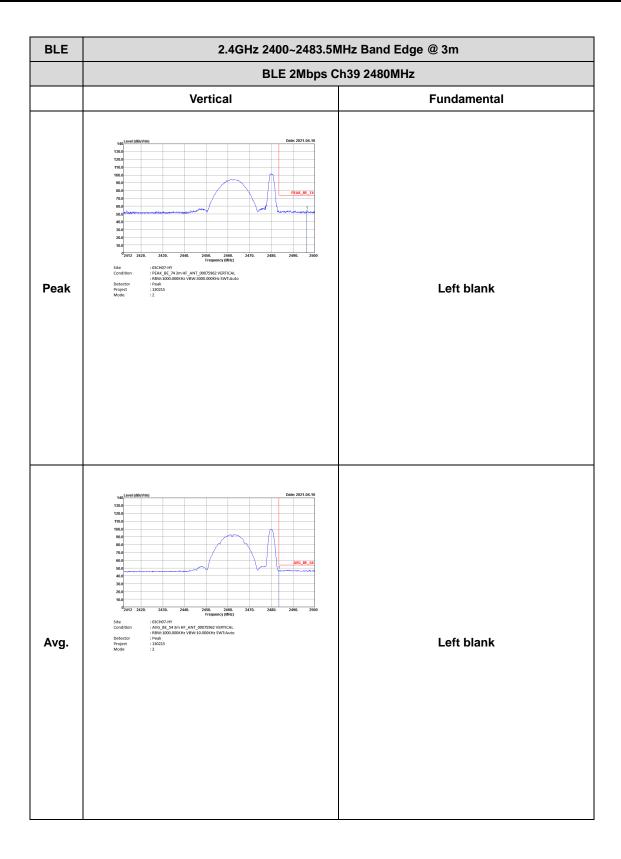
TEL: 886-3-327-3456 Page Number: B12 of B21



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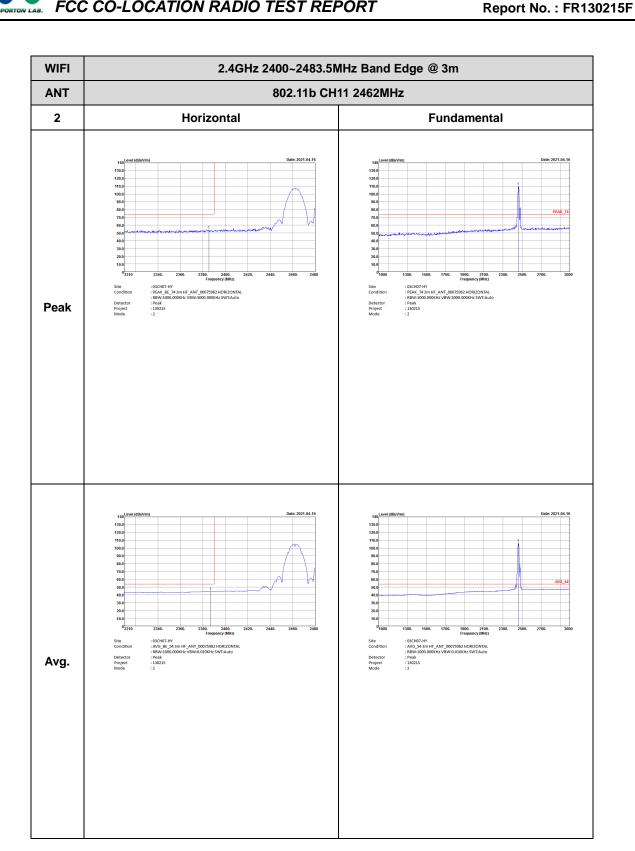


TEL: 886-3-327-3456 Page Number : B14 of B21



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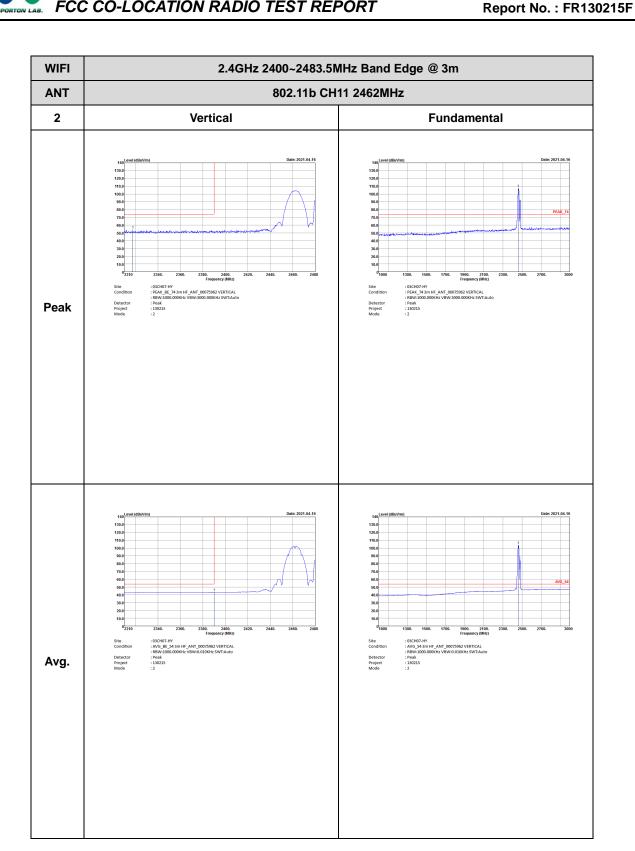


TEL: 886-3-327-3456 Page Number : B16 of B21

WIFI 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT 802.11b CH11 2462MHz 2 Horizontal **Fundamental** Peak Left blank Left blank Avg.

Report No.: FR130215F

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WIFI 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT 802.11b CH11 2462MHz 2 Vertical **Fundamental** Peak Left blank Avg. Left blank

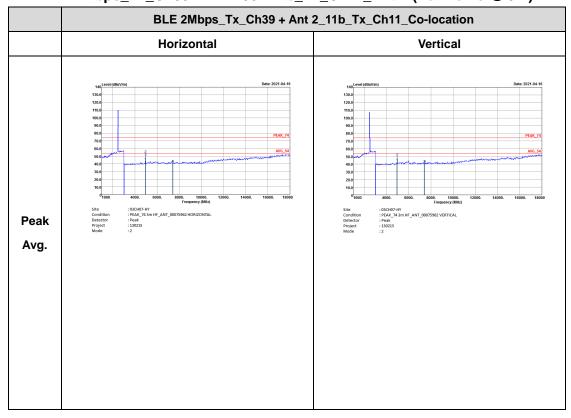
Report No.: FR130215F

TEL: 886-3-327-3456 Page Number: B19 of B21



BLE 2Mbps_Tx_Ch39 + WIFI 802.11b_Tx_Ch11_Ant 2 (Harmonic @ 3m)

Report No.: FR130215F

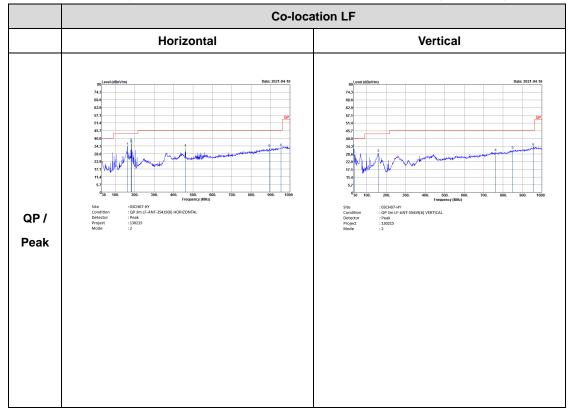


TEL: 886-3-327-3456 Page Number: B20 of B21



Emission below 1GHz
BLE 2Mbps_Tx_Ch39 + WIFI 802.11b_Tx_Ch11_Ant 2 (LF @ 3m)

Report No.: FR130215F



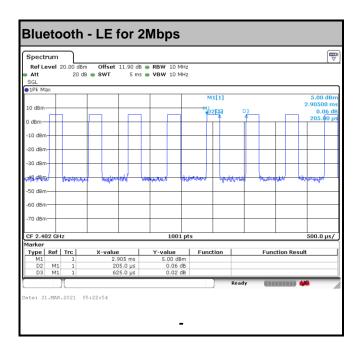
TEL: 886-3-327-3456 Page Number : B21 of B21



Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
-	Bluetooth - LE for 2Mbps	32.8	205	4.88	10kHz	4.84
2	802.11b	99.15	-	-	10Hz	0.04
1+2	5GHz 802.11ac VHT80 for Ant 1	94.07	1110	0.90	1kHz	0.27
1+2	5GHz 802.11ac VHT80 for Ant 2	94.02	1100	0.91	1kHz	0.27

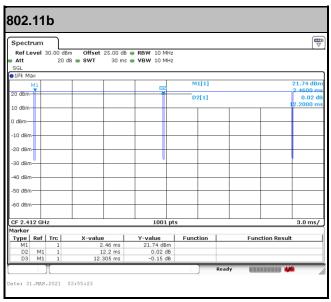
Report No.: FR130215F



TEL: 886-3-327-3456 Page Number : C1 of C2

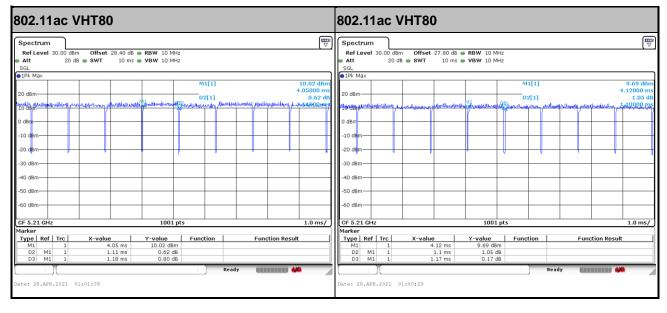
Report No.: FR130215F

<Ant. 2>



MIMO <Ant. 1>

MIMO <Ant. 2>



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