RADIO TEST REPORT

Product	:	Speaker
Model Name	:	SR0191
FCC ID	:	JNZSR0191
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date	:	2021/11/15
Test Date	:	2021/11/15 ~ 2022/3/8
Issued Date	:	2022/3/16
Applicant	:	Logitech Far East Ltd. #2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

REVISION HISTORY

Original Test Report No.: 4790190314-US-R1-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4790190314-US-R1-V0	2022/3/16	-	Initial issue

Table of Contents

1. Attestation of Test Results 4

2. Summary of Test Results 5

3. Test Methodology and Reference Procedures 6

4. Facilities and Accreditation 6

5. Measurement Uncertainty 7

6. Equipment under Test 8

6.1. Description of EUT 8
6.2. Channel List 10
6.3. Test Condition 10
6.4. Description of Available Antennas 10
6.5. Test Mode Applicability and Tested Channel Detail 11
6.6. Duty cycle 12

7. Test Equipment 13

8. Description of Test Setup 15

9. Test Results 17

9.1. 6dB Bandwidth 17
9.2. Conducted Output Power 20
9.3. Power Spectral Density 22
9.4. Conducted Out of Band Emission 25
9.5. Radiated Spurious Emission 30
9.6. AC Power Line Conducted Emission 49

1. Attestation of Test Results

APPLICANT:	Logitech Far East Ltd. #2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.
MANUFACTURER:	Logitech Europe S. A. EPFL - Quartier de l'Innovation, Daniel Borel Innovation Center, 1015 Lausanne, SWITZERLAND
EUT DESCRIPTION:	Speaker
BRAND:	logitech
MODEL:	SR0191
SAMPLE STAGE:	Engineering Verification Test sample
DATE of TESTED:	2021/11/15 ~ 2022/3/8

APPLICABLE STANDARDS

STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Sally Lu

Sally Lu Date : 2022/3/16
Project Handler

Approved and Authorized By:

WaterNil.Guan

Waternil Guan Date : 2022/3/16
Engineer

2. Summary of Test Results

Summary of Test Results		
FCC Clause	**Test Items**	**Result**
15.247(a)(2)	6dB Bandwidth	PASS
15.247(b)	Conducted Output Power	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Antenna Port Emission	PASS
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS
15.207	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS

3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB558074 D01 Meas Guidance v05r02, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	±3.1 dB
RF Conducted	9 kHz - 40GHz	±1.9 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	±1.9 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	±5.4 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	±4.7 dB

6. Equipment under Test

6.1. Description of EUT

Product	Speaker
Brand Name	logitech
Model Name	SR0191
Operating Frequency	BT-LE-1M: 2402~2480 MHz BT-LE-2M: 2404~2478 MHz
Modulation	GFSK
Transfer Rate	Up to 2 Mbps
Number of Channel	BT-LE-1M: 40 Channels BT-LE-2M: 37 Channels (excluding 2402, 2426 and 2480 primary advertising channels)
Maximum Output Power	1.16 dBm
Normal Voltage	120Vac/ 60Hz
S/N	2143GG02AA48
Sample ID	Conducted Test: 4393416 Radiated Test: 4393415

Note:

1. The EUT contains following accessory devices:

Product	Brand	Model	Description
Audio Cable	EASON	EWS00663	200cm

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

6.2. Channel List

40 channels are provided to this EUT:

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

Note: 2402, 2426 and 2480 MHz primary advertising channels only support 1 Mbps data rate.

6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	21~26℃/ 61~68%RH	120Vac/ 60Hz	2021/11/15~ 2021/11/26	Mike Cai
Radiated Spurious Emission	966-2	21~26℃/ 61~68%RH	120Vac/ 60Hz	2021/11/15~ 2022/3/8	Mike Cai
AC power Line Conducted Emission	SR1	21~26℃/ 61~68%RH	120Vac/ 60Hz	2021/11/15~ 2022/3/8	Mike Cai

FCC Test Firm Registration Number: 498077

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Maximum Gain (dBi)
1	Chain (0)	DongGuan JIASHI Communication Co., LTD	JS-BYM235B	PCB	-0.09

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

6.5. Test Mode Applicability and Tested Channel Detail

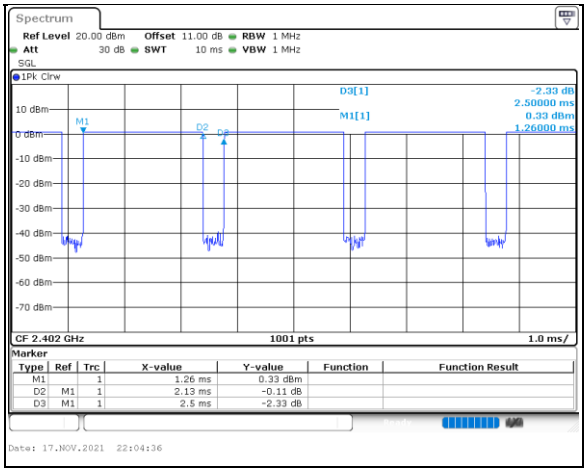
- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.
- For below 1 GHz radiated emission and AC power line conducted emission have performed all modes of operation were investigated and the worst-case emissions are reported.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test Item	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Emissions	GFSK	0 to 39	0,19,39	1 Mbps
	GFSK	1 to 38	1,19,38	2 Mbps
Radiated Emissions (Below 1GHz)	GFSK	0 to 39	0	1 Mbps
AC Power Line Conducted Emission	GFSK	0 to 39	0	1 Mbps
Antenna Port Conducted Measurement	GFSK	0 to 39	0,19,39	1 Mbps
	GFSK	1 to 38	1,19,38	2 Mbps

6.6. Duty cycle

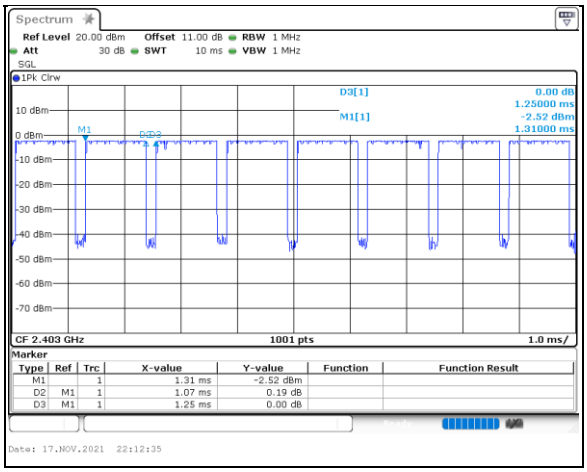
BT LE_1Mbps

Duty cycle = 2.13/2.5 = 85.2%, Duty factor(dB) = 10 * log(1/0.852) = 0.7



BT LE_2Mbps

Duty cycle = 1.07/1.25 = 85.6%, Duty factor(dB) = 10 * log(1/0.856) = 0.68



7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2021/11/9	2022/11/8
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2020/12/11	2021/12/10
				2021/12/10	2022/12/9
Loop Antenna	ETS lindgren	6502	00213440	2020/12/25	2021/12/24
				2021/12/23	2022/12/22
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2021/1/13	2022/1/12
				2022/2/8	2023/2/7
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2020/12/30	2021/12/29
				2021/12/13	2022/12/12
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2020/12/30	2021/12/29
				2021/12/17	2022/12/16
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2021/6/8	2022/6/7
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2021/2/3	2022/2/2
				2022/2/16	2023/2/15
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2021/5/19	2022/5/18
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2021/1/22	2022/1/21
				2021/12/3	2022/12/2
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2021/1/22	2022/1/21
				2021/12/3	2022/12/2

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Antenna Port Conducted Measurement					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101490	2021/9/7	2022/9/6
Pulse Power Sensor	Anritsu	MA2411B	1531202	2020/12/21	2021/12/20
Power Meter	Anritsu	ML2495A	1645002	2020/12/21	2021/12/20
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2020/11/17	2021/11/16
				2021/11/15	2022/11/14
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2021/8/30	2022/8/29
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2021/8/26	2022/8/25
Cables	TITAN	CFD200	T0732ACFD20020A300-2	2021/4/7	2022/4/6

UL Software		
Description	**Name**	**Version**
Radiated measurement	e3	6.191211 (V6)
Conducted measurement	RF Conducted Test Tools	ver 2.4.0.620b
AC power Line Conducted Emission	EZ_EMC	UL-3A1.2

8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Laptop	DELL	Latitude E5470	5M2MWF2	Provided by Lab
B	Test Tool	Waveshare	FT232	NA	Supplied by client

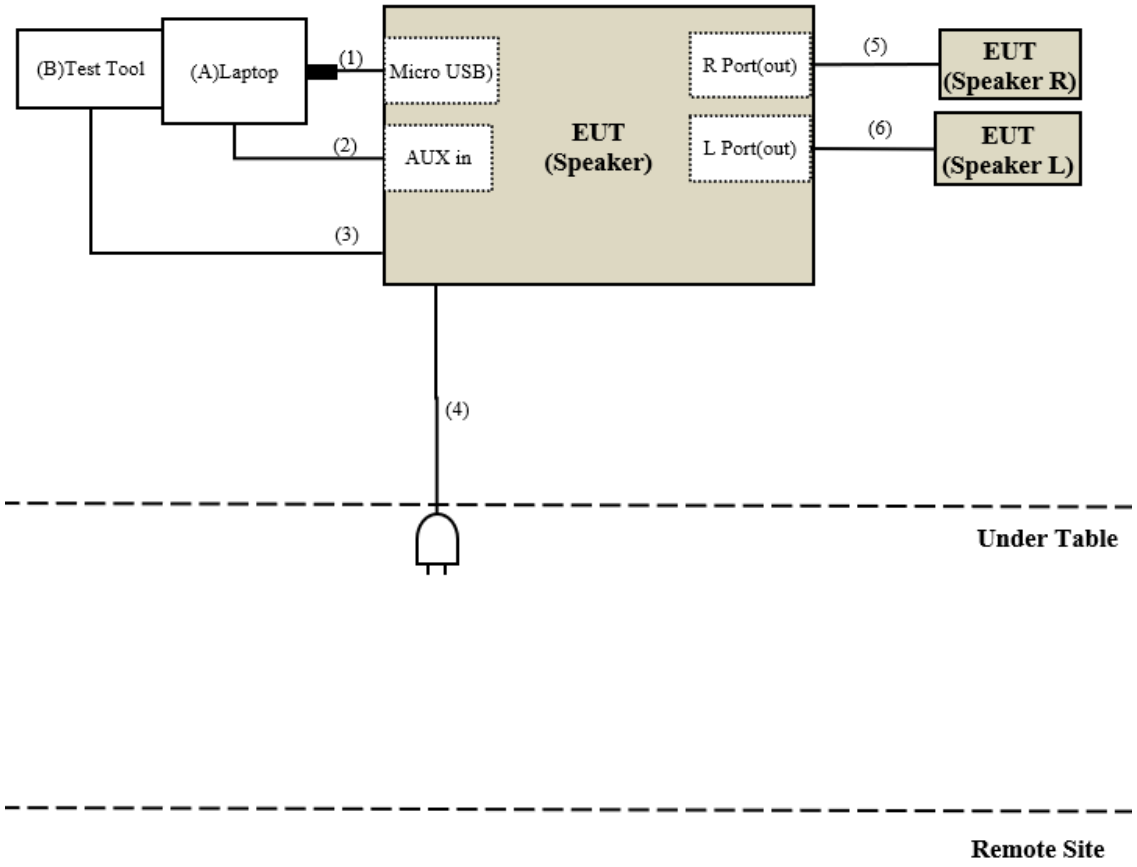
I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	USB Cable	NA	NA	3	with one core Supplied by client
2	Audio Cable	EASON	EWS00663	2	Supplied by client
3	Console Cable	LONG HSIN	VW-1	0.2	Supplied by client
4	AC Cable	logitech	Speaker	1.86	A part of EUT
5	Audio Cable	logitech	Speaker R	1.84	A part of EUT
6	Audio Cable	logitech	Speaker L	1.84	A part of EUT

Test Setup

Controlled using a bespoke application (BT FCC Tool V2.22) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test



9. Test Results

9.1. 6dB Bandwidth

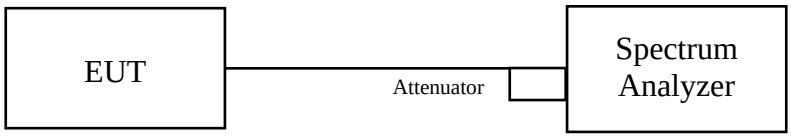
Requirements

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

Test procedure

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Setup



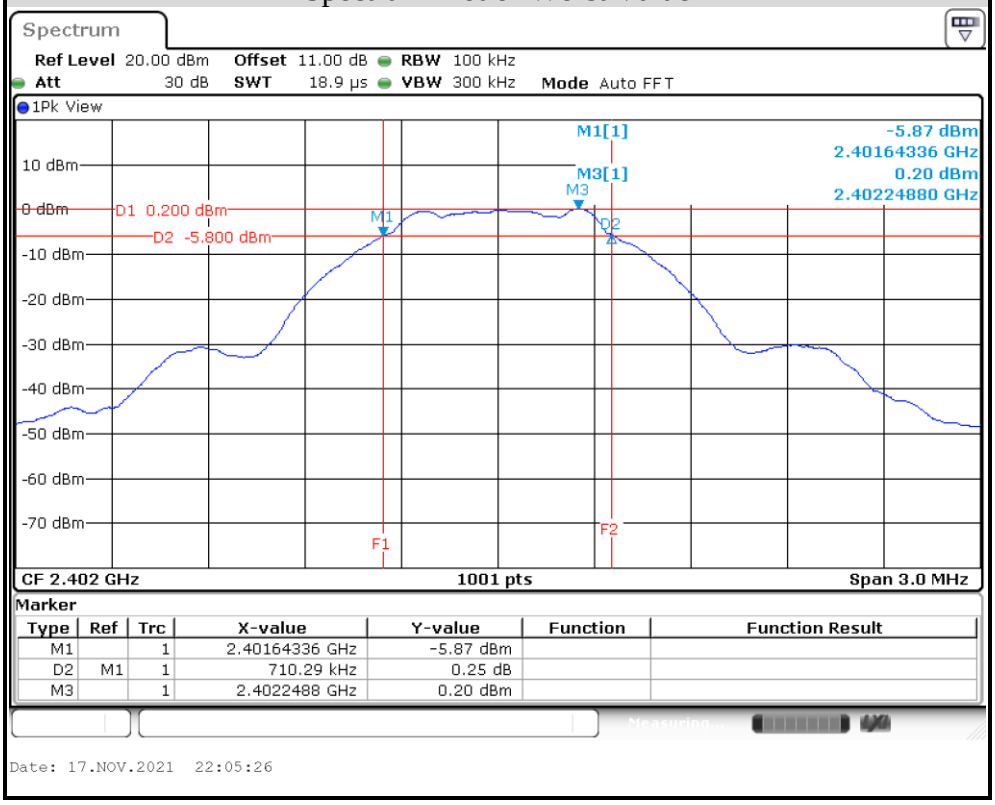
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

BT LE_1Mbps

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.71	0.5	PASS
19	2440	0.72	0.5	PASS
39	2480	0.72	0.5	PASS

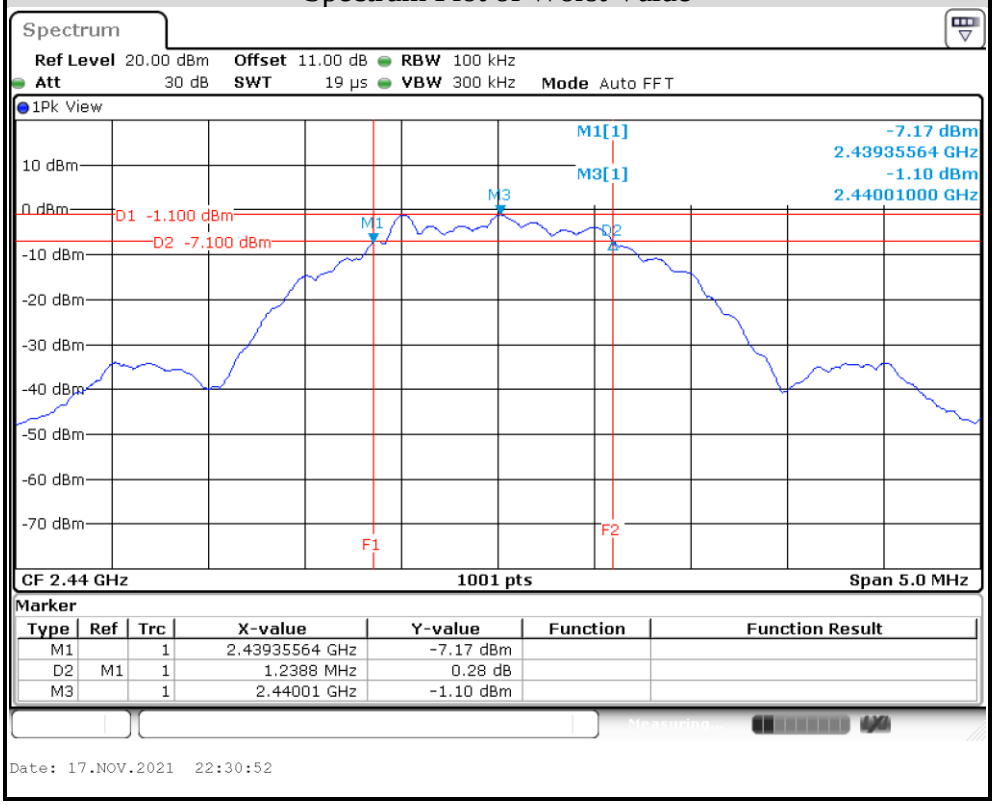
Spectrum Plot of Worst Value



BT LE_2Mbps

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2404	1.24	0.5	PASS
19	2440	1.24	0.5	PASS
38	2478	1.25	0.5	PASS

Spectrum Plot of Worst Value



9.2. Conducted Output Power

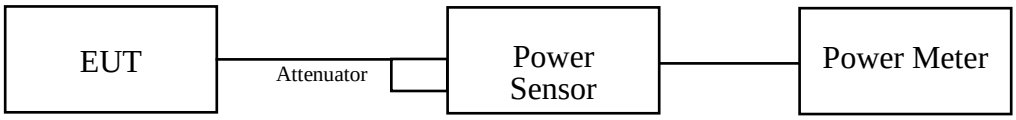
Requirements

For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Test Setup



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.

Test Data

Peak Power

BT LE_1Mbps

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	1.306	1.16	30	PASS
19	2440	1.127	0.52	30	PASS
39	2480	0.973	-0.12	30	PASS

BT LE_2Mbps

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2404	1.3	1.14	30	PASS
19	2440	1.132	0.54	30	PASS
38	2478	0.975	-0.11	30	PASS

Average Power (Reference Only)

BT LE_1Mbps

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	1.259	1.00
19	2440	1.079	0.33
39	2480	0.929	-0.32

BT LE_2Mbps

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2404	1.233	0.91
19	2440	1.072	0.30
38	2478	0.925	-0.34

9.3. Power Spectral Density

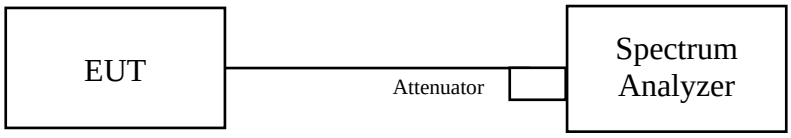
Requirements

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

Test procedure

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

Test Setup



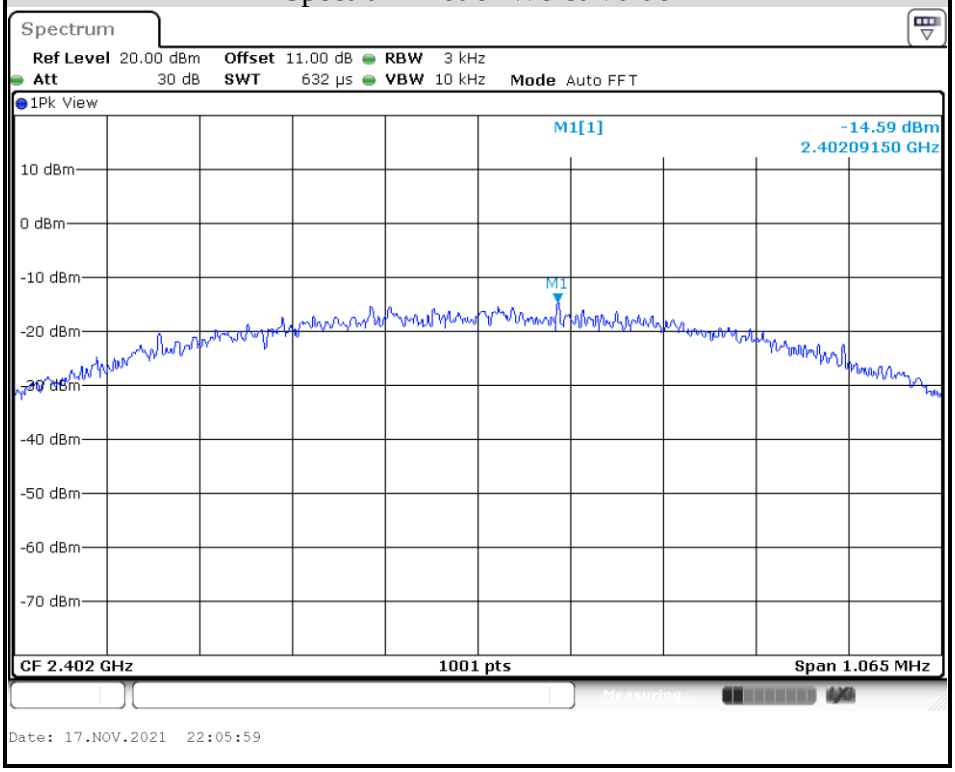
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

BT LE_1Mbps

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-14.59	8	PASS
19	2440	-15.33	8	PASS
39	2480	-16.09	8	PASS

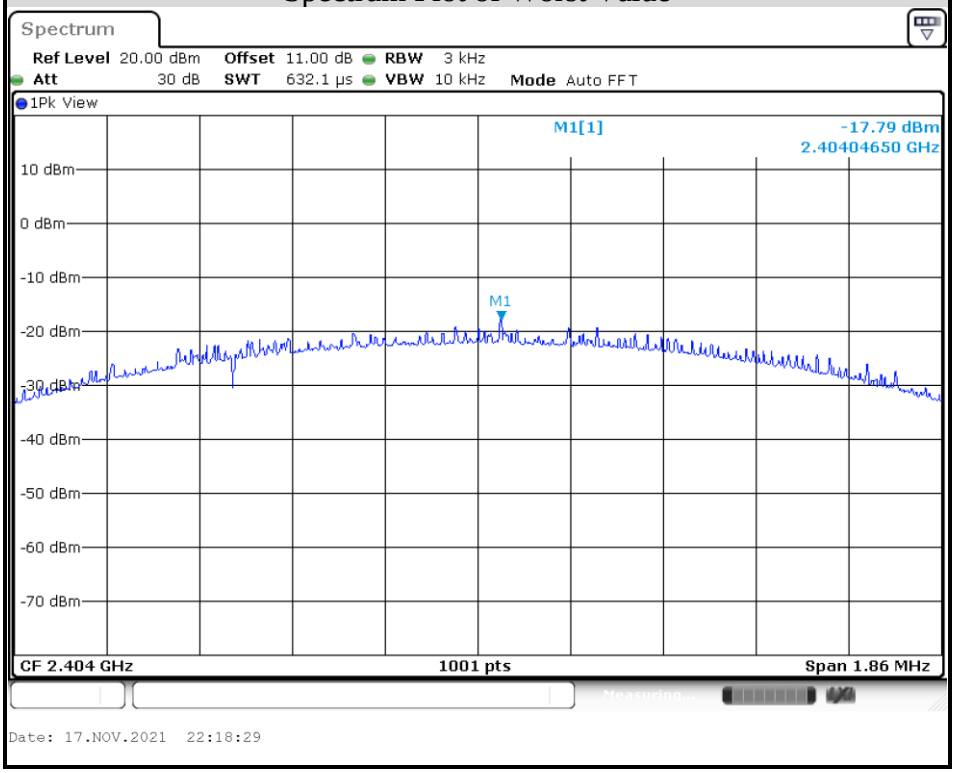
Spectrum Plot of Worst Value



BT LE_2Mbps

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2404	-17.79	8	PASS
19	2440	-18.52	8	PASS
38	2478	-19.22	8	PASS

Spectrum Plot of Worst Value



9.4. Conducted Out of Band Emission

Requirements

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b) (3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209 (a) is not required.

Test procedure

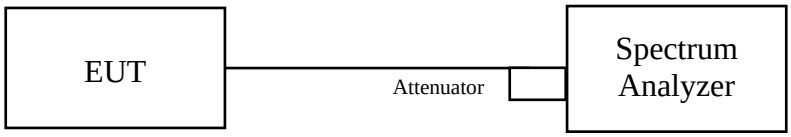
Measurement Procedure REF

a. Set the RBW = 100 kHz.
b. Set the VBW ≥ 300 kHz.
c. Set the span to 1.5 times the DTS bandwidth.
d. Detector = peak.
e. Sweep time = auto couple.
f. Trace mode = max hold.
g. Allow trace to fully stabilize.
h. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement Procedure OOBE

a. Set RBW = 100 kHz.
b. Set VBW ≥ 300 kHz.
c. Detector = peak.
d. Sweep = auto couple.
e. Trace Mode = max hold.
f. Allow trace to fully stabilize.
g. Use the peak marker function to determine the maximum amplitude level.

Test Setup

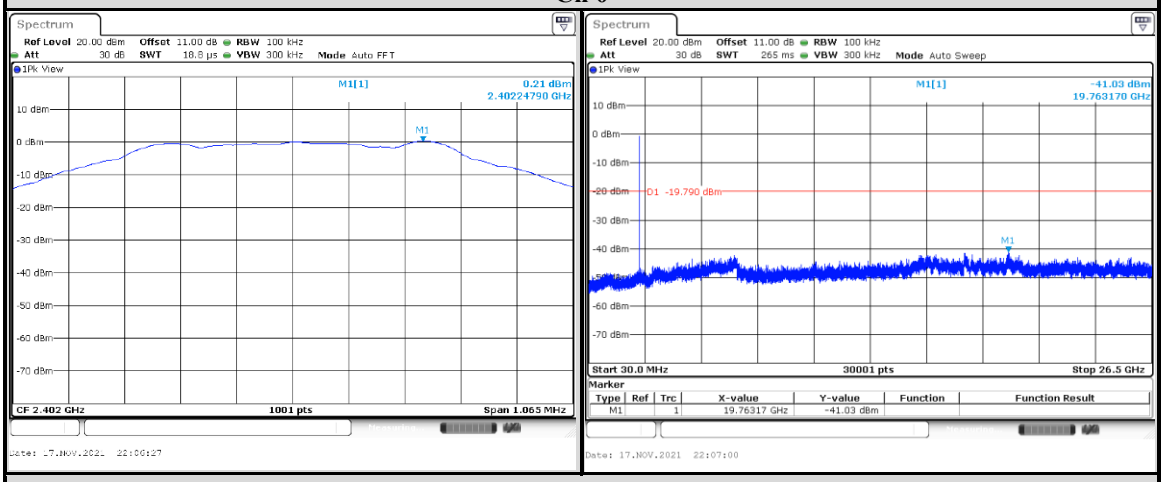


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

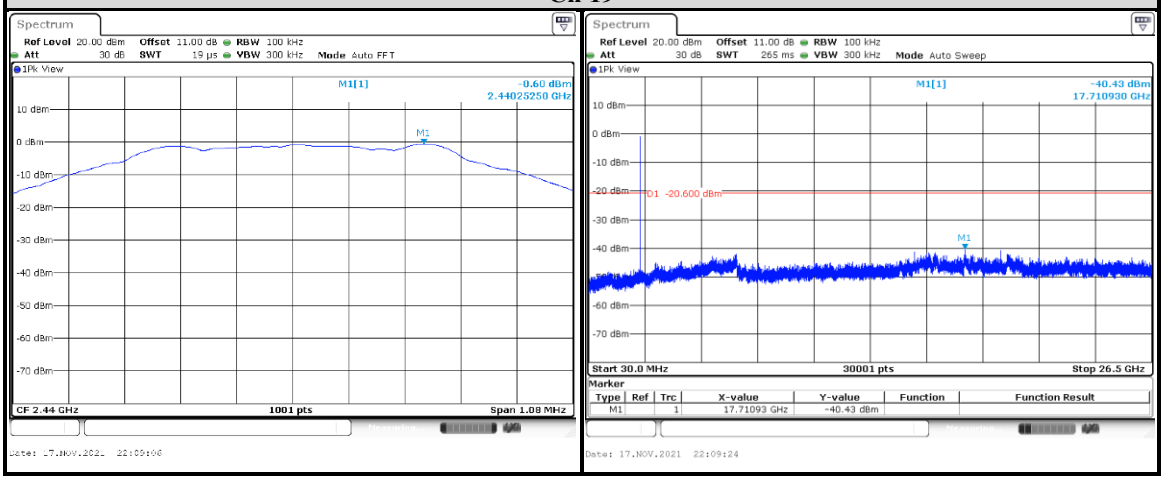
Test Data

BT LE_1Mbps

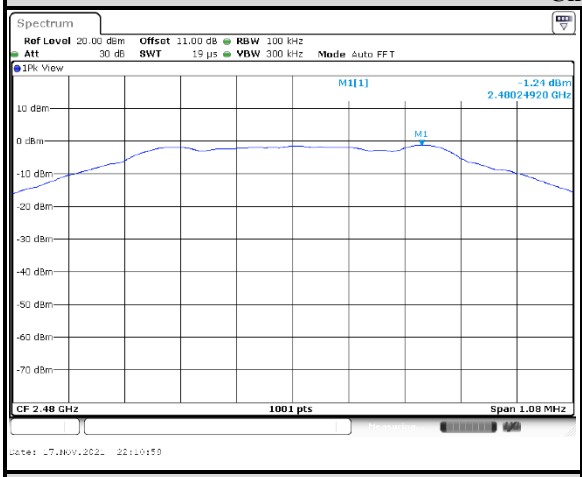
Ch 0

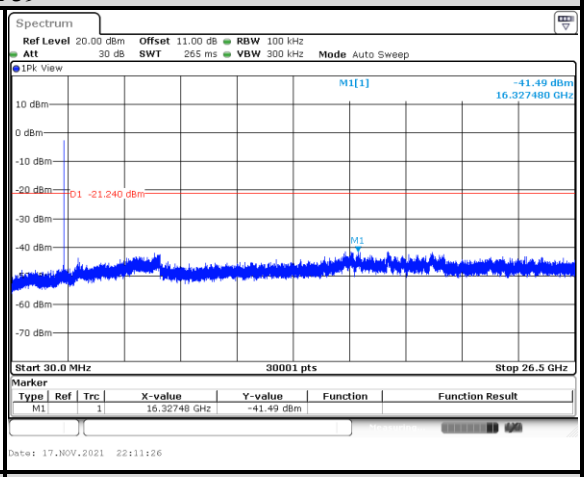


Ch 19

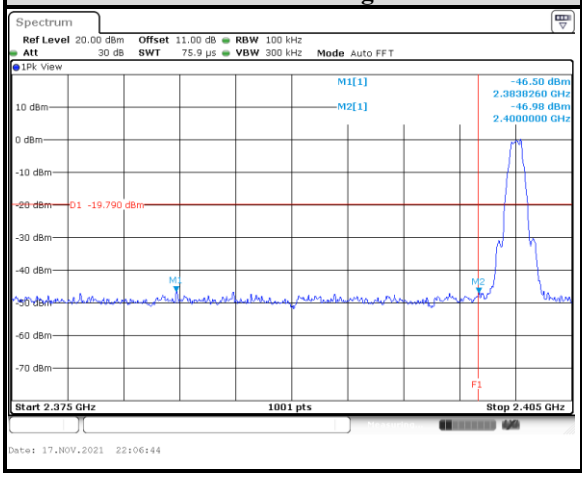


Ch 39

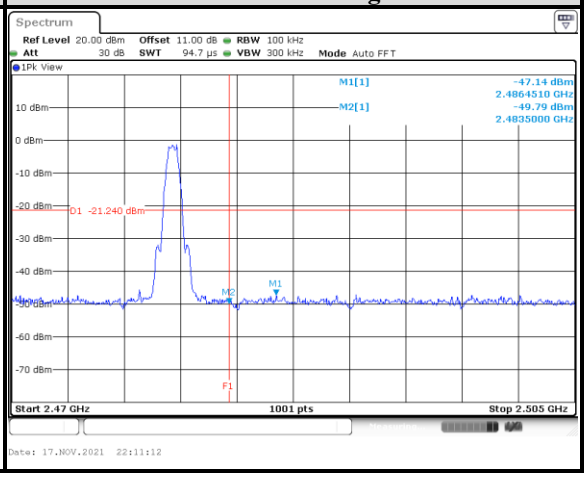




Ch 0 Band Edge

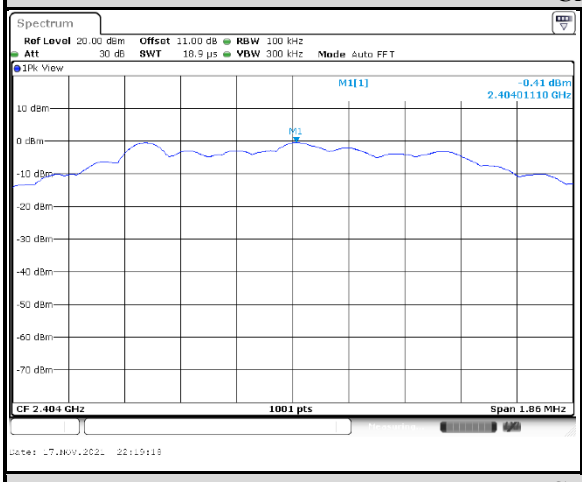


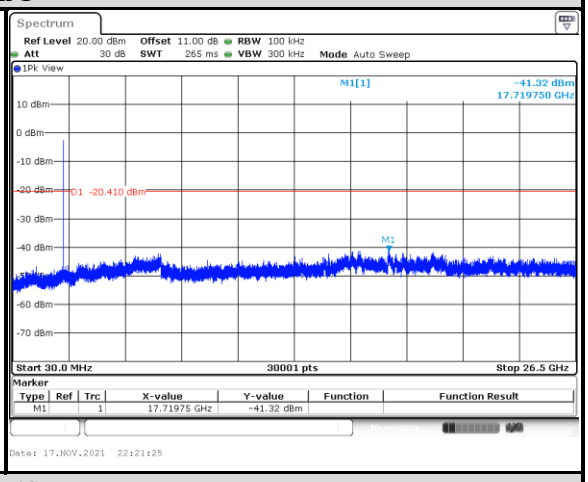
Ch 39 Band Edge



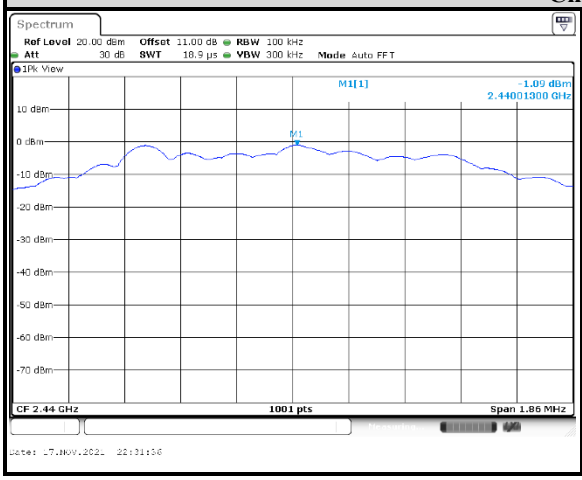
BT LE_2Mbps

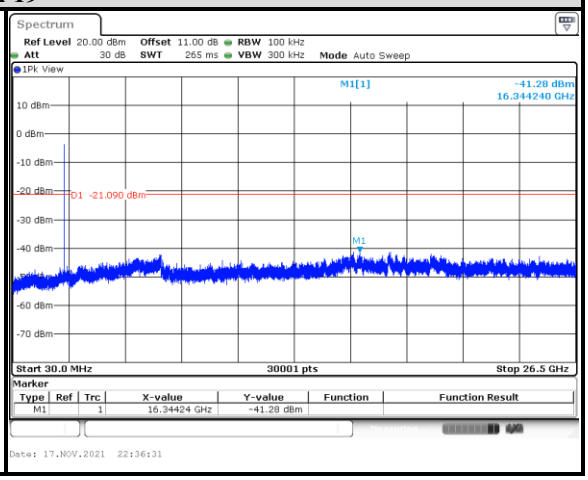
Ch 1



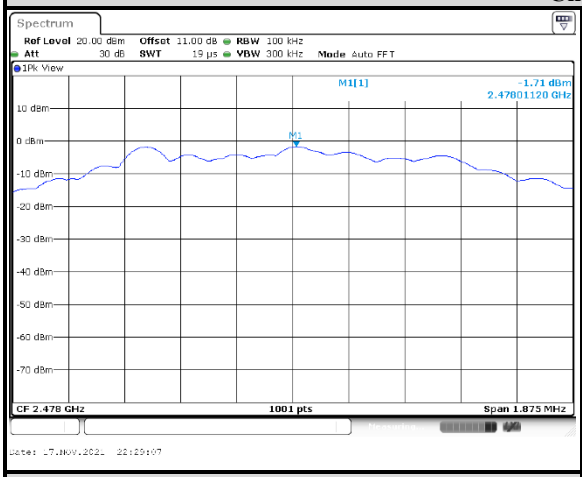


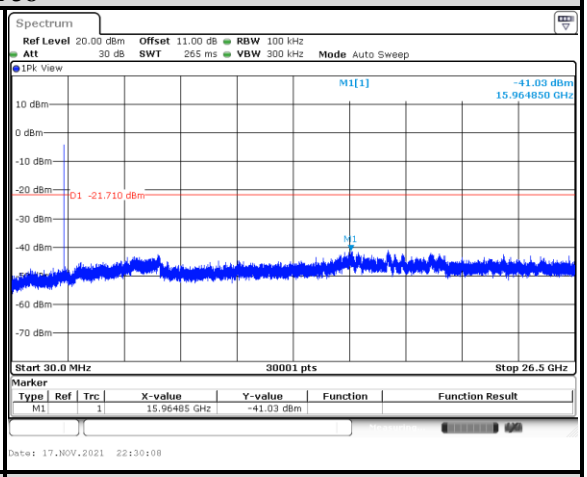
Ch 19



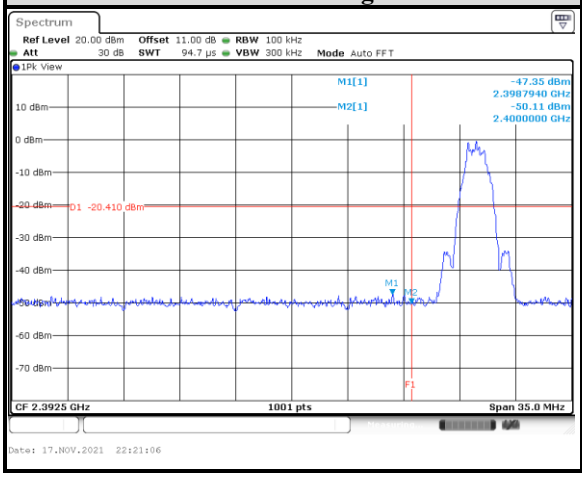


Ch 38

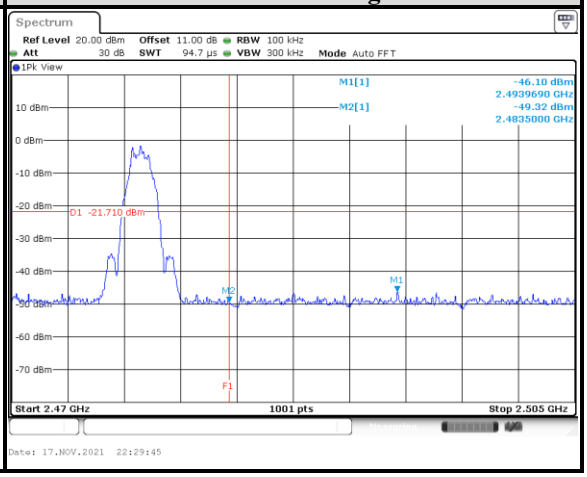




Ch 1 Band Edge



Ch 38 Band Edge



9.5. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Test Procedures

[For 9 kHz ~ 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.

Configuration	Average	
	RBW	VBW
BT LE_1Mbps	1MHz	510Hz
BT LE_2Mbps	1MHz	1kHz

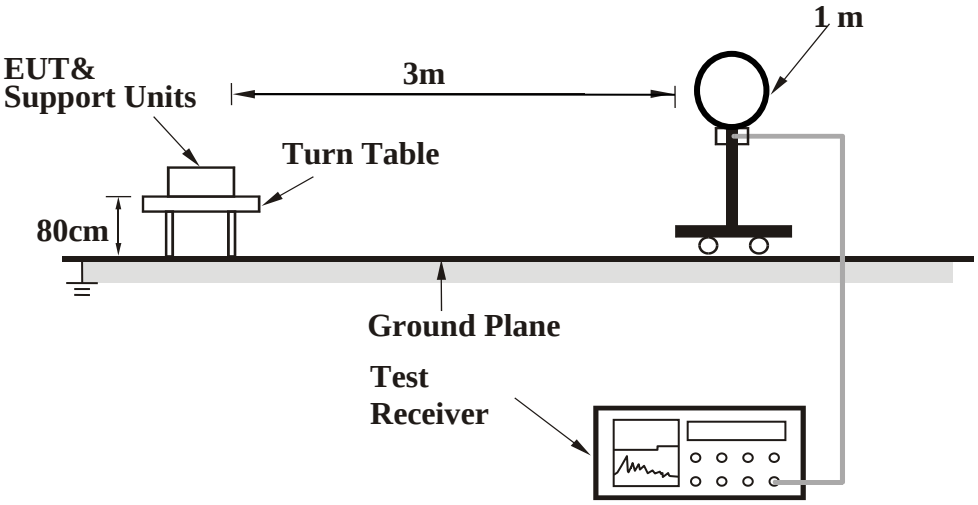
Note:

- The BT-LE-1M Duty cycle = (2.13/2.5)*100% = 85.2 <98%, so video bandwidth is 1/2.13 = 0.469 kHz. Therefore VBW configuration is 510Hz for testing.
- The BT-LE-2M Duty cycle = (1.07/1.25)*100% = 85.6 <98%, so video bandwidth is 1/1.07 = 0.935 kHz. Therefore VBW configuration is 1kHz for testing.
- Refer to section 6.6 for duty cycle.

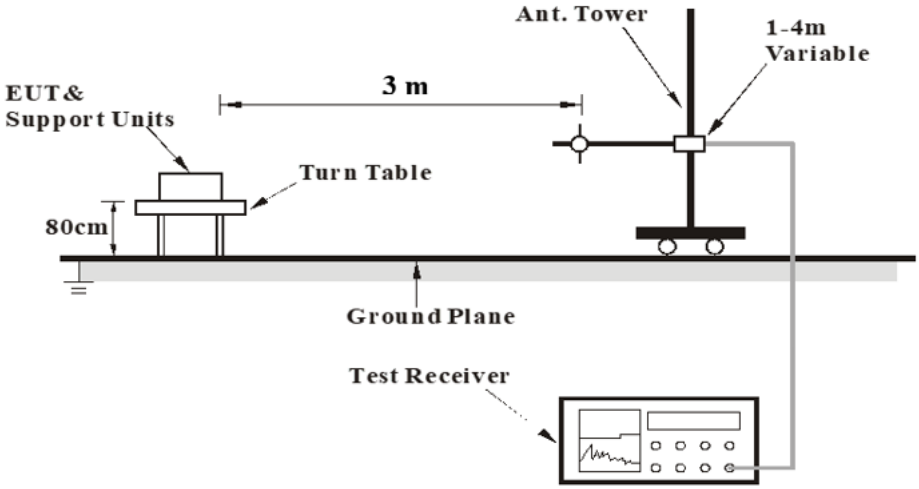
d. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
e. Test data of Result value (dBuV/m) = Reading value (dBuV) + Correction Factor (dB/m).
f. Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
g. Test data of Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).
h. Test data of Notation "@" = Fundamental Frequency
i. Test data of Notation " * " = The peak result under 20 dB above and complies with AVG limit, AVG result is deemed to comply with AVG limit.

Test Setup

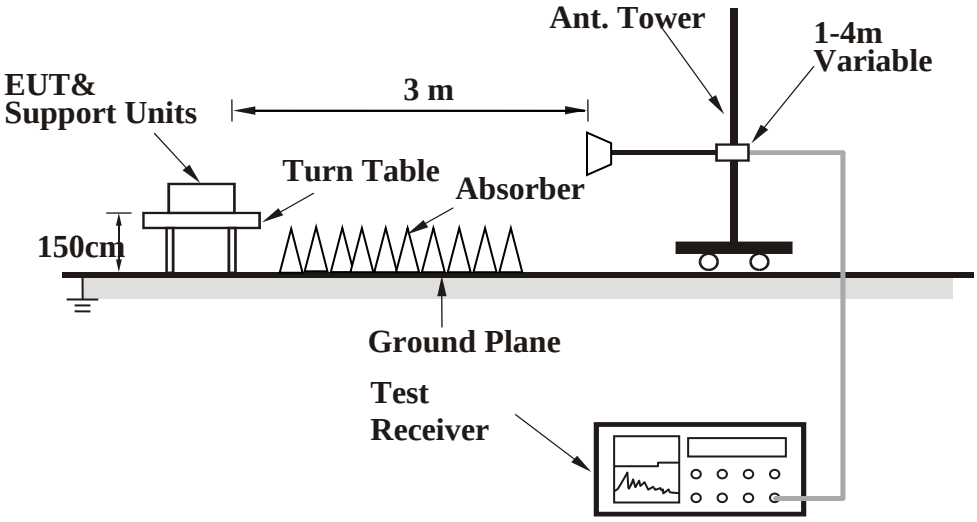
<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.

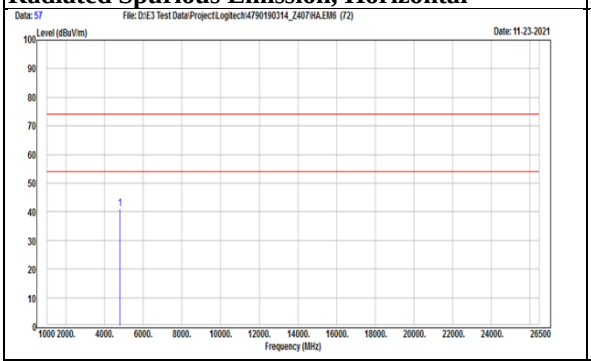
Test Data

Above 1 GHz

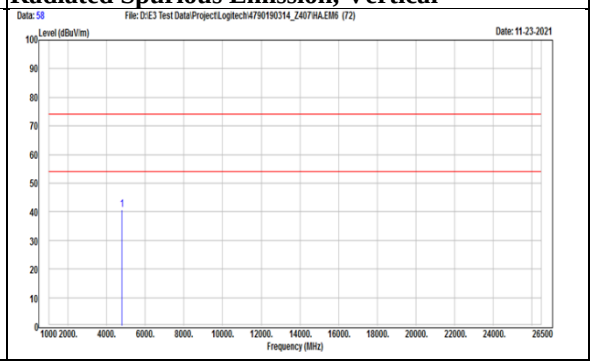
Mode	BT-LE-1Mbps	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2310.38	40.73	12.2	52.93	74	-21.07	PK
		2357.5	29.88	12.05	41.93	54	-12.07	AVG
	@	2402	86.17	12.13	98.3	N/A	N/A	PK
	@	2402	85.59	12.13	97.72	N/A	N/A	AVG
	*	4804	38.61	2.46	41.07	74	-32.93	PK
Vertical		2378.59	41.23	12.08	53.31	74	-20.69	PK
		2386.57	29.09	12.1	41.19	54	-12.81	AVG
	@	2402	82.45	12.13	94.58	N/A	N/A	PK
	@	2402	81.86	12.13	93.99	N/A	N/A	AVG
	*	4804	38.26	2.46	40.72	74	-33.28	PK

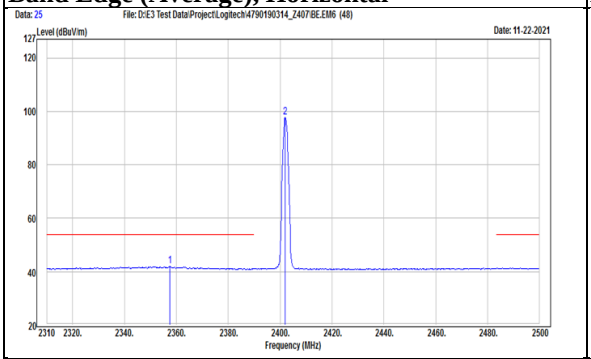
TX, BT-LE-1Mbps (Ch 0)
Radiated Spurious Emission, Horizontal



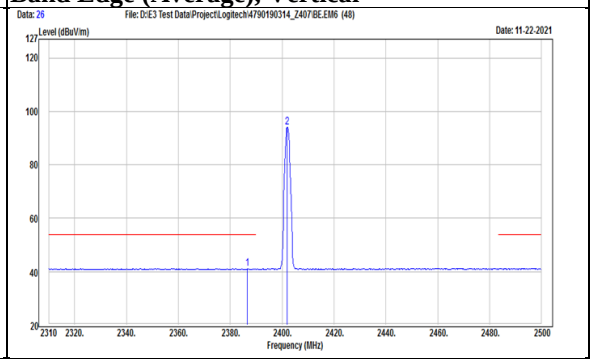
TX, BT-LE-1Mbps (Ch 0)
Radiated Spurious Emission, Vertical



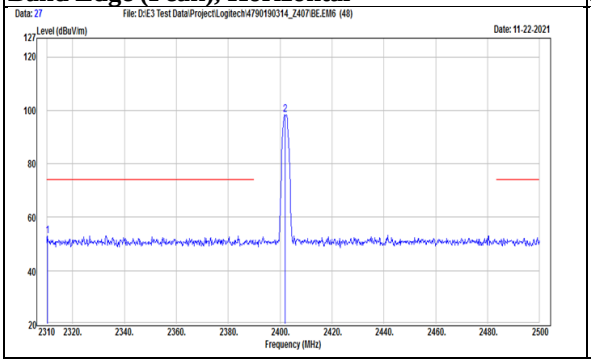
TX, BT-LE-1Mbps (Ch 0)
Band Edge (Average), Horizontal



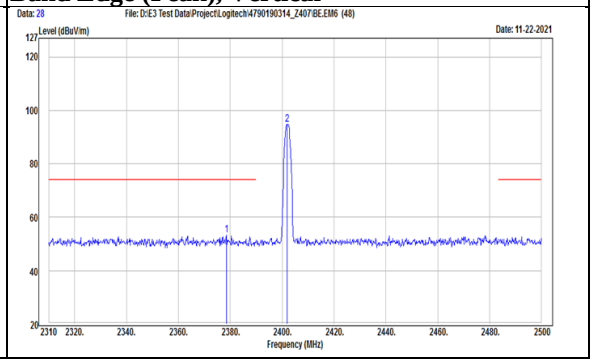
TX, BT-LE-1Mbps (Ch 0)
Band Edge (Average), Vertical



TX, BT-LE-1Mbps (Ch 0)
Band Edge (Peak), Horizontal



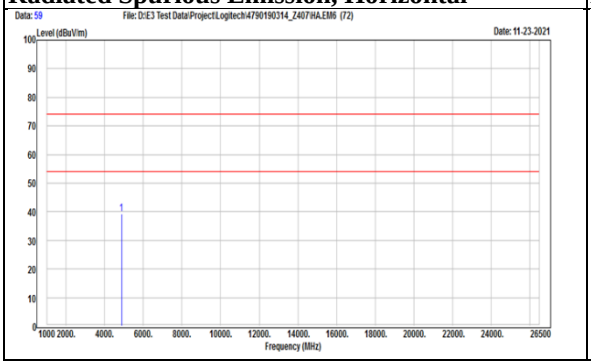
TX, BT-LE-1Mbps (Ch 0)
Band Edge (Peak), Vertical



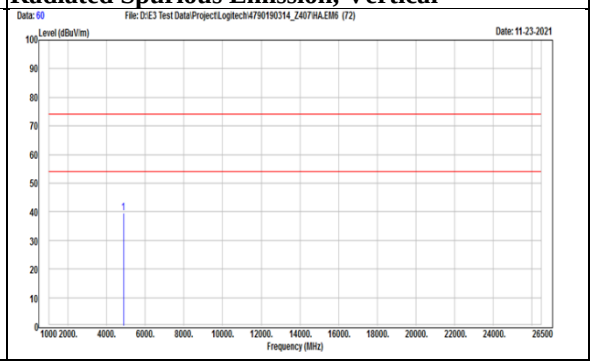
Mode	BT-LE-1Mbps	Channel	19

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2351.04	41.14	12.03	53.17	74	-20.83	PK
		2389.61	29.88	12.1	41.98	54	-12.02	AVG
	@	2440	85.29	12.11	97.4	N/A	N/A	PK
	@	2440	84.55	12.11	96.66	N/A	N/A	AVG
		2491.45	40.86	12.1	52.96	74	-21.04	PK
		2498.67	28.98	12.1	41.08	54	-12.92	AVG
	*	4880	36.71	2.66	39.37	74	-34.63	PK
Vertical		2348.19	41.03	12.04	53.07	74	-20.93	PK
		2388.28	29.11	12.1	41.21	54	-12.79	AVG
	@	2440	82.73	12.11	94.84	N/A	N/A	PK
	@	2440	82.1	12.11	94.21	N/A	N/A	AVG
		2483.66	29.01	12.1	41.11	54	-12.89	AVG
		2494.68	40.53	12.1	52.63	74	-21.37	PK
	*	4880	36.96	2.66	39.62	74	-34.38	PK

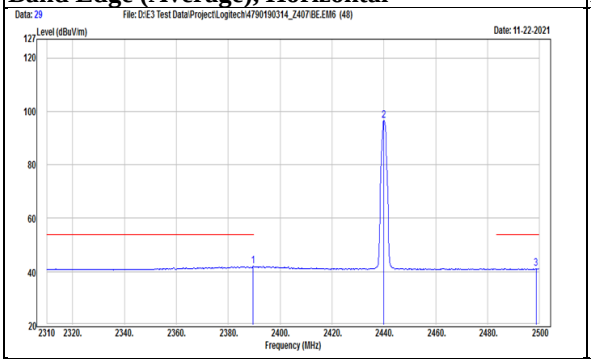
TX, BT-LE-1Mbps (Ch 19)
Radiated Spurious Emission, Horizontal



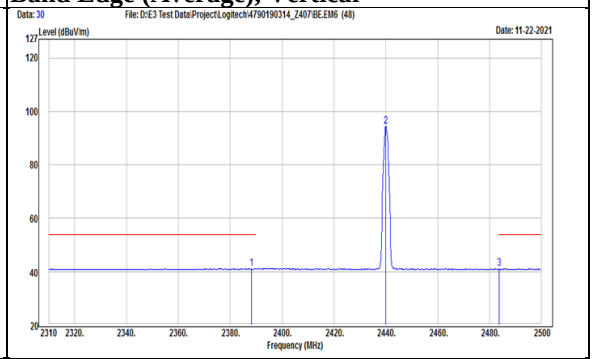
TX, BT-LE-1Mbps (Ch 19)
Radiated Spurious Emission, Vertical



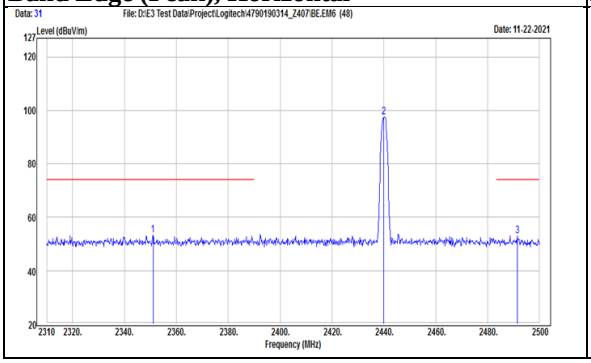
TX, BT-LE-1Mbps (Ch 19)
Band Edge (Average), Horizontal



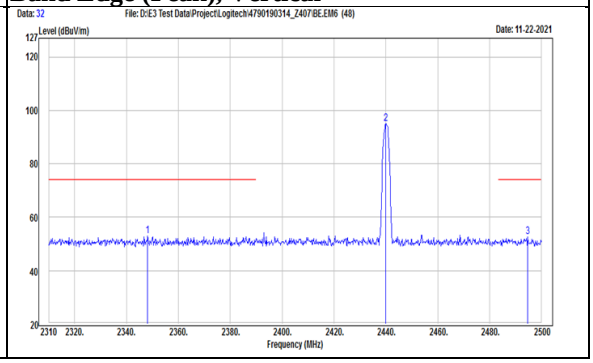
TX, BT-LE-1Mbps (Ch 19)
Band Edge (Average), Vertical



TX, BT-LE-1Mbps (Ch 19)
Band Edge (Peak), Horizontal



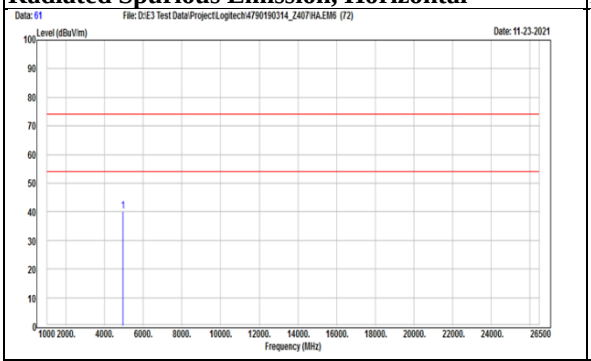
TX, BT-LE-1Mbps (Ch 19)
Band Edge (Peak), Vertical



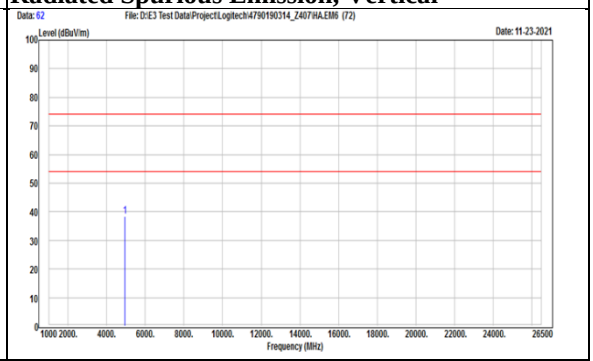
Mode	BT-LE-1Mbps	Channel	39

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2480	85.01	12.1	97.11	N/A	N/A	PK
	@	2480	84.1	12.1	96.2	N/A	N/A	AVG
		2483.66	29.34	12.1	41.44	54	-12.56	AVG
		2487.65	40.16	12.1	52.26	74	-21.74	PK
	*	4960	37.56	2.62	40.18	74	-33.82	PK
Vertical	@	2480	83.77	12.1	95.87	N/A	N/A	PK
	@	2480	83.13	12.1	95.23	N/A	N/A	AVG
		2484.99	29.05	12.1	41.15	54	-12.85	AVG
		2487.08	40.46	12.1	52.56	74	-21.44	PK
	*	4960	35.88	2.62	38.5	74	-35.5	PK

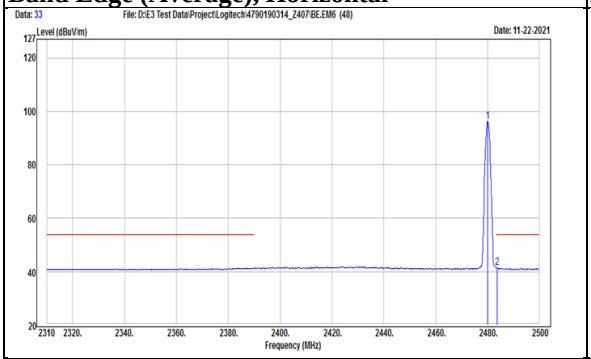
TX, BT-LE-1Mbps (Ch 39)
Radiated Spurious Emission, Horizontal



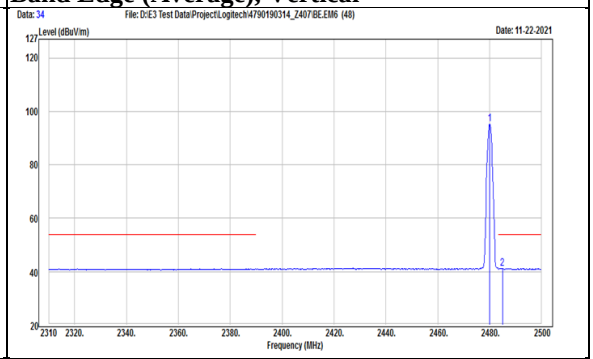
TX, BT-LE-1Mbps (Ch 39)
Radiated Spurious Emission, Vertical



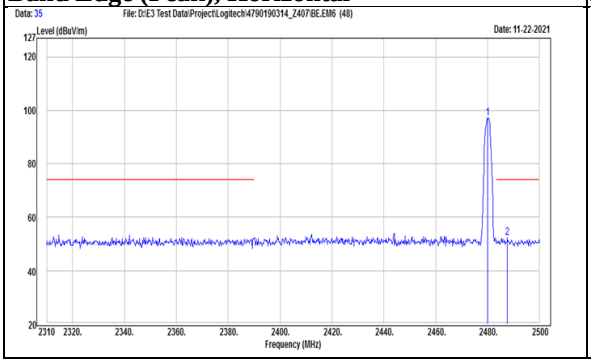
TX, BT-LE-1Mbps (Ch 39)
Band Edge (Average), Horizontal



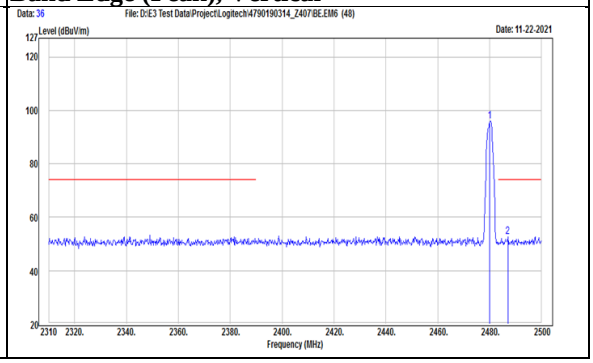
TX, BT-LE-1Mbps (Ch 39)
Band Edge (Average), Vertical



TX, BT-LE-1Mbps (Ch 39)
Band Edge (Peak), Horizontal



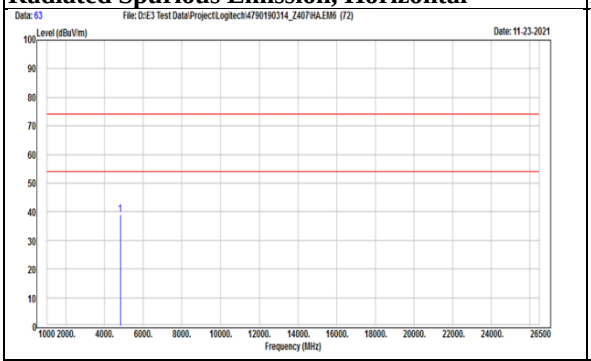
TX, BT-LE-1Mbps (Ch 39)
Band Edge (Peak), Vertical



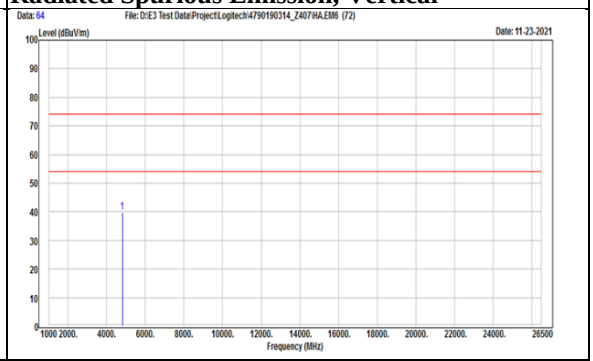
Mode	BT-LE-2Mbps	Channel	1

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2337.55	40.72	12.07	52.79	74	-21.21	PK
		2355.41	29.92	12.04	41.96	54	-12.04	AVG
	@	2404	85.97	12.12	98.09	N/A	N/A	PK
	@	2404	83.83	12.12	95.95	N/A	N/A	AVG
	*	4808	36.52	2.47	38.99	74	-35.01	PK
Vertical		2323.49	41.26	12.15	53.41	74	-20.59	PK
		2341.54	29.43	12.06	41.49	54	-12.51	AVG
	@	2404	82.19	12.12	94.31	N/A	N/A	PK
	@	2404	79.97	12.12	92.09	N/A	N/A	AVG
	*	4808	37.34	2.47	39.81	74	-34.19	PK

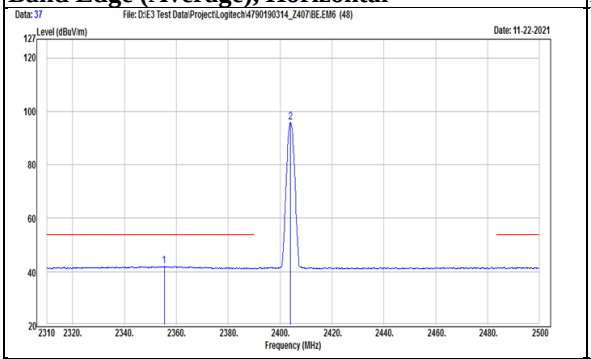
TX, BT-LE-2Mbps (Ch 1)
Radiated Spurious Emission, Horizontal



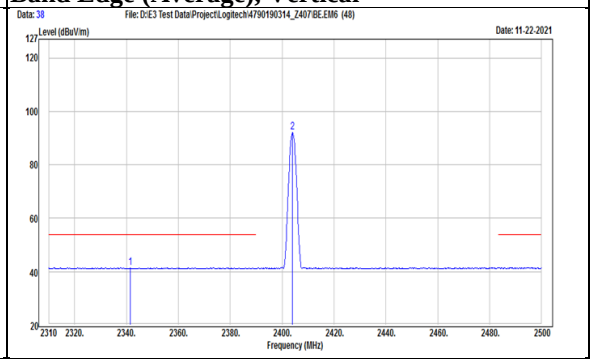
TX, BT-LE-2Mbps (Ch 1)
Radiated Spurious Emission, Vertical



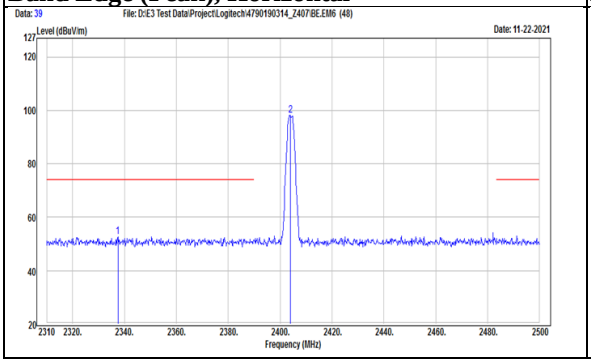
TX, BT-LE-2Mbps (Ch 1)
Band Edge (Average), Horizontal



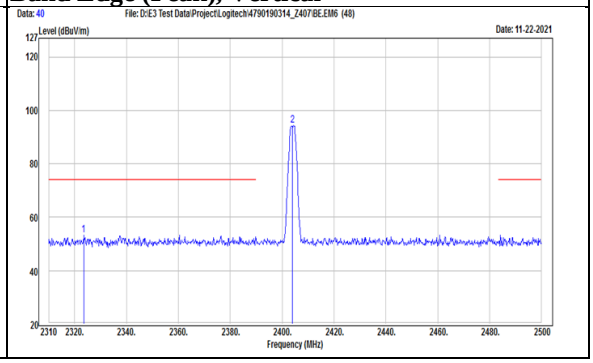
TX, BT-LE-2Mbps (Ch 1)
Band Edge (Average), Vertical



TX, BT-LE-2Mbps (Ch 1)
Band Edge (Peak), Horizontal



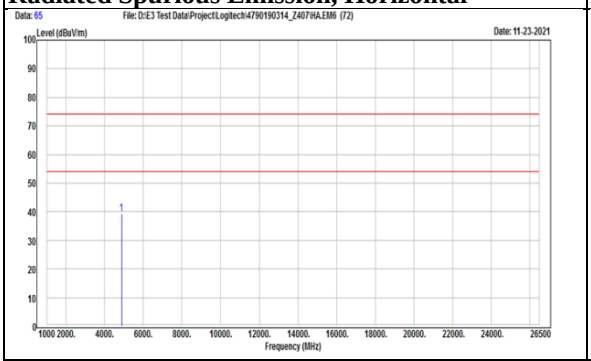
TX, BT-LE-2Mbps (Ch 1)
Band Edge (Peak), Vertical



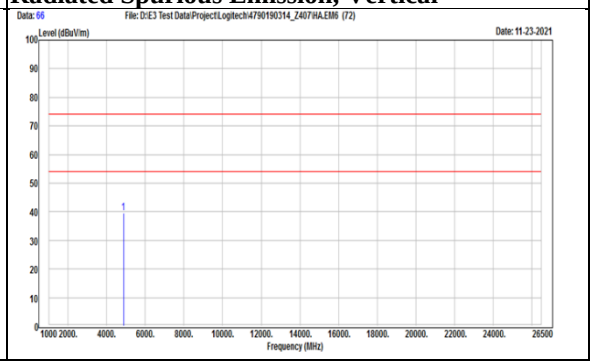
Mode	BT-LE-2Mbps	Channel	19

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2311.33	40.95	12.19	53.14	74	-20.86	PK
		2389.8	30.06	12.1	42.16	54	-11.84	AVG
	@	2440	84.55	12.11	96.66	N/A	N/A	PK
	@	2440	82.9	12.11	95.01	N/A	N/A	AVG
		2486.13	29.29	12.1	41.39	54	-12.61	AVG
		2498.29	41.54	12.1	53.64	74	-20.36	PK
	*	4880	36.51	2.66	39.17	74	-34.83	PK
Vertical		2356.55	41.92	12.04	53.96	74	-20.04	PK
		2384.67	29.42	12.09	41.51	54	-12.49	AVG
	@	2440	82.39	12.11	94.5	N/A	N/A	PK
	@	2440	80.63	12.11	92.74	N/A	N/A	AVG
		2490.12	40.81	12.1	52.91	74	-21.09	PK
		2499.81	29.3	12.1	41.4	54	-12.6	AVG
	*	4880	36.74	2.66	39.4	74	-34.6	PK

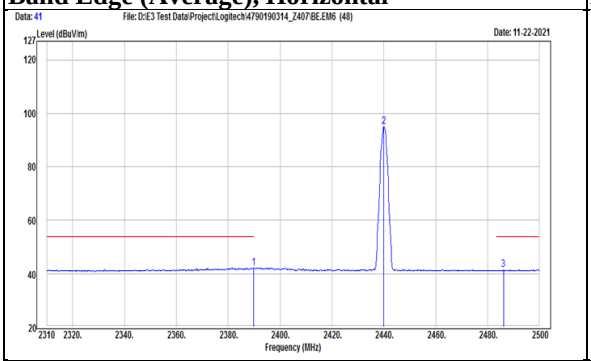
TX, BT-LE-2Mbps (Ch 19)
Radiated Spurious Emission, Horizontal



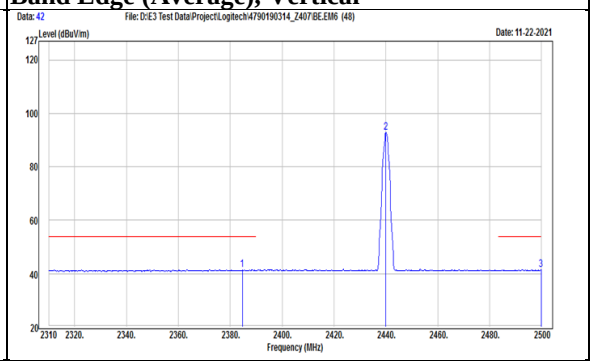
TX, BT-LE-2Mbps (Ch 19)
Radiated Spurious Emission, Vertical



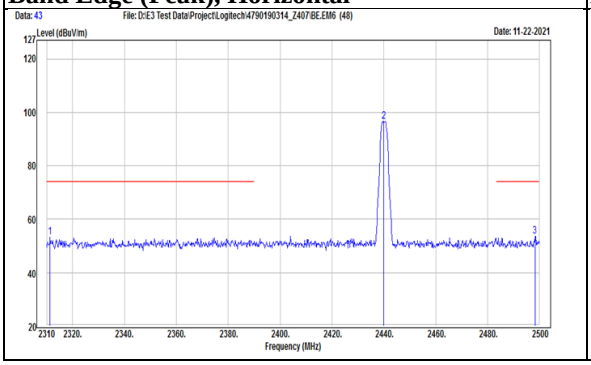
TX, BT-LE-2Mbps (Ch 19)
Band Edge (Average), Horizontal



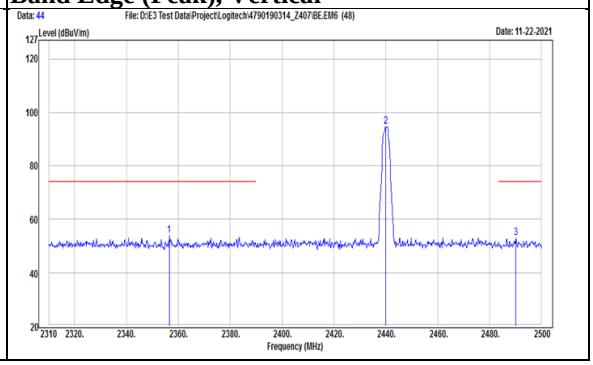
TX, BT-LE-2Mbps (Ch 19)
Band Edge (Average), Vertical



TX, BT-LE-2Mbps (Ch 19)
Band Edge (Peak), Horizontal



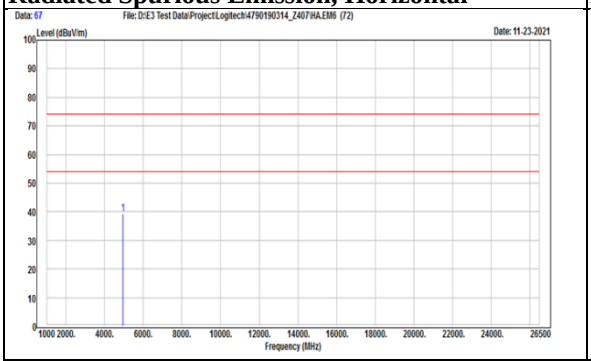
TX, BT-LE-2Mbps (Ch 19)
Band Edge (Peak), Vertical



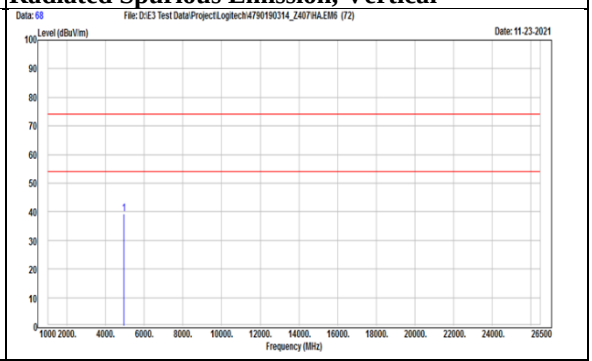
Mode	BT-LE-2Mbps	Channel	38

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2478	84.11	12.1	96.21	N/A	N/A	PK
	@	2478	82.32	12.1	94.42	N/A	N/A	AVG
		2493.73	29.33	12.1	41.43	54	-12.57	AVG
		2499.05	40.64	12.1	52.74	74	-21.26	PK
	*	4956	36.61	2.61	39.22	74	-34.78	PK
Vertical	@	2478	83.87	12.1	95.97	N/A	N/A	PK
	@	2478	81.91	12.1	94.01	N/A	N/A	AVG
		2494.68	40.81	12.1	52.91	74	-21.09	PK
		2496.01	29.43	12.1	41.53	54	-12.47	AVG
	*	4956	36.58	2.61	39.19	74	-34.81	PK

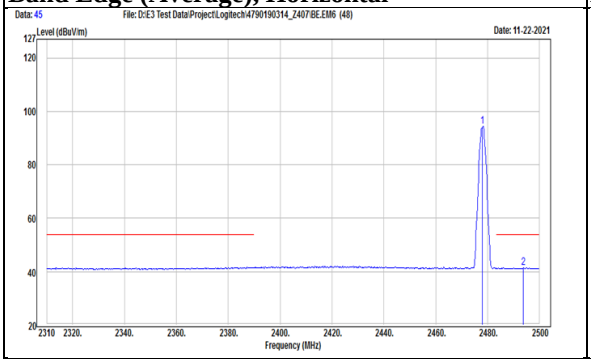
TX, BT-LE-2Mbps (Ch 38)
Radiated Spurious Emission, Horizontal



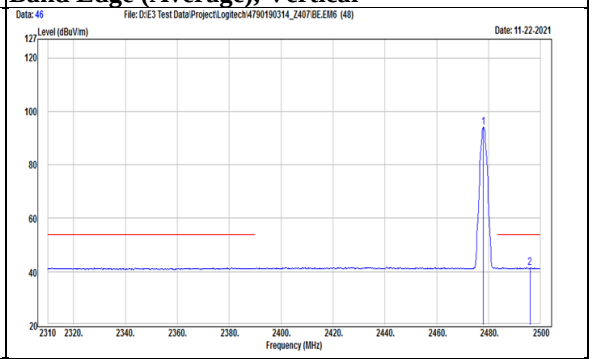
TX, BT-LE-2Mbps (Ch 38)
Radiated Spurious Emission, Vertical



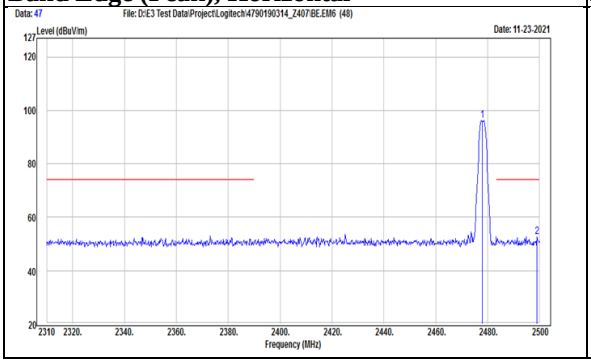
TX, BT-LE-2Mbps (Ch 38)
Band Edge (Average), Horizontal



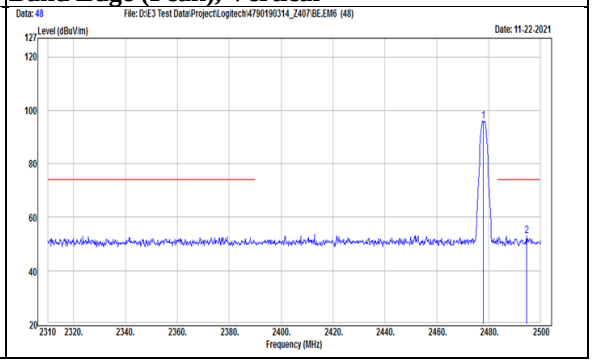
TX, BT-LE-2Mbps (Ch 38)
Band Edge (Average), Vertical



TX, BT-LE-2Mbps (Ch 38)
Band Edge (Peak), Horizontal



TX, BT-LE-2Mbps (Ch 38)
Band Edge (Peak), Vertical

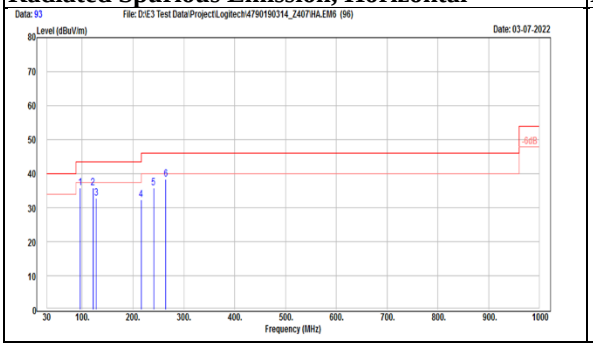


Below 1 GHz

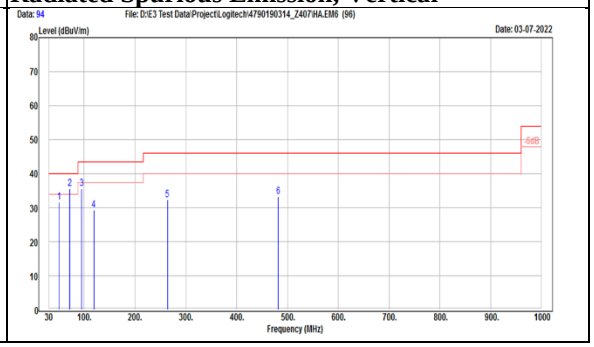
Mode	BT-LE-1Mbps	Channel	0

Polarization	Notation @	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		95.96	52.81	-17.09	35.72	43.5	-7.78	PK
		121.18	50	-14.23	35.77	43.5	-7.73	PK
		127.97	46.5	-13.67	32.83	43.5	-10.67	PK
		216.24	45.69	-13.33	32.36	46	-13.64	PK
		240.49	47.85	-12.14	35.71	46	-10.29	PK
		264.74	49.58	-11.21	38.37	46	-7.63	PK
Vertical		50.37	42.84	-11.15	31.69	40	-8.31	PK
		71.71	49.88	-14.4	35.48	40	-4.52	PK
		94.99	52.78	-17.27	35.51	43.5	-7.99	PK
		119.24	43.72	-14.43	29.29	43.5	-14.21	PK
		263.77	43.56	-11.27	32.29	46	-13.71	PK
		482.02	38.34	-5.17	33.17	46	-12.83	PK

TX, BT-LE-1Mbps (Ch 0)
Radiated Spurious Emission, Horizontal



TX, BT-LE-1Mbps (Ch 0)
Radiated Spurious Emission, Vertical



9 kHz ~ 30 MHz Data:

For 9 kHz to 30 MHz radiated emission have performed all modes of operation were investigated. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

No non-compliance noted:

KDB 414788 D01 OATS and Chamber Correlation Justification

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

- OATs and chamber correlation testing had been performed and chamber measured test results is the worst case test result.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

9.6. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

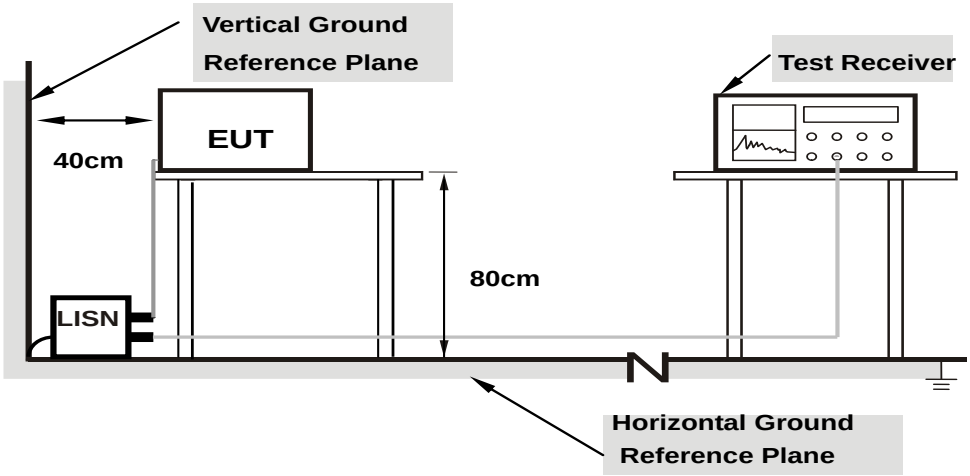
Note:
1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
3. Test data of Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB).
4. Test data of Margin(dB) = Result value (dBuV) - Limit value (dBuV).
5. Test data of Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).

Test Setup



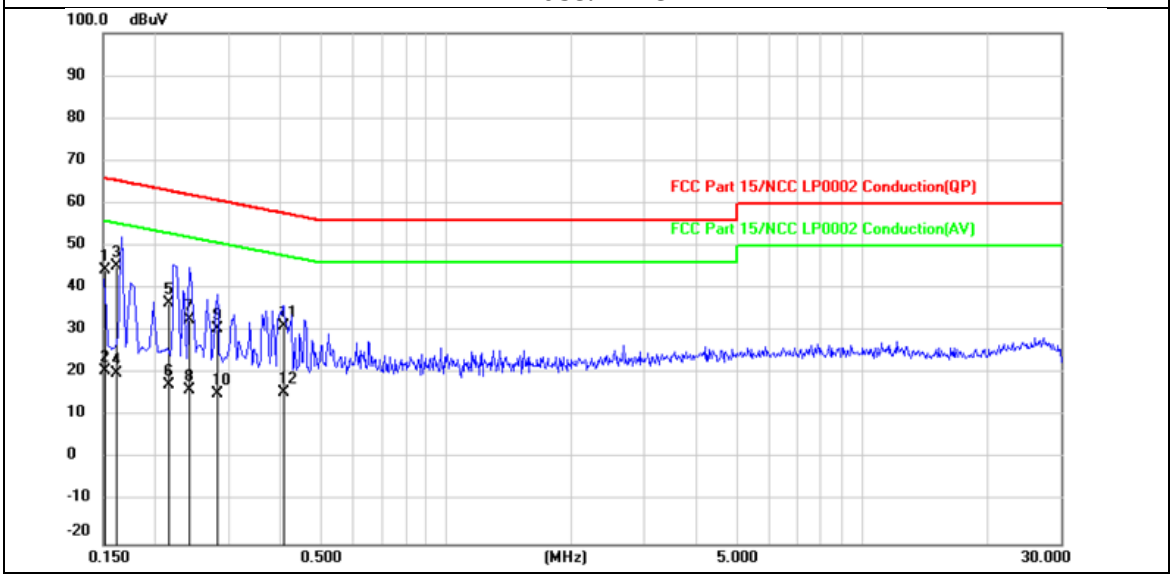
Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

Test Data

Mode	BLE(1M)_TX2402	Channel	0

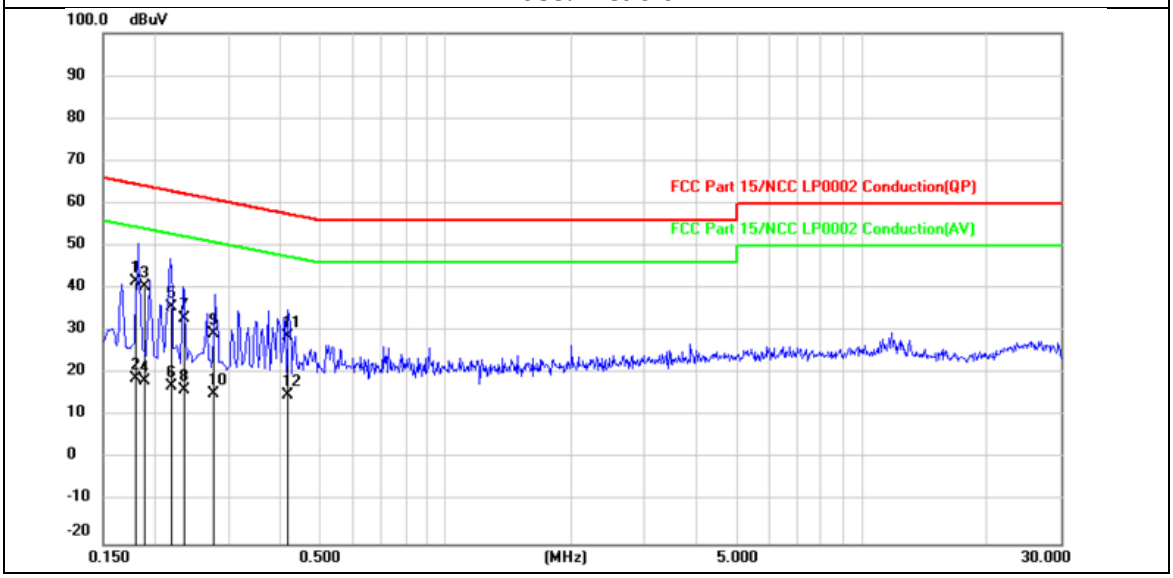
Phase: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1519	25.01	19.49	44.50	65.90	-21.40	QP
2	0.1519	1.19	19.49	20.68	55.90	-35.22	AVG
3	0.1620	25.66	19.49	45.15	65.36	-20.21	QP
4	0.1620	0.63	19.49	20.12	55.36	-35.24	AVG
5	0.2174	17.01	19.49	36.50	62.92	-26.42	QP
6	0.2174	-2.26	19.49	17.23	52.92	-35.69	AVG
7	0.2413	13.23	19.49	32.72	62.05	-29.33	QP
8	0.2413	-3.31	19.49	16.18	52.05	-35.87	AVG
9	0.2829	10.92	19.49	30.41	60.73	-30.32	QP
10	0.2829	-4.12	19.49	15.37	50.73	-35.36	AVG
11	0.4062	11.79	19.49	31.28	57.73	-26.45	QP
12	0.4062	-3.80	19.49	15.69	47.73	-32.04	AVG

Mode	BLE(1M)_TX2402	Channel	0

Phase: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1790	22.31	19.49	41.80	64.53	-22.73	QP
2	0.1790	-0.61	19.49	18.88	54.53	-35.65	AVG
3	0.1898	20.96	19.49	40.45	64.05	-23.60	QP
4	0.1898	-1.16	19.49	18.33	54.05	-35.72	AVG
5	0.2186	16.08	19.49	35.57	62.87	-27.30	QP
6	0.2186	-2.29	19.49	17.20	52.87	-35.67	AVG
7	0.2347	13.39	19.49	32.88	62.28	-29.40	QP
8	0.2347	-3.28	19.49	16.21	52.28	-36.07	AVG
9	0.2744	9.96	19.49	29.45	60.98	-31.53	QP
10	0.2744	-4.18	19.49	15.31	50.98	-35.67	AVG
11	0.4182	9.41	19.49	28.90	57.48	-28.58	QP
12	0.4182	-4.55	19.49	14.94	47.48	-32.54	AVG

END OF REPORT