

TEST REPORT

Report Number: R15607285-E1

Applicant : RF IDEAS
425 N. Martingale Road
Suite 1680
Schaumburg, IL 60173, USA

Model : SP30L00

FCC ID : M9MSP30L00

IC : 6571A-SP30L00

EUT Description : WAVE ID Mobile SP LEGIC USB Black Reader

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C: 2025
RSS-210 ISSUE 11: 2024
RSS-GEN ISSUE 5 + A1 + A2: 2021

Date Of Issue:

2025-03-25

Prepared by:

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2025-02-10	Initial Issue	Manish Baral
V2	2025-03-25	Added Additional Test Equipment, Technical Notes, and Revised AC Mains Remeasurement	Charles Moody

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: RF IDEAS
425 N. Martingale Road, Suite 1680
Schaumburg, IL 60173, USA

EUT DESCRIPTION: WAVE ID Mobile SP LEGIC USB Black Reader

MODEL: SP30L0

SERIAL NUMBER: WLHA000127, WLHA000115, WLHA000139, WLHA000134

SAMPLE RECEIPT DATE: 2024-12-13

DATE TESTED: 2025-01-13 To 2025-01-16

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C: 2025	Complies
ISED RSS-210 Issue 11: 2024	Complies
ISED RSS-GEN Issue 5 + A1 + A2: 2021	Complies


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:



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Project Engineer
Consumer, Medical and IT Segment.
UL LLC.



Manish Baral
Engineer
Consumer, Medical and IT Segment.
UL LLC.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with:

- ANSI C63.10-2020
- FCC 47 CFR Part 2
- FCC 47 CFR Part 15C
- RSS-GEN Issue 5 + A1 + A2: 2021
- RSS-210 Issue 11: 2024
- KDB 174176

3. SUMMARY OF TEST RESULTS

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. RFID radio operational specifications (see section 6.4)

Requirement Description	Requirement Clause Number	Result	Remarks
Occupied Bandwidth	For Reporting Purposes Only	Passed	None.
Fundamental Measurements.	FCC §15.225 (a-d) FCC §15.209 (d)		
Tx Spurious Emissions	IC RSS-210, Annex B.6 IC RSS-GEN, Section 8.9 (Transmitter)		
Frequency Stability	FCC FCC §15.225 (e) RSS-210, Annex B.6		
AC Mains Line Conducted Emissions	FCC §15.207 IC RSS-GEN, Section 8.8		

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, Certificate Number #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
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
<input checked="" type="checkbox"/>	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	U _{Lab}
Radio Frequency (Spectrum Analyzer)	419.38 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%

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

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

36.5 dBuV + 0 dB + 10.1 dB + 0 dB = 46.6 dBuV

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a dual band RFID card reader capable of reading both 125 kHz and 13.56 MHz credentials and Legic Secure Segment credentials via Bluetooth communication. This report covers the full emissions testing of the 13.56MHz RFID radio.

6.2. MAXIMUM ELECTRIC FIELD STRENGTH

The transmitter has a maximum peak radiated electric field strength as follows:

Fundamental Frequency (MHz)	E-Field at 30-Meters (dBuV/m)
13.56	22.5

6.3. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was:

EUT Firmware: WN5020600UPX7L0

6.4. WORST-CASE CONFIGURATION AND MODE

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

In addition, Type A and B with and without a tag were investigated to determine the worst case based on the highest power and spurious emissions. Type A without a tag was determined to be the worst case and therefore selected for all final tests.

6.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	T14	0623PF4FKVWW	N/A
Laptop Charger	Lenovo	ADLX65YDC2D	8SSA10R16970D1SG	N/A
Laptop	HP	HP EliteBook Resolve 810 G2	8CG4340RMV	N/A
13.56MHz Tag	RF Ideas	N/A	996302030	N/A
125kHz Tag	RF Ideas	N/A	23993	N/A

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Power	1	N/A	USB	<3m	N/A
2	Power	1	N/A	USB and RS232	<3m	Power to USB and RS232. RS232 to USB adapter For Rx Only

SETUP DIAGRAM

Please refer to R15607285-EP1 for setup diagrams

7. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-10-02	2025-10-02
30-1000 MHz					
90629	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-01-30	2026-01-30
Gain-Loss Chains					
91974	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-08	2025-05-08
91976	Gain-loss string: 25-1000MHz	Various	Various	2024-05-08	2025-05-08
Receiver & Software					
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-08-29	2025-08-29
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
241205	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Common Equipment Conducted Room 2					
90416	Spectrum Analyzer	Keysight Technologies	N9030A	2024-09-23	2025-09-23
76023	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2025-01-15	2026-01-31
248881	Environmental Meter	Control Company	06-662-4	2024-04-10	2026-04-10
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	NA	NA
SOFTEMI	Antenna Port Software	UL	Version 2024.2.23	NA	NA
Additional Equipment used					
91212	True RMS Multimeter	Agilent	U1232A	2024-08-01	2025-08-01

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
70374	EMI Test Receiver	ROHDE & SCHWARZ	ESCI7	2024-07-30	2025-07-30
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2024-04-04	2025-04-04
179892	Environmental Meter	Fisher Scientific	15-077-963	2024-08-12	2025-08-12
80391	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2024-08-01	2025-08-01
PS216	AC Power Source	Elgar	CW2501M	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

8. OCCUPIED BANDWIDTH

LIMITS

Reporting Purposes Only

TEST PROCEDURE

C63.10 6.9.2 and 6.9.3

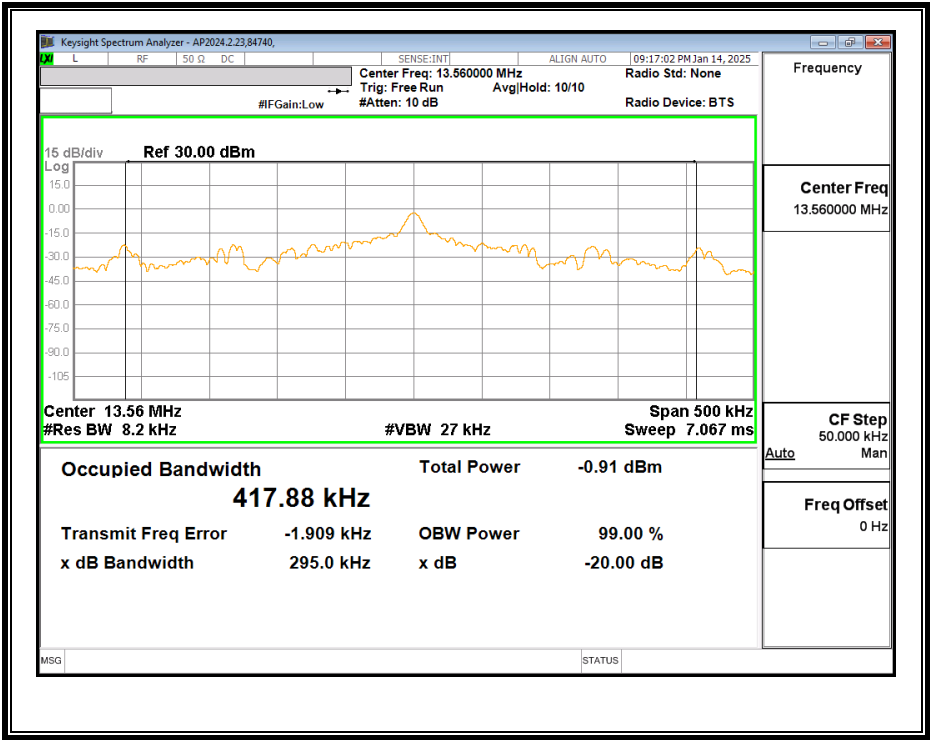
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1-5% of the 20dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

8.1. TAG OFF

RESULTS

Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
13.56	0.2950	0.4179



9. RADIATED EMISSION TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMIT

FCC §15.225

IC RSS-210, Annex B.6

IC RSS-GEN, Section 8.9 (Transmitter)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz

or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (uV/m)

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

TEST PROCEDURE

ANSI C63.10, 2020

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 9kHz to the 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.

Note: For all Below 30MHz test data, 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 $40 \cdot \log(\text{test distance} / \text{specification distance})$

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

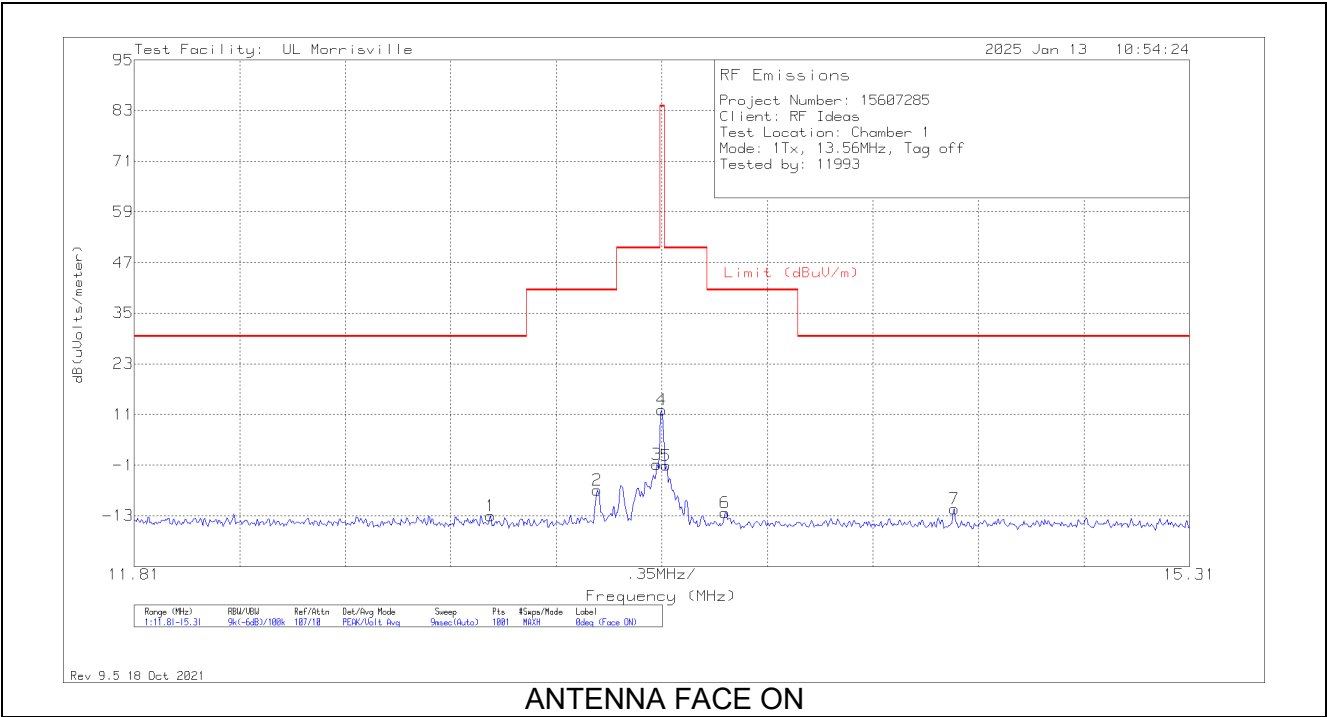
RESULTS

9.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (Below 30MHz)

Note: 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*Log (test distance / specification distance).

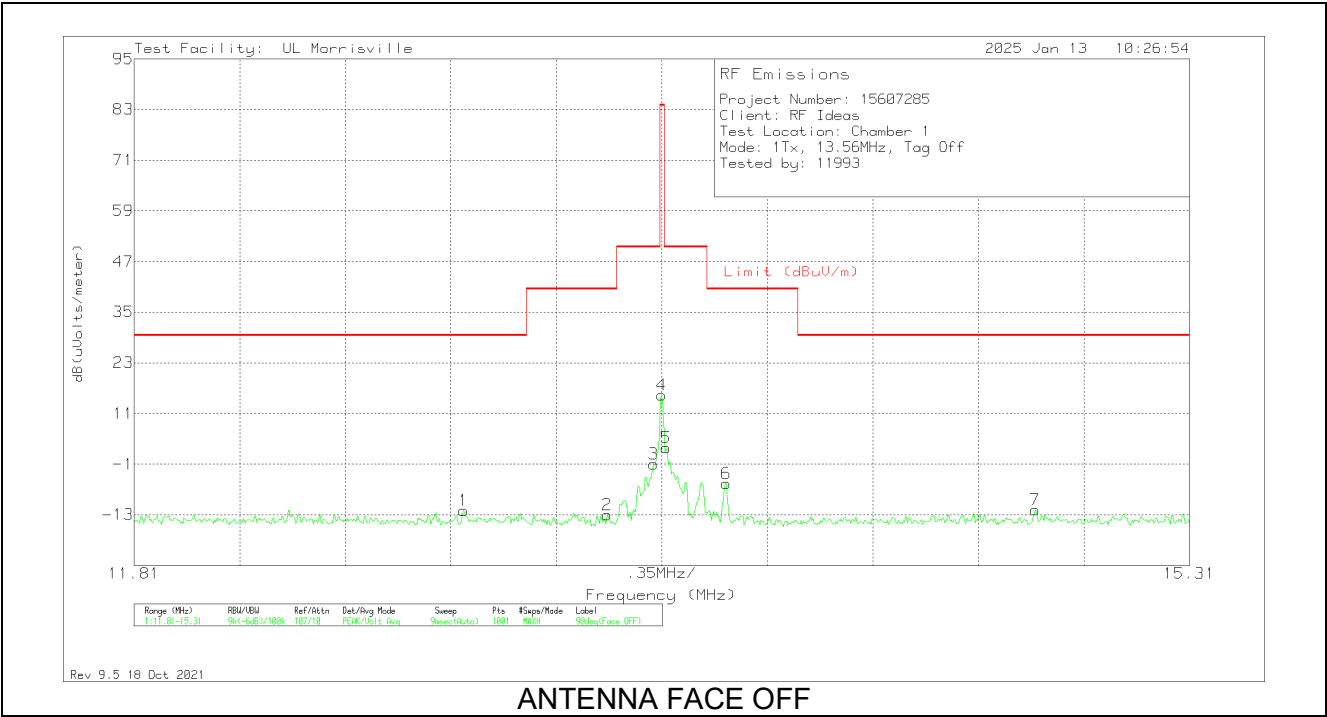
9.2.1. TAG OFF

FUNDAMENTAL



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
1	12.993	16.61	Pk	9.8	.6	-40	-12.99	29.5	-42.49	168	0 degs
2	13.3465	22.73	Pk	9.8	.6	-40	-6.87	40.5	-47.37	168	0 degs
3	13.5425	28.82	Pk	9.8	.6	-40	-.78	50.5	-51.28	168	0 degs
4	13.56	41.65	Pk	9.8	.6	-40	12.05	84	-71.95	168	0 degs
5	13.574	28.54	Pk	9.8	.6	-40	-1.06	50.5	-51.56	168	0 degs
6	13.77	17.49	Pk	9.7	.6	-40	-12.21	40.5	-52.71	168	0 degs
7	14.5295	18.31	Pk	9.7	.6	-40	-11.39	29.5	-40.89	168	0 degs

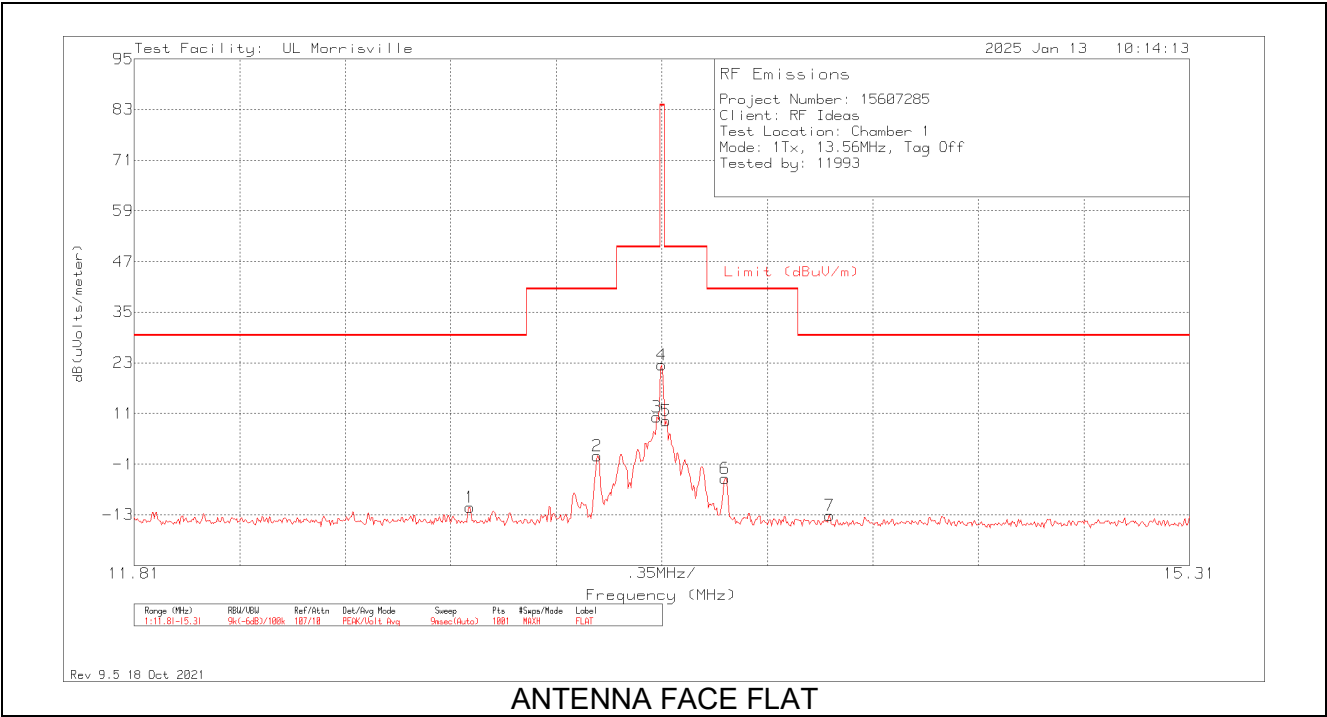
Pk - Peak detector



ANTENNA FACE OFF

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
1	12.902	17.47	Pk	9.9	.6	-40	-12.03	29.5	-41.53	103	100	90 degs
2	13.378	16.58	Pk	9.8	.6	-40	-13.02	40.5	-53.52	103	100	90 degs
3	13.532	28.64	Pk	9.8	.6	-40	-.96	50.5	-51.46	103	100	90 degs
4	13.56	44.94	Pk	9.8	.6	-40	15.34	84	-68.66	103	100	90 degs
5	13.574	32.53	Pk	9.8	.6	-40	2.93	50.5	-47.57	103	100	90 degs
6	13.7735	24.13	Pk	9.7	.6	-40	-5.57	40.5	-46.07	103	100	90 degs
7	14.799	17.97	Pk	9.6	.6	-40	-11.83	29.5	-41.33	103	100	90 degs

Pk - Peak detector

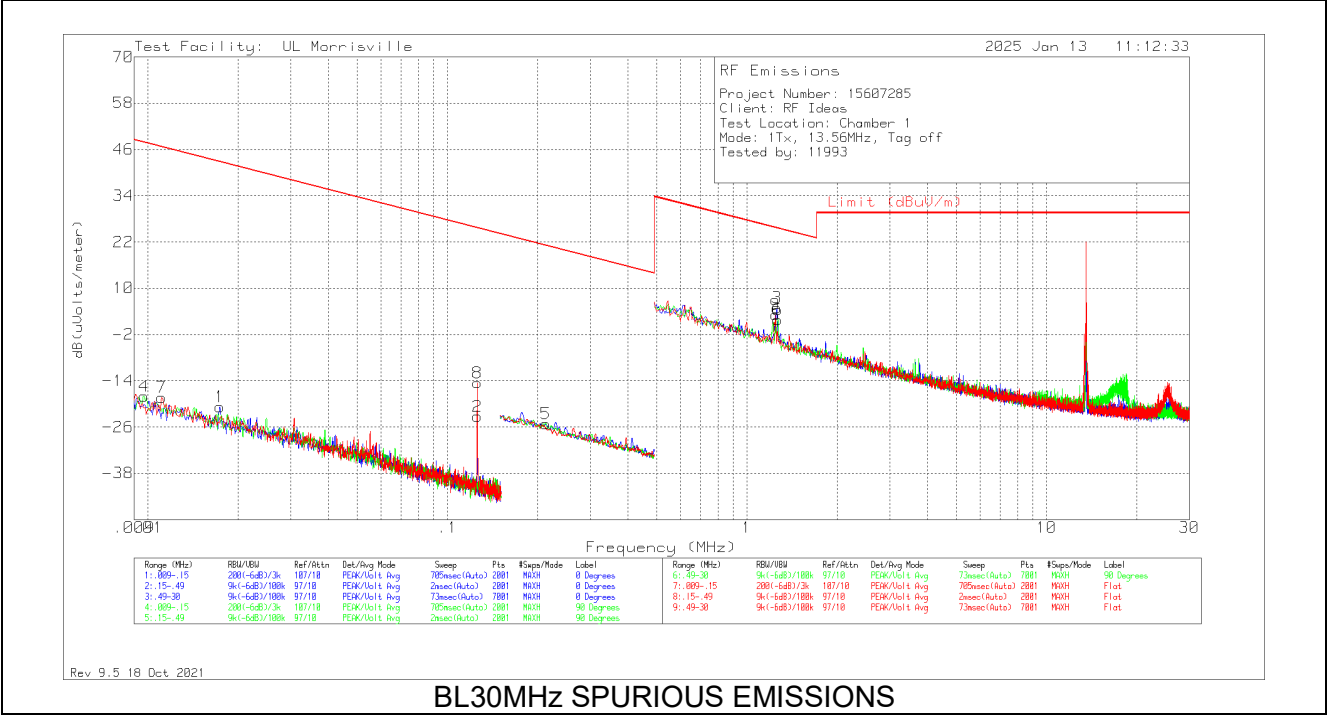


ANTENNA FACE FLAT

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
1	12.923	18.39	Pk	9.8	.6	-40	-11.21	29.5	-40.71	154	Flat
2	13.3465	30.5	Pk	9.8	.6	-40	.9	40.5	-39.6	154	Flat
3	13.5425	39.8	Pk	9.8	.6	-40	10.2	50.5	-40.3	154	Flat
4	13.56	52.1	Pk	9.8	.6	-40	22.5	84	-61.5	154	Flat
5	13.574	38.88	Pk	9.8	.6	-40	9.28	50.5	-41.22	154	Flat
6	13.77	25.35	Pk	9.7	.6	-40	-4.35	40.5	-44.85	154	Flat
7	14.1165	16.59	Pk	9.7	.6	-40	-13.11	29.5	-42.61	154	Flat

Pk - Peak detector

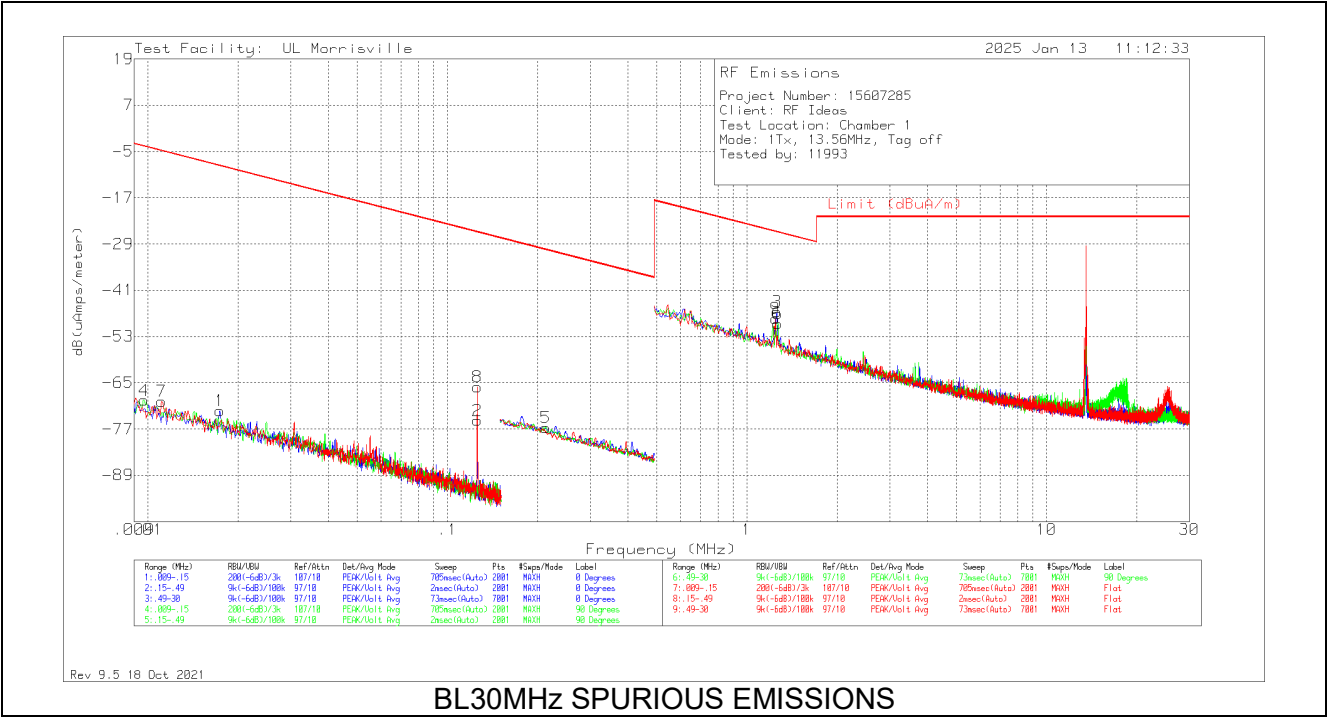
SPURIOUS EMISSION – E FIELD



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	.00971	43.33	Pk	18.5	.1	-80	-18.07	47.86	67.86	-65.93	0-360	90 degs
7	.01113	43.88	Pk	17.7	.1	-80	-18.32	46.67	66.67	-64.99	0-360	Flat
1	.01738	44.12	Pk	15	.1	-80	-20.78	42.8	62.8	-63.58	0-360	0 degs
2	.12587	45.62	Pk	11	.1	-80	-23.28	25.61	45.61	-48.89	0-360	0 degs
8	.12587	54.39	Pk	11	.1	-80	-14.51	25.61	45.61	-40.12	0-360	Flat
5	.21341	43.91	Pk	10.9	.1	-80	-25.09	21.02	41.02	-46.11	0-360	90 degs
9	1.24466	31.92	Pk	11	.2	-40	3.12	25.7	-	-22.58	0-360	Flat
3	1.25731	33.75	Pk	11	.2	-40	4.95	25.62	-	-20.67	0-360	0 degs
6	1.26574	30.71	Pk	11	.2	-40	1.91	25.56	-	-23.65	0-360	90 degs

Pk - Peak detector

SPURIOUS EMISSION – H FIELD



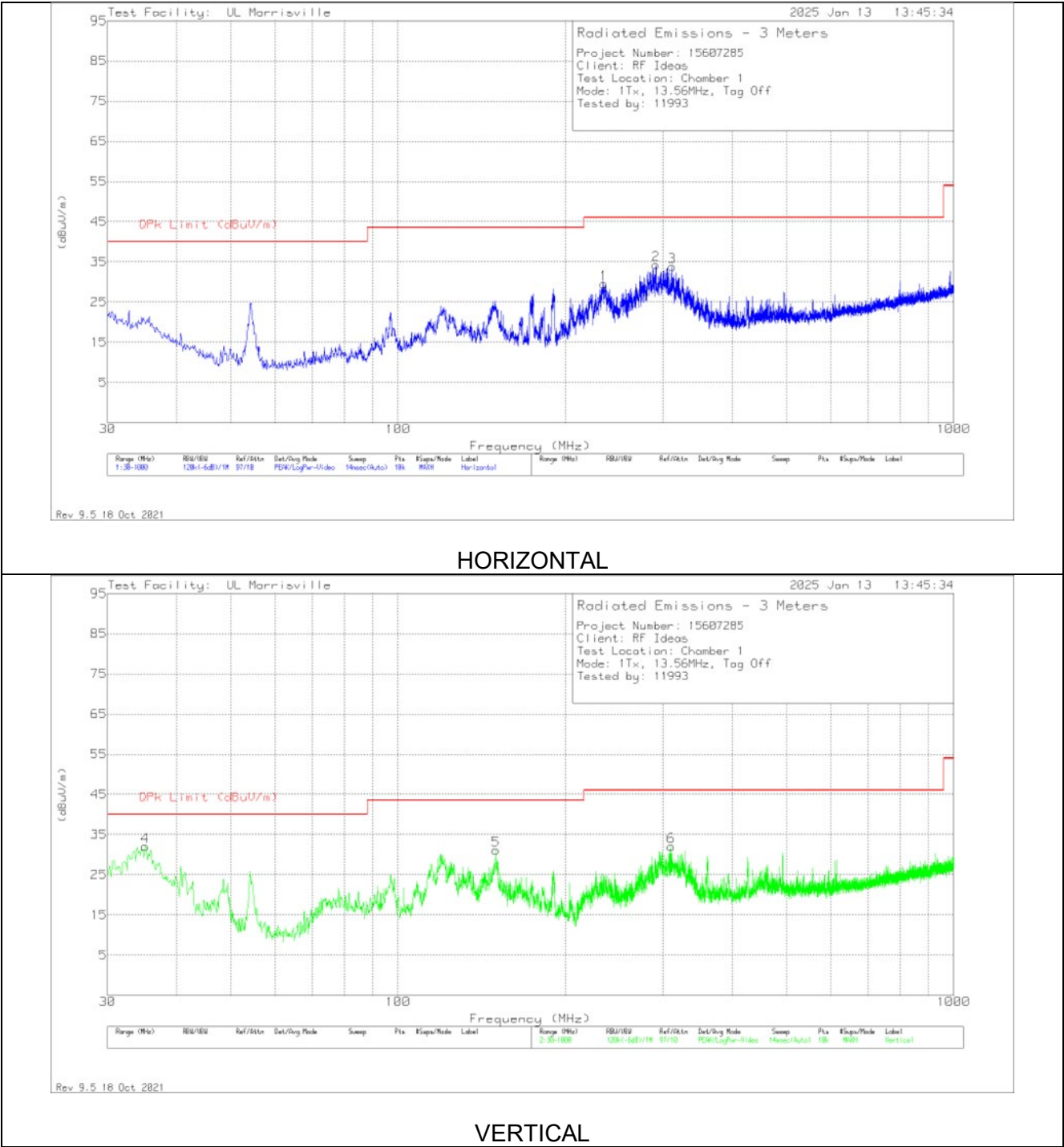
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	QP/AV Limit (dBuA/m)	PK Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
4	.00971	43.33	Pk	-33	.1	-80	-69.57	-3.64	16.36	-65.93	0-360	90 degs
7	.01113	43.88	Pk	-33.8	.1	-80	-69.82	-4.83	15.17	-64.99	0-360	Flat
1	.01738	44.12	Pk	-36.5	.1	-80	-72.28	-8.7	11.3	-63.58	0-360	0 degs
2	.12587	45.62	Pk	-40.5	.1	-80	-74.78	-25.89	-5.89	-48.89	0-360	0 degs
8	.12587	54.39	Pk	-40.5	.1	-80	-66.01	-25.89	-5.89	-40.12	0-360	Flat
5	.21341	43.91	Pk	-40.6	.1	-80	-76.59	-30.48	-10.48	-46.11	0-360	90 degs
9	1.24466	31.92	Pk	-40.5	.2	-40	-48.38	-25.8	-	-22.58	0-360	Flat
3	1.25731	33.75	Pk	-40.5	.2	-40	-46.55	-25.88	-	-20.67	0-360	0 degs
6	1.26574	30.71	Pk	-40.5	.2	-40	-49.59	-25.94	-	-23.65	0-360	90 degs

Pk - Peak detector

9.3. TX SPURIOUS EMISSION 30 TO 1000 MHz

9.3.1. TAG OFF

SPURIOUS EMISSION



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90629 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	35.044	40.38	Pk	23.4	-31.7	32.08	40	-7.92	0-360	100	V
5	149.989	42.88	Pk	18.8	-30.5	31.18	43.52	-12.34	0-360	100	V
1	234.67	42.46	Pk	17.4	-30.3	29.56	46.02	-16.46	0-360	100	H
2	291.124	44.66	Pk	19.5	-29.9	34.26	46.02	-11.76	0-360	100	H
6	309.942	41.45	Pk	19.8	-29.2	32.05	46.02	-13.97	0-360	100	V
3	311.591	43.19	Pk	19.8	-29.2	33.79	46.02	-12.23	0-360	100	H

Pk - Peak detector

Qp - Quasi-Peak detector

10. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

IC RSS-210, Annex B.6

Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

TEST PROCEDURE

ANSI C63.10-2020 Clause 6.8

RESULTS

No non-compliance noted.

10.1. TAG OFF

Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir. Temp	Frequency Deviation Measured with Time Elapse								
(Vdc)	(°C)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
5.00	50	13.5599790	3.923	13.5599632	5.088	13.5599482	6.195	13.5599545	5.726	± 100
5.00	40	13.5599801	3.838	13.5599909	3.046	13.5599817	3.724	13.5599802	3.831	± 100
5.00	30	13.5600051	1.999	13.5600094	1.681	13.5600265	0.420	13.5600246	0.557	± 100
5.00	20	13.5600322	0.000	13.5600216	0.782	13.5600330	-0.063	13.5600241	0.594	± 100
5.00	10	13.5600584	-1.932	13.5600838	-3.809	13.5600966	-4.749	13.5601070	-5.516	± 100
5.00	0	13.5601373	-7.751	13.5601351	-7.592	13.5601393	-7.898	13.5601376	-7.777	± 100
5.00	-10	13.5601439	-8.241	13.5601457	-8.374	13.5601524	-8.868	13.5601417	-8.075	± 100
5.00	-20	13.5601520	-8.838	13.5601467	-8.448	13.5601397	-7.928	13.5601475	-8.503	± 100
4.25	20	13.5600281	0.305	13.5600280	0.310	13.5600196	0.930	13.5600197	0.922	± 100
5.75	20	13.5600315	0.048	13.5600196	0.931	13.5600233	0.659	13.5600291	0.229	± 100

Tested by: 84740

Test date: 2025-01-15

11. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207

IC RSS-GEN, Section 8.8

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

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.

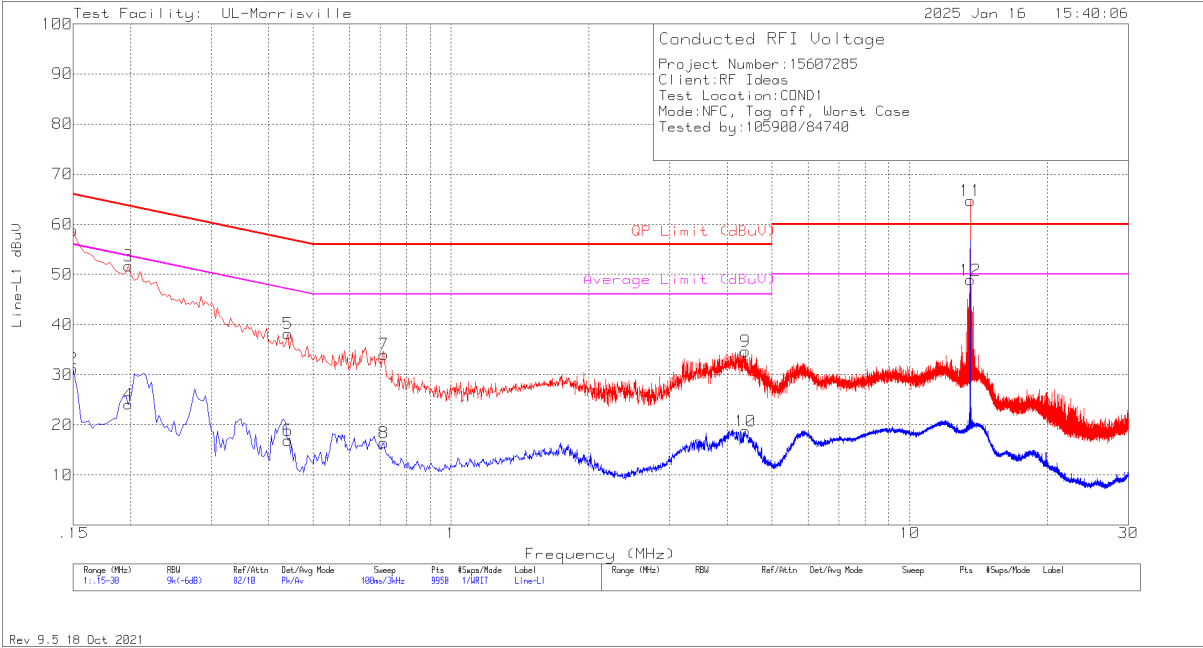
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

11.1.1. TAG OFF

LINE 1 RESULTS



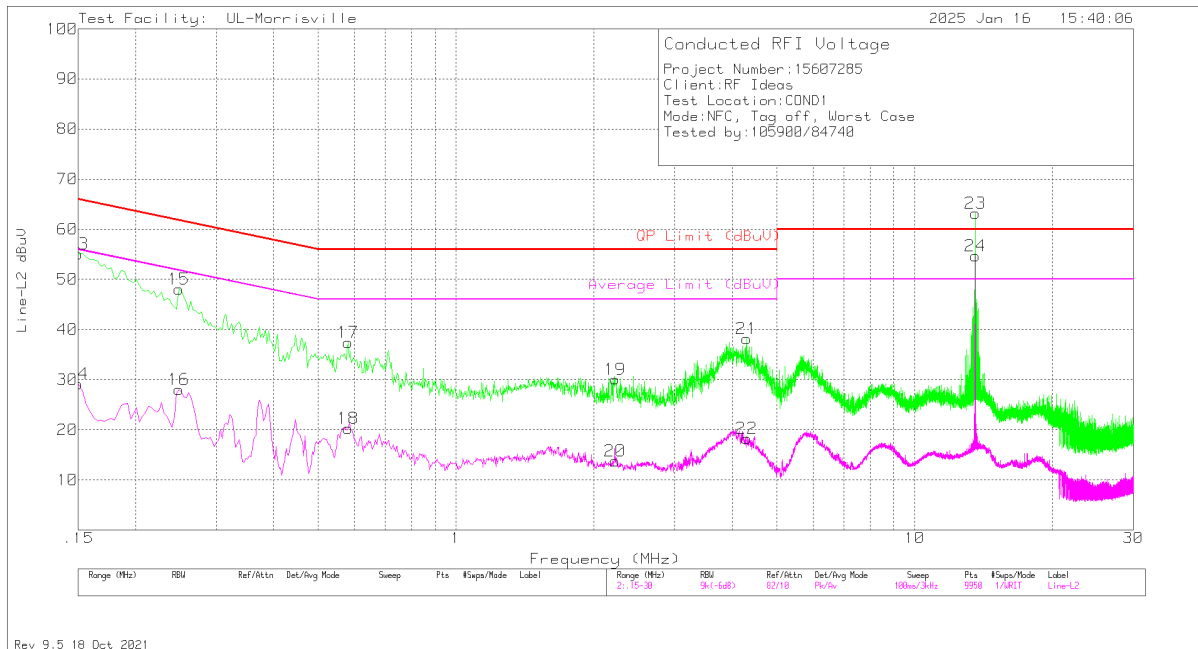
Emissions

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	.15	48.76	Pk	.3	9.8	58.86	66	-7.14	-	-
2	.15	21.08	Av	.3	9.8	31.18	-	-	56	-24.82
3	.198	41.69	Pk	.2	9.8	51.69	63.69	-12	-	-
4	.198	14.08	Av	.2	9.8	24.08	-	-	53.69	-29.61
5	.441	28.27	Pk	.1	9.8	38.17	57.04	-18.87	-	-
6	.441	7.03	Av	.1	9.8	16.93	-	-	47.04	-30.11
7	.714	24.2	Pk	0	9.8	34	56	-22	-	-
8	.714	6.57	Av	0	9.8	16.37	-	-	46	-29.63
9	4.383	24.62	Pk	.1	9.9	34.62	56	-21.38	-	-
10	4.383	8.71	Av	.1	9.9	18.71	-	-	46	-27.29
11	13.56048	53.39	Qp	.1	10	63.49	60	3.49	-	-
12	13.5604	49.28	Ca	.1	10	59.38	-	-	50	9.38

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector
Ca - CISPR average detection

NOTE* - Since the fundamental is over the limit, a terminated sample will be used to show compliance. Refer to section 11.1.2.

LINE 2 RESULTS



Emissions

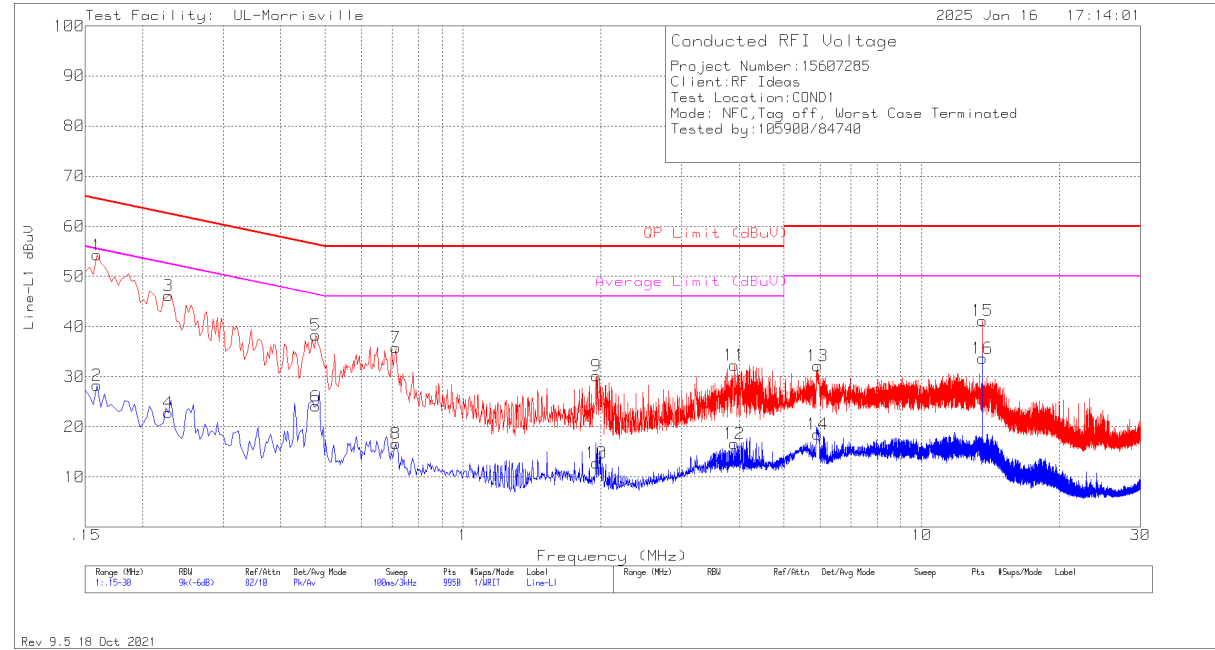
Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBBuV	QP Limit (dBBuV)	Margin (dB)	Average Limit (dBBuV)	Margin (dB)
13	.15	44.96	Pk	.3	9.8	55.06	66	-10.94	-	-
14	.15	19.02	Av	.3	9.8	29.12	-	-	56	-26.88
15	.249	38.12	Pk	.1	9.8	48.02	61.79	-13.77	-	-
16	.249	18.09	Av	.1	9.8	27.99	-	-	51.79	-23.8
17	.582	27.6	Pk	0	9.8	37.4	56	-18.6	-	-
18	.582	10.51	Av	0	9.8	20.31	-	-	46	-25.69
19	2.223	20.29	Pk	0	9.8	30.09	56	-25.91	-	-
20	2.223	3.97	Av	0	9.8	13.77	-	-	46	-32.23
21	4.299	28.19	Pk	.1	9.9	38.19	56	-17.81	-	-
22	4.299	8.28	Av	.1	9.9	18.28	-	-	46	-27.72
23	13.5605	53.62	Qp	.1	10	63.72	60	3.72	-	-
24	13.5605	55.07	Ca	.1	10	65.17	-	-	50	15.17

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector
Ca - CISPR average detection

NOTE* - Since the fundamental is over the limit, a terminated sample will be used to show compliance. Refer to section 11.1.2.

11.1.2. **TERMINATED SAMPLE**

LINE 1 RESULTS

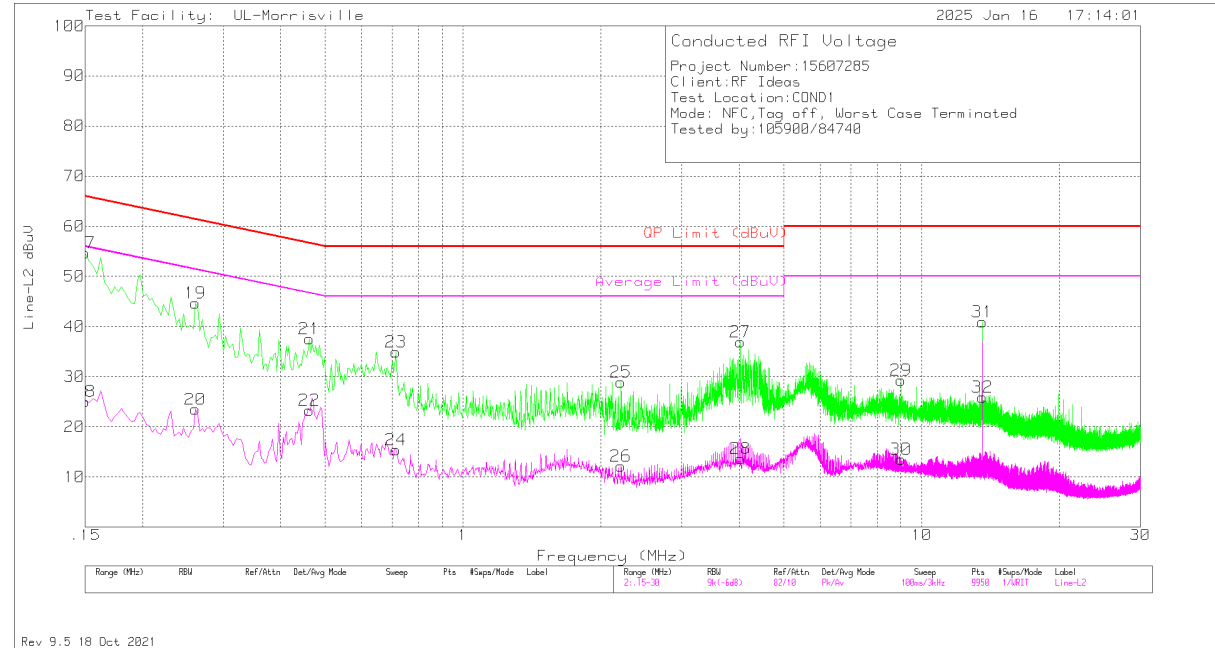


Emissions

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	.159	44.26	Pk	.2	9.8	54.26	65.52	-11.26	-	-
2	.159	18.24	Av	.2	9.8	28.24	-	-	55.52	-27.28
3	.228	36.26	Pk	.1	9.8	46.16	62.52	-16.36	-	-
4	.228	12.93	Av	.1	9.8	22.83	-	-	52.52	-29.69
5	.477	28.54	Pk	0	9.8	38.34	56.39	-18.05	-	-
6	.477	14.29	Av	0	9.8	24.09	-	-	46.39	-22.3
7	.714	26.01	Pk	0	9.8	35.81	56	-20.19	-	-
8	.714	6.81	Av	0	9.8	16.61	-	-	46	-29.39
9	1.953	20.41	Pk	0	9.8	30.21	56	-25.79	-	-
10	1.953	2.95	Av	0	9.8	12.75	-	-	46	-33.25
11	3.906	22.41	Pk	0	9.9	32.31	56	-23.69	-	-
12	3.906	6.75	Av	0	9.9	16.65	-	-	46	-29.35
13	5.928	22.2	Pk	.1	9.9	32.2	60	-27.8	-	-
14	5.928	8.56	Av	.1	9.9	18.56	-	-	50	-31.44
15	13.56	31.12	Pk	.1	10	41.22	60	-18.78	-	-
16	13.56	23.52	Av	.1	10	33.62	-	-	50	-16.38

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS



Emissions

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)
17	.15	44.6	Pk	.3	9.8	54.7	66	-11.3	-	-
18	.15	14.89	Av	.3	9.8	24.99	-	-	56	-31.01
19	.261	34.78	Pk	.1	9.8	44.68	61.4	-16.72	-	-
20	.261	13.57	Av	.1	9.8	23.47	-	-	51.4	-27.93
21	.462	27.76	Pk	0	9.8	37.56	56.66	-19.1	-	-
22	.462	13.5	Av	0	9.8	23.3	-	-	46.66	-23.36
23	.714	25.14	Pk	0	9.8	34.94	56	-21.06	-	-
24	.714	5.57	Av	0	9.8	15.37	-	-	46	-30.63
25	2.211	19.08	Pk	0	9.8	28.88	56	-27.12	-	-
26	2.211	2.32	Av	0	9.8	12.12	-	-	46	-33.88
27	4.023	26.97	Pk	0	9.9	36.87	56	-19.13	-	-
28	4.023	3.76	Av	0	9.9	13.66	-	-	46	-32.34
29	9.021	19.22	Pk	.1	10	29.32	60	-30.68	-	-
30	9.021	3.46	Av	.1	10	13.56	-	-	50	-36.44
31	13.56	30.87	Pk	.1	10	40.97	60	-19.03	-	-
32	13.56	15.83	Av	.1	10	25.93	-	-	50	-24.07

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector

12. SETUP PHOTOS

Please refer to R15607285-EP1 for setup photos

END OF TEST REPORT