



# FCC RADIO TEST REPORT

**FCC ID** : SH6MDBT50Q  
**Equipment** : MDBT50Q  
**Brand Name** : Raytac  
**Model Name** : MDBT50Q  
**Applicant** : Proxy, Inc.  
500 3rd St, San Francisco, CA 94107  
**Manufacturer** : Unigen Corporation  
39730 Eureka Dr, Newark, CA 94560  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Mar. 30, 2020 and testing was started from Apr. 09, 2020 and completed on Apr. 16, 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 partial 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.)



## Table of Contents

<b>History of this test report.....</b>	<b>3</b>
<b>Summary of Test Result.....</b>	<b>4</b>
<b>1 General Description.....</b>	<b>5</b>
1.1 Product Feature of Equipment Under Test.....	5
1.2 Modification of EUT .....	5
1.3 Testing Location .....	6
1.4 Applicable Standards.....	6
<b>2 Test Configuration of Equipment Under Test .....</b>	<b>7</b>
2.1 Carrier Frequency Channel .....	7
2.2 Test Mode.....	8
2.3 Connection Diagram of Test System.....	9
2.4 Support Unit used in test configuration and system .....	9
2.5 EUT Operation Test Setup .....	9
<b>3 Test Result.....</b>	<b>10</b>
3.1 Output Power Measurement.....	10
3.2 Radiated Band Edges and Spurious Emission Measurement .....	11
3.3 Antenna Requirements .....	15
<b>4 List of Measuring Equipment .....</b>	<b>16</b>
<b>5 Uncertainty of Evaluation.....</b>	<b>18</b>
<b>Appendix A. Conducted Test Results</b>	
<b>Appendix B. Radiated Spurious Emission</b>	
<b>Appendix C. Radiated Spurious Emission Plots</b>	
<b>Appendix D. Duty Cycle Plots</b>	
<b>Appendix E. Setup Photographs</b>	



## History of this test report

Report No.	Version	Description	Issued Date
FR991726-01	01	Initial issue of report	Apr. 29, 2020

## Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(2)	6dB Bandwidth	-	See Note
-	2.1049	99% Occupied Bandwidth	-	See Note
3.1	15.247(b)(3)	Output Power	Pass	-
-	15.247(e)	Power Spectral Density	-	See Note
-	15.247(d)	Conducted Band Edges and Spurious Emission	-	See Note
3.2	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	Under limit 1.68 dB at 2483.520 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

**Note:**

1. Not required means after assessing, test items are not necessary to carry out.
2. The module (Model: MDBT50Q) makes no difference after verifying output power, this report reuses test data from the module report.

**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 - LE

Product Specification subjective to this standard	
Sample 1	Host with Antenna 1
Sample 2	Host with Antenna 2
Installed into Host	Brand Name: Proxy Model Name: Mobile Reader Nano Inline

**Remark:** All test items were performed with Sample 1.

Antenna Information				
Antenna 1	Model number	146153-0150	Peak gain (dBi)	2.8
			Type	Dipole
Antenna 2	Model number	146153-0300	Peak gain (dBi)	2.2
			Type	Dipole

## 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.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH05-HY	03CH07-HY

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

FCC designation No.: TW1190

### 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 KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ 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. 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

### 2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-



## 2.2 Test Mode

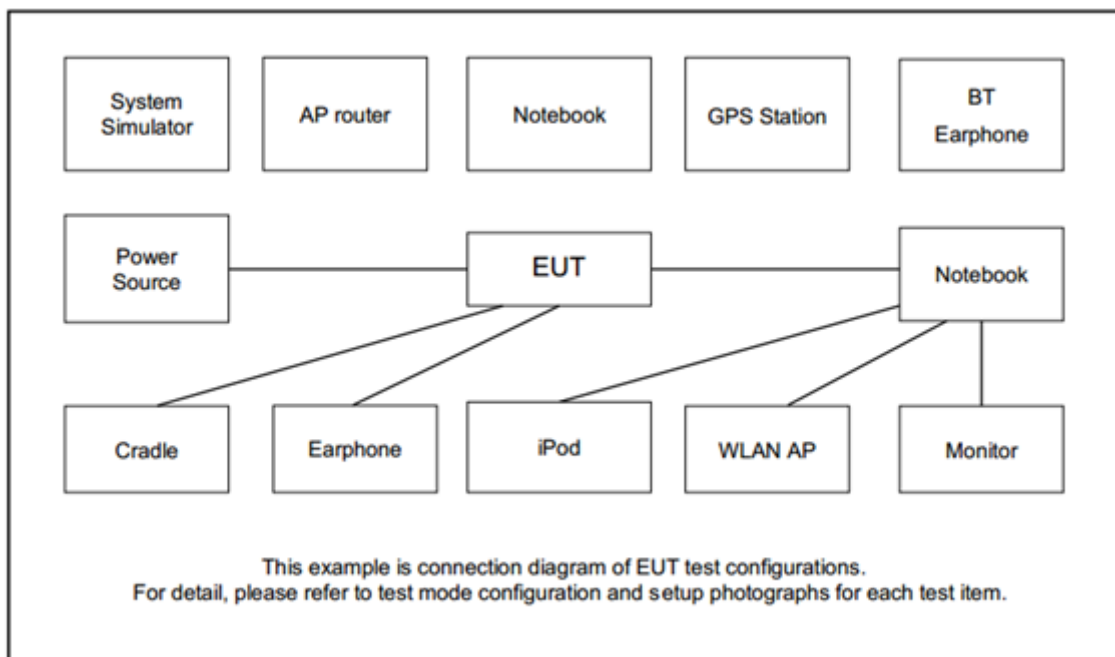
The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth – LE / GFSK
Radiated Test Cases	Mode 1: Bluetooth Tx CH00_2402 MHz_2Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_2Mbps
	Mode 3: Bluetooth Tx CH39_2480 MHz_2Mbps



## 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.	Notebook	DELL	Latitude E3340	FCC DoC/ Contains FCC ID: PD97260NGU	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

## 2.5 EUT Operation Test Setup

The RF test items, utility “nRF\_DTM v0.9.1” 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 Output Power Measurement

##### 3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

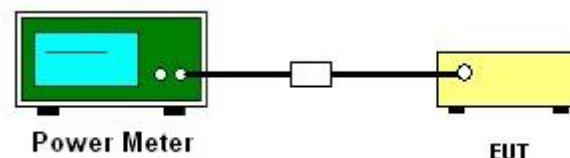
##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

##### 3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT was connected to the power meter by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Measure the conducted output power and record the results in the test report.

##### 3.1.4 Test Setup



##### 3.1.5 Test Result of Average Output Power

Please refer to Appendix A.

## 3.2 Radiated Band Edges and Spurious Emission Measurement

### 3.2.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

### 3.2.2 Measuring Instruments

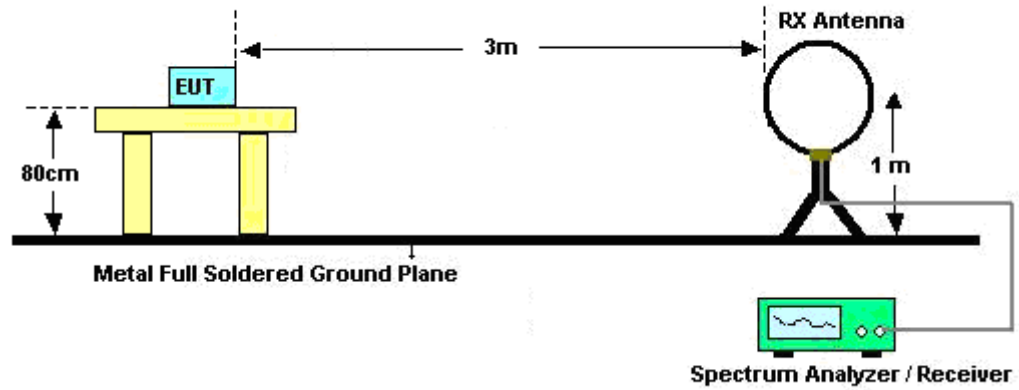
See list of measuring equipment of this test report.

### 3.2.3 Test Procedures

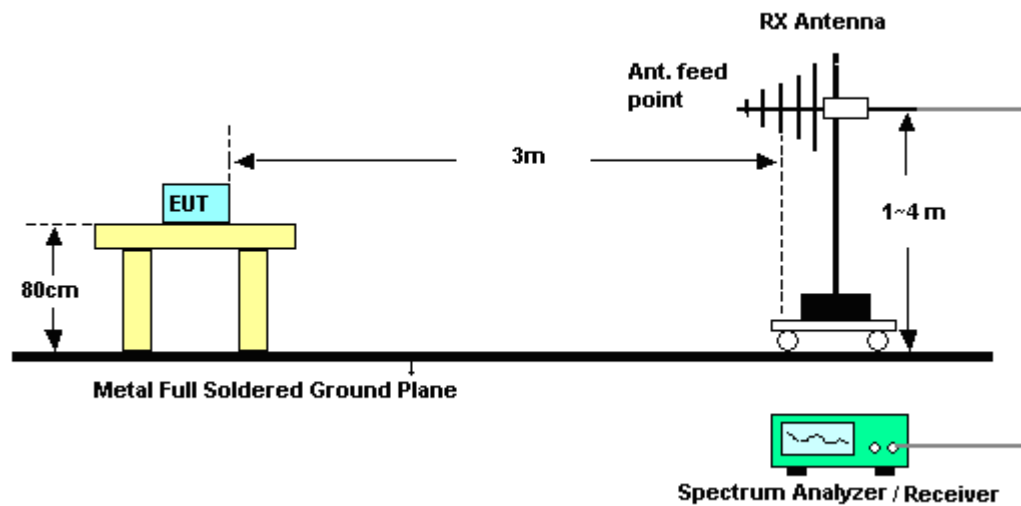
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, 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 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.
8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz;  $VBW \geq RBW$ ; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \geq 1$  GHz for peak measurement.  
For average measurement:
    - $VBW = 10$  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.

### 3.2.4 Test Setup

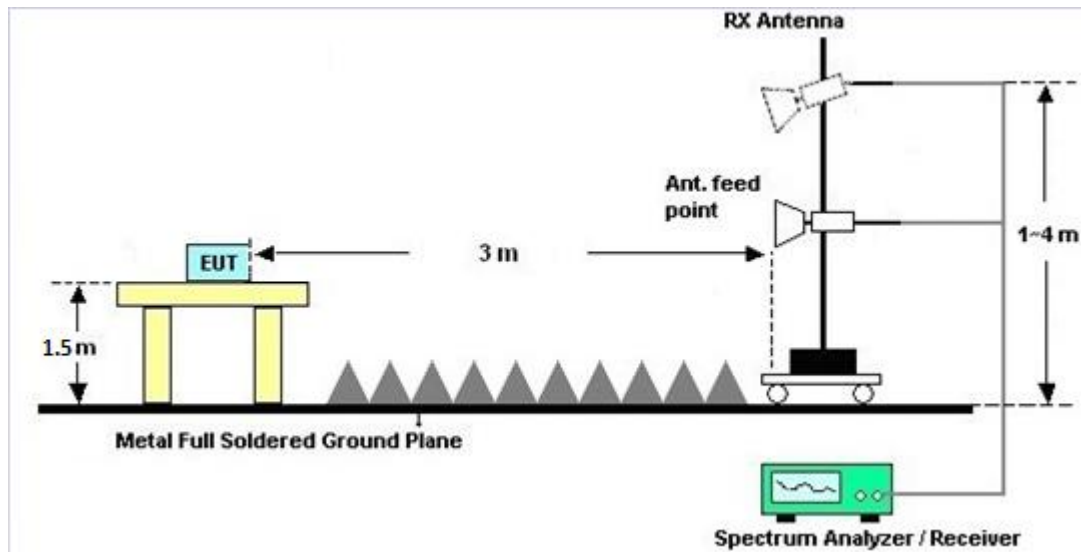
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.2.5 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.

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

Please refer to Appendix B and C.

### 3.2.7 Duty Cycle

Please refer to Appendix D.

### 3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B and C.



### **3.3 Antenna Requirements**

#### **3.3.1 Standard Applicable**

If directional gain of transmitting antennas is greater than 6dBi, the power 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.

#### **3.3.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

#### **3.3.3 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
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01 N-06	35419 & 03	30MHz~1GHz	Apr. 30, 2019	Apr. 16, 2020	Apr. 29, 2020	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 06, 2019	Apr. 16, 2020	Dec. 05, 2020	Radiation (03CH07-HY)
EMI Test Receiver	Agilent	N9038A (MXE)	MY532900 53	20Hz~26.5GHz	Jan. 18, 2020	Apr. 16, 2020	Jan. 17, 2021	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB24 68	Temperature and humidity recorder	Jan. 15, 2020	Apr. 16, 2020	Jan. 14, 2021	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Dec. 26, 2019	Apr. 16, 2020	Dec. 25, 2020	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz~18GHz	Apr. 24, 2019	Apr. 16, 2020	Apr. 23, 2020	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	May 20, 2019	Apr. 16, 2020	May 19, 2020	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A023 62	1GHz~26.5GHz	Nov. 01, 2019	Apr. 16, 2020	Oct. 31, 2020	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/ 4,MY2865 5/4	9kHz~30MHz	Feb. 25, 2020	Apr. 16, 2020	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/ 4,MY2497 1/4,MY156 82/4	30MHz~1GHz	Feb. 25, 2020	Apr. 16, 2020	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/ 4,MY2497 1/4,MY156 82/4	1GHz~18GHz	Feb. 25, 2020	Apr. 16, 2020	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2	18GHz~40GHz	Feb. 25, 2020	Apr. 16, 2020	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126	532078/12 6E	30MHz~18GHz	Sep. 19, 2019	Apr. 16, 2020	Sep. 18, 2020	Radiation (03CH07-HY)
Controller	ChainTek	Chaintek 3000	N/A	Control Turn table	N/A	Apr. 16, 2020	N/A	Radiation (03CH07-HY)
Controller	Max-Full	MF7802	MF780208 368	Control Ant Mast	N/A	Apr. 16, 2020	N/A	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Apr. 16, 2020	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Apr. 16, 2020	N/A	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 251	18GHz~40GHz	Nov. 26, 2019	Apr. 16, 2020	Nov. 25, 2020	Radiation (03CH07-HY)
Spectrum Analyzer	Keysight	N9010A	MY542004 85	10Hz~44GHz	Feb. 11, 2020	Apr. 16, 2020	Feb. 10, 2021	Radiation (03CH07-HY)
Software	Audix	E3 6.2009-8-24	N/A	N/A	N/A	Apr. 16, 2020	N/A	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 13, 2019	Apr. 16, 2020	Dec. 12, 2020	Radiation (03CH07-HY)





Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H2	41410069	N/A	Jun. 17, 2019	Apr. 09, 2020	Jun. 16, 2020	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	13I00030S NO32	9kHz~6GHz	Dec. 17, 2019	Apr. 09, 2020	Dec. 16, 2020	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Jul. 15, 2019	Apr. 09, 2020	Jul. 14, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC120838 2	N/A	Aug. 15, 2019	Apr. 09, 2020	Aug. 14, 2020	Conducted (TH05-HY)

## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.6
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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
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.3
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**Appendix A. Test Result of Conducted Test Items**

Test Engineer:	Jacob Yu	Temperature:	21~25	°C
Test Date:	2020/4/9	Relative Humidity:	51~54	%

**TEST RESULTS DATA**  
**Average Power Table**

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	7.60
BLE	1Mbps	1	19	2440	7.50
BLE	1Mbps	1	39	2480	7.30

**TEST RESULTS DATA**  
**Average Power Table**

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)
BLE	2Mbps	1	0	2402	7.70
BLE	2Mbps	1	19	2440	7.60
BLE	2Mbps	1	39	2480	7.40



## Appendix B. Radiated Spurious Emission

Test Engineer :	Jesse Wang	Temperature :	23.2~24.1°C
		Relative Humidity :	49.5~50.4%

&lt;2Mbps&gt;

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preampl Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
BLE CH 00 2402MHz		2350.53	54.23	-19.77	74	39.64	31.9	17.9	35.21	362	87	P	H
		2325.96	46.29	-7.71	54	31.76	31.87	17.86	35.2	362	87	A	H
	*	2402	102.65	-	-	88.09	31.8	18	35.24	362	87	P	H
	*	2402	101.57	-	-	87.01	31.8	18	35.24	362	87	A	H
													H
		2349.69	53.82	-20.18	74	39.23	31.9	17.9	35.21	357	204	P	V
		2342.13	46.06	-7.94	54	31.48	31.9	17.89	35.21	357	204	A	V
	*	2402	101.46	-	-	86.9	31.8	18	35.24	357	204	P	V
	*	2402	100.33	-	-	85.77	31.8	18	35.24	357	204	A	V
													V
BLE CH 39 2480MHz	*	2480	105.48	-	-	90.58	32.07	18.12	35.29	303	94	P	H
	*	2480	104.35	-	-	89.45	32.07	18.12	35.29	303	94	A	H
		2483.56	58.75	-15.25	74	43.85	32.07	18.12	35.29	303	94	P	H
		2483.52	52.32	-1.68	54	37.42	32.07	18.12	35.29	303	94	A	H
													H
	*	2480	103.82	-	-	88.92	32.07	18.12	35.29	382	200	P	V
	*	2480	102.68	-	-	87.78	32.07	18.12	35.29	382	200	A	V
		2483.56	57.57	-16.43	74	42.67	32.07	18.12	35.29	382	200	P	V
		2483.56	51.04	-2.96	54	36.14	32.07	18.12	35.29	382	200	A	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

**2.4GHz 2400~2483.5MHz****BLE (Harmonic @ 3m)**

BLE	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	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 19 2440MHz		4880	43.09	-30.91	74	56.22	34.1	11.69	58.92	100	0	P	H
		7320	41.54	-32.46	74	50.12	35.57	14.16	58.31	100	0	P	H
													H
													H
		4880	42.61	-31.39	74	55.74	34.1	11.69	58.92	100	0	P	V
		7320	41.32	-32.68	74	49.9	35.57	14.16	58.31	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

## Emission below 1GHz

## 2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	(dBμV)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
2.4GHz  BLE  LF		168.51	36.9	-6.6	43.5	49.16	15.3	2.33	29.89	-	-	P	H
		191.73	37.3	-6.2	43.5	50.31	14.4	2.45	29.86	100	0	P	H
		264.09	39.1	-6.9	46	46.73	19.3	2.86	29.79	-	-	P	H
		335.7	39.2	-6.8	46	46.09	19.62	3.26	29.77	-	-	P	H
		395.2	39.11	-6.89	46	44.06	21.3	3.54	29.79	-	-	P	H
		958.7	34.3	-11.7	46	26.52	30.68	5.6	28.5	-	-	P	H
													H
													H
													H
													H
													H
													H
		30	32.99	-7.01	40	37.33	24.7	0.94	29.98	100	0	P	V
		167.97	32.29	-11.21	43.5	44.45	15.4	2.33	29.89	-	-	P	V
		192.27	32.67	-10.83	43.5	45.68	14.4	2.45	29.86	-	-	P	V
		384	35.16	-10.84	46	40.7	20.76	3.49	29.79	-	-	P	V
		498.1	32.15	-13.85	46	34.57	23.47	3.91	29.8	-	-	P	V
		947.5	34.14	-11.86	46	26.93	30.22	5.57	28.58	-	-	P	V
													V
													V
												V	
												V	
												V	
												V	
												V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>over limit</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



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

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
BLE CH 00 2402MHz		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 C. Radiated Spurious Emission Plots

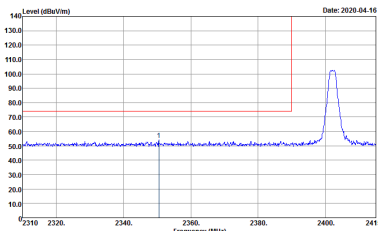
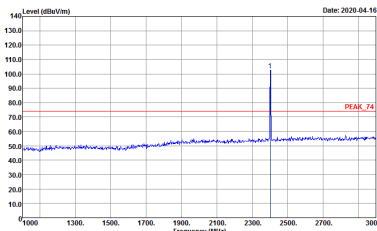
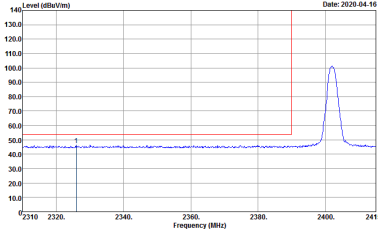
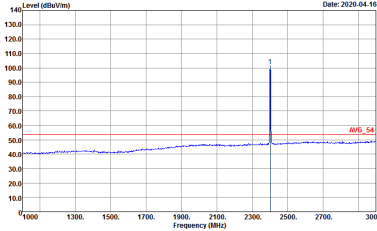
Test Engineer :	Jesse Wang	Temperature :	23.2~24.1°C
		Relative Humidity :	49.5~50.4%



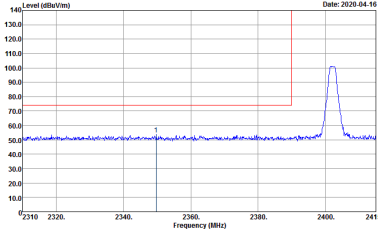
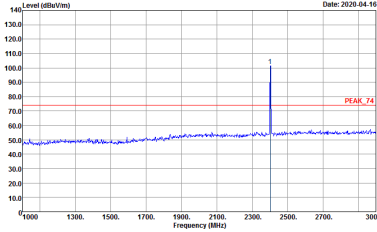
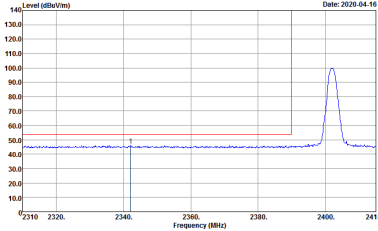
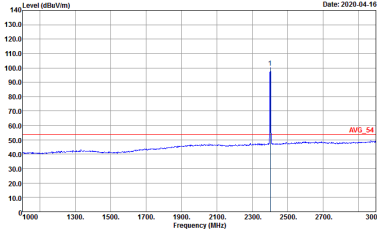
&lt;2Mbps&gt;

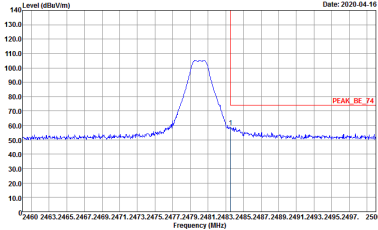
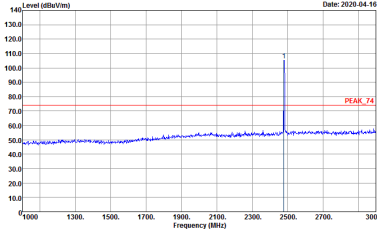
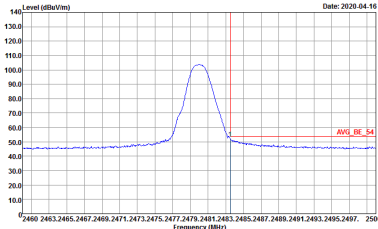
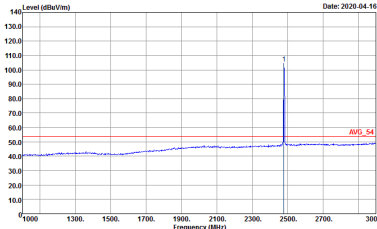
2.4GHz 2400~2483.5MHz

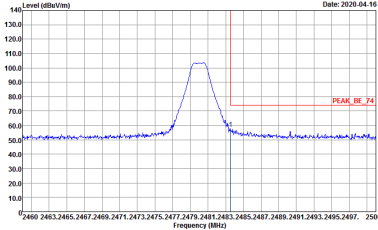
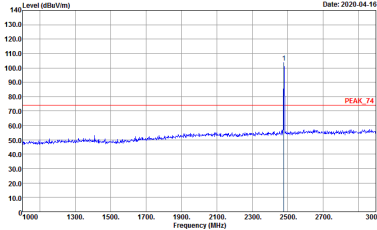
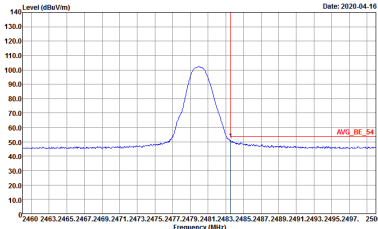
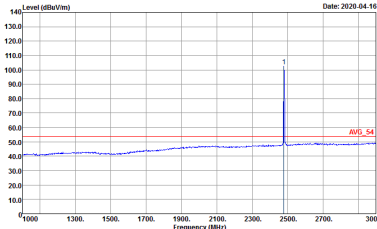
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 991726-01 Date: 2020-04-16</p>	 <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 991726-01 Date: 2020-04-16</p>
Avg.	 <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak Mode : 991726-01 Date: 2020-04-16</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak Mode : 991726-01 Date: 2020-04-16</p>

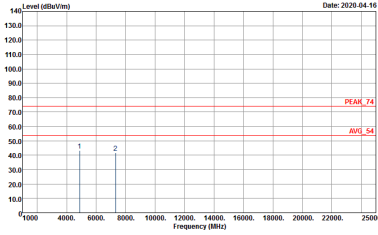
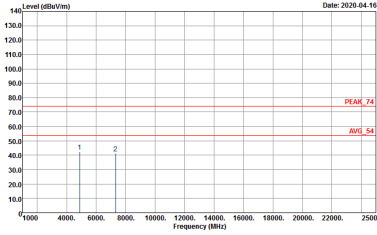


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Vertical	Fundamental
Peak	<div><p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 991726-01 Mode : 1</p></div>	<div><p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 991726-01 Mode : 1</p></div>
Avg	<div><p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : 991726-01 Mode : 1</p></div>	<div><p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : 991726-01 Mode : 1</p></div>

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Project : Peak Mode : 991726-01 3</p>	 <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Project : Peak Mode : 991726-01 3</p>
Avg.	 <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000kHz VBW:10.000kHz SWT:Auto Project : Peak Mode : 991726-01 3</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000kHz VBW:10.000kHz SWT:Auto Project : Peak Mode : 991726-01 3</p>

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Project : Peak Mode : 991726-01 3</p>	 <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Project : Peak Mode : 991726-01 3</p>
Avg.	 <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000kHz VBW:10.000kHz SWT:Auto Project : Peak Mode : 991726-01 3</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000kHz VBW:10.000kHz SWT:Auto Project : Peak Mode : 991726-01 3</p>

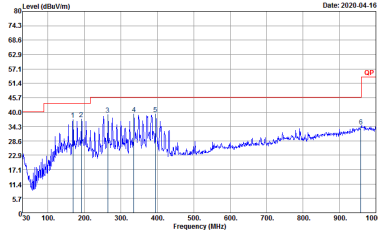
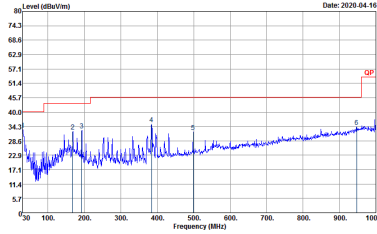
**2.4GHz 2400~2483.5MHz**
**BLE (Harmonic @ 3m)**

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
<b>Peak</b>  <b>Avg.</b>	 <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 991726-01 Mode : 2</p>	 <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 991726-01 Mode : 2</p>



Emission below 1GHz

2.4GHz BLE (LF)

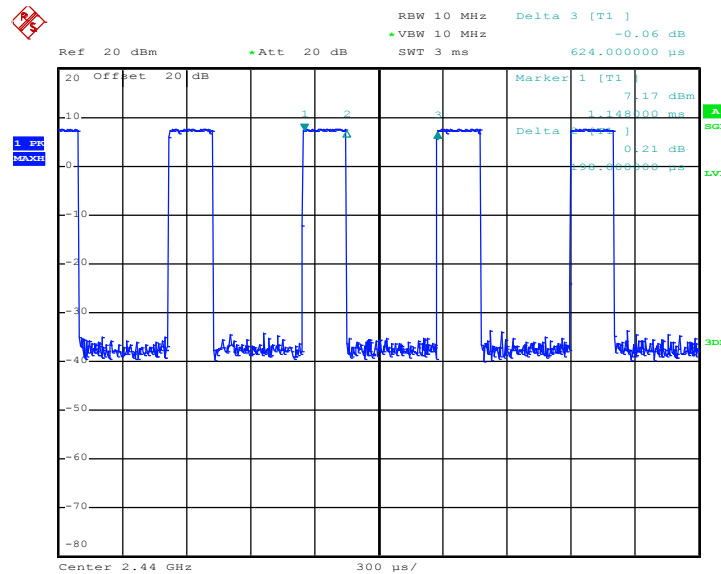
BLE	2.4GHz 2400~2483.5MHz	
	BLE LF	
	Horizontal	Vertical
QP / Peak	 <p>Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(G) HORIZONTAL Detector : Peak Project : 991726-01 Mode : 4</p>	 <p>Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(G) VERTICAL Detector : Peak Project : 991726-01 Mode : 4</p>



## Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
Bluetooth –LE for 2Mbps	31.73	198	5.05	10kHz	4.99

### Bluetooth - LE for 2Mbps



Date: 17.APR.2020 14:13:34