

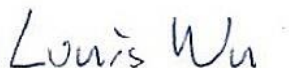


FCC CO-LOCATION RADIO TEST REPORT

FCC ID : UZ7ET45CA
Equipment : Tablet
Brand Name : Zebra
Model Name : ET45CA
Applicant : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Manufacturer : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Standard : FCC Part 15 Subpart E §15.407

The product was received on Jun. 16, 2022 and testing was performed from Jun. 23, 2022 to Jun. 30, 2022. 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 from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.



Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory

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



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History of this test report

Report No.	Version	Description	Issued Date
FR1N2541G	01	Initial issue of report	Aug. 16, 2022

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 2.47 dB at 5351.200 MHz
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

Declaration of Conformity:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Uncertainty of Evaluation".

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Keven Cheng

Report Producer: Lucy Wu



1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Tablet
Brand Name	Zebra
Model Name	ET45CA
FCC ID	UZ7ET45CA
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/5G NR/NFC/GNSS WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 WLAN 11ax HE20/HE40/HE80 Bluetooth BR/EDR/LE Note: 2.4G doesn't support BW 40/80.
HW Version	EV2-2
SW Version	ET45-userdebug 11 11-10-12.00-RG-U00-PRD-GSE MXJ release-keys
MFD	10MAY22
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer.

Specification of Accessories				
Battery	Brand Name	Zebra	Model Name	BT-000455

Supported Unit Used in Test Configuration and System				
AC Adapter	Brand Name	Zebra	Part Number	PWR-WUA5V12W0US
Earphone 1	Brand Name	Zebra	Part Number	HDST-35MM-PTVP-01
Earphone 2	Brand Name	Zebra	Part Number	HDST-USBC-PTT1-01
USB Cable (Type C to Type A)	Brand Name	Zebra	Part Number	CBL-TC5X-USBC2A-01
Type C-Audio Cable (Type C to 3.5mm)	Brand Name	Zebra	Part Number	ADP-USBC-35MM1-01

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard			
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz 5260 MHz ~ 5320 MHz		
Antenna Type / Gain	Bluetooth-LE: IFA Antenna type with gain 1.39 dBi WLAN <5260 MHz ~ 5320 MHz> Ant. 6 : IFA Antenna with gain 1.68 dBi Ant. 7 : IFA Antenna with gain 1.35 dBi		
Type of Modulation	Bluetooth LE : GFSK 802.11ax : OFDMA (BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM)		
Antenna Function Description		Ant. 6	Ant. 7
	Bluetooth-LE	V	-
	802.11 ax MIMO	V	V

Remark:

1. MIMO Ant. 6+7 is a calculated result from sum of the power MIMO Ant. 6 and MIMO Ant. 7.
2. The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.3 Modification of EUT

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

1.4 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.
	03CH16-HY

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

FCC designation No.: TW3786



1.5 Applicable Standards

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

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

Remark:

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

2 Test Configuration of Equipment Under Test

- 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, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find X plane as worst plane.

2.1 Carrier Frequency and Channel

<Ant. 6>

2400-2483.5 MHz	
Bluetooth - LE for 2Mbps	
Channel	Freq. (MHz)
39	2480

MIMO <Ant. 6+7>

5250-5350 MHz	
802.11ax HE20	
Channel	Freq. (MHz)
64	5320

2.2 Test Mode

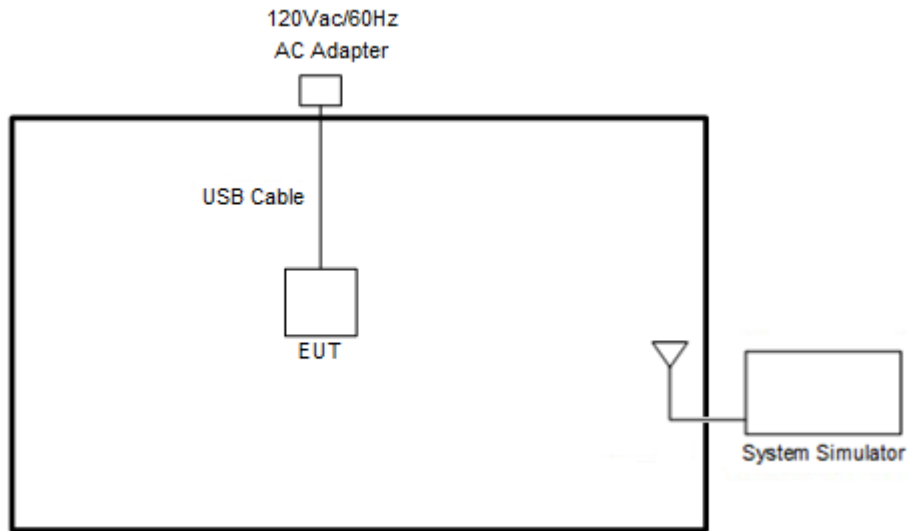
Final test modes are considering the modulation and worse data rates as below table.

<Co-Location>

Test Mode	Modulation	Data Rate
Mode 1	Bluetooth - LE for Ant. 6 + WLAN 5GHz 802.11ax for MIMO <Ant. 6+7> + LTE Band 7	2 Mbps + MCS0 + QPSK

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

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

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

2.5 EUT Operation Test Setup

The RF test items, utility “CMD V 10.1.18362.1256” 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.

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

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

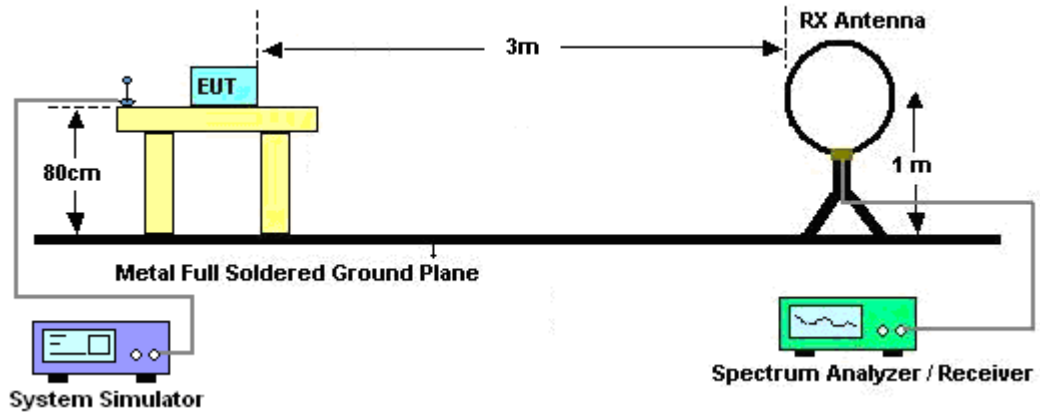
See list of measuring equipment of this test report.

3.1.3 Test Procedures

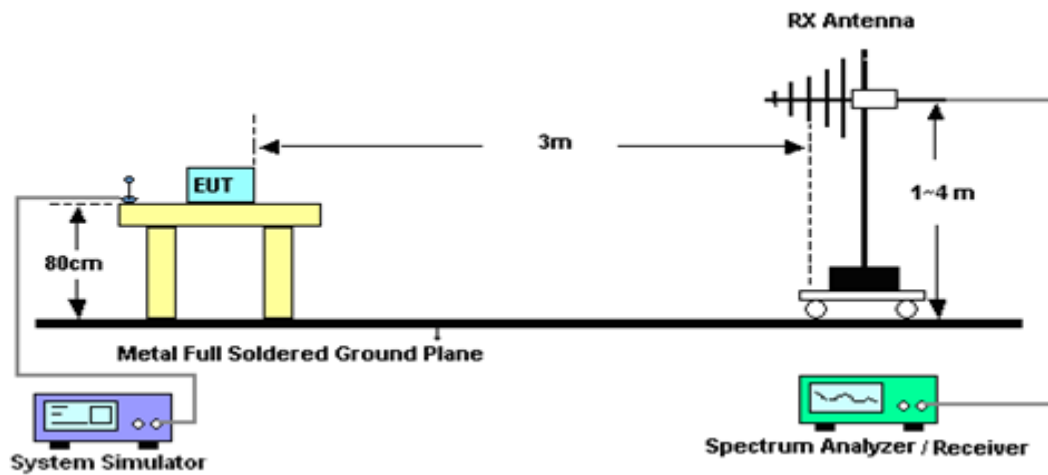
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section G) Unwanted emissions measurement.
(1) Procedure for Unwanted Emissions Measurements Below 1000 MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold(2) Procedure for Peak Unwanted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

3.1.4 Test Setup

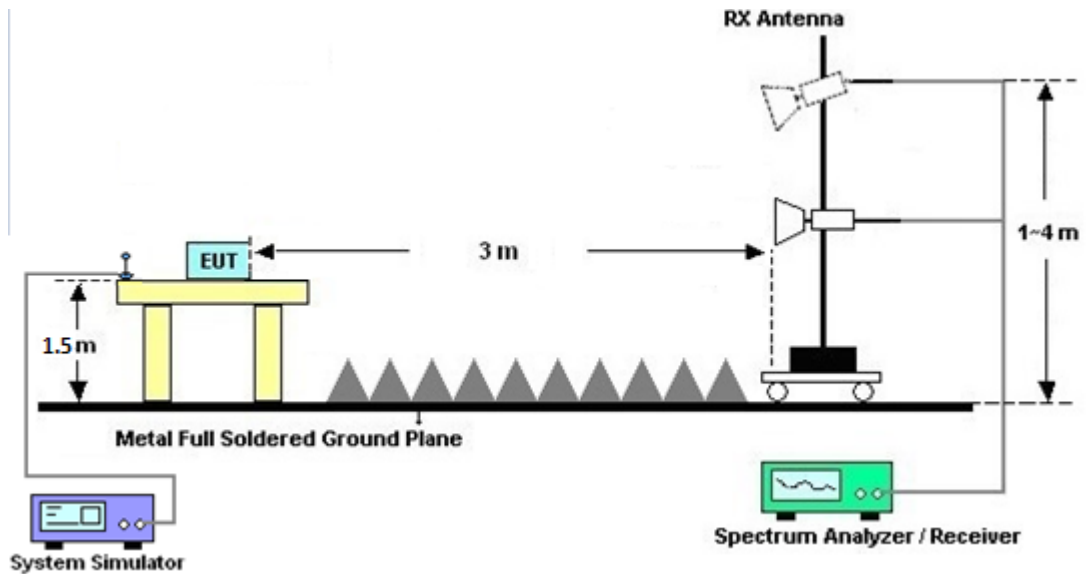
For radiated emissions below 30MHz



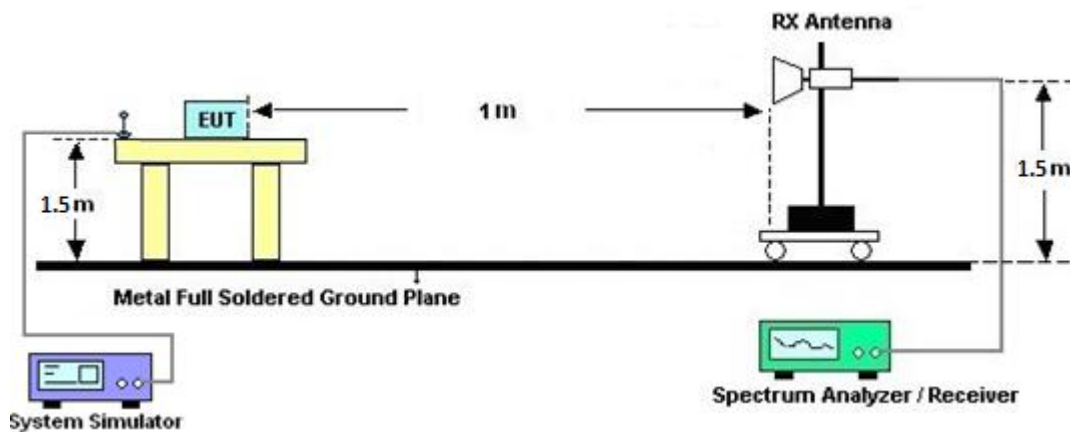
For radiated emissions from 30MHz to 1GHz



For radiated 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 directional gain of transmitting antennas is greater than 6dBi, the power and the peak power spectral density shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

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	May 13, 2022	Jun. 23, 2022~ Jun. 30, 2022	May 12, 2023	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz to 1GHz	Oct. 09, 2021	Jun. 23, 2022~ Jun. 30, 2022	Oct. 08, 2022	Radiation (03CH16-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1G~18GHz	Mar. 10, 2022	Jun. 23, 2022~ Jun. 30, 2022	Mar. 09, 2023	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	00993	18GHz ~40GHz	Nov. 30, 2021	Jun. 23, 2022~ Jun. 30, 2022	Nov. 29, 2022	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1G	Jul. 05, 2021	Jun. 23, 2022~ Jun. 30, 2022	Jul. 04, 2022	Radiation (03CH16-HY)
Preamplifier	EMEC	EM18G40G	060812	18GHz~40GHz	Dec. 27, 2021	Jun. 23, 2022~ Jun. 30, 2022	Dec. 26, 2022	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 09, 2021	Jun. 23, 2022~ Jun. 30, 2022	Dec. 08, 2022	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY57290111	3Hz~26.5GHz	Dec. 15, 2021	Jun. 23, 2022~ Jun. 30, 2022	Dec. 14, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11680/4PE	NA	Aug. 28, 2021	Jun. 23, 2022~ Jun. 30, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11688/4PE	NA	Aug. 28, 2021	Jun. 23, 2022~ Jun. 30, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-57 57	NA	Aug. 28, 2021	Jun. 23, 2022~ Jun. 30, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Jun. 23, 2022~ Jun. 30, 2022	N/A	Radiation (03CH16-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Jun. 23, 2022~ Jun. 30, 2022	N/A	Radiation (03CH16-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jun. 23, 2022~ Jun. 30, 2022	N/A	Radiation (03CH16-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jun. 23, 2022~ Jun. 30, 2022	N/A	Radiation (03CH16-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.8 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2 dB
--	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.8 dB
--	--------



Appendix A. Radiated Spurious Emission

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

BLE (2M)_Tx_CH39 + WLAN (5GHz) 802.11ax HE20_Tx_CH64 + LTE Band 7 CH21100 Link

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	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)
BLE CH 39 2480MHz	*	2480	97.18	-	-	81.03	27.82	18.38	30.05	133	138	P	H
	*	2480	95.69	-	-	79.54	27.82	18.38	30.05	133	138	A	H
		2488.56	56.68	-17.32	74	40.47	27.85	18.4	30.04	133	138	P	H
		2497.12	49.16	-4.84	54	32.9	27.89	18.41	30.04	133	138	A	H
													H
													H
	*	2480	96.35	-	-	80.2	27.82	18.38	30.05	400	191	P	V
	*	2480	94.91	-	-	78.76	27.82	18.38	30.05	400	191	A	V
		2486.28	57.53	-16.47	74	41.32	27.85	18.4	30.04	400	191	P	V
		2499.32	49.37	-4.63	54	33.09	27.9	18.42	30.04	400	191	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 2 - 5250~5350MHz

WIFI 802.11ax HE20 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
6+7		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ax HE20 CH 64 5320MHz	*	5320	113.31	-	-	97.44	32.86	12.52	29.51	100	2	P	H
	*	5320	104.66	-	-	88.79	32.86	12.52	29.51	100	2	A	H
		5351.36	61.93	-12.07	74	46.03	32.8	12.62	29.52	100	2	P	H
		5351.2	51.53	-2.47	54	35.63	32.8	12.62	29.52	100	2	A	H
													H
													H
	*	5320	111.58	-	-	95.71	32.86	12.52	29.51	400	166	P	V
	*	5320	102.15	-	-	86.28	32.86	12.52	29.51	400	166	A	V
		5353.92	58.85	-15.15	74	42.93	32.81	12.63	29.52	400	166	P	V
		5350.08	48.85	-5.15	54	32.95	32.8	12.62	29.52	400	166	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

BLE (2M)_Tx_CH39 + WLAN (5GHz) 802.11ax HE20_Tx_CH64 + LTE Band 7 CH21100 Link

(Harmonic @ 3m)

BLE+WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz + 802.11ax HE20 CH 64 5320MHz + LTE Band 7 Link		4960	56.02	-17.98	74	40.03	33.12	12.28	29.41	-	-	P	H
		4960	44.05	-9.95	54	28.06	33.12	12.28	29.41	-	-	A	H
		7440	44.54	-29.46	74	57.42	36.46	16.45	65.79	-	-	P	H
		10641	47.96	-26.04	74	56.38	39.2	18.95	66.57	-	-	P	H
		15965	46.75	-27.25	74	53.33	37.13	22.96	66.67	-	-	P	H
													H
													H
													H
													H
													H
													H
		4960	55.23	-18.77	74	39.24	33.12	12.28	29.41	-	-	P	V
		4960	44.54	-9.46	54	28.55	33.12	12.28	29.41	-	-	A	V
		7440	44.52	-29.48	74	57.4	36.46	16.45	65.79	-	-	P	V
		10641	47.9	-26.1	74	56.32	39.2	18.95	66.57	-	-	P	V
		15965	47.07	-26.93	74	53.65	37.13	22.96	66.67	-	-	P	V
													V
													V
													V
													V
												V	
												V	
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												
	3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

BLE (2M)_Tx_CH39 + WLAN (5GHz) 802.11ax HE20_Tx_CH64 + LTE Band 7 CH21100 Link

Emission below 1GHz (LF@ 3m)

BLE+WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz + 802.11ax HE20 CH 64 5320MHz + LTE Band 7 Link		38.73	25.62	-14.38	40	36.73	20.15	1.04	32.3	-	-	P	H
		66.86	27.57	-12.43	40	46.26	12.14	1.45	32.28	-	-	P	H
		134.76	28.32	-15.18	43.5	40.94	17.61	2.04	32.27	-	-	P	H
		423.82	24.31	-21.69	46	30.17	22.96	3.59	32.41	-	-	P	H
		704.15	31.31	-14.69	46	32.59	26.54	4.57	32.39	-	-	P	H
		948.59	35.15	-10.85	46	30.45	30.51	5.4	31.21	-	-	P	H
													H
													H
													H
													H
													H
													H
		37.76	33.95	-6.05	40	44.45	20.79	1.01	32.3	-	-	P	V
		66.86	30.57	-9.43	40	49.26	12.14	1.45	32.28	-	-	P	V
		124.09	28.15	-15.35	43.5	40.93	17.53	1.96	32.27	-	-	P	V
		428.67	23.96	-22.04	46	29.76	22.99	3.62	32.41	-	-	P	V
		620.73	28.32	-17.68	46	30.55	25.98	4.34	32.55	-	-	P	V
		943.74	34.45	-11.55	46	29.97	30.34	5.38	31.24	-	-	P	V
													V
													V
													V
													V
													V
													V
												V	
Remark	1. No other spurious found.												
	2. All results are PASS against limit line.												
	3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.												



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	Peak or Average
H/V	Horizontal or Vertical



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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Chain	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)
802.11ax		5330	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 64													
5320MHz		5330	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 @ 5330MHz:

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 @ 5330MHz:

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 :	Andy Yang, Karl Hou and Steven Wu	Temperature :	20~25°C
		Relative Humidity :	50~60%

Note symbol

-L	Low channel location
-R	High channel location



BLE (2M)_Tx_CH39 + WLAN (5GHz) 802.11ax HE20_Tx_CH64 + LTE Band 7 CH21100 Link

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

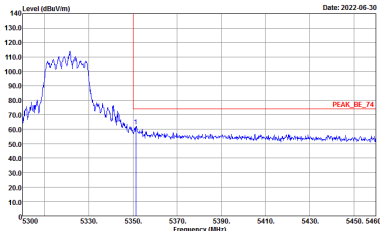
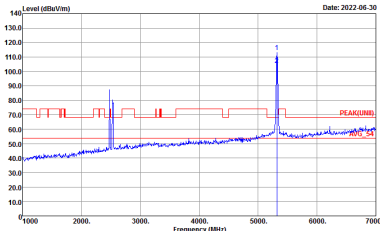
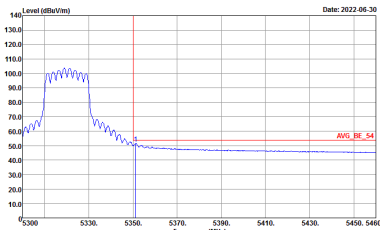
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE_CH39 2480MHz	
	Horizontal	Fundamental
Peak	Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_220310 HORIZONTAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522_220310 HORIZONTAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_220310 HORIZONTAL RBW:1000.000kHz VBW:10.000kHz SWT:Auto	Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_220310 HORIZONTAL RBW:1000.000kHz VBW:10.000kHz SWT:Auto



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE_CH39 2480MHz	
	Vertical	Fundamental
Peak	Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_220310 VERTICAL : RBW:1000.000KHz VBW:10.000KHz SWT:Auto	Site : 03CH16-HY Condition : AVG_54 3m 91200_1522_220310 VERTICAL : RBW:1000.000KHz VBW:10.000KHz SWT:Auto



Band 2 - 5250~5350MHz
WIFI 802.11ax HE20 (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE20 CH62 5320MHz - L	
6+7	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_220310 HORIZONTAL : RBW:3000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK(LINE) 3m 91200_1522_220310 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_220310 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	Left blank

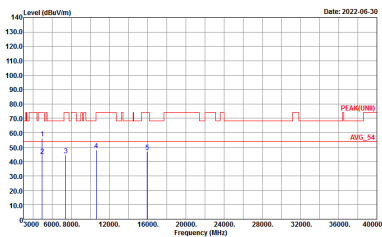
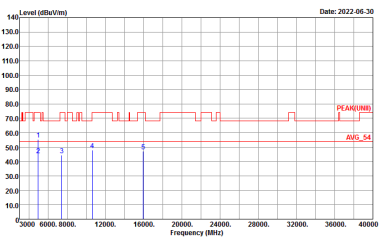


WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE20 CH62 5320MHz	
6+7	Vertical	Fundamental
Peak	Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522_220310 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Site : 03CH16-HY Condition : PEAK(FUND) 3m 91200_1522_220310 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522_220310 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank



BLE (2M)_Tx_CH39 + WLAN (5GHz) 802.11ax HE20_Tx_CH64 + LTE Band 7 CH21100 Link

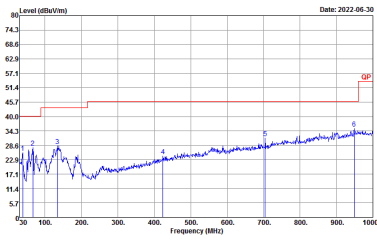
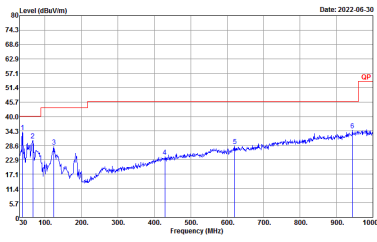
(Harmonic @ 3m)

BLE+WIFI	2.4GHz 2400~2483.5MHz + Band 2 5250~5350MHz Harmonic @ 3m	
ANT	BLE_CH39 + 802.11ax HE20_CH64 + LTE Band 7	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 91200_1522_220310 HORIZONTAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 91200_1522_220310 VERTICAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto



BLE (2M)_Tx_CH39 + WLAN (5GHz) 802.11ax HE20_Tx_CH64 + LTE Band 7 CH21100 Link

Emission below 1GHz (LF@ 3m)

BLE+WIFI	2.4GHz 2400~2483.5MHz + Band 2 5250~5350MHz	
ANT	BLE_CH39 + 802.11ax HE20_CH64 + LTE Band 7	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03C716-14V Condition : QP 3m BIL06_47020_211009 HORIZONTAL	 Site : 03C716-14V Condition : QP 3m BIL06_47020_211009 VERTICAL



Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
6	Bluetooth - LE for 2Mbps	31.09	194	5.15	10kHz
6+7	5GHz 802.11ax HE20 Full RU	97.50	3900	0.26	300Hz

<Ant. 6>

MIMO <Ant. 6+7>

