TEST REPORT

Report Number: 13486961-E4V1

Applicant	:	XIAMEN NEW SOUND TECHNOLOGY CO,. LTD NO.13 of XIANG YUE ROAD, TORCH HI-TECH INDUSTRIAL DEVELOPMENT ZONE, XIANG AN DISTRICT, XIAMEN, CHINA
Model	:	Primo W
FCC ID	:	2AI4Q-PRIMO
EUT Description	:	HEARING AID
Test Standard(s)	:	FCC CFR 47 PART 15 SUBPART C

Date Of Issue:
September 17, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	9/17/2020	Initial Issue	

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

TABLE OF CONTENTS

REPORT REVISION HISTORY 2

TABLE OF CONTENTS 3

1. ATTESTATION OF TEST RESULTS 5

2. TEST RESULTS SUMMARY 7

3. TEST METHODOLOGY 7

4. FACILITIES AND ACCREDITATION 7

5. DECISION RULES AND MEASUREMENT UNCERTAINTY 8

5.1. METROLOGICAL TRACEABILITY 8

5.2. DECISION RULES 8

5.3. MEASUREMENT UNCERTAINTY 8

5.4. SAMPLE CALCULATION 8

6. EQUIPMENT UNDER TEST 9

6.1. EUT DESCRIPTION 9

6.2. MAXIMUM OUTPUT POWER 9

6.3. DESCRIPTION OF AVAILABLE ANTENNAS 9

6.4. SOFTWARE AND FIRMWARE 9

6.5. WORST-CASE CONFIGURATION AND MODE 9

6.6. DESCRIPTION OF TEST SETUP 10

7. MEASUREMENT METHOD 13

8. TEST AND MEASUREMENT EQUIPMENT 14

9. ANTENNA PORT TEST RESULTS 15

9.1. ON TIME AND DUTY CYCLE 15

9.2. 99% BANDWIDTH 16

9.3. 6 dB BANDWIDTH 17

9.4. OUTPUT POWER 18

9.5. AVERAGE POWER 19

9.6. POWER SPECTRAL DENSITY 20

9.7. CONDUCTED SPURIOUS EMISSIONS 21

10. RADIATED TEST RESULTS 23

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

10.1. LIMITS AND PROCEDURE.....23
10.2. TRANSMITTER ABOVE 1 GHz.....25
10.3. WORST CASE BELOW 30MHZ.....35
10.4. WORST CASE BELOW 1 GHZ.....36
10.5. WORST CASE 18-26 GHZ.....38
10.6. AC POWER LINE CONDUCTED EMISSIONS.....40

11. SETUP PHOTOS 43

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: XIAMEN NEW SOUND TECHNOLOGY CO,. LTD
NO.13 of XIANG YUE ROAD,
TORCH HI-TECH INDUSTRIAL DEVELOPMENT ZONE,
XIANG AN DISTRICT, XIAMEN, CHINA

EUT DESCRIPTION: Hearing Aids

MODEL: Primo W

SERIAL NUMBER: RX13 (Conducted); RX12 (Radiated)

DATE TESTED: SEPTEMBER 09, 2020 – SEPTEMBER 11,2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC CFR 47 Part 15 Subpart C	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 NVLAP, NIST, any agency of the Federal Government.

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

Approved & Released For
UL Verification Services Inc. By:

DAN CORONIA
OPERATIONS LEAD
UL Verification Services Inc.

Prepared By:

ERIC YU
TEST ENGINEER
UL Verification Services Inc.

Reviewed By:

TINA CHU
SENIOR PROJECT ENGINEER
UL Verification Services Inc.

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

2. TEST RESULTS SUMMARY

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
15.247 (a) (2)	6dB BW	Complies	None.
15.247 (b) (3)	Output Power	Complies	None.
See Comment	Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	PSD	Complies	None.
15.247 (d)	Conducted Spurious Emissions	Complies	None.
15.209, 15.205	Radiated Emissions	Complies	None.
15.207	AC Mains Conducted Emissions	Complies	None.

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 v01r0.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions were measured at 47658 Kato RD address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Rd
☐ Chamber A	☐ Chamber D	☐ Chamber I
☐ Chamber B	☐ Chamber E	☐ Chamber J
☐ Chamber C	☐ Chamber F	☒ Chamber K
	☐ Chamber G	☐ Chamber L
	☐ Chamber H	☐ Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code: 2324B.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

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	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.26 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.39 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.19 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:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a hearing aid with BLE radio.

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	-1.07	0.78

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a chip antenna, with a maximum gain of 3.77 dBi.

6.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Version: 4.1.3.35
The software installed in the EUT during testing was 4.0.12

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated band edge, harmonics, and spurious emissions from 1 GHz to 18GHz were performed with the EUT was set to transmit at the Low/Middle/High channels.

Radiated emission below 30MHz, below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT was set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Worst-case data rate as provided by the client was:
BLE: 1 Mbps.

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

6.6. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID/ DoC**
Laptop	Dell	Latitude E7470	3F94RC2	DoC
Laptop AC/DC adapter	Dell	LA65NM130	CN-03NKWD-72438-38D-0F54-A00	DoC
EUT AC/DC adapter	Huoniu	HNEM050200UU	None	DoC
Debug Board	SchmartBoard Inc.	RS-232 710-0001-01	FAB#201-0200-01 #0528	DoC
Wireless charger	Xiamen New Sound Technology Co,. Ltd	SBW01	2035	2AI4Q-SBW

I/O CABLES (RF CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	AC	Un-shielded	1	AC Mains to AC/DC Adapter
2	DC	1	DC	Un-shielded	1.5	AC/DC Adapter to Laptop
3	USB	1	UART	Un-shielded	1.5	Laptop to debug board
4	DC	1	DC	Un-shielded	0.18	Debug board To EUT
5	Antenna	1	SMA	Un-shielded	1.1	To spectrum analyzer

I/O CABLES (RF RADIATED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	UART	Un-shielded	1.65	AC/DC adapter to debug board
2	DC	1	DC	Un-shielded	0.18	Debug board To EUT

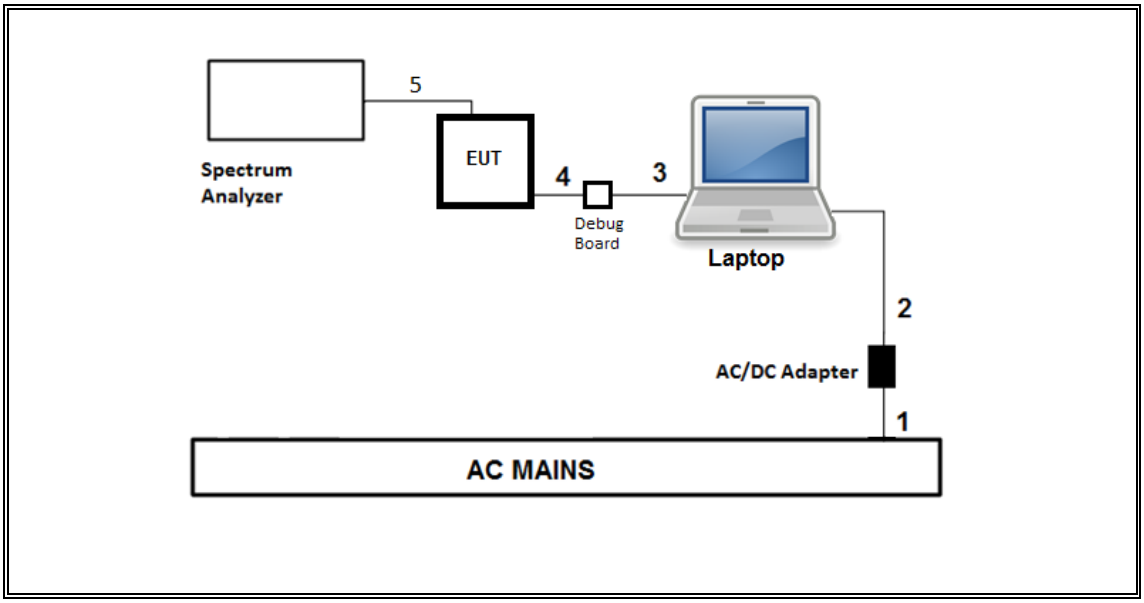
I/O CABLES (AC Power Line TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	AC	Un-shielded	1	N/A
2	USB	1	USB Type C	Un-shielded	1	N/A

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

TEST SETUP-CONDUCTED TEST

The EUT was connected to the debug board. Test software exercised the EUT.

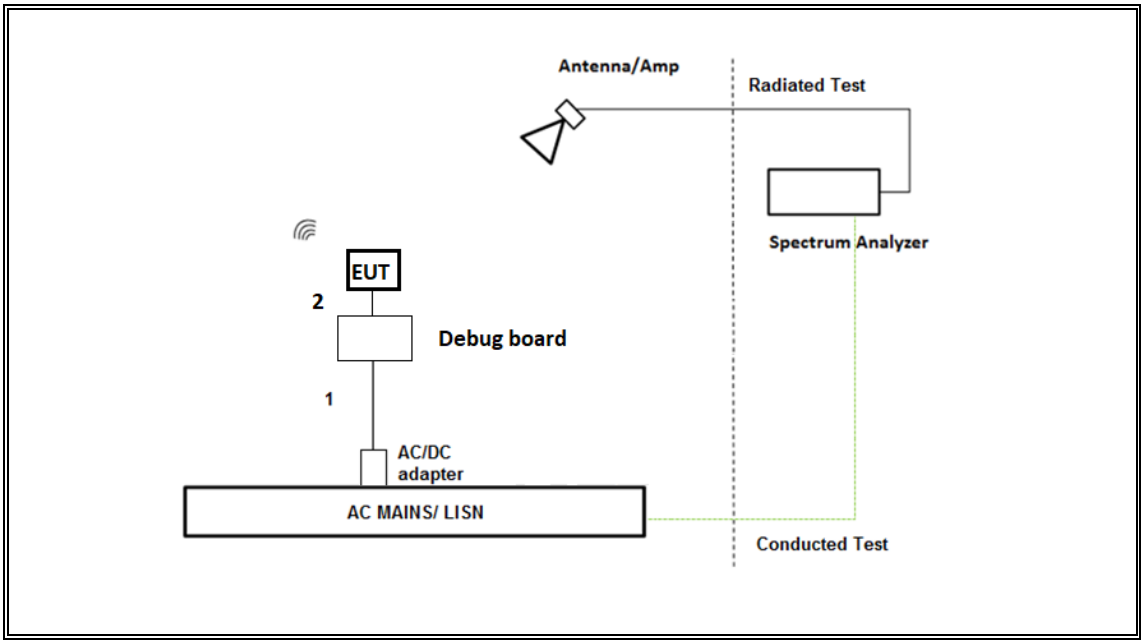
SETUP DIAGRAM



TEST SETUP- RADIATED TEST

The EUT was connected to the debug board. Test software exercised the EUT.

SETUP DIAGRAM

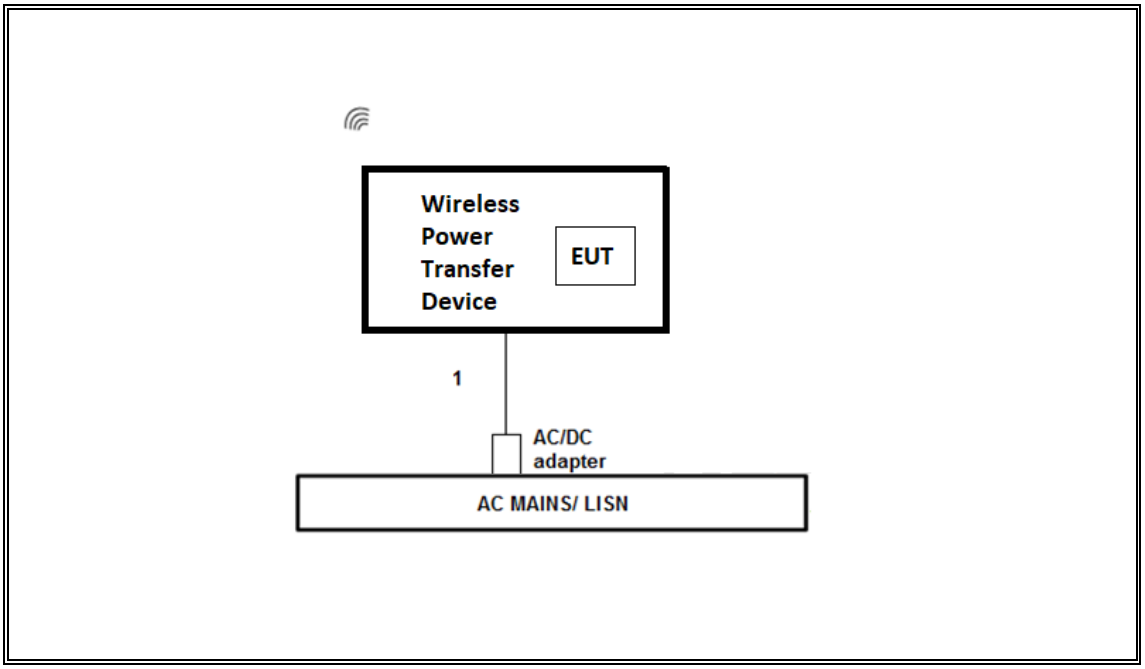


UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

TEST SETUP- AC POWER LINE TEST

The EUT was charged in a wireless transfer power device. Test software exercised the EUT.

SETUP DIAGRAM



UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

7. MEASUREMENT METHOD

6 dB BW: ANSI C63.10 Subclause -11.8.1

Occupied BW (99%): ANSI C63.10-2013 Section 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

Conducted emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.2

Band-edge: ANSI C63.10 Subclause -11.13.3.4 Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

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, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	PRE0179465	07/27/2021
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	PRE0179467	07/27/2021
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	08/31/2021
Amplifier, 100MHz-18GHz	AMPLICAL	AMP0.1G18-47-20	PRE0197319	05/04/2021
Antenna, Broadband Hybrid, 30MHz to 3GHz	SunAR rf motion	JB3	PRE0181574	10/14/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	01/23/2021
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179376	04/03/2021
Antenna Horn, 18 to 26GHz	ARA	SWH-28	T448	05/20/2021
Pre-Amp 18-26GHz	Agilent Technology	8449B	PRE0183142	04/08/2021
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1268	01/22/2021
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	T413	02/26/2021
AC Line Conducted				
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**
LISN	Fischer Custom Communications, Inc	FCC-LISN-50/250-25-2-01-480V	PRE0186446	01/21/2021
L.I.S.N	FCC INC.	FCC LISN 50/250	24	01/21/2021
EMI TEST RECEIVER	Rohde & Schwarz	ESR	T1436	02/20/2021
Transient Limiter	COM-POWER	LIT-930A	PRE0129246	01/23/2021
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Rev 9.5, 30 Apr, 2020	
Antenna Port Software	UL	UL RF	AP2020.9.1	

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

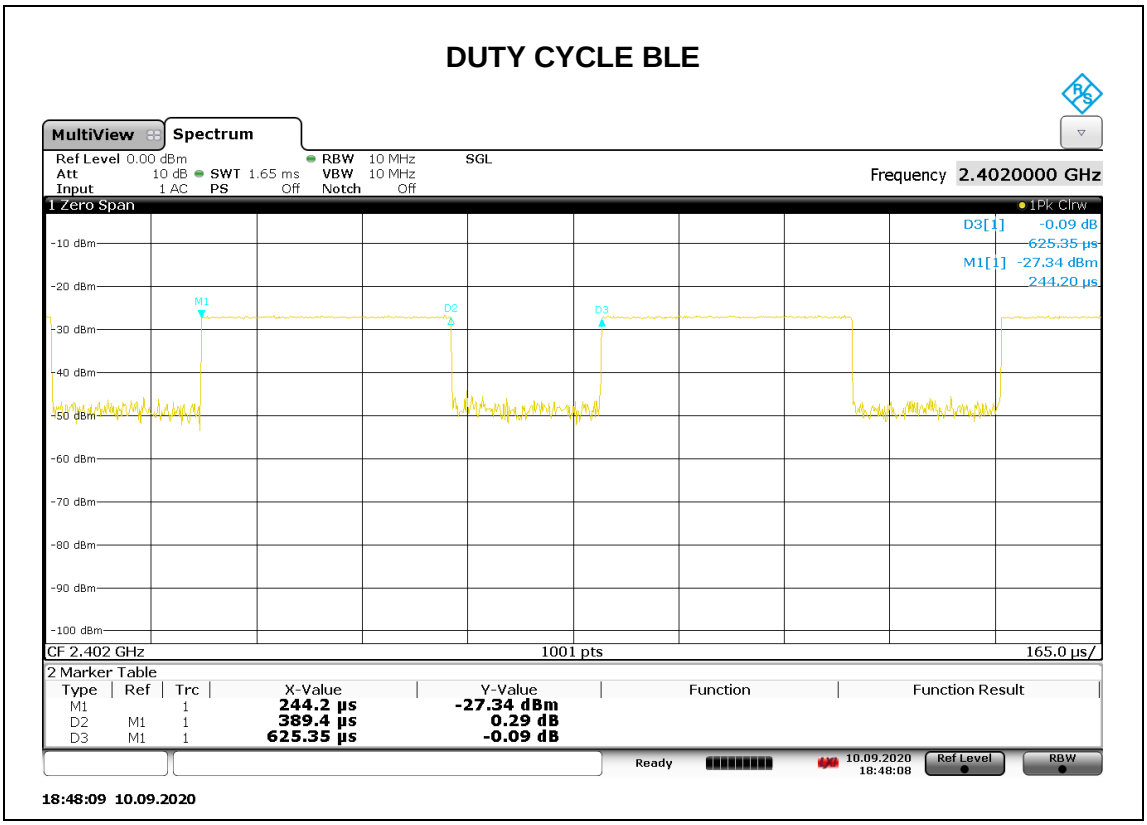
ANSI C63.10 Section 11.6 Zero-Span Spectrum Analyzer Method.

Tested by:	19498 ER

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
BLE	0.389	0.625	0.623	62.27%	2.06	2.568

DUTY CYCLE PLOTS



UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

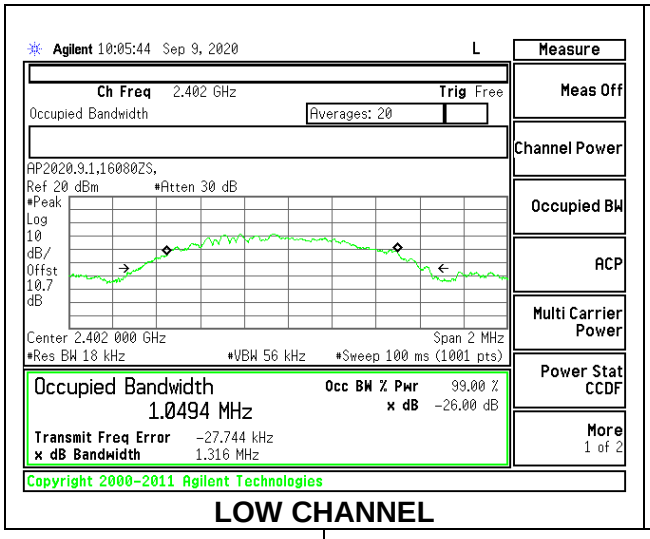
9.2. 99% BANDWIDTH

LIMITS

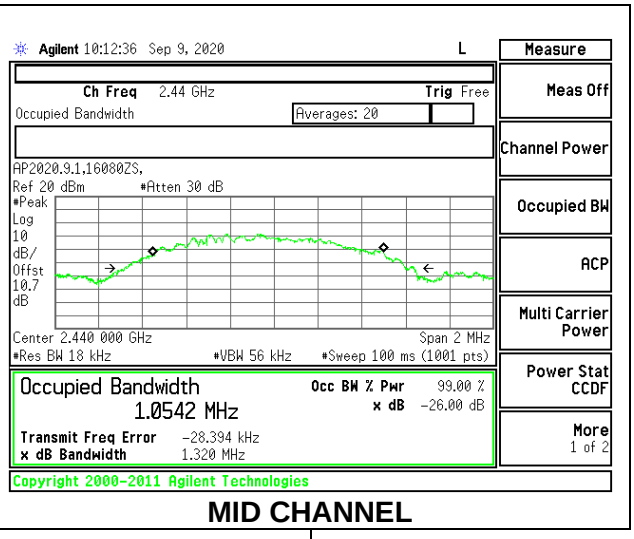
None; for reporting purposes only.

RESULTS

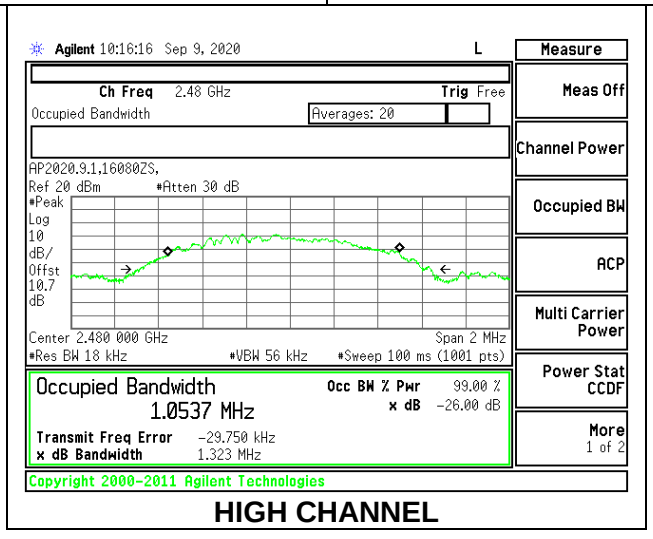
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.049
Middle	2440	1.054
High	2480	1.054



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.3. 6 dB BANDWIDTH

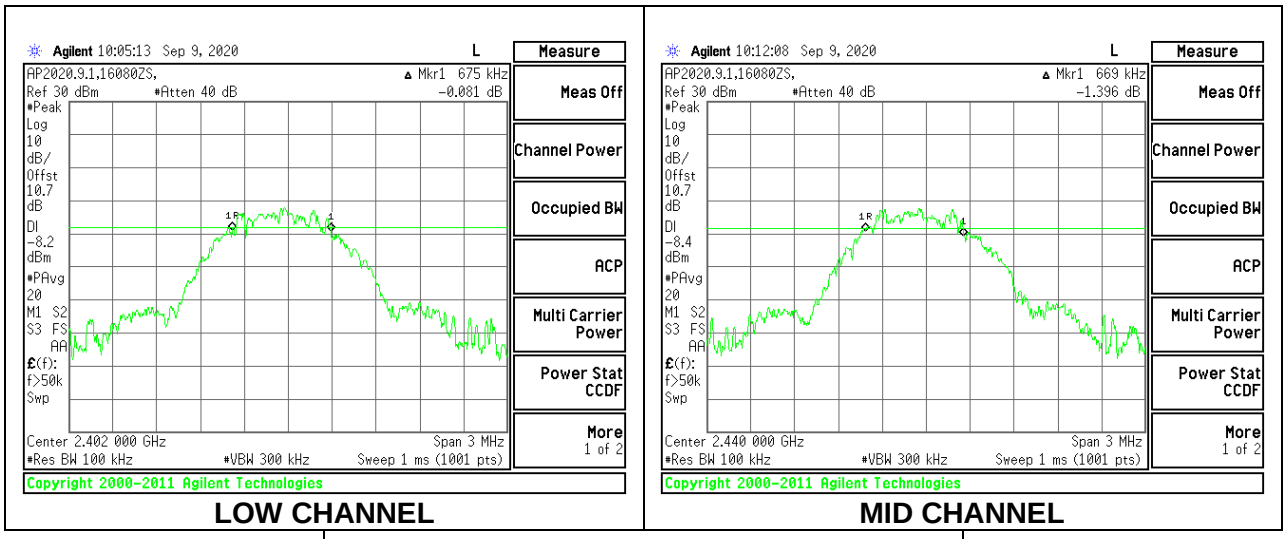
LIMITS

FCC §15.247 (a) (2)

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

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.675	0.5
Middle	2440	0.669	0.5
High	2480	0.696	0.5



UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

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 cable assembly insertion loss was entered as an offset in the power meter to allow for a gated peak reading of power.

RESULTS

Tested By:	16080ZS
Date:	9/9/2020

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-1.07	30.00	-31.07
Middle	2440	-1.10	30.00	-31.10
High	2480	-1.34	30.00	-31.34

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

Tested By:	16080ZS
Date:	9/9/2020

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	-1.34
Middle	2440	-1.38
High	2480	-1.60

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.6. POWER SPECTRAL DENSITY

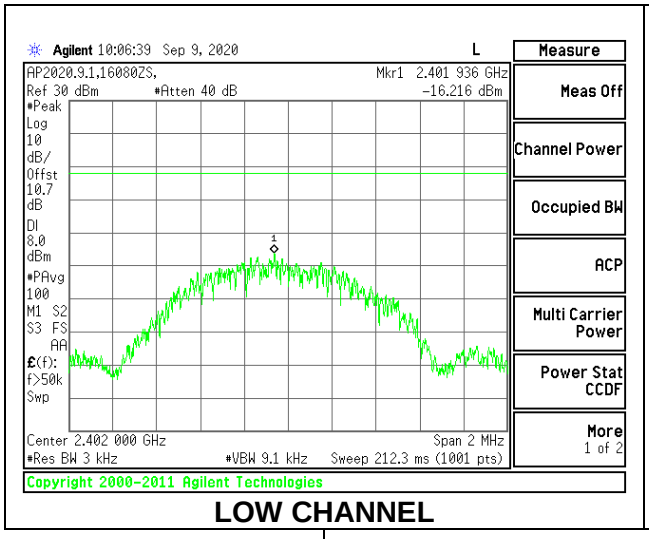
LIMITS

FCC §15.247 (e)

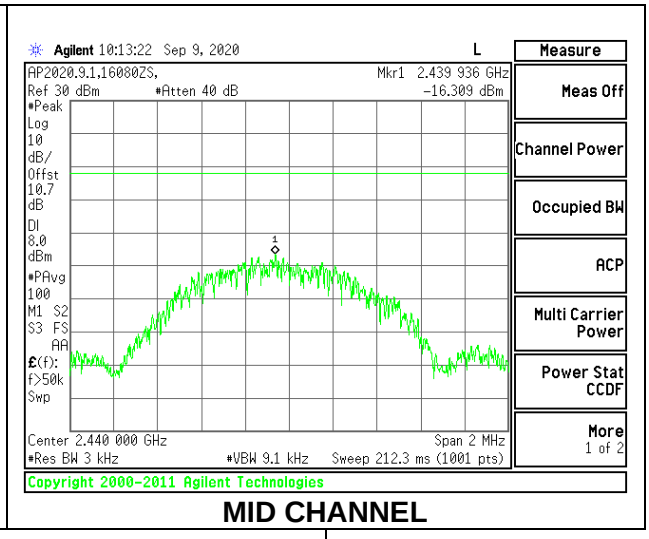
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

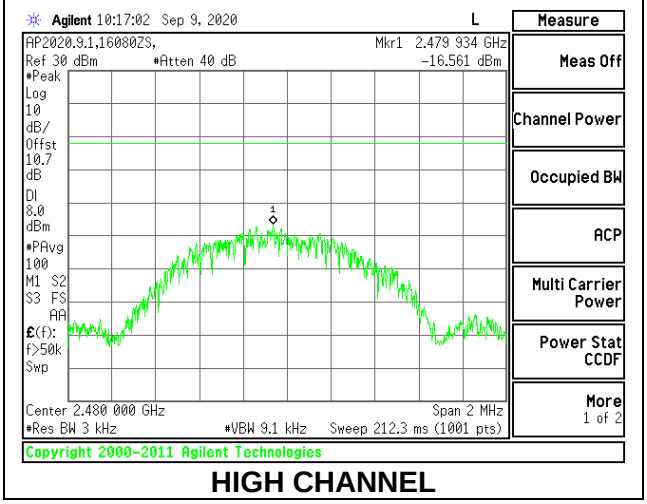
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-16.22	8	-24.22
Middle	2440	-16.31	8	-24.31
High	2480	-16.56	8	-24.56



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.7. CONDUCTED SPURIOUS EMISSIONS

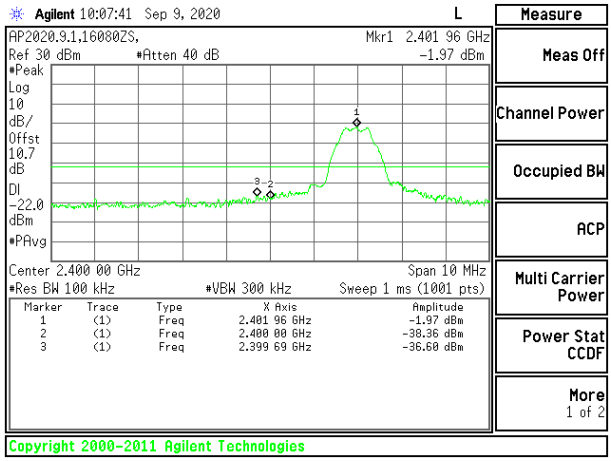
LIMITS

FCC §15.247 (d)

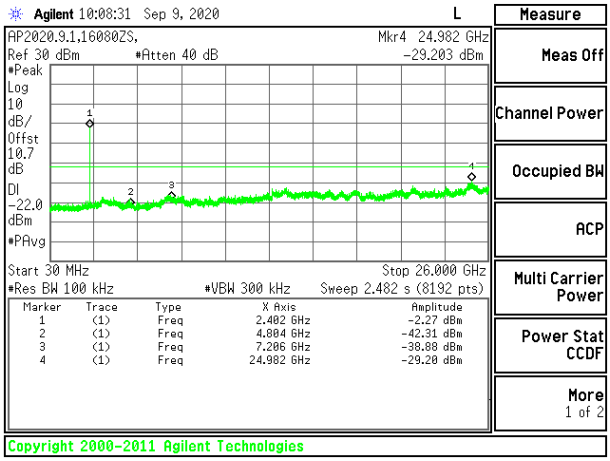
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

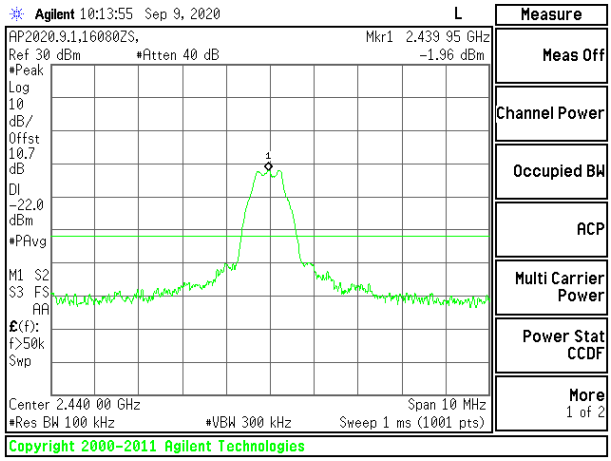
UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888



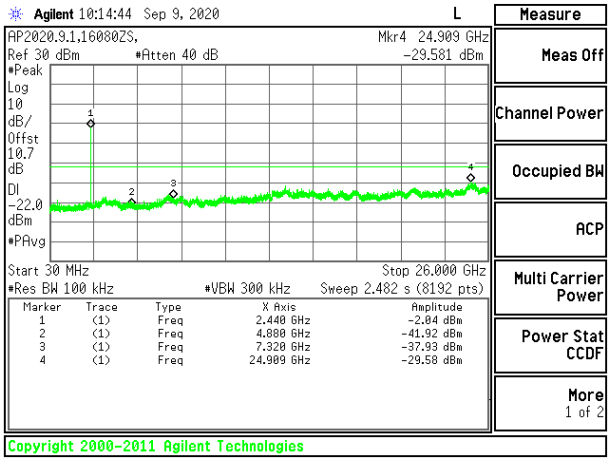
LOW CHANNEL BANDEDGE



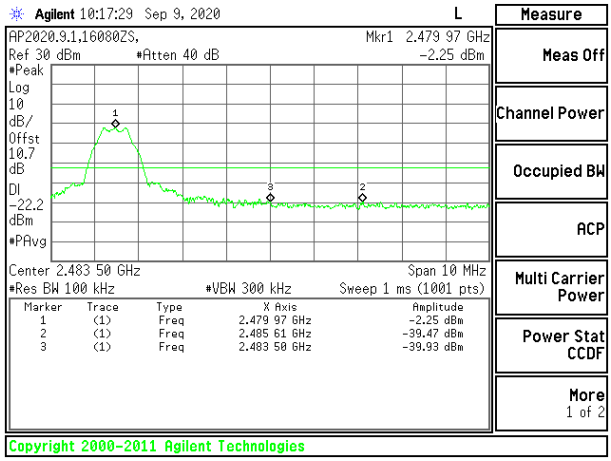
OUT-OF-BAND LOW CHANNEL



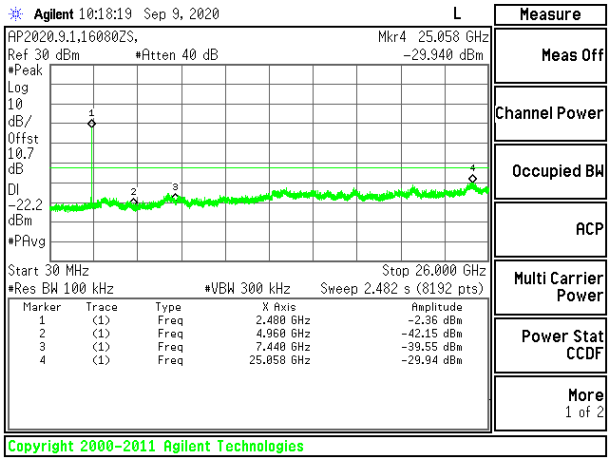
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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. Peak detection is used unless otherwise noted as quasi-peak.

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.

2D antenna use - 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.

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

KDB 414788 Open Field Site(OFS) 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.

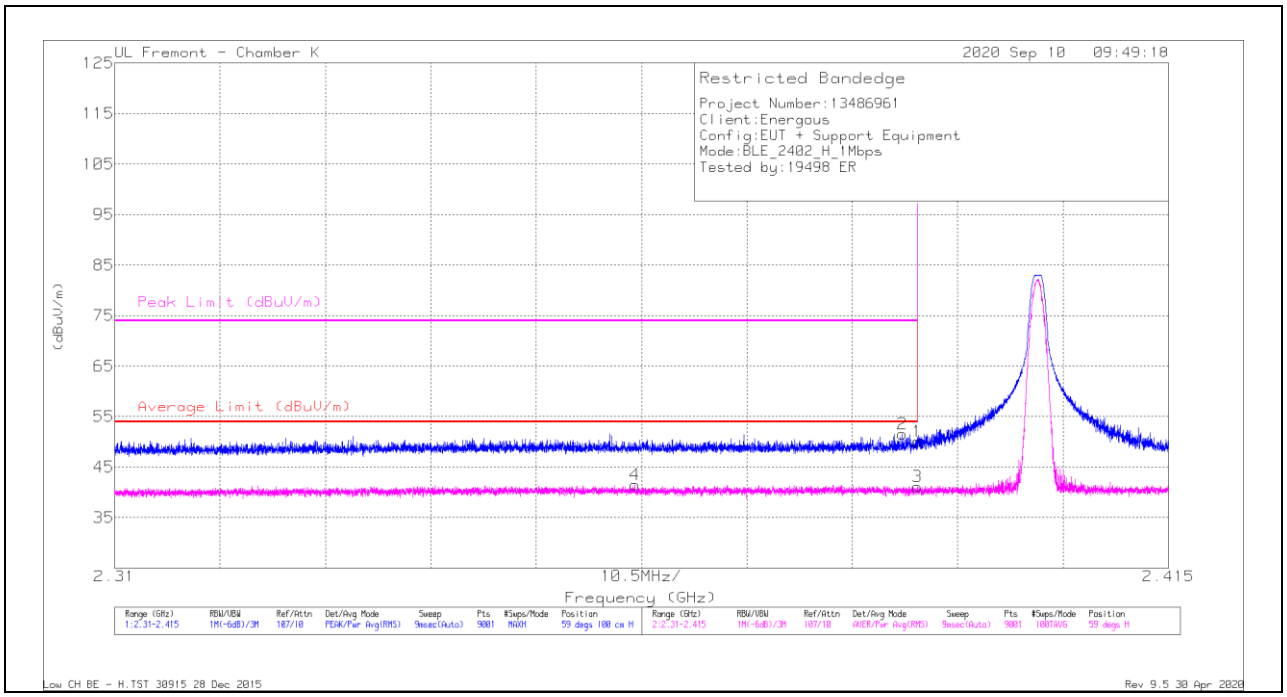
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

10.2. TRANSMITTER ABOVE 1 GHz

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT

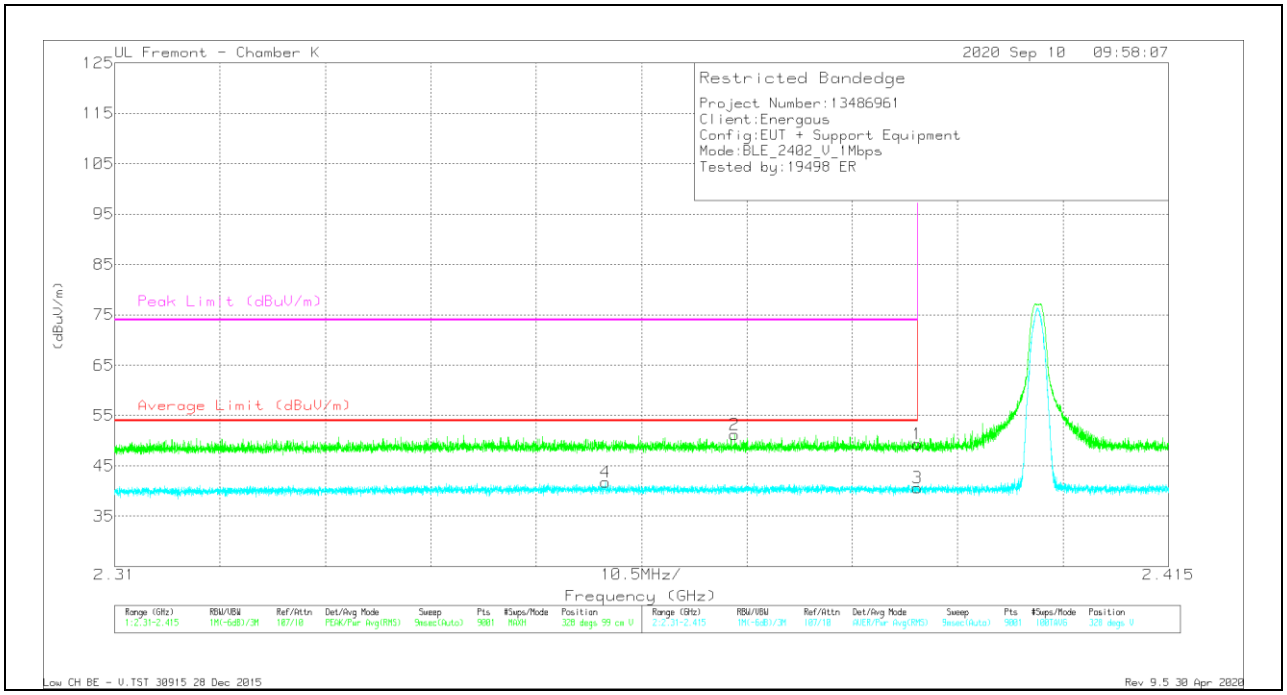


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	52.63	Pk	32.4	-35	0	50.03	-	-	74	-23.97	59	100	H
2	* 2.3885	54.2	Pk	32.4	-35	0	51.6	-	-	74	-22.4	59	100	H
3	* 2.38999	41.63	RMS	32.4	-35	2.06	41.09	54	-12.91	-	-	59	100	H
4	* 2.36184	42.2	RMS	32.4	-35.2	2.06	41.46	54	-12.54	-	-	59	100	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

VERTICAL RESULT



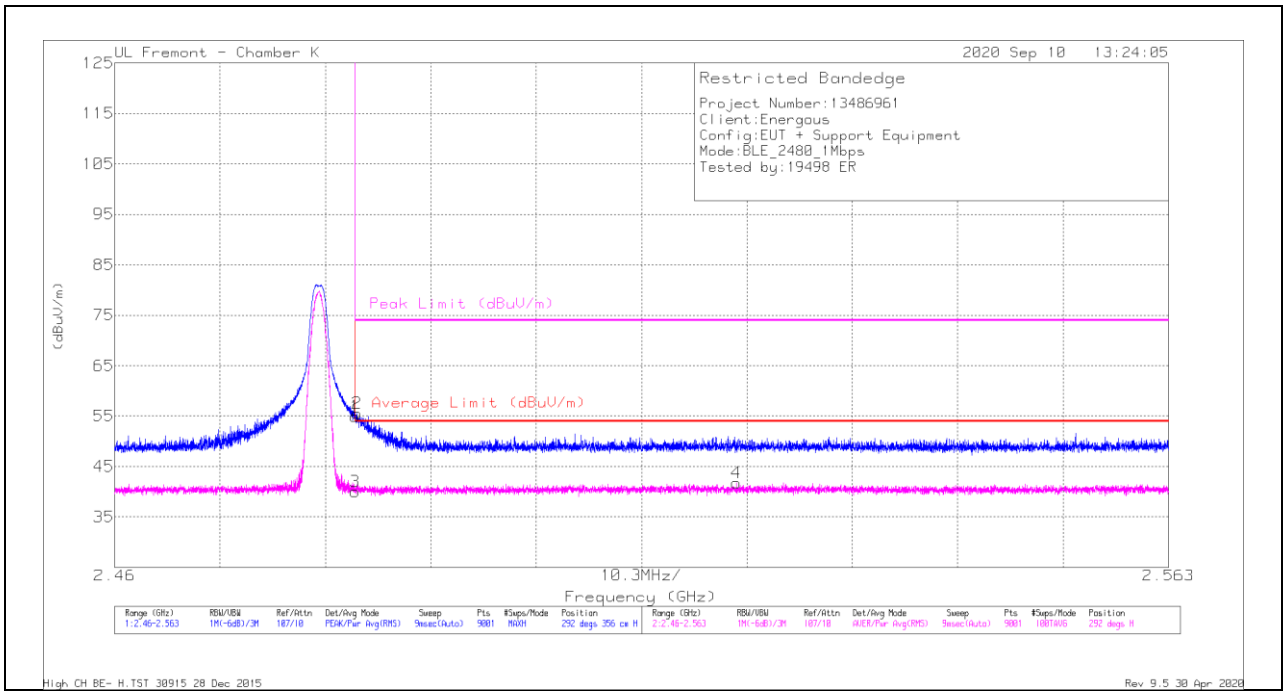
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	51.89	Pk	32.4	-35	0	49.29	-	-	74	-24.71	328	99	V
2	* 2.37175	53.88	Pk	32.4	-35.1	0	51.18	-	-	74	-22.82	328	99	V
3	* 2.38999	41.21	RMS	32.4	-35	2.06	40.67	54	-13.33	-	-	328	100	V
4	* 2.35892	42.47	RMS	32.4	-35.2	2.06	41.73	54	-12.27	-	-	328	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

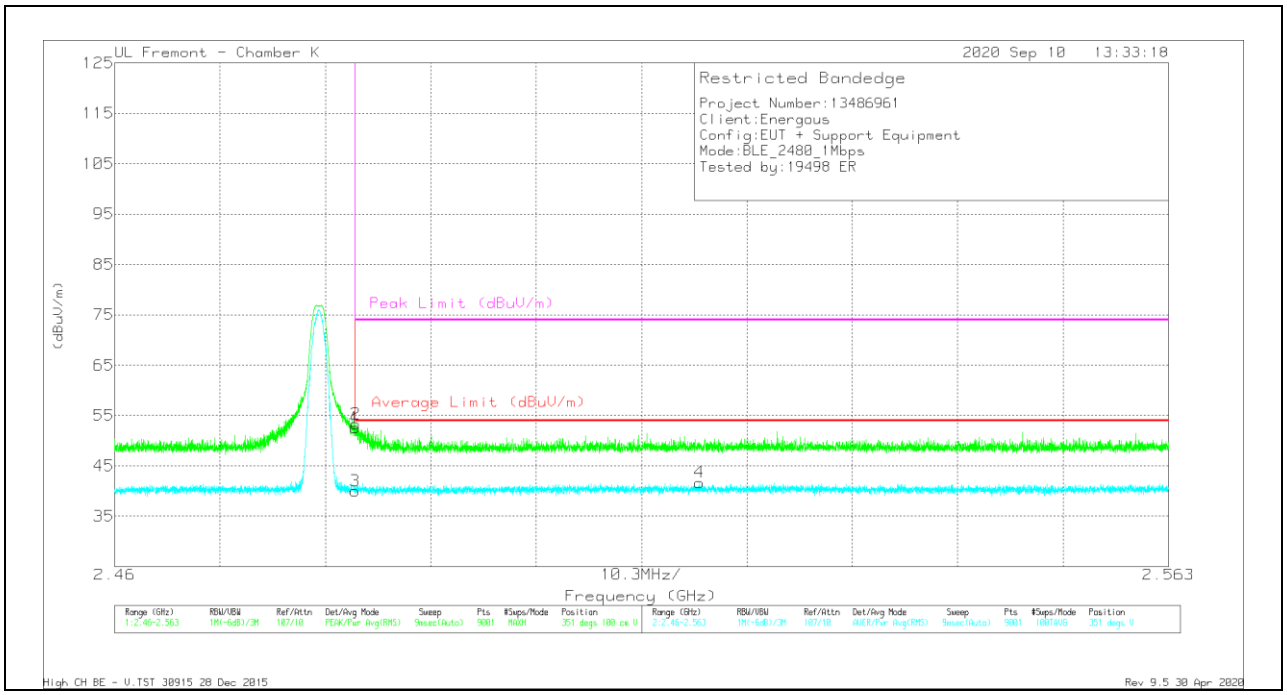


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	57.02	Pk	32.5	-34.6	0	54.92	-	-	74	-19.08	292	356	H
2	* 2.48368	57.7	Pk	32.5	-34.6	0	55.6	-	-	74	-18.4	292	356	H
3	* 2.48351	40.05	RMS	32.5	-34.6	2.06	40.01	54	-13.99	-	-	292	356	H
4	2.52077	41.5	RMS	32.8	-34.6	2.06	41.76	54	-12.24	-	-	292	356	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

VERTICAL RESULT



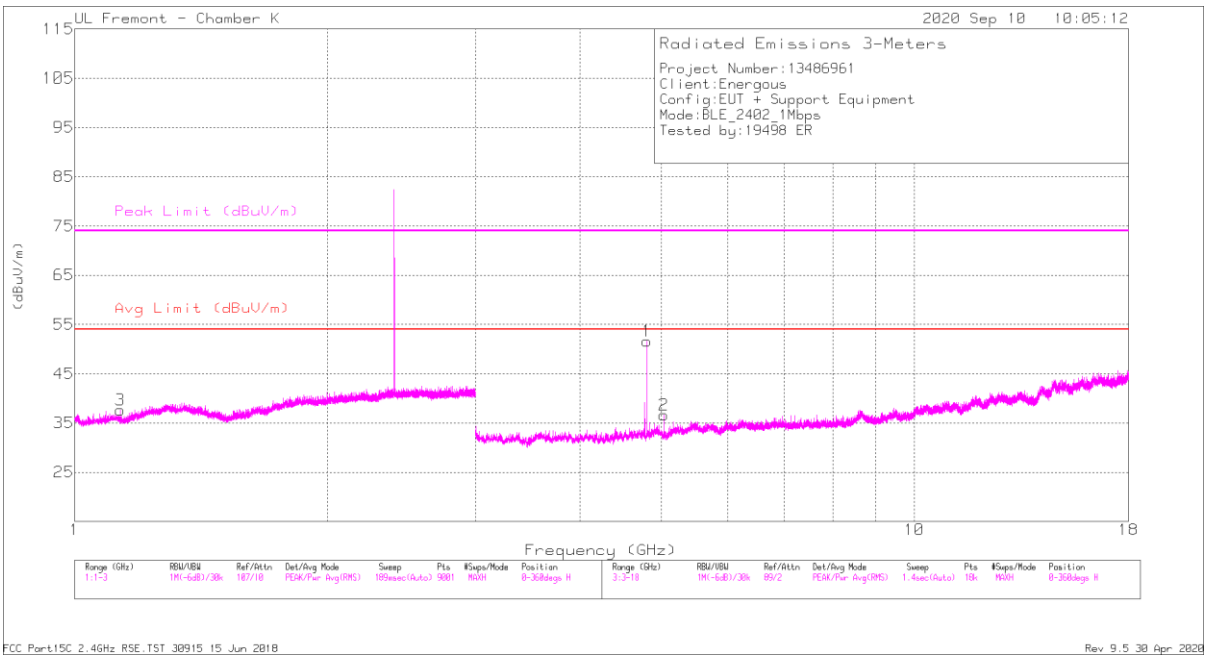
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	54.62	Pk	32.5	-34.6	0	52.52	-	-	74	-21.48	351	100	V
2	* 2.48356	55.43	Pk	32.5	-34.6	0	53.33	-	-	74	-20.67	351	100	V
3	* 2.48351	40.03	RMS	32.5	-34.6	2.06	39.99	54	-14.01	-	-	351	100	V
4	2.51717	41.34	RMS	32.8	-34.5	2.06	41.7	54	-12.3	-	-	351	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

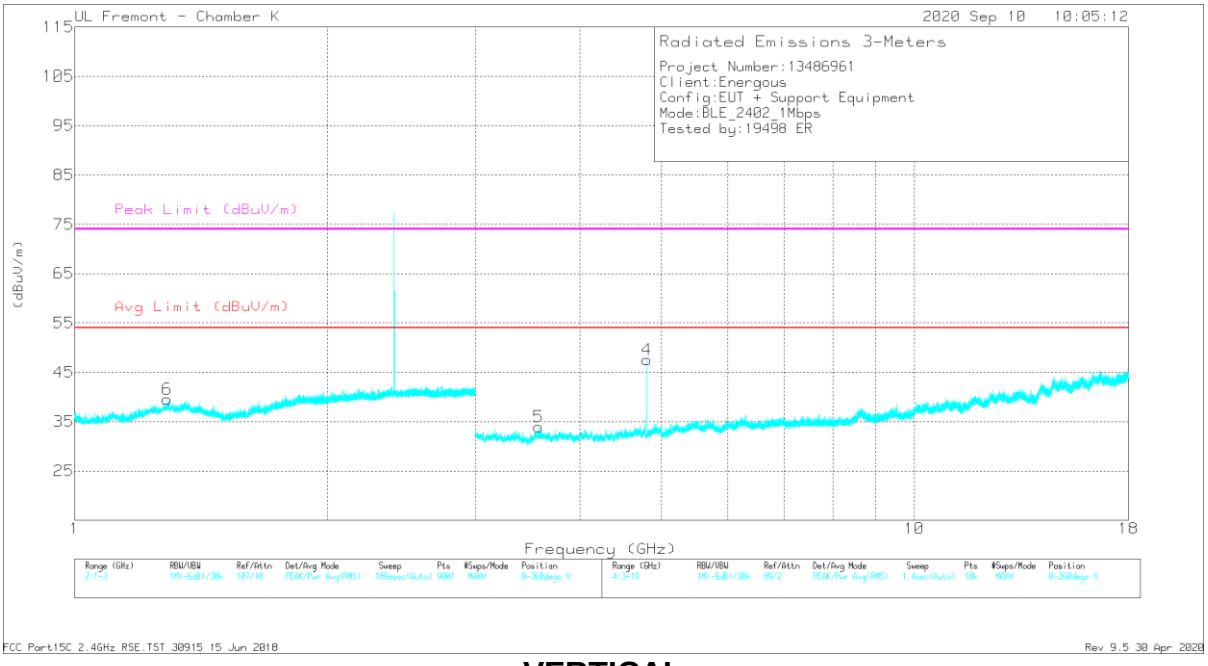
UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

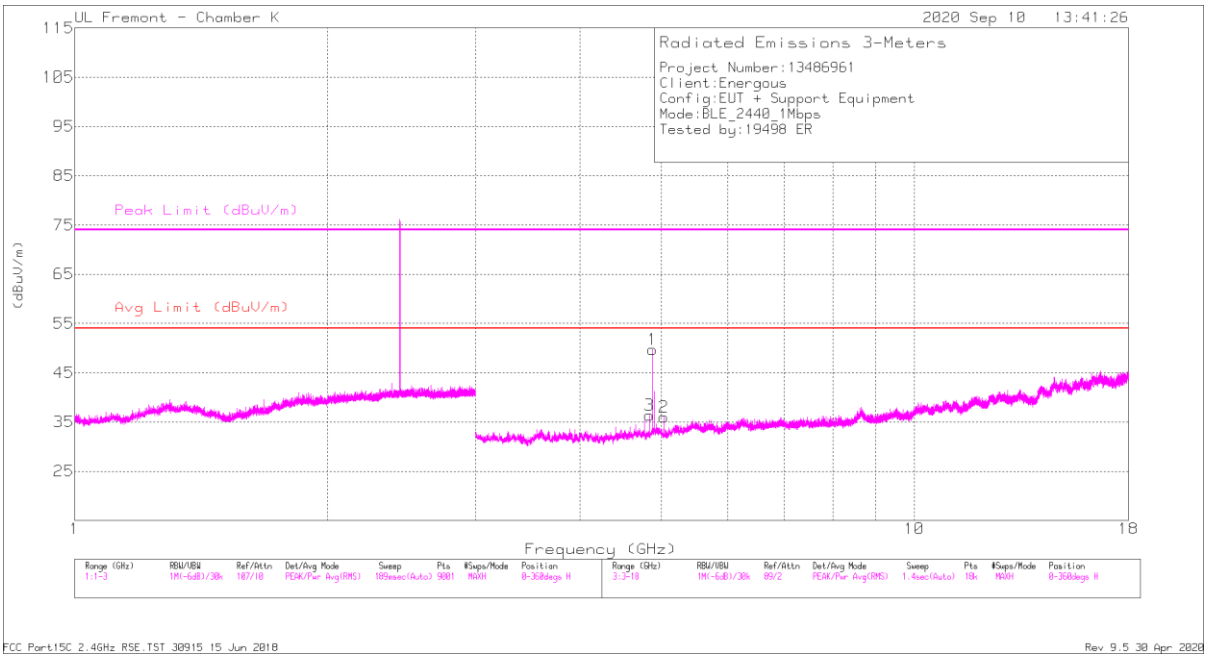
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/ 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
* 1.1337	56	PK2	27.3	-37.3	0	46	-	-	74	-28	265	122	H
* 1.1293	44.49	MAv1	27.3	-37.3	2.06	36.55	54	-17.45	-	-	265	122	H
* 1.29198	55.5	PK2	29.5	-36.8	0	48.2	-	-	74	-25.8	107	374	V
* 1.29393	44.18	MAv1	29.5	-36.7	2.06	39.04	54	-14.96	-	-	107	374	V
* 4.8043	61.41	PK2	34.4	-40.7	0	55.11	-	-	74	-18.89	164	116	H
* 4.80368	55.56	MAv1	34.4	-40.8	2.06	51.22	54	-2.78	-	-	164	116	H
* 5.03505	50.9	PK2	34.4	-40.5	0	44.8	-	-	74	-29.2	275	112	H
* 5.03687	35.94	MAv1	34.3	-40.5	2.06	31.8	54	-22.2	-	-	275	112	H
* 4.80338	57.75	PK2	34.4	-40.8	0	51.35	-	-	74	-22.65	215	398	V
* 4.80366	50.79	MAv1	34.4	-40.8	2.06	46.45	54	-7.55	-	-	215	398	V
* 3.5648	51.69	PK2	33.2	-42.2	0	42.69	-	-	74	-31.31	105	147	V
* 3.56402	39.94	MAv1	33.2	-42.2	2.06	33	54	-21	-	-	105	147	V

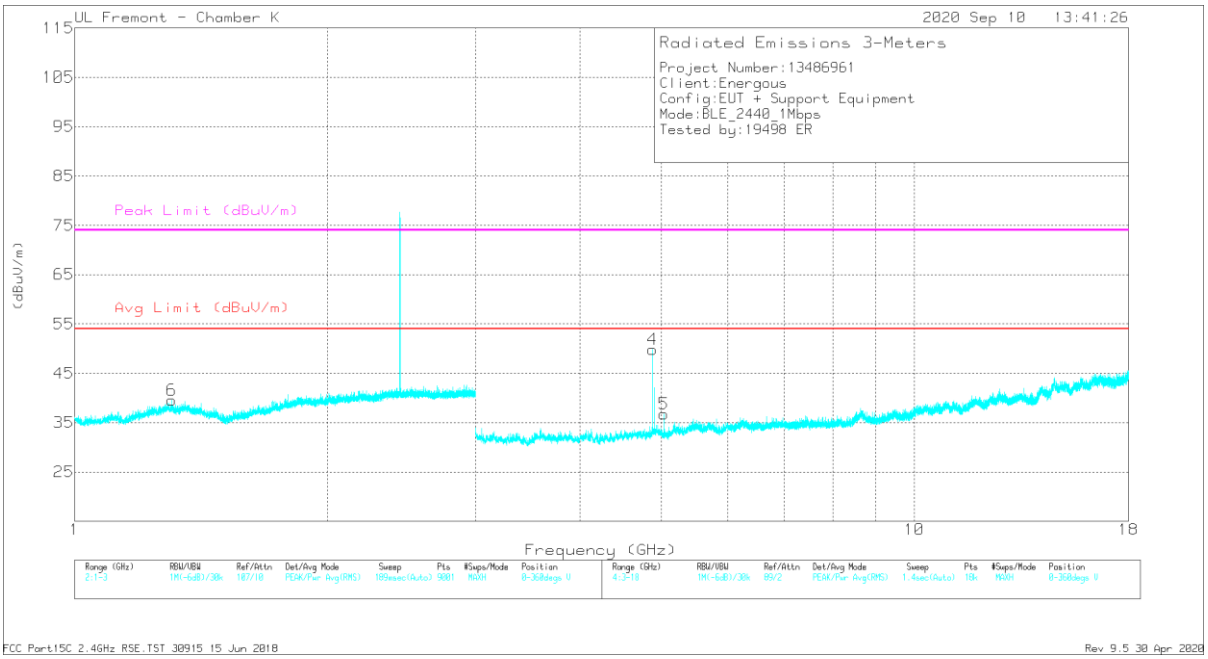
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

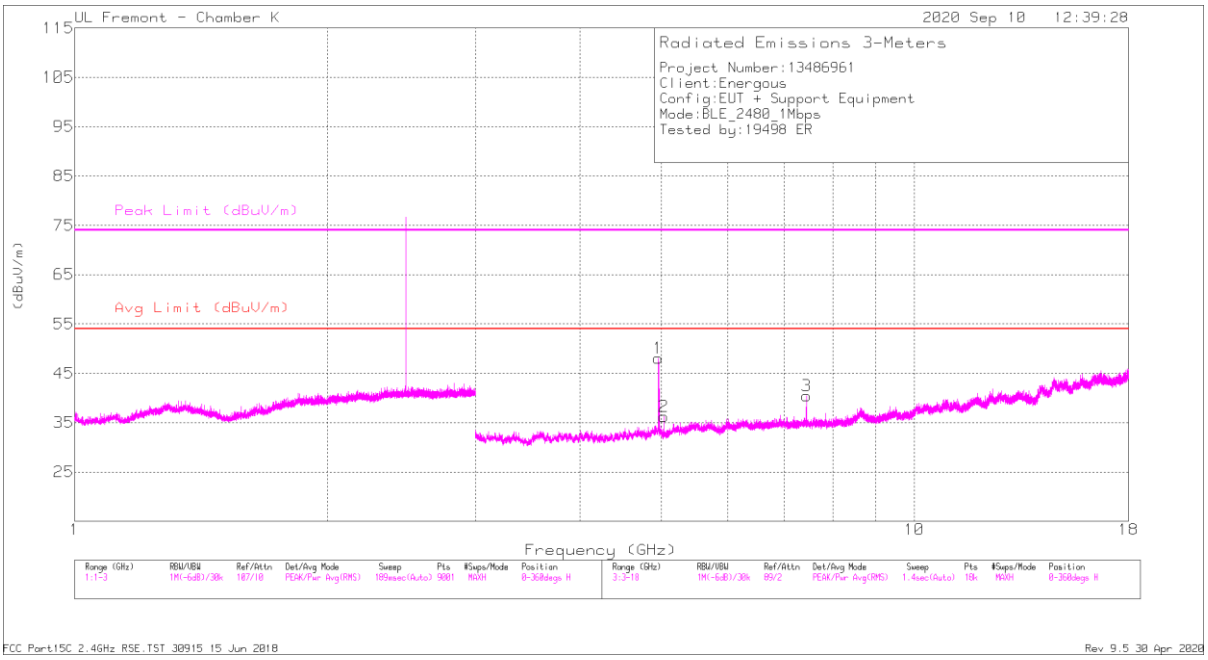
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/ 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
* 1.30118	55.84	PK2	29.2	-36.7	0	48.34	-	-	74	-25.66	37	232	V
* 1.30578	43.97	MAv1	29.3	-36.7	2.06	38.63	54	-15.37	-	-	37	232	V
* 4.87942	61.06	PK2	34.4	-40.6	0	54.86	-	-	74	-19.14	274	106	H
* 4.8797	54.97	MAv1	34.4	-40.6	2.06	50.83	54	-3.17	-	-	274	106	H
* 5.03468	52.33	PK2	34.4	-40.5	0	46.23	-	-	74	-27.77	107	101	H
* 5.03357	35.28	MAv1	34.4	-40.5	2.06	31.24	54	-22.76	-	-	107	101	H
* 4.83652	55.79	PK2	34.4	-40.6	0	49.59	-	-	74	-24.41	355	173	H
* 4.83631	38.67	MAv1	34.4	-40.6	2.06	34.53	54	-19.47	-	-	355	173	H
* 4.87946	61.15	PK2	34.4	-40.6	0	54.95	-	-	74	-19.05	313	199	V
* 4.87947	54.91	MAv1	34.4	-40.6	2.06	50.77	54	-3.23	-	-	313	199	V
* 5.03379	52.2	PK2	34.4	-40.5	0	46.1	-	-	74	-27.9	265	235	V
* 5.03529	36.4	MAv1	34.3	-40.5	2.06	32.26	54	-21.74	-	-	265	235	V

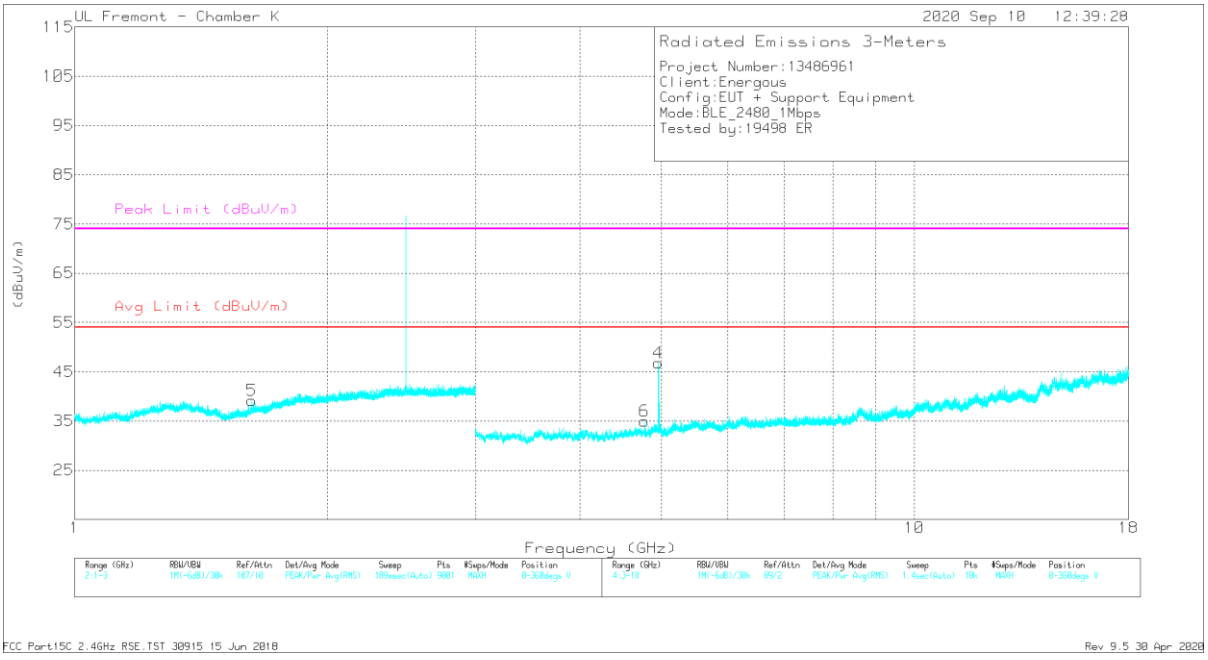
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

RADIATED EMISSIONS

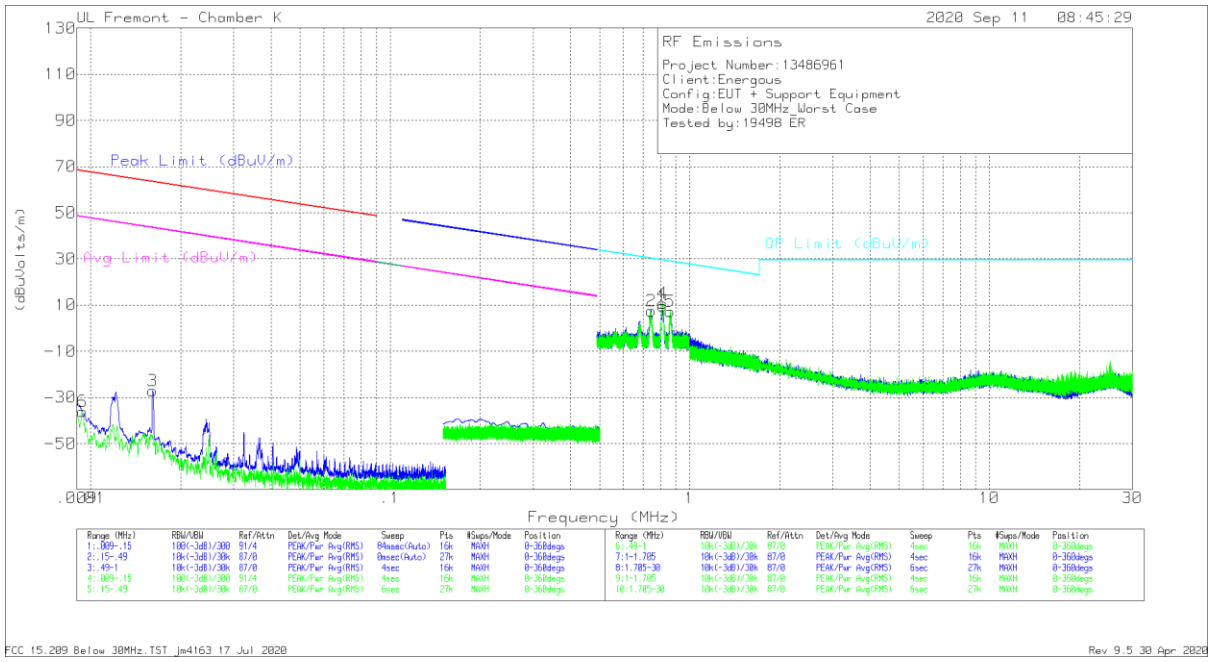
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.62546	53.11	PK2	28.7	-36.6	0	45.21	-	-	74	-28.79	236	159	V
* 1.6256	42.86	MAv1	28.7	-36.6	2.06	37.02	54	-16.98	-	-	236	159	V
* 4.96034	58.27	PK2	34.3	-40.6	0	51.97	-	-	74	-22.03	271	96	H
* 4.95948	50.81	MAv1	34.3	-40.6	2.06	46.57	54	-7.43	-	-	271	96	H
* 5.03466	52.71	PK2	34.4	-40.5	0	46.61	-	-	74	-27.39	349	113	H
* 5.03348	35.64	MAv1	34.4	-40.5	2.06	31.6	54	-22.4	-	-	349	113	H
* 7.44068	49.65	PK2	36.1	-37.9	0	47.85	-	-	74	-26.15	37	107	H
* 7.43916	39.11	MAv1	36.1	-38	2.06	39.27	54	-14.73	-	-	37	107	H
* 4.95942	58.71	PK2	34.3	-40.6	0	52.41	-	-	74	-21.59	312	183	V
* 4.95957	51.98	MAv1	34.3	-40.6	2.06	47.74	54	-6.26	-	-	312	183	V
* 4.77558	49.93	PK2	34.3	-40.9	0	43.33	-	-	74	-30.67	306	130	V
* 4.77635	37.86	MAv1	34.3	-40.9	2.06	33.32	54	-20.68	-	-	306	130	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

10.3. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (E ACF)	Amp/Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.01615	25.26	Pk	59.3	-31.8	-80	-27.24	63.42	-90.66	43.42	-70.66	0-360
6	.00939	14.55	Pk	60.7	-31.3	-80	-36.05	68.13	-104.18	48.13	-84.18	0-360

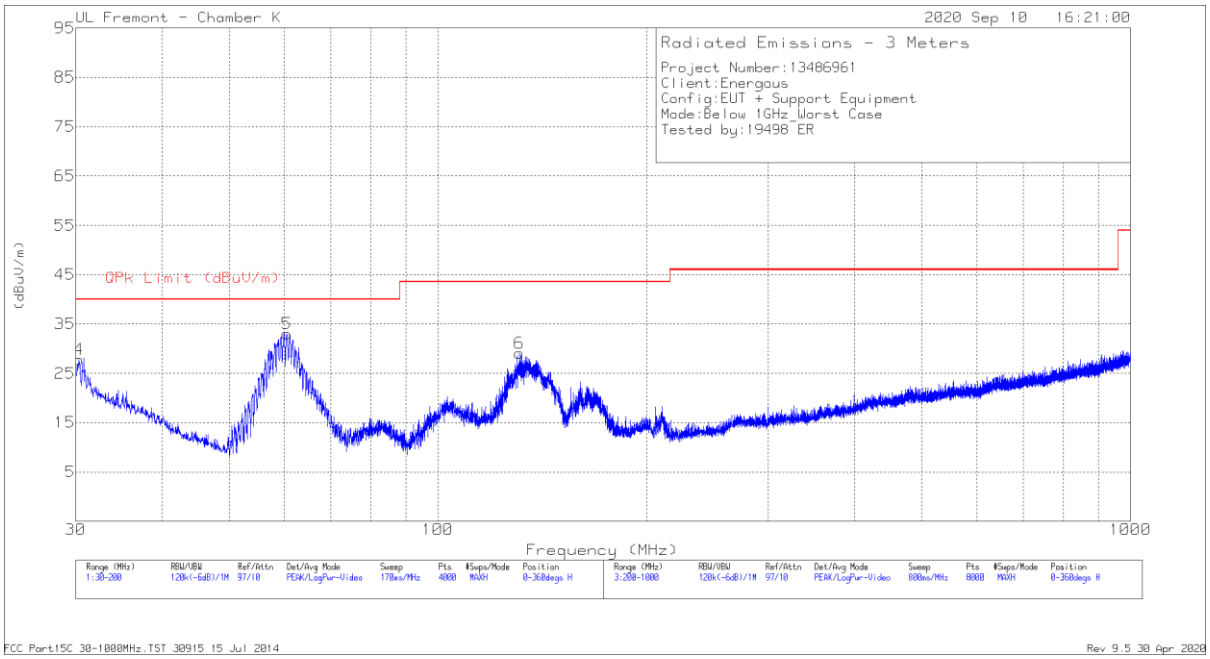
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (E ACF)	Amp/Cbl (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuVolts/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.81054	25.75	Pk	56	-32.2	-40	9.55	29.44	-19.89	0-360
2	.74302	23.57	Pk	56	-32.2	-40	7.37	30.19	-22.82	0-360
4	.81102	27.06	Pk	56	-32.2	-40	10.86	29.44	-18.58	0-360
5	.8597	23.28	Pk	56	-32.2	-40	7.08	28.93	-21.85	0-360

Pk - Peak detector

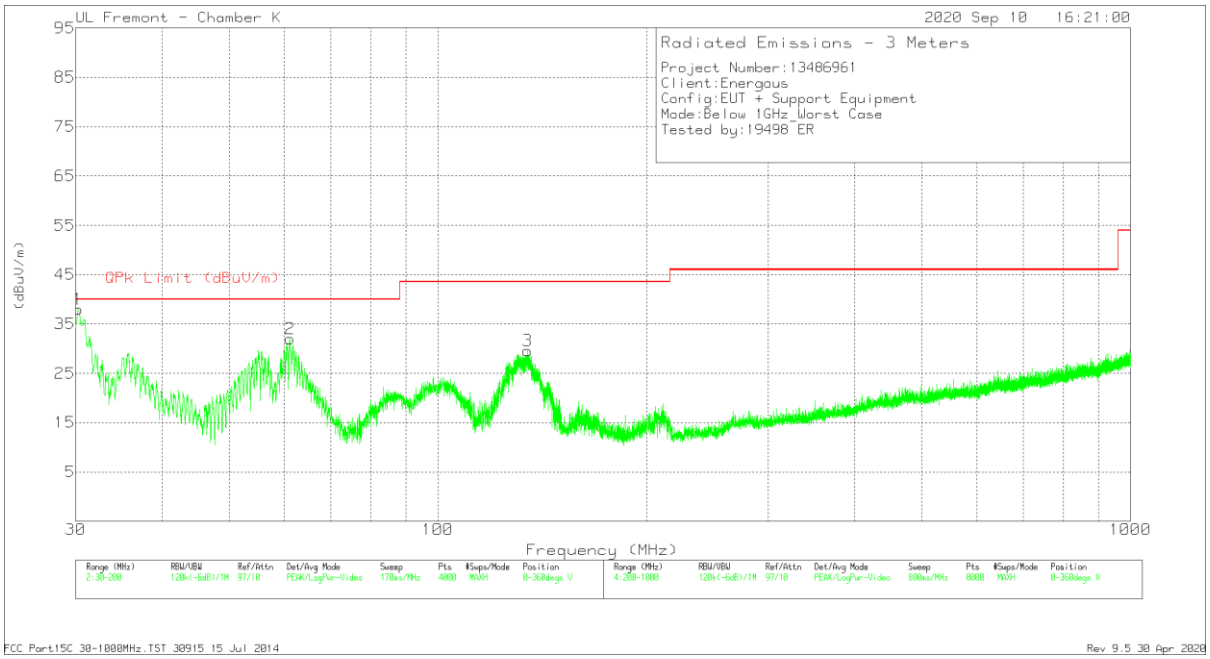
UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

10.4. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

Below 1GHz Data

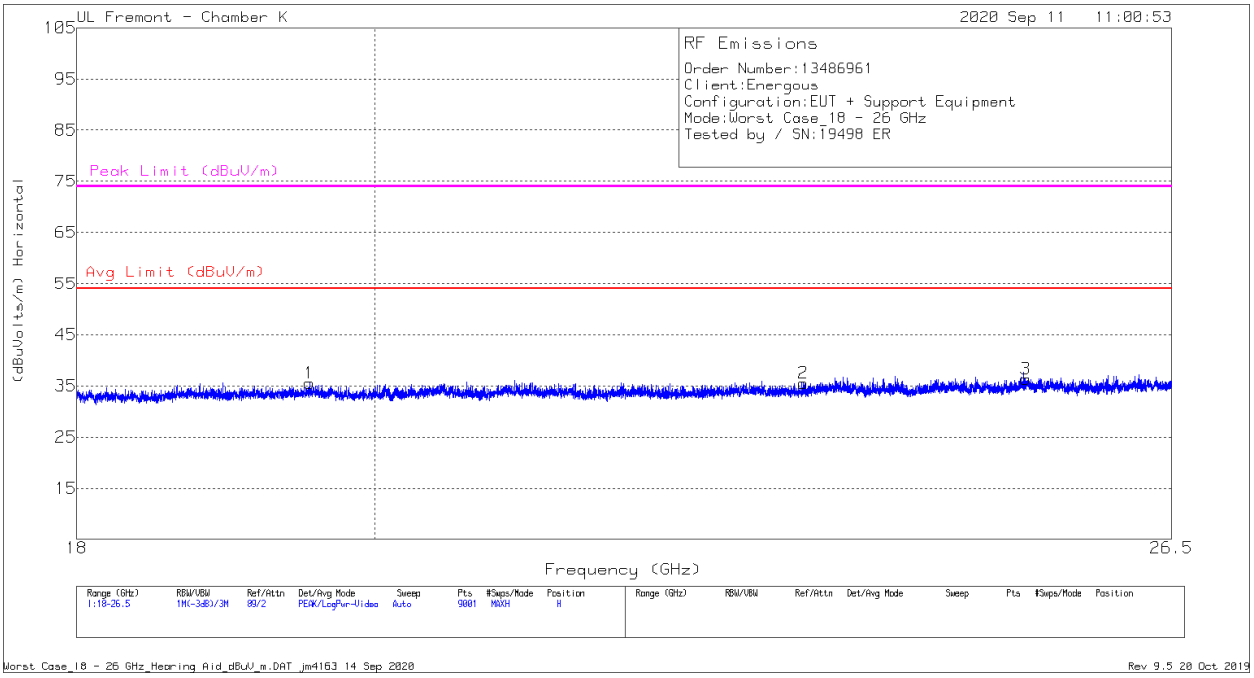
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0181574 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	30.3401	32.69	Pk	26.7	-31.6	27.79	40	-12.21	0-360	301	H
5	60.4804	50.88	Pk	13.4	-31.2	33.08	40	-6.92	0-360	301	H
6	* 131.1337	40.04	Pk	19.7	-30.7	29.04	43.52	-14.48	0-360	201	H
1	30.2551	42.92	Pk	26.7	-31.6	38.02	40	-1.98	0-360	95	V
	30.4335	39.34	Qp	26.6	-31.6	34.34	40	-5.66	70	106	V
2	61.1181	49.77	Pk	13.4	-31.2	31.97	40	-8.03	0-360	95	V
3	* 134.7046	40.88	Pk	19.4	-30.7	29.58	43.52	-13.94	0-360	95	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
Qp - Quasi-Peak detector

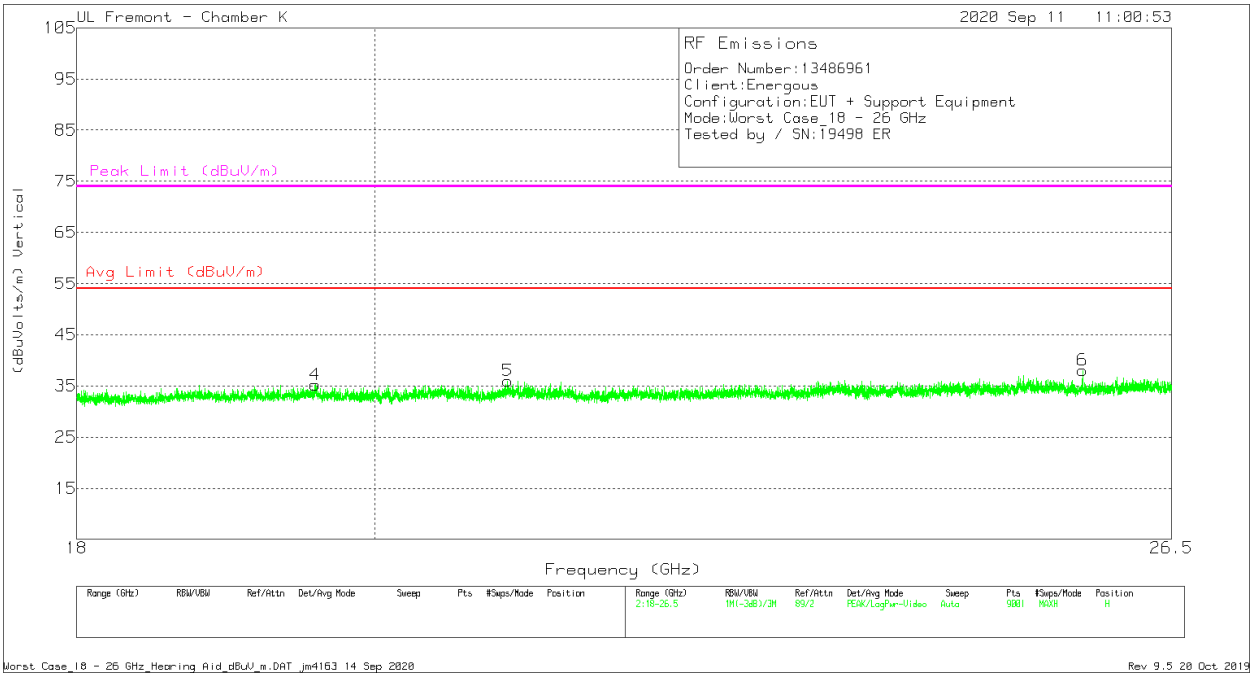
UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

10.5. WORST CASE 18-26 GHZ

SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T448 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.54228	69.45	Pk	32.8	-57.2	-9.5	35.55	54	-18.45	74	-38.45
2	23.26622	68.26	Pk	33.8	-57	-9.5	35.56	54	-18.44	74	-38.44
3	25.16644	66.67	Pk	34.6	-55.4	-9.5	36.37	54	-17.63	74	-37.63
4	19.58194	68.85	Pk	32.8	-56.9	-9.5	35.25	54	-18.75	74	-38.75
5	20.95894	69.29	Pk	33.3	-57.1	-9.5	35.99	54	-18.01	74	-38.01
6	25.67833	68.07	Pk	34.4	-54.9	-9.5	38.07	54	-15.93	74	-35.93

Pk - Peak detector

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

10.6. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

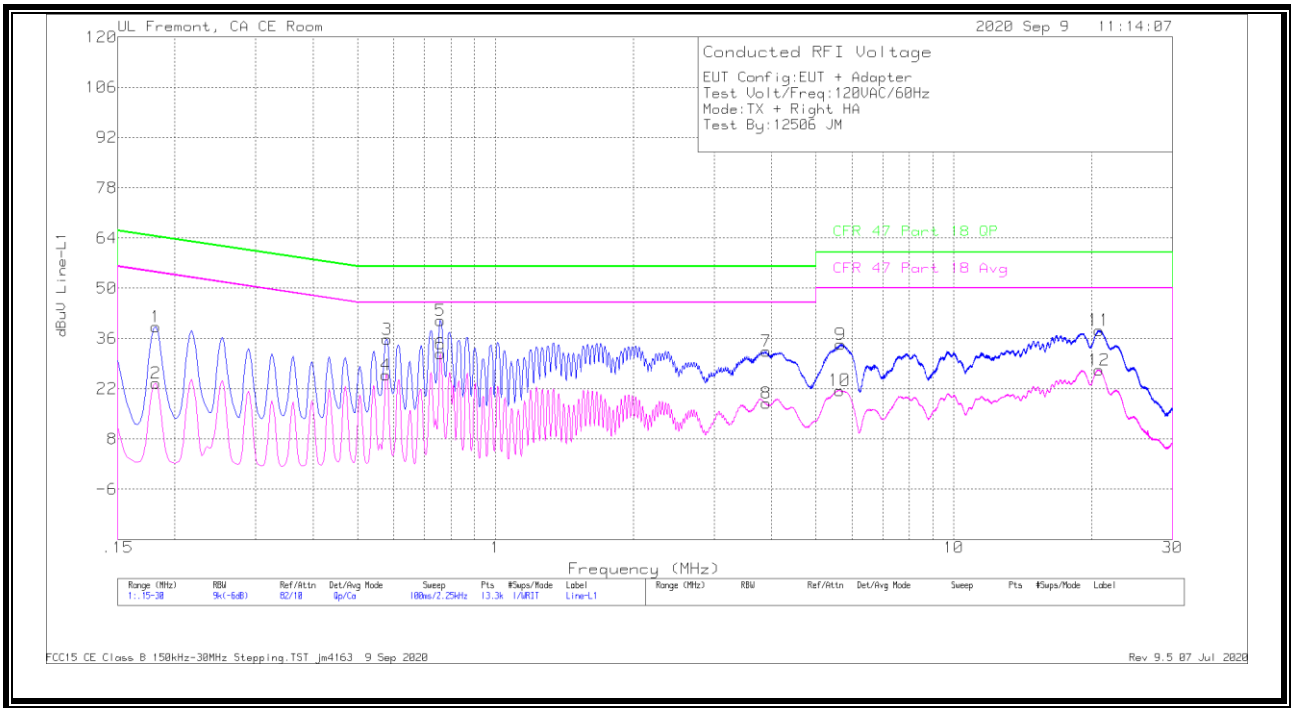
Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

RESULTS

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

LINE 1 RESULTS



WORST EMISSIONS

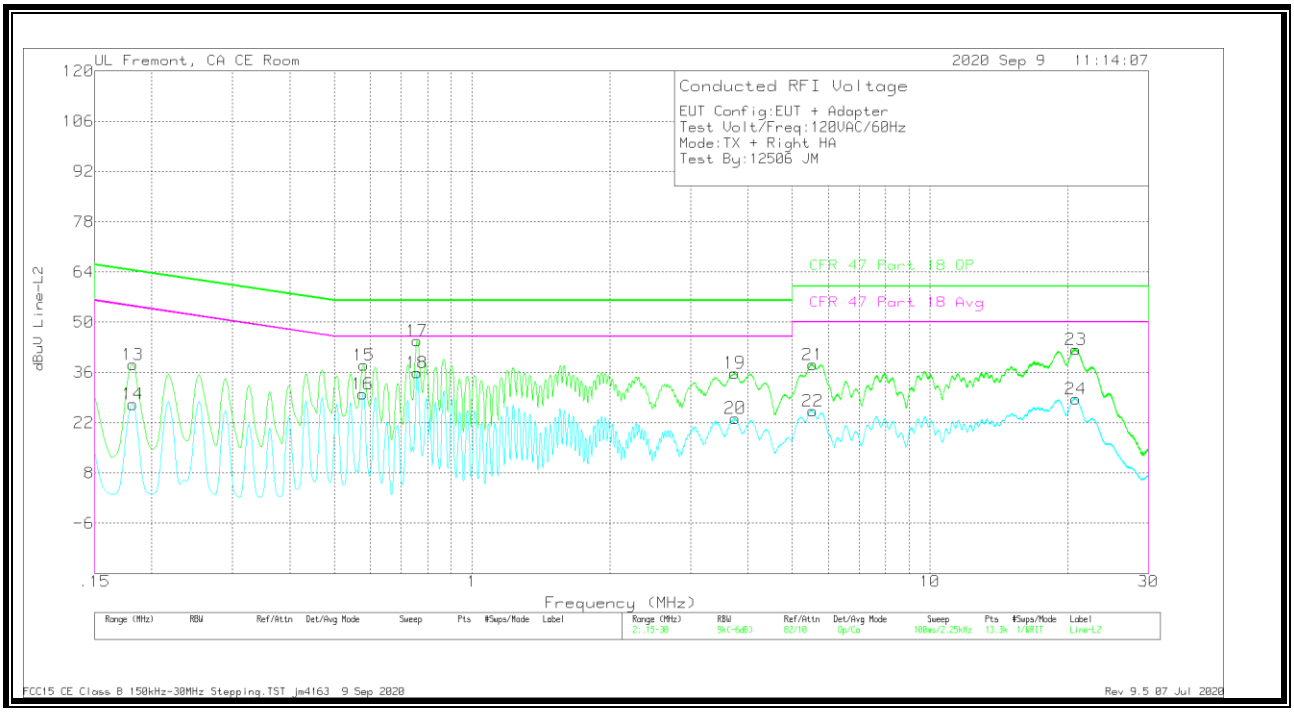
Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 18 QP	QP Margin (dB)	CFR 47 Part 18 Avg	Av(CISPR)Margin (dB)
1	.1815	29.34	Qp	0	0	10	39.34	64.42	-25.08	-	-
2	.1815	13.6	Ca	0	0	10	23.6	-	-	54.42	-30.82
3	.57975	25.7	Qp	0	0	10	35.7	56	-20.3	-	-
4	.5775	15.88	Ca	0	0	10	25.88	-	-	46	-20.12
5	.75975	31.01	Qp	0	0	10	41.01	56	-14.99	-	-
6	.75975	21.7	Ca	0	0	10	31.7	-	-	46	-14.3
7	3.8985	22.38	Qp	0	.1	10	32.48	56	-23.52	-	-
8	3.8985	7.86	Ca	0	.1	10	17.96	-	-	46	-28.04
9	5.66363	24.04	Qp	0	.2	10.1	34.34	60	-25.66	-	-
10	5.64225	11.25	Ca	0	.2	10.1	21.55	-	-	50	-28.45
11	20.73525	27.8	Qp	0	.3	10.2	38.3	60	-21.7	-	-
12	20.76225	16.78	Ca	0	.3	10.2	27.28	-	-	50	-22.72

Qp - Quasi-Peak detector
Ca - CISPR average detection

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

LINE 2 RESULTS



WORST EMISSIONS

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 18 QP	QP Margin (dB)	CFR 47 Part 18 Avg	Av(CISPR)Margin (dB)
13	.1815	28.23	Qp	0	0	10	38.23	64.42	-26.19	-	-
14	.1815	17.14	Ca	0	0	10	27.14	-	-	54.42	-27.28
15	.57975	28.05	Qp	0	0	10	38.05	56	-17.95	-	-
16	.5775	19.94	Ca	0	0	10	29.94	-	-	46	-16.06
17	.75975	34.86	Qp	0	0	10	44.86	56	-11.14	-	-
18	.75975	25.99	Ca	0	0	10	35.99	-	-	46	-10.01
19	3.74775	25.76	Qp	0	.1	10	35.86	56	-20.14	-	-
20	3.75225	13.19	Ca	0	.1	10	23.29	-	-	46	-22.71
21	5.54325	27.99	Qp	0	.2	10.1	38.29	60	-21.71	-	-
22	5.541	15.06	Ca	0	.2	10.1	25.36	-	-	50	-24.64
23	20.81175	31.95	Qp	0	.3	10.2	42.45	60	-17.55	-	-
24	20.8095	18.19	Ca	0	.3	10.2	28.69	-	-	50	-21.31

Qp - Quasi-Peak detector
Ca - CISPR average detection

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888