TEST REPORT

Report Number. : 13714272-E1V1

Applicant	:	LEVITON MANUFACTURING CO., INC. 10385 SW AVERY TUALATIN, OR 97062-2210 USA
Model	:	MSC-B9604
Brand	:	LEVITON
FCC ID	:	2ASLN-ZL07S
IC	:	25037-ZL07S
EUT Description	:	MSC MUSHROOM LOGIC BOARD B9604
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:
September 02, 2021

Prepared by:
UL VERIFICATION SERVICES
47173 Benicia Street
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ACCREDITED
CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	9/2/2021	Initial Issue	

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	LEVITON MANUFACTURING CO., INC. 10385 SW AVERY TUALATIN, OR 97062-2210 USA
EUT DESCRIPTION:	MSC MUSHROOM LOGIC BOARD B9604
MODEL:	MSC-B9604
BRAND:	LEVITON
SERIAL NUMBER:	9MC (Conducted) 6MR, 7MR, 8MR, 10MR (Radiated)
DATE TESTED:	MAY 24 – JUNE 29, 2021

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

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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		None.
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power		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		None.
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions		None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions		None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions		None.

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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 LLC is accredited by A2LA, certification #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
☐	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	208313
☐	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	22541	208313
☒	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	US0104	2324B	208313

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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	4.88 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:
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

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a BLE & ZIGBEE MSC Mushroom Logic Board B9604. It is a limited module and tested in number of host models. Models# 0-10V: ZLD7S-N00, ZLD70-N00 and DALI: ZLDDS-N00, ZLDD0-N00 containing BG21 are identical in terms of enclosure and PCB board and their configurations to model# 0-10V: ZL07S-N00, ZL070-N00 and DALI: ZL0DS-N00, ZL0D0-N00 containing MG21; the only difference is these are BLE-only and had other proprietary protocol features disabled by silicon manufacturer.

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	7.95	6.24

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes wire antenna, with a maximum gain of 1.5dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was SiLabs Railtest firmware version # 2.8.6
The EUT firmware installed during testing was SiLabs Railtest_efr32mg21_mushroom.s37
The test utility software used during testing was RealTerm version 2.0.0.70

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6.5. WORST-CASE CONFIGURATION AND MODE

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.

A metal plate(for end product installation purposes) was attached to the host per applicant's request. The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

Part number ZL07S-N00 with both BLE/Zigbee protocol was set for full testing and spot check verification has been done on models ZL070-N00, ZL0DS-N00 and ZL0D0-N00 for radiated harmonic spurious.

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Asus	EeePC1101HAB	-	DoC
FTDI to USB Cable	-	-	-	-
LED Electronics Driver	Signify	XI040C110V054PST2	-	-
LED Electronics Driver	Signify	XI040C110V054VPT2	-	-
5V Power Supply	Cui Inc	SWM6-5-NH-C	172400495	-

I/O CABLES (CONDUCTED EMISSIONS)

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	DC	Unshielded	3	Driver to EUT
2	FTDI	1	USB	Unshielded	1.8	EUT to Laptop (maintenance cable)
3	Antenna Port	1	SMA	Unshielded	0.2	EUT to Analyzer
4	AC	1	AC	Unshielded	3	

I/O CABLES (RADIATED EMISSIONS 1 to 18GHz)

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	DC	Unshielded	3	AC/DC Supply
2	FTDI	1	USB	Unshielded	1.8	EUT to Laptop (maintenance cable)

I/O CABLES (RADIATED EMISSIONS 9KHz to 30MHz, 30MHz to 1GHz AND AC POWER LINE CONDUCTED EMISSIONS)

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	DC	Unshielded	3	AC/DC Supply

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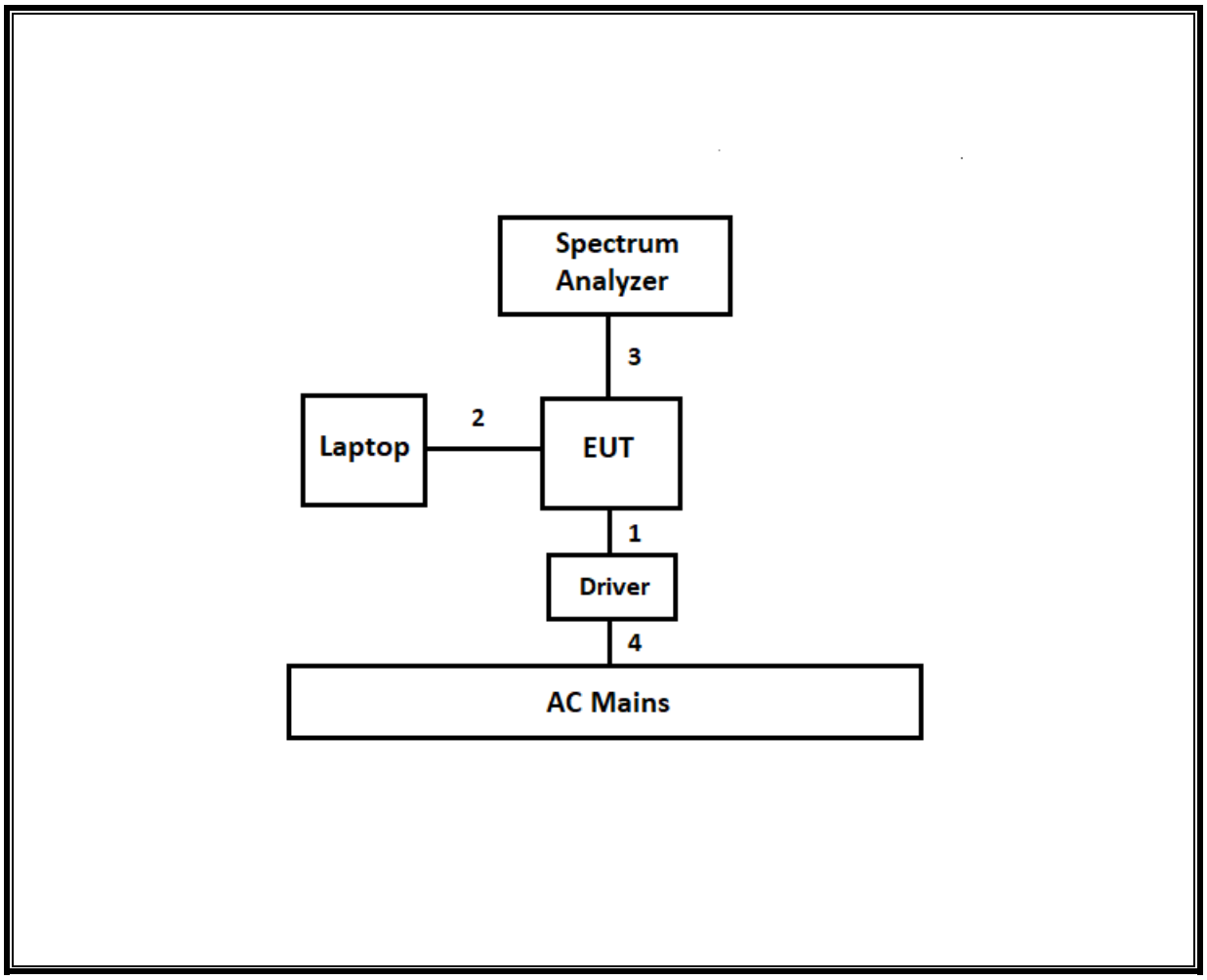
SETUP DIAGRAM FOR CONDUCTED TESTS

TEST SETUP

The EUT is powered by the Driver. Test software exercised the radio card.



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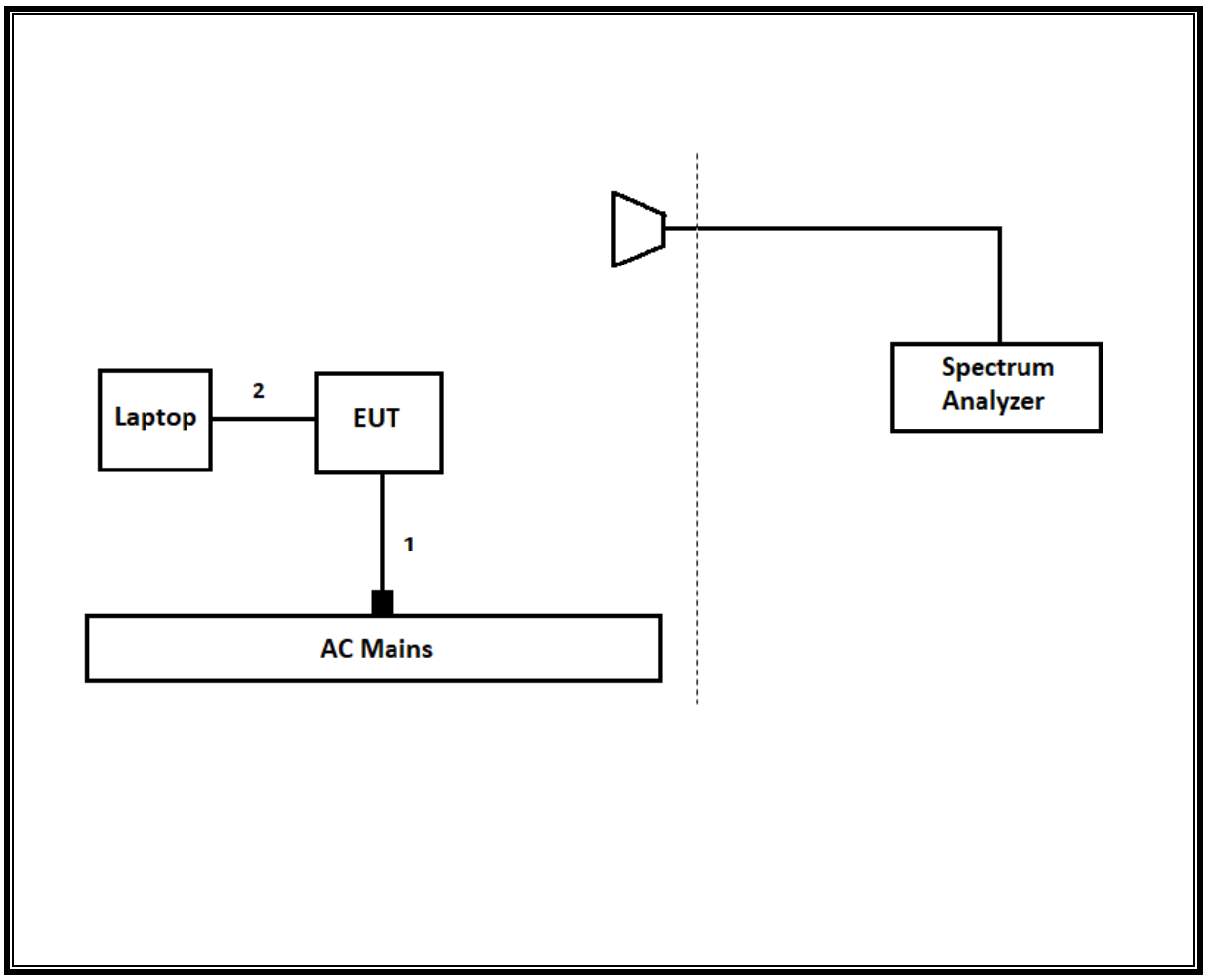
SETUP DIAGRAM FOR RADIATED TESTS (1GHz to 18GHz)

TEST SETUP

The EUT is powered by the 5V AC/DC Adapter. Test software exercised the radio card.



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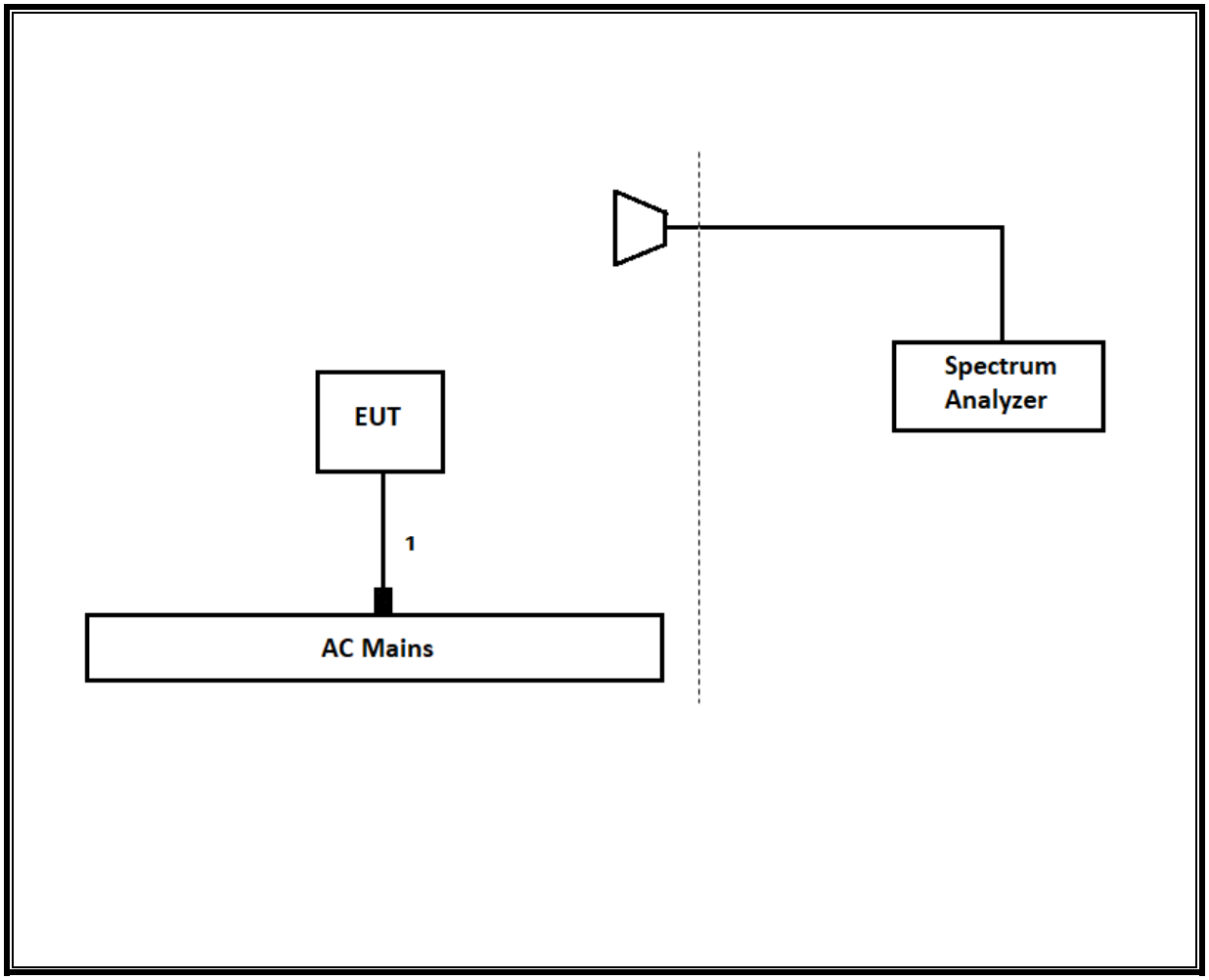
SETUP DIAGRAM FOR RADIATED TESTS(9KHz to 30MHz, 30MHz to 1GHz) AND AC POWER LINE CONDUCTED EMISSIONS

TEST SETUP

The EUT is powered by the 5V AC/DC Adapter. Test software exercised the radio card. The laptop was used for setup and removed during testing.



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7. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Section 11.8.1

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

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

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

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

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

Radiated emissions restricted frequency bands: ANSI C63.10 Section -11.12.1 and KDB558074 Section 11, Question 3 (a)

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

Band-edge: ANSI C63.10 Section 6.10

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

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

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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**	**ID Num**	**Cal Due**	**Last Cal**
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179367	2/21/2022	2/21/2021
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179377	2/23/2022	2/23/2022
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	8/31/2021	8/31/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T344	*5/26/2021	5/26/2020
Amplifier, 100MHz-18GHz	AMPLICAL	AMP0.1G18-47-20	PRE0197319	4/8/2022	4/8/2021
Amplifier, 1 - 18GHz	MITEQ	AFS42-00101800-25-S-42	T1568	4/9/2022	4/9/2021
Antenna, Broadband Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	T477 (81560)	9/24/2021	9/24/2020
Antenna, Broadband Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	174373	12/2/2021	12/2/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	1/21/2022	1/21/2021
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	T300	3/2/2022	3/2/2021
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	SC-8015	5/24/2022	5/24/2021
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	SC-8014	5/24/2022	5/24/2021
Spectrum Analyzer, PSA, 3Hz to 26.5GHz	Keysight Technologies Inc	E4440A	T198	5/13/2022	5/13/2021
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	T1227	3/16/2022	3/16/2021
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1264	1/26/2022	1/26/2021
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	T447	9/24/2021	9/24/2020
Rf Amplifier, 18-26.5GHz, 60dB gain	AMPLICAL	AMP18G26.5-60	171590	5/21/2022	5/21/2021
AC Line					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
LISN	FCC INC.	FCC-LISN-50/250-25-2-01-480V	PRE0186446	1/20/2022	1/20/2021
EMI TEST RECEIVER	Rohde & Schwarz	ESR	T1436	2/19/2022	2/19/2021
Transient Limiter	COM-TE	TBFL1	207996	6/1/2022	6/1/2020
Thermometer	Control Company	14-650-118	175736	8/26/2021	6/26/2020
Test Software List					
Description	**Manufacturer**	**Model**	**Version**		
Radiated Software	UL	UL EMC	Rev 9.5, April 30, 2020 (below 30MHz, below 1G, 1-18G radiated emissions), Oct 21, 2019 (above 18G radiated emissions)		
Antenna Port Software	UL	UL RF	AP 2021.4.1 & 2021.5.12		
AC Line Conducted Software	UL	UL EMC	Rev 9.5, July 07, 2020		

NOTES:

1. * Testing is completed before equipment expiration date.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

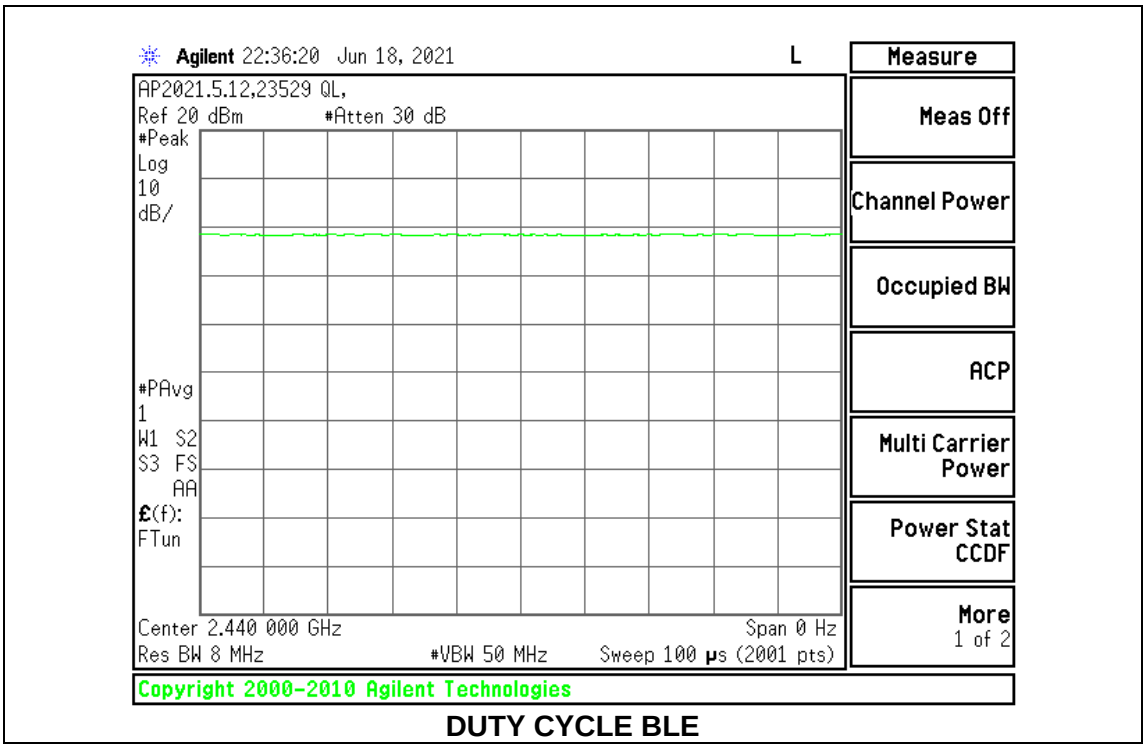
KDB 558074 Zero-Span Spectrum Analyzer Method.

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	0.100	0.100	1.000	100	0.00	0.010

Note: For testing purposes, the EUT is transmitting continuously
For DCCF used for radiated harmonic average measurements, DCCF is based on manufacturer's declared operational duty cycle of 28.28%
DCCF = 20*log(0.2828) = -10.97 dB

DUTY CYCLE PLOTS



DUTY CYCLE BLE

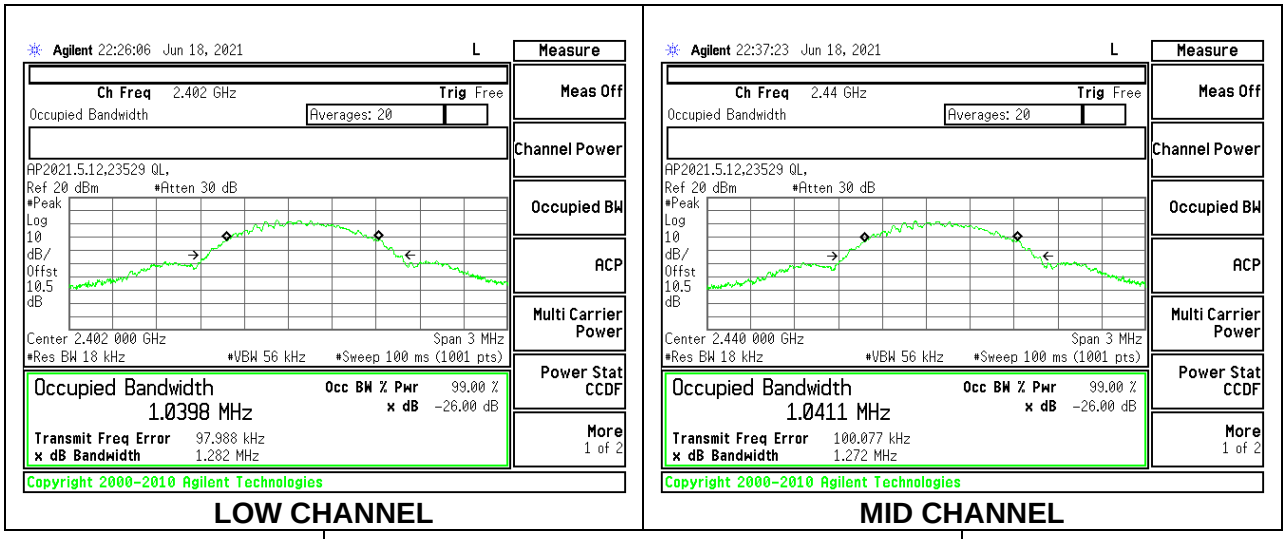
9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0398
Middle	2440	1.0411
High	2480	1.0396



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9.3. 6 dB BANDWIDTH

LIMITS

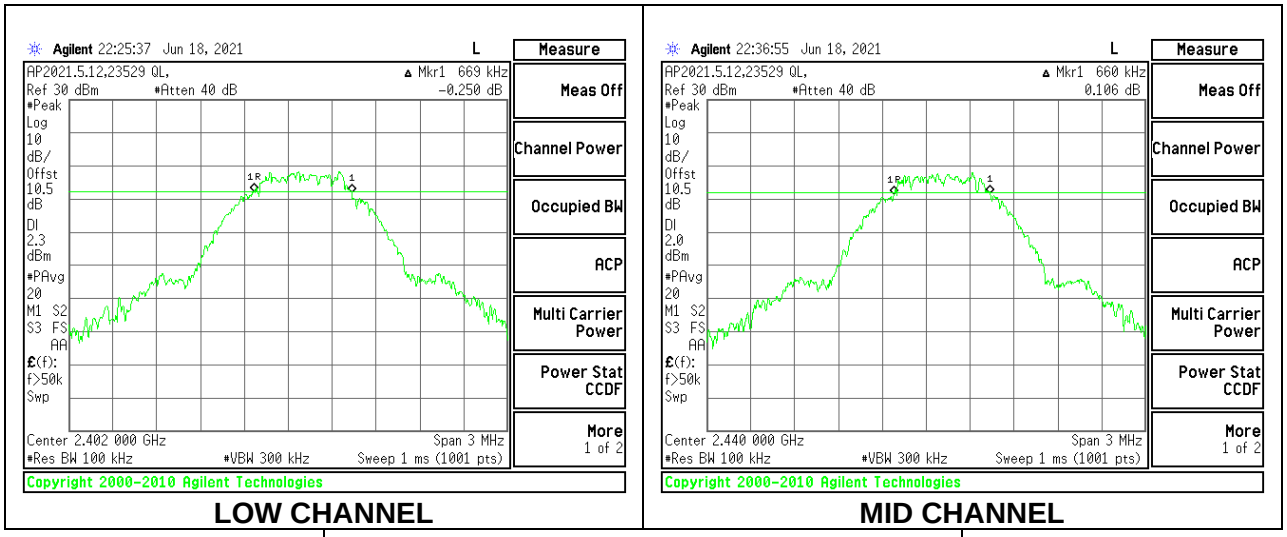
FCC §15.247 (a) (2)

RSS-247 5.2 (a)

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

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.669	0.5
Middle	2440	0.660	0.5
High	2480	0.687	0.5



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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 peak power sensor. Peak output power was read directly from power meter.

RESULTS

Tested By:	19480 BS
Date:	6/25/2021

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.95	30	-22.05
Middle	2440	7.74	30	-22.26
High	2480	7.52	30	-22.48

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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 average power sensor. Gated average output power was read directly from power meter.

RESULTS

Tested By:	19480 BS
Date:	6/25/2021

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	7.89
Middle	2440	7.67
High	2480	7.45

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9.6. POWER SPECTRAL DENSITY

LIMITS

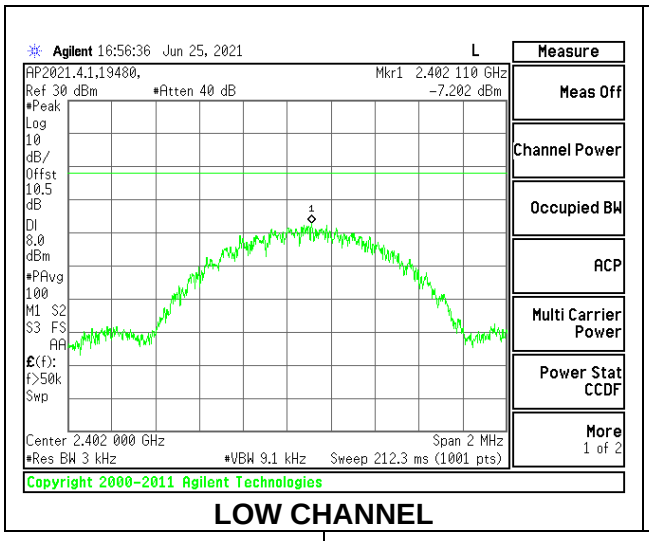
FCC §15.247 (e)

RSS-247 (5.2) (b)

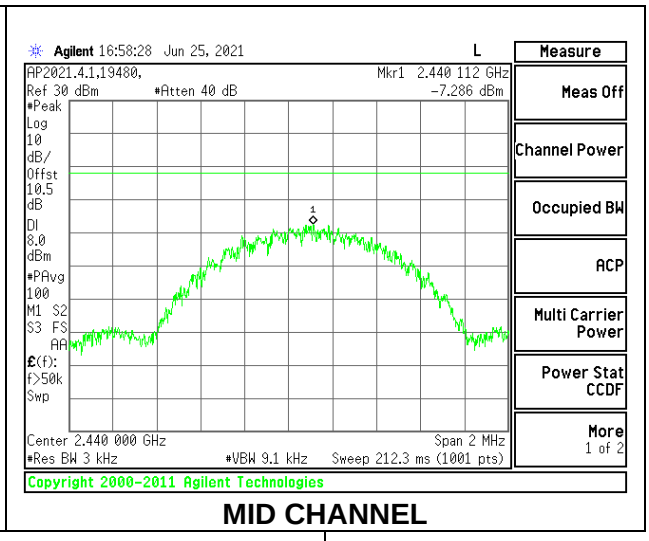
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

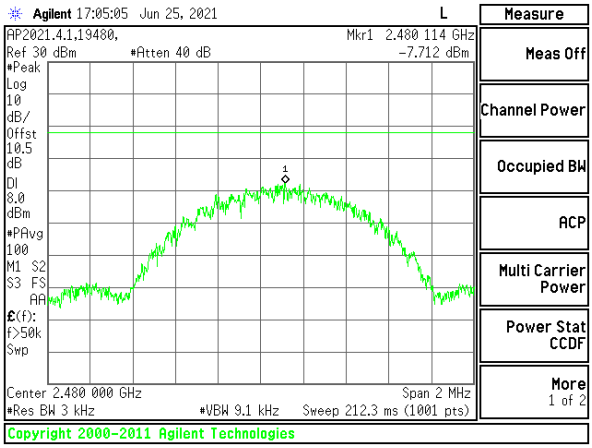
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-7.202	8	-15.20
Middle	2440	-7.286	8	-15.29
High	2480	-7.712	8	-15.71



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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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, spurious emissions are required to be 20 dBc.

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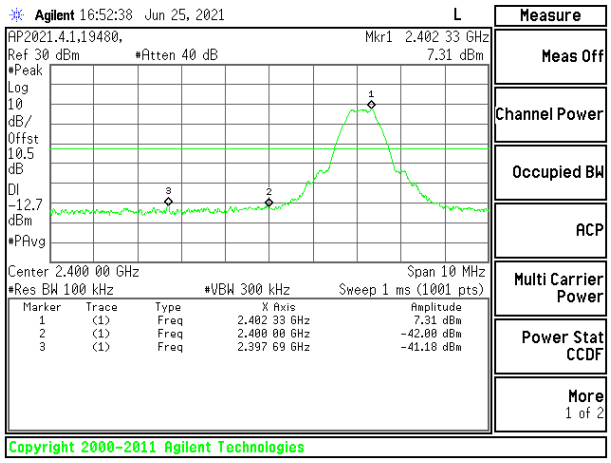
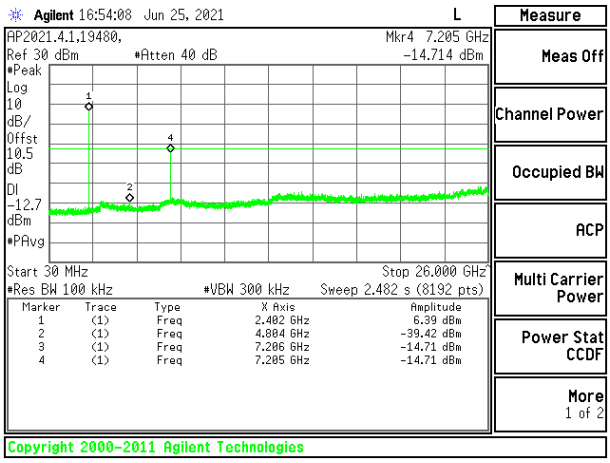
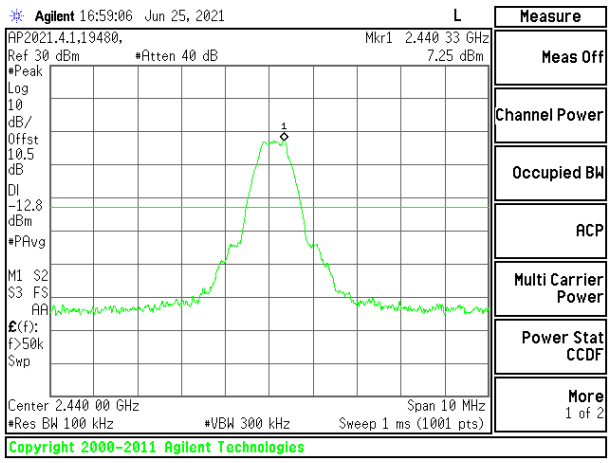
RESULTS



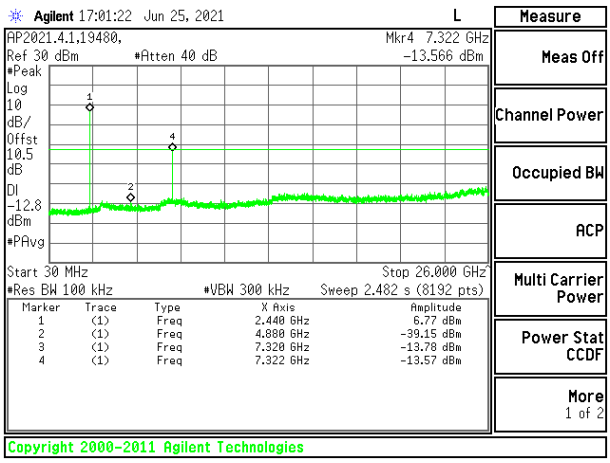
LOW CHANNEL BANDEDGE



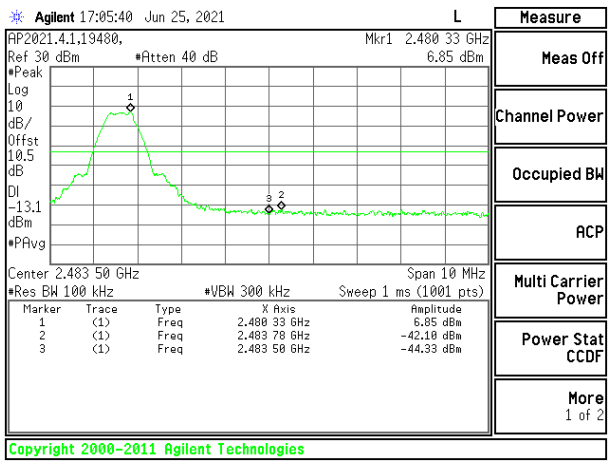
OUT-OF-BAND LOW CHANNEL



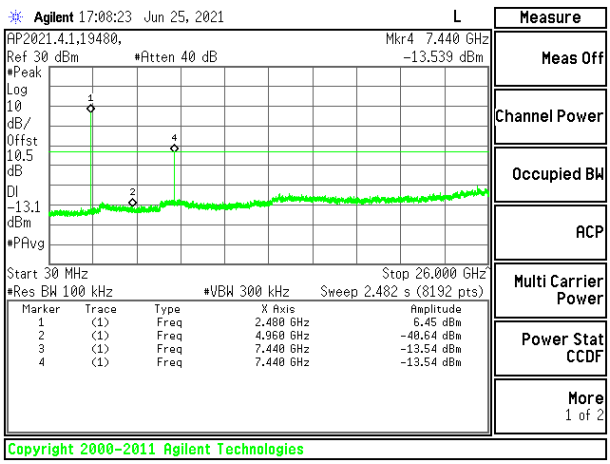
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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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.

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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.

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.

NOTE: 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.

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.

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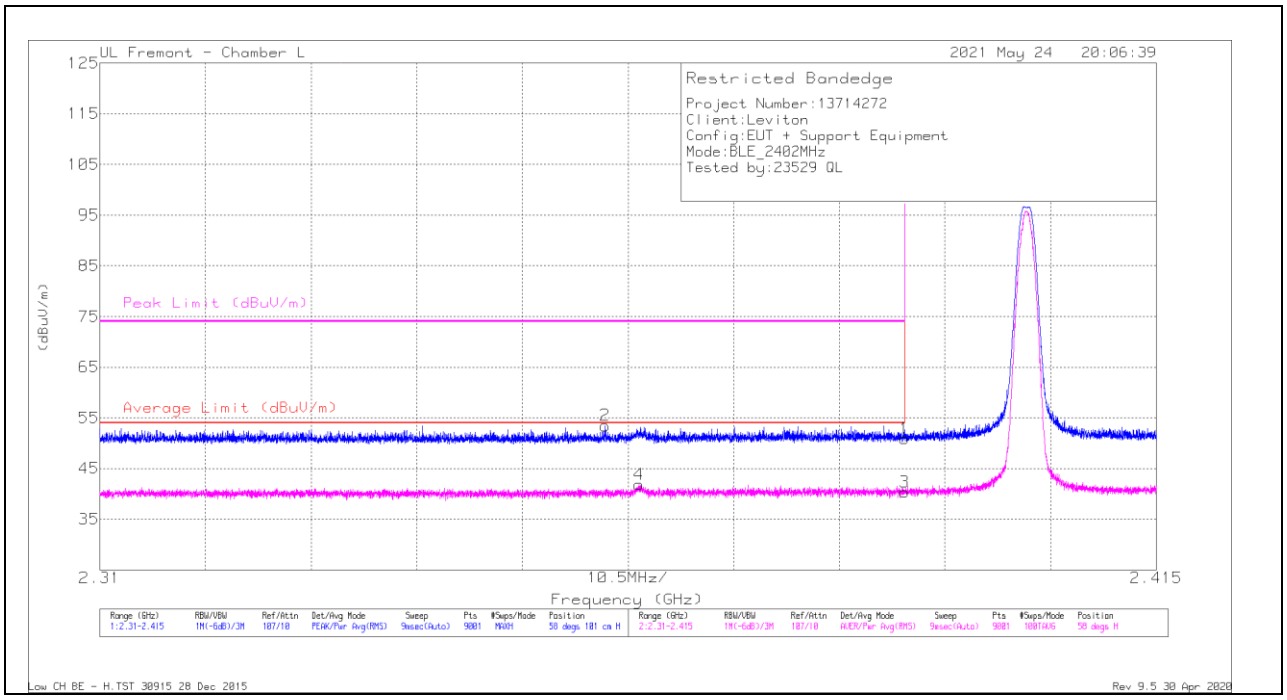
10.2. TRANSMITTER ABOVE 1 GHz

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF 344 (dB/m)	Amp/Cbl/Fltr/Pad (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	38.36	Pk	31.9	-19.3	50.96	-	-	74	-23.04	58	101	H
2	* 2.36019	41.16	Pk	31.7	-19.4	53.46	-	-	74	-20.54	58	101	H
3	* 2.38999	27.73	RMS	31.9	-19.3	40.33	54	-13.67	-	-	58	101	H
4	* 2.36361	29.54	RMS	31.7	-19.4	41.84	54	-12.16	-	-	58	101	H

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

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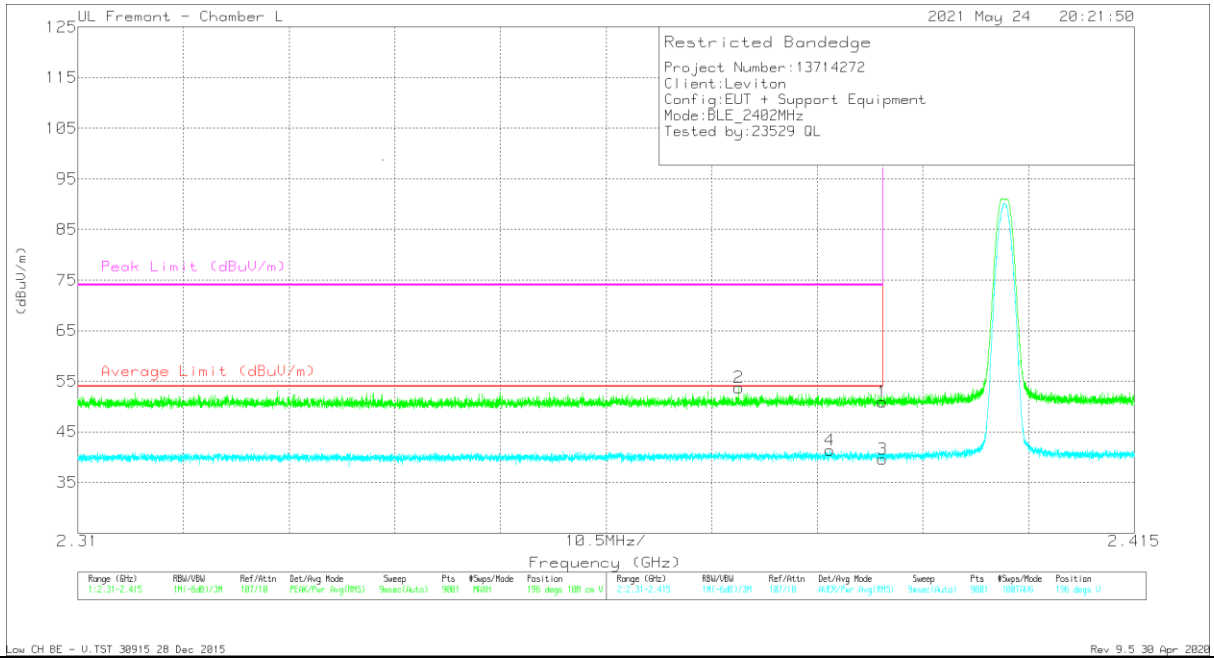
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF 344 (dB/m)	Amp/Cbl/Fltr/Pad (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	38.35	Pk	31.9	-19.3	50.95	-	-	74	-23.05	196	108	V
2	* 2.37567	41.31	Pk	31.8	-19.4	53.71	-	-	74	-20.29	196	108	V
3	* 2.38999	27.02	RMS	31.9	-19.3	39.62	54	-14.38	-	-	196	108	V
4	* 2.38472	28.86	RMS	31.8	-19.3	41.36	54	-12.64	-	-	196	108	V

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

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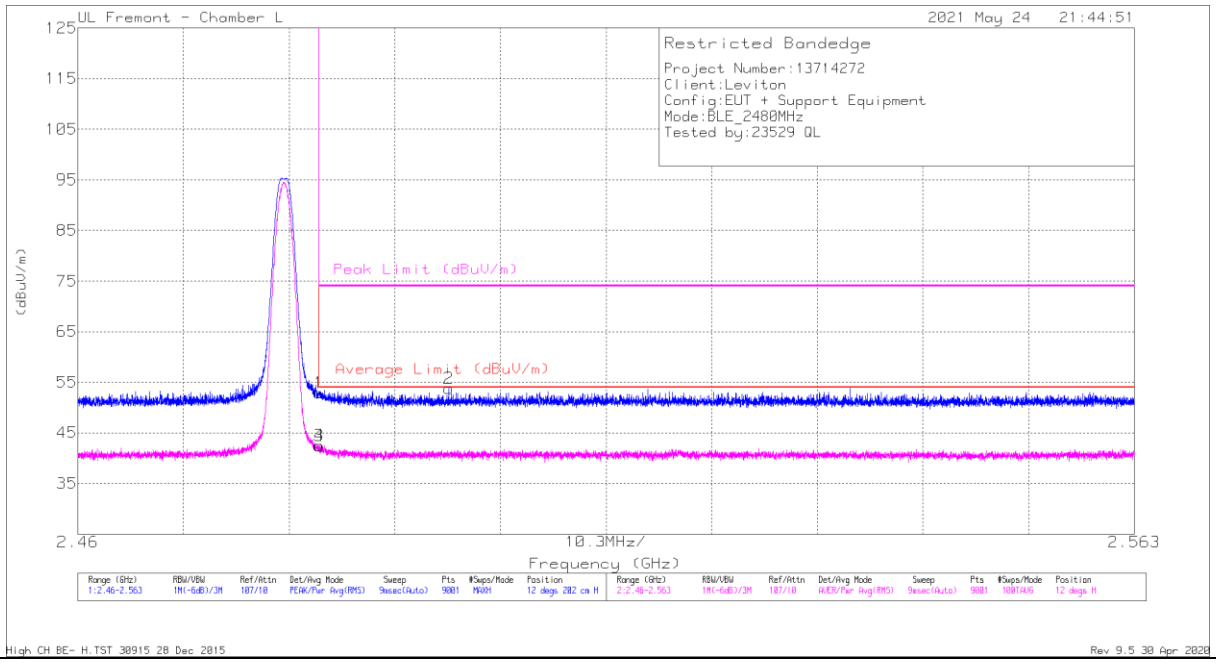
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF 344 (dB/m)	Amp/Cbl/Fltr/Pad (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	39.58	Pk	32.3	-19	52.88	-	-	74	-21.12	12	202	H
2	* 2.49616	40.61	Pk	32.3	-19.1	53.81	-	-	74	-20.19	12	202	H
3	* 2.48351	29.19	RMS	32.3	-19	42.49	54	-11.51	-	-	12	202	H
4	* 2.48353	29.2	RMS	32.3	-19	42.5	54	-11.5	-	-	12	202	H

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

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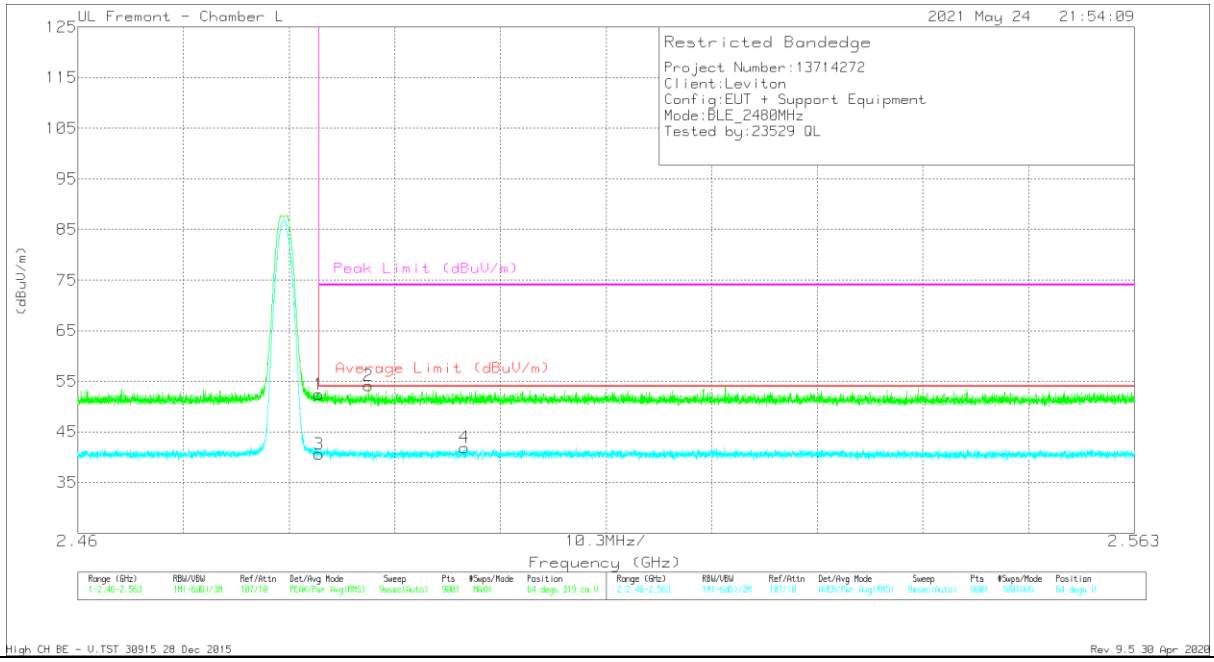
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF 344 (dB/m)	Amp/Cbl/Fltr/Pad (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	39.13	Pk	32.3	-19	52.43	-	-	74	-21.57	64	319	V
2	* 2.48832	40.99	Pk	32.3	-19.1	54.19	-	-	74	-19.81	64	319	V
3	* 2.48351	27.28	RMS	32.3	-19	40.58	54	-13.42	-	-	64	319	V
4	* 2.49767	28.61	RMS	32.4	-19.1	41.91	54	-12.09	-	-	64	319	V

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

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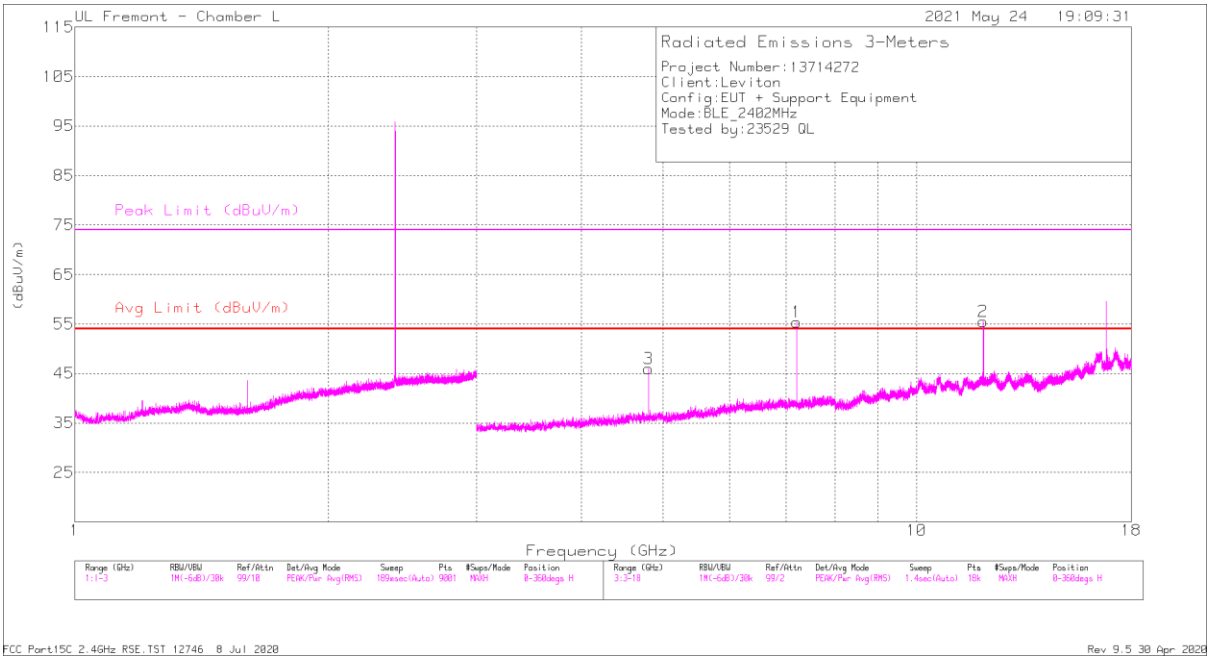
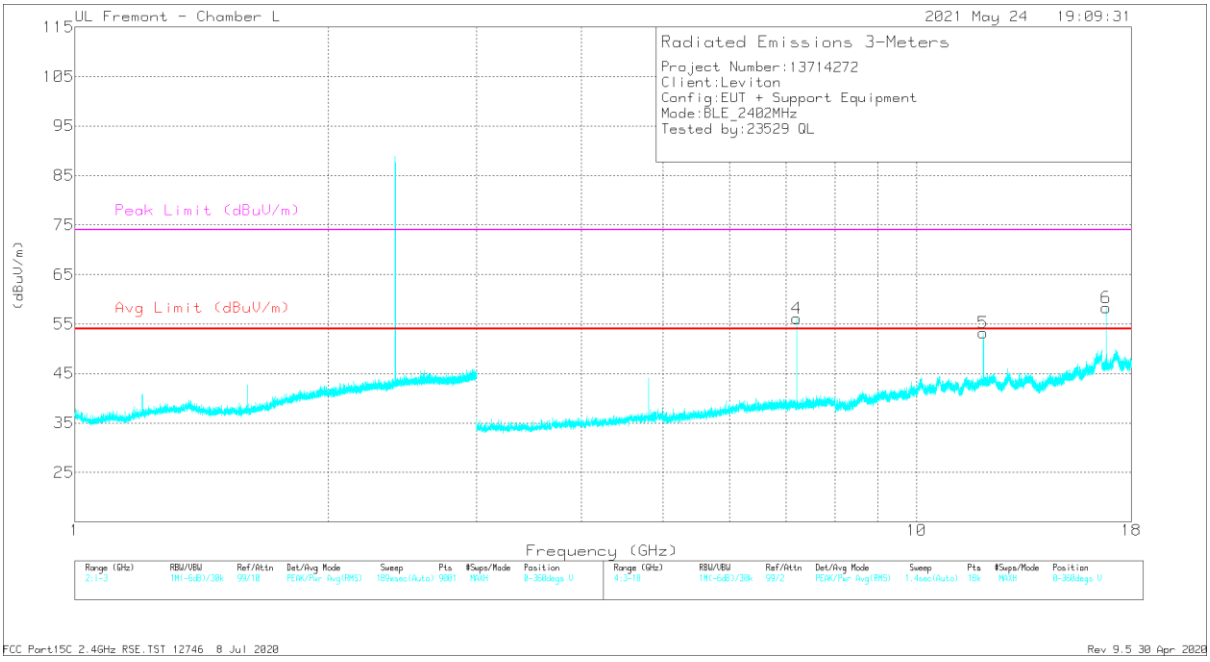
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Maker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF 344 (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	7.20698	45.39	PK2	35.5	-20.2	0	60.69	-	-	-	-	298	102	H
2	* 12.00924	37.65	PK2	38.7	-16.3	0	60.05	-	-	74	-13.95	359	101	H
	* 12.00924	37.65	AV	38.7	-16.3	-10.97	49.08	54	-4.92	-	-	359	101	H
3	* 4.80365	40.05	PK2	34.2	-24.5	0	49.75	-	-	74	-24.25	249	101	H
	* 4.80365	40.05	AV	34.2	-24.5	-10.97	38.78	54	-15.22	-	-	249	101	H
4	7.20698	43.45	PK2	35.5	-20.2	0	58.75	-	-	-	-	182	102	V
5	* 12.01173	35.39	PK2	38.7	-16.3	0	57.79	-	-	74	-16.21	12	101	V
	* 12.01173	35.39	AV	38.7	-16.3	-10.97	46.82	54	-7.18	-	-	12	101	V
6	16.81626	36.13	PK2	42.2	-15	0	63.33	-	-	-	-	67	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
AV = Peak reading + Duty Cycle Correction Factor(KDB558074 Section 11, Question 3 (a)
Duty Cycle Correction Factor = -10.97 dB. Refer to Section 9.1

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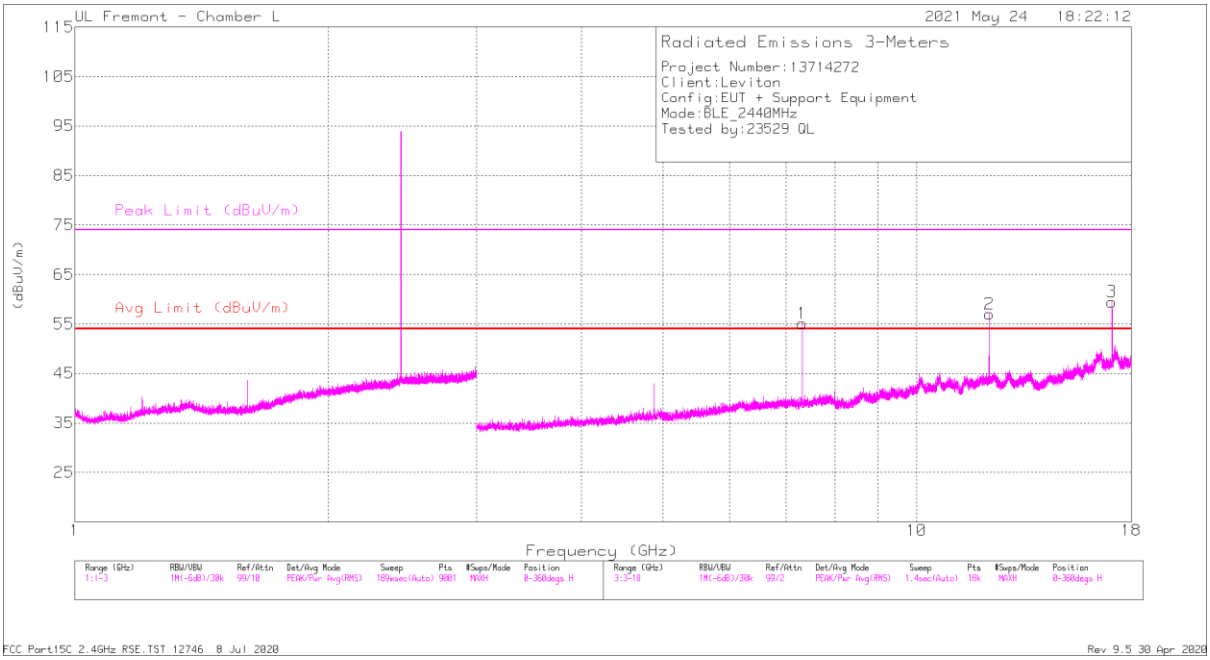
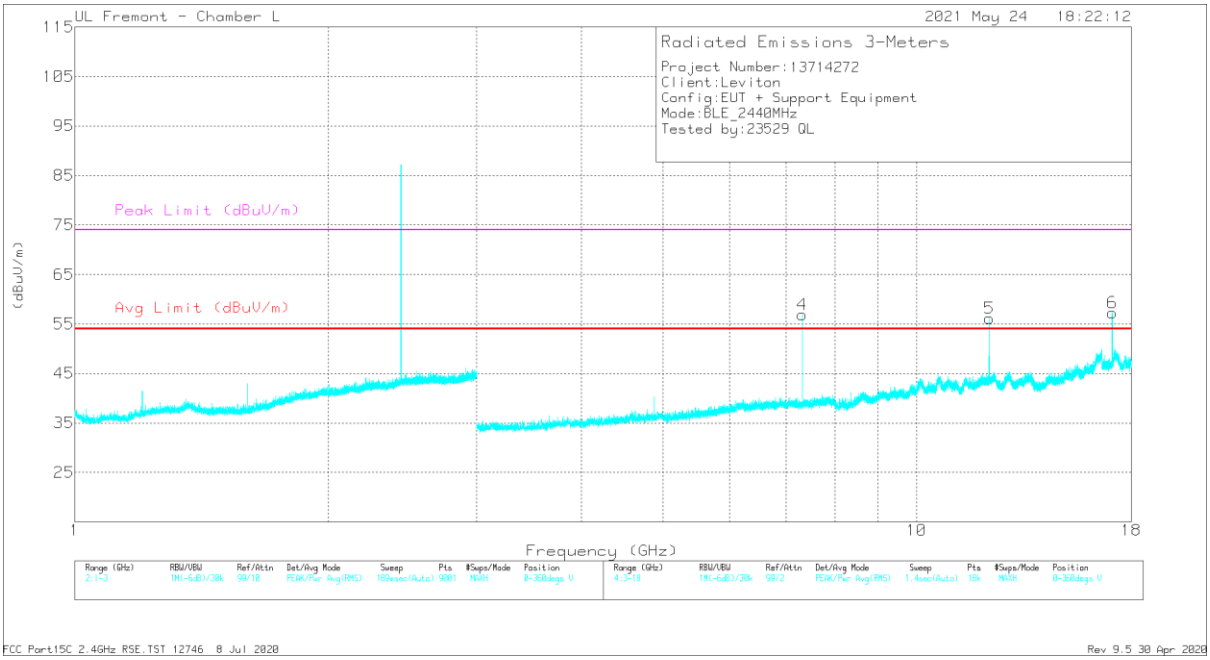
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF 344 (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
2	* 12.20166	38.11	PK2	38.9	-16.7	0	60.31	-	-	74	-13.69	359	101	H
	* 12.20166	38.11	AV	38.9	-16.7	-10.97	49.34	54	-4.66	-	-	359	101	H
1	* 7.321	44.51	PK2	35.5	-20.1	0	59.91	-	-	74	-14.09	291	102	H
	* 7.321	44.51	AV	35.5	-20.1	-10.97	48.94	54	-5.06	-	-	291	102	H
3	17.08228	35.36	PK2	41.7	-15.2	0	61.86	-	-	-	-	326	143	H
4	* 7.32101	46.65	PK2	35.5	-20.1	0	62.05	-	-	74	-11.95	41	102	V
	* 7.32101	46.65	AV	35.5	-20.1	-10.97	51.08	54	-2.92	-	-	41	102	V
5	* 12.19919	36.79	PK2	38.9	-16.7	0	58.99	-	-	74	-15.01	8	101	V
	* 12.19919	36.79	AV	38.9	-16.7	-10.97	48.02	54	-5.98	-	-	8	101	V
6	17.08233	36.49	PK2	41.7	-15.2	0	62.99	-	-	-	-	71	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
AV = Peak reading + Duty Cycle Correction Factor(KDB558074 Section 11, Question 3 (a)
Duty Cycle Correction Factor = -10.97 dB. Refer to Section 9.1

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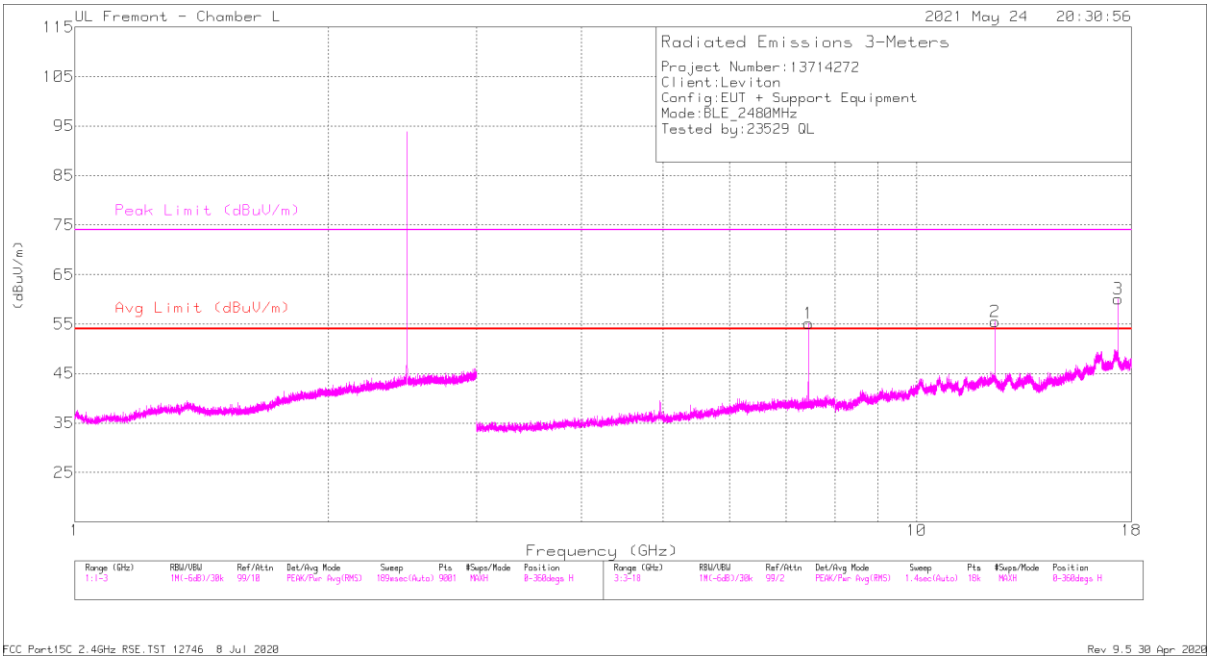
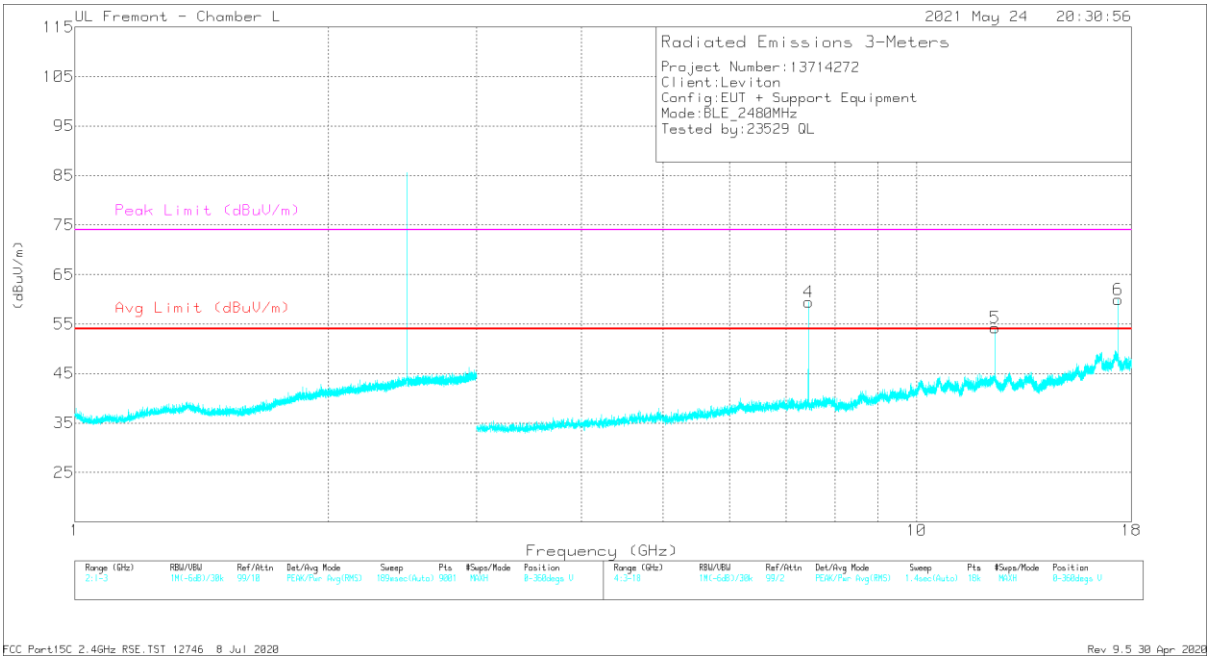
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF 344 (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	* 7.44098	44.74	PK2	35.6	-20	0	60.34	-	-	74	-13.66	284	102	H
	* 7.44098	44.74	AV	35.6	-20	-10.97	49.37	54	-4.63	-	-	284	102	H
2	* 12.40167	35.6	PK2	39	-16.3	0	58.3	-	-	74	-15.7	4	101	H
	* 12.40167	35.6	AV	39	-16.3	-10.97	47.33	54	-6.67	-	-	4	101	H
3	17.36234	37.89	PK2	41.5	-14.9	0	64.49	-	-	-	-	89	201	H
4	* 7.4409	48.22	PK2	35.6	-20	0	63.82	-	-	74	-10.18	35	101	V
	* 7.4409	48.22	AV	35.6	-20	-10.97	52.85	54	-1.15	-	-	35	101	V
5	* 12.40163	35.29	PK2	39	-16.3	0	57.99	-	-	74	-16.01	10	101	V
	* 12.40163	35.29	AV	39	-16.3	-10.97	47.02	54	-6.98	-	-	10	101	V
6	17.35906	37.58	PK2	41.6	-14.8	0	64.38	-	-	-	-	77	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
AV = Peak reading + Duty Cycle Correction Factor(KDB558074 Section 11, Question 3 (a)
Duty Cycle Correction Factor = -10.97 dB. Refer to Section 9.1

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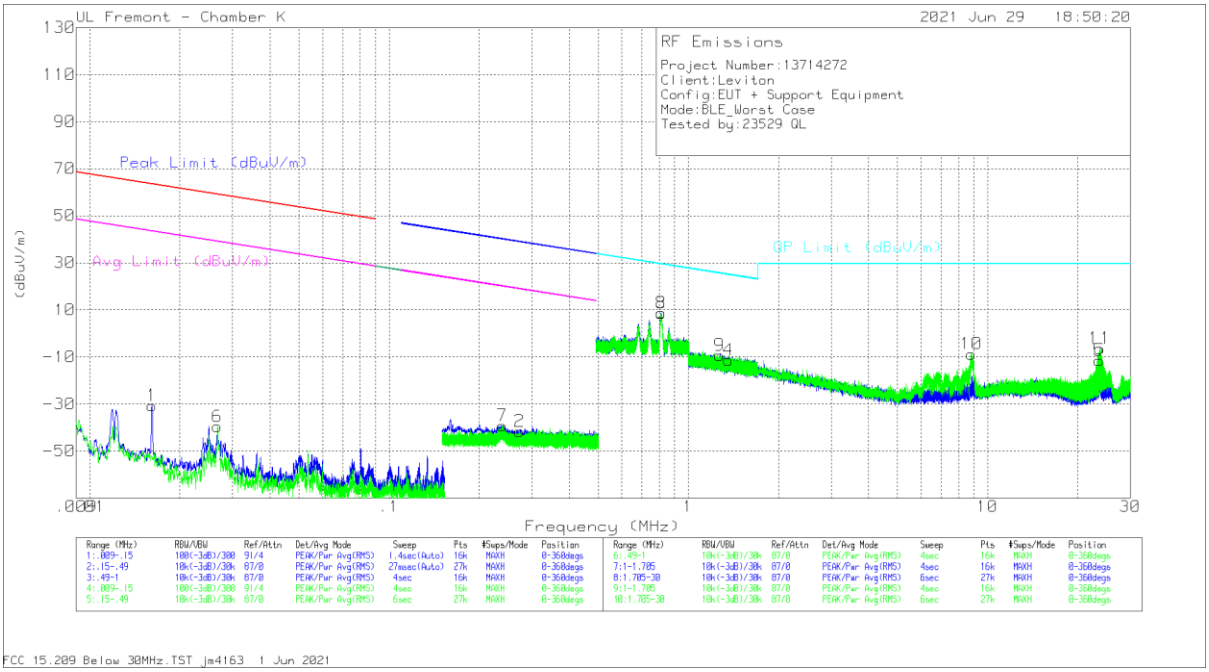
10.3. WORST CASE BELOW 30MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

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Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (E ACF)	Amp/Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.01612	21.63	Pk	59.5	-31.8	-80	-30.67	63.44	-94.11	43.44	-74.11	-	-	-	-	0-360
2	.27297	14.39	Pk	56.2	-32.2	-80	-41.61	-	-	-	-	38.89	-80.5	18.89	-60.5	0-360
6	.0267	14.35	Pk	58.3	-32.2	-80	-39.55	59.05	-98.6	39.05	-78.6	-	-	-	-	0-360
7	.23893	16.77	Pk	56.2	-32.2	-80	-39.23	-	-	-	-	40.05	-79.28	20.05	-59.28	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (E ACF)	Amp/Cbl (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.81128	24.65	Pk	56.2	-32.2	-40	8.65	29.43	-20.78	0-360
8	.81077	24.7	Pk	56.2	-32.2	-40	8.7	29.44	-20.74	0-360
4	1.36045	15.97	Pk	44.8	-32.1	-40	-11.33	24.96	-36.29	0-360
5	23.60506	26.88	Pk	33.3	-31.6	-40	-11.42	29.5	-40.92	0-360
9	1.2743	17.44	Pk	45.3	-32.1	-40	-9.36	25.52	-34.88	0-360
10	8.81882	28.89	Pk	34.3	-31.9	-40	-8.71	29.5	-38.21	0-360
11	23.71195	31.9	Pk	33.3	-31.6	-40	-6.4	29.5	-35.9	0-360

Pk - Peak detector

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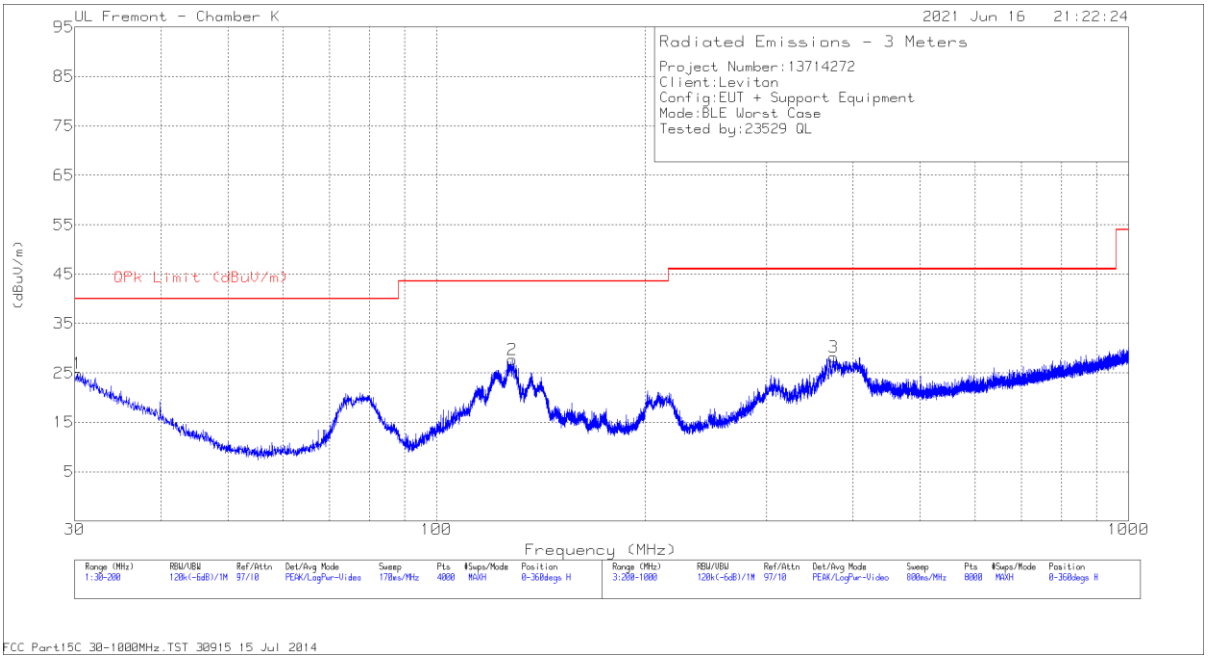
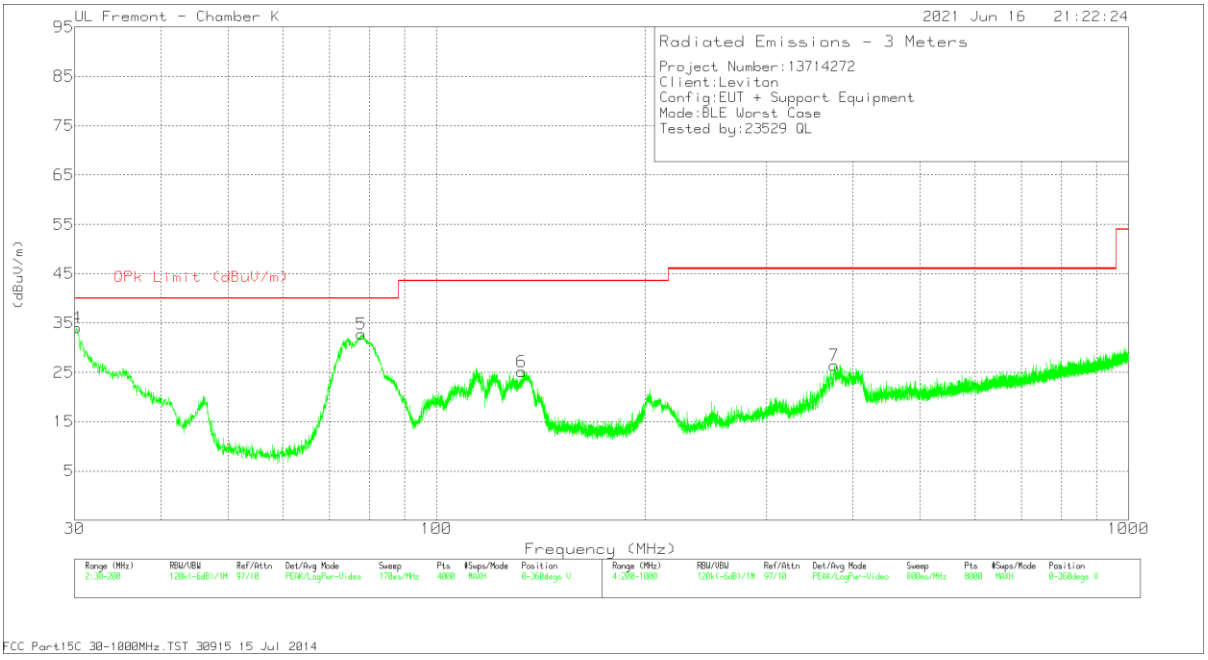
10.4. WORST CASE BELOW 1 GHz

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



HORIZONTAL



VERTICAL

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Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF 81560 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.2976	28.67	Pk	27.8	-31.6	24.87	40	-15.13	0-360	299	H
2	* 128.7531	38.52	Pk	19.9	-30.7	27.72	43.52	-15.8	0-360	199	H
4	30.093	39	Pk	27.9	-31.6	35.3	40	-4.7	82	95	V
	30.093	34.15	Qp	27.9	-31.6	30.45	40	-9.55	82	95	V
5	77.377	50.08	Pk	14.1	-31.1	33.08	40	-6.92	92	100	V
	77.377	47.15	Qp	14.1	-31.1	30.15	40	-9.85	92	100	V
6	* 132.8766	36.19	Pk	19.7	-30.7	25.19	43.52	-18.33	0-360	95	V
3	374.8227	36.24	Pk	21.4	-29.5	28.14	46.02	-17.88	0-360	99	H
7	375.8229	34.55	Pk	21.5	-29.6	26.45	46.02	-19.57	0-360	100	V

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

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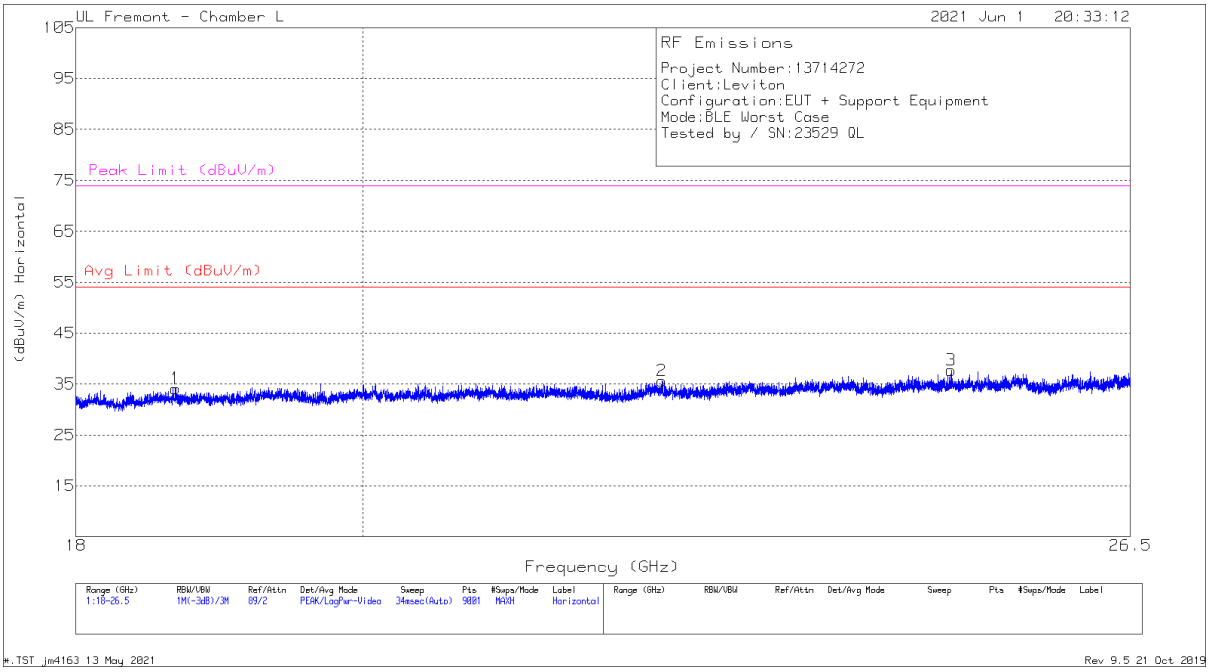
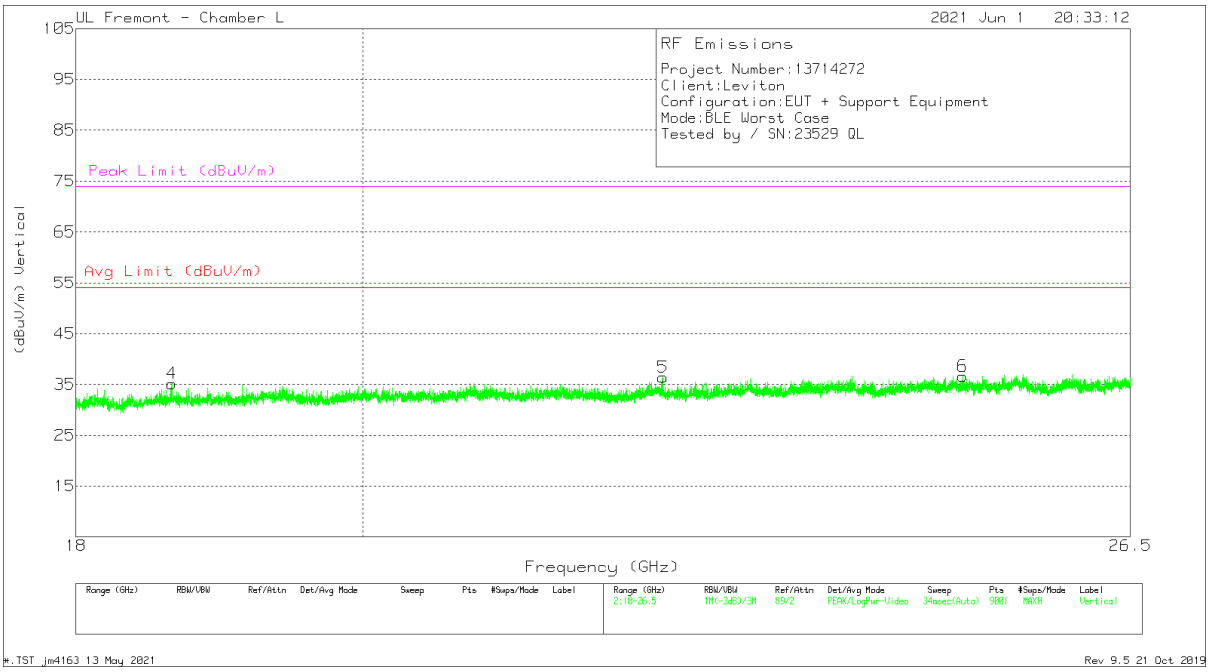
10.5. WORST CASE 18-26 GHz

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



HORIZONTAL



VERTICAL

18 – 26 GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T447 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.66867	69.81	Pk	32.4	-58.6	-9.5	34.11	54	-19.89	74	-39.89
2	22.31516	69.31	Pk	33.6	-57.8	-9.5	35.61	54	-18.39	74	-38.39
3	24.81416	68.31	Pk	34.5	-55.6	-9.5	37.71	54	-16.29	74	-36.29
4	18.64411	70.96	Pk	32.4	-58.7	-9.5	35.16	54	-18.84	74	-38.84
5	22.32461	70.14	Pk	33.6	-57.8	-9.5	36.44	54	-17.56	74	-37.56
6	24.919	67.32	Pk	34.5	-55.7	-9.5	36.62	54	-17.38	74	-37.38

Pk - Peak detector

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11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	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

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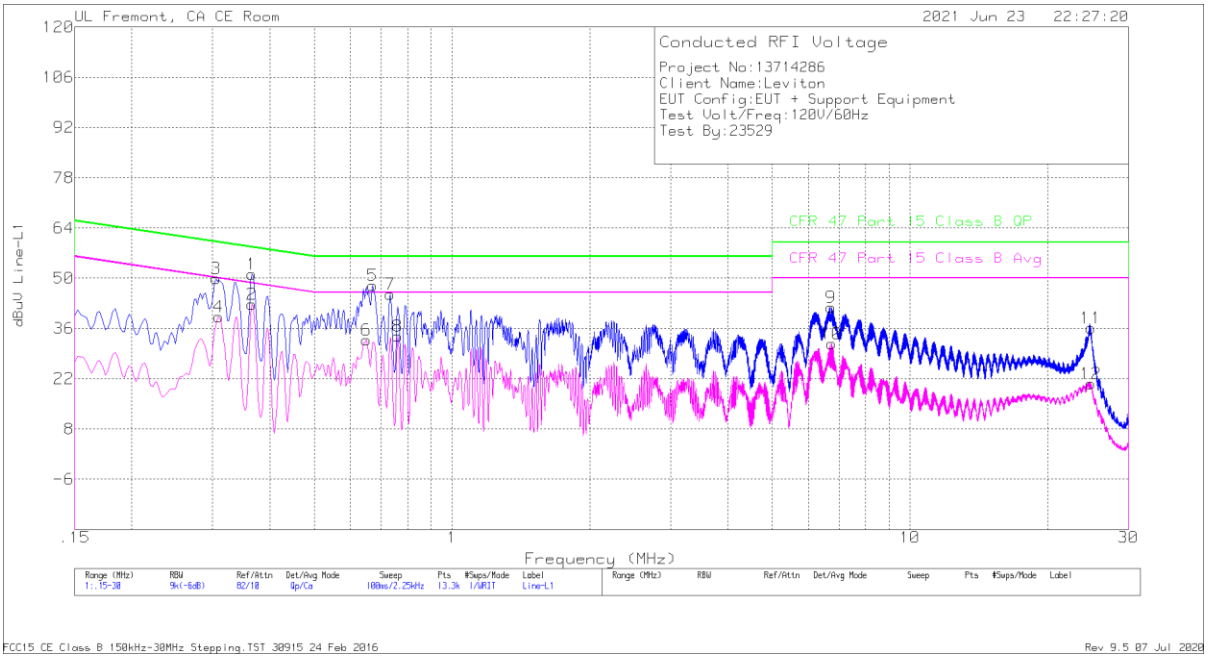
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 L1	LC Cables C1&C3 dB	TekBox Limiter TBFL1 Model 207	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.366	41.83	Qp	0	0	9.3	51.13	58.59	-7.46	-	-
2	.366	33.45	Ca	0	0	9.3	42.75	-	-	48.59	-5.84
3	.30525	40.63	Qp	0	0	9.3	49.93	60.1	-10.17	-	-
4	.30975	30.02	Ca	0	0	9.3	39.32	-	-	49.98	-10.66
5	.672	38.7	Qp	0	0	9.3	48	56	-8	-	-
6	.6495	23.48	Ca	0	0	9.3	32.78	-	-	46	-13.22
7	.73275	36.21	Qp	0	0	9.3	45.51	56	-10.49	-	-
8	.762	24.46	Ca	0	.1	9.3	33.86	-	-	46	-12.14
9	6.7155	32.55	Qp	0	.1	9.3	41.95	60	-18.05	-	-
10	6.747	22.34	Ca	0	.1	9.3	31.74	-	-	50	-18.26
11	24.79875	26.52	Qp	0	.3	9.3	36.12	60	-23.88	-	-
12	24.79875	11.03	Ca	0	.3	9.3	20.63	-	-	50	-29.37

Qp - Quasi-Peak detector
Ca - CISPR average detection

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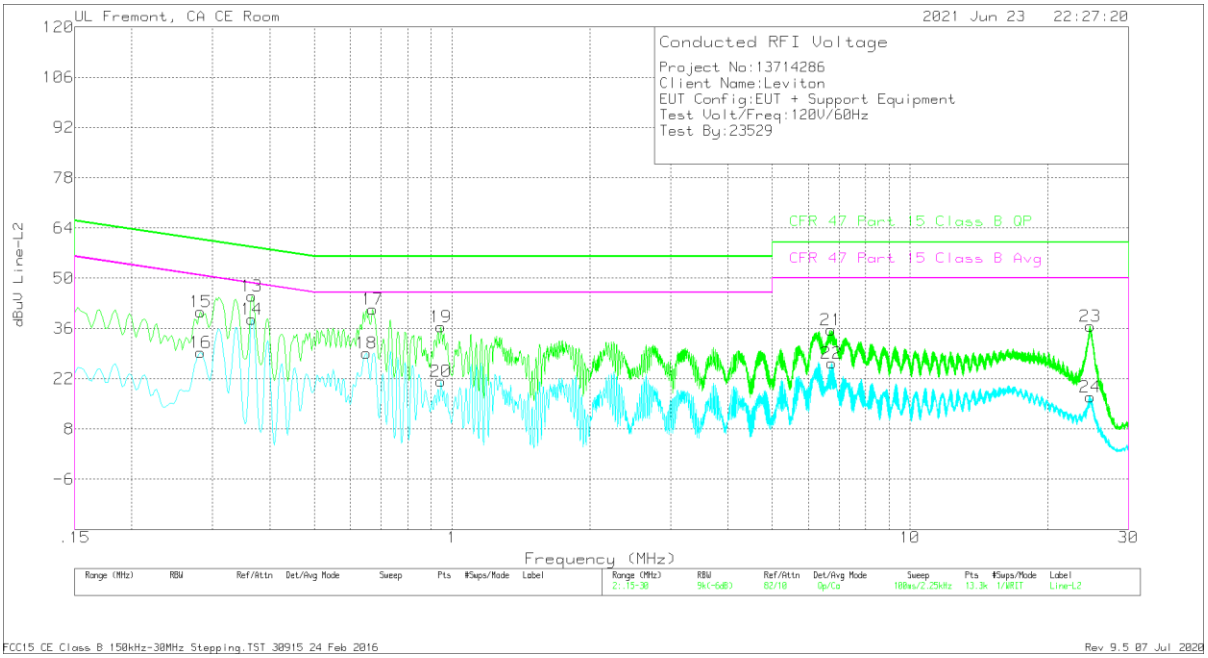
LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 L2	LC Cables C2&C3 dB	TekBox Limiter TBFL1 Model 207	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.366	35.76	Qp	0	0	9.3	45.06	58.59	-13.53	-	-
14	.366	29.26	Ca	0	0	9.3	38.56	-	-	48.59	-10.03
15	.28275	31.28	Qp	0	0	9.3	40.58	60.73	-20.15	-	-
16	.28275	20.09	Ca	0	0	9.3	29.39	-	-	50.73	-21.34
17	.672	32.09	Qp	0	0	9.3	41.39	56	-14.61	-	-
18	.6495	19.87	Ca	0	0	9.3	29.17	-	-	46	-16.83
19	.9465	27.02	Qp	0	.1	9.3	36.42	56	-19.58	-	-
20	.9465	11.86	Ca	0	.1	9.3	21.26	-	-	46	-24.74
21	6.7155	26.12	Qp	0	.1	9.3	35.52	60	-24.48	-	-
22	6.74475	17.03	Ca	0	.1	9.3	26.43	-	-	50	-23.57
23	24.76275	26.9	Qp	.1	.3	9.3	36.6	60	-23.4	-	-
24	24.73575	7.26	Ca	.1	.3	9.3	16.96	-	-	50	-33.04

Qp - Quasi-Peak detector
Ca - CISPR average detection

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