

TEST REPORT

Report Number: R14978455-E1

Applicant : Hunter Industries
1940 Diamond St.
San Marcos, CA 92078, United States

Model : WV-OM

FCC ID : M3U-WVOM

IC : 2772A-WVOM

EUT Description : Quick plug-in controller

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C: 2023
ISED RSS-247 ISSUE 3: 2023
ISED RSS-GEN ISSUE 5 + A2: 2021

Date Of Issue:
2024-07-05

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-10-31	Initial Issue	Charles Moody
V2	2024-02-05	Hyphen added to model name and FCC ID	Niklas Haydon
V3	2024-04-26	Correct Peak Antenna Gain Corrected Typo in section 6.2	Noah Bennett
V4	2024-07-05	Updated Antenna gain	Noah Bennett

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Hunter Industries
1940 Diamond St.
San Marcos, CA 92078, United States

EUT DESCRIPTION: Quick plug-in controller

MODEL: WV-OM

SERIAL NUMBER: 434261, 347826

SAMPLE RECEIPT DATE: 2023-10-11 TO 2023-10-17

DATE TESTED: 2023-10-16 TO 2023-10-27

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C: 2023	Refer to Section 2
ISED RSS-247 Issue 3: 2023	Refer to Section 2
ISED RSS-GEN Issue 5 + A2: 2021	Refer to Section 2

UL LLC 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.

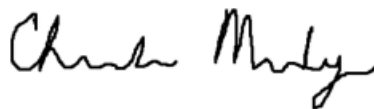
This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document.

Approved & Released For
UL LLC By:



Michael Ferrer
Staff Engineer
Consumer, Medical and IT Segment
UL LLC

Prepared By:



Charles Moody
Engineer
Consumer, Medical and IT Segment
UL LLC

2. TEST RESULTS SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL LLC 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	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.

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 Radiated Test Site v01r01, RSS-GEN Issue 5 + A2, and RSS-247 Issue 3.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by a2La, cert. # 0751.06 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: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

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	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%
Time	3.39%

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)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a quick plug-in controller that allows wireless irrigation control which contains a BLE and a LoRa radio. This report covers the full emissions testing of the LoRa 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)
900MHz	LoRa	14.52	28.31

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes an Helix antenna, with a maximum gain of +1.3 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware/software used for testing is as follows:

WVOM Production App V1.00.000

WVOM Constant Tx V1.02.050

WVOM Constant Tx Sim Tx V1.02.052.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 30 MHz was performed with the EUT set to transmit at the channel with highest power spectral density as worst-case scenario. This was found to be low channel. For radiated emissions between 30 MHz and 10 GHz, the EUT was set to transmit on low and high channels at the highest power.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation was worst-case orientation. The fundamental of the antenna was also investigated in 2 positions, antenna position 1 and antenna position 2. It was determined that antenna position 2 was worst-case orientation; therefore, all final radiated testing was performed with the EUT and antenna in Z orientation and antenna position 2.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Controller	Hunter	ICC 2 Plastic	-	-

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	8 Pin	1	8 Pin serial cable	Non-shielded	<3m	Connects EUT to ICC 2 controller to power EUT
2	Power Cable	1	AC Mains Plug	Shielded	<3m	Connects Controller to AC Mains

TEST SETUP

The EUT is connected to a test laptop prior to testing. Test software exercised the radio card.

SETUP DIAGRAMS

Please refer to 14978455-EP1 for setup diagrams

7. MEASUREMENT METHOD

Duty Cycle: ANSI C63.10 Section 11.6

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)

General Radiated Spurious Emissions: ANSI C63.10 Sections 6.3-6.6

Emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11 and 6.10.4

Emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1

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

8. TEST AND MEASUREMENT EQUIPMENT

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
	Conducted Room 1				
238710	Environmental Meter	Fisher Scientific	15-077-963	2023-06-27	2024-06-27
211056	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2023-08-01	2024-08-01
90410	Spectrum Analyzer	Keysight Technologies	N9030A	2023-06-14	2024-06-14
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16	NA	NA
	Attenuators				
226560	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2023-02-16	2024-02-16
	Cables				
CBL099	Micro-Coax UTiFLEX Cable Assembly, Low Loss,40Ghz, 39.3", Connectors 2	Carlisle Interconnect Technologies	UFA147A-0-0180-200200	2023-02-17	2024-02-17

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2023-04-04	2024-04-04
179892	Environmental Meter	Fisher Scientific	15-077-963	2023-07-26	2024-06-31
80391	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2023-07-31	2024-07-31
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2023-08-01	2024-08-01
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2023-04-04	2024-04-04
PS214	AC Power Source	Elgar	CW2501M	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
135144	Active Loop Antenna	ETS-Lindgren	6502	2023-01-17	2024-01-17
	30-1000 MHz				
90629	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2023-01-06	2024-01-06
	1-18 GHz				
89509	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-05-23	2025-05-23
	Gain-Loss Chains				
207638	Gain-loss string: 0.009-30MHz	Various	Various	2023-09-18	2024-09-18
207639	Gain-loss string: 25-1000MHz	Various	Various	2023-09-18	2024-09-18
207640	Gain-loss string: 1-18GHz	Various	Various	2023-05-17	2024-05-17
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-04-10	2024-04-10
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
200540	Environmental Meter	Fisher Scientific	15-077-963	2022-10-05	2023-10-31
167153 (BRF007)	902-928MHz notch filter, 2W, Fhigh =1.5GHz	Micro-Tronics	BRC17691	2023-02-15	2024-02-29

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

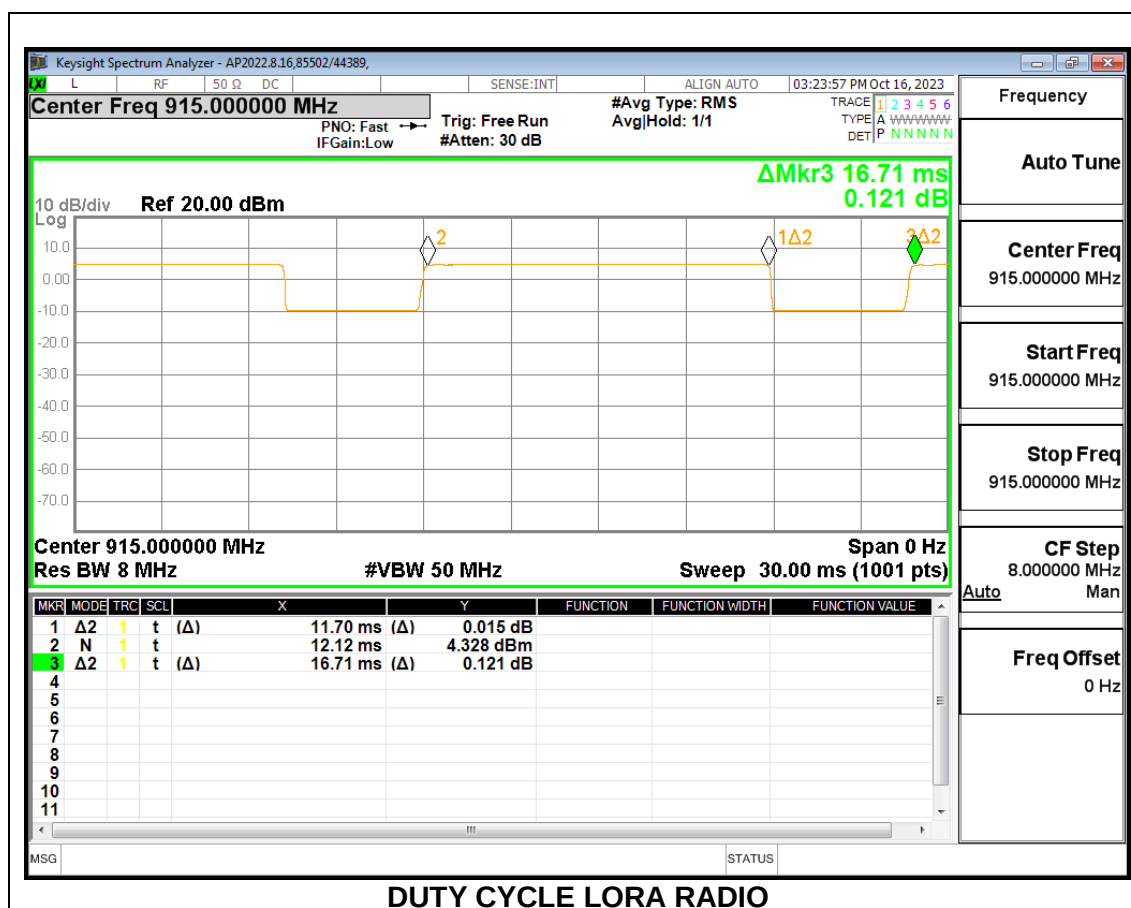
PROCEDURE

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)
900 MHz Band						
LoRa Radio	11.700	16.710	0.700	70.02	3.10	0.085

DUTY CYCLE PLOTS



9.2. 99% BANDWIDTH

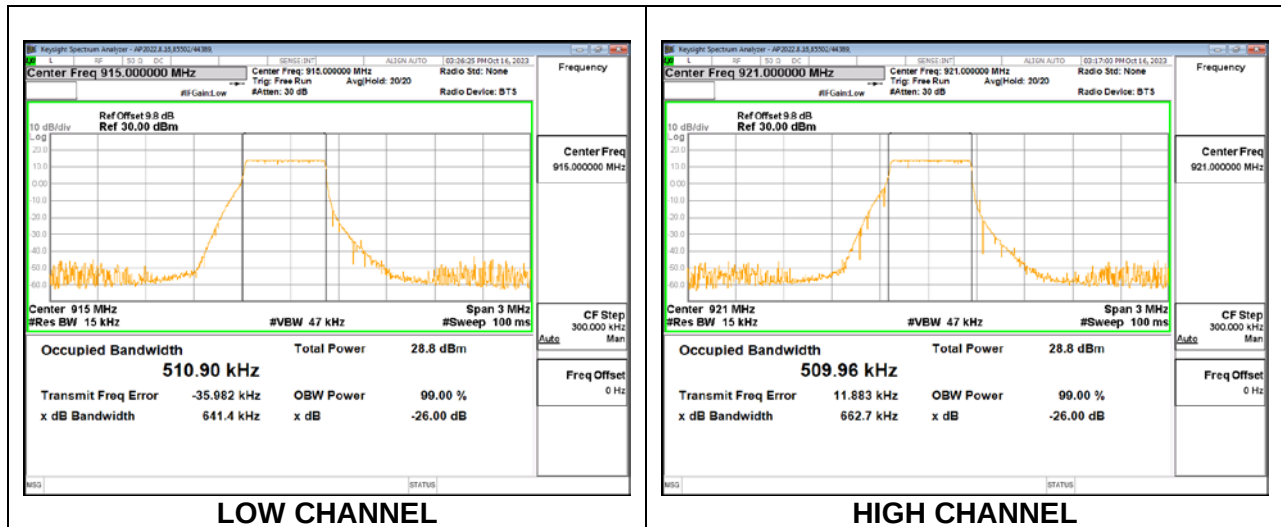
LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. LoRa

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	914.968	510.90
High	921	509.96



9.3. 6 dB BANDWIDTH

LIMITS

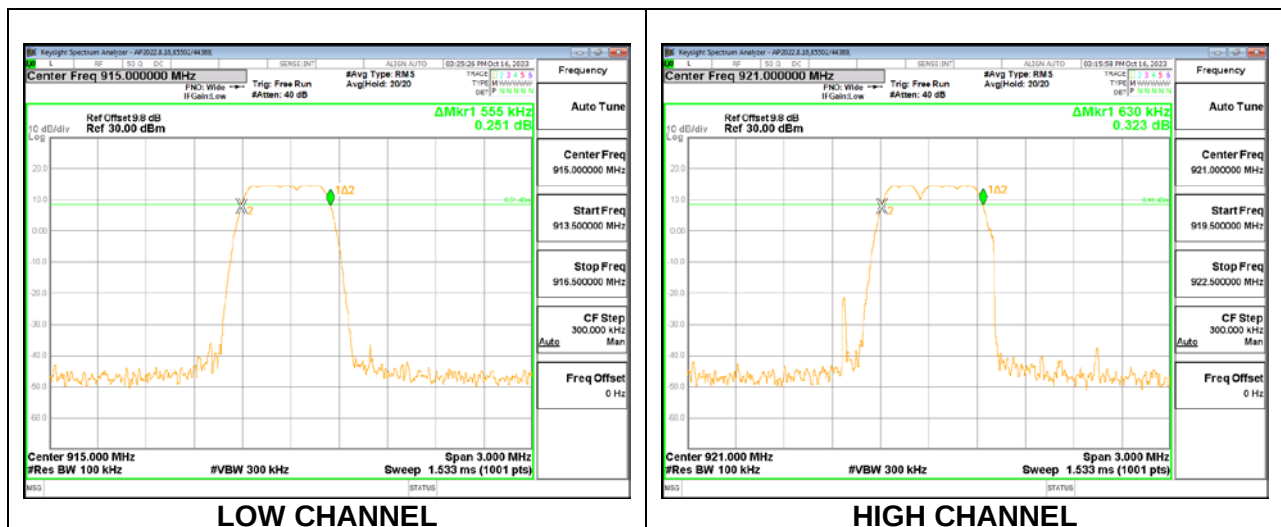
FCC §15.247 (a) (2)
RSS-247 5.2 (a)

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

RESULTS

9.3.1. LoRa

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	914.968	0.555	0.5
High	921	0.630	0.5



9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)
RSS-247 5.4 (d)

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 9.80 dB (including 9.63 dB pad and 0.17 dB test cable) was entered as an offset in the power meter to allow for a peak reading of power.

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. Peak output power was read directly from power meter.

RESULTS

9.4.1. LoRa

Tested By:	85502/44389
Date:	2023-10-16

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	914.968	14.52	30	-15.480
High	921	14.49	30	-15.510

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 9.80 dB (including 9.63 dB pad and 0.17 dB test cable) was entered as an offset in the power meter to allow for a gated average reading of power.

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

9.5.1. LoRa

Tested By:	2023-10-16
Date:	85502-44389

Channel	Frequency (MHz)	AV power (dBm)
Low	914.968	14.28
High	921	14.23

9.6. POWER SPECTRAL DENSITY

LIMITS

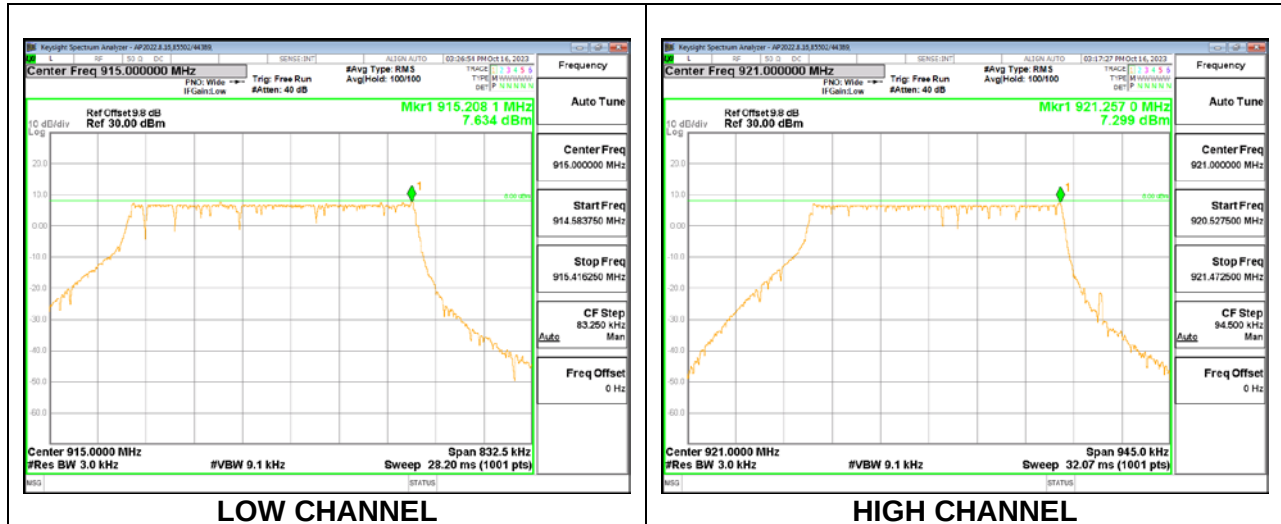
FCC §15.247 (e)
RSS-247 (5.2) (b)

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

RESULTS

9.6.1. LoRa

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	914.968	7.634	8	-0.37
High	921	7.299	8	-0.70



9.7. CONDUCTED SPURIOUS EMISSIONS

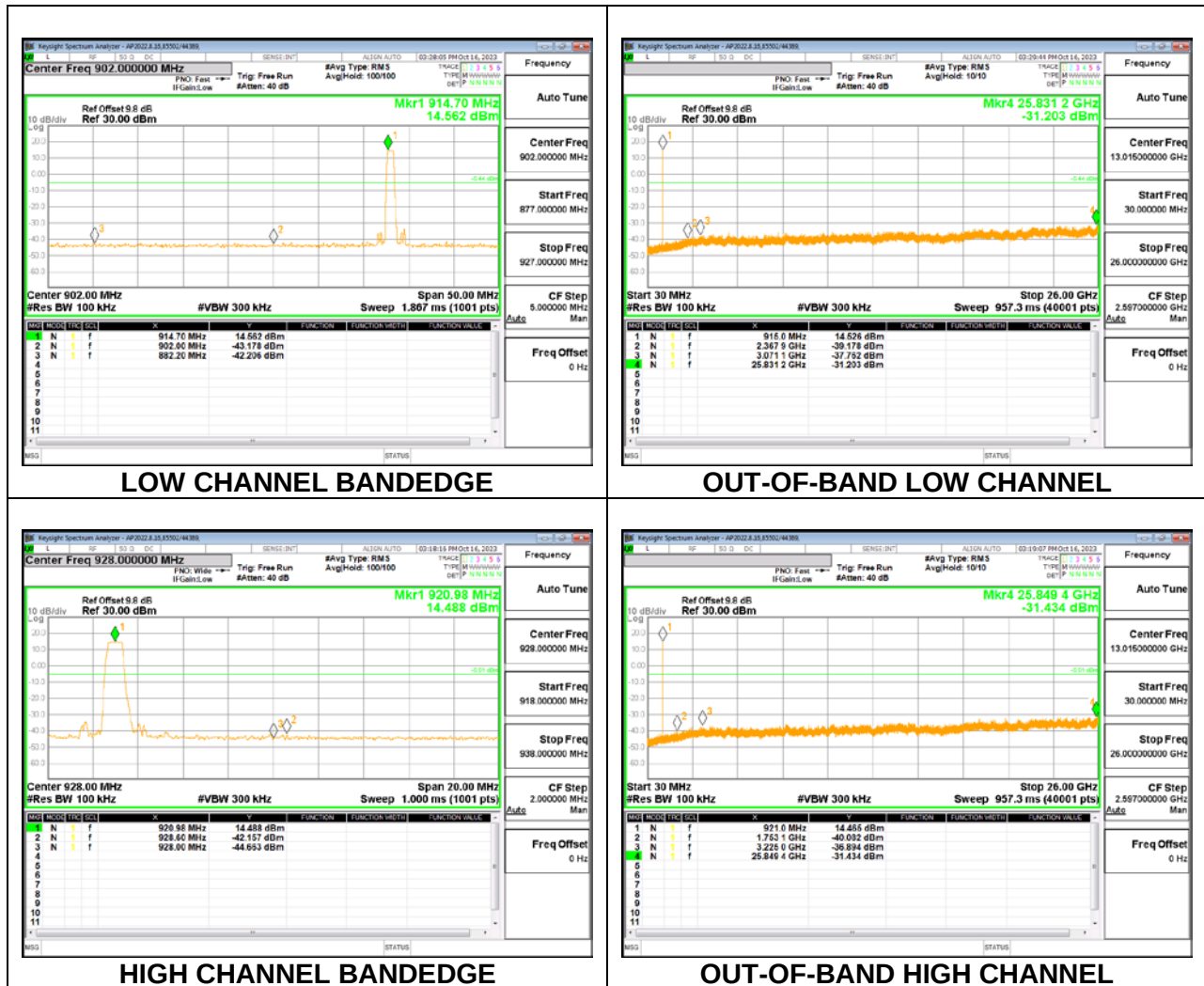
LIMITS

FCC §15.247 (d)
RSS-247 5.5

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

RESULTS

9.7.1. LoRa



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

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uA/m) at 3 m	Field Strength Limit (dBuA/m) at 3 m
0.009-0.490	6.37/F(kHz) @ 300 m	-
0.490-1.705	63.7/F(kHz) @ 30 m	-
1.705 - 30	0.08 @ 30m	-
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
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 3 MHz 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 linear voltage averaging measurements.

The spectrum from 30 MHz to 1000 MHz and 1 GHz to 10 GHz is investigated with the transmitter set to the lowest and highest channels in each applicable band. Below 30 MHz emissions, the channel with the highest power spectral density 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.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

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.

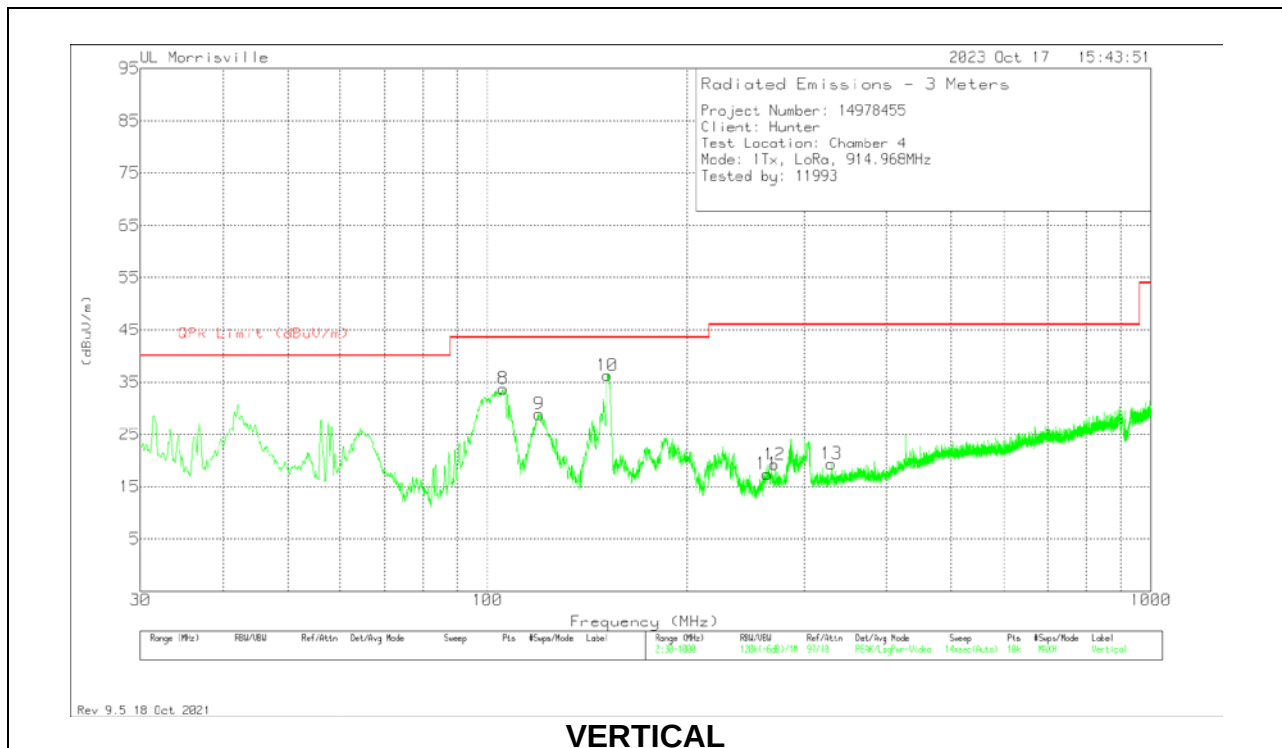
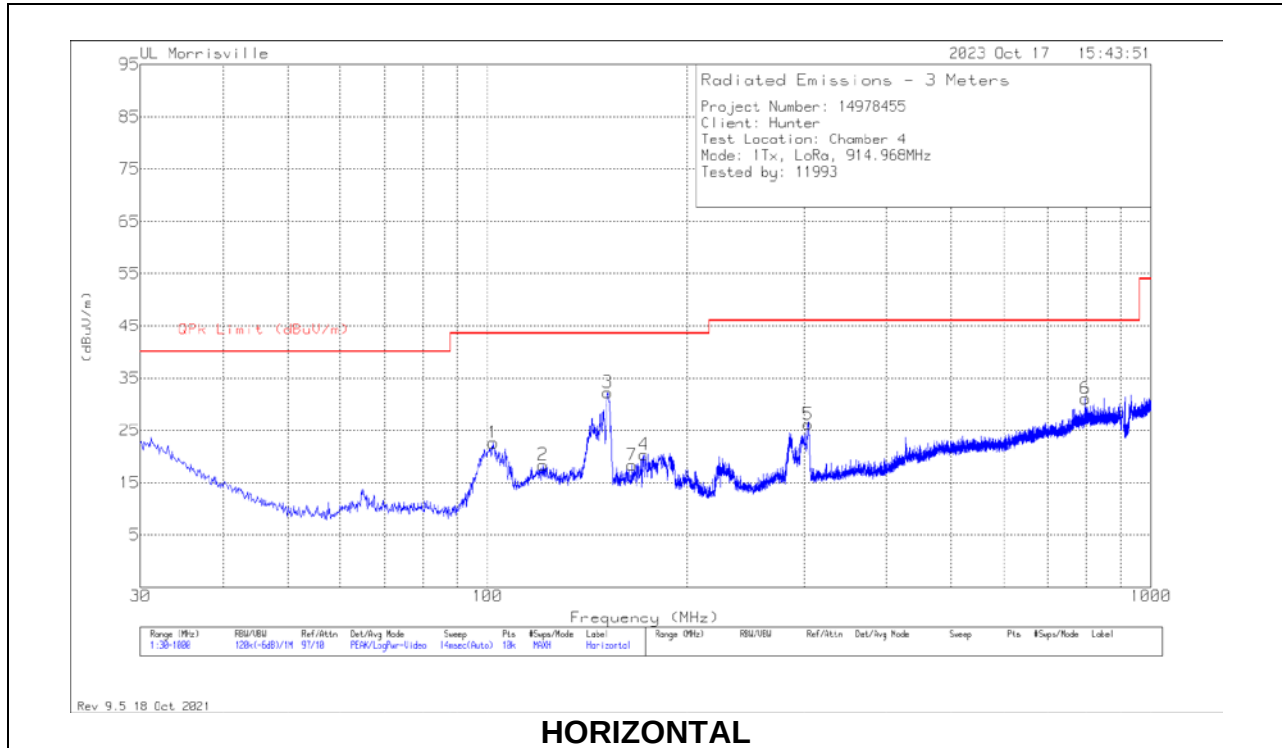
KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification

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

10.2. TRANSMITTER BELOW 1 GHz

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

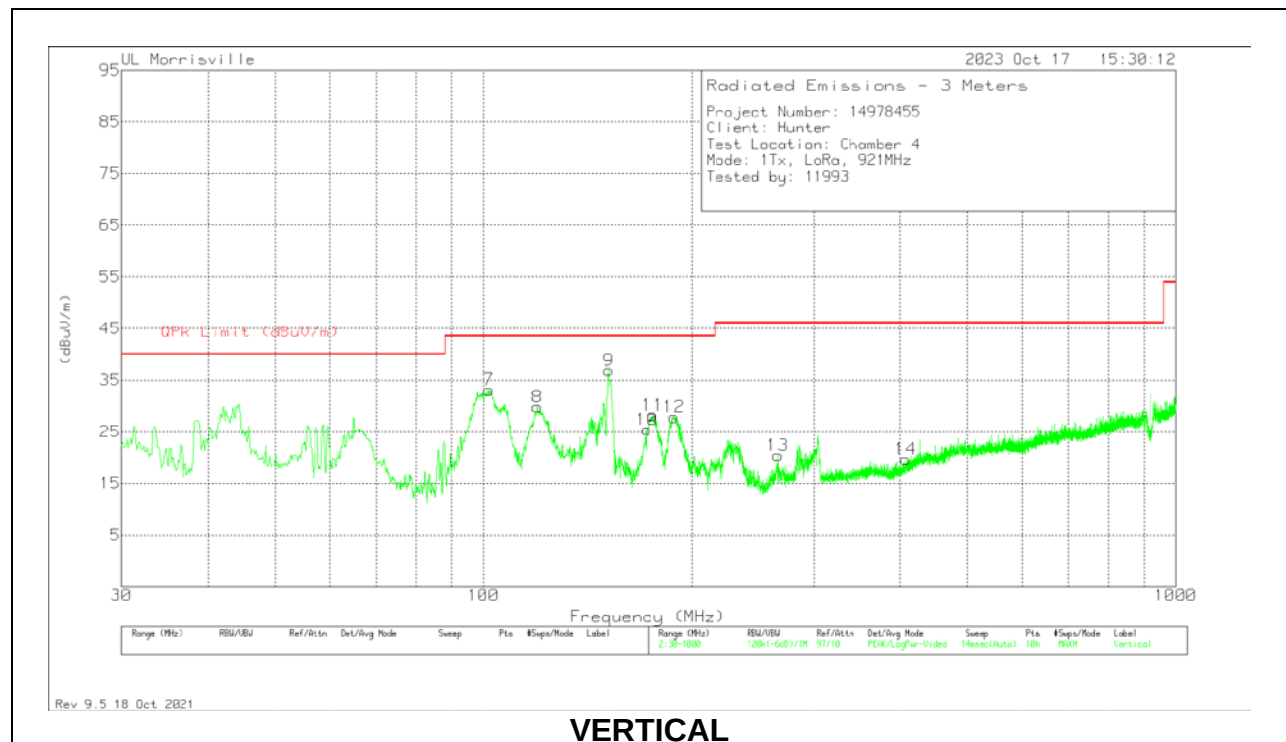
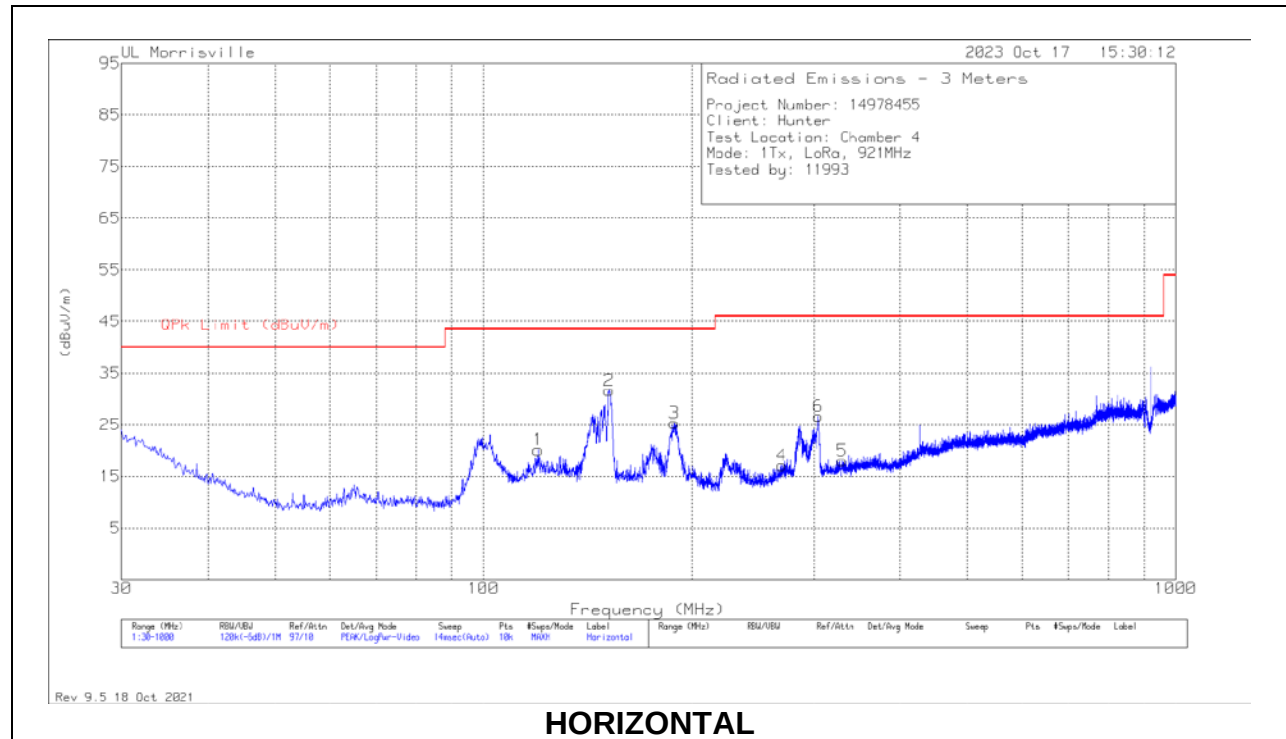
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90629 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* ** 121.277	29.28	Pk	20	-31.3	.4	18.38	43.52	-25.14	0-360	200	H
4	* ** 172.202	33.04	Pk	17.8	-30.9	.4	20.34	43.52	-23.18	0-360	200	H
6	** 796.882	31.12	Pk	27.2	-28.4	1.2	31.12	46.02	-14.9	0-360	100	H
7	*** 165.315	30.56	Pk	18.3	-31	.5	18.36	43.52	-25.16	0-360	200	H
9	* ** 119.628	39.82	Pk	20	-31.3	.4	28.92	43.52	-14.6	0-360	100	V
11	* ** 264.061	28.72	Pk	18.6	-30.5	.6	17.42	46.02	-28.6	0-360	100	V
12	* ** 270.948	29.8	Pk	19.3	-30.5	.6	19.2	46.02	-26.82	0-360	100	V
13	* ** 330.021	28.75	Pk	20.1	-30.2	.7	19.35	46.02	-26.67	0-360	200	V
1	102.071	36.7	Pk	17	-31.5	.4	22.6	-	-	0-360	200	H
8	105.66	46.95	Pk	17.8	-31.4	.4	33.75	-	-	0-360	100	V
10	151.638	48.35	Pk	18.6	-31.1	.4	36.25	-	-	0-360	100	V
3	151.832	44.39	Pk	18.6	-31.1	.4	32.29	-	-	0-360	100	H
5	304.316	36.27	Pk	19.6	-30.3	.6	26.17	-	-	0-360	200	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90629 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 119.919	31.06	Pk	20	-31.3	.4	20.16	43.52	-23.36	0-360	100	H
4	* ** 269.978	27.8	Pk	19.2	-30.5	.6	17.1	46.02	-28.92	0-360	200	H
5	* ** 329.827	27.52	Pk	20.1	-30.2	.6	18.02	46.02	-28	0-360	100	H
8	* ** 119.6765	40.72	Pk	20	-31.3	.4	29.82	43.52	-13.7	0-360	100	V
10	* ** 172.202	38.12	Pk	17.8	-30.9	.4	25.42	43.52	-18.1	0-360	100	V
13	* ** 266.195	31.51	Pk	18.8	-30.5	.6	20.41	46.02	-25.61	0-360	100	V
14	* ** 407.233	26.9	Pk	21.9	-29.9	.8	19.7	46.02	-26.32	0-360	100	V
7	101.877	47.25	Pk	17	-31.5	.4	33.15	-	-	0-360	100	V
9	151.638	48.96	Pk	18.6	-31.1	.4	36.86	-	-	0-360	100	V
2	151.832	43.75	Pk	18.6	-31.1	.4	31.65	-	-	0-360	100	H
11	175.694	40.95	Pk	17.6	-30.9	.5	28.15	-	-	0-360	100	V
12	188.498	40.83	Pk	17.4	-30.9	.5	27.83	-	-	0-360	100	V
3	188.595	38.33	Pk	17.4	-30.9	.5	25.33	-	-	0-360	100	H
6	304.413	36.73	Pk	19.6	-30.3	.6	26.63	-	-	0-360	200	H

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

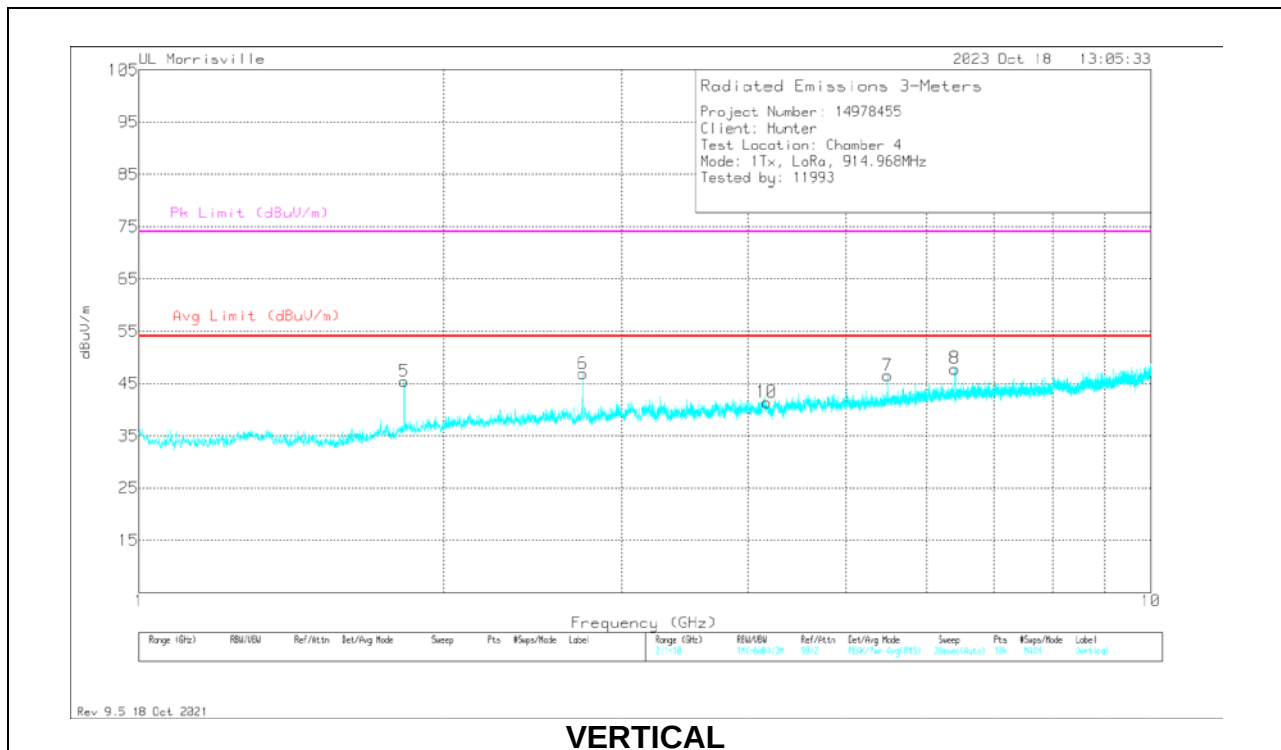
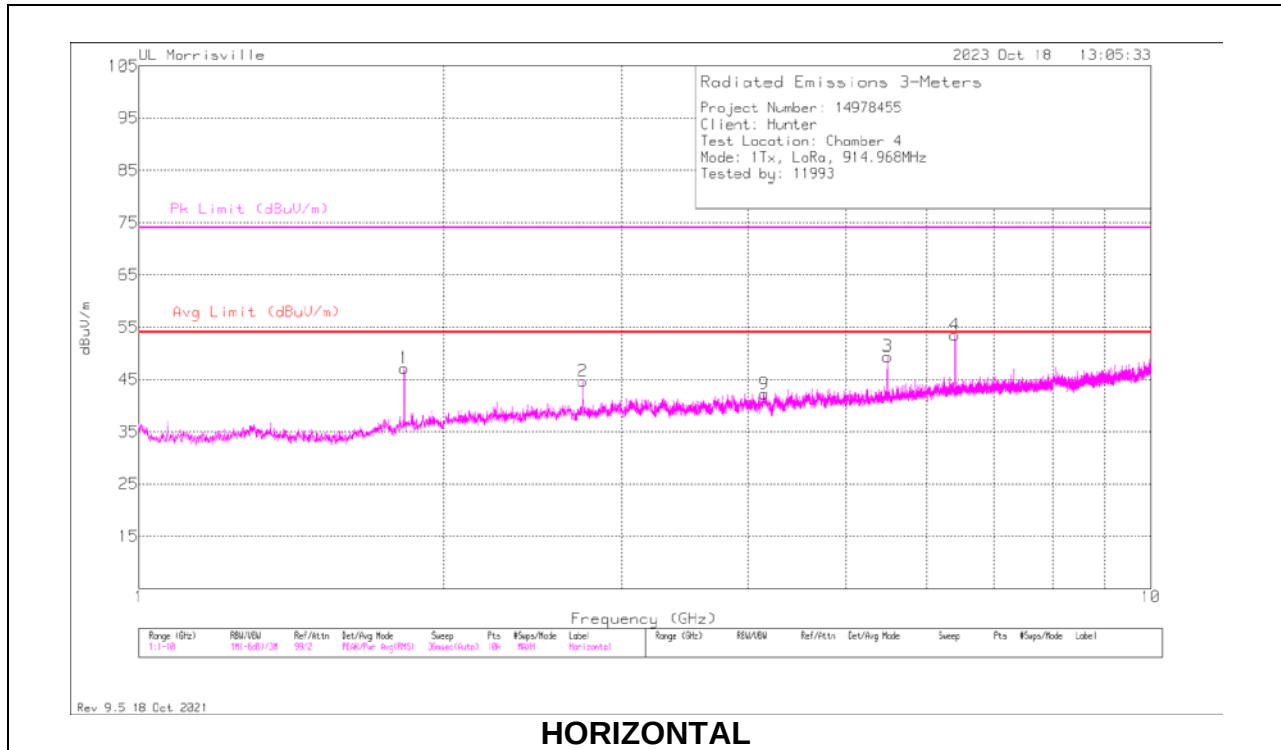
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10.3. TRANSMITTER ABOVE 1 GHz

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

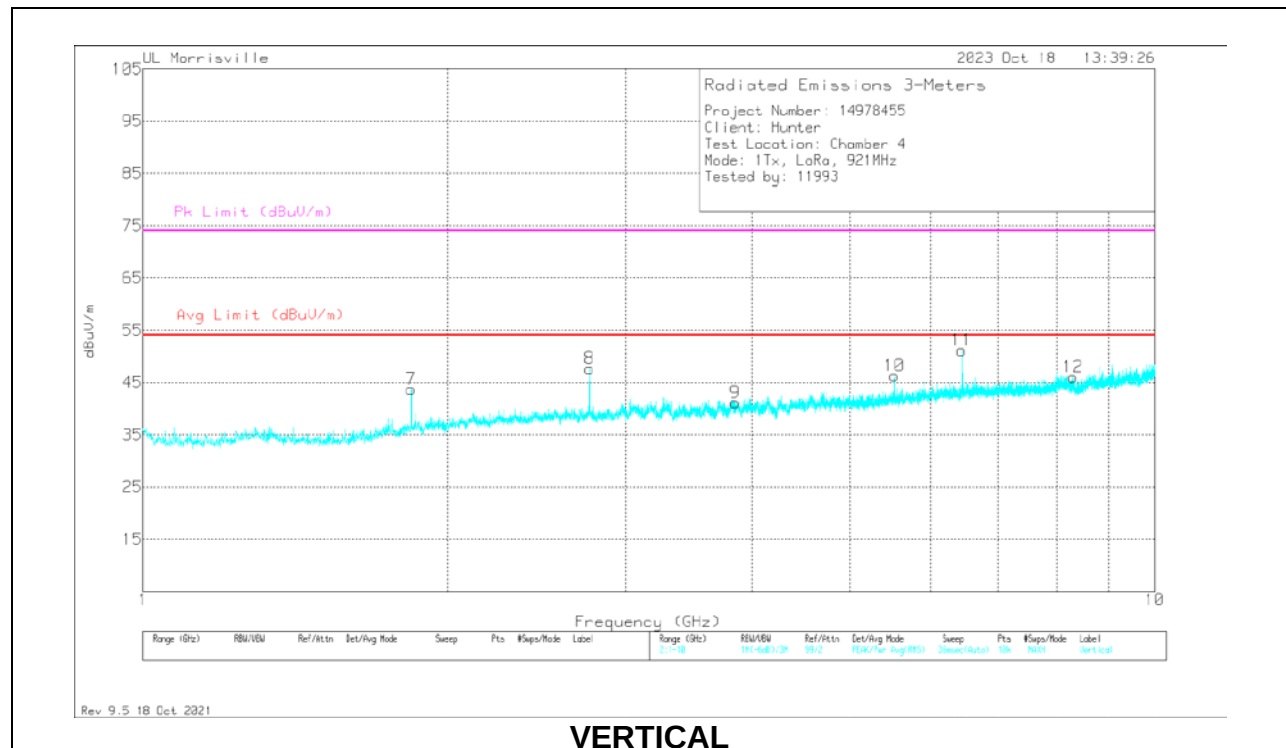
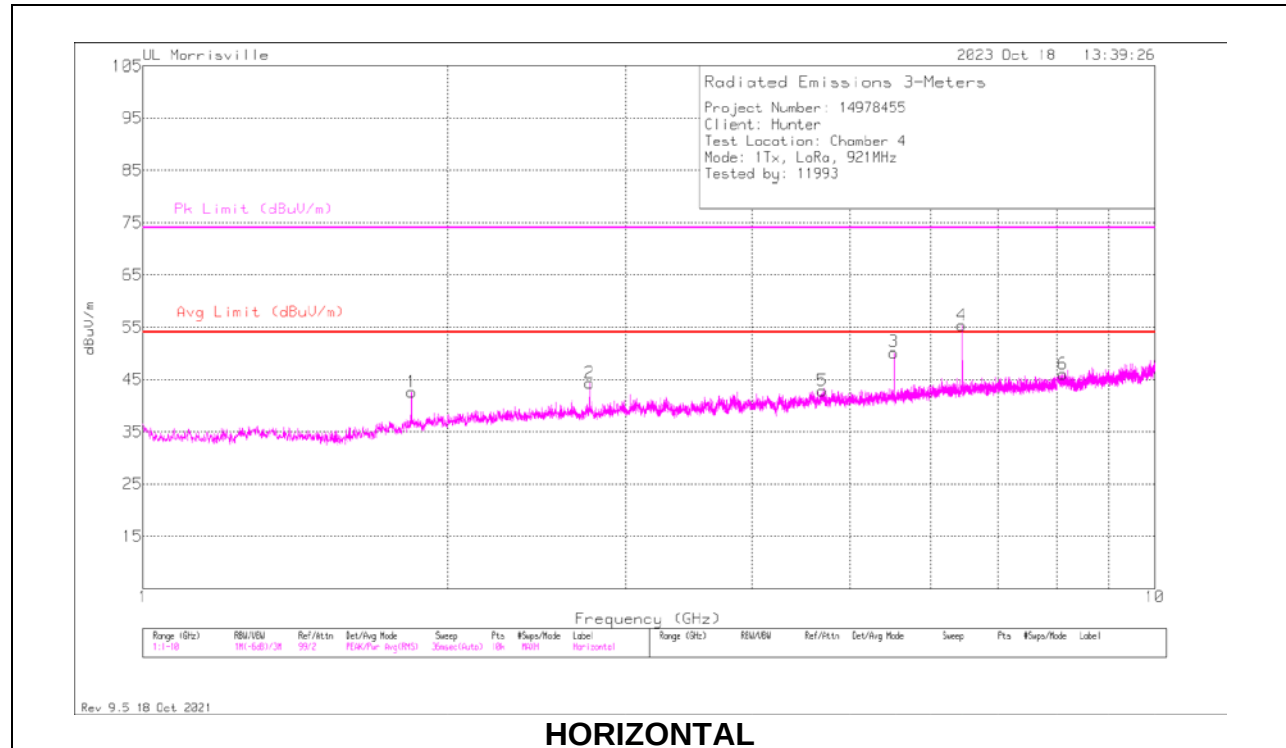
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 1.8289	52.62	Pk	30.3	-36.1	.4	47.22	54	-6.78	74	-26.78	0-360	100	H
2	* ** 2.7442	47.75	Pk	32.5	-35.9	.4	44.75	54	-9.25	74	-29.25	0-360	100	H
9	* ** 4.1464	40.42	Pk	33.5	-32.5	.8	42.22	54	-11.78	74	-31.78	0-360	100	H
5	** 1.8289	50.88	Pk	30.3	-36.1	.4	45.48	54	-8.52	74	-28.52	0-360	200	V
6	* ** 2.7442	49.98	Pk	32.5	-35.9	.4	46.98	54	-7.02	74	-27.02	0-360	200	V
10	* ** 4.1716	39.9	Pk	33.5	-32.6	.6	41.4	54	-12.6	74	-32.6	0-360	300	V
3	5.4892	45.82	Pk	34.6	-31.3	.3	49.42	-	-	-	-	0-360	100	H
7	5.4892	42.96	Pk	34.6	-31.3	.3	46.56	-	-	-	-	0-360	400	V
4	6.4036	47.01	Pk	35.4	-29.2	.3	53.51	-	-	-	-	0-360	100	H
8	6.4054	41.46	Pk	35.4	-29.3	.3	47.86	-	-	-	-	0-360	200	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 1.8424	47.76	Pk	30.4	-36	.4	42.56	54	-11.44	74	-21.44	0-360	100	H
2	*** 2.7631	47.25	Pk	32.5	-35.8	.4	44.35	54	-9.65	74	-29.65	0-360	100	H
5	*** 4.6909	40.32	Pk	34.1	-32.2	.6	42.82	54	-11.18	74	-31.18	0-360	100	H
6	*** 8.1136	37.58	Pk	35.8	-27.8	.5	46.08	54	-7.92	74	-27.92	0-360	300	H
7	** 1.8415	48.87	Pk	30.4	-36	.4	43.67	54	-10.33	74	-30.33	0-360	200	V
8	*** 2.7622	50.52	Pk	32.5	-35.8	.4	47.62	54	-6.38	74	-26.38	0-360	200	V
9	*** 3.8476	40.44	Pk	33.4	-33.5	.7	41.04	54	-12.96	74	-32.96	0-360	200	V
12	*** 8.3026	37.16	Pk	35.8	-27.4	.5	46.06	54	-7.94	74	-27.94	0-360	200	V
3	5.5252	46.92	Pk	34.6	-31.6	.3	50.22	-	-	-	-	0-360	100	H
10	5.5261	43.03	Pk	34.6	-31.6	.3	46.33	-	-	-	-	0-360	200	V
11	6.4459	44.66	Pk	35.4	-29.2	.3	51.16	-	-	-	-	0-360	200	V
4	6.4486	48.67	Pk	35.4	-29.1	.4	55.37	-	-	-	-	0-360	100	H

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

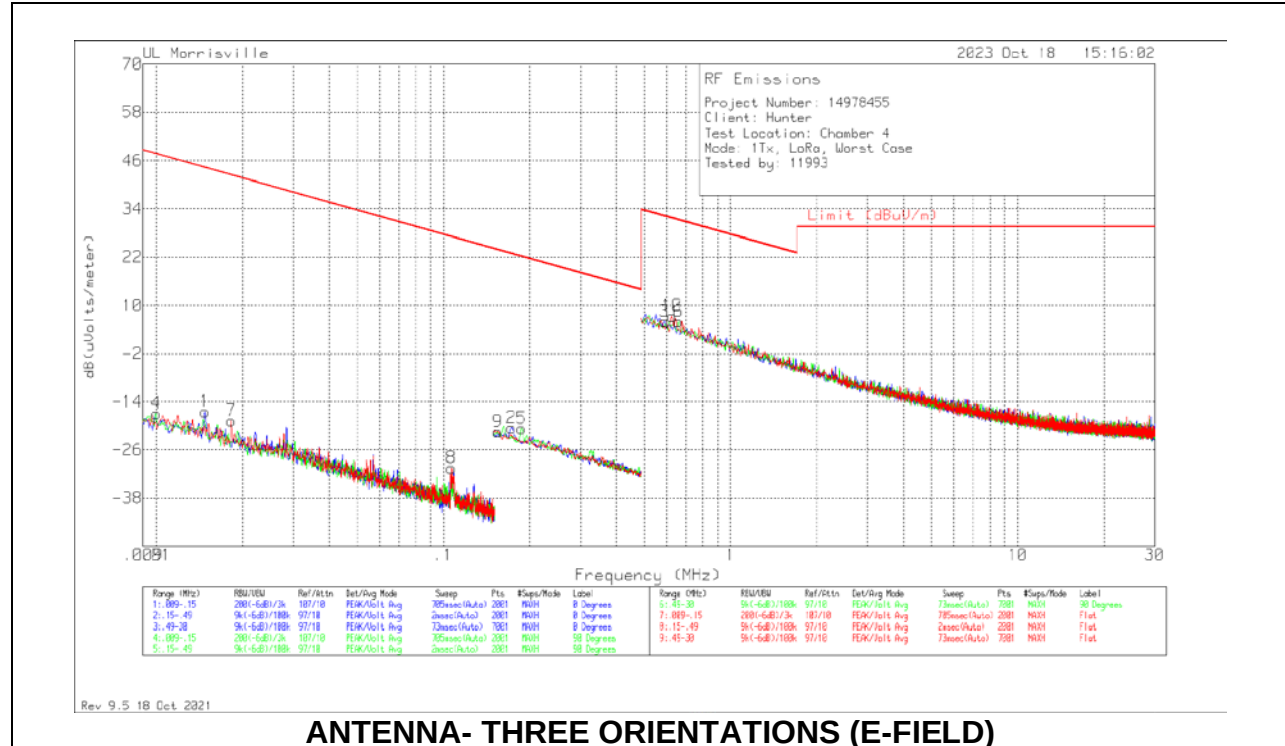
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10.4. WORST CASE BELOW 30MHZ

Note for below 30 MHz scans: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were $40 \cdot \log(\text{test distance} / \text{specification distance})$.

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION E-FIELD)



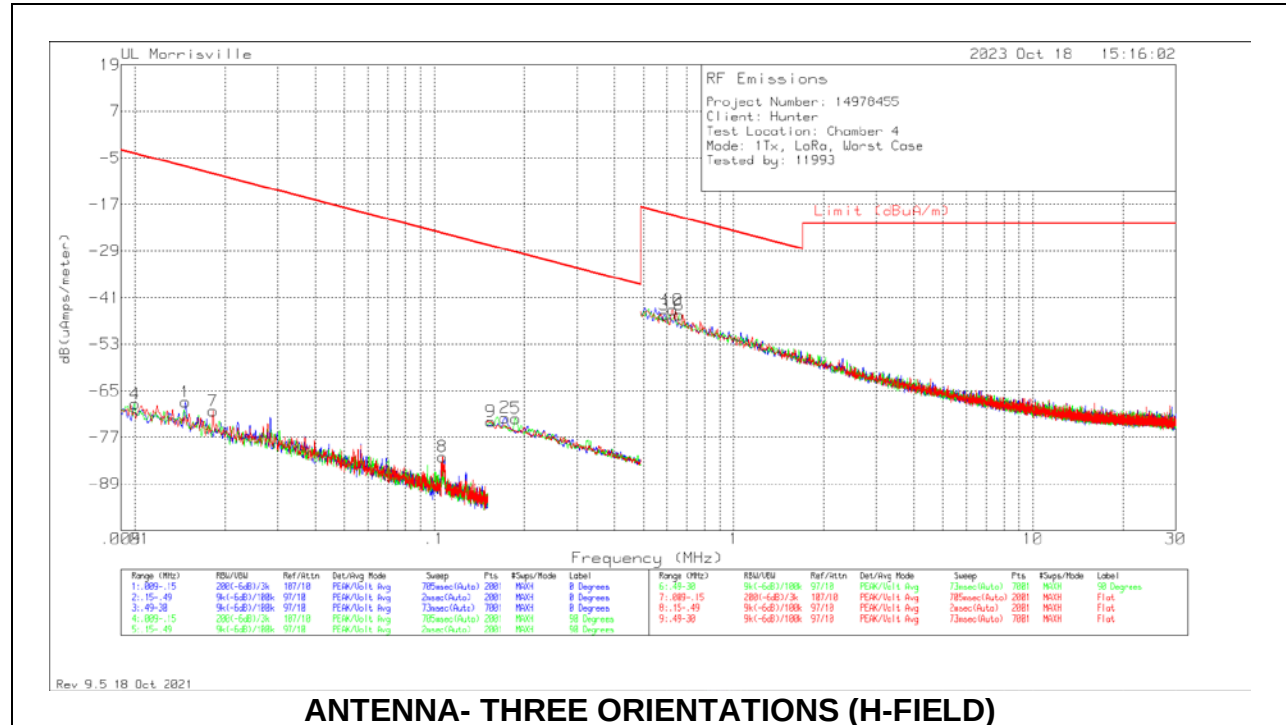
ANTENNA- THREE ORIENTATIONS (E-FIELD)

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	QP/AV Limit (dBuV/m)	PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
4	.00999	43.72	Pk	19.3	0	-80	-16.98	47.61	67.61	-64.59	0-360	90 degs
1	.01475	46.31	Pk	17.2	0	-80	-16.49	44.23	64.23	-60.72	0-360	0 degs
7	.01823	45.65	Pk	15.7	0	-80	-18.65	42.39	62.39	-61.04	0-360	Flat
8	.10684	37.26	Pk	12.2	0	-80	-30.54	27.03	-	-57.57	0-360	Flat
9	.15451	46.39	Pk	12.2	0	-80	-21.41	23.83	43.83	-45.24	0-360	Flat
2	.17287	47.38	Pk	12.2	0	-80	-20.42	22.85	42.85	-43.27	0-360	0 degs
5	.18723	47.11	Pk	12.2	0	-80	-20.69	22.16	42.16	-42.85	0-360	90 degs
3	.58697	33.74	Pk	12.2	.1	-40	6.04	32.23	-	-26.19	0-360	0 degs
10	.62491	35.06	Pk	12.2	.1	-40	7.36	31.69	-	-24.33	0-360	Flat
6	.65864	33.68	Pk	12.2	.1	-40	5.98	31.23	-	-25.25	0-360	90 degs

Pk - Peak detector

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION H-FIELD)



ANTENNA- THREE ORIENTATIONS (H-FIELD)

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	QP/AV Limit (dBuA/m)	PK Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
4	.00999	43.72	Pk	-32.2	0	-80	-68.48	-3.89	16.11	-64.59	0-360	90 degs
1	.01475	46.31	Pk	-34.3	0	-80	-67.99	-7.27	12.73	-60.72	0-360	0 degs
7	.01823	45.65	Pk	-35.8	0	-80	-70.15	-9.11	10.89	-61.04	0-360	Flat
8	.10684	37.26	Pk	-39.3	0	-80	-82.04	-24.47	-	-57.57	0-360	Flat
9	.15451	46.39	Pk	-39.3	0	-80	-72.91	-27.67	-7.67	-45.24	0-360	Flat
2	.17287	47.38	Pk	-39.3	0	-80	-71.92	-28.65	-8.65	-43.27	0-360	0 degs
5	.18723	47.11	Pk	-39.3	0	-80	-72.19	-29.34	-9.34	-42.85	0-360	90 degs
3	.58697	33.74	Pk	-39.3	.1	-40	-45.46	-19.27	-	-26.19	0-360	0 degs
10	.62491	35.06	Pk	-39.3	.1	-40	-44.14	-19.81	-	-24.33	0-360	Flat
6	.65864	33.68	Pk	-39.3	.1	-40	-45.52	-20.27	-	-25.25	0-360	90 degs

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)
RSS-Gen 8.8

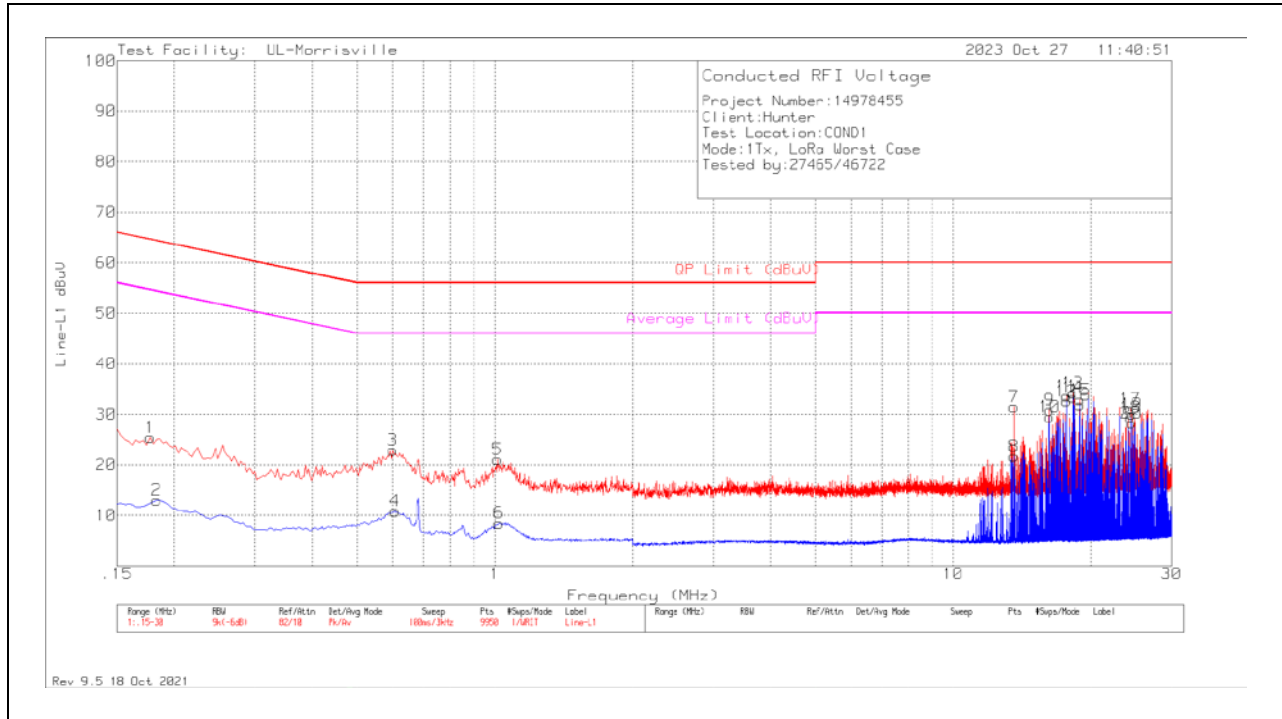
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

RESULTS

11.1.1. AC Power Line Norm

LINE 1 RESULTS

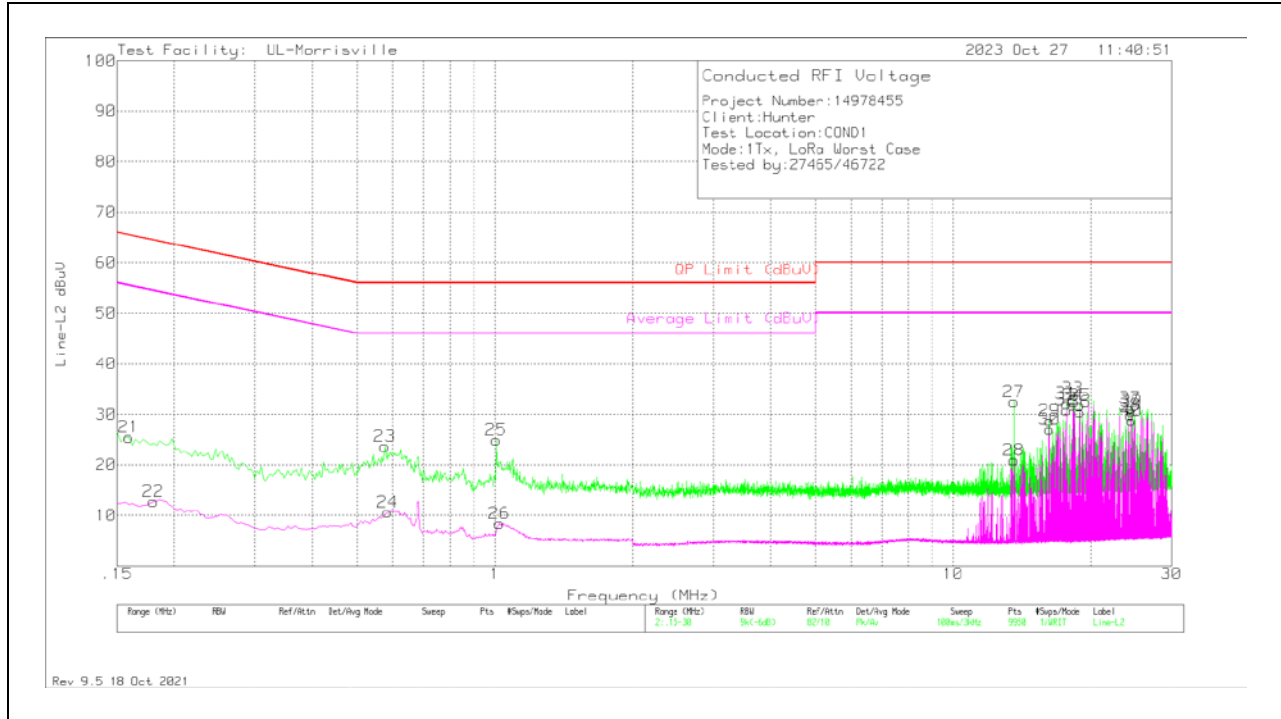


Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.177	15.3	Pk	.3	9.8	25.4	64.63	-39.23	-	-
2	.183	2.94	Av	.3	9.8	13.04	-	-	54.35	-41.31
3	.6	13.03	Pk	.1	9.8	22.93	56	-33.07	-	-
4	.606	.93	Av	.1	9.8	10.83	-	-	46	-35.17
5	1.014	11.16	Pk	.1	9.8	21.06	56	-34.94	-	-
6	1.02	-1.43	Av	.1	9.8	8.47	-	-	46	-37.53
7	13.563	21.29	Pk	.2	10	31.49	60	-28.51	-	-
8	13.56	11.54	Av	.2	10	21.74	-	-	50	-28.26
9	16.23	20.52	Pk	.2	10.1	30.82	60	-29.18	-	-
10	16.23	19.16	Av	.2	10.1	29.46	-	-	50	-20.54
11	17.694	23.35	Pk	.2	10.1	33.65	60	-26.35	-	-
12	17.694	22.32	Av	.2	10.1	32.62	-	-	50	-17.38
13	18.243	23.93	Pk	.2	10.1	34.23	60	-25.77	-	-
14	18.243	23.11	Av	.2	10.1	33.41	-	-	50	-16.59
15	18.915	22.61	Pk	.2	10.1	32.91	60	-27.09	-	-
16	18.915	21.55	Av	.2	10.1	31.85	-	-	50	-18.15
17	24.351	20.62	Pk	.3	10.2	31.12	60	-28.88	-	-
18	24.351	18.88	Av	.3	10.2	29.38	-	-	50	-20.62
19	24.534	19.5	Pk	.3	10.2	30	60	-30	-	-
20	24.534	17.72	Av	.3	10.2	28.22	-	-	50	-21.78

Pk - Peak detector

Av - Average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
21	.159	15.38	Pk	.3	9.8	25.48	65.52	-40.04	-	-
22	.18	2.61	Av	.3	9.8	12.71	-	-	54.49	-41.78
23	.576	13.8	Pk	.1	9.8	23.7	56	-32.3	-	-
24	.585	.71	Av	.1	9.8	10.61	-	-	46	-35.39
25	1.008	15.06	Pk	.1	9.8	24.96	56	-31.04	-	-
26	1.023	-1.54	Av	.1	9.8	8.36	-	-	46	-37.64
27	13.563	22.24	Pk	.2	10	32.44	60	-27.56	-	-
28	13.563	10.7	Av	.2	10	20.9	-	-	50	-29.1
29	16.23	18.51	Pk	.2	10.1	28.81	60	-31.19	-	-
30	16.23	16.78	Av	.2	10.1	27.08	-	-	50	-22.92
31	17.694	21.88	Pk	.2	10.1	32.18	60	-27.82	-	-
32	17.694	20.64	Av	.2	10.1	30.94	-	-	50	-19.06
33	18.243	22.88	Pk	.2	10.1	33.18	60	-26.82	-	-
34	18.243	21.61	Av	.2	10.1	31.91	-	-	50	-18.09
35	18.915	21.55	Pk	.2	10.1	31.85	60	-28.15	-	-
36	18.915	20.17	Av	.2	10.1	30.47	-	-	50	-19.53
37	24.351	20.8	Pk	.3	10.2	31.3	60	-28.7	-	-
38	24.351	19.36	Av	.3	10.2	29.86	-	-	50	-20.14
39	24.534	20.14	Pk	.3	10.2	30.64	60	-29.36	-	-
40	24.534	18.28	Av	.3	10.2	28.78	-	-	50	-21.22

Pk - Peak detector

Av - Average detection

12. SETUP PHOTOS

Please refer to R14978455-EP1 for setup photos

END OF TEST REPORT