



# FCC RADIO TEST REPORT

FCC ID	:	BEJNT-15U50T
Equipment	:	Notebook Computer
Brand Name	:	LG
Model Name	:	15U50T,15UD50T,15UG50T,15UB50T,15UT50T *(* can be 0 to 9 or A to Z or blank denoting buyer request)
Applicant	:	LG Electronics USA, Inc. 111 Sylvan Avenue North Building Englewood Cliffs, NJ 07632 United States
Manufacturer	:	LG ELECTRONICS INC.
Standard	:	FCC Part 15 Subpart C §15.247

The product was received on Aug. 05, 2024 and testing was performed from Aug. 09, 2024 to Sep. 05, 2024. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Louis Wu

Approved by: Louis Wu

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

Page Number: 1 of 24Issue Date: Sep. 20, 2024Report Version: 01



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# History of this test report

Report No.	Version	Description	Issue Date
FR480505B	01	Initial issue of report	Sep. 20, 2024



# 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	Pass	-
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	5.10 dB under the limit at 2487.42 MHz
3.6	15.207	AC Conducted Emission	Pass	15.43 dB under the limit at 0.21 MHz
3.7	15.203	Antenna Requirement	Pass	-

#### Conformity Assessment Condition:

 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.

The purpose of different model name is for marketing segmentation.

### Reviewed by: Sheng Kuo Report Producer: Lucy Wu



# **1** General Description

# **1.1 Product Feature of Equipment Under Test**

Product Feature				
General Specs				
Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, and Wi-Fi 5GHz 802.11a/n/ac/ax.				
Antenna Type WLAN: <ant. 1="">: PIFA Antenna <ant. 2="">: PIFA Antenna Bluetooth: PIFA Antenna</ant.></ant.>				
Sample 1         EUT with High-Tek Electronics Co., Ltd Antenna				
Sample 2 EUT with Pulse Antenna				
Integrated WLAN module Brand Name: Intel® Wi-Fi 6 AX203 Model Name: AX203NGW				

Antenna Information (High-Tek Electronics Co., Ltd Antenna)					
<b>2400 MHz ~ 2483.5 MHz</b> Peak Gain (dBi) 2.83					
Antenna Information (Pulse Antenna)					
A	ntenna information (P	ruise Antenna)			

**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**

Test Site	Sporton International Inc. Wensan Laboratory		
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855		
Test Site No.	Sporton Site No.		
1651 Sile 140.	TH05-HY,CO07-HY, 03CH23-HY		

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

FCC designation No.: 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.

# 2 Test Configuration of Equipment Under Test

# 2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (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
2400-2483.5 MHz	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

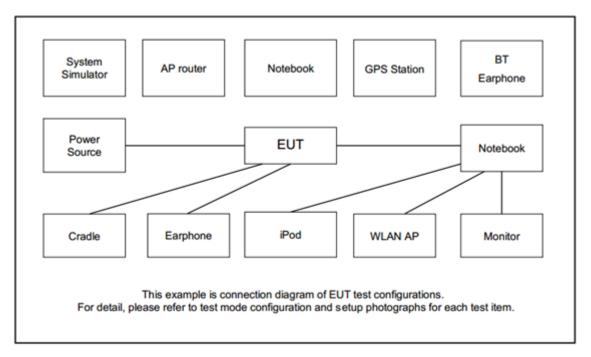
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).
- 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				
	Bluetooth – LE / GFSK				
	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps				
Conducted	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps				
Test Cases	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps				
Test Cases	Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps				
	Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps				
	Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps				
	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps				
	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps				
Radiated	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps				
Test Cases	Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps				
	Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps				
	Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps				
AC Conducted	Mode 1: WLAN (2.4GHz) Link + Bluetooth Link + Monitor+ USB HD (USB Type A)				
Emission	Emission + USB HD (USB Type C) + iPod + Earphone for Sample 1				
Remark:					
	d Test Cases, the tests were performed with Sample 2.				
	<ol> <li>For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.</li> </ol>				



# 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.	Bluetooth Earphone	Sony	SBH20	PY7-RD0010	N/A	N/A
2.	WLAN AP	ASUS	RT-AC52	MSQ-RTAC4A00	N/A	Unshielded,1.8m
3.	iPod	Apple	A1199	FCC DoC	Shielded, 1.0 m	N/A
4.	Earphone + Mic	Samsung	Ecouteur	N/A	Unshielded 1.8m	N/A
5.	LCD Monitor	AOC	U2879VF	FCC DoC	N/A	Shielded, 1m
6.	USB HD	ADATA	HV620S-1T	FCC DoC	Shielded, 1m	N/A
7.	USB HD	Transcend	TS1TSJ25A3W	FCC DoC	Shielded, 0.5m	N/A
8.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

# 2.5 EUT Operation Test Setup

The RF test items, utility "DRTU Version : DRTU.06643.23.60.0" was installed in EUT 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.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)



# 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.

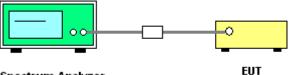
### 3.1.2 Measuring Instruments

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.
- 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)  $\ge$  3 \* RBW.
- 6. Measure and record the results in the test report.

### 3.1.4 Test Setup



Spectrum Analyzer

### 3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

### 3.1.6 Test Result of 99% Occupied Bandwidth



### 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.

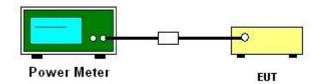
### 3.2.2 Measuring Instruments

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

### 3.2.3 Test Procedures

- 1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
- 2. The RF output of EUT is connected to the power meter by RF cable and attenuator.
- 3. The path loss is 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



### 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.

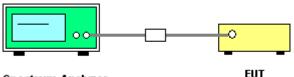
### 3.3.2 Measuring Instruments

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.
- 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.
- 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



Spectrum Analyzer

## 3.3.5 Test Result of Power Spectral Density



### 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.

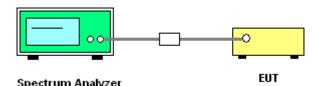
### 3.4.2 Measuring Instruments

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

# 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 transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required 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	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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.

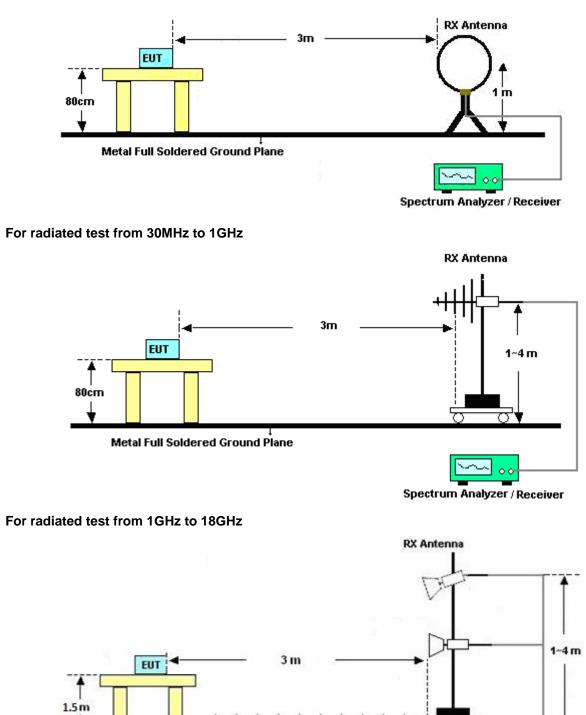
### 3.5.3 Test Procedures

- 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: Antenna Factor + Cable Loss + Read Level Preamp Factor = Level
- 6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
- 7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
- 8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW = 100 kHz for f < 1 GHz; VBW ≥ 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 ≥ 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

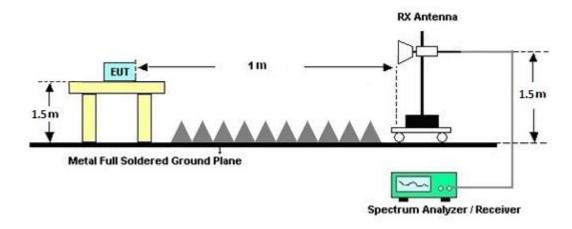


Metal Full Soldered Ground Plane

Spectrum Analyzer / Receiver



#### 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.

### 3.5.7 Duty Cycle

Please refer to Appendix D.

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



## 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 (dBµV)		
Frequency of emission (MHZ)	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

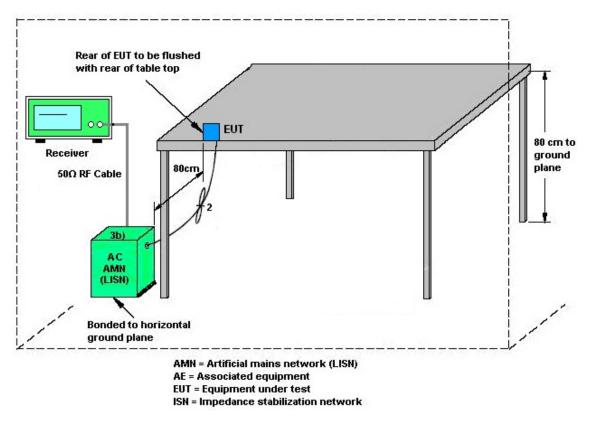
Please refer to the measuring equipment list in this test report.

### 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.
- 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



# 3.7 Antenna Requirements

### 3.7.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

### 3.7.2 Antenna Anti-Replacement Construction

Antenna permanently attached.



# 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	Sep. 12, 2023	Aug. 27, 2024~ Sep. 05, 2024	Sep. 11, 2024	Radiation (03CH23-HY)
Bilog Antenna with 6dB pad	TESEQ & WOKEN	CBL 6111D & 00802N1D-06	63303 & 001	N/A	Oct. 15, 2023	Aug. 27, 2024~ Sep. 05, 2024	Oct. 14, 2024	Radiation (03CH23-HY)
Amplifier	SONOMA	310N	421580	N/A	Jul. 14, 2024	Aug. 27, 2024~ Sep. 05, 2024	Jul. 13, 2025	Radiation (03CH23-HY)
Double Ridged Guide Horn Antenna	RFSPIN	DRH18-E	LE2C05A18E N	1GHz~18GHz	Jun. 20, 2024	Aug. 27, 2024~ Sep. 05, 2024	Jun. 19, 2025	Radiation (03CH23-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA9170	1223	18GHz-40GHz	Jun. 24, 2024	Aug. 27, 2024~ Sep. 05, 2024	Jun. 23, 2025	Radiation (03CH23-HY)
Amplifier	EMEC	EM01G18GA	060878	N/A	Sep. 28, 2023	Aug. 27, 2024~ Sep. 05, 2024	Sep. 27, 2024	Radiation (03CH23-HY)
Preamplifier	EMEC	EM18G40G	060871	18-40GHz	Aug. 23, 2024	Aug. 27, 2024~ Sep. 05, 2024	Aug. 22, 2025	Radiation (03CH23-HY)
Signal Analyzer	Agilent	N9010A	MY53470118	N/A	Aug. 09, 2024	Aug. 27, 2024~ Sep. 05, 2024	Aug. 08, 2025	Radiation (03CH23-HY)
Hygrometer	TECPEL	DTM-303B	TP211542	N/A	Oct. 30, 2023	Aug. 27, 2024~ Sep. 05, 2024	Oct. 29, 2024	Radiation (03CH23-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Aug. 27, 2024~ Sep. 05, 2024	N/A	Radiation (03CH23-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Aug. 27, 2024~ Sep. 05, 2024	N/A	Radiation (03CH23-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Aug. 27, 2024~ Sep. 05, 2024	N/A	Radiation (03CH23-HY)
Software	Audix	E3 6.09824_2019 122	RK-002348	N/A	N/A	Aug. 27, 2024~ Sep. 05, 2024	N/A	Radiation (03CH23-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9kHz~30MHz	Mar. 06, 2024	Aug. 27, 2024~ Sep. 05, 2024	Mar. 05, 2025	Radiation (03CH23-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804395/2	N/A	Nov. 27, 2023	Aug. 27, 2024~ Sep. 05, 2024	Nov. 26, 2024	Radiation (03CH23-HY)
RF Cable	EMC	EMC101Y	231115/23111 9/231122	N/A	Nov. 27, 2023	Aug. 27, 2024~ Sep. 05, 2024	Nov. 26, 2024	Radiation (03CH23-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 07, 2023	Aug. 09, 2024~ Aug. 22, 2024	Nov. 06, 2024	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	17I00015SNO 35 (NO:109)	10MHz~6GHz	Jan. 15, 2024	Aug. 09, 2024~ Aug. 22, 2024	Jan. 14, 2025	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101564	10Hz~40GHz	Sep. 12, 2023	Aug. 09, 2024~ Aug. 22, 2024	Sep. 11, 2024	Conducted (TH05-HY)
Switch Control Mainframe	Burgeon	ETF-058	EC1300485 (BOX4)	N/A	Apr. 08, 2024	Aug. 09, 2024~ Aug. 22, 2024	Apr. 07, 2025	Conducted (TH05-HY)
Software	Sporton	BTWIFI_Final_ version_24051 3	N/A	Conducted Other Test Item	N/A	Aug. 09, 2024~ Aug. 22, 2024	N/A	Conducted (TH05-HY)



Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ACPOWER	AFC-11003G	F317040033	N/A	N/A	Aug. 13, 2024	N/A	Conduction (CO07-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Aug. 13, 2024	N/A	Conduction (CO07-HY)
Pulse Limiter	SCHWARZBE CK	VTSD 9561-F N	9561-F N00373	9kHz-200MHz	Oct. 20, 2023	Aug. 13, 2024	Oct. 19, 2024	Conduction (CO07-HY)
RF Cable	HUBER + SUHNER	RG 214/U	1358175	9kHz~30MHz	Mar. 14, 2024	Aug. 13, 2024	Mar. 13, 2025	Conduction (CO07-HY)
Two-Line V-Network	TESEQ	NNB 51	45051	N/A	Mar. 10, 2024	Aug. 13, 2024	Mar. 09, 2025	Conduction (CO07-HY)
Four-Line V-Network	TESEQ	NNB 52	36122	N/A	Mar. 07, 2024	Aug. 13, 2024	Mar. 06, 2025	Conduction (CO07-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102317	9kHz~3.6GHz	Sep. 20, 2023	Aug. 13, 2024	Sep. 19, 2024	Conduction (CO07-HY)



# 5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence	3.44 dB
of 95% (U = 2Uc(y))	3.44 UB

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

Measuring Uncertainty for a Level of Confidence	6.5 dB
of 95% (U = 2Uc(y))	0.3 dB

#### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence	
of 95% (U = 2Uc(y))	4.6 dB

#### Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence	4.6 dB
of 95% (U = 2Uc(y))	4.0 dB

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

Measuring Uncertainty for a Level of Confidence	5.3 dB
of 95% (U = 2Uc(y))	5.5 UB

Report Number : FR480505B

## Appendix A. Test Result of Conducted Test Items

Test Engineer:	Kevin Xiao	Temperature:	21~25	°C
Test Date:	2024/8/9~2024/8/22	Relative Humidity:	51~54	%

					<u>6dE</u>		RESULTS 6 Occupie		<u>dth</u>			
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	1.039	0.670	0.50	Pass				
BLE	1Mbps	1	19	2440	1.035	0.672	0.50	Pass				
BLE	1Mbps	1	39	2480	1.035	0.689	0.50	Pass				
							<u>RESULTS</u> ge Power					
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Aver Cond Pov (dE	ucted wer	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail	
BLE	1Mbps	1	0	2402	5.4	40	30.00	2.92	8.32	36.00	Pass	
BLE	1Mbps	1	19	2440	5.9	90	30.00	2.92	8.82	36.00	Pass	
BLE	1Mbps	1	39	2480	5.9	90	30.00	2.92	8.82	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	5.55	-9.40	2.92	8.00	Pass
BLE	1Mbps	1	19	2440	6.11	-8.89	2.92	8.00	Pass
BLE	1Mbps	1	39	2480	6.10	-9.35	2.92	8.00	Pass

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

Report Number : FR480505B

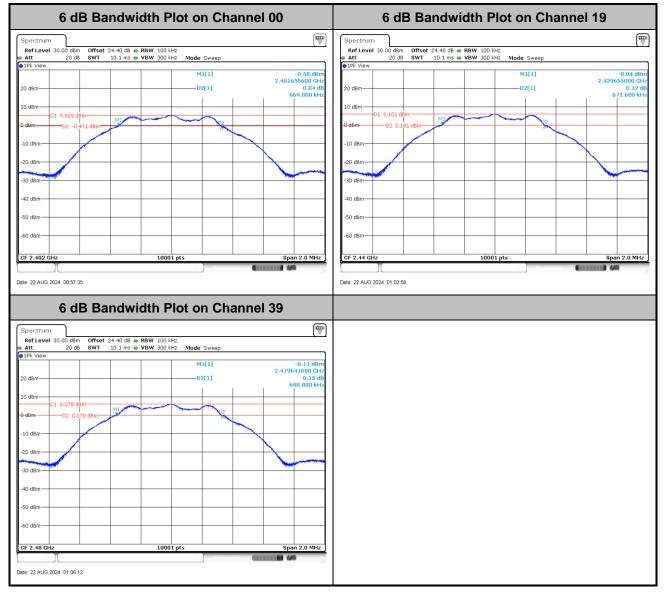
					<u>6d</u> B	-	RESULTS 6 Occupie		<u>dth</u>			
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail				
BLE	2Mbps	1	0	2402	2.034	1.132	0.50	Pass				
BLE	2Mbps	1	19	2440	2.034	1.114	0.50	Pass				
BLE	2Mbps	1	39	2480	2.038	1.133	0.50	Pass				
							<u>RESULTS</u> ge Power					
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Aver Cond Pov (dB	ucted ver	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail	
BLE	2Mbps	1	0	2402	5.4	40	30.00	2.92	8.32	36.00	Pass	
BLE	2Mbps	1	19	2440	5.9	90	30.00	2.92	8.82	36.00	Pass	
BLE	2Mbps	1	39	2480	6.0	00	30.00	2.92	8.92	36.00	Pass	

<u>TEST RESULTS DATA</u> <u>Peak Power Density</u>											
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	5.57	-12.00	2.92	8.00	Pass		
BLE	2Mbps	1	19	2440	6.12	-11.50	2.92	8.00	Pass		
BLE	2Mbps	1	39	2480	6.13	-11.32	2.92	8.00	Pass		



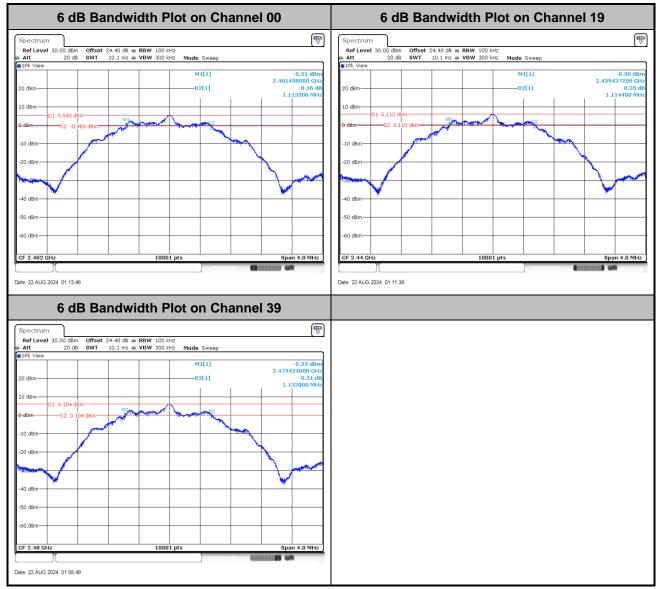
### 6dB Bandwidth

#### <1Mbps>





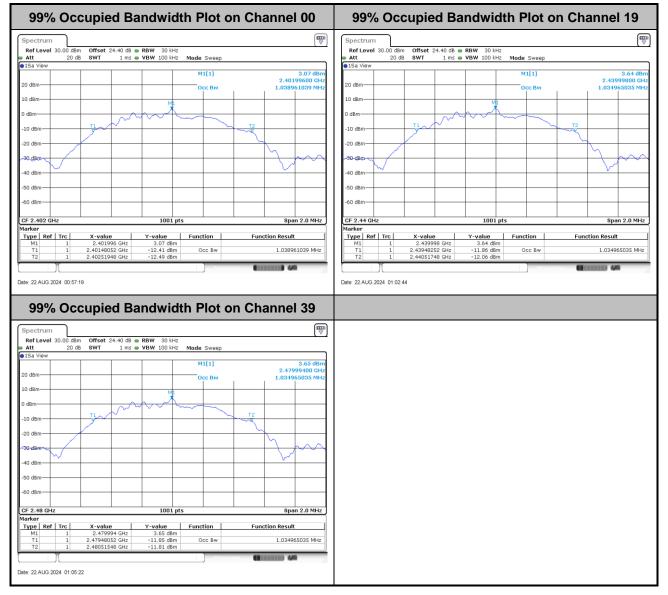
#### <2Mbps>





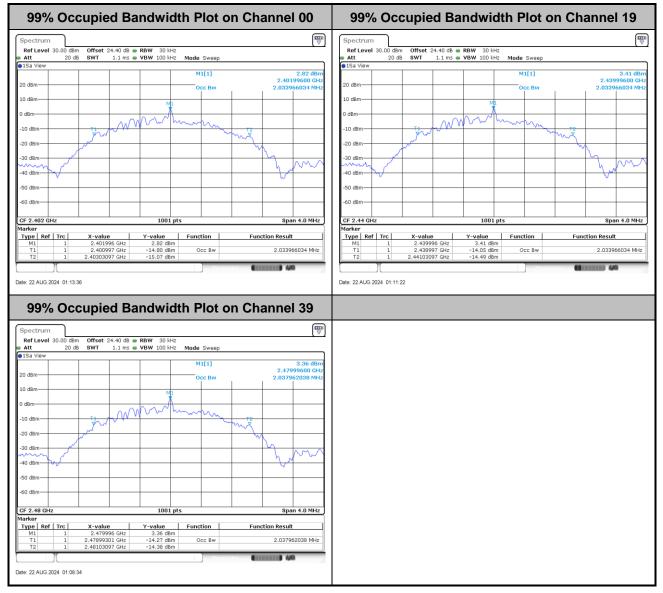
### 99% Occupied Bandwidth

#### <1Mbps>





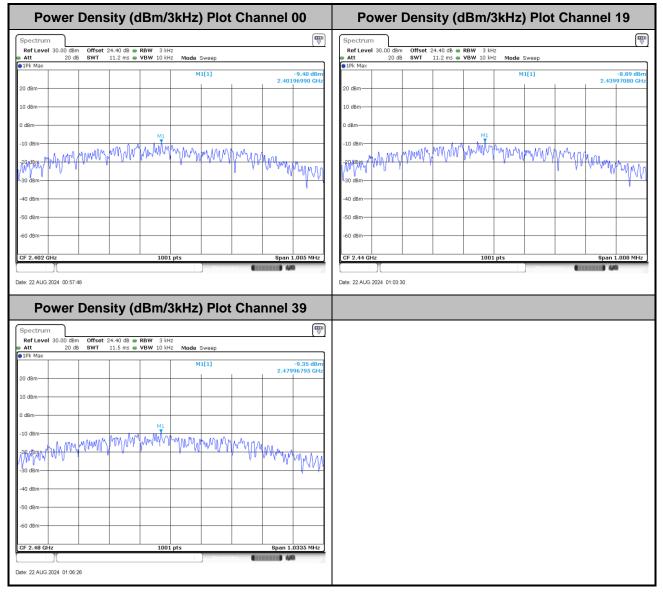
#### <2Mbps>





### Power Spectral Density (dBm/3kHz)

#### <1Mbps>





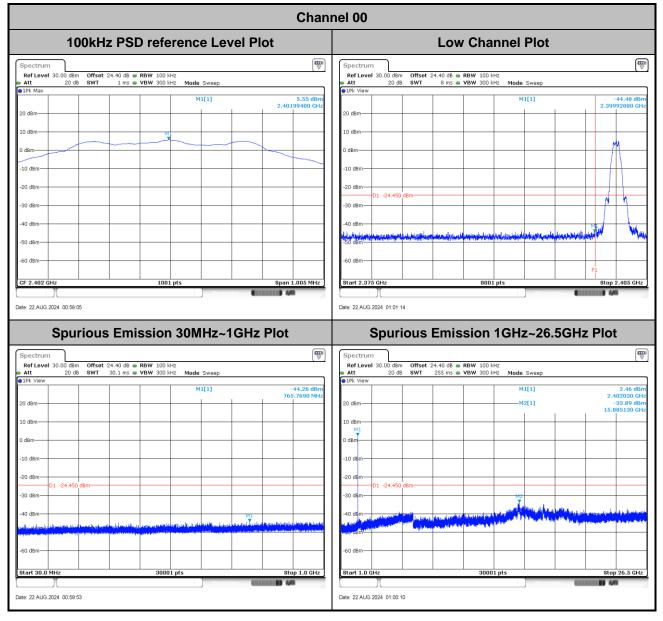
# <2Mbps>

Power Density (dBm/3kHz) Plot Channel 00	Power Density (dBm/3kHz) Plot Channel 19
Spectrum 🕎	Spectrum 🕎
RefLevel 30.00 dBm Offset 24.40 dB	Ref Level         30.00 dBm         Offset         24.40 dB         RBW         3 kHz           Att         20 dB         SWT         18.6 ms         VBW         10 kHz         Mode         Sweep
1Pk Max     M1[1] -12.00 dBm	●1Pk Max M1[1] -11.50 dBm
20 dBm	20 dBm 20 dBm
10 dBm	10 d8m
0 dBm	0 dBm
20.00° MARANA MARANA WATANA ARA ARA ARA ARA ARA ARA ARA ARA ARA	29 00 THIN THIN THINK WITH THINK THINK TO A THINK THE AND A TH
-30 generation of the second s	
-40 dBm	-40 dBm
-50 dBm-	-50 d8m-
-60 dBm-	-60 dBm
CF 2.402 GHz 1001 pts 8pan 1.6695 MHz	CF 2.44 GHz 1001 pts Span 1.671 MHz
Date: 22.AUG.2024 01:13:59	Date: 22.AUG:2024 01:11:48
Power Density (dBm/3kHz) Plot Channel 39	
Spectrum 🕎	
Ref Level         30.00 dBm         Offset         24.40 dB         RBW         3 kHz           Att         20 dB         SWT         18.9 ms         VBW         10 kHz         Mode         Sweep	
PPk Max     M1[1] -11.32 dBm	
20 dBm	
10 dBm-	
0.08m	
-10 dem-	
-20 dam - Mary an Mala Ma AMAA AMAA AMAA AMAA AMAA AMAA A	
TAN NUM ALLANDAR ALLA	
sopen.	
-ro gew	
-40 dBm	

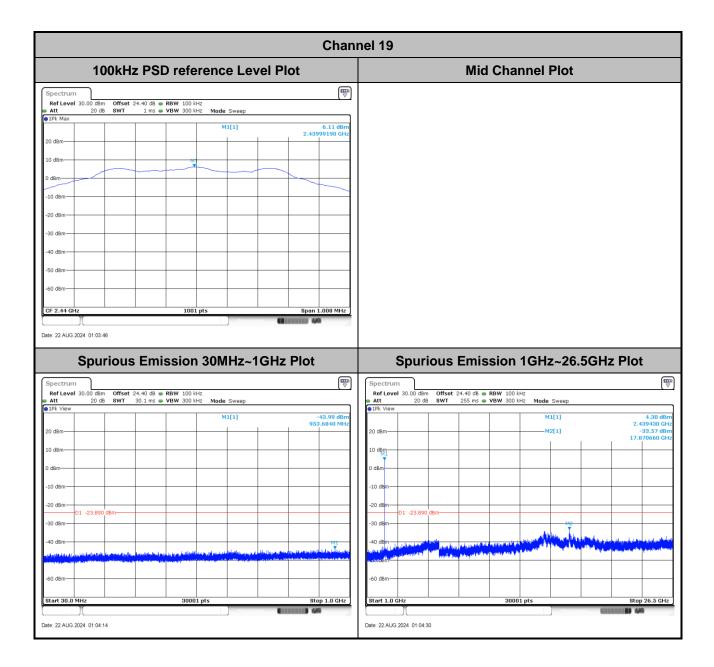


### Band Edge and Conducted Spurious Emission

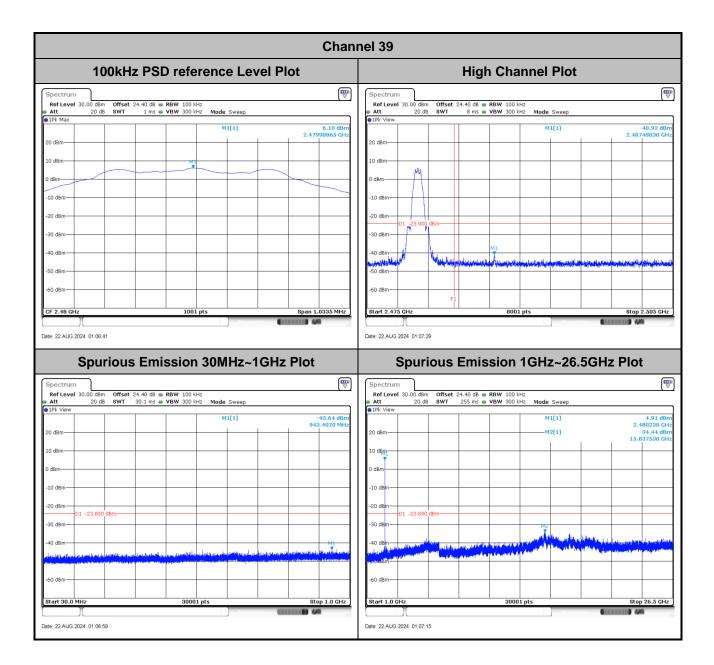
#### <1Mbps>





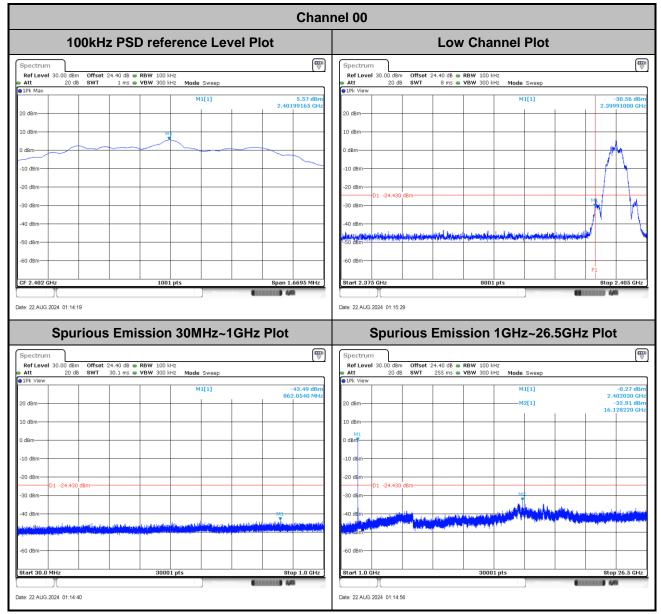




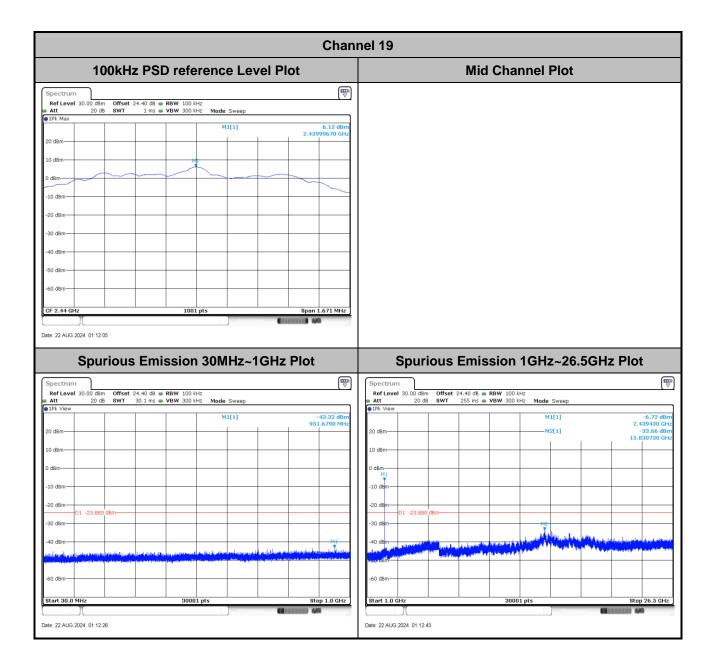




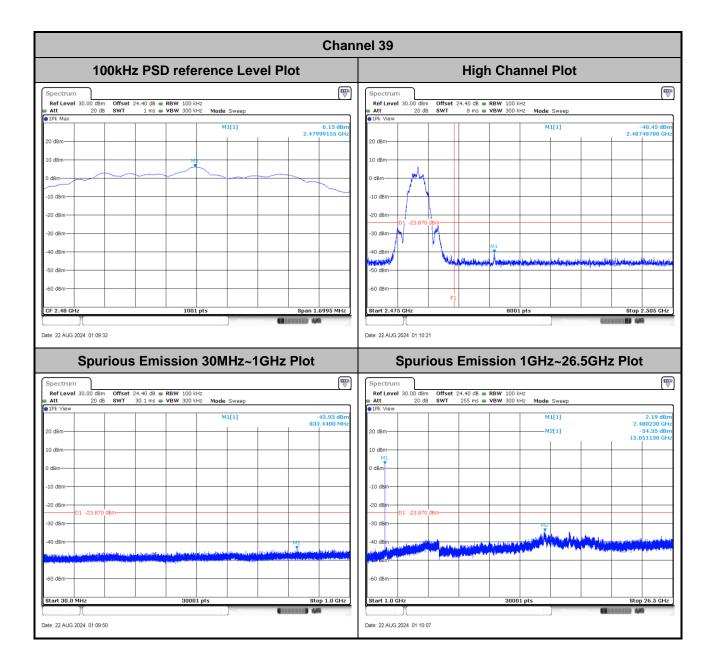
#### <2Mbps>











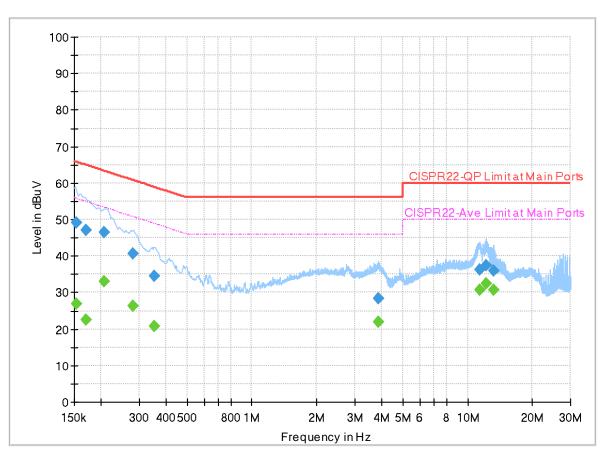


# Appendix B. AC Conducted Emission Test Results

Test Engineer		Temperature :	22.5~25.6°C	
Test Engineer : Louis Chung	Relative Humidity :	53.2~58.3%		

#### **EUT Information**

Report NO : Test Mode : Test Voltage : Phase : 480505 Mode 1 120Vac/60Hz Line



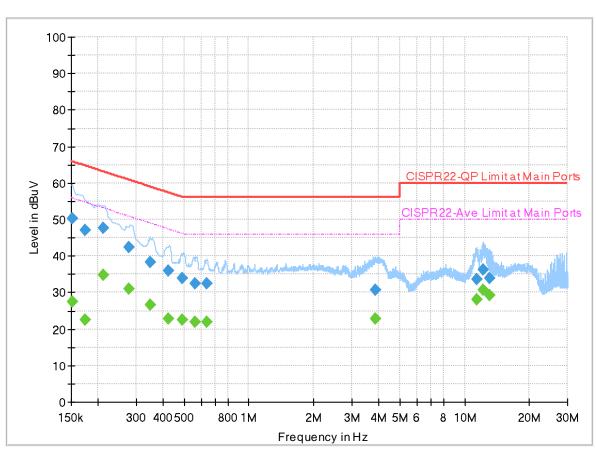
Full Spectrum

### Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152633		26.93	55.86	28.93	L1	OFF	19.9
0.152633	49.22		65.86	16.64	L1	OFF	19.9
0.170250	-	22.51	54.95	32.44	L1	OFF	19.9
0.170250	47.08		64.95	17.87	L1	OFF	19.9
0.207420		32.95	53.31	20.36	L1	OFF	19.9
0.207420	46.58		63.31	16.73	L1	OFF	19.9
0.280500		26.34	50.80	24.46	L1	OFF	19.9
0.280500	40.62		60.80	20.18	L1	OFF	19.9
0.351060		20.80	48.94	28.14	L1	OFF	19.9
0.351060	34.56		58.94	24.38	L1	OFF	19.9
3.840000		21.90	46.00	24.10	L1	OFF	20.0
3.840000	28.38		56.00	27.62	L1	OFF	20.0
11.392260		30.65	50.00	19.35	L1	OFF	20.1
11.392260	36.11		60.00	23.89	L1	OFF	20.1
12.212250		32.36	50.00	17.64	L1	OFF	20.1
12.212250	37.45		60.00	22.55	L1	OFF	20.1
13.236000		30.70	50.00	19.30	L1	OFF	20.1
13.236000	36.07		60.00	23.93	L1	OFF	20.1

#### **EUT Information**

Report NO : Test Mode : Test Voltage : Phase : 480505 Mode 1 120Vac/60Hz Neutral



#### FullSpectrum

### Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.151620		27.34	55.91	28.57	Ν	OFF	19.9
0.151620	50.23		65.91	15.68	Ν	OFF	19.9
0.174570		22.53	54.74	32.21	Ν	OFF	19.9
0.174570	47.21		64.74	17.53	Ν	OFF	19.9
0.210390		34.89	53.19	18.30	Ν	OFF	19.9
0.210390	47.76		63.19	15.43	Ν	OFF	19.9
0.277440		30.85	50.89	20.04	Ν	OFF	19.9
0.277440	42.47		60.89	18.42	Ν	OFF	19.9
0.350250		26.63	48.96	22.33	Ν	OFF	19.9
0.350250	38.37		58.96	20.59	Ν	OFF	19.9
0.424500		22.85	47.36	24.51	Ν	OFF	19.9
0.424500	36.05		57.36	21.31	Ν	OFF	19.9
0.492000		22.63	46.13	23.50	Ν	OFF	19.9
0.492000	33.78		56.13	22.35	Ν	OFF	19.9
0.564000		21.93	46.00	24.07	Ν	OFF	19.9
0.564000	32.50		56.00	23.50	Ν	OFF	19.9
0.636630		21.88	46.00	24.12	Ν	OFF	19.9
0.636630	32.35		56.00	23.65	Ν	OFF	19.9
3.854490		22.91	46.00	23.09	Ν	OFF	20.0

3.854490	30.79		56.00	25.21	Ν	OFF	20.0
11.426190		28.14	50.00	21.86	Ν	OFF	20.1
11.426190	33.69		60.00	26.31	Ν	OFF	20.1
12.232500		30.74	50.00	19.26	Ν	OFF	20.1
12.232500	36.29		60.00	23.71	Ν	OFF	20.1
13.054020		29.32	50.00	20.68	Ν	OFF	20.1
13.054020	34.02		60.00	25.98	Ν	OFF	20.1



## Appendix C. Radiated Spurious Emission Test Data

		Temperature :	21.7~22.5°C
Test Engineer .	st Engineer : Leo Li and Lucifer Jiang	Relative Humidity :	51~57%

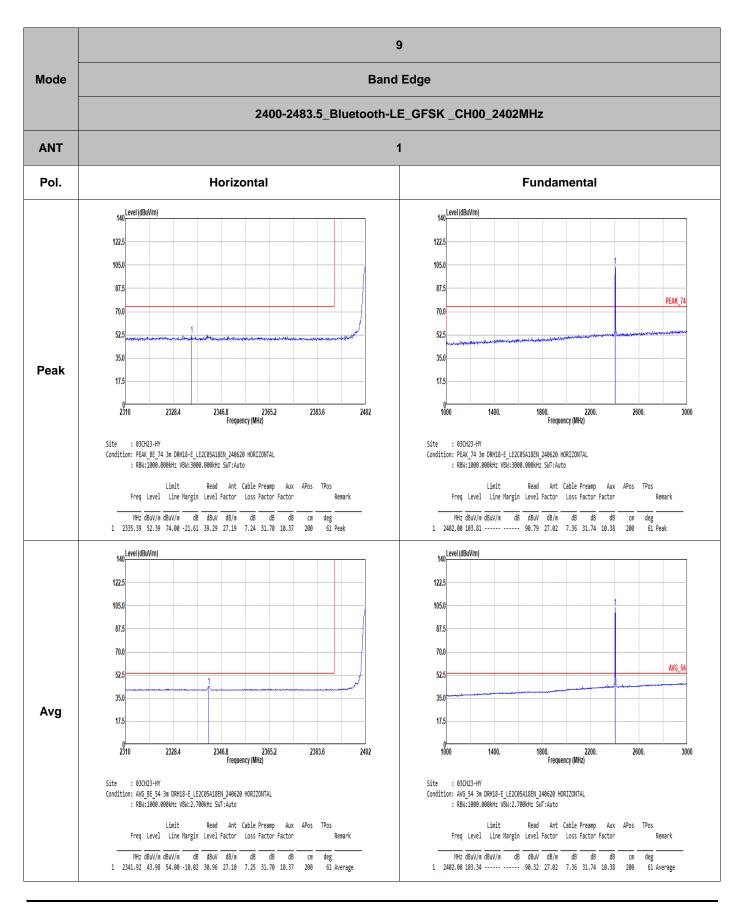
# C1. Radiated Spurious Emission Test Modes

Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 9	2400-2483.5	1	Bluetooth-LE_GFSK	00	2402	1Mbps	-	-
Mode 10	2400-2483.5	1	Bluetooth-LE_GFSK	19	2440	1Mbps	-	-
Mode 11	2400-2483.5	1	Bluetooth-LE_GFSK	39	2480	1Mbps	-	-
Mode 12	2400-2483.5	1	Bluetooth-LE_GFSK	00	2402	2Mbps	-	-
Mode 13	2400-2483.5	1	Bluetooth-LE_GFSK	19	2440	2Mbps	-	-
Mode 14	2400-2483.5	1	Bluetooth-LE_GFSK	39	2480	2Mbps	-	-
Mode 15	2400-2483.5	1	Bluetooth-LE_GFSK	39	2480	2Mbps	-	LF
Mode 16	2400-2483.5	1	Bluetooth-LE_GFSK	39	2480	2Mbps	-	SHF

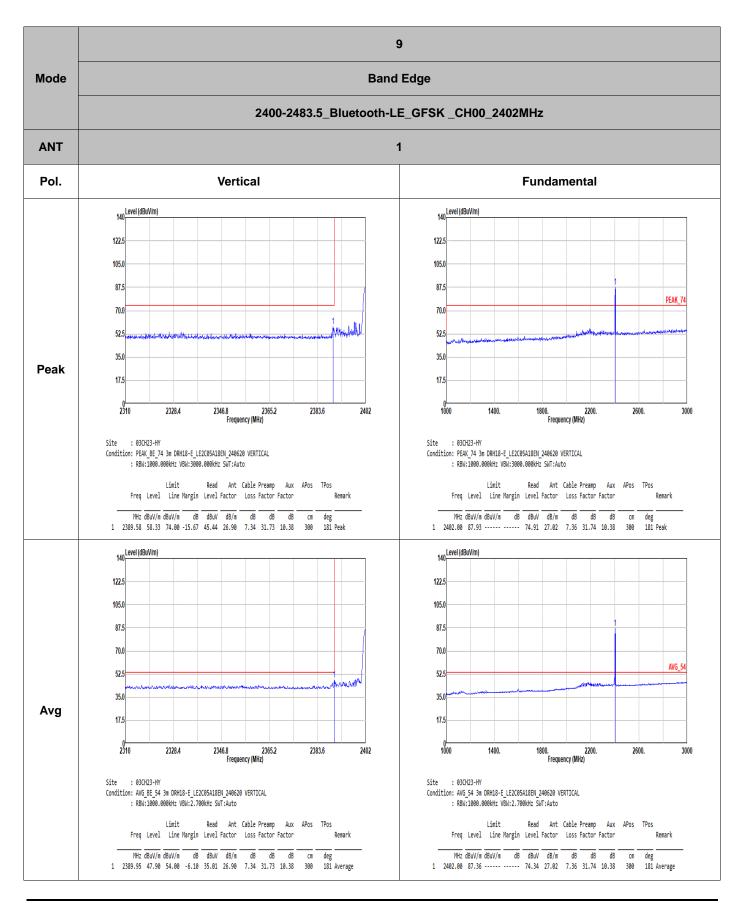
# C2. Summary of each worse mode

Mode	Modulation	Ch.	Freq.	Level	Limit	Margin	Pol.	Peak	Result	RU	Remark
Mode	wouldation	<b>G</b> I.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	POI.	Avg.	Result	NU	Relliark
9	Bluetooth-LE_GFSK	00	2389.95	47.90	54.00	-6.10	V	Avg.	Pass	-	Band Edge
9	Bluetooth-LE_GFSK	00	3195.00	47.52	74.00	-26.48	V	Peak	Pass	-	Harmonic
10	Bluetooth-LE_GFSK	19	-	-	-	-	-	-	-	-	Band Edge
10	Bluetooth-LE_GFSK	19	7320.00	40.14	54.00	-13.86	Н	Avg.	Pass	-	Harmonic
11	Bluetooth-LE_GFSK	39	2487.42	46.78	54.00	-7.22	Н	Avg.	Pass	-	Band Edge
11	Bluetooth-LE_GFSK	39	7440.00	39.51	54.00	-14.49	Н	Avg.	Pass	-	Harmonic
12	Bluetooth-LE_GFSK	00	2389.86	47.54	54.00	-6.46	V	Avg.	Pass	-	Band Edge
12	Bluetooth-LE_GFSK	00	3195.00	51.73	74.00	-22.27	V	Peak	Pass	-	Harmonic
13	Bluetooth-LE_GFSK	19	-	-	-	-	-	-	-	-	Band Edge
13	Bluetooth-LE_GFSK	19	7320.00	41.48	54.00	-12.52	V	Avg.	Pass	-	Harmonic
4.4	Bluetooth-LE_GFSK	39	2487.42	48.90	54.00	-5.10	Н	Avg.	Pass	-	Band Edge
14	Bluetooth-LE_GFSK	39	7440.00	41.39	54.00	-12.61	Н	Avg.	Pass	-	Harmonic
15	LF	39	533.43	33.26	46.00	-12.74	V	QP	Pass	-	LF
16	SHF	39	18220.00	40.78	74.00	-33.22	Н	Peak	Pass	-	SHF

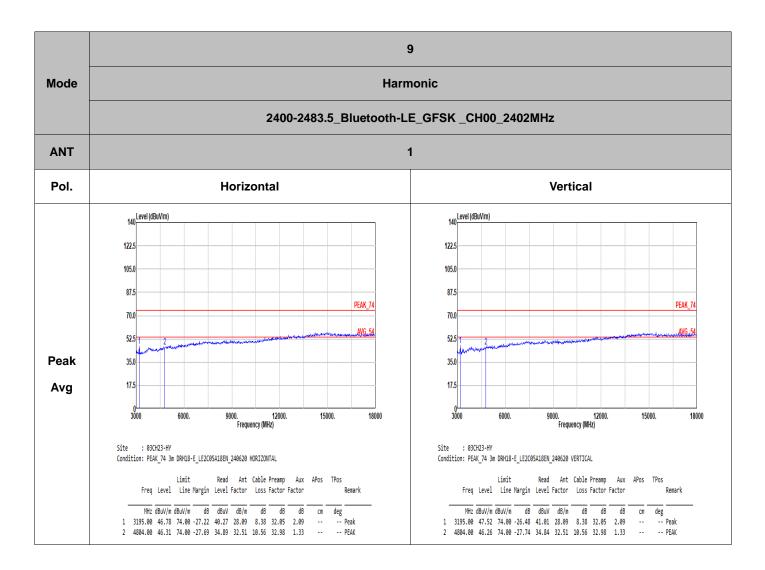




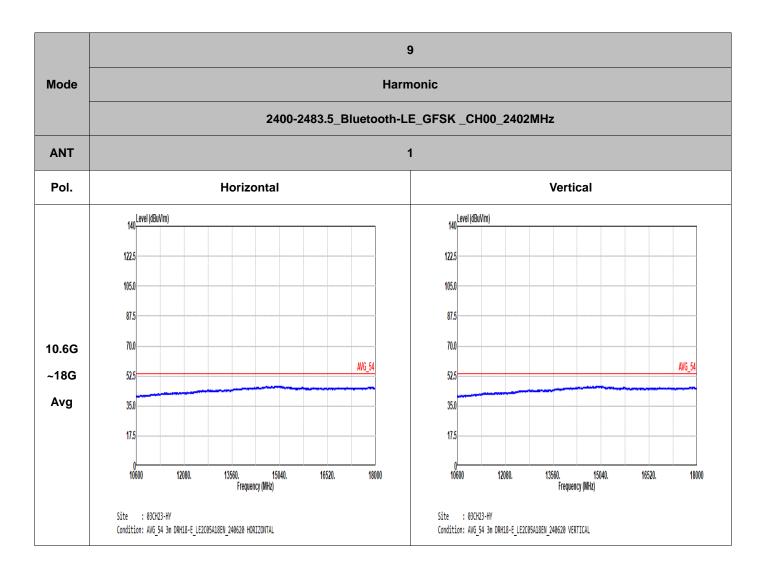




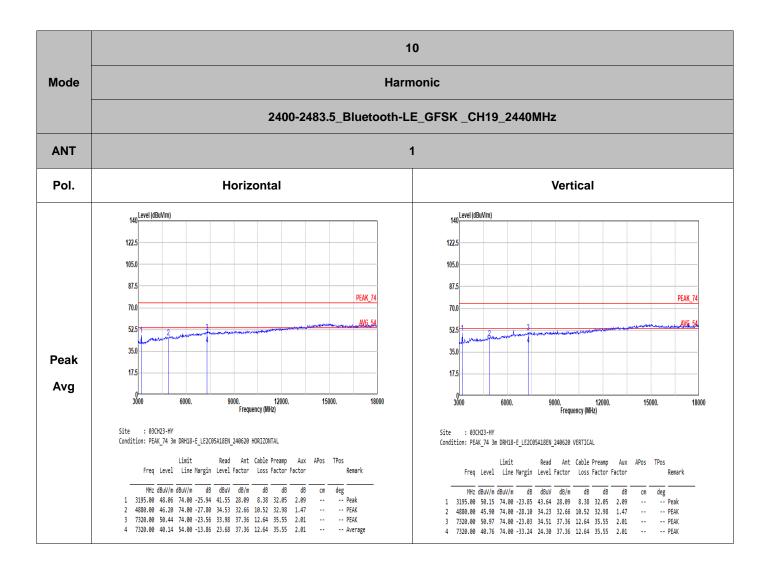




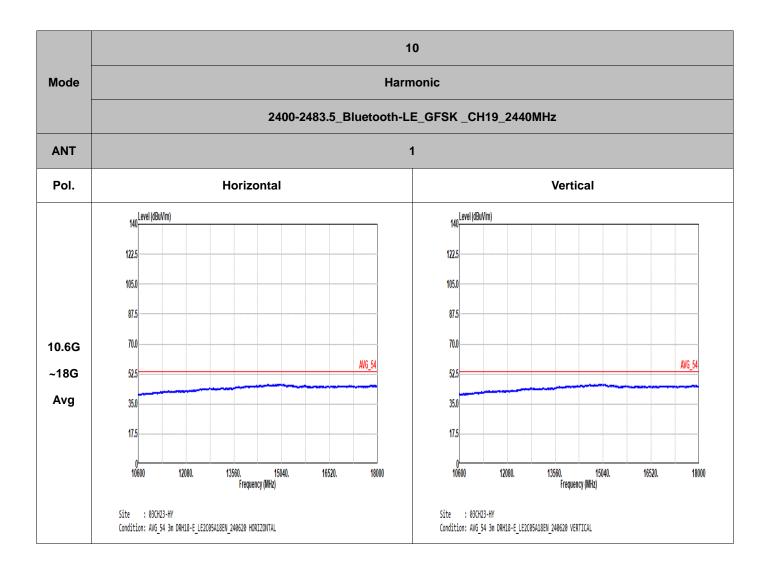




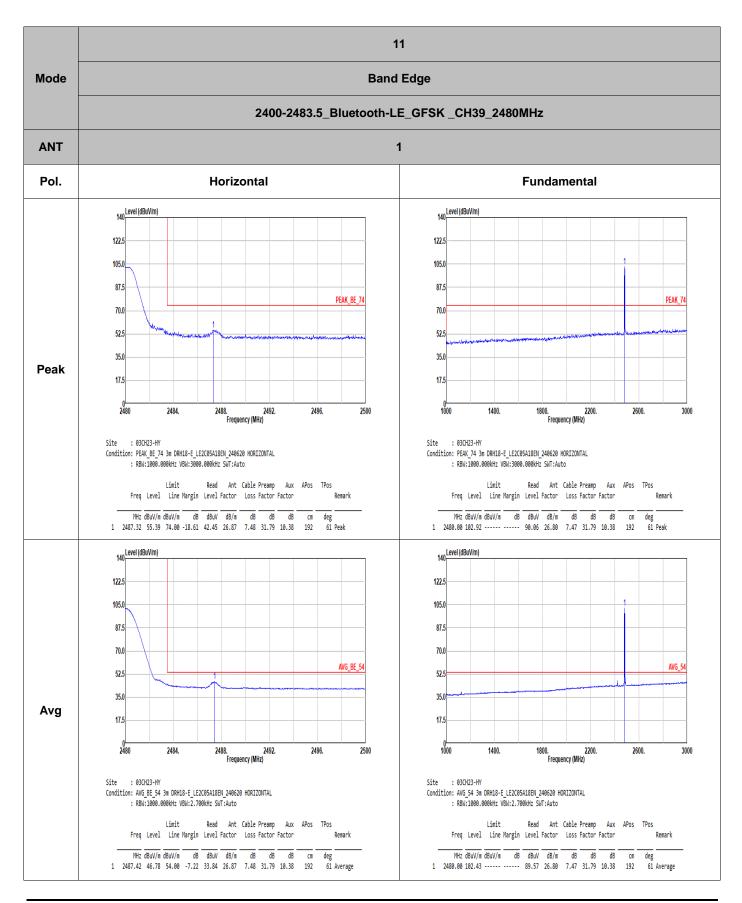




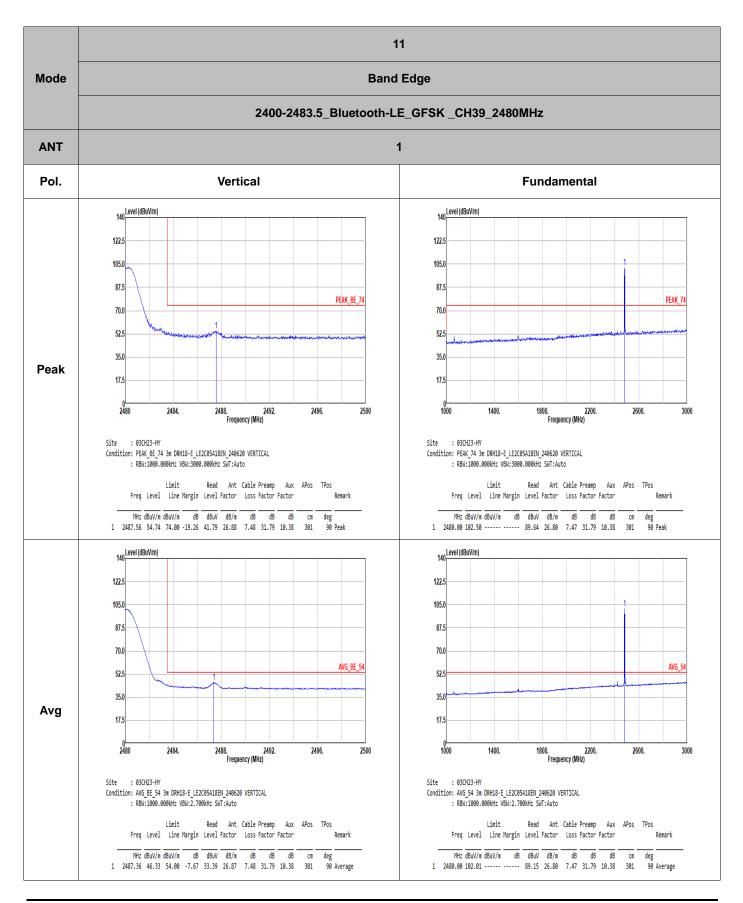




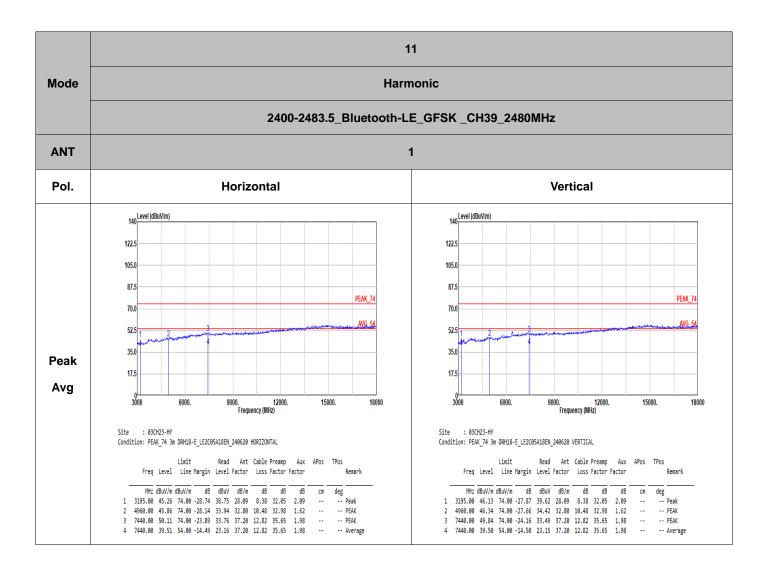




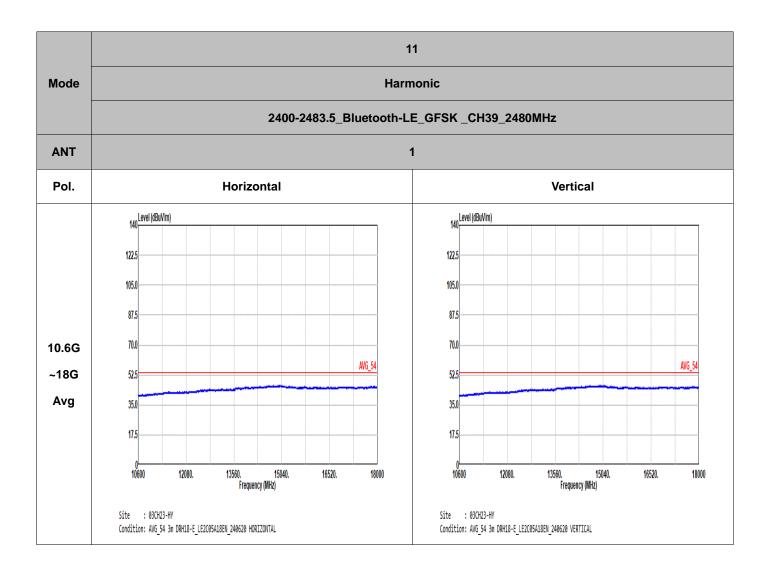




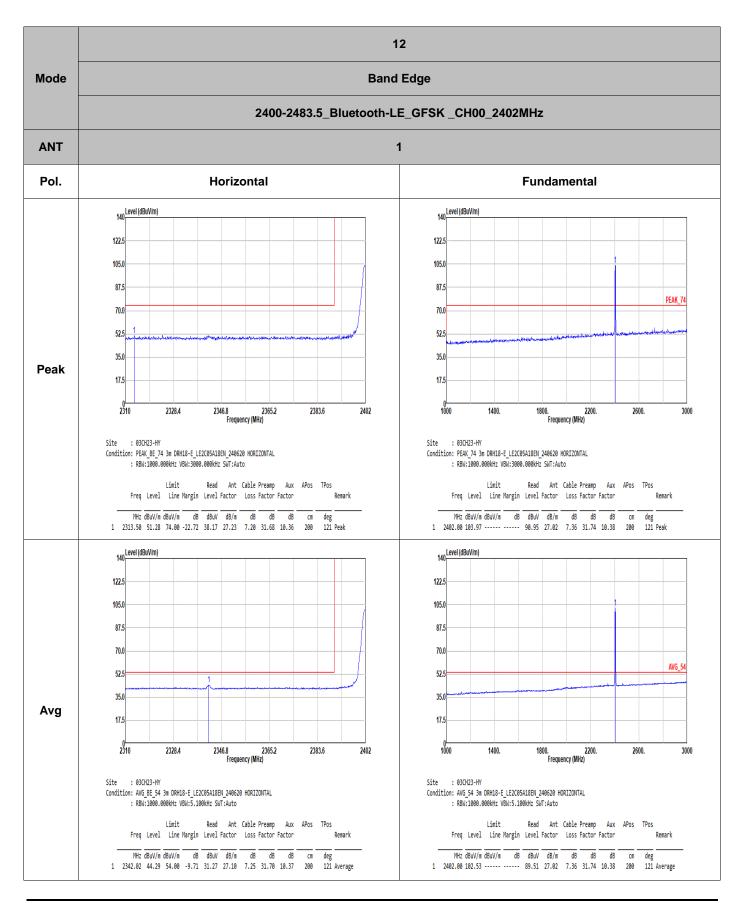




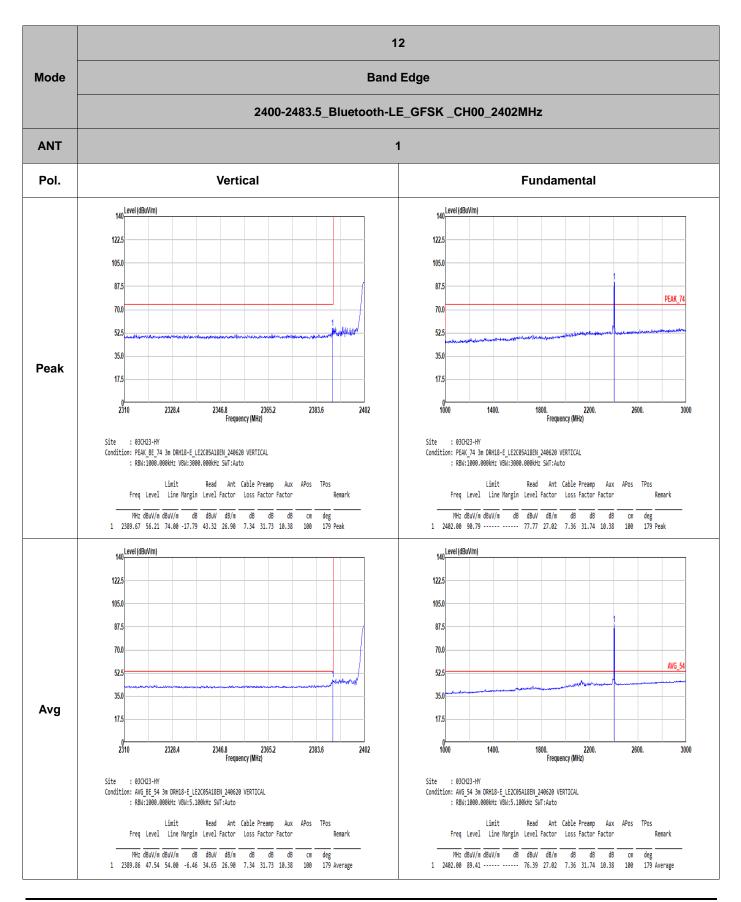




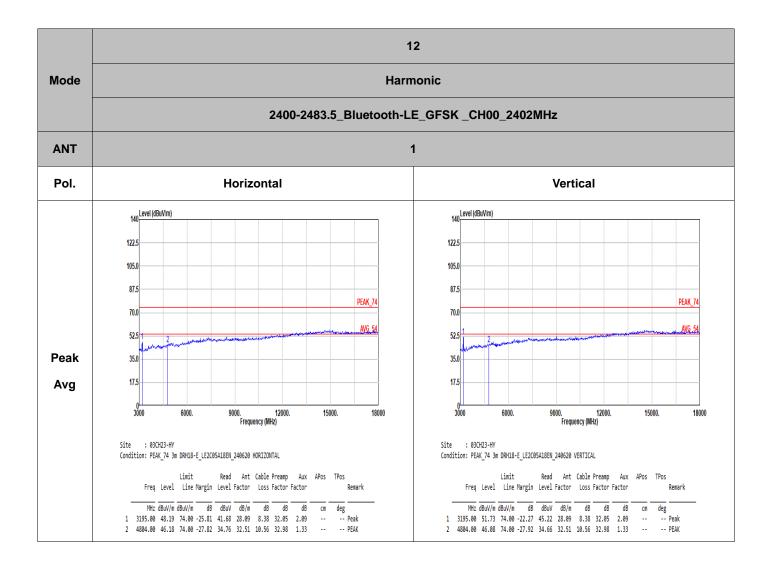




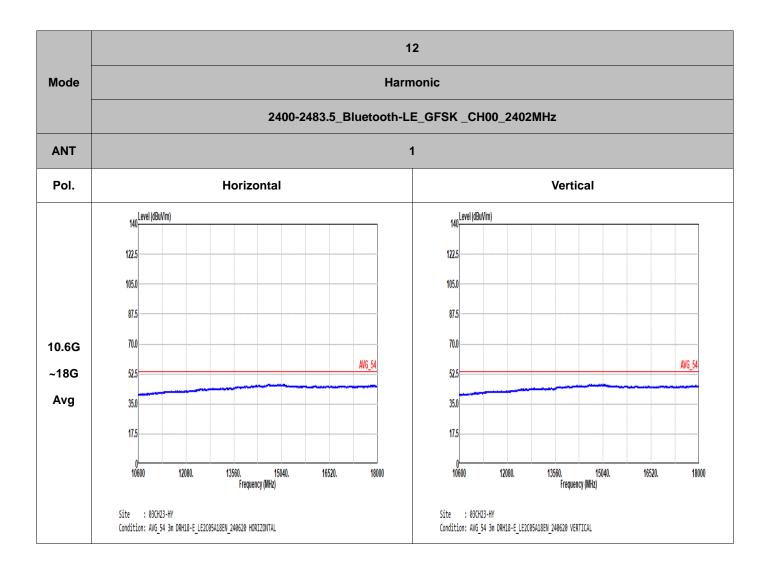




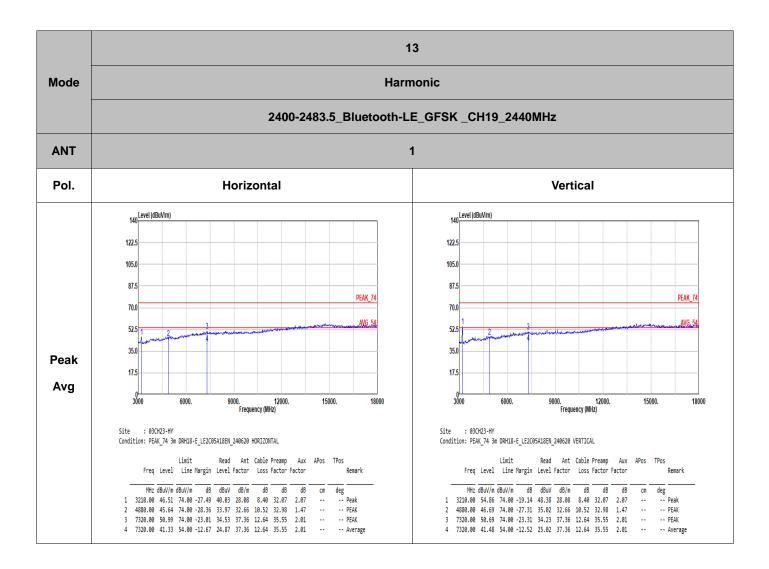




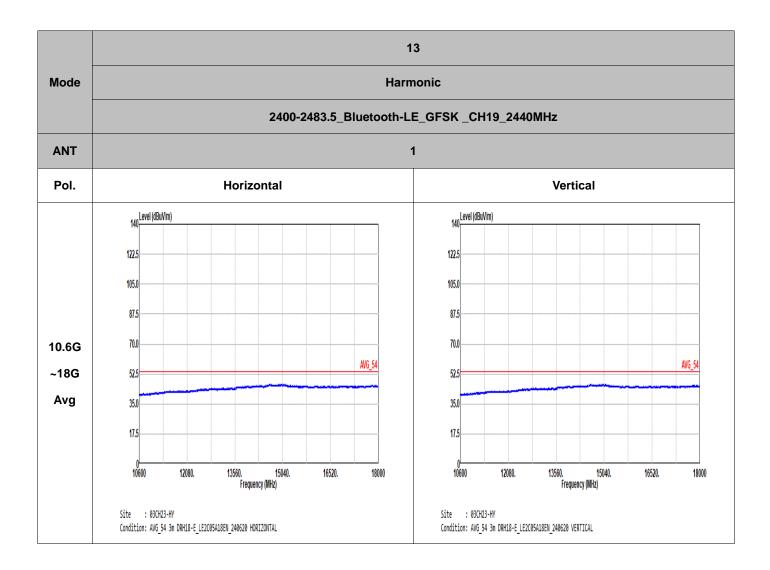




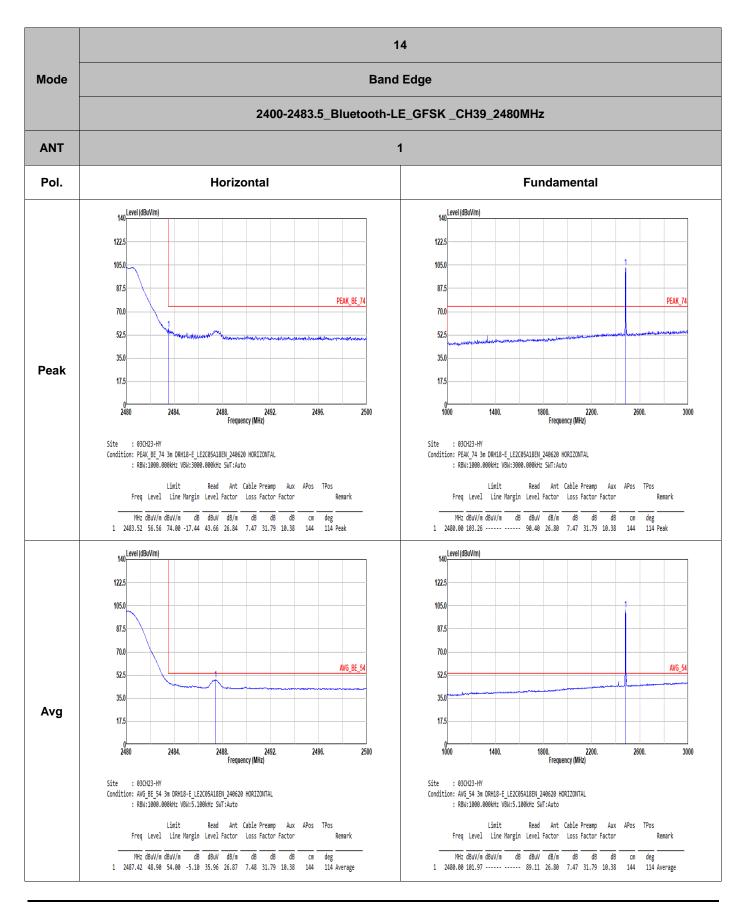




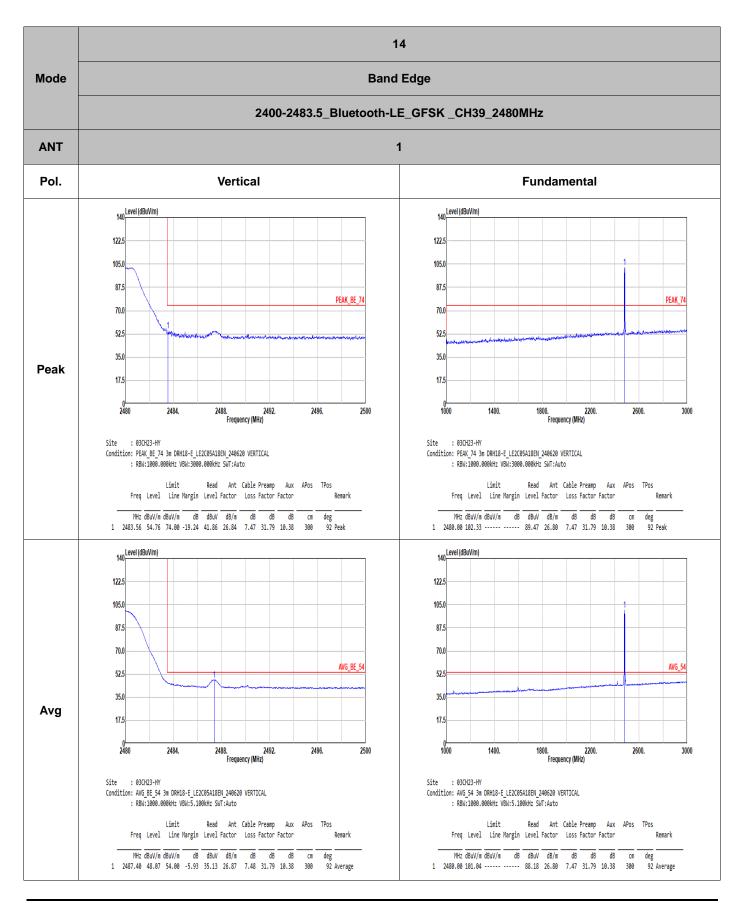




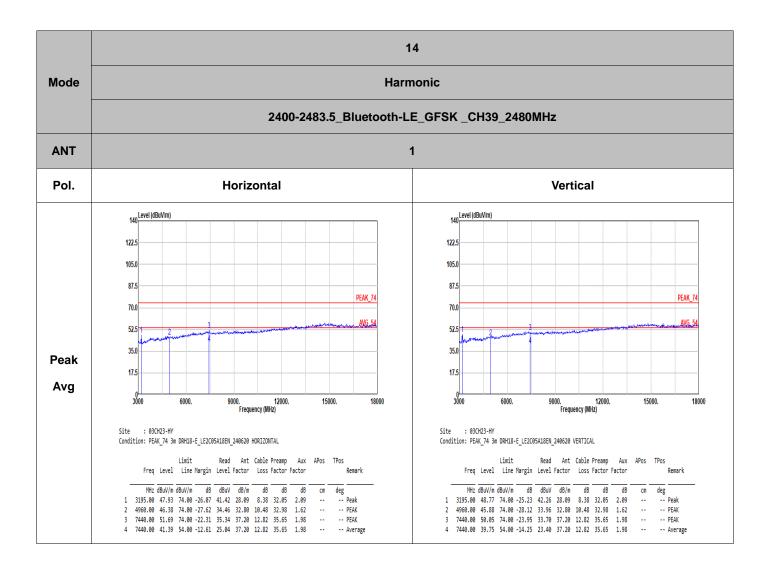




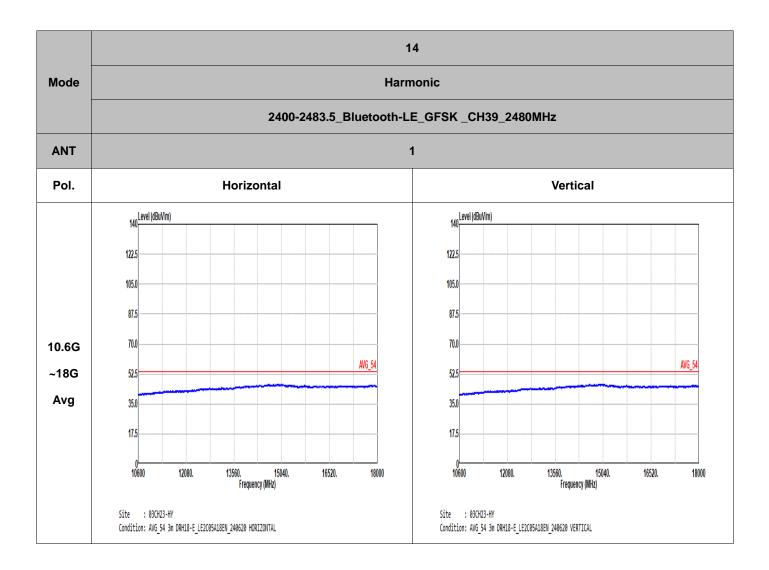




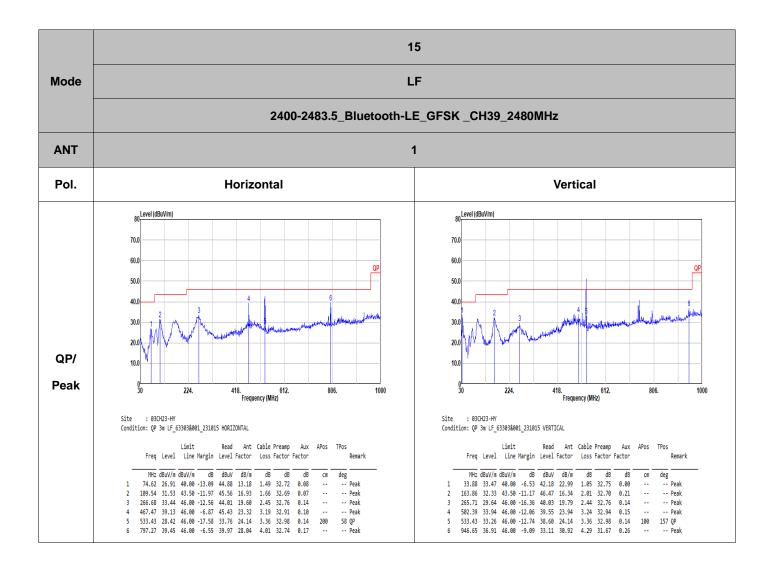




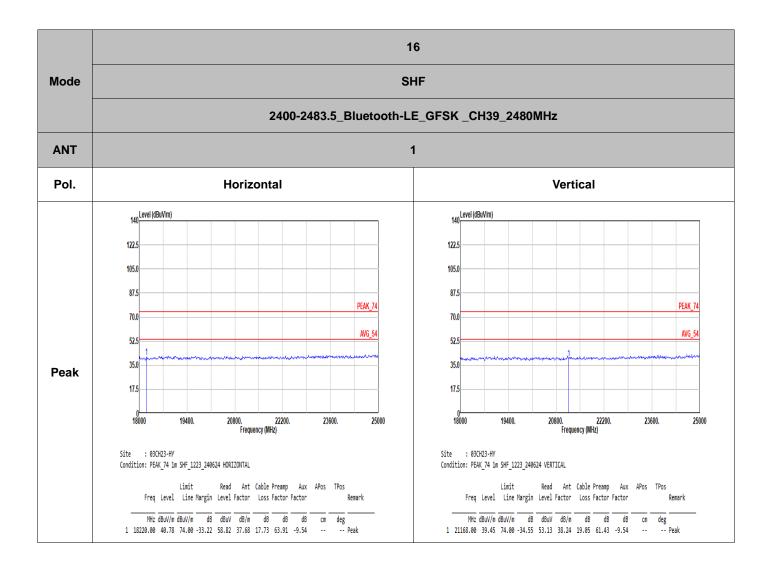
















# Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth –LE for 1Mbps	62.30	390	2.56	2.7KHz
Bluetooth –LE for 2Mbps	33.23	208	4.81	5.1KHz

