



# FCC RADIO TEST REPORT

**FCC ID** : TVE-111T15C  
**Equipment** : Bluetooth 5.1 Low Energy Module  
**Brand Name** : **FORTINET FORTINET®**  
**Model Name** : FBLE-2020TI  
**Marketing Name** : Bluetooth 5.1 Low Energy Module  
**Applicant** : Fortinet Inc.  
 899 KIFER RD  
 SUNNYVALE CA 94086  
 UNITED STATES  
**Manufacturer** : Fortinet Inc.  
 899 KIFER RD  
 SUNNYVALE CA 94086  
 UNITED STATES  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Jan. 19, 2021 and testing was started from Jan. 27, 2021 and completed on Mar. 09, 2021. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

*Louis Wu*

Approved by: Louis Wu

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

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



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### 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)	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	Under limit 4.10 dB at 456.800 MHz
3.6	15.207	AC Conducted Emission	Pass	Under limit 4.73 dB at 0.677 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	Pass	-

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by: Wii Chang**

**Report Producer: Amy Chen**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Bluetooth-LE.

Product Specification subjective to this standard	
Sample 1	EUT with FWF-81F-2R-3G4G-DSL
Sample 2	EUT with FWF-81F-2R-3G4G-POE
Antenna Type	Bluetooth-LE: PIFA Antenna
Integrated the Host	Equipment Name: Network Security Gateway Brand Name: FORTINET Model Name: FWF-80F-2Rxxxxxx, FortiWiFi 80F-2Rxxxxxx, FORTIWIFI-80F-2Rxxxxxx FWF-81F-2Rxxxxxx, FortiWiFi 81F-2Rxxxxxx, FORTIWIFI-81F-2Rxxxxxx FWF-80F-2R-3G4G-DSLxxxxxx, FortiWiFi 80F-2R-3G4G-DSLxxxxxx, FORTIWIFI-80F-2R-3G4G-DSLxxxxxx FWF-81F-2R-3G4G-DSLxxxxxx, FortiWiFi 81F-2R-3G4G-DSLxxxxxx, FORTIWIFI-81F-2R-3G4G-DSLxxxxxx, FortiGate 80F-POExxxxxx, FORTIGATE-80F-POExxxxxx, FG-80F-POExxxxxx, FortiGate 81F-POExxxxxx, FORTIGATE-81F-POExxxxxx, FG-81F-POExxxxxx, FortiWiFi 80F-2R-POExxxxxx, FORTIWIFI-80F-2R-POExxxxxx, FWF-80F-2R-POExxxxxx, FortiWiFi 81F-2R-POExxxxxx, FORTIWIFI-81F-2R-POExxxxxx, FWF-81F-2R-POExxxxxx, FortiWiFi 80F-2R-3G4G-POExxxxxx, FORTIWIFI-80F-2R-3G4G-POExxxxxx, FWF-80F-2R-3G4G-POExxxxxx, FortiWiFi 81F-2R-3G4G-POExxxxxx, FORTIWIFI-81F-2R-3G4G-POExxxxxx, FWF-81F-2R-3G4G-POExxxxxx (where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only)

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	0.74

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

## 1.2 Modification of EUT

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



### 1.3 Testing Location

<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> TH05-HY, CO05-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> 03CH16-HY (TAF Code: 3786)
<b>Remark</b>	The Radiated Emission test item subcontracted to Sporton International Inc. Wensan Laboratory.

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

FCC designation No.: TW1190 and TW0007

### 1.4 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ ANSI C63.10-2013

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.



## 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, pre-scanned in two antenna degrees (Ant. Horizontal and Ant. Vertical). The worst cases (Ant. Vertical) were recorded 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: Bluetooth Link + Adapter 1*2 for Sample 1
	Mode 2: Bluetooth Idle + Adapter 1*2 for Sample 1
	Mode 3: Bluetooth Link + Adapter 2*2 for Sample 2
	Mode 4: Bluetooth Idle + Adapter 2*2 for Sample 2
<b>Remark:</b> The worst case of conducted emission is mode 3; only the test data of it was reported.	



### 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.	Phone	SAMSUNG	SM-A730F/DS	A3LSMA730F	N/A	N/A



## 2.5 EUT Operation Test Setup

The RF test items, utility “Tera Term V4.89” 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

See list of measuring equipment of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was 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

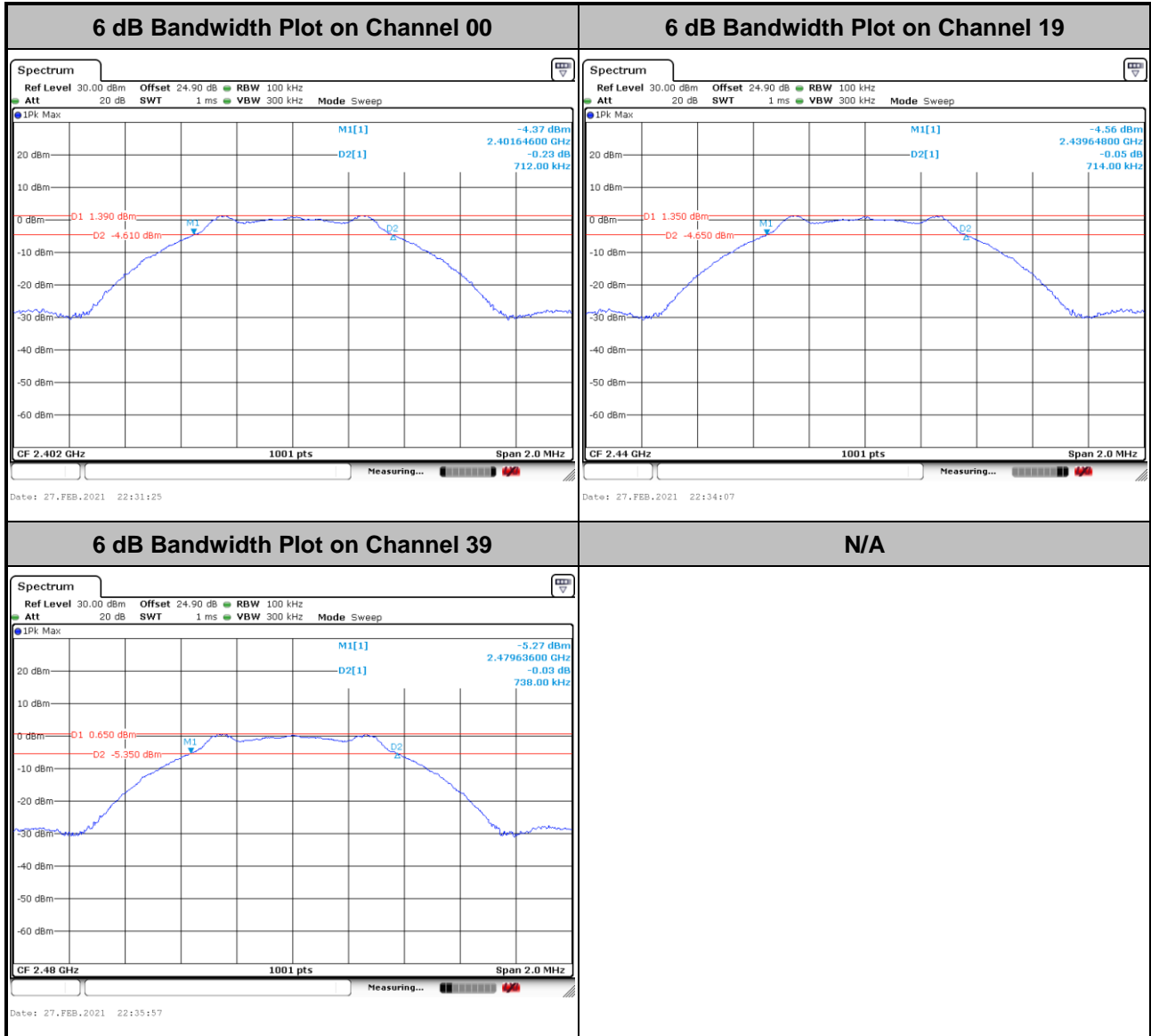




### 3.1.5 Test Result of 6dB Bandwidth

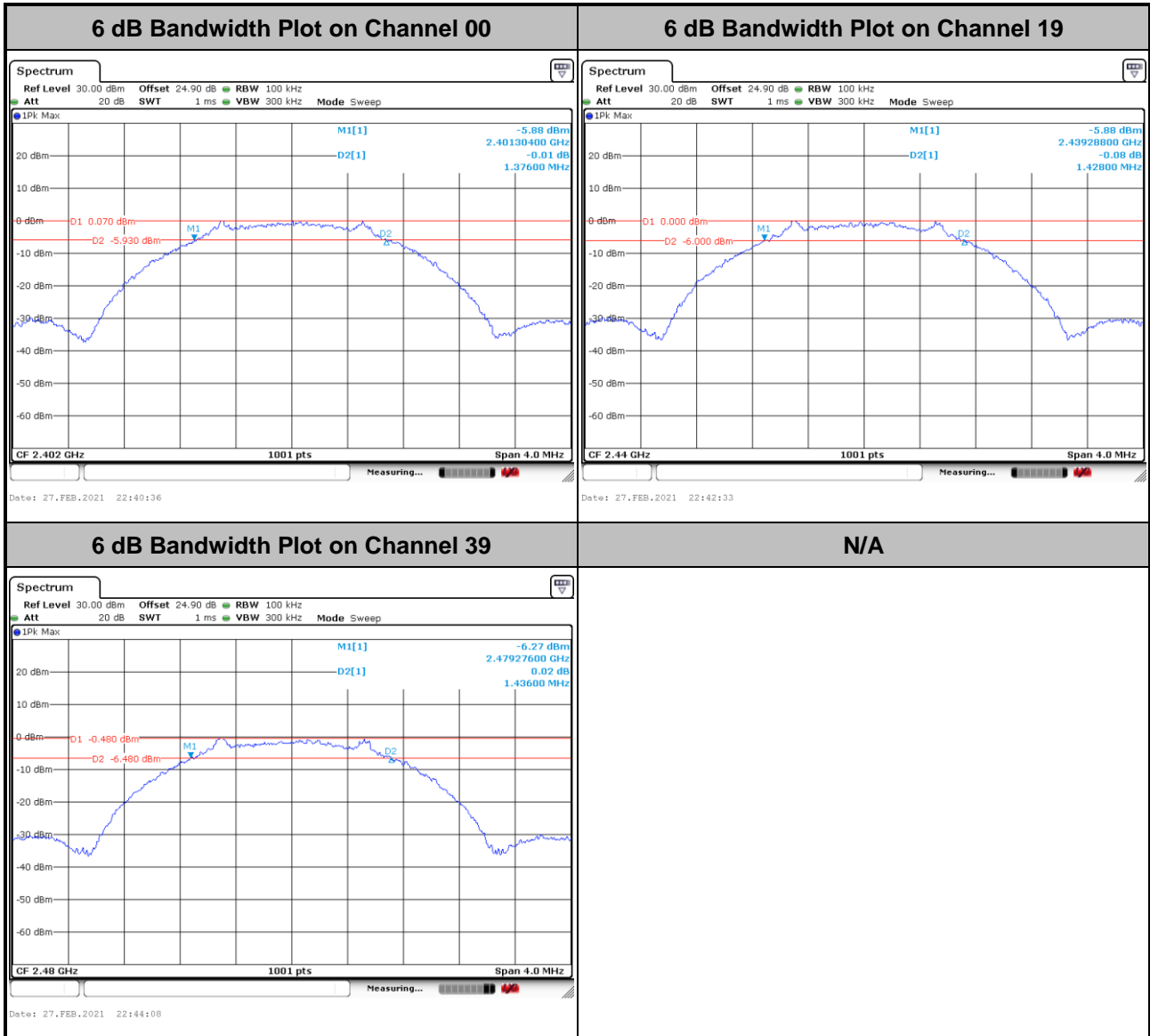
Please refer to Appendix A.

<1Mbps>





<2Mbps>

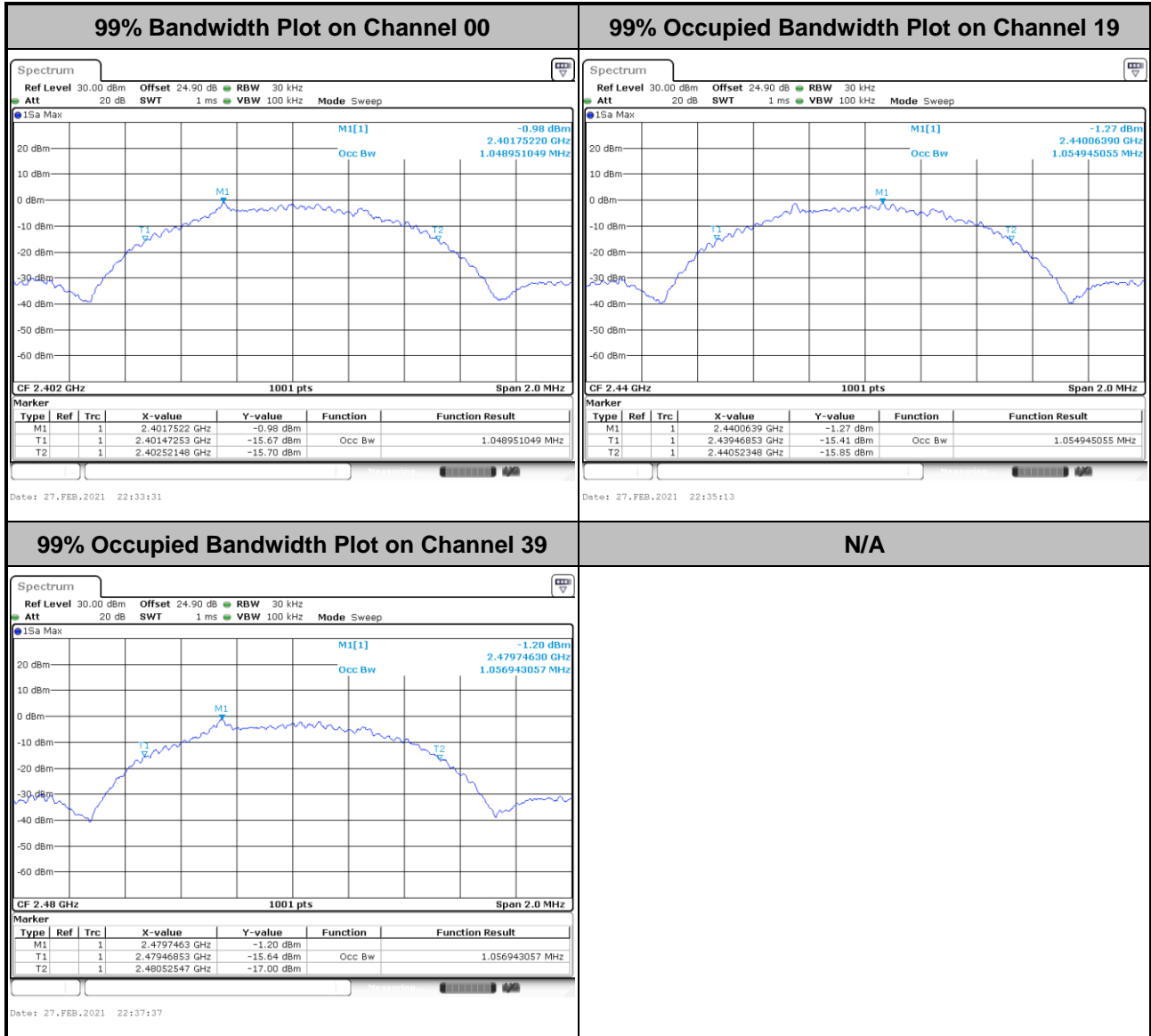




### 3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

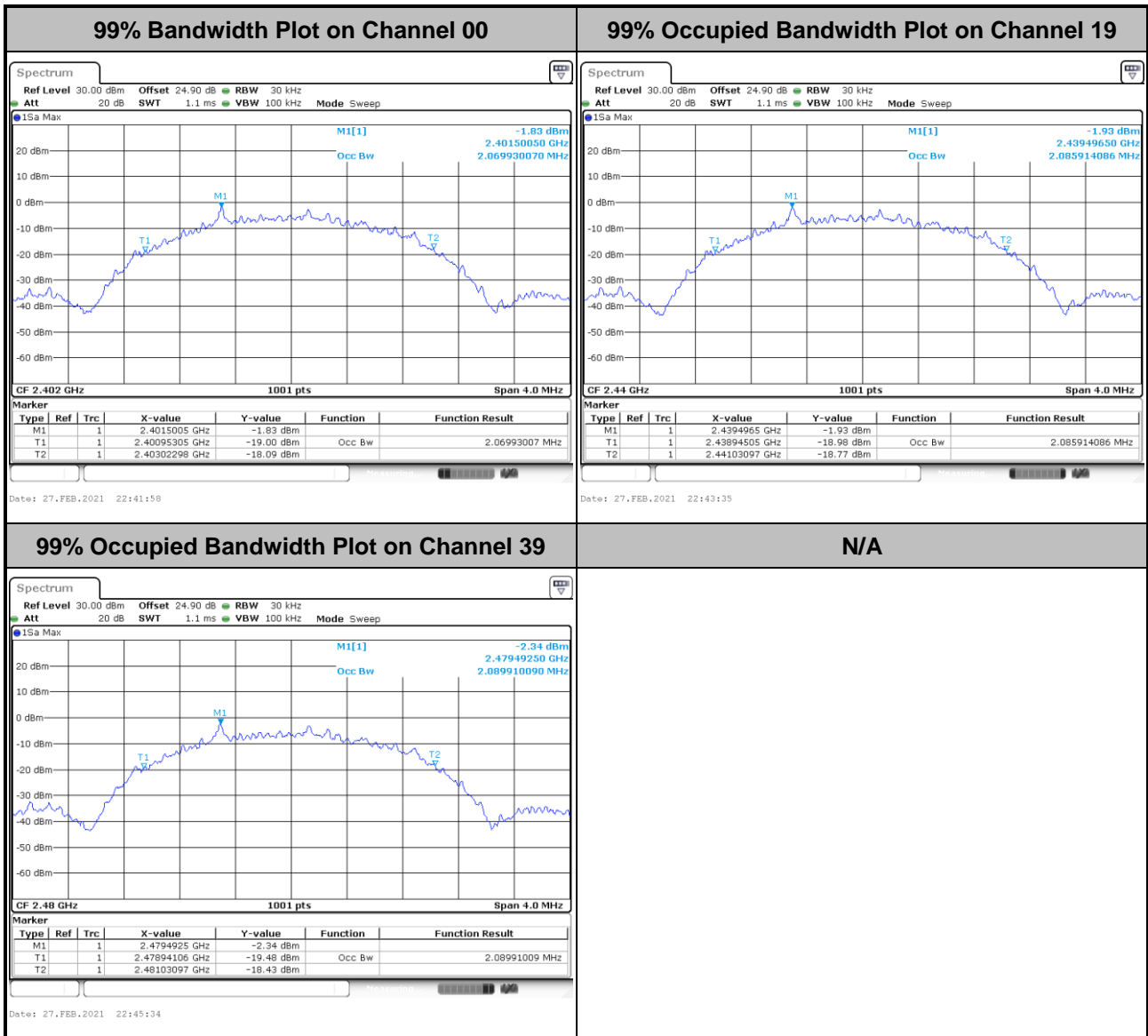
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Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



<2Mbps>



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

## 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.

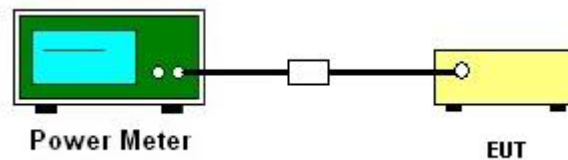
### 3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.2.3 Test Procedures

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

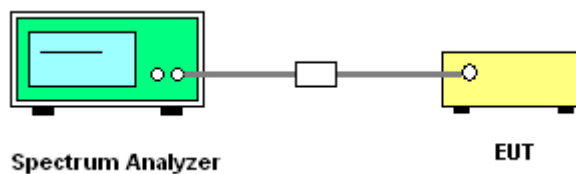
#### 3.3.2 Measuring Instruments

See list of measuring equipment of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was 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. (6dB 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



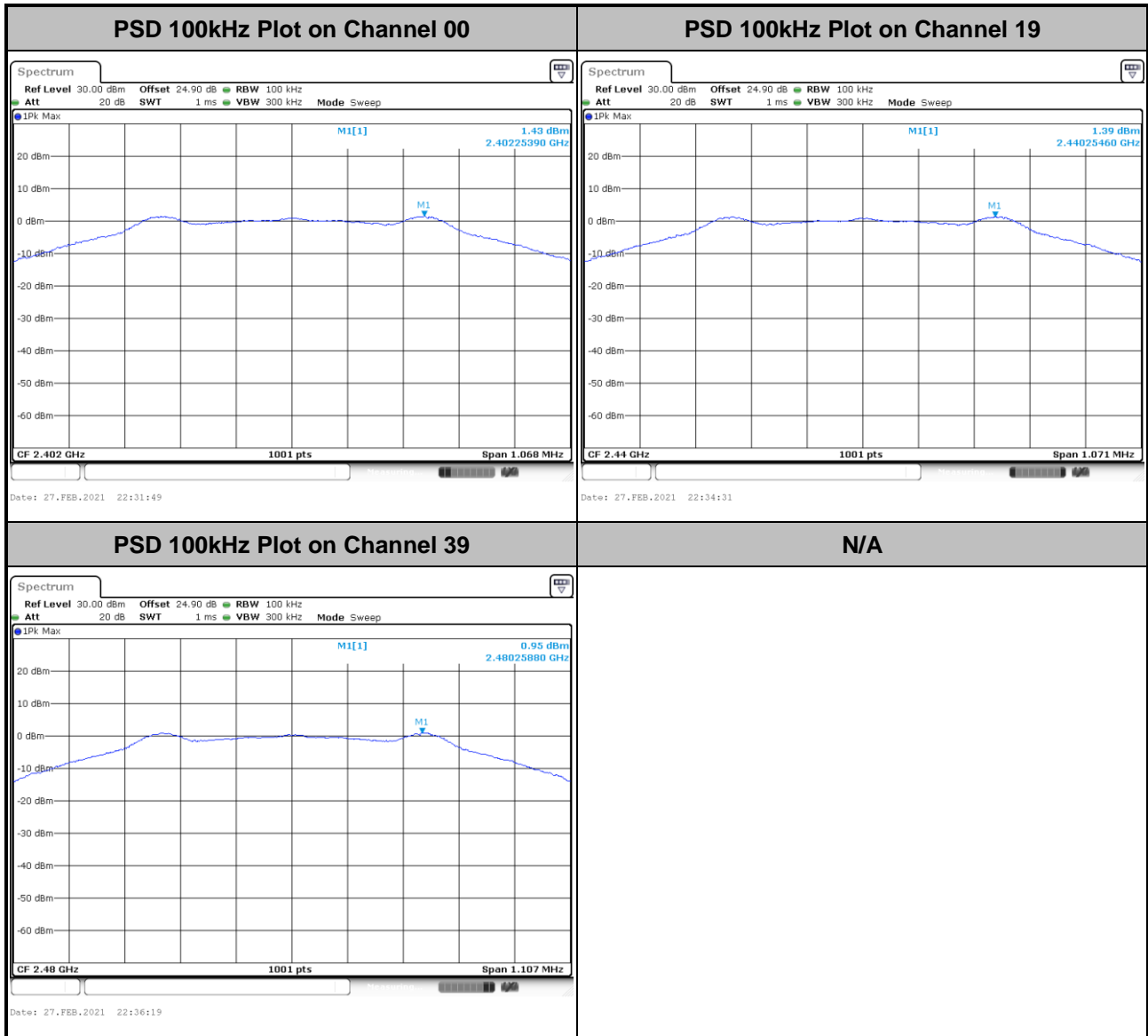
#### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



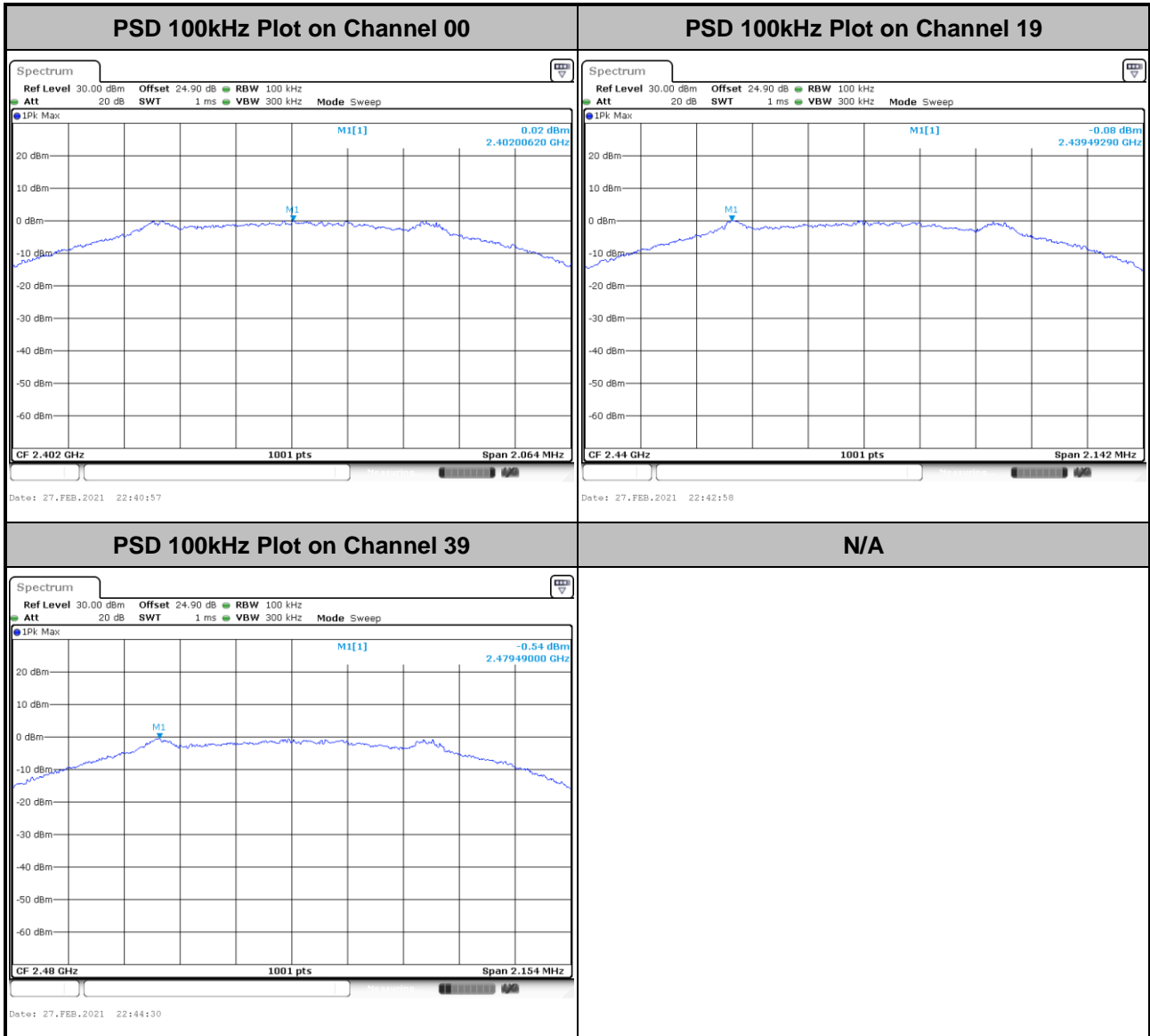
### 3.3.6 Test Result of Power Spectral Density Plots (100kHz)

<1Mbps>





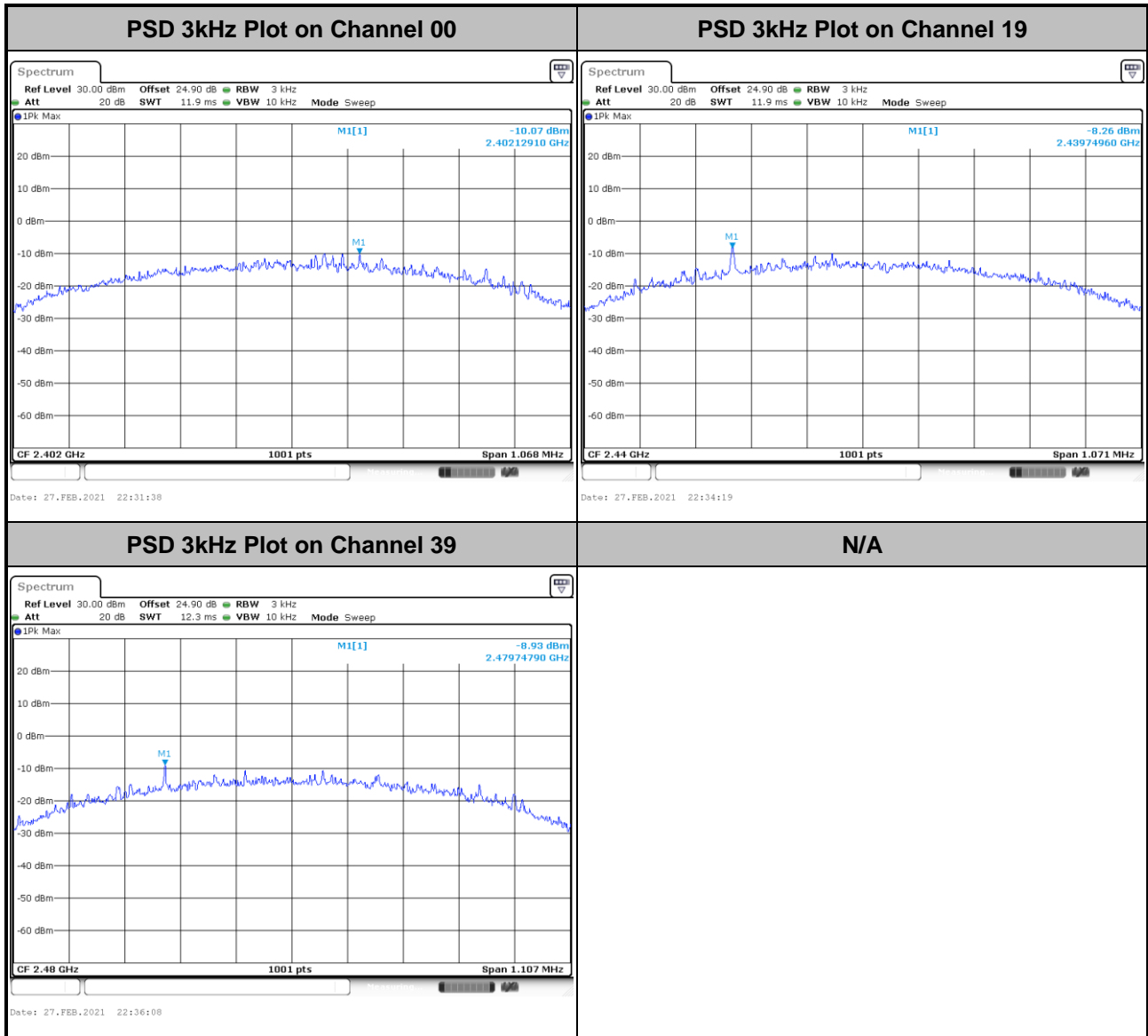
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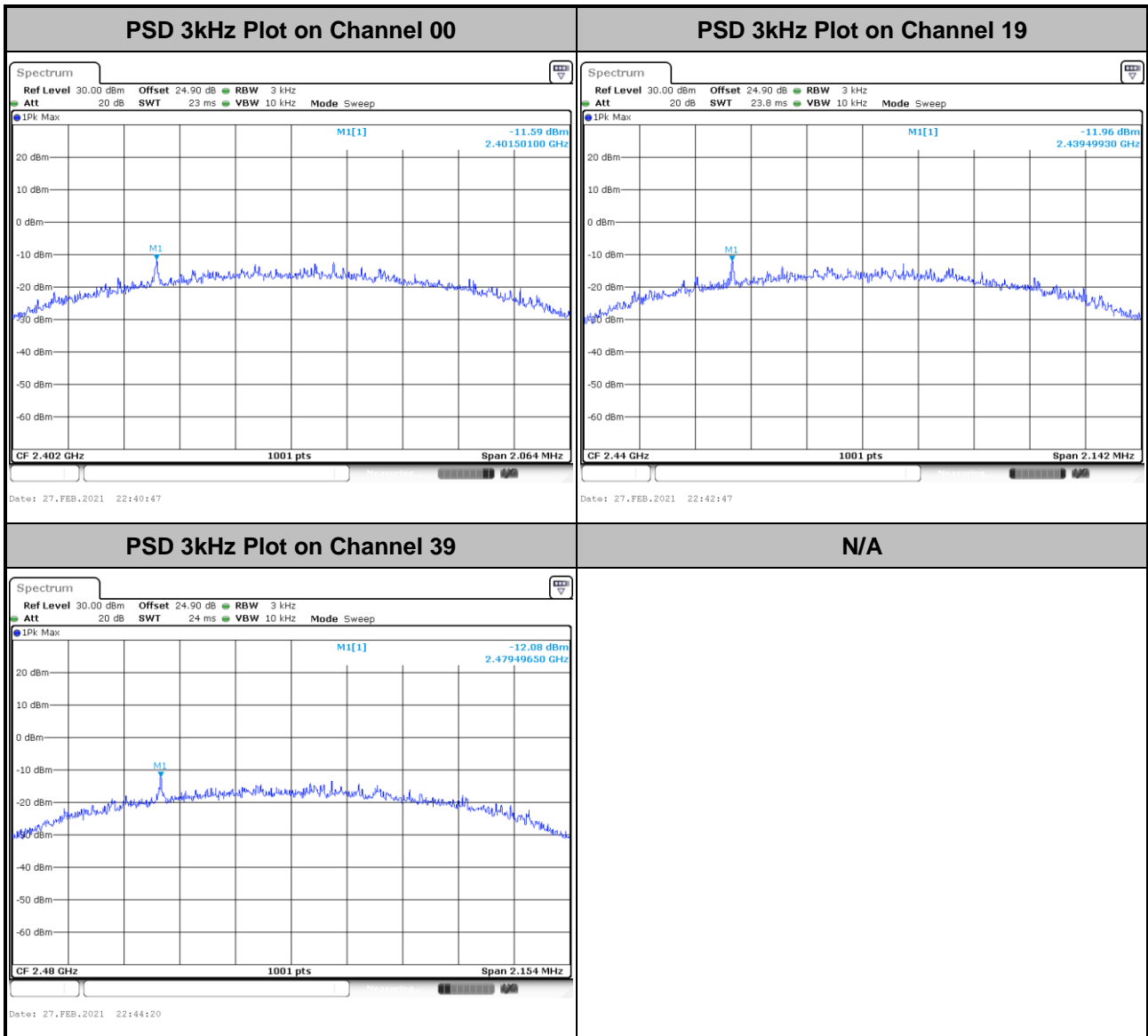
### 3.3.7 Test Result of Power Spectral Density Plots (3kHz)

<1Mbps>





<2Mbps>



## 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 20 dB down from the highest emission level within the authorized band.

### 3.4.2 Measuring Instruments

See list of measuring equipment of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was 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.

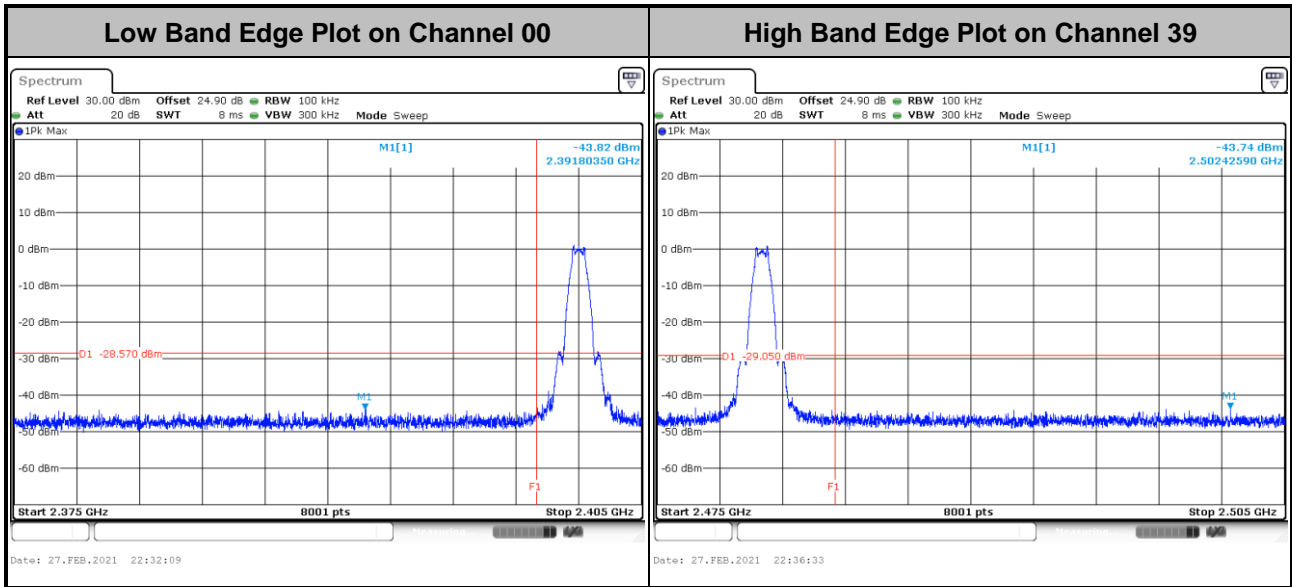
### 3.4.4 Test Setup



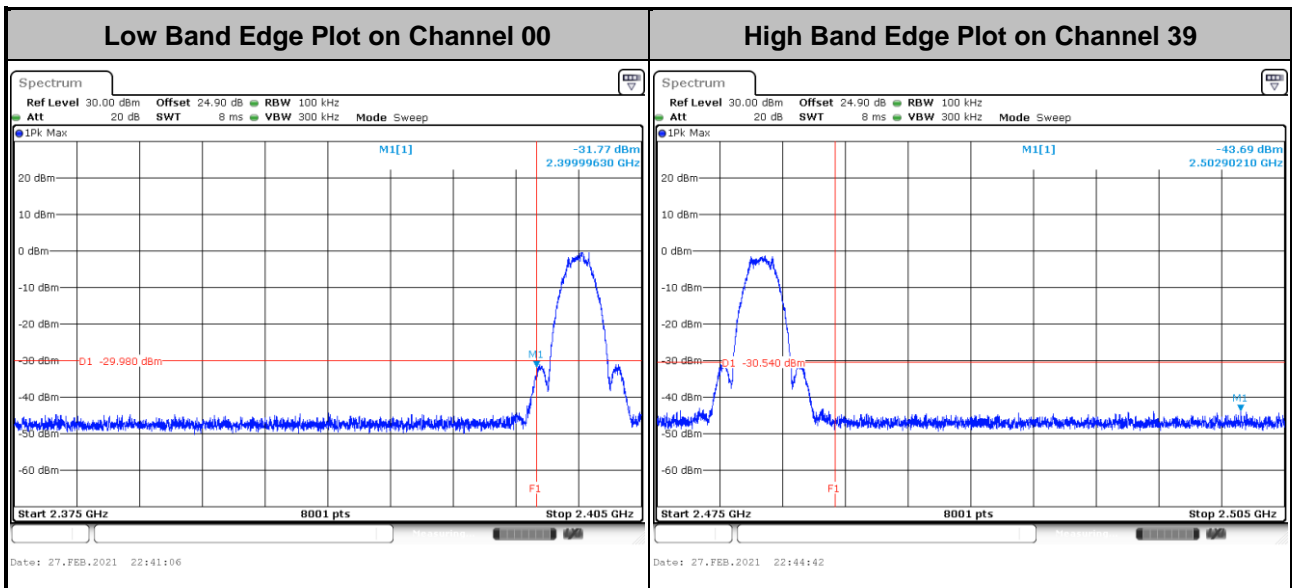


### 3.4.5 Test Result of Conducted Band Edges Plots

<1Mbps>

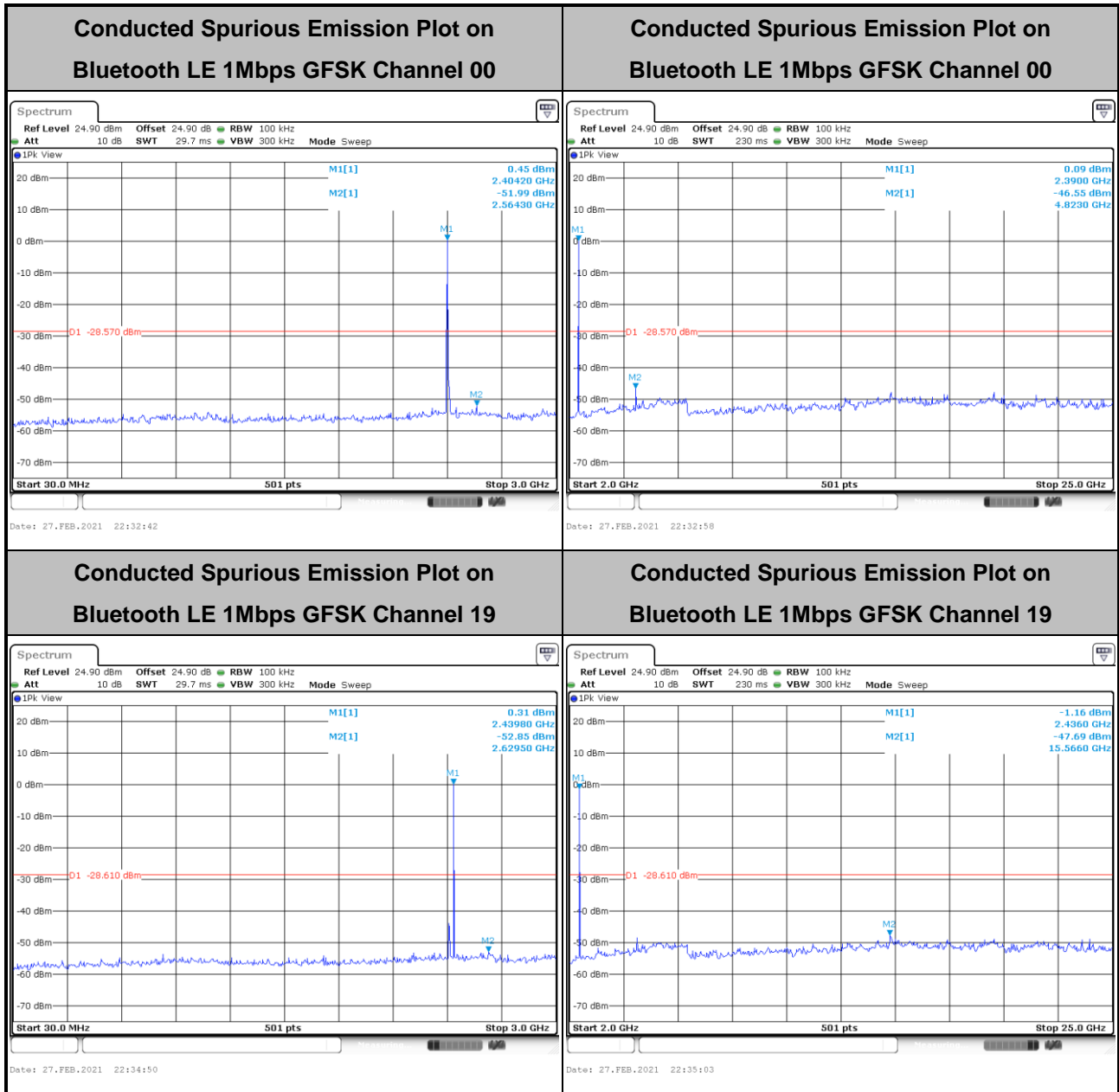


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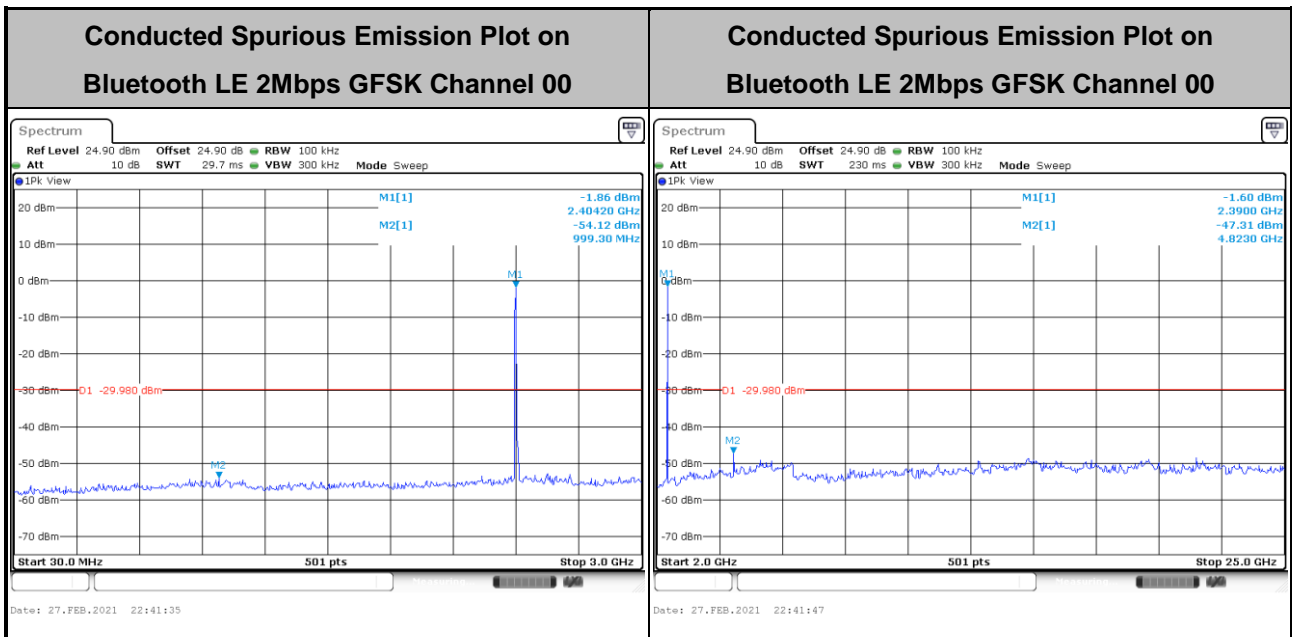
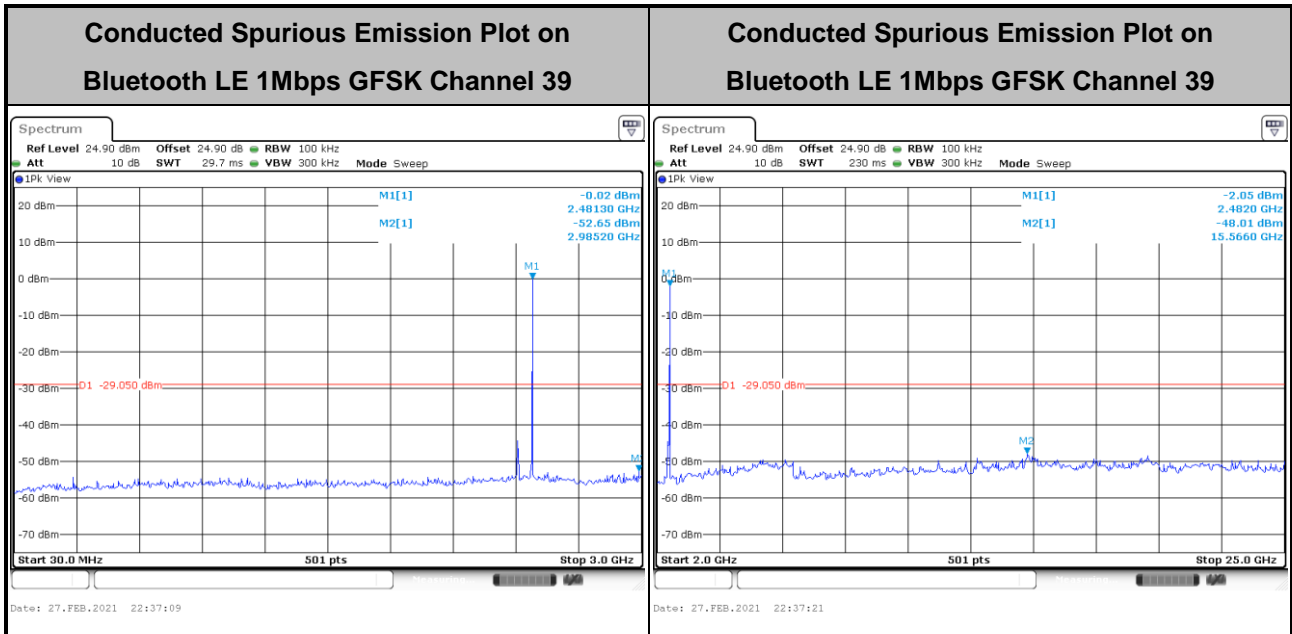


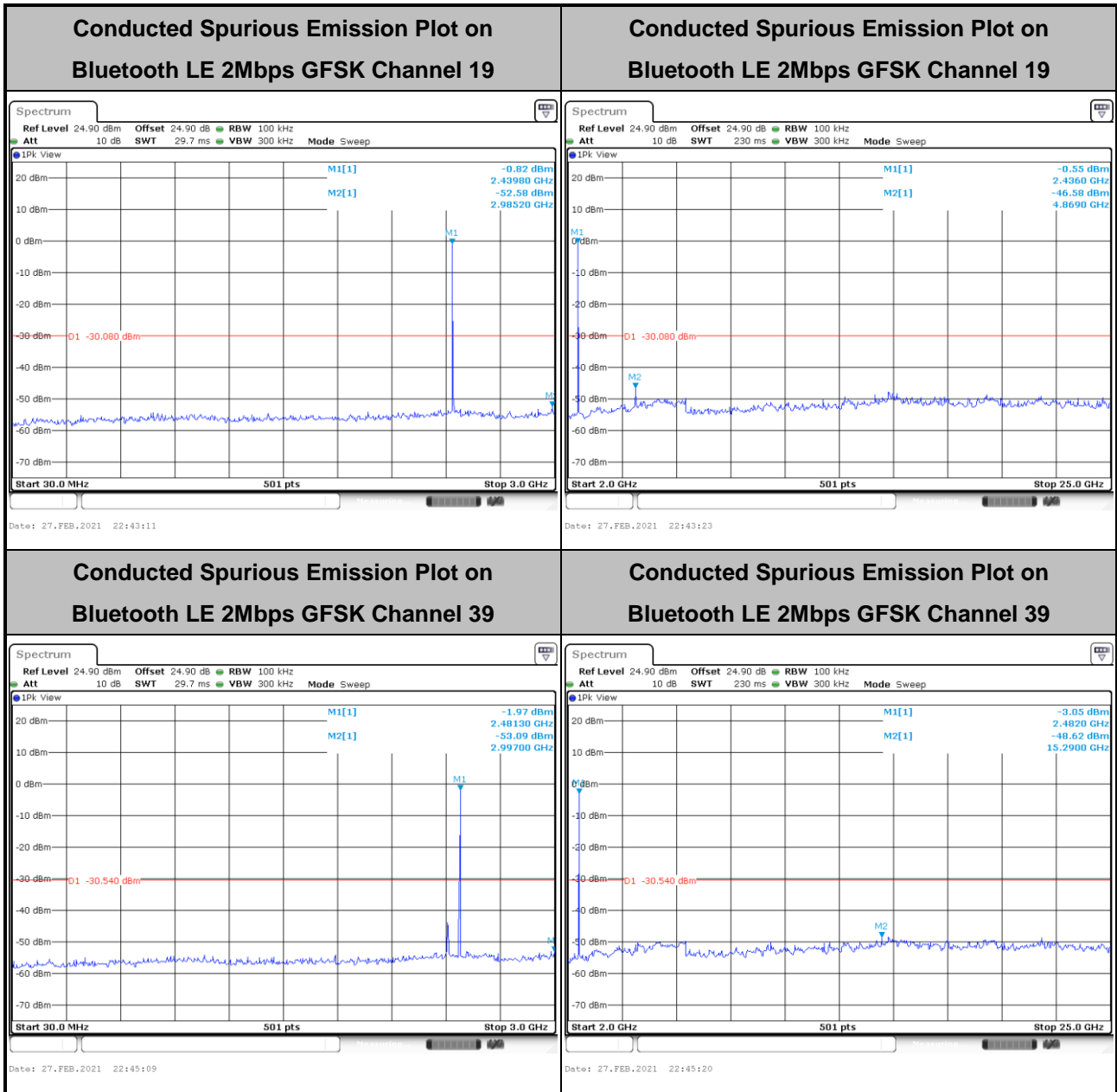


### 3.4.6 Test Result of Conducted Spurious Emission Plots











### 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 was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

#### 3.5.2 Measuring Instruments

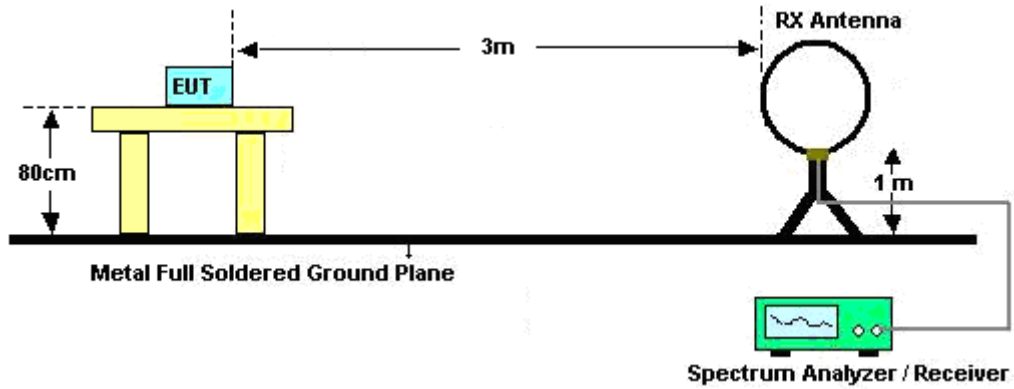
See list of measuring equipment of this test report.

**3.5.3 Test Procedures**

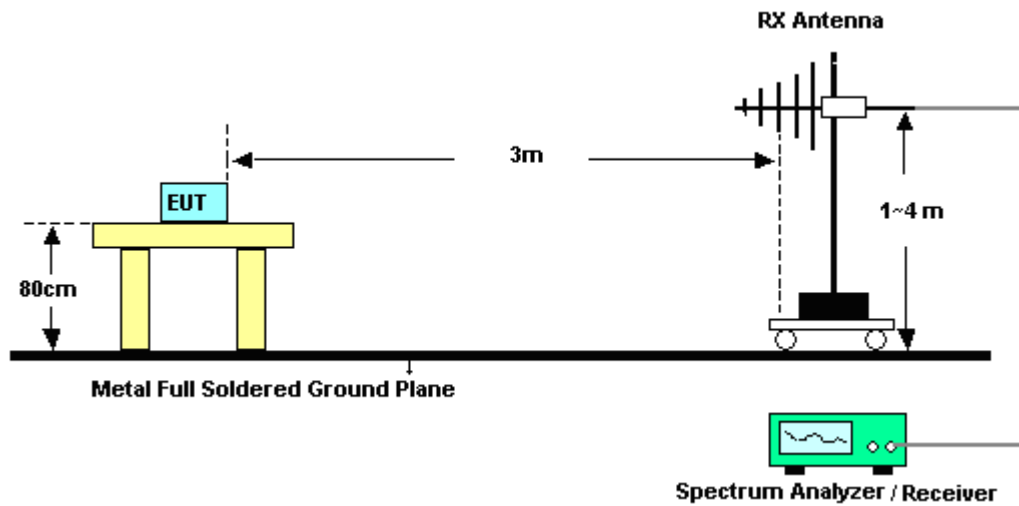
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1 GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and be reported.
7. For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and be reported.
8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW = 100 kHz for  $f < 1$  GHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW = 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.

### 3.5.4 Test Setup

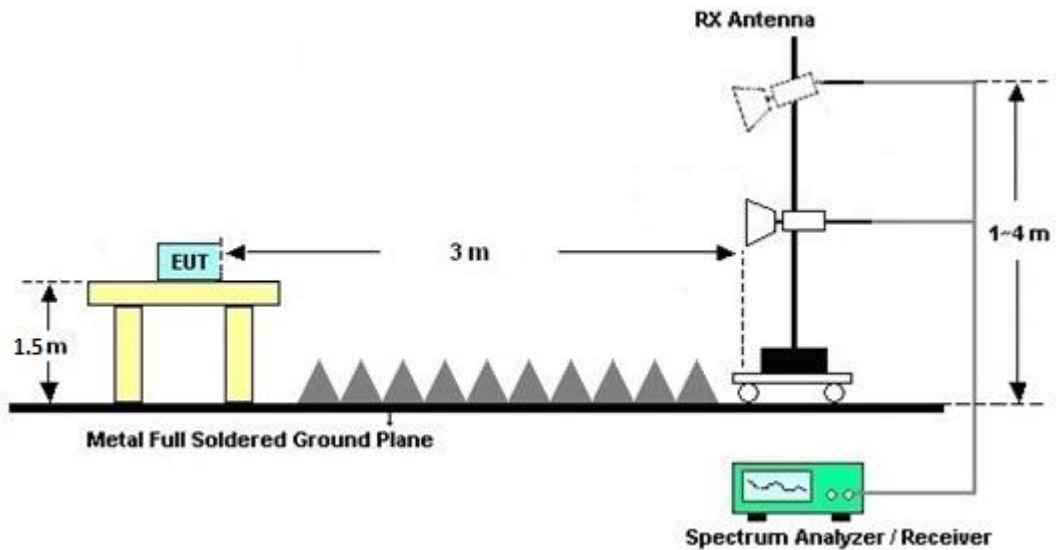
For radiated test below 30MHz



For radiated test from 30MHz to 1GHz



For radiated test above 1GHz





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

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

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

### **3.5.6 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

See list of measuring equipment of this test report.

#### 3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was 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 sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) 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**

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.

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

An embedded-in antenna design is used.

### **3.7.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jul. 14, 2020	Feb. 04, 2021~ Mar. 05, 2021	Jul. 13, 2021	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-0 6	47020 & 06	30MHz to 1GHz	Oct. 11, 2020	Feb. 04, 2021~ Mar. 05, 2021	Oct. 10, 2021	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1G	Sep. 30, 2020	Feb. 04, 2021~ Mar. 05, 2021	Sep. 29, 2021	Radiation (03CH16-HY)
Horn Antenna	SCHWARZB ECK	BBHA 9120 D	9120D-1522	1G~18GHz	Sep. 29, 2020	Feb. 04, 2021~ Mar. 05, 2021	Sep. 28, 2021	Radiation (03CH16-HY)
Amplifier	EMCI	EMC051845SE	980729	1-18GHz	Jul. 10, 2020	Feb. 04, 2021~ Mar. 05, 2021	Jul. 09, 2021	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZB ECK	BBHA 9170	BBHA9170576	18GHz ~40GHz	May 22, 2020	Feb. 04, 2021~ Mar. 05, 2021	May 21, 2021	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 10, 2020	Feb. 04, 2021~ Mar. 05, 2021	Dec. 09, 2021	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A	MY59053012	3Hz~26.5GHz	Nov. 18, 2020	Feb. 04, 2021~ Mar. 05, 2021	Nov. 17, 2021	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11680/4PE	NA	Aug. 29, 2020	Feb. 04, 2021~ Mar. 05, 2021	Aug. 28, 2021	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11688/4PE	NA	Aug. 29, 2020	Feb. 04, 2021~ Mar. 05, 2021	Aug. 28, 2021	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-575 7	NA	Aug. 29, 2020	Feb. 04, 2021~ Mar. 05, 2021	Aug. 28, 2021	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Feb. 04, 2021~ Mar. 05, 2021	N/A	Radiation (03CH16-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Feb. 04, 2021~ Mar. 05, 2021	N/A	Radiation (03CH16-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Feb. 04, 2021~ Mar. 05, 2021	N/A	Radiation (03CH16-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Feb. 04, 2021~ Mar. 05, 2021	N/A	Radiation (03CH16-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Mar. 05, 2021~ Mar. 09, 2021	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 30, 2020	Mar. 05, 2021~ Mar. 09, 2021	Nov. 29, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 18, 2020	Mar. 05, 2021~ Mar. 09, 2021	Nov. 17, 2021	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 16, 2020	Mar. 05, 2021~ Mar. 09, 2021	Nov. 15, 2021	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Mar. 05, 2021~ Mar. 09, 2021	N/A	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Feb. 25, 2021	Mar. 05, 2021~ Mar. 09, 2021	Feb. 24, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 31, 2020	Mar. 05, 2021~ Mar. 09, 2021	Dec. 30, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34893241	N/A	Mar. 02, 2020	Jan. 27, 2021~ Feb. 27, 2021	Mar. 01, 2021	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16100054SNO1 0	10MHz~6GHz	Dec. 09, 2020	Jan. 27, 2021~ Feb. 27, 2021	Dec. 08, 2021	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz ~ 40GHz	Jul. 22, 2020	Jan. 27, 2021~ Feb. 27, 2021	Jul. 21, 2021	Conducted (TH05-HY)
Switch Box & RF Cable	EM Electronics	EMSW18SE	SW200302	N/A	Mar. 17, 2020	Jan. 27, 2021~ Feb. 27, 2021	Mar. 16, 2021	Conducted (TH05-HY)



## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.3
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.5
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	6.3
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.7
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**Appendix A. Test Result of Conducted Test Items**

Test Engineer:	Hank Hsu	Temperature:	21~25	°C
Test Date:	2021/1/27~2021/2/27	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)	Pass/Fail
BLE	1Mbps	1	0	2402	1.049	0.712	0.50	Pass
BLE	1Mbps	1	19	2440	1.055	0.714	0.50	Pass
BLE	1Mbps	1	39	2480	1.057	0.738	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	1Mbps	1	0	2402	1.70	30.00	0.74	2.44	36.00	Pass
BLE	1Mbps	1	19	2440	1.70	30.00	0.74	2.44	36.00	Pass
BLE	1Mbps	1	39	2480	1.30	30.00	0.74	2.04	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	1.43	-10.07	0.74	8.00	Pass
BLE	1Mbps	1	19	2440	1.39	-8.26	0.74	8.00	Pass
BLE	1Mbps	1	39	2480	0.95	-8.93	0.74	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	2.069	1.376	0.50	Pass
BLE	2Mbps	1	19	2440	2.085	1.428	0.50	Pass
BLE	2Mbps	1	39	2480	2.089	1.436	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	1.70	30.00	0.74	2.44	36.00	Pass
BLE	2Mbps	1	19	2440	1.70	30.00	0.74	2.44	36.00	Pass
BLE	2Mbps	1	39	2480	1.30	30.00	0.74	2.04	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	0.02	-11.59	0.74	8.00	Pass
BLE	2Mbps	1	19	2440	-0.08	-11.96	0.74	8.00	Pass
BLE	2Mbps	1	39	2480	-0.54	-12.08	0.74	8.00	Pass

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



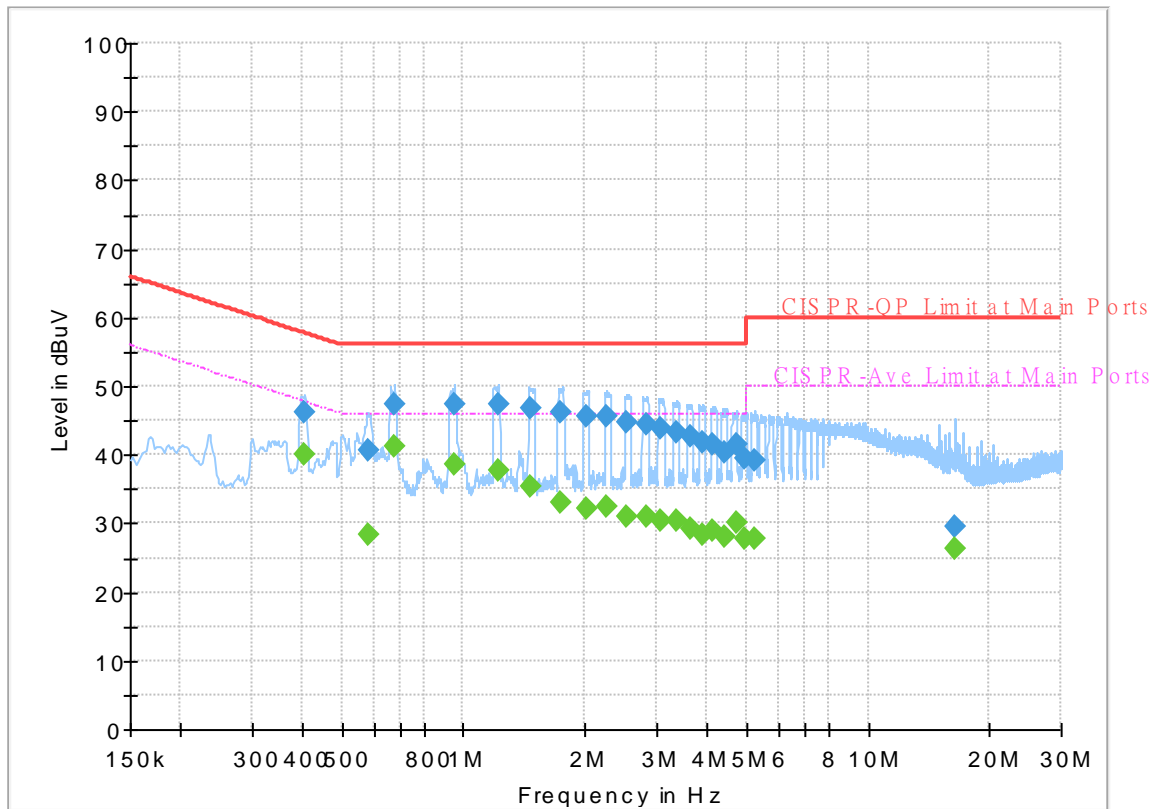
## Appendix B. AC Conducted Emission Test Results

Test Engineer :	Tom Lee and Howrd Huang	Temperature :	23~26°C
		Relative Humidity :	40~50%

# EUT Information

Report NO : 122656  
 Test Mode : Mode 3  
 Test Voltage : 120Vac/60Hz  
 Phase : Line

Full Spectrum



## Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.406500	---	40.12	47.72	7.60	L1	OFF	19.8
0.406500	46.24	---	57.72	11.48	L1	OFF	19.8
0.582000	---	28.32	46.00	17.68	L1	OFF	20.0
0.582000	40.51	---	56.00	15.49	L1	OFF	20.0
0.676500	---	41.27	46.00	4.73	L1	OFF	20.0
0.676500	47.44	---	56.00	8.56	L1	OFF	20.0
0.948750	---	38.56	46.00	7.44	L1	OFF	20.2
0.948750	47.42	---	56.00	8.58	L1	OFF	20.2
1.216500	---	37.80	46.00	8.20	L1	OFF	20.3
1.216500	47.34	---	56.00	8.66	L1	OFF	20.3
1.468500	---	35.27	46.00	10.73	L1	OFF	20.2
1.468500	46.90	---	56.00	9.10	L1	OFF	20.2
1.736250	---	33.15	46.00	12.85	L1	OFF	20.2
1.736250	46.34	---	56.00	9.66	L1	OFF	20.2
2.006250	---	32.07	46.00	13.93	L1	OFF	20.2
2.006250	45.76	---	56.00	10.24	L1	OFF	20.2
2.256000	---	32.41	46.00	13.59	L1	OFF	20.2
2.256000	45.48	---	56.00	10.52	L1	OFF	20.2
2.532750	---	31.05	46.00	14.95	L1	OFF	20.2
2.532750	44.79	---	56.00	11.21	L1	OFF	20.2
2.834250	---	31.07	46.00	14.93	L1	OFF	20.1

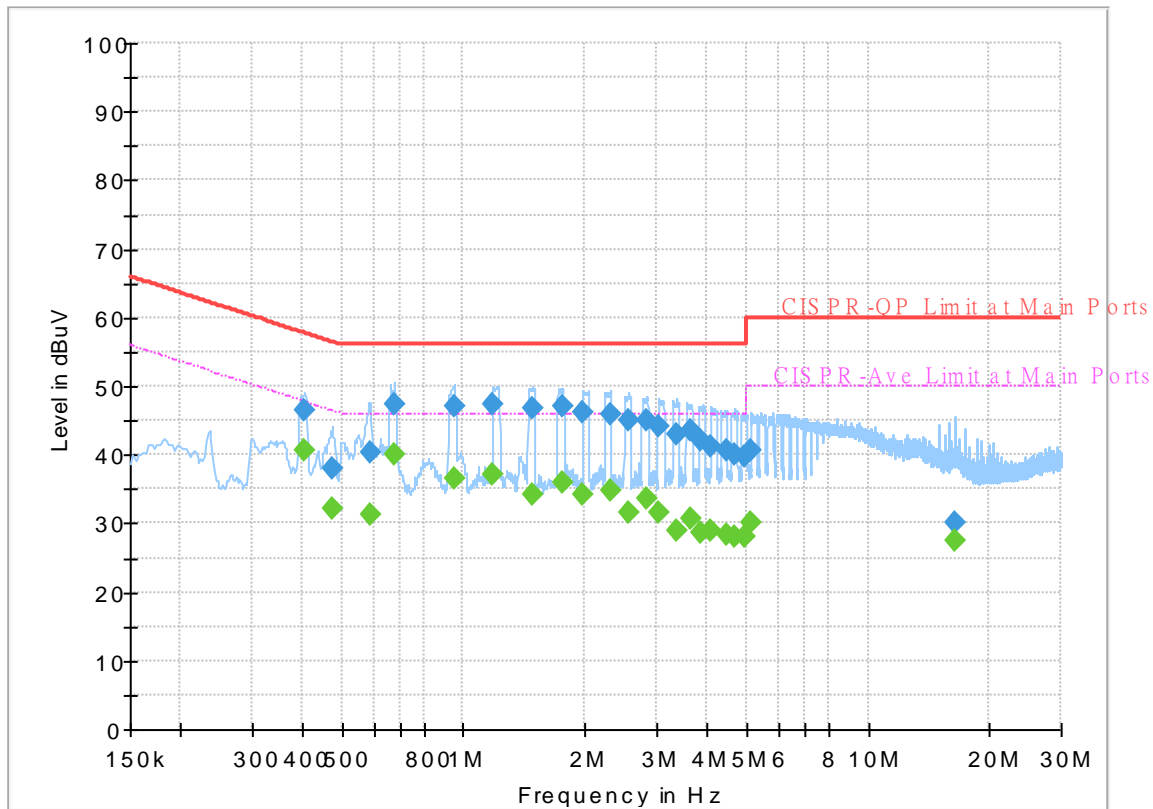
2.834250	44.39	---	56.00	11.61	L1	OFF	20.1
3.070500	---	30.32	46.00	15.68	L1	OFF	20.1
3.070500	43.78	---	56.00	12.22	L1	OFF	20.1
3.378750	---	30.31	46.00	15.69	L1	OFF	20.1
3.378750	43.23	---	56.00	12.77	L1	OFF	20.1
3.637500	---	29.24	46.00	16.76	L1	OFF	20.1
3.637500	42.56	---	56.00	13.44	L1	OFF	20.1
3.885000	---	28.50	46.00	17.50	L1	OFF	20.1
3.885000	41.73	---	56.00	14.27	L1	OFF	20.1
4.128000	---	28.90	46.00	17.10	L1	OFF	20.1
4.128000	41.53	---	56.00	14.47	L1	OFF	20.1
4.413750	---	28.10	46.00	17.90	L1	OFF	20.1
4.413750	40.44	---	56.00	15.56	L1	OFF	20.1
4.749000	---	30.18	46.00	15.82	L1	OFF	20.1
4.749000	41.55	---	56.00	14.45	L1	OFF	20.1
4.947000	---	27.79	46.00	18.21	L1	OFF	20.1
4.947000	39.42	---	56.00	16.58	L1	OFF	20.1
5.248500	---	27.85	50.00	22.15	L1	OFF	20.1
5.248500	39.23	---	60.00	20.77	L1	OFF	20.1
16.332000	---	26.38	50.00	23.62	L1	OFF	20.4
16.332000	29.46	---	60.00	30.54	L1	OFF	20.4



# EUT Information

Report NO : 122656  
 Test Mode : Mode 3  
 Test Voltage : 120Vac/60Hz  
 Phase : Neutral

Full Spectrum



## Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.406500	---	40.62	47.72	7.10	N	OFF	19.8
0.406500	46.39	---	57.72	11.33	N	OFF	19.8
0.474000	---	32.20	46.44	14.24	N	OFF	19.9
0.474000	37.88	---	56.44	18.56	N	OFF	19.9
0.586500	---	31.35	46.00	14.65	N	OFF	20.0
0.586500	40.37	---	56.00	15.63	N	OFF	20.0
0.676500	---	40.08	46.00	5.92	N	OFF	20.1
0.676500	47.48	---	56.00	8.52	N	OFF	20.1
0.951000	---	36.46	46.00	9.54	N	OFF	20.3
0.951000	47.15	---	56.00	8.85	N	OFF	20.3
1.185000	---	37.14	46.00	8.86	N	OFF	20.3
1.185000	47.27	---	56.00	8.73	N	OFF	20.3
1.477500	---	34.20	46.00	11.80	N	OFF	20.3
1.477500	46.83	---	56.00	9.17	N	OFF	20.3
1.763250	---	35.98	46.00	10.02	N	OFF	20.3
1.763250	47.21	---	56.00	8.79	N	OFF	20.3
1.974750	---	34.35	46.00	11.65	N	OFF	20.3
1.974750	46.30	---	56.00	9.70	N	OFF	20.3
2.303250	---	34.77	46.00	11.23	N	OFF	20.2
2.303250	46.02	---	56.00	9.98	N	OFF	20.2
2.562000	---	31.45	46.00	14.55	N	OFF	20.2

2.562000	44.89	---	56.00	11.11	N	OFF	20.2
2.845500	---	33.50	46.00	12.50	N	OFF	20.2
2.845500	45.00	---	56.00	11.00	N	OFF	20.2
3.043500	---	31.59	46.00	14.41	N	OFF	20.1
3.043500	44.13	---	56.00	11.87	N	OFF	20.1
3.351750	---	29.09	46.00	16.91	N	OFF	20.1
3.351750	42.84	---	56.00	13.16	N	OFF	20.1
3.664500	---	30.73	46.00	15.27	N	OFF	20.1
3.664500	43.42	---	56.00	12.58	N	OFF	20.1
3.858000	---	28.74	46.00	17.26	N	OFF	20.1
3.858000	41.96	---	56.00	14.04	N	OFF	20.1
4.078500	---	29.07	46.00	16.93	N	OFF	20.1
4.078500	41.31	---	56.00	14.69	N	OFF	20.1
4.449750	---	28.45	46.00	17.55	N	OFF	20.1
4.449750	40.72	---	56.00	15.28	N	OFF	20.1
4.704000	---	28.00	46.00	18.00	N	OFF	20.1
4.704000	39.92	---	56.00	16.08	N	OFF	20.1
4.940250	---	27.98	46.00	18.02	N	OFF	20.1
4.940250	39.66	---	56.00	16.34	N	OFF	20.1
5.142750	---	30.13	50.00	19.87	N	OFF	20.1
5.142750	40.69	---	60.00	19.31	N	OFF	20.1
16.374750	---	27.36	50.00	22.64	N	OFF	20.5
16.374750	30.17	---	60.00	29.83	N	OFF	20.5



### Appendix C. Radiated Spurious Emission

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

<Sample 1>

<1Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
BLE CH 00 2402MHz		2379.825	57.18	-16.82	74	41.38	27.62	18.46	30.28	103	237	P	H	
		2312.625	44.25	-9.75	54	28.34	27.87	18.34	30.3	103	237	A	H	
	*	2402	90.77	-	-	75.05	27.5	18.5	30.28	103	237	P	H	
	*	2402	90.17	-	-	74.45	27.5	18.5	30.28	103	237	A	H	
													H	
			2358.615	56.36	-17.64	74	40.48	27.75	18.42	30.29	169	173	P	V
			2350.005	44.29	-9.71	54	28.37	27.8	18.41	30.29	169	173	A	V
	*		2402	92.98	-	-	77.26	27.5	18.5	30.28	169	173	P	V
	*		2402	92.38	-	-	76.66	27.5	18.5	30.28	169	173	A	V
														V
BLE CH 19 2440MHz		2319.66	56.34	-17.66	74	40.43	27.86	18.35	30.3	100	236	P	H	
		2312.52	44.44	-9.56	54	28.53	27.87	18.34	30.3	100	236	A	H	
	*	2440	95.46	-	-	79.73	27.42	18.58	30.27	100	236	P	H	
	*	2440	94.86	-	-	79.13	27.42	18.58	30.27	100	236	A	H	
			2495.59	57.04	-16.96	74	41.2	27.4	18.69	30.25	100	236	P	H
			2499.86	44.53	-9.47	54	28.69	27.4	18.69	30.25	100	236	A	H
			2356.48	57.15	-16.85	74	41.26	27.76	18.42	30.29	212	168	P	V
			2312.52	44.45	-9.55	54	28.54	27.87	18.34	30.3	212	168	A	V
	*		2440	96.95	-	-	81.22	27.42	18.58	30.27	212	168	P	V
	*		2440	96.45	-	-	80.72	27.42	18.58	30.27	212	168	A	V
			2490.55	56.97	-17.03	74	41.14	27.4	18.68	30.25	212	168	P	V
			2499.93	44.77	-9.23	54	28.93	27.4	18.69	30.25	212	168	A	V



<b>BLE CH 39 2480MHz</b>	*	2480	97.24	-	-	81.44	27.4	18.66	30.26	249	107	P	H
	*	2480	96.69	-	-	80.89	27.4	18.66	30.26	249	107	A	H
		2493.96	56.79	-17.21	74	40.96	27.4	18.68	30.25	249	107	P	H
		2483.72	44.64	-9.36	54	28.83	27.4	18.66	30.25	249	107	A	H
													H
													H
	*	2480	97.66	-	-	81.86	27.4	18.66	30.26	127	177	P	V
	*	2480	97.08	-	-	81.28	27.4	18.66	30.26	127	177	A	V
		2491.72	55.89	-18.11	74	40.06	27.4	18.68	30.25	127	177	P	V
		2483.52	44.49	-9.51	54	28.68	27.4	18.66	30.25	127	177	A	V
													V
													V
<b>Remark</b>	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 ( dBµV/m )	Over Limit ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
BLE CH 00 2402MHz		4804	45.66	-28.34	74	56.55	31.11	13.36	55.36	100	0	P	H	
													H	
													H	
													H	
			4804	47.06	-26.94	74	57.95	31.11	13.36	55.36	100	0	P	V
														V
														V
BLE CH 19 2440MHz		4880	42.75	-31.25	74	53.63	31.14	13.36	55.38	100	0	P	H	
		7320	45.67	-28.33	74	49.31	36.44	16.18	56.26	100	0	P	H	
													H	
													H	
			4880	43.05	-30.95	74	53.93	31.14	13.36	55.38	100	0	P	V
			7320	46.17	-27.83	74	49.81	36.44	16.18	56.26	100	0	P	V
														V
BLE CH 39 2480MHz		4960	43.59	-30.41	74	54.28	31.34	13.36	55.39	100	0	P	H	
		7440	45.44	-28.56	74	48.94	36.4	16.39	56.29	100	0	P	H	
													H	
													H	
			4960	41.61	-32.39	74	52.3	31.34	13.36	55.39	100	0	P	V
			7440	45.3	-28.7	74	48.8	36.4	16.39	56.29	100	0	P	V
														V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Emission below 1GHz  
2.4GHz BLE (LF)

BLE	Note	Frequency ( MHz )	Level ( dBµV/m )	Over Limit ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
2.4GHz BLE LF		94.02	26.49	-17.01	43.5	42.38	15.26	1.48	32.63	-	-	P	H	
		276.38	33.91	-12.09	46	44.91	18.84	2.8	32.64	-	-	P	H	
		576.11	39.05	-6.95	46	41.68	25.92	4.12	32.67	100	0	P	H	
		704.15	34.82	-11.18	46	36.03	26.62	4.59	32.42	-	-	P	H	
		793.39	30.36	-15.64	46	30.28	28	4.91	32.83	-	-	P	H	
		924.34	37.19	-8.81	46	33.98	29.88	5.37	32.04	-	-	P	H	
														H
														H
														H
														H
														H
														H
			94.02	34.91	-8.59	43.5	50.8	15.26	1.48	32.63	-	-	P	V
			256.01	28.28	-17.72	46	38.91	19.38	2.7	32.71	-	-	P	V
			500.45	36.5	-9.5	46	41.22	24.16	3.78	32.66	-	-	P	V
			576.11	39.7	-6.3	46	42.33	25.92	4.12	32.67	100	0	P	V
			719.67	38.33	-7.67	46	39	27.19	4.63	32.49	-	-	P	V
			838.01	37.31	-8.69	46	36	28.95	5.05	32.69	-	-	P	V
													V	
													V	
													V	
													V	
													V	
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.													



<2Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	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		2367.12	56.7	-17.3	74	40.85	27.7	18.44	30.29	103	237	P	H	
		2312.625	44.57	-9.43	54	28.66	27.87	18.34	30.3	103	237	A	H	
	*	2402	91.04	-	-	75.32	27.5	18.5	30.28	103	237	P	H	
	*	2402	89.51	-	-	73.79	27.5	18.5	30.28	103	237	A	H	
													H	
														H
			2341.815	57.06	-16.94	74	41.14	27.82	18.39	30.29	167	170	P	V
			2357.775	44.52	-9.48	54	28.64	27.75	18.42	30.29	167	170	A	V
	*		2402	93.21	-	-	77.49	27.5	18.5	30.28	167	170	P	V
	*		2402	91.6	-	-	75.88	27.5	18.5	30.28	167	170	A	V
														V
													V	
BLE CH 19 2440MHz		2338.14	56.5	-17.5	74	40.59	27.82	18.39	30.3	103	234	P	H	
		2351.3	44.52	-9.48	54	28.61	27.79	18.41	30.29	103	234	A	H	
	*	2440	95.74	-	-	80.01	27.42	18.58	30.27	103	234	P	H	
	*	2440	94.13	-	-	78.4	27.42	18.58	30.27	103	234	A	H	
			2499.72	56.33	-17.67	74	40.49	27.4	18.69	30.25	103	234	P	H
			2499.93	44.72	-9.28	54	28.88	27.4	18.69	30.25	103	234	P	H
			2386.3	56.38	-17.62	74	40.61	27.58	18.47	30.28	215	166	P	V
			2312.52	44.78	-9.22	54	28.87	27.87	18.34	30.3	215	166	A	V
	*		2440	97.05	-	-	81.32	27.42	18.58	30.27	215	166	P	V
	*		2440	95.5	-	-	79.77	27.42	18.58	30.27	215	166	A	V
			2483.62	55.79	-18.21	74	39.98	27.4	18.66	30.25	215	166	P	V
		2500	45.04	-8.96	54	29.2	27.4	18.69	30.25	215	166	A	V	



<b>BLE CH 39 2480MHz</b>	*	2480	96.99	-	-	81.19	27.4	18.66	30.26	100	110	P	H
	*	2480	95.47	-	-	79.67	27.4	18.66	30.26	100	110	A	H
		2484.16	57.16	-16.84	74	41.35	27.4	18.66	30.25	100	110	P	H
		2483.52	45.83	-8.17	54	30.02	27.4	18.66	30.25	100	110	A	H
													H
													H
	*	2480	97.76	-	-	81.96	27.4	18.66	30.26	302	171	P	V
	*	2480	96.2	-	-	80.4	27.4	18.66	30.26	302	171	A	V
		2488.12	57.36	-16.64	74	41.54	27.4	18.67	30.25	302	171	P	V
		2483.52	46.11	-7.89	54	30.3	27.4	18.66	30.25	302	171	A	V
													V
													V
<b>Remark</b>	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 ( dBµV/m )	Over Limit ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
BLE CH 00 2402MHz		4804	46.47	-27.53	74	57.36	31.11	13.36	55.36	100	0	P	H
													H
													H
													H
		4804	46.34	-27.66	74	57.23	31.11	13.36	55.36	100	0	P	V
													V
													V
BLE CH 19 2440MHz		4880	43.25	-30.75	74	54.13	31.14	13.36	55.38	100	0	P	H
		7320	45.5	-28.5	74	49.14	36.44	16.18	56.26	100	0	P	H
													H
													H
		4880	41.92	-32.08	74	52.8	31.14	13.36	55.38	100	0	P	V
		7320	45.87	-28.13	74	49.51	36.44	16.18	56.26	100	0	P	V
													V
BLE CH 39 2480MHz		4960	41.83	-32.17	74	52.52	31.34	13.36	55.39	100	0	P	H
		7440	45.78	-28.22	74	49.28	36.4	16.39	56.29	100	0	P	H
													H
													H
		4960	40.63	-33.37	74	51.32	31.34	13.36	55.39	100	0	P	V
		7440	45.31	-28.69	74	48.81	36.4	16.39	56.29	100	0	P	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz  
2.4GHz BLE (LF)

BLE	Note	Frequency ( MHz )	Level ( dBµV/m )	Over Limit ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
2.4GHz BLE LF		120.21	25.56	-17.94	43.5	38.96	17.54	1.72	32.66	-	-	P	H	
		256.01	33.93	-12.07	46	44.56	19.38	2.7	32.71	-	-	P	H	
		500.45	33.85	-12.15	46	38.57	24.16	3.78	32.66	-	-	P	H	
		576.11	38.99	-7.01	46	41.62	25.92	4.12	32.67	100	0	P	H	
		749.74	37.32	-8.68	46	37.09	28.16	4.7	32.63	-	-	P	H	
		924.34	36.84	-9.16	46	33.63	29.88	5.37	32.04	-	-	P	H	
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
														H
			95.96	34.45	-9.05	43.5	50.08	15.49	1.5	32.62	-	-	P	V
			277.35	27.01	-18.99	46	37.99	18.85	2.8	32.63	-	-	P	V
		500.45	36.11	-9.89	46	40.83	24.16	3.78	32.66	-	-	P	V	
		576.11	39.53	-6.47	46	42.16	25.92	4.12	32.67	100	0	P	V	
		729.37	34.6	-11.4	46	34.75	27.74	4.65	32.54	-	-	P	V	
		924.34	38.61	-7.39	46	35.4	29.88	5.37	32.04	-	-	P	V	
													V	
													V	
													V	
													V	
													V	
													V	
													V	
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.													



<Sample 2>

<2Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	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 39 2480MHz	*	2480	94.05	-	-	78.25	27.4	18.66	30.26	100	240	P	H
	*	2480	92.54	-	-	76.74	27.4	18.66	30.26	100	240	A	H
		2484	56.41	-17.59	74	40.6	27.4	18.66	30.25	100	240	P	H
		2483.52	45.32	-8.68	54	29.51	27.4	18.66	30.25	100	240	A	H
													H
													H
	*	2480	96.65	-	-	80.85	27.4	18.66	30.26	263	175	P	V
	*	2480	95.08	-	-	79.28	27.4	18.66	30.26	263	175	A	V
		2495.64	56.52	-17.48	74	40.68	27.4	18.69	30.25	263	175	P	V
		2483.52	45.81	-8.19	54	30	27.4	18.66	30.25	263	175	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 ( dBµV/m )	Over Limit ( dB )	Limit Line ( dBµV/m )	Read Level ( dBµV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
BLE CH 39 2480MHz		4960	41.47	-32.53	74	52.16	31.34	13.36	55.39	100	0	P	H
		7440	46.17	-27.83	74	49.67	36.4	16.39	56.29	100	0	P	H
													H
													H
		4960	40.94	-33.06	74	51.63	31.34	13.36	55.39	100	0	P	V
		7440	45.27	-28.73	74	48.77	36.4	16.39	56.29	100	0	P	V
													V
													V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz  
2.4GHz BLE (LF)

BLE	Note	Frequency ( MHz )	Level ( dBµV/m )	Over Limit ( dB )	Limit Line ( dBµV/m )	Read Level (dBµV)	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)	
2.4GHz BLE LF		159.01	27.34	-16.16	43.5	41.4	16.7	2.02	32.78	-	-	P	H	
		308.39	38.71	-7.29	46	48.92	19.37	2.95	32.53	-	-	P	H	
		463.59	36.58	-9.42	46	41.95	23.53	3.65	32.55	100	178	Q	H	
		650.8	37.23	-8.77	46	38.9	26.48	4.38	32.53	-	-	P	H	
		721.61	38.6	-7.4	46	39.16	27.31	4.63	32.5	-	-	P	H	
		894.27	39.04	-6.96	46	37.09	29.12	5.28	32.45	-	-	P	H	
														H
														H
														H
														H
														H
														H
														H
			52.31	28.66	-11.34	40	47.21	13.29	1	32.84	-	-	P	V
			76.56	28.63	-11.37	40	46.96	13.09	1.3	32.72	-	-	P	V
			310.33	31.76	-14.24	46	41.93	19.4	2.96	32.53	-	-	P	V
			456.8	41.9	-4.1	46	47.41	23.41	3.61	32.53	100	332	Q	V
			719.67	34.26	-11.74	46	34.93	27.19	4.63	32.49	-	-	P	V
			893.3	38.29	-7.71	46	36.36	29.11	5.27	32.45	-	-	P	V
														V
													V	
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



**Note symbol**

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



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

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		( MHz )	( dBμV/m )	( dB )	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
					( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
BLE		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 00		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H
2402MHz													

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =  
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

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

**For Average Limit @ 2390MHz:**

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

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



## Appendix D. Radiated Spurious Emission Plots

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

### Note symbol

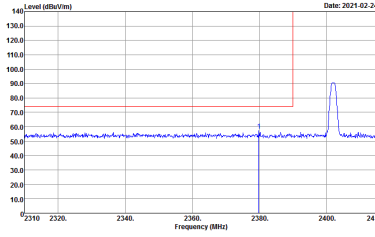
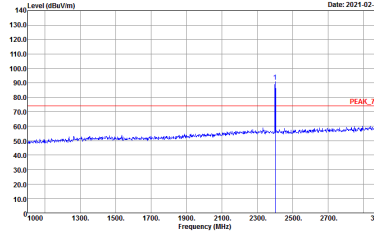
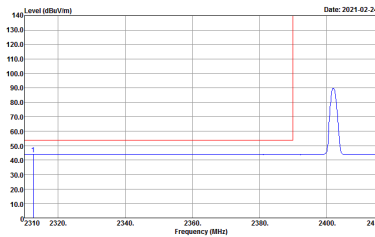
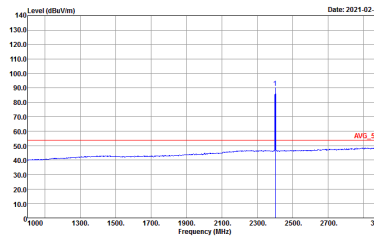
-L	Low channel location
-R	High channel location





<Sample 1>  
<1Mbps>

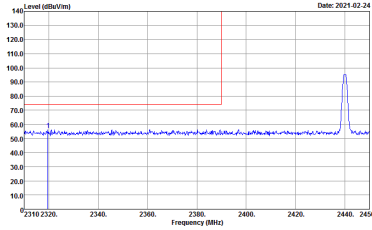
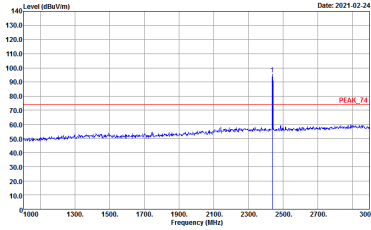
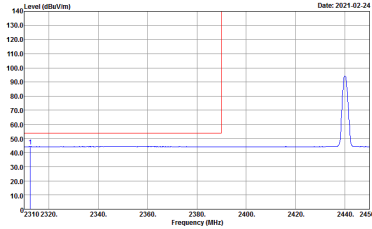
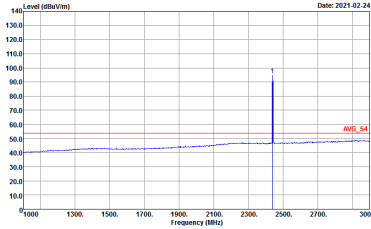
2.4GHz 2400~2483.5MHz  
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH00 2402MHz		
	Horizontal	Fundamental
Peak	 <p>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 135 dBuV/m.</p> <p>Site : 03CH16-HY Condition : PEAK_SE_74 3m 91200_1522 HORIZONTAL : 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 1900 to 3000 MHz. A red line indicates the peak level at approximately 85 dBuV/m.</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <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 average level at approximately 85 dBuV/m.</p> <p>Site : 03CH16-HY Condition : AVG_SE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz 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 1900 to 3000 MHz. A red line indicates the average level at approximately 55 dBuV/m.</p> <p>Site : 03CH16-HY Condition : AVG_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

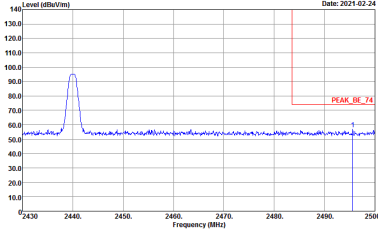
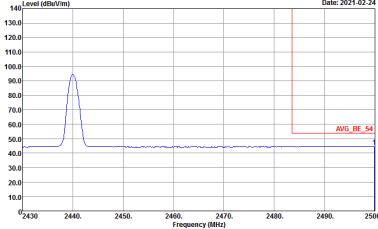


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Vertical	Fundamental
Peak	<p>Level (dBm/1m) vs Frequency (MHz) plot for Peak measurement. The plot shows a sharp peak at approximately 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBm/1m, and the x-axis ranges from 2310 to 2415 MHz. A red line indicates the peak level at approximately 100 dBm/1m.</p> <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Fundamental Peak Spectrum Plot. The plot shows a sharp peak at approximately 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBm/1m, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the peak level at approximately 75 dBm/1m, labeled 'PEAK_74'.</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg	<p>Vertical Average Spectrum Plot. The plot shows a peak at approximately 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBm/1m, and the x-axis ranges from 2310 to 2415 MHz. A red line indicates the average level at approximately 50 dBm/1m.</p> <p>Site : 03CH16-HY Condition : AV6_BE_54 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	<p>Fundamental Average Spectrum Plot. The plot shows a peak at approximately 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBm/1m, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the average level at approximately 50 dBm/1m, labeled 'AVG_54'.</p> <p>Site : 03CH16-HY Condition : AV6_54 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

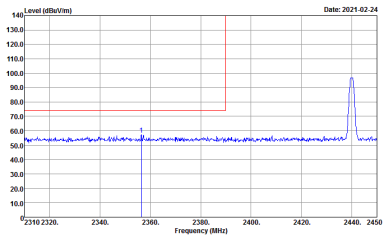
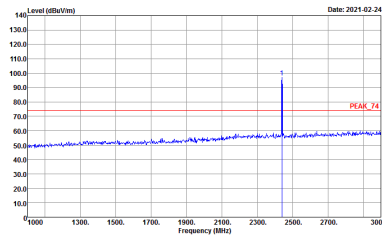
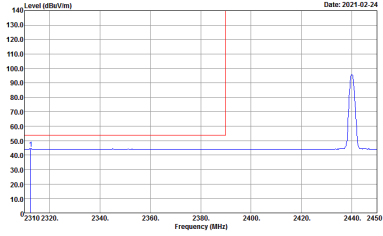
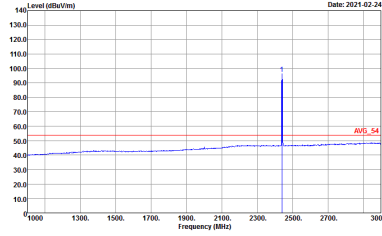


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH19 2440MHz - L		
	Horizontal	Fundamental
Peak	 <p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : AVG_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

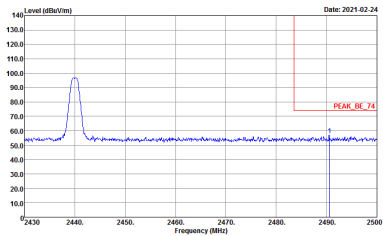
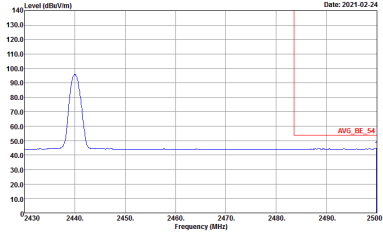


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Horizontal	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.100KHz SWT:Auto</p>	Left blank



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH19 2440MHz - L		
Vertical		Fundamental
Peak	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing a peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBµV/m, and the x-axis ranges from 2310 to 2450 MHz. A red line indicates the peak level at approximately 100 dBµV/m.</p> <p>Site : 03CH16-HY            Condition : PEAK_BE_74 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing a peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBµV/m, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the peak level at approximately 75 dBµV/m.</p> <p>Site : 03CH16-HY            Condition : PEAK_74 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing an average level at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBµV/m, and the x-axis ranges from 2310 to 2450 MHz. A red line indicates the average level at approximately 50 dBµV/m.</p> <p>Site : 03CH16-HY            Condition : AV6_BE_54 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing an average level at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBµV/m, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the average level at approximately 50 dBµV/m.</p> <p>Site : 03CH16-HY            Condition : AV6_54 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

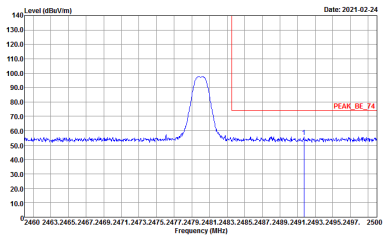
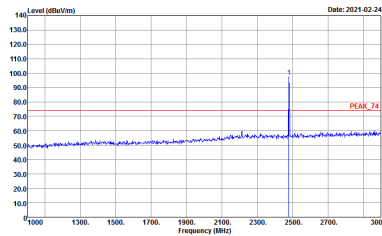
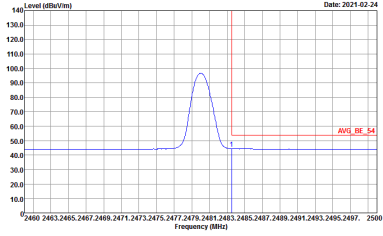
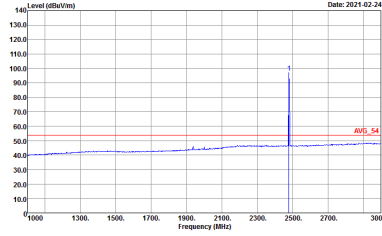


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH19 2440MHz - R		
	Vertical	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:0.100KHz SWT:Auto</p>	Left blank



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	<p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : AVG_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz 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 horizontal line labeled 'PEAK_BE_74' and a blue vertical line at the peak frequency. 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 : 03CH16-HY            Condition : PEAK_BE_74 3m 91200_1522 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 horizontal line labeled 'PEAK_74' and a blue vertical line at the peak frequency. The x-axis ranges from 1000 to 3000 MHz, and the y-axis ranges from 10.0 to 140.0 dBµV/m.</p> <p>Site : 03CH16-HY            Condition : PEAK_74 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing an average spectrum with a peak at 2480 MHz. The peak level is approximately 100 dBµV/m. The plot includes a red horizontal line labeled 'AVG_BE_54' and a blue vertical line at the peak frequency. 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 : 03CH16-HY            Condition : AVG_BE_54 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing an average spectrum with a peak at 2480 MHz. The peak level is approximately 100 dBµV/m. The plot includes a red horizontal line labeled 'AVG_54' and a blue vertical line at the peak frequency. The x-axis ranges from 1000 to 3000 MHz, and the y-axis ranges from 10.0 to 140.0 dBµV/m.</p> <p>Site : 03CH16-HY            Condition : AVG_54 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>



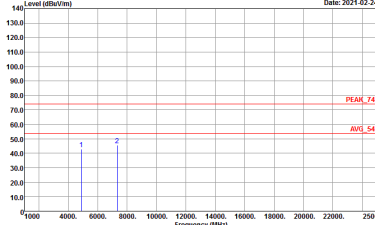
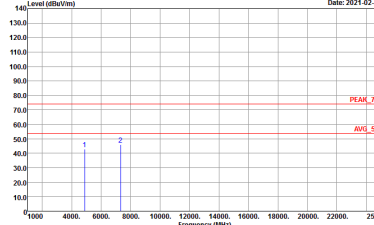


2.4GHz 2400~2483.5MHz

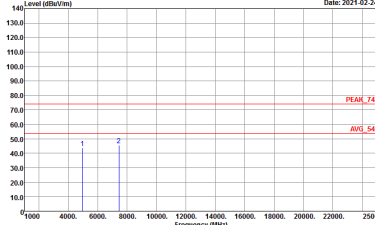
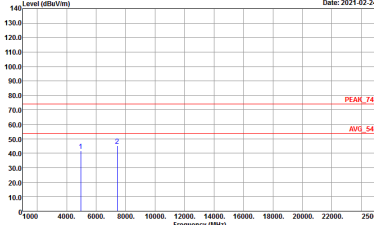
BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak Avg.	 <p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522 HORIZONTAL</p>	 <p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522 VERTICAL</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL</p>	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL</p>



Emission below 1GHz

2.4GHz BLE (LF)

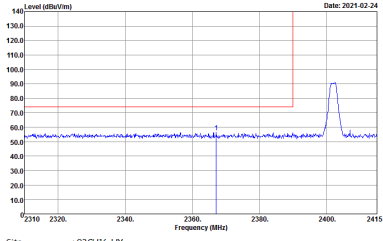
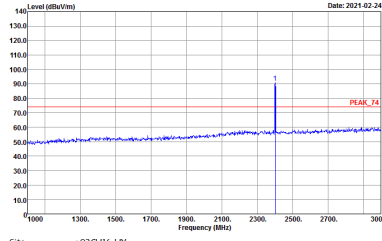
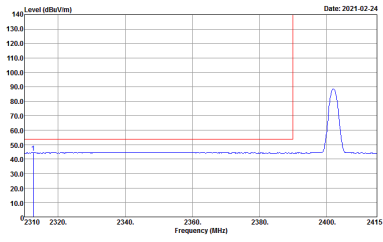
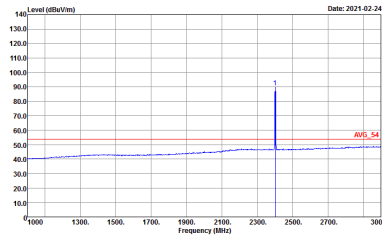
BLE	2.4GHz 2400~2483.5MHz	
	BLE LF	
	Horizontal	Vertical
QP / Peak	<p>Site : 03CH16-HY Condition : QP 3m BIL06_47020406 HORIZONTAL</p>	<p>Site : 03CH16-HY Condition : QP 3m BIL06_47020406 VERTICAL</p>



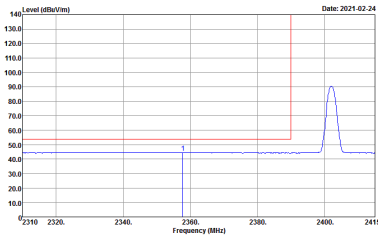
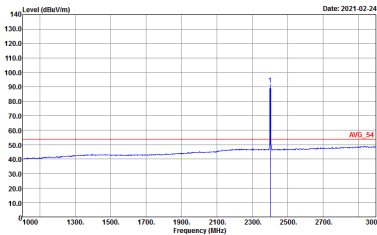
<2Mbps>

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 : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : AVG_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

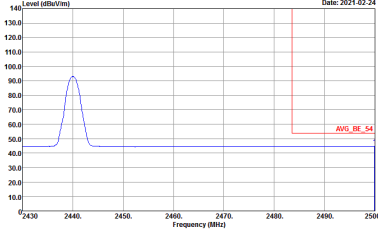


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH00 2402MHz		
Vertical		Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at 2402 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A red line indicates the peak level at approximately 100 dBuV/m.</p> <p>Site : 03CH16-HY  Condition : PEAK_BE_74 3m 91200_1522 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>Site : 03CH16-HY  Condition : PEAK_74 3m 91200_1522 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>Site : 03CH16-HY  Condition : AV6_BE_54 3m 91200_1522 VERTICAL  : RBW:1000.000KHz VBW:0.010KHz 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>Site : 03CH16-HY  Condition : AV6_54 3m 91200_1522 VERTICAL  : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>



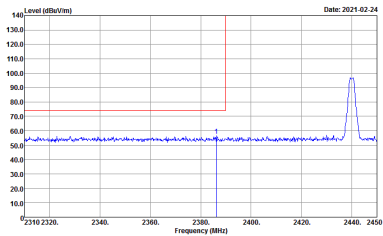
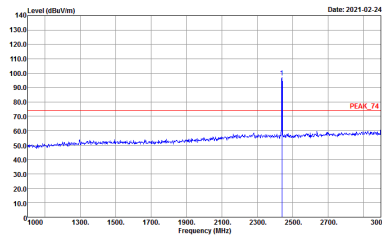
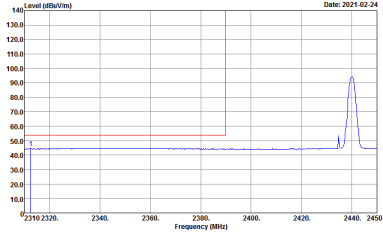
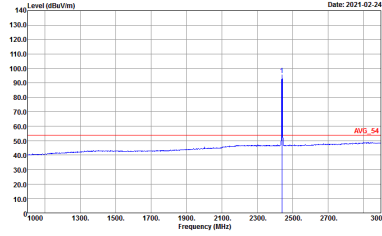
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Horizontal	Fundamental
Peak	<p>Horizontal Peak plot showing Level (dBm/1m) vs Frequency (MHz) from 2310 to 2450. The plot shows a sharp peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBm/1m. The x-axis ranges from 2310 to 2450 MHz. The plot is titled 'Horizontal' and 'Date: 2021-02-24'. The site information is '03CH16-HY' and the condition is 'PEAK_BE_74 3m 91200_1522 HORIZONTAL' with 'RBW:1000.000kHz VBW:3000.000kHz SWT:Auto'.</p>	<p>Fundamental Peak plot showing Level (dBm/1m) vs Frequency (MHz) from 1000 to 3000. The plot shows a sharp peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBm/1m. The x-axis ranges from 1000 to 3000 MHz. The plot is titled 'Fundamental' and 'Date: 2021-02-24'. The site information is '03CH16-HY' and the condition is 'PEAK_74 3m 91200_1522 HORIZONTAL' with 'RBW:1000.000kHz VBW:3000.000kHz SWT:Auto'.</p>
Avg.	<p>Horizontal Avg. plot showing Level (dBm/1m) vs Frequency (MHz) from 2310 to 2450. The plot shows a sharp peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBm/1m. The x-axis ranges from 2310 to 2450 MHz. The plot is titled 'Horizontal' and 'Date: 2021-02-24'. The site information is '03CH16-HY' and the condition is 'AVG_BE_54 3m 91200_1522 HORIZONTAL' with 'RBW:1000.000kHz VBW:0.010kHz SWT:Auto'.</p>	<p>Fundamental Avg. plot showing Level (dBm/1m) vs Frequency (MHz) from 1000 to 3000. The plot shows a sharp peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBm/1m. The x-axis ranges from 1000 to 3000 MHz. The plot is titled 'Fundamental' and 'Date: 2021-02-24'. The site information is '03CH16-HY' and the condition is 'AVG_54 3m 91200_1522 HORIZONTAL' with 'RBW:1000.000kHz VBW:0.010kHz SWT:Auto'.</p>



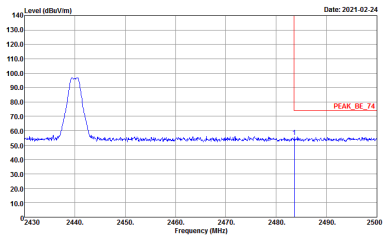
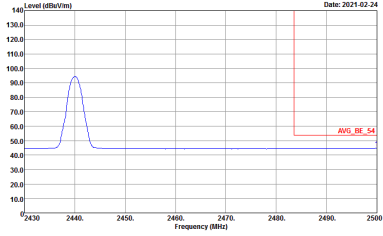
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Horizontal	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.100KHz SWT:Auto</p>	Left blank



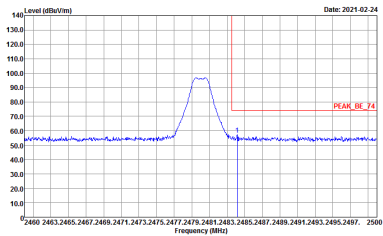
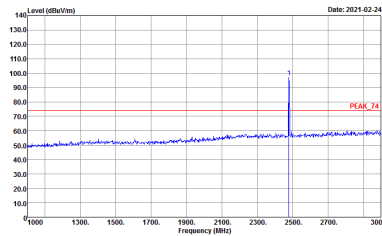
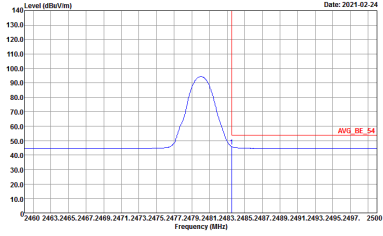
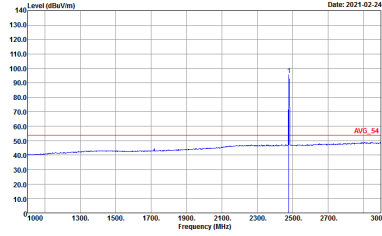


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
BLE CH19 2440MHz - L		
Vertical		Fundamental
Peak	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing a peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBµV/m, and the x-axis ranges from 2310 to 2450 MHz. A red vertical line marks the peak at 2440 MHz.</p> <p>Site : 03CH16-HY            Condition : PEAK_BE_74 3m 91200_1522 VERTICAL                          : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing a peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBµV/m, and the x-axis ranges from 1000 to 3000 MHz. A red vertical line marks the peak at 2440 MHz.</p> <p>Site : 03CH16-HY            Condition : PEAK_74 3m 91200_1522 VERTICAL                          : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing an average spectrum with a peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBµV/m, and the x-axis ranges from 2310 to 2450 MHz. A red vertical line marks the peak at 2440 MHz.</p> <p>Site : 03CH16-HY            Condition : AV6_BE_54 3m 91200_1522 VERTICAL                          : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing an average spectrum with a peak at 2440 MHz. The y-axis ranges from 10.0 to 140.0 dBµV/m, and the x-axis ranges from 1000 to 3000 MHz. A red vertical line marks the peak at 2440 MHz.</p> <p>Site : 03CH16-HY            Condition : AV6_54 3m 91200_1522 VERTICAL                          : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

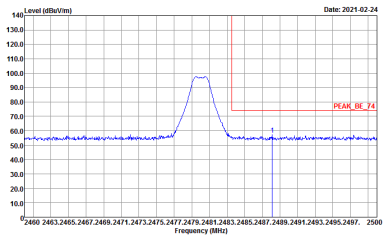
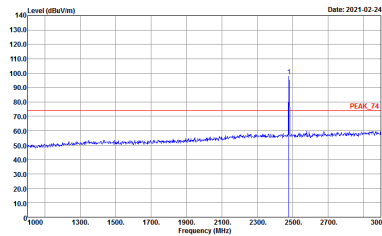
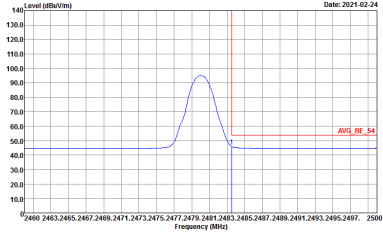
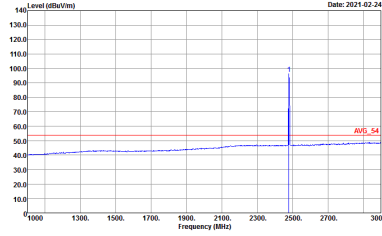


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 VERTICAL : RBW:1000.000KHz VBW:0.100KHz SWT:Auto</p>	Left blank



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-HY Condition : AV6_BE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : AV6_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz 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 horizontal line labeled 'PEAK_BE_74' at the peak level.</p> <p>Site : 03CH16-HY            Condition : PEAK_BE_74 3m 91200_1522 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 horizontal line labeled 'PEAK_74' at the peak level.</p> <p>Site : 03CH16-HY            Condition : PEAK_74 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing an average spectrum with a peak at 2480 MHz. The peak level is approximately 100 dBµV/m. The plot includes a red horizontal line labeled 'AVG_BE_54' at the peak level.</p> <p>Site : 03CH16-HY            Condition : AVG_BE_54 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Level (dBµV/m) vs Frequency (MHz) plot showing an average spectrum with a peak at 2480 MHz. The peak level is approximately 100 dBµV/m. The plot includes a red horizontal line labeled 'AVG_54' at the peak level.</p> <p>Site : 03CH16-HY            Condition : AVG_54 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

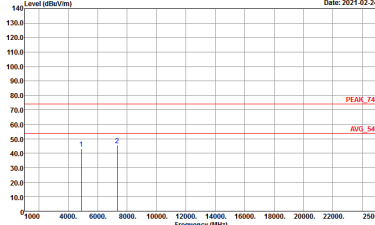
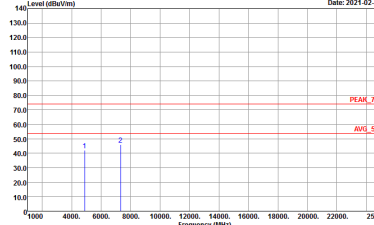


2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak Avg.	 <p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL</p>	 <p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak	<p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL</p>	<p>Date: 2021-02-24</p> <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL</p>



Emission below 1GHz

2.4GHz BLE (LF)

BLE	2.4GHz 2400~2483.5MHz	
	BLE LF	
	Horizontal	Vertical
QP / Peak	<p>Site : 03CH16-HY Condition : QP 3m BIL06_47020406 HORIZONTAL</p>	<p>Site : 03CH16-HY Condition : QP 3m BIL06_47020406 VERTICAL</p>



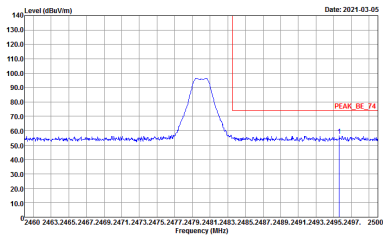
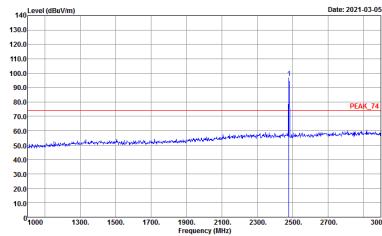
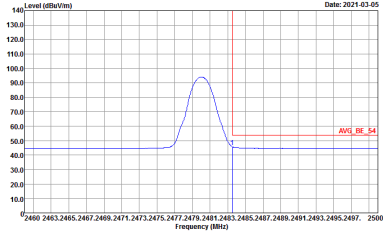
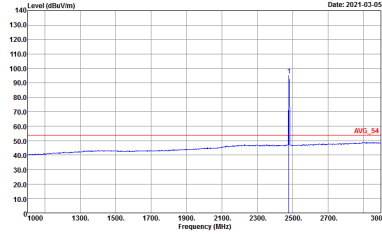


<Sample 2>  
<2Mbps>

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

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	<p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : AVG_54 3m 91200_1522 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz 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' and a blue vertical line at the peak frequency. The x-axis ranges from 2460 to 2500 MHz, and the y-axis ranges from 10.0 to 140.0 dBm/1m.</p> <p>Site : 03CH16-HY            Condition : PEAK_BE_74 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <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_74' and a blue vertical line at the peak frequency. The x-axis ranges from 1000 to 3000 MHz, and the y-axis ranges from 10.0 to 140.0 dBm/1m.</p> <p>Site : 03CH16-HY            Condition : PEAK_74 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Level (dBm/1m) vs Frequency (MHz) plot showing an average level at 2480 MHz. The average level is approximately 50 dBm/1m. The plot includes a red horizontal line labeled 'AVG_BE_54' and a blue vertical line at the peak frequency. The x-axis ranges from 2460 to 2500 MHz, and the y-axis ranges from 10.0 to 140.0 dBm/1m.</p> <p>Site : 03CH16-HY            Condition : AVG_BE_54 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Level (dBm/1m) vs Frequency (MHz) plot showing an average level at 2480 MHz. The average level is approximately 50 dBm/1m. The plot includes a red horizontal line labeled 'AVG_54' and a blue vertical line at the peak frequency. The x-axis ranges from 1000 to 3000 MHz, and the y-axis ranges from 10.0 to 140.0 dBm/1m.</p> <p>Site : 03CH16-HY            Condition : AVG_54 3m 91200_1522 VERTICAL            : RBW:1000.000KHz VBW:0.010KHz 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 : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL</p>



Emission below 1GHz

2.4GHz BLE (LF)

BLE	2.4GHz 2400~2483.5MHz	
	BLE LF	
	Horizontal	Vertical
QP / Peak	<p>Site : 03CH16-HY Condition : QP 3m BIL06_47020406 HORIZONTAL</p>	<p>Site : 03CH16-HY Condition : QP 3m BIL06_47020406 VERTICAL</p>



## Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
Bluetooth –LE for 1Mbps	100	-	-	10Hz	0.00
Bluetooth –LE for 2Mbps	100	-	-	10Hz	0.00

