

TEST REPORT

Report Number: R14541906-E1

Applicant : Oxit, LLC
3131 Westinghouse Blvd
Charlotte, NC 28273, USA

Model : Sense Asset+

FCC ID : 2AYW9-SENSE-APLUS

EUT Description : Omni-Id Sense Asset Communication Device

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C: 2023
ISED RSS-247 ISSUE 2: 2017
ISED RSS-GEN ISSUE 5 + A2:2021

Date Of Issue:
2023-08-14

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-02-24	Initial Issue	Charles Moody
V2	2023-03-15	Updated Conducted Spurious Emissions and Output Power	Charles Moody
V3	2023-08-14	Updated Test Equipment Section and Radiated Test Results	Charles Moody

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Oxit, LLC
3131 Westinghouse Blvd
Charlotte, NC 28273, USA

EUT DESCRIPTION: Omni-Id Sense Asset Communication Device

MODEL: Sense Asset+

SERIAL NUMBER: Non-Serialized

SAMPLE RECEIVED DATE: 2022-12-30, 2023-01-11

DATE TESTED: 2023-02-15 TO 2023-03-10

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C: 2023	Compliant
ISED RSS-247 Issue 2: 2017	Compliant
ISED RSS-GEN Issue 5 + A2: 2021	Compliant

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:

Prepared By:



Mike Antola
Staff Engineer
Consumer, Medical and IT Segment
UL LLC

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Electrical Engineer
Consumer, Medical and IT Segment
UL LLC

2. TEST RESULTS SUMMARY

This report contains data/info 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/info 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	20dB/99% OBW	Reporting purposes only	ANSI C63.10 Sections 6.9.2 and 6.9.3
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW	Compliant	None
15.247 (a)(1)	RSS-247 (5.1) (b)	Hopping Frequency Separation		
15.247(a)(1)(i)	RSS-247 (5.1) (c)	Number of Hopping Channels		
15.247(a)(1)(i)	RSS-247 (5.1) (c)	Average Time of Occupancy		
15.247 (b)(2) and (b)(3)	RSS-247 (5.4) (a) and (d)	Output Power		
15.247 (e)	RSS-247 5.2 (b)	PSD		
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions		
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions		
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Not Applicable	EUT is Battery Powered

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15: 2023, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A2: 2021, and RSS-247 Issue 2: 2017.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 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 an Omni-Id Sense Asset that contains a BLE and a LoRa radio. This report covers the full emissions testing of the LoRa radio.

6.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
902-928	LoRa 125kHz	15.00	31.62
902-928	LoRa 500kHz	15.66	36.81

NOTE 1: Maximum output power for 125 kHz BW is based on average power measurements as PKPSD for 125 kHz didn't pass the limit. Therefore average PSD and power was used for measurements and conducted spurious limit calculations.

NOTE 2: Maximum output power for 500 kHz BW is based on peak power measurements as the PKPSD method for 500 kHz passed the limit.

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a helical antenna, with a maximum gain of 2.15 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 1.0

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 30 MHz were performed with the EUT set to transmit at the channel and bandwidth with output power as worst-case scenario.

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

The EUT is a hybrid system. The 125kHz and 500kHz bandwidth is both FHSS and DTS.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	Inspiron 15 3000	2SFMJP3	-

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	6 Pin	1	I/O	Programmer Cable	<1M	Used to Configure EUT Radio Prior to Testing

TEST SETUP

The EUT is connected to a support laptop to configure the radio prior to emissions testing. However, for final emissions scans, the EUT was disconnected from the support laptop.

SETUP DIAGRAMS

Please refer to R14541906-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

Carrier Frequency Separation: ANSI C63.10-2013 Section 7.8.2

Number of Hopping Frequencies: ANSI C63.10-2013 Section 7.8.3

Time of Occupancy (Dwell Time): ANSI C63.10-2013 Section 7.8.4

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

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)

PSD: ANSI C63.10 Subclause -11.10.3 Method AVGPS-1 (Average PSD)

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

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

8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
PWM001	RF Power Meter	Keysight	N1912A	2022-08-30	2023-08-30
PWS001	Wideband Power Sensor	Keysight	N1921A	2022-07-02	2023-07-02
SA0025	Spectrum Analyzer	Keysight	N9030A	2022-05-02	2023-05-02
76022	DC Power Supply	CircuitSpecialists.com	CSI3005X5	-	-
MM0167	True RMS Multimeter	Keysight	U1232A	2021-08-17	2023-08-17
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16	NA	NA
	Additional Equipment used				
226565	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CENTRICRF	C18S2-10	2022-05-03	2023-05-03
CBL101	Micro-Coax UTiFLEX Cable Assembly, Low Loss, 40Ghz, 39.3", Connectors 2	CARLISLE INTERCONNECT TECHNOLOGIES	UFA147A-0-0180-200200	2022-01-04	2024-01-04

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 (AT0075)	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2023-01-06	2024-01-06
	1-18 GHz				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-05-24	2023-05-24
	Gain-Loss Chains				
207638	Gain-loss string: 0.009-30MHz	Various	Various	2022-05-20	2023-05-20
207639	Gain-loss string: 25-1000MHz	Various	Various	2022-05-20	2023-05-20
207640	Gain-loss string: 1-18GHz	Various	Various	2022-05-20	2023-05-20
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-02-02	2024-02-02
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
21642	Environmental Meter	Fisher Scientific	15-077-963 (s/n 210701692)	2021-08-16	2023-08-16
**92492 (HPF012)	1GHz high-pass filter, 2W, $F_{high} = 18\text{GHz}$	Micro-Tronics	HPM18129	2022-02-17	2023-02-28
**82635 (HPF009)	1GHz high-pass filter, 2W, $F_{high} = 10\text{GHz}$	Micro-Tronics	HPM17672	2022-02-17	2023-02-28
BRF007	902-928MHz notch filter, 2W, $F_{high} = 1.5\text{GHz}$	Micro-Tronics	BRC17691	2022-05-27	2023-05-27

****NOTE:** Testing using this equipment was performed prior to 2023-02-28. Therefore, at the time of testing, all equipment was calibrated.

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

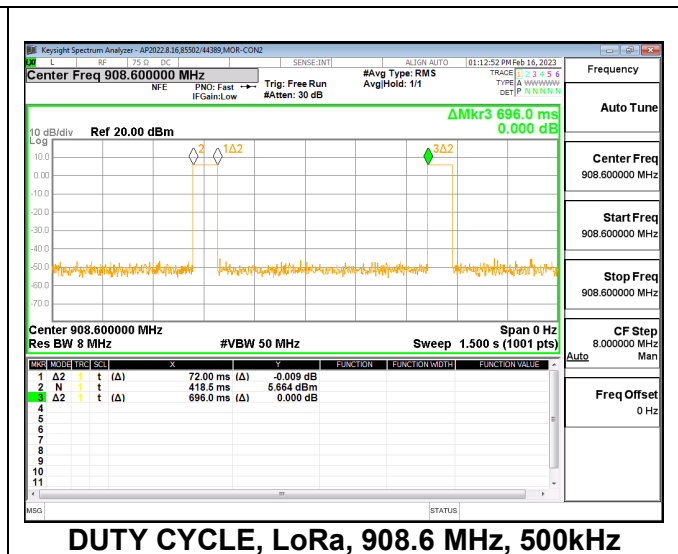
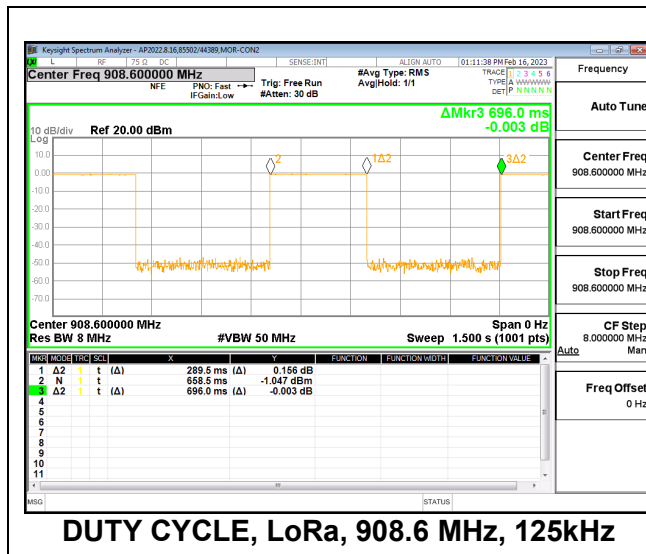
PROCEDURE

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

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	RMS Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
900 MHz Band						
LoRa - 125kHz	289.5	696.0	0.416	41.59%	3.81	0.003
LoRa - 500kHz	72.0	696.0	0.103	10.34%	9.85	0.014

DUTY CYCLE PLOTS



9.2. 99% BANDWIDTH

LIMITS

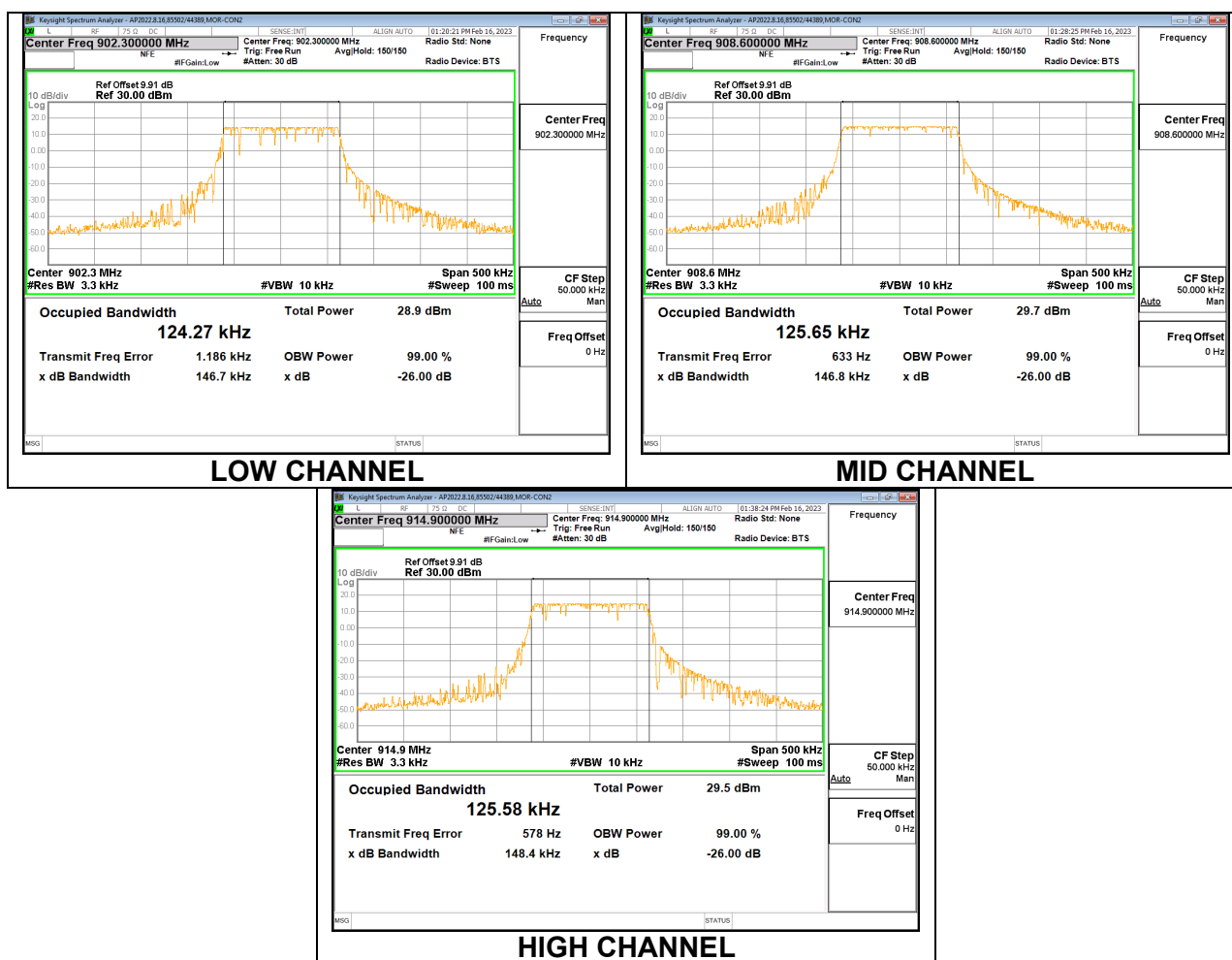
None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to between 1-5% of the OBW. The VBW is set to >3xRBW. The sweep time is coupled.

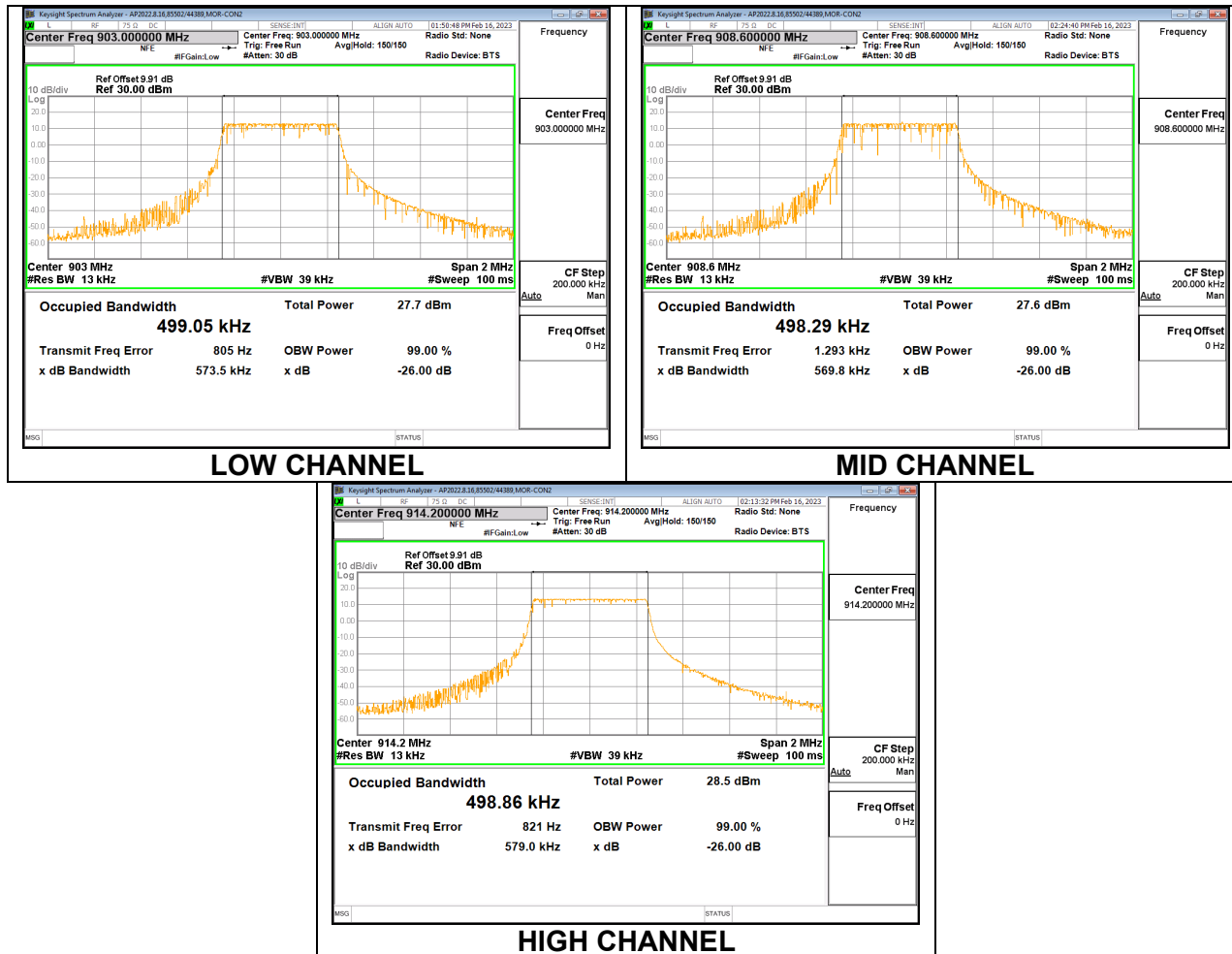
9.2.1. LoRa – 125kHz

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	902.3	0.12427
Middle	908.6	0.12565
High	914.9	0.12558



9.2.2. LoRa – 500kHz

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	903	0.49905
Middle	908.6	0.49829
High	914.2	0.49886



9.3. 20 dB BANDWIDTH

LIMITS

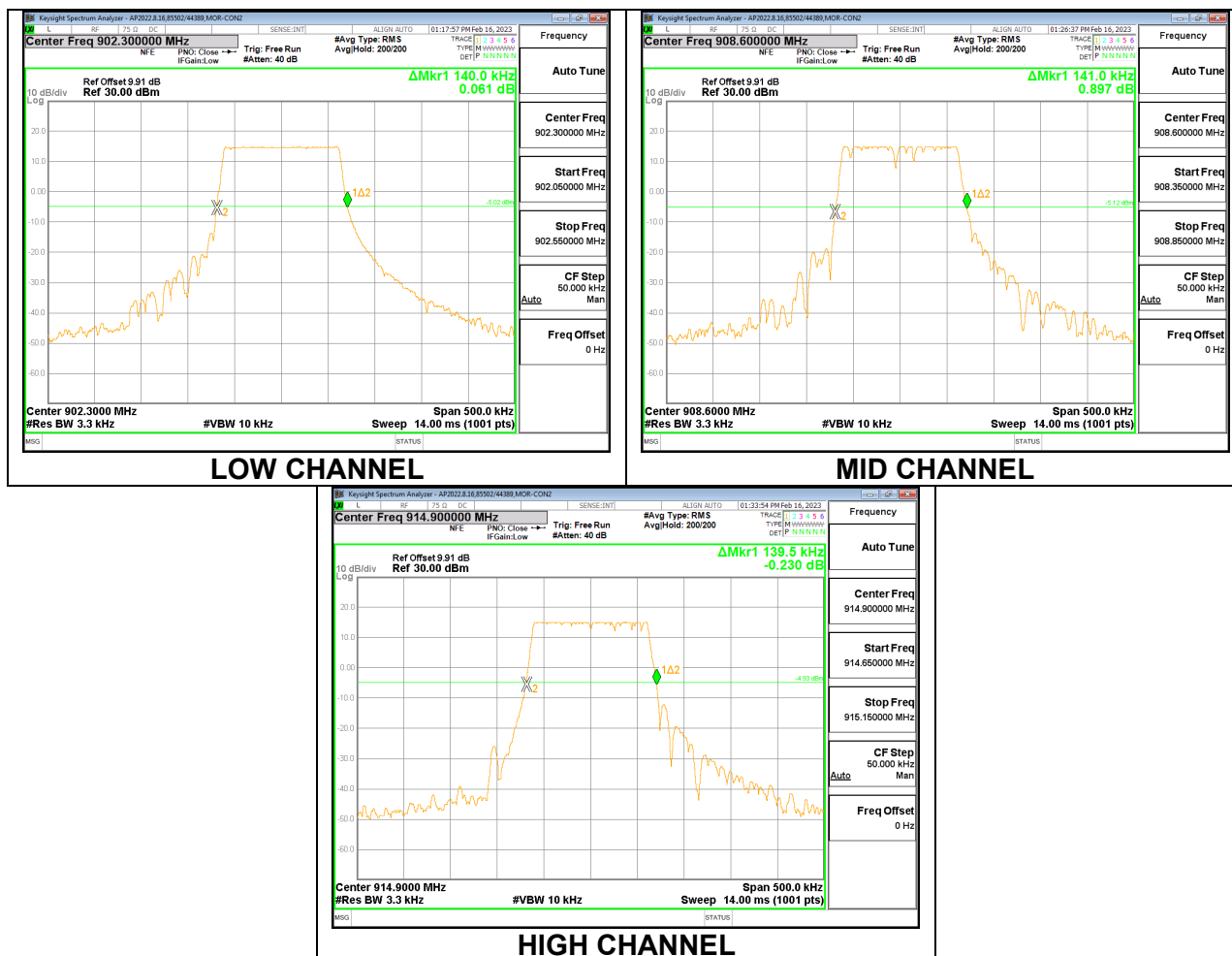
None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1-5% of the 20 dB bandwidth. The VBW is set to 3xRBW. The sweep time is coupled.

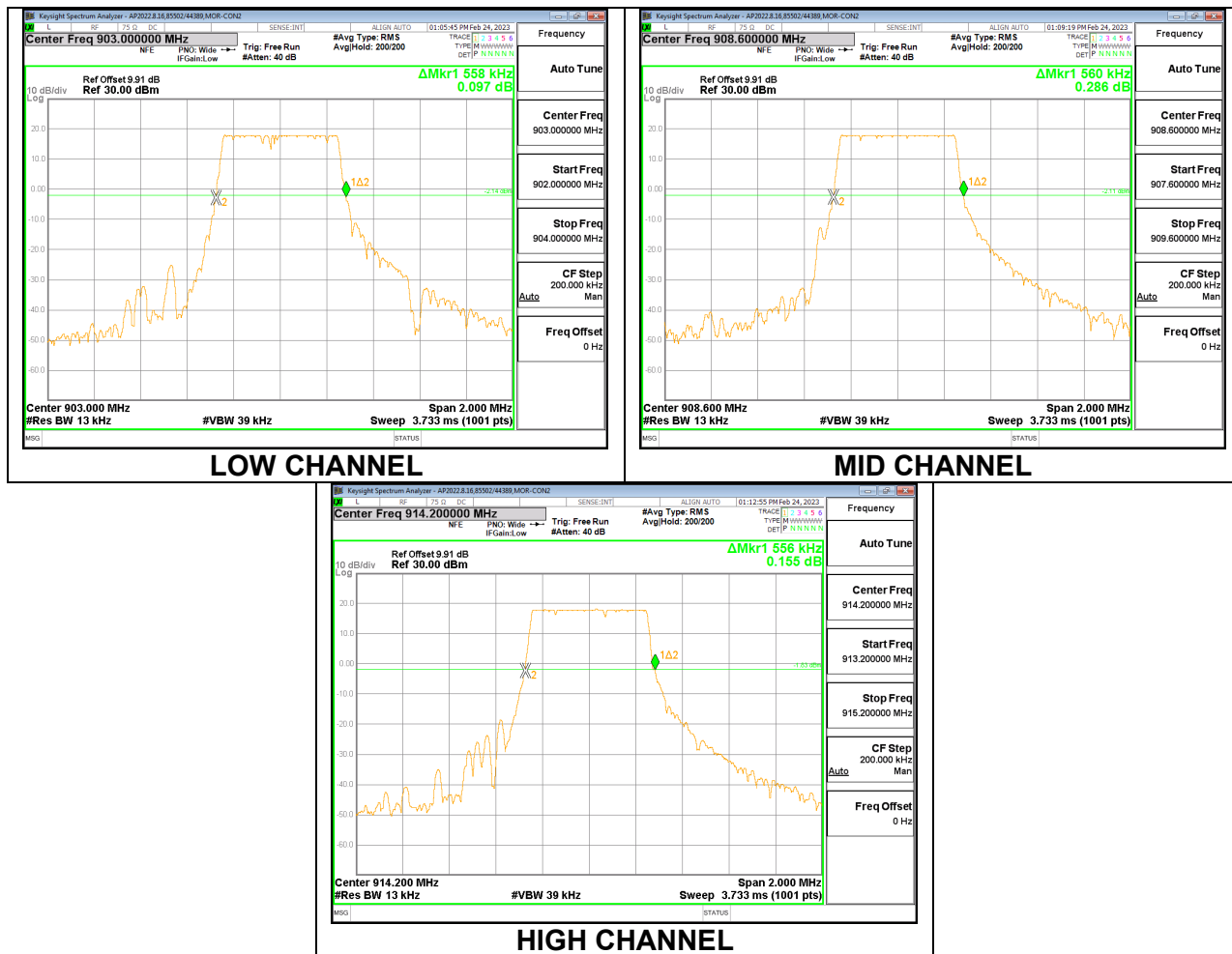
9.3.1. LoRa – 125kHz

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	902.3	0.1400
Mid	908.6	0.1410
High	914.9	0.1395



9.3.2. LoRa – 500kHz

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	903	0.558
Mid	908.6	0.560
High	914.2	0.556



9.4. 6 dB BANDWIDTH

LIMITS

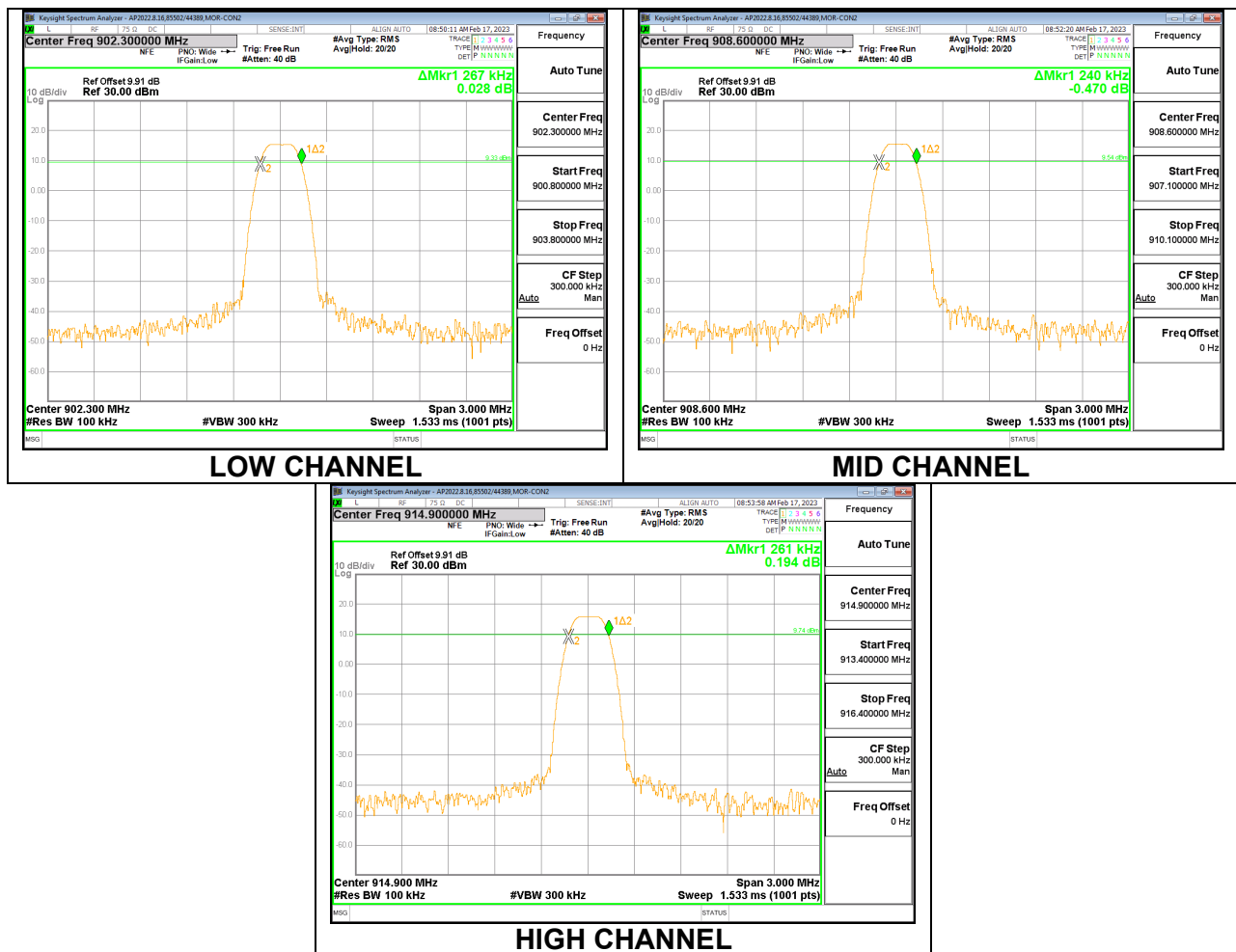
FCC §15.247 (a) (2)
RSS-247 5.2 (a)

Note: 125kHz and 500kHz BW is a Hybrid (FHSS/DTS) system, therefore no minimum BW requirement.

RESULTS

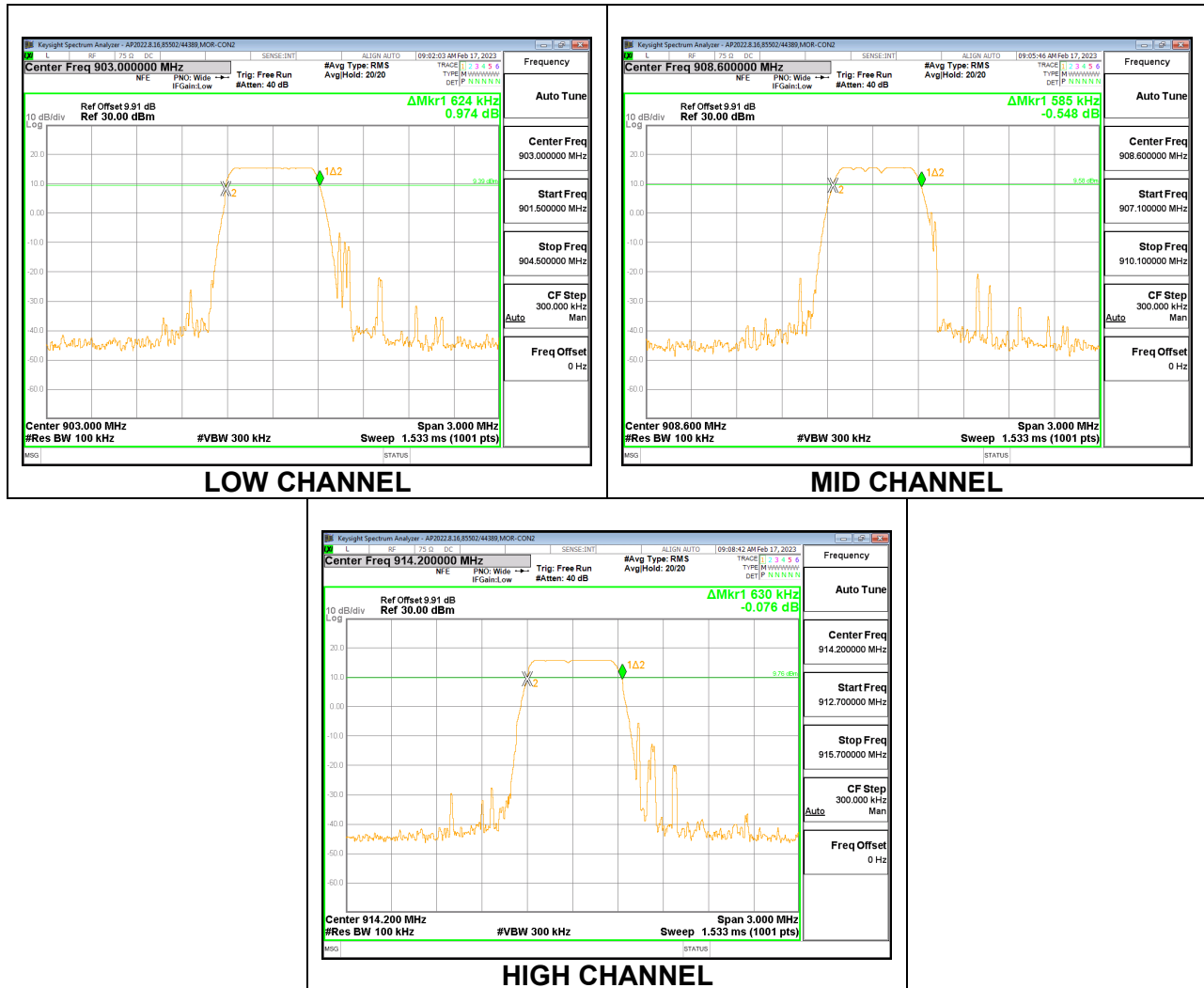
9.4.1. LoRa – 125kHz

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
Low	902.3	0.267
Middle	908.6	0.240
High	914.9	0.261



9.4.2. LoRa – 500kHz

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
Low	903	0.624
Middle	908.6	0.585
High	914.2	0.630



9.5. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)
RSS-247 (5.1) (b)

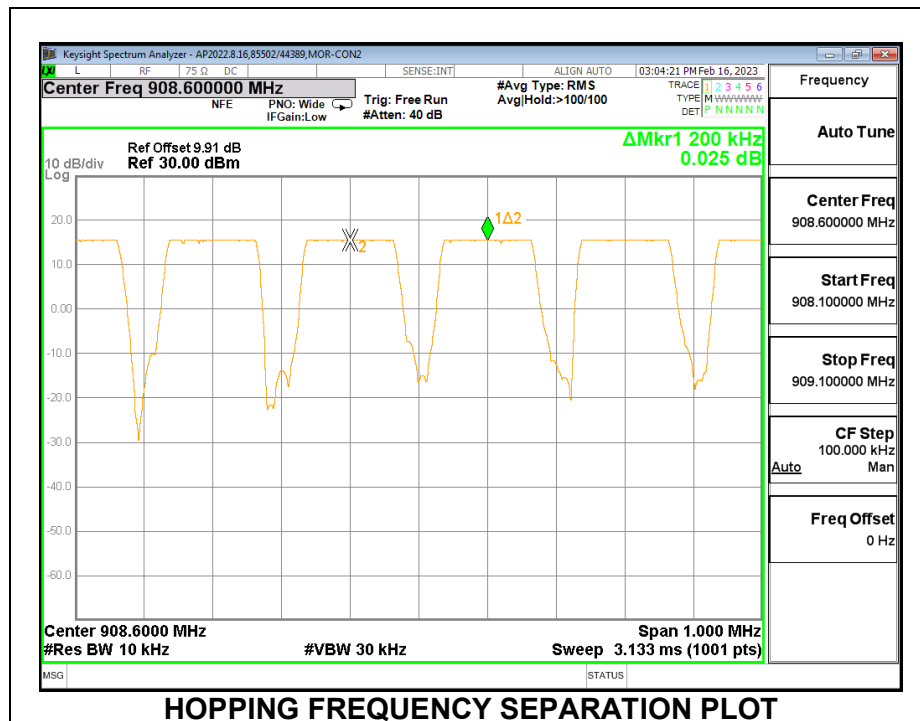
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

TEST PROCEDURE

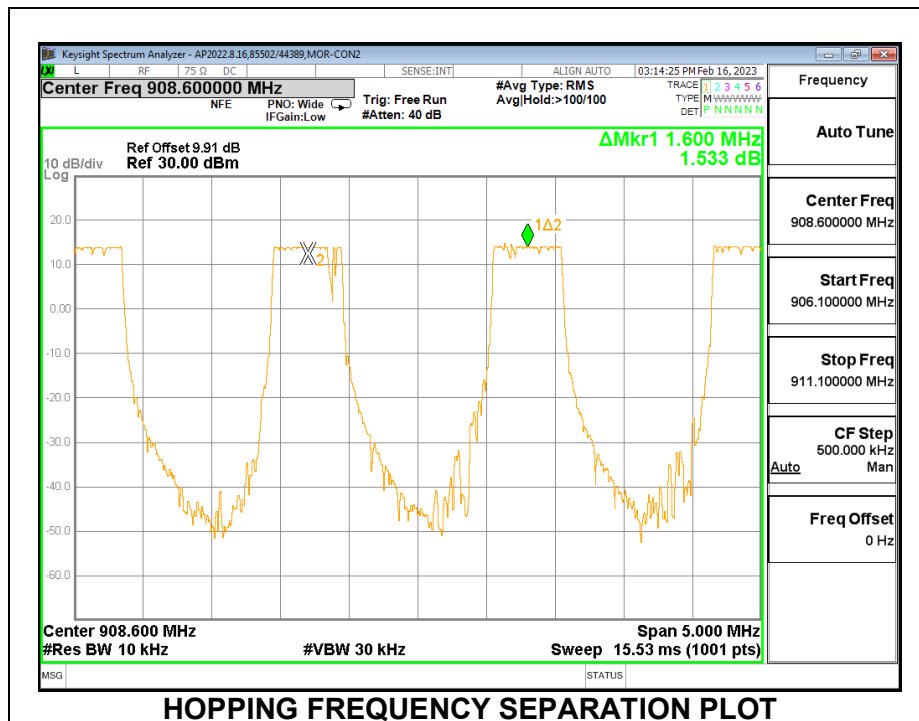
The transmitter output is connected to a spectrum analyzer. The RBW is set to 30% of the channel spacing adjusting as necessary to best identify the center of each individual channel and the VBW is set to $VBW \geq RBW$. The sweep time is coupled.

RESULTS

9.5.1. LoRa – 125kHz



9.5.2. LoRa – 500kHz



9.6. NUMBER OF HOPPING CHANNELS

LIMITS

For reporting purposes only (ref FCC §15.247 (f) and RSS-247 (5.3) (a))

TEST PROCEDURE

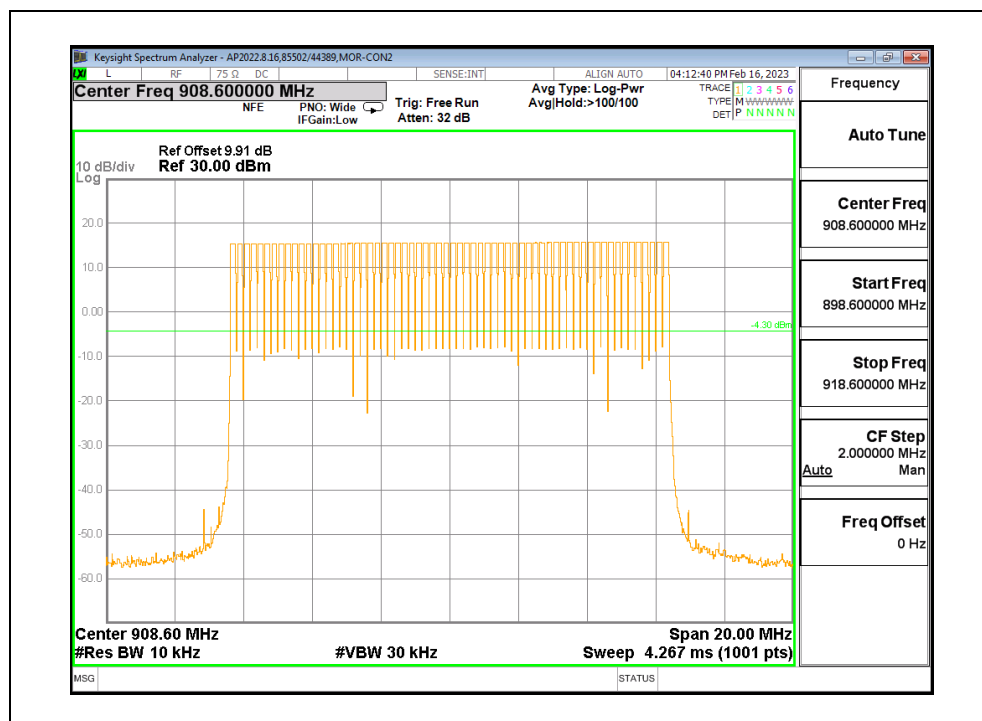
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 30% of the 20dB BW. The analyzer is set to Max Hold.

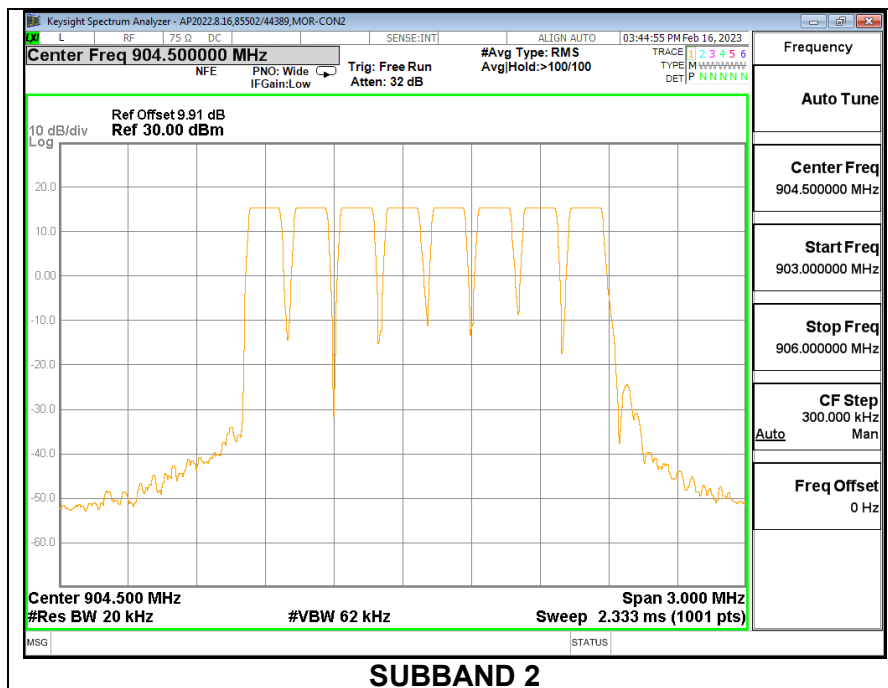
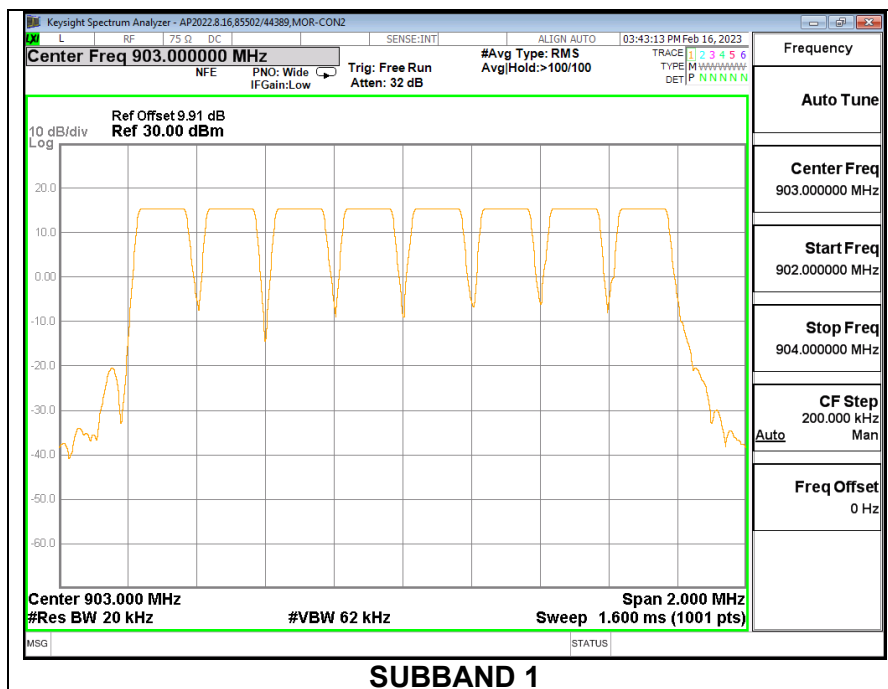
Mode 125kHz: 64 Total Channels (8 sub-bands with 8 channels per band) Observed. Note – The device will only operate on 1 sub-band or 8 channels at a time after the joining procedure.

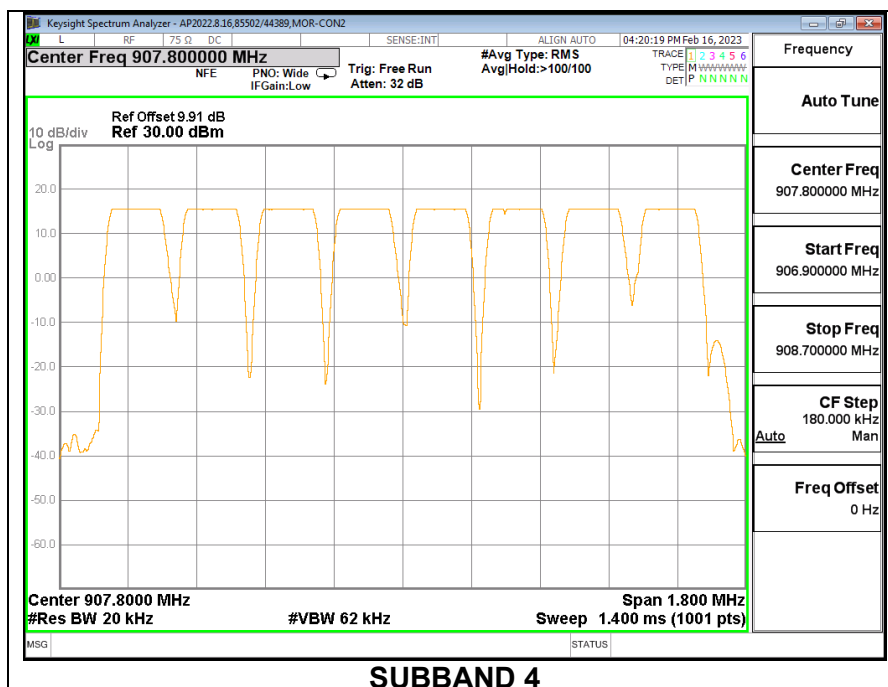
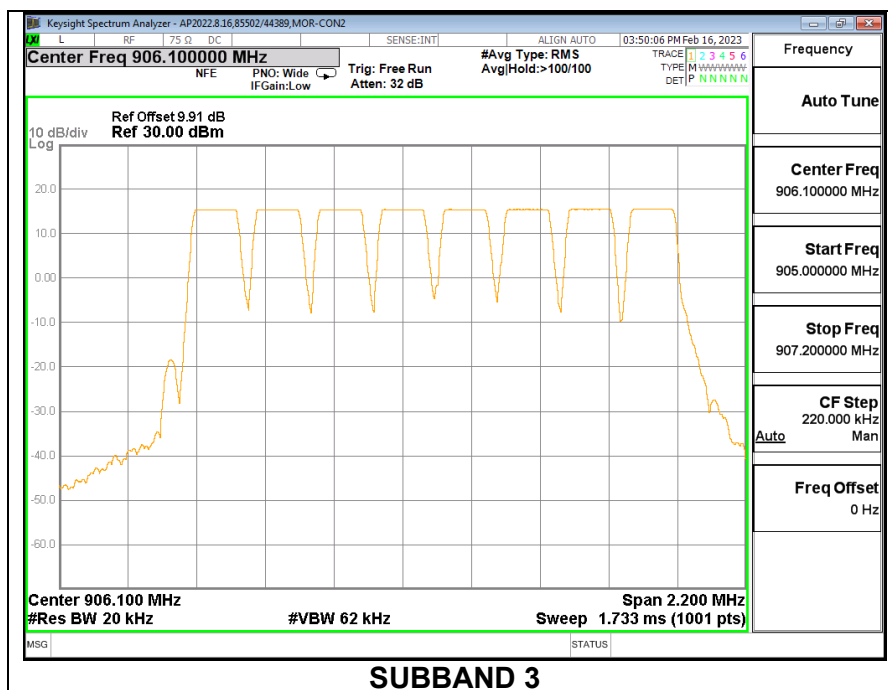
Mode 500kHz: 8 total channels observed.

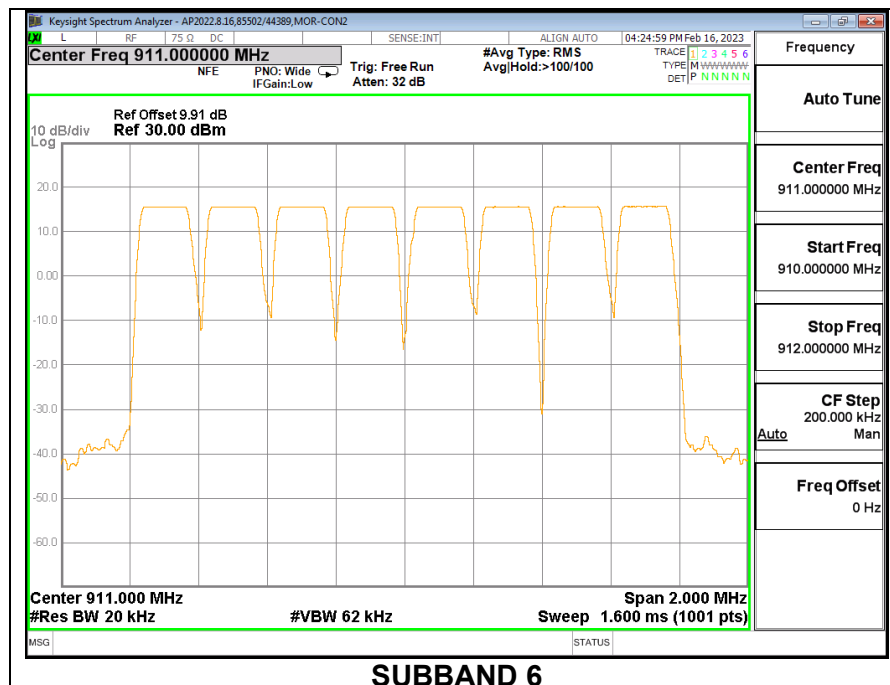
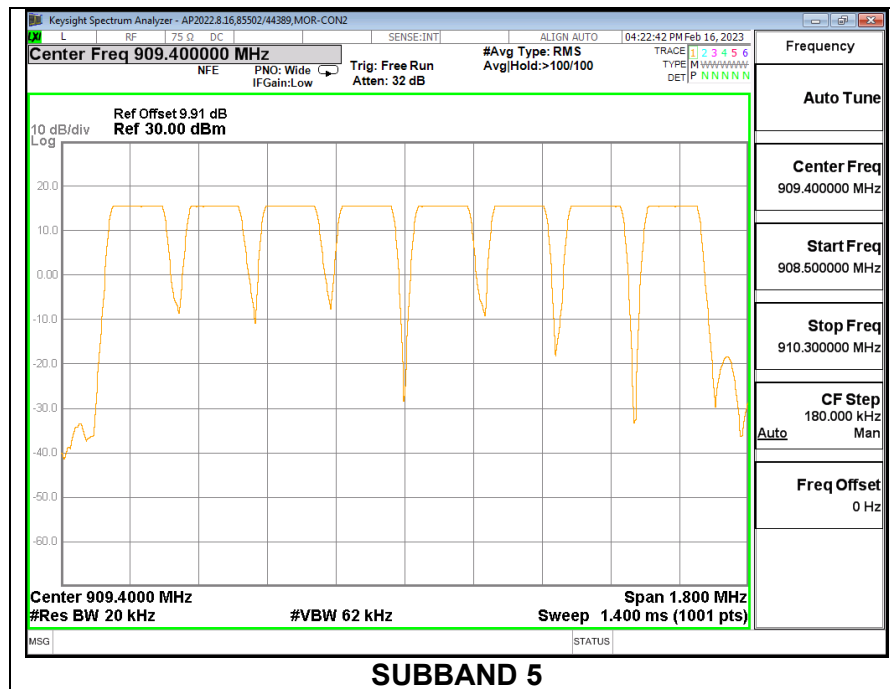
RESULTS

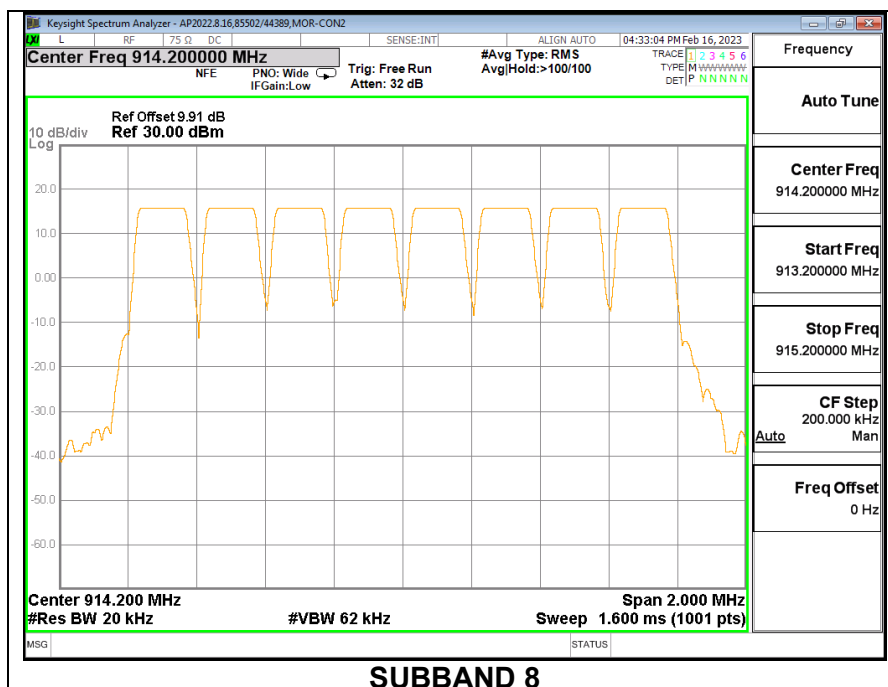
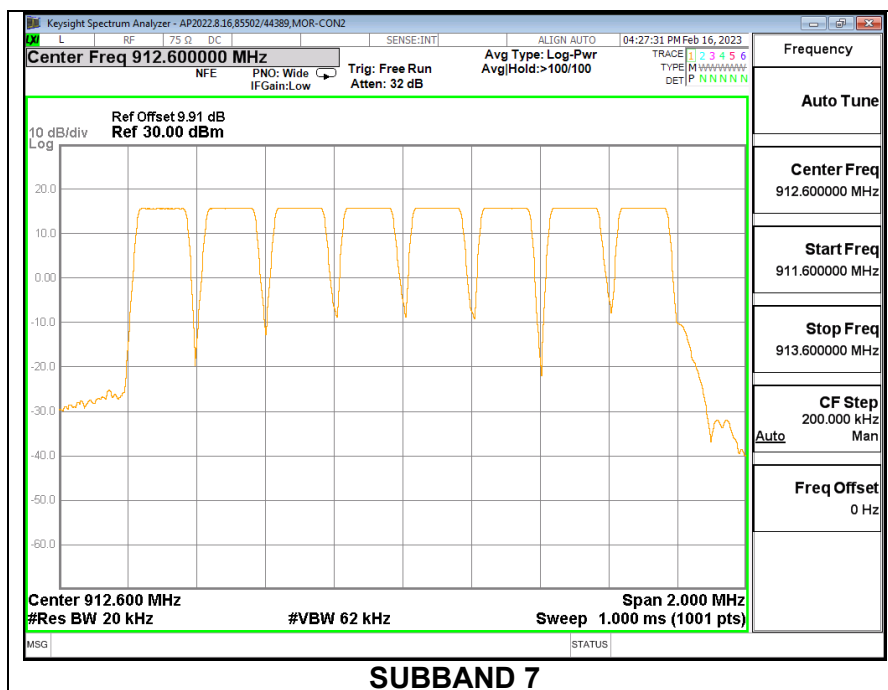
9.6.1. LoRa – 125kHz



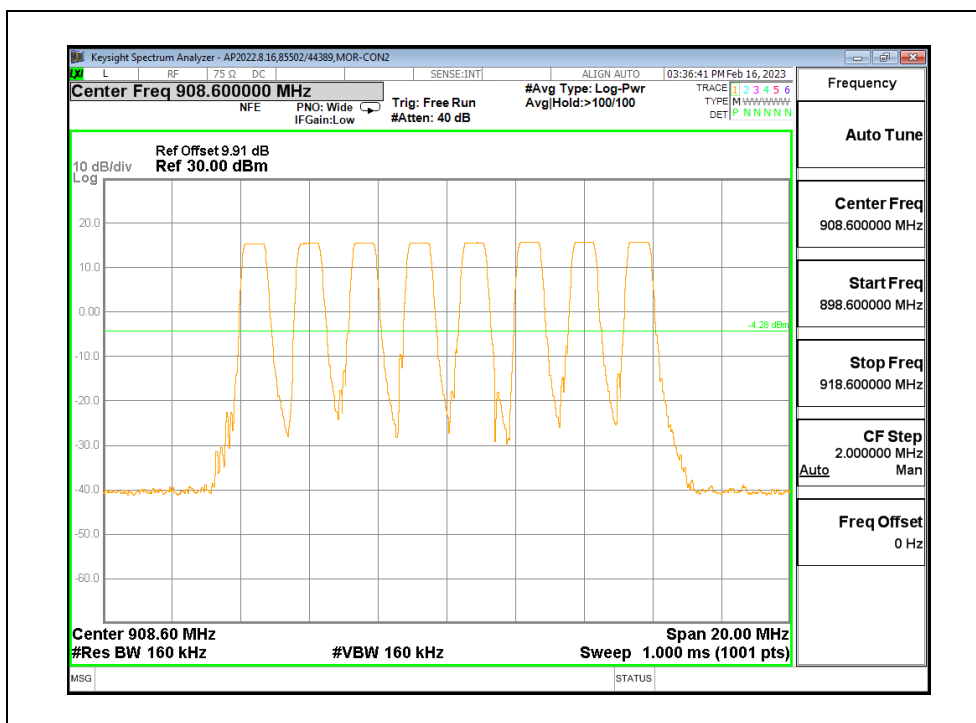








9.6.2. LoRa – 500kHz



9.7. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (f)
RSS-247 (5.3) (a)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.2 second scan, to enable resolution of each occurrence.

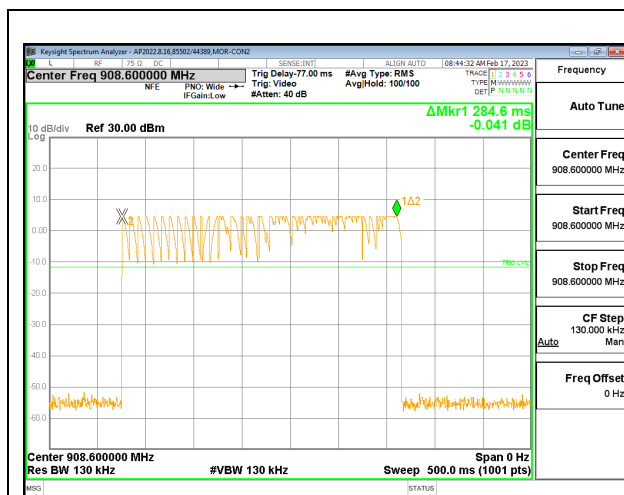
The average time of occupancy in the specified 3.2 second period (8 channels * 0.4 s) is equal to (# of pulses in 3.2 s) * pulse width.

Note – For the 125 kHz BW, the device will only operate on 1 sub-band or 8 channels at a time after the joining procedure. For the 500 kHz BW, the device operates on one of the 8 total channels at the time.

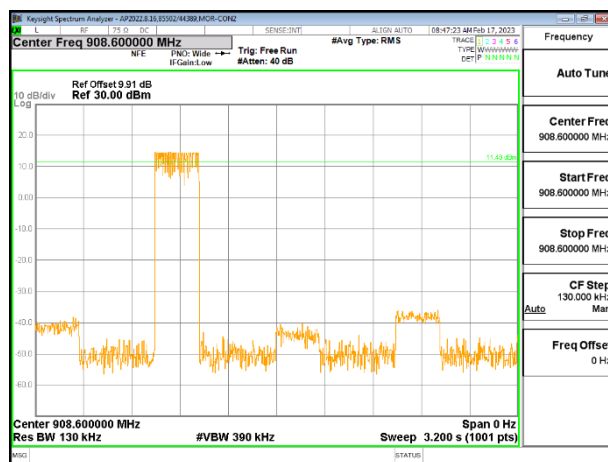
RESULTS

9.7.1. LoRa – 125 kHz

Pulse Width (msec)	Number of Pulses in 3.2s	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
284.6	1	0.2846	0.4	-0.1154



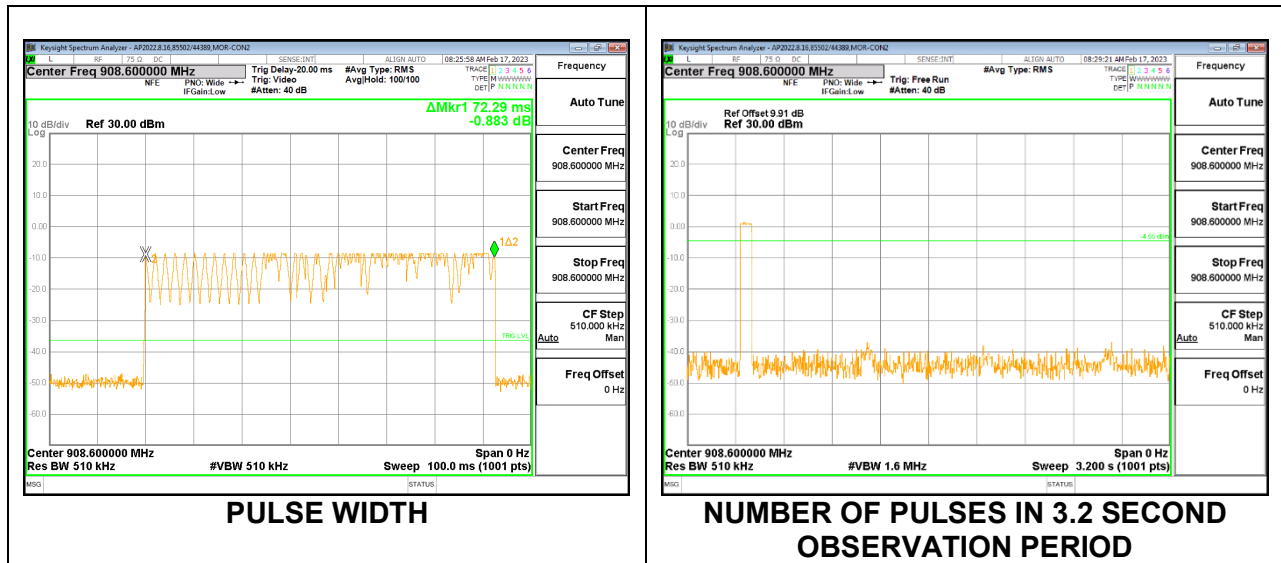
PULSE WIDTH



NUMBER OF PULSES IN 3.2 SECOND OBSERVATION PERIOD

9.7.2. LoRa – 500kHz

Pulse Width (msec)	Number of Pulses in 3.2s	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
72.29	1	0.0723	0.4	-0.3277



9.8. OUTPUT POWER

LIMITS

FCC §15.247 (b) (2) and (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 gated-average power meter for the 125 kHz bandwidth and a peak power meter for the 500 kHz bandwidth.

The cable assembly insertion loss of 9.91 dB, 0.25 dB (test cable) and a 9.66 (attenuator), was entered as an offset in the power meter.

RESULTS

9.8.1. LoRa – 125kHz

Tested By:	27465/44389
Date:	2023-03-10

Channel	Frequency (MHz)	AV power (dBm)	Limit (dBm)	Margin (dB)
Low	902.3	14.85	30	-15.15
Middle	908.6	14.96	30	-15.04
High	914.9	15	30	-15.00

9.8.2. LoRa – 500kHz

Tested By:	85502/44389
Date:	2023-02-16

Channel	Frequency (MHz)	PK Power (dBm)	Limit (dBm)	Margin (dB)
Low	903	15.34	30	-14.66
Middle	908.6	15.54	30	-14.46
High	914.2	15.66	30	-14.34

9.9. 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.

FCC §15.247 (f)

RSS-247 (5.3) (b)

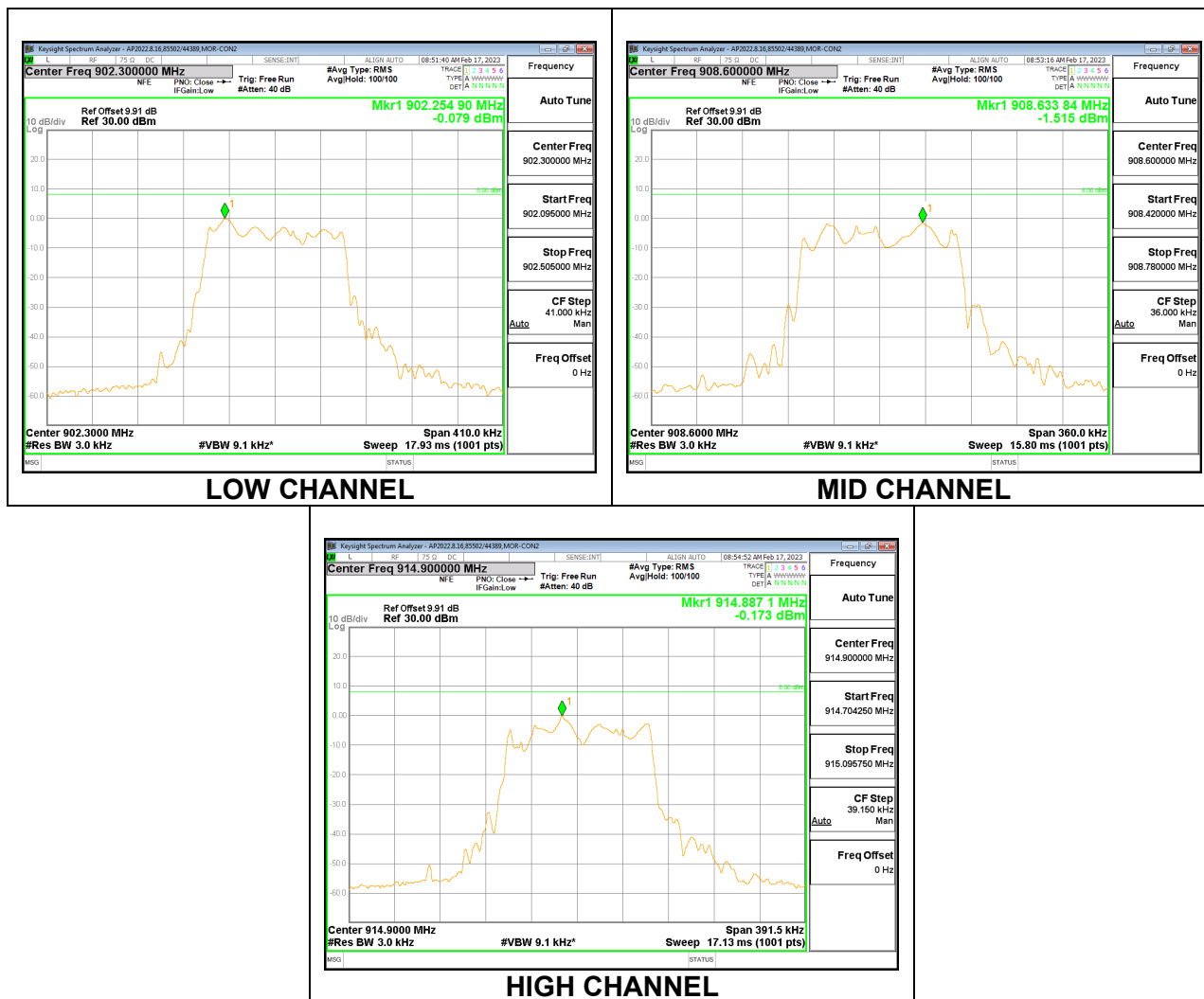
The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

NOTE: Average PSD method was used for 125 kHz bandwidth since peak PSD method did not pass the required limit. However, for 500 kHz bandwidth, peak PSD was still used.

RESULTS

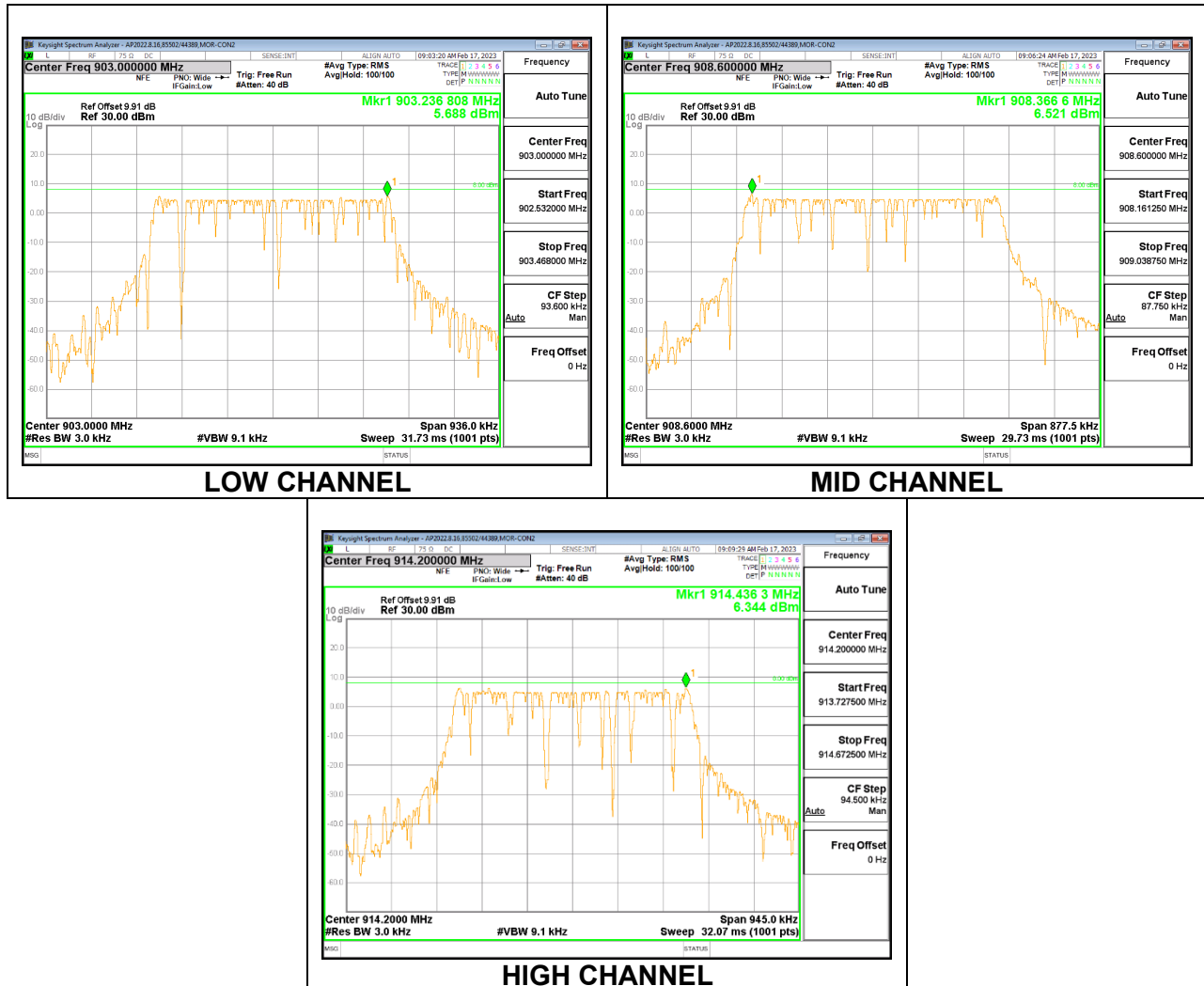
9.9.1. LoRa – 125kHz

Channel	Frequency (MHz)	PSD (dBm/3kHz)	DCCF (dB)	Corrected PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	902.3	-0.079	3.81	3.73	8	-4.27
Middle	908.6	-1.515	3.81	2.30	8	-5.71
High	914.9	-0.173	3.81	3.64	8	-4.36



9.9.2. LoRa – 500kHz

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	903	5.688	8	-2.31
Middle	908.6	6.521	8	-1.48
High	914.2	6.344	8	-1.66



9.10. CONDUCTED SPURIOUS EMISSIONS

LIMITS

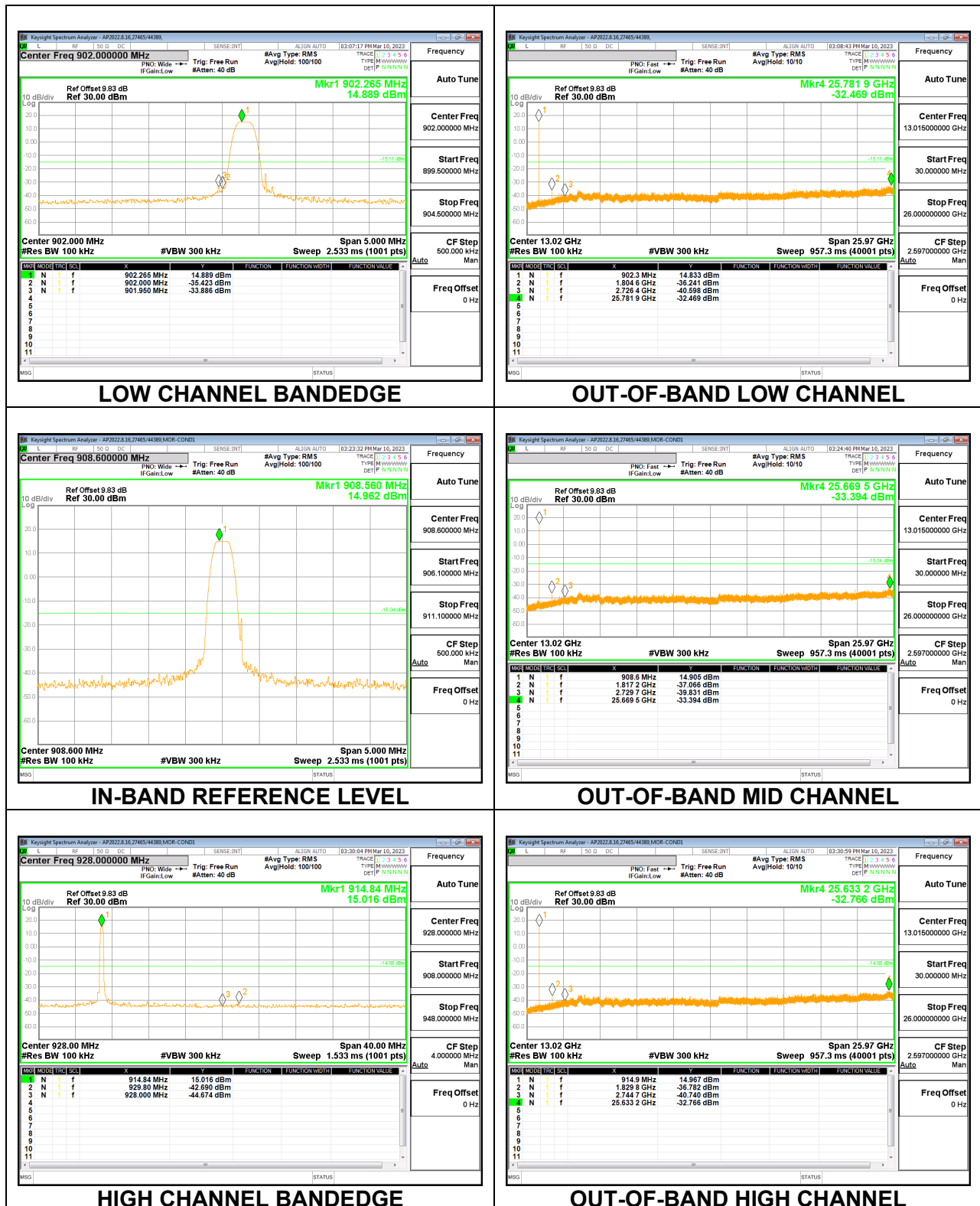
FCC §15.247 (d)

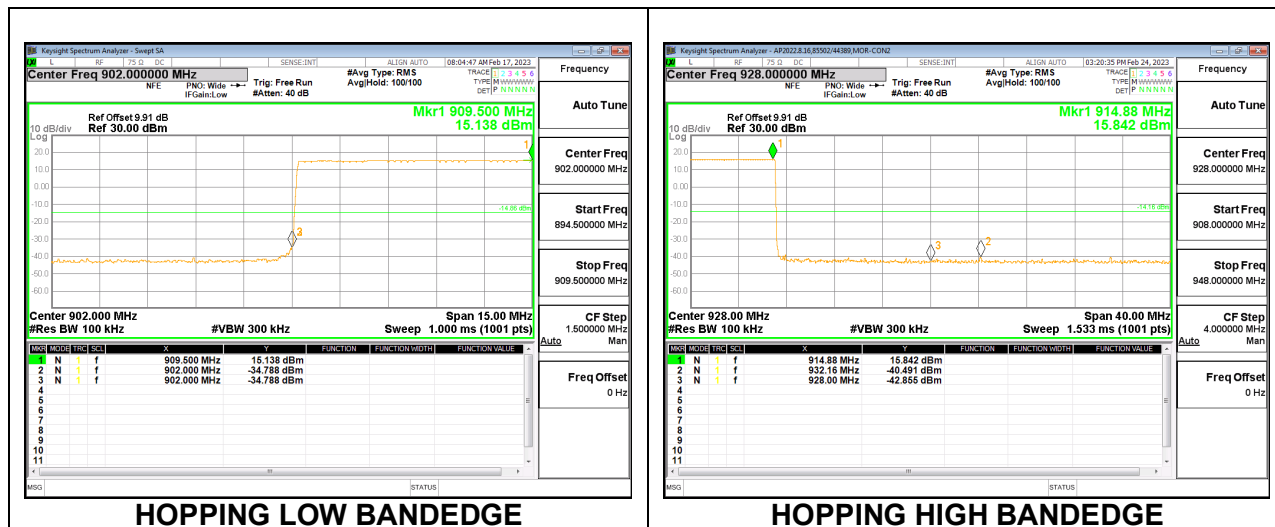
RSS-247 5.5

Output power was measured based on the use of an average measurement for the 125 kHz bandwidth, therefore the required attenuation is -30dBc. Output power for the 500 kHz bandwidth was based on the use of a peak measurement, therefore its required attenuation is -20dBc.

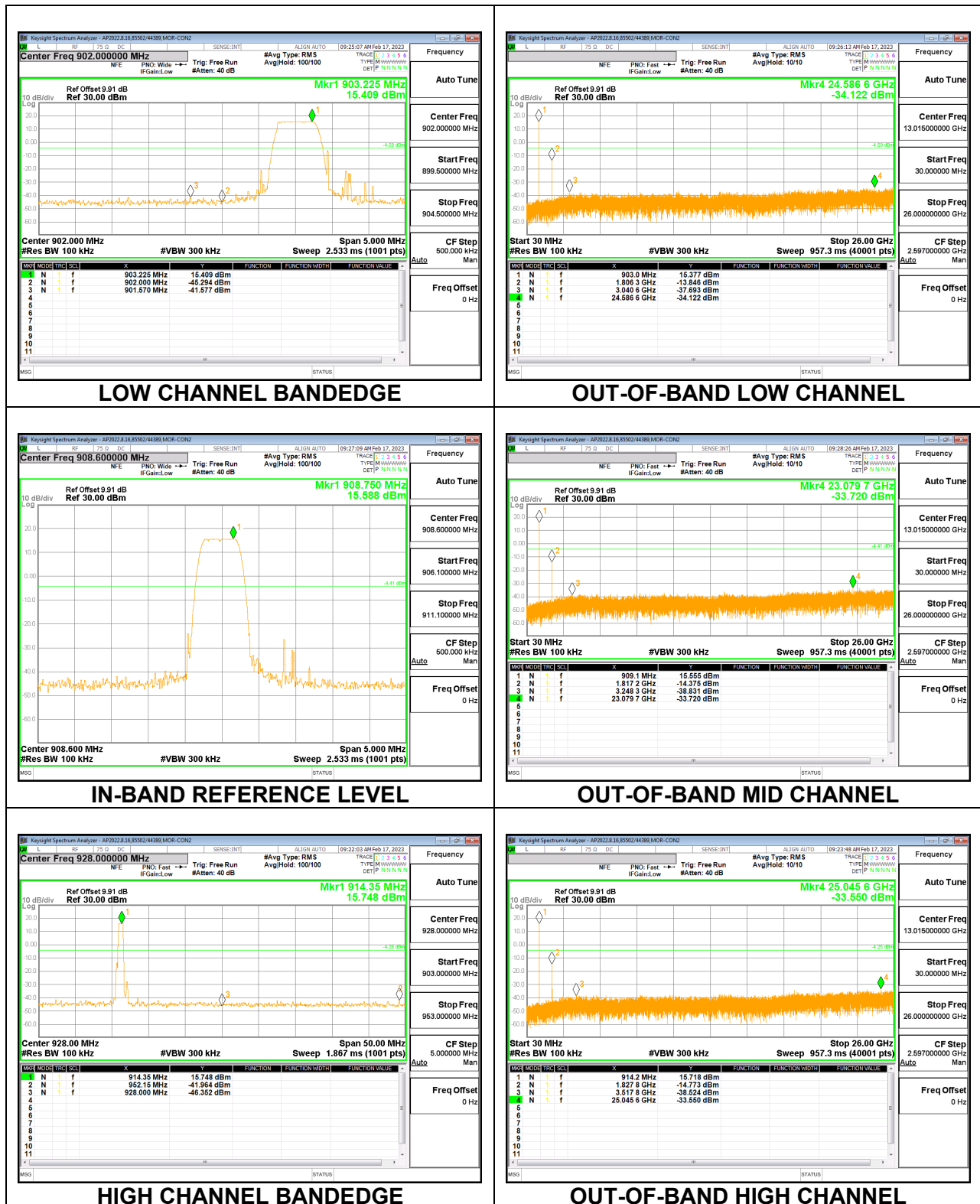
RESULTS

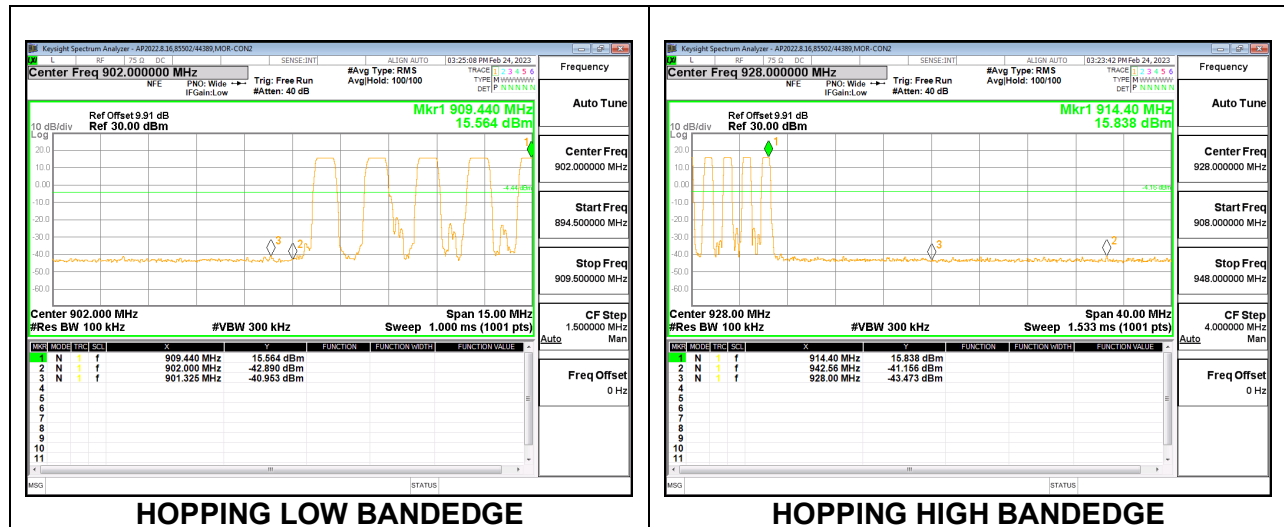
9.10.1. LoRa – 125kHz





9.10.2. LoRa – 500kHz





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. For this project the linear averaging method is to use $VBW \geq 1/T_{on}$, where T_{on} is the on time.

The spectrum from 30 MHz to 1000 MHz and 1 GHz to 10 GHz is investigated with the transmitter set to the low, mid, and high channels in each applicable band. Below 30 MHz 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.

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

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

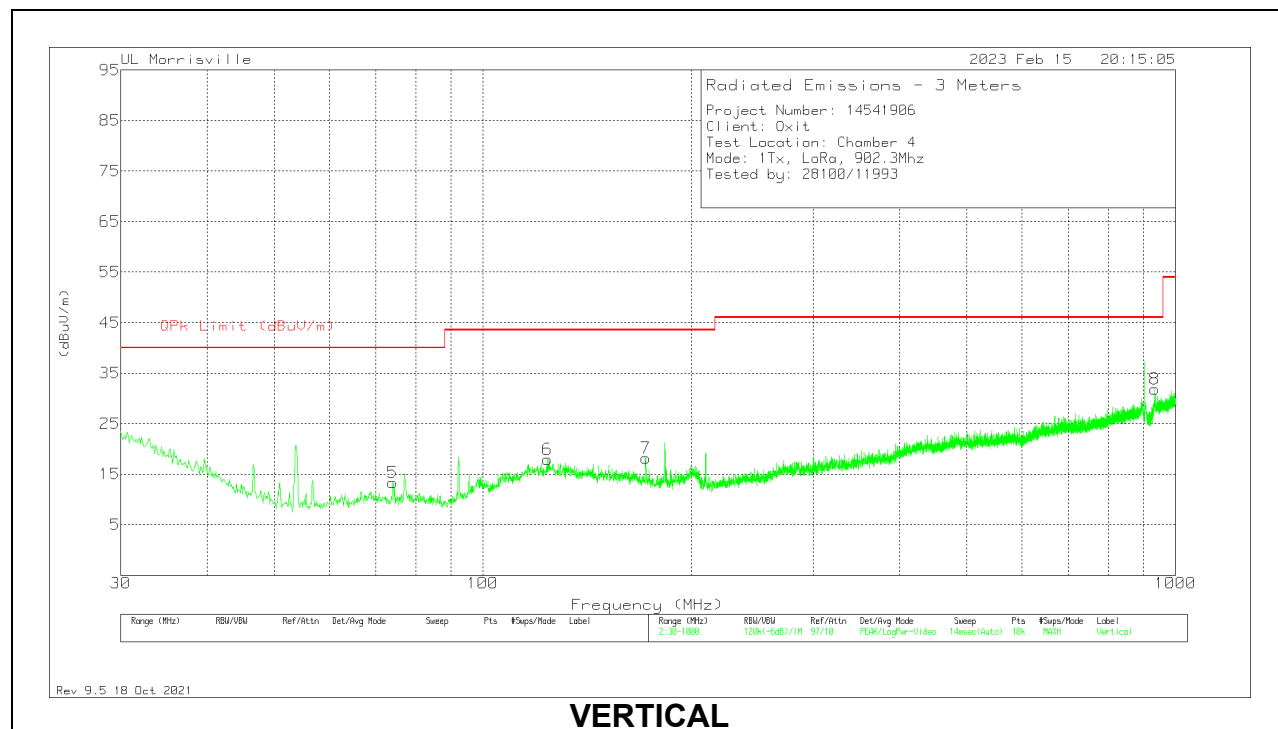
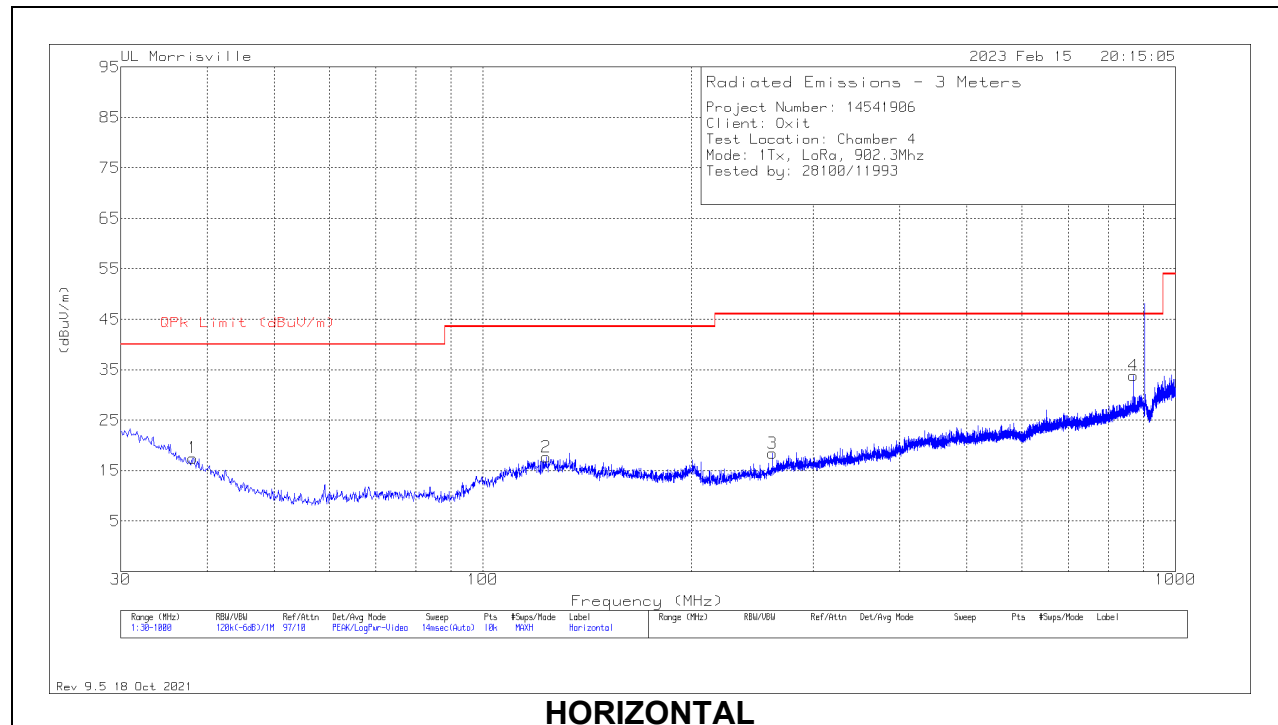
KDB 414788 Open Field Site (OFS) and Chamber Correlation Justification

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

10.2. LoRa - 125kHz

10.2.1. TRANSMITTER BELOW 1GHz HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



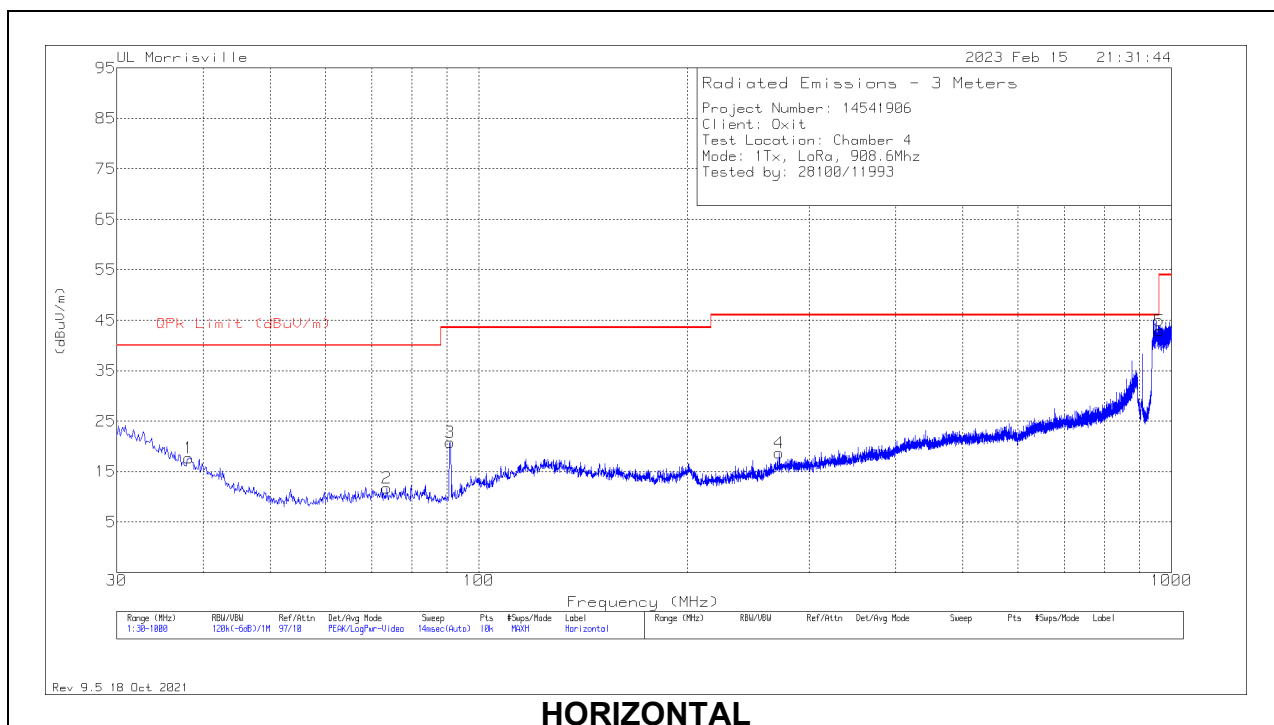
RADIATED EMISSIONS

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
1	* 38.148	28	Pk	21.1	-31.7	.1	17.5	40	-22.5	0-360	200	H
2	* 123.314	27.74	Pk	20.1	-30.5	.4	17.74	43.52	-25.78	0-360	300	H
3	* 261.733	29.1	Pk	18.2	-29.3	.4	18.4	46.02	-27.62	0-360	200	H
5	* 74.135	29.78	Pk	14.4	-31	.2	13.38	40	-26.62	0-360	200	V
6	* 123.993	27.95	Pk	20.1	-30.5	.4	17.95	43.52	-25.57	0-360	100	V
7	* 171.814	30.08	Pk	17.8	-30	.3	18.18	43.52	-25.34	0-360	100	V
4	870.311	30.57	Pk	28	-25.8	1.1	33.87	-	-	0-360	100	H
8	933.846	26.6	Pk	28.9	-24.9	1.2	31.8	-	-	0-360	200	V

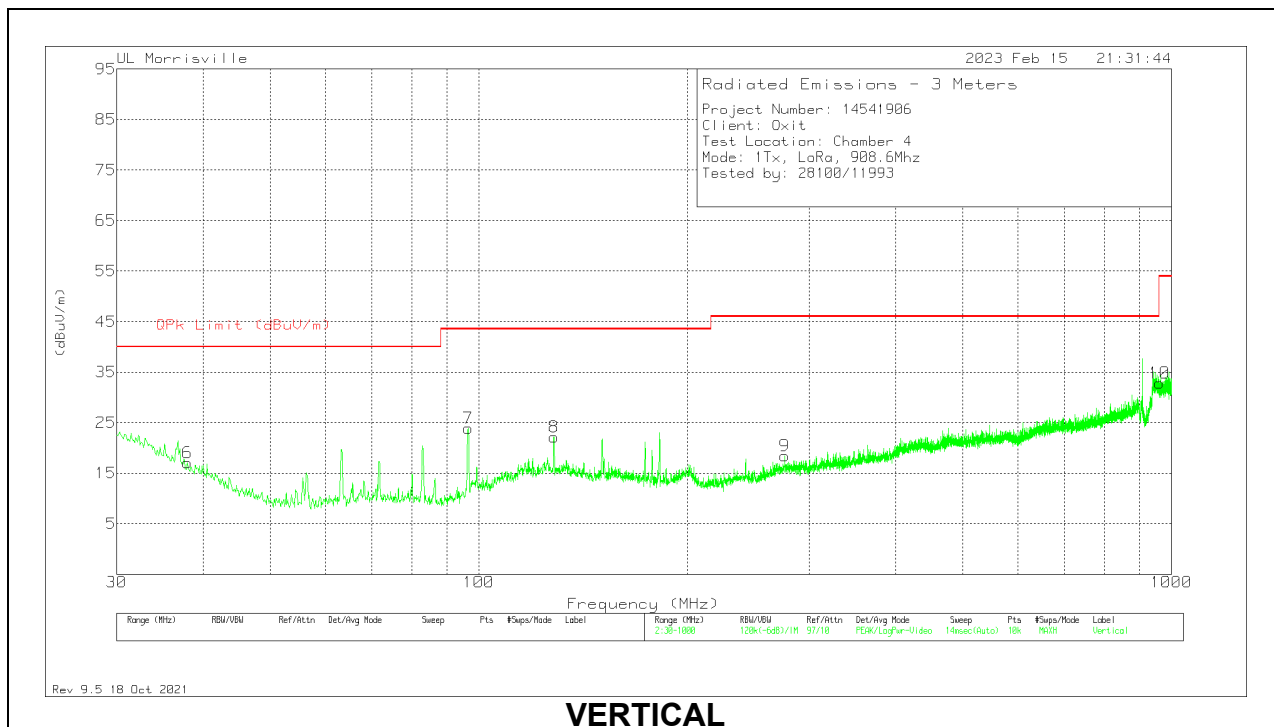
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

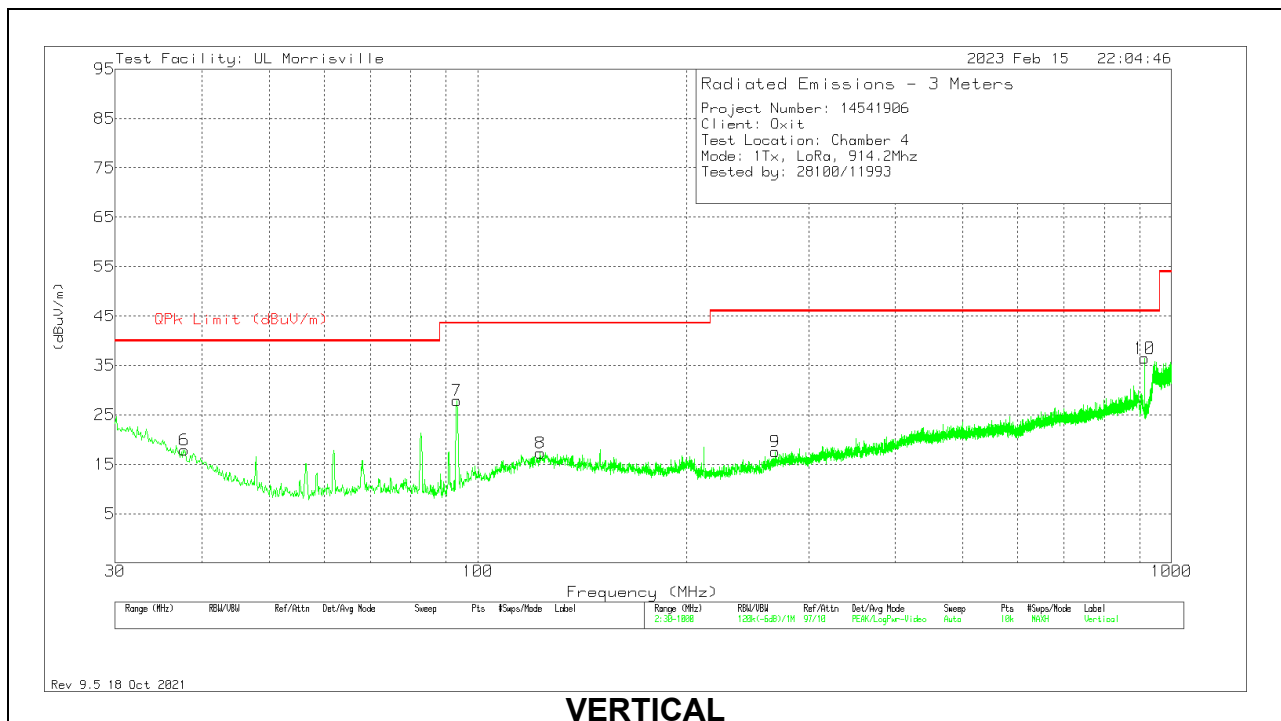
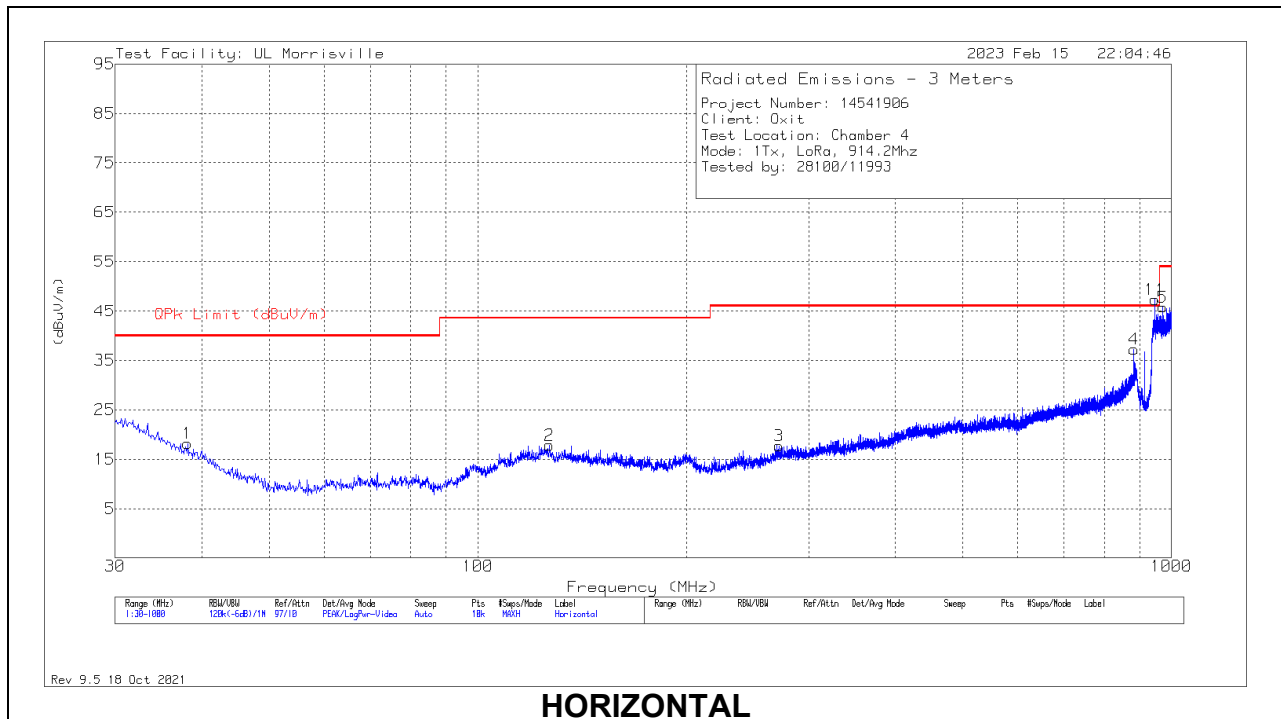
RADIATED EMISSIONS

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	* 38.148	28.14	Pk	21.1	-31.7	.1	17.64	40	-22.36	0-360	100	H
2	* 73.65	28.24	Pk	14.4	-31.1	.2	11.74	40	-28.26	0-360	200	H
4	* 271.53	28.17	Pk	19.3	-29.2	.4	18.67	46.02	-27.35	0-360	100	H
5	* 960.715	37.66	Pk	28.8	-24.6	1	42.86	53.97	-11.11	0-360	100	H
6	* 37.954	27.56	Pk	21.2	-31.8	.1	17.06	40	-22.94	0-360	200	V
8	* 128.358	32.38	Pk	20	-30.6	.4	22.18	43.52	-21.34	0-360	100	V
9	* 276.574	27.88	Pk	19.4	-29.3	.4	18.38	46.02	-27.64	0-360	100	V
10	* 960.715	27.64	Pk	28.8	-24.6	1	32.84	53.97	-21.13	0-360	100	V
3	90.819	37.06	Pk	14.2	-30.7	.2	20.76	-	-	0-360	200	H
7	96.445	38.25	Pk	16.2	-30.8	.2	23.85	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-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	* 38.148	28.69	Pk	21.1	-31.7	.1	18.19	40	-21.81	0-360	200	H
2	* 126.806	28.02	Pk	20	-30.6	.4	17.82	43.52	-25.7	0-360	100	H
3	* 271.821	27.03	Pk	19.3	-29	.4	17.73	46.02	-28.29	0-360	100	H
5	* 971.676	39.99	Pk	29	-24.2	1	45.79	53.97	-8.18	0-360	100	H
6	* 37.76	28.2	Pk	21.4	-31.8	.1	17.9	40	-22.1	0-360	200	V
8	* 123.023	27.29	Pk	20.1	-30.5	.4	17.29	43.52	-26.23	0-360	200	V
9	* 268.426	27.57	Pk	19	-29.4	.4	17.57	46.02	-28.45	0-360	100	V
7	93.244	43.57	Pk	14.9	-30.8	.2	27.87	-	-	0-360	100	V
4	883.018	33.65	Pk	28	-25.6	1.2	37.25	-	-	0-360	100	H
10	914.931	31.95	Pk	28.5	-25.2	1.2	36.45	-	-	0-360	100	V
11	946.941	41.84	Pk	29	-24.7	1.2	47.34	-	-	0-360	100	H

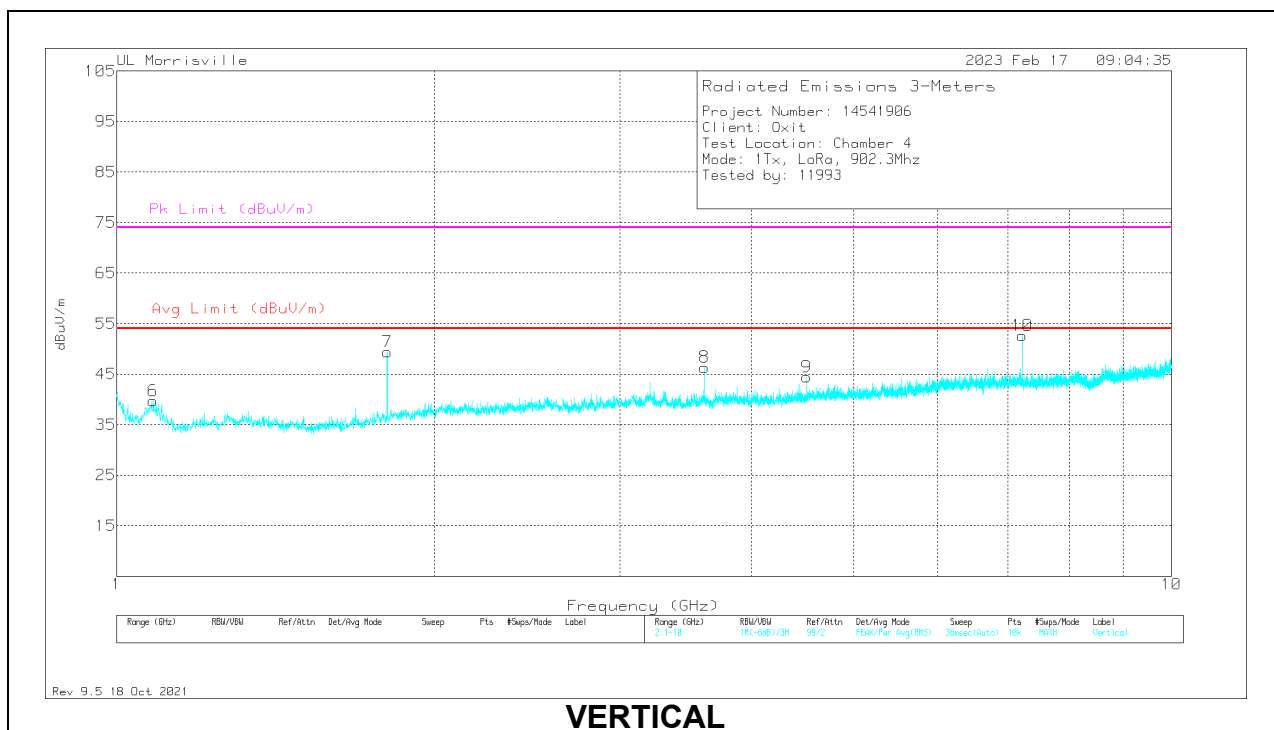
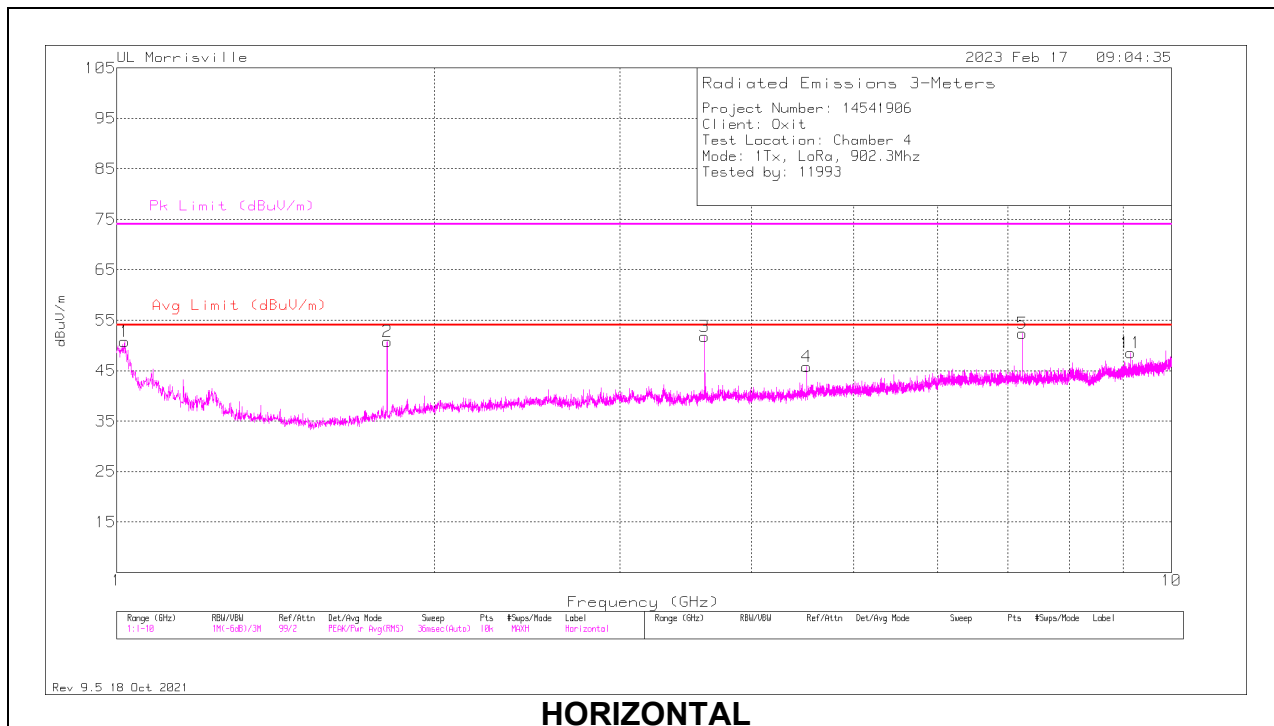
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

10.2.2. TRANSMITTER ABOVE 1 GHz

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (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	* 1.01733	56.66	PK2	27.4	-35.5	1.9	50.46	-	-	74	-23.54	348	170	H
	* 1.01732	45.12	V1TV	27.4	-35.5	1.9	38.92	54	-15.08	-	-	348	170	H
3	* 3.60917	54.53	PK2	33.1	-34.3	.6	53.93	-	-	74	-20.07	302	107	H
	* 3.60905	51.46	V1TV	33.1	-34.3	.6	50.86	54	-3.14	-	-	302	107	H
4	* 4.5118	43.75	Pk	33.8	-32.1	.4	45.85	54	-8.15	74	-28.15	0-360	100	H
11	* 9.15061	36.46	PK2	36.2	-26.6	.5	46.56	-	-	74	-27.44	165	373	H
	* 9.15045	23.96	V1TV	36.2	-26.6	.5	34.06	54	-19.94	-	-	165	373	H
6	* 1.0828	46.58	Pk	27.5	-35.6	1.2	39.68	54	-14.32	74	-34.32	0-360	400	V
8	* 3.6091	46.97	Pk	33.1	-34.3	.6	46.37	54	-7.63	74	-27.63	0-360	400	V
9	* 4.5118	42.36	Pk	33.8	-32.1	.4	44.46	54	-9.54	74	-29.54	0-360	400	V
2	1.8046	56.33	Pk	30.4	-36.3	.4	50.83	-	-	-	-	0-360	200	H
7	1.8046	54.88	Pk	30.4	-36.3	.4	49.38	-	-	-	-	0-360	400	V
5	7.2181	45.03	Pk	35.7	-28.9	.6	52.43	-	-	-	-	0-360	100	H
10	7.219	45.21	Pk	35.7	-28.9	.6	52.61	-	-	-	-	0-360	200	V

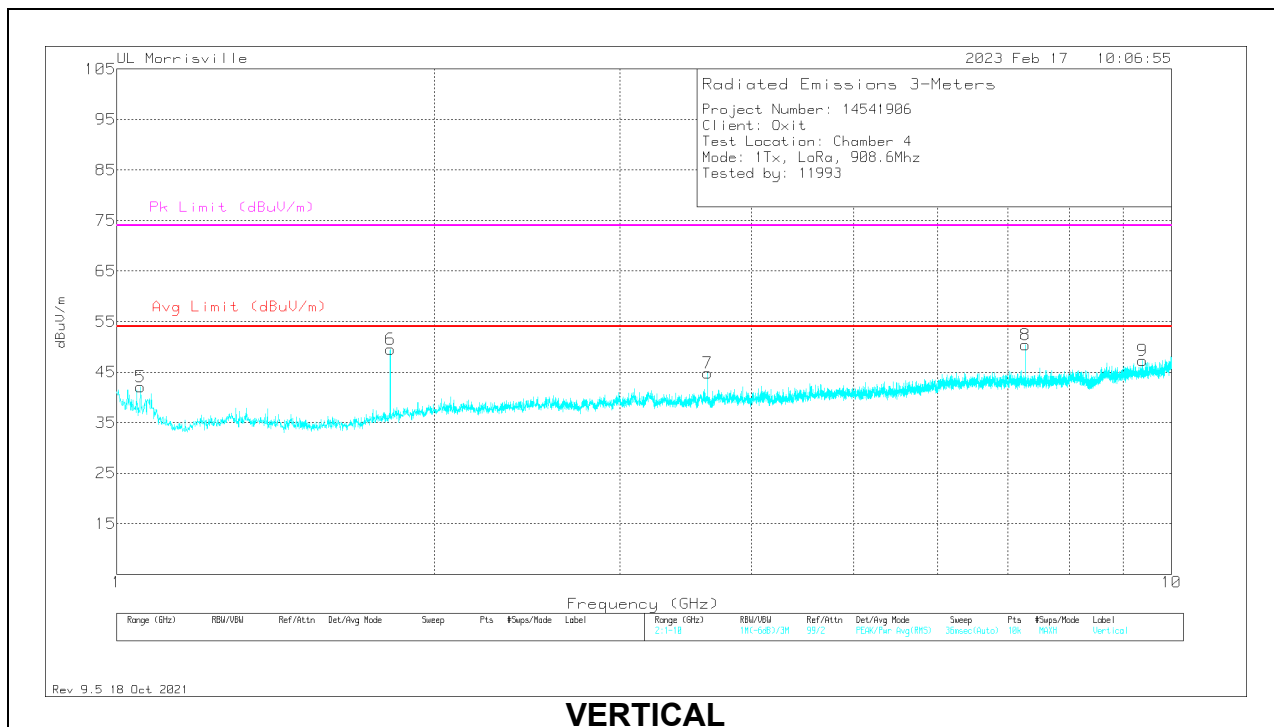
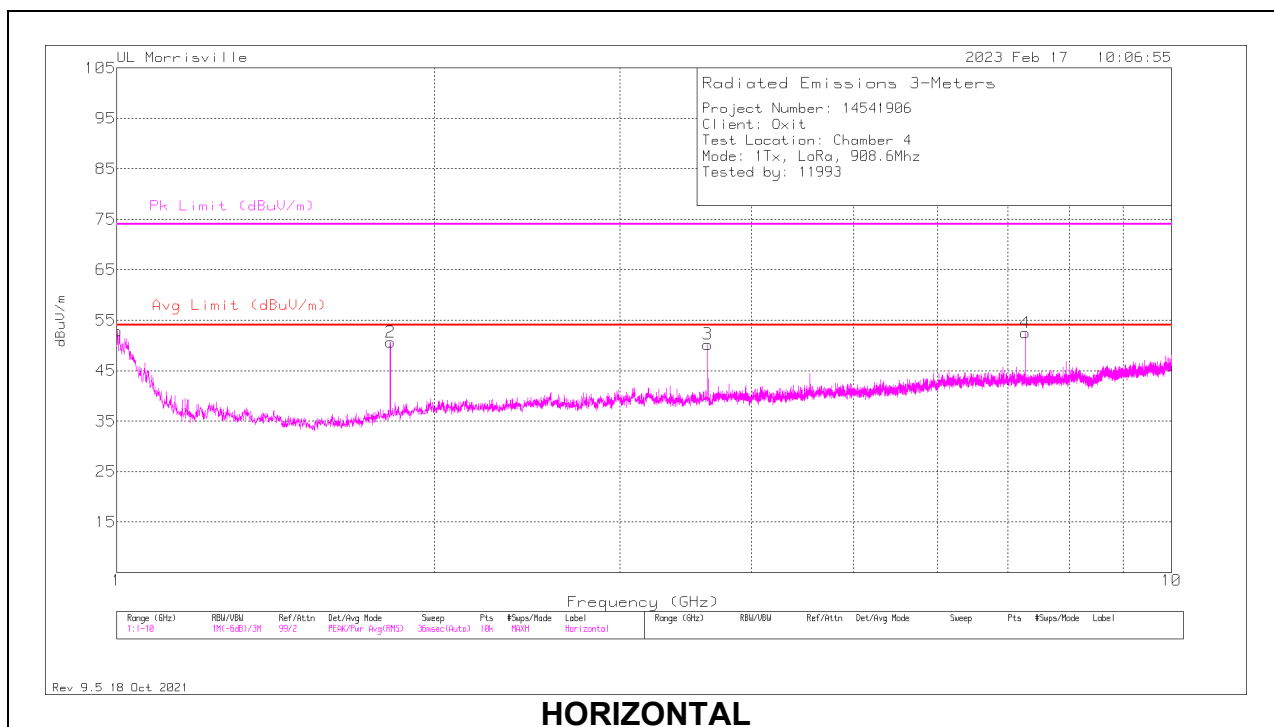
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (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	59.04	PK2	27.8	-35.4	2.6	54.04	-	-	74	-19.96	207	271	H
	* 1.00009	46.93	V1TV	27.8	-35.4	2.6	41.93	54	-12.07	-	-	207	271	H
3	* 3.63425	53	PK2	33.1	-34.4	.4	52.1	-	-	74	-21.9	144	103	H
	* 3.6342	50.52	V1TV	33.1	-34.4	.4	49.62	54	-4.38	-	-	144	103	H
4	* 7.26904	47.26	PK2	35.7	-28.5	.5	54.96	-	-	74	-19.04	116	104	H
	* 7.26902	44.34	V1TV	35.7	-28.5	.5	52.04	54	-1.96	-	-	116	104	H
5	* 1.0531	49.64	Pk	26.9	-35.8	1.3	42.04	54	-11.96	74	-31.96	0-360	400	V
7	* 3.6343	45.68	Pk	33.1	-34.4	.4	44.78	54	-9.22	74	-29.22	0-360	400	V
8	* 7.26835	45.27	PK2	35.7	-28.5	.5	52.97	-	-	74	-21.03	122	103	V
	* 7.26914	41.86	V1TV	35.7	-28.5	.5	49.56	54	-4.44	-	-	122	103	V
9	* 9.3889	36.52	Pk	36.5	-26.4	.7	47.32	54	-6.68	74	-26.68	0-360	400	V
2	1.8172	55.97	Pk	30.6	-36.3	.4	50.67	-	-	-	-	0-360	100	H
6	1.8172	54.82	Pk	30.6	-36.3	.4	49.52	-	-	-	-	0-360	400	V

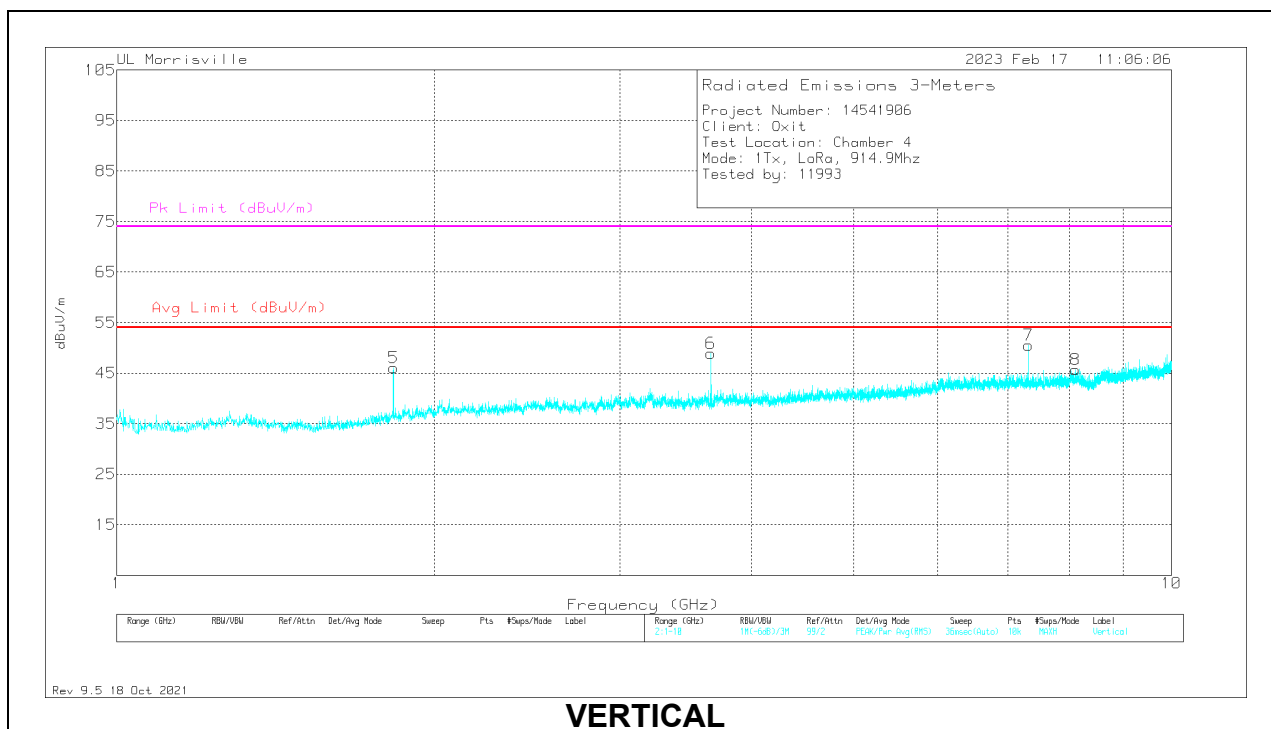
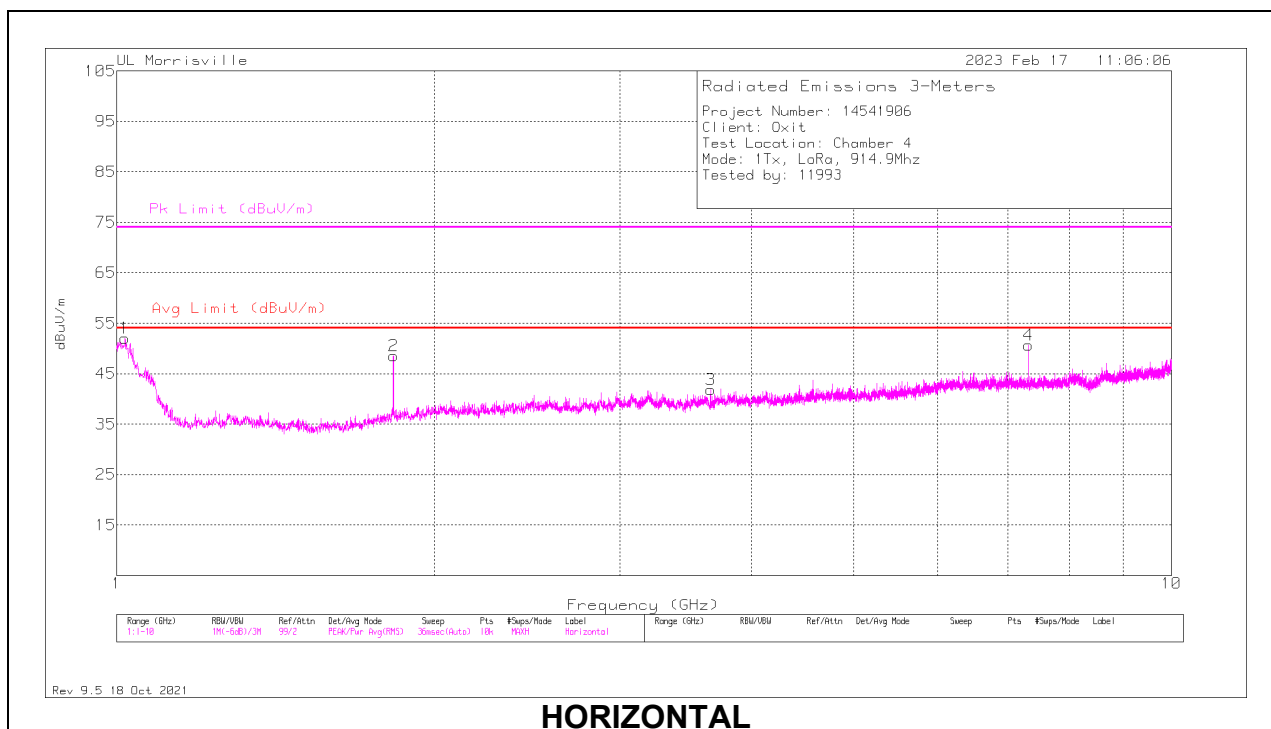
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (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	* 1.0187	62.14	PK2	27.4	-35.5	1.9	55.94	-	-	74	-18.06	201	190	H
	* 1.01738	47.32	V1TV	27.4	-35.5	1.9	41.12	54	-12.88	-	-	201	190	H
3	* 3.6595	42.78	Pk	33.1	-34.3	.3	41.88	54	-12.12	74	-32.12	0-360	100	H
4	* 7.31876	44.92	PK2	35.6	-28.8	.6	52.32	-	-	74	-21.68	96	195	H
	* 7.3192	39.04	V1TV	35.6	-28.8	.6	46.44	54	-7.56	-	-	96	195	H
6	* 3.65955	46.18	PK2	33.1	-34.3	.3	45.28	-	-	74	-28.72	98	253	V
	* 3.65966	39.86	V1TV	33.1	-34.3	.3	38.96	54	-15.04	-	-	98	253	V
7	* 7.31908	40.96	PK2	35.6	-28.8	.6	48.36	-	-	74	-25.64	162	397	V
	* 7.31922	31.93	V1TV	35.6	-28.8	.6	39.33	54	-14.67	-	-	162	397	V
8	* 8.1136	37.57	Pk	35.8	-28.1	.4	45.67	54	-8.33	74	-28.33	0-360	200	V
2	1.8298	53.57	Pk	30.8	-36.2	.4	48.57	-	-	-	-	0-360	100	H
5	1.8298	51.04	Pk	30.8	-36.2	.4	46.04	-	-	-	-	0-360	400	V

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

Pk - Peak detector

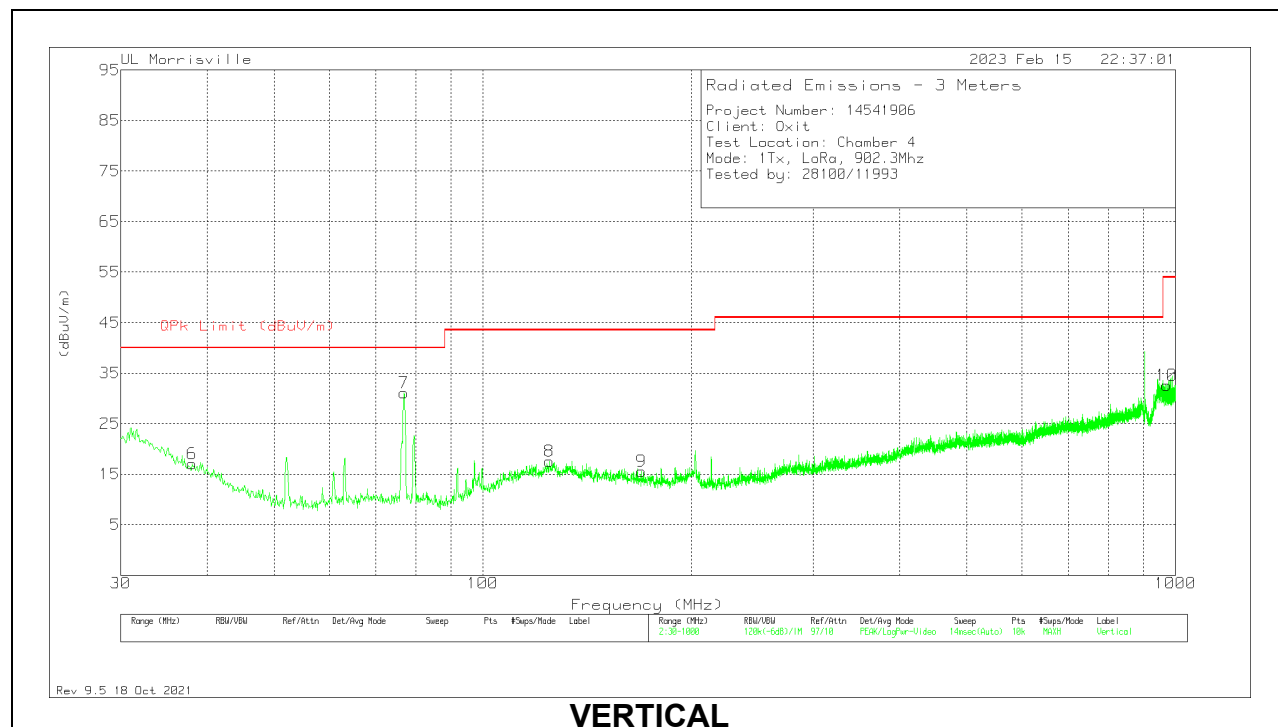
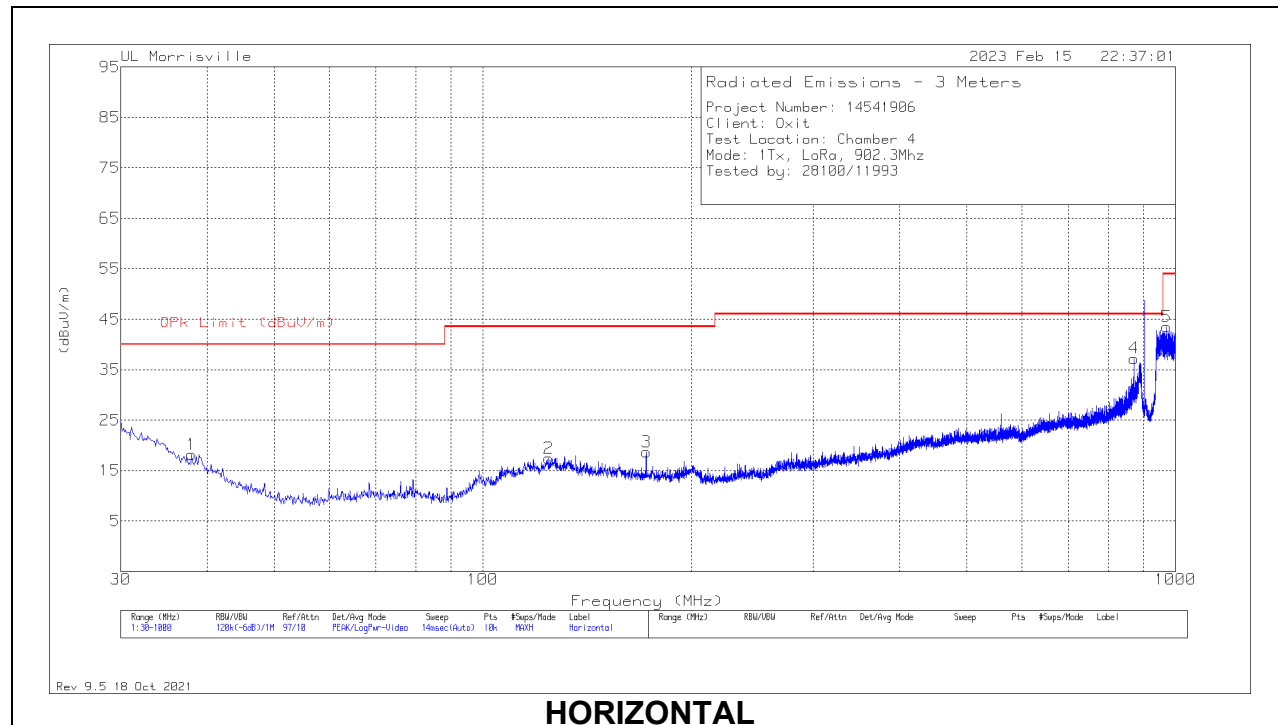
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

10.3. LoRa - 500kHz

10.3.1. TRANSMITTER BELOW 1 GHz HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS

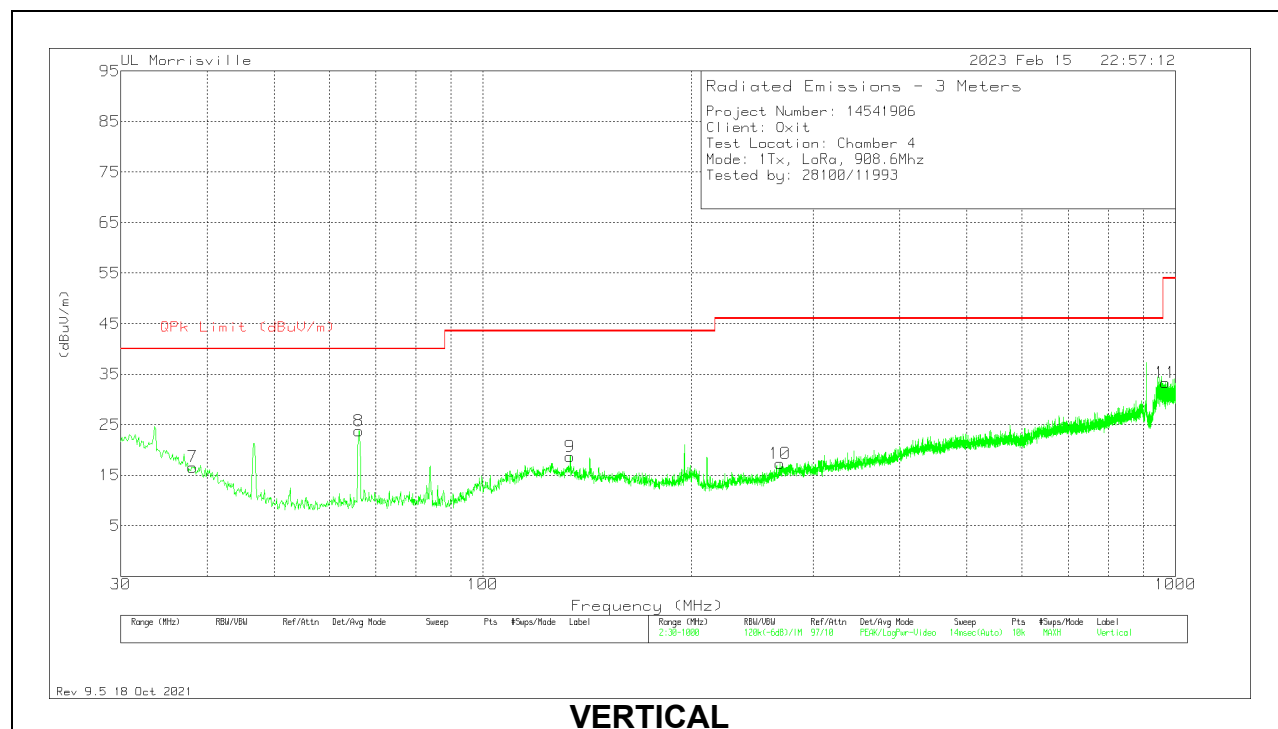
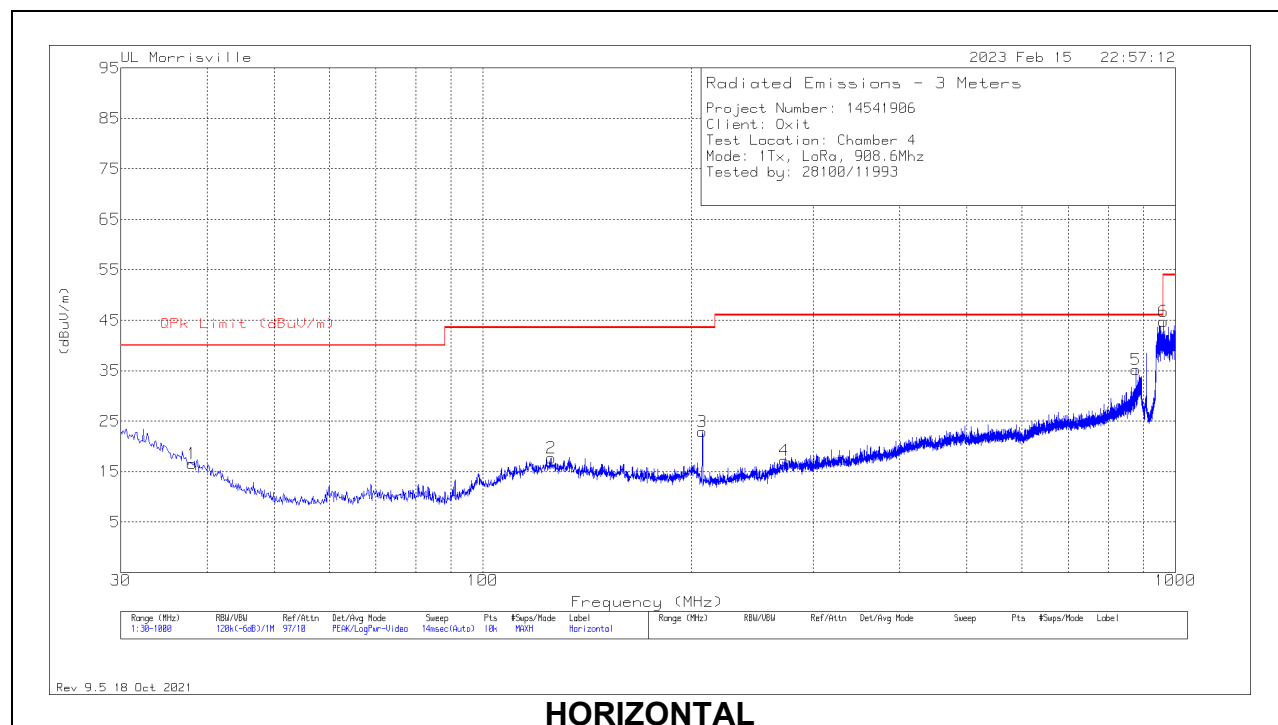


RADIATED EMISSIONS

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
1	* 37.954	28.64	Pk	21.2	-31.8	.1	18.14	40	-21.86	0-360	100	H
2	* 124.478	27.49	Pk	20.1	-30.5	.4	17.49	43.52	-26.03	0-360	200	H
3	* 172.202	30.62	Pk	17.8	-30	.3	18.72	43.52	-24.8	0-360	100	H
5	* 970.221	37.88	Pk	29	-24.4	1	43.48	53.97	-10.49	0-360	100	H
6	* 38.051	27.42	Pk	21.2	-31.7	.1	17.02	40	-22.98	0-360	100	V
8	* 124.672	27.48	Pk	20.1	-30.4	.4	17.58	43.52	-25.94	0-360	200	V
9	* 169.486	27.49	Pk	18	-30.2	.3	15.59	43.52	-27.93	0-360	100	V
10	* 970.415	26.87	Pk	29	-24.3	1	32.57	53.97	-21.4	0-360	100	V
7	76.948	47.8	Pk	14.3	-31.3	.3	31.1	-	-	0-360	100	V
4	870.893	34.04	Pk	28	-25.9	1.1	37.24	-	-	0-360	100	H

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

MID CHANNEL RESULTS

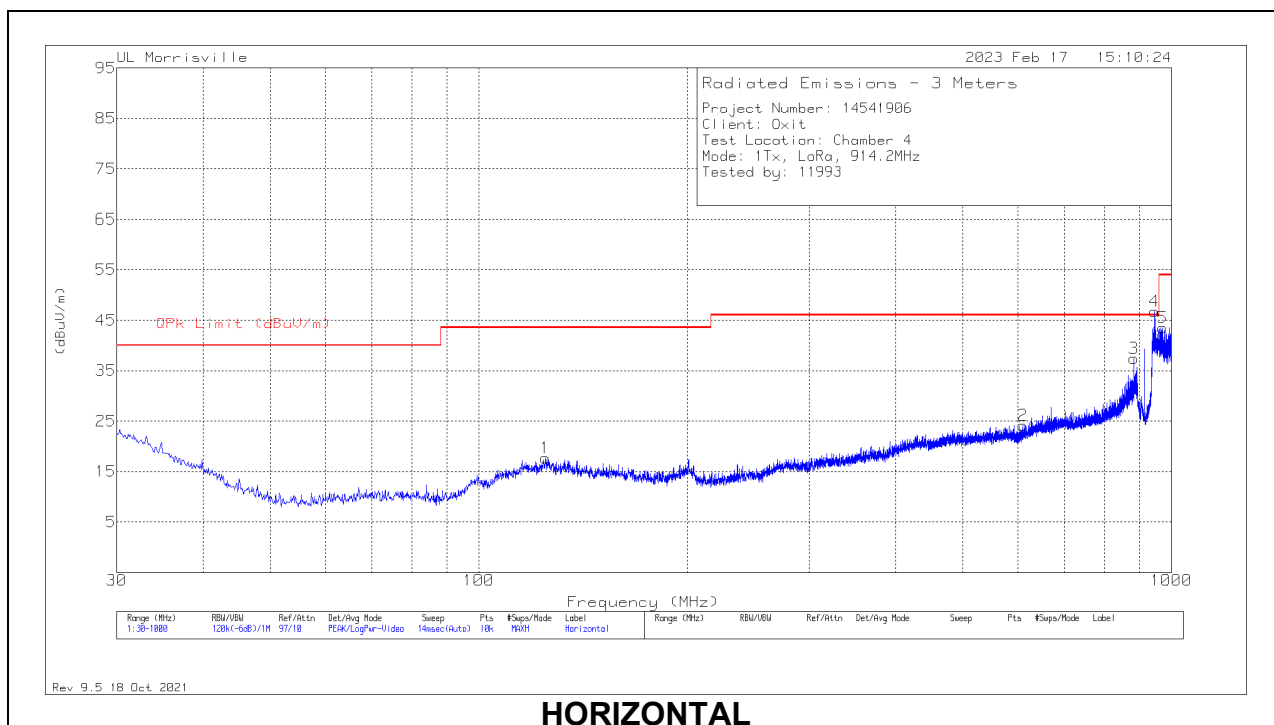


RADIATED EMISSIONS

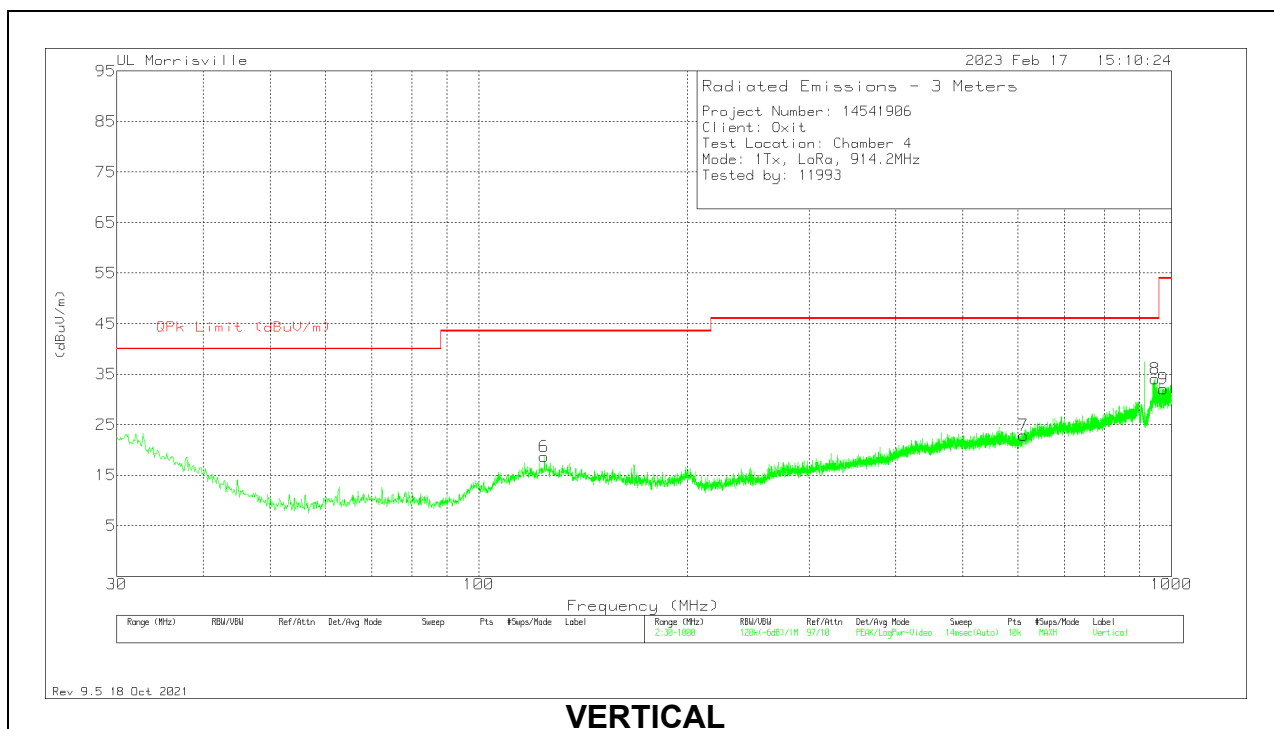
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90629 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 38.051	26.95	Pk	21.2	-31.7	.1	16.55	40	-23.45	0-360	100	H
2	* 125.448	27.6	Pk	20.1	-30.4	.4	17.7	43.52	-25.82	0-360	200	H
4	* 272.306	26.84	Pk	19.3	-29.3	.4	17.24	46.02	-28.78	0-360	100	H
6	* 961.103	39.62	Pk	28.8	-24.7	1	44.72	53.97	-9.25	0-360	100	H
7	* 38.148	27.13	Pk	21.1	-31.7	.1	16.63	40	-23.37	0-360	200	V
9	* 133.693	29.13	Pk	19.6	-30.5	.4	18.63	43.52	-24.89	0-360	200	V
10	* 268.426	27.36	Pk	19	-29.4	.4	17.36	46.02	-28.66	0-360	200	V
11	* 966.438	27.78	Pk	28.8	-24.3	1	33.28	53.97	-20.69	0-360	100	V
8	66.181	40.53	Pk	14.2	-31.2	.2	23.73	-	-	0-360	200	V
3	207.51	35.74	Pk	16.6	-29.8	.4	22.94	-	-	0-360	300	H
5	876.81	31.84	Pk	27.9	-25.7	1.2	35.24	-	-	0-360	100	H

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

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

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	* 124.769	27.55	Pk	20.1	-30.4	.4	17.65	43.52	-25.87	0-360	300	H
2	* 610.06	26.32	Pk	24.7	-27.6	.7	24.12	46.02	-21.9	0-360	300	H
5	* 970.803	37.68	Pk	29	-24.2	1	43.48	53.97	-10.49	0-360	100	H
6	* 124.187	28.7	Pk	20.1	-30.5	.4	18.7	43.52	-24.82	0-360	200	V
7	* 611.321	25.1	Pk	24.7	-27.6	.7	22.9	46.02	-23.12	0-360	100	V
9	* 973.713	26.43	Pk	29.1	-24.4	1	32.13	53.97	-21.84	0-360	100	V
3	882.436	33.91	Pk	28	-25.7	1.2	37.41	-	-	0-360	100	H
4	946.068	41.27	Pk	29	-24.7	1.2	46.77	-	-	0-360	100	H
8	946.359	28.49	Pk	29	-24.6	1.2	34.09	-	-	0-360	100	V

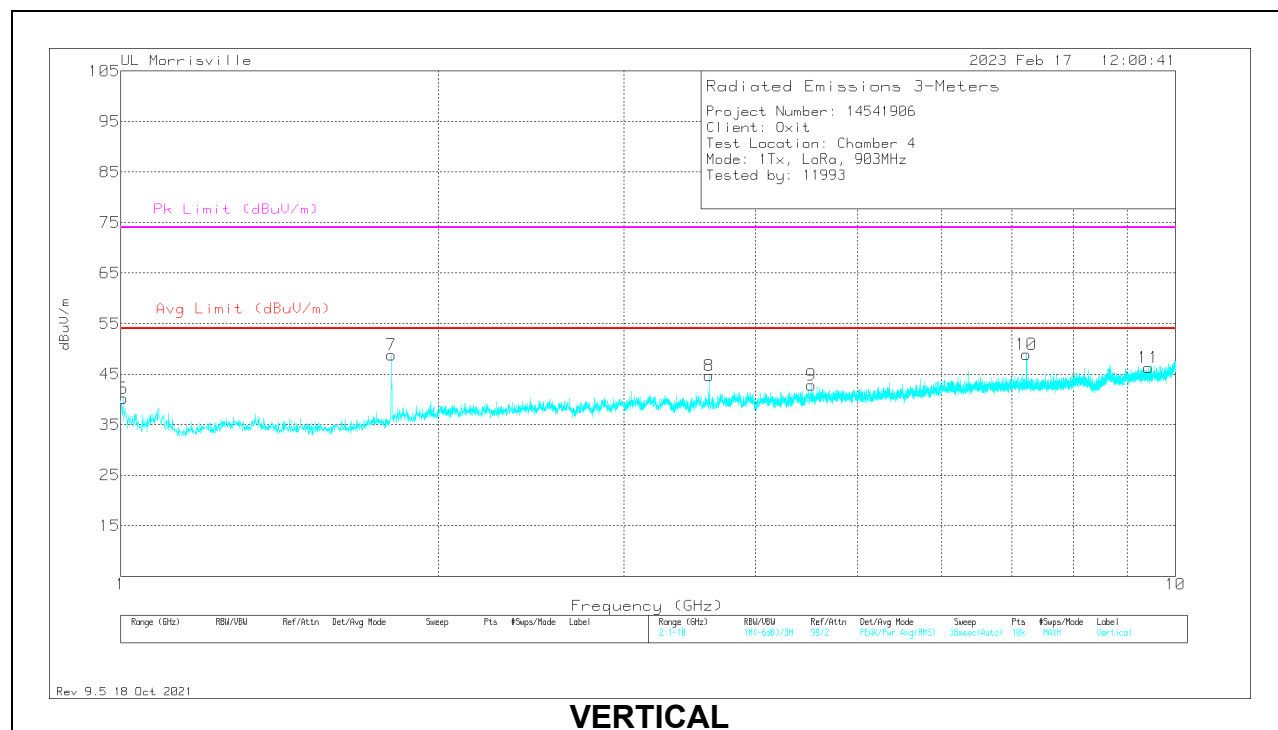
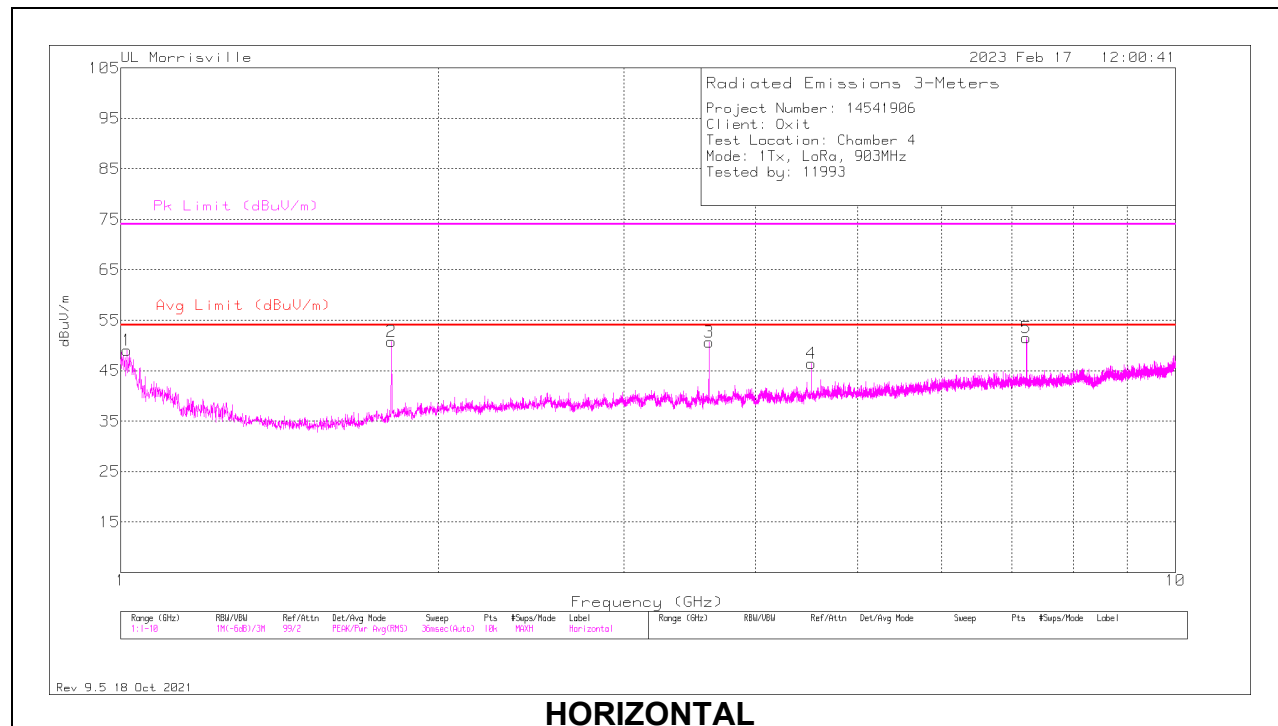
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

10.3.2. TRANSMITTER ABOVE 1 GHz

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (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	* 1.01554	58.49	PK2	27.4	-35.5	2.1	52.49	-	-	74	-21.51	186	150	H
	* 1.0159	44.82	V1TV	27.4	-35.5	2.1	38.82	54	-15.18	-	-	186	150	H
3	* 3.6116	54.17	PK2	33.1	-34.3	.2	53.17	-	-	74	-20.83	123	109	H
	* 3.61202	44.89	V1TV	33.1	-34.3	.2	43.89	54	-10.11	-	-	123	109	H
4	* 4.5163	44.26	Pk	33.9	-32.1	.4	46.46	54	-7.54	74	-27.54	0-360	100	H
6	* 1.0054	45.27	Pk	27.7	-35.4	2.6	40.17	54	-13.83	74	-33.83	0-360	300	V
8	* 3.6118	45.67	Pk	33.1	-34.3	.2	44.67	54	-9.33	74	-29.33	0-360	400	V
9	* 4.5145	40.62	Pk	33.8	-32.1	.5	42.82	54	-11.18	74	-31.18	0-360	400	V
11	* 9.4294	35.7	Pk	36.5	-26.3	.4	46.3	54	-7.7	74	-27.7	0-360	300	V
7	1.8055	54.21	Pk	30.5	-36.3	.4	48.81	-	-	-	-	0-360	400	V
2	1.8064	56.19	Pk	30.5	-36.3	.4	50.79	-	-	-	-	0-360	100	H
10	7.2226	41.69	Pk	35.7	-28.9	.4	48.89	-	-	-	-	0-360	200	V
5	7.2244	44.37	Pk	35.7	-28.9	.4	51.57	-	-	-	-	0-360	100	H

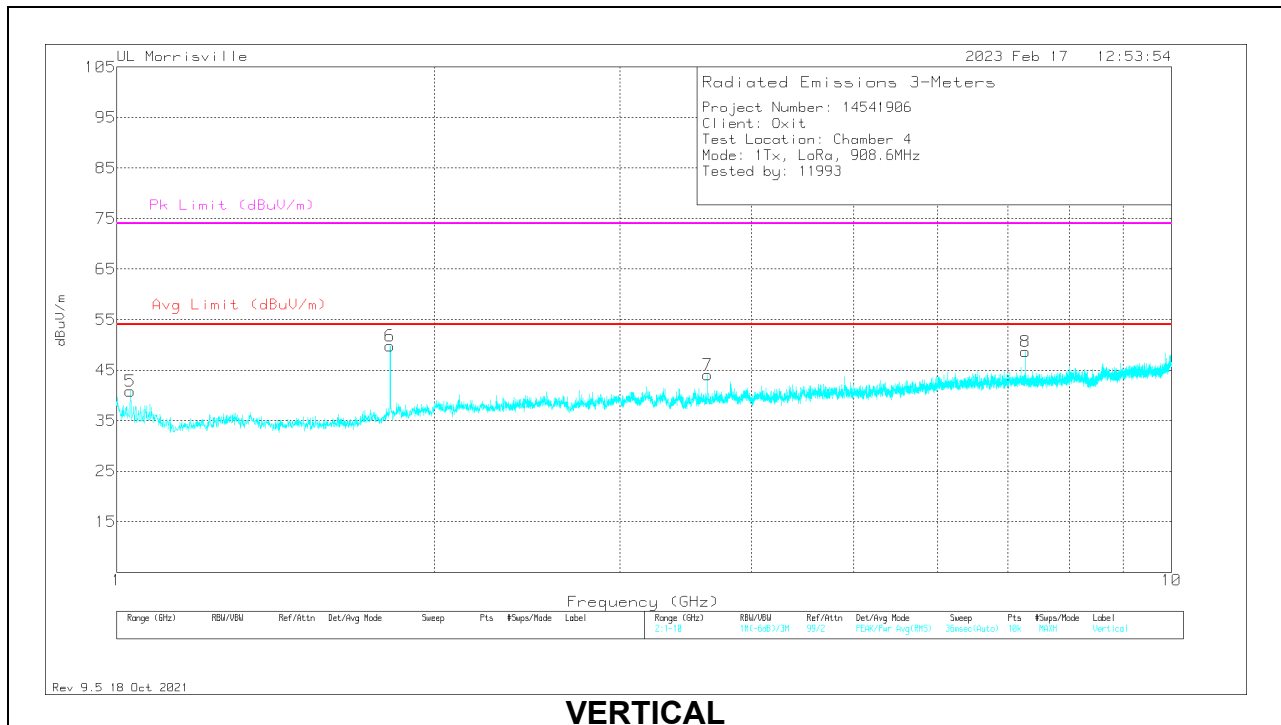
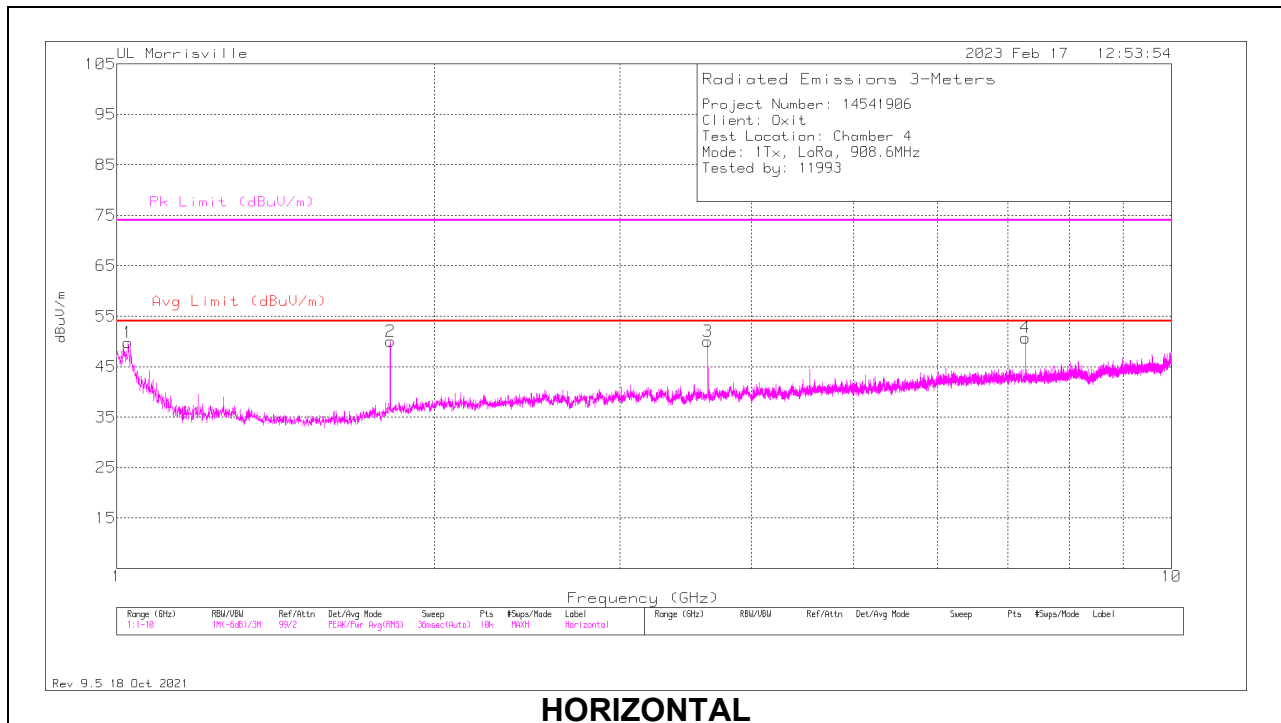
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (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	* 1.02592	60.04	PK2	27.2	-35.5	1.8	53.54	-	-	74	-20.46	187	188	H
	* 1.02237	45.8	V1TV	27.3	-35.5	1.9	39.5	54	-14.5	-	-	187	188	H
3	* 3.63382	52.7	PK2	33.1	-34.4	.2	51.6	-	-	74	-22.4	120	126	H
	* 3.63438	43.29	V1TV	33.1	-34.4	.2	42.19	54	-11.81	-	-	120	126	H
4	* 7.26925	46.16	PK2	35.7	-28.5	.4	53.76	-	-	74	-20.24	115	103	H
	* 7.26993	30.28	V1TV	35.7	-28.5	.4	37.88	54	-16.12	-	-	115	103	H
5	* 1.0297	47.48	Pk	27.2	-35.5	1.7	40.88	54	-13.12	74	-33.12	0-360	400	V
7	* 3.6334	45.19	Pk	33.1	-34.4	.2	44.09	54	-9.91	74	-29.91	0-360	400	V
8	* 7.26742	44.73	PK2	35.7	-28.5	.4	52.33	-	-	74	-21.67	117	119	V
	* 7.2686	28.94	V1TV	35.7	-28.5	.4	36.54	54	-17.46	-	-	117	119	V
6	1.8163	55.11	Pk	30.6	-36.3	.4	49.81	-	-	-	-	0-360	400	V
2	1.8172	55.32	Pk	30.6	-36.3	.4	50.02	-	-	-	-	0-360	100	H

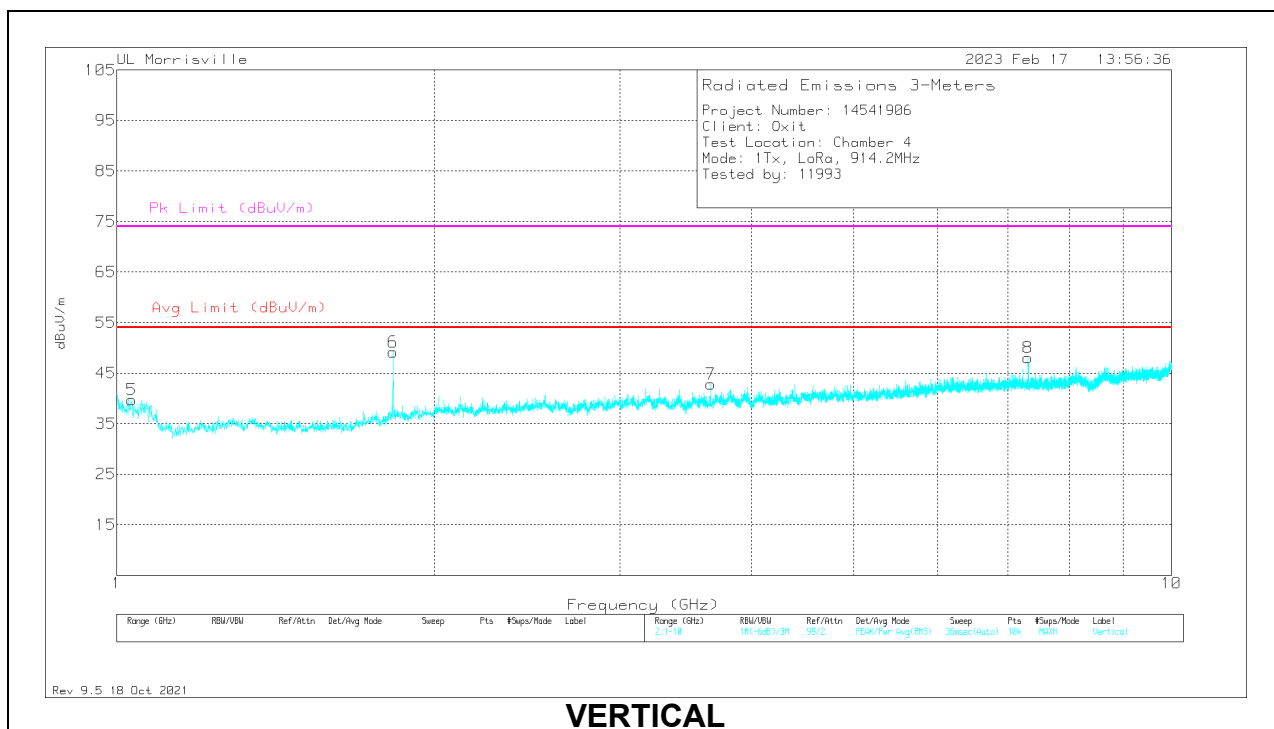
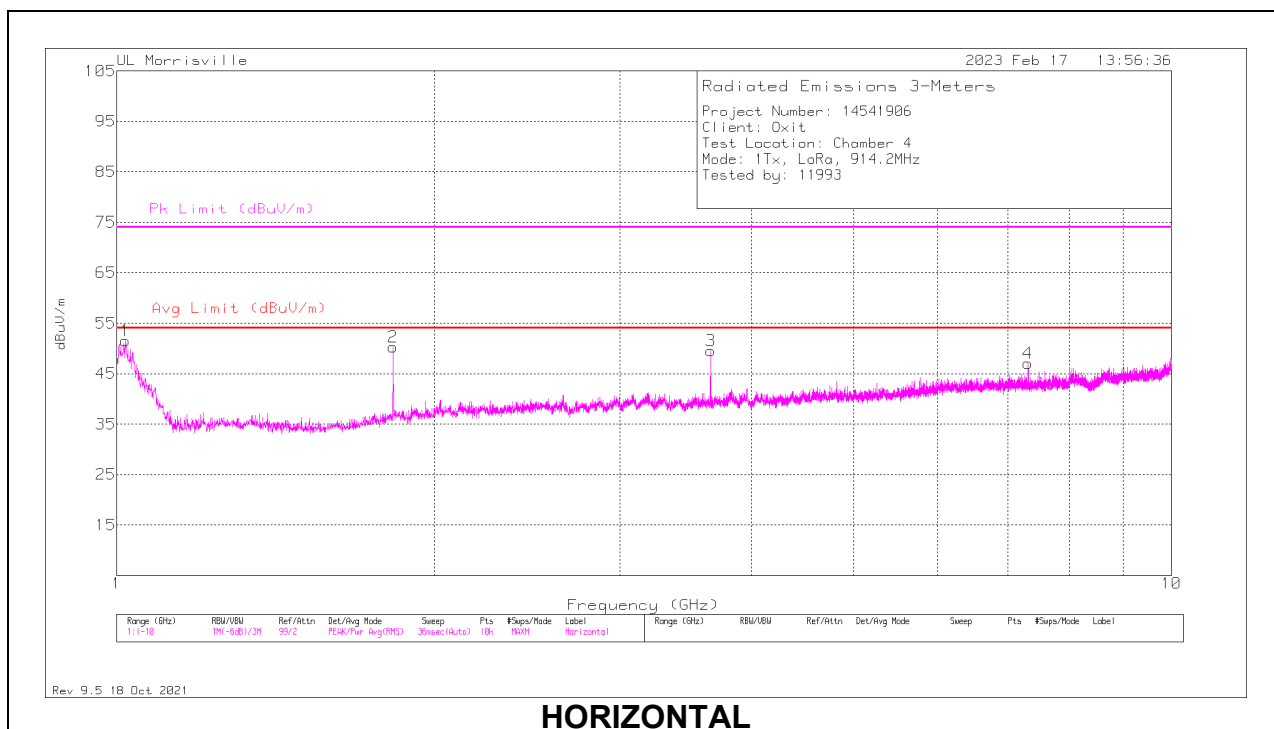
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (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	* 1.02054	62.14	PK2	27.3	-35.5	1.9	55.84	-	-	74	-18.16	185	189	H
	* 1.02123	47.32	V1TV	27.3	-35.5	1.9	41.02	54	-12.98	-	-	185	189	H
3	* 3.65608	51.87	PK2	33.1	-34.3	.4	51.07	-	-	74	-22.93	127	101	H
	* 3.65681	42.37	V1TV	33.1	-34.3	.4	41.57	54	-12.43	-	-	127	101	H
4	* 7.3135	39.71	Pk	35.6	-28.7	.4	47.01	54	-6.99	74	-26.99	0-360	100	H
5	* 1.0333	46.57	Pk	27.1	-35.5	1.6	39.77	54	-14.23	74	-34.23	0-360	400	V
7	* 3.6568	43.59	Pk	33.1	-34.3	.4	42.79	54	-11.21	74	-31.21	0-360	400	V
8	* 7.31431	44.83	PK2	35.6	-28.7	.4	52.13	-	-	74	-21.87	119	104	V
	* 7.31483	29	V1TV	35.6	-28.8	.4	36.2	54	-17.8	-	-	119	104	V
2	1.828	55.23	Pk	30.8	-36.2	.5	50.33	-	-	-	-	0-360	100	H
6	1.828	54.05	Pk	30.8	-36.2	.5	49.15	-	-	-	-	0-360	300	V

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

Pk - Peak detector

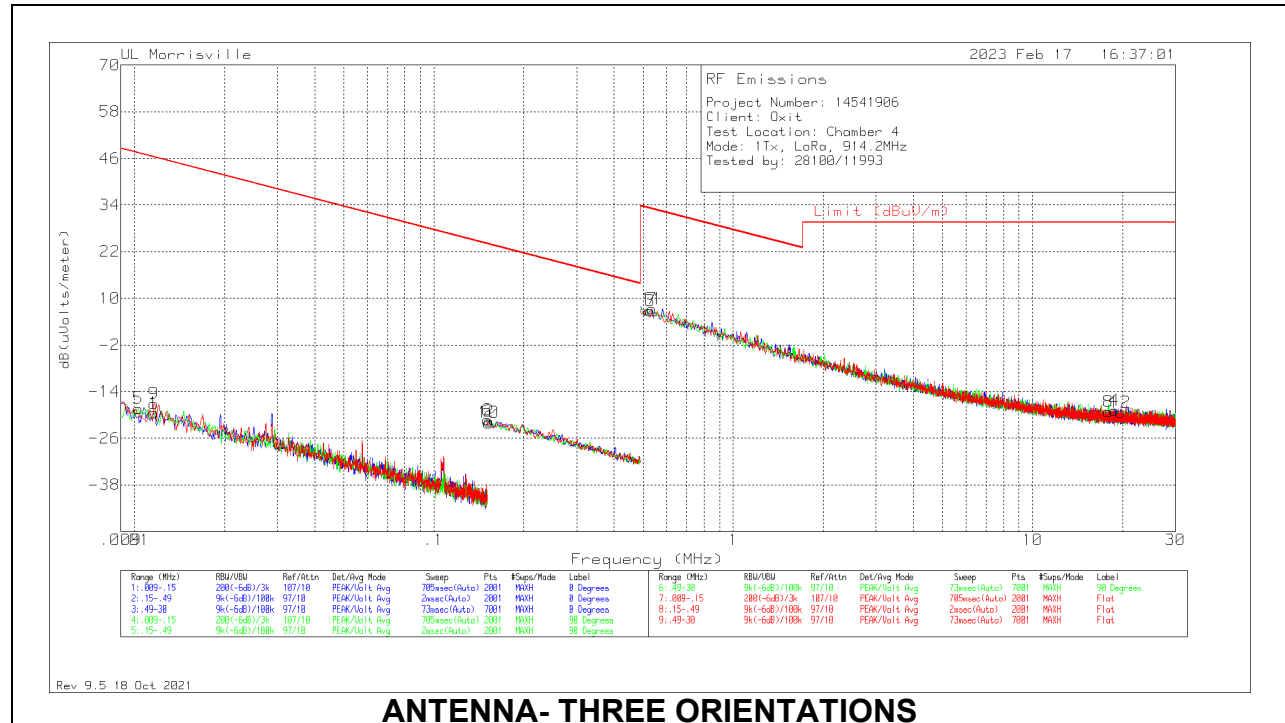
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

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)



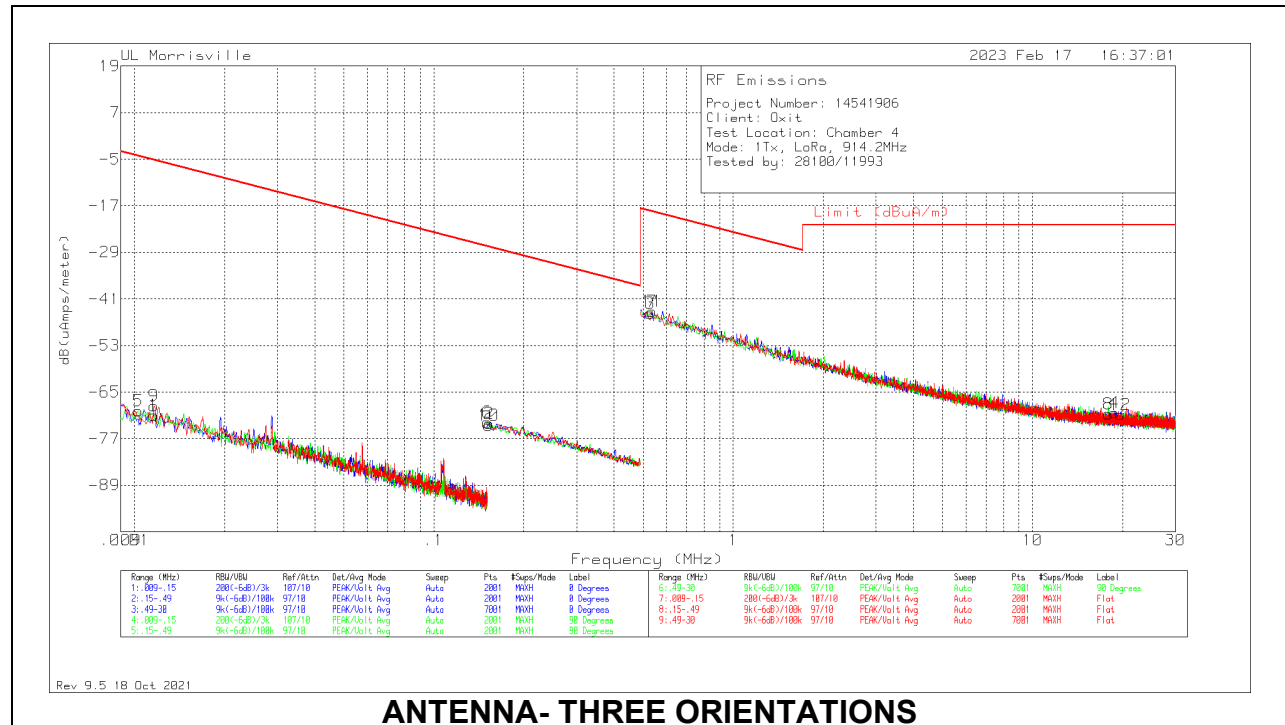
ANTENNA- THREE ORIENTATIONS

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
5	.01028	42.5	Pk	19.2	0	-80	-18.3	47.37	67.37	-65.67	0-360	90 degs
1	.01163	41.93	Pk	18.6	0	-80	-19.47	46.3	66.3	-65.77	0-360	0 degs
9	.01163	44.26	Pk	18.6	0	-80	-17.14	46.3	66.3	-63.44	0-360	Flat
6	.15111	46.36	Pk	12.2	.1	-80	-21.34	24.02	44.02	-45.36	0-360	90 degs
10	.15238	45.7	Pk	12.2	.1	-80	-22	23.95	43.95	-45.95	0-360	Flat
2	.15323	46.15	Pk	12.2	.1	-80	-21.55	23.9	43.90	-45.45	0-360	0 degs
3	.52794	34.47	Pk	12.2	.1	-40	6.77	33.15	-	-26.38	0-360	0 degs
7	.53638	35	Pk	12.2	.1	-40	7.3	33.01	-	-25.71	0-360	90 degs
11	.53638	34.97	Pk	12.2	.1	-40	7.27	33.01	-	-25.74	0-360	Flat
8	17.91051	9.99	Pk	10.1	.8	-40	-19.11	29.54	-	-48.65	0-360	90 degs
4	18.77901	10.5	Pk	9.9	.8	-40	-18.8	29.54	-	-48.34	0-360	0 degs
12	19.60534	9.99	Pk	9.8	.9	-40	-19.31	29.54	-	-48.85	0-360	Flat

Pk - Peak detector

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



ANTENNA- THREE ORIENTATIONS

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuA)	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
5	.01028	42.5	Pk	-32.3	0	-80	-69.8	-4.13	15.87	-65.67	0-360	90 degs
1	.01163	41.93	Pk	-32.9	0	-80	-70.97	-5.2	14.8	-65.77	0-360	0 degs
9	.01163	44.26	Pk	-32.9	0	-80	-68.64	-5.2	14.8	-63.44	0-360	Flat
6	.15111	46.36	Pk	-39.3	.1	-80	-72.84	-27.48	-7.48	-45.36	0-360	90 degs
10	.15238	45.7	Pk	-39.3	.1	-80	-73.5	-27.55	-7.55	-45.95	0-360	Flat
2	.15323	46.15	Pk	-39.3	.1	-80	-73.05	-27.6	-7.6	-45.45	0-360	0 degs
3	.52794	34.47	Pk	-39.3	.1	-40	-44.73	-18.35	-	-26.38	0-360	0 degs
7	.53638	35	Pk	-39.3	.1	-40	-44.2	-18.49	-	-25.71	0-360	90 degs
11	.53638	34.97	Pk	-39.3	.1	-40	-44.23	-18.49	-	-25.74	0-360	Flat
8	17.91051	9.99	Pk	-41.4	.8	-40	-70.61	-21.96	-	-48.65	0-360	90 degs
4	18.77901	10.5	Pk	-41.6	.8	-40	-70.3	-21.96	-	-48.34	0-360	0 degs
12	19.60534	9.99	Pk	-41.7	.9	-40	-70.81	-21.96	-	-48.85	0-360	Flat

Pk - Peak detector

11. SETUP PHOTOS

Please refer to R14541906-EP1 for setup photos

END OF TEST REPORT