



# FCC RADIO TEST REPORT

**FCC ID** : 2AVDZCM27  
**Equipment** : IEEE 802.11 2X2 MIMO a/b/g/n/ac  
Wireless LAN + Bluetooth + NFC  
NGFF Module  
**Brand Name** : LiveU  
**Applicant** : LiveU, Inc  
2 University Plaza Drive Suite 505,  
Hackensack, New Jersey  
**Manufacturer** : LiveU Ltd.  
5 Hagavish St, Kfar Saba 4442211, Israel  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Jan. 15, 2022 and testing was performed from Jan. 24, 2022 to Jul. 26, 2022. We, Sporton International (USA) Inc., 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 partial report apply exclusively to the tested model / sample. Without written approval from Sporton International (USA) Inc., the test report shall not be reproduced except in full.

Approved by: Neil Kao

**Sportun International (USA) Inc.**  
1175 Montague Expressway, Milpitas, CA 95035



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## History of this test report



## 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	6.67 dB under the limit at 2335.410 MHz
3.3	15.207	AC Conducted Emission	Pass	21.45 dB under the limit at 23.149 MHz
3.4	15.203 & 15.247(b)	Antenna Requirement	Pass	-

**Note:** The module (FCC ID: 2AVDZCM27) inside the host (Model: LU800) makes no significant difference in conducted output power which is a bit lower compared to the original module report after the measurements, hence, the conducted test results can be leveraged from the original module report.

### Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. Please refer to the section "Uncertainty Evaluation" for measurement uncertainty.

### 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.



## 1 General Description

### 1.1 Product Feature of Equipment Under Test

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

Product Feature	
<b>Installed into the Host</b>	Equipment Name: Live Video Transmission System Brand Name: LiveU Model Name: LU800
<b>Sample 1</b>	Module 0
<b>Sample 2</b>	Module 1
<b>Antenna Type</b>	WLAN: <Ant. 1>: PCB Printed Antenna Inverted F <Ant. 2>: PCB Printed Antenna Inverted F <Ant. 3>: PCB Printed Antenna Inverted F <Ant. 4>: PCB Printed Antenna Inverted F Bluetooth: <Ant. 1>: PCB Printed Antenna Inverted F <Ant. 3>: PCB Printed Antenna Inverted F
Antenna information	
<b>2400 MHz ~ 2483.5 MHz</b>	Peak Gain (dBi) <Ant 1>: 0.62dBi <Ant 3>: 4.18dBi

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

### 1.2 Modification of EUT

No modifications made to the EUT during the testing.



### 1.3 Testing Location

<b>Test Site</b>	Sportun International (USA) Inc.		
<b>Test Site Location</b>	1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300		
<b>Test Site No.</b>	<b>Sportun Site No.</b>		
	TH01-CA	CO01-CA	03CH02-CA
<b>Test Engineer</b>	LilianaGonzalez	Yuan Lee	Michael Bui, Daniel Lee, Yuan Lee and Fu Chen
<b>Temperature (°C)</b>	15.4~25	20~22	20~25
<b>Relative Humidity (%)</b>	31.8~52.6	40~42	42~50

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

### 1.4 Applicable Standards

According to the specifications declared by 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:** All the test items were validated and recorded in accordance with the standards without any modification during the testing.



## 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	-	-



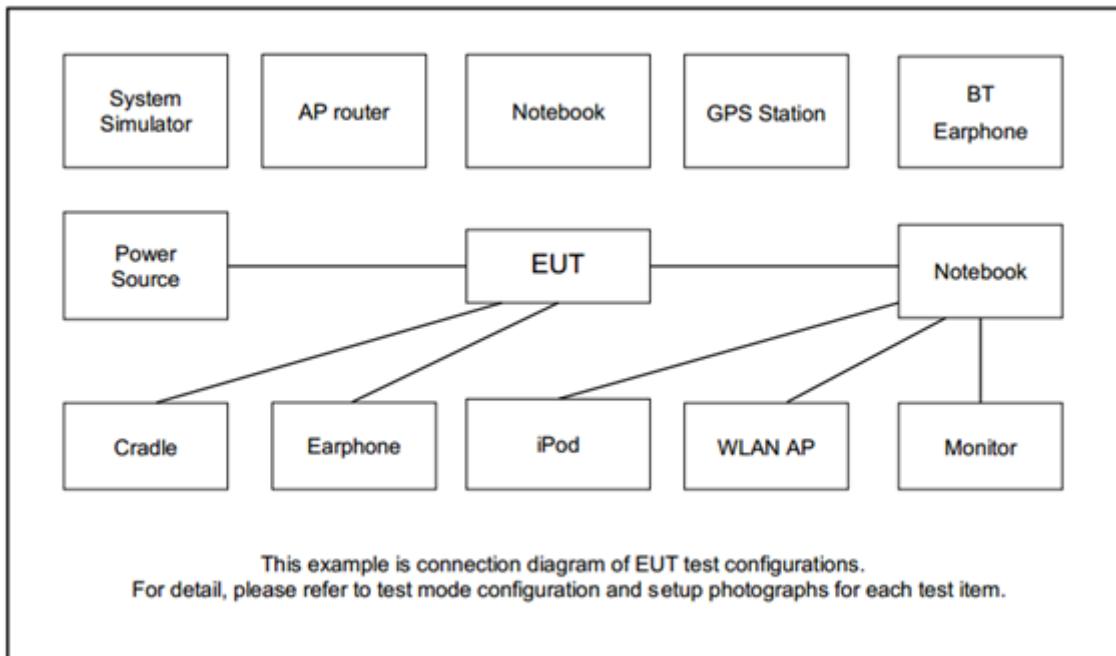
## 2.2 Test Mode

- 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: conduction emission (150 kHz to 30 MHz), 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.
- b. AC power line Conducted Emission was tested under maximum output power.

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
Radiated Test Cases	<b>Bluetooth – LE / GFSK</b>  <b>&lt;Sample 1&gt;</b> Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps <b>&lt;Sample 2&gt;</b> Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1 :Bluetooth-LE Tx + Charging from Adapter for Sample 1 Mode 2 :Bluetooth-LE Tx + Charging from Adapter for Sample 2

## 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.	Laptop	Acer	Altos PS548-G1	FCC DoC	N/A	Unshielded, 1.8 m

## 2.5 EUT Operation Test Setup

The RF test items, utility “Putty V0.62” 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 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi 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 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

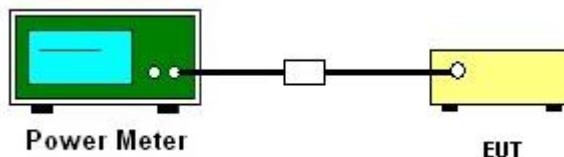
##### 3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

##### 3.1.3 Test Procedures

1. For Peak Power, the testing follows ANSI C63.10 Section 11.9.1.3 PKPM1.
2. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
3. The RF output of EUT is connected to the power meter by RF cable and attenuator.
4. The path loss is compensated to the results for each measurement.
5. Set the maximum power setting and enable the EUT to transmit continuously.
6. Measure the conducted output power and record the results in the test report.

##### 3.1.4 Test Setup





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

<Sample 1>

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)
BLE	1Mbps	1	0	2402	4.17
BLE	1Mbps	1	19	2440	4.37
BLE	1Mbps	1	39	2480	4.30

<Sample 2>

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)
BLE	1Mbps	1	0	2402	4.11
BLE	1Mbps	1	19	2440	4.37
BLE	1Mbps	1	39	2480	4.06



## 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 is 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

Please refer to the measuring equipment list in this test report.



### 3.2.3 Test Procedures

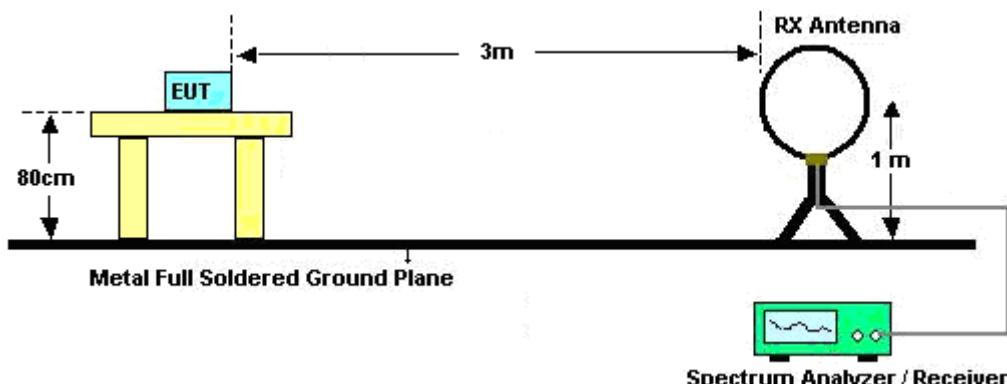
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT is 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.
4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-”.
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as “-”.
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 = 3 MHz for  $f \geq 1$  GHz for peak measurement.

For average measurement:

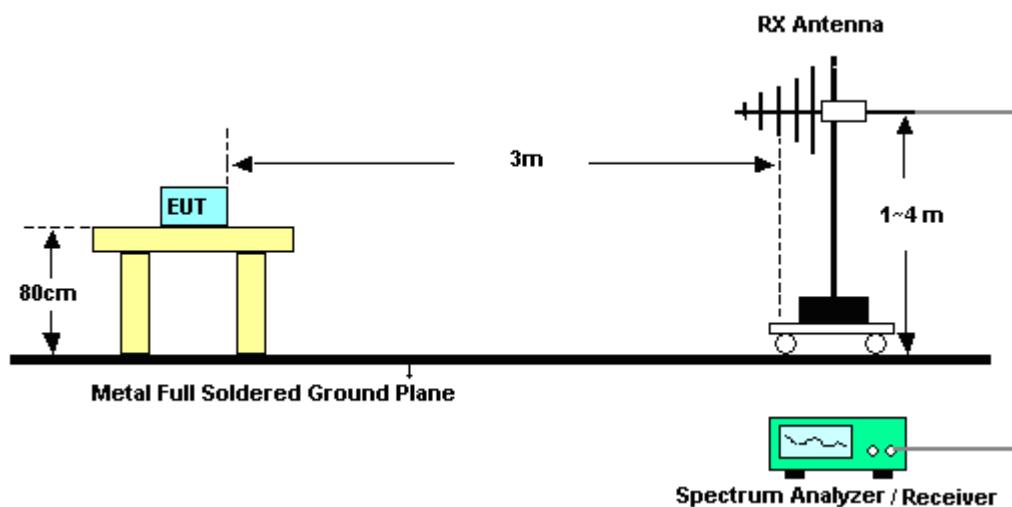
  - VBW = 10 Hz, when duty cycle is no less than 98 percent.
  - VBW  $\geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.2.4 Test Setup

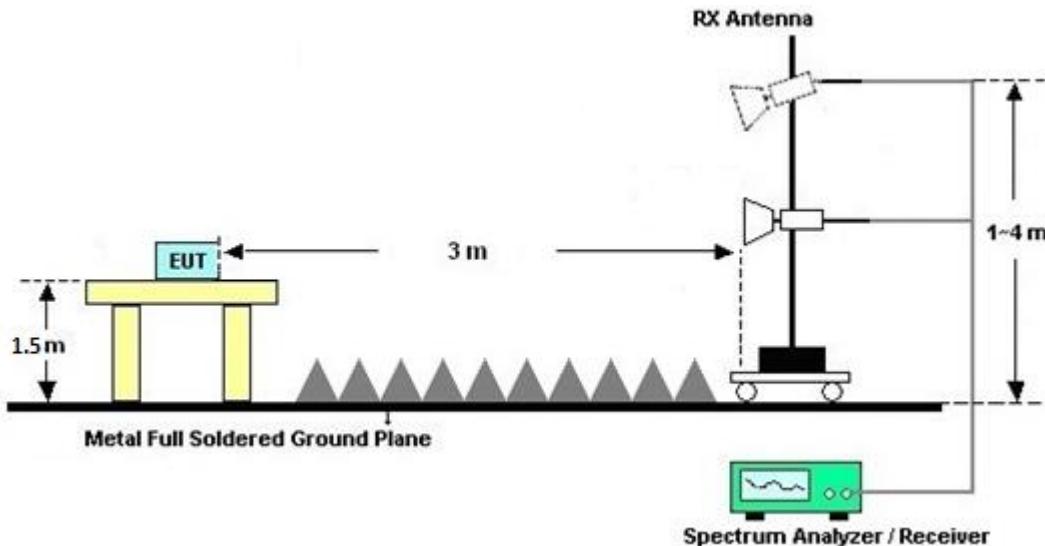
For radiated test below 30MHz



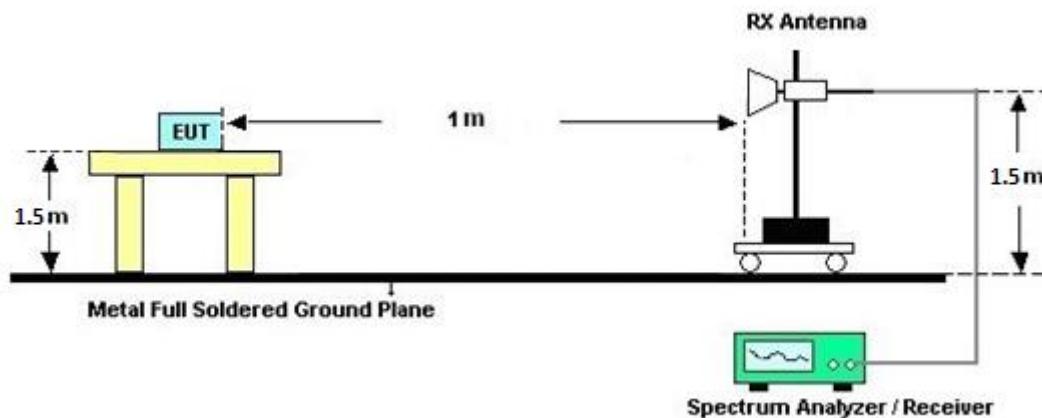
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



### 3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes 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 (30 MHz ~ 10th Harmonic)

Please refer to Appendix B and C.

**Note:** When the scan with peak detector exceeds the limit associated with the average detector, additional scan with average detection was performed to show compliance with the average limit. The additional scan plot of the low channel is provided for justification.



### 3.3 AC Conducted Emission Measurement

#### 3.3.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

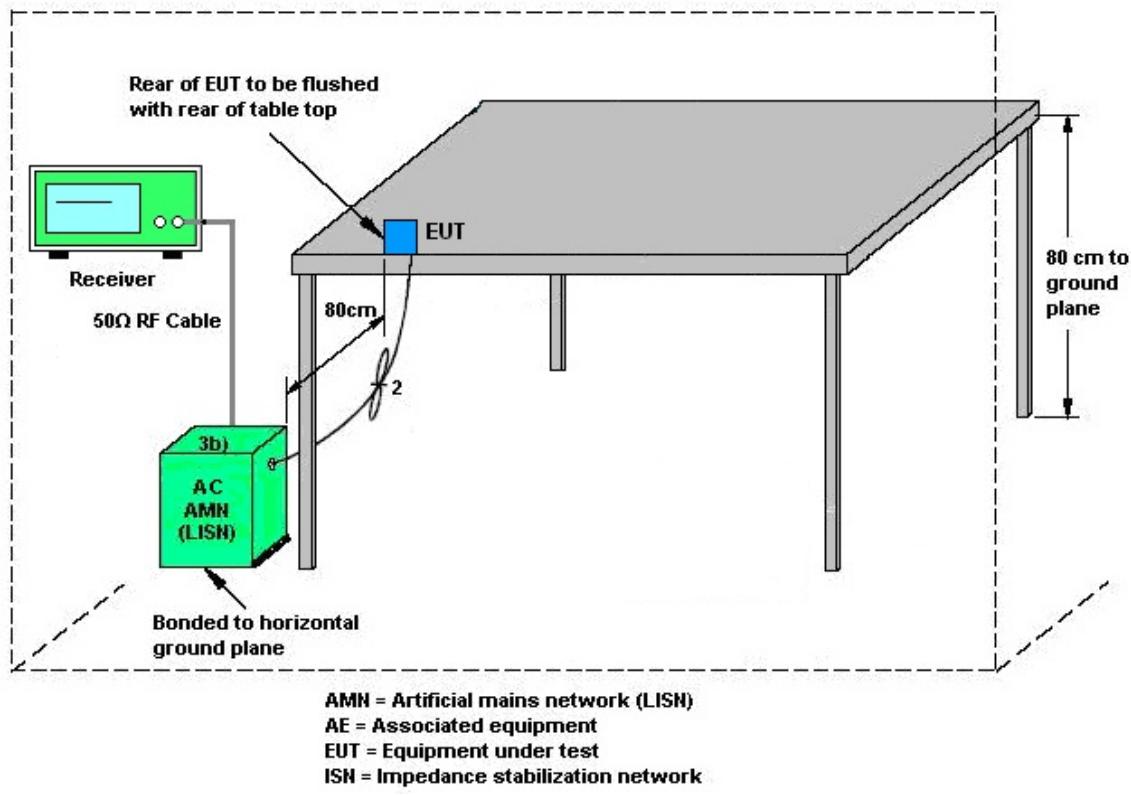
#### 3.3.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

#### 3.3.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

### 3.3.4 Test Setup



### 3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix A.



## 3.4 Antenna Requirements

### 3.4.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. 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.

### 3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

### 3.4.3 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	100315	9kHz~30MHz	Jan. 07, 2022	Jan. 24, 2022~Jul. 26, 2022	Jan. 06, 2023	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	54683	30MHz~1GHz	Oct. 15, 2021	Jan. 24, 2022~Jul. 26, 2022	Oct. 14, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	01895	1GHz~18GHz	Aug. 25, 2021	Jan. 24, 2022~Jul. 26, 2022	Aug. 24, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00842	18GHz~40GHz	Jul. 20, 2021	Jan. 24, 2022~Jul. 18, 2022	Jul. 19, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00841	18GHz~40GHz	Aug. 26, 2021	Jul. 19, 2022~Jul. 26, 2022	Aug. 25, 2022	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	Aug. 09, 2021	Jan. 24, 2022~May 09, 2022	Aug. 08, 2022	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	May 10, 2022	May 10, 2022~Jul. 26, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	Jul. 27, 2021	Jan. 24, 2022~May 10, 2022	Jul. 26, 2022	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	May 11, 2022	May 11, 2022~Jul. 26, 2022	May 10, 2023	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18 G-56-01-A70	EC1900251	1GHz~18GHz	Mar. 30, 2021	Jan. 24, 2022~Mar. 29, 2022	Mar. 29, 2022	Radiation (03CH02-CA)
Preamplifier	Jet-Power	JPA0118-55-303	17100018000 55004	1GHz~18GHz	Jul. 21, 2021	Mar. 29, 2022~May 09, 2022	Jul. 20, 2022	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18 G-56-01-A70	EC1900251	1GHz~18GHz	May 10, 2022	May 10, 2022~Jul. 26, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060725	18GHz~40GHz	Jul. 21, 2021	Jan. 24, 2022~May 09, 2022	Jul. 20, 2022	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060725	18GHz~40GHz	May 10, 2022	May 10, 2022~Jul. 26, 2022	May 09, 2023	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	8024032/2, 8024062/2, 802856/2	N/A	Jun. 23, 2021	Jan. 24, 2022~Jun. 21, 2022	Jun. 22, 2022	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	8024032/2, 802406/2, 802875/2	N/A	Jun. 22, 2022	Jun. 22, 2022~Jul. 26, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Sep. 22, 2021	Jan. 24, 2022~Jul. 26, 2022	Sep. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3GHz High Pass Filter	Jul. 22, 2021	Jan. 24, 2022~Jul. 20, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3GHz High Pass Filter	Jul. 21, 2022	Jul. 21, 2022~Jul. 26, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN1	1.2GHz Low Pass Filter	Jul. 22, 2021	Jan. 24, 2022~Jul. 20, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN1	1.2GHz Low Pass Filter	Jul. 21, 2022	Jul. 21, 2022~Jul. 26, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 04, 2021	Jan. 24, 2022~Jul. 26, 2022	Aug. 03, 2022	Radiation (03CH02-CA)
Controller	ChainTek	EM-1000	060876	NA	N/A	Jan. 24, 2022~Jul. 26, 2022	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jan. 24, 2022~Jul. 26, 2022	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jan. 24, 2022~Jul. 26, 2022	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Jan. 24, 2022~Jul. 26, 2022	N/A	Radiation (03CH02-CA)



Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H1	45142595	N/A	Aug. 30, 2021	Jan. 24, 2022~ Jul. 11, 2022	Aug. 29, 2022	Conducted (TH01-CA)
Power Sensor	EM Electronics Corporation	RPR3006W	RPR6W-1901 026	10MHz-6GHz	Jul. 26, 2021	Jan. 24, 2022~ Jul. 11, 2022	Jul. 25, 2022	Conducted (TH01-CA)
Power meter	Anritsu	ML2495A	1804004	N/A	Jul. 22, 2021	Jan. 24, 2022~ Jul. 11, 2022	Jul. 21, 2022	Conducted (TH01-CA)
Power Sensor	Anritsu	MA2411B	1726149	300MHz~40GHz	Jul. 22, 2021	Jan. 24, 2022~ Jul. 11, 2022	Jul. 21, 2022	Conducted (TH01-CA)
Switch Box & RF Cable	EM Electronics	EMSW26	1090304	N/A	Apr. 01, 2021	Jan. 24, 2022~ Mar. 29, 2022	Mar. 31, 2022	Conducted (TH01-CA)
Switch Box & RF Cable	EM Electronics	EMSW26	1090304	N/A	Mar. 30, 2022	Mar. 31, 2022~ Jul. 11, 2022	Mar. 29, 2023	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101089	10Hz-40GHz	Jun. 02, 2021	Jan. 24, 2022~ May 31, 2022	Jun. 01, 2022	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101089	10Hz-40GHz	Jun. 01, 2022	Jun. 02, 2022~ Jul. 11, 2022	May 31, 2023	Conducted (TH01-CA)
LISN	TESEQ	NNB51	47415	N/A	May 10, 2022	Jul. 13, 2022	May 09, 2023	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	SCHWARZBECK	VTSD 9561-F N	9561-F-N00412	N/A	Jul. 05, 2022	Jul. 13, 2022	Jul. 04, 2023	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	7GHz	May 31, 2022	Jul. 13, 2022	May 30, 2023	Conduction (CO01-CA)
Software	R&S	EMC32	N/A	Version 10.30.00	N/A	Jul. 13, 2022	N/A	Conduction (CO01-CA)



## 5 Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))</b>	2.0 dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))</b>	4.70 dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))</b>	6.20 dB
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))</b>	6.40 dB
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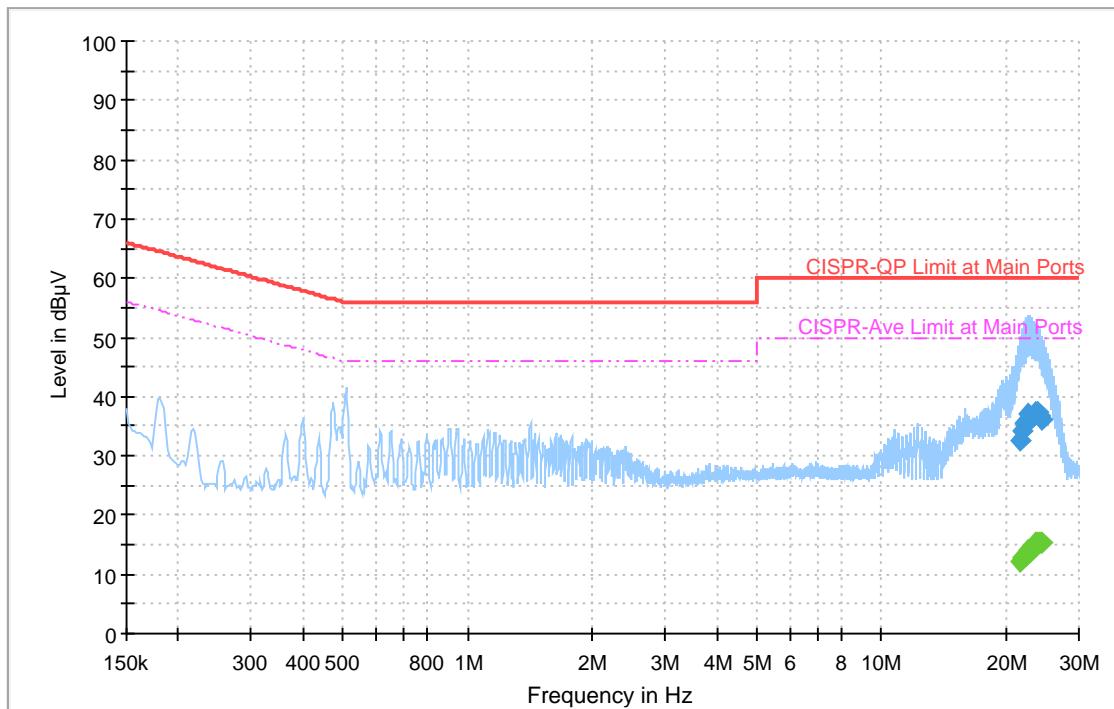
## **Appendix A. AC Conducted Emission Test Results**

<Sample 1>

## EUT Information

Site: CO01-CA  
Power: 120Vac/60Hz  
Project: 220103001

Full Spectrum



## Final Result

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	CAverage (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Line	Filter	Corr. (dB)
21.577362	32.70	---	60.00	27.30	L1	OFF	20.5
21.577362	---	12.20	50.00	37.80	L1	OFF	20.5
21.832899	34.26	---	60.00	25.74	L1	OFF	20.5
21.832899	---	12.63	50.00	37.37	L1	OFF	20.5
22.085088	35.50	---	60.00	24.50	L1	OFF	20.5
22.085088	---	13.02	50.00	36.98	L1	OFF	20.5
22.332300	35.74	---	60.00	24.26	L1	OFF	20.5
22.332300	---	13.18	50.00	36.82	L1	OFF	20.5
22.621002	36.91	---	60.00	23.09	L1	OFF	20.5
22.621002	---	13.93	50.00	36.07	L1	OFF	20.5
22.871607	36.17	---	60.00	23.83	L1	OFF	20.5
22.871607	---	13.78	50.00	36.22	L1	OFF	20.5
23.125632	36.50	---	60.00	23.50	L1	OFF	20.6
23.125632	---	14.39	50.00	35.61	L1	OFF	20.6
23.372943	36.68	---	60.00	23.32	L1	OFF	20.6
23.372943	---	14.64	50.00	35.36	L1	OFF	20.6
23.669556	37.51	---	60.00	22.49	L1	OFF	20.6
23.669556	---	15.22	50.00	34.78	L1	OFF	20.6
23.920197	37.26	---	60.00	22.74	L1	OFF	20.6
23.920197	---	15.33	50.00	34.67	L1	OFF	20.6
24.174717	36.61	---	60.00	23.39	L1	OFF	20.6
24.174717	---	15.47	50.00	34.53	L1	OFF	20.6

---

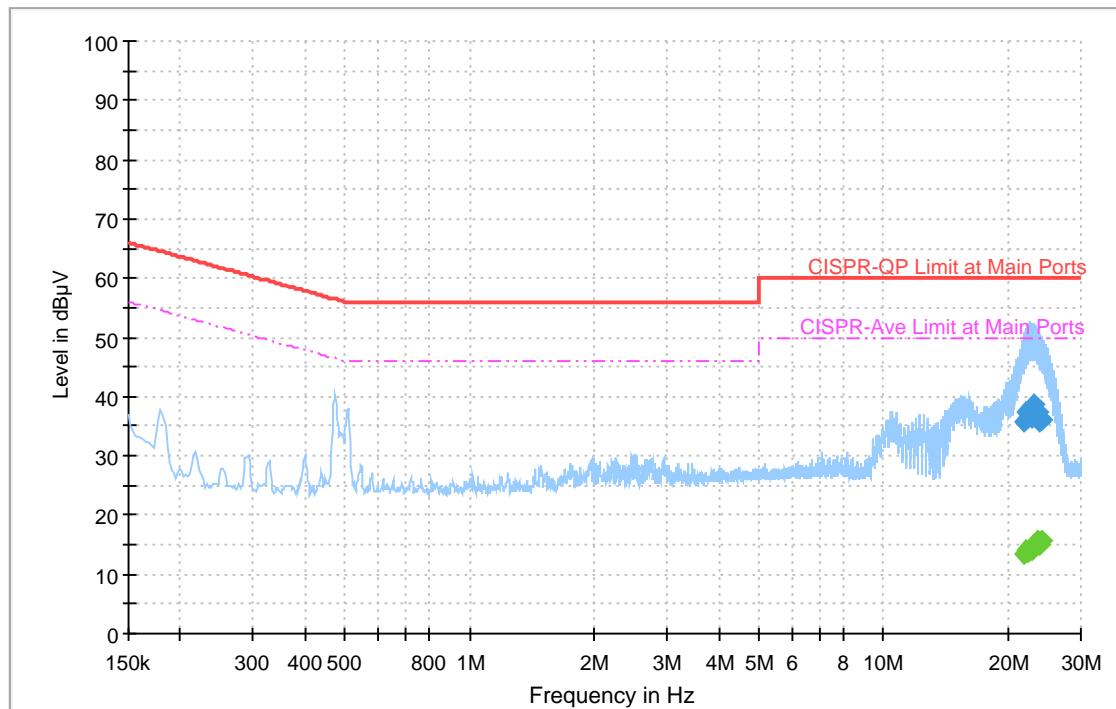
Frequency (MHz)	QuasiPeak (dB $\mu$ V)	CAverage (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Line	Filter	Corr. (dB)
24.456480	36.10	---	60.00	23.90	L1	OFF	20.6
24.456480	---	15.38	50.00	34.62	L1	OFF	20.6

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## EUT Information

Site: CO01-CA  
 Power: 120Vac/60Hz  
 Project: 220103001

Full Spectrum



## Final Result

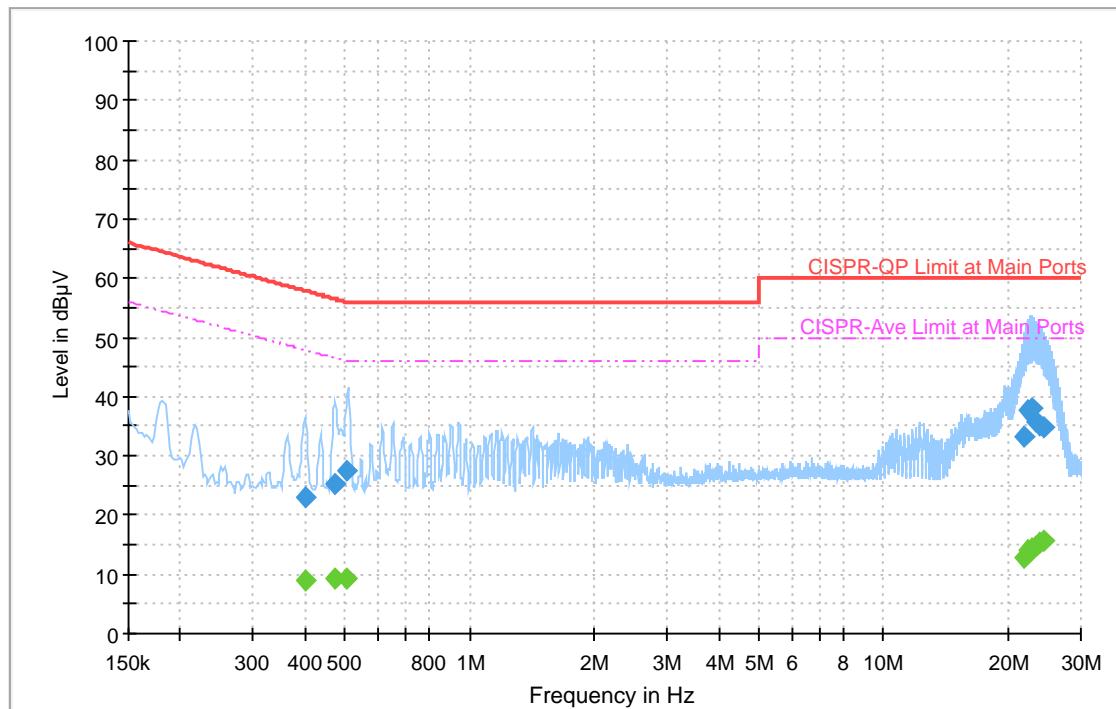
Frequency (MHz)	QuasiPeak (dB $\mu$ V)	CAverage (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Line	Filter	Corr. (dB)
21.869736	35.79	---	60.00	24.21	N	OFF	20.5
21.869736	---	13.52	50.00	36.48	N	OFF	20.5
22.123617	37.47	---	60.00	22.53	N	OFF	20.5
22.123617	---	13.92	50.00	36.08	N	OFF	20.5
22.358850	37.32	---	60.00	22.68	N	OFF	20.5
22.358850	---	13.89	50.00	36.11	N	OFF	20.5
22.608645	37.39	---	60.00	22.61	N	OFF	20.5
22.608645	---	13.95	50.00	36.05	N	OFF	20.5
22.861194	36.44	---	60.00	23.56	N	OFF	20.5
22.861194	---	14.10	50.00	35.90	N	OFF	20.5
23.149410	38.55	---	60.00	21.45	N	OFF	20.5
23.149410	---	15.13	50.00	34.87	N	OFF	20.5
23.397414	36.50	---	60.00	23.50	N	OFF	20.5
23.397414	---	14.93	50.00	35.07	N	OFF	20.5
23.658252	37.30	---	60.00	22.70	N	OFF	20.5
23.658252	---	15.55	50.00	34.45	N	OFF	20.5
23.907111	35.64	---	60.00	24.36	N	OFF	20.5
23.907111	---	15.14	50.00	34.86	N	OFF	20.5
24.191907	36.07	---	60.00	23.93	N	OFF	20.5
24.191907	---	15.81	50.00	34.19	N	OFF	20.5

<Sample 2>

## EUT Information

Site: CO01-CA  
Power: 120Vac/60Hz  
Project: 220103001

Full Spectrum



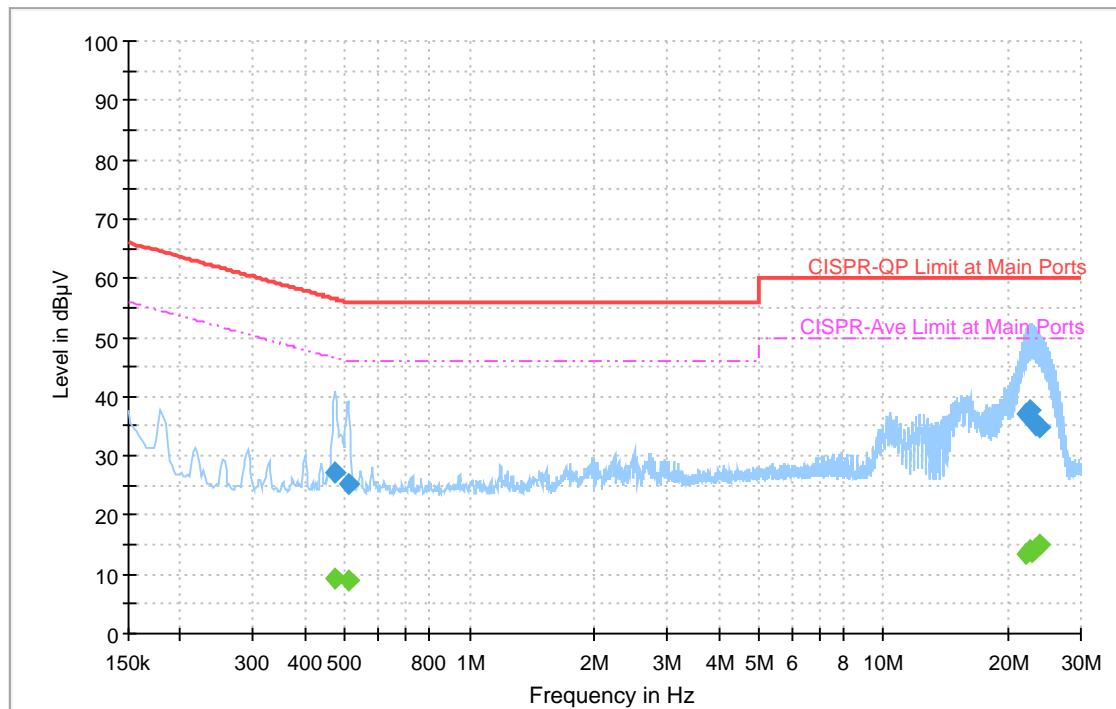
## Final Result

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	CAverage (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.399156	---	9.08	47.87	38.79	L1	OFF	20.3
0.399156	22.97	---	57.87	34.90	L1	OFF	20.3
0.473154	---	9.16	46.46	37.30	L1	OFF	20.3
0.473154	25.11	---	56.46	31.35	L1	OFF	20.3
0.506364	---	9.11	46.00	36.89	L1	OFF	20.3
0.506364	27.38	---	56.00	28.62	L1	OFF	20.3
21.834555	---	12.65	50.00	37.35	L1	OFF	20.5
21.834555	33.30	---	60.00	26.70	L1	OFF	20.5
22.377642	---	13.90	50.00	36.10	L1	OFF	20.5
22.377642	37.58	---	60.00	22.42	L1	OFF	20.5
22.878735	---	14.38	50.00	35.62	L1	OFF	20.5
22.878735	37.87	---	60.00	22.13	L1	OFF	20.5
23.384958	---	14.71	50.00	35.29	L1	OFF	20.6
23.384958	35.83	---	60.00	24.17	L1	OFF	20.6
23.881101	---	15.21	50.00	34.79	L1	OFF	20.6
23.881101	35.20	---	60.00	24.80	L1	OFF	20.6
24.427176	---	15.51	50.00	34.49	L1	OFF	20.6
24.427176	34.82	---	60.00	25.18	L1	OFF	20.6

## EUT Information

Site: CO01-CA  
 Power: 120Vac/60Hz  
 Project: 220103001

Full Spectrum



## Final Result

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	CAverage (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.472641	---	9.22	46.47	37.25	N	OFF	20.3
0.472641	27.09	---	56.47	29.38	N	OFF	20.3
0.509163	---	8.92	46.00	37.08	N	OFF	20.3
0.509163	25.20	---	56.00	30.80	N	OFF	20.3
22.083171	---	13.31	50.00	36.69	N	OFF	20.5
22.083171	36.93	---	60.00	23.07	N	OFF	20.5
22.626033	---	14.16	50.00	35.84	N	OFF	20.5
22.626033	37.66	---	60.00	22.34	N	OFF	20.5
22.839540	---	13.88	50.00	36.12	N	OFF	20.5
22.839540	36.09	---	60.00	23.91	N	OFF	20.5
23.376921	---	14.45	50.00	35.55	N	OFF	20.5
23.376921	35.19	---	60.00	24.81	N	OFF	20.5
23.888985	---	14.96	50.00	35.04	N	OFF	20.5
23.888985	34.67	---	60.00	25.33	N	OFF	20.5



## Appendix B. Radiated Spurious Emission

Test Engineer :	Michael Bui, Daniel Lee, Yuan Lee and Fu Chen	Temperature :	20~25°C
		Relative Humidity :	42~50%

<Sample 1>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Margin 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)	Peak Avg. (H/V)
BLE CH 00 2402MHz		2313.045	55.11	-18.89	74	41.18	27.96	17.29	31.32	101	207	P	H
		2332.89	46.06	-7.94	54	32.18	27.86	17.33	31.31	101	207	A	H
	*	2402	97.36	-	-	83.52	27.66	17.45	31.27	101	207	P	H
	*	2402	97.08	-	-	83.24	27.66	17.45	31.27	101	207	A	H
													H
		2329.635	56.18	-17.82	74	42.26	27.92	17.32	31.32	298	345	P	V
		2333.1	47.2	-6.8	54	33.26	27.92	17.33	31.31	298	345	A	V
	*	2402	100.65	-	-	86.73	27.74	17.45	31.27	298	345	P	V
	*	2402	100.29	-	-	86.37	27.74	17.45	31.27	298	345	A	V
													V
BLE CH 19 2440MHz		2327.1	55.15	-18.85	74	41.26	27.89	17.32	31.32	200	260	P	H
		2366.85	45.71	-8.29	54	31.88	27.74	17.39	31.3	200	260	A	H
	*	2440	94.29	-	-	80.38	27.66	17.51	31.26	200	260	P	H
	*	2440	94	-	-	80.09	27.66	17.51	31.26	200	260	A	H
		2486.4	54.51	-19.49	74	40.55	27.62	17.58	31.24	200	260	P	H
		2495.44	45.53	-8.47	54	31.56	27.61	17.59	31.23	200	260	A	H
		2366.7	55.52	-18.48	74	41.57	27.86	17.39	31.3	302	330	P	V
		2367.15	47.24	-6.76	54	33.29	27.86	17.39	31.3	302	330	A	V
	*	2440	99.94	-	-	86.1	27.59	17.51	31.26	302	330	P	V
	*	2440	99.65	-	-	85.81	27.59	17.51	31.26	302	330	A	V
		2497.52	54.55	-19.45	74	40.69	27.49	17.6	31.23	302	330	P	V
		2498.16	45.54	-8.46	54	31.68	27.49	17.6	31.23	302	330	A	V



BLE	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Margin 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 39 2480MHz	*	2480	94.68	-	-	80.72	27.63	17.57	31.24	392	124	P	H
	*	2480	94.35	-	-	80.39	27.63	17.57	31.24	392	124	A	H
		2498.08	55.65	-18.35	74	41.67	27.61	17.6	31.23	392	124	P	H
		2488	45.88	-8.12	54	31.92	27.62	17.58	31.24	392	124	A	H
													H
													H
	*	2480	100.66	-	-	86.82	27.51	17.57	31.24	355	352	P	V
	*	2480	100.29	-	-	86.45	27.51	17.57	31.24	355	352	A	V
		2493.48	55.3	-18.7	74	41.45	27.49	17.59	31.23	355	352	P	V
		2487.56	45.87	-8.13	54	32.03	27.5	17.58	31.24	355	352	A	V
													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 )	Margin 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 00 2402MHz		4804	37.76	-36.24	74	62.98	31.51	11.19	67.92	-	-	P	H
		11505	49.21	-24.79	74	59.37	40.16	17.26	67.58	-	-	P	H
		11505	39.82	-14.18	54	49.98	40.16	17.26	67.58	-	-	A	H
		14490	51.15	-22.85	74	57.35	41.94	19.6	67.74	-	-	P	H
		14490	41.71	-12.29	54	47.91	41.94	19.6	67.74	-	-	A	H
		17955	59.74	-14.26	74	59.62	47.65	22.4	69.93	-	-	P	H
		17955	49.8	-4.2	54	49.68	47.65	22.4	69.93	-	-	A	H
													H
													H
													H
													H
													H
													V
		4804	39.52	-34.48	74	64.71	31.54	11.19	67.92	-	-	P	V
		11190	49.05	-24.95	74	60.65	39.7	16.99	68.29	-	-	P	V
		11190	39.21	-14.79	54	50.81	39.7	16.99	68.29	-	-	A	V
		14490	51.18	-22.82	74	57.38	41.94	19.6	67.74	-	-	P	V
		14490	41.49	-12.51	54	47.69	41.94	19.6	67.74	-	-	A	V
		17985	59.89	-14.11	74	58.35	48.7	22.43	69.59	-	-	P	V
		17985	50.26	-3.74	54	48.72	48.7	22.43	69.59	-	-	A	V
													V
													V
													V
													V



BLE	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Margin 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	38.16	-35.84	74	63.27	31.45	11.35	67.91	-	-	P	H
		7320	43.54	-30.46	74	60.26	36.33	13.78	66.83	-	-	P	H
		11610	49.12	-24.88	74	59.32	39.94	17.35	67.49	-	-	P	H
		11610	39.14	-14.86	54	49.34	39.94	17.35	67.49	-	-	A	H
		14490	51.43	-22.57	74	57.63	41.94	19.6	67.74	-	-	P	H
		14490	41.47	-12.53	54	47.67	41.94	19.6	67.74	-	-	A	H
		17970	59.3	-14.7	74	58.61	48.04	22.41	69.76	-	-	P	H
		17970	49.66	-4.34	54	48.97	48.04	22.41	69.76	-	-	A	H
													H
													H
													H
													H
													V
		4880	39.45	-34.55	74	64.63	31.38	11.35	67.91	-	-	P	V
		7320	43.92	-30.08	74	60.57	36.4	13.78	66.83	-	-	P	V
		11460	48.92	-25.08	74	59.37	40.07	17.22	67.74	-	-	P	V
		11460	38.52	-15.48	54	48.97	40.07	17.22	67.74	-	-	A	V
		14490	51.34	-22.66	74	57.54	41.94	19.6	67.74	-	-	P	V
		14490	41.68	-12.32	54	47.88	41.94	19.6	67.74	-	-	A	V
		17985	59.83	-14.17	74	58.29	48.7	22.43	69.59	-	-	P	V
		17985	50.11	-3.89	54	48.57	48.7	22.43	69.59	-	-	A	V
													V
													V
													V



BLE	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Margin 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 39 2480MHz		4960	39.96	-34.04	74	64.96	31.51	11.51	68.02	-	-	P	H
		7440	43.72	-30.28	74	60.6	36.49	13.91	67.28	-	-	P	H
		10890	48.95	-25.05	74	60.49	40.16	16.74	68.44	-	-	P	H
		10890	39.01	-14.99	54	50.55	40.16	16.74	68.44	-	-	A	H
		14490	51.91	-22.09	74	58.11	41.94	19.6	67.74	-	-	P	H
		14490	41.99	-12.01	54	48.19	41.94	19.6	67.74	-	-	A	H
		17985	59.74	-14.26	74	58.47	48.43	22.43	69.59	-	-	P	H
		17985	50.21	-3.79	54	48.94	48.43	22.43	69.59	-	-	A	H
													H
													H
													H
													H
													V
		4960	38.51	-35.49	74	63.56	31.46	11.51	68.02	-	-	P	V
		7440	42.8	-31.2	74	59.7	36.47	13.91	67.28	-	-	P	V
		10965	49	-25	74	60.23	40.12	16.81	68.16	-	-	P	V
		10965	39.09	-14.91	54	50.32	40.12	16.81	68.16	-	-	A	V
		14490	50.89	-23.11	74	57.09	41.94	19.6	67.74	-	-	P	V
		14490	41.79	-12.21	54	47.99	41.94	19.6	67.74	-	-	A	V
		18000	59.74	-14.26	74	57.68	49.04	22.44	69.42	-	-	P	V
		18000	49.38	-4.62	54	47.32	49.04	22.44	69.42	-	-	A	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. 4. The emission level close to 18GHz is checked that the average emission level is noise floor only.											



## Emission above 18GHz

## 2.4GHz BLE (SHF)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.									
												Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
												( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )
2.4GHz BLE SHF		23817	40.4	-33.6	74	37.67	38.7	15.33	51.3	-	-	P	H									
	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.																				



## Emission below 1GHz

## 2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
												Limit	Line
												Level	Factor
2.4GHz BLE LF		38.73	29.83	-10.17	40	40.87	20.36	1.04	32.44	-	-	P	H
		95.96	30.26	-13.24	43.5	45.52	15.49	1.66	32.41	-	-	P	H
		375.32	33.81	-12.19	46	41.99	21.21	3.09	32.48	205	316	Q	H
		499.48	38.34	-7.66	46	43.21	24.09	3.62	32.58	-	-	P	H
		624.61	38.11	-7.89	46	40.75	25.98	3.97	32.59	-	-	P	H
		874.87	36.51	-9.49	46	34.31	29.2	4.78	31.78	178	360	Q	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													V
2.4GHz BLE LF		32.91	29.48	-10.52	40	37.22	23.75	0.95	32.44	100	358	Q	V
		105.66	33.07	-10.43	43.5	46.97	16.77	1.74	32.41	-	-	P	V
		375.32	35.93	-10.07	46	44.11	21.21	3.09	32.48	-	-	P	V
		499.48	37.2	-8.8	46	42.07	24.09	3.62	32.58	-	-	P	V
		624.61	38.69	-7.31	46	41.33	25.98	3.97	32.59	-	-	P	V
		874.87	32.01	-13.99	46	29.81	29.2	4.78	31.78	101	358	Q	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 and emission level has at least 6dB margin against limit or noise floor only.											



&lt;Sample 2&gt;

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
BLE CH 00 2402MHz		2326.17	55.4	-18.6	74	41.51	27.9	17.31	31.32	110	210	P	H
		2335.41	47.33	-6.67	54	33.46	27.85	17.33	31.31	110	210	A	H
	*	2402	98.29	-	-	84.45	27.66	17.45	31.27	110	210	P	H
	*	2402	97.98	-	-	84.14	27.66	17.45	31.27	110	210	A	H
													H
													H
		2373.735	55.61	-18.39	74	41.66	27.83	17.41	31.29	193	128	P	V
		2375.73	46.28	-7.72	54	32.33	27.83	17.41	31.29	193	128	A	V
	*	2402	94.52	-	-	80.6	27.74	17.45	31.27	193	128	P	V
	*	2402	94.18	-	-	80.26	27.74	17.45	31.27	193	128	A	V
BLE CH 19 2440MHz													V
		2339.4	55.49	-18.51	74	41.63	27.83	17.34	31.31	223	51	P	H
		2369.55	46.75	-7.25	54	32.92	27.73	17.4	31.3	223	51	A	H
	*	2440	102.14	-	-	88.23	27.66	17.51	31.26	223	51	P	H
	*	2440	101.49	-	-	87.58	27.66	17.51	31.26	223	51	A	H
		2486.64	55.49	-18.51	74	41.53	27.62	17.58	31.24	223	51	P	H
		2492.96	46.03	-7.97	54	32.06	27.61	17.59	31.23	223	51	A	H
		2369.4	56.67	-17.33	74	42.72	27.85	17.4	31.3	290	138	P	V
		2369.4	46.51	-7.49	54	32.56	27.85	17.4	31.3	290	138	A	V
	*	2440	100.54	-	-	86.7	27.59	17.51	31.26	290	138	P	V
	*	2440	100.32	-	-	86.48	27.59	17.51	31.26	290	138	A	V
		2490.96	55.04	-18.96	74	41.18	27.5	17.59	31.23	290	138	P	V
		2495.04	45.98	-8.02	54	32.13	27.49	17.59	31.23	290	138	A	V



BLE	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Margin 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 39 2480MHz	*	2480	97.47	-	-	83.51	27.63	17.57	31.24	108	126	P	H
	*	2480	97.2	-	-	83.24	27.63	17.57	31.24	108	126	A	H
		2496.88	56.3	-17.7	74	42.32	27.61	17.6	31.23	108	126	P	H
		2486.16	46.15	-7.85	54	32.19	27.62	17.58	31.24	108	126	A	H
													H
													H
	*	2480	100.95	-	-	87.11	27.51	17.57	31.24	177	268	P	V
	*	2480	100.74	-	-	86.9	27.51	17.57	31.24	177	268	A	V
		2487.24	56.7	-17.3	74	42.86	27.5	17.58	31.24	177	268	P	V
		2487.96	46.48	-7.52	54	32.64	27.5	17.58	31.24	177	268	A	V
													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 )	Margin 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 00 2402MHz		4804	39.41	-34.59	74	64.63	31.51	11.19	67.92	-	-	P	H
		10890	49.62	-24.38	74	61.16	40.16	16.74	68.44	-	-	P	H
		10890	40.44	-13.56	54	51.98	40.16	16.74	68.44	-	-	A	H
		14490	50.72	-23.28	74	56.92	41.94	19.6	67.74	-	-	P	H
		14490	40.79	-13.21	54	46.99	41.94	19.6	67.74	-	-	A	H
		18000	58.39	-15.61	74	56.55	48.82	22.44	69.42	-	-	P	H
		18000	48.66	-5.34	54	46.82	48.82	22.44	69.42	-	-	A	H
													H
													H
													H
													H
													H
													V
		4804	42.23	-31.77	74	67.42	31.54	11.19	67.92	-	-	P	V
		11340	48.96	-25.04	74	60.33	39.81	17.12	68.3	-	-	P	V
		11340	39.35	-14.65	54	50.72	39.81	17.12	68.3	-	-	A	V
		14490	51.04	-22.96	74	57.24	41.94	19.6	67.74	-	-	P	V
		14490	41.64	-12.36	54	47.84	41.94	19.6	67.74	-	-	A	V
		17970	59.11	-14.89	74	58.1	48.36	22.41	69.76	-	-	P	V
		17970	49.78	-4.22	54	48.77	48.36	22.41	69.76	-	-	A	V
													V
													V
													V
													V



BLE	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Margin 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	39.9	-34.1	74	65.01	31.45	11.35	67.91	-	-	P	H
		7320	44.24	-29.76	74	60.96	36.33	13.78	66.83	-	-	P	H
		11580	49.47	-24.53	74	59.63	40.02	17.32	67.5	-	-	P	H
		11580	39.02	-14.98	54	49.18	40.02	17.32	67.5	-	-	A	H
		14490	51.26	-22.74	74	57.46	41.94	19.6	67.74	-	-	P	H
		14490	41.72	-12.28	54	47.92	41.94	19.6	67.74	-	-	A	H
		17955	58.7	-15.3	74	58.58	47.65	22.4	69.93	-	-	P	H
		17955	49.04	-4.96	54	48.92	47.65	22.4	69.93	-	-	A	H
													H
													H
													H
													H
													V
		4880	41.36	-32.64	74	66.54	31.38	11.35	67.91	-	-	P	V
		7320	44.23	-29.77	74	60.88	36.4	13.78	66.83	-	-	P	V
		11370	48.87	-25.13	74	60.03	39.87	17.14	68.17	-	-	P	V
		11370	39.63	-14.37	54	50.79	39.87	17.14	68.17	-	-	A	V
		14490	51.35	-22.65	74	57.55	41.94	19.6	67.74	-	-	P	V
		14490	41.78	-12.22	54	47.98	41.94	19.6	67.74	-	-	A	V
		17970	59.27	-14.73	74	58.26	48.36	22.41	69.76	-	-	P	V
		17970	49.69	-4.31	54	48.68	48.36	22.41	69.76	-	-	A	V
													V
													V
													V



BLE	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Margin 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 39 2480MHz		4980	39.37	-34.63	74	64.29	31.57	11.56	68.05	-	-	P	H
		7440	43.68	-30.32	74	60.56	36.49	13.91	67.28	-	-	P	H
		11385	49.78	-24.22	74	60.75	39.97	17.15	68.09	-	-	P	H
		11385	39.53	-14.47	54	50.5	39.97	17.15	68.09	-	-	A	H
		14490	52.37	-21.63	74	58.57	41.94	19.6	67.74	-	-	P	H
		14490	42.37	-11.63	54	48.57	41.94	19.6	67.74	-	-	A	H
		18000	58.33	-15.67	74	56.49	48.82	22.44	69.42	-	-	P	H
		18000	48.79	-5.21	54	46.95	48.82	22.44	69.42	-	-	A	H
													H
													H
													H
													H
													V
		4980	38.86	-35.14	74	63.73	31.62	11.56	68.05	-	-	P	V
		7440	45.19	-28.81	74	62.09	36.47	13.91	67.28	-	-	P	V
		10935	49.39	-24.61	74	60.79	40.1	16.78	68.28	-	-	P	V
		10935	38.72	-15.28	54	50.12	40.1	16.78	68.28	-	-	A	V
		14490	50.76	-23.24	74	56.96	41.94	19.6	67.74	-	-	P	V
		14490	40.64	-13.36	54	46.84	41.94	19.6	67.74	-	-	A	V
		17985	58.54	-15.46	74	57	48.7	22.43	69.59	-	-	P	V
		17985	49.35	-4.65	54	47.81	48.7	22.43	69.59	-	-	A	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. 4. The emission level close to 18GHz is checked that the average emission level is noise floor only.											



## Emission above 18GHz

## 2.4GHz BLE (SHF)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.	
2.4GHz BLE SHF	24629	40.66	-33.34	74	37.14	38.9	16.07	51.45	-	-	P	H		
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
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.													



## Emission below 1GHz

## 2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
												Limit	Line
												Level	Factor
2.4GHz BLE LF		38.73	30.84	-9.16	40	41.88	20.36	1.04	32.44	-	-	P	H
		96.93	30.59	-12.91	43.5	45.73	15.59	1.69	32.42	-	-	P	H
		375.32	34.14	-11.86	46	42.32	21.21	3.09	32.48	223	309	Q	H
		499.48	38.29	-7.71	46	43.16	24.09	3.62	32.58	-	-	P	H
		624.61	38.51	-7.49	46	41.15	25.98	3.97	32.59	-	-	P	H
		874.87	36.05	-9.95	46	33.85	29.2	4.78	31.78	282	360	Q	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													V
2.4GHz BLE LF		34.85	32.36	-7.64	40	41.14	22.68	0.97	32.43	100	261	Q	V
		62.98	26.97	-13.03	40	46.21	11.9	1.29	32.43	118	282	Q	V
		105.66	32.55	-10.95	43.5	46.45	16.77	1.74	32.41	-	-	P	V
		375.32	36.54	-9.46	46	44.72	21.21	3.09	32.48	-	-	P	V
		499.48	36.53	-9.47	46	41.4	24.09	3.62	32.58	-	-	P	V
		624.61	38.7	-7.3	46	41.34	25.98	3.97	32.59	-	-	P	V
													V
													V
													V
													V
Remark	1.	No other spurious found.											
	2.	All results are PASS against Peak and Average limit line.											
Remark	3.	The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or noise floor only.											

**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 or Average</b>
H/V	<b>Horizontal or Vertical</b>



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

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
			Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
<b>BLE CH 00 2402MHz</b>		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(dB $\mu$ V/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB $\mu$ V) - Preamp Factor(dB)

3. Margin Limit(dB) = Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ V/m)

#### For Peak Limit @ 2390MHz:

1. Level(dB $\mu$ V/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB $\mu$ V) - 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. Margin Limit(dB)

= Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ V/m)

= 55.45(dB $\mu$ V/m) – 74(dB $\mu$ V/m)

= -18.55(dB)

#### For Average Limit @ 2390MHz:

1. Level(dB $\mu$ V/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB $\mu$ 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)

1. Margin Limit(dB)

= Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ 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”.



## Appendix C. Radiated Spurious Emission Plots

<b>Test Engineer :</b>	Michael Bui, Daniel Lee, Yuan Lee and Fu Chen	<b>Temperature :</b>	20~25°C
		<b>Relative Humidity :</b>	42~50%

### Note symbol

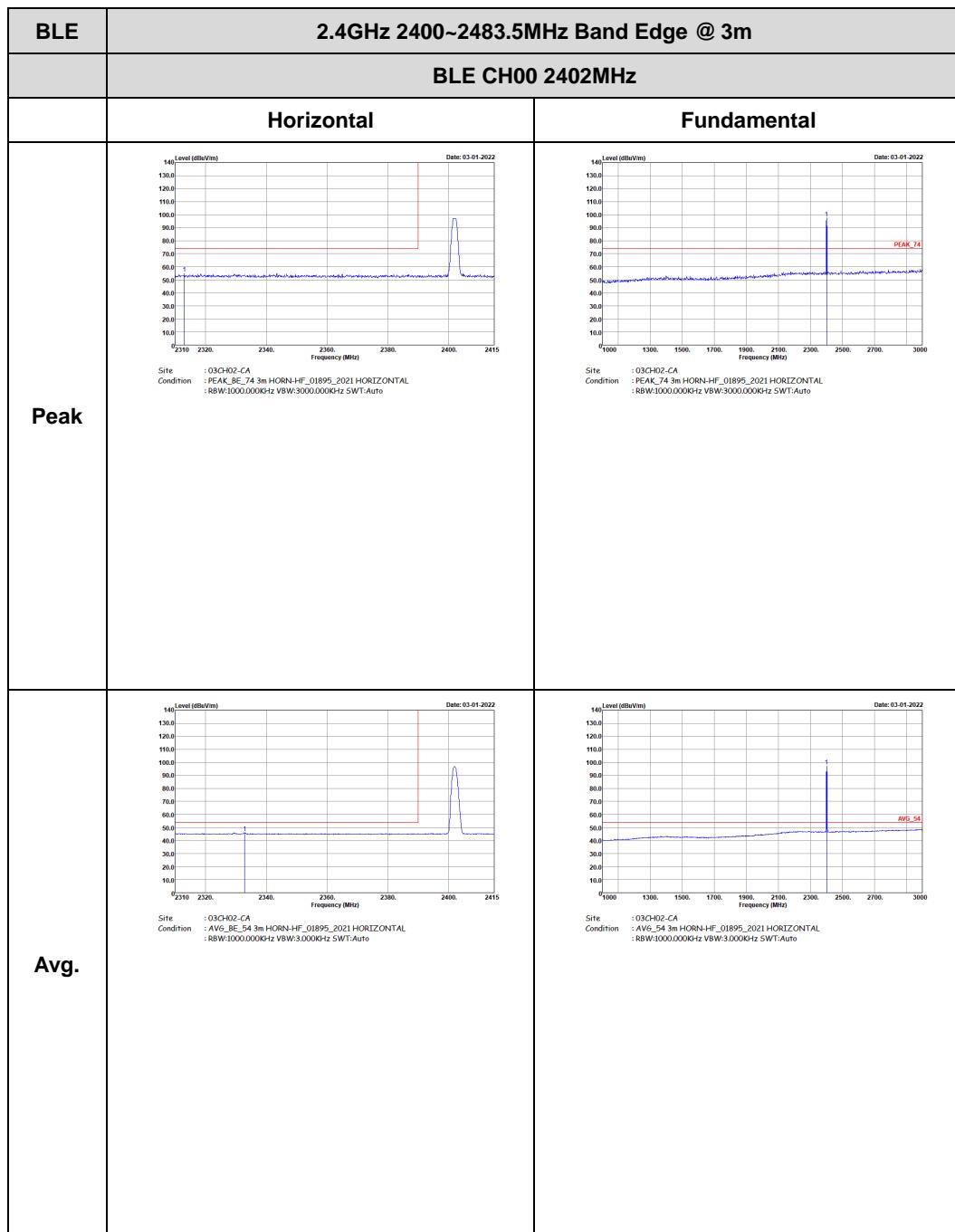
-L	<b>Low channel location</b>
-R	<b>High channel location</b>

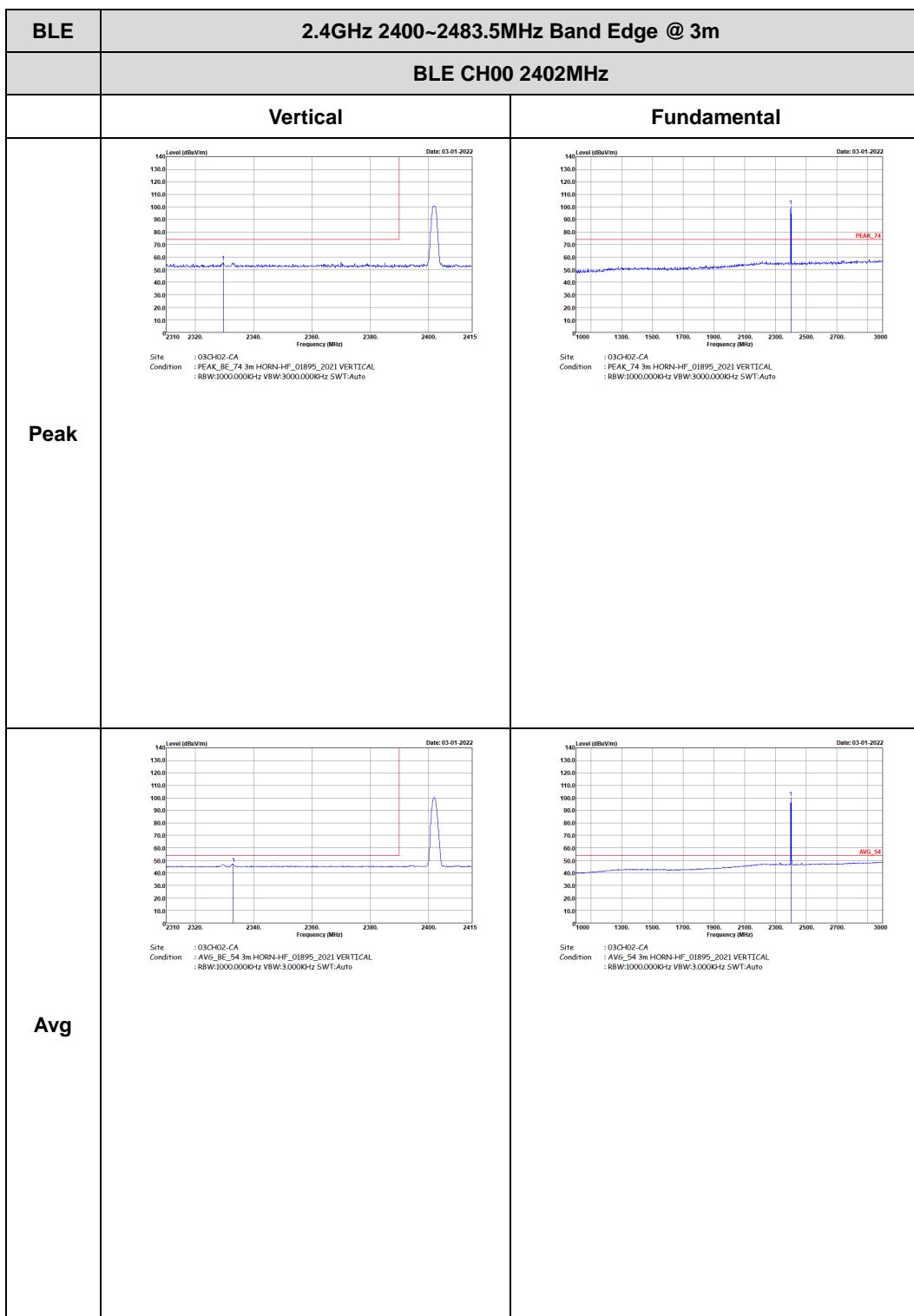


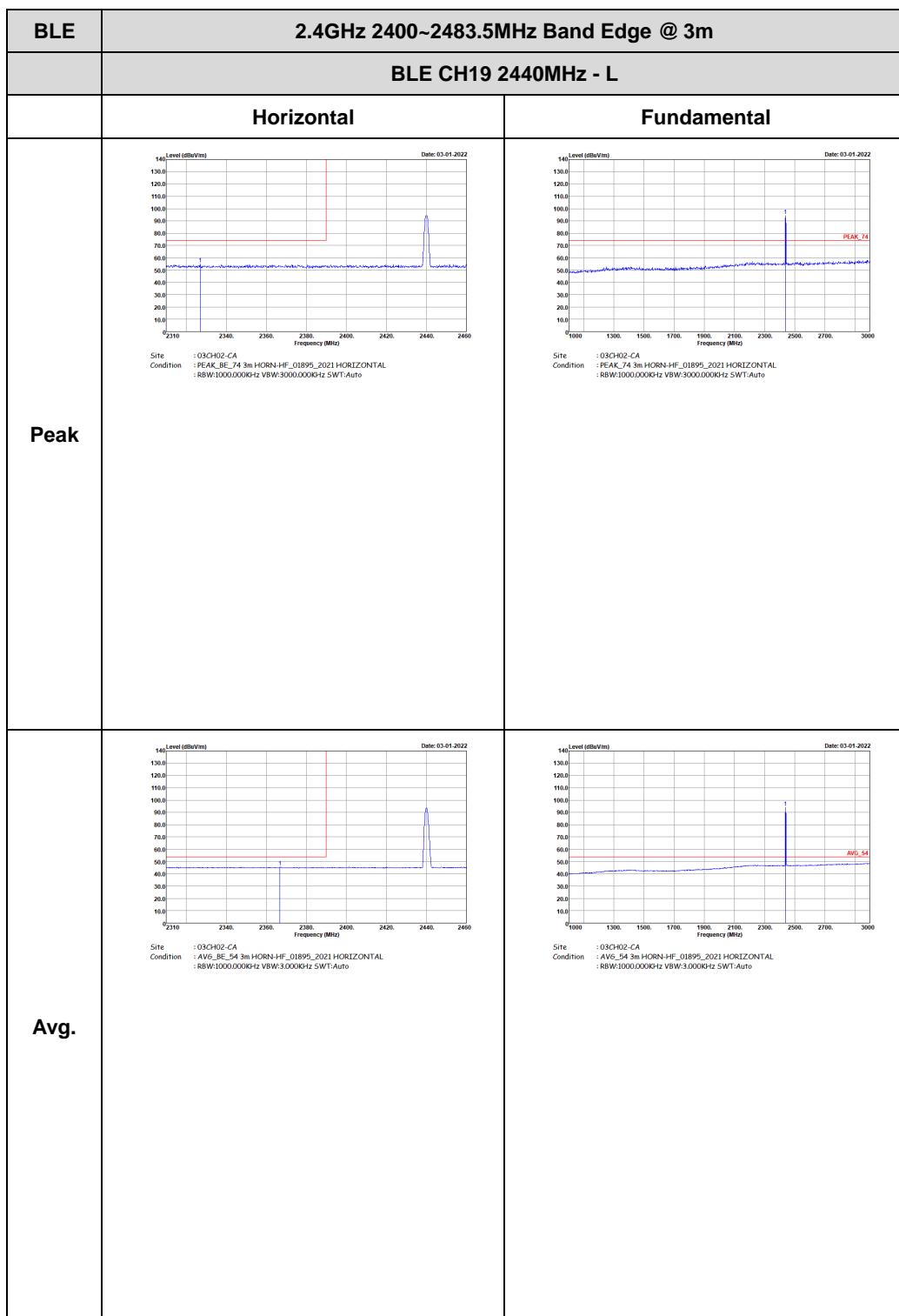
&lt;Sample 1&gt;

2.4GHz 2400~2483.5MHz

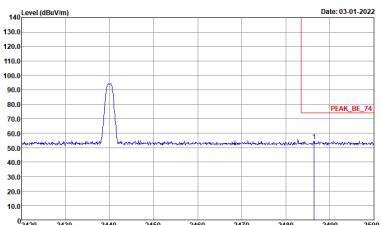
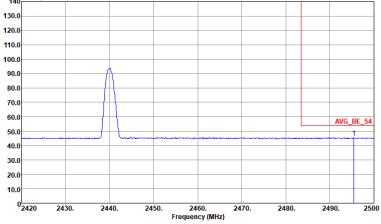
BLE (Band Edge @ 3m)

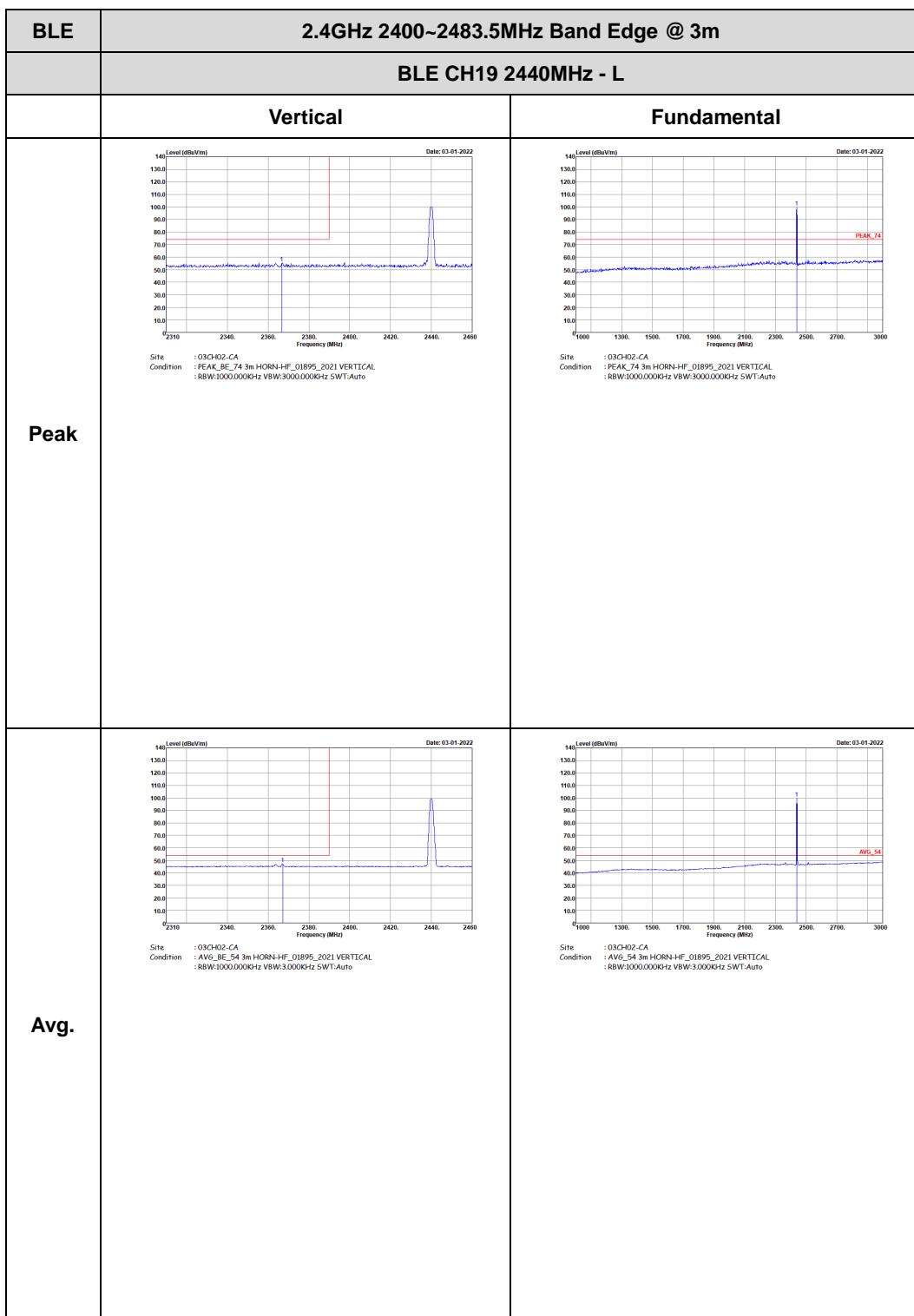




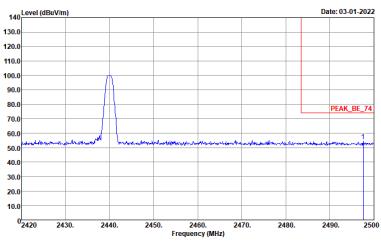
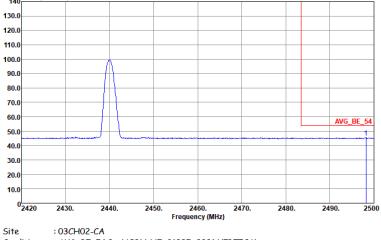


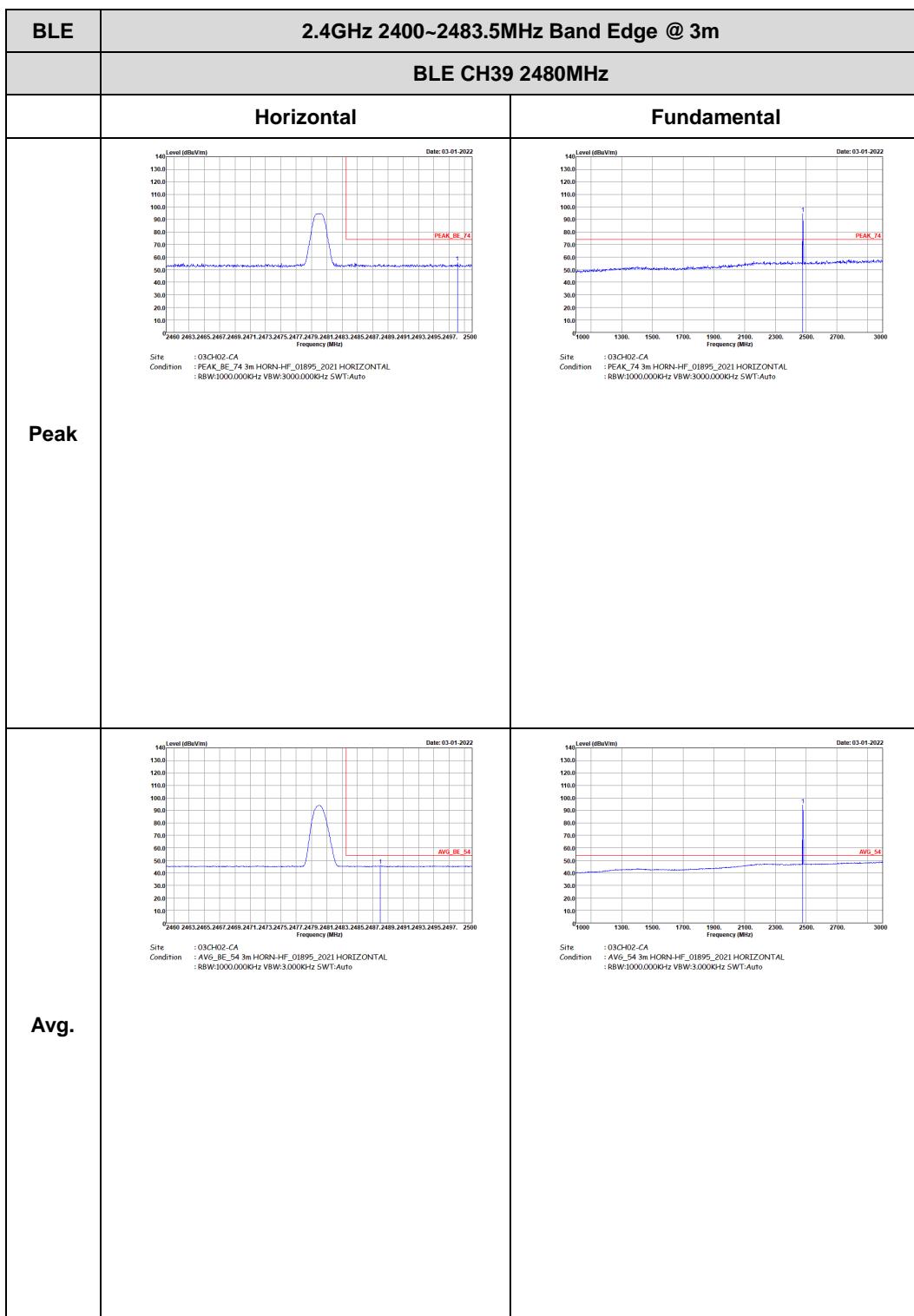


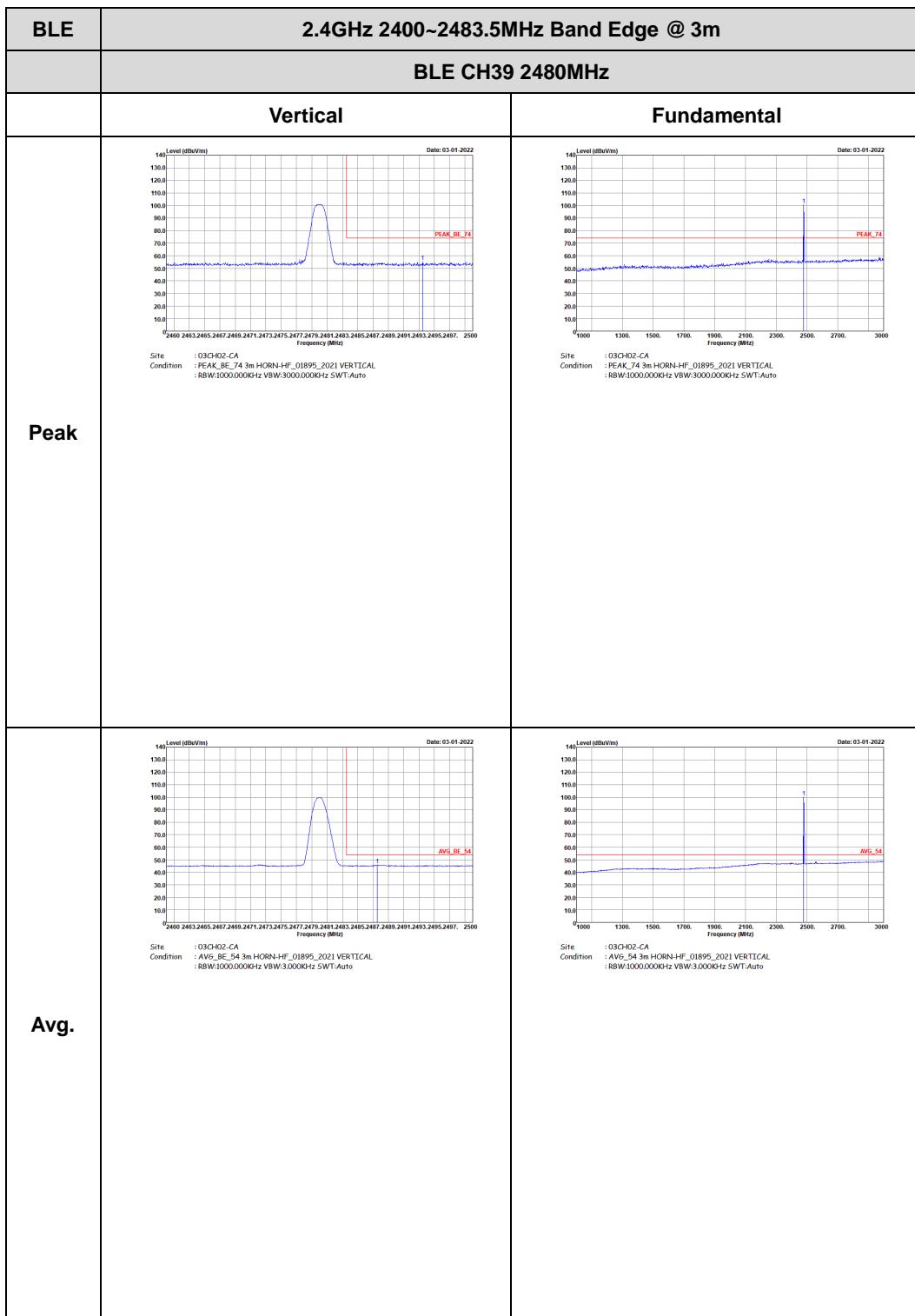
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Horizontal	Fundamental
Peak	 <p>Level (dBuV/m)</p> <p>Date: 03-01-2022</p> <p>PEAK_BE_74</p> <p>Site : 03CH02-CA</p> <p>Condition : PEAK_BE_74 3m HORN-HF_01895_2021 HORIZONTAL</p> <p>: 88W:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	 <p>Level (dBuV/m)</p> <p>Date: 03-01-2022</p> <p>AVG_BE_54</p> <p>Site : 03CH02-CA</p> <p>Condition : AVG_BE_54 3m HORN-HF_01895_2021 HORIZONTAL</p> <p>: 88W:1000.000KHz VBW:3.000KHz SWT:Auto</p>	Left blank





BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak	 <p>Level (dBuV/m)</p> <p>Date: 03-01-2022</p> <p>2420 2430. 2440. 2450. 2460. 2470. 2480. 2490. 2500</p> <p>Frequency (MHz)</p> <p>Site : 03CH02-CA</p> <p>Condition : PEAK_BE_74 3m HORN-HF_01895_2021 VERTICAL</p> <p>: 88W:1000.000KHz VBW:3000.000KHz SWF:Auto</p>	Left blank
Avg.	 <p>Level (dBuV/m)</p> <p>Date: 03-01-2022</p> <p>2420 2430. 2440. 2450. 2460. 2470. 2480. 2490. 2500</p> <p>Frequency (MHz)</p> <p>Site : 03CH02-CA</p> <p>Condition : AVG_BE_54 3m HORN-HF_01895_2021 VERTICAL</p> <p>: 88W:1000.000KHz VBW:3.000KHz SWF:Auto</p>	Left blank

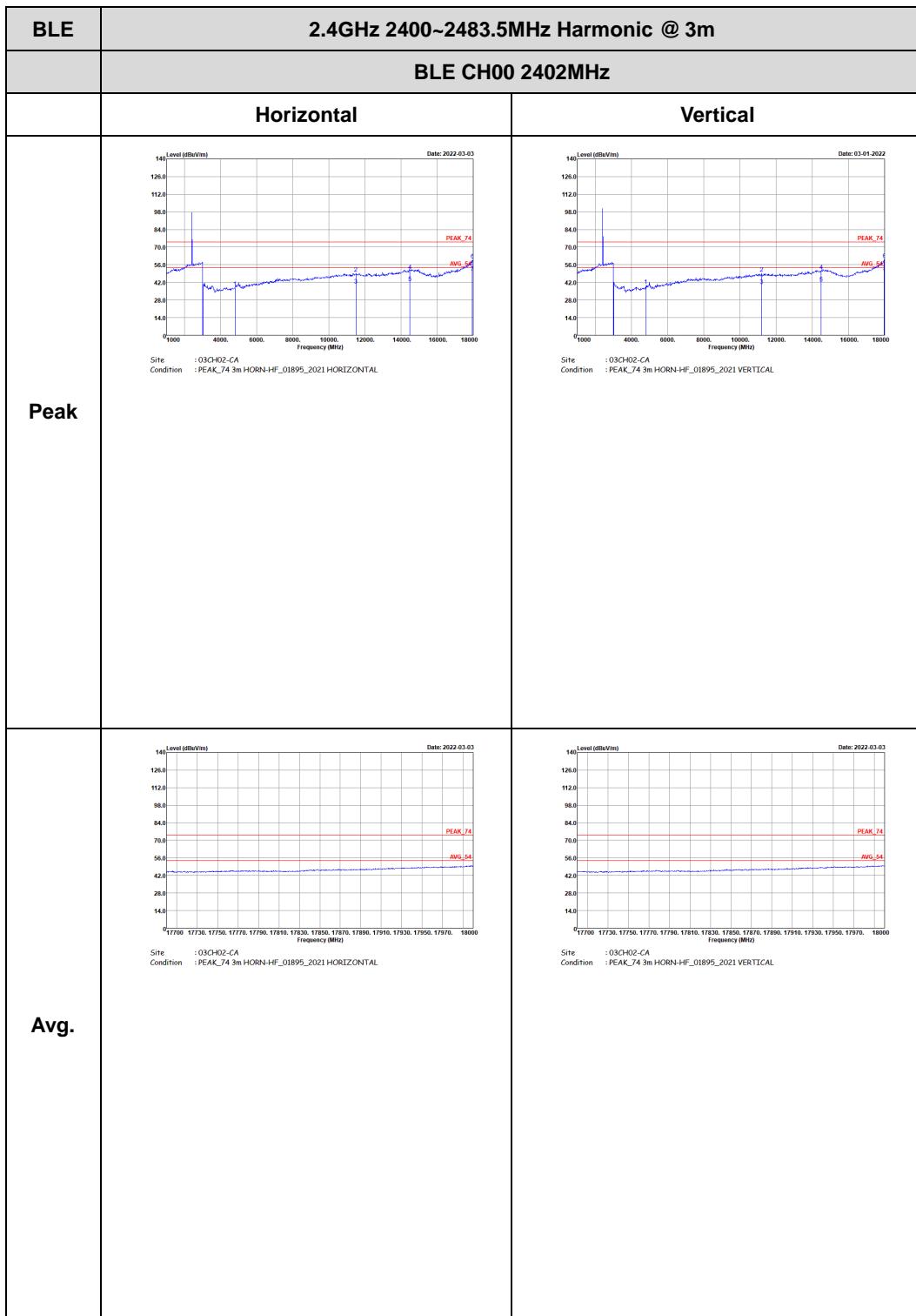


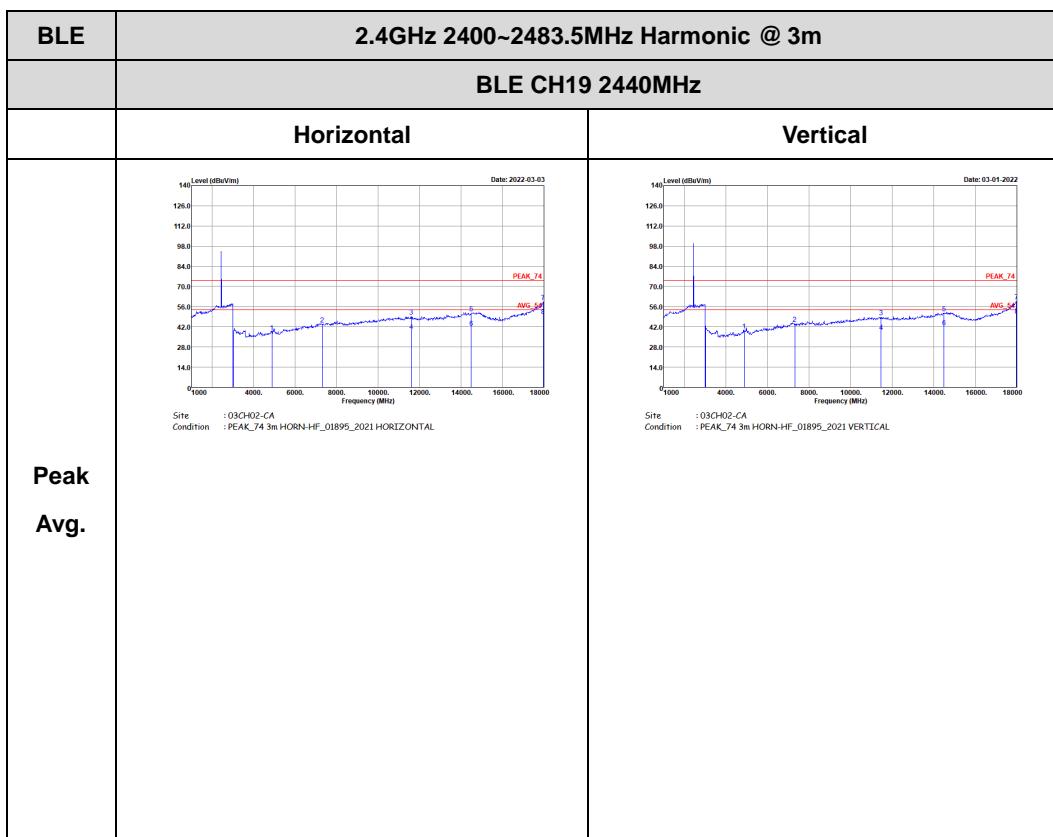


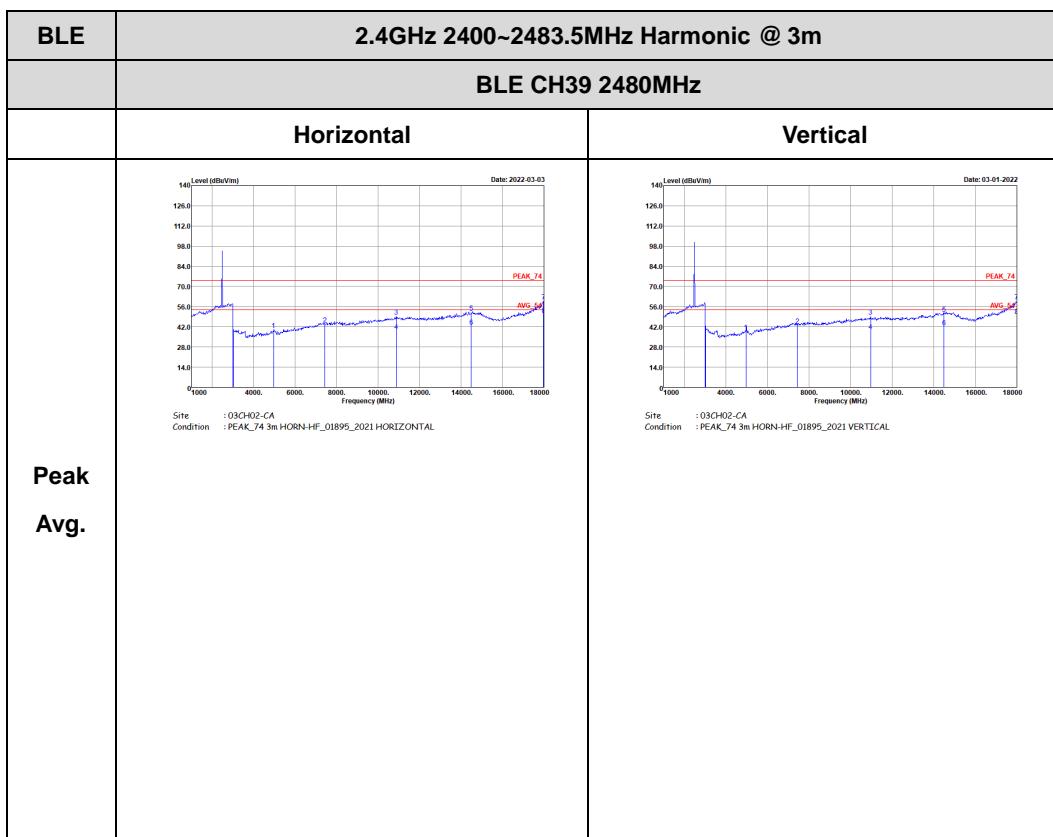


## 2.4GHz 2400~2483.5MHz

## BLE (Harmonic @ 3m)



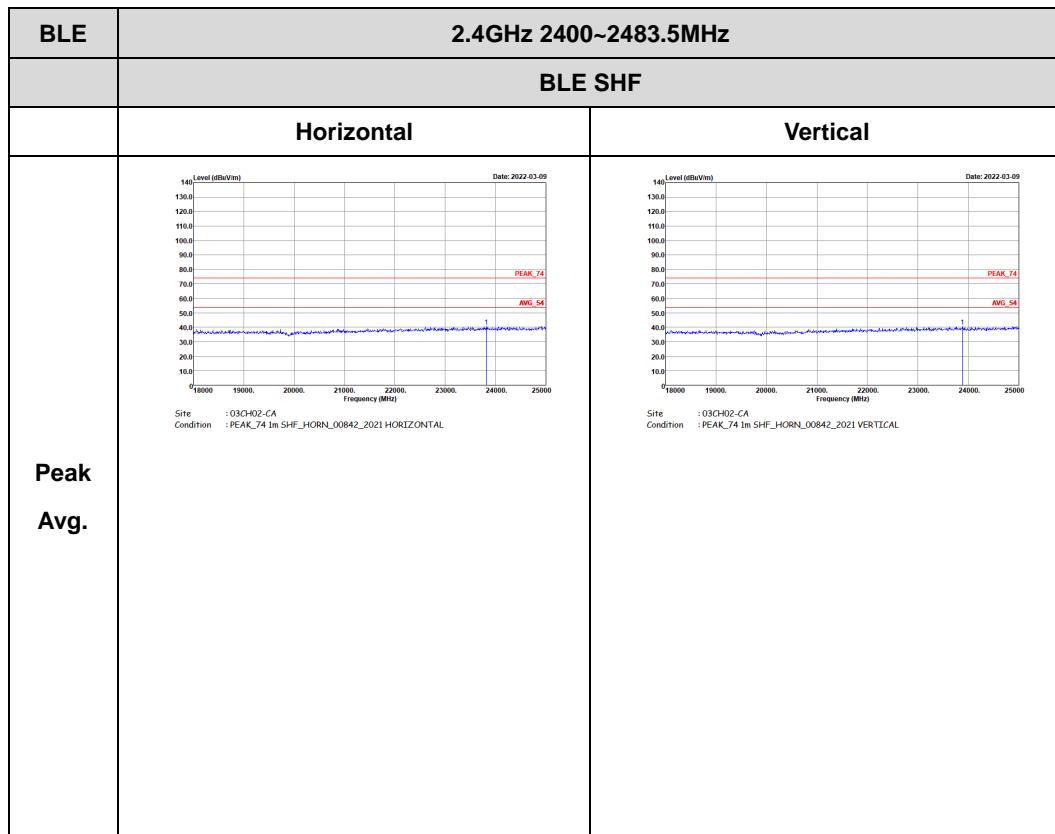






## Emission above 18GHz

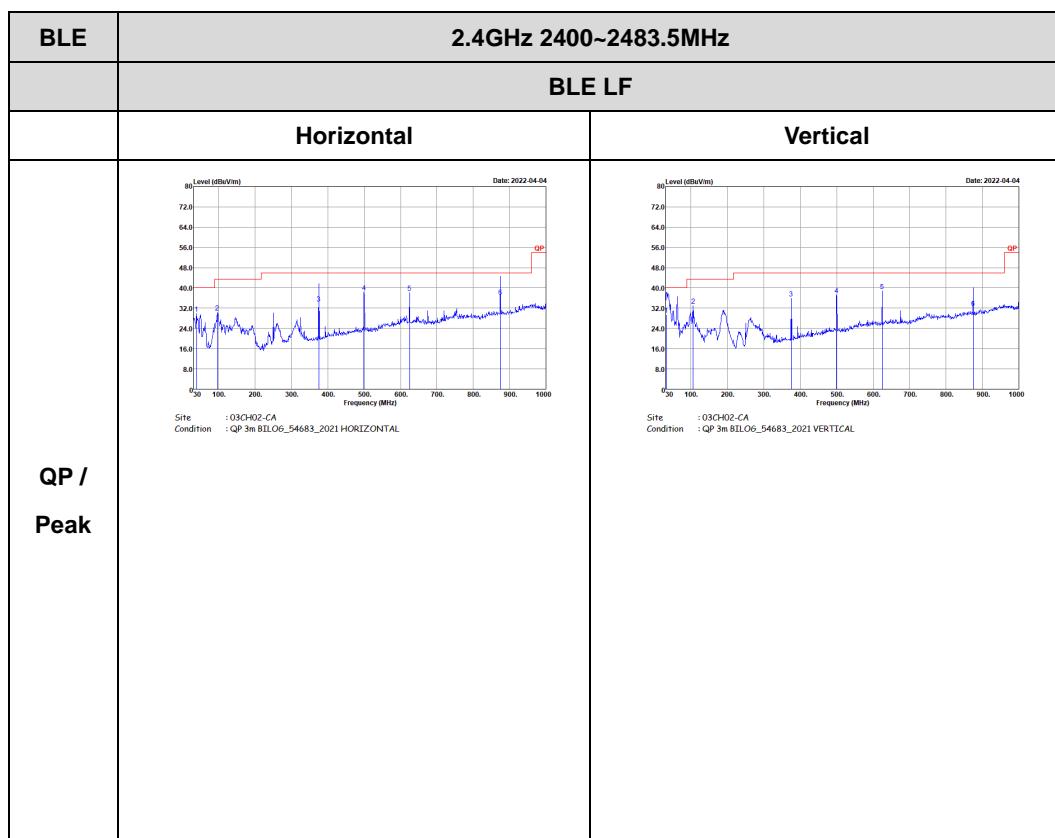
## 2.4GHz BLE (SHF @ 1m)





## Emission below 1GHz

## 2.4GHz BLE (LF)

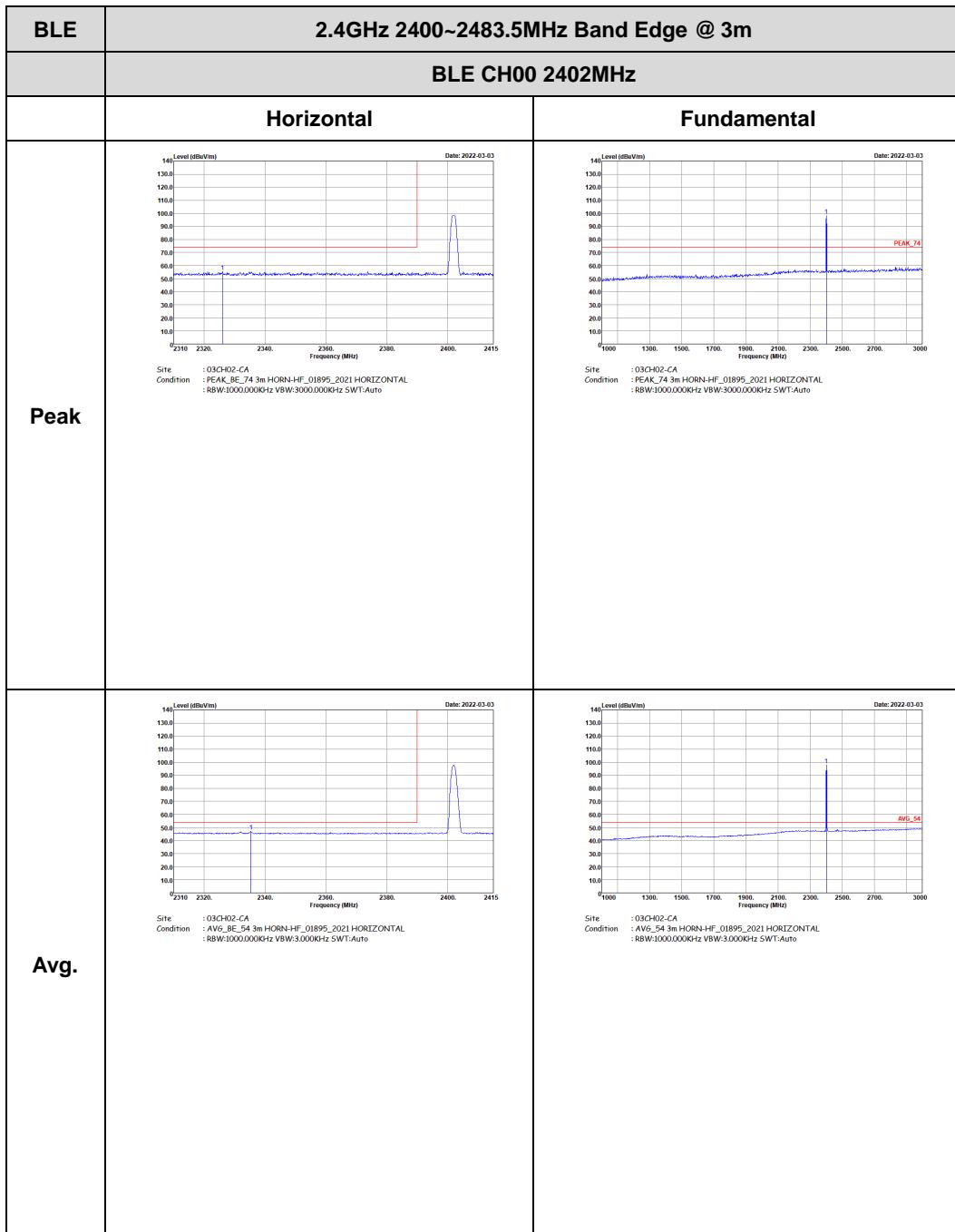


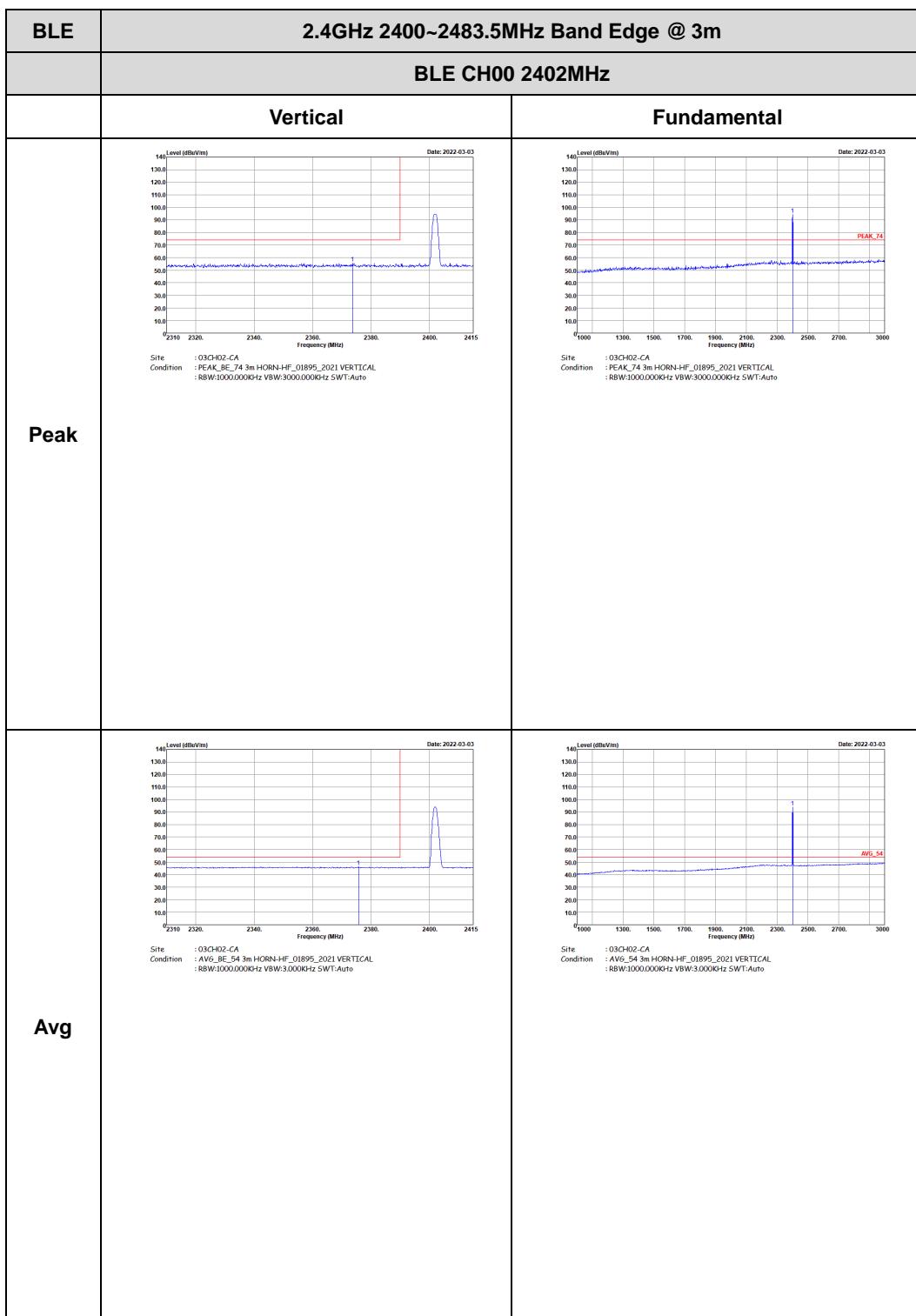


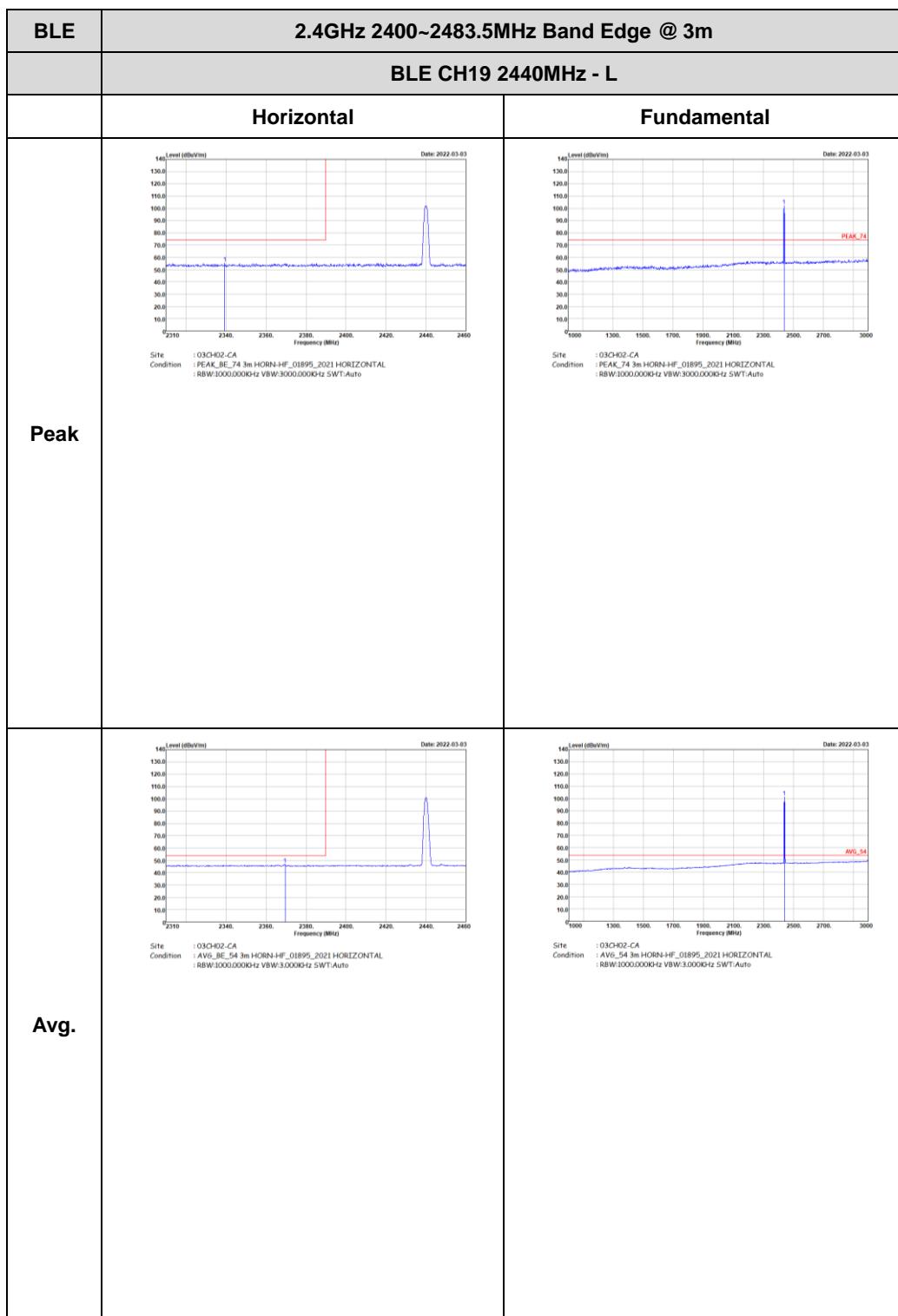
&lt;Sample 2&gt;

2.4GHz 2400~2483.5MHz

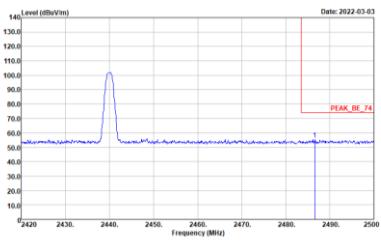
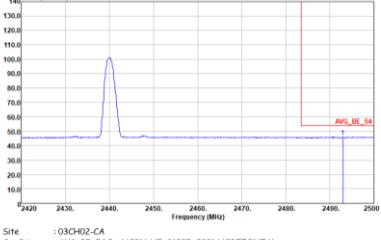
BLE (Band Edge @ 3m)

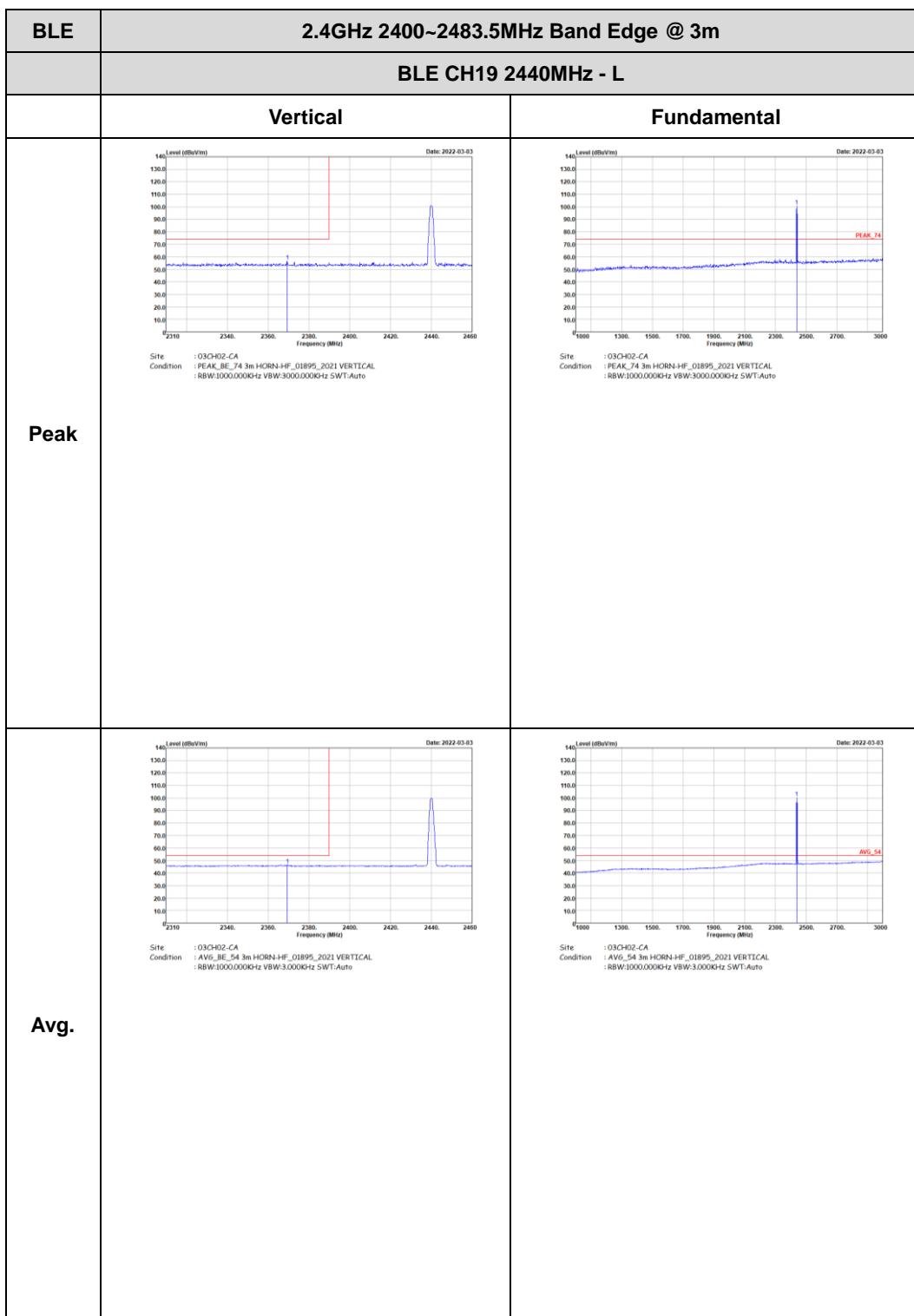




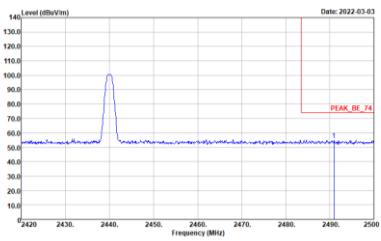
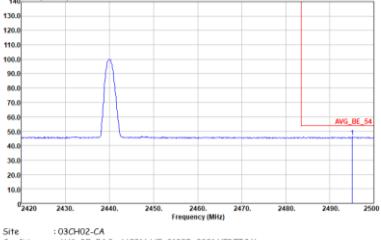


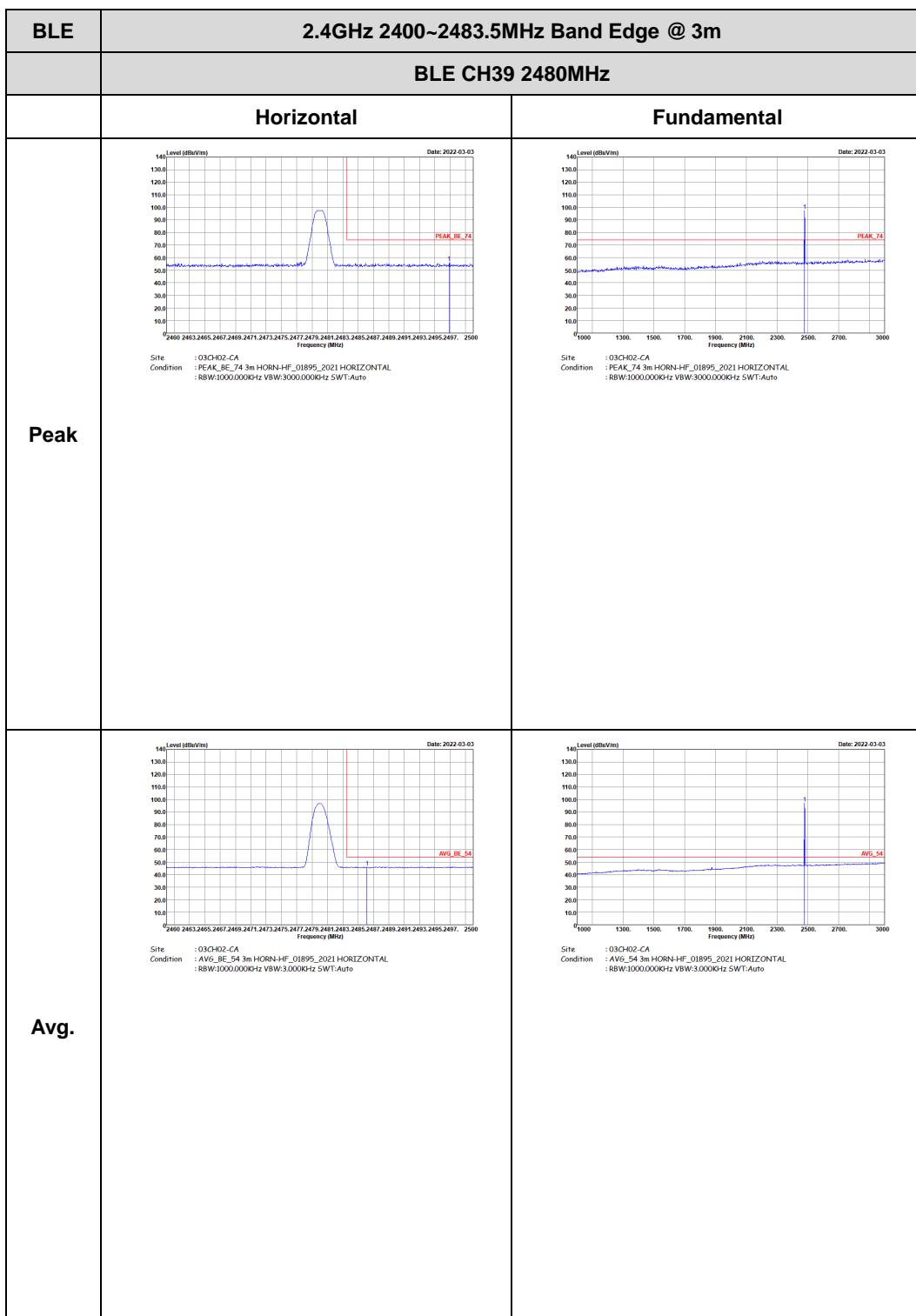


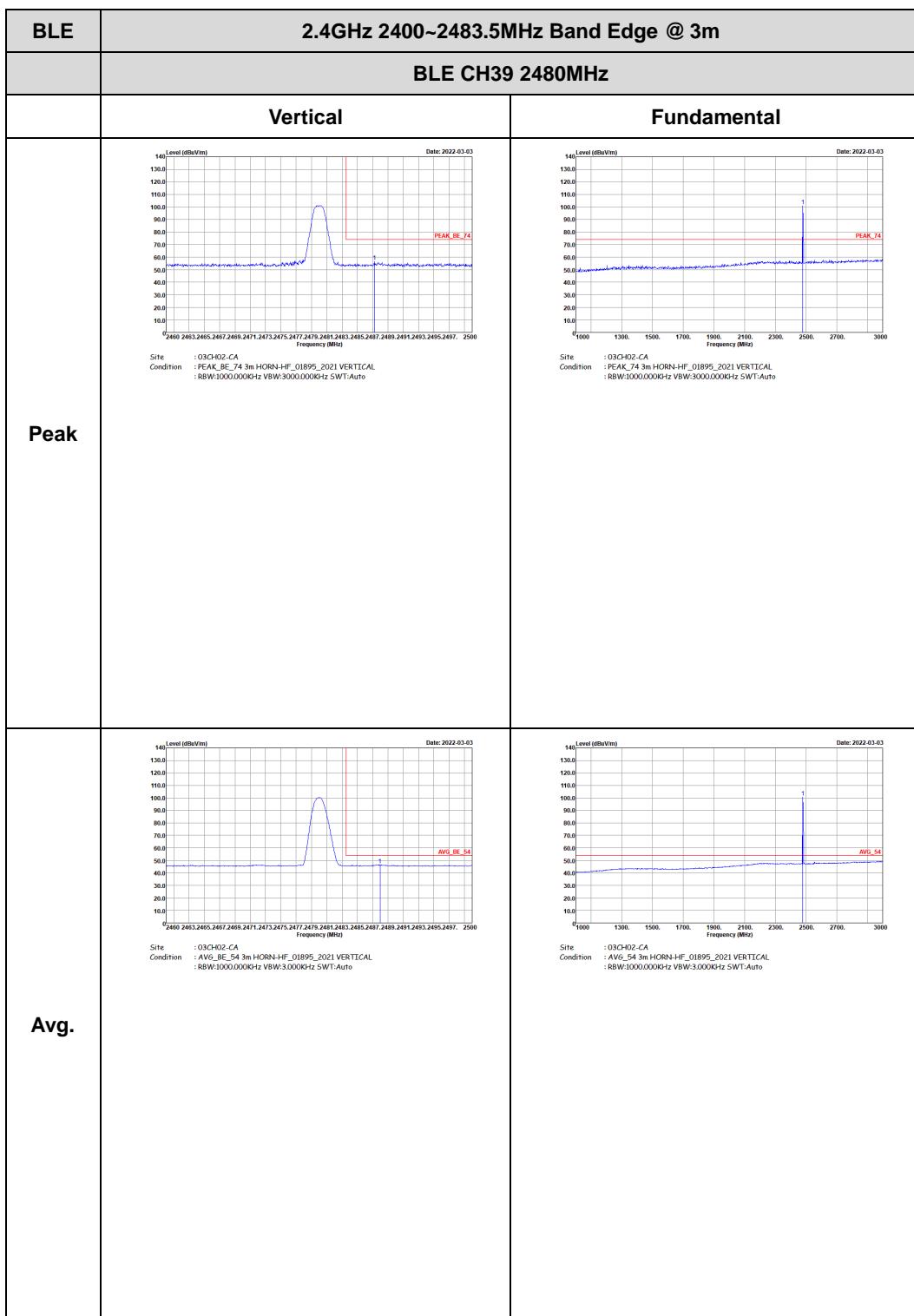
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Horizontal	Fundamental
Peak	 <p>Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto</p>	Left blank
Avg.	 <p>Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.0000Hz VBW:3.0000Hz SWT:Auto</p>	Left blank





BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak	 <p>14 Level (dBmV/m) Date: 2022-03-03 2420 2430. 2440. 2450. 2460. 2470. 2480. 2490. 2500 Frequency (MHz) Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto</p>	Left blank
Avg.	 <p>14 Level (dBmV/m) Date: 2022-03-03 2420 2430. 2440. 2450. 2460. 2470. 2480. 2490. 2500 Frequency (MHz) Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.0000Hz VBW:3.0000Hz SWT:Auto</p>	Left blank

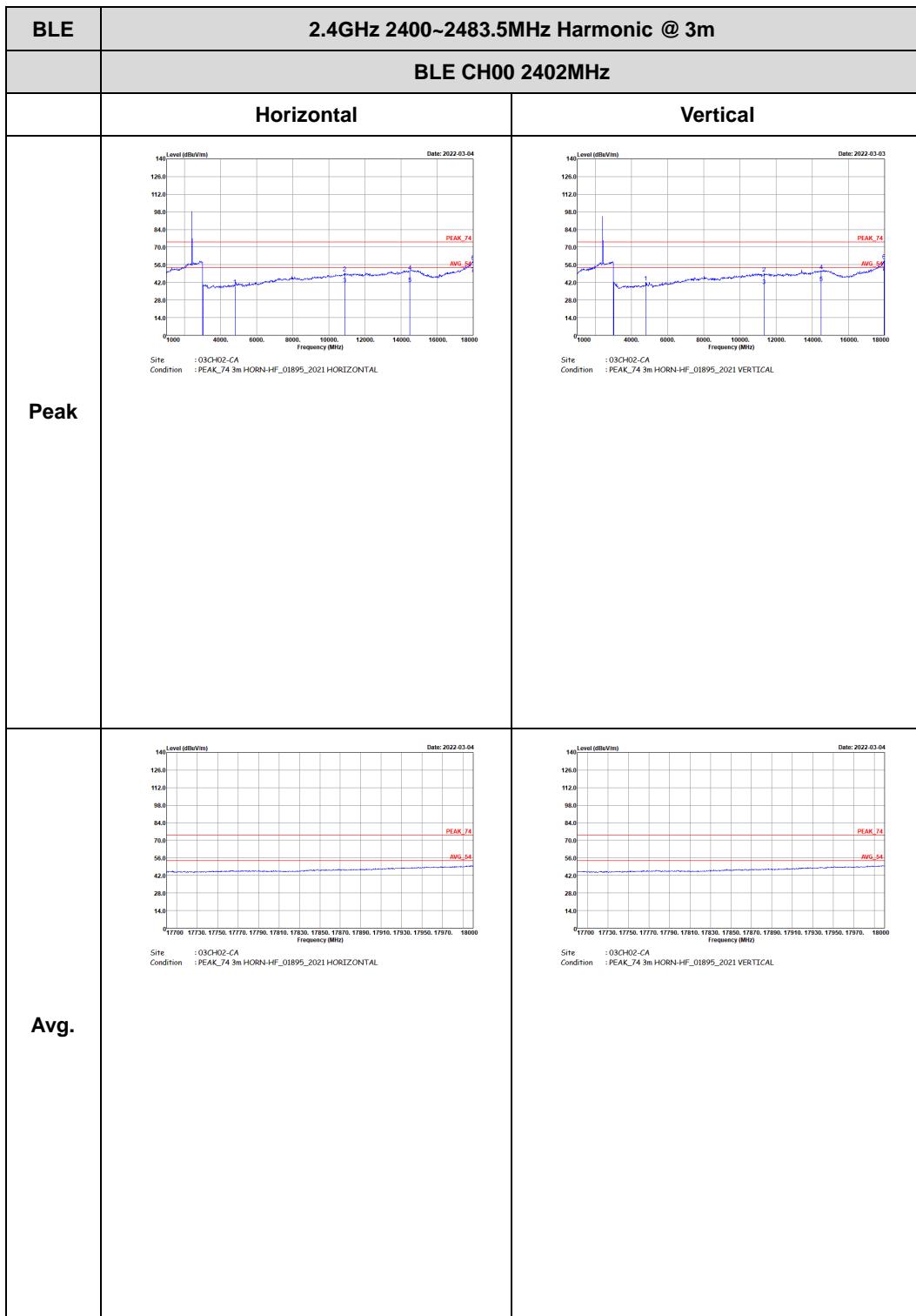


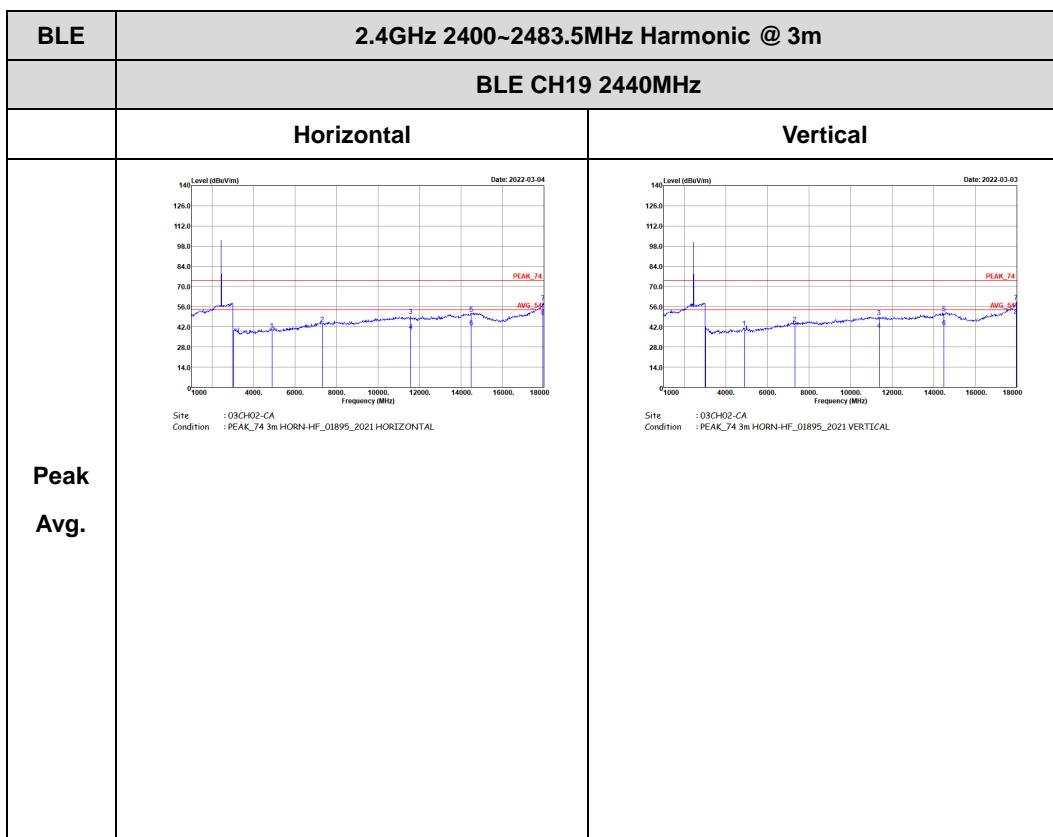


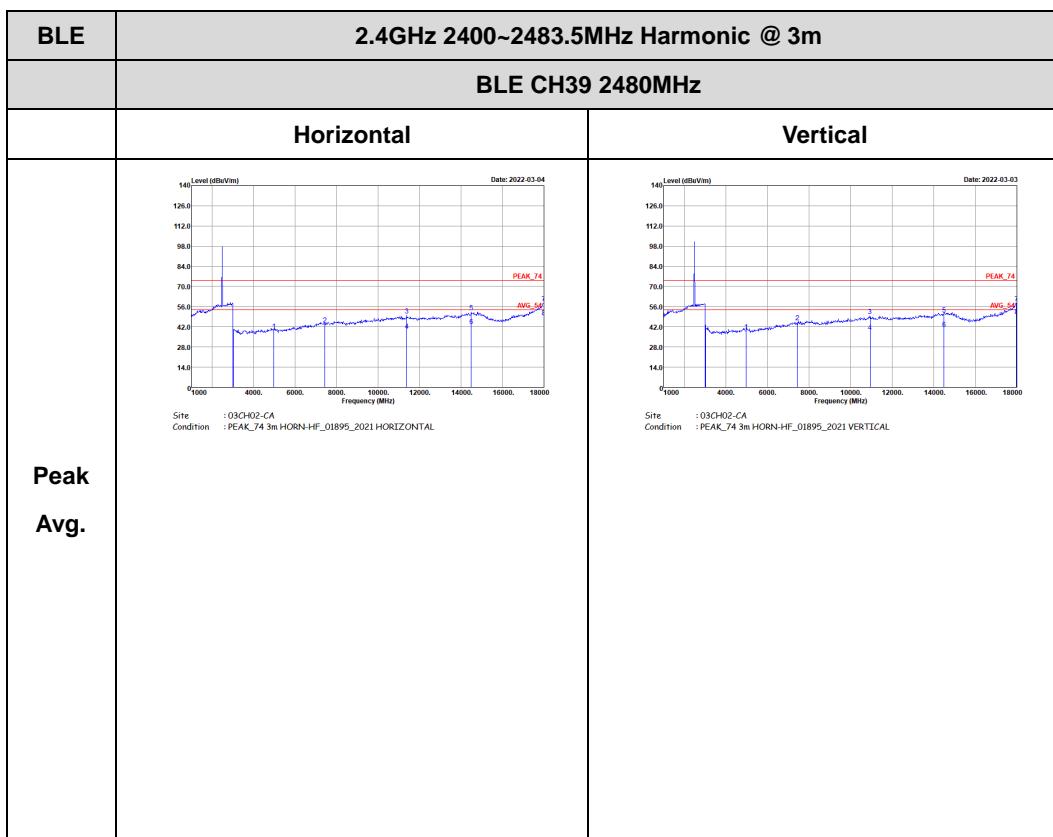


## 2.4GHz 2400~2483.5MHz

## BLE (Harmonic @ 3m)



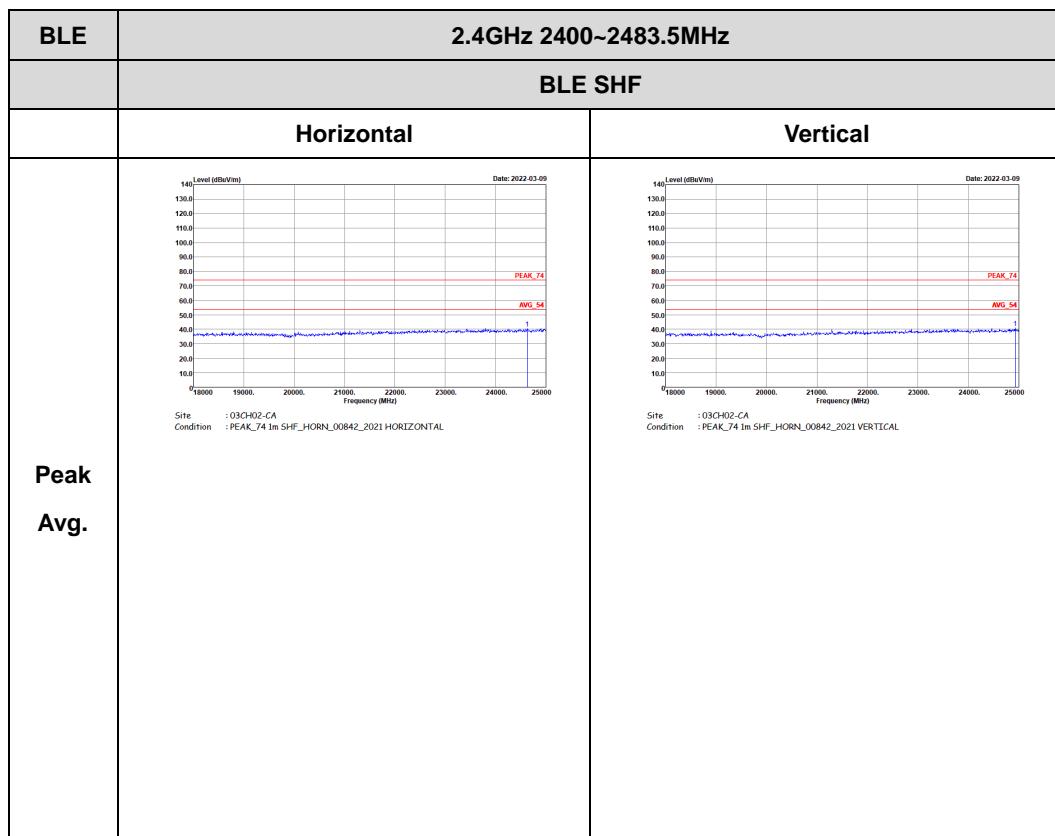






## Emission above 18GHz

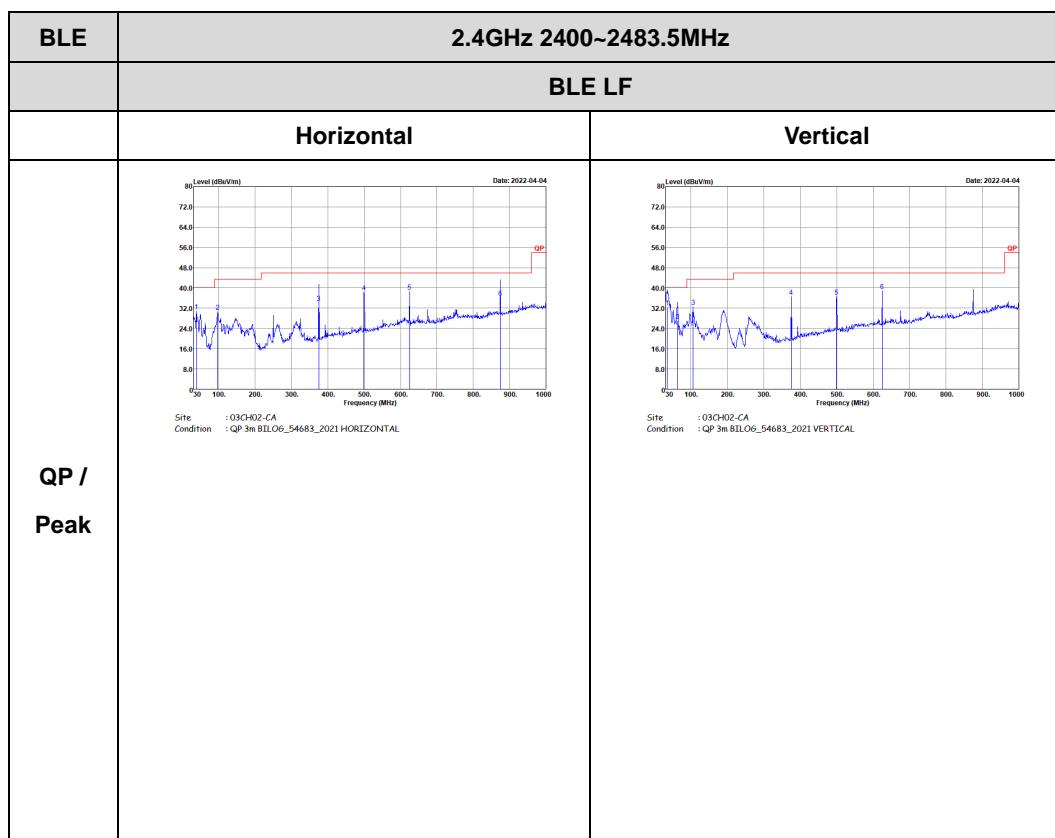
## 2.4GHz BLE (SHF @ 1m)





## Emission below 1GHz

## 2.4GHz BLE (LF)

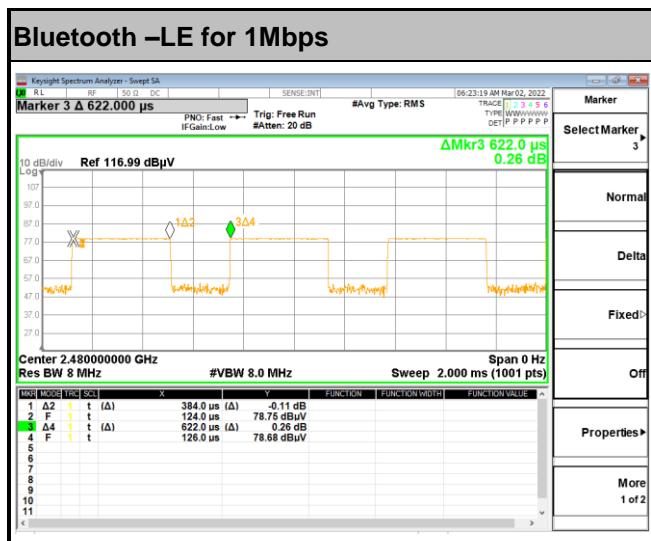




## Appendix D. Duty Cycle Plots

<Sample 1>

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth - LE for 1Mbps	61.74	384	2.60	3kHz



<Sample 2>

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth - LE for 1Mbps	61.86	386	2.59	3kHz

