TEST REPORT

Report Number. : 14943060-E1V2

Applicant	:	NNOXX 113 Cherry St., PMB 92856 Seattle, WA 98104 USA
Model	:	NNOXX ONE
FCC ID	:	2BC5ONXO1
EUT Description	:	WEARABLE DEVICE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
2023-11-21

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
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ACCREDITED
CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-11-14	Initial Issue	Kyia Kedida
V2	2023-11-21	Updated Section 5.4, 6.5, 7, 8,10.2.1, 10.3, 10.4, 10.5 Added Section AC Line Data and Set-up Photos in Section 10.6 and 10.7	Kyia Kedida

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: NNOXX

EUT DESCRIPTION: Wearable device

MODEL: NNOXX ONE

SERIAL NUMBER: Radiated Samples: 002 and 003
Conducted Sample: 004

DATE TESTED: 2023-08-31 to 2023-11-20

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
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 ensure 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, 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.

Below is a list of the data provided by the customer:

1) Antenna gain and type (see section 6.3)

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	Compliant	None.
15.247 (b) (3)	Output Power	Compliant	None.
See Comment	Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	PSD	Compliant	None.
15.247 (d)	Conducted Spurious Emissions	Compliant	None.
15.209, 15.205	Radiated Emissions	Compliant	None.
15.207	AC Mains Conducted Emissions	Compliant	None.

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3. TEST METHODOLOGY

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

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
☒	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
☐	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A			
☒	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A			

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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}
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22%
Power Spectral Density	2.47 dB
RF Power Measurement Direct Method Using Power Meter	1.3 dB (PK) / 0.45 dB (AV)
Unwanted Emissions, Conducted	1.94 dB
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	2.87 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
Time Domain Measurements	3.39%
Temperature	0.57˚C
Humidity	3.39%
DC Supply Voltages	0.57%

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

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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 wearable device that measures nitric oxide and oxygenation in a persons body.

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	5.49	3.54

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two Ceramic Chip Antenna, with a maximum gain of 2.7 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was dtm_app.core.hex and dtm_net_core.hex.

The test utility software used during testing was nRF Connect Direct Test Mode V2.1.0.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz and above 18GHz 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.

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

The worst-case data rate provided by the client was 1Mbps.

The NNOXX declares device has two chip antennas for the BLE radio. The chip antennas and RF tuning circuits are identical. The antennas operate in a switch diversity configuration (SISO) with only one antenna active at a time. The RF circuits use the same component values/part numbers for the chip antennas, resistors, capacitors, and inductors. Because both chip antennas are the same part number/manufacturer, the gain for both antennas are the same. Both chip antennas are on the same PCB, and have the same trace width, trace length, impedance, trace distance from internal ground plane, and distance from chip antenna to ground plane. Since both chip antennas are on the same PCB, the manufacturing process (solder paste, reflow oven temperature) are the same. Based on the identical antenna type/gain only one antenna was tested to represent the other.

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

SUPPORT TEST EQUIPMENT				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID/ DoC**
Laptop	Lenovo	Thinkpad	N/A	N/A
Laptop AC/DC	Lenovo 65W	Lenovo 65W	N/A	N/A
AC Adapter	Dongquan WILL Electronics	DMA-050150U	N/A	N/A

I/O CABLES (RF CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	1	RF	Shielded	0.2	To PXA
2	USB	1	USB	Un-shielded	1	EUT to Laptop
3	USB	1	USB	Un-shielded	1	EUT to AC Mains
4	AC	2	AC	Un-shielded	1.25	AC Mains to Laptop
5	DC	1	DC	Un-shielded	1	AC/DC Adapter to Laptop

I/O CABLES (RF RADIATED and AC LINE CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	USB	Un-shielded	1	EUT to AC Mains

TEST SETUP

The EUT is normally powered by a Li-Ion battery at 3.7V and rechargeable via USB. The laptop is used for setting up purposes and was removed during testing.

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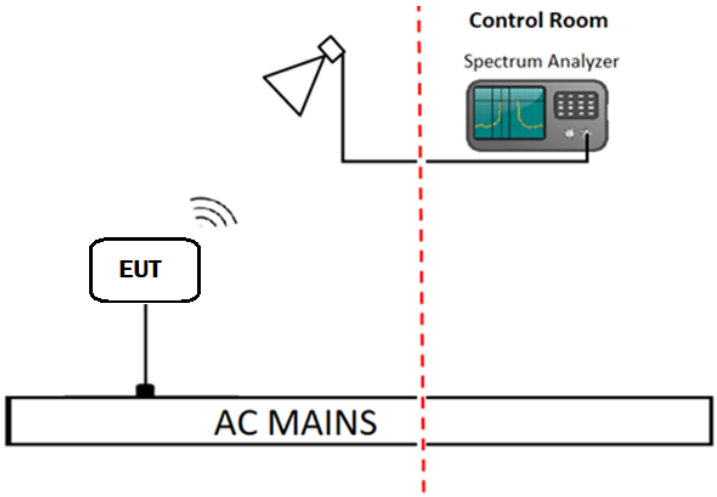
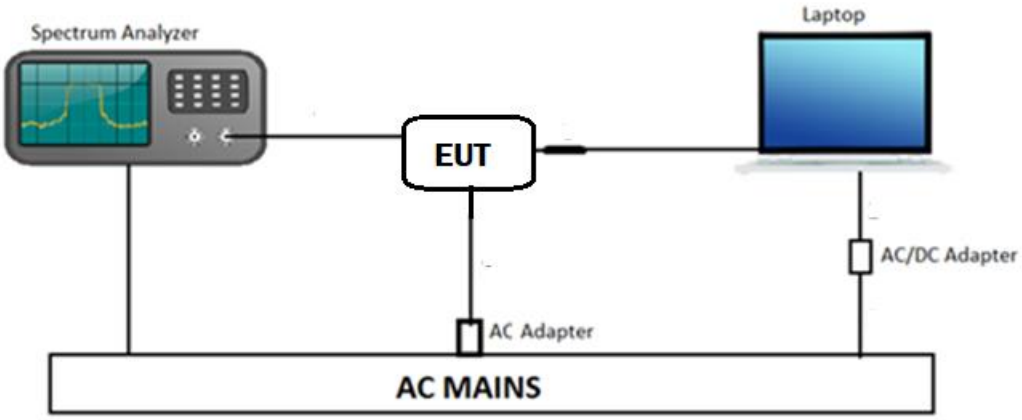
SETUP DIAGRAM

Radiated and AC Line Conducted Configuration



Conducted Configuration



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7. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW ≥ DTS BW

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 Section 6.10

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

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

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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**
Antenna, Broadband Hybrid, 30MHz to 1GHz	Sunol Sciences Corp.	JB3	174374	2024-04-30	2023-04-05
Link File, @3m, 30-1000MHz Hybrid Path Loss	UL-FR1	Port 0 Factors	211121	2024-04-30	2023-04-17
Link File, @3m, 9KHz-30MHz Passive Loop Path Loss	UL-FR1	Port 0 Factors	211120	2024-04-30	2023-04-17
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	206806	2023-10-07	2022-10-07
RF Filter Box, 1-18GHz	UL-FR1	n/a	171013	2024-05-31	2023-05-04
EMI TEST RECEIVER, with B8 option	Rohde & Schwarz	ESW44	191429	2024-02-29	2023-02-15
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	225688 (chamber k)	2024-02-29	2023-02-14
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	199659	2023-12-06	2022-12-06
Amplifier 18-26.5GHz, +5Vdc, -54dBm P1dB	AMPLICAL	AMP18G26.5-60	234683	2024-03-29	2023-03-18
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	170016	2024-08-31	2023-08-24
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	170014	2024-08-31	2023-08-24
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent Technologies	N9030A	85201	2024-02-29	2023-02-02
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent Technologies	N9030A	80396	2024-01-31	2023-01-27
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90719	2024-01-31	2023-01-25
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	225688	2024-02-29	2023-02-14
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	81319	2024-01-31	2023-01-25
10dB Fixed Attenuator	Pasternack Enterprises	PE7087-10	N/A	Verified	Verified
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Ver 2023-01-18, 2023-03-03, 2023-05-01		
Antenna Port Software	UL	UL RF	Ver 2022.5.31		
AC Line Conducted Software	UL	UL EMC	Version 9.5, 2023-03-03		

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
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

	B (msec)	(msec)	x (linear)	Cycle (%)	Correction Factor (dB)	Minimum VBW (kHz)
2.4GHz Band						
BLE	0.3828	0.6248	0.613	61.27%	2.13	2.612

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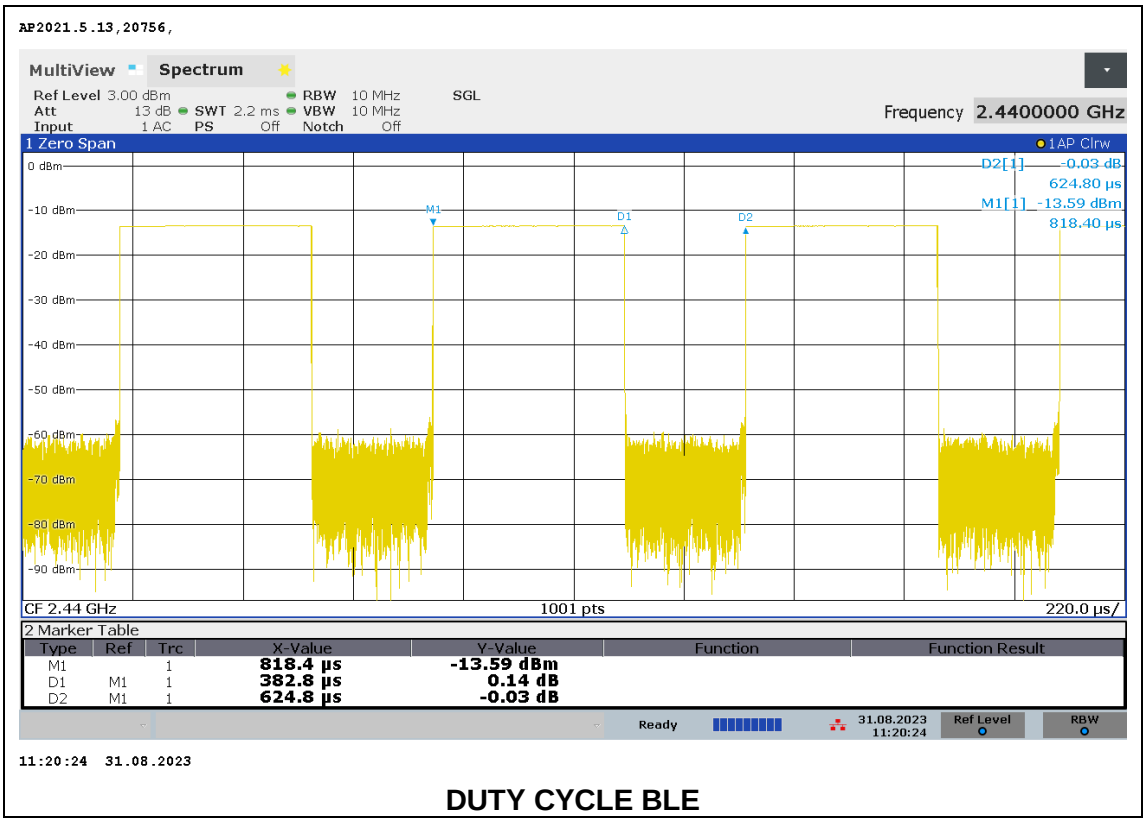
DUTY CYCLE PLOTS



DUTY CYCLE BLE

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9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

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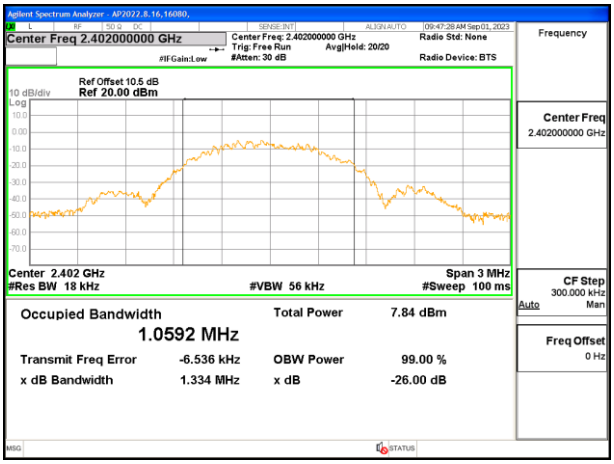
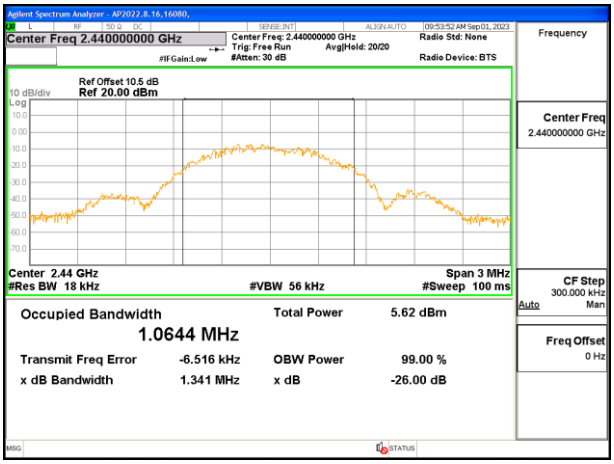
9.2.1. BLE (1Mbps)

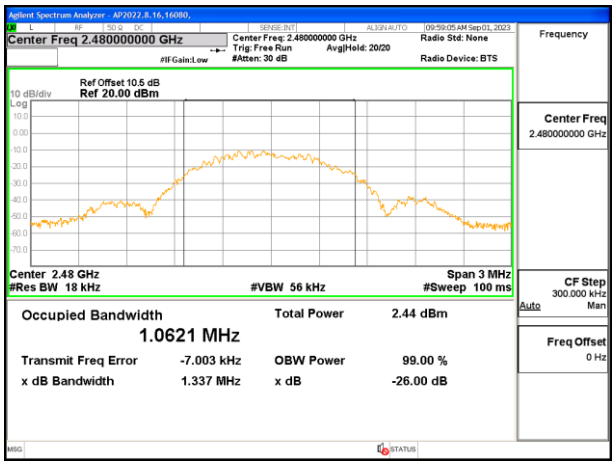
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0592
Middle	2440	1.0644
High	2480	1.0621



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

RESULTS

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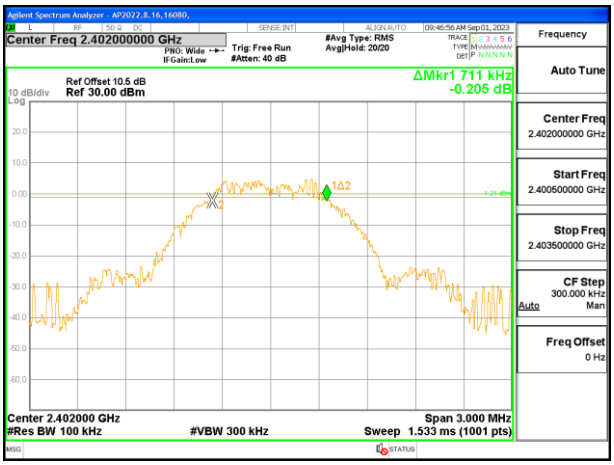
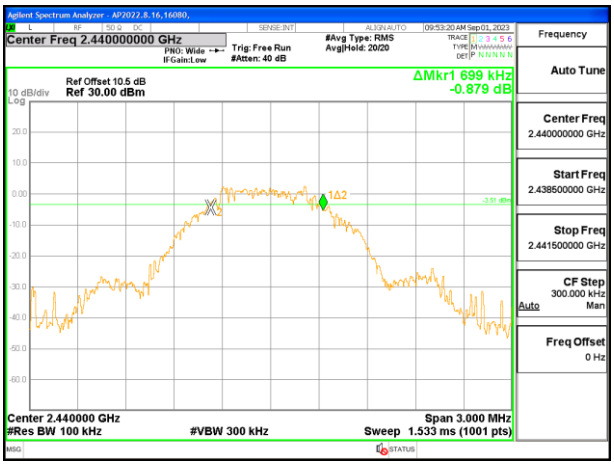
9.3.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.711	0.5
Middle	2440	0.699	0.5
High	2480	0.699	0.5



LOW CHANNEL



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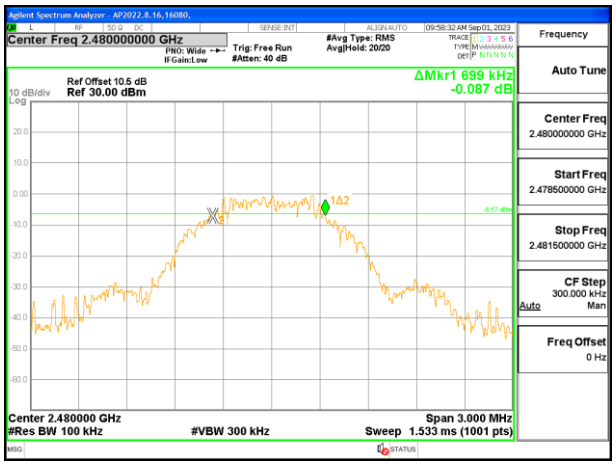

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9.4. OUTPUT POWER

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 of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated peak reading of power.

RESULTS

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9.4.1. BLE (1Mbps)

Tested By:	16080 ZS
Date:	2023-09-01

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.49	30	-24.510
Middle	2440	3.48	30	-26.520
High	2480	0.69	30	-29.310

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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 cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

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9.5.1. BLE (1Mbps)

Tested By:	16080 ZS
Date:	2023-09-01

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	5.25
Middle	2440	3.24
High	2480	-0.39

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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

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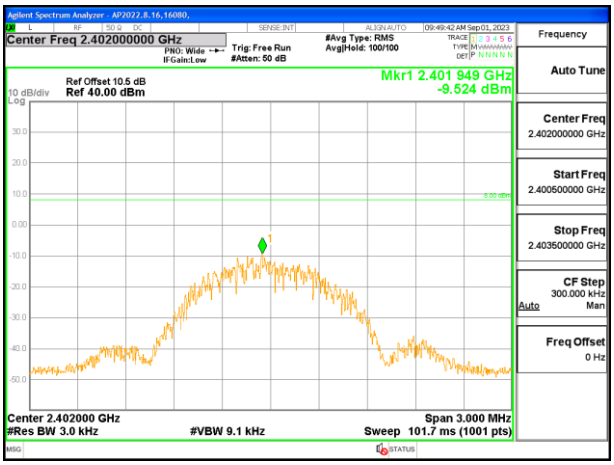
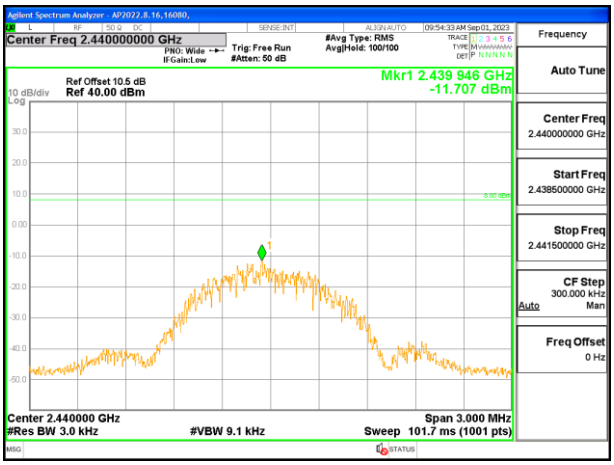
9.6.1. BLE (1Mbps)

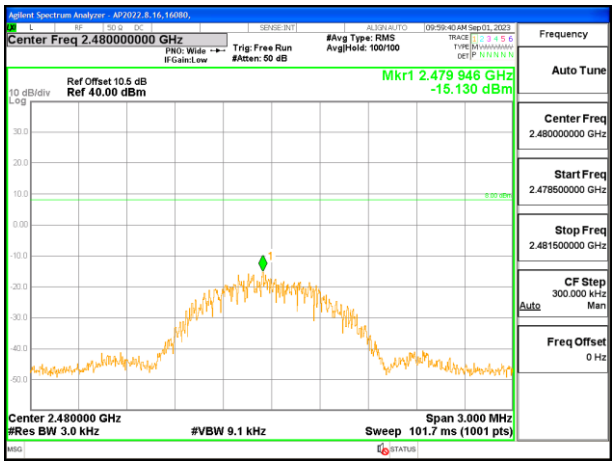
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-9.524	8	-17.52
Middle	2440	-11.707	8	-19.71
High	2480	-15.130	8	-23.13



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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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

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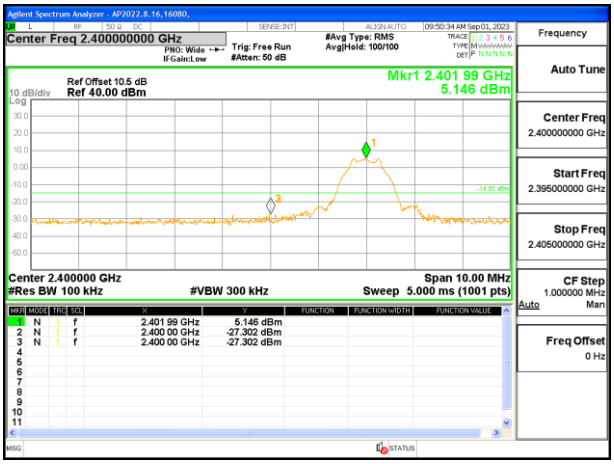
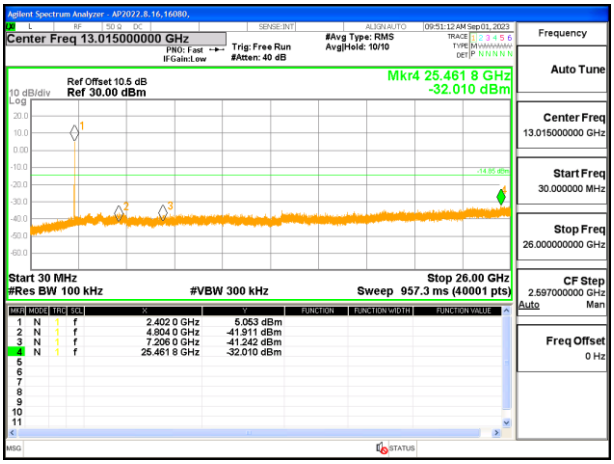
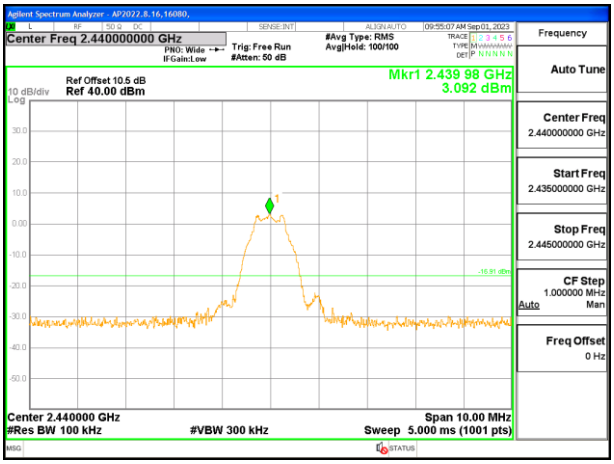
9.7.1. BLE (1Mbps)



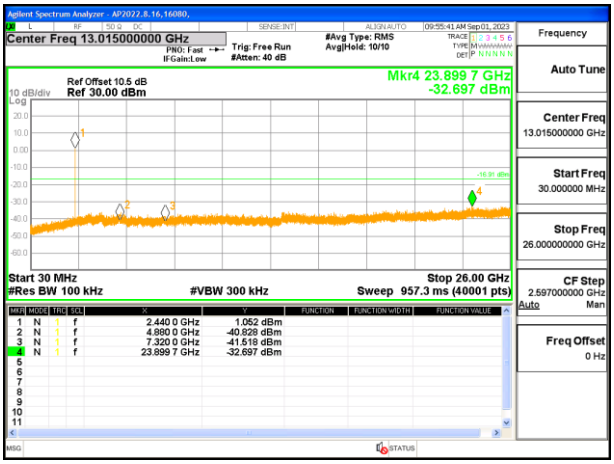
LOW CHANNEL BANDEDGE



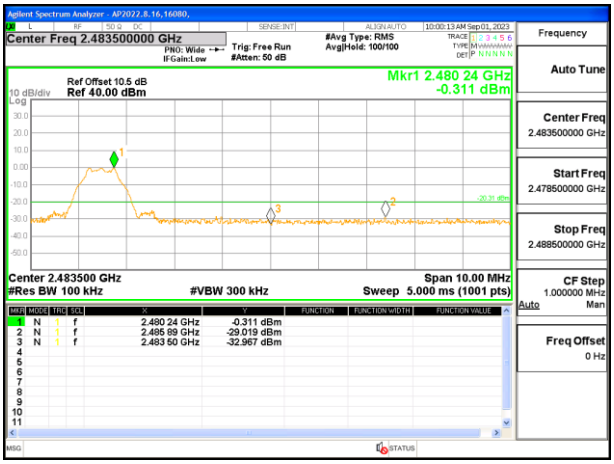
OUT-OF-BAND LOW CHANNEL



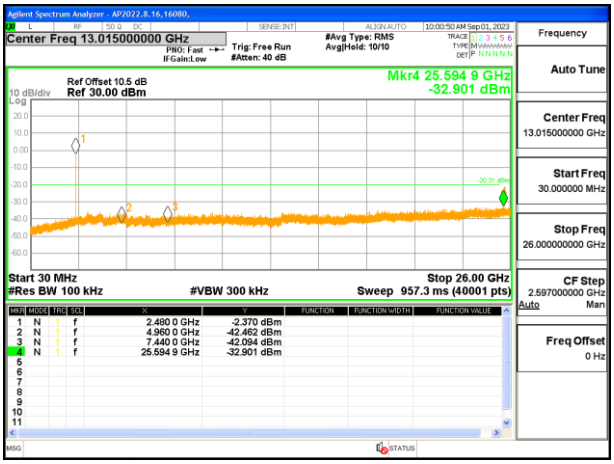
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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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

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.

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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.

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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.

Based 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.

NOTE: The limits in FCC 47 CFR, 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.

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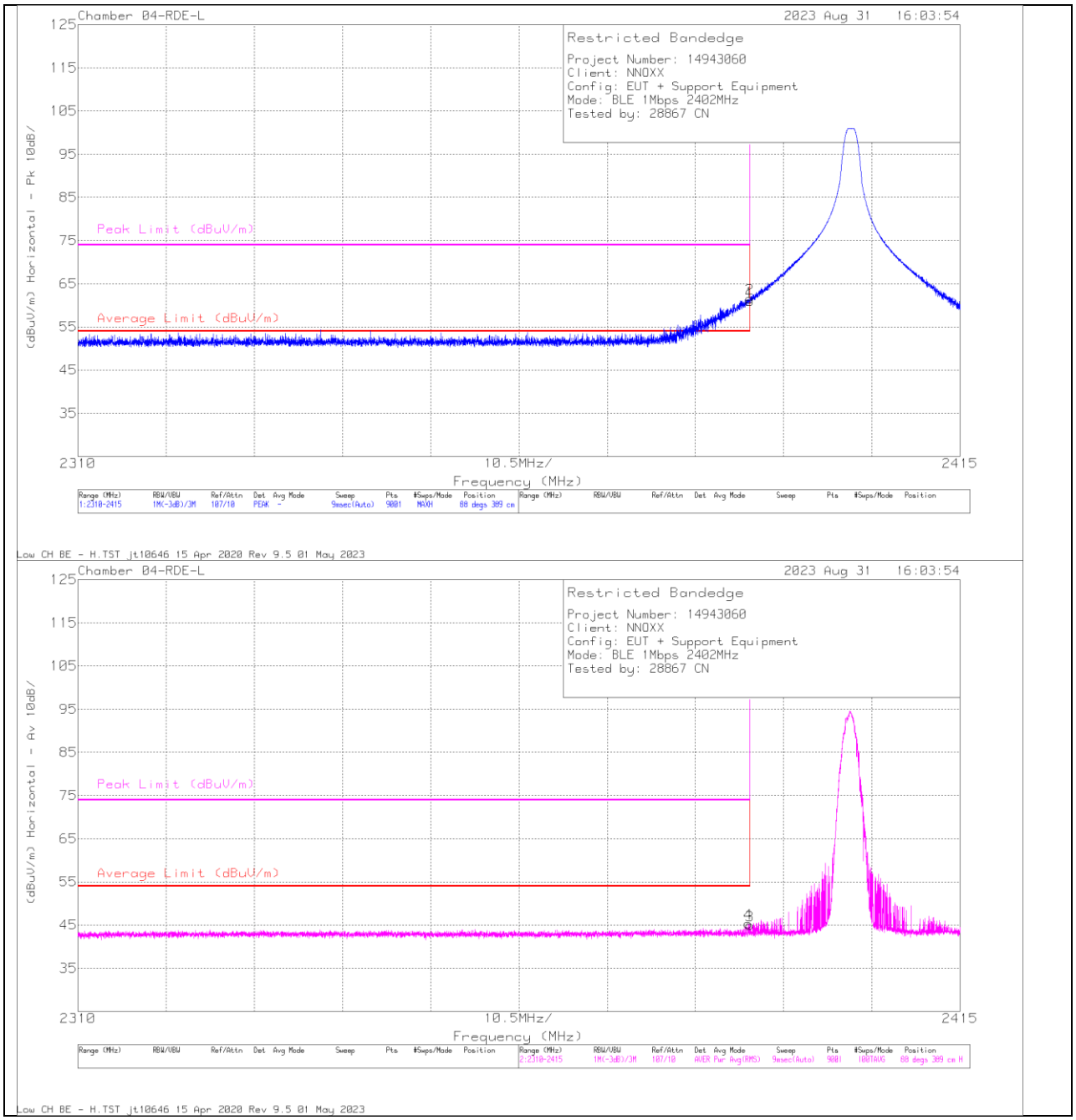
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



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Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB/m) 3mH	AMP/CBL	DCCF (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	47.75	Pk	32	-18.8	0	60.95	-	-	74	-13.05	88	389	H
2	* 2389.966	48.38	Pk	32	-18.8	0	61.58	-	-	74	-12.42	88	389	H
3	* 2390	29.62	RMS	32	-18.8	2.13	44.95	54	-9.05	-	-	88	389	H
4	* 2389.779	30.01	RMS	32	-18.8	2.13	45.34	54	-8.66	-	-	88	389	H

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

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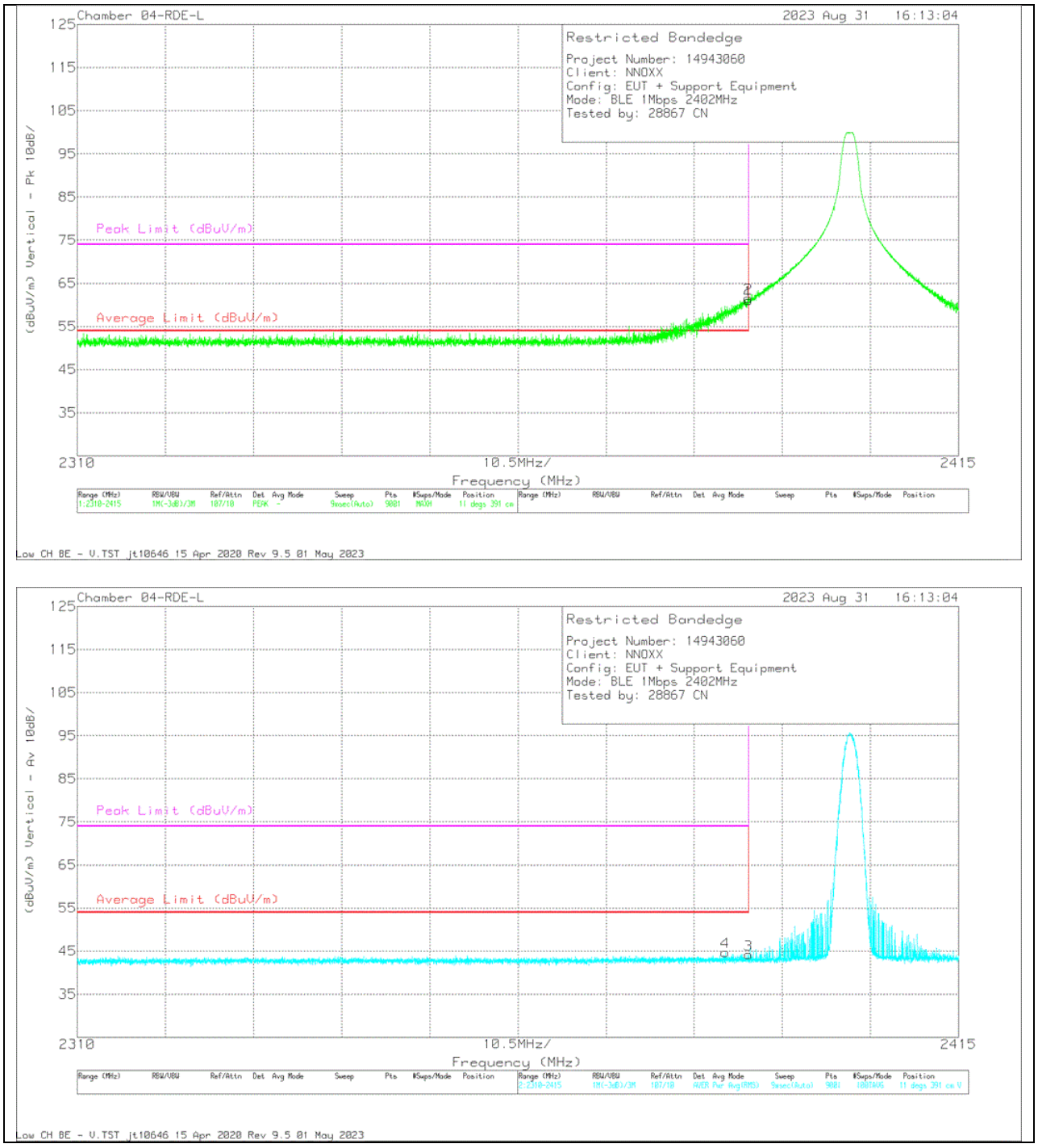
VERTICAL RESULT



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Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB/m) 3mH	AMP/CBL	DCCF (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	47.9	Pk	32	-18.8	0	61.1	-	-	74	-12.9	11	391	V
2	* 2389.942	48.37	Pk	32	-18.8	0	61.57	-	-	74	-12.43	11	391	V
3	* 2390	28.87	RMS	32	-18.8	2.13	44.2	54	-9.8	-	-	11	391	V
4	* 2387.201	29.34	RMS	32	-18.7	2.13	44.77	54	-9.23	-	-	11	391	V

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

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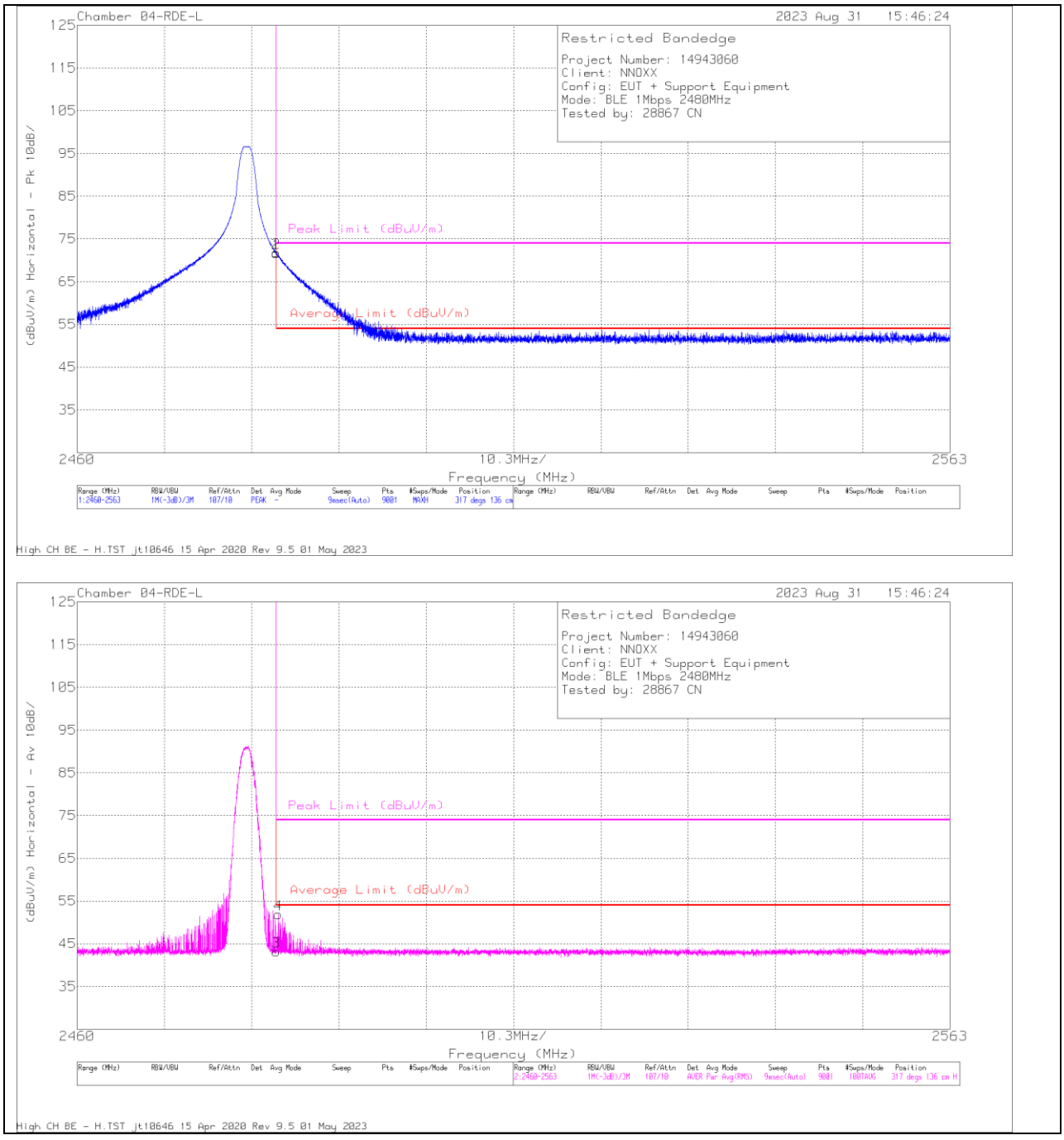
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



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Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB/m) 3mH	AMP/CBL	DCCF (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	58.24	Pk	32	-18.6	0	71.64	-	-	74	-2.36	317	136	H
2	* 2483.506	58.27	Pk	32	-18.5	0	71.77	-	-	74	-2.23	317	136	H
3	* 2483.5	27.66	RMS	32	-18.6	2.13	43.19	54	-10.81	-	-	317	136	H
4	* 2483.723	36.24	RMS	32	-18.5	2.13	51.87	54	-2.13	-	-	317	136	H

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

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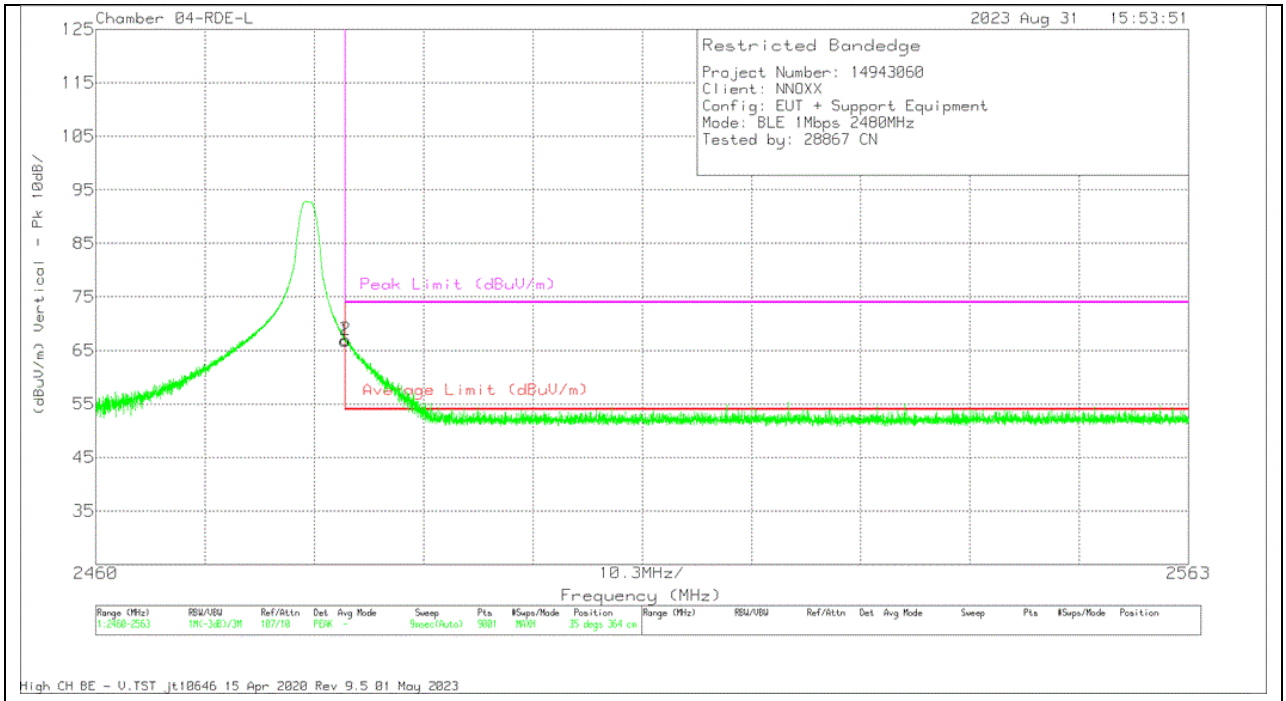
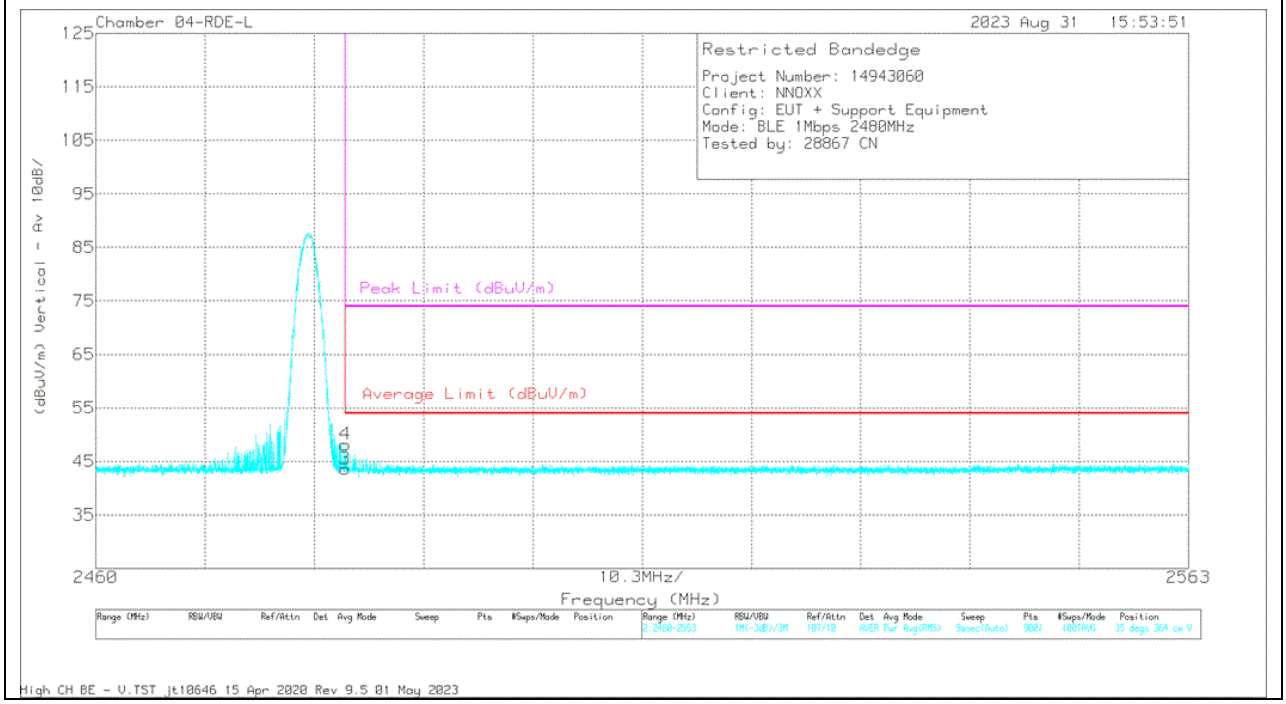
VERTICAL RESULT





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Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB/m) 3mH	AMP/CBL	DCCF (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	53.4	Pk	32	-18.6	0	66.8	-	-	74	-7.2	35	364	V
2	* 2483.529	53.53	Pk	32	-18.5	0	67.03	-	-	74	-6.97	35	364	V
3	* 2483.5	28.07	RMS	32	-18.6	2.13	43.6	54	-10.4	-	-	35	364	V
4	* 2483.517	32.55	RMS	32	-18.5	2.13	48.18	54	-5.82	-	-	35	364	V

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

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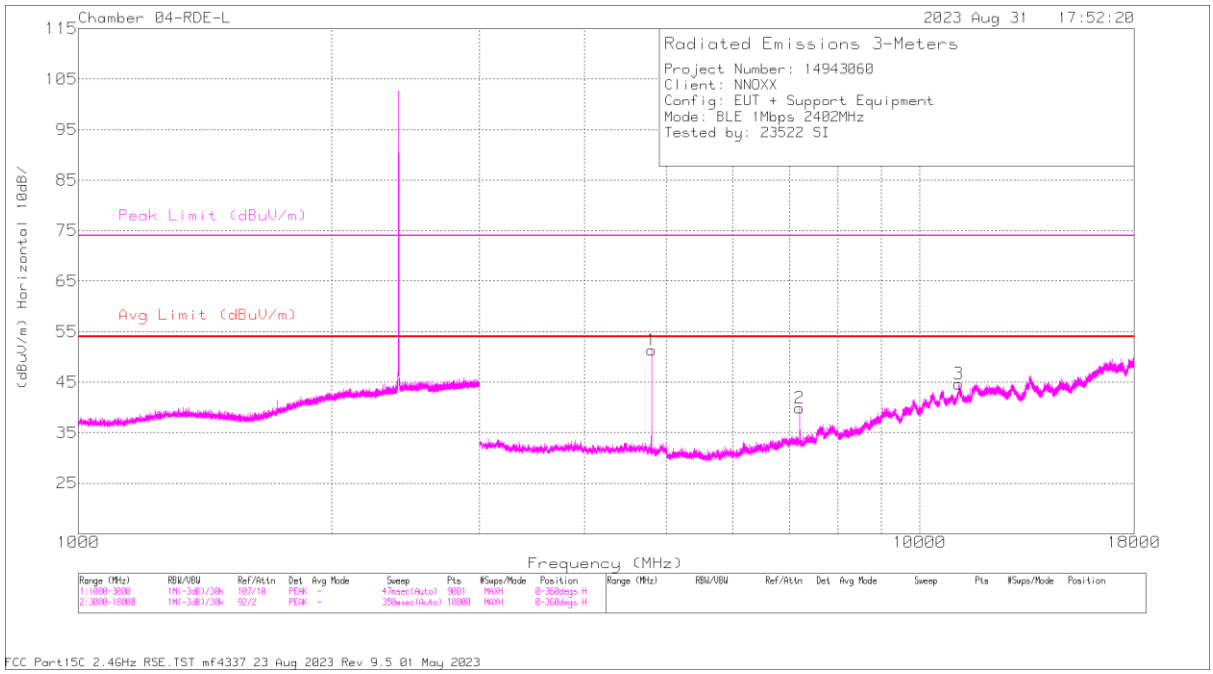
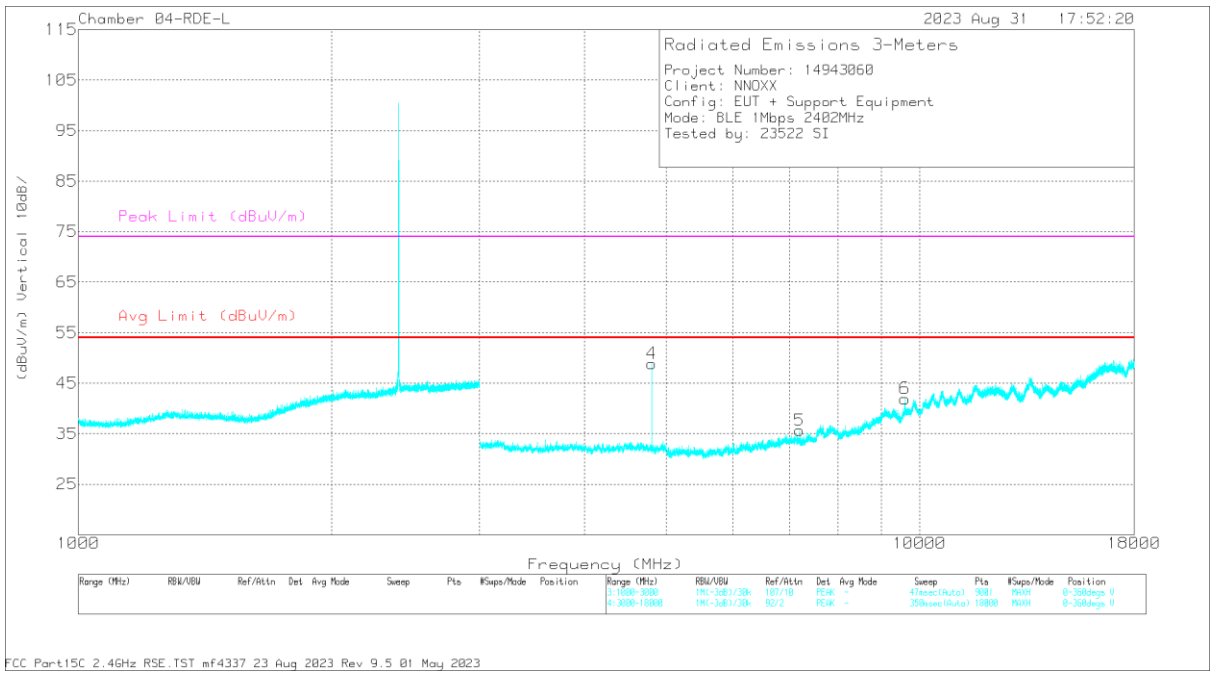
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB/m) 3mH	AMP/CBL	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4803.435	46.68	PK2	33.9	-25.1	0	55.48	-	-	74	-18.52	29	102	H
* 4803.746	39.72	MAv1	33.9	-25.1	2.13	50.65	54	-3.35	-	-	29	102	H
7206.594	36.77	PK2	35.6	-21.6	0	50.77	-	-	-	-	108	258	H
7206.477	26.65	MAv1	35.6	-21.6	2.13	42.78	-	-	-	-	108	258	H
* 11136.795	30.99	PK2	37.8	-14.9	0	53.89	-	-	74	-20.11	283	211	H
* 11139.337	19.97	MAv1	37.8	-14.9	2.13	45	54	-9	-	-	283	211	H
* 4804.366	46.18	PK2	33.9	-25.1	0	54.98	-	-	74	-19.02	63	231	V
* 4804.172	38.57	MAv1	33.9	-25.1	2.13	49.5	54	-4.5	-	-	63	231	V
7205.841	33.65	PK2	35.6	-21.6	0	47.65	-	-	-	-	81	242	V
7206.634	21.92	MAv1	35.6	-21.6	2.13	38.05	-	-	-	-	81	242	V
9607.045	32.96	PK2	36.6	-17	0	52.56	-	-	-	-	209	234	V
9607.333	21.1	MAv1	36.6	-17	2.13	42.83	-	-	-	-	209	234	V

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

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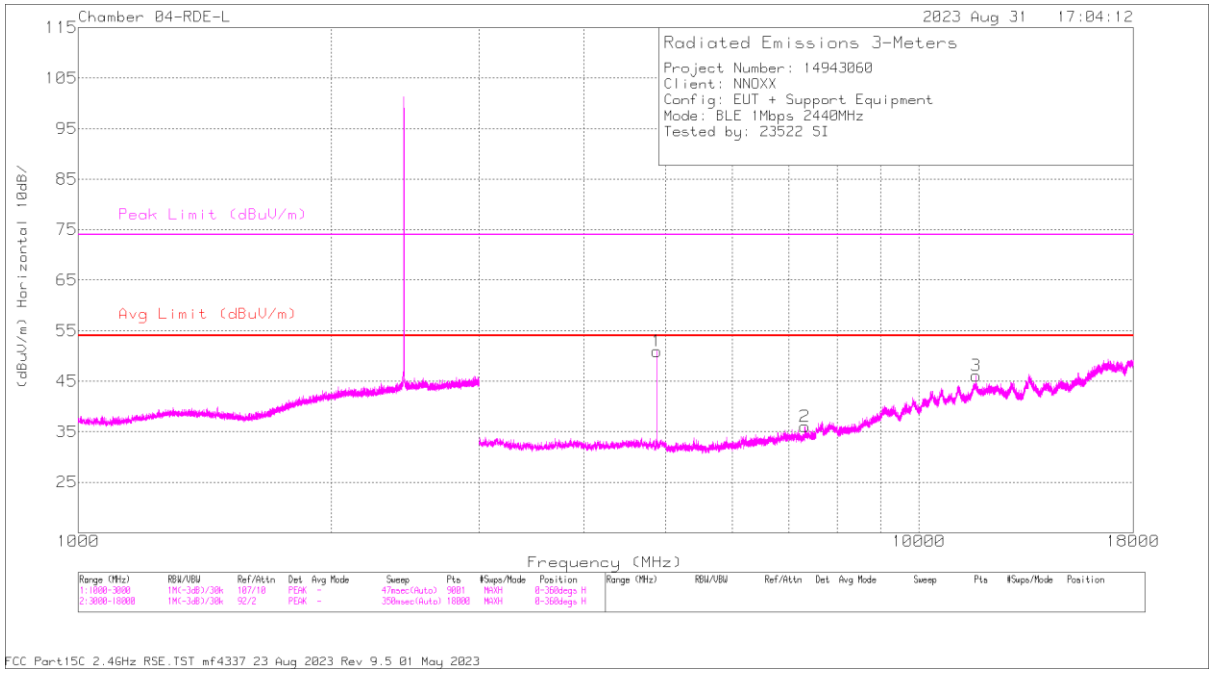
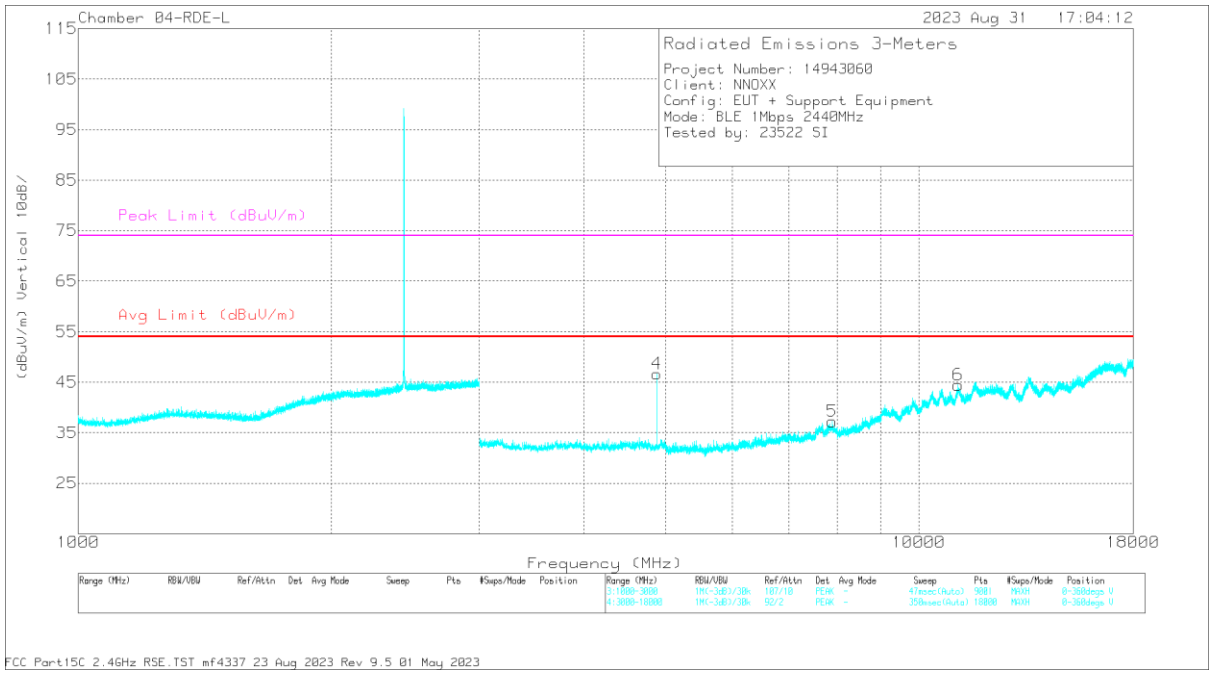
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB/m) 3mH	AMP/CBL	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4879.45	45.13	PK2	33.9	-25	0	54.03	-	-	74	-19.97	30	101	H
* 4879.671	37.95	MAv1	33.9	-25	2.13	48.98	54	-5.02	-	-	30	101	H
* 7319.552	34.91	PK2	35.6	-21.3	0	49.21	-	-	74	-24.79	99	249	H
* 7319.565	23.91	MAv1	35.6	-21.3	2.13	40.34	54	-13.66	-	-	99	249	H
* 11699.41	32.02	PK2	38.3	-16	0	54.32	-	-	74	-19.68	189	145	H
* 11700.946	20.74	MAv1	38.3	-16	2.13	45.17	54	-8.83	-	-	189	145	H
* 4880.687	44.61	PK2	33.9	-25	0	53.51	-	-	74	-20.49	67	224	V
* 4880.147	35.95	MAv1	33.9	-25	2.13	46.98	54	-7.02	-	-	67	224	V
7884.615	31.82	PK2	35.7	-20	0	47.52	-	-	-	-	346	370	V
7885.018	20.39	MAv1	35.7	-20	2.13	38.22	-	-	-	-	346	370	V
* 11141.302	31.26	PK2	37.8	-14.8	0	54.26	-	-	74	-19.74	141	370	V
* 11141.882	19.76	MAv1	37.8	-14.8	2.13	44.89	54	-9.11	-	-	141	370	V

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

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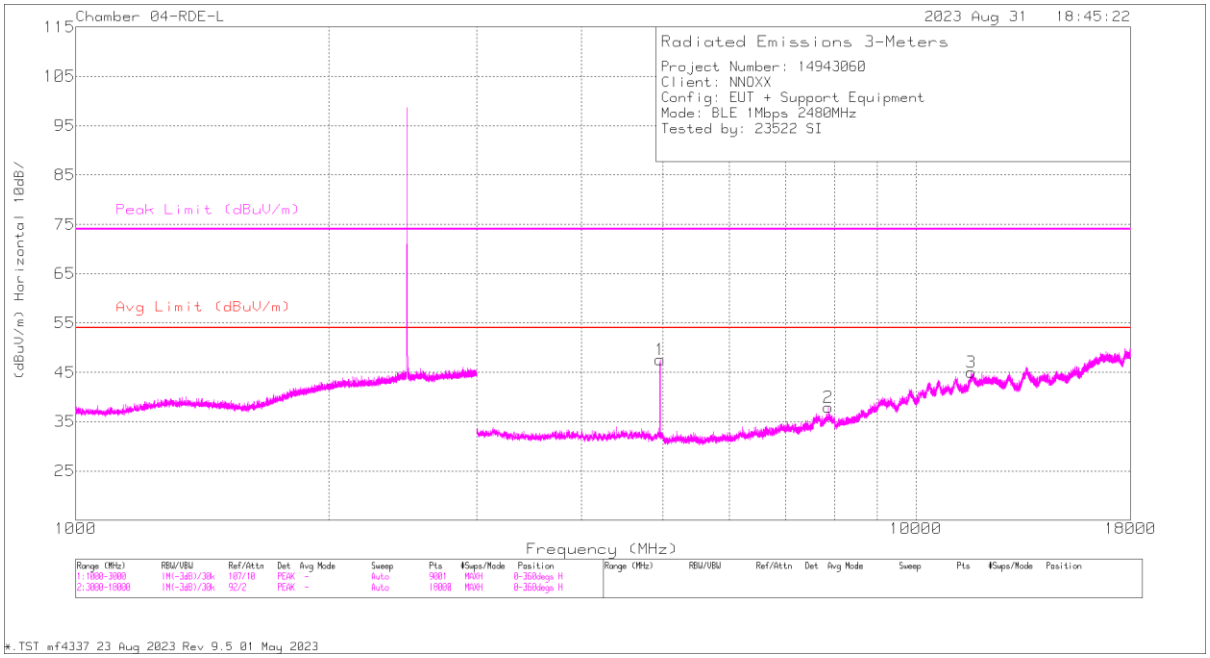
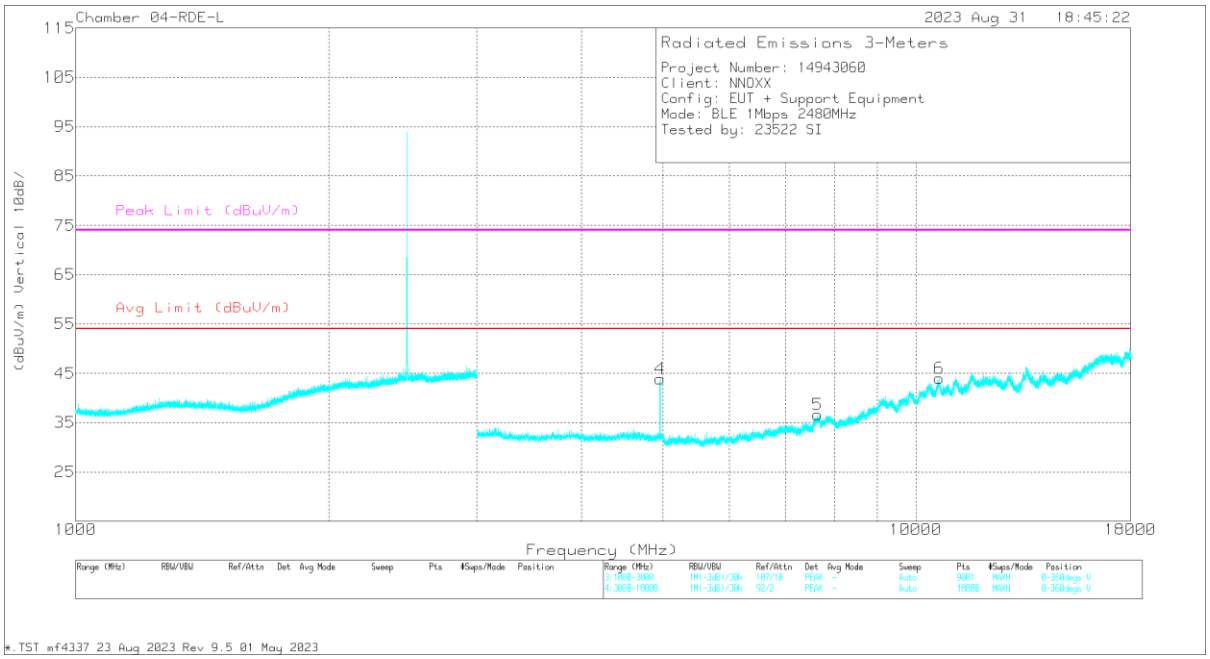
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Frequency (MHz)	Meter Reading (dBuV)	Det	206806 ACF (dB/m) 3mH	AMP/CBL	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4960.377	44.41	PK2	33.9	-24	0	54.31	-	-	74	-19.69	283	229	H
* 4959.855	36.91	MAv1	33.9	-24	2.13	48.94	54	-5.06	-	-	283	229	H
7866.038	33.29	PK2	35.7	-20.1	0	48.89	-	-	-	-	226	230	H
7866.747	21.3	MAv1	35.7	-20.1	2.13	39.03	-	-	-	-	226	230	H
* 11625.489	32.58	PK2	38.3	-15.6	0	55.28	-	-	74	-18.72	257	246	H
* 11627.393	20.45	MAv1	38.3	-15.6	2.13	45.28	54	-8.72	-	-	257	246	H
* 4960.553	38.7	PK2	33.9	-24	0	48.6	-	-	74	-25.4	13	103	V
* 4959.646	29.69	MAv1	33.9	-24	2.13	41.72	54	-12.28	-	-	13	103	V
* 7633.345	32.81	PK2	35.7	-20.4	0	48.11	-	-	74	-25.89	90	249	V
* 7632.614	20.11	MAv1	35.7	-20.4	2.13	37.54	54	-16.46	-	-	90	249	V
* 10655.42	30.77	PK2	37.6	-14.7	0	53.67	-	-	74	-20.33	205	294	V
* 10656.813	19.06	MAv1	37.6	-14.7	2.13	44.09	54	-9.91	-	-	205	294	V

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

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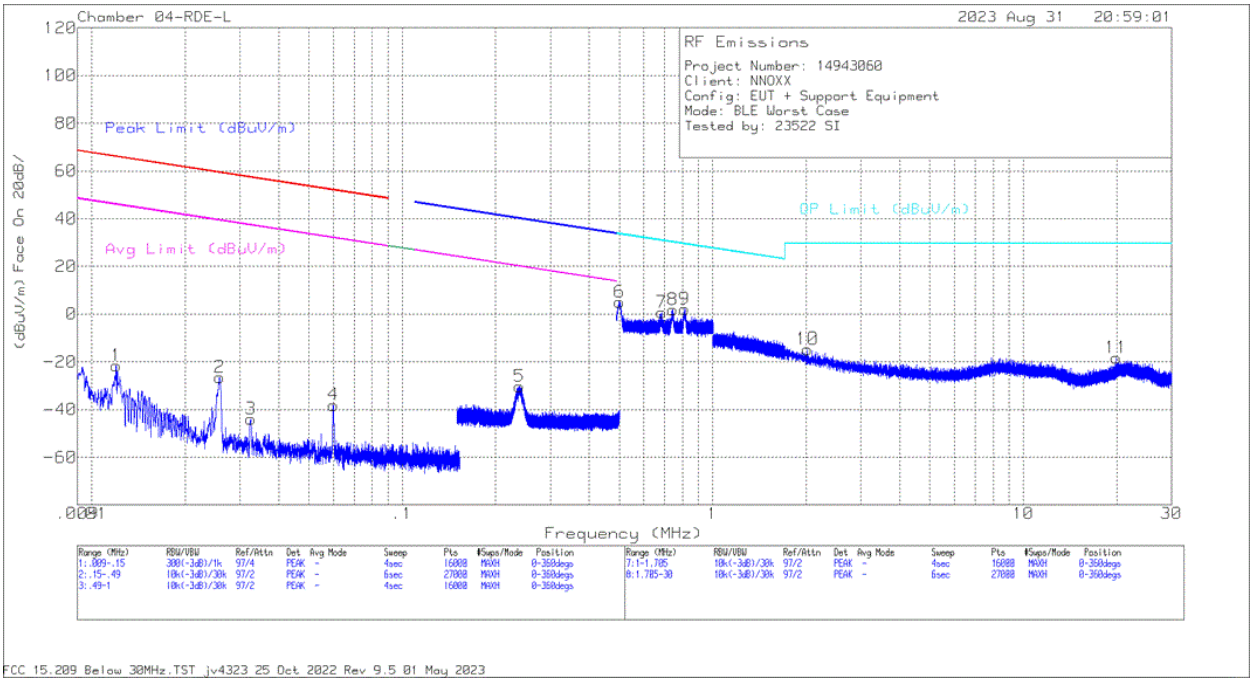
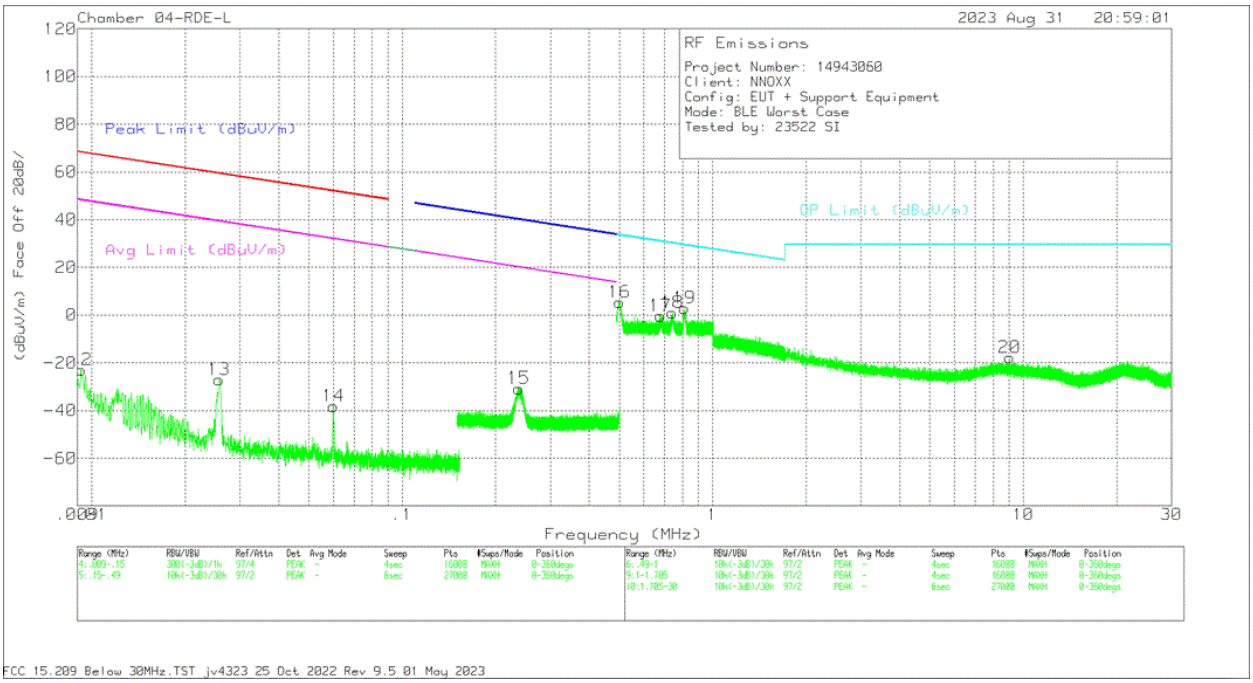
10.3. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)





ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

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Below 30MHz Data

Range 1: Face On .009 - .15MHz

Marker	Frequency MHz	Meter Reading (dBuV)	Det	Loop Antenna ACF dB/m	CBL/AMP	Dist Corr 300m	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	0.012	27.87	Pk	59.9	-29.4	-80	-21.63	66	-87.63	46	-67.63	0-360
2	0.0259	26.82	Pk	58.2	-31.4	-80	-26.38	59.33	-85.71	39.33	-65.71	0-360
3	0.0326	10.21	Pk	57.6	-31.7	-80	-43.89	57.33	-101.22	37.33	-81.22	0-360
4	0.06	17.83	Pk	56	-31.9	-80	-38.07	52.02	-90.09	32.02	-70.09	0-360

Range 2: Face On .15 - .49MHz

Marker	Frequency MHz	Meter Reading (dBuV)	Det	Loop Antenna ACF dB/m	CBL/AMP	Dist Corr 300m	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	0.2384	25.81	Pk	56	-32	-80	-30.19	40.07	-70.26	20.07	-50.26	0-360

Range 3: Face On .49 - 1MHz

Marker	Frequency MHz	Meter Reading (dBuV)	Det	Loop Antenna ACF dB/m	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
6	0.5014	20.96	Pk	56	-31.9	-40	5.06	33.6	-28.54	0-360
7	0.684	16.5	Pk	56.1	-31.9	-40	0.7	30.91	-30.21	0-360
8	0.7428	17.58	Pk	56.1	-31.9	-40	1.78	30.2	-28.42	0-360
9	0.8128	17.88	Pk	56.1	-31.9	-40	2.08	29.42	-27.34	0-360

Range 4: Face Off .009 - .15MHz

Marker	Frequency MHz	Meter Reading (dBuV)	Det	Loop Antenna ACF dB/m	CBL/AMP	Dist Corr 300m	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
12	0.0092	24.84	Pk	60.8	-28.6	-80	-22.96	68.27	-91.23	48.27	-71.23	0-360
13	0.0258	26.12	Pk	58.2	-31.3	-80	-26.98	59.37	-86.35	39.37	-66.35	0-360
14	0.06	17.62	Pk	56	-31.9	-80	-38.28	52.02	-90.3	32.02	-70.3	0-360

Range 5: Face Off .15 - .49MHz

Marker	Frequency MHz	Meter Reading (dBuV)	Det	Loop Antenna ACF dB/m	CBL/AMP	Dist Corr 300m	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
15	0.237	25.28	Pk	56	-32	-80	-30.72	40.12	-70.84	20.12	-50.84	0-360

Range 6: Face Off .49 - 1MHz

Marker	Frequency MHz	Meter Reading (dBuV)	Det	Loop Antenna ACF dB/m	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
16	0.5019	21.31	Pk	56	-31.9	-40	5.41	33.59	-28.18	0-360
17	0.6793	15.52	Pk	56.1	-31.9	-40	-0.28	30.97	-31.25	0-360
18	0.7422	16.89	Pk	56.1	-31.9	-40	1.09	30.2	-29.11	0-360
19	0.8127	18.72	Pk	56.1	-31.9	-40	2.92	29.42	-26.5	0-360

Range 8: Face On 1.705 - 30MHz

Marker	Frequency MHz	Meter Reading (dBuV)	Det	Loop Antenna ACF dB/m	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
10	2.0173	15.65	Pk	41.5	-31.8	-40	-14.65	29.5	-44.15	0-360
11	19.9077	18.56	Pk	34.3	-31.3	-40	-18.44	29.5	-47.94	0-360

Range 10: Face Off 1.705 - 30MHz

Marker	Frequency MHz	Meter Reading (dBuV)	Det	Loop Antenna ACF dB/m	CBL/AMP	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
20	9.0253	19.01	Pk	34.6	-31.5	-40	-17.89	29.5	-47.39	0-360

Pk - Peak detector

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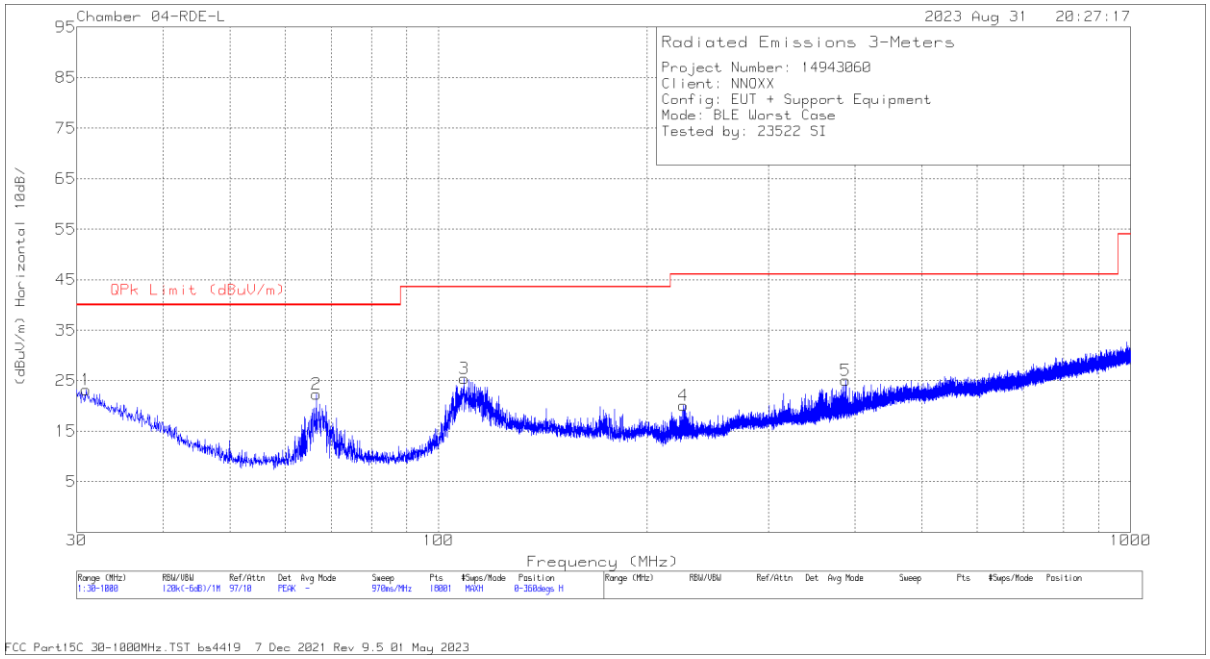
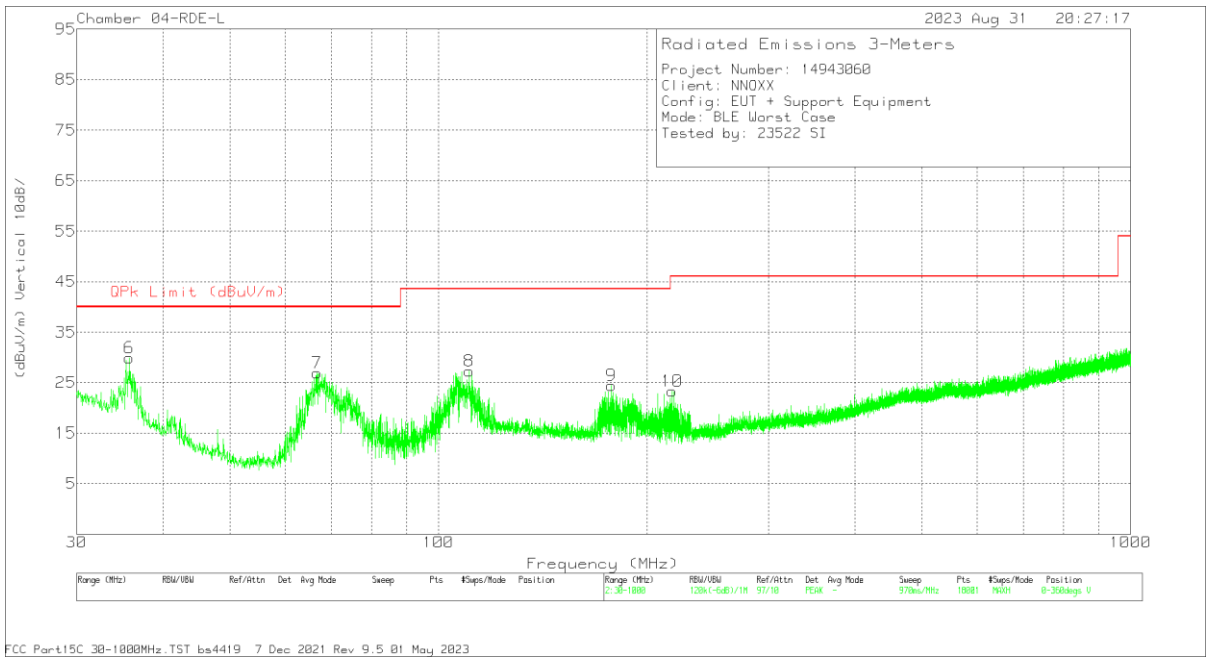
10.4. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

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Below 1GHz Data

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	174374 ANSI ACF (dB/m) 3 mH	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.97	28.48	Pk	25.8	-31.1	23.18	40	-16.82	0-360	299	H
2	66.6445	39.08	Pk	13.9	-30.7	22.28	40	-17.72	0-360	399	H
3	108.84	37.49	Pk	18.3	-30.3	25.49	43.52	-18.03	0-360	299	H
4	225.671	32.79	Pk	16.8	-29.5	20.09	46.02	-25.93	0-360	99	H
5	387.446	32.75	Pk	21.1	-28.8	25.05	46.02	-20.97	0-360	99	H
6	36.1531	27.42	Qp	22.3	-31.1	18.62	40	-21.38	47	204	V
7	66.8062	43.77	Pk	13.9	-30.7	26.97	40	-13.03	0-360	99	V
8	110.726	39.09	Pk	18.5	-30.3	27.29	43.52	-16.23	0-360	99	V
9	177.602	36.93	Pk	17.2	-29.7	24.43	43.52	-19.09	0-360	99	V
10	217.372	36.29	Pk	16.5	-29.5	23.29	46.02	-22.73	0-360	99	V

Pk - Peak detector
Qp - Quasi-Peak detector

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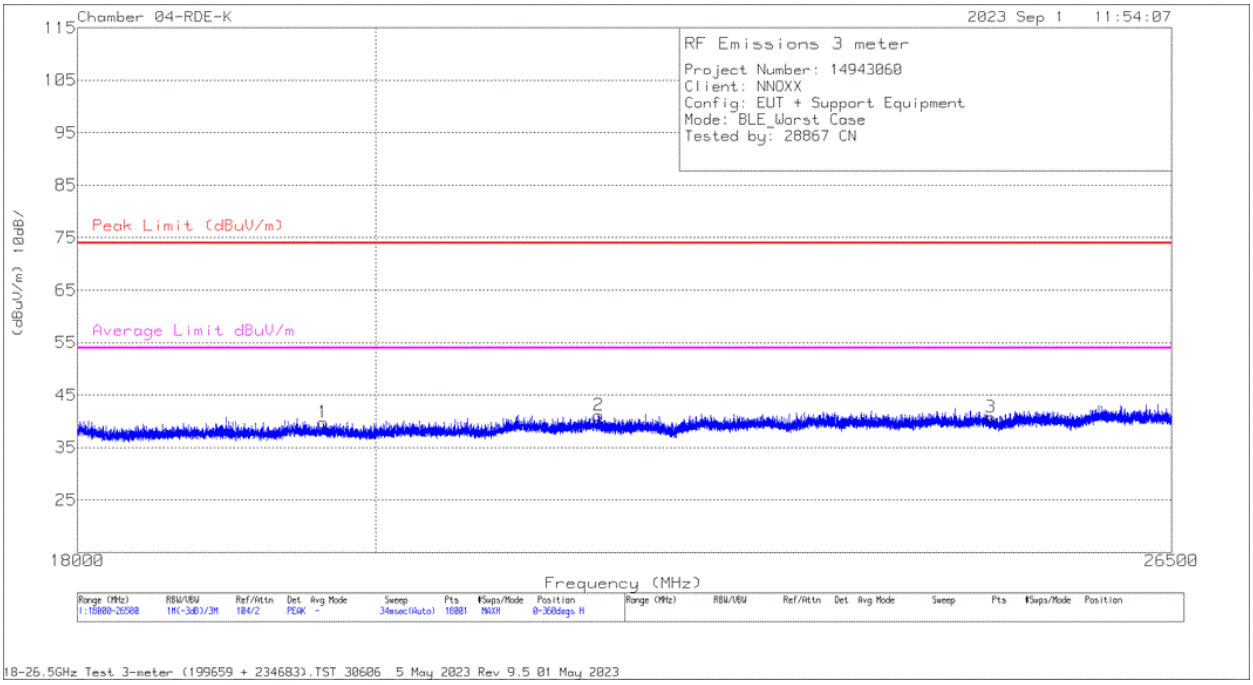
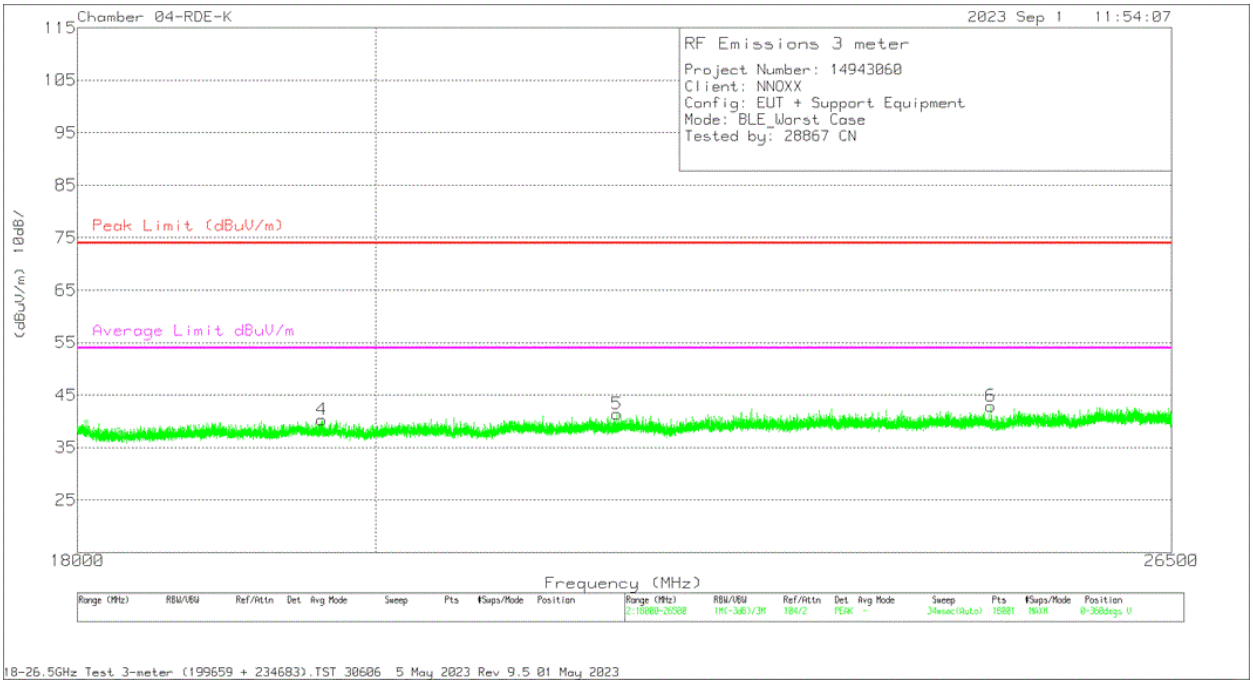
10.5. WORST CASE 18-26 GHZ

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



HORIZONTAL



VERTICAL

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18 – 26GHz DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Horn ACF (dB/m)	234683 Amp/Cbl (dB)	Cables (dB)	Corrected Reading (dBuV/volts)	Peak Limit (dBuV/m)	PK Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 19634.36	51.05	Pk	32.7	-62.6	18.6	39.75	74	-34.25	-	-	0-360	200	H
2	21643.193	50.71	Pk	33.1	-62	19.4	41.21	74	-32.79	-	-	0-360	200	H
3	24858.08	48.27	Pk	33.9	-62.2	20.8	40.77	74	-33.23	-	-	0-360	200	H
4	* 19625.86	51.56	Pk	32.7	-62.6	18.6	40.26	74	-33.74	-	-	0-360	200	V
5	21782.498	51.19	Pk	33.1	-62.3	19.4	41.39	74	-32.61	-	-	0-360	200	V
6	24858.552	50.44	Pk	33.9	-62.2	20.8	42.94	74	-31.06	-	-	0-360	200	V

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

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10.6. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

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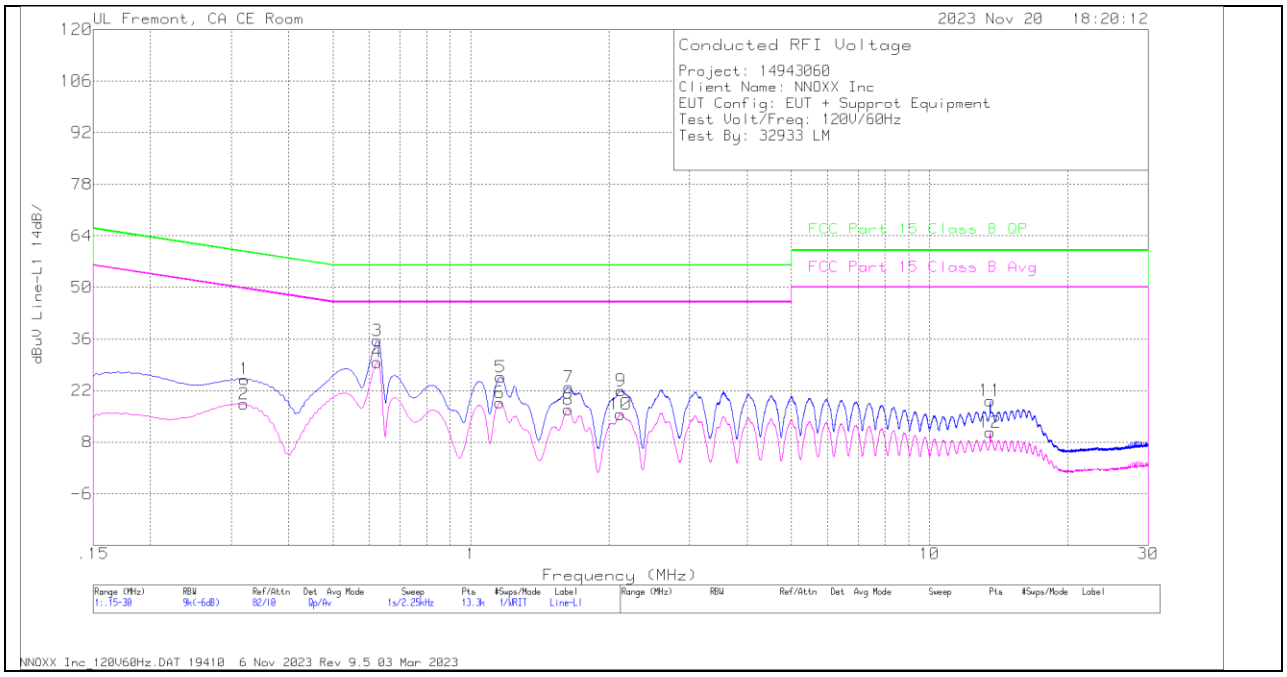
10.6.1. AC Power Line Norm

LINE 1 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN (dB)	Cbl (dB)	Trns Limiter (dB)	Corrected Reading dBuV	FCC Part 15 Class B QP	QP Margin (dB)	FCC Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.321	15.57	Qp	0	.1	9.4	25.07	59.68	-34.61	-	-
2	.3199	8.81	Ca	0	.1	9.4	18.31	-	-	49.68	-24.61
3	.6248	26.14	Qp	0	0	9.4	35.54	56	-20.46	-	-
4	.6248	20.31	Ca	0	0	9.4	29.71	-	-	46	-10.46
5	1.1603	16.17	Qp	0	.1	9.4	25.67	56	-30.33	-	-
6	1.1558	9.22	Ca	0	.1	9.4	18.72	-	-	46	-20.33
7	1.6328	13.37	Qp	0	.1	9.4	22.87	56	-33.13	-	-
8	1.6294	7.33	Ca	0	.1	9.4	16.83	-	-	46	-23.13
9	2.1233	12.56	Qp	0	.1	9.3	21.96	56	-34.04	-	-
10	2.1188	6.17	Ca	0	.1	9.3	15.57	-	-	46	-24.04
11	13.56	9.36	Qp	.1	.3	9.5	19.26	60	-40.74	-	-
12	13.56	.77	Ca	.1	.3	9.5	10.67	-	-	50	-30.74

Qp - Quasi-Peak detector
Ca - CISPR average detection

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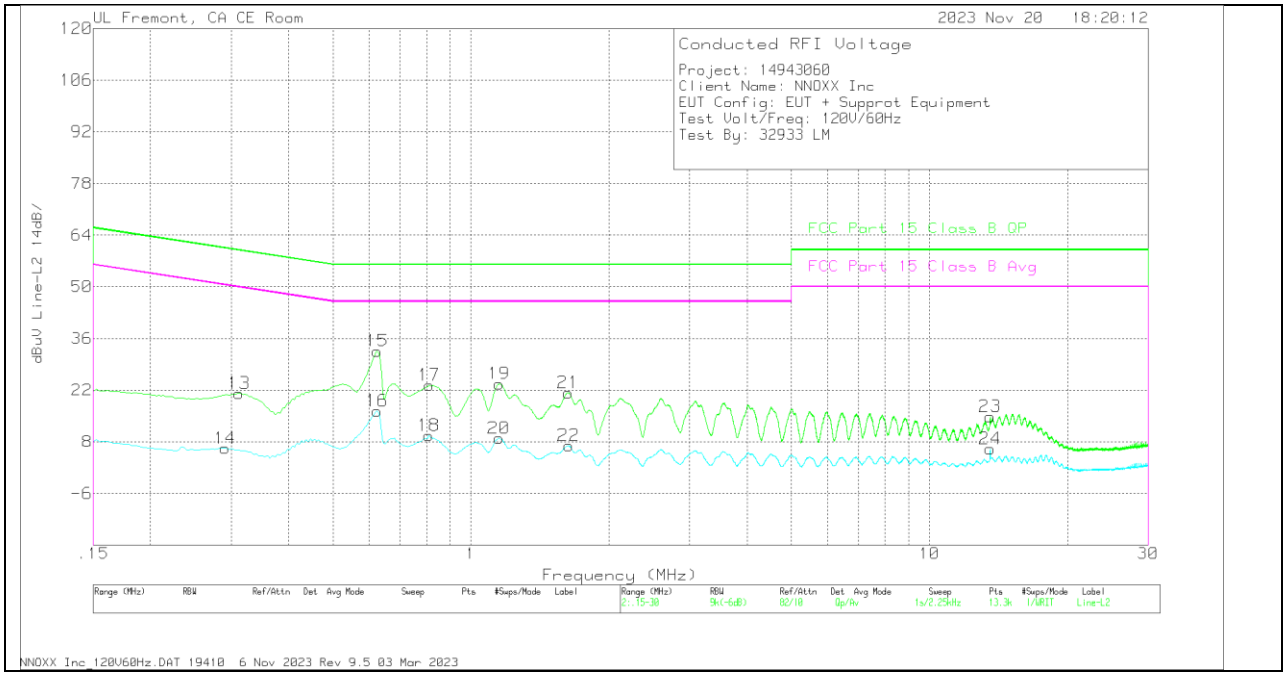
LINE 2 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN (dB)	Cbl (dB)	Trns Limiter (dB)	Corrected Reading dBuV	FCC Part 15 Class B QP	QP Margin (dB)	FCC Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.312	11.6	Qp	0	.1	9.4	21.1	59.92	-38.82	-	-
14	.2906	-3.3	Ca	0	.1	9.4	6.2	-	-	49.92	-28.82
15	.6248	23.07	Qp	0	.1	9.4	32.57	56	-23.43	-	-
16	.6236	6.85	Ca	0	.1	9.4	16.35	-	-	46	-13.43
17	.8104	14.01	Qp	0	0	9.3	23.31	56	-32.69	-	-
18	.8093	.39	Ca	0	0	9.3	9.69	-	-	46	-22.69
19	1.1513	14.12	Qp	0	.2	9.4	23.72	56	-32.28	-	-
20	1.1501	-.65	Ca	0	.2	9.4	8.95	-	-	46	-22.28
21	1.6305	11.81	Qp	0	.1	9.4	21.31	56	-34.69	-	-
22	1.6328	-2.56	Ca	0	.1	9.4	6.94	-	-	46	-24.69
23	13.56	5.03	Qp	.1	.2	9.5	14.83	60	-45.17	-	-
24	13.56	-3.7	Ca	.1	.2	9.5	6.1	-	-	50	-35.17

Qp - Quasi-Peak detector
Ca - CISPR average detection

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