RADIO TEST REPORT

Product	:	FluentPet Connect
Model Name	:	B100
Series Model	:	E200
FCC ID	:	2A2ZM-FPC100
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date	:	2021/11/23
Test Date	:	2021/11/23 ~ 2021/12/3
Issued Date	:	2022/3/2
Applicant	:	CleverPet, Inc. 302 Washington St. 150-3668 San Diego California United States
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

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REVISION HISTORY

Original Test Report No.: 4790201427-US-R0-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4790201427-US-R0-V0	2022/3/2	-	Initial issue

Table of Contents

1. Attestation of Test Results

APPLICANT:	CleverPet, Inc. 302 Washington St. 150-3668 San Diego California United States
EUT DESCRIPTION:	FluentPet Connect
BRAND:	FluentPet
MODEL:	B100
SERIES MODEL:	E200
SAMPLE STAGE:	Engineering Verification Test sample
DATE of TESTED:	2021/11/23 ~ 2021/12/3

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 Date : 2022/3/2
Project Handler

Approved and Authorized By:

Waternil Guan Date : 2022/3/2
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	FluentPet Connect
Brand Name	FluentPet
Model Name	B100
Series Model	E200
Operating Frequency	2402MHz ~ 2480MHz
Modulation	GFSK
Transfer Rate	Up to 1 Mbps
Number of Channel	40
Maximum Output Power	1.35 dBm
Normal Voltage	**B100:** 3.7Vdc from battery 5Vdc from Host **E200:** 4.5Vdc from battery (1.5V x3 AA-LR6)
Sample ID	Conducted Test: 4424547 Radiated Test: 4424545

Note:

1. The models difference table as below:

Model Functional Difference	
B100 (Mother)	**E200 (Daughter)**
Main PCB V2R3	Main PCB V2R3
BLE	BLE
Wi-Fi Module (FCC ID: 2AC7Z-ESP32S2WROOM)	N/A
Speaker	N/A
Lipo Battery (3.7Vdc 1200mAh)	Alkaline AA Battery (4.5Vdc)
USB port	N/A

2. The EUT contains following accessory devices:

Product	**Description**
USB Cable	Length: 0.24m

3. 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

6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	20~27°C/ 50~68%RH	3.7Vdc & 5Vdc	2021/11/23~ 2021/12/03	Mike Cai
Radiated Spurious Emission	966-2	20~27°C/ 50~68%RH	3.7Vdc & 5Vdc	2021/11/23~ 2021/12/03	Mike Cai
AC power Line Conducted Emission	SR1	20~27°C/ 50~68%RH	3.7Vdc & 5Vdc	2021/11/23~ 2021/12/03	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)	N/A	N/A	PCB	3.11

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

Model: B100

- The EUT has two power source types: 3.7Vdc from battery and 5Vdc from Host, above two types were pre-tested, the worst case was found in the 5Vdc. Therefore only the test data of the 5Vdc was recorded in this report.
- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Y plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Y plane.
- 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
Radiated Emissions (Below 1GHz)	GFSK	0 to 39	19	1 Mbps
AC Power Line Conducted Emission	GFSK	0 to 39	19	1 Mbps
Antenna Port Conducted Measurement	GFSK	0 to 39	0,19,39	1 Mbps

Model: E200

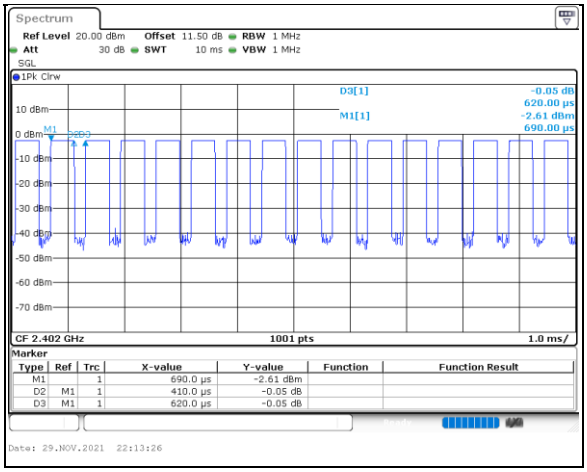
- The EUT only one power source types: 4.5Vdc from battery. Therefore only the test data of the 4.5Vdc was recorded in this report.
- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Y plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Y plane.
- 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.
- 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
Radiated Emissions (Below 1GHz)	GFSK	0 to 39	19	1 Mbps

6.6. Duty cycle

BT LE_1Mbps

BT-LE-1M: Duty cycle = 0.41/0.62 = 66.1%, Duty factor(dB) = 10 * log(1/0.661) = 1.8



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
Loop Antenna	ETS lindgren	6502	00213440	2020/12/25	2021/12/24
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2021/1/13	2022/1/12
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2020/12/30	2021/12/29
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2020/12/30	2021/12/29
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
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
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2021/1/22	2022/1/21

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	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	T0732ACFD20 020A300-1	2021/3/2	2022/3/1

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	USB Adapter	Xiaomi	AD16TW	AD16TW193400006532	Provided by Lab

I/O Cables

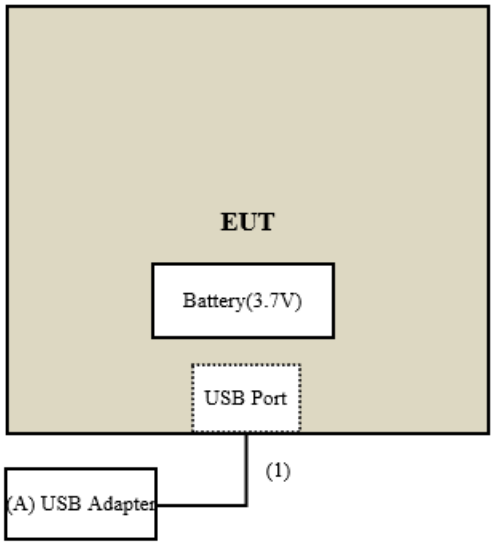
ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	Type C to Type C USB Cable	N/A	N/A	0.24	Supplied by client

Test Setup

Controlled using a bespoke application (SmartSnippets_Studio_v2.0.16.1760) 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

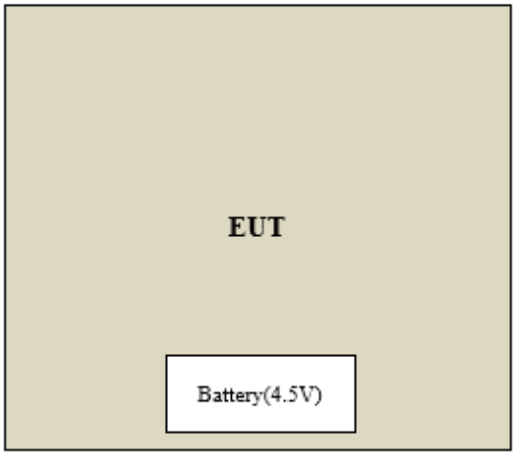
B100



Under Table

Remote Site

E200



Under Table

Remote Site

9. Test Results

9.1. 6dB Bandwidth

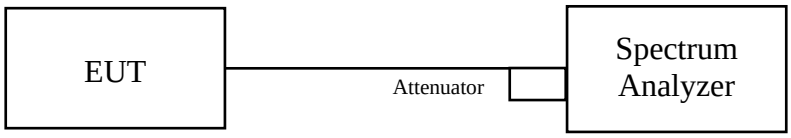
Requirements

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



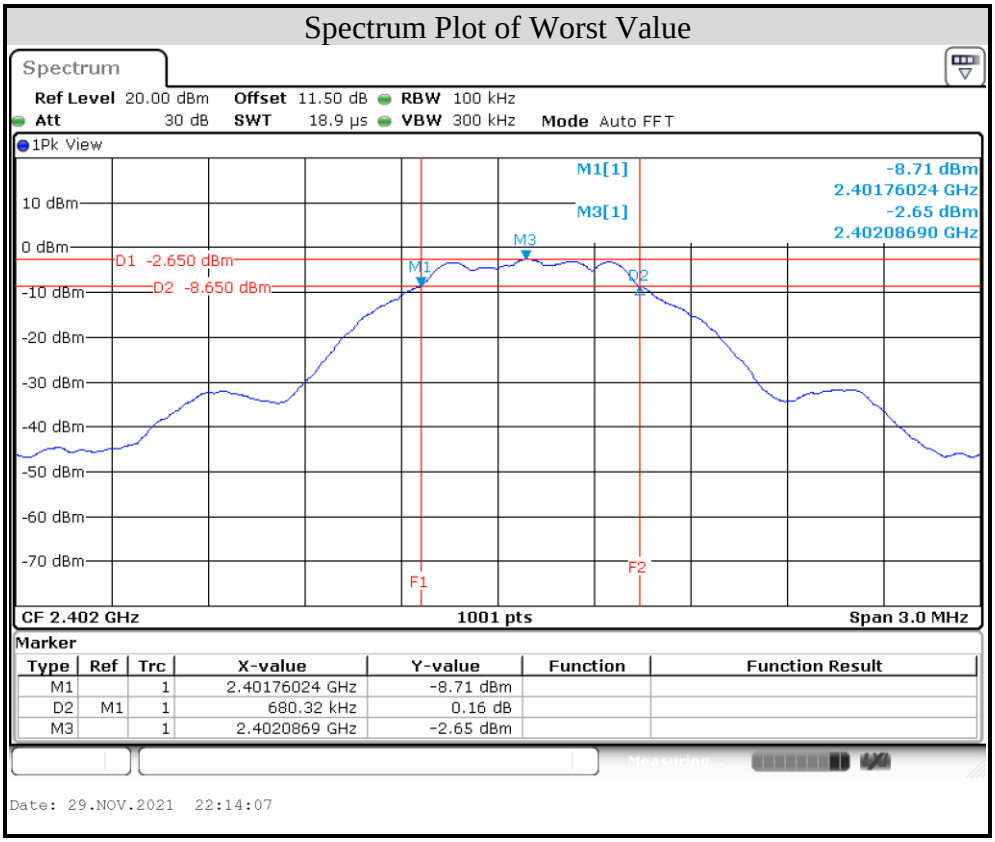
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

BT LE_1Mbps

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.68	0.5	PASS
19	2440	0.69	0.5	PASS
39	2480	0.68	0.5	PASS

Spectrum Plot of Worst Value



9.2. Conducted Output Power

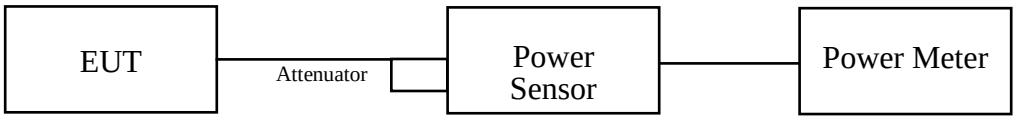
Requirements

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	1.358	1.33	30	PASS
19	2440	1.365	1.35	30	PASS
39	2480	1.327	1.23	30	PASS

Average Power (Reference Only)

BT LE_1Mbps

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	1.297	1.13
19	2440	1.309	1.17
39	2480	1.274	1.05

9.3. Power Spectral Density

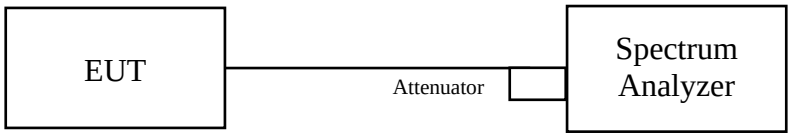
Requirements

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



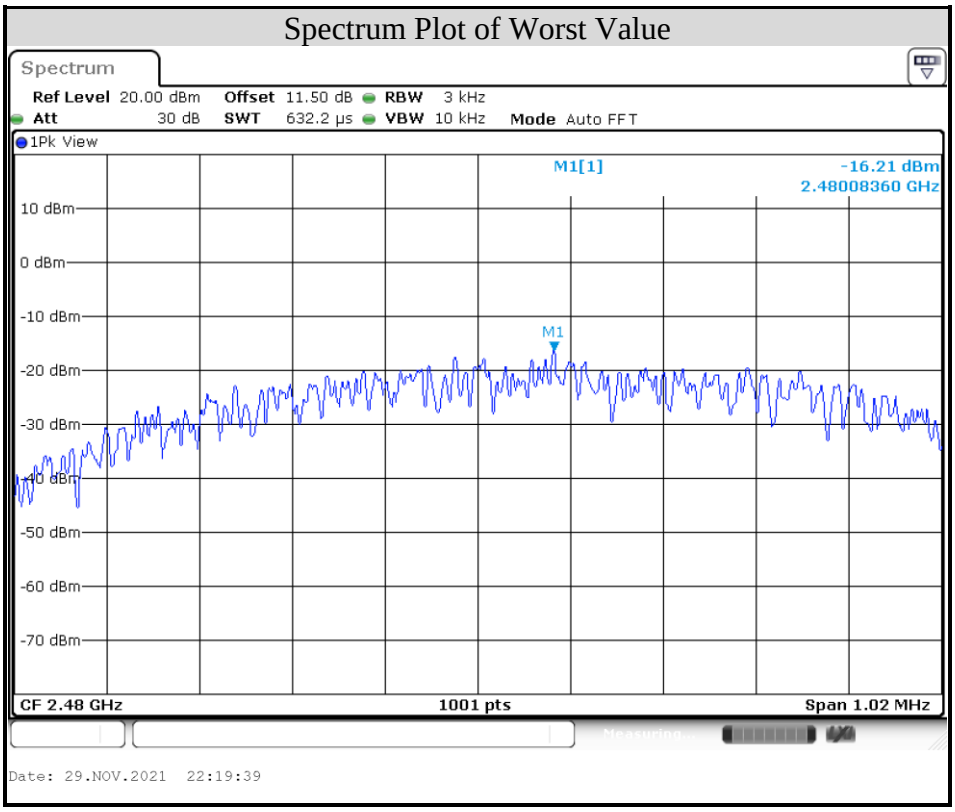
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

BT LE_1Mbps

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-16.82	8	PASS
19	2440	-16.77	8	PASS
39	2480	-16.21	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

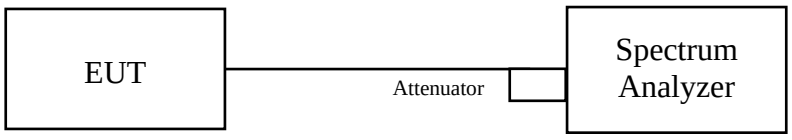
Measurement Procedure REF

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

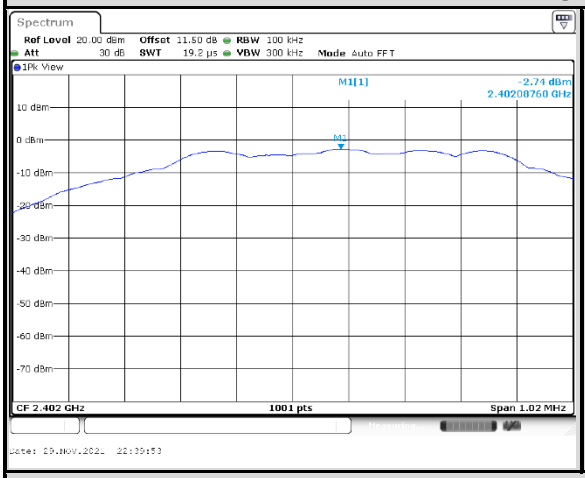


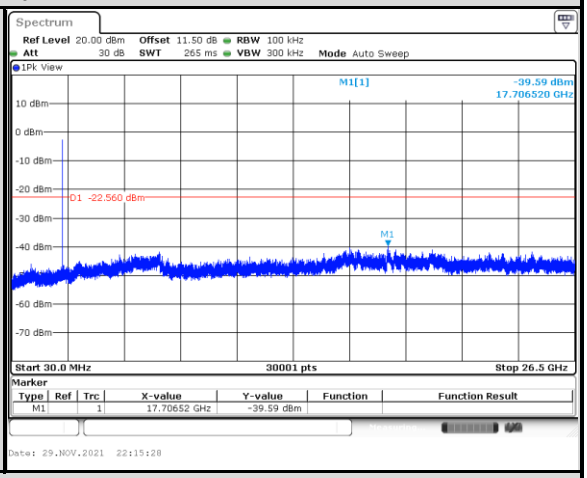
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

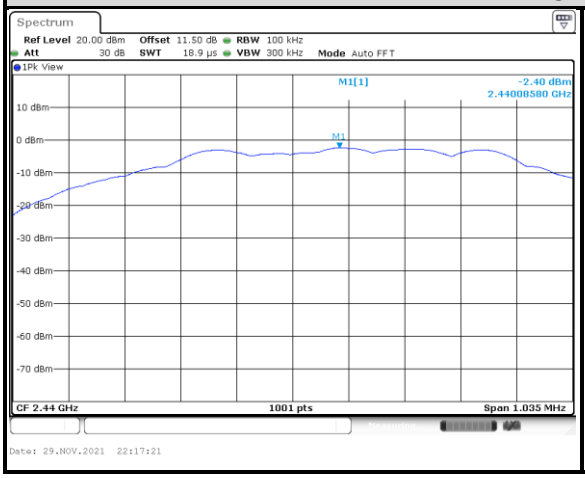
BT LE_1Mbps

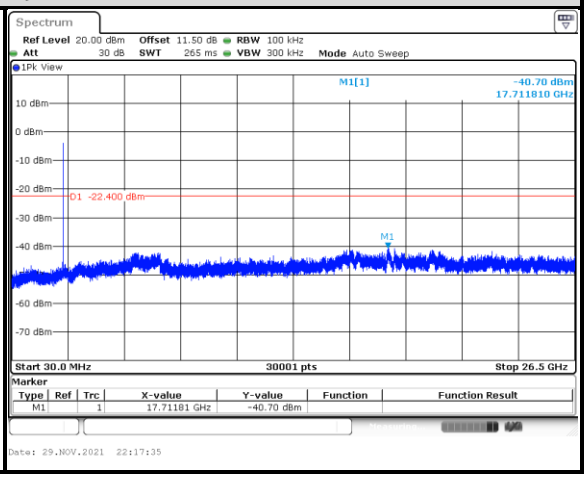
Ch 0



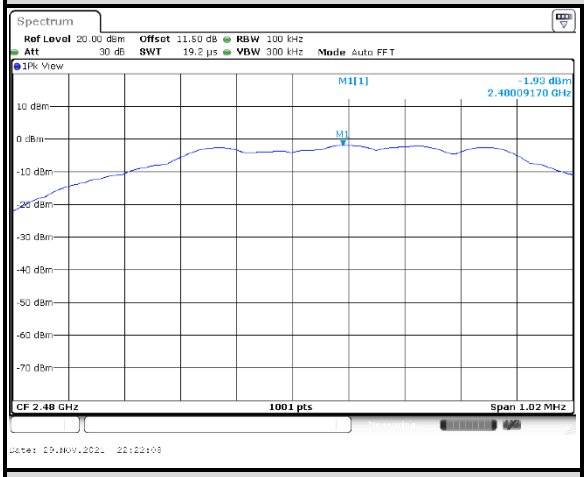


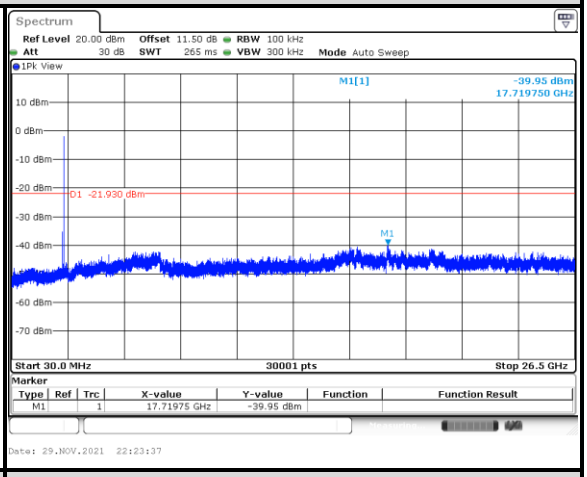
Ch 19



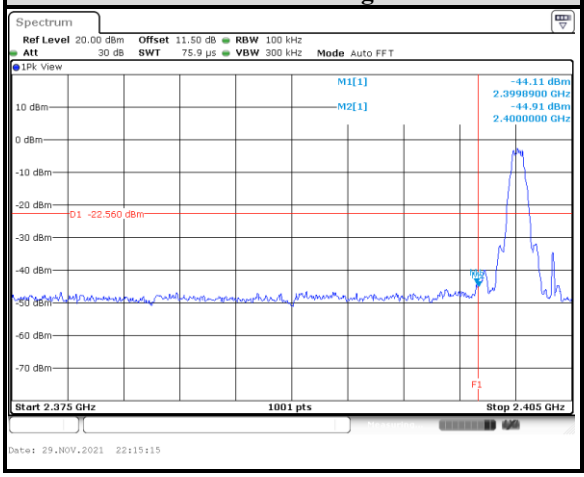


Ch 39

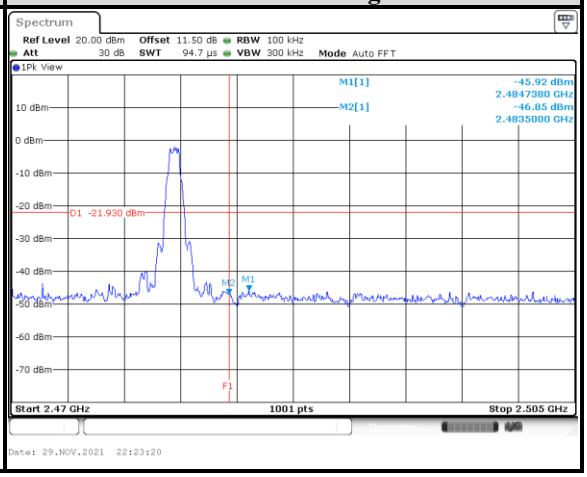




Ch 0 Band Edge



Ch 39 Band Edge



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
Bluetooth LE	1MHz	3kHz

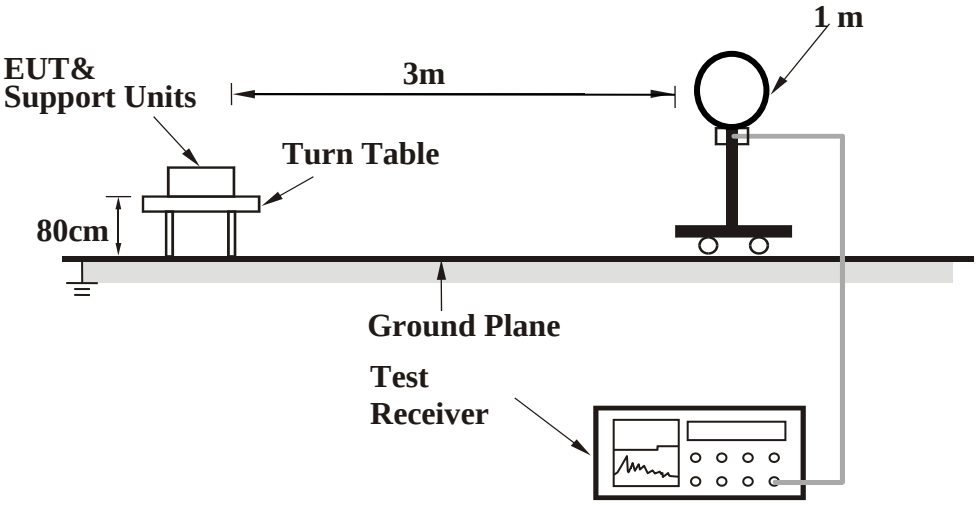
Note:

- The BT-LE-1M Duty cycle = (0.41/0.62)*100% = 66.129 <98%, so video bandwidth is 1/0.41 = 2.439 kHz. Therefore VBW configuration is 3kHz for testing.
- Refer to section 6.6 for duty cycle.

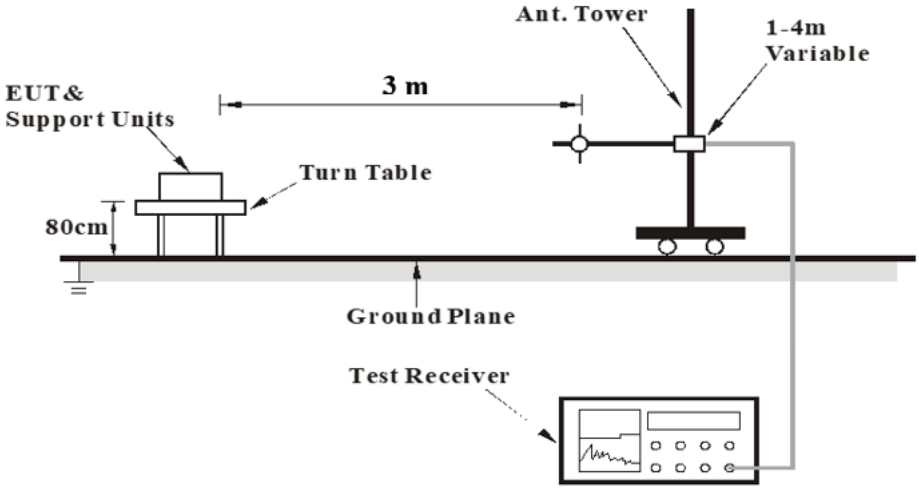
d. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
e. Test data of Result value (dBuV/m) = Reading value (dBuV) + Correction Factor (dB/m).
f. Test data of Margin(dB) = Result 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

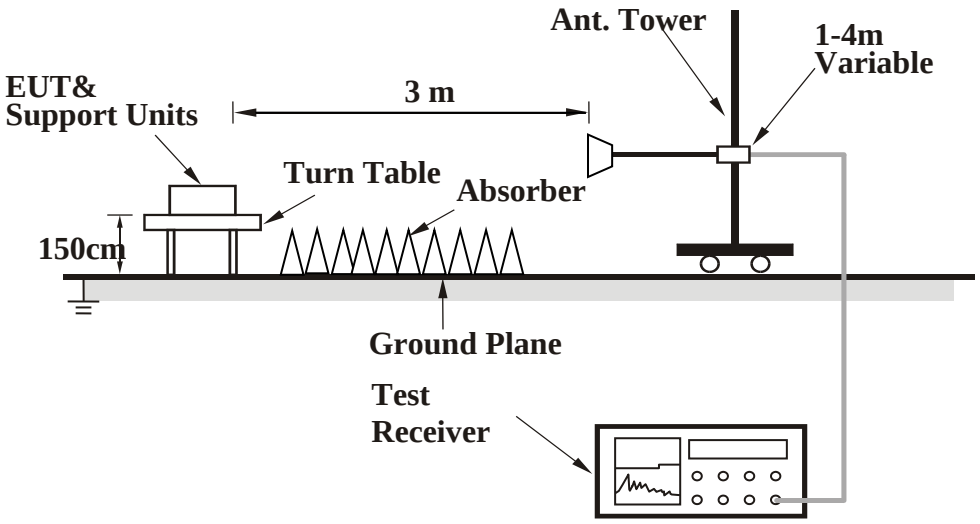
<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



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

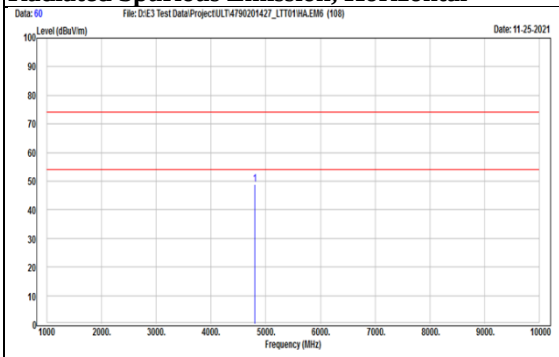
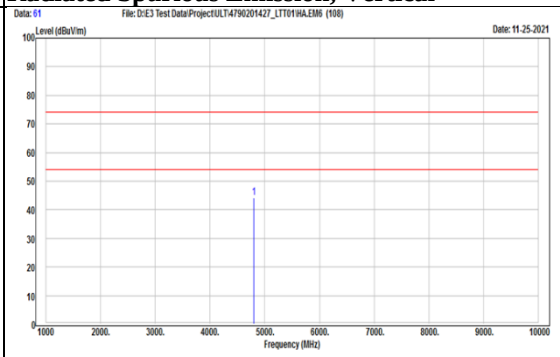
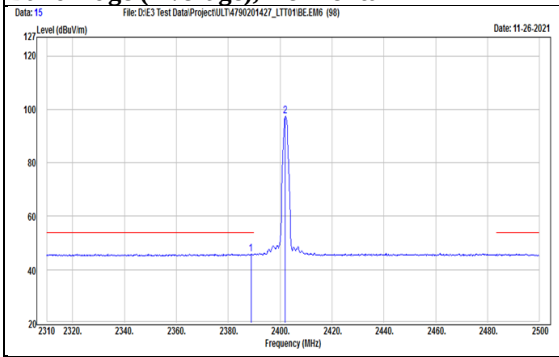
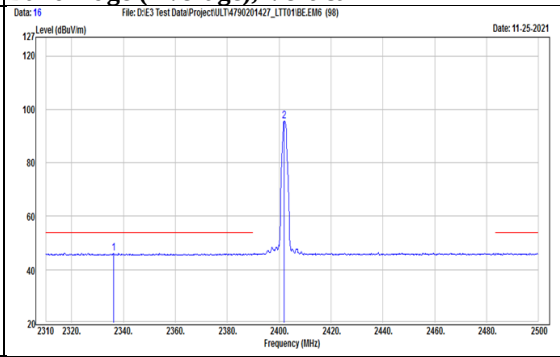
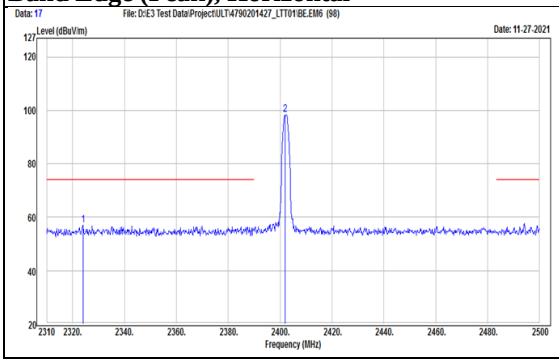
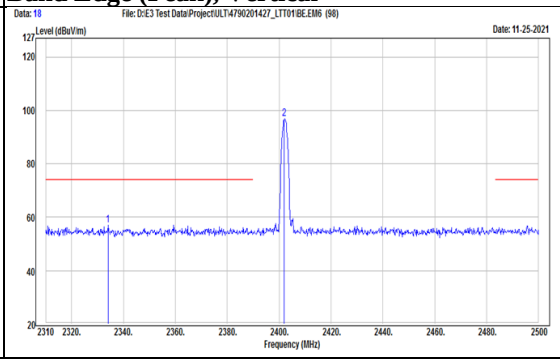
Test Data

B100

Above 1 GHz

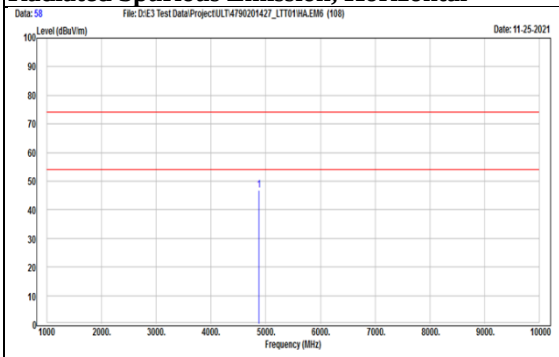
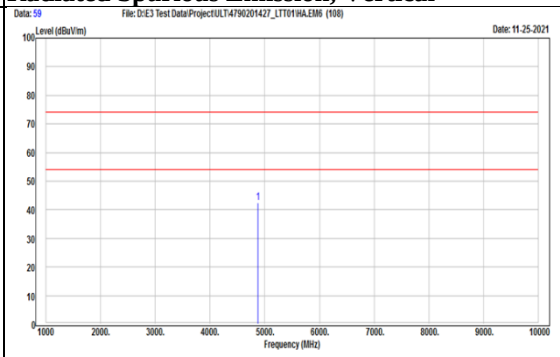
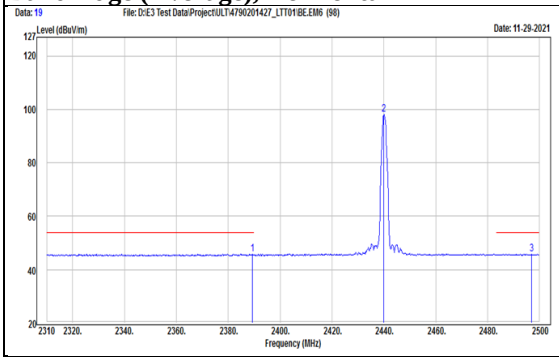
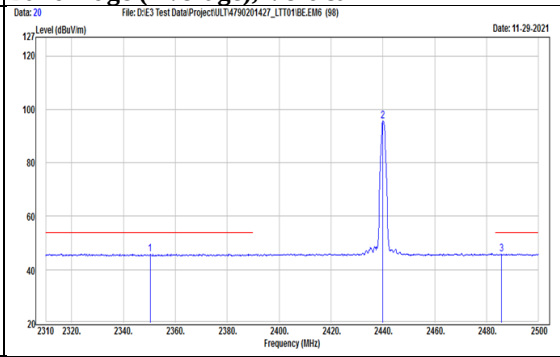
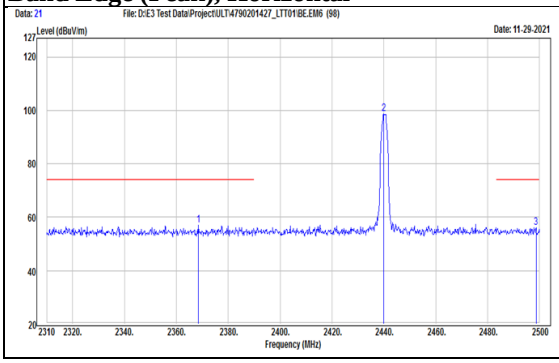
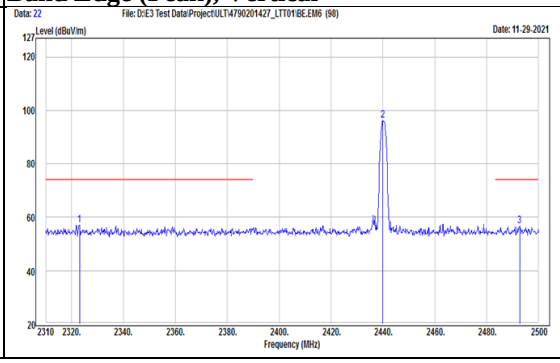
Mode	BT-LE-1Mbps	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2324.06	40.89	16.15	57.04	74	-16.96	PK
		2388.85	29.73	16.1	45.83	54	-8.17	AVG
	@	2402	82.11	16.13	98.24	N/A	N/A	PK
	@	2402	81.21	16.13	97.34	N/A	N/A	AVG
	*	4804	46.44	2.46	48.9	74	-25.1	PK
Vertical		2334.13	40.94	16.1	57.04	74	-16.96	PK
		2336.22	29.99	16.08	46.07	54	-7.93	AVG
	@	2402	80.6	16.13	96.73	N/A	N/A	PK
	@	2402	79.55	16.13	95.68	N/A	N/A	AVG
	*	4804	41.58	2.46	44.04	74	-29.96	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**
	

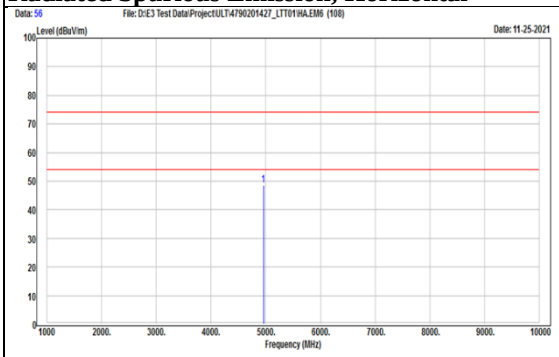
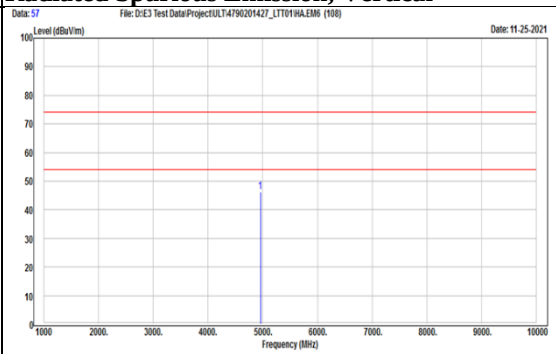
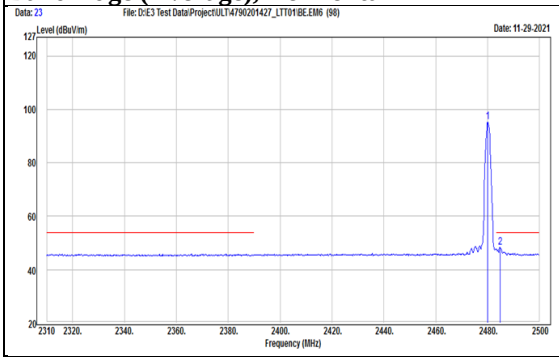
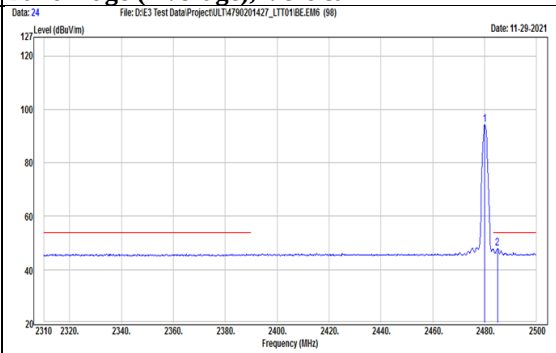
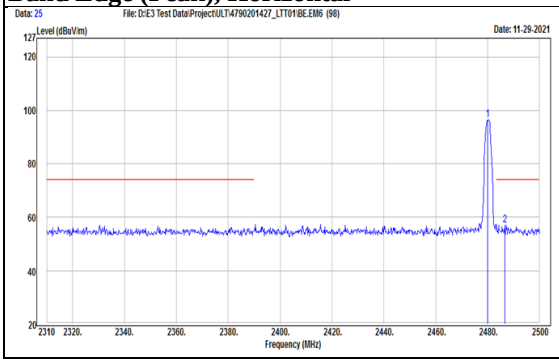
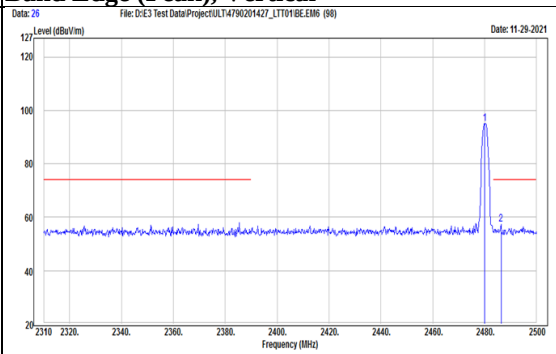
Mode	BT-LE-1Mbps	Channel	19

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2368.52	40.88	16.07	56.95	74	-17.05	PK
		2389.42	29.79	16.1	45.89	54	-8.11	AVG
	@	2440	82.62	16.11	98.73	N/A	N/A	PK
	@	2440	81.81	16.11	97.92	N/A	N/A	AVG
		2496.96	29.67	16.1	45.77	54	-8.23	AVG
		2498.67	39.93	16.1	56.03	74	-17.97	PK
	*	4880	44	2.66	46.66	74	-27.34	PK
Vertical		2323.11	40.89	16.14	57.03	74	-16.97	PK
		2350.28	29.87	16.03	45.9	54	-8.1	AVG
	@	2440	79.97	16.11	96.08	N/A	N/A	PK
	@	2440	79.41	16.11	95.52	N/A	N/A	AVG
		2485.75	29.86	16.1	45.96	54	-8.04	AVG
		2492.78	40.58	16.1	56.68	74	-17.32	PK
	*	4880	39.77	2.66	42.43	74	-31.57	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

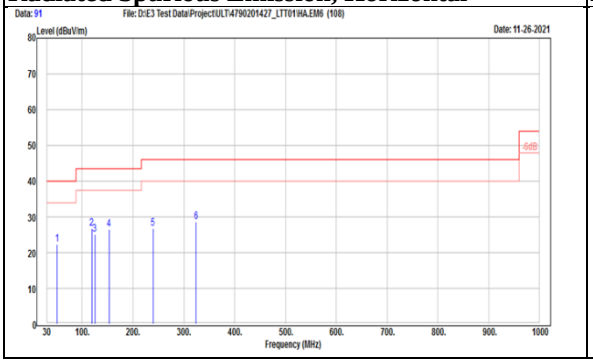
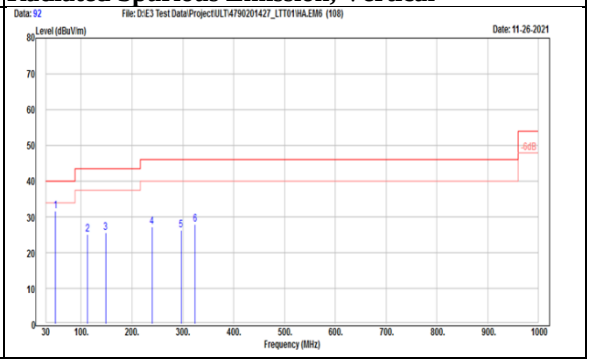
Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2480	80.29	16.1	96.39	N/A	N/A	PK
	@	2480	79.16	16.1	95.26	N/A	N/A	AVG
		2484.8	32.16	16.1	48.26	54	-5.74	AVG
		2486.7	40.95	16.1	57.05	74	-16.95	PK
	*	4960	46.07	2.62	48.69	74	-25.31	PK
Vertical	@	2480	78.88	16.1	94.98	N/A	N/A	PK
	@	2480	78.11	16.1	94.21	N/A	N/A	AVG
		2484.99	31.75	16.1	47.85	54	-6.15	AVG
		2486.32	41.1	16.1	57.2	74	-16.8	PK
	*	4960	43.49	2.62	46.11	74	-27.89	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**
	

Below 1 GHz

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		50.37	33.36	-11.1	22.26	40	-17.74	PK
		119.24	41.26	-14.41	26.85	43.5	-16.65	PK
		125.06	39.11	-13.96	25.15	43.5	-18.35	PK
		153.19	37.84	-11.34	26.5	43.5	-17	PK
		239.52	38.96	-12.12	26.84	46	-19.16	PK
		323.91	37.76	-9.18	28.58	46	-17.42	PK
Vertical		49.4	42.7	-11.15	31.55	40	-8.45	PK
		112.45	39.92	-14.75	25.17	43.5	-18.33	PK
		148.34	37.07	-11.54	25.53	43.5	-17.97	PK
		239.52	39.41	-12.12	27.29	46	-18.71	PK
		296.75	36.35	-10.08	26.27	46	-19.73	PK
		323.91	37.17	-9.18	27.99	46	-18.01	PK

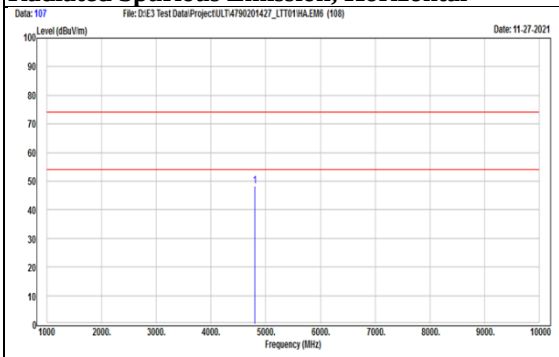
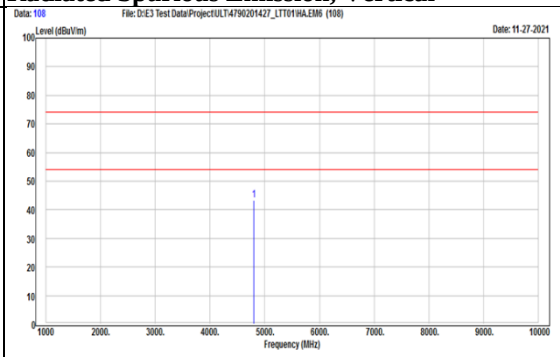
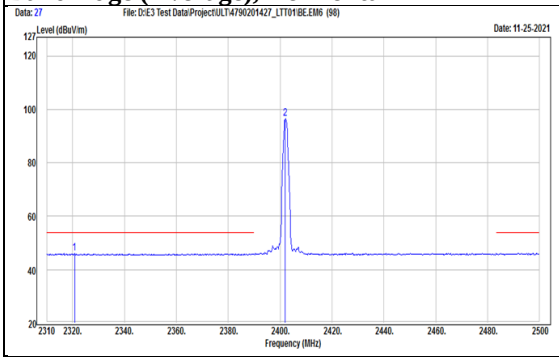
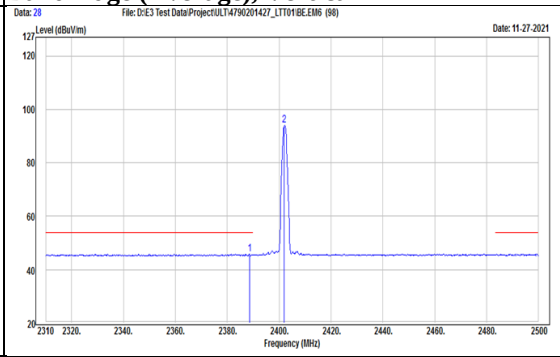
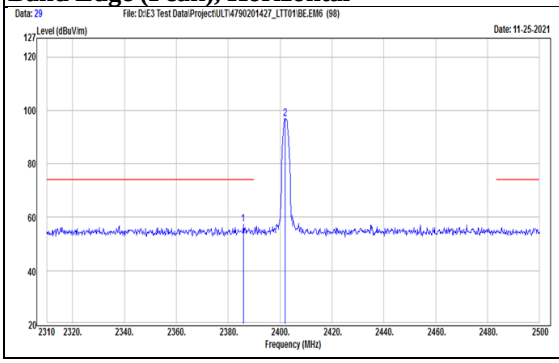
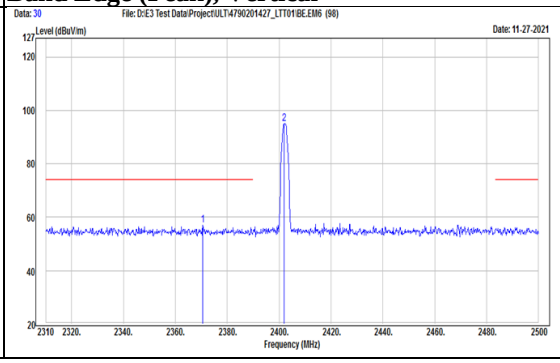
TX, BT-LE-1Mbps (Ch 19) Radiated Spurious Emission, Horizontal	TX, BT-LE-1Mbps (Ch 19) Radiated Spurious Emission, Vertical
	

E200

Above 1 GHz

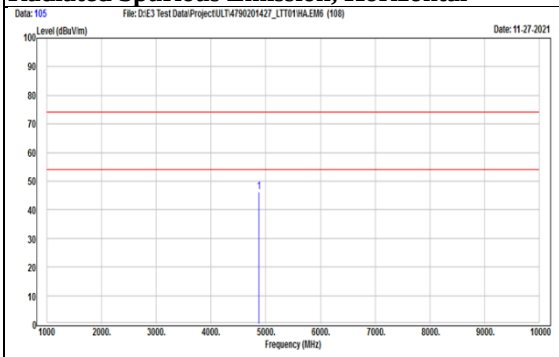
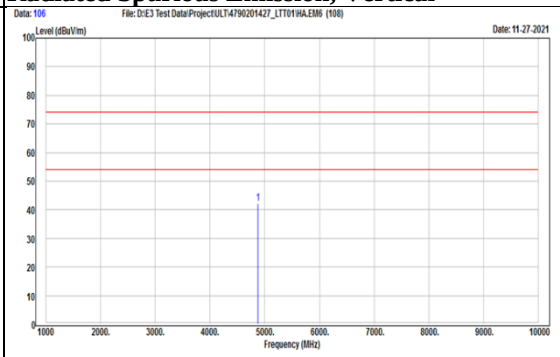
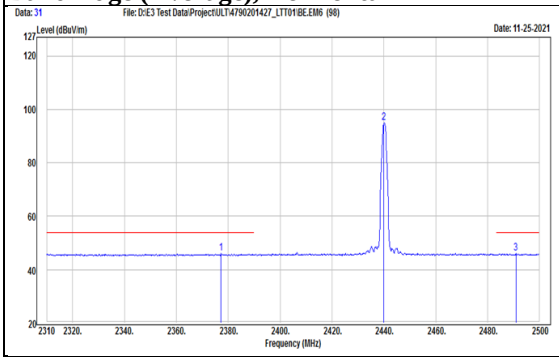
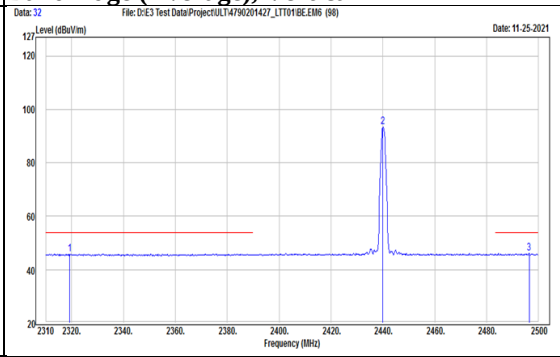
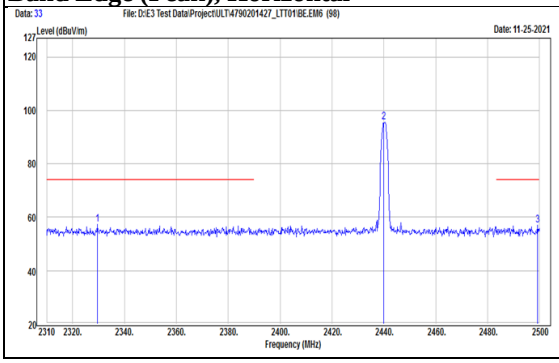
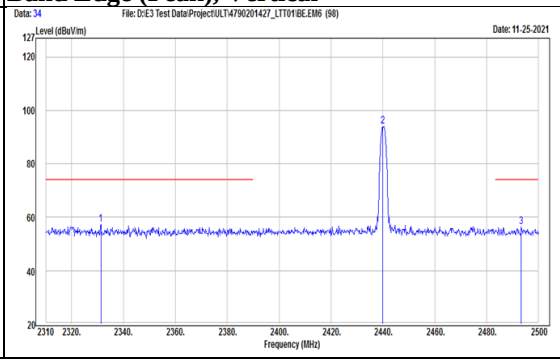
Mode	BT-LE-1Mbps	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2320.83	29.83	16.16	45.99	54	-8.01	AVG
		2385.81	41.25	16.09	57.34	74	-16.66	PK
	@	2402	80.68	16.13	96.81	N/A	N/A	PK
	@	2402	80.3	16.13	96.43	N/A	N/A	AVG
	*	4804	45.89	2.46	48.35	74	-25.65	PK
Vertical		2370.61	40.81	16.07	56.88	74	-17.12	PK
		2388.66	29.71	16.1	45.81	54	-8.19	AVG
	@	2402	78.93	16.13	95.06	N/A	N/A	PK
	@	2402	77.84	16.13	93.97	N/A	N/A	AVG
	*	4804	40.99	2.46	43.45	74	-30.55	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**
	

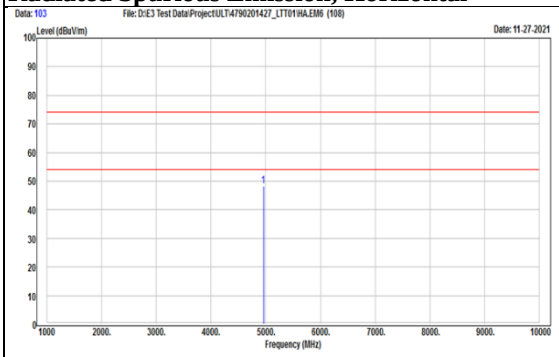
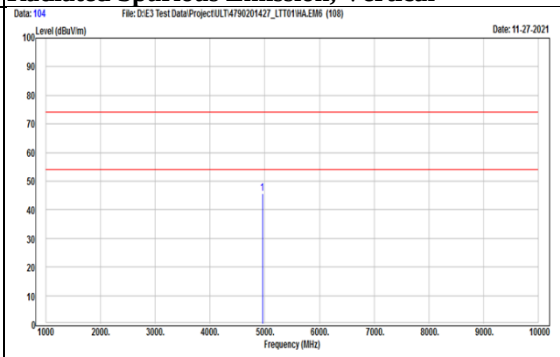
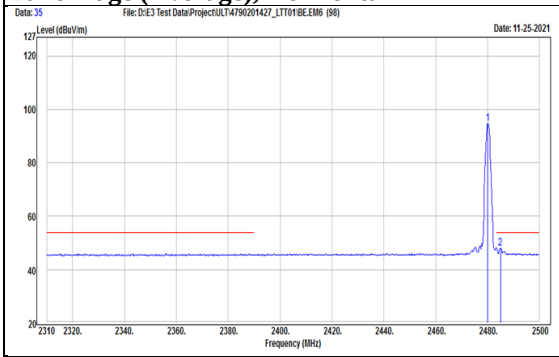
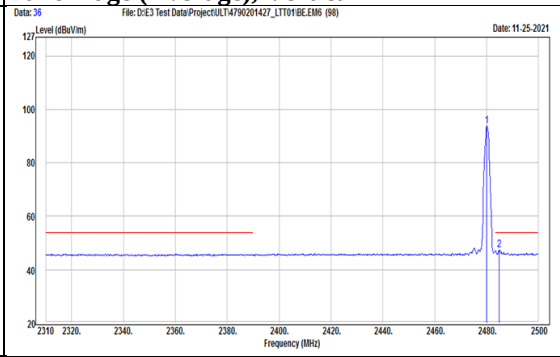
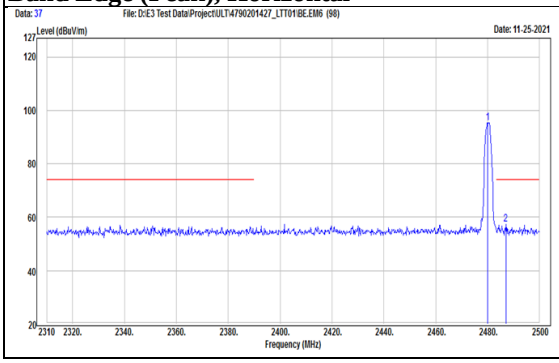
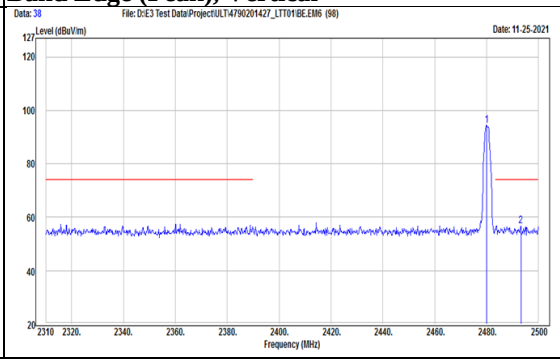
Mode	BT-LE-1Mbps	Channel	19

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		2329.57	41.3	16.11	57.41	74	-16.59	PK
		2377.26	30.1	16.08	46.18	54	-7.82	AVG
	@	2440	79.37	16.11	95.48	N/A	N/A	PK
	@	2440	78.77	16.11	94.88	N/A	N/A	AVG
		2490.88	29.95	16.1	46.05	54	-7.95	AVG
		2499.24	40.77	16.1	56.87	74	-17.13	PK
	*	4880	43.5	2.66	46.16	74	-27.84	PK
Vertical		2319.31	29.79	16.16	45.95	54	-8.05	AVG
		2331.28	41.16	16.1	57.26	74	-16.74	PK
	@	2440	77.94	16.11	94.05	N/A	N/A	PK
	@	2440	77.32	16.11	93.43	N/A	N/A	AVG
		2493.35	40.31	16.1	56.41	74	-17.59	PK
		2496.39	30.04	16.1	46.14	54	-7.86	AVG
	*	4880	39.4	2.66	42.06	74	-31.94	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

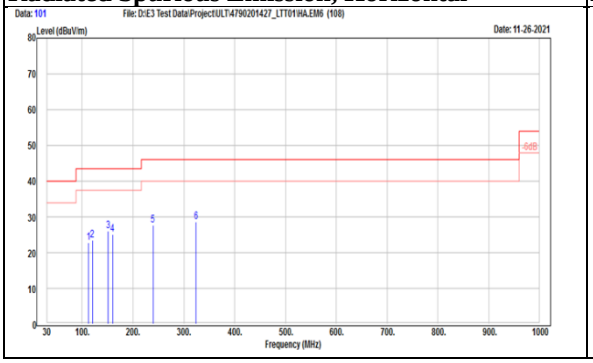
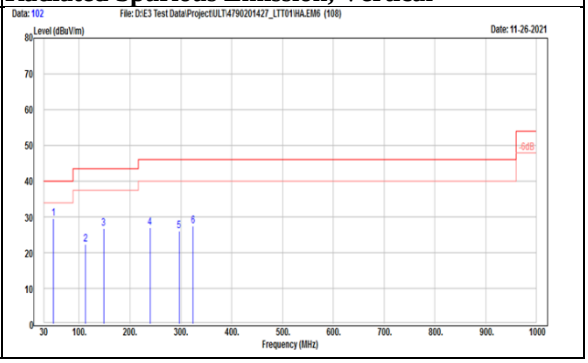
Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	2480	79.3	16.1	95.4	N/A	N/A	PK
	@	2480	78.62	16.1	94.72	N/A	N/A	AVG
		2484.99	31.93	16.1	48.03	54	-5.97	AVG
		2487.08	41.17	16.1	57.27	74	-16.73	PK
	*	4960	45.51	2.62	48.13	74	-25.87	PK
Vertical	@	2480	78.21	16.1	94.31	N/A	N/A	PK
	@	2480	77.51	16.1	93.61	N/A	N/A	AVG
		2484.8	31.26	16.1	47.36	54	-6.64	AVG
		2493.16	40.68	16.1	56.78	74	-17.22	PK
	*	4960	42.9	2.62	45.52	74	-28.48	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**
	

Below 1 GHz

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		112.45	37.62	-14.75	22.87	43.5	-20.63	PK
		120.21	37.72	-14.3	23.42	43.5	-20.08	PK
		151.25	37.48	-11.43	26.05	43.5	-17.45	PK
		159.98	36.15	-11.08	25.07	43.5	-18.43	PK
		239.52	39.81	-12.12	27.69	46	-18.31	PK
		323.91	37.77	-9.18	28.59	46	-17.41	PK
Vertical		49.4	40.76	-11.15	29.61	40	-10.39	PK
		112.45	37.1	-14.75	22.35	43.5	-21.15	PK
		148.34	38.3	-11.54	26.76	43.5	-16.74	PK
		239.52	39.06	-12.12	26.94	46	-19.06	PK
		296.75	36.13	-10.08	26.05	46	-19.95	PK
		323.91	36.69	-9.18	27.51	46	-18.49	PK

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

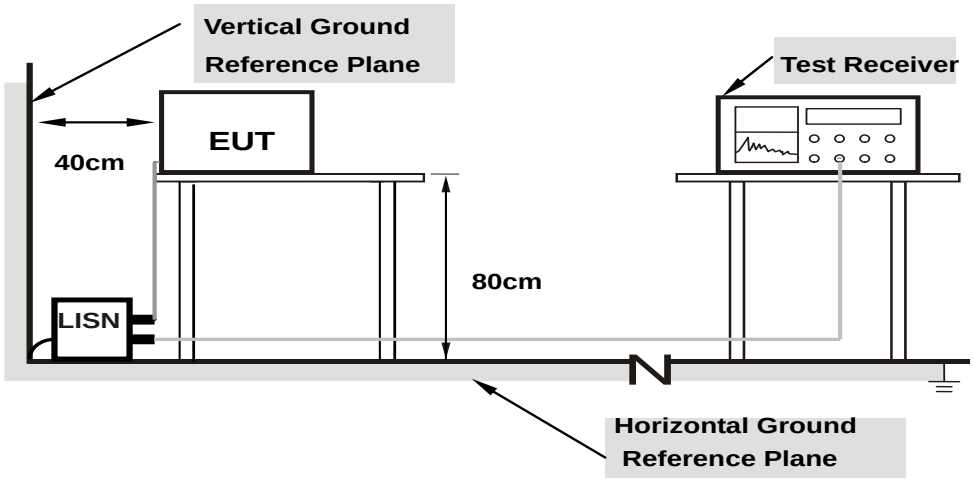
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

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



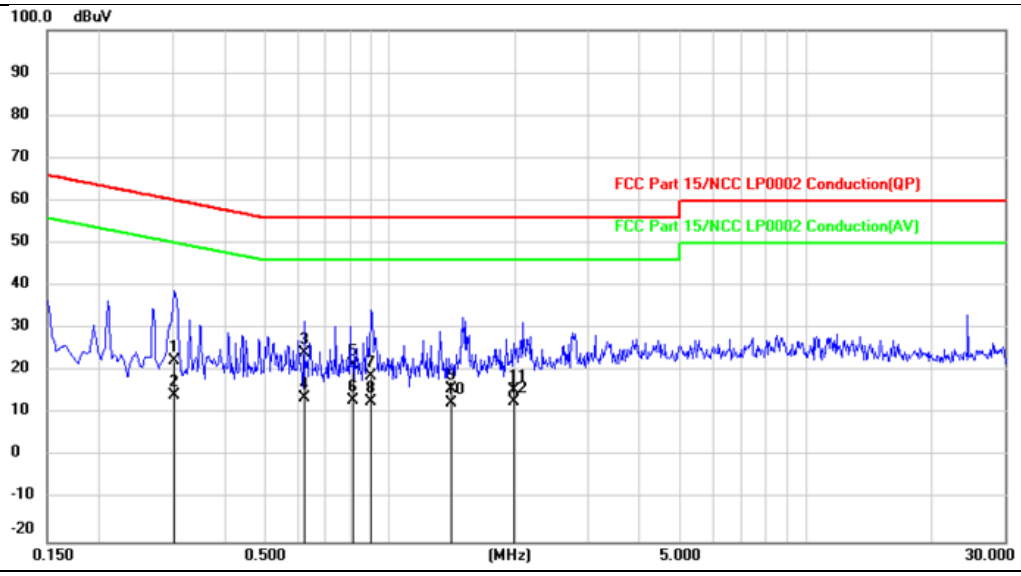
Note: 1.Support units were connected to second LISN.

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

Test Data

Mode	BLE(1M)_TX	Channel	19

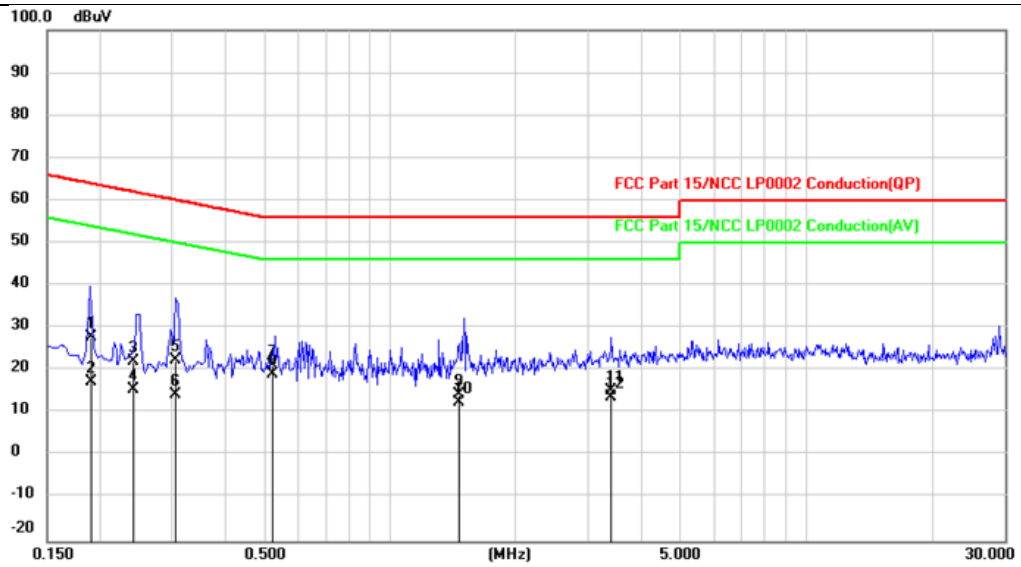
Phase: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.3017	2.85	19.48	22.33	60.20	-37.87	QP
2	0.3017	-5.25	19.48	14.23	50.20	-35.97	AVG
3	0.6221	4.68	19.50	24.18	56.00	-31.82	QP
4	0.6221	-5.84	19.50	13.66	46.00	-32.34	AVG
5	0.8141	2.00	19.51	21.51	56.00	-34.49	QP
6	0.8141	-6.40	19.51	13.11	46.00	-32.89	AVG
7	0.9014	-0.59	19.50	18.91	56.00	-37.09	QP
8	0.9014	-6.56	19.50	12.94	46.00	-33.06	AVG
9	1.4137	-3.76	19.51	15.75	56.00	-40.25	QP
10	1.4137	-6.82	19.51	12.69	46.00	-33.31	AVG
11	1.9907	-3.96	19.52	15.56	56.00	-40.44	QP
12	1.9907	-6.67	19.52	12.85	46.00	-33.15	AVG

Mode	BLE(1M)_TX	Channel	19

Phase: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1913	8.25	19.49	27.74	63.98	-36.24	QP
2	0.1913	-2.24	19.49	17.25	53.98	-36.73	AVG
3	0.2418	2.65	19.49	22.14	62.03	-39.89	QP
4	0.2418	-4.04	19.49	15.45	52.03	-36.58	AVG
5	0.3048	3.11	19.49	22.60	60.11	-37.51	QP
6	0.3048	-5.17	19.49	14.32	50.11	-35.79	AVG
7	0.5212	1.80	19.50	21.30	56.00	-34.70	QP
8	0.5212	-0.48	19.50	19.02	46.00	-26.98	AVG
9	1.4588	-5.19	19.52	14.33	56.00	-41.67	QP
10	1.4588	-6.94	19.52	12.58	46.00	-33.42	AVG
11	3.4170	-4.25	19.56	15.31	56.00	-40.69	QP
12	3.4170	-5.89	19.56	13.67	46.00	-32.33	AVG

END OF REPORT