FCC RADIO TEST REPORT

FCC ID	:	**A4RGB62Z**
Equipment	:	**Phone**
Model Name	:	**GB62Z**
Applicant	:	**Google LLC** **1600 Amphitheatre Parkway,** **Mountain View, California, 94043 USA**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Nov. 11, 2021 and testing was performed from Nov. 15, 2021 to Feb. 21, 2022. 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.)

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History of this test report

Report No.	Version	Description	Issue Date
FR161608-03B	01	Initial issue of report	Jan. 26, 2022
FR161608-03B	02	Revise Appendix C, D, Connection Diagram of Test System, Limit of Conducted Band Edges and Spurious Emission and List of Measuring Equipment	Feb. 16, 2022
FR161608-03B	03	1. Revise test data and List of Measuring Equipment 2. Add description in test mode	Feb. 22, 2022

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	3.05 dB under the limit at 7440.000 MHz
3.6	15.207	AC Conducted Emission	Pass	7.66 dB under the limit at 0.184 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 product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: William Chen

Report Producer: Clio Lo

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Phone
Model Name	GB62Z
FCC ID	A4RGB62Z
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/5G NR/NFC/GNSS WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE

Remark: The above EUT's information was declared by manufacturer.

EUT Information List	
S/N	Performed Test Item
1A261FQGR00043	RF Conducted Measurement
1B011FQGR00012 1B011FQGR00008	Radiated Spurious Emission
1B011FQGR00006	Conducted Emission

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel (37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	**<Ant. 4>** Bluetooth – LE (1Mbps): 19.42 dBm / 0.0875 W Bluetooth – LE (2Mbps): 19.45 dBm / 0.0881 W **<Ant. 3>** Bluetooth – LE (1Mbps): 19.96 dBm / 0.0991 W Bluetooth – LE (2Mbps): 20.70 dBm / 0.1175 W
99% Occupied Bandwidth	**<Ant. 4>** Bluetooth – LE (1Mbps): 1.039 MHz Bluetooth – LE (2Mbps): 2.054 MHz **<Ant. 3>** Bluetooth – LE (1Mbps): 1.037 MHz Bluetooth – LE (2Mbps): 2.050 MHz
Antenna Type / Gain	**<Ant. 4> :** IFA Antenna with gain -2.7 dBi **<Ant. 3> :** IFA Antenna with gain -0.2 dBi
Type of Modulation	Bluetooth LE : GFSK

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

1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	CO05-HY (TAF Code: 1190)
Remark	The AC Conducted Emission test item subcontracted to Sporton International Inc. EMC & Wireless Communications Laboratory

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

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.**
	TH05-HY; 03CH15-HY

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

FCC designation No.: TW1190 and TW3786

1.5 Applicable Standards

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

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

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

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

2.2 Test Mode

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and accessory (Adapter or Earphone), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find X plane with Adapter as worst plane.

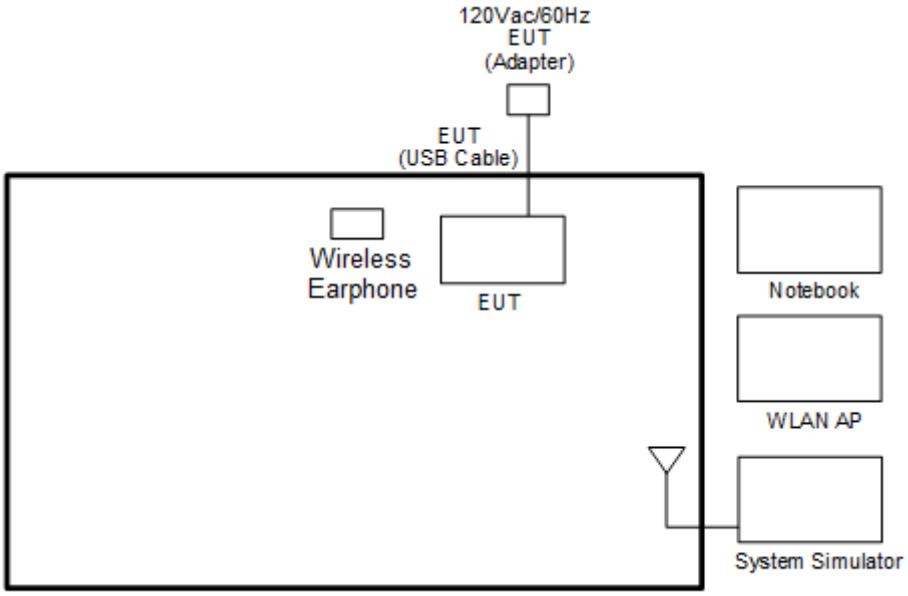
b. AC power line Conducted Emission was tested under maximum output power.

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

Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
Conducted Test Cases	**Bluetooth – LE / GFSK**
	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
Radiated Test Cases	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
AC Conducted Emission	Mode 1: GSM850 Idle + WLAN (2.4GHz) Link + Bluetooth Link + USB Cable 2 (Charging from AC Adapter 1)
Remark: For Radiated Test Cases, the tests were performed with Adapter 1 and USB Cable 2.	

2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



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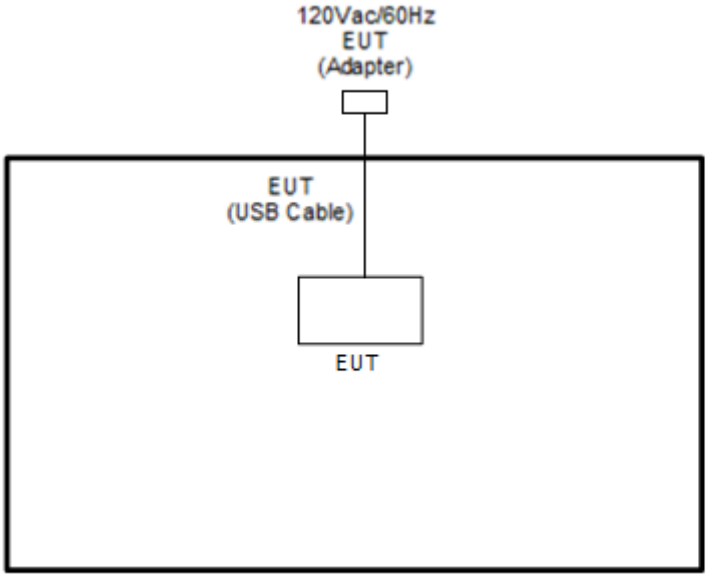


2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Wireless Earphone	Google	G1007/G1008	A4RG1007/ A4RG1008	N/A	N/A
3.	WLAN AP	NETGEAR64	RAXE500	N/A	N/A	Unshielded, 1.8 m
4.	Notebook	Dell	Latitude E3400	FCC DoC	N/A	AC I/P：Unshielded, 1.2m DC O/P：Shielded, 1.8m

2.5 EUT Operation Test Setup

The RF test items, utility “Command v10.0.17134.134” 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.

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.

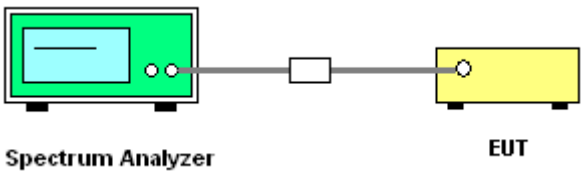
3.1.2 Measuring Instruments

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.
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) ≥ 3 * RBW.
6. Measure and record the results in the test report.

3.1.4 Test Setup

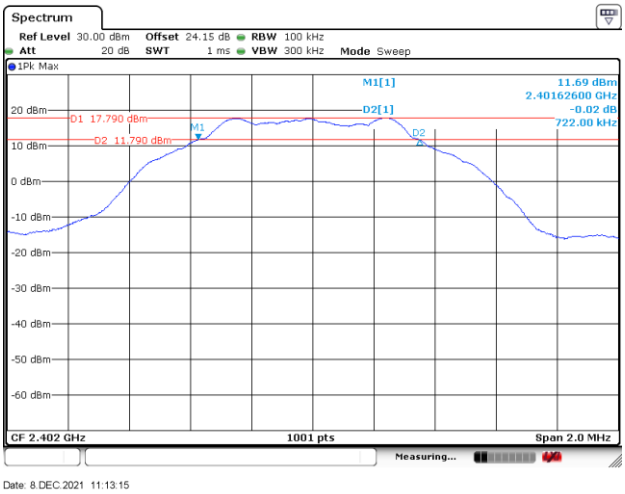
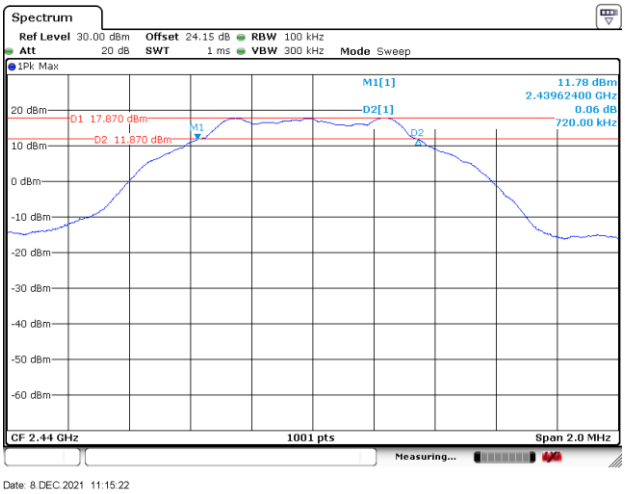


3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

<Ant. 4>

<1Mbps>

6 dB Bandwidth Plot on Channel 00	6 dB Bandwidth Plot on Channel 19
	
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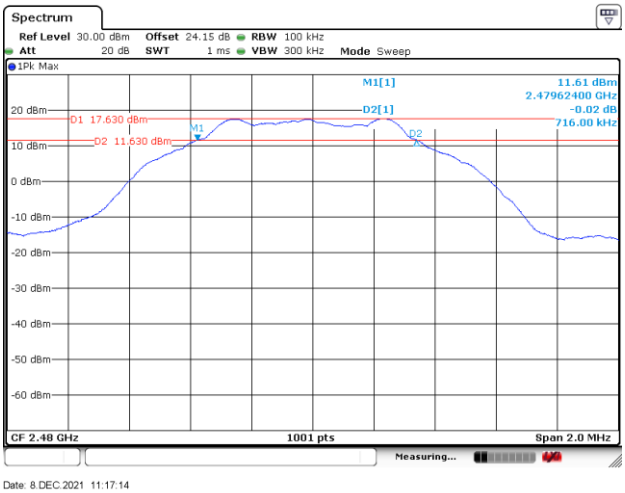
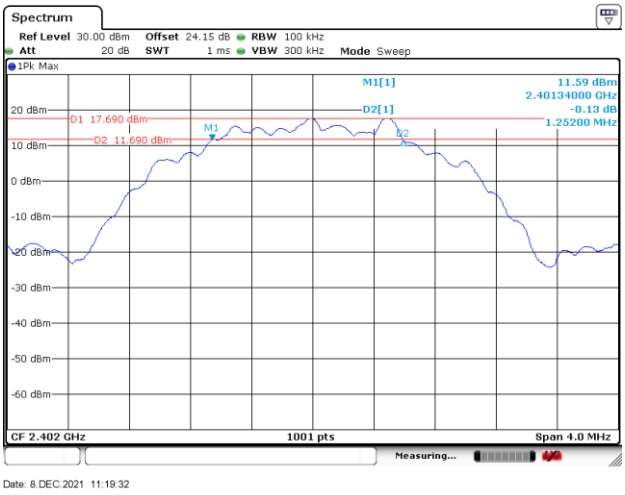
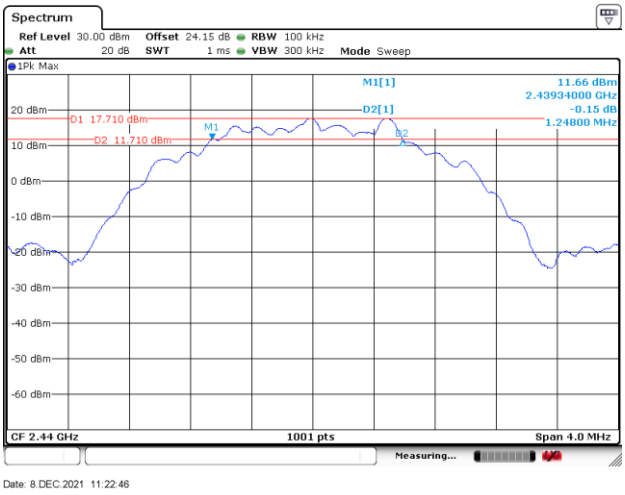
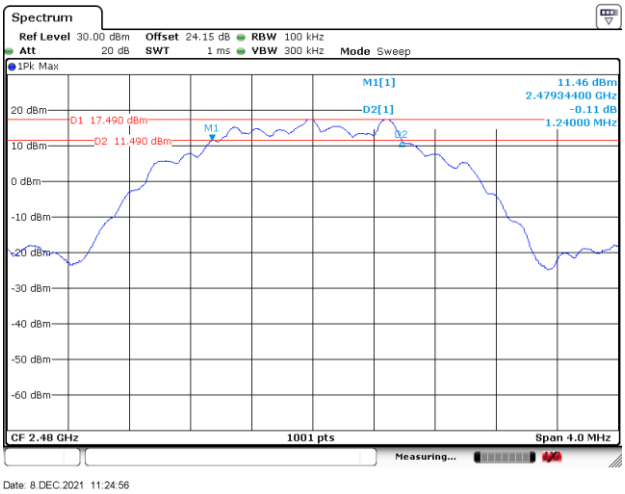
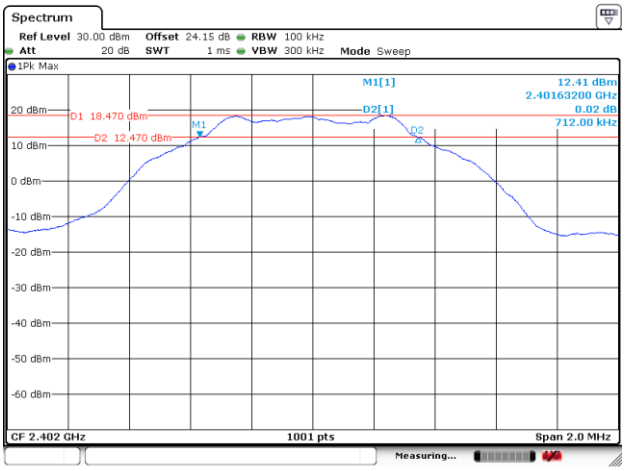
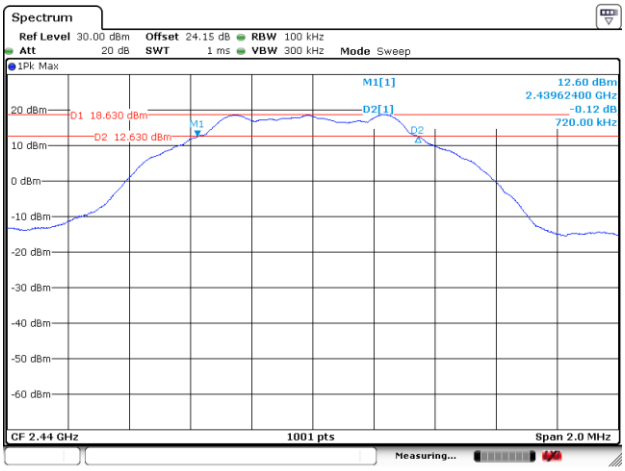
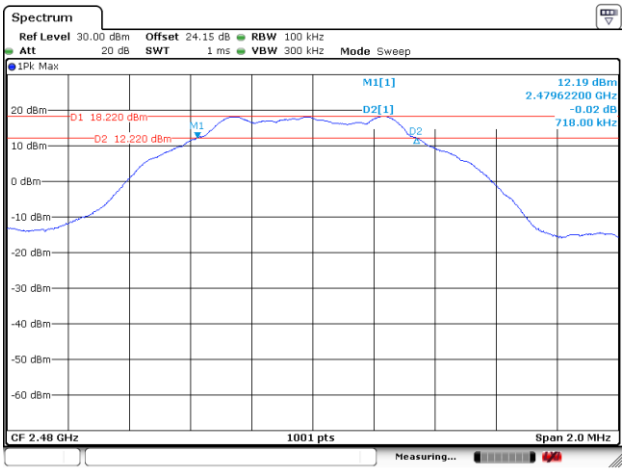
	

<2Mbps>

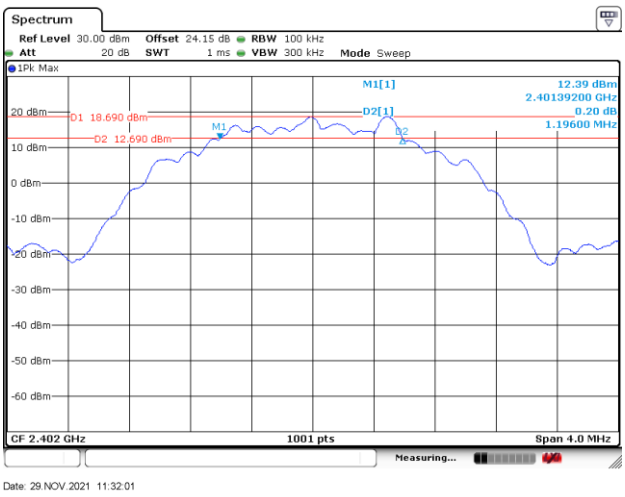
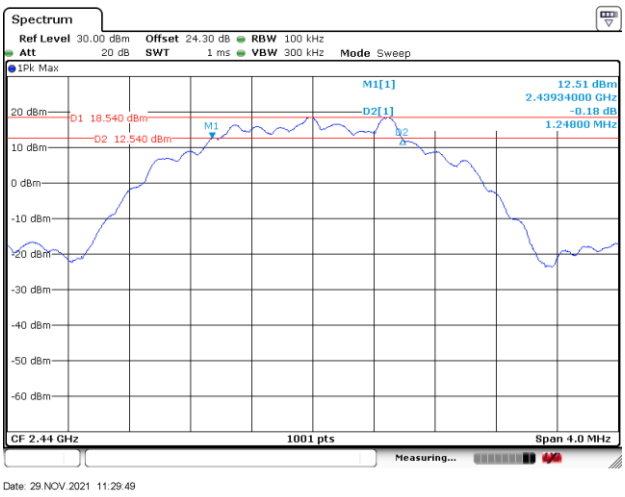
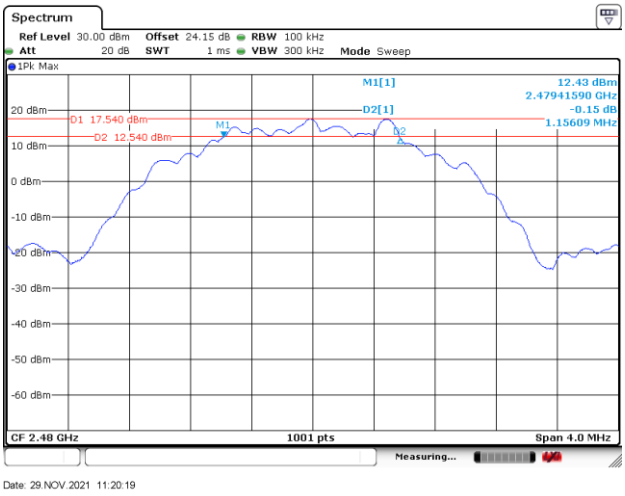
6 dB Bandwidth Plot on Channel 00	6 dB Bandwidth Plot on Channel 19
	
6 dB Bandwidth Plot on Channel 39	**N/A**
	

<Ant. 3>

<1Mbps>

6 dB Bandwidth Plot on Channel 00	6 dB Bandwidth Plot on Channel 19
	
6 dB Bandwidth Plot on Channel 39	**N/A**
	

<2Mbps>

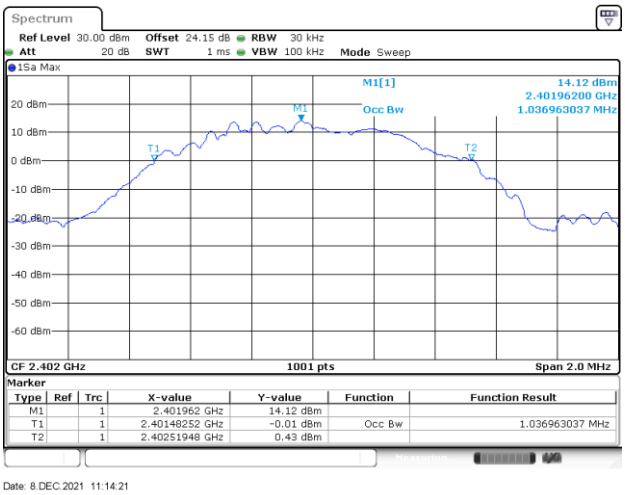
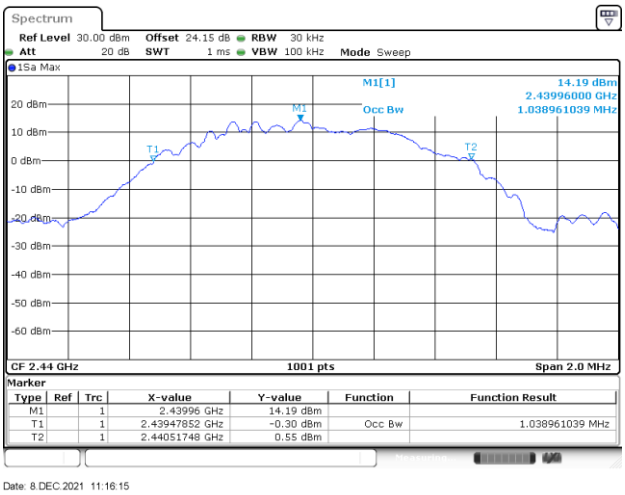
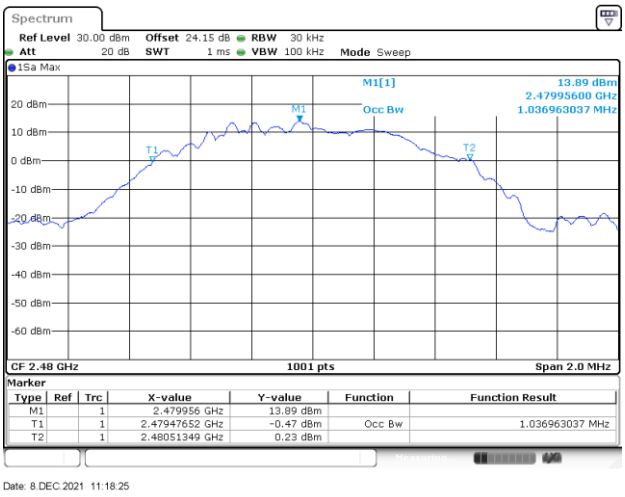
6 dB Bandwidth Plot on Channel 00	6 dB Bandwidth Plot on Channel 19
	
6 dB Bandwidth Plot on Channel 39	**N/A**
	

3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

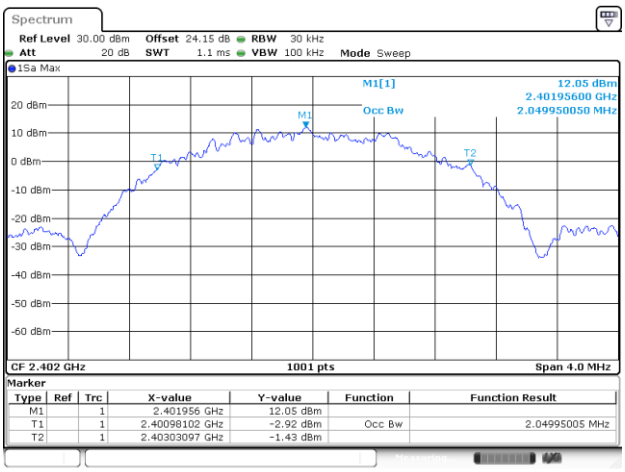
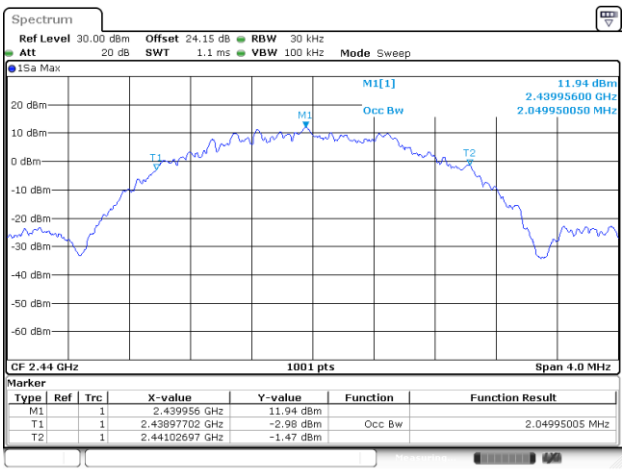
<Ant. 4>

<1Mbps>

99% Bandwidth Plot on Channel 00	99% Occupied Bandwidth Plot on Channel 19
	
99% Occupied Bandwidth Plot on Channel 39	**N/A**
	

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

<2Mbps>

99% Bandwidth Plot on Channel 00	99% Occupied Bandwidth Plot on Channel 19
	
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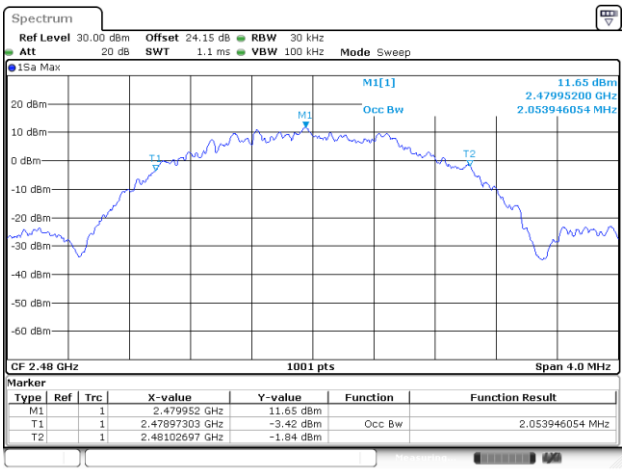
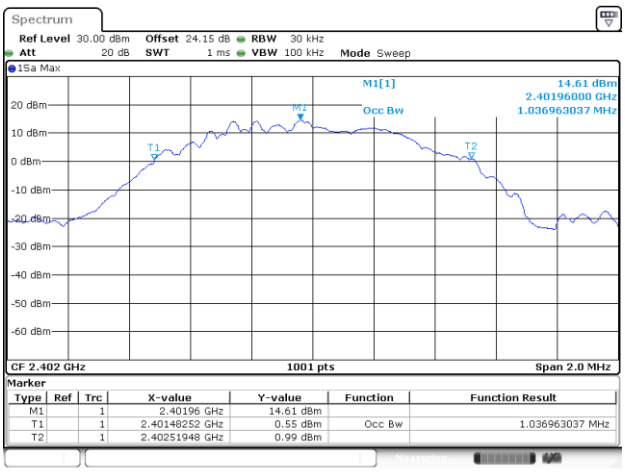
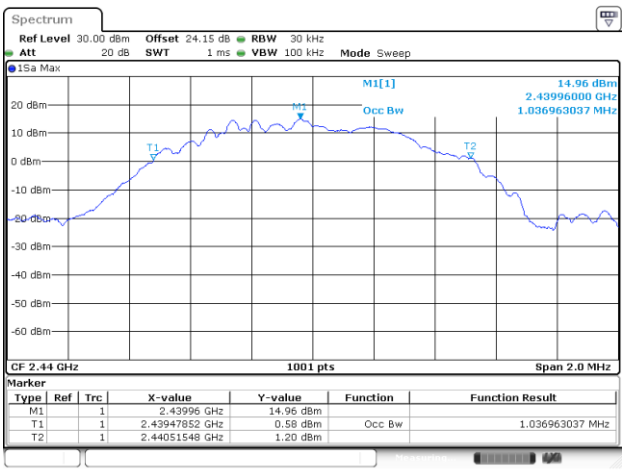
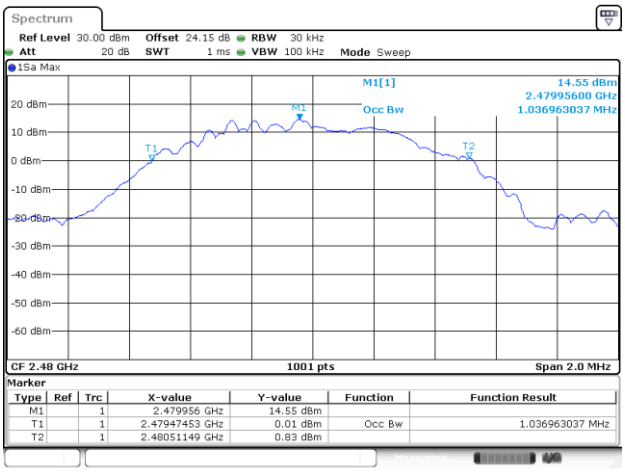
	

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

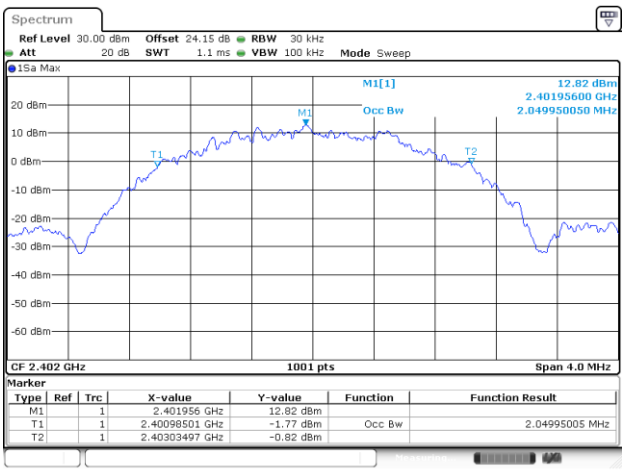
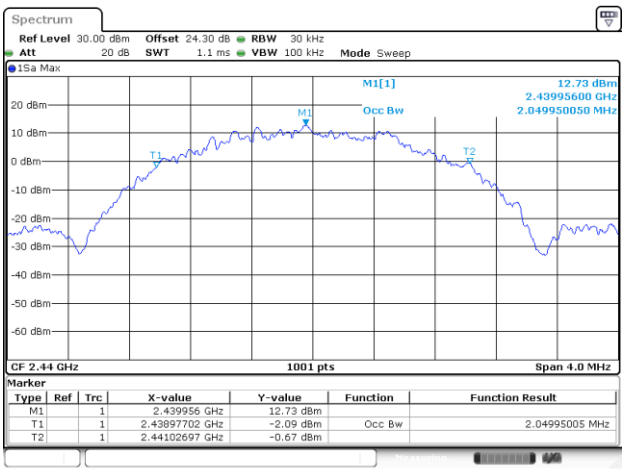
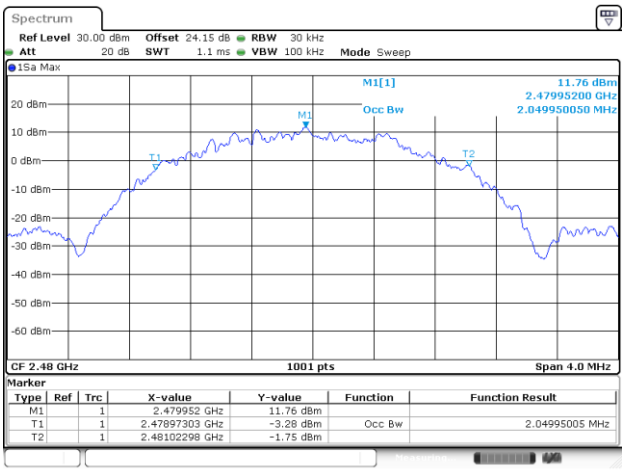
<Ant. 3>

<1Mbps>

99% Bandwidth Plot on Channel 00	99% Occupied Bandwidth Plot on Channel 19
	
99% Occupied Bandwidth Plot on Channel 39	**N/A**
	

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

<2Mbps>

99% Bandwidth Plot on Channel 00	99% Occupied Bandwidth Plot on Channel 19
	
99% Occupied Bandwidth Plot on Channel 39	**N/A**
	

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.

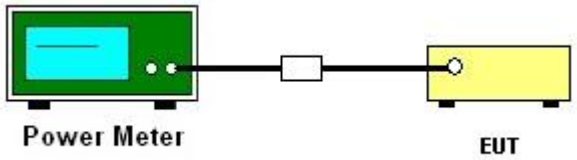
3.2.2 Measuring Instruments

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

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

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

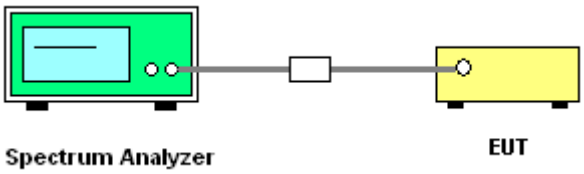
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

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

3.3.4 Test Setup



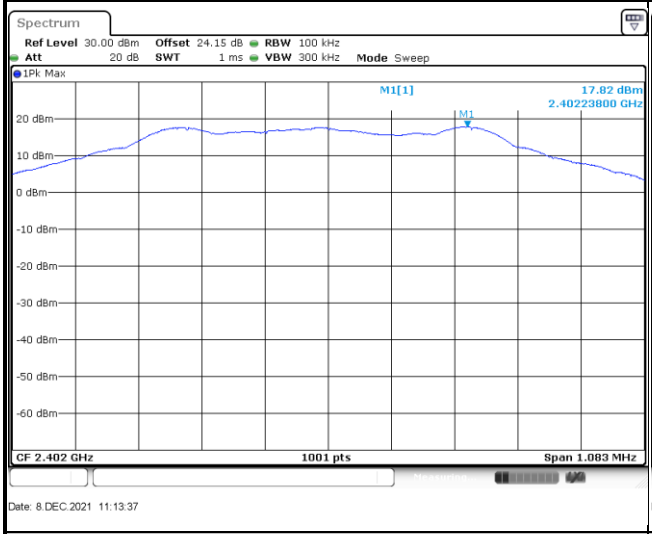
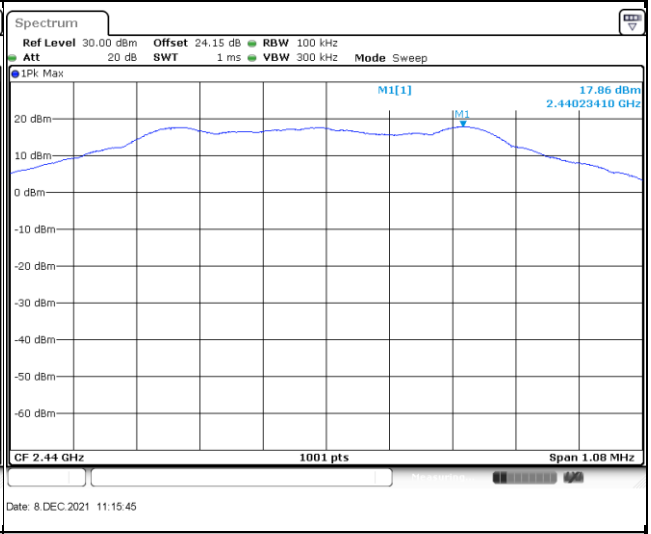
3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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

<Ant. 4>

<1Mbps>

PSD 100kHz Plot on Channel 00	PSD 100kHz Plot on Channel 19
	
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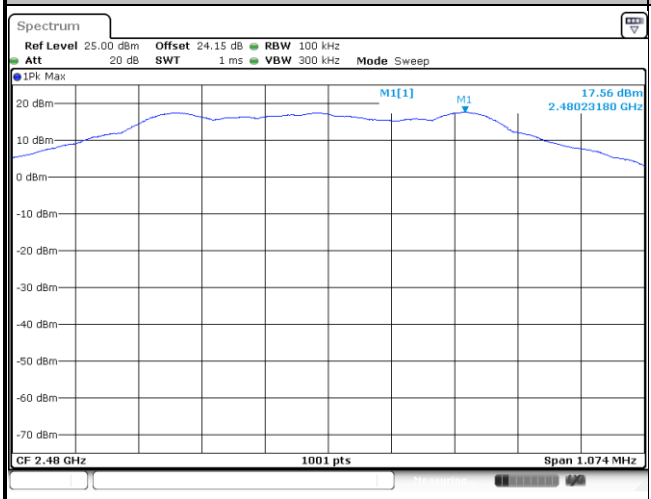	

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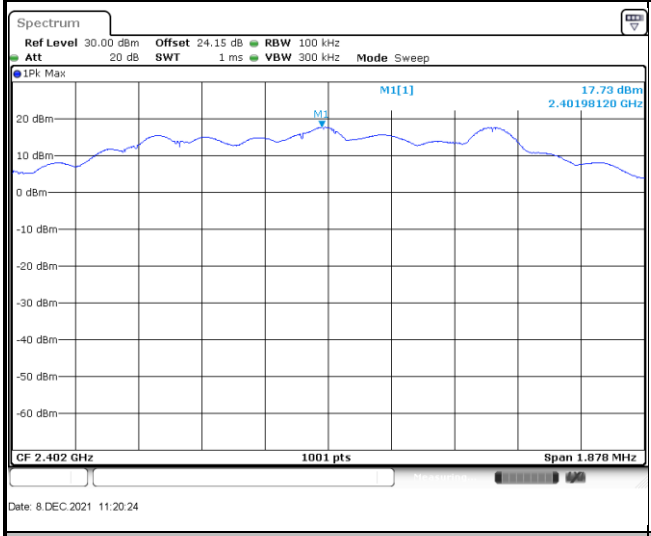	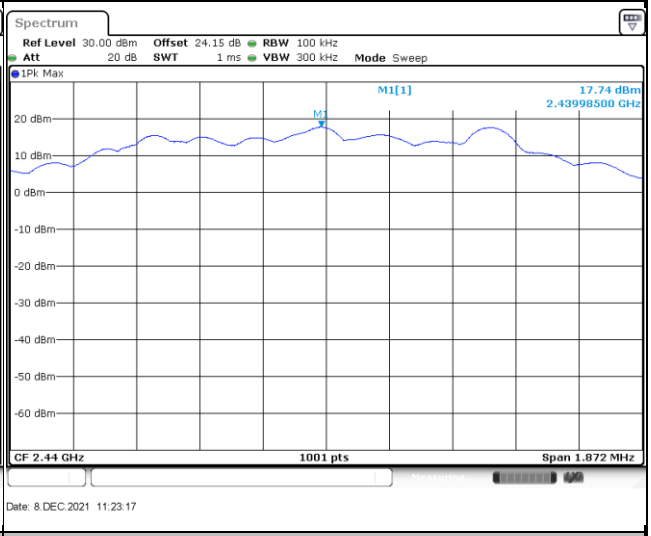
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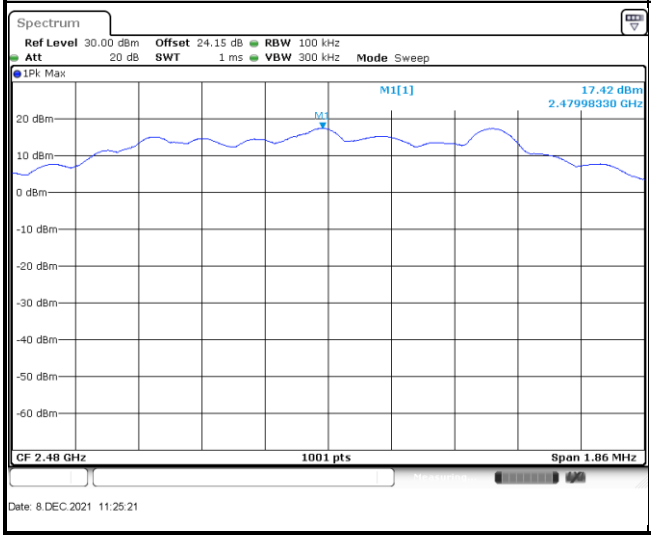	

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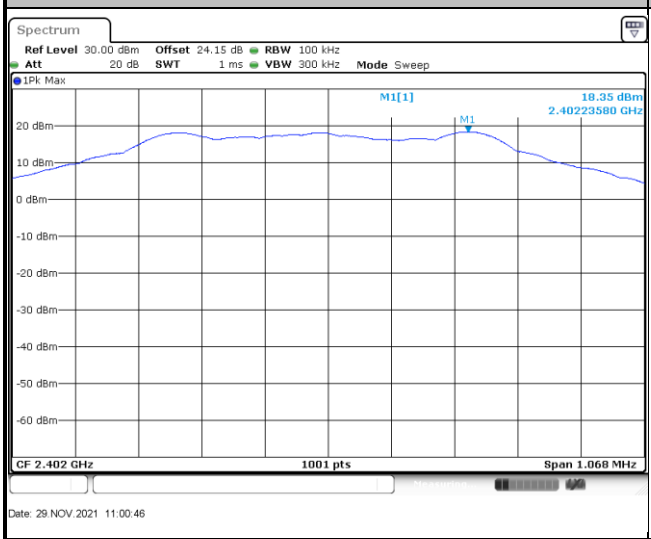
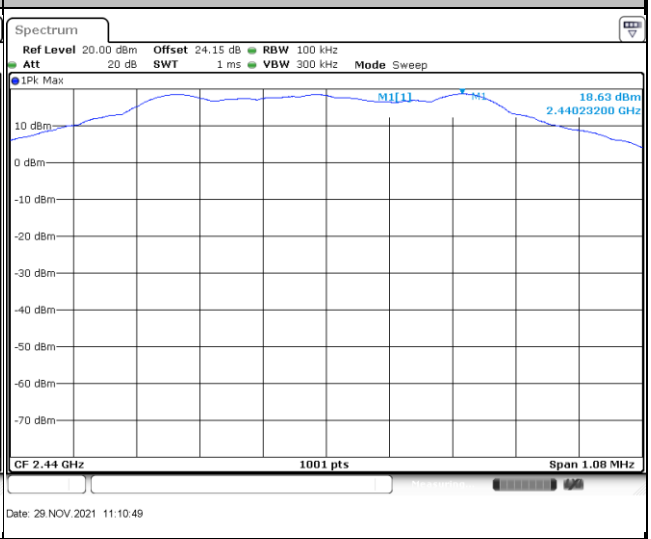
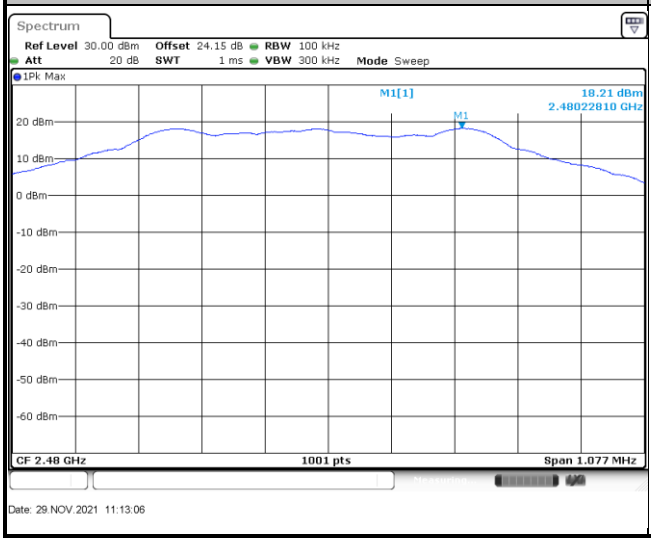
PSD 100kHz Plot on Channel 00	PSD 100kHz Plot on Channel 19
	
PSD 100kHz Plot on Channel 39	**N/A**
	

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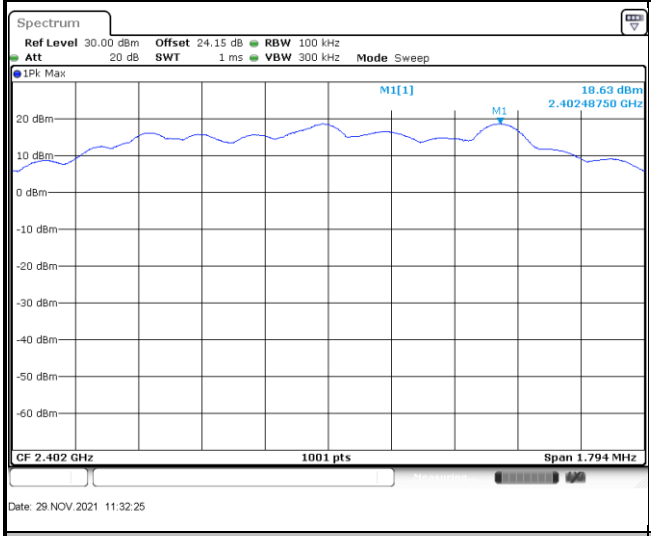
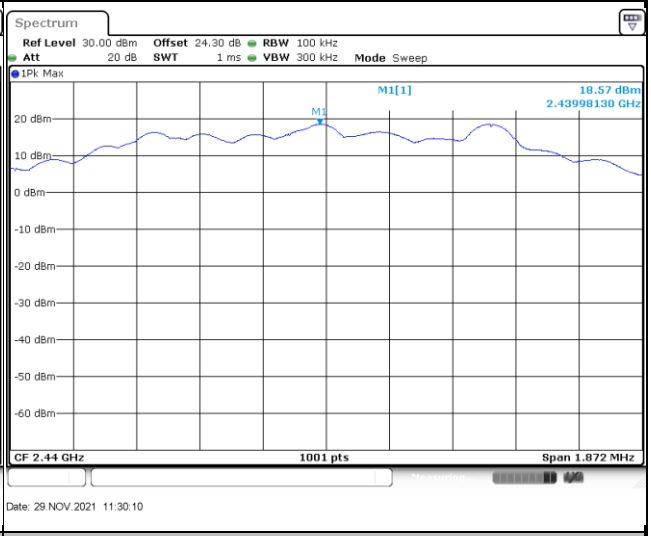
PSD 100kHz Plot on Channel 00	PSD 100kHz Plot on Channel 19
	
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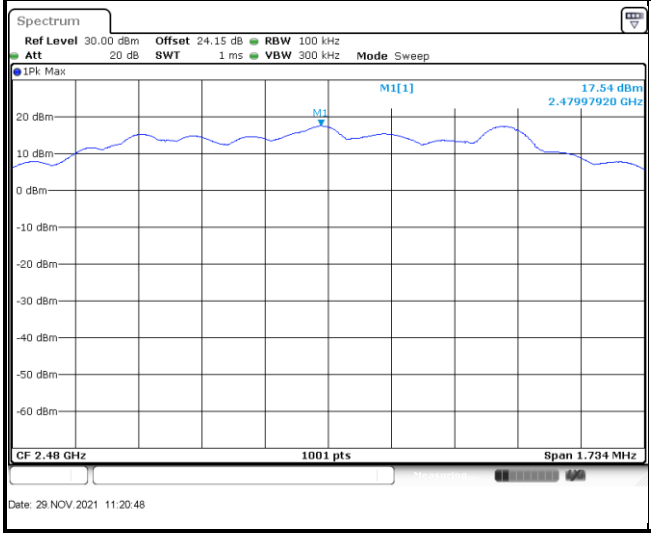	

3.3.7 Test Result of Power Spectral Density Plots (3kHz)

<Ant. 4>

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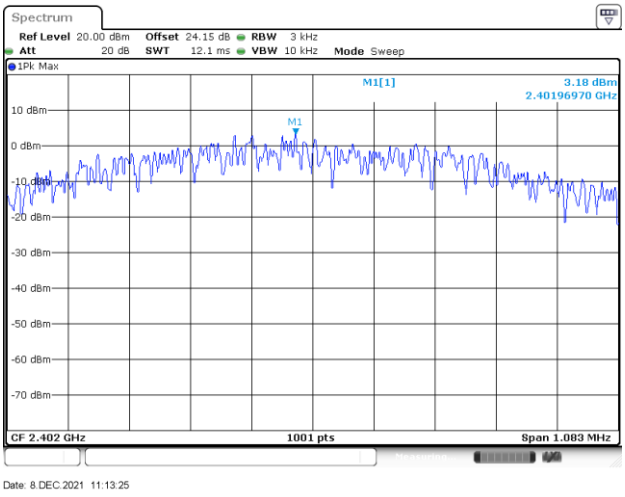
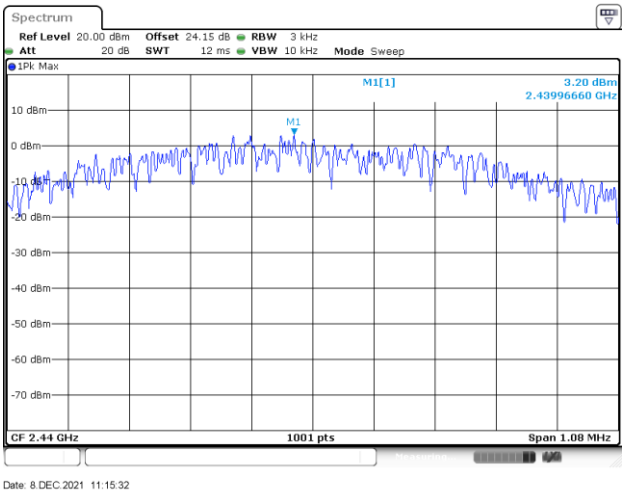
PSD 3kHz Plot on Channel 00	PSD 3kHz Plot on Channel 19
	
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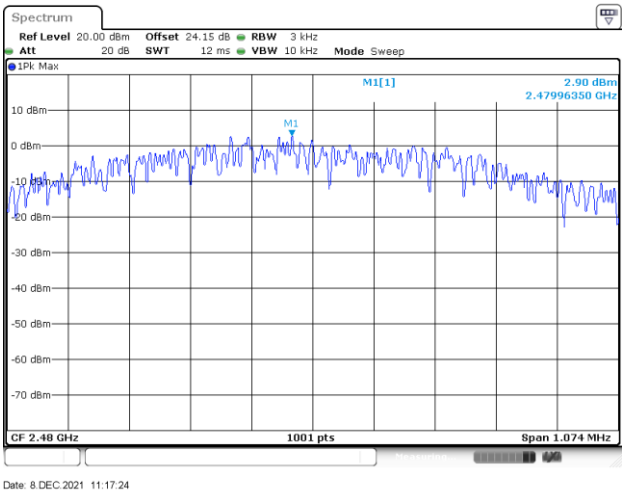	

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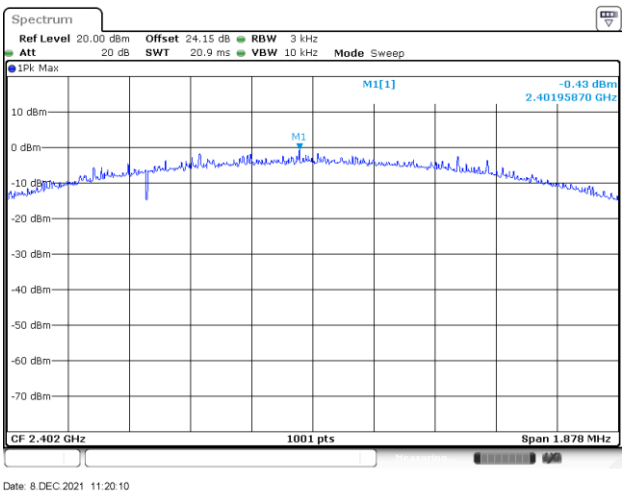
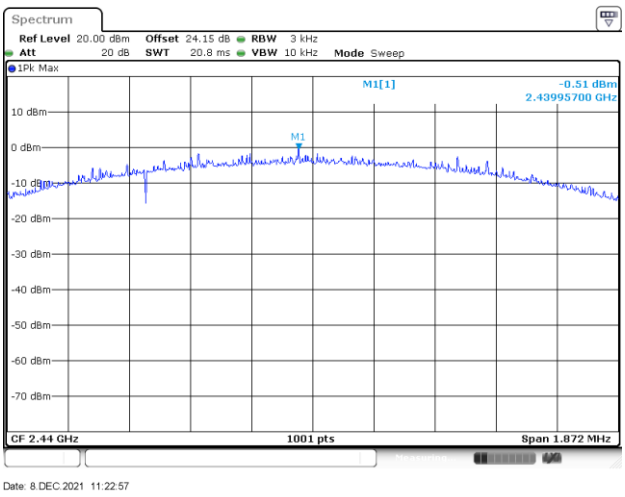
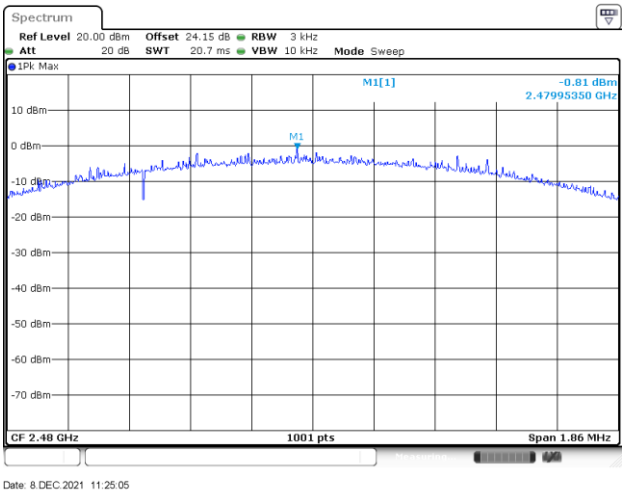
	
PSD 3kHz Plot on Channel 39	**N/A**
	

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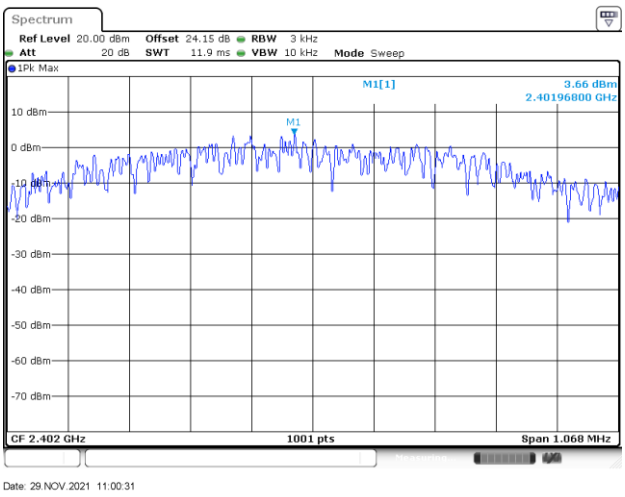
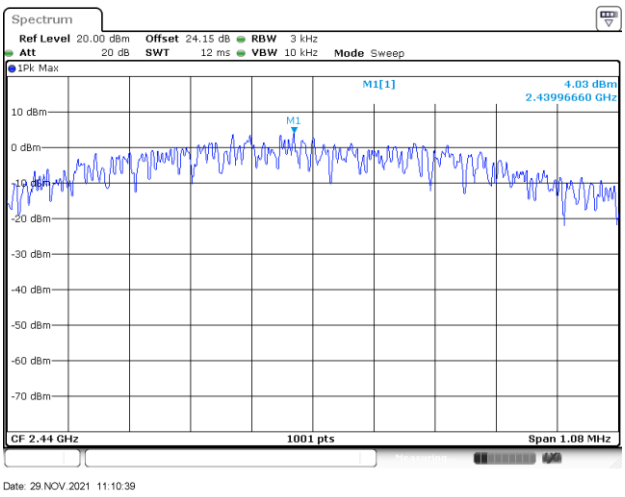
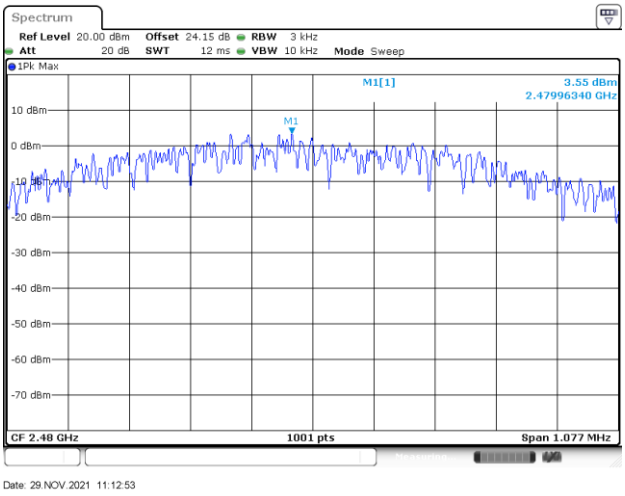
PSD 3kHz Plot on Channel 00	PSD 3kHz Plot on Channel 19
	
PSD 3kHz Plot on Channel 39	**N/A**
	

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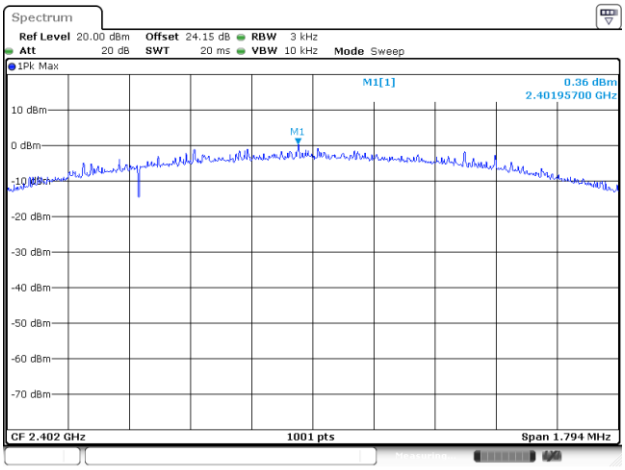
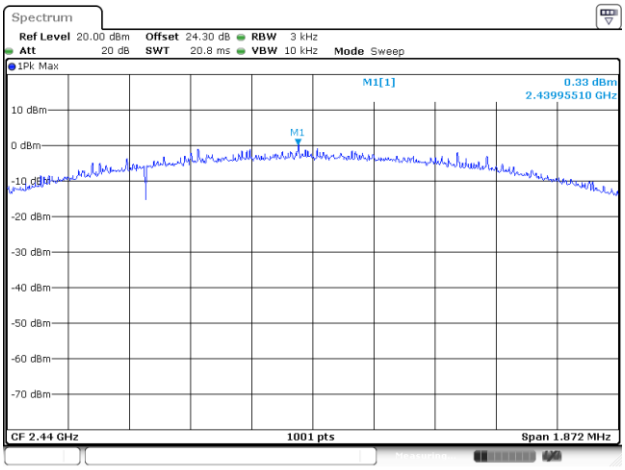
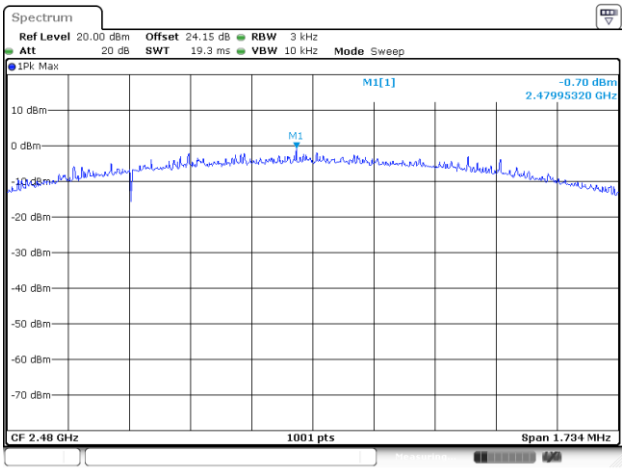
PSD 3kHz Plot on Channel 00	PSD 3kHz Plot on Channel 19
	
PSD 3kHz Plot on Channel 39	**N/A**
	

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

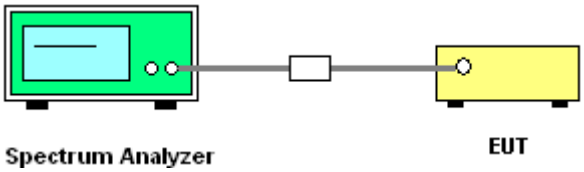
3.4.2 Measuring Instruments

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.

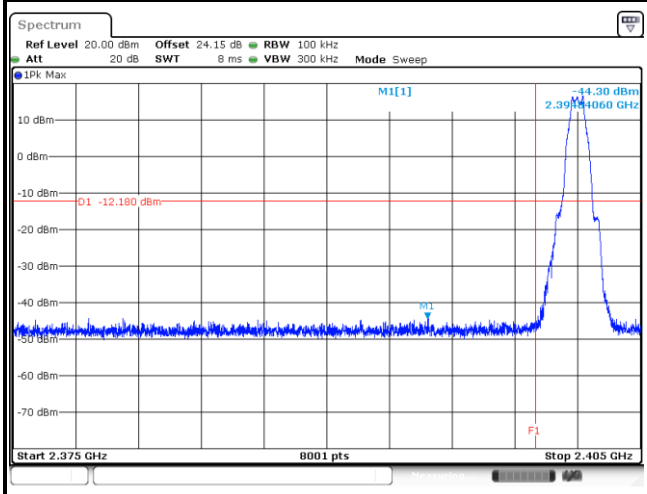
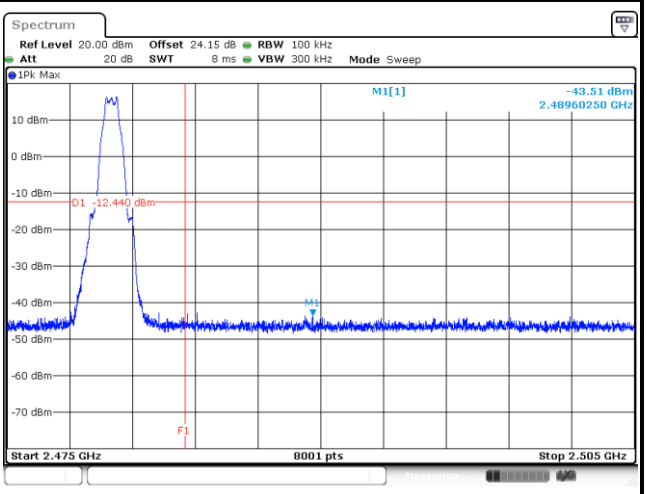
3.4.4 Test Setup



3.4.5 Test Result of Conducted Band Edges Plots

<Ant. 4>

<1Mbps>

Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 39
	

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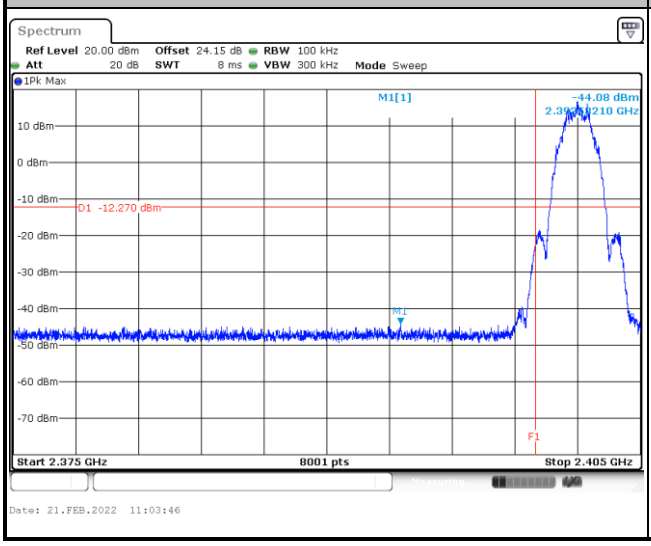
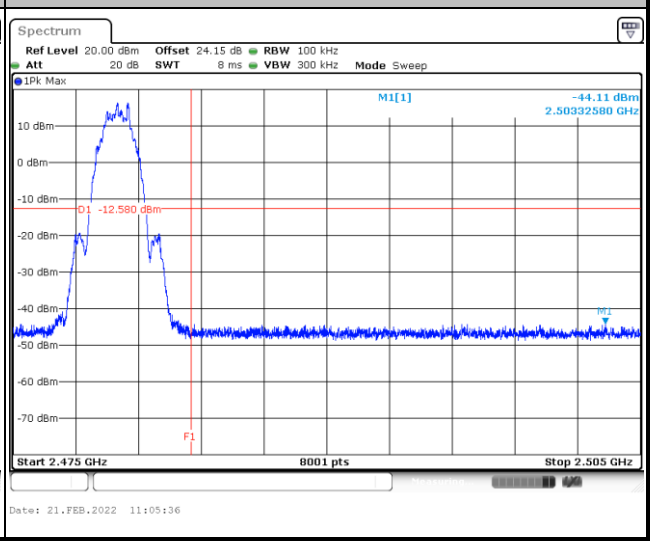
Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 39
	

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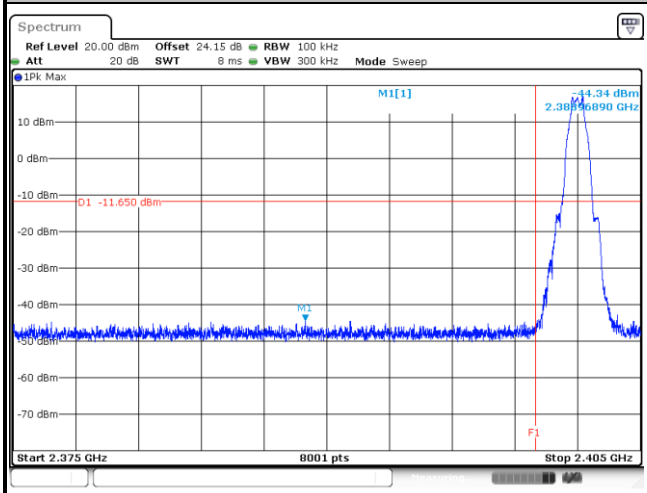
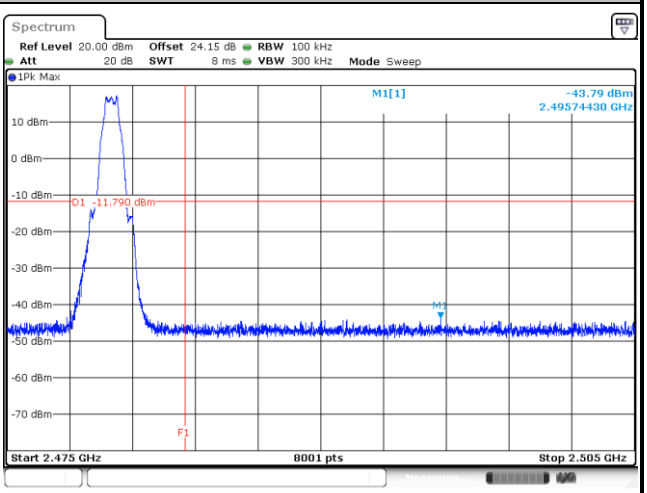
Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 39
	

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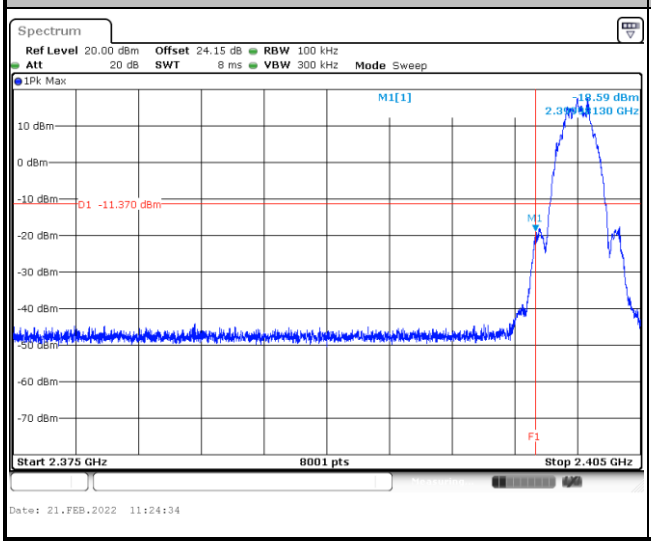
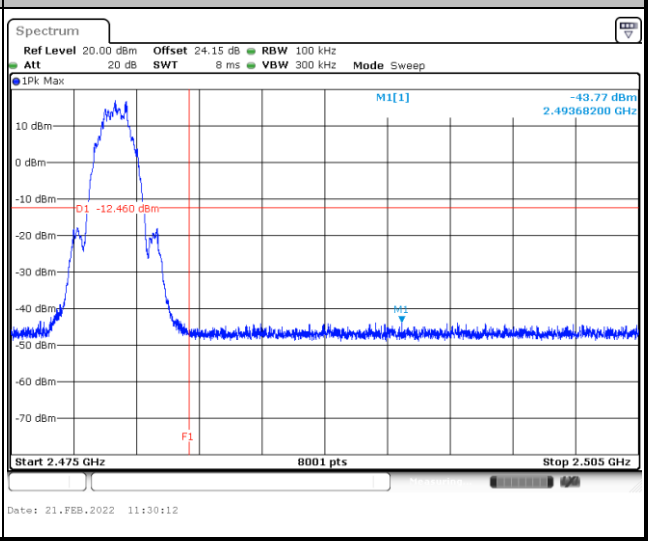
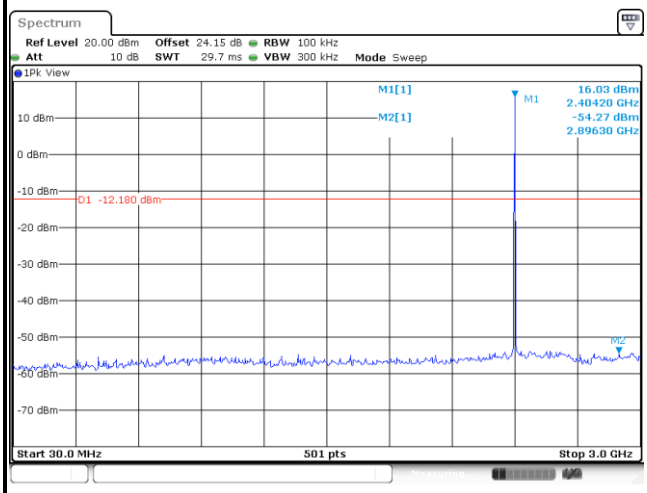
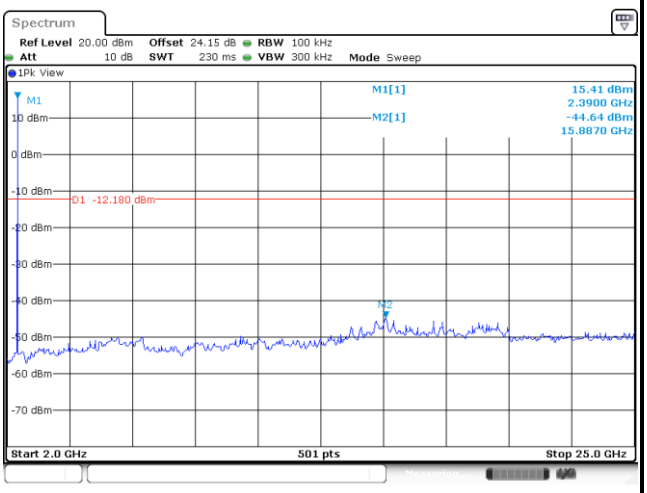
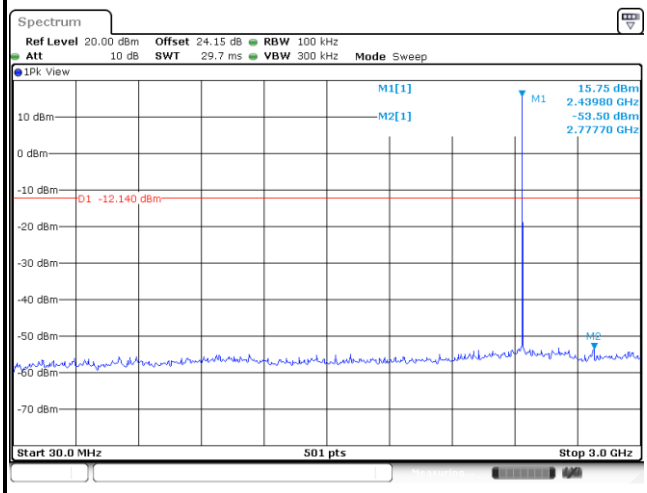
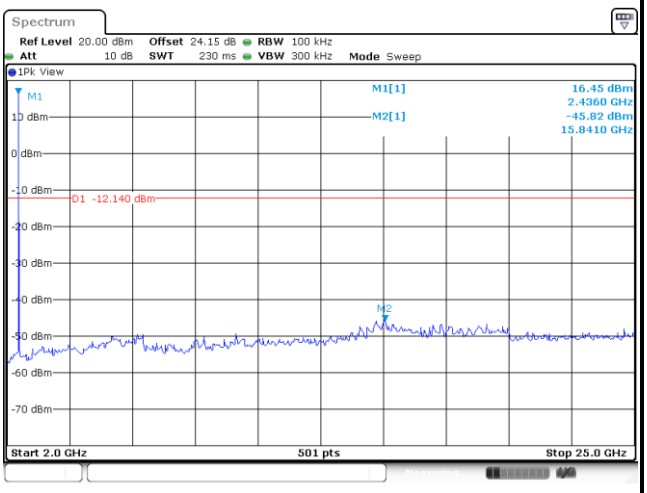
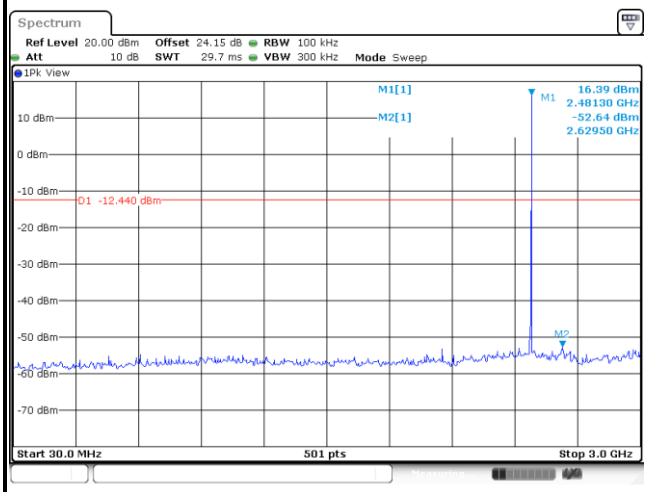
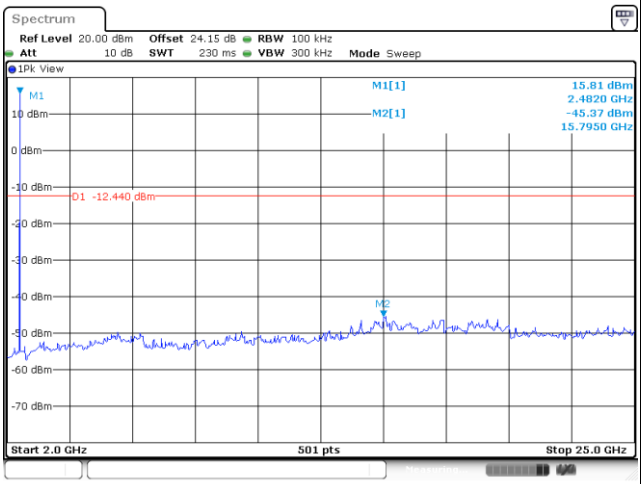
Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 39
	

3.4.6 Test Result of Conducted Spurious Emission Plots

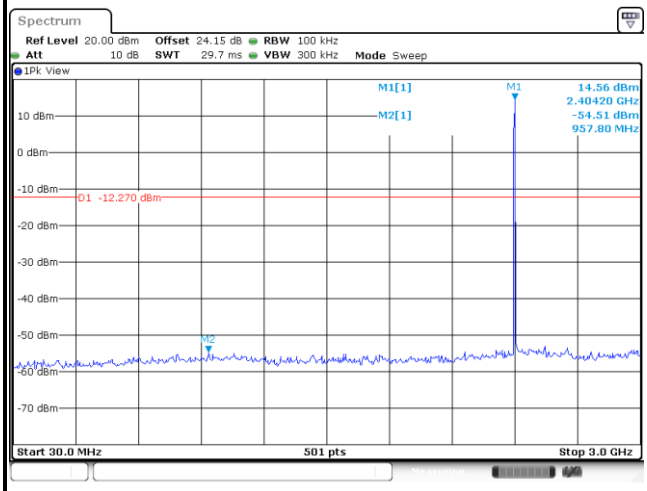
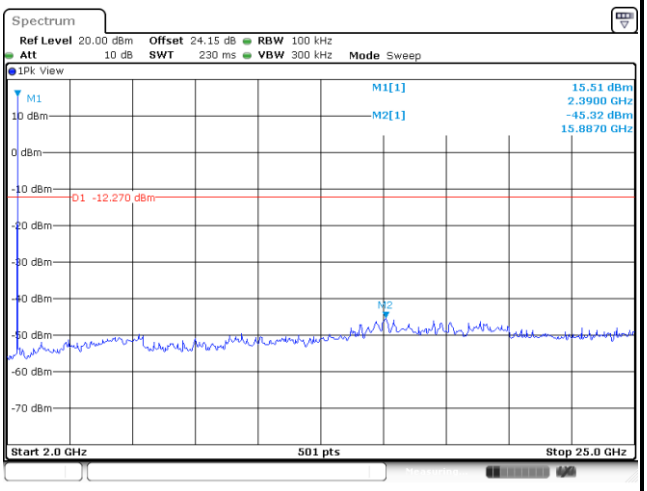
<Ant. 4>

<1Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39
	

<2Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00
	
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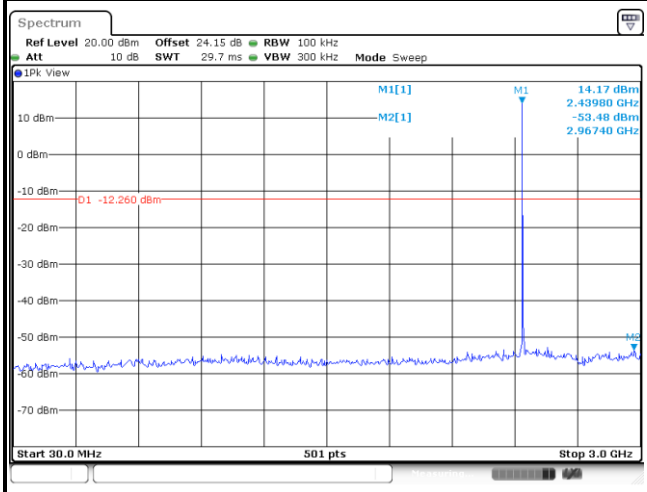
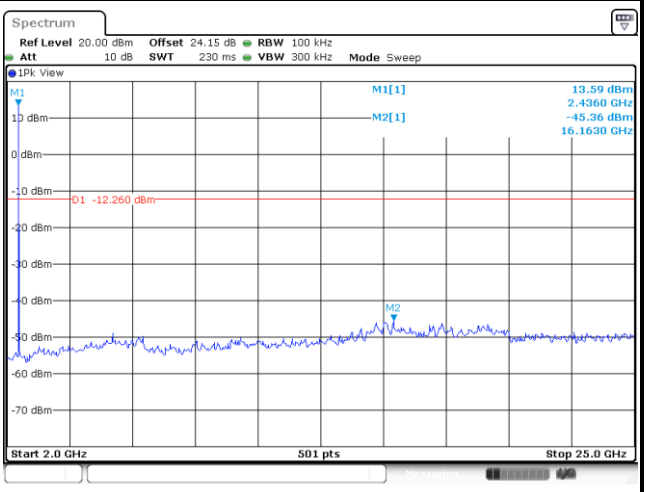
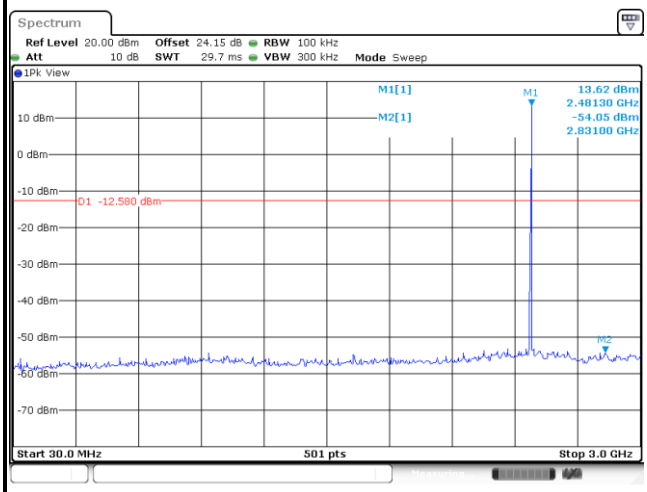
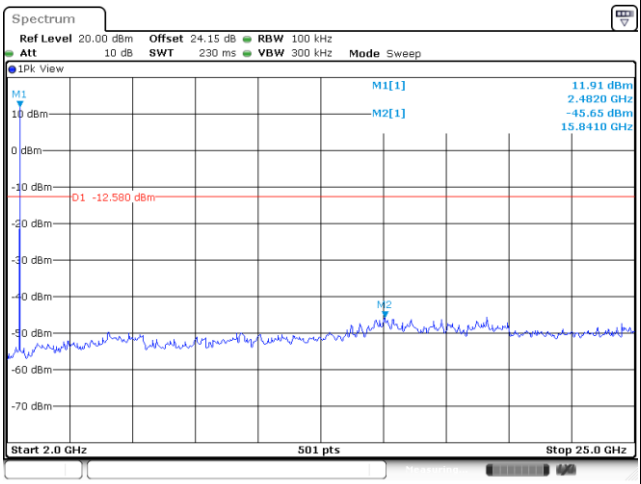
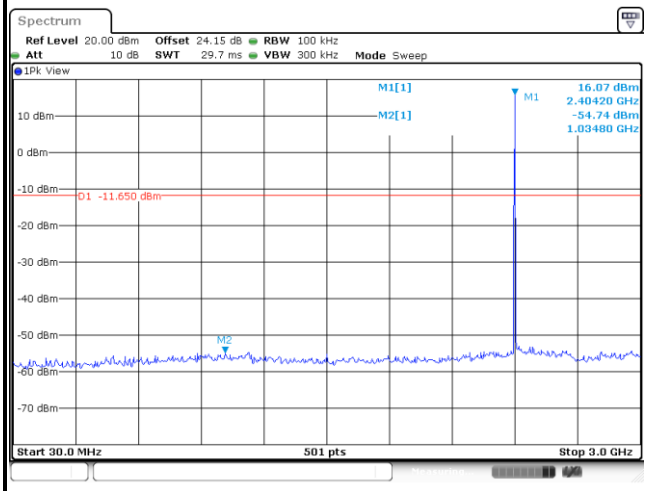
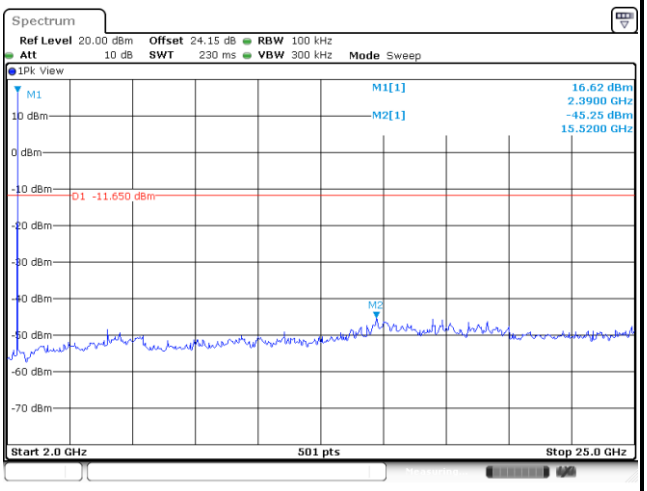
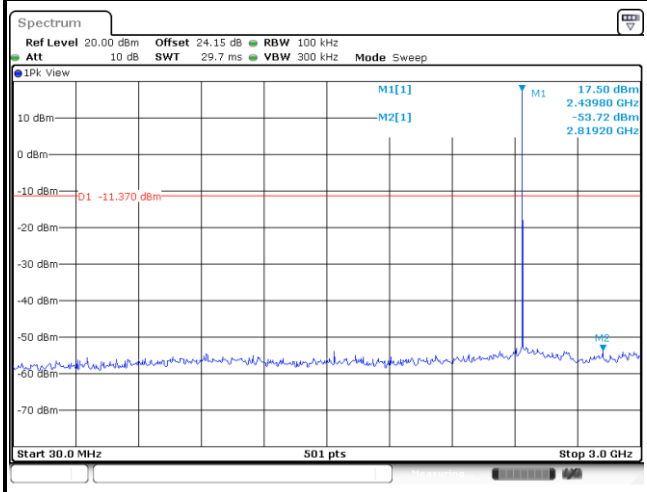
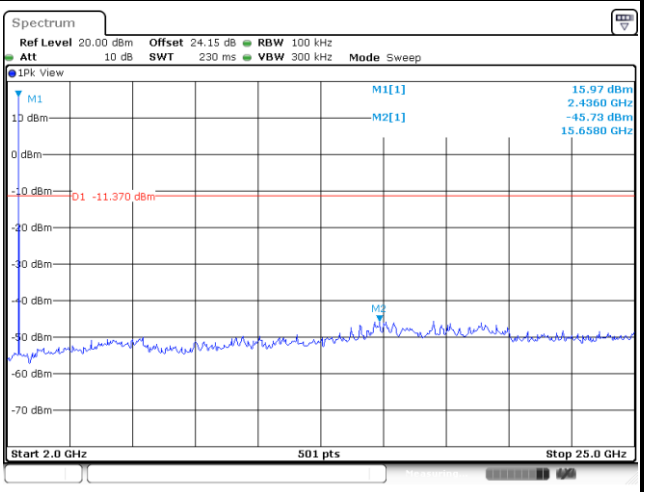
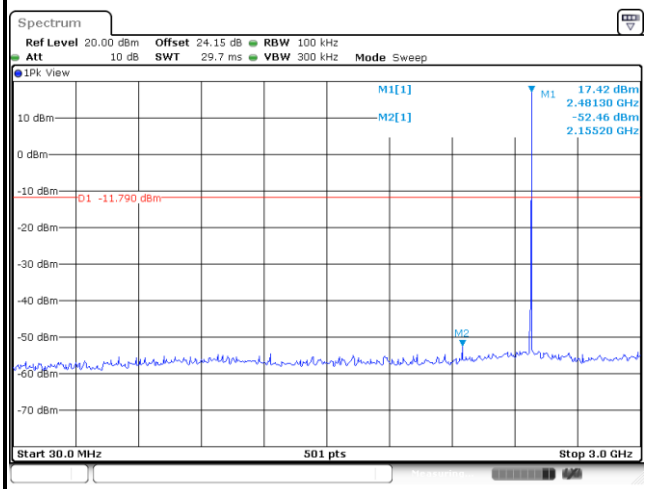
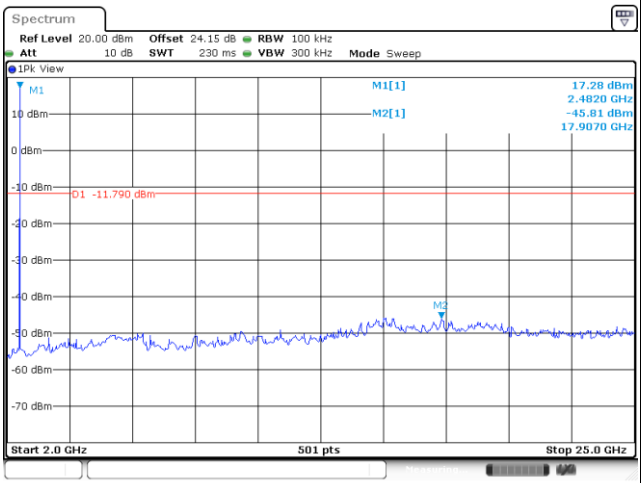
	

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39
	

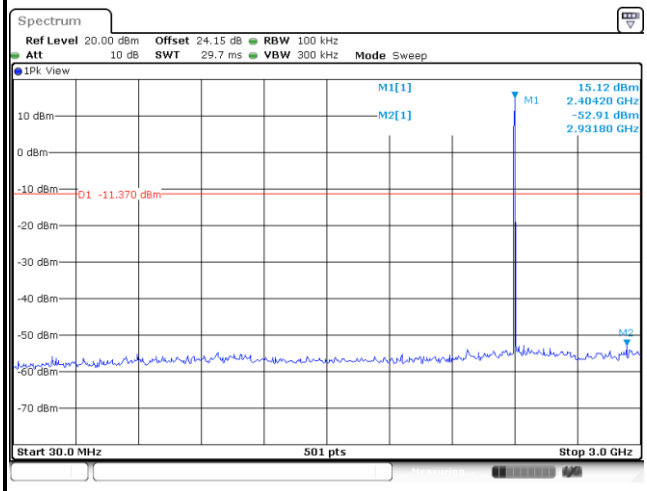
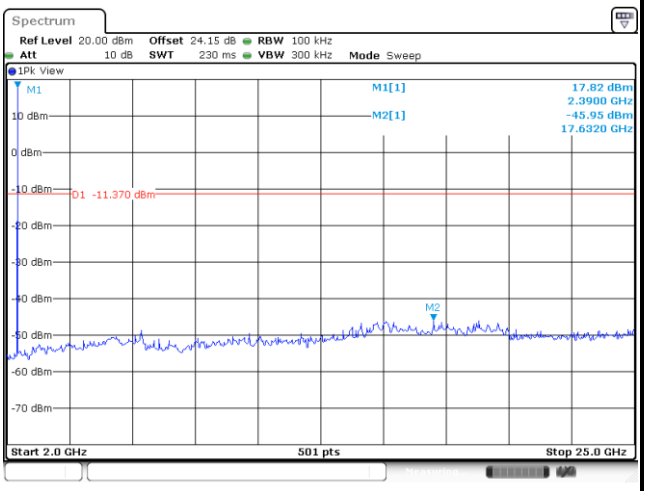
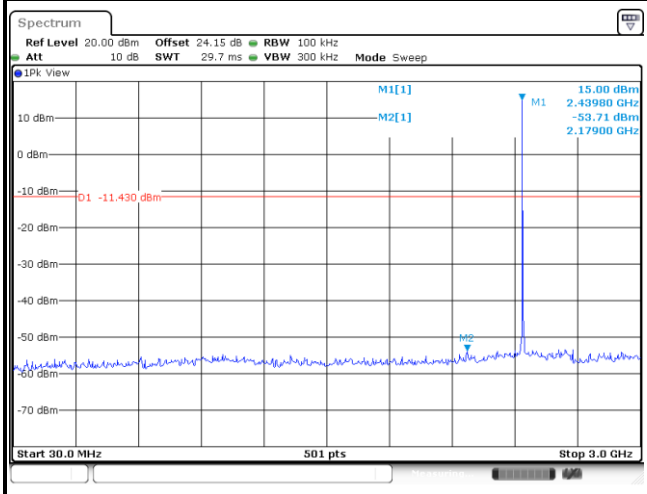
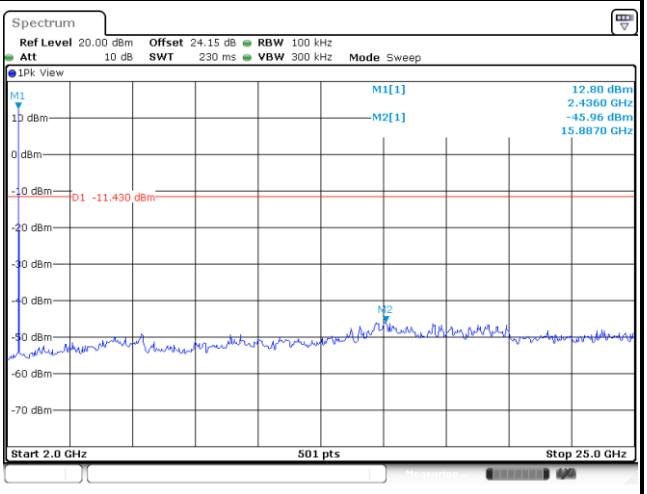
<Ant. 3>

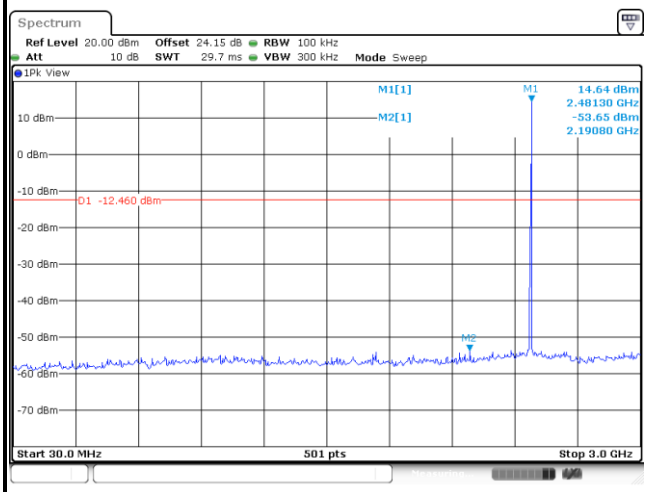
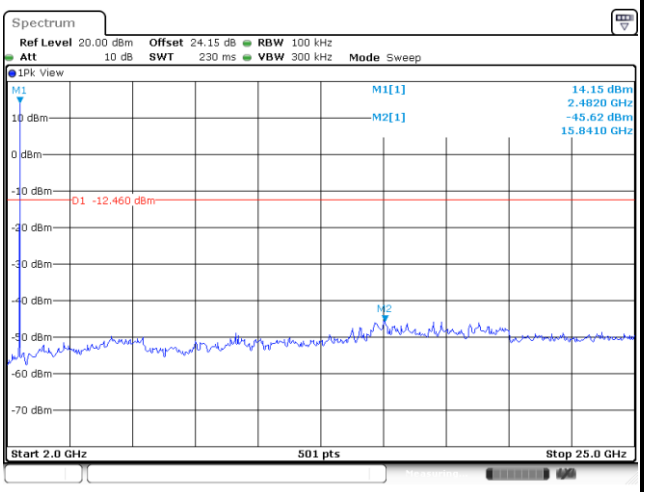
<1Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39
	

<2Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39
	

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

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

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

3.5.2 Measuring Instruments

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

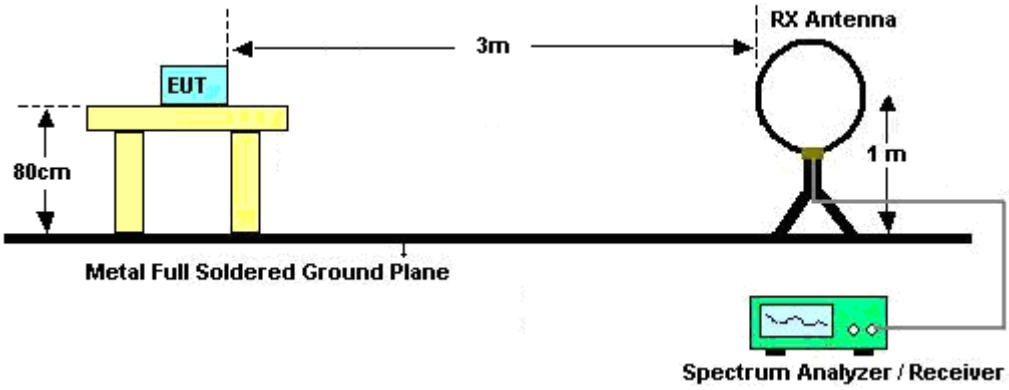
3.5.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: 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 “-“.

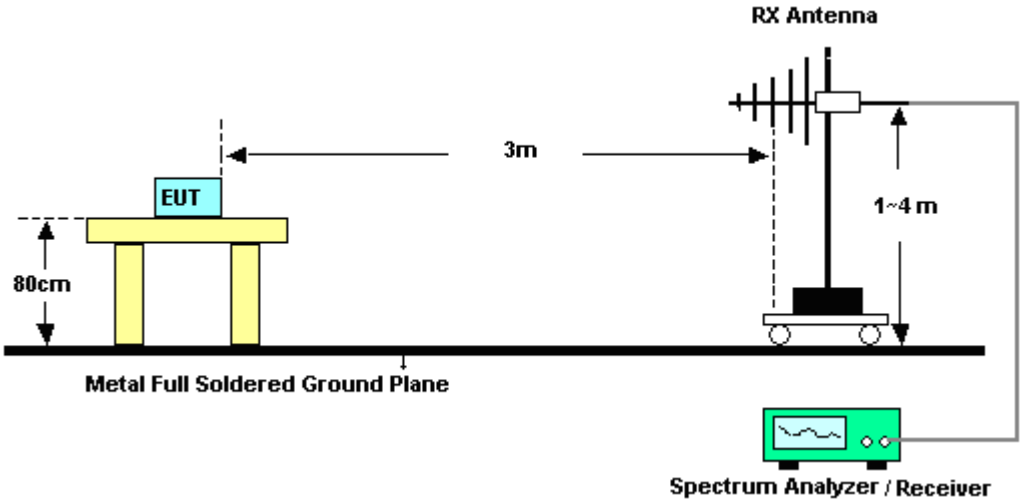
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with 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 ≥ 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

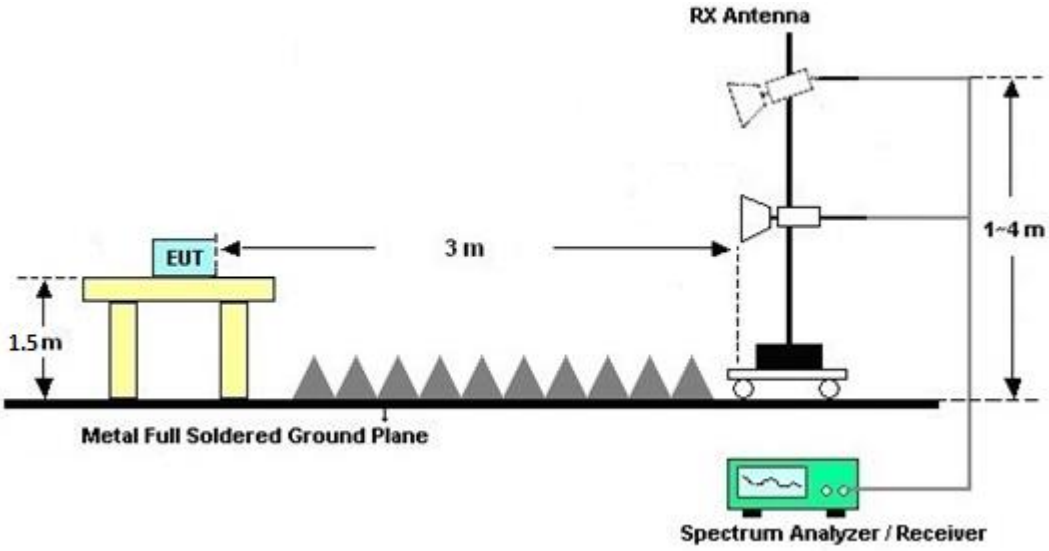
For radiated test below 30MHz



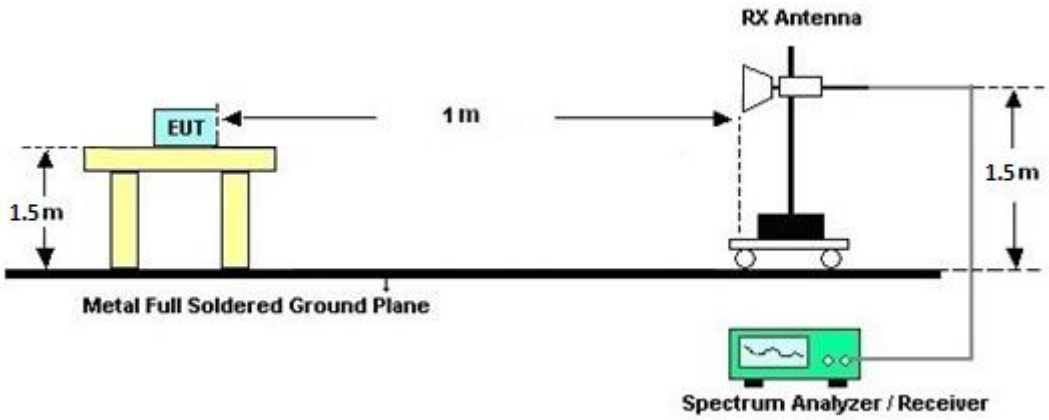
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



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

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

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

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

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

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

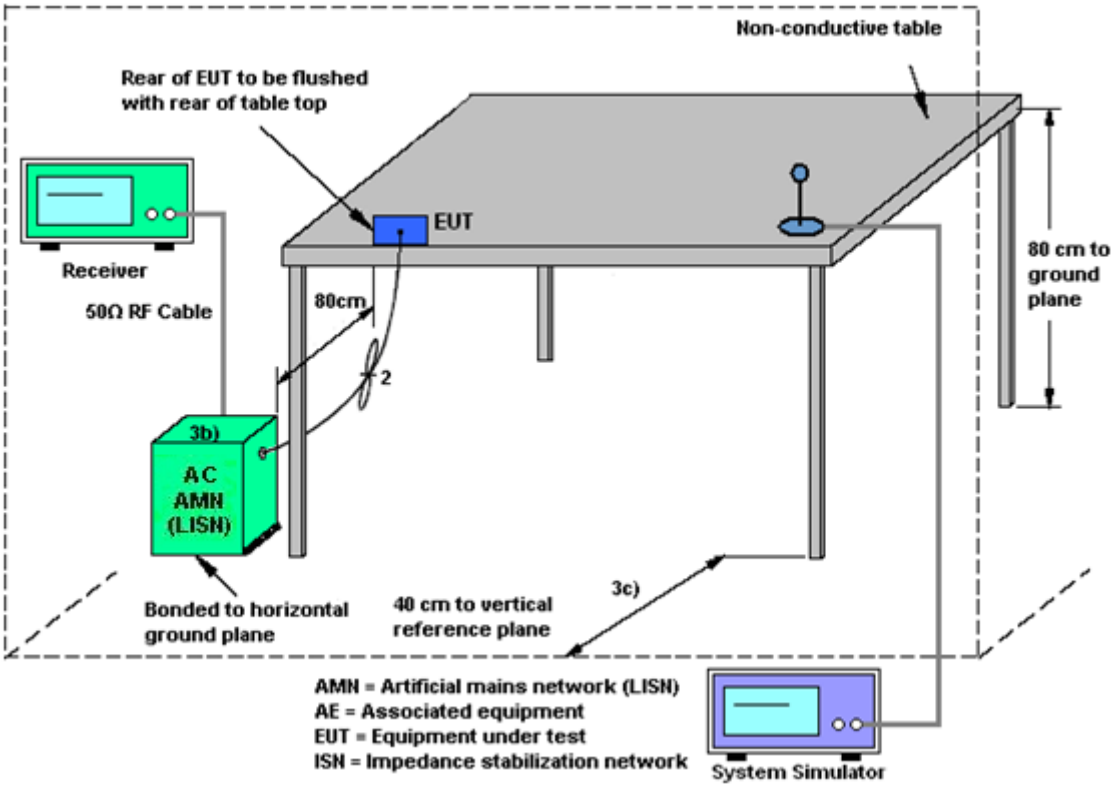
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

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

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 Standard Applicable

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	100315	9 kHz~30 MHz	Jan. 04, 2021	Nov. 25, 2021~ Dec. 20, 2021	Jan. 03, 2022	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	41912 & 05	30MHz~1GHz	Feb. 08, 2021	Nov. 25, 2021~ Dec. 20, 2021	Feb. 07, 2022	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 28, 2020	Nov. 25, 2021~ Dec. 20, 2021	Dec. 27, 2021	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-01620	1GHz~18GHz	Oct. 25, 2021	Nov. 25, 2021~ Dec. 20, 2021	Oct. 24, 2022	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	00991	18GHz~40GHz	May 12, 2021	Nov. 25, 2021~ Dec. 20, 2021	May 11, 2022	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-30 3	17100018000 55006	1GHz~18GHz	May 06, 2021	Nov. 25, 2021~ Dec. 20, 2021	May 05, 2022	Radiation (03CH15-HY)
Preamplifier	EM Electronics	EM01G18G	060802	1GHz-18GHz	Jul. 26, 2021	Nov. 25, 2021~ Dec. 02, 2021	Jul. 25, 2022	Radiation (03CH15-HY)
Preamplifier	E-INSTRUME NT TECH LTD.	ERA-10M-700 0-MR	EC1900247	10MHz-7GHz	Dec. 03, 2021	Dec. 03, 2021~ Dec. 20, 2021	Dec. 02, 2022	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	060801	18-40GHz	Jun. 22, 2021	Nov. 25, 2021~ Dec. 20, 2021	Jun. 21, 2022	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	20MHz~8.4GHz	Jul. 15, 2021	Nov. 25, 2021~ Dec. 20, 2021	Jul. 14, 2022	Radiation (03CH15-HY
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	May 07, 2021	Nov. 25, 2021~ Dec. 20, 2021	May 06, 2022	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Nov. 25, 2021~ Dec. 20, 2021	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Nov. 25, 2021~ Dec. 20, 2021	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24 (k5)	RK-000451	N/A	N/A	Nov. 25, 2021~ Dec. 20, 2021	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104, 102E	MY36980/4, MY9838/4PE, 508405/2E	30MHz~18G	Nov. 15, 2021	Nov. 25, 2021~ Dec. 20, 2021	Nov. 14, 2022	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz-40GHz	Feb. 22, 2021	Nov. 25, 2021~ Dec. 20, 2021	Feb. 21, 2022	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz-40GHz	Feb. 22, 2021	Nov. 25, 2021~ Dec. 20, 2021	Feb. 21, 2022	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 11, 2021	Nov. 25, 2021~ Dec. 20, 2021	Mar. 10, 2022	Radiation (03CH15-HY)
Filter	Wainwright	WLJ4-1000-15 30-6000-40ST	SN4	1.53GHz Low Pass Filter	Jul. 02, 2021	Nov. 25, 2021~ Dec. 20, 2021	Jul. 01, 2022	Radiation (03CH15-HY)
Filter	Wainwright	WHKX12-2700 -3000-18000-6 0ST	SN4	3GHz High Pass Filter	Sep. 15, 2021	Nov. 25, 2021~ Dec. 20, 2021	Sep. 14, 2022	Radiation (03CH15-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 15, 2021	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 30, 2020	Nov. 15, 2021	Nov. 29, 2021	Conduction (CO05-HY)
Hygrometer	TECPEL	DTM-303A	TP201973	N/A	Oct. 22, 2021	Nov. 15, 2021	Oct. 21, 2022	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 01, 2020	Nov. 15, 2021	Nov. 30, 2021	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Nov. 15, 2021	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Jul. 28, 2021	Nov. 15, 2021	Jul. 27, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 31, 2020	Nov. 15, 2021	Dec. 30, 2021	Conduction (CO05-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 16, 2021	Nov. 22, 2021~ Feb. 21, 2022	Nov. 15, 2022	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 01, 2021	Nov. 22, 2021~ Feb. 21, 2022	Jul. 31, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Nov. 22, 2021~ Feb. 21, 2022	Aug. 29, 2022	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	1036004	N/A	Aug. 01, 2021	Nov. 22, 2021~ Feb. 21, 2022	Jul. 31, 2022	Conducted (TH05-HY)
Switch Box & RF Cable	EM Electronics	EMSW18SE	SW200302 (BOX9)	N/A	Mar. 17, 2021	Nov. 22, 2021~ Feb. 21, 2022	Mar. 16, 2022	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))	3.1 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.8 dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.6 dB

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Benny Ku	Temperature:	21~25	°C
Test Date:	2021/11/22~2022/2/21	Relative Humidity:	51~54	%

<Ant.4>

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	1.037	0.722	0.50	Pass
BLE	1Mbps	1	19	2440	1.039	0.720	0.50	Pass
BLE	1Mbps	1	39	2480	1.037	0.716	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	18.60	30.00	-2.70	15.90	36.00	Pass
BLE	1Mbps	1	19	2440	19.42	30.00	-2.70	16.72	36.00	Pass
BLE	1Mbps	1	39	2480	19.05	30.00	-2.70	16.35	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	17.82	3.18	-2.70	8.00	Pass
BLE	1Mbps	1	19	2440	17.86	3.20	-2.70	8.00	Pass
BLE	1Mbps	1	39	2480	17.56	2.90	-2.70	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	2.050	1.252	0.50	Pass
BLE	2Mbps	1	19	2440	2.050	1.248	0.50	Pass
BLE	2Mbps	1	39	2480	2.054	1.240	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	18.92	30.00	-2.70	16.22	36.00	Pass
BLE	2Mbps	1	19	2440	19.45	30.00	-2.70	16.75	36.00	Pass
BLE	2Mbps	1	39	2480	19.22	30.00	-2.70	16.52	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	17.73	-0.43	-2.70	8.00	Pass
BLE	2Mbps	1	19	2440	17.74	-0.51	-2.70	8.00	Pass
BLE	2Mbps	1	39	2480	17.42	-0.81	-2.70	8.00	Pass

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

<Ant.3>

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	1.037	0.712	0.50	Pass
BLE	1Mbps	1	19	2440	1.037	0.720	0.50	Pass
BLE	1Mbps	1	39	2480	1.037	0.718	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	19.72	30.00	-0.20	19.52	36.00	Pass
BLE	1Mbps	1	19	2440	19.47	30.00	-0.20	19.27	36.00	Pass
BLE	1Mbps	1	39	2480	19.96	30.00	-0.20	19.76	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	18.35	3.66	-0.20	8.00	Pass
BLE	1Mbps	1	19	2440	18.63	4.03	-0.20	8.00	Pass
BLE	1Mbps	1	39	2480	18.21	3.55	-0.20	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	2.050	1.196	0.50	Pass
BLE	2Mbps	1	19	2440	2.050	1.248	0.50	Pass
BLE	2Mbps	1	39	2480	2.050	1.156	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	20.70	30.00	-0.20	20.50	36.00	Pass
BLE	2Mbps	1	19	2440	20.40	30.00	-0.20	20.20	36.00	Pass
BLE	2Mbps	1	39	2480	20.27	30.00	-0.20	20.07	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	18.63	0.36	-0.20	8.00	Pass
BLE	2Mbps	1	19	2440	18.57	0.33	-0.20	8.00	Pass
BLE	2Mbps	1	39	2480	17.54	-0.70	-0.20	8.00	Pass

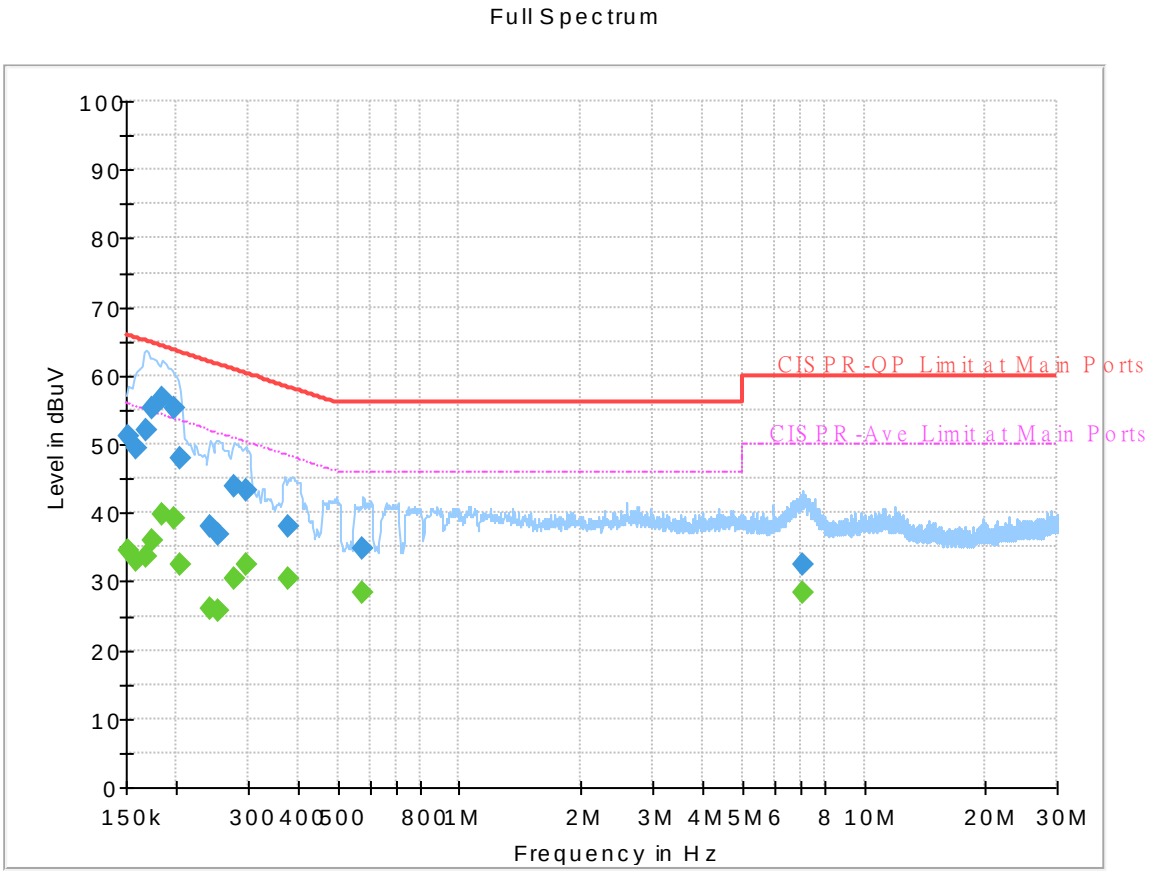
Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Tom Lee	**Temperature :**	23~26℃
		Relative Humidity :	45~55%

EUT Information

Report NO :	161608-03
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line



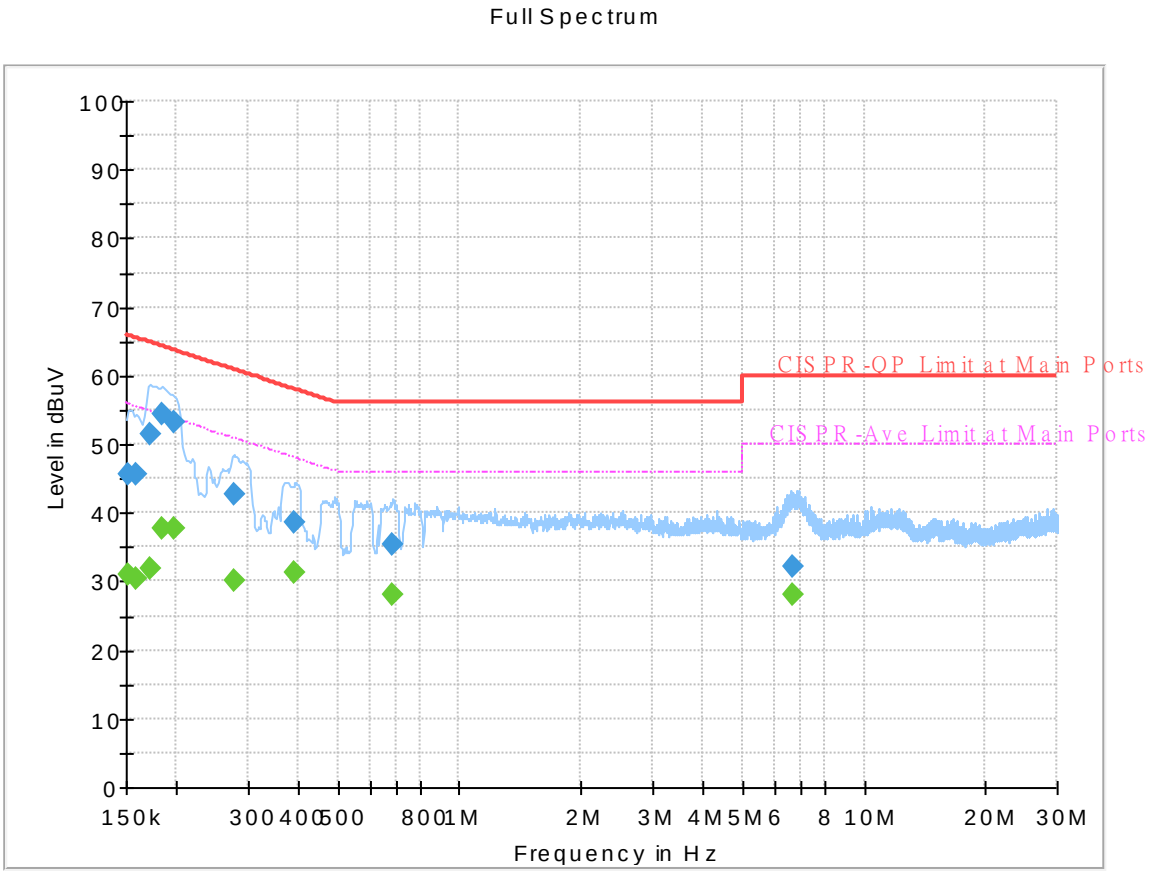
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	34.57	55.88	21.31	L1	OFF	19.7
0.152250	51.07	---	65.88	14.81	L1	OFF	19.7
0.159000	---	33.06	55.52	22.46	L1	OFF	19.7
0.159000	49.46	---	65.52	16.06	L1	OFF	19.7
0.168000	---	33.65	55.06	21.41	L1	OFF	19.7
0.168000	52.02	---	65.06	13.04	L1	OFF	19.7
0.174750	---	35.89	54.73	18.84	L1	OFF	19.7
0.174750	55.33	---	64.73	9.40	L1	OFF	19.7
0.183750	---	39.91	54.31	14.40	L1	OFF	19.7
0.183750	56.65	---	64.31	7.66	L1	OFF	19.7
0.197250	---	39.26	53.73	14.47	L1	OFF	19.7
0.197250	55.37	---	63.73	8.36	L1	OFF	19.7
0.204000	---	32.52	53.45	20.93	L1	OFF	19.7
0.204000	47.95	---	63.45	15.50	L1	OFF	19.7
0.242250	---	26.15	52.02	25.87	L1	OFF	19.7
0.242250	38.02	---	62.02	24.00	L1	OFF	19.7
0.253500	---	25.85	51.64	25.79	L1	OFF	19.7
0.253500	36.76	---	61.64	24.88	L1	OFF	19.7
0.278250	---	30.33	50.87	20.54	L1	OFF	19.7
0.278250	43.98	---	60.87	16.89	L1	OFF	19.7
0.296250	---	32.44	50.35	17.91	L1	OFF	19.7

0.296250	**43.20**	**---**	**60.35**	**17.15**	**L1**	**OFF**	**19.7**
0.379500	**---**	**30.34**	**48.29**	**17.95**	**L1**	**OFF**	**19.7**
0.379500	**38.11**	**---**	**58.29**	**20.18**	**L1**	**OFF**	**19.7**
0.577500	**---**	**28.22**	**46.00**	**17.78**	**L1**	**OFF**	**19.9**
0.577500	**34.89**	**---**	**56.00**	**21.11**	**L1**	**OFF**	**19.9**
7.035000	**---**	**28.42**	**50.00**	**21.58**	**L1**	**OFF**	**20.1**
7.035000	**32.48**	**---**	**60.00**	**27.52**	**L1**	**OFF**	**20.1**

EUT Information

Report NO :	161608-03
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	31.13	55.88	24.75	N	OFF	19.7
0.152250	45.70	---	65.88	20.18	N	OFF	19.7
0.159000	---	30.45	55.52	25.07	N	OFF	19.7
0.159000	45.51	---	65.52	20.01	N	OFF	19.7
0.172500	---	31.80	54.84	23.04	N	OFF	19.7
0.172500	51.32	---	64.84	13.52	N	OFF	19.7
0.183750	---	37.68	54.31	16.63	N	OFF	19.7
0.183750	54.51	---	64.31	9.80	N	OFF	19.7
0.197250	---	37.62	53.73	16.11	N	OFF	19.7
0.197250	53.26	---	63.73	10.47	N	OFF	19.7
0.276000	---	29.98	50.94	20.96	N	OFF	19.7
0.276000	42.78	---	60.94	18.16	N	OFF	19.7
0.390750	---	31.40	48.05	16.65	N	OFF	19.7
0.390750	38.59	---	58.05	19.46	N	OFF	19.7
0.685500	---	27.99	46.00	18.01	N	OFF	20.0
0.685500	35.35	---	56.00	20.65	N	OFF	20.0
6.666000	---	27.98	50.00	22.02	N	OFF	20.1
6.666000	32.16	---	60.00	27.84	N	OFF	20.1

Appendix C. Radiated Spurious Emission

Test Engineer :	Leo Lee, Mancy Chou and Bigshow Wang	Temperature :	22.1~23.1°C
		Relative Humidity :	55~60%

<Ant. 4>

<1Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE ANT 4	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		2313.045	52.87	-21.13	74	43.27	27.97	16.44	34.81	100	103	P	H
		2382.135	43.02	-10.98	54	33.45	27.84	16.55	34.82	100	103	A	H
	*	2402	109.33	-	-	99.79	27.79	16.58	34.83	100	103	P	H
	*	2402	108.74	-	-	99.2	27.79	16.58	34.83	100	103	A	H
													H
		2377.095	52.88	-21.12	74	43.31	27.85	16.54	34.82	387	226	P	V
		2376.675	42.97	-11.03	54	33.4	27.85	16.54	34.82	387	226	A	V
	*	2402	105.1	-	-	95.56	27.79	16.58	34.83	387	226	P	V
	*	2402	104.51	-	-	94.97	27.79	16.58	34.83	387	226	A	V
													V
BLE CH 19 2440MHz		2320.88	52.38	-21.62	74	42.78	27.96	16.45	34.81	100	120	P	H
		2329.52	42.83	-11.17	54	33.24	27.94	16.46	34.81	100	120	A	H
	*	2440	109.83	-	-	100.39	27.64	16.64	34.84	100	120	P	H
	*	2440	109.21	-	-	99.77	27.64	16.64	34.84	100	120	A	H
		2493.52	52.12	-21.88	74	42.65	27.6	16.72	34.85	100	120	P	H
		2486.59	43.03	-10.97	54	33.57	27.6	16.71	34.85	100	120	A	H
		2365.52	53.73	-20.27	74	44.16	27.87	16.52	34.82	365	196	P	V
		2371.28	43.16	-10.84	54	33.59	27.86	16.53	34.82	365	196	A	V
	*	2440	106.08	-	-	96.64	27.64	16.64	34.84	365	196	P	V
	*	2440	105.45	-	-	96.01	27.64	16.64	34.84	365	196	A	V
		2489.29	52.24	-21.76	74	42.77	27.6	16.72	34.85	365	196	P	V
		2484.43	42.96	-11.04	54	33.5	27.6	16.71	34.85	365	196	A	V

BLE CH 39 2480MHz	*	2480	108.59	-	-	99.14	27.6	16.7	34.85	105	123	P	H
	*	2480	108	-	-	98.55	27.6	16.7	34.85	105	123	A	H
		2494.68	52.14	-21.86	74	42.66	27.6	16.73	34.85	105	123	P	H
		2483.64	43.65	-10.35	54	34.19	27.6	16.71	34.85	105	123	A	H
													H
													H
	*	2480	105.76	-	-	96.31	27.6	16.7	34.85	400	208	P	V
	*	2480	105.11	-	-	95.66	27.6	16.7	34.85	400	208	A	V
		2487.68	52.6	-21.4	74	43.13	27.6	16.72	34.85	400	208	P	V
		2484	43.04	-10.96	54	33.58	27.6	16.71	34.85	400	208	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 ANT 4	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	42.69	-31.31	74	60.03	31.38	10.13	58.85	-	-	P	H
		11085	49.66	-24.34	74	55.38	40.34	14.8	60.86	-	-	P	H
		11085	40.66	-13.34	54	46.38	40.34	14.8	60.86	-	-	A	H
		14490	49.42	-24.58	74	54.36	41.37	16.86	63.17	-	-	P	H
		14490	42.42	-11.58	54	47.36	41.37	16.86	63.17	-	-	A	H
		18000	56.36	-17.64	74	46.25	48.4	18.95	57.24	-	-	P	H
		18000	48.36	-5.64	54	38.25	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
													H
		4804	43.93	-30.07	74	61.27	31.38	10.13	58.85	-	-	P	V
		11025	49.61	-24.39	74	55.18	40.52	14.77	60.86	-	-	P	V
		11025	40.6	-13.4	54	46.17	40.52	14.77	60.86	-	-	A	V
		14475	49.43	-24.57	74	54.43	41.33	16.85	63.18	-	-	P	V
		14475	42.42	-11.58	54	47.42	41.33	16.85	63.18	-	-	A	V
		17985	57.14	-16.86	74	47.37	48.1	18.94	57.27	-	-	P	V
		17985	48.14	-5.86	54	38.37	48.1	18.94	57.27	-	-	A	V
													V
													V
													V
													V
													V

BLE ANT 4	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 19 2440MHz		4880	41.81	-32.19	74	59.19	31.32	10.21	58.91	-	-	P	H
		7320	53.66	-20.34	74	63.3	36.34	12.43	58.41	100	299	P	H
		7320	49.34	-4.66	54	58.98	36.34	12.43	58.41	100	299	A	H
		10890	50.5	-23.5	74	56.3	40.38	14.7	60.88	-	-	P	H
		10890	40.51	-13.49	54	46.31	40.38	14.7	60.88	-	-	A	H
		14490	48.91	-25.09	74	53.85	41.37	16.86	63.17	-	-	P	H
		14490	41.91	-12.09	54	46.85	41.37	16.86	63.17	-	-	A	H
		18000	57.41	-16.59	74	47.3	48.4	18.95	57.24	-	-	P	H
		18000	48.51	-5.49	54	38.4	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
		4880	43.94	-30.06	74	61.32	31.32	10.21	58.91	-	-	P	V
		7320	53.8	-20.2	74	63.44	36.34	12.43	58.41	100	47	P	V
		7320	50.32	-3.68	54	59.96	36.34	12.43	58.41	100	47	A	V
		11055	49.47	-24.53	74	55.12	40.43	14.78	60.86	-	-	P	V
		11055	41.47	-12.53	54	47.12	40.43	14.78	60.86	-	-	A	V
		14490	49.66	-24.34	74	54.6	41.37	16.86	63.17	-	-	P	V
		14490	42.66	-11.34	54	47.6	41.37	16.86	63.17	-	-	A	V
		18000	56.58	-17.42	74	46.47	48.4	18.95	57.24	-	-	P	V
		18000	48.58	-5.42	54	38.47	48.4	18.95	57.24	-	-	A	V
													V
													V
													V

BLE ANT 4	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		4965	42.05	-31.95	74	59.28	31.46	10.29	58.98	-	-	P	H
		7440	47.98	-26.02	74	57.34	36.36	12.48	58.2	-	-	P	H
		10890	50.17	-23.83	74	55.97	40.38	14.7	60.88	-	-	P	H
		10890	41.17	-12.83	54	46.97	40.38	14.7	60.88	-	-	A	H
		14475	49.26	-24.74	74	54.26	41.33	16.85	63.18	-	-	P	H
		14475	42.26	-11.74	54	47.26	41.33	16.85	63.18	-	-	A	H
		18000	57.14	-16.86	74	47.03	48.4	18.95	57.24	-	-	P	H
		18000	48.14	-5.86	54	38.03	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
		4965	42.78	-31.22	74	60.01	31.46	10.29	58.98	-	-	P	V
		7440	55.26	-18.74	74	64.62	36.36	12.48	58.2	100	45	P	V
		7440	50.95	-3.05	54	60.31	36.36	12.48	58.2	100	45	A	V
		11280	50.26	-23.74	74	56.23	40	14.9	60.87	-	-	P	V
		11280	40.25	-13.75	54	46.22	40	14.9	60.87	-	-	A	V
		14490	51.16	-22.84	74	56.1	41.37	16.86	63.17	-	-	P	V
		14490	42.16	-11.84	54	47.1	41.37	16.86	63.17	-	-	A	V
		18000	57.46	-16.54	74	47.35	48.4	18.95	57.24	-	-	P	V
		18000	48.46	-5.54	54	38.35	48.4	18.95	57.24	-	-	A	V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Emission above 18GHz

2.4GHz BLE (SHF)

BLE ANT 4	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 SHF		21448	40.65	-33.35	74	60.64	37.96	-3.25	54.7	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		21520	40.51	-33.49	74	60.43	38.02	-3.24	54.7	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

<2Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE ANT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2372.79	52.93	-21.07	74	43.36	27.85	16.54	34.82	100	99	P	H
		2384.13	42.18	-11.82	54	32.62	27.83	16.55	34.82	100	99	A	H
	*	2402	109.85	-	-	100.31	27.79	16.58	34.83	100	99	P	H
	*	2402	108.28	-	-	98.74	27.79	16.58	34.83	100	99	A	H
													H
													H
		2317.665	52.93	-21.07	74	43.34	27.96	16.44	34.81	300	218	P	V
		2366.175	42.11	-11.89	54	32.54	27.87	16.52	34.82	300	218	A	V
	*	2402	103.66	-	-	94.12	27.79	16.58	34.83	300	218	P	V
	*	2402	102.13	-	-	92.59	27.79	16.58	34.83	300	218	A	V
													V
													V
BLE CH 19 2440MHz		2321.68	52.54	-21.46	74	42.94	27.96	16.45	34.81	100	120	P	H
		2388.08	42.06	-11.94	54	32.51	27.82	16.56	34.83	100	120	A	H
	*	2440	109.76	-	-	100.32	27.64	16.64	34.84	100	120	P	H
	*	2440	108.25	-	-	98.81	27.64	16.64	34.84	100	120	A	H
		2498.74	52.13	-21.87	74	42.65	27.6	16.73	34.85	100	120	P	H
		2484.43	42.14	-11.86	54	32.68	27.6	16.71	34.85	100	120	A	H
		2378.32	53.04	-20.96	74	43.48	27.84	16.54	34.82	300	228	P	V
		2350.64	42.15	-11.85	54	32.57	27.9	16.5	34.82	300	228	A	V
	*	2440	102.86	-	-	93.42	27.64	16.64	34.84	300	228	P	V
	*	2440	101.32	-	-	91.88	27.64	16.64	34.84	300	228	A	V
		2495.68	52.31	-21.69	74	42.83	27.6	16.73	34.85	300	228	P	V
		2498.65	42.05	-11.95	54	32.57	27.6	16.73	34.85	300	228	A	V

BLE CH 39 2480MHz	*	2480	109.5	-	-	100.05	27.6	16.7	34.85	100	116	P	H
	*	2480	108.01	-	-	98.56	27.6	16.7	34.85	100	116	A	H
		2483.64	53.37	-20.63	74	43.91	27.6	16.71	34.85	100	116	P	H
		2483.52	44.04	-9.96	54	34.58	27.6	16.71	34.85	100	116	A	H
													H
													H
	*	2480	102.17	-	-	92.72	27.6	16.7	34.85	300	228	P	V
	*	2480	100.61	-	-	91.16	27.6	16.7	34.85	300	228	A	V
		2483.52	53.05	-20.95	74	43.59	27.6	16.71	34.85	300	228	P	V
		2484.28	42.28	-11.72	54	32.82	27.6	16.71	34.85	300	228	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 ANT 4	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	44.48	-29.52	74	61.82	31.38	10.13	58.85	-	-	P	H
		10875	50.69	-23.31	74	56.53	40.35	14.69	60.88	-	-	P	H
		10875	40.69	-13.31	54	46.53	40.35	14.69	60.88	-	-	A	H
		14490	49.21	-24.79	74	54.15	41.37	16.86	63.17	-	-	P	H
		14490	42.21	-11.79	54	47.15	41.37	16.86	63.17	-	-	A	H
		18000	57.03	-16.97	74	46.92	48.4	18.95	57.24	-	-	P	H
		18000	48.02	-5.98	54	37.91	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
													H
		4804	44.48	-29.52	74	61.82	31.38	10.13	58.85	-	-	P	V
		11280	50.47	-23.53	74	56.44	40	14.9	60.87	-	-	P	V
		11280	40.47	-13.53	54	46.44	40	14.9	60.87	-	-	A	V
		14490	49.94	-24.06	74	54.88	41.37	16.86	63.17	-	-	P	V
		14490	41.92	-12.08	54	46.86	41.37	16.86	63.17	-	-	A	V
		18000	58.35	-15.65	74	48.24	48.4	18.95	57.24	-	-	P	V
		18000	48.34	-5.66	54	38.23	48.4	18.95	57.24	-	-	A	V
													V
													V
													V
													V
													V

BLE ANT 4	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 19 2440MHz		4880	43.29	-30.71	74	60.67	31.32	10.21	58.91	-	-	P	H
		7320	54.61	-19.39	74	64.25	36.34	12.43	58.41	100	296	P	H
		7320	45.69	-8.31	54	55.33	36.34	12.43	58.41	100	296	A	H
		11085	49.97	-24.03	74	55.69	40.34	14.8	60.86	-	-	P	H
		11085	40.97	-13.03	54	46.69	40.34	14.8	60.86	-	-	A	H
		14475	48.93	-25.07	74	53.93	41.33	16.85	63.18	-	-	P	H
		14475	41.93	-12.07	54	46.93	41.33	16.85	63.18	-	-	A	H
		17985	57.43	-16.57	74	47.66	48.1	18.94	57.27	-	-	P	H
		17985	48.43	-5.57	54	38.66	48.1	18.94	57.27	-	-	A	H
													H
													H
													H
		4880	45.19	-28.81	74	62.57	31.32	10.21	58.91	-	-	P	V
		7320	55.08	-18.92	74	64.72	36.34	12.43	58.41	100	44	P	V
		7320	46.24	-7.76	54	55.88	36.34	12.43	58.41	100	44	A	V
		11055	50.6	-23.4	74	56.25	40.43	14.78	60.86	-	-	P	V
		11055	40.6	-13.4	54	46.25	40.43	14.78	60.86	-	-	A	V
		14475	49.71	-24.29	74	54.71	41.33	16.85	63.18	-	-	P	V
		14475	41.71	-12.29	54	46.71	41.33	16.85	63.18	-	-	A	V
		18000	57.75	-16.25	74	47.64	48.4	18.95	57.24	-	-	P	V
		18000	48.33	-5.67	54	38.22	48.4	18.95	57.24	-	-	A	V
													V
													V
													V

BLE ANT 4	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	44.65	-29.35	74	61.91	31.44	10.28	58.98	-	-	P	H
		7440	53.36	-20.64	74	62.72	36.36	12.48	58.2	100	301	P	H
		7440	47.77	-6.23	54	57.13	36.36	12.48	58.2	100	301	A	H
		11025	49.55	-24.45	74	55.12	40.52	14.77	60.86	-	-	P	H
		11025	40.54	-13.46	54	46.11	40.52	14.77	60.86	-	-	A	H
		14475	49.21	-24.79	74	54.21	41.33	16.85	63.18	-	-	P	H
		14475	42.2	-11.8	54	47.2	41.33	16.85	63.18	-	-	A	H
		17985	56.86	-17.14	74	47.09	48.1	18.94	57.27	-	-	P	H
		17985	47.86	-6.14	54	38.09	48.1	18.94	57.27	-	-	A	H
													H
													H
													H
		4960	42.95	-31.05	74	60.21	31.44	10.28	58.98	-	-	P	V
		7440	55.35	-18.65	74	64.71	36.36	12.48	58.2	100	43	P	V
		7440	49.98	-4.02	54	59.34	36.36	12.48	58.2	100	43	A	V
		10680	49.62	-24.38	74	56.13	39.8	14.59	60.9	-	-	P	V
		10680	39.61	-14.39	54	46.12	39.8	14.59	60.9	-	-	A	V
		14490	49.13	-24.87	74	54.07	41.37	16.86	63.17	-	-	P	V
		14490	42.13	-11.87	54	47.07	41.37	16.86	63.17	-	-	A	V
		17985	56.8	-17.2	74	47.03	48.1	18.94	57.27	-	-	P	V
		17985	47.8	-6.2	54	38.03	48.1	18.94	57.27	-	-	A	V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Emission above 18GHz

2.4GHz BLE (SHF)

BLE ANT 4	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 SHF		23072	41.64	-32.36	74	60.12	38.76	-3.15	54.09	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		21512	40.28	-33.72	74	60.21	38.01	-3.24	54.7	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Emission below 1GHz

2.4GHz BLE (LF)

BLE ANT 4	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		30.97	22.75	-17.25	40	30.42	24.21	0.62	32.5	-	-	P	H
		95.96	29.7	-13.8	43.5	45.44	15.45	1.29	32.48	-	-	P	H
		173.56	24.59	-18.91	43.5	39.96	15.31	1.81	32.49	-	-	P	H
		209.45	24.13	-19.37	43.5	39.43	15.13	2	32.43	-	-	P	H
		656.62	27.73	-18.27	46	30.41	26.24	3.45	32.37	-	-	P	H
		869.05	31.84	-14.16	46	30.55	29.03	4.04	31.78	-	-	P	H
													H
													H
													H
													H
													H
													H
		34.85	30.67	-9.33	40	40.33	22.21	0.67	32.54	-	-	P	V
		95.96	25.63	-17.87	43.5	41.37	15.45	1.29	32.48	-	-	P	V
		170.65	21.11	-22.39	43.5	36.21	15.57	1.82	32.49	-	-	P	V
		211.39	19.71	-23.79	43.5	35.06	15.07	2.01	32.43	-	-	P	V
		590.66	26.54	-19.46	46	30.02	25.68	3.33	32.49	-	-	P	V
		930.16	32.07	-13.93	46	29.65	29.64	4.21	31.43	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.												

<Ant. 3>

<1Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE ANT 3	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		2319.03	48.55	-25.45	74	45.26	27.96	16.45	41.12	100	210	P	H
		2331.105	39.5	-14.5	54	36.22	27.94	16.47	41.13	100	210	A	H
	*	2402	113.56	-	-	110.33	27.79	16.58	41.14	100	210	P	H
	*	2402	113	-	-	109.77	27.79	16.58	41.14	100	210	A	H
													H
													H
		2357.355	49.26	-24.74	74	45.99	27.89	16.51	41.13	376	307	P	V
		2326.38	39.34	-14.66	54	36.05	27.95	16.46	41.12	376	307	A	V
	*	2402	109.59	-	-	106.36	27.79	16.58	41.14	376	307	P	V
	*	2402	108.98	-	-	105.75	27.79	16.58	41.14	376	307	A	V
													V
													V
BLE CH 19 2440MHz		2360.08	48.52	-25.48	74	45.26	27.88	16.51	41.13	100	212	P	H
		2311.12	39.26	-14.74	54	35.97	27.98	16.43	41.12	100	212	A	H
	*	2440	112.18	-	-	109.05	27.64	16.64	41.15	100	212	P	H
	*	2440	111.55	-	-	108.42	27.64	16.64	41.15	100	212	A	H
		2484.52	48.22	-25.78	74	45.08	27.6	16.71	41.17	100	212	P	H
		2488.84	39.25	-14.75	54	36.1	27.6	16.72	41.17	100	212	A	H
		2388.08	48.89	-25.11	74	45.65	27.82	16.56	41.14	400	301	P	V
		2318.16	39.25	-14.75	54	35.97	27.96	16.44	41.12	400	301	A	V
	*	2440	107.57	-	-	104.44	27.64	16.64	41.15	400	301	P	V
	*	2440	107.06	-	-	103.93	27.64	16.64	41.15	400	301	A	V
		2484.07	48.75	-25.25	74	45.61	27.6	16.71	41.17	400	301	P	V
		2492.71	39.14	-14.86	54	35.99	27.6	16.72	41.17	400	301	A	V

BLE CH 39 2480MHz	*	2480	113.75	-	-	110.61	27.6	16.7	41.16	100	216	P	H
	*	2480	113.18	-	-	110.04	27.6	16.7	41.16	100	216	A	H
		2483.52	52.33	-21.67	74	49.19	27.6	16.71	41.17	100	216	P	H
		2483.52	42.42	-11.58	54	39.28	27.6	16.71	41.17	100	216	A	H
													H
													H
	*	2480	111.32	-	-	108.18	27.6	16.7	41.16	400	302	P	V
	*	2480	110.72	-	-	107.58	27.6	16.7	41.16	400	302	A	V
		2483.88	50.27	-23.73	74	47.13	27.6	16.71	41.17	400	302	P	V
		2483.52	41.43	-12.57	54	38.29	27.6	16.71	41.17	400	302	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 ANT 3	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	37.78	-36.22	74	55.12	31.38	10.13	58.85	-	-	P	H
		11265	50.57	-23.43	74	56.55	40	14.89	60.87	-	-	P	H
		11265	40.82	-13.18	54	46.8	40	14.89	60.87	-	-	A	H
		14490	49.75	-24.25	74	54.69	41.37	16.86	63.17	-	-	P	H
		14490	40.98	-13.02	54	45.92	41.37	16.86	63.17	-	-	A	H
		18000	56.68	-17.32	74	46.57	48.4	18.95	57.24	-	-	P	H
		18000	46.91	-7.09	54	36.8	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
													H
		4804	38.5	-35.5	74	55.84	31.38	10.13	58.85	-	-	P	V
		11205	49.49	-24.51	74	55.49	40	14.86	60.86	-	-	P	V
		11205	39.72	-14.28	54	45.72	40	14.86	60.86	-	-	A	V
		14475	49.98	-24.02	74	54.98	41.33	16.85	63.18	-	-	P	V
		14475	41.32	-12.68	54	46.32	41.33	16.85	63.18	-	-	A	V
		18000	56.36	-17.64	74	46.25	48.4	18.95	57.24	-	-	P	V
		18000	46.5	-7.5	54	36.39	48.4	18.95	57.24	-	-	A	V
													V
													V
													V
													V
													V

BLE ANT 3	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 19 2440MHz		4880	40.19	-33.81	74	57.57	31.32	10.21	58.91	-	-	P	H
		7320	45.45	-28.55	74	55.09	36.34	12.43	58.41	-	-	P	H
		11400	50.11	-23.89	74	55.82	40.2	14.96	60.87	-	-	P	H
		11400	40.45	-13.55	54	46.16	40.2	14.96	60.87	-	-	A	H
		14490	49.21	-24.79	74	54.15	41.37	16.86	63.17	-	-	P	H
		14490	40.44	-13.56	54	45.38	41.37	16.86	63.17	-	-	A	H
		18000	58.09	-15.91	74	47.98	48.4	18.95	57.24	-	-	P	H
		18000	48.42	-5.58	54	38.31	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
		4880	38.42	-35.58	74	55.8	31.32	10.21	58.91	-	-	P	V
		7320	43.91	-30.09	74	53.55	36.34	12.43	58.41	-	-	P	V
		11160	50.25	-23.75	74	56.15	40.12	14.84	60.86	-	-	P	V
		11160	40.48	-13.52	54	46.38	40.12	14.84	60.86	-	-	A	V
		14490	49.97	-24.03	74	54.91	41.37	16.86	63.17	-	-	P	V
		14490	41.2	-12.8	54	46.14	41.37	16.86	63.17	-	-	A	V
		17985	57.04	-16.96	74	47.27	48.1	18.94	57.27	-	-	P	V
		17985	47.27	-6.73	54	37.5	48.1	18.94	57.27	-	-	A	V
													V
													V
													V
													V

BLE ANT 3	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	38.5	-35.5	74	55.76	31.44	10.28	58.98	-	-	P	H
		7440	44.73	-29.27	74	54.09	36.36	12.48	58.2	-	-	P	H
		10860	49.58	-24.42	74	55.46	40.32	14.68	60.88	-	-	P	H
		10860	39.81	-14.19	54	45.69	40.32	14.68	60.88	-	-	A	H
		14475	49.35	-24.65	74	54.35	41.33	16.85	63.18	-	-	P	H
		14475	40.58	-13.42	54	45.58	41.33	16.85	63.18	-	-	A	H
		18000	57.28	-16.72	74	47.17	48.4	18.95	57.24	-	-	P	H
		18000	47.61	-6.39	54	37.5	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
		4960	38.63	-35.37	74	55.89	31.44	10.28	58.98	-	-	P	V
		7440	45.41	-28.59	74	54.77	36.36	12.48	58.2	-	-	P	V
		11205	50.1	-23.9	74	56.1	40	14.86	60.86	-	-	P	V
		11205	40.35	-13.65	54	46.35	40	14.86	60.86	-	-	A	V
		14475	48.92	-25.08	74	53.92	41.33	16.85	63.18	-	-	P	V
		14475	40.15	-13.85	54	45.15	41.33	16.85	63.18	-	-	A	V
		18000	56.74	-17.26	74	46.63	48.4	18.95	57.24	-	-	P	V
		18000	46.97	-7.03	54	36.86	48.4	18.95	57.24	-	-	A	V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Emission above 18GHz

2.4GHz BLE (SHF)

BLE ANT 3	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 SHF		23216	41.79	-32.21	74	60.08	38.87	-3.1	54.06	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		22344	40.71	-33.29	74	60.19	38.36	-3.28	54.56	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

<2Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE ANT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
3		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2379.825	48.32	-25.68	74	45.07	27.84	16.55	41.14	100	215	P	H
		2343.81	38.37	-15.63	54	35.1	27.91	16.49	41.13	100	215	A	H
	*	2402	113.44	-	-	110.21	27.79	16.58	41.14	100	215	P	H
	*	2402	111.5	-	-	108.27	27.79	16.58	41.14	100	215	A	H
													H
													H
		2368.695	49.19	-24.81	74	45.94	27.86	16.53	41.14	400	243	P	V
		2376.885	38.35	-15.65	54	35.1	27.85	16.54	41.14	400	243	A	V
	*	2402	104.05	-	-	100.82	27.79	16.58	41.14	400	243	P	V
	*	2402	102.43	-	-	99.2	27.79	16.58	41.14	400	243	A	V
													V
													V
BLE CH 19 2440MHz		2383.92	48.6	-25.4	74	45.36	27.83	16.55	41.14	100	217	P	H
		2322.16	38.27	-15.73	54	34.98	27.96	16.45	41.12	100	217	A	H
	*	2440	112.25	-	-	109.12	27.64	16.64	41.15	100	217	P	H
	*	2440	110.67	-	-	107.54	27.64	16.64	41.15	100	217	A	H
		2491.81	47.79	-26.21	74	44.64	27.6	16.72	41.17	100	217	P	H
		2486.86	38.33	-15.67	54	35.19	27.6	16.71	41.17	100	217	A	H
		2325.52	48.75	-25.25	74	45.46	27.95	16.46	41.12	400	303	P	V
		2356.56	38.34	-15.66	54	35.07	27.89	16.51	41.13	400	303	A	V
	*	2440	107.06	-	-	103.93	27.64	16.64	41.15	400	303	P	V
	*	2440	105.44	-	-	102.31	27.64	16.64	41.15	400	303	A	V
		2484.88	48.11	-25.89	74	44.97	27.6	16.71	41.17	400	303	P	V
		2493.7	38.22	-15.78	54	35.06	27.6	16.73	41.17	400	303	A	V

BLE CH 39 2480MHz	*	2480	112.27	-	-	109.13	27.6	16.7	41.16	100	209	P	H
	*	2480	110.7	-	-	107.56	27.6	16.7	41.16	100	209	A	H
		2483.8	51.83	-22.17	74	48.69	27.6	16.71	41.17	100	209	P	H
		2483.52	43.65	-10.35	54	40.51	27.6	16.71	41.17	100	209	A	H
													H
													H
	*	2480	109.36	-	-	106.22	27.6	16.7	41.16	399	306	P	V
	*	2480	107.85	-	-	104.71	27.6	16.7	41.16	399	306	A	V
		2484.16	49.96	-24.04	74	46.82	27.6	16.71	41.17	399	306	P	V
		2483.52	41.63	-12.37	54	38.49	27.6	16.71	41.17	399	306	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 ANT 3	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	38.22	-35.78	74	55.56	31.38	10.13	58.85	-	-	P	H
		11310	50.3	-23.7	74	56.24	40.02	14.91	60.87	-	-	P	H
		11310	40.53	-13.47	54	46.47	40.02	14.91	60.87	-	-	A	H
		14490	49.82	-24.18	74	54.76	41.37	16.86	63.17	-	-	P	H
		14490	41.05	-12.95	54	45.99	41.37	16.86	63.17	-	-	A	H
		18000	57.18	-16.82	74	47.07	48.4	18.95	57.24	-	-	P	H
		18000	47.41	-6.59	54	37.3	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
													H
		4804	38.57	-35.43	74	55.91	31.38	10.13	58.85	-	-	P	V
		11055	50.25	-23.75	74	55.9	40.43	14.78	60.86	-	-	P	V
		11055	40.49	-13.51	54	46.14	40.43	14.78	60.86	-	-	A	V
		14490	50.27	-23.73	74	55.21	41.37	16.86	63.17	-	-	P	V
		14490	40.5	-13.5	54	45.44	41.37	16.86	63.17	-	-	A	V
		18000	57.22	-16.78	74	47.11	48.4	18.95	57.24	-	-	P	V
		18000	47.46	-6.54	54	37.35	48.4	18.95	57.24	-	-	A	V
													V
													V
													V
													V
													V

BLE ANT 3	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 19 2440MHz		4880	39.69	-34.31	74	57.07	31.32	10.21	58.91	-	-	P	H
		7320	43.94	-30.06	74	53.58	36.34	12.43	58.41	-	-	P	H
		10995	50.13	-23.87	74	55.65	40.59	14.75	60.86	-	-	P	H
		10995	40.36	-13.64	54	45.88	40.59	14.75	60.86	-	-	A	H
		14490	49.88	-24.12	74	54.82	41.37	16.86	63.17	-	-	P	H
		14490	41.33	-12.67	54	46.27	41.37	16.86	63.17	-	-	A	H
		18000	57.29	-16.71	74	47.18	48.4	18.95	57.24	-	-	P	H
		18000	47.62	-6.38	54	37.51	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
		4880	38.84	-35.16	74	56.22	31.32	10.21	58.91	-	-	P	V
		7320	44.21	-29.79	74	53.85	36.34	12.43	58.41	-	-	P	V
		10890	49.6	-24.4	74	55.4	40.38	14.7	60.88	-	-	P	V
		10890	39.83	-14.17	54	45.63	40.38	14.7	60.88	-	-	A	V
		14490	50.36	-23.64	74	55.3	41.37	16.86	63.17	-	-	P	V
		14490	41.59	-12.41	54	46.53	41.37	16.86	63.17	-	-	A	V
		18000	57.38	-16.62	74	47.27	48.4	18.95	57.24	-	-	P	V
		18000	47.61	-6.39	54	37.5	48.4	18.95	57.24	-	-	A	V
													V
													V
													V
													V

BLE ANT 3	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	41.48	-32.52	74	58.74	31.44	10.28	58.98	-	-	P	H
		7440	44.47	-29.53	74	53.83	36.36	12.48	58.2	-	-	P	H
		11055	51.52	-22.48	74	57.17	40.43	14.78	60.86	-	-	P	H
		11055	41.75	-12.25	54	47.4	40.43	14.78	60.86	-	-	A	H
		14490	49.05	-24.95	74	53.99	41.37	16.86	63.17	-	-	P	H
		14490	40.58	-13.42	54	45.52	41.37	16.86	63.17	-	-	A	H
		18000	57.56	-16.44	74	47.45	48.4	18.95	57.24	-	-	P	H
		18000	47.79	-6.21	54	37.68	48.4	18.95	57.24	-	-	A	H
													H
													H
													H
													H
		4960	40.76	-33.24	74	58.02	31.44	10.28	58.98	-	-	P	V
		7440	44.4	-29.6	74	53.76	36.36	12.48	58.2	-	-	P	V
		10800	50.51	-23.49	74	56.55	40.2	14.65	60.89	-	-	P	V
		10800	40.74	-13.26	54	46.78	40.2	14.65	60.89	-	-	A	V
		14475	49.7	-24.3	74	54.7	41.33	16.85	63.18	-	-	P	V
		14475	40.93	-13.07	54	45.93	41.33	16.85	63.18	-	-	A	V
		18000	57.32	-16.68	74	47.21	48.4	18.95	57.24	-	-	P	V
		18000	47.55	-6.45	54	37.44	48.4	18.95	57.24	-	-	A	V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Emission above 18GHz

2.4GHz BLE (SHF)

BLE ANT 3	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 SHF		23008	40.55	-33.45	74	59.11	38.71	-3.17	54.1	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		23376	40.8	-33.2	74	59.01	38.85	-3.04	54.02	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. \ 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

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

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

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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

Appendix D. Radiated Spurious Emission Plots

Test Engineer :	Leo Lee, Mancy Chou and Bigshow Wang	**Temperature :**	22.1~23.1°C
		Relative Humidity :	55~60%

Note symbol

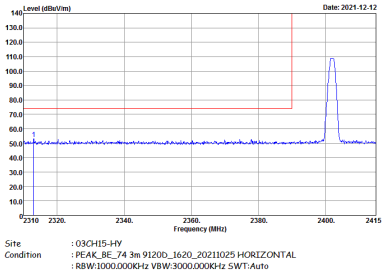
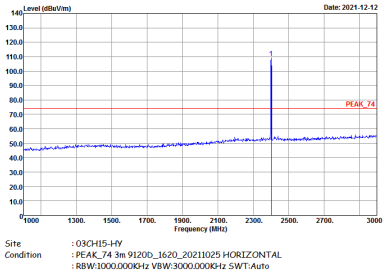
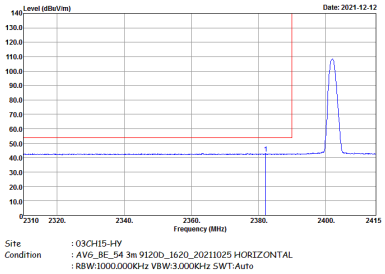
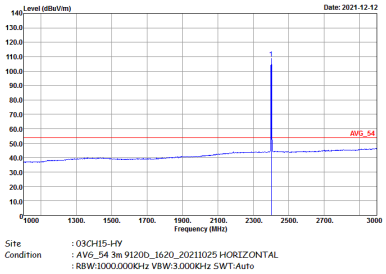
-L	**Low channel location**
-R	**High channel location**

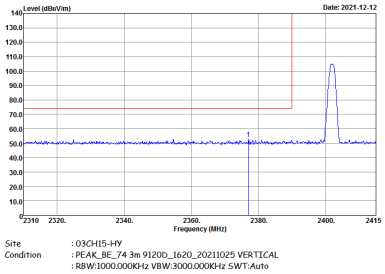
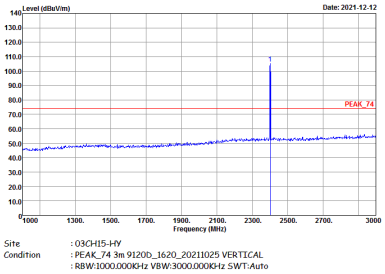
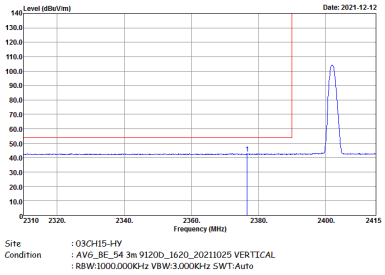
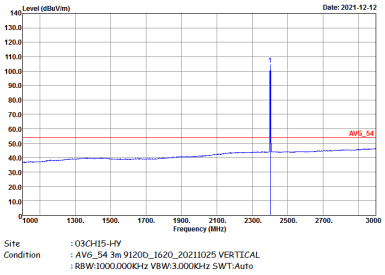
<Ant. 4>

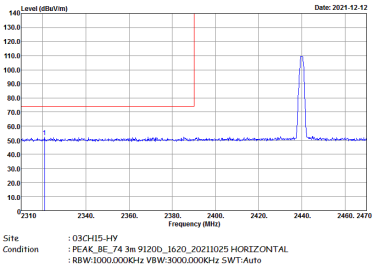
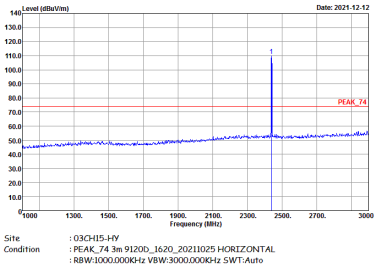
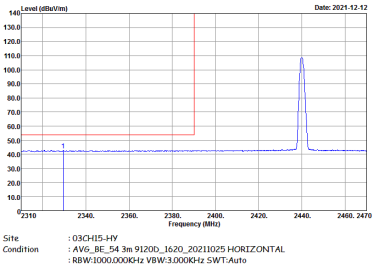
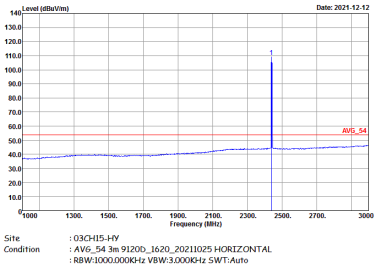
<1Mbps>

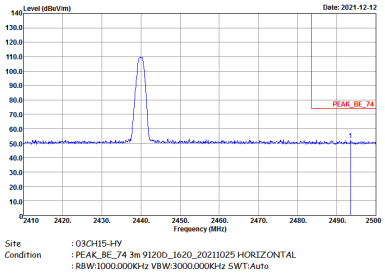
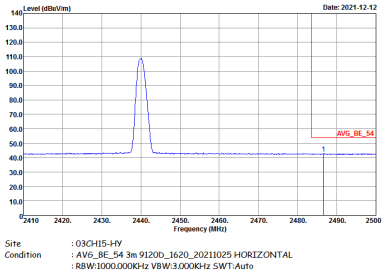
2.4GHz 2400~2483.5MHz

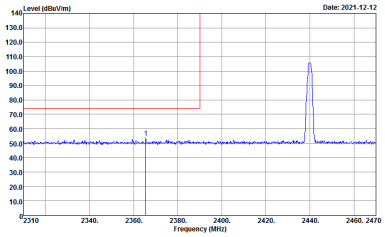
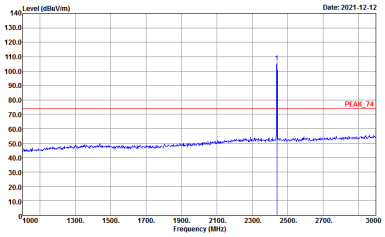
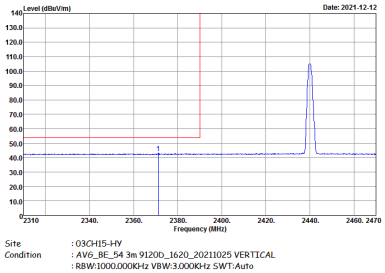
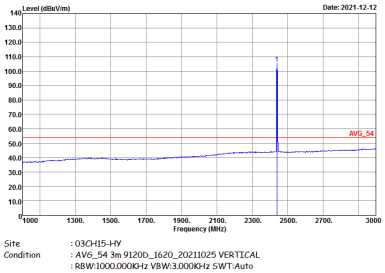
BLE (Band Edge @ 3m)

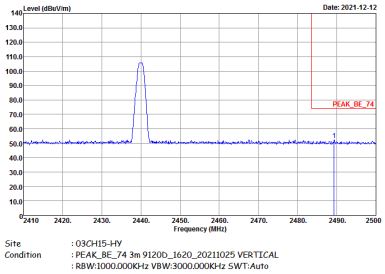
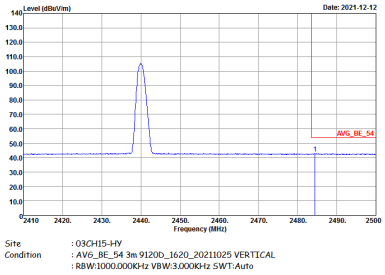
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
4	Horizontal	Fundamental
Peak		
Avg.		

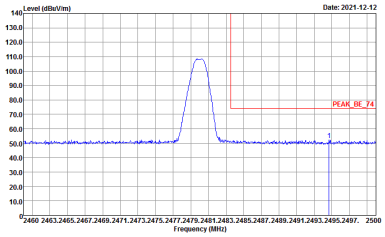
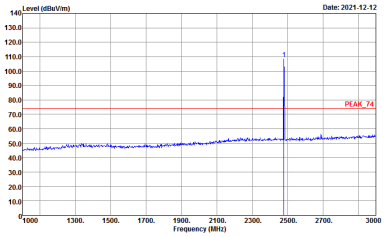
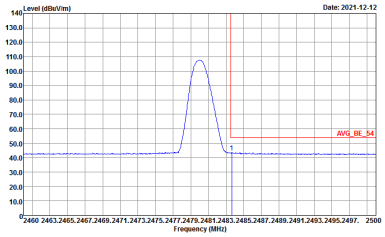
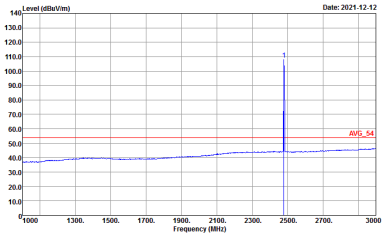
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
4	Vertical	Fundamental
Peak		
Avg		

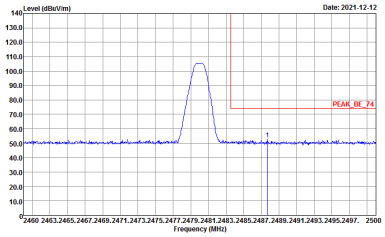
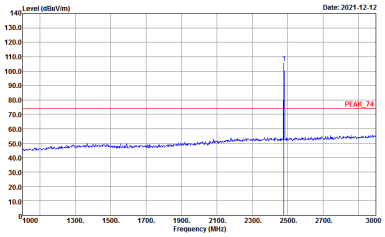
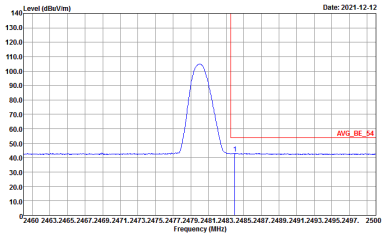
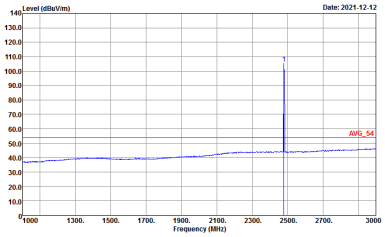
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
4	Horizontal	Fundamental
Peak		
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
4	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
4	Vertical	Fundamental
Peak		
Avg.		

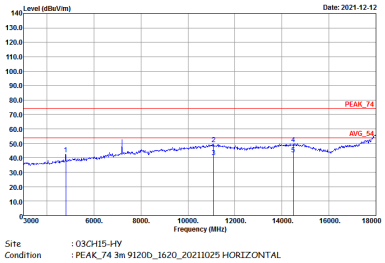
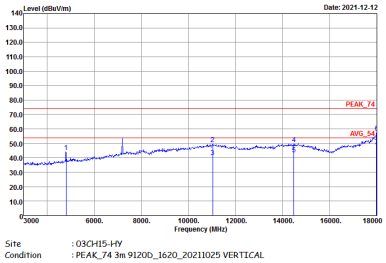
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
4	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

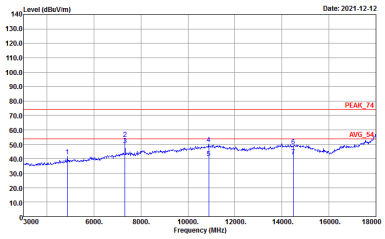
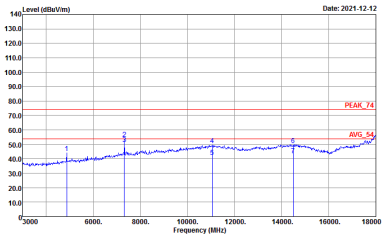
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
4	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_1620_20211025 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH15-HY Condition : PEAK_74 3m 9120D_1620_20211025 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 9120D_1620_20211025 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto	 Site : 03CH15-HY Condition : AVG_54 3m 9120D_1620_20211025 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto

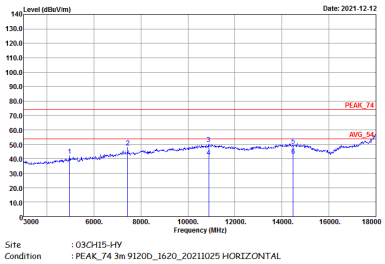
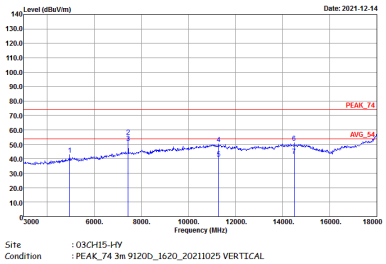
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
4	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_1620_20211025 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH15-HY Condition : PEAK_74 3m 9120D_1620_20211025 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 9120D_1620_20211025 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto	 Site : 03CH15-HY Condition : AVG_54 3m 9120D_1620_20211025 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

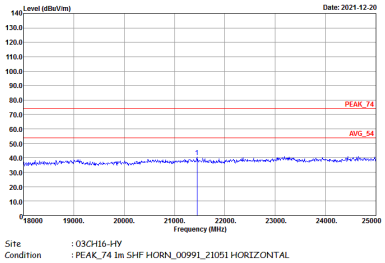
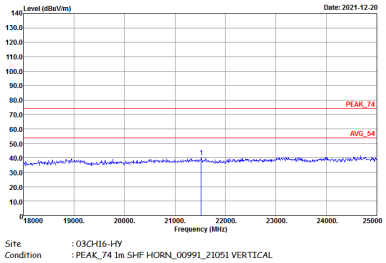
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
4	Horizontal	Vertical
Peak Avg.		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
4	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK_74 3m 9120D_1620_20211025 HORIZONTAL	 Site : 03CH15-HY Condition : PEAK_74 3m 9120D_1620_20211025 VERTICAL

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
4	Horizontal	Vertical
Peak Avg.	 	

Emission above 18GHz

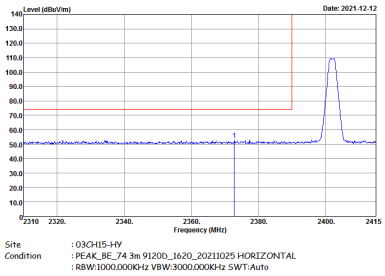
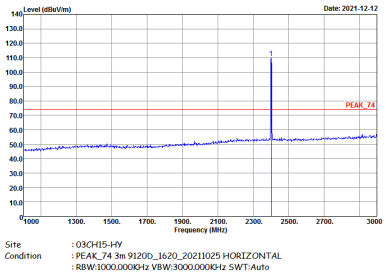
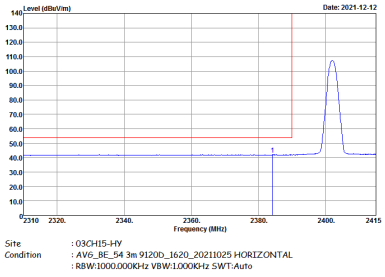
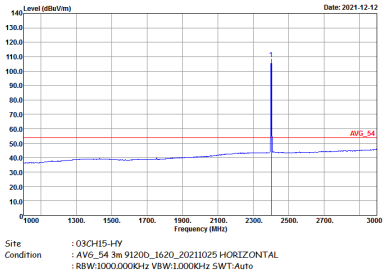
2.4GHz BLE (SHF @ 1m)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE SHF	
4	Horizontal	Vertical
Peak Avg.		

<2Mbps>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
4	Horizontal	Fundamental
Peak		
Avg.