

TEST REPORT

Report Number: R15701621-E2b

Applicant : HID Global Corporation
611 Center Ridge Dr
Austin, TX 78753 USA

Model : 20KV2

FCC ID : JQ6-SIGNO20KV2

IC : 2236B-SIGNO20KV2

EUT Description : Smartcard 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:
2025-06-24

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2025-06-01	Initial Issue	Noah Bennett
V2	2025-06-24	Revised Worst-Case Statement, Removed Pigtail AC Lines, and Editorial Revision	Charles Moody

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: HID Global Corporation
611 Center Ridge Dr
Austin, TX 78753 USA

EUT DESCRIPTION: Smartcard Reader

MODEL: 20KV2

SERIAL NUMBER: FL0P0U00N0WO20KTKF8087

SAMPLE RECEIPT DATE: 2025-03-10

DATE TESTED: 2025-03-12 thru 2025-05-01

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C: 2025	
ISED RSS-210 Issue 11:2024	Refer to Section 3
ISED RSS-GEN Issue 5 + A1 + A2: 2021	

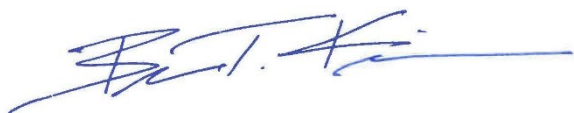
UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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:



Brian Kiewra
Project Engineer
Consumer, Medical and IT Segment
UL LLC



Noah Bennett
Engineer Project Associate
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

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 correctly integrating customer-provided data with measurements performed by UL LLC.

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

- 1) Cable loss (section 9)
- 2) Supported Data-Rates and Power Settings. Orientation of Operation (Section 6.4)
- 3) Software, Firmware and Hardware Versions of EUT (section 6.3)

Requirement Description	Requirement Clause Number	Result	Remarks
Occupied Bandwidth	FCC §15.215 (c) RSS-Gen 6.7	Compliant	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 §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)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

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. DESCRIPTION OF EUT

Signo Reader is a smartcard reader typically installed near doorway as part of physical access system, to control access to that door. A user will approach the door and present a BLE or RFID credentials to the reader with intention of entering the door. The reader will read the credential and send its data to a connected access control panel, which determine whether or not grant the user access to the door.

The EUT supports the following technologies:

Wireless technologies	Frequency Band(s)	Operating mode(s)
NFC	13.56MHz	Type A 106, 212, 424 & 848 Kbps
	125KHz	4 Kbps
Bluetooth	2.4 GHz	LE 1 & 2 Mbps
Notes: 1) The EUT operated in a 1x1 SISO mode. 2) The EUT only supports 1 type(s) of NFC tag.		

This report covers the full testing of the 13.56MHz NFC/HF radio.

6.2. MAXIMUM ELECTRIC FIELD STRENGTH

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

Fundamental Frequency (MHz)	E-Field (dBuV/m)	Mode
13.56	40.57	Tag Off

6.3. SOFTWARE AND FIRMWARE

EUT FW Version: 10.1

EUT HW Version: Rev H

6.4. WORST-CASE CONFIGURATION AND MODE

The EUT is only meant to be installed in one orientation during normal operation. Therefore, radiated tests were done in that orientation only. Additionally, 2 Configurations of power cables, (1) "Pigtail" and (2) "Terminal" were investigated. It was found that (2) "Terminal" was worst-case. Therefore, testing was done using that cable.

The EUT is meant to be powered via an auxiliary device (access controller) that does not come with the product. Therefore, for AC Lines, the scan was run using a DC power supply as representative.

The worst-case between Tag On configuration and Tag Off configuration was found by measuring the highest fundamental E-Field during pre-testing. It was found that Tag Off was worst-case configuration. Therefore, radiated testing was done in Tag Off orientation only. The worst-case data rate as provided by the manufacturer as tested was Type A 106 Kbps.

6.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	Yoga 7 16IAP7	PF49WDF9	-
Laptop	Lenovo	T14 Gen3	PF4FKW01	-
Laptop Charger	Lenovo	ADLX65YLC2D	8ssa10R16920L1CZ35T1VXJ	-
USB to Type C cable	ANKER	-	-	-
Laptop	Lenovo	IdeaPad Flex 5 14IAU7	PW0DWR8R	TX2-RTL8852BE

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	Barrel	Unshielded	<3m	Used to connect EUT to DC Power Supply.
2	1	1	Type C	Unshielded	<6m	Programing cable

SETUP DIAGRAM

Please refer to R15701621-EP1b for setup diagrams

TEST SETUP

The EUT is connected to a DC power supply during the tests. The EUT was set to continuously be reading for a tag. The Tag was placed on the EUT for Tag On, and removed for Tag Off.

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 2)

Equip. ID	Description	Manufacturer/Brand	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				
159203	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-03-05	2026-03-05
	Gain-Loss Chains				
91975	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-10	2025-05-10
91978	Gain-loss string: 25-1000MHz	Various	Various	2024-05-10	2025-05-10
	Receiver & Software				
**197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-03-05	2025-03-31
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
200540	Environmental Meter	Fisher Scientific	15-077-963	2023-07-19	2025-07-19

**NOTE: At the time of testing, all equipment was in calibration.

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	2025-04-17	2026-04-17
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
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2024-04-04 2025-04-17	2025-04-30 2026-04-17
236852	CW-AC Power Source	Ametek	CW2501	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
	Conducted Room 1				
90411	Spectrum Analyzer	Keysight Technologies	N9030A	2024-08-01	2025-08-01
207726	Temp/Humid Chamber	Thermotron	SM-32-8200	2025-01-15	2026-01-15
179892	Environmental Meter	Fisher Scientific	15-077-963	2024-08-12	2025-08-12
-	DC Power Supply	Keysight Technologies	E3633A	-	-
SOFTEMI	Antenna Port Software	UL	Version 2024.2.23	NA	NA

8. 20dB and 99% BANDWIDTH

LIMITS

§15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

TEST PROCEDURE

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.

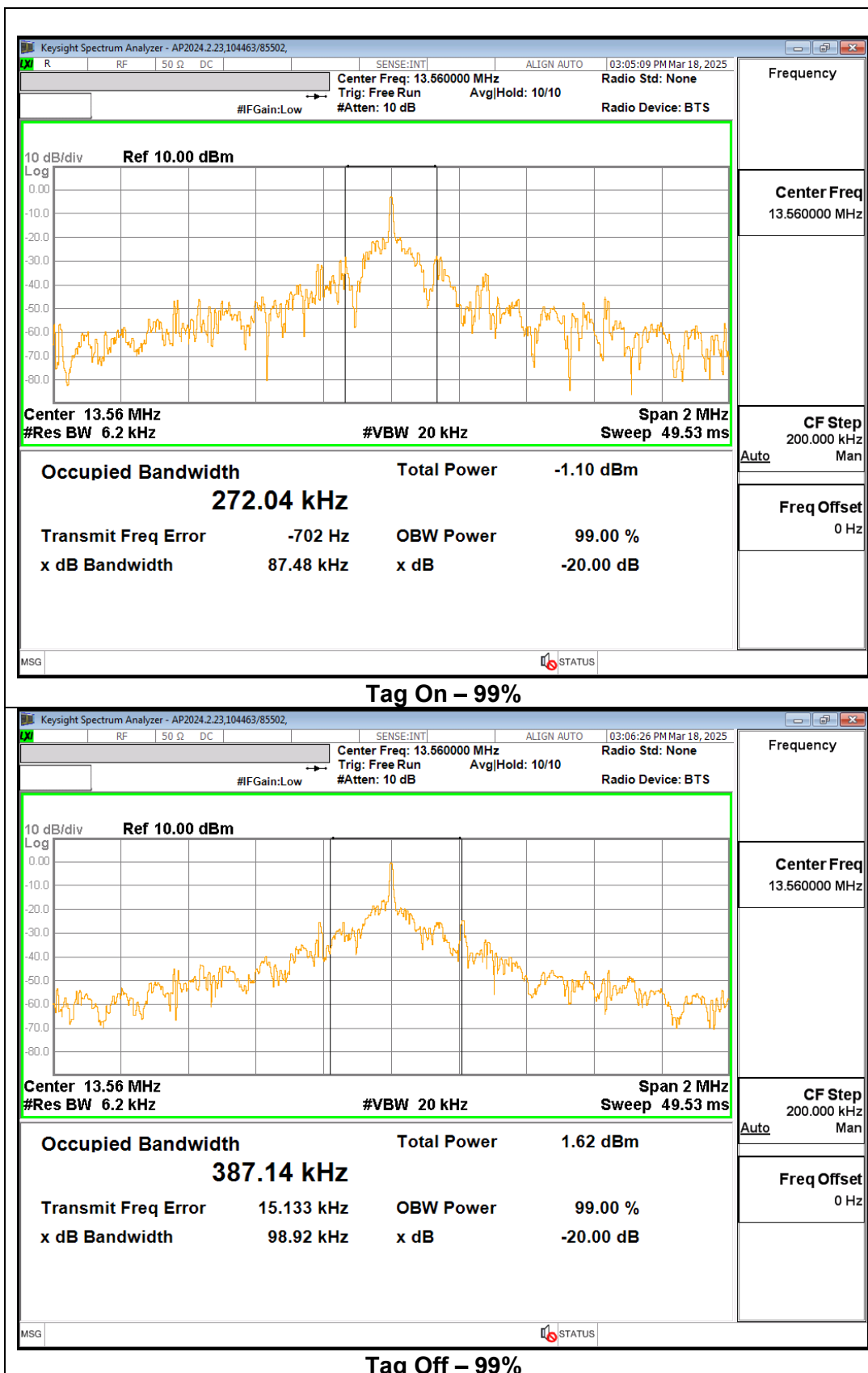
RESULTS

Mode	Frequency (MHz)	20dB Bandwidth* (kHz)	99% Bandwidth (kHz)
Type A (Tag On)	13.56	87.48	272.04
Type A (Tag off)	13.56	98.92	387.14

*Note:

Because the measured signal is CW or CW-like, adjusting the RBW per C63.10 would not be practical, since the measured bandwidth would always follow the RBW.

8.1. Type A



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
Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µA/m)	Measurement Distance (m)
0.009 – 0.490	6.37 / F (kHz)	300
0.490 – 1.705	63.7 / F (kHz)	30
1.705 – 30.0	.08	30

** 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 (e) The provisions in §§ 15.31, 15.33, and 15.35, 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.

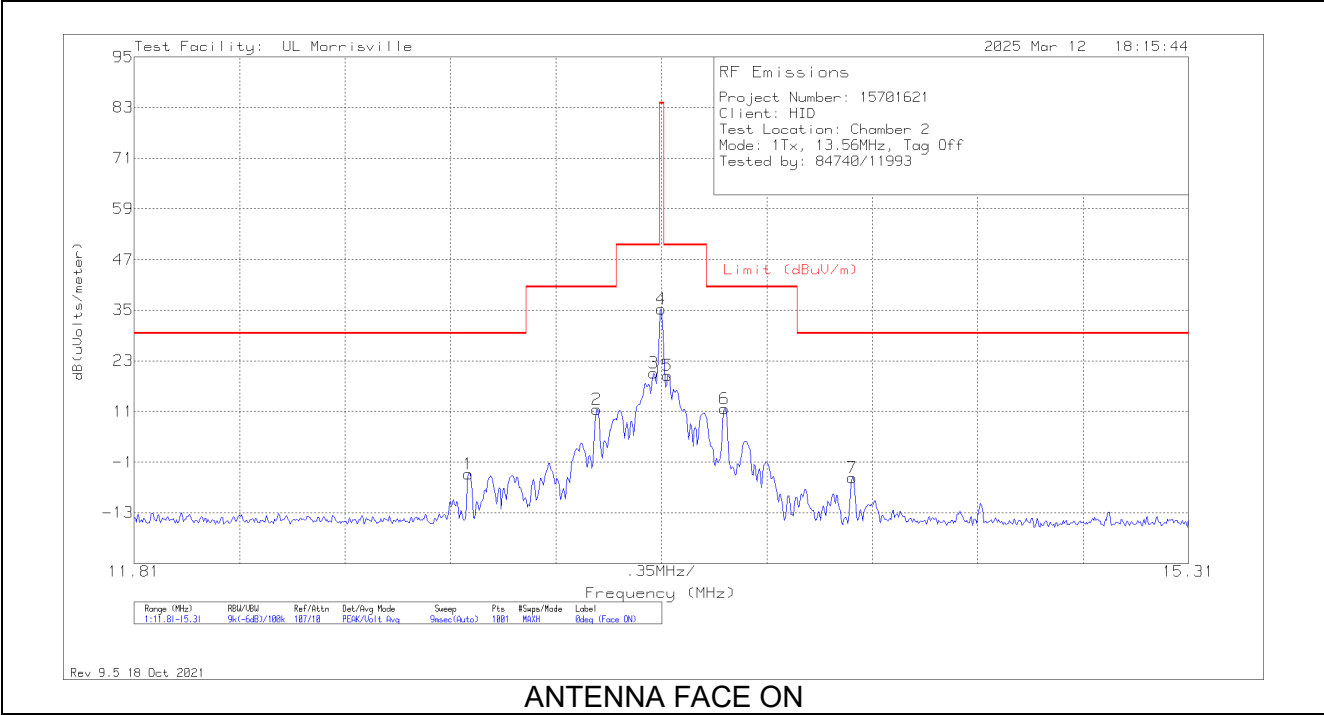
Note: For all Below 30MHz test data, all measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious 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 $40 \cdot \log(\text{test distance} / \text{specification distance})$

RESULTS

9.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (<30MHz)

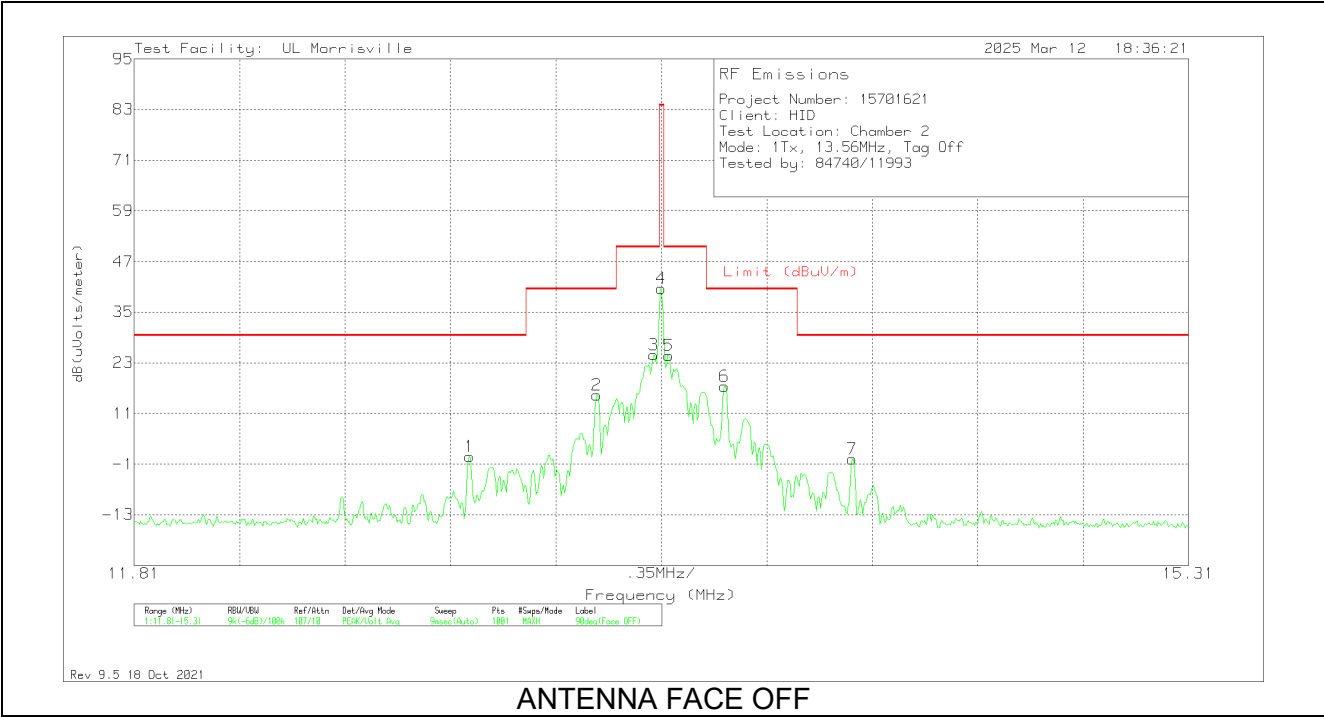
9.2.1. TYPE A, TAG OFF

FUNDAMENTAL



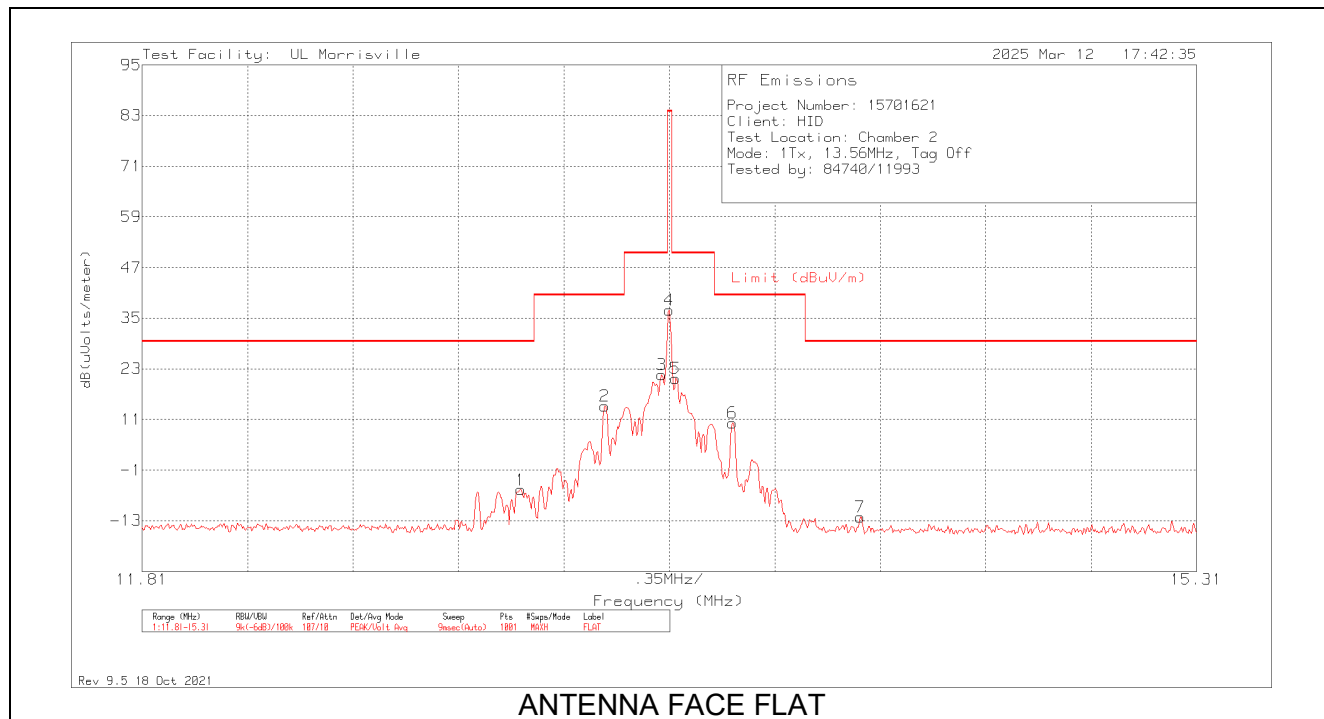
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
1	12.9195	25.83	Pk	9.8	.6	-40	-3.77	29.5	-33.27	7	100	0 degs
2	13.3465	41.14	Pk	9.8	.6	-40	11.54	40.5	-28.96	7	100	0 degs
3	13.5355	49.73	Pk	9.8	.6	-40	20.13	50.5	-30.37	7	100	0 degs
4	13.56	64.86	Pk	9.8	.6	-40	35.26	84	-48.74	7	100	0 degs
5	13.581	49.1	Pk	9.8	.6	-40	19.5	50.5	-31	7	100	0 degs
6	13.77	41.37	Pk	9.7	.6	-40	11.67	40.5	-28.83	7	100	0 degs
7	14.1935	24.95	Pk	9.7	.6	-40	-4.75	29.5	-34.25	7	100	0 degs

Pk - Peak detector



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	12.923	30.36	Pk	9.8	.6	-40	.76	29.5	-28.74	100	100	90 degs
2	13.3465	44.96	Pk	9.8	.6	-40	15.36	40.5	-25.14	100	100	90 degs
3	13.5355	54.54	Pk	9.8	.6	-40	24.94	50.5	-25.56	100	100	90 degs
4	13.56	70.17	Pk	9.8	.6	-40	40.57	84	-43.43	100	100	90 degs
5	13.5845	54.3	Pk	9.8	.6	-40	24.7	50.5	-25.8	100	100	90 degs
6	13.77	47.17	Pk	9.7	.6	-40	17.47	40.5	-23.03	100	100	90 degs
7	14.1935	29.91	Pk	9.7	.6	-40	.21	29.5	-29.29	100	100	90 degs

Pk - Peak detector

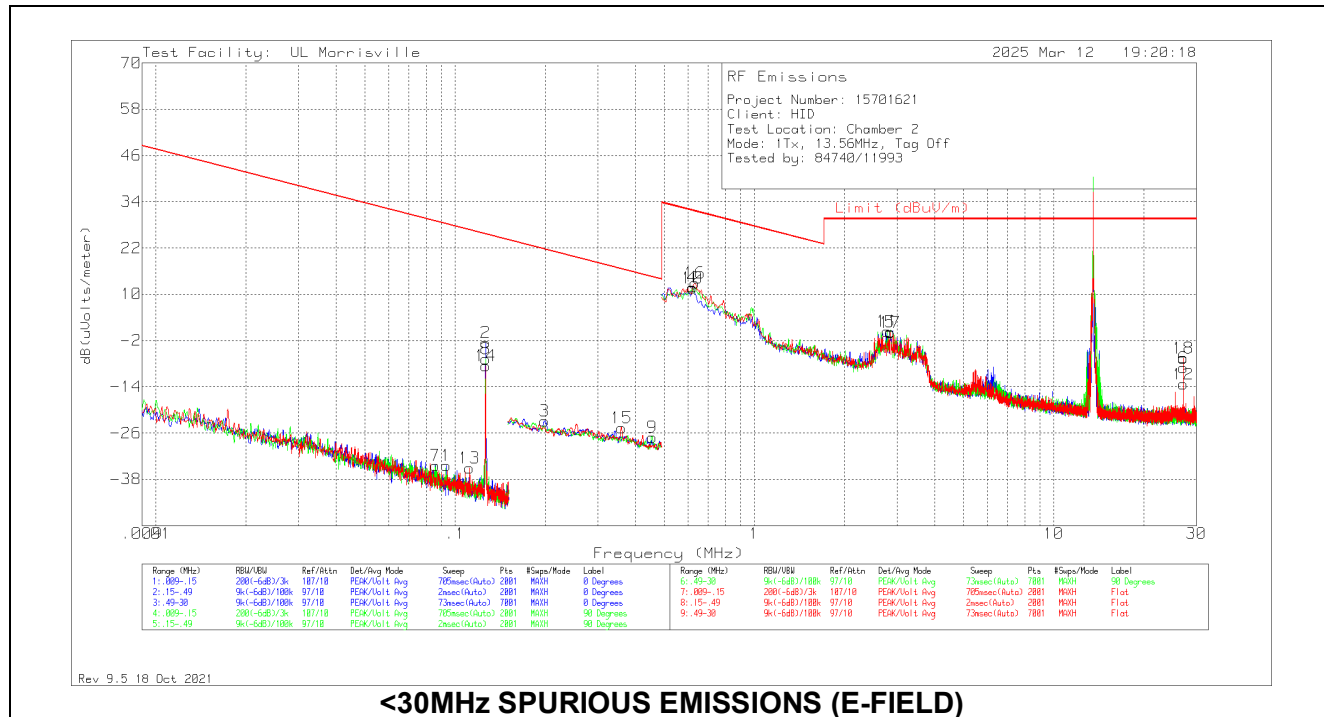


ANTENNA FACE FLAT

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)	Height (cm)	Loop Angle
1	13.0665	23.94	Pk	9.8	.6	-40	-5.66	29.5	-35.16	354	100	Flat
2	13.3465	43.83	Pk	9.8	.6	-40	14.23	40.5	-26.27	354	100	Flat
3	13.5355	51.19	Pk	9.8	.6	-40	21.59	50.5	-28.91	354	100	Flat
4	13.56	66.48	Pk	9.8	.6	-40	36.88	84	-47.12	354	100	Flat
5	13.581	50.31	Pk	9.8	.6	-40	20.71	50.5	-29.79	354	100	Flat
6	13.77	39.86	Pk	9.7	.6	-40	10.16	40.5	-30.34	354	100	Flat
7	14.1935	17.63	Pk	9.7	.6	-40	-12.07	29.5	-41.57	354	100	Flat

Pk - Peak detector

SPURIOUS EMISSION – E FIELD (Worst Case Configuration)



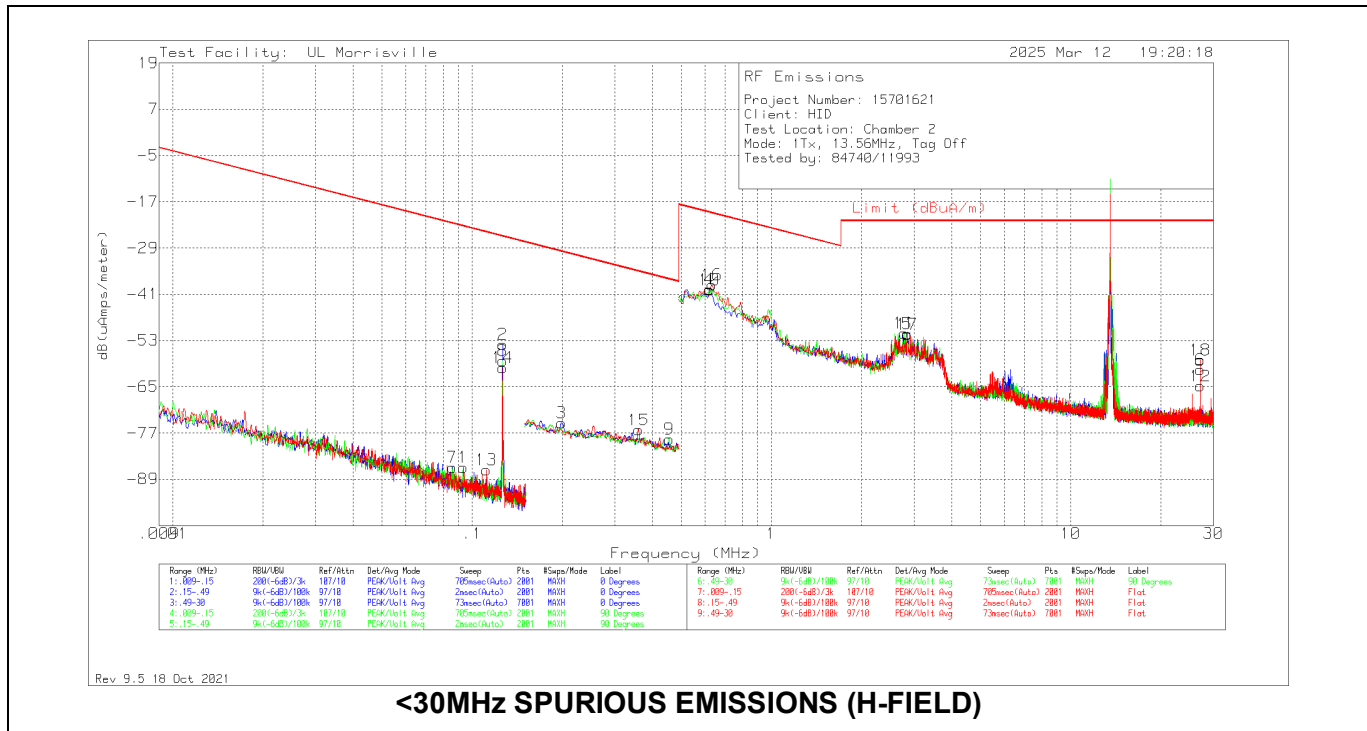
<30MHz SPURIOUS EMISSIONS (E-FIELD)

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)	Height (cm)	Loop Angle
7	.08589	34.3	Pk	11.2	.1	-80	-34.4	28.93	48.93	-63.33	0-360	401	90 degs
1	.09335	34.41	Pk	11.1	.1	-80	-34.39	28.2	48.20	-62.59	0-360	401	0 degs
13	.11181	33.68	Pk	11.1	.1	-80	-35.12	26.63	46.63	-61.75	0-360	401	Flat
2*	.12636	66.42	Pk	11	.1	-80	-	-	-	-	0-360	401	0 degs
8*	.12636	62.19	Pk	11	.1	-80	-	-	-	-	0-360	401	90 degs
14*	.12636	60.36	Pk	11	.1	-80	-	-	-	-	0-360	401	Flat
3	.19922	46.04	Pk	11	.1	-80	-22.86	21.62	41.62	-44.48	0-360	401	0 degs
15	.35978	44.27	Pk	10.9	.1	-80	-24.73	16.48	36.48	-41.21	0-360	401	Flat
9	.45549	41.8	Pk	11	.1	-80	-27.1	14.43	34.43	-41.53	0-360	401	90 degs
4	.6207	40.74	Pk	11	.1	-40	11.84	31.75	-	-19.91	0-360	401	0 degs
10	.6207	40.57	Pk	11	.1	-40	11.67	31.75	-	-20.08	0-360	401	90 degs
16	.63334	41.86	Pk	11	.1	-40	12.96	31.57	-	-18.61	0-360	401	Flat
11	2.77929	29.1	Pk	11.1	.2	-40	.4	29.54	-	-29.14	0-360	401	90 degs
5	2.83831	28.98	Pk	11.1	.2	-40	.28	29.54	-	-29.26	0-360	401	0 degs
17	2.83831	28.78	Pk	11.1	.2	-40	.08	29.54	-	-29.46	0-360	401	Flat
18	27.12036	24.92	Pk	7.7	.8	-40	-6.58	29.54	-	-36.12	0-360	401	Flat
6	27.12247	22.44	Pk	7.7	.8	-40	-9.06	29.54	-	-38.6	0-360	401	0 degs
12	27.12247	18.15	Pk	7.7	.8	-40	-13.35	29.54	-	-42.89	0-360	401	90 degs

Pk - Peak detector

* Indicates fundamental of 125kHz transmitter, not subject to test in this report.

SPURIOUS EMISSION – H FIELD (Worst-Case Configuration)



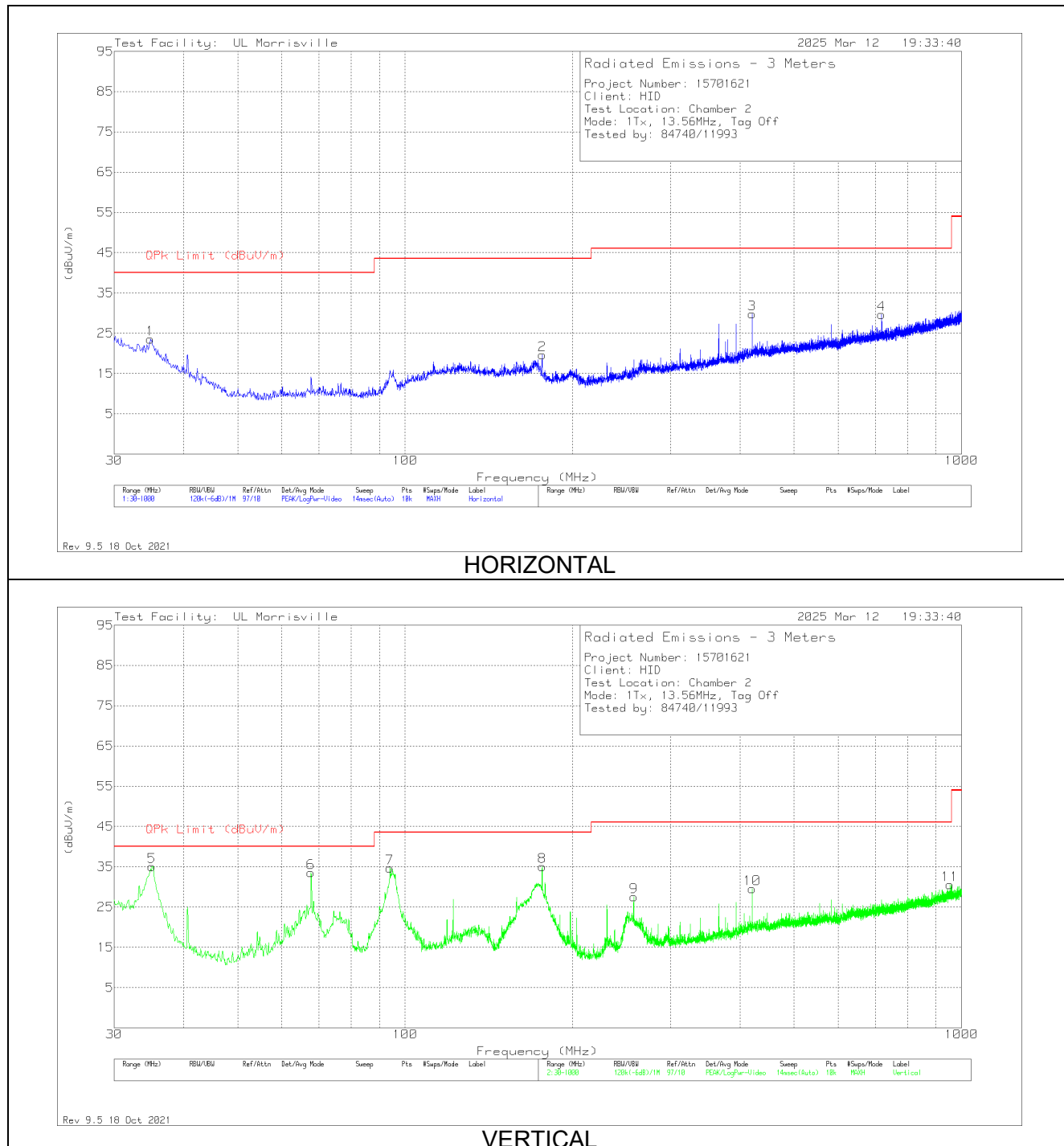
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	QP/AV Limit (dBuA/m)	PK Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
7	.08589	34.3	Pk	-40.3	.1	-80	-85.9	-22.57	-2.57	-63.33	0-360	401	90 degs
1	.09335	34.41	Pk	-40.4	.1	-80	-85.89	-23.3	-3.3	-62.59	0-360	401	0 degs
13	.11181	33.68	Pk	-40.4	.1	-80	-86.62	-24.87	-4.87	-61.75	0-360	401	Flat
2*	.12636	66.42	Pk	-40.5	.1	-80	-	-	-	-	0-360	401	0 degs
8*	.12636	62.19	Pk	-40.5	.1	-80	-	-	-	-	0-360	401	90 degs
14*	.12636	60.36	Pk	-40.5	.1	-80	-	-	-	-	0-360	401	Flat
3	.19922	46.04	Pk	-40.5	.1	-80	-74.36	-29.88	-9.88	-44.48	0-360	401	0 degs
15	.35978	44.27	Pk	-40.6	.1	-80	-76.23	-35.02	-15.02	-41.21	0-360	401	Flat
9	.45549	41.8	Pk	-40.5	.1	-80	-78.6	-37.07	-17.07	-41.53	0-360	401	90 degs
4	.6207	40.74	Pk	-40.5	.1	-40	-39.66	-19.75	-	-19.91	0-360	401	0 degs
10	.6207	40.57	Pk	-40.5	.1	-40	-39.83	-19.75	-	-20.08	0-360	401	90 degs
16	.63334	41.86	Pk	-40.5	.1	-40	-38.54	-19.93	-	-18.61	0-360	401	Flat
11	2.77929	29.1	Pk	-40.4	.2	-40	-51.1	-21.96	-	-29.14	0-360	401	90 degs
5	2.83831	28.98	Pk	-40.4	.2	-40	-51.22	-21.96	-	-29.26	0-360	401	0 degs
17	2.83831	28.78	Pk	-40.4	.2	-40	-51.42	-21.96	-	-29.46	0-360	401	Flat
18	27.12036	24.92	Pk	-43.8	.8	-40	-58.08	-21.96	-	-36.12	0-360	401	Flat
6	27.12247	22.44	Pk	-43.8	.8	-40	-60.56	-21.96	-	-38.6	0-360	401	0 degs
12	27.12247	18.15	Pk	-43.8	.8	-40	-64.85	-21.96	-	-42.89	0-360	401	90 degs

Pk - Peak detector

* Indicates fundamental of 125kHz transmitter, not subject to test in this report.

9.3. TX SPURIOUS EMISSION 30 TO 1000 MHz

9.3.1. TYPE A, TAG OFF



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	159203 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	34.85	31.27	Pk	24	-31.7	23.57	40	-16.43	0-360	299	H
5	35.1557	39.69	Qp	23.8	-31.6	31.89	40	-8.11	35	106	V
6	67.733	50.16	Pk	14.6	-31.2	33.56	40	-6.44	0-360	101	V
7	93.923	50.54	Pk	15.1	-31	34.64	43.52	-8.88	0-360	101	V
2	176.276	31.94	Pk	17.9	-30.2	19.64	43.52	-23.88	0-360	199	H
8	176.276	47.38	Pk	17.9	-30.2	35.08	43.52	-8.44	0-360	101	V
9	257.659	38.74	Pk	18.4	-29.6	27.54	46.02	-18.48	0-360	101	V
3	420.328	35.8	Pk	22.8	-28.8	29.8	46.02	-16.22	0-360	101	H
10	420.328	35.57	Pk	22.8	-28.8	29.57	46.02	-16.45	0-360	101	V
4	718.7	30.14	Pk	27	-27.5	29.64	46.02	-16.38	0-360	101	H
11	952.858	26.4	Pk	29.6	-25.5	30.5	46.02	-15.52	0-360	101	V

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. TYPE A, WITH NO TAG

Reference Frequency: EUT Channel 13.56 MHz @ 20°C 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)
12.00	50	13.5598506	3.866	13.5598495	3.947	13.5598482	4.040	13.5598479	4.066	± 100
12.00	40	13.5598670	2.654	13.5598650	2.805	13.5598627	2.973	13.5598602	3.156	± 100
12.00	30	13.5598905	0.926	13.5598882	1.095	13.5598861	1.247	13.5598833	1.454	± 100
12.00	20	13.5599030	0.000	13.5598998	0.236	13.5598959	0.524	13.5598907	0.907	± 100
12.00	10	13.5599448	-3.081	13.5599427	-2.931	13.5599405	-2.769	13.5599386	-2.629	± 100
12.00	0	13.5599594	-4.163	13.5599587	-4.107	13.5599579	-4.049	13.5599569	-3.975	± 100
12.00	-10	13.5599637	-4.478	13.5599638	-4.485	13.5599638	-4.487	13.5599638	-4.480	± 100
12.00	-20	13.5599648	-4.558	13.5599645	-4.535	13.5599634	-4.455	13.5599614	-4.304	± 100
10.20	20	13.5598899	0.966	13.5598887	1.055	13.5598869	1.187	13.5598848	1.342	± 100
13.2	20	13.5598905	0.922	13.55989258	0.768	13.55989505	0.586	13.55989808	0.363	± 100

Tested by: 85502

Test date: 2025-03-18

Note: EUT was tested at the highest extreme supported voltage of 13.2VDC, or 12VDC*110%.

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)
RSS-Gen 8.8

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

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

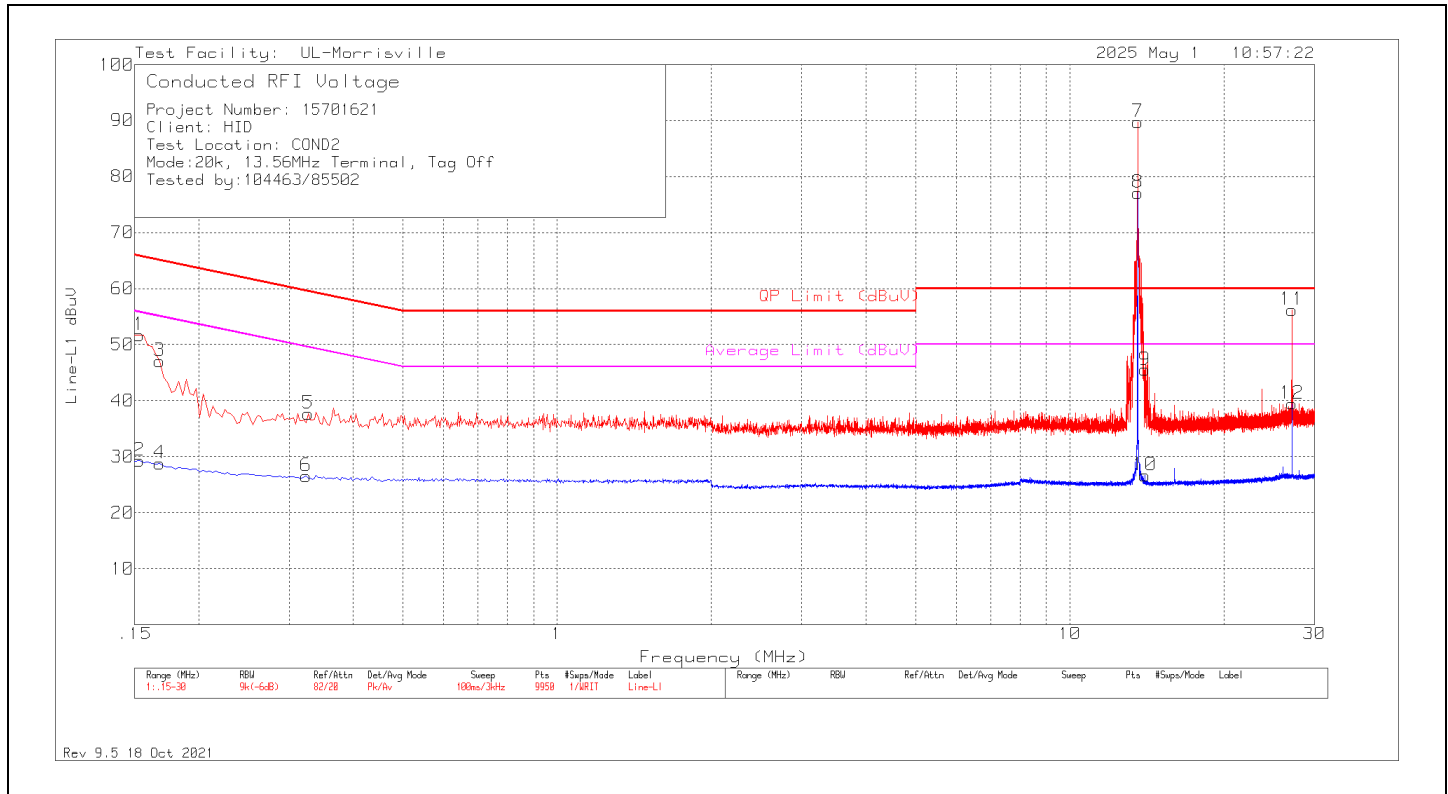
Line conducted data is recorded for both lines.

RESULTS

Note: Both *Pigtail* and *Terminal* Input power cables were tested and reported.

11.1. AC Mains Tag Off

LINE 1 RESULTS

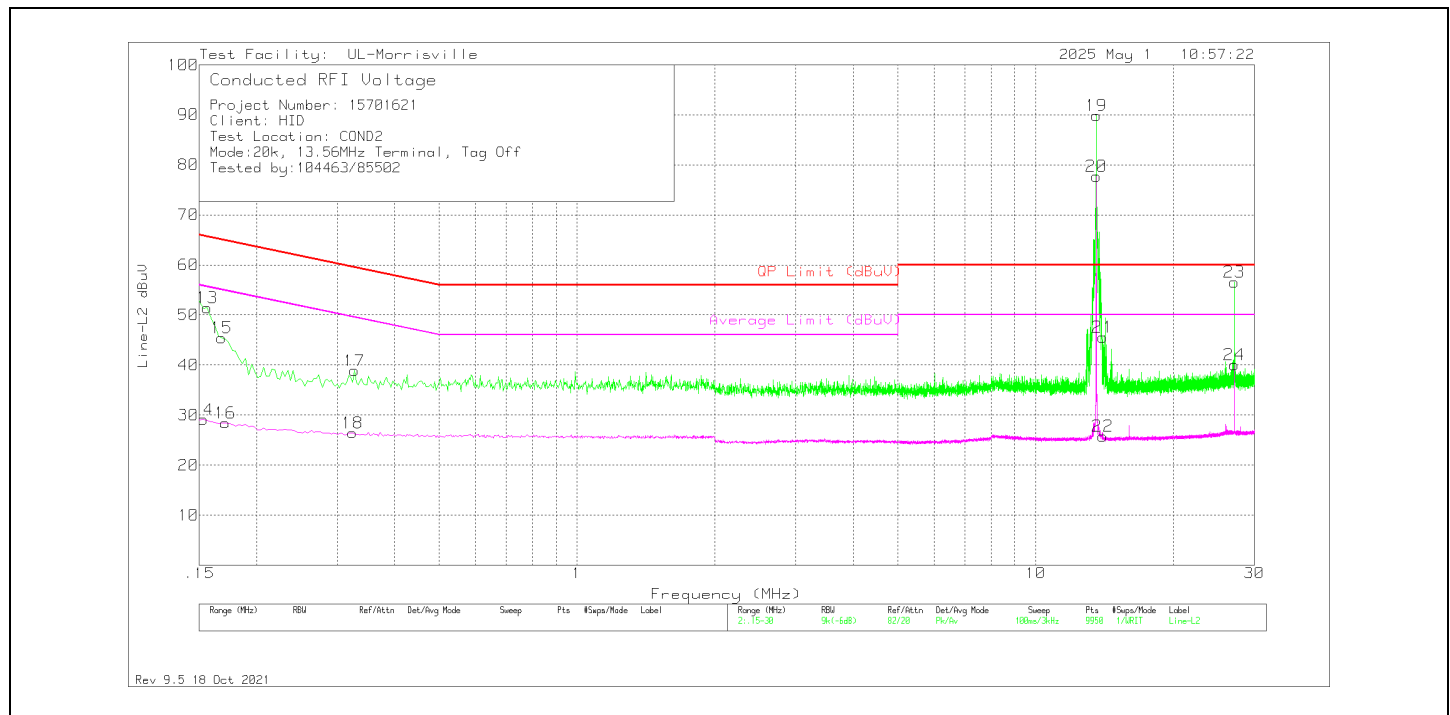


Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	171083 (dB)	Atten (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.153	31.54	Pk	.2	0	20	51.74	65.84	-14.1	-	-
2	.153	9.09	Av	.2	0	20	29.29	-	-	55.84	-26.55
3	.168	26.89	Pk	.2	0	20	47.09	65.06	-17.97	-	-
4	.168	8.55	Av	.2	0	20	28.75	-	-	55.06	-26.31
6	.324	6.4	Av	.1	0	20	26.5	-	-	49.6	-23.1
5	.327	17.56	Pk	.1	0	20	37.66	59.53	-21.87	-	-
7*	13.5605	67.62	Qp	.1	.3	20	88.02	60	28.02	-	-
8*	13.5605	57.47	Ca	.1	.3	20	77.87	-	-	50	27.87
10	14.001	6.23	Av	.1	.3	20	26.63	-	-	50	-23.37
9	14.01	25.09	Pk	.1	.3	20	45.49	60	-14.51	-	-
11	27.1215	32	Qp	.4	.4	20	52.8	60	-7.2	-	-
12	27.1215	17.74	Ca	.4	.4	20	38.54	-	-	50	-11.46

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

*Note: Markers 7 and 8 are the fundamentals of the device, and not spurious emissions. Section 11.1.1 shows compliance with an NFC/HF terminated sample.

LINE 2 RESULTS



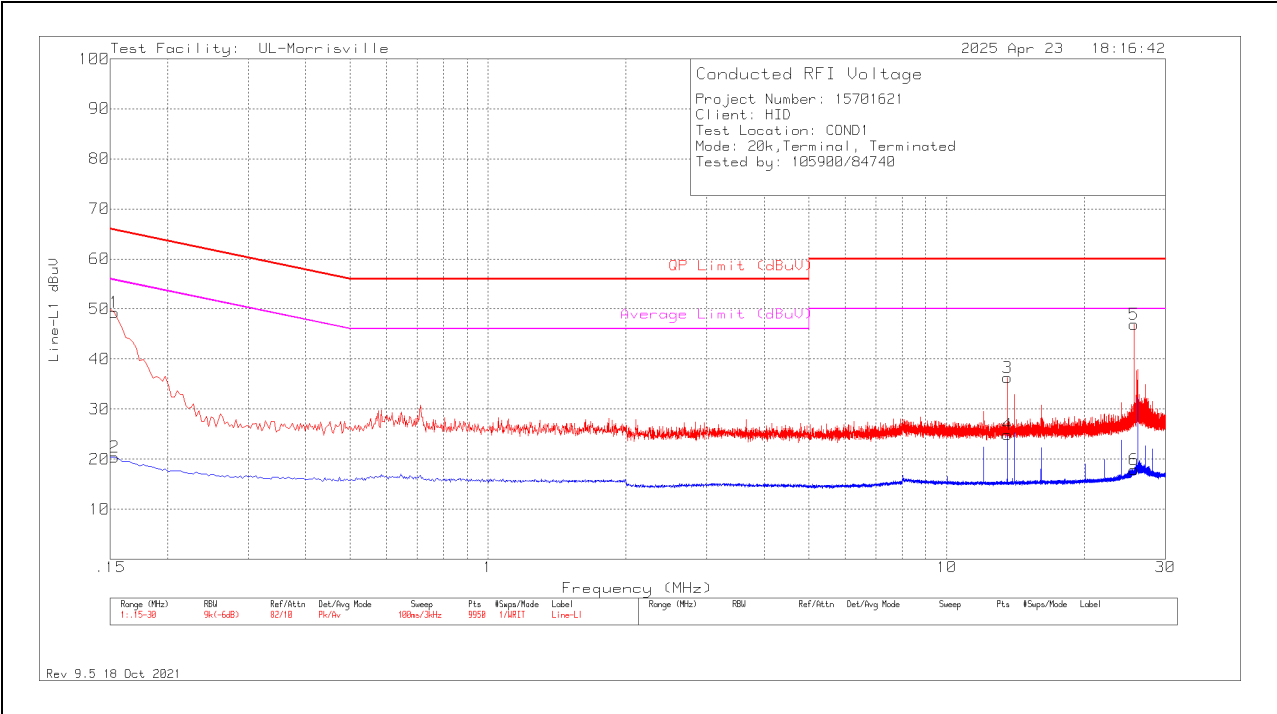
Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	171083 (dB)	Atten (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
14	.153	8.9	Av	.2	0	20	29.1	-	-	55.84	-26.74
13	.156	31.25	Pk	.2	0	20	51.45	65.67	-14.22	-	-
15	.168	25.23	Pk	.2	0	20	45.43	65.06	-19.63	-	-
16	.171	8.26	Av	.2	0	20	28.46	-	-	54.91	-26.45
18	.324	6.36	Av	.1	0	20	26.46	-	-	49.6	-23.14
17	.327	18.76	Pk	.1	0	20	38.86	59.53	-20.67	-	-
19*	13.5605	67.89	Qp	.1	.3	20	88.29	60	28.29	-	-
20*	13.5605	57.37	Ca	.1	.3	20	77.77	-	-	50	27.77
22	14.004	5.41	Av	.1	.3	20	25.81	-	-	50	-24.19
21	14.01	25.19	Pk	.1	.3	20	45.59	60	-14.41	-	-
23	27.1218	32.12	Qp	.4	.4	20	52.92	60	-7.08	-	-
24	27.12	19.26	Av	.4	.4	20	40.06	-	-	50	-9.94

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

*Note: Markers 19 and 20 are the fundamentals of the device, and not spurious emissions. Section 11.1.1 shows compliance with an NFC/HF terminated sample.

11.2. NFC/HF Terminated Sample

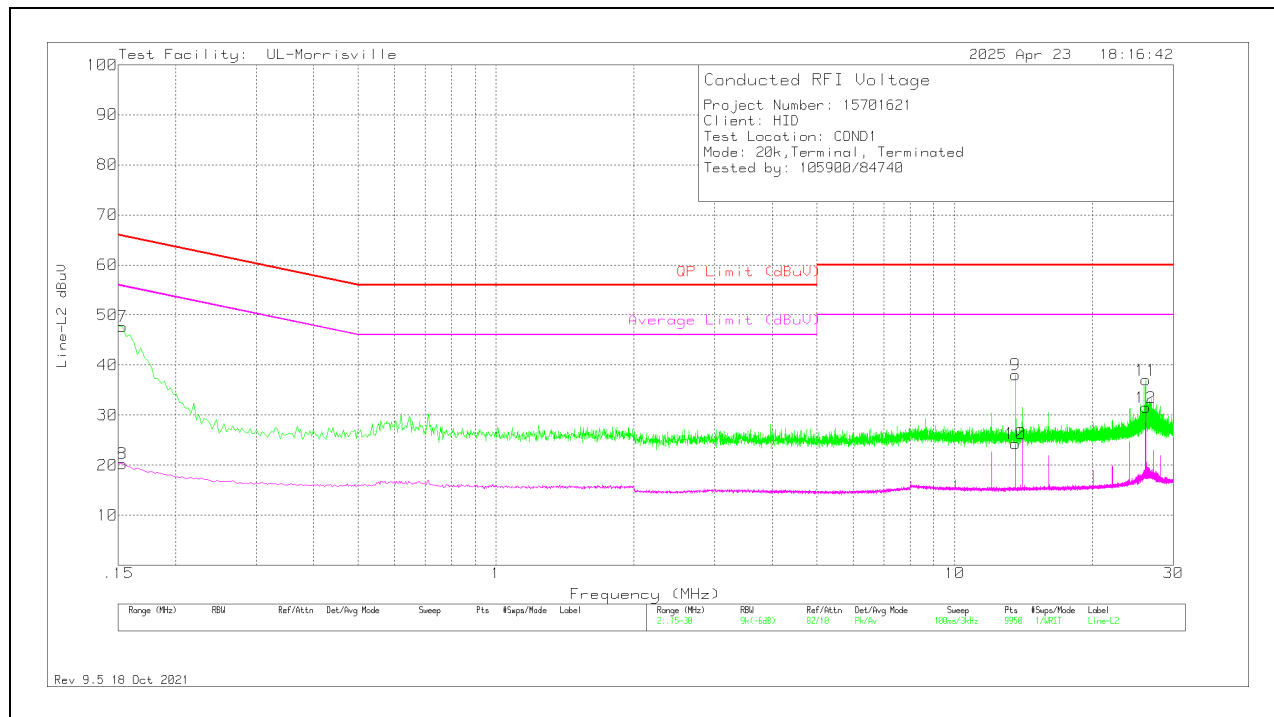
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	171083 (dB)	Atten (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.153	29.09	Pk	.2	0	20	49.29	65.84	-16.55	-	-
2	.153	.19	Av	.2	0	20	20.39	-	-	55.84	-35.45
3	13.56	15.9	Pk	.1	.3	20	36.3	60	-23.7	-	-
4	13.56	4.53	Av	.1	.3	20	24.93	-	-	50	-25.07
6	25.596	-2.95	Av	.4	.4	20	17.85	-	-	50	-32.15
5	25.626	26.18	Pk	.4	.4	20	46.98	60	-13.02	-	-

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)	171083 (dB)	Atten (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
7	.153	27.46	Pk	.2	0	20	47.66	65.84	-18.18	-	-
8	.153	.12	Av	.2	0	20	20.32	-	-	55.84	-35.52
9	13.56	17.61	Pk	.1	.3	20	38.01	60	-21.99	-	-
10	13.56	3.88	Av	.1	.3	20	24.28	-	-	50	-25.72
12	26.079	10.68	Av	.4	.4	20	31.48	-	-	50	-18.52
11	26.0805	16.18	Pk	.4	.4	20	36.98	60	-23.02	-	-

Pk - Peak detector; Av - Average detection;

12. SETUP PHOTOS

Please refer to R15701621-EP1b for setup photos

END OF TEST REPORT