



# FCC RADIO TEST REPORT

**FCC ID** : 2AY4J-TK23  
**Equipment** : Tack GPS Location Tracker  
**Brand Name** : Tack  
**Model Name** : TK23  
**Marketing Name** : Tackgps Plus  
**Applicant** : Tack One Private Limited  
22 SIN MING LANE #06-76, SINGAPORE 573969  
**Manufacturer** : Tack One Private Limited  
22 SIN MING LANE #06-76, SINGAPORE 573969  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on May 05, 2023 and testing was performed from May 24, 2023 to Jul. 05, 2023. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

**Sporton International Inc. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)



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### History of this test report

Report No.	Version	Description	Issue Date
FR342615A	01	Initial issue of report	Aug. 03, 2023
FR342615A	02	Revise Appendix D This report is an updated version, replacing the report issued on Aug. 03, 2023.	Sep. 08, 2023



## Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(2)	6dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.247(b)(3) 15.247(b)(4)	Output Power	Pass	-
3.3	15.247(e)	Power Spectral Density	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	4.24 dB under the limit at 7320.00 MHz
3.6	15.207	AC Conducted Emission	Pass	3.15 dB under the limit at 0.15 MHz
3.7	15.203	Antenna Requirement	Pass	-

**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. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty".

**Disclaimer:**

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

**Reviewed by: Alan Liu****Report Producer: Ming Chen**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Product Feature	
<b>General Specs</b> LTE, Bluetooth-LE, Wi-Fi 2.4GHz 802.11b/g/n, and GPS.	
<b>Antenna Type</b> WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth-LE: PIFA Antenna GPS: PIFA Antenna	

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	-0.36

**Remark:** The EUT's information above is declared by manufacturer. Please refer to Disclaimer 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>	Sporton International Inc. EMC & Wireless Communications Laboratory
<b>Test Site Location</b>	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
<b>Test Site No.</b>	<b>Sporton Site No.</b> CO05-HY, 03CH07-HY

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

<b>Test Site</b>	Sporton International Inc. Wensan Laboratory
<b>Test Site Location</b>	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
<b>Test Site No.</b>	<b>Sporton Site No.</b> TH05-HY (TAF Code: 3786)
<b>Remark</b>	The Conducted test item subcontracted to Sporton International Inc. Wensan Laboratory.

FCC designation No.: TW1190 and TW3786

### 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 15.247 Meas Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ ANSI C63.10-2013

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
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

### 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 only the worst case emissions were reported in this report.
- 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
<b>Conducted Test Cases</b>	<b>Bluetooth – LE / GFSK</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
	Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps
	Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps
	Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps
<b>Radiated Test Cases</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
	Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps
	Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps
	Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps
<b>AC Conducted Emission</b>	Mode 1: WLAN (2.4GHz) Link + Battery 1 + USB Cable (Charging/Data Link from Laptop)
	Mode 2: Bluetooth Tx + Battery 1 + USB Cable (Charging/Data Link from Laptop)
<b>Remark:</b>	
1. The worst case of Conducted Emission is mode 1; only the test data of it was reported.	
2. For Radiated Test Cases, the tests were performed with Battery 1.	
3. Data Link with Notebook means data application transferred mode between EUT and Notebook.	
4. For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.	



### 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.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
2.	Notebook	Dell	Latitude 3340	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

### 2.5 EUT Operation Test Setup

The RF test items, utility “EspRFTestTool\_v2.8\_Manual” 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.



## 2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

### 3 Test Result

#### 3.1 6dB and 99% Bandwidth Measurement

##### 3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW)  $\geq 3 * RBW$ .
6. Measure and record the results in the test report.

##### 3.1.4 Test Setup



##### 3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

##### 3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

## 3.2 Output Power Measurement

### 3.2.1 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.

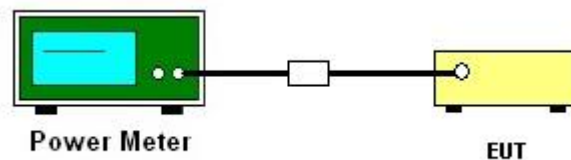
### 3.2.2 Measuring Instruments

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

### 3.2.3 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.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Average Output Power

Please refer to Appendix A.

### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

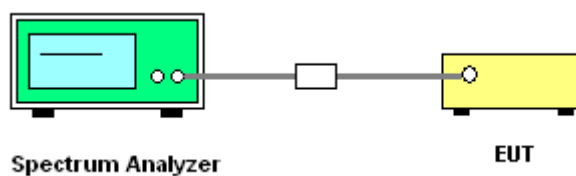
#### 3.3.2 Measuring Instruments

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

#### 3.3.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth (VBW) = 10 kHz. In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6 dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100 kHz is a reference level and is used as 20 dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

#### 3.3.4 Test Setup



#### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

#### 3.3.6 Test Result of Power Spectral Density Plots (100kHz)

Please refer to Appendix A.

#### 3.3.7 Test Result of Power Spectral Density Plots (3kHz)

Please refer to Appendix A.

## **3.4 Conducted Band Edges and Spurious Emission Measurement**

### **3.4.1 Limit of Conducted Band Edges and Spurious Emission**

All harmonics/spurious must be at least 30 dB down from the highest emission level within the authorized band.

### **3.4.2 Measuring Instruments**

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

### **3.4.3 Test Procedure**

1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Set RBW = 100 kHz, VBW = 300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### **3.4.4 Test Setup**



### **3.4.5 Test Result of Conducted Band Edges Plots**

Please refer to Appendix A.

### **3.4.6 Test Result of Conducted Spurious Emission Plots**

Please refer to Appendix A.



### 3.5 Radiated Band Edges and Spurious Emission Measurement

#### 3.5.1 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

#### 3.5.2 Measuring Instruments

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

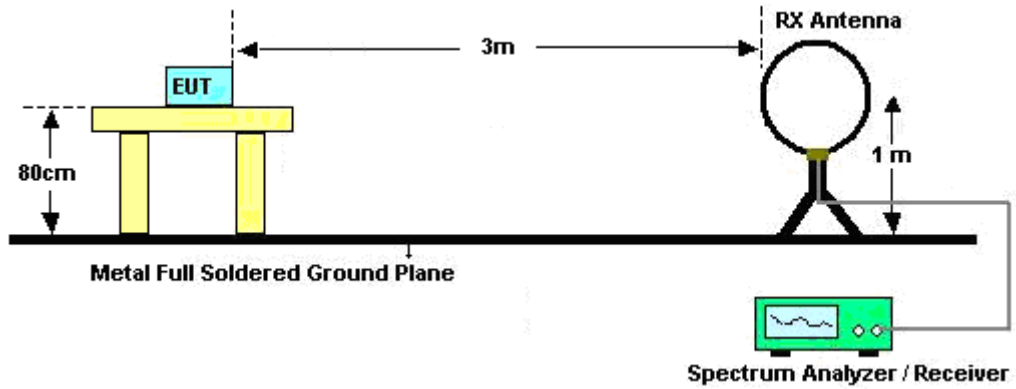
**3.5.3 Test Procedures**

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:  $\text{Antenna Factor} + \text{Cable Loss} + \text{Read Level} - \text{Preamp Factor} = \text{Level}$
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  $f < 1 \text{ GHz}$ ;  $\text{VBW} \geq \text{RBW}$ ; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW = 3 MHz for  $f \geq 1 \text{ GHz}$  for peak measurement.  
For average measurement:
    - $\text{VBW} = 10 \text{ Hz}$ , when duty cycle is no less than 98 percent.
    - $\text{VBW} \geq 1/T$ , 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.

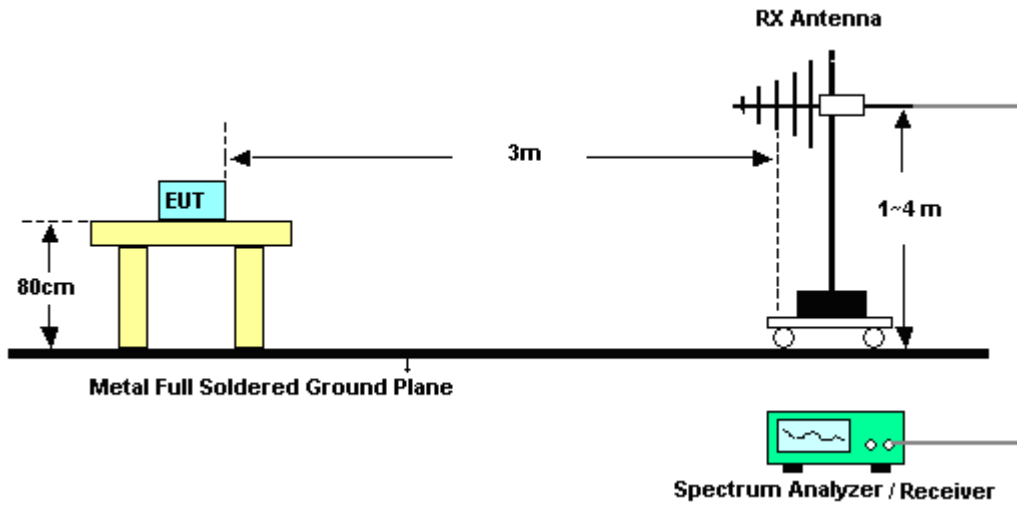


### 3.5.4 Test Setup

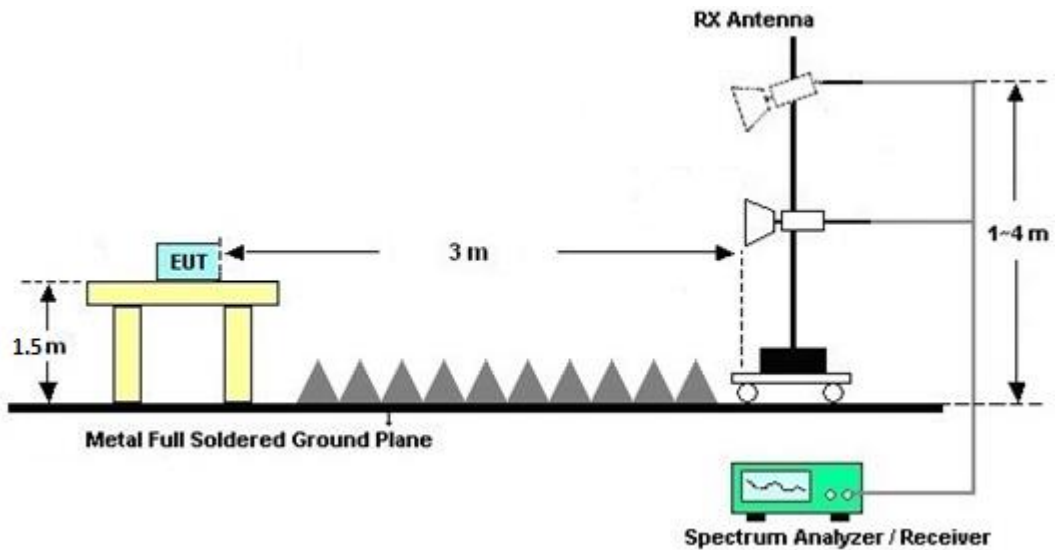
For radiated test below 30MHz



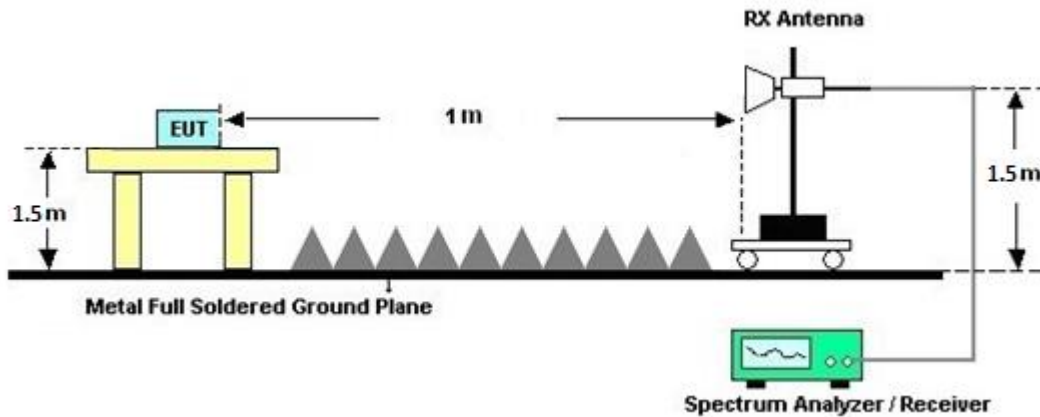
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



### 3.5.5 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.

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

Please refer to Appendix C and D.

### 3.5.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.



### 3.6 AC Conducted Emission Measurement

#### 3.6.1 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.

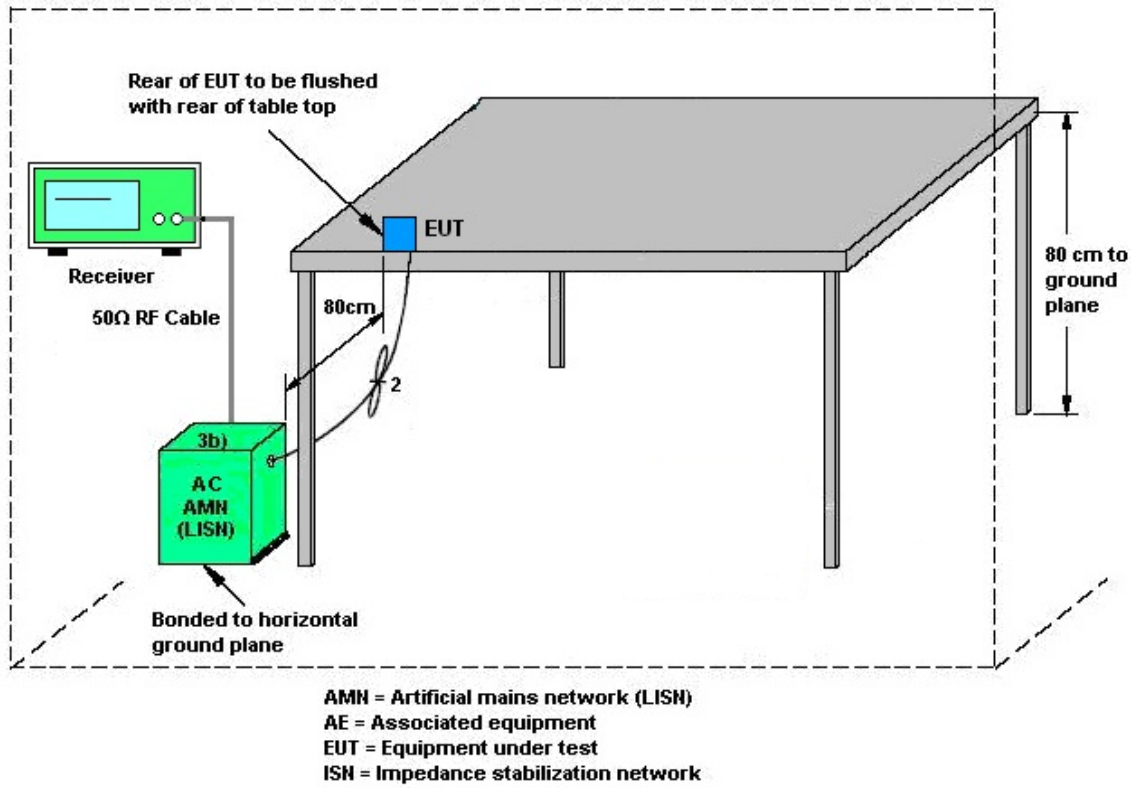
#### 3.6.2 Measuring Instruments

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

#### 3.6.3 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 = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 3.6.4 Test Setup



### 3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



## **3.7 Antenna Requirements**

### **3.7.1 Standard Applicable**

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.

### **3.7.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.



## 4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jul. 05, 2023	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2022	Jul. 05, 2023	Nov. 30, 2023	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2022	Jul. 05, 2023	Nov. 16, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 01, 2022	Jul. 05, 2023	Nov. 30, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 17, 2022	Jul. 05, 2023	Nov. 16, 2023	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Jul. 05, 2023	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Aug. 01, 2022	Jul. 05, 2023	Jul. 31, 2023	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 29, 2022	Jul. 05, 2023	Dec. 28, 2023	Conduction (CO05-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 17, 2022	May 24, 2023 Jun. 29, 2023	Nov. 16, 2023	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054SNO12 (NO:113)	10MHz~6GHz	Dec. 13, 2022	May 24, 2023 Jun. 29, 2023	Dec. 12, 2023	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101905	10Hz - 40GHz(amp)	Aug. 03, 2022	May 24, 2023 Jun. 29, 2023	Aug. 02, 2023	Conducted (TH05-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 23, 2023	Jun. 13, 2023~ Jun. 29, 2023	Apr. 22, 2024	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 01, 2022	Jun. 13, 2023~ Jun. 29, 2023	Nov. 30, 2023	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Feb. 28, 2023	Jun. 13, 2023~ Jun. 29, 2023	Feb. 27, 2024	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00101 800-30-10P	1590075	1GHz~18GHz	Apr. 20, 2023	Jun. 13, 2023~ Jun. 29, 2023	Apr. 19, 2024	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Oct. 03, 2022	Jun. 13, 2023~ Jun. 29, 2023	Oct. 02, 2023	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Mar. 24, 2023	Jun. 13, 2023~ Jun. 29, 2023	Mar. 23, 2024	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Jul. 21, 2022	Jun. 13, 2023~ Jun. 29, 2023	Jul. 20, 2023	Radiation (03CH07-HY)
Spectrum Analyzer	Keysight	Keysight	MY60241058	10Hz~44GHz	Jul. 07, 2022	Jun. 13, 2023~ Jun. 29, 2023	Jul. 06, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682/4	30MHz to 18GHz	Feb. 22, 2023	Jun. 13, 2023~ Jun. 29, 2023	Feb. 21, 2024	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4	9kHz to 18GHz	Feb. 22, 2023	Jun. 13, 2023~ Jun. 29, 2023	Feb. 21, 2024	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4	9kHz to 18GHz	Feb. 22, 2023	Jun. 13, 2023~ Jun. 29, 2023	Feb. 21, 2024	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126	532078/126E	30MHz~18GHz	Sep. 16, 2022	Jun. 13, 2023~ Jun. 29, 2023	Sep. 15, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2	18GHz~40GHz	Feb. 22, 2023	Jun. 13, 2023~ Jun. 29, 2023	Feb. 21, 2024	Radiation (03CH07-HY)



Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Jun. 13, 2023~ Jun. 29, 2023	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Jun. 13, 2023~ Jun. 29, 2023	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Jun. 13, 2023~ Jun. 29, 2023	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Jun. 13, 2023~ Jun. 29, 2023	N/A	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Jun. 13, 2023~ Jun. 29, 2023	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 14, 2023	Jun. 13, 2023~ Jun. 29, 2023	Mar. 13, 2024	Radiation (03CH07-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Feb. 13, 2023	Jun. 13, 2023~ Jun. 29, 2023	Feb. 12, 2024	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170251	18GHz~40GHz	Nov. 24, 2022	Jun. 13, 2023~ Jun. 29, 2023	Nov. 23, 2023	Radiation (03CH07-HY)



## 5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.5 dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	6.5 dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.5 dB
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### Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.2 dB
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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 dB
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**Appendix A. Test Result of Conducted Test Items**

Test Engineer:	James Li	Temperature:	21~25	°C
Test Date:	2023/5/24~2023/6/29	Relative Humidity:	51~54	%

**TEST RESULTS DATA**  
**6dB and 99% Occupied Bandwidth**

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)
BLE	1Mbps	1	0	2402	1.017	0.634	0.50
BLE	1Mbps	1	19	2440	1.017	0.634	0.50
BLE	1Mbps	1	39	2480	1.017	0.632	0.50

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

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	4.55	30.00	-0.36	4.19	36.00	Pass
BLE	1Mbps	1	19	2440	2.55	30.00	-0.36	2.19	36.00	Pass
BLE	1Mbps	1	39	2480	2.65	30.00	-0.36	2.29	36.00	Pass

**TEST RESULTS DATA**  
**Peak Power Density**

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	4.93	-10.92	-0.36	8.00	Pass
BLE	1Mbps	1	19	2440	3.17	-12.67	-0.36	8.00	Pass
BLE	1Mbps	1	39	2480	3.41	-12.52	-0.36	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

**TEST RESULTS DATA**  
**6dB and 99% Occupied Bandwidth**

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	2Mbps	1	0	2402	2.010	1.112	0.50	Pass
BLE	2Mbps	1	19	2440	2.010	1.112	0.50	Pass
BLE	2Mbps	1	39	2480	2.014	1.108	0.50	Pass

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

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	4.55	30.00	-0.36	4.19	36.00	Pass
BLE	2Mbps	1	19	2440	5.65	30.00	-0.36	5.29	36.00	Pass
BLE	2Mbps	1	39	2480	5.45	30.00	-0.36	5.09	36.00	Pass

**TEST RESULTS DATA**  
**Peak Power Density**

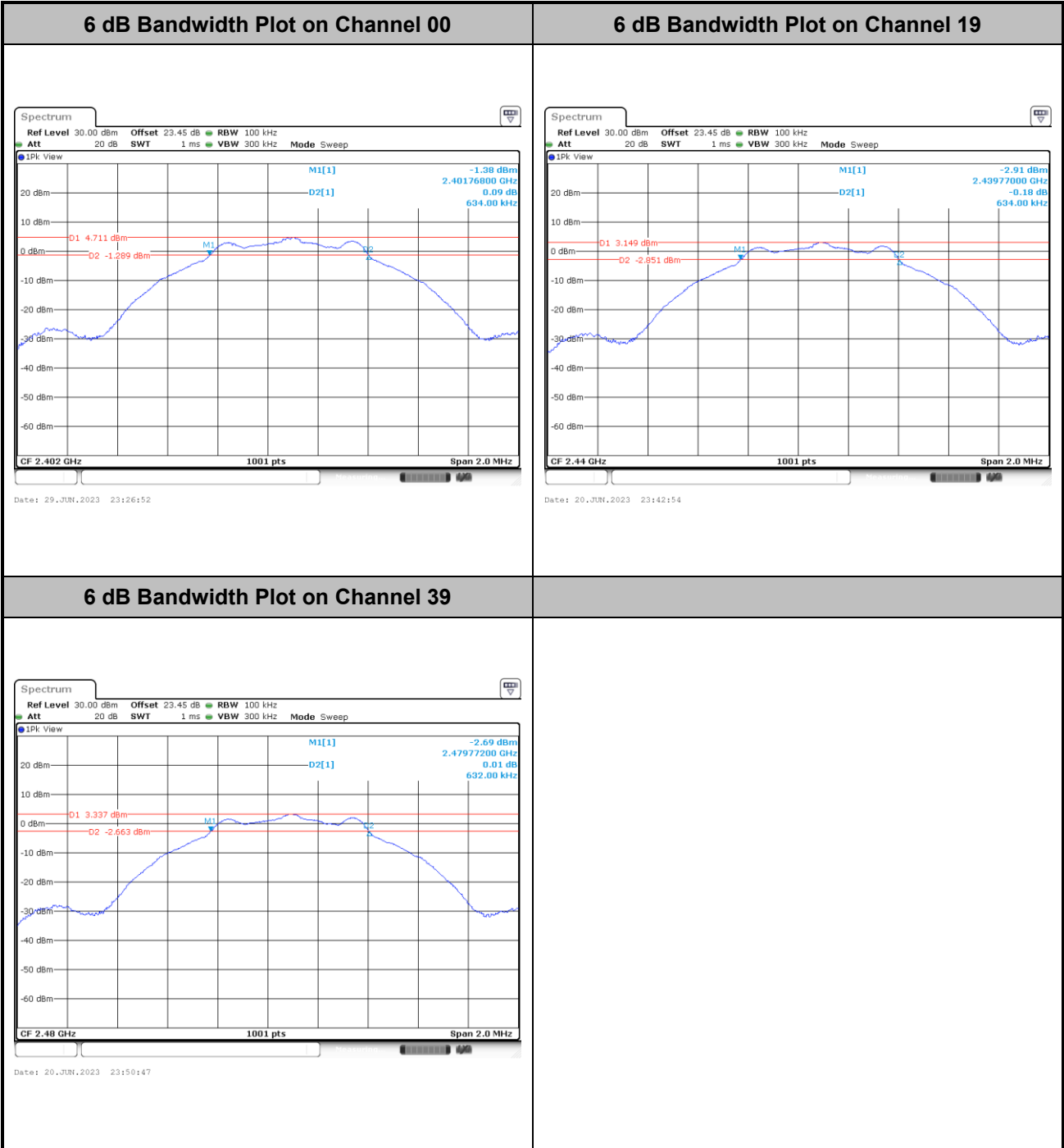
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	2Mbps	1	0	2402	5.27	-12.40	-0.36	8.00	Pass
BLE	2Mbps	1	19	2440	6.43	-10.90	-0.36	8.00	Pass
BLE	2Mbps	1	39	2480	6.25	-11.44	-0.36	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.



# 6dB Bandwidth

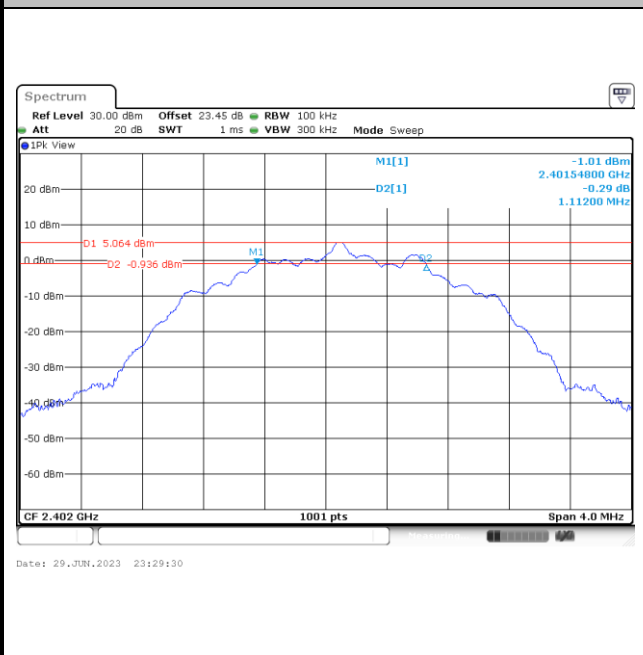
<1Mbps>



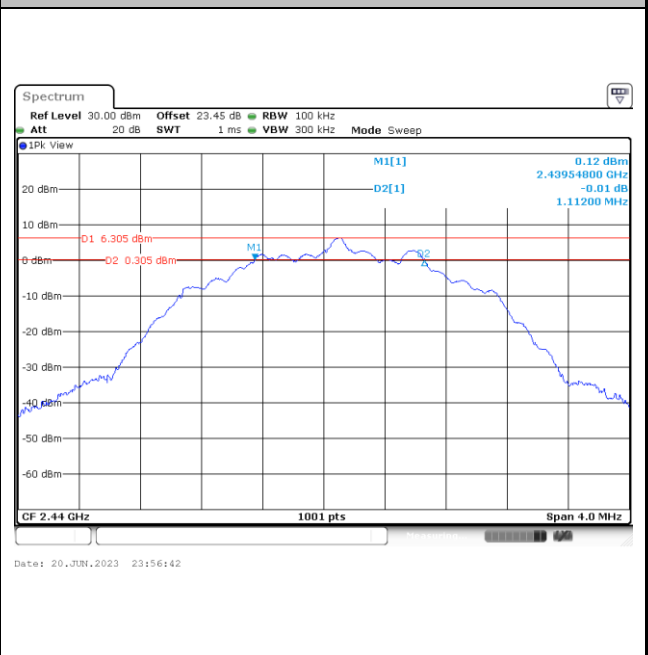


<2Mbps>

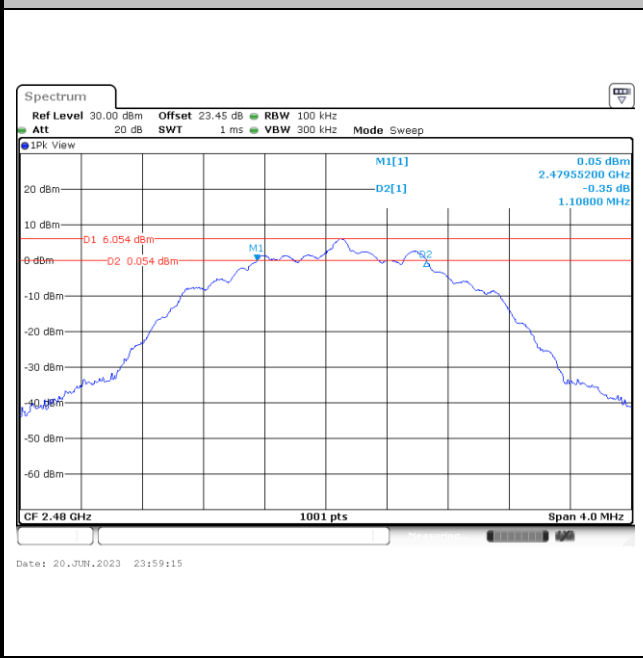
6 dB Bandwidth Plot on Channel 00



6 dB Bandwidth Plot on Channel 19



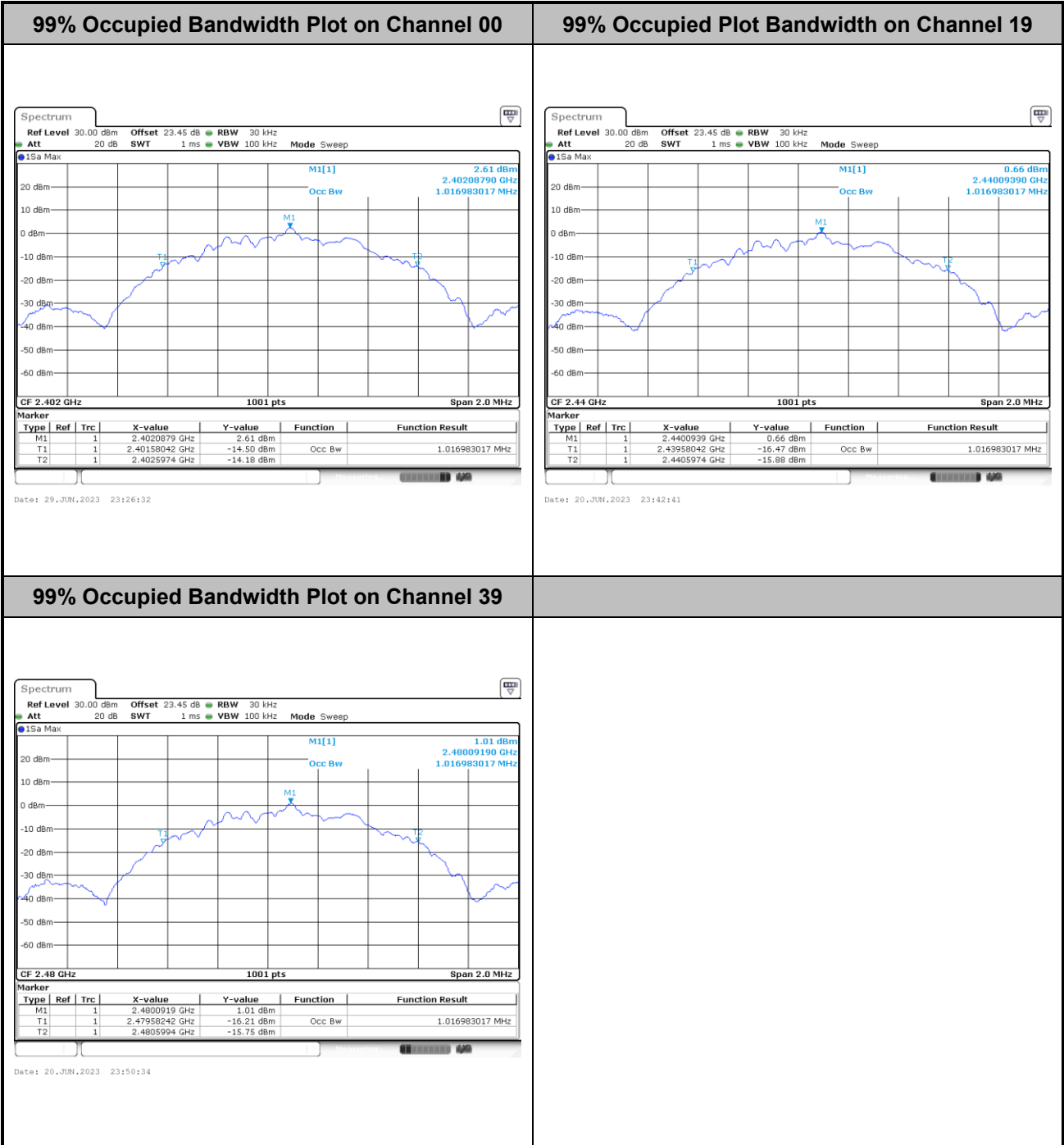
6 dB Bandwidth Plot on Channel 39





# 99% Occupied Bandwidth

<1Mbps>

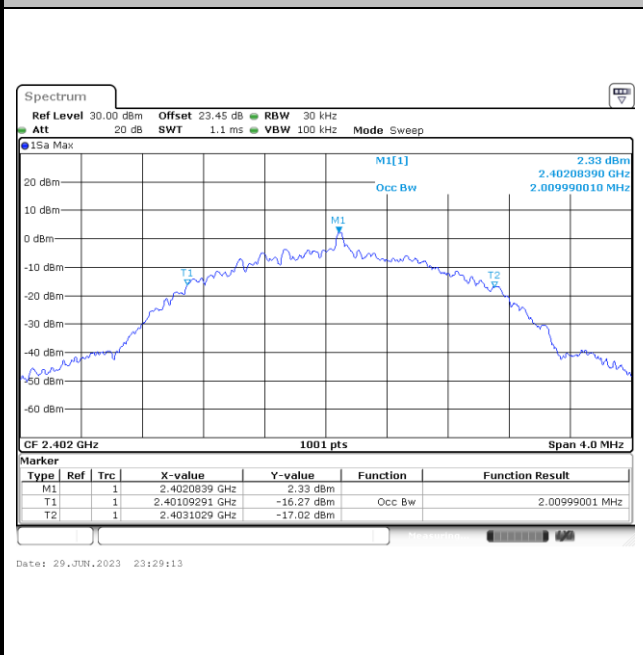


Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

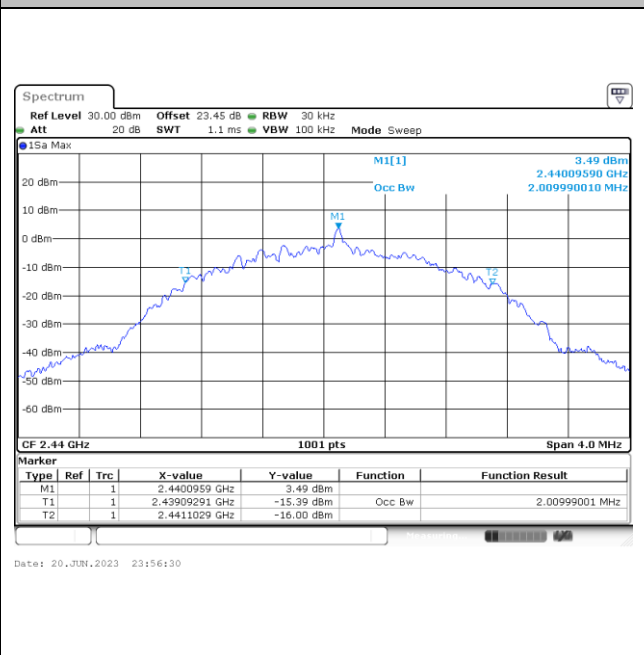


<2Mbps>

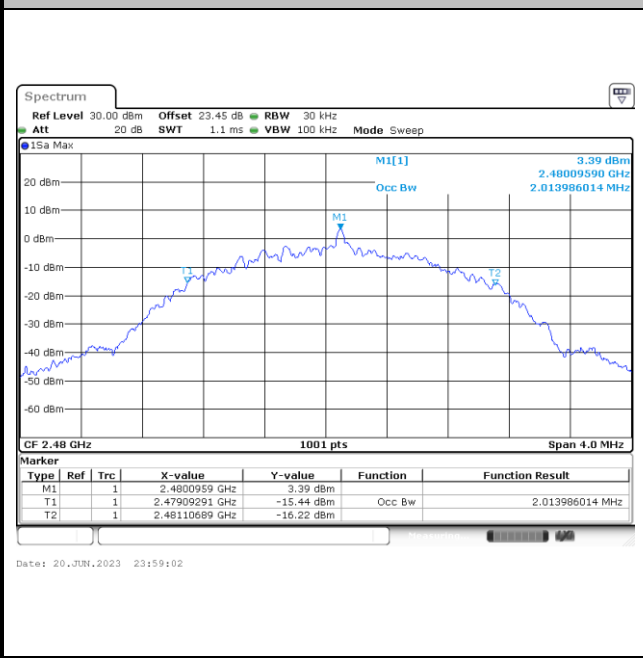
99% Occupied Bandwidth Plot on Channel 00



99% Occupied Plot Bandwidth on Channel 19



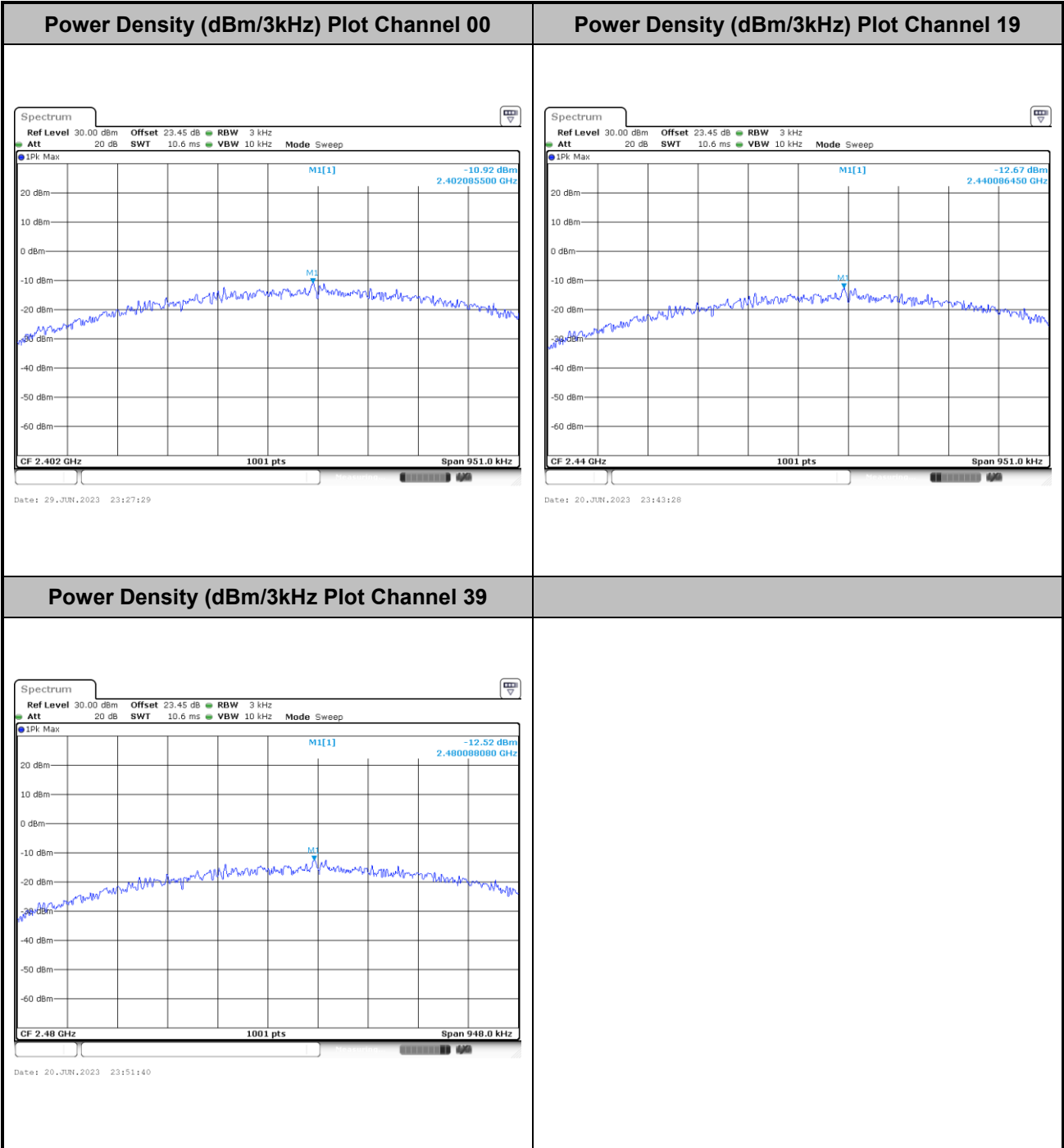
99% Occupied Bandwidth Plot on Channel 39





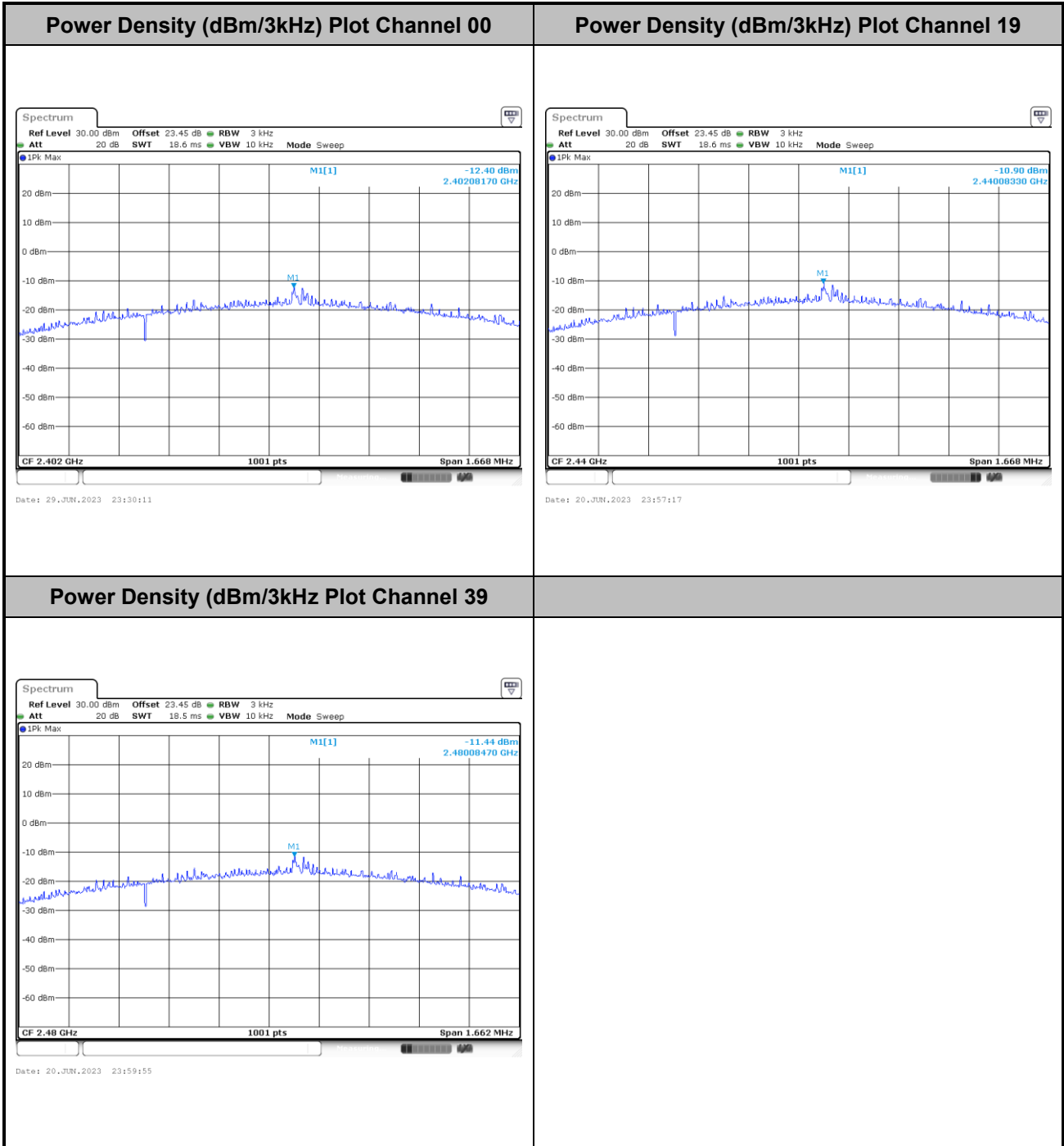
# Power Spectral Density (dBm/3kHz)

<1Mbps>





<2Mbps>

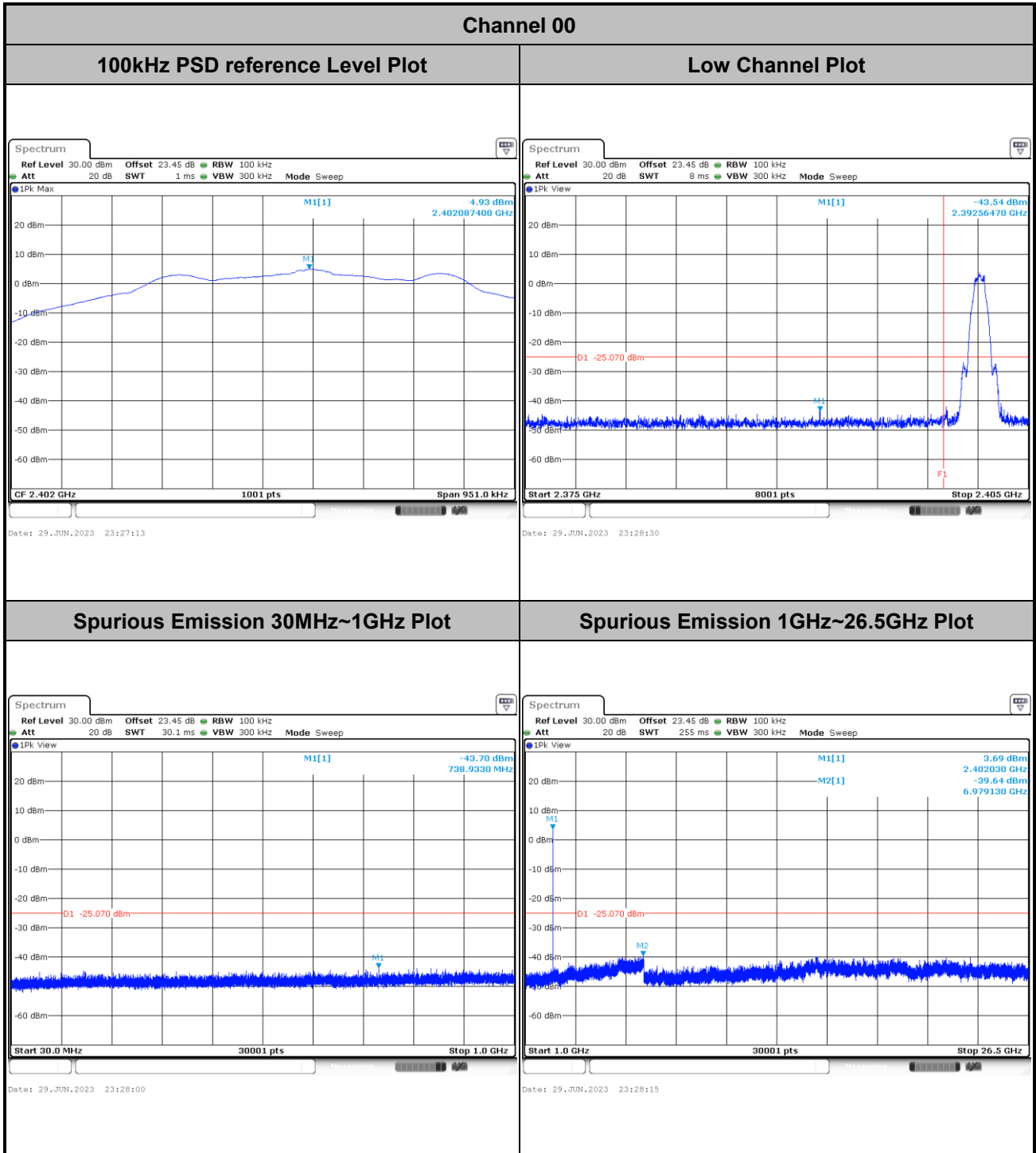






# Band Edge and Conducted Spurious Emission

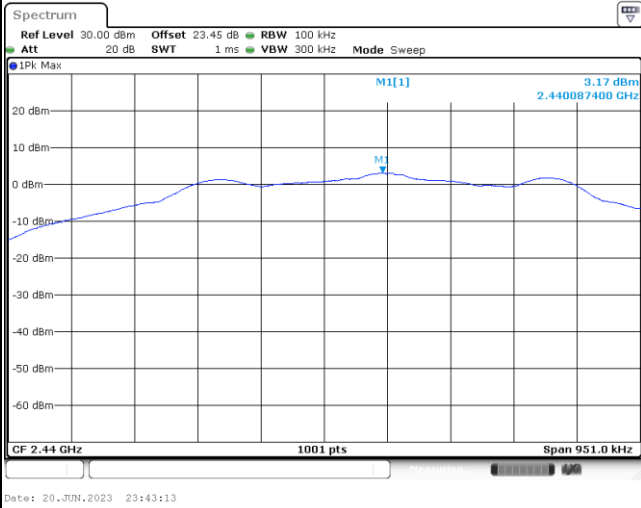
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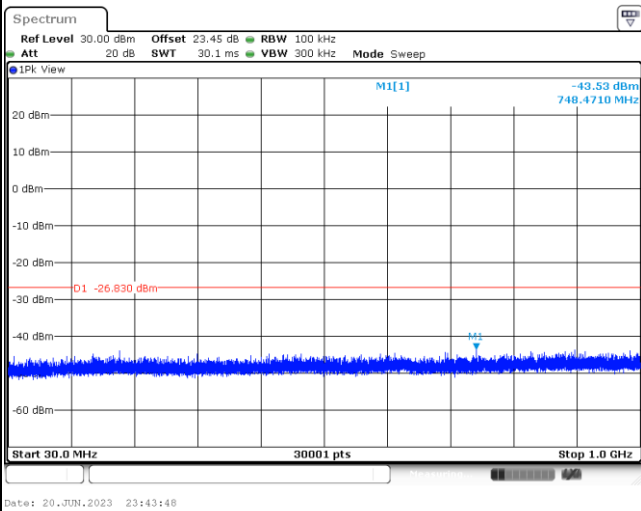
Channel 19

100kHz PSD reference Level Plot

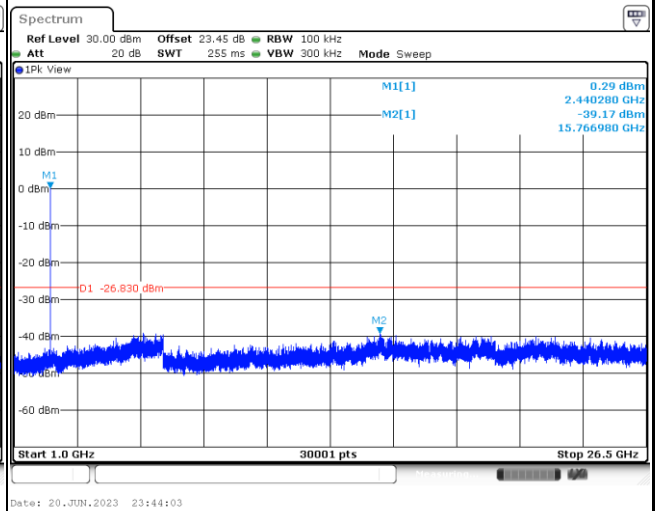


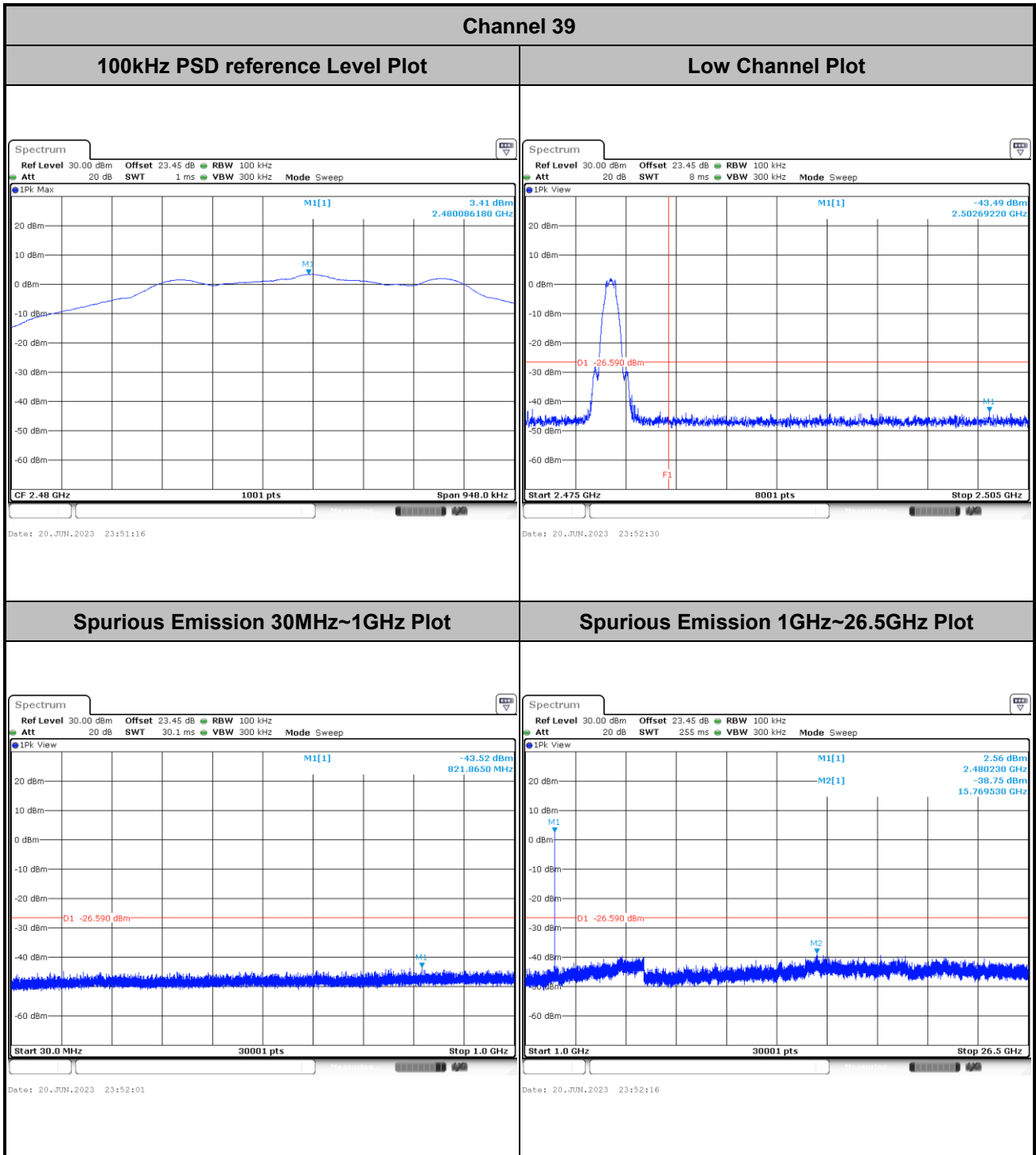
Low Channel Plot

Spurious Emission 30MHz~1GHz Plot



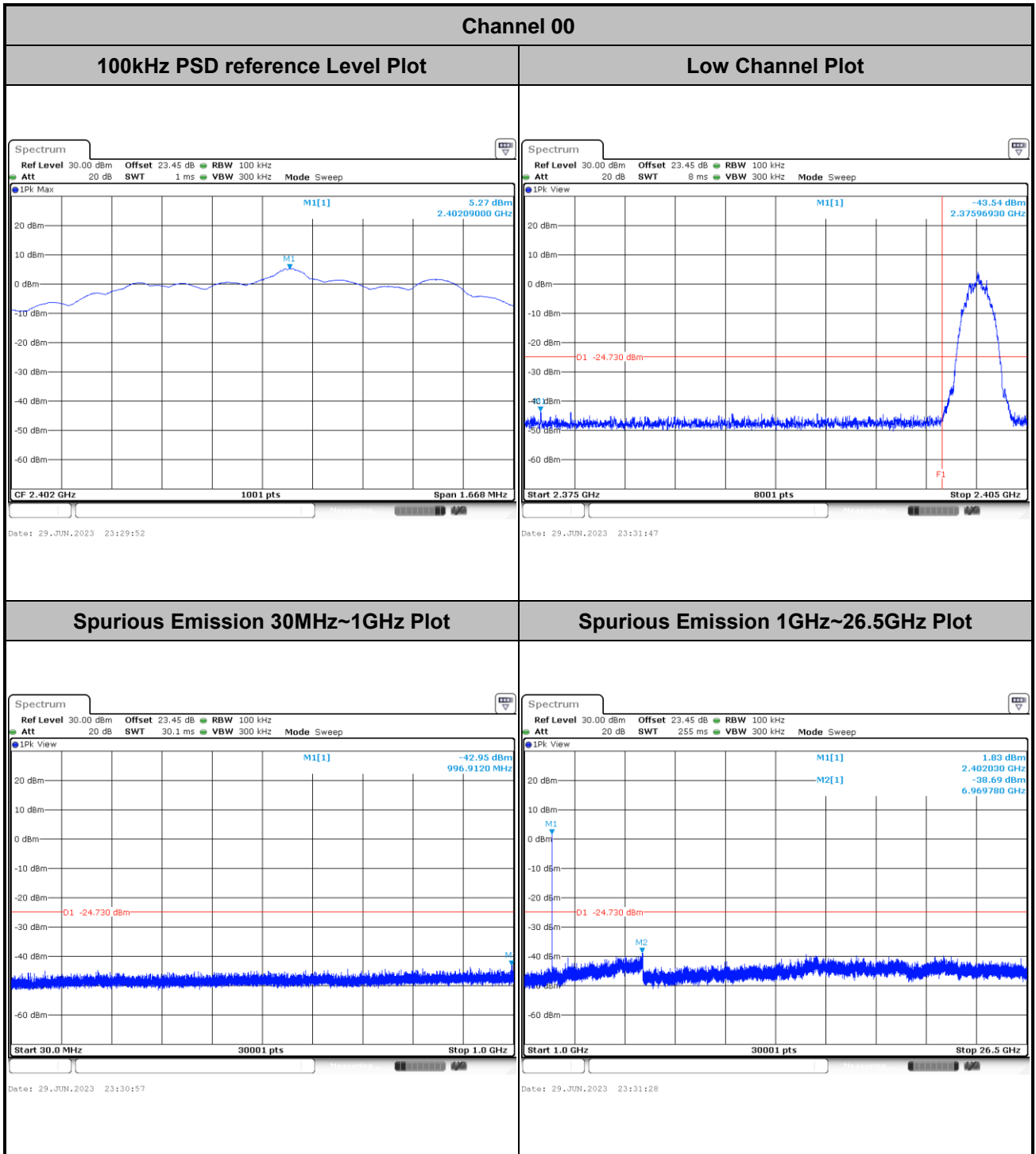
Spurious Emission 1GHz~26.5GHz Plot

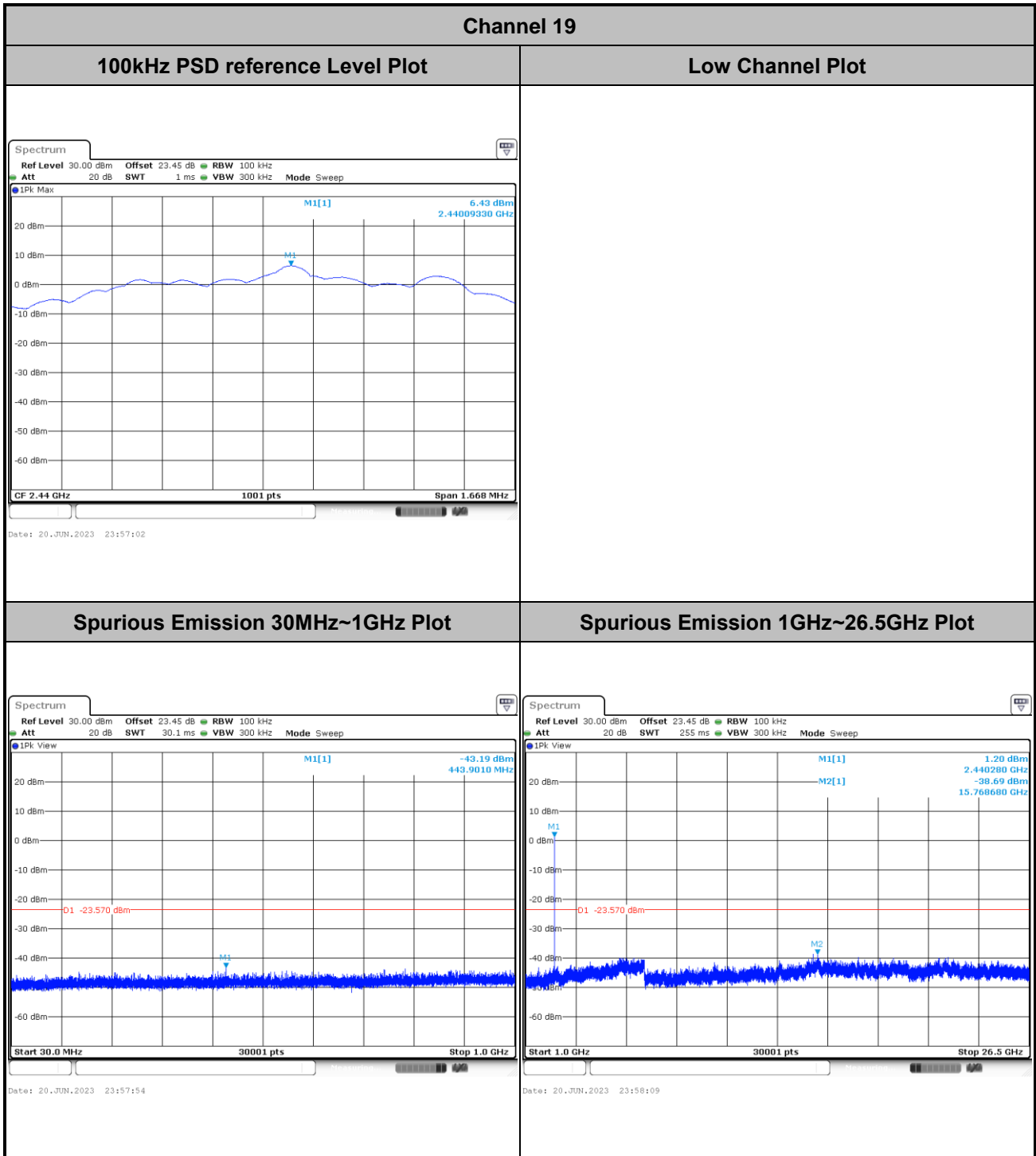


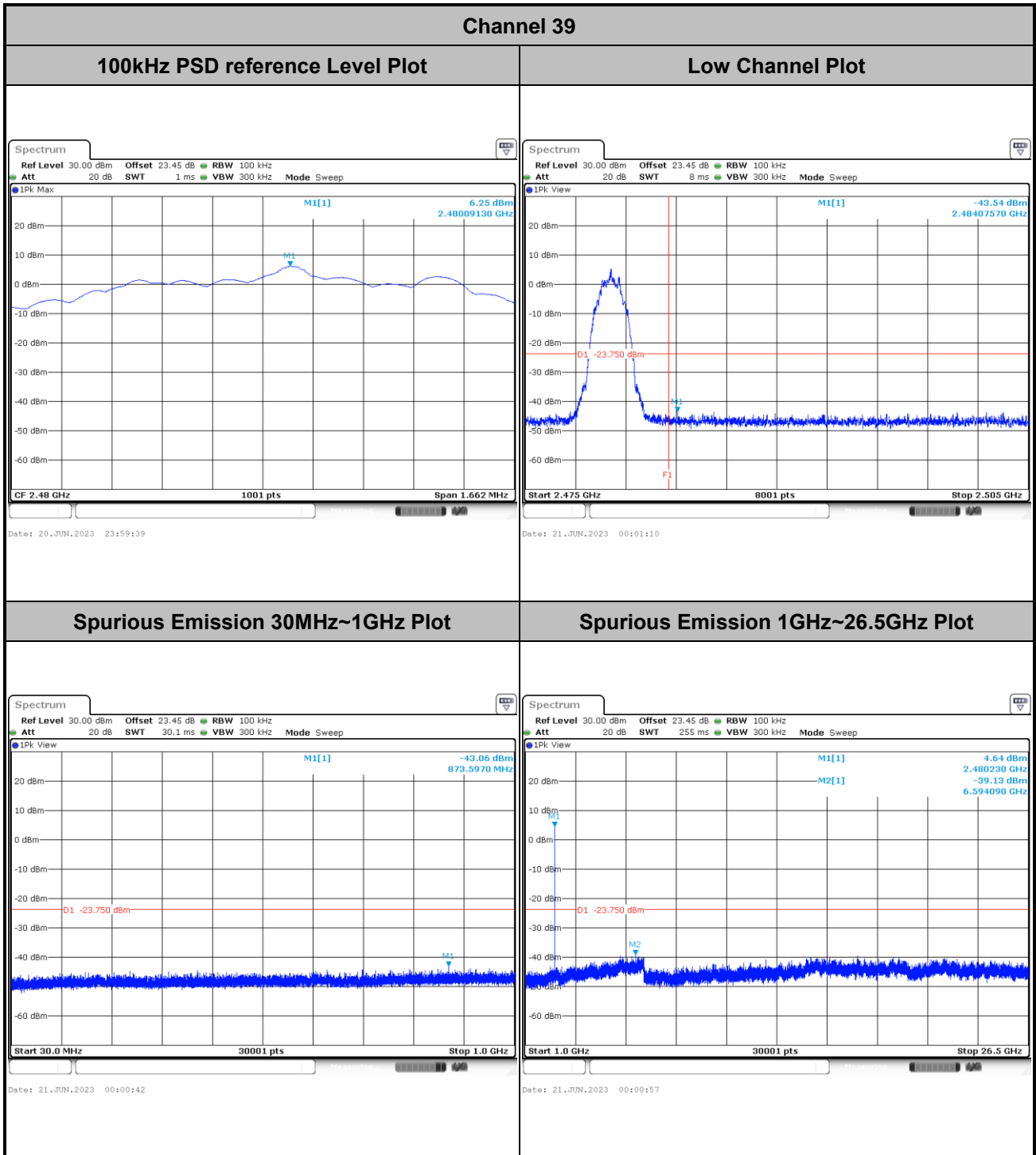




<2Mbps>









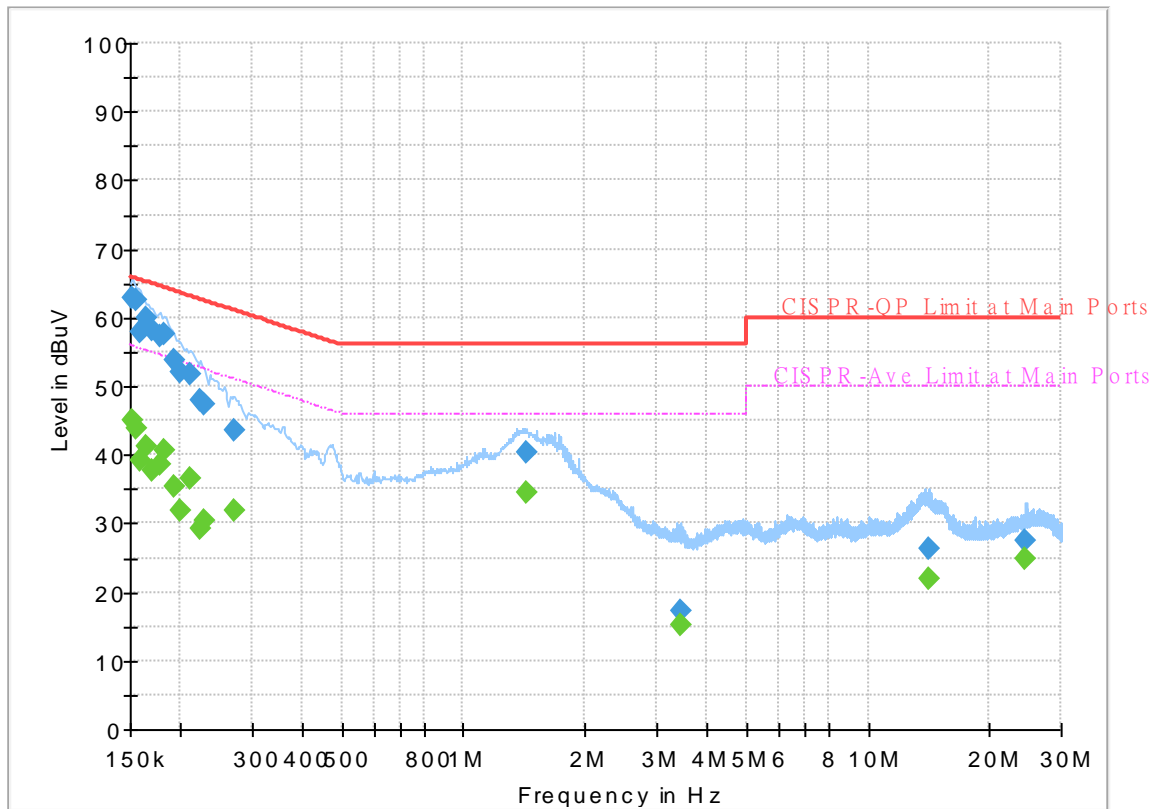
## Appendix B. AC Conducted Emission Test Results

Test Engineer :	LI YAN-XUN	Temperature :	23~26°C
		Relative Humidity :	45~55%

# EUT Information

Report NO : 342615  
 Test Mode : Mode 1  
 Test Voltage : Power From System  
 Phase : Line

Full Spectrum



## Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	44.91	55.88	10.97	L1	OFF	19.8
0.152250	62.73	---	65.88	3.15	L1	OFF	19.8
0.154500	---	43.74	55.75	12.01	L1	OFF	19.8
0.154500	62.52	---	65.75	3.23	L1	OFF	19.8
0.159000	---	39.16	55.52	16.36	L1	OFF	19.8
0.159000	58.02	---	65.52	7.50	L1	OFF	19.8
0.163500	---	41.18	55.28	14.10	L1	OFF	19.8
0.163500	59.97	---	65.28	5.31	L1	OFF	19.8
0.170250	---	37.73	54.95	17.22	L1	OFF	19.8
0.170250	58.13	---	64.95	6.82	L1	OFF	19.8
0.177000	---	38.69	54.63	15.94	L1	OFF	19.8
0.177000	57.34	---	64.63	7.29	L1	OFF	19.8
0.181500	---	40.52	54.42	13.90	L1	OFF	19.8
0.181500	57.51	---	64.42	6.91	L1	OFF	19.8
0.192750	---	35.48	53.92	18.44	L1	OFF	19.8
0.192750	53.76	---	63.92	10.16	L1	OFF	19.8
0.199500	---	31.99	53.63	21.64	L1	OFF	19.8
0.199500	51.96	---	63.63	11.67	L1	OFF	19.8
0.210750	---	36.57	53.18	16.61	L1	OFF	19.8
0.210750	51.86	---	63.18	11.32	L1	OFF	19.8
0.224250	---	29.23	52.66	23.43	L1	OFF	19.8

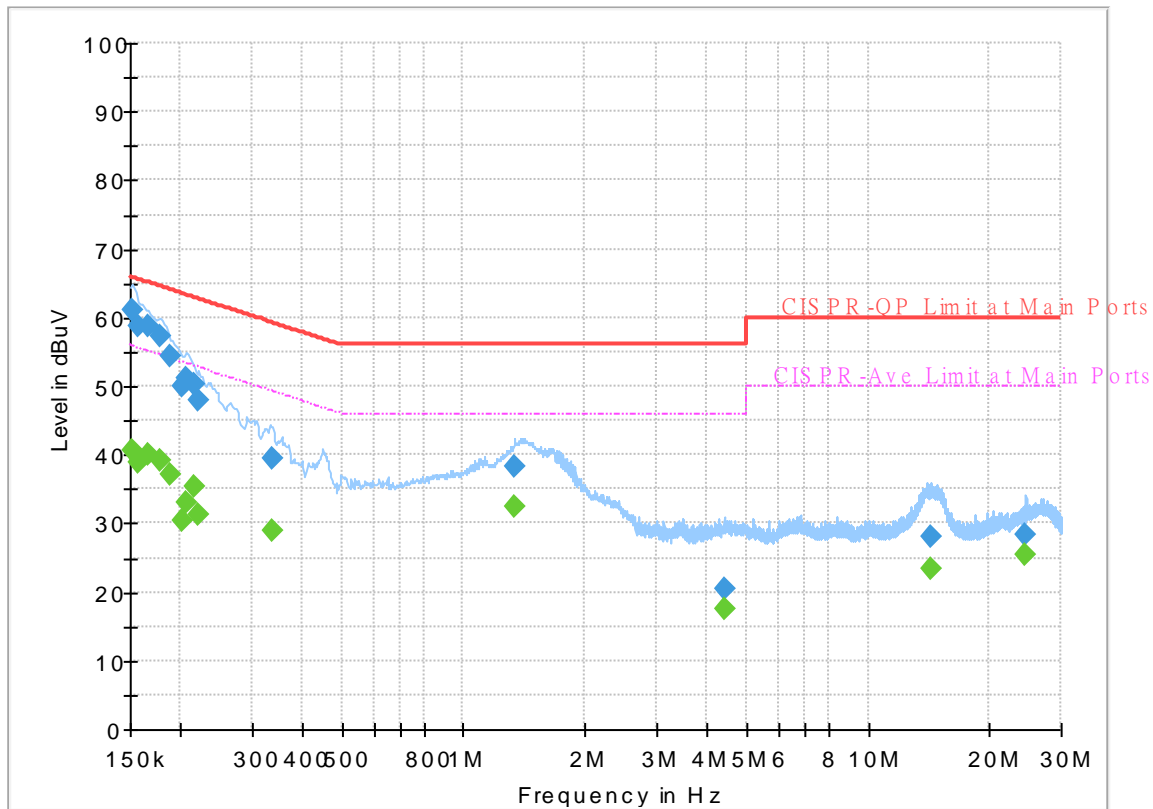


0.224250	47.97	---	62.66	14.69	L1	OFF	19.8
0.228750	---	30.31	52.50	22.19	L1	OFF	19.8
0.228750	47.39	---	62.50	15.11	L1	OFF	19.8
0.271500	---	31.81	51.07	19.26	L1	OFF	19.8
0.271500	43.55	---	61.07	17.52	L1	OFF	19.8
1.425750	---	34.53	46.00	11.47	L1	OFF	19.8
1.425750	40.31	---	56.00	15.69	L1	OFF	19.8
3.439500	---	15.28	46.00	30.72	L1	OFF	19.9
3.439500	17.20	---	56.00	38.80	L1	OFF	19.9
14.138250	---	21.79	50.00	28.21	L1	OFF	20.0
14.138250	26.19	---	60.00	33.81	L1	OFF	20.0
24.576000	---	24.98	50.00	25.02	L1	OFF	20.0
24.576000	27.46	---	60.00	32.54	L1	OFF	20.0

# EUT Information

Report NO : 342615  
 Test Mode : Mode 1  
 Test Voltage : Power From System  
 Phase : Neutral

Full Spectrum



## Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	40.54	55.88	15.34	N	OFF	19.8
0.152250	61.21	---	65.88	4.67	N	OFF	19.8
0.156750	---	38.96	55.63	16.67	N	OFF	19.8
0.156750	58.66	---	65.63	6.97	N	OFF	19.8
0.165750	---	40.07	55.17	15.10	N	OFF	19.8
0.165750	58.71	---	65.17	6.46	N	OFF	19.8
0.177000	---	39.10	54.63	15.53	N	OFF	19.8
0.177000	57.19	---	64.63	7.44	N	OFF	19.8
0.188250	---	37.01	54.11	17.10	N	OFF	19.8
0.188250	54.35	---	64.11	9.76	N	OFF	19.8
0.201750	---	30.55	53.54	22.99	N	OFF	19.8
0.201750	50.06	---	63.54	13.48	N	OFF	19.8
0.206250	---	32.91	53.36	20.45	N	OFF	19.8
0.206250	51.15	---	63.36	12.21	N	OFF	19.8
0.215250	---	35.43	53.00	17.57	N	OFF	19.8
0.215250	50.33	---	63.00	12.67	N	OFF	19.8
0.222000	---	31.29	52.74	21.45	N	OFF	19.8
0.222000	47.82	---	62.74	14.92	N	OFF	19.8
0.336750	---	29.03	49.28	20.25	N	OFF	19.8
0.336750	39.59	---	59.28	19.69	N	OFF	19.8
1.335750	---	32.40	46.00	13.60	N	OFF	19.8

1.335750	38.27	---	56.00	17.73	N	OFF	19.8
4.400250	---	17.54	46.00	28.46	N	OFF	19.9
4.400250	20.37	---	56.00	35.63	N	OFF	19.9
14.352000	---	23.31	50.00	26.69	N	OFF	20.1
14.352000	28.08	---	60.00	31.92	N	OFF	20.1
24.576000	---	25.36	50.00	24.64	N	OFF	20.2
24.576000	28.32	---	60.00	31.68	N	OFF	20.2



## Appendix C. Radiated Spurious Emission

<b>Test Engineer :</b>	Jesse Wang, Stan Hsieh and Ken Wu	<b>Temperature :</b>	23.8~26.7°C
		<b>Relative Humidity :</b>	46.8~65%



<1Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp 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		2362.815	54.94	-19.06	74	38.87	32.1	18.16	34.19	100	230	P	H	
		2386.125	45.35	-8.65	54	29.18	32.1	18.27	34.2	100	230	A	H	
		2402	102.39	-	-	86.21	32.1	18.28	34.2	100	230	P	H	
		2402	101.16	-	-	84.98	32.1	18.28	34.2	100	230	A	H	
													H	
													H	
			2352.42	54.71	-19.29	74	38.65	32.1	18.15	34.19	400	238	P	V
			2385.285	45.38	-8.62	54	29.21	32.1	18.27	34.2	400	238	A	V
			2402	93.02	-	-	76.84	32.1	18.28	34.2	400	238	P	V
			2402	91.83	-	-	75.65	32.1	18.28	34.2	400	238	A	V
													V	
												V		
BLE CH 19 2440MHz		2370.06	55.46	-18.54	74	39.39	32.1	18.16	34.19	123	228	P	H	
		2389.1	45.61	-8.39	54	29.44	32.1	18.27	34.2	123	228	A	H	
	*	2440	99.81	-	-	83.66	32.02	18.34	34.21	123	228	P	H	
	*	2440	98.68	-	-	82.53	32.02	18.34	34.21	123	228	A	H	
			2484.67	55.04	-18.96	74	38.87	32	18.39	34.22	123	228	P	H
			2484.18	45.51	-8.49	54	29.34	32	18.39	34.22	123	228	A	H
			2342.48	55.23	-18.77	74	39.22	32.05	18.15	34.19	400	42	P	V
			2384.48	45.37	-8.63	54	29.2	32.1	18.27	34.2	400	42	A	V
	*		2440	92.62	-	-	76.47	32.02	18.34	34.21	400	42	P	V
	*		2440	91.62	-	-	75.47	32.02	18.34	34.21	400	42	A	V
			2499.72	55.16	-18.84	74	38.99	32	18.39	34.22	400	42	P	V
		2491.39	45.44	-8.56	54	29.27	32	18.39	34.22	400	42	A	V	



<b>BLE CH 39 2480MHz</b>	*	2480	98.51	-	-	82.33	32	18.4	34.22	286	227	P	H
	*	2480	97.44	-	-	81.26	32	18.4	34.22	286	227	A	H
		2484.24	54.97	-19.03	74	38.8	32	18.39	34.22	286	227	P	H
		2484	45.68	-8.32	54	29.51	32	18.39	34.22	286	227	A	H
													H
													H
	*	2480	93.66	-	-	77.48	32	18.4	34.22	363	293	P	V
	*	2480	92.54	-	-	76.36	32	18.4	34.22	363	293	A	V
		2499	54.91	-19.09	74	38.74	32	18.39	34.22	363	293	P	V
		2493.76	45.55	-8.45	54	29.38	32	18.39	34.22	363	293	A	V
													V
													V
<b>Remark</b>	<ol style="list-style-type: none"> <li>1. No other spurious found.</li> <li>2. All results are PASS against Peak and Average limit line.</li> </ol>												



2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	Note	Frequency ( MHz )	Level ( dBμV/m )	Margin ( 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 00 2402MHz		4804	51.29	-22.71	74	63.3	34.02	13.01	59.04	400	156	P	H	
		4804	47.39	-6.61	54	59.4	34.02	13.01	59.04	400	156	A	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
			4804	50.43	-23.57	74	62.44	34.02	13.01	59.04	298	283	P	V
			4804	46.29	-7.71	54	58.3	34.02	13.01	59.04	298	283	A	V
														V
														V
														V
														V
														V
														V
														V
													V	



FCC RADIO TEST REPORT

Report No. : FR342615A

BLE	Note	Frequency ( MHz )	Level ( dBμV/m )	Margin ( 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 19 2440MHz		4880	50.06	-23.94	74	61.8	34.14	13.03	58.91	100	258	P	H	
		4880	45.98	-8.02	54	57.72	34.14	13.03	58.91	100	258	A	H	
		7320	45.99	-28.01	74	52.5	35.7	15.36	57.57	100	302	P	H	
		7320	37.83	-16.17	54	44.34	35.7	15.36	57.57	100	302	A	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
			4880	47.96	-26.04	74	59.7	34.14	13.03	58.91	302	302	P	V
			4880	42.05	-11.95	54	53.79	34.14	13.03	58.91	302	302	A	V
			7320	47.72	-26.28	74	54.23	35.7	15.36	57.57	313	252	P	V
			7320	39.39	-14.61	54	45.9	35.7	15.36	57.57	313	252	A	V
														V
														V
														V
														V
													V	
													V	
													V	





BLE	Note	Frequency ( MHz )	Level ( dBµV/m )	Margin ( 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		4960	49.99	-24.01	74	61.43	34.3	13.04	58.78	275	140	P	H	
		4960	45.86	-8.14	54	57.3	34.3	13.04	58.78	275	140	A	H	
		7440	42.38	-31.62	74	49.1	35.6	15.38	57.7	-	-	P	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
			4960	43.74	-30.26	74	55.18	34.3	13.04	58.78	-	-	P	V
			7440	43.31	-30.69	74	50.03	35.6	15.38	57.7	-	-	P	V
														V
														V
														V
														V
														V
														V
														V
<b>Remark</b>	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> <li>The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.</li> </ol>													



<2Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp 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		2341.08	54.99	-19.01	74	38.98	32.05	18.15	34.19	102	237	P	H	
		2353.26	45.35	-8.65	54	29.29	32.1	18.15	34.19	102	237	A	H	
	*	2402	102.75	-	-	86.57	32.1	18.28	34.2	102	237	P	H	
	*	2402	101.08	-	-	84.9	32.1	18.28	34.2	102	237	A	H	
													H	
													H	
			2384.235	55.3	-18.7	74	39.13	32.1	18.27	34.2	400	292	P	V
			2386.125	45.37	-8.63	54	29.2	32.1	18.27	34.2	400	292	A	V
	*		2402	96.52	-	-	80.34	32.1	18.28	34.2	400	292	P	V
	*		2402	94.34	-	-	78.16	32.1	18.28	34.2	400	292	A	V
													V	
												V		
BLE CH 19 2440MHz		2336.6	54.87	-19.13	74	38.99	32.02	18.05	34.19	100	227	P	H	
		2381.54	45.43	-8.57	54	29.26	32.1	18.27	34.2	100	227	A	H	
	*	2440	102.2	-	-	86.05	32.02	18.34	34.21	100	227	P	H	
	*	2440	98.99	-	-	82.84	32.02	18.34	34.21	100	227	A	H	
			2490.27	54.6	-19.4	74	38.43	32	18.39	34.22	100	227	P	H
			2494.68	45.56	-8.44	54	29.39	32	18.39	34.22	100	227	A	H
			2388.54	55.12	-18.88	74	38.95	32.1	18.27	34.2	400	41	P	V
			2385.74	45.46	-8.54	54	29.29	32.1	18.27	34.2	400	41	A	V
	*		2440	95.59	-	-	79.44	32.02	18.34	34.21	400	41	P	V
	*		2440	93.56	-	-	77.41	32.02	18.34	34.21	400	41	A	V
			2489.5	54.87	-19.13	74	38.7	32	18.39	34.22	400	41	P	V
		2494.61	45.58	-8.42	54	29.41	32	18.39	34.22	400	41	A	V	



<b>BLE CH 39 2480MHz</b>	*	2480	101.03	-	-	84.85	32	18.4	34.22	323	226	P	H
	*	2480	99.17	-	-	82.99	32	18.4	34.22	323	226	A	H
		2494.52	55.57	-18.43	74	39.4	32	18.39	34.22	323	226	P	H
		2483.92	46.23	-7.77	54	30.06	32	18.39	34.22	323	226	A	H
													H
													H
	*	2480	96.05	-	-	79.87	32	18.4	34.22	365	292	P	V
	*	2480	93.74	-	-	77.56	32	18.4	34.22	365	292	A	V
		2483.92	55.6	-18.4	74	39.43	32	18.39	34.22	365	292	P	V
		2483.88	45.5	-8.5	54	29.33	32	18.39	34.22	365	292	A	V
													V
													V
<b>Remark</b>	<ol style="list-style-type: none"> <li>1. No other spurious found.</li> <li>2. All results are PASS against Peak and Average limit line.</li> </ol>												



2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	Note	Frequency ( MHz )	Level ( dBμV/m )	Margin ( 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 00 2402MHz		4804	51.68	-22.32	74	63.69	34.02	13.01	59.04	400	160	P	H	
		4804	46.28	-7.72	54	58.29	34.02	13.01	59.04	400	160	A	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
			4804	50.59	-23.41	74	62.6	34.02	13.01	59.04	297	284	P	V
			4804	44.81	-9.19	54	56.82	34.02	13.01	59.04	297	284	A	V
														V
														V
														V
														V
														V
														V
													V	



BLE	Note	Frequency ( MHz )	Level ( dBµV/m )	Margin ( 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 )	
<b>BLE CH 19 2440MHz</b>		4880	52.91	-21.09	74	64.65	34.14	13.03	58.91	249	151	P	H	
		4880	46.72	-7.28	54	58.46	34.14	13.03	58.91	249	151	A	H	
		7320	54.28	-19.72	74	60.79	35.7	15.36	57.57	368	45	P	H	
		7320	49.76	-4.24	54	56.27	35.7	15.36	57.57	368	45	A	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
			4880	51.64	-22.36	74	63.38	34.14	13.03	58.91	299	178	P	V
			4880	45.6	-8.4	54	57.34	34.14	13.03	58.91	299	178	A	V
		7320	55.93	-18.07	74	62.44	35.7	15.36	57.57	302	134	P	V	
		7320	49.45	-4.55	54	55.96	35.7	15.36	57.57	302	134	A	V	
													V	
													V	
													V	
													V	
													V	
													V	
													V	
													V	
													V	



BLE	Note	Frequency ( MHz )	Level ( dBμV/m )	Margin ( 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 )	
<b>BLE CH 39 2480MHz</b>		4960	52.2	-21.8	74	63.64	34.3	13.04	58.78	259	136	P	H	
		4960	46.4	-7.6	54	57.84	34.3	13.04	58.78	259	136	A	H	
		7440	49.16	-24.84	74	55.88	35.6	15.38	57.7	100	309	P	H	
		7440	41.52	-12.48	54	48.24	35.6	15.38	57.7	100	309	A	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
			4960	48.7	-25.3	74	60.14	34.3	13.04	58.78	335	0	P	V
			4960	42.31	-11.69	54	53.75	34.3	13.04	58.78	335	0	A	V
		7440	49.03	-24.97	74	55.75	35.6	15.38	57.7	261	349	P	V	
		7440	42.08	-11.92	54	48.8	35.6	15.38	57.7	261	349	A	V	
													V	
													V	
													V	
													V	
													V	
													V	
													V	
													V	
													V	
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Emission above 18GHz

2.4GHz BLE (SHF)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
2.4GHz BLE SHF		18098	42.46	-31.54	74	51.69	37.7	12.69	59.62	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
			18063	42.31	-31.69	74	51.53	37.7	12.69	59.61	-	-	P
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against 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.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
2.4GHz BLE LF		69.69	33.53	-6.47	40	49.48	12.24	1.68	29.87	-	-	P	H	
		225.21	34.27	-11.73	46	45.76	15.8	2.69	29.98	-	-	P	H	
		272.19	34.14	-11.86	46	42.34	18.83	2.9	29.93	-	-	P	H	
		320.3	32.49	-13.51	46	39.93	19.41	3.06	29.91	-	-	P	H	
		416.2	31.7	-14.3	46	35.54	22.52	3.52	29.88	-	-	P	H	
		952.4	35.1	-10.9	46	28.06	30.35	5.51	28.82	-	-	P	H	
														H
														H
														H
														H
														H
														H
			30	32.39	-7.61	40	36.96	24.11	1.4	30.08	-	-	P	V
			38.91	29.37	-10.63	40	37.75	20.15	1.43	29.96	-	-	P	V
			68.61	31.17	-8.83	40	47.25	12.13	1.68	29.89	-	-	P	V
			799.1	31.65	-14.35	46	28.36	27.86	5	29.57	-	-	P	V
			874	33.64	-12.36	46	28.51	28.95	5.34	29.16	-	-	P	V
			958.7	34.15	-11.85	46	26.8	30.63	5.51	28.79	-	-	P	V
														V
														V
													V	
													V	
													V	
													V	

**Remark**

- No other spurious found.
- All results are PASS against limit line.
- 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**

*	<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>Margin</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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		( 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. Margin (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. Margin (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. Margin (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 D. Radiated Spurious Emission Plots

<b>Test Engineer :</b>	Jesse Wang, Stan Hsieh and Ken Wu	<b>Temperature :</b>	23.8~26.7°C
		<b>Relative Humidity :</b>	46.8~65%

### Note symbol

-L	Low channel location
-R	High channel location



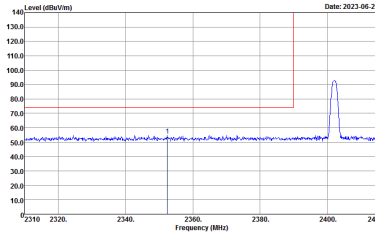
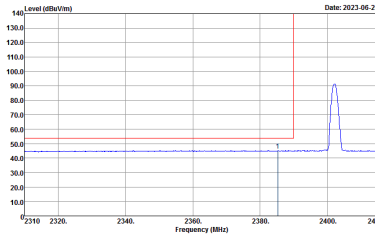
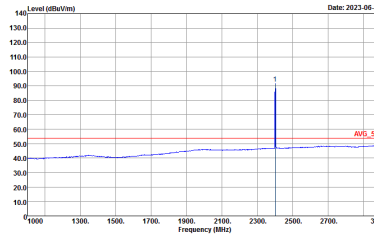
<1Mbps>

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_3m HE_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	<p>Site : 03CH07-HY Condition : PEAK_3m HE_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	<p>Site : 03CH07-HY Condition : AVG_BE_3m HE_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>	<p>Site : 03CH07-HY Condition : AVG_3m HE_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Vertical	Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical Peak. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A sharp peak is visible at approximately 2402 MHz, reaching a level of about 135 dBuV/m. A red vertical line marks the peak position.</p> <p>Site : 03CH07-HY Condition : PEAK_BE_24 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz; VBW:3000.000kHz; SWT:Auto</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental Peak. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A sharp peak is visible at approximately 2402 MHz, reaching a level of about 135 dBuV/m. A red vertical line marks the peak position, labeled 'PEAK_74'.</p> <p>Site : 03CH07-HY Condition : PEAK_24 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz; VBW:3000.000kHz; SWT:Auto</p>
Avg	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical Avg. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A peak is visible at approximately 2402 MHz, reaching a level of about 135 dBuV/m. A red vertical line marks the peak position.</p> <p>Site : 03CH07-HY Condition : AVG_BE_24 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz; VBW:3.000kHz; SWT:Auto</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental Avg. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A peak is visible at approximately 2402 MHz, reaching a level of about 135 dBuV/m. A red vertical line marks the peak position, labeled 'AVG_54'.</p> <p>Site : 03CH07-HY Condition : AVG_24 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz; VBW:3.000kHz; SWT:Auto</p>

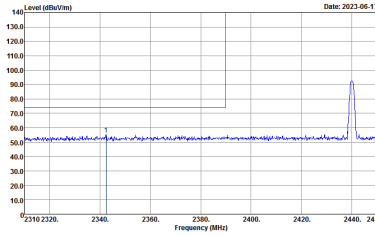
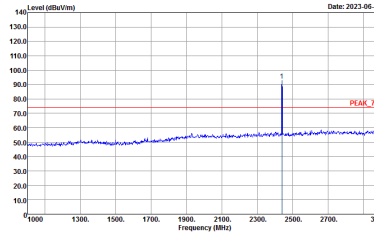
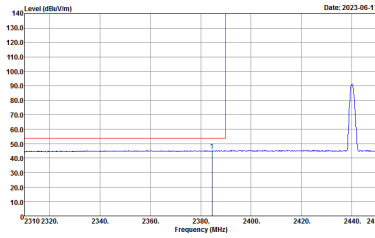
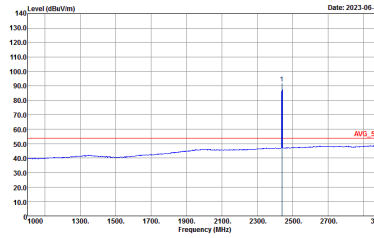


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH19 2440MHz - L		
Horizontal		Fundamental
Peak	<p>Date: 2023-06-17</p> <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	<p>Date: 2023-06-17</p> <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	<p>Date: 2023-06-17</p> <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>	<p>Date: 2023-06-17</p> <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>



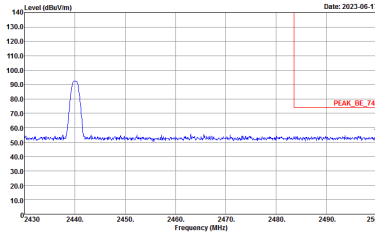
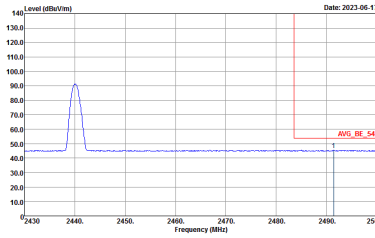
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Horizontal	Fundamental
Peak	<p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWF:Auto</p>	Left blank
Avg.	<p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3.000kHz SWF:Auto</p>	Left blank



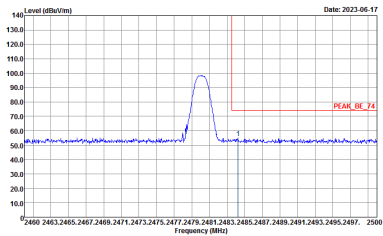
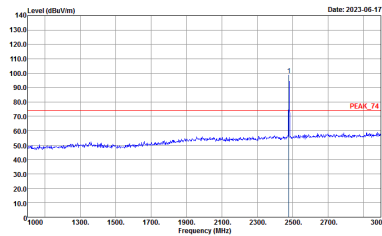
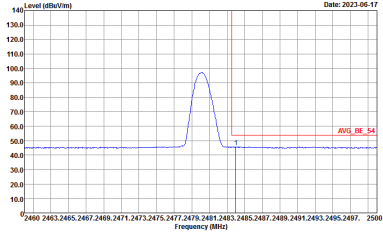
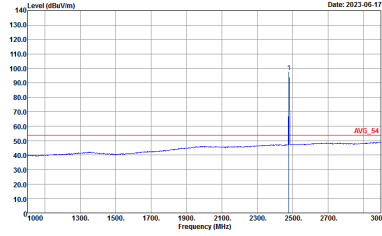
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Vertical	Fundamental
Peak	 <p>Site Condition : 03CH07-HY : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>Site Condition : 03CH07-HY : PEAK_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	 <p>Site Condition : 03CH07-HY : AVG_BE_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>	 <p>Site Condition : 03CH07-HY : AVG_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>



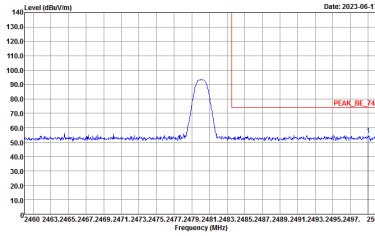
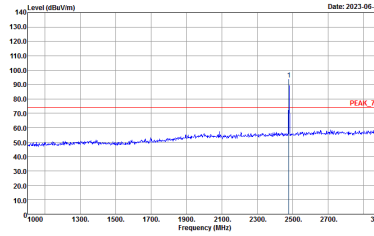
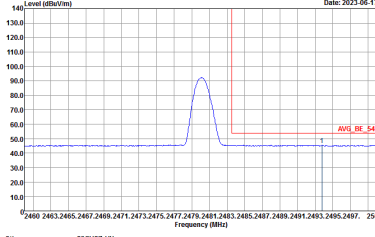
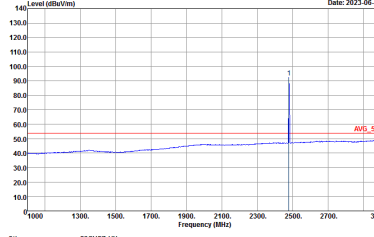


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWFAuto</p>	Left blank
Avg.	 <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:1.000kHz SWFAuto</p>	Left blank



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH39 2480MHz		
Horizontal		Fundamental
Peak	 <p>Date: 2023-06-17</p> <p>Site Condition : 03CH07-HY : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>Date: 2023-06-17</p> <p>Site Condition : 03CH07-HY : PEAK_24 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	 <p>Date: 2023-06-17</p> <p>Site Condition : 03CH07-HY : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>	 <p>Date: 2023-06-17</p> <p>Site Condition : 03CH07-HY : AVG_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>

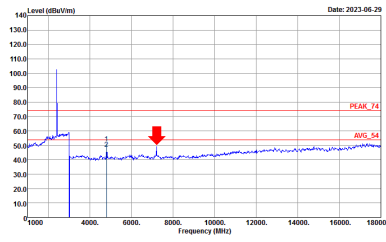
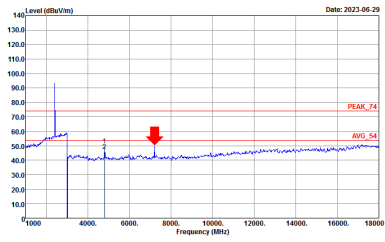


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing a peak at 2480 MHz. The peak level is approximately 100 dBµV/m. The plot includes a red line indicating the peak level and a blue line for the noise floor. The x-axis ranges from 2460 to 2500 MHz, and the y-axis ranges from 10.0 to 140.0 dBµV/m.</p> <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing a peak at 2480 MHz. The peak level is approximately 100 dBµV/m. The plot includes a red line indicating the peak level and a blue line for the noise floor. The x-axis ranges from 1900 to 3000 MHz, and the y-axis ranges from 10.0 to 140.0 dBµV/m.</p> <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing the average level at 2480 MHz. The average level is approximately 55 dBµV/m. The plot includes a red line indicating the average level and a blue line for the noise floor. The x-axis ranges from 2460 to 2500 MHz, and the y-axis ranges from 10.0 to 140.0 dBµV/m.</p> <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing the average level at 2480 MHz. The average level is approximately 55 dBµV/m. The plot includes a red line indicating the average level and a blue line for the noise floor. The x-axis ranges from 1900 to 3000 MHz, and the y-axis ranges from 10.0 to 140.0 dBµV/m.</p> <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>



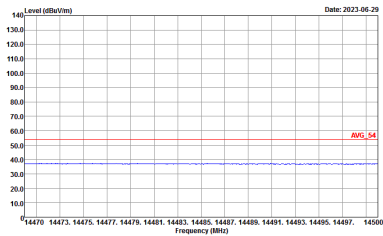
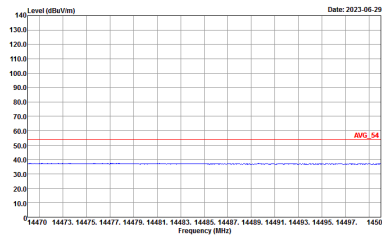
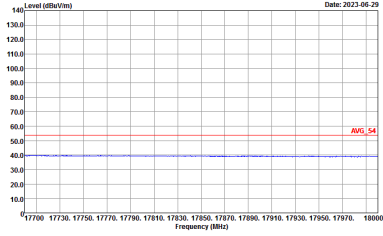
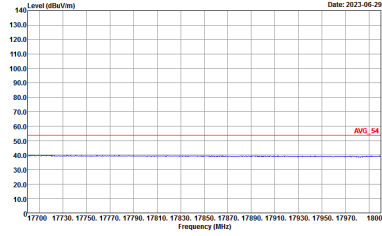
2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

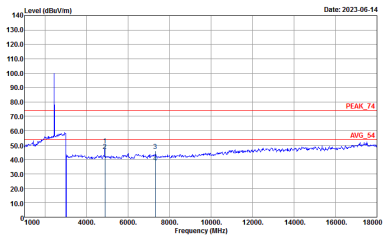
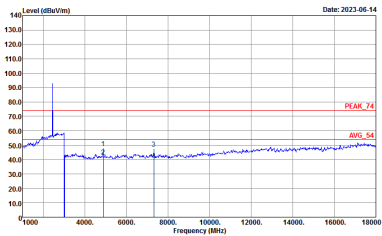
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.	 <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL</p>

**Remark:** The unwanted signal of red marks in plot falls within the non-restricted band and meet the requirements of 15.247 (d).

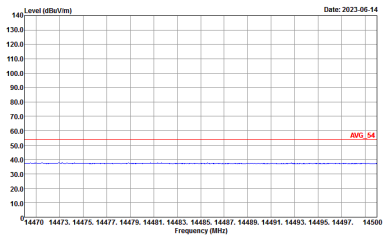
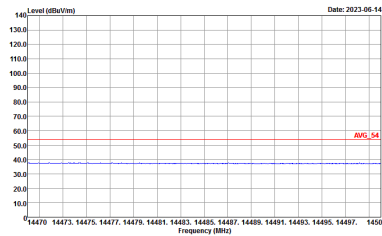
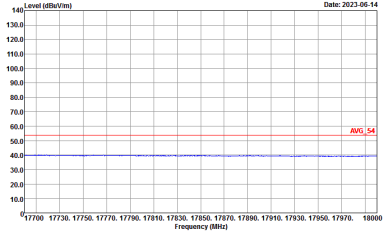
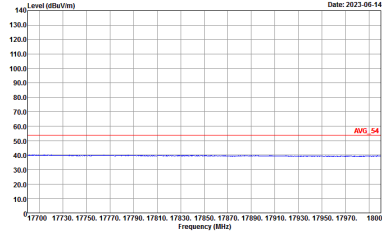


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
<p><b>14.47G</b> <b>~14.5G</b> <b>Avg.</b></p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL</p>
<p><b>17.7G</b> <b>~18G</b> <b>Avg</b></p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL</p>

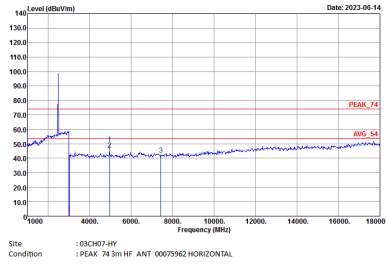
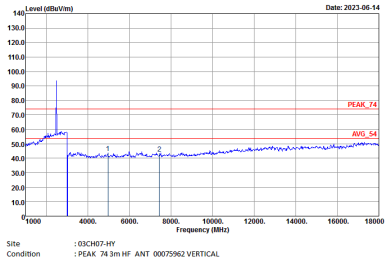


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak Avg.	 <p>Site : 09CH07-HY Condition : PEAK_24 3m HF_ANT_00075962 HORIZONTAL - - - - -</p>	 <p>Site : 09CH07-HY Condition : PEAK_24 3m HF_ANT_00075962 VERTICAL - - - - -</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
BLE CH19 2440MHz		
Horizontal		Vertical
<p><b>14.47G</b> <b>~14.5G</b> <b>Avg.</b></p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL</p>
<p><b>17.7G</b> <b>~18G</b> <b>Avg</b></p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak	 <p>Site : 03CH07-HY Condition : PEAK 74 3m HF ANT 00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : PEAK 74 3m HF ANT 00075962 VERTICAL</p>





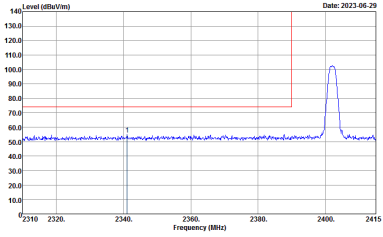
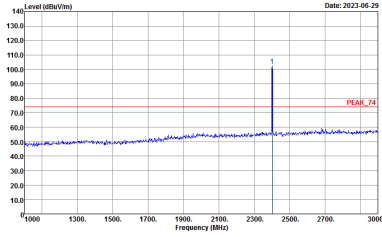
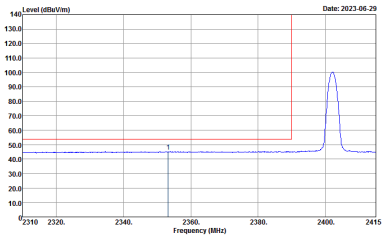
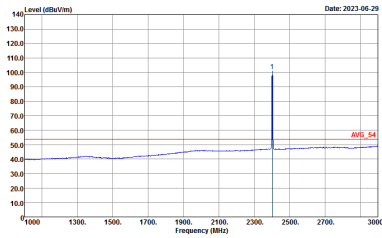
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
BLE CH39 2480MHz		
Horizontal		Vertical
<p>14.47G ~14.5G Avg.</p>	<p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 HORIZONTAL</p>	<p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 VERTICAL</p>
<p>17.7G ~18G Avg</p>	<p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 HORIZONTAL</p>	<p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 VERTICAL</p>



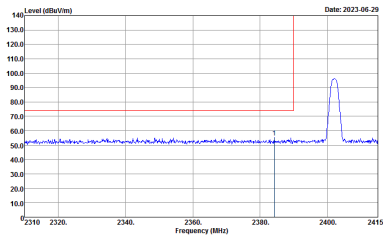
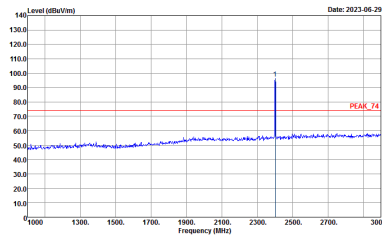
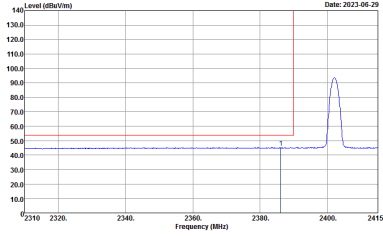
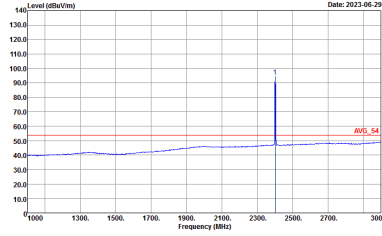
<2Mbps>

2.4GHz 2400~2483.5MHz

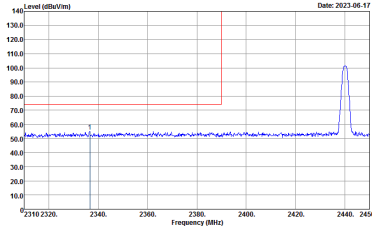
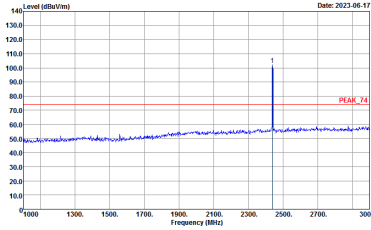
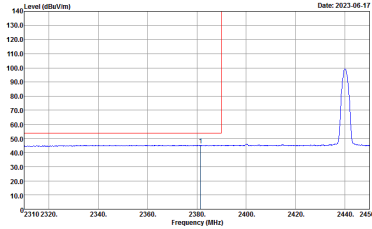
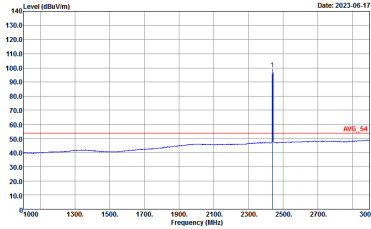
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE_3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>Site : 03CH07-HY Condition : PEAK_3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	 <p>Site : 03CH07-HY Condition : AVG_BE_3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>	 <p>Site : 03CH07-HY Condition : AVG_3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>

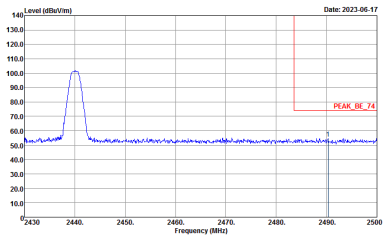
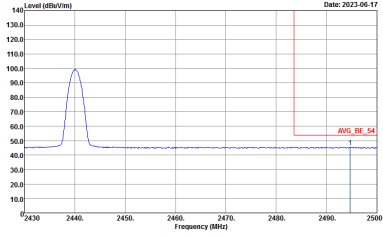


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH00 2402MHz		
Vertical		Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A red line indicates the peak level at approximately 100 dBuV/m.</p> <p>Date: 2023-06-29</p> <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the peak level at approximately 75 dBuV/m.</p> <p>Date: 2023-06-29</p> <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing an average level at 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A red line indicates the average level at approximately 50 dBuV/m.</p> <p>Date: 2023-06-29</p> <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3.000kHz SWT:Auto</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing an average level at 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the average level at approximately 50 dBuV/m.</p> <p>Date: 2023-06-29</p> <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3.000kHz SWT:Auto</p>

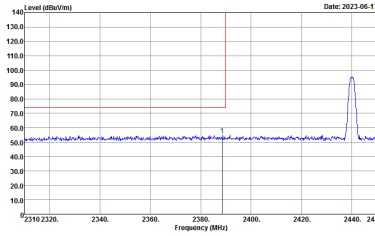
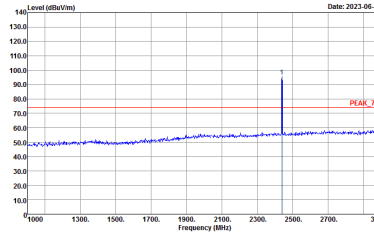
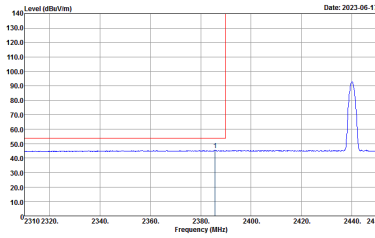
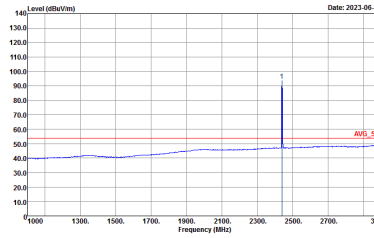


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH19 2440MHz - L		
	Horizontal	Fundamental
Peak	 <p>Date: 2023-06-17</p> <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	 <p>Date: 2023-06-17</p> <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	 <p>Date: 2023-06-17</p> <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>	 <p>Date: 2023-06-17</p> <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>

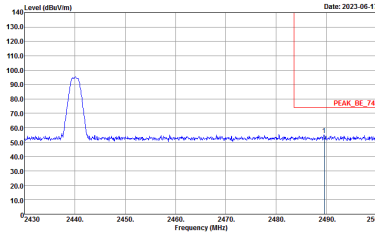
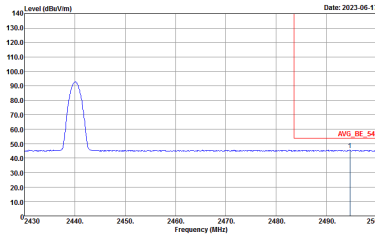


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH19 2440MHz - R		
Horizontal		Fundamental
<p><b>Peak</b></p>	 <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWF:Auto</p>	<p>Left blank</p>
<p><b>Avg.</b></p>	 <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3.000kHz SWF:Auto</p>	<p>Left blank</p>



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Vertical	Fundamental
Peak	 <p>Site Condition : 03CH07-HY : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWF:Auto</p>	 <p>Site Condition : 03CH07-HY : PEAK_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWF:Auto</p>
Avg.	 <p>Site Condition : 03CH07-HY : AVG_BE_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:1.000kHz SWF:Auto</p>	 <p>Site Condition : 03CH07-HY : AVG_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:1.000kHz SWF:Auto</p>



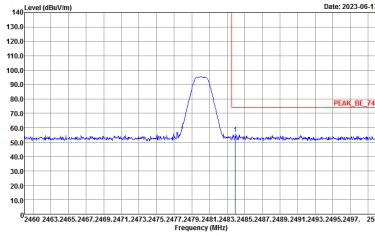
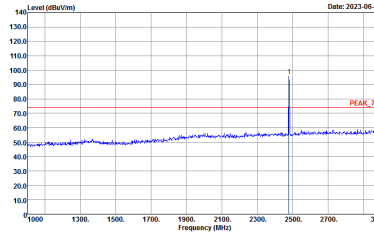
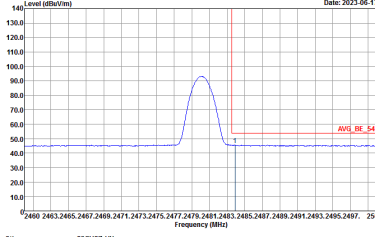
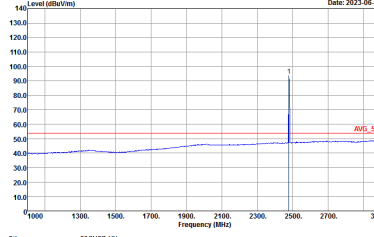
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWFAuto</p>	Left blank
Avg.	 <p>Site : 03CH07-HY Condition : : AVG_BE_54 3m HF_ANT_00075962 VERTICAL : RBW:1000.000kHz VBW:3.000kHz SWFAuto</p>	Left blank



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH39 2480MHz		
Horizontal		Fundamental
Peak	<p>Date: 2023-06-17</p> <p>Site Condition : 03CH07-HY : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>	<p>Date: 2023-06-17</p> <p>Site Condition : 03CH07-HY : PEAK_74 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p>
Avg.	<p>Date: 2023-06-17</p> <p>Site Condition : 03CH07-HY : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>	<p>Date: 2023-06-17</p> <p>Site Condition : 03CH07-HY : AVG_54 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000kHz VBW:1.000kHz SWT:Auto</p>





BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak	 <p>Level (dBm/1m) vs Frequency (MHz) plot showing a peak at 2480 MHz. The peak level is approximately 100 dBm/1m. The plot includes a red horizontal line labeled 'PEAK_BE_74' at the peak level.</p> <p>Site : 03CH07-HY Condition : :PEAK_BE_74 3m HF_ANT_00075962 VERTICAL :RBW:1000.000kHz;VBW:3000.000kHz;SWT:Auto</p>	 <p>Level (dBm/1m) vs Frequency (MHz) plot showing a sharp peak at 2480 MHz. The peak level is approximately 100 dBm/1m. The plot includes a red horizontal line labeled 'PEAK_74' at the peak level.</p> <p>Site : 03CH07-HY Condition : :PEAK_74 3m HF_ANT_00075962 VERTICAL :RBW:1000.000kHz;VBW:3000.000kHz;SWT:Auto</p>
Avg.	 <p>Level (dBm/1m) vs Frequency (MHz) plot showing the average level of the signal. The average level is approximately 50 dBm/1m. The plot includes a red horizontal line labeled 'AVG_BE_54' at the average level.</p> <p>Site : 03CH07-HY Condition : :AVG_BE_54 3m HF_ANT_00075962 VERTICAL :RBW:1000.000kHz;VBW:1.000kHz;SWT:Auto</p>	 <p>Level (dBm/1m) vs Frequency (MHz) plot showing the average level of the signal. The average level is approximately 50 dBm/1m. The plot includes a red horizontal line labeled 'AVG_54' at the average level.</p> <p>Site : 03CH07-HY Condition : :AVG_54 3m HF_ANT_00075962 VERTICAL :RBW:1000.000kHz;VBW:1.000kHz;SWT:Auto</p>



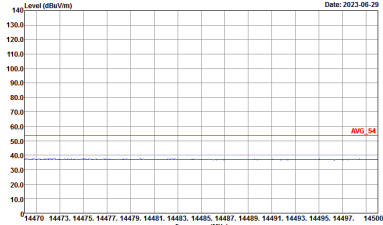
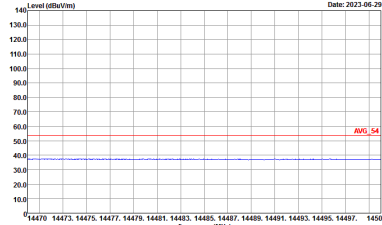
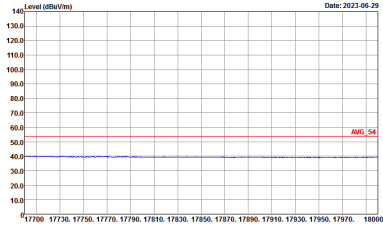
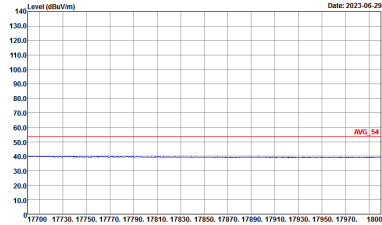
2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

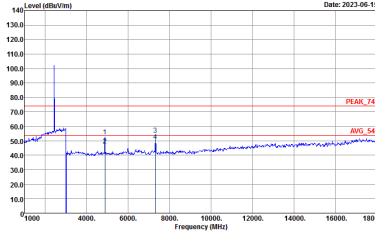
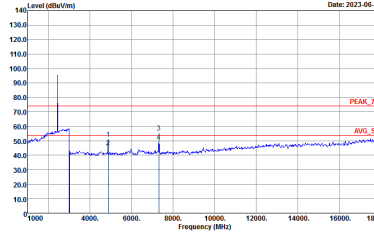
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH07-HY Condition : PEAK 74 3m HF ANT 00075962 HORIZONTAL</p>	<p>Site : 03CH07-HY Condition : PEAK 74 3m HF ANT 00075962 VERTICAL</p>

**Remark:** The unwanted signal of red marks in plot falls within the non-restricted band and meet the requirements of 15.247 (d).

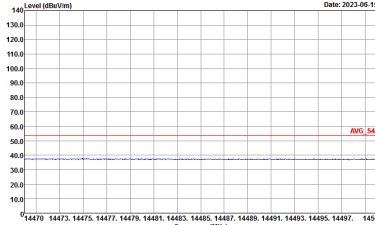
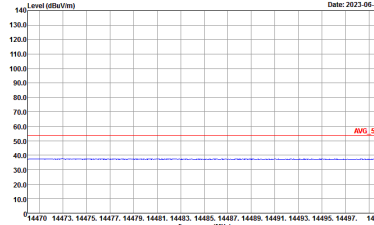
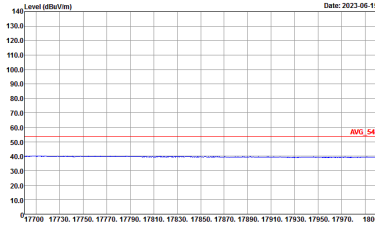
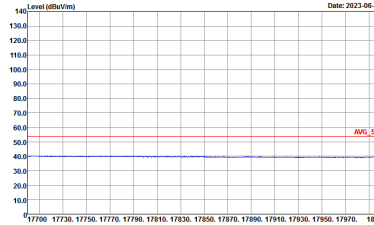


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
BLE CH00 2402MHz		
	Horizontal	Vertical
<p><b>14.47G</b> <b>~14.5G</b> <b>Avg.</b></p>	 <p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 VERTICAL</p>
<p><b>17.7G</b> <b>~18G</b> <b>Avg</b></p>	 <p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 VERTICAL</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak Avg.	 <p>Site : 03CH07-HY Condition : PEAK 74 3m HF ANT 00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : PEAK 74 3m HF ANT 00075962 VERTICAL</p>

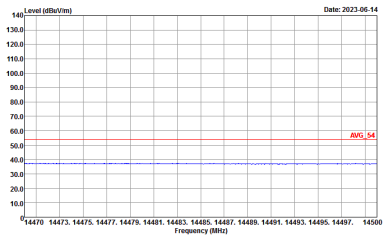
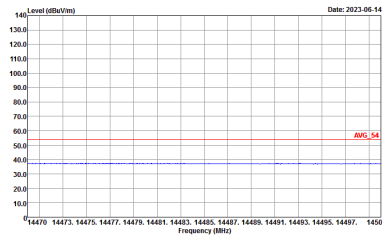
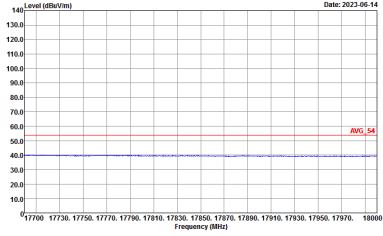
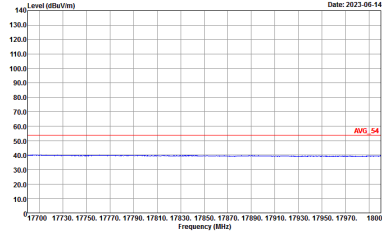


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
BLE CH19 2440MHz		
Horizontal		Vertical
<p><b>14.47G</b> <b>~14.5G</b> <b>Avg.</b></p>	 <p>Date: 2023-06-15</p> <p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 HORIZONTAL</p>	 <p>Date: 2023-06-15</p> <p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 VERTICAL</p>
<p><b>17.7G</b> <b>~18G</b> <b>Avg</b></p>	 <p>Date: 2023-06-15</p> <p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 HORIZONTAL</p>	 <p>Date: 2023-06-15</p> <p>Site : 03CH07-HY Condition : AVG 54 3m HF ANT 00075962 VERTICAL</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak	<p>Horizontal spectrum plot showing Level (dBuV/m) vs Frequency (MHz). The plot includes a peak at 2480 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 1000 to 18000 MHz. A red horizontal line indicates the peak level at approximately 75 dBuV/m, labeled 'PEAK_74'. A blue horizontal line indicates the average level at approximately 54 dBuV/m, labeled 'AVG_54'. The plot is dated 2023-06-14. Below the plot, the following text is present: Site: 09CH07-HY, Condition: PEAK_24 3m HF_ANT_00075962 HORIZONTAL.</p>	<p>Vertical spectrum plot showing Level (dBuV/m) vs Frequency (MHz). The plot includes a peak at 2480 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 1000 to 18000 MHz. A red horizontal line indicates the peak level at approximately 75 dBuV/m, labeled 'PEAK_74'. A blue horizontal line indicates the average level at approximately 54 dBuV/m, labeled 'AVG_54'. The plot is dated 2023-06-14. Below the plot, the following text is present: Site: 09CH07-HY, Condition: PEAK_24 3m HF_ANT_00075962 VERTICAL.</p>

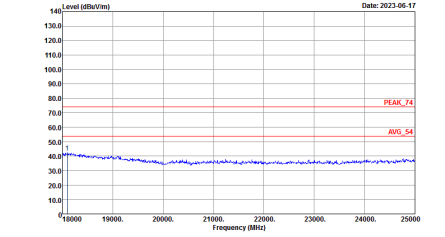
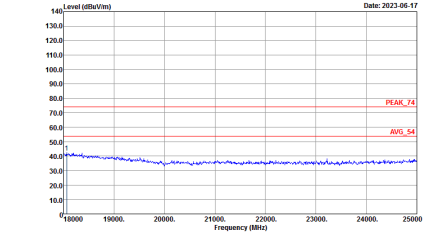


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
BLE CH39 2480MHz		
Horizontal		Vertical
<p><b>14.47G</b> <b>~14.5G</b> <b>Avg.</b></p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL</p>
<p><b>17.7G</b> <b>~18G</b> <b>Avg</b></p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 VERTICAL</p>



Emission above 18GHz

2.4GHz BLE (SHF @ 1m)

<b>BLE</b>	<b>2.4GHz 2400~2483.5MHz</b>	
	<b>BLE SHF</b>	
	<b>Horizontal</b>	<b>Vertical</b>
<b>Peak</b>  <b>Avg.</b>	 <p>Site : 03CH07-RY Condition : PEAK_24 1m SHF-EHF_9170251 HORIZONTAL</p>	 <p>Site : 03CH07-RY Condition : PEAK_24 1m SHF-EHF_9170251 VERTICAL</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(6)_H HORIZONTAL</p>	<p>Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6)_H VERTICAL</p>



## Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth - LE for 1Mbps	84.00	2100	0.48	1kHz
Bluetooth - LE for 2Mbps	56.53	1060	0.94	1kHz

