



TEST REPORT

Report Number. : 14296835-E1V3

Applicant : LOGITECH FAR EAST LTD.
7700 GATEWAY BLVD
NEWARK, CA 94560
UNITED STATES

Model : YR0089

Brand : LOGITECH

FCC ID : JNZYR0089

IC : 4418A-YR0089

EUT Description : BLUETOOTH KEYBOARD

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED RSS-247 ISSUE 2
ISED RSS-GEN ISSUE 5 + A1 + A2

Date Of Issue:

2022-11-15

Prepared by:

UL VERIFICATION SERVICES INC.

47173 Benicia Street

Fremont, CA 94538 U.S.A.

TEL: (510) 319-4000

FAX: (510) 661-0888



CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2022-08-01	Initial Issue	---
V2	2022-11-10	Added attenuator info on Section 8, added a statement on Section 9.1 to address TCB's questions	Tina Chu
V3	2022-11-15	Updated Section 9.1 and 10.2 duty cycle info	Tina Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LOGITECH FAR EAST LTD.
7700 GATEWAY BLVD
NEWARK, CA 94560
UNITED STATES

EUT DESCRIPTION: BLUETOOTH KEYBOARD

MODEL: YR0089

BRAND: LOGITECH

SERIAL NUMBER: 2222LZ907UZ8 (Conducted); 2222LZ907V68 (Radiated)

SAMPLE RECEIPT DATE: 2022-07-06

DATE TESTED: 2022-07-06 TO 2022-07-20, 2022-11-15

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5 + A1 + A2	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 A2LA, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:

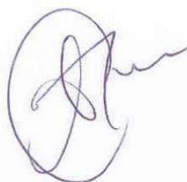
Prepared By:



Francisco deAnda
Staff Engineer
Consumer Technology Division
UL Verification Services Inc.

Gerardo Abrego
Senior Test Engineer
Consumer Technology Division
UL Verification Services Inc.

Reviewed By:



Tina Chu
Senior Project Engineer
Consumer Technology Division
UL Verification Services Inc.

2. TEST RESULTS SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	RSS-GEN 6.7	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW	Complies	None.
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power	Complies	None.
See Comment		Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	RSS-247 5.2 (b)	PSD	Complies	None.
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Complies	None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Complies	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Not Applicable	EUT is powered by batteries

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A1 + A2, and RSS-247 Issue 2.

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, Certificate Number 0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input checked="" type="checkbox"/>	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
<input type="checkbox"/>	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	US0104	2324A	550739

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U _{Lab}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.84 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB

Uncertainty figures are valid to a confidence level of 95%.

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$
$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Final Voltage (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \text{LISN Insertion Loss.}$$
$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a keyboard and case for iPad with Bluetooth Low Energy connectivity. It is powered by two CR2032 coin cell batteries.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	3.84	2.42

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

The radio utilizes an PCB printed antenna, with a maximum gain of 5 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was B0003.

6.5. WORST-CASE CONFIGURATION AND MODE

EUT has two variants. These two variants are identical except for different PCB and LDO manufacturers. Investigation was performed and it was determined that variant #1 is worst case. Report only shows worst case results.

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

EUT is a desktop device, therefore, all final radiated testing was performed with the EUT in type mode orientation.

Data rates provided by the client were:

BLE mode: 1Mbps

BLE mode: 2Mbps

6.6. DESCRIPTION OF TEST SETUP

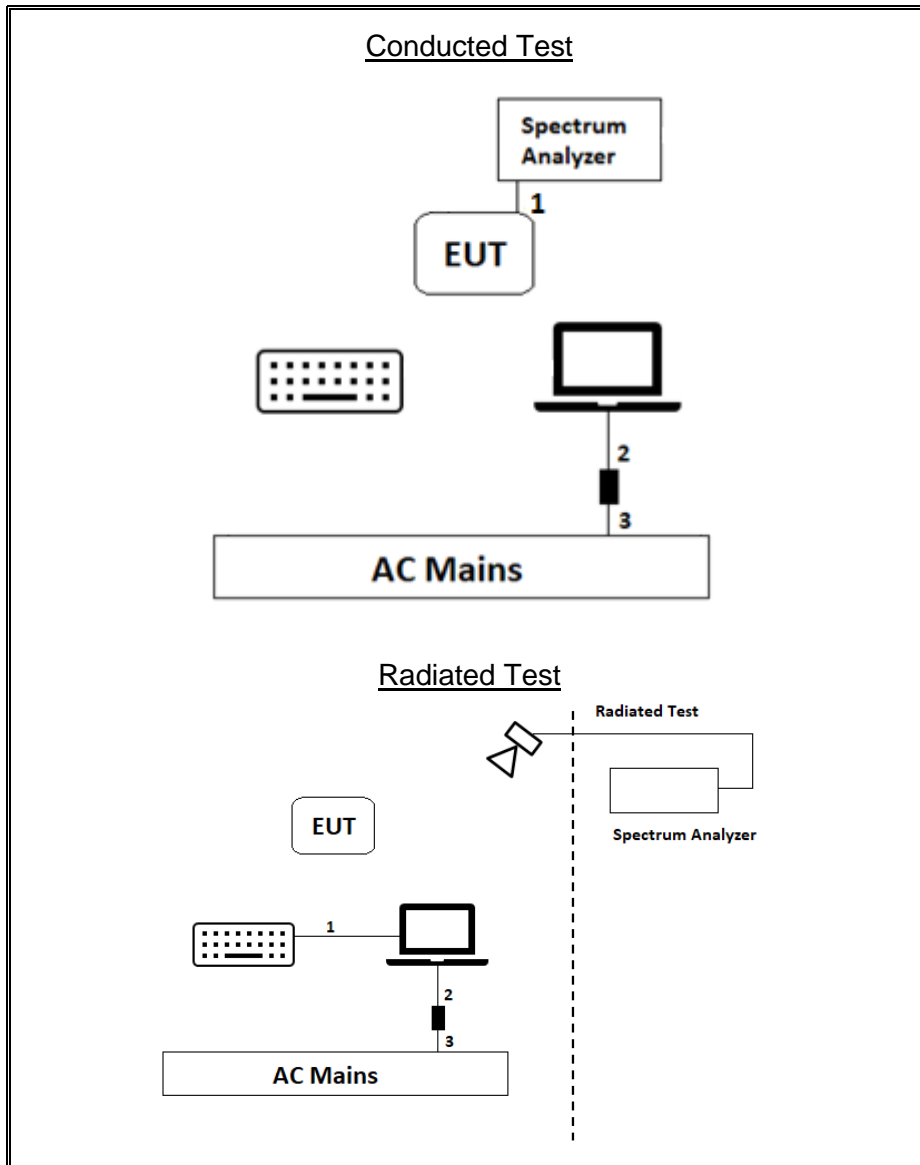
SUPPORT TEST EQUIPMENT						
Description	Manufacturer	Model	Serial Number	FCC ID/ DoC		
Laptop	Dell	P72G002	GWC7PQ2	DoC		
Laptop AC/DC Adapter	Dell	LA65NM130	0G4X7T	DoC		
Bluetooth Keyboard	Logitech	K270	1917SY01KZG8	DoC		
Wired Keyboard	HP	K45	7CH7121L76	DoC		
I/O CABLES (CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA	Unshielded	0.5	To spectrum Analyzer
2	DC Power	1	DC	Unshielded	1.5	AC/DC Adapter to Laptop
3	AC Power	1	AC	Unshielded	1.2	AC Mains to AC/DC Adapter
I/O CABLES (RADIATED TEST/AC POWER LINE EMISSIONS)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB type A	Shielded	1.4	Connect to Laptop
2	DC Power	1	DC	Unshielded	1.5	AC/DC Adapter to Laptop
3	AC Power	1	AC	Unshielded	1.2	AC Mains to AC/DC Adapter

TEST SETUP

Conducted Test: The EUT is powered by batteries. Test software exercised the radio card wirelessly.

Radiated Test: The EUT is powered by batteries. Keyboard connected to a test laptop during the tests. Test software exercised the radio card wirelessly.

SETUP DIAGRAMS



7. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10 Section 11.6.

6 dB BW: ANSI C63.10 Subclause -11.8.1

Occupied BW (99%): ANSI C63.10 Subclause- 6.9.3

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter

Output Power: ANSI C63.10 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

PSD: ANSI C63.10 Subclause -11.10.2 Method PKPSD (peak PSD)

Radiated emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1

Band-edge: ANSI C63.10 Section 6.10

KDB 558074 D01 15.247 Meas Guidance v05r02 Question 3 (a) DC correction application

8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	80404	2022-08-04
RF Filter Box, 8 port, 1-18GHz	UL-FR1 (CTECH)	SAC 8 port rf box 1	197920	2023-04-19
Antenna, Broadband Hybrid, 30MHz to 2GHz	Sunol Sciences Corp.	JB1	82258	2022-10-01
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	2023-02-08
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169927	2023-02-16
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	81138	2022-10-13
Amplifier 18-26.5GHz	AMPLICAL	AMP18G26.5-60	215705	2023-02-26
Spectrum Analyzer, PXA, 3Hz- 26.5GHz	Agilent Technologies	N9030A-526	206414	2023-03-22
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90733	2023-01-24
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90388	2023-01-24
10dB Fixed Attenuator	Pasternack Enterprises	PE7087-10	178557	Verified/characterized before use
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Rev 9.5, Jan 03, 2020	
Antenna Port Software	UL	UL RF	Ver 2022.2.17, Ver 2022.8.16	

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

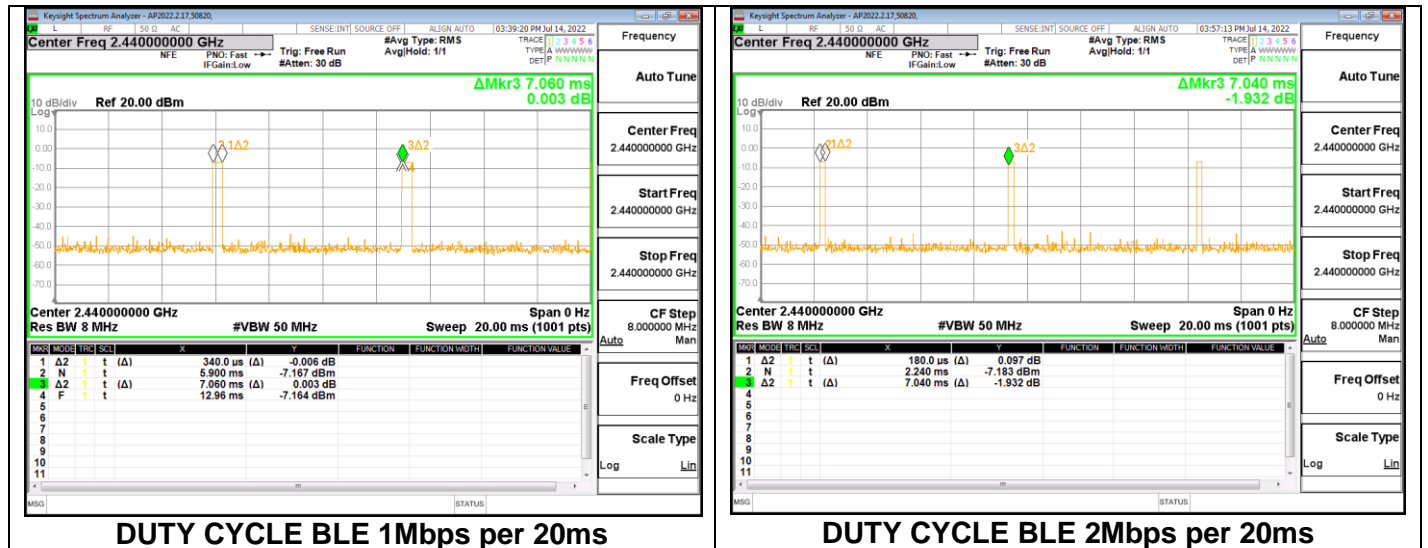
LIMITS

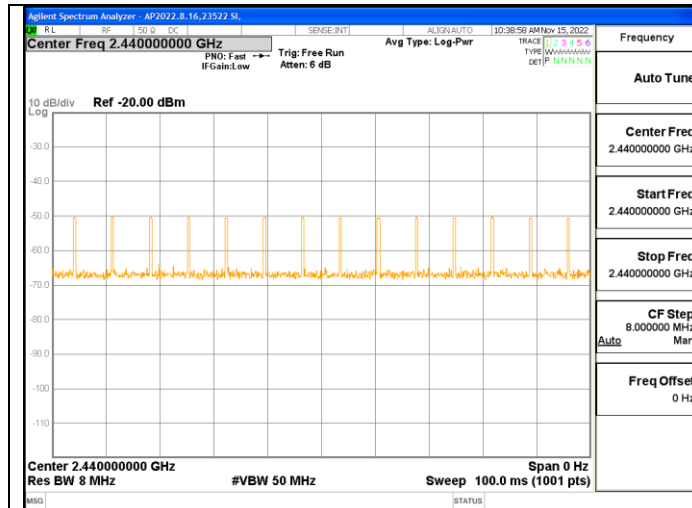
Mode	ON Time B (msec)	Number of pulse per 100ms	Total ON Time per 100ms	Duty Cycle x	Duty Cycle Correction Factor (dB) · 20log(1/x)
BLE 1Mbps	0.34	14	4.76	0.0476	26.45
BLE 2Mbps	0.18	14	2.52	0.0252	31.97

PROCEDURE

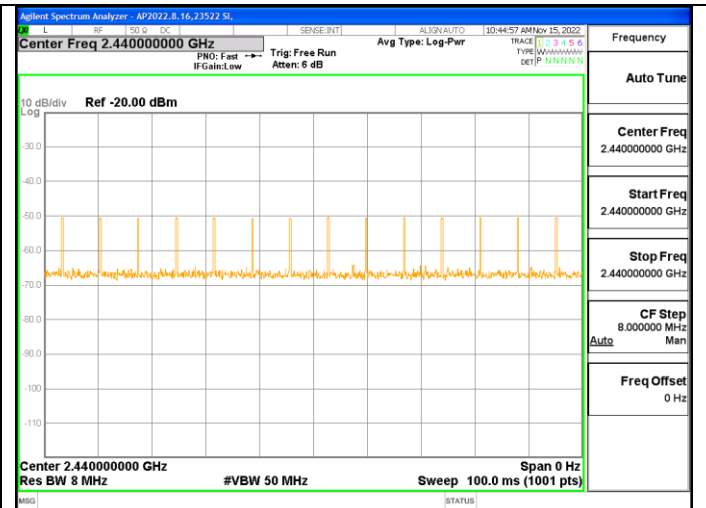
KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS





DUTY CYCLE BLE 1Mbps per 100ms



DUTY CYCLE BLE 2Mbps per 100ms

9.2. 99% BANDWIDTH

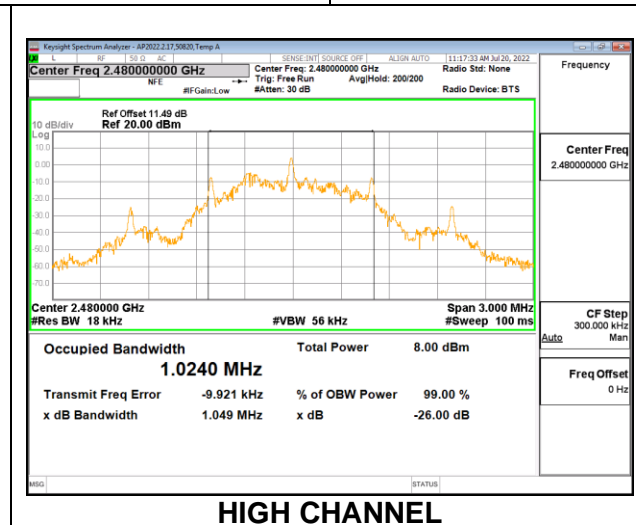
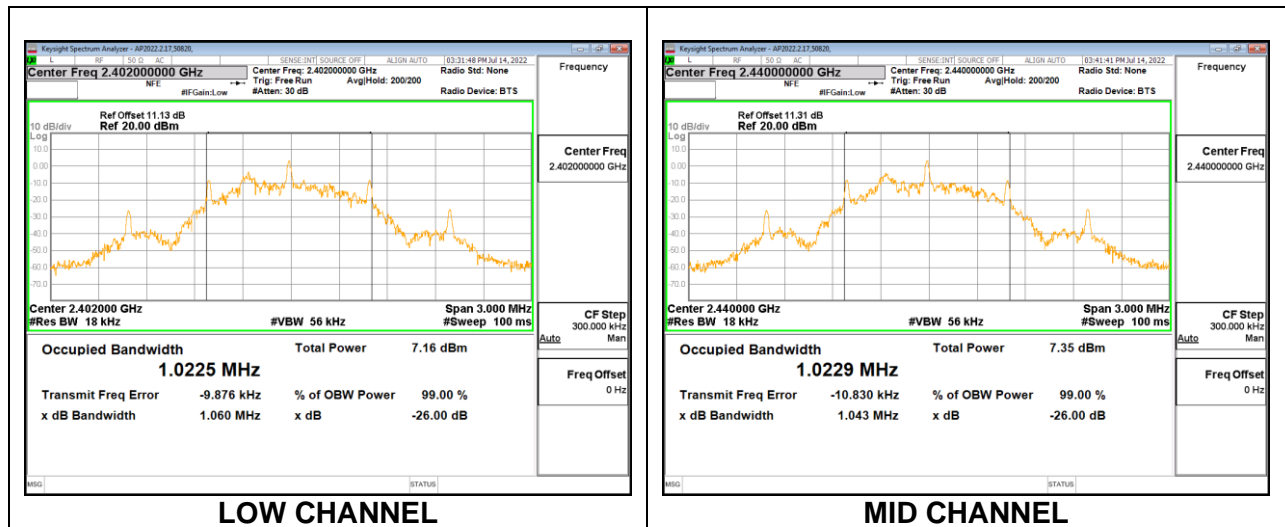
LIMITS

None; for reporting purposes only.

RESULTS

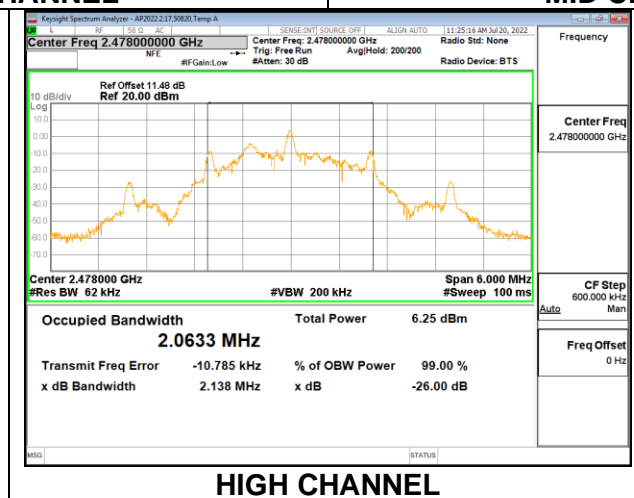
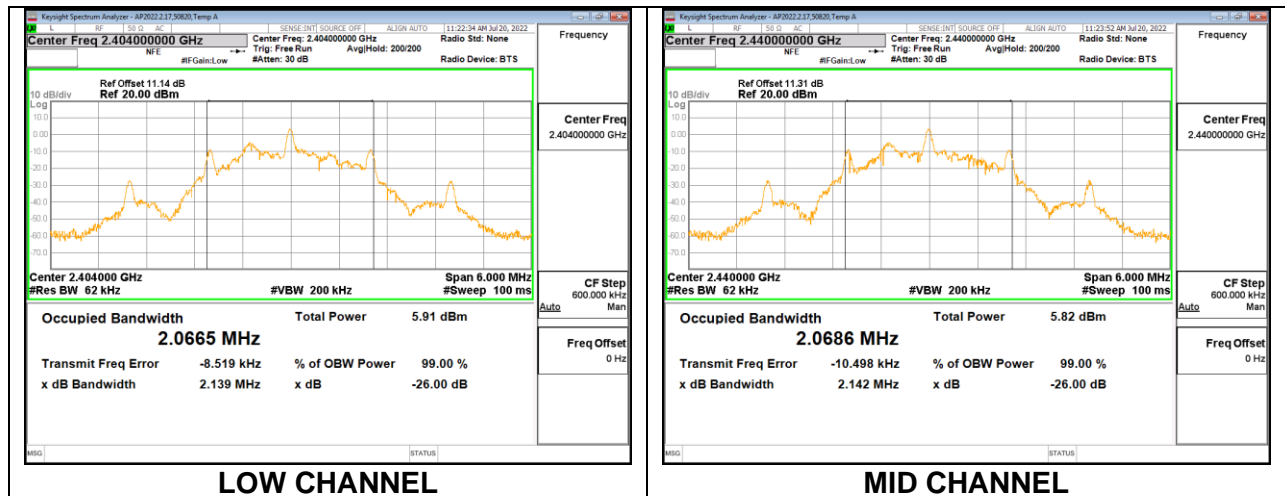
9.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0225
Middle	2440	1.0229
High	2480	1.0240



9.2.2. BLE (2Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2404	2.0665
Middle	2440	2.0686
High	2478	2.0633



9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

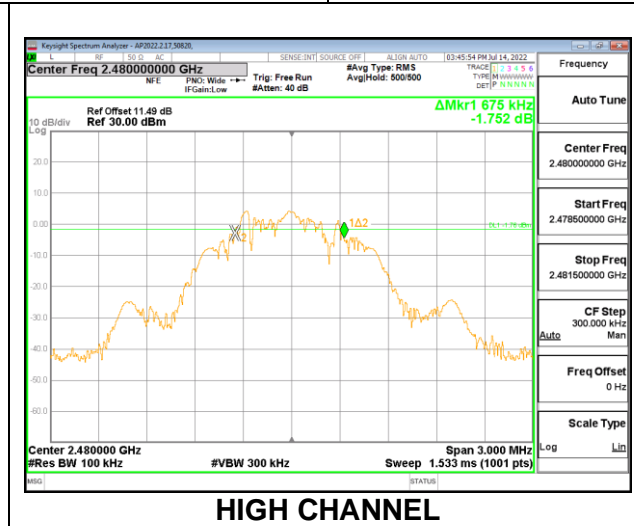
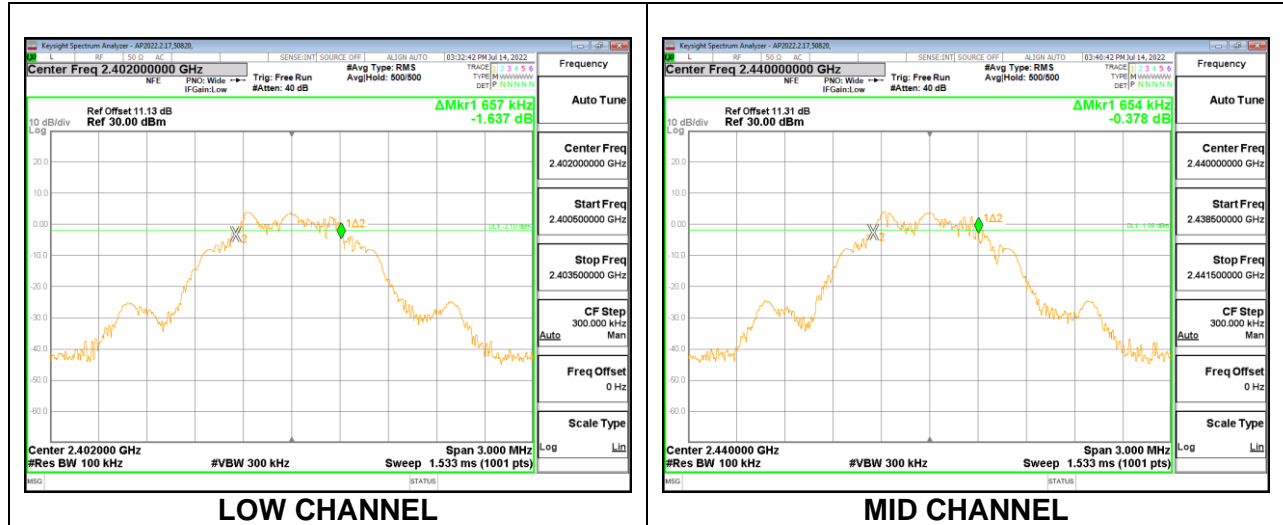
RSS-247 5.2 (a)

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

RESULTS

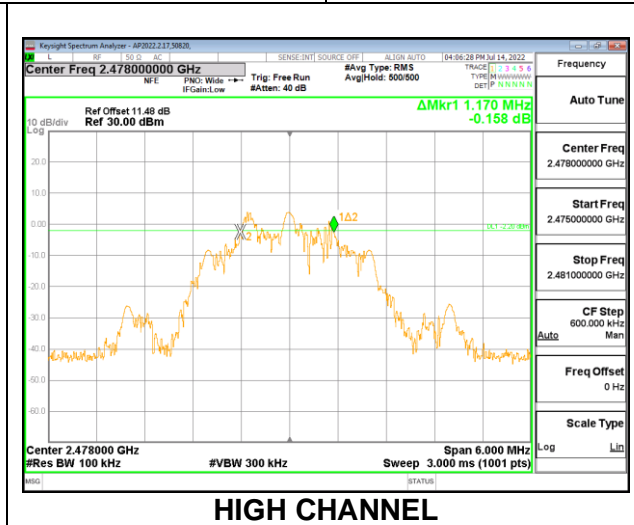
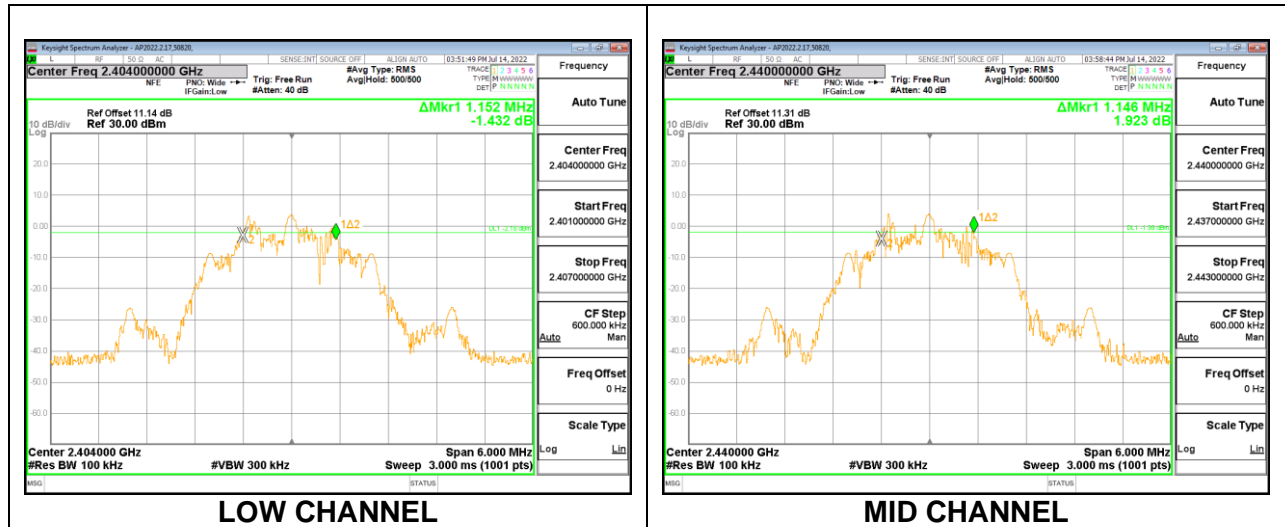
9.3.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6570	0.5
Middle	2440	0.6540	0.5
High	2480	0.6750	0.5



9.3.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2404	1.1520	0.5
Middle	2440	1.1460	0.5
High	2478	1.1700	0.5



9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

RESULTS

9.4.1. BLE (1Mbps)

Tested By:	20756 CW
Date:	2022-07-06

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.820	30	-26.180
Middle	2440	3.840	30	-26.160
High	2480	3.810	30	-26.190

9.4.2. BLE (2Mbps)

Tested By:	20756 CW
Date:	2022-07-06

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2404	3.810	30	-26.190
Middle	2440	3.820	30	-26.180
High	2478	3.810	30	-26.190

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Gated average output power was read directly from power meter.

RESULTS

9.5.1. BLE (1Mbps)

Tested By:	20756 CW
Date:	2022-07-06

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	3.72
Middle	2440	3.73
High	2480	3.71

9.5.2. BLE (2Mbps)

Tested By:	20756 CW
Date:	2022-07-06

Channel	Frequency (MHz)	AV power (dBm)
Low	2404	3.72
Middle	2440	3.73
High	2478	3.71

9.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

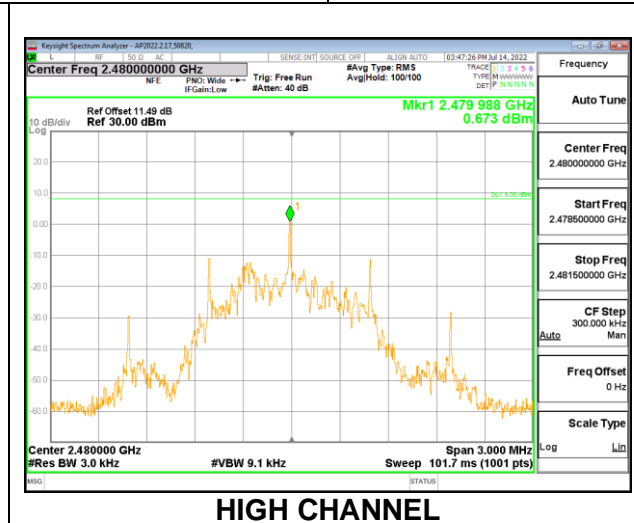
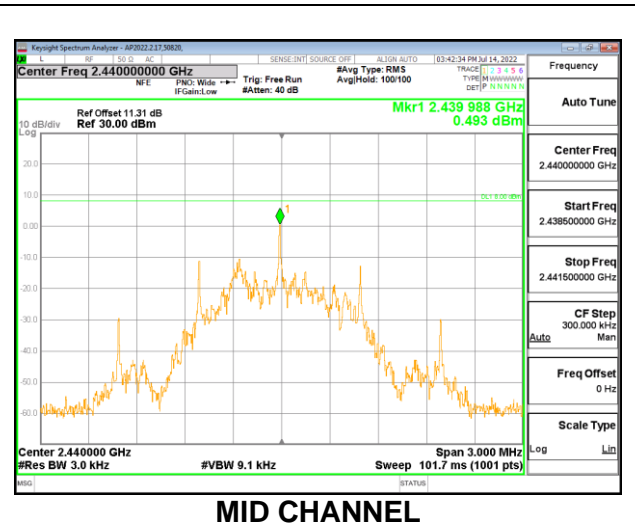
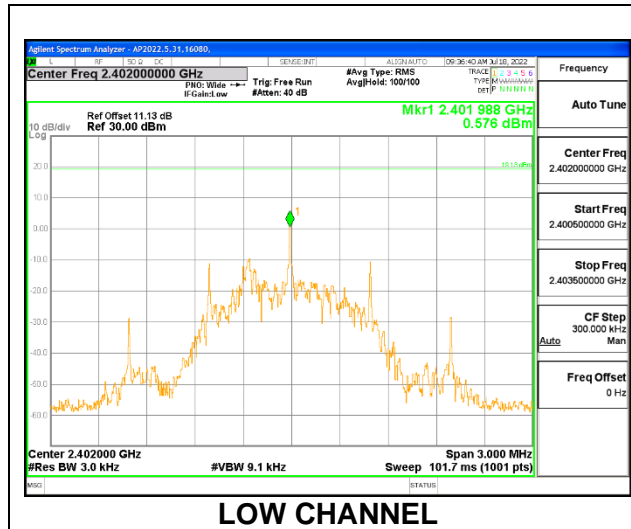
RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

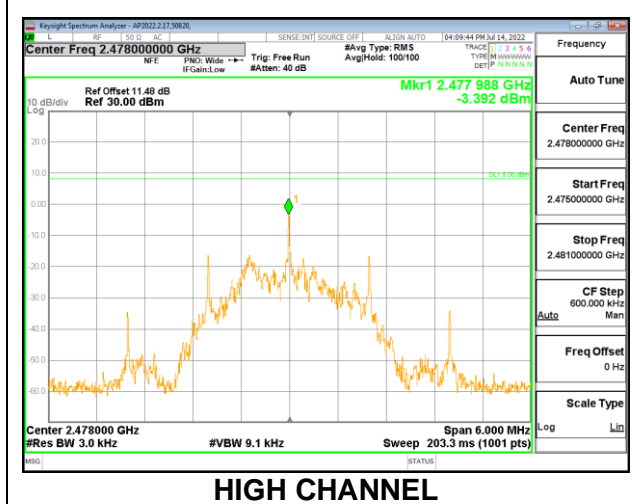
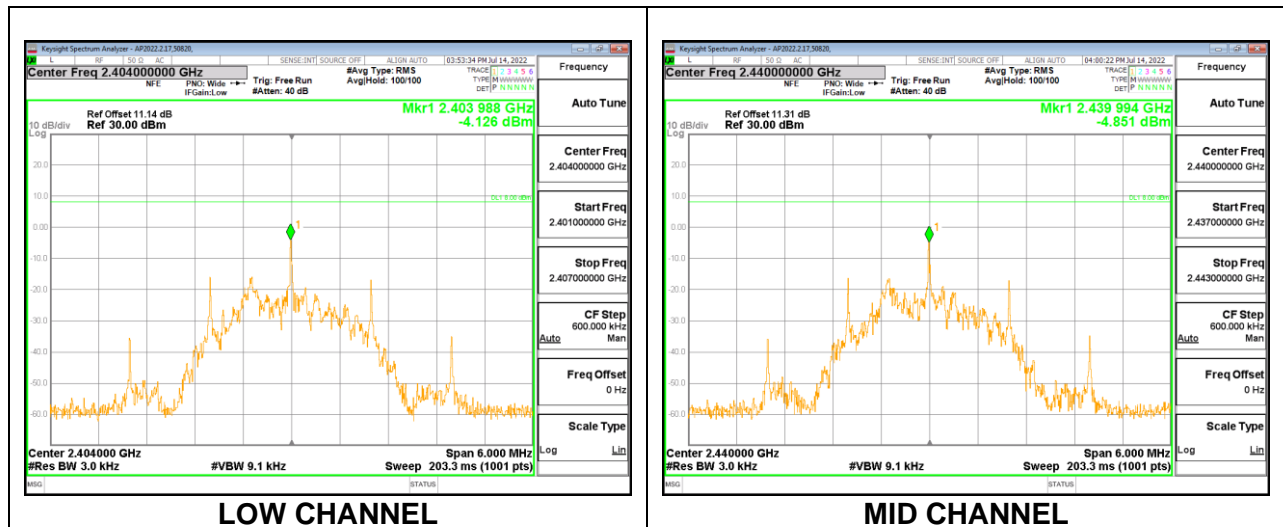
9.6.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	0.58	8	-7.42
Middle	2440	0.49	8	-7.51
High	2480	0.67	8	-7.33



9.6.2. BLE (2Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2404	-4.13	8	-12.13
Middle	2440	-4.85	8	-12.85
High	2478	-3.39	8	-11.39



9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

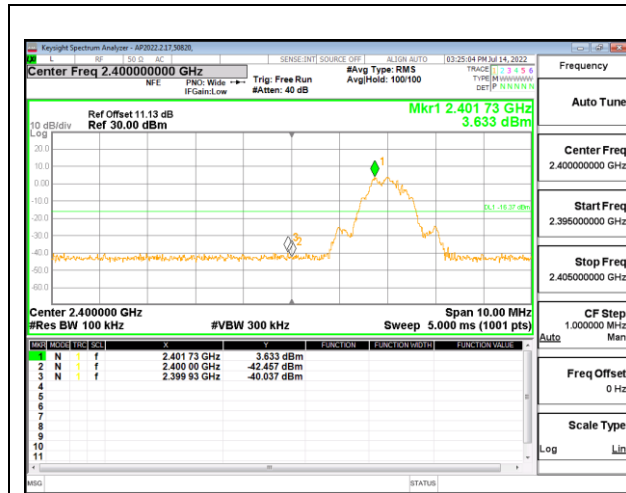
FCC §15.247 (d)

RSS-247 5.5

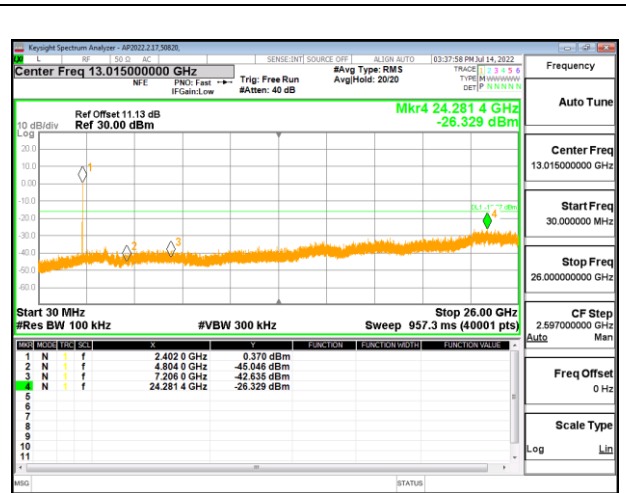
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dBc.

RESULTS

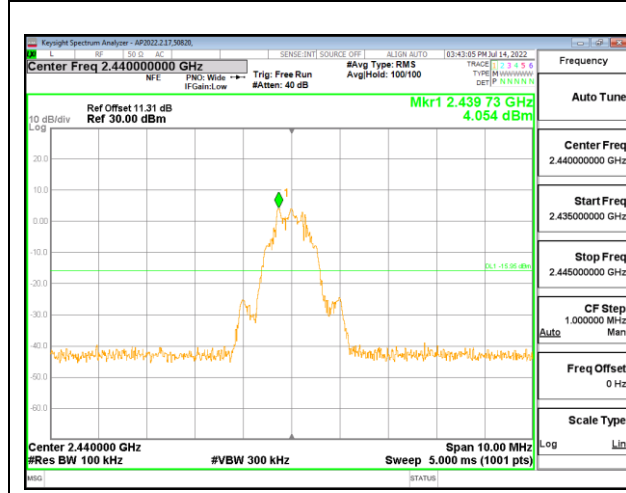
9.7.1. BLE (1Mbps)



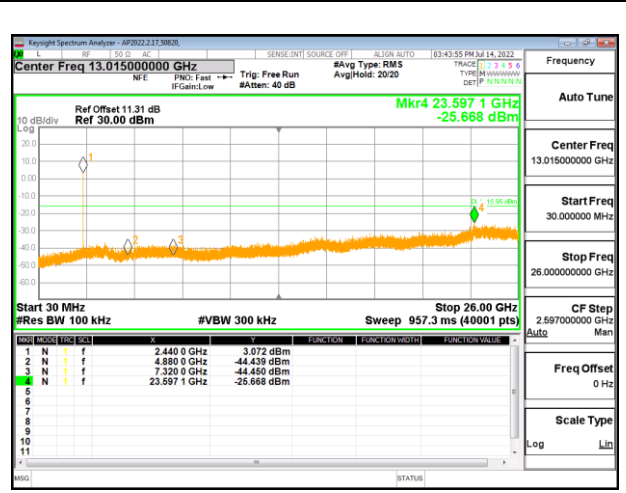
LOW CHANNEL BANDEDGE



OUT-OF-BAND LOW CHANNEL



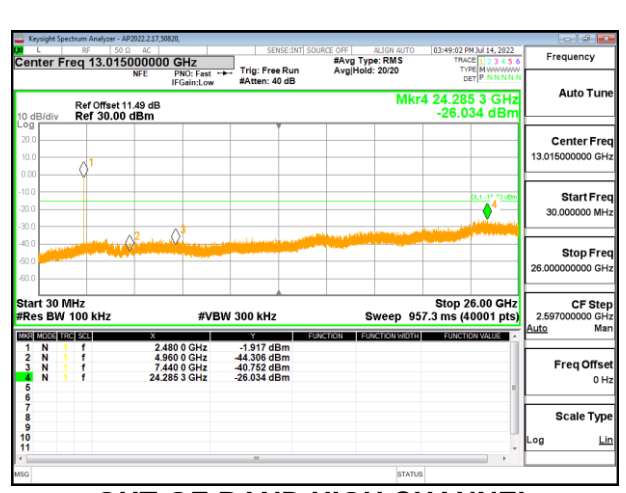
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

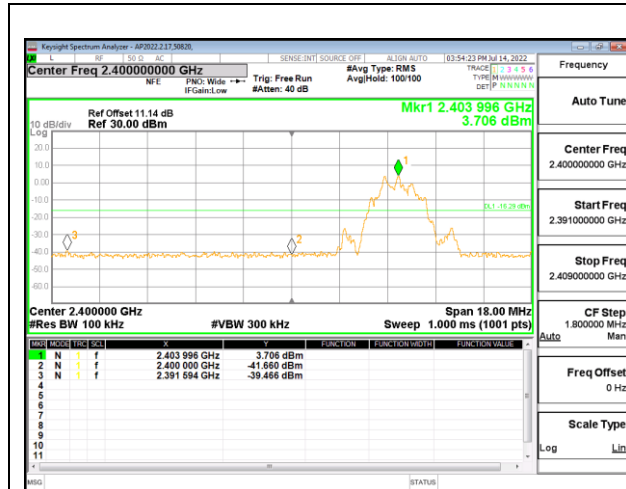


HIGH CHANNEL BANDEDGE

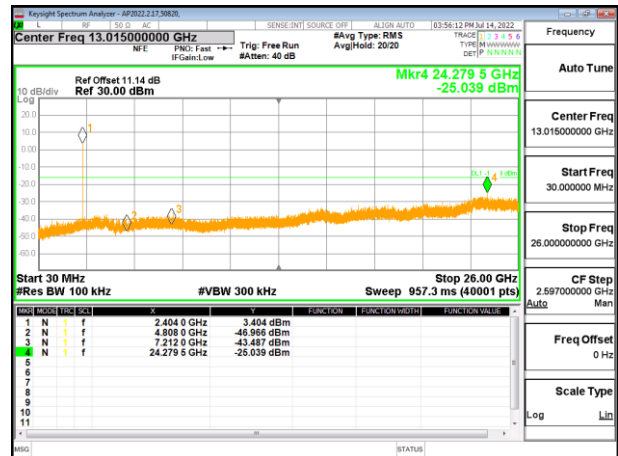


OUT-OF-BAND HIGH CHANNEL

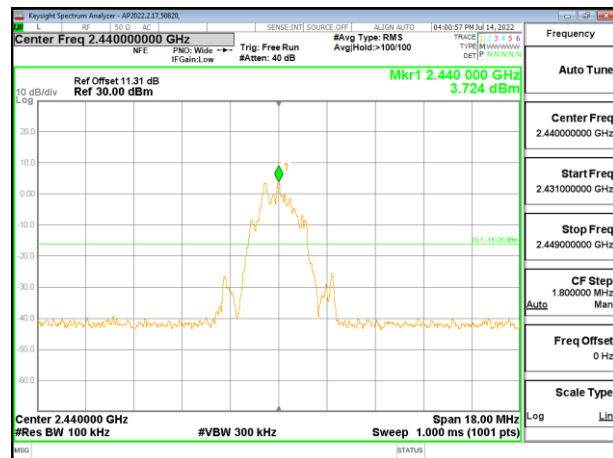
9.7.2. BLE (2Mbps)



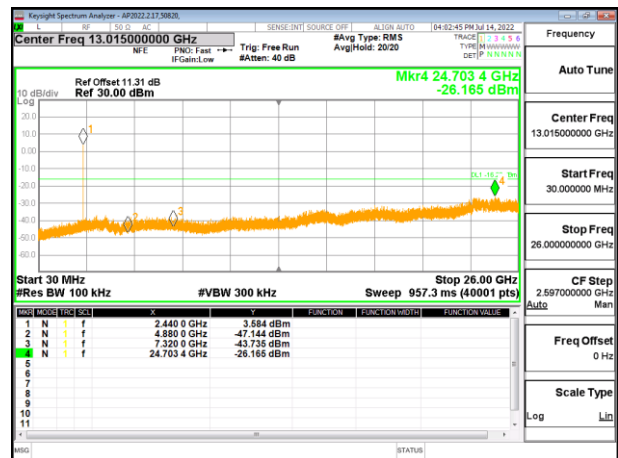
LOW CHANNEL BANDEDGE



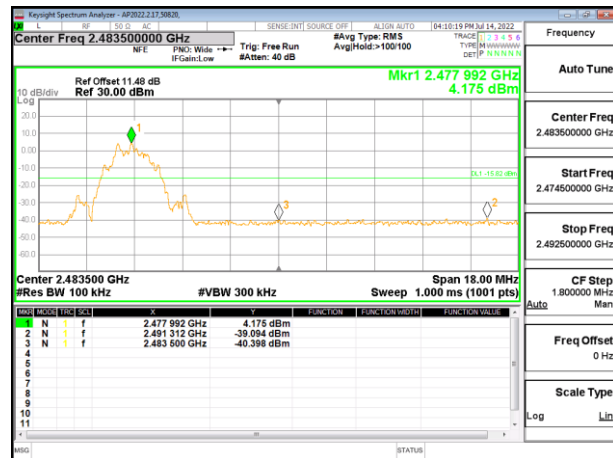
OUT-OF-BAND LOW CHANNEL



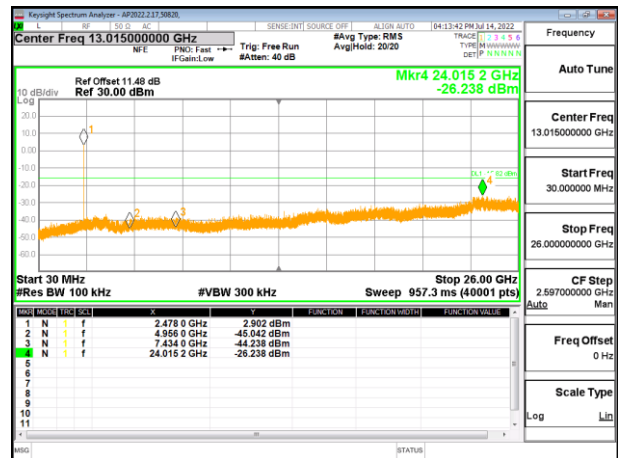
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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. Blue color trace on plots: Parallel orientation. Green color trace on plots: Perpendicular orientation.

The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table), using the free space impedance of 377 Ohms. For example the measurement at frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to $Y - 51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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.

KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification

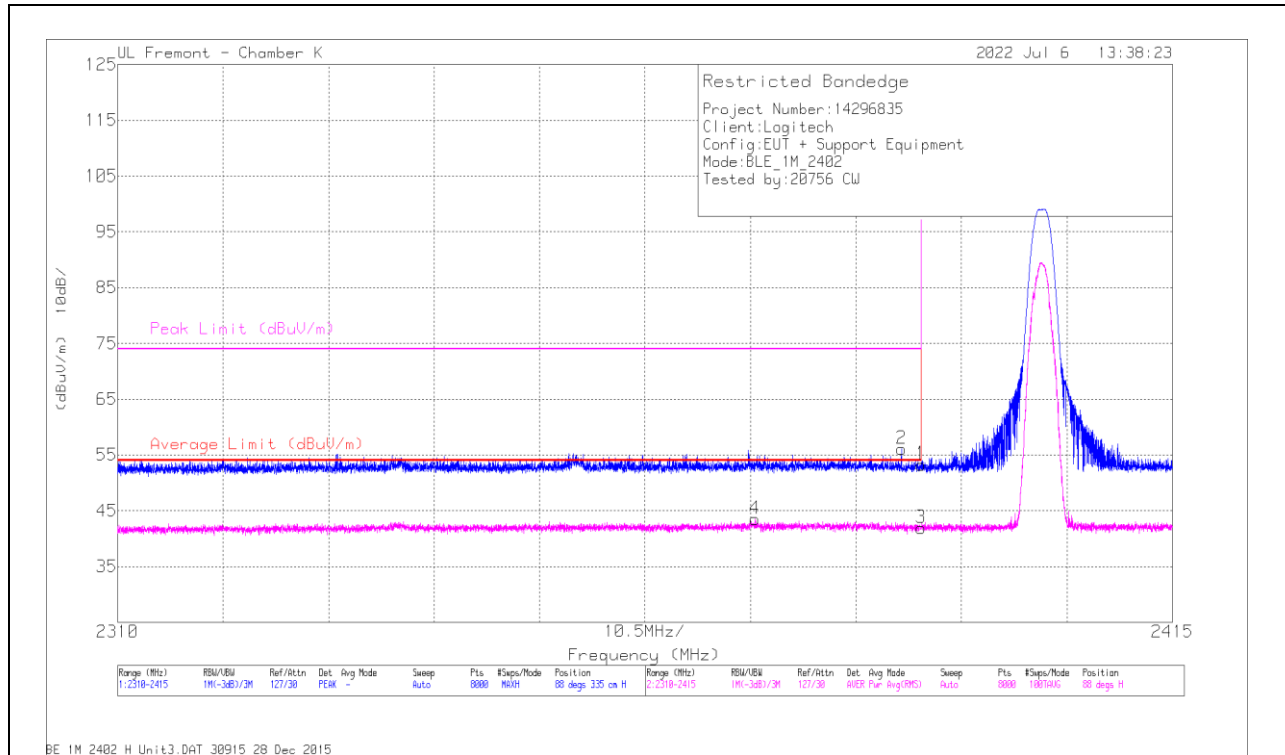
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (MHz)	Meter Reading (dBUV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBUV/m)	Average Limit (dBUV/m)	Margin (dB)	Peak Limit (dBUV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2390	56.11	PK	32.1	-34.9	0	53.31	-	-	74	-20.69	88	335	H
2	* 2388.027	58.8	PK	32.1	-34.8	0	56.1	-	-	74	-17.9	88	335	H
3	* 2390	56.11	AVG	32.1	-34.9	-26.45	26.86	54	-27.14	-	-	88	335	H
4	* 2388.027	58.8	AVG	32.1	-34.8	-26.45	29.65	54	-24.35	-	-	88	335	H

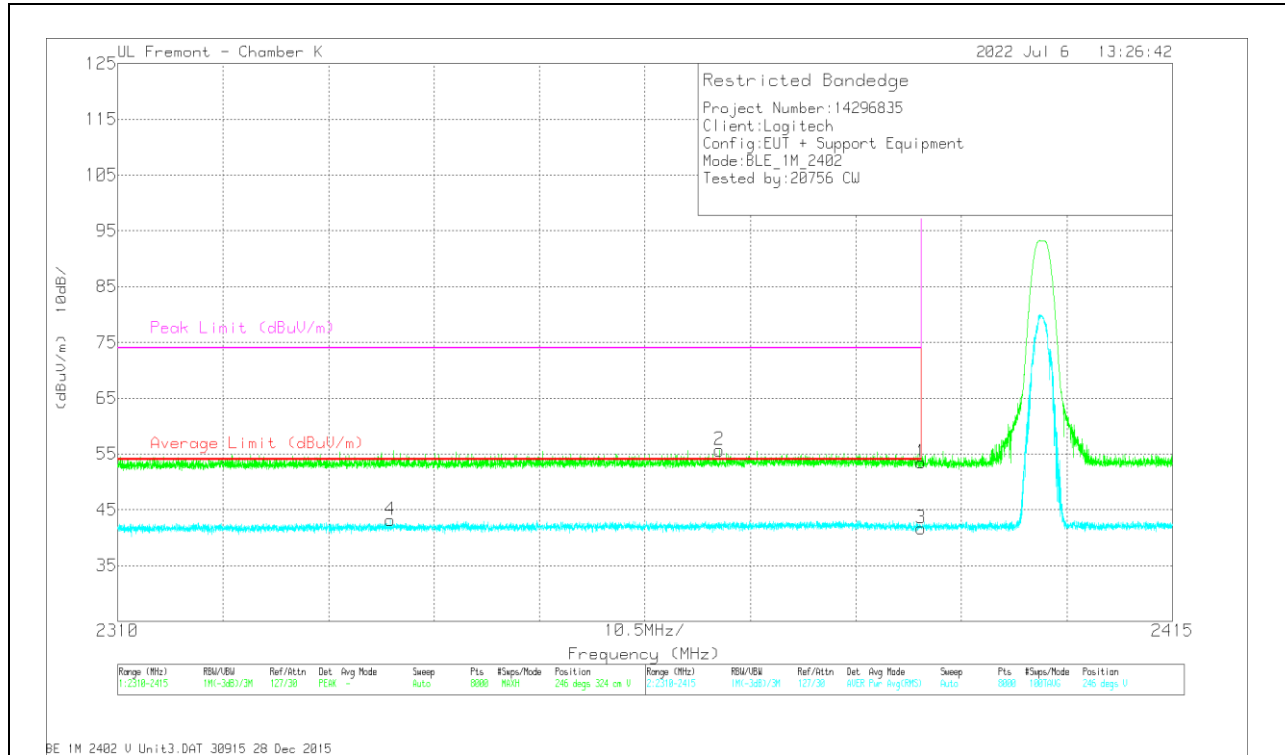
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

AVG = Peak Reading - Duty Cycle Correction Factor

Duty Cycle Correction Factor = $20 \log(1/0.0476) = 26.45$

VERTICAL RESULT

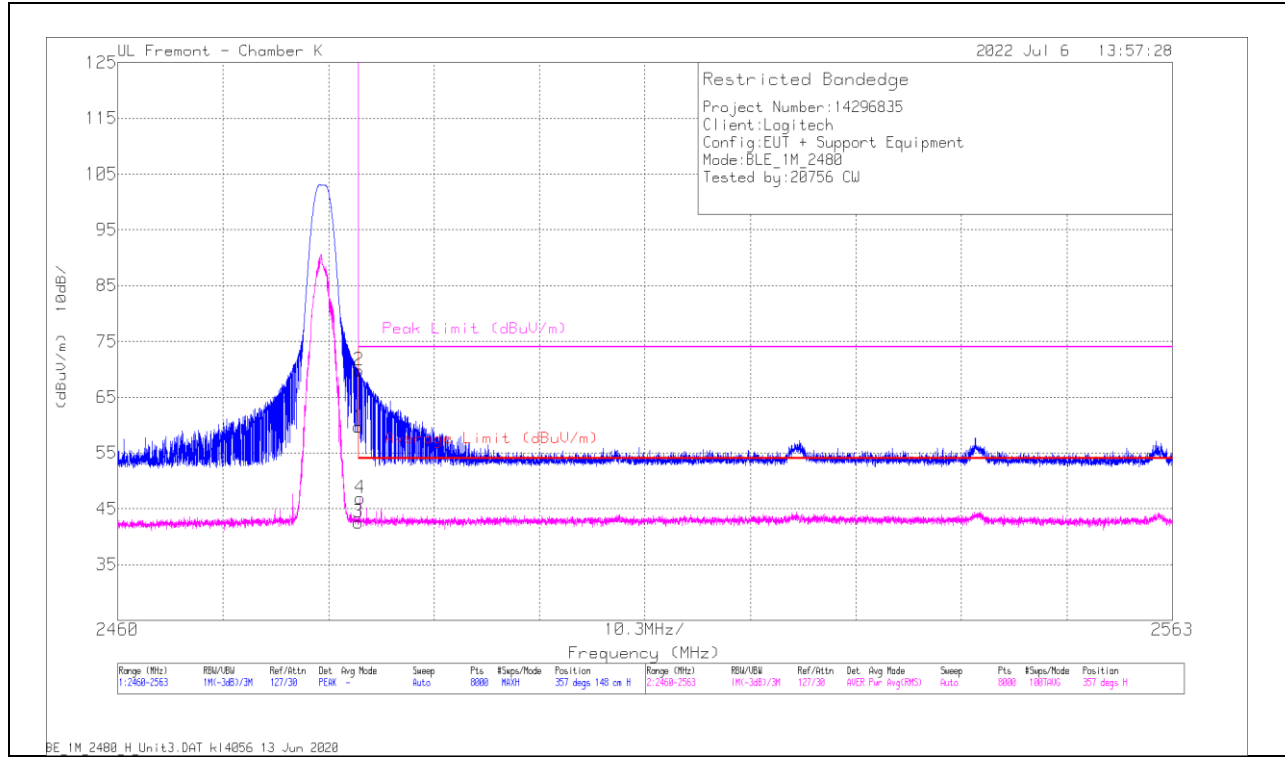


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2390	56.32	Pk	32.1	-34.9	0	53.52	-	-	74	-20.48	246	324	V
2	* 2369.885	58.47	Pk	32.1	-34.9	0	55.67	-	-	74	-18.33	246	324	V
3	* 2390	56.32	AVG	32.1	-34.9	-26.45	27.07	54	-26.93	-	-	246	324	V
4	* 2369.885	58.47	AVG	32.1	-34.9	-26.45	29.22	54	-24.78	-	-	246	324	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0476) = 26.45

BANDEDGE (HIGH CHANNEL)

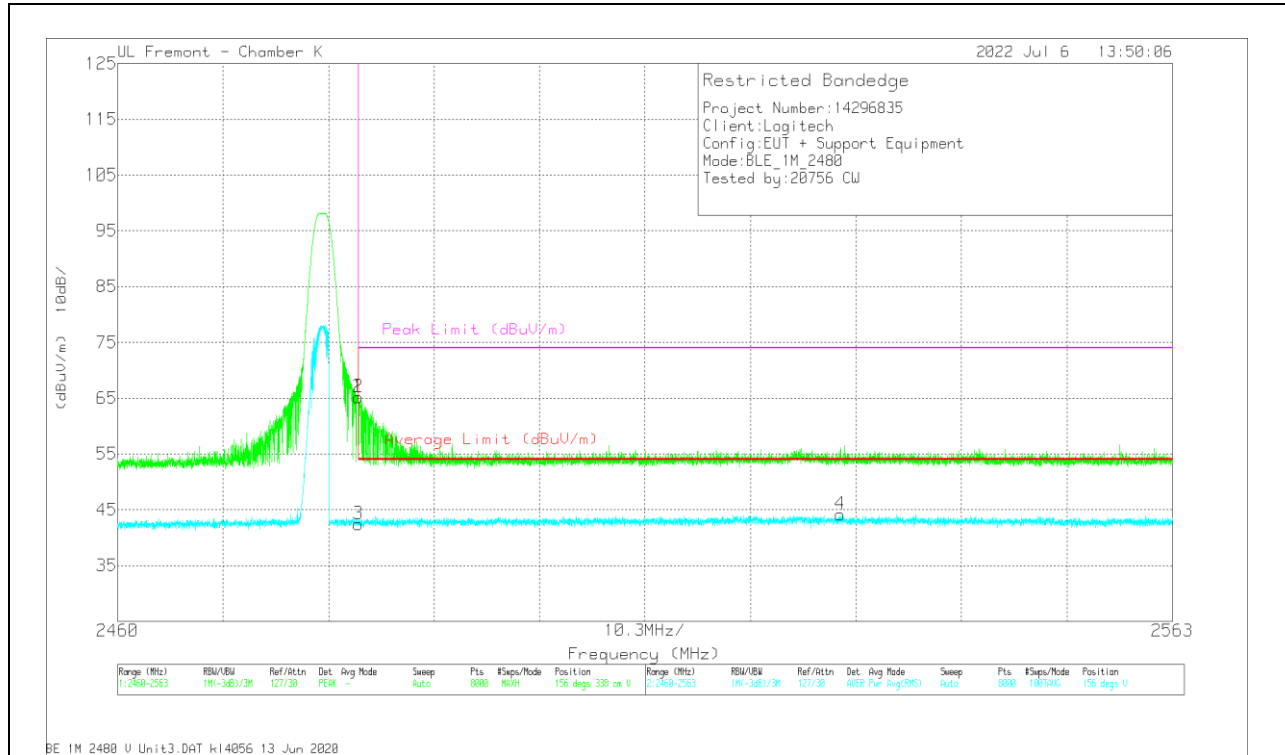
HORIZONTAL RESULT



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2483.5	61.47	Pk	32.7	-34.5	0	59.67	-	-	74	-14.33	357	148	H
2	* 2483.578	71.56	Pk	32.7	-34.5	0	69.76	-	-	74	-4.24	357	148	H
3	* 2483.5	61.47	AVG	32.7	-34.5	-26.45	33.22	54	-20.78	-	-	357	148	H
4	* 2483.578	71.56	AVG	32.7	-34.5	-26.45	43.31	54	-10.69	-	-	357	148	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0476) = 26.45

VERTICAL RESULT

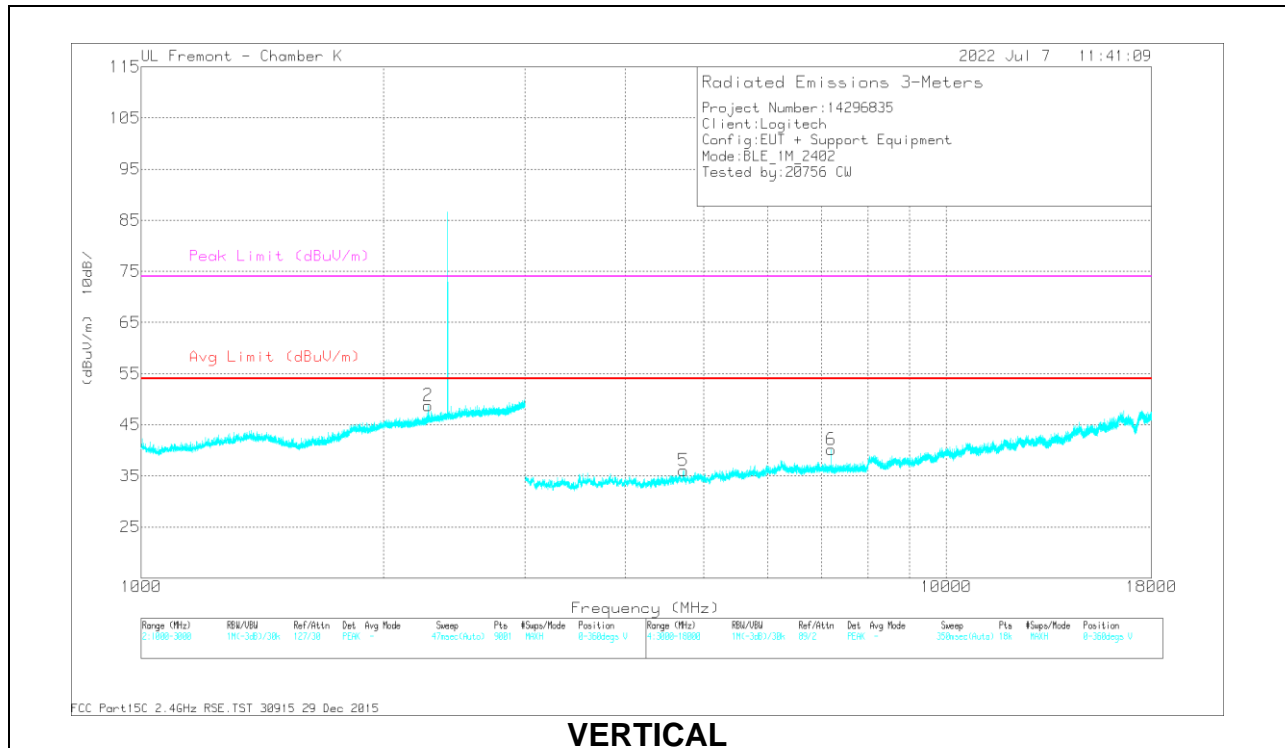
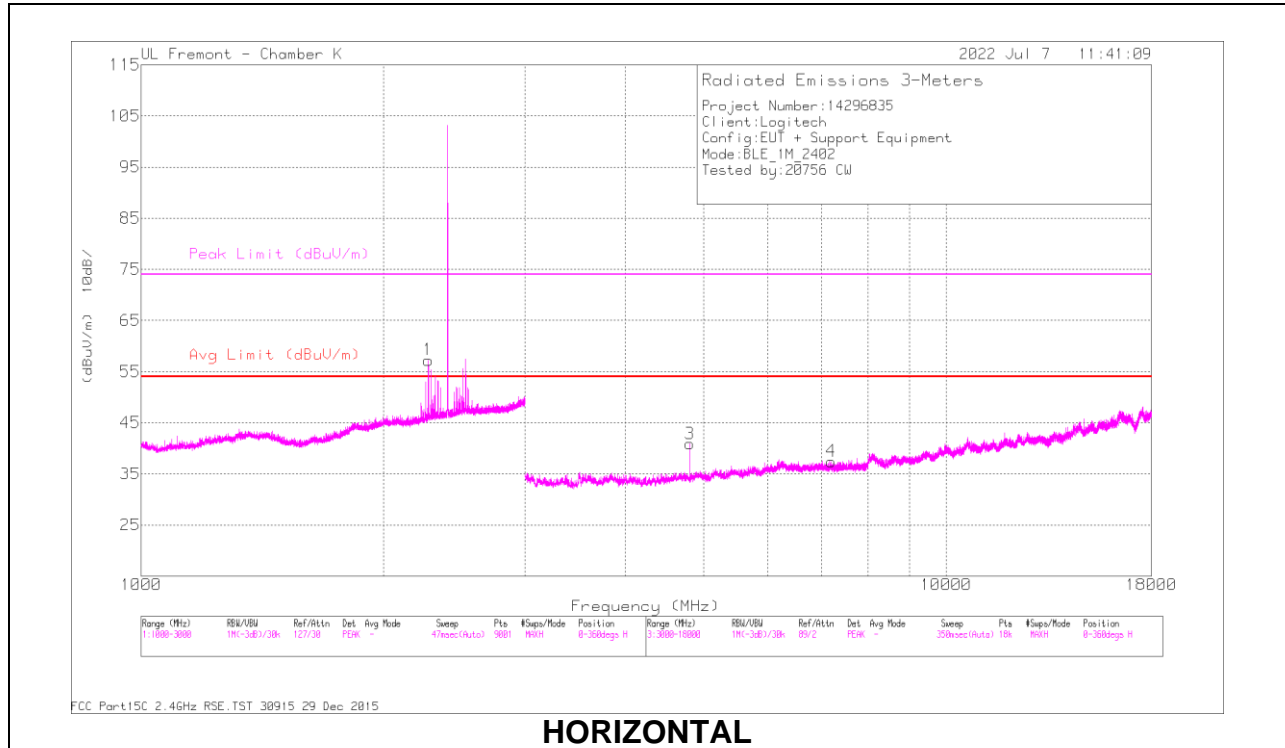


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2483.5	66.97	Pk	32.7	-34.5	0	65.17	-	-	74	-8.83	156	338	V
2	* 2483.501	66.99	Pk	32.7	-34.5	0	65.19	-	-	74	-8.81	156	338	V
3	* 2483.5	66.97	AVG	32.7	-34.5	-26.45	38.72	54	-15.28	-	-	156	338	V
4	* 2483.501	66.99	AVG	32.7	-34.5	-26.45	38.74	54	-15.26	-	-	156	338	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0476) = 26.45

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS

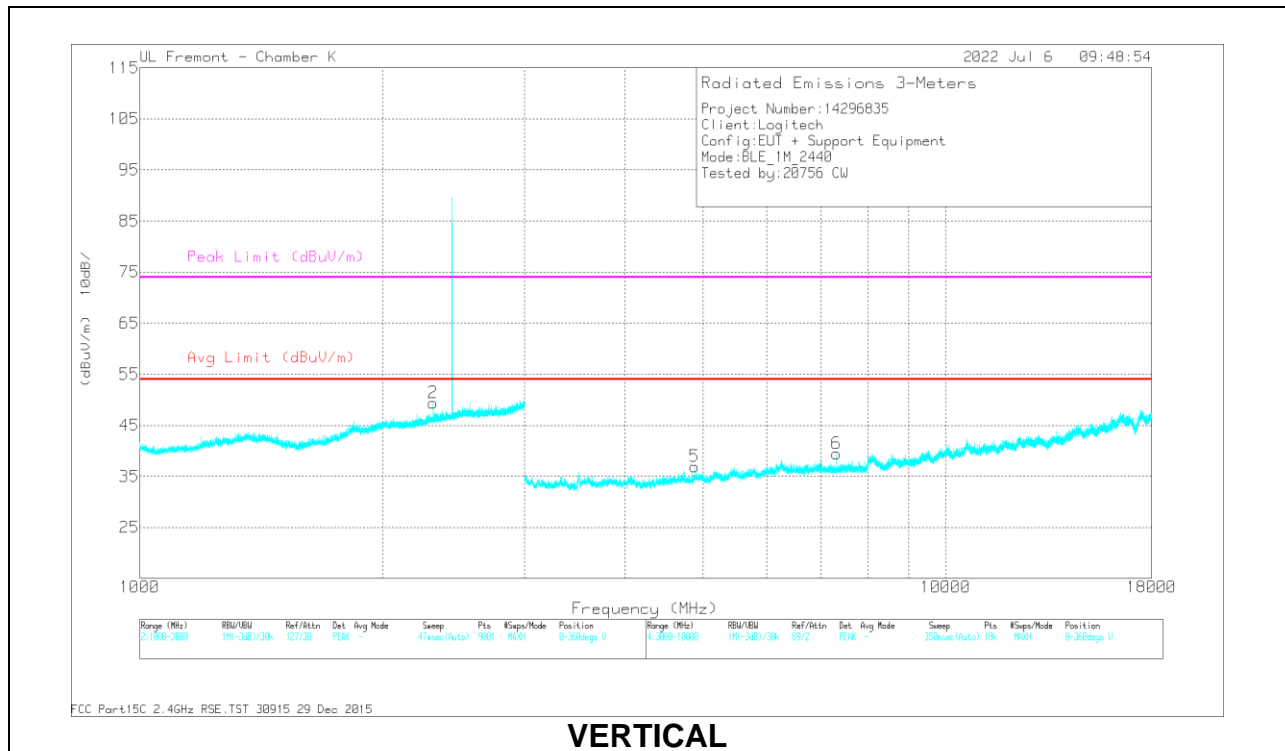
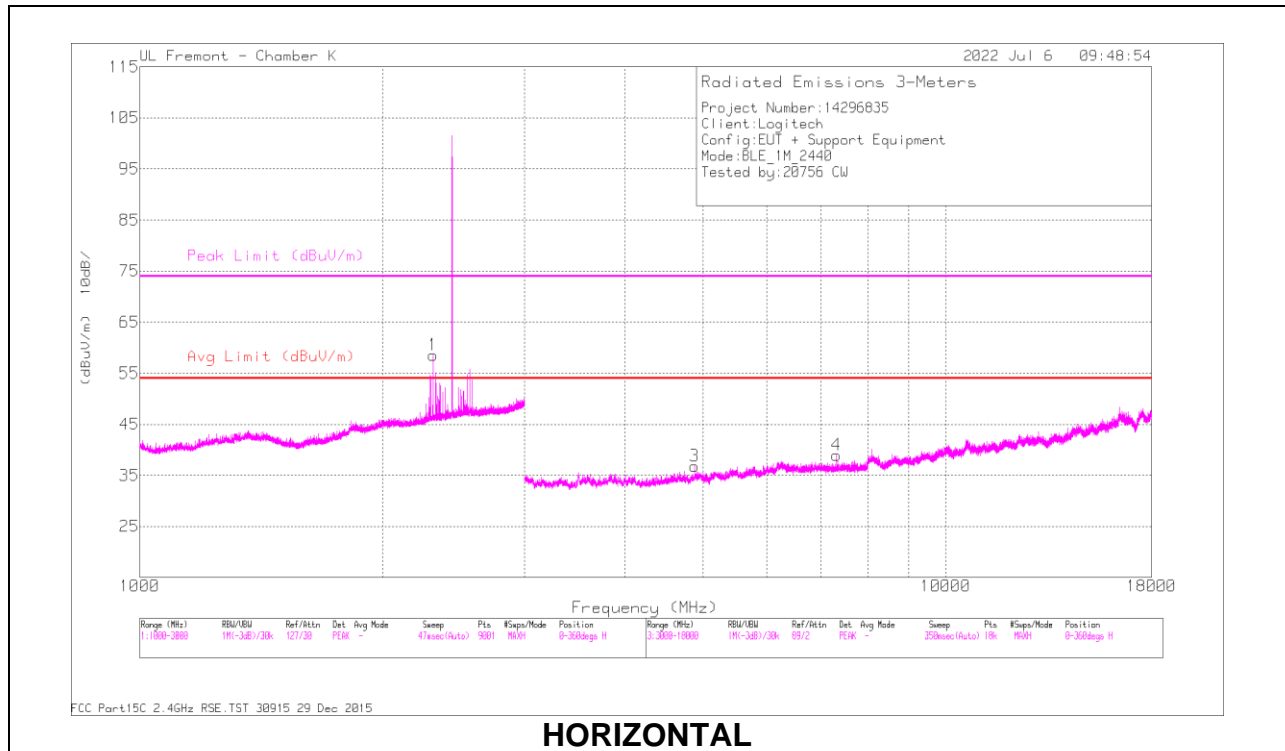


RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2274.302	65.76	PK2	31.8	-35.3	0	62.26	-	-	74	-11.74	356	112	H
	* ** 2274.302	65.76	AVG	31.8	-35.3	-26.45	35.81	54	-18.19	-	-	356	112	H
2	* ** 2273.674	62.66	PK2	31.8	-35.3	0	59.16	-	-	74	-14.84	197	385	V
	* ** 2273.674	62.66	AVG	31.8	-35.3	-26.45	32.71	54	-21.29	-	-	197	385	V
3	* ** 4804.11	61.51	PK2	34.2	-40.6	0	55.11	-	-	74	-18.89	33	130	H
	* ** 4804.11	61.51	AVG	34.2	-40.6	-26.45	28.66	54	-25.34	-	-	33	130	H
4	7205.511	53.57	PK2	35.9	-38.3	0	51.17	-	-	-	-	272	131	H
	7205.511	53.57	AVG	35.9	-38.3	-26.45	24.79	-	-	-	-	272	131	H
5	* ** 4720.582	52.09	PK2	34.1	-41.1	0	45.09	-	-	74	-28.91	291	274	V
	* ** 4720.582	52.09	AVG	34.1	-41.1	-26.45	18.64	54	-35.36	-	-	291	274	V
6	7205.471	51.86	PK2	35.9	-38.3	0	49.46	-	-	-	-	89	115	V
	7205.471	51.86	AVG	35.9	-38.3	-26.45	23.01	-	-	-	-	89	115	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0476) = 26.45

MID CHANNEL RESULTS

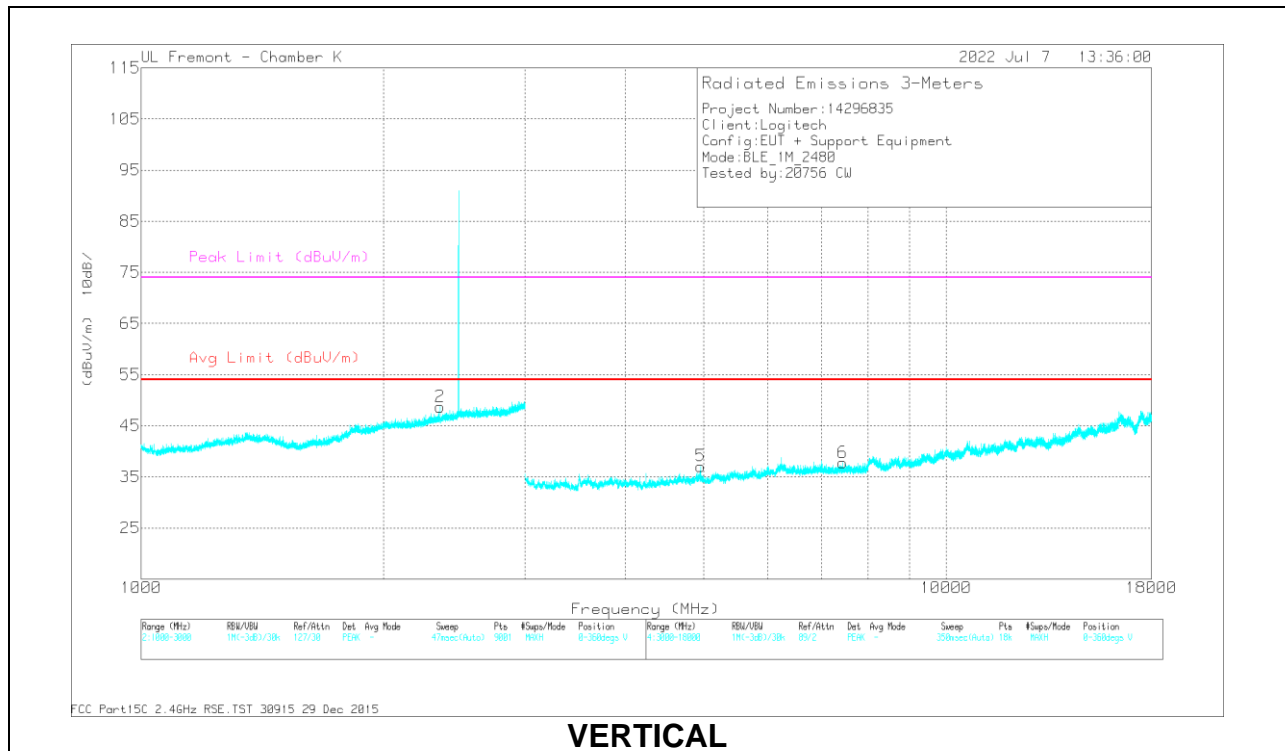
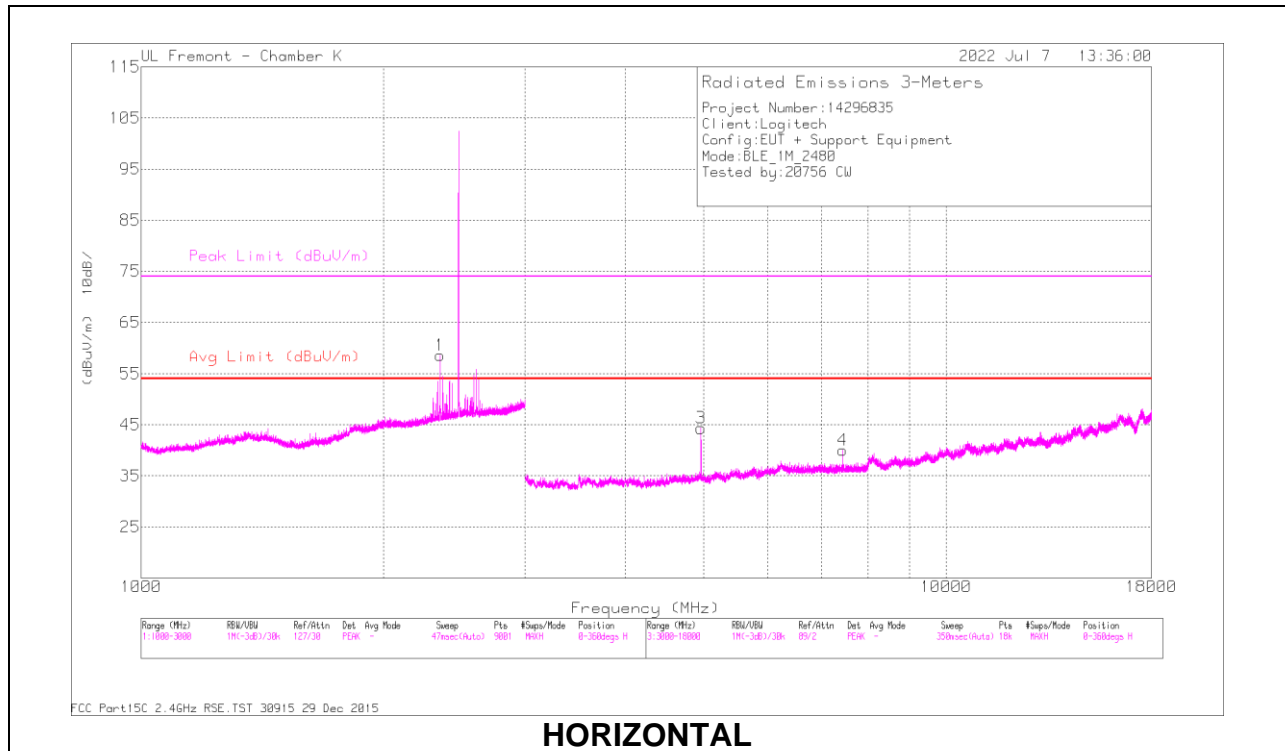


RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2311.798	66.5	PK2	31.9	-35.2	0	63.2	-	-	74	-10.8	357	137	H
	** 2311.798	66.5	AVG	31.9	-35.2	-26.45	36.75	54	-17.25	-	-	357	137	H
2	*** 2311.827	63.67	PK2	31.9	-35.2	0	60.37	-	-	74	-13.63	205	371	V
	** 2311.827	63.67	AVG	31.9	-35.2	-26.45	33.92	54	-20.08	-	-	205	371	V
3	*** 4880.113	58.91	PK2	34.1	-40.4	0	52.51	-	-	74	-21.39	256	156	H
	** 4880.113	58.91	AVG	34.1	-40.4	-26.45	26.16	54	-27.84	-	-	256	156	H
4	*** 7320.499	52.16	PK2	35.8	-38	0	49.96	-	-	74	-24.04	260	100	H
	** 7320.499	52.16	AVG	35.8	-38	-26.45	23.51	54	-30.49	-	-	260	100	H
5	*** 4880.161	55.77	PK2	34.1	-40.4	0	49.47	-	-	74	-24.53	226	377	V
	** 4880.161	55.77	AVG	34.1	-40.4	-26.45	23.02	54	-30.98	-	-	226	377	V
6	*** 7319.788	50.69	PK2	35.8	-38	0	48.49	-	-	74	-25.51	126	102	V
	** 7319.788	50.69	AVG	35.8	-38	-26.45	22.04	54	-31.96	-	-	126	102	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0476) = 26.45

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

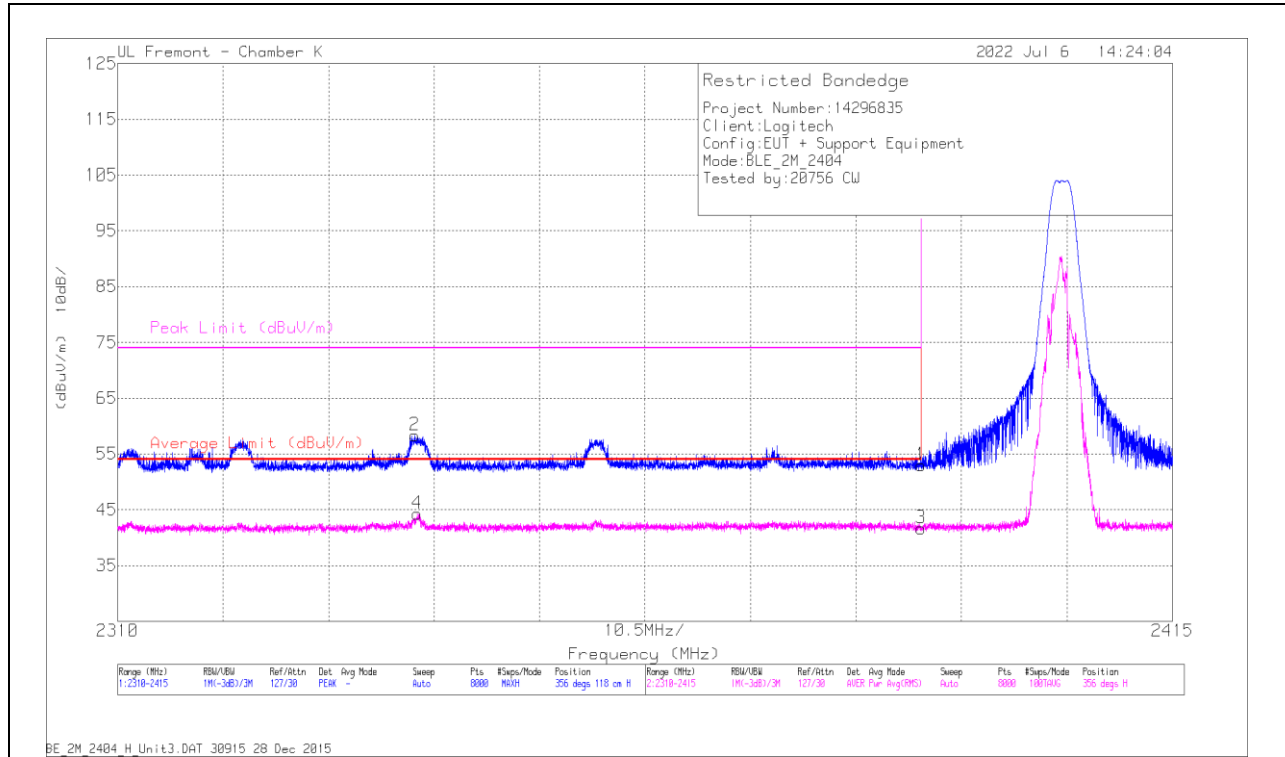
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 2351.771	67.54	PK2	32	-35	0	64.54	-	-	74	-9.46	355	159	H
	** 2351.771	67.54	AVG	32	-35	-26.45	38.09	54	-15.91	-	-	355	159	H
2	** 2351.719	62.7	PK2	32	-35	0	59.7	-	-	74	-14.3	168	358	V
	** 2351.719	62.7	AVG	32	-35	-26.45	33.25	54	-20.75	-	-	168	358	V
3	** 4959.986	58.13	PK2	34.1	-40.4	0	51.83	-	-	74	-22.17	255	101	H
	** 4959.986	58.13	AVG	34.1	-40.4	-26.45	25.38	54	-28.62	-	-	255	101	H
4	** 7440.389	50.62	PK2	35.8	-37.8	0	48.62	-	-	74	-25.38	255	117	H
	** 7440.389	50.62	AVG	35.8	-37.8	-26.45	22.17	54	-31.83	-	-	255	117	H
5	** 4960.104	55.69	PK2	34.1	-40.4	0	49.39	-	-	74	-24.61	227	384	V
	** 4960.104	55.69	AVG	34.1	-40.4	-26.45	22.94	54	-31.06	-	-	227	384	V
6	** 7439.853	50.38	PK2	35.8	-37.8	0	48.38	-	-	74	-25.62	121	100	V
	** 7439.853	50.38	AVG	35.8	-37.8	-26.45	21.93	54	-32.07	-	-	121	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0476) = 26.45

10.2.2. BLE (2Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2390	55.85	Pk	32.1	-34.9	0	53.05	-	-	74	-20.95	356	118	H
2	* 2339.549	61.33	Pk	32	-35	0	58.33	-	-	74	-15.67	356	118	H
3	* 2390	55.85	AVG	32.1	-34.9	-31.97	21.08	54	-32.92	-	-	356	118	H
4	* 2339.549	61.33	AVG	32	-35	-31.97	26.36	54	-27.64	-	-	356	118	H

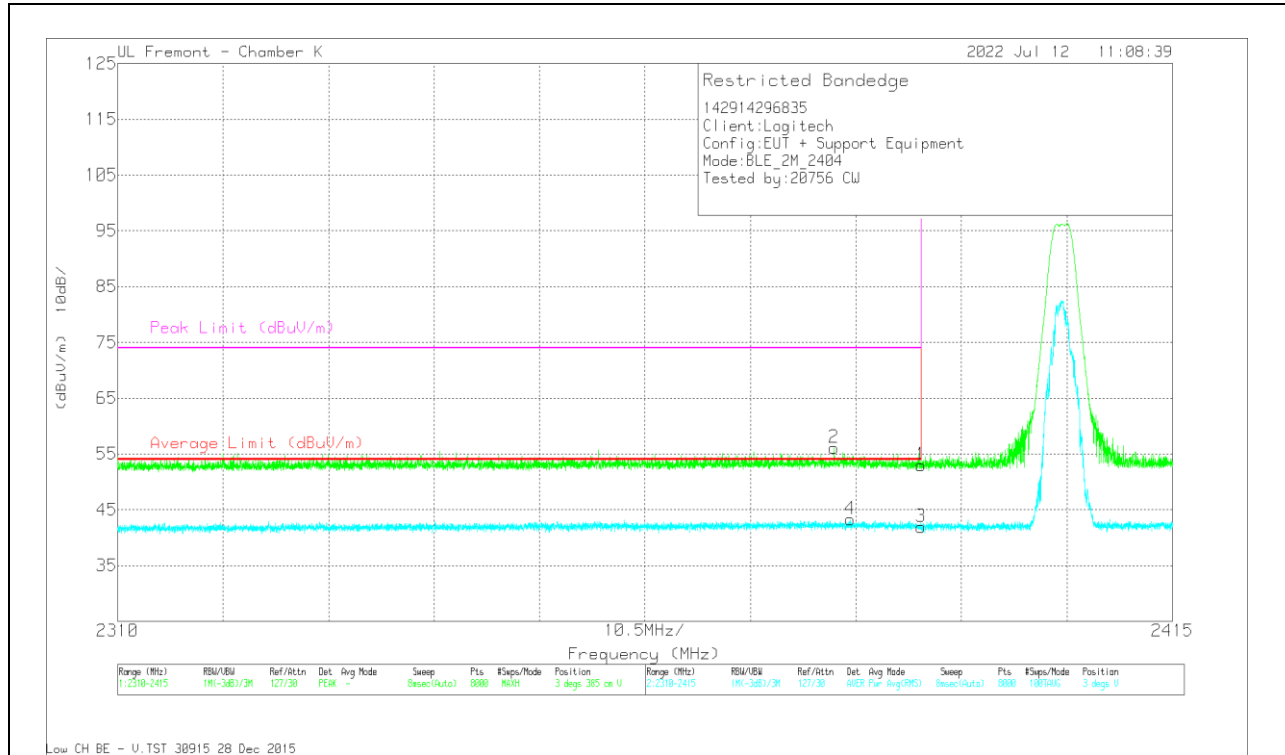
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

AVG = Peak Reading - Duty Cycle Correction Factor

Duty Cycle Correction Factor = 20 Log (1/0.0252)=-31.97

VERTICAL RESULT

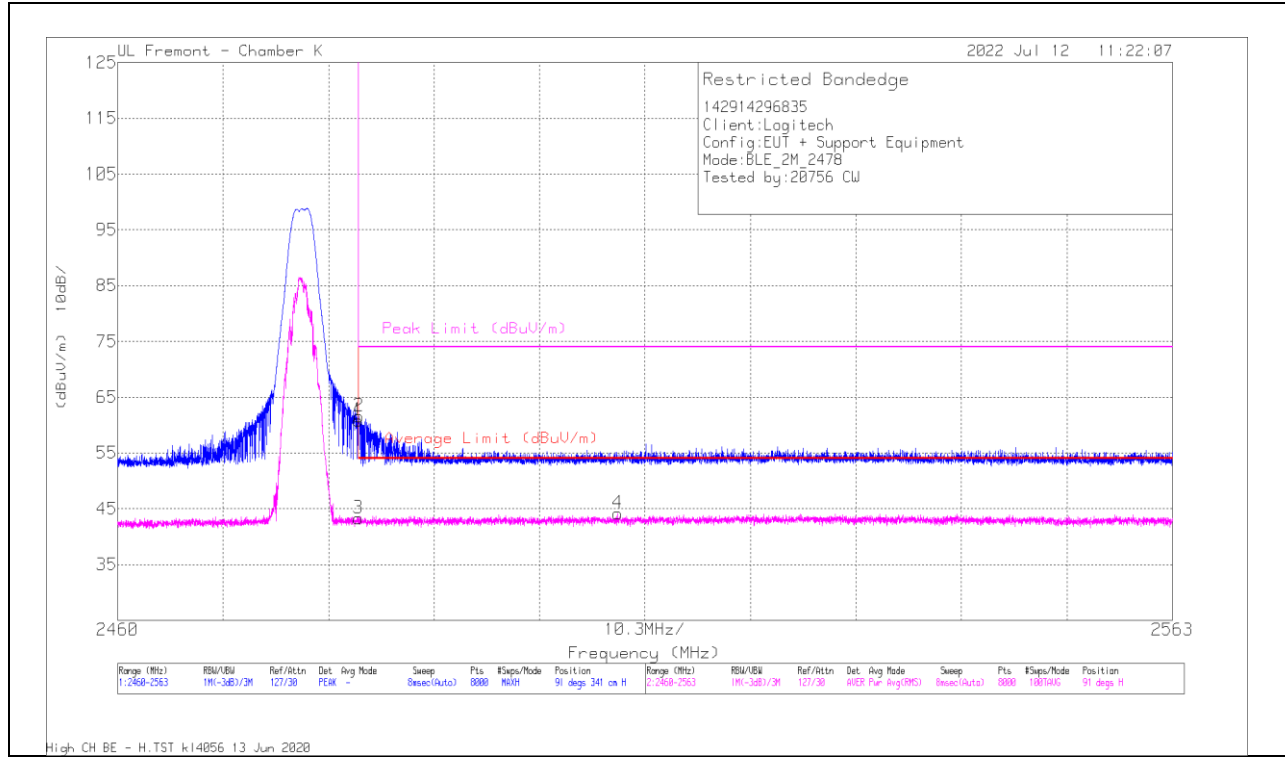


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2390	55.85	Pk	32.1	-34.9	0	53.05	-	-	74	-20.95	3	385	V
2	2381.332	58.76	Pk	32.2	-34.9	0	56.06	-	-	74	-17.94	3	385	V
3	2390	55.85	AVG	32.1	-34.9	-31.97	21.08	54	-32.92	-	-	3	385	V
4	2381.332	58.76	AVG	32.2	-34.9	-31.97	24.09	54	-29.91	-	-	3	385	V

Pk - Peak detector
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0252)=31.97

BANDEDGE (HIGH CHANNEL)

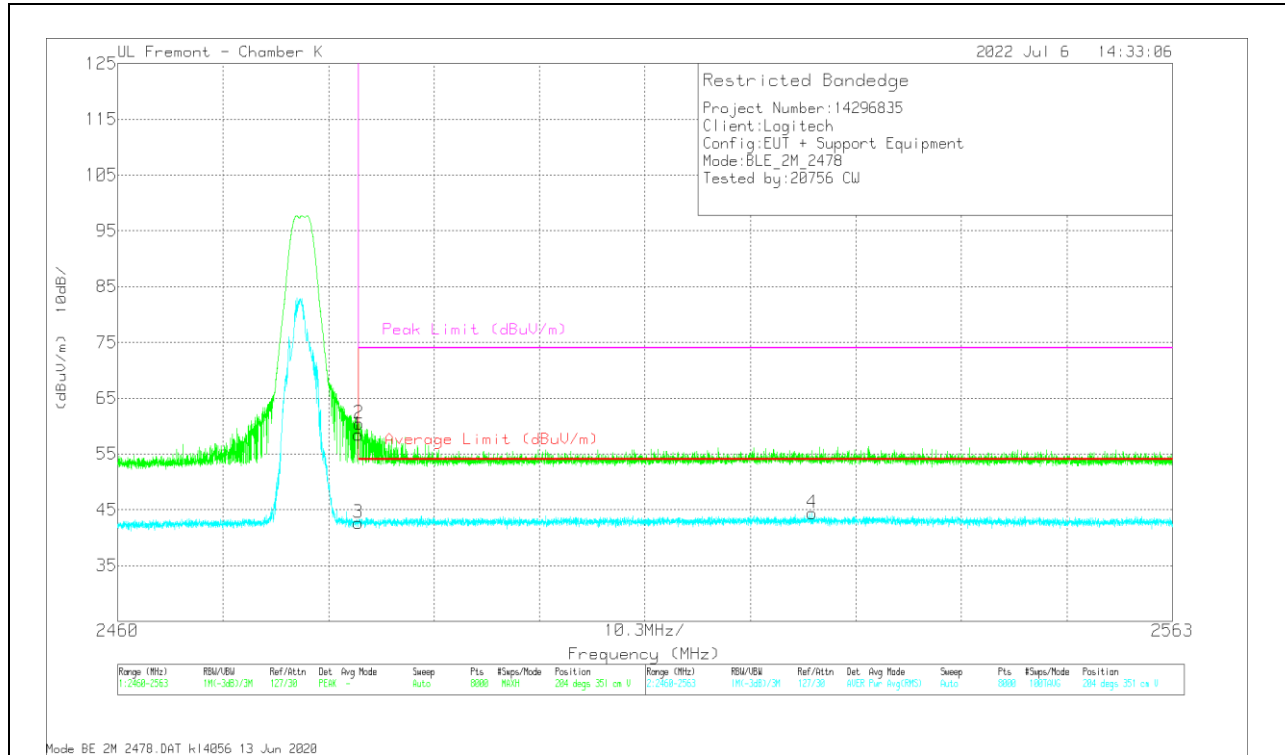
HORIZONTAL RESULT



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2483.5	62.69	Pk	32.7	-34.5	0	60.89	-	-	74	-13.11	91	341	H
2	2483.552	63.35	Pk	32.7	-34.5	0	61.55	-	-	74	-12.45	91	341	H
3	2483.5	62.69	AVG	32.7	-34.5	-31.97	28.92	54	-25.08	-	-	91	341	H
4	2483.552	63.35	AVG	32.7	-34.5	-31.97	29.58	54	-24.42	-	-	91	341	H

Pk - Peak detector
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0252)=31.97

VERTICAL RESULT



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2483.5	60.22	Pk	32.7	-34.5	0	58.42	-	-	74	-15.58	204	351	V
2	* 2483.552	62.31	Pk	32.7	-34.5	0	60.51	-	-	74	-13.49	204	351	V
3	* 2483.5	60.22	AVG	32.7	-34.5	-31.97	26.45	54	-27.55	-	-	204	351	V
4	* 2483.552	62.31	AVG	32.7	-34.5	-31.97	28.54	54	-25.46	-	-	204	351	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

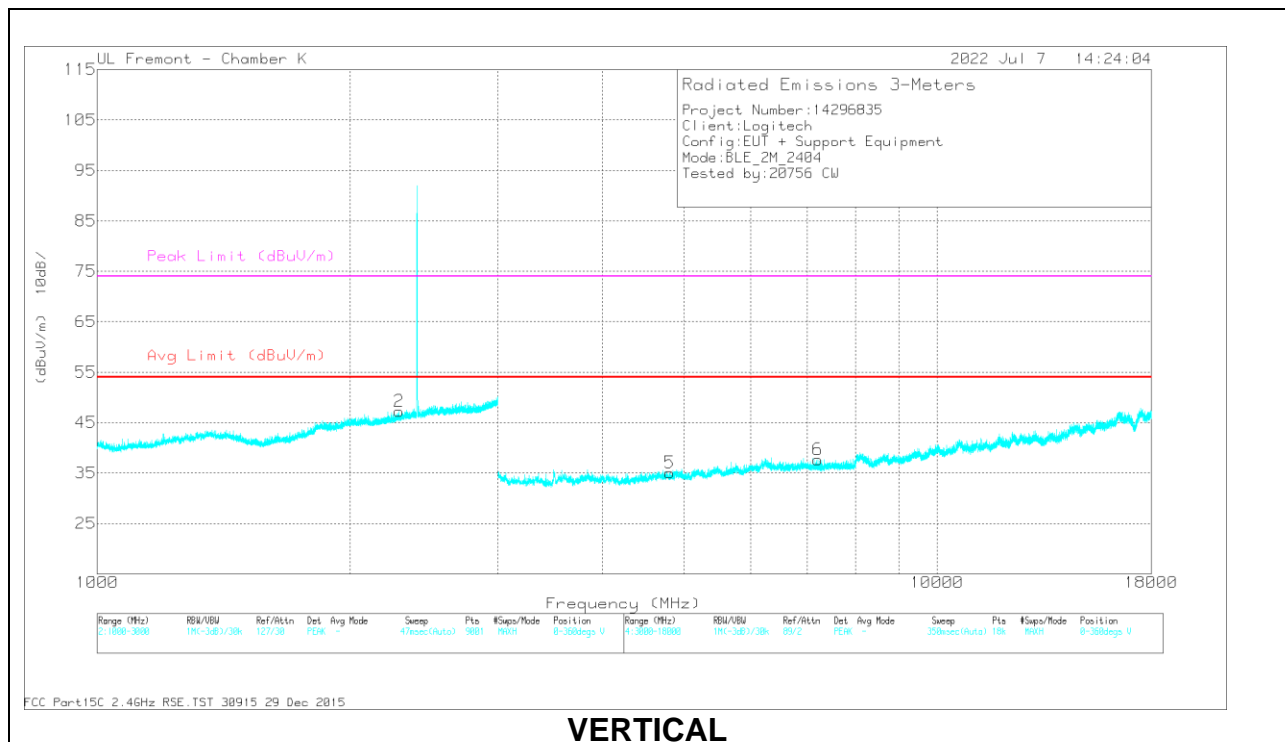
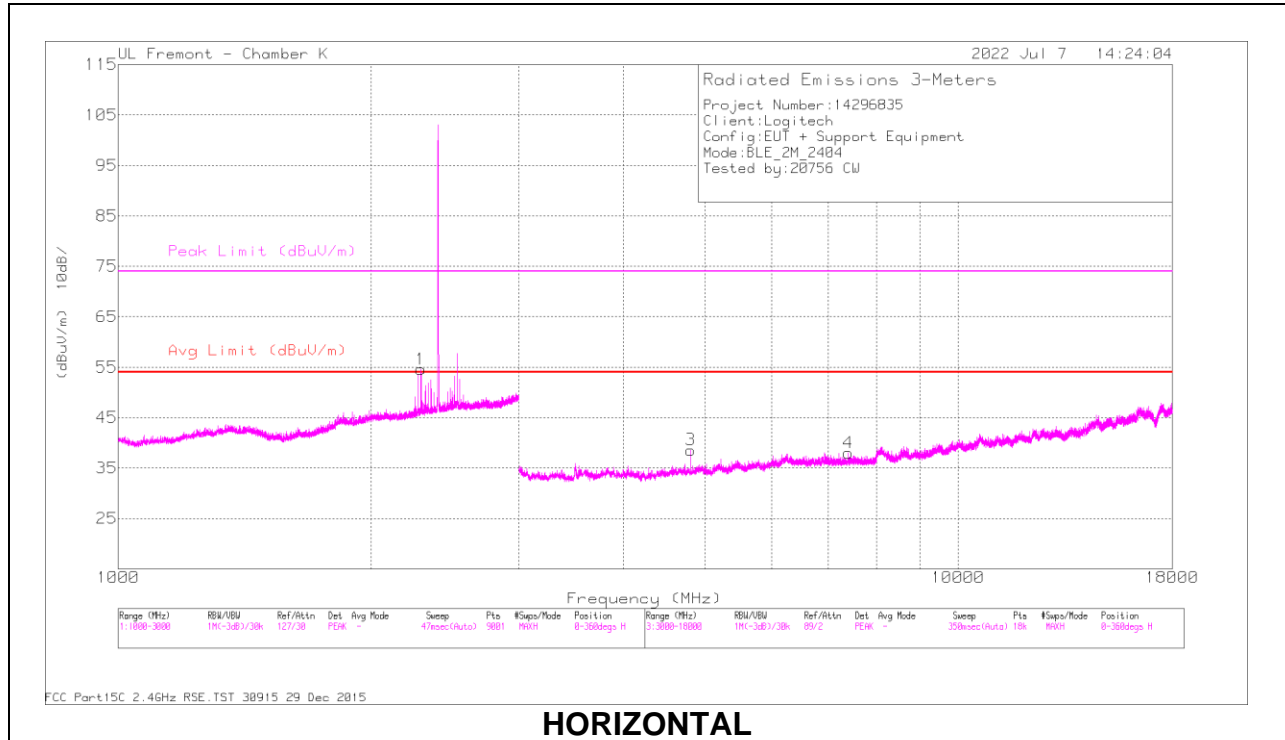
Pk - Peak detector

AVG = Peak Reading - Duty Cycle Correction Factor

Duty Cycle Correction Factor = 20 Log (1/0.0252) = 31.97

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS

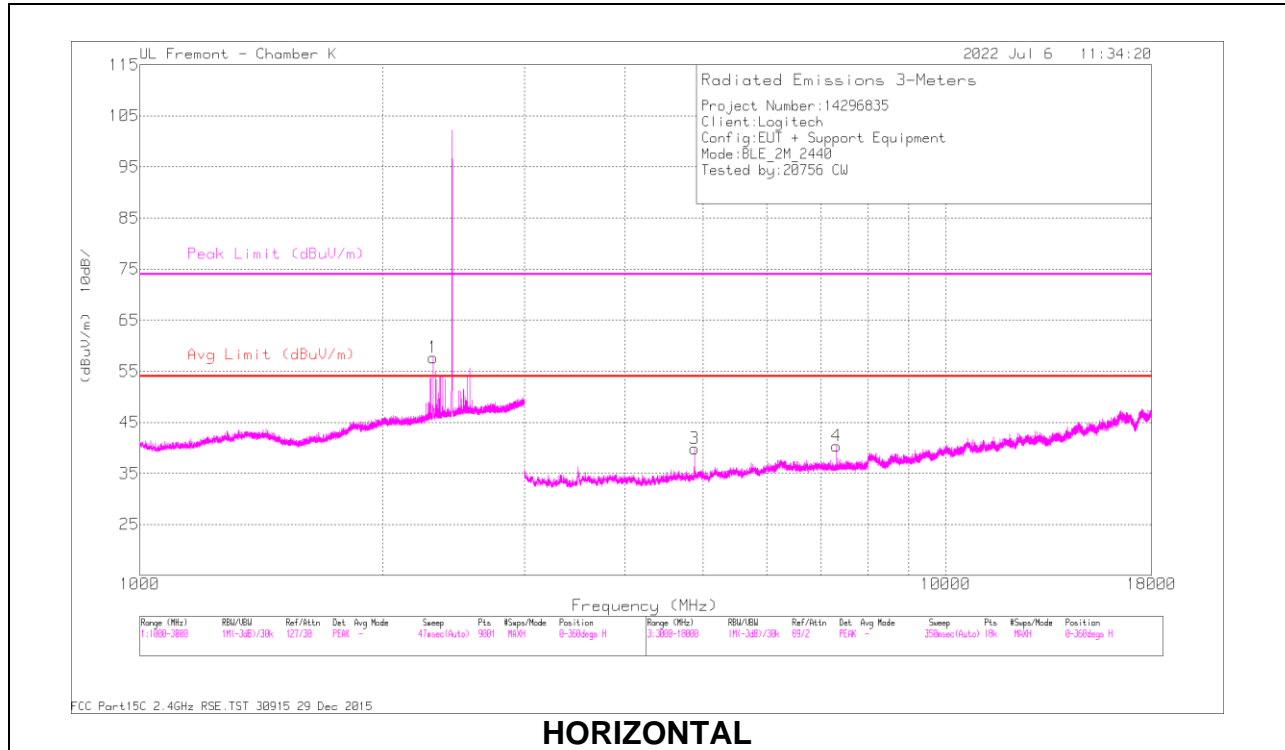


RADIATED EMISSIONS

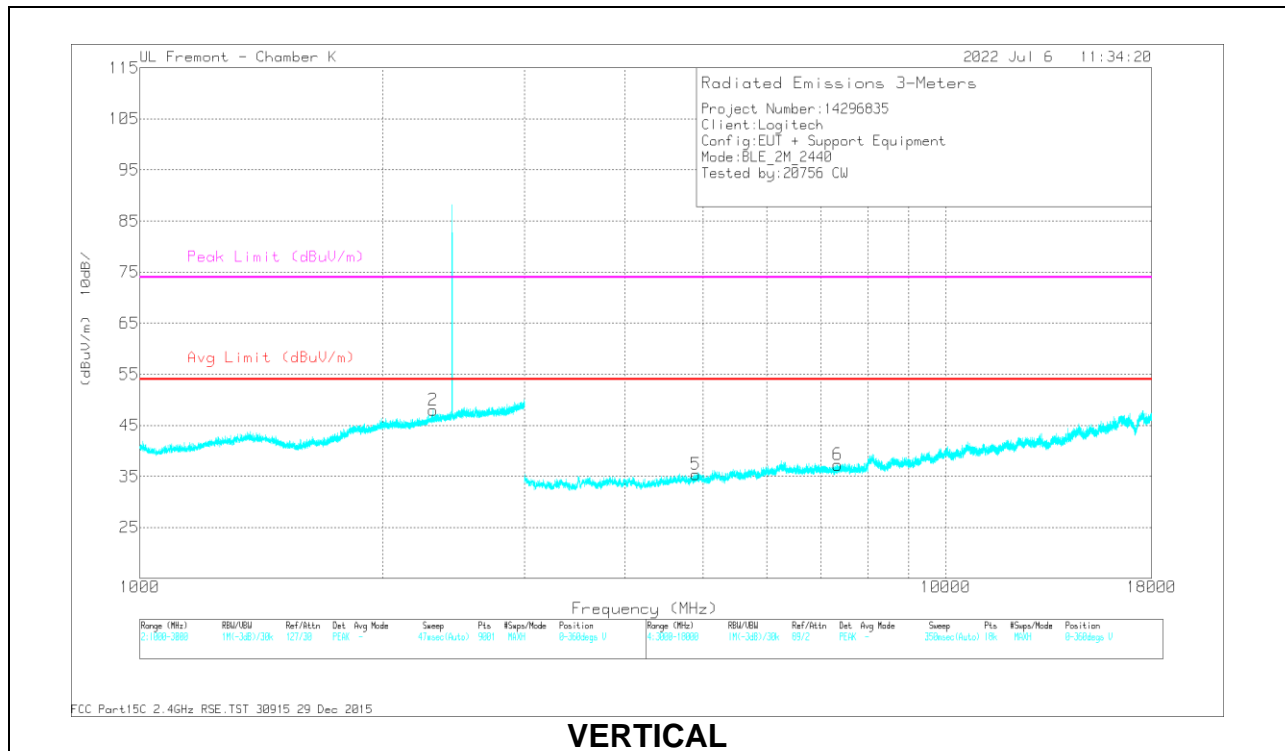
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 2293.961	64.48	PK2	31.8	-35.3	0	60.98	-	-	74	-13.02	355	107	H
	** 2293.961	64.48	AVG	31.8	-35.3	-31.97	29.01	54	-24.99	-	-	355	107	H
2	** 2287.426	60.15	PK2	31.9	-35.2	0	56.85	-	-	74	-17.15	73	378	V
	** 2287.426	60.15	AVG	31.9	-35.2	-31.97	24.88	54	-29.12	-	-	73	378	V
3	** 4807.929	60.37	PK2	34.2	-40.5	0	54.07	-	-	74	-19.93	39	146	H
	** 4807.929	60.37	AVG	34.2	-40.5	-31.97	22.1	54	-31.9	-	-	39	146	H
4	** 7400.402	49	PK2	35.8	-37.7	0	47.1	-	-	74	-26.9	102	205	H
	** 7400.402	49	AVG	35.8	-37.7	-31.97	15.13	54	-38.87	-	-	102	205	H
5	** 4804.492	51.12	PK2	34.2	-40.6	0	44.72	-	-	74	-29.28	198	115	V
	** 4804.492	51.12	AVG	34.2	-40.6	-31.97	12.75	54	-41.25	-	-	198	115	V
6	7211.881	51.24	PK2	35.9	-38.3	0	48.84	-	-	-	-	93	130	V
	7211.881	51.24	AVG	35.9	-38.3	-31.97	17.14	-	-	-	-	93	130	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0252)=31.97

MID CHANNEL RESULTS



HORIZONTAL



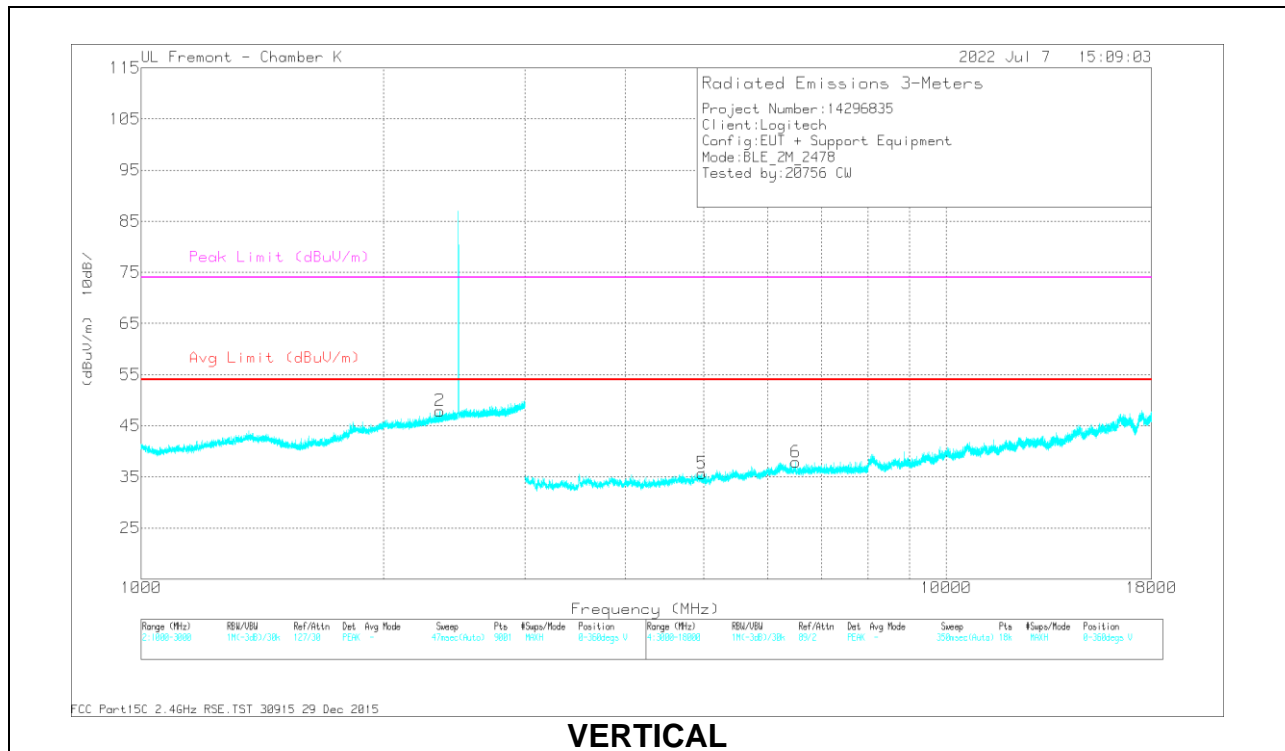
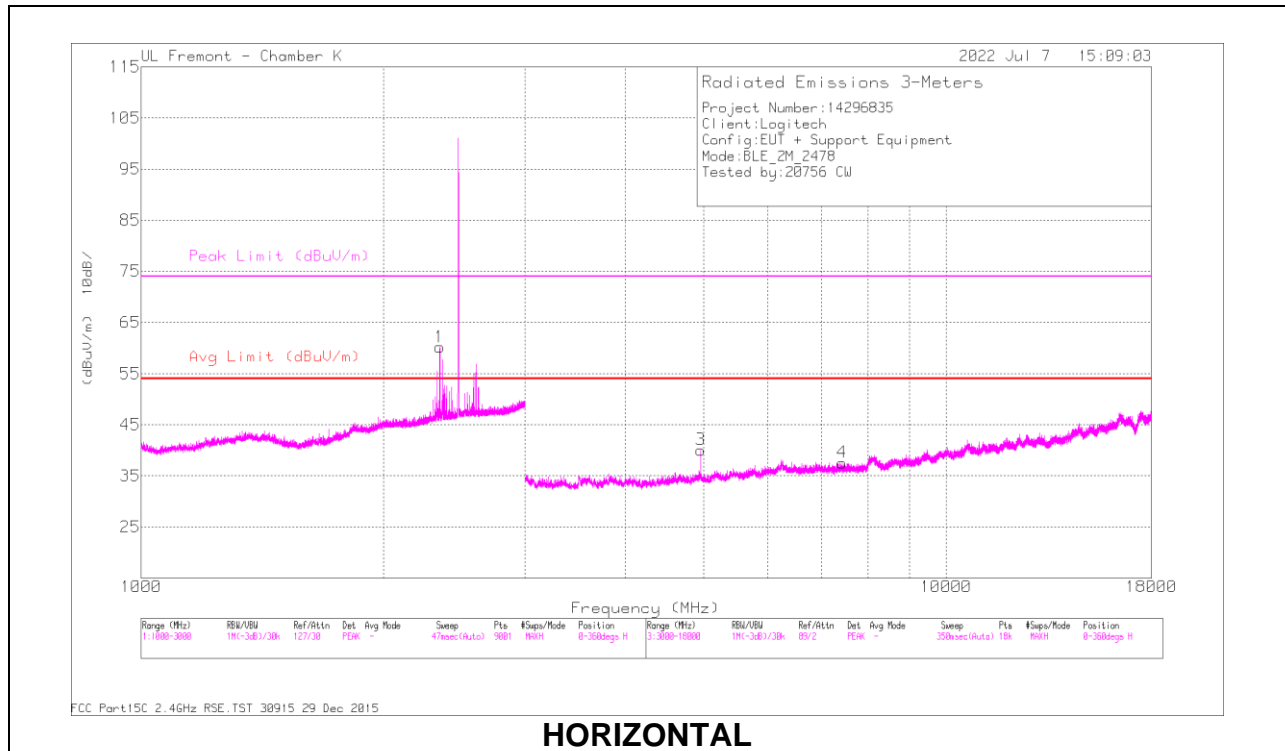
VERTICAL

RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2312.251	66.23	PK2	31.9	-35.2	0	62.93	-	-	74	-11.07	3	206	H
	*** 2312.251	66.23	AVG	31.9	-35.2	-31.97	30.96	54	23.04	-	-	3	206	H
2	*** 2311.606	62.99	PK2	31.9	-35.2	0	59.69	-	-	74	-14.31	206	369	V
	*** 2311.606	62.99	AVG	31.9	-35.2	-31.97	27.72	54	26.28	-	-	206	369	V
3	*** 4879.867	58.14	PK2	34.1	-40.4	0	51.84	-	-	74	-22.16	263	128	H
	*** 4879.867	58.14	AVG	34.1	-40.4	-31.97	19.87	54	34.13	-	-	263	128	H
4	*** 7318.308	51.87	PK2	35.8	-38	0	49.67	-	-	74	-24.33	272	106	H
	*** 7318.308	51.87	AVG	35.8	-38	-31.97	17.7	54	-36.3	-	-	272	106	H
5	*** 4893.284	52.75	PK2	34.1	-40.5	0	46.35	-	-	74	-27.65	223	336	V
	*** 4893.284	52.75	AVG	34.1	-40.5	-31.97	14.38	54	39.62	-	-	223	336	V
6	*** 7344.083	49.62	PK2	35.8	-37.8	0	47.62	-	-	74	-26.38	31	138	V
	*** 7344.083	49.62	AVG	35.8	-37.8	-31.97	15.65	54	38.35	-	-	31	138	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0252)=31.97

HIGH CHANNEL RESULTS



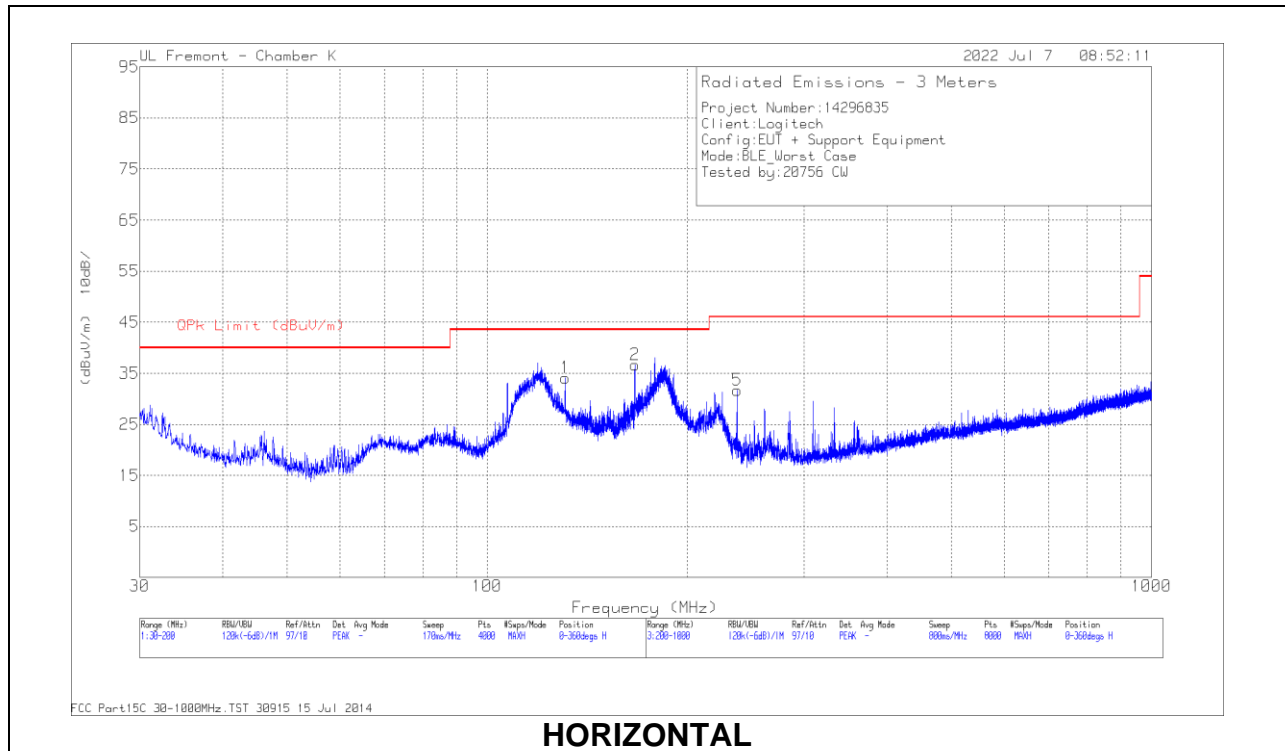
RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 80404 (dB/m)	Amp/Cbl/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2350.067	66.84	PK2	32	-35	0	63.84	-	-	74	-10.16	2	159	H
	** 2350.067	66.84	AVG	32	-35	-31.97	31.87	54	-22.13	-	-	2	159	H
2	* ** 2349.455	62.98	PK2	32	-35	0	59.98	-	-	74	-14.02	9	361	V
	** 2349.455	62.98	AVG	32	-35	-31.97	28.01	54	-25.99	-	-	9	361	V
3	* ** 4955.725	57.67	PK2	34.1	-40.4	0	51.37	-	-	74	-22.63	254	125	H
	** 4955.725	57.67	AVG	34.1	-40.4	-31.97	19.4	54	-34.6	-	-	254	125	H
4	* ** 7432.365	51.42	PK2	35.8	-37.7	0	49.52	-	-	74	-24.48	273	108	H
	** 7432.365	51.42	AVG	35.8	-37.7	-31.97	17.55	54	-36.45	-	-	273	108	H
5	* ** 4973.721	51.9	PK2	34.1	-40.3	0	45.7	-	-	74	-28.3	11	321	V
	** 4973.721	51.9	AVG	34.1	-40.3	-31.97	13.73	54	-40.27	-	-	11	321	V
6	6503.422	49.57	PK2	35.9	-38.7	0	46.77	-	-	-	-	239	266	V
	6503.422	49.57	AVG	35.9	-38.7	-31.97	15.07	-	-	-	-	239	266	V

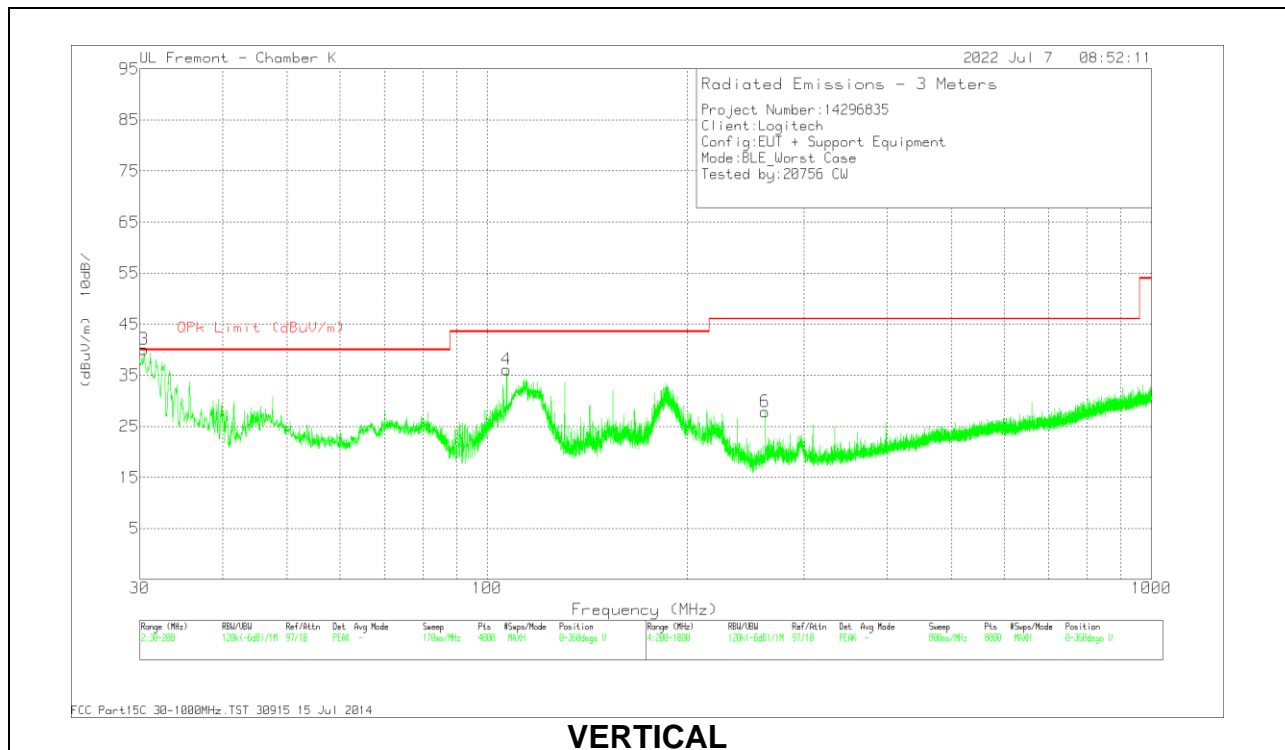
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 AVG = Peak Reading - Duty Cycle Correction Factor
 Duty Cycle Correction Factor = 20 Log (1/0.0252)=31.97

10.3. WORST CASE BELOW 1 GHZ

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	82258 ACF (dB)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 131.091	44.72	Pk	20.1	-30.7	34.12	43.52	-9.4	0-360	197	H
2	** 166.843	48.91	Pk	18.2	-30.5	36.61	43.52	-6.91	0-360	197	H
3	30.3343	38.7	Qp	27.6	-31.5	34.8	40	-5.2	206	106	V
4	107.03	48.64	Pk	18.4	-30.9	36.14	43.52	-7.38	0-360	97	V
5	237.805	43.91	Pk	17.9	-30.1	31.71	46.02	-14.31	0-360	99	H
6	** 261.908	38.82	Pk	19	-29.9	27.92	46.02	-18.1	0-360	199	V

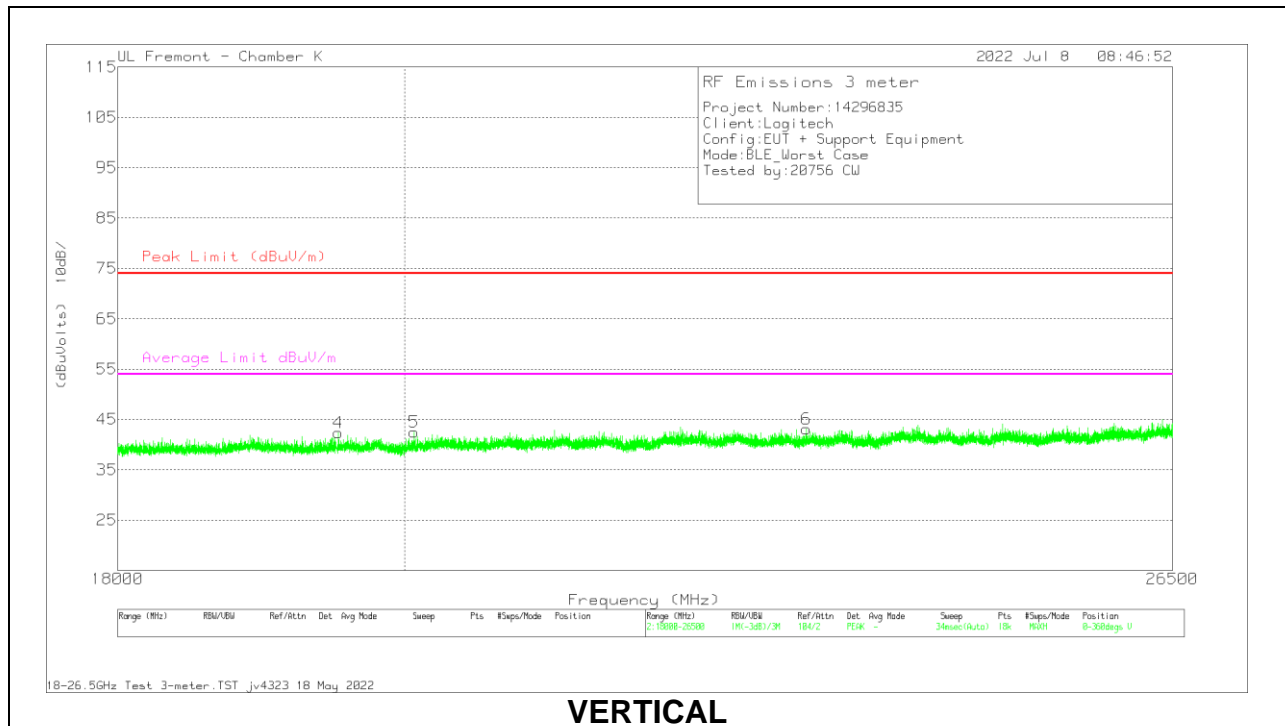
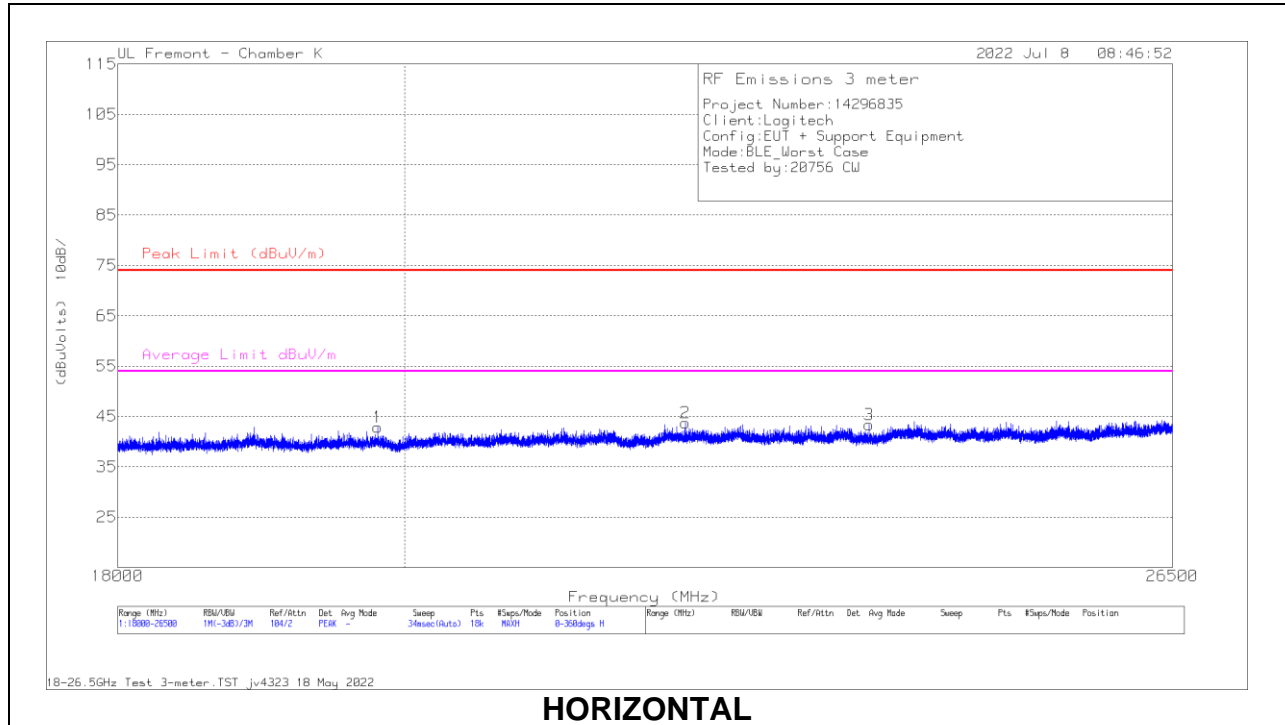
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

Qp - Quasi-Peak detector

10.4. WORST CASE 18-26.5GHz
SPURIOUS EMISSIONS 18 TO 26.5 GHz (WORST-CASE CONFIGURATION)



18-26.5 GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	172354 ACF (dB)	220194 Amp (dB)	Cables (dB)	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	PK Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 19803.416	50.85	Pk	33.2	-59.5	18.3	42.85	74	-31.15	54	-11.15	0-360	199	H
2	*** 22164.526	49.76	Pk	34	-59.4	19.4	43.76	74	-30.24	54	-10.24	0-360	199	H
3	*** 23709.164	49.3	Pk	34.5	-60.5	20.1	43.4	74	-30.6	54	-10.6	0-360	100	H
4	*** 19518.194	51.02	Pk	33.2	-60	18.2	42.42	74	-31.58	54	-11.58	0-360	100	V
5	*** 20065.971	49.52	Pk	33.4	-58.9	18.5	42.52	74	-31.48	54	-11.48	0-360	100	V
6	23170.831	48.86	Pk	34.2	-59.8	19.9	43.16	74	-30.84	54	-10.84	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector