Test Report

Report No	EW0989-2
Client	LumiraDx
Address	221 Crescent St. STE 502 Waltham, MA 02453
Phone	617-543-0690
FCC ID	2AV6APOC
Product Name	LumiraDx Instrument
Model/HVIN	SPEC-30874 Rev6
FVIN	1.27 RC1
Equipment Code	DXX – Part 15 Low Power Communication Device Transmitter
FCC/IC Rule Parts	CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 10 Annex B.6
Test Dates	Dec 22 - Dec 27, 2022
FCC Test Firm DN	US1028
Canada CABID	US0106
Prepared by	Ryan M. Brown – Sr. EMC/ Wireless Engineer
Authorized by	Yunus Faziloglu – Wireless Manager
Issue Date	Feb 23, 2023

Contents

Form Final Report REV 12-07-15

Summary and Test Methodology

This test report supports an application for a Class II Permissive Change for a transmitter operating under:

CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 10 Annex B.6
For details of the modifications to the product, please refer to the Class II Permissive Change Request Letter in the certification application package.

The LumiraDx Instrument is a multi-protocol RFID read/write module for use with most industry standard 13.56MHz RFID tags and smart labels.

All the testing was performed in accordance with ANSI C63.10-2013. During testing, the EUT was positioned on its back in tabletop configuration as seen in the Test Setup Photos exhibit. This position was declared by the client as EUT's only installation and use configuration.

We found that the product met the above requirements without modifications. Test sample was received in good condition.

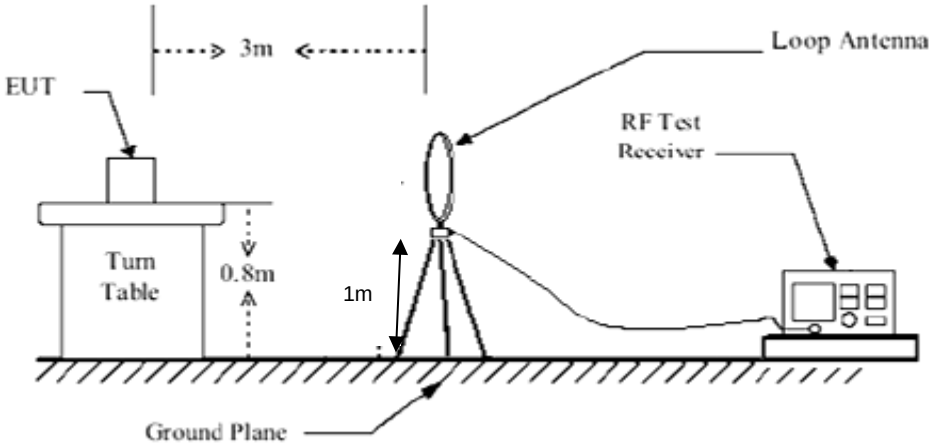
The environmental conditions during testing are documented on the associated data tables.

Following bandwidths were used during emissions testing:

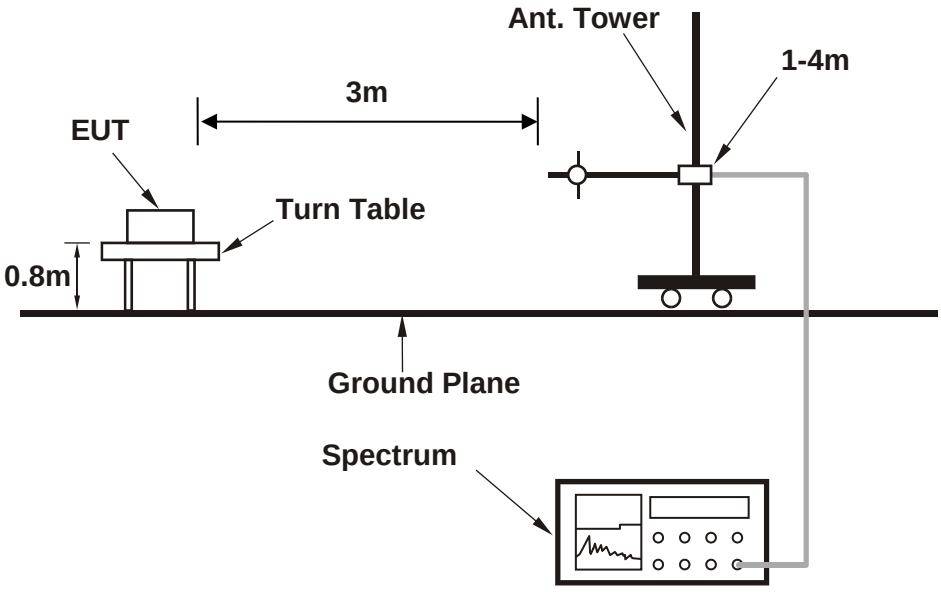
Freq. (MHz)	RBW	VBW	Pre-scan	Final
0.009-0.15	200Hz	1kHz	Peak	Quasi Peak
0.15-30	9kHz	30kHz	Peak	Quasi Peak
30-1000	120kHz	300kHz	Peak	Quasi Peak
1000-2000	1MHz	3MHz	Peak	Peak Max Hold and RMS Power Avg Max Hold

If peak measurements were below the applicable limit, QPk and RMS measurements were not performed. Testing above 2GHz was not required since client declared the highest clock in the EUT as 200MHz.

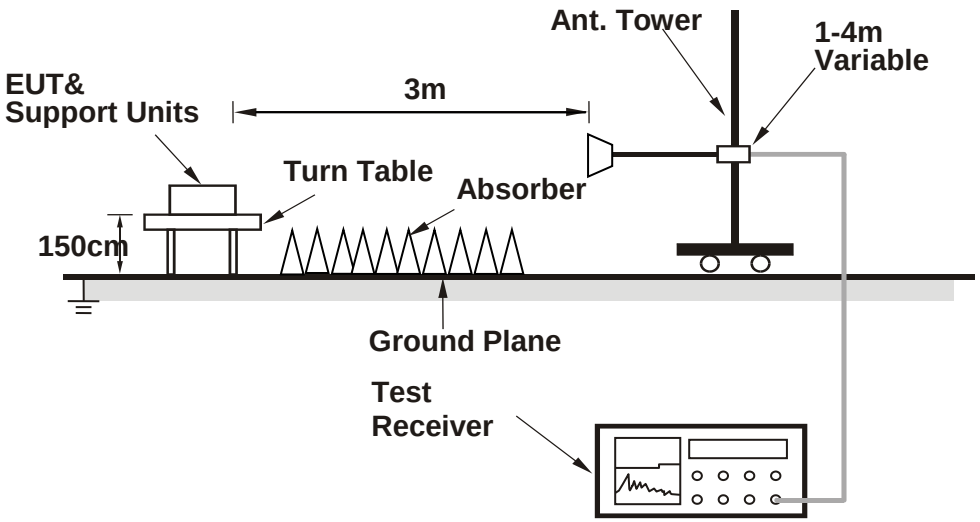
9kHz - 30MHz Test Setup



30MHz - 1GHz Test Setup



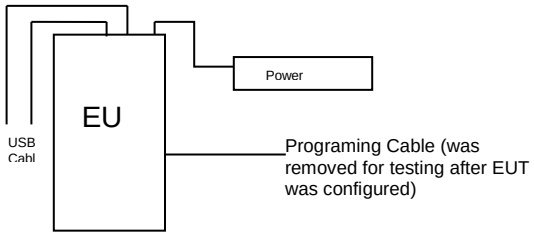
1GHz – 2GHz Test Setup



Product Tested - Configuration Documentation

EUT Configuration										
Work Order:	W0989									
Company:	LumiraDx									
Company Address:	221 Crescent St. STE 502									
	Waltham, MA 02453									
Contact:	Dr. David Bonyuet									
Person Present:	Dr. David Bonyuet									
Product Marketing Name	LumiraDx Instrument									
Model / HVIN	SPEC-30874 Rev6									
FVIN	1.27 RC1									
Serial Number	30874-22-09-59346									
EUT Radio Frequency:	13.56MHz									
EUT Max Frequency:	200MHz									
EUT Min Frequency:	32.768kHz									
EUT Ports:										
Port Label	**Port Type**	**No. of ports**	**No. Populated**	**Cable Type**	**Shielded**	**Ferrites**	**Length**	**Max Length**	**In/Out NEBS Type**	**Unpopulated Reason**
USB	USB	2	2	USB	Yes	No	3	5	Indoor	
AC	Power	1	1	Power	No	No	2	2	Indoor	
Software / Operating Mode Description:										
Continuously Transmitting at 13.56MHz										
Performance Criteria:										
N/A: Emissions Only										

Block Diagram



	RFID
Operating Frequency	13.56 MHz
Modulation	ASK

Summary of Results

The EUT complied with the following requirements:

RSS-GEN	RSP-100	RSS 210	Part 15	Comments
6.4			15.15(b)	There are no controls accessible to the user that varies the output power.
	3.1		15.19	The label is shown in the label exhibit.
	3.2		15.21	Information to the user is shown in the instruction manual exhibit.
			15.27	No special accessories are required for compliance.
3.2			15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13.2			15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
6.13.1			15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
6.8			15.203	EUT has an integral loop antenna.
8.10 8.9		7.3	15.205 15.209	Fundamental is not in a restricted band and the spurious and harmonic emissions in the restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable.
8.8			15.207	Complies with applicable AC line conducted emission limits.

Modifications Required for Compliance

No modifications were required to achieve compliance.

Testing Notes

RSS-GEN Table 6 H-field limits are 51.5dB lower than FCC 15.209(a) E-field limits. Measurements are performed in terms of magnetic field and converted to electric field using the free space impedance of 377Ω (E-field = H-field + 51.5). Therefore resulting pass/fail margin would be the same if an E-field reading is compared to an E-field limit or an H-field reading is compared to an H-field limit.

Test Results

Fundamental and Emissions Mask

(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.

Conversion formulas used:

3m Distance =(dBuV/m@30m)+40Log(30/3)
Margin = Reading – Preamp + Antenna Factor + Cable Factor - Limit

MEASUREMENTS / RESULTS

Radiated Emissions Table

Date: 22-Dec-22 **Company:** LumiraDx **Work Order:** W0989
Engineer: Matthew McCarthy **EUT Desc:** **EUT Operating Voltage/Frequency:** 120V/60Hz
Temp: 21.3°C **Humidity:** 40% **Pressure:** 1026mBar
Frequency Range: 13.56MHz **Measurement Distance:** 3 m
Notes: 13.56MHz Fundamental **EUT Max Freq:**

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC 15.209(a) Limit (dBµV/m)	FCC 15.209(a) Margin (dB)	FCC 15.209(a) Result (Pass/Fail)
Parallel	13.56	46.4	0.0	10.8	0.1	57.3	---	---	---	69.5	-12.2	Pass
Perpendicular	13.56	44.6	0.0	10.8	0.1	55.5	---	---	---	69.5	-14.0	Pass
Para to Floor	13.56	38.2	0.0	10.8	0.1	49.1	---	---	---	69.5	-20.4	Pass

Table Result: Pass by -12.2 dB ***Worst Freq:*** 13.56 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2681 **Cable 2:** Asset #2580 **Cable 3:** ---
Analyzer: 1170725 **Preamp:** None **Antenna:** Asset 2615 Loop **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.225

Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Emission mask defined in 15.225 (a)-(d) was not necessary since the highest 13.56MHz fundamental of 57.3dBuV/m at 3m is below the 15.209 limit of 69.5dBuV/m at 3m. In addition, all radiated spurious emissions were below the 15.209 limits.

Radiated Spurious Emissions

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 and RSS-Gen.

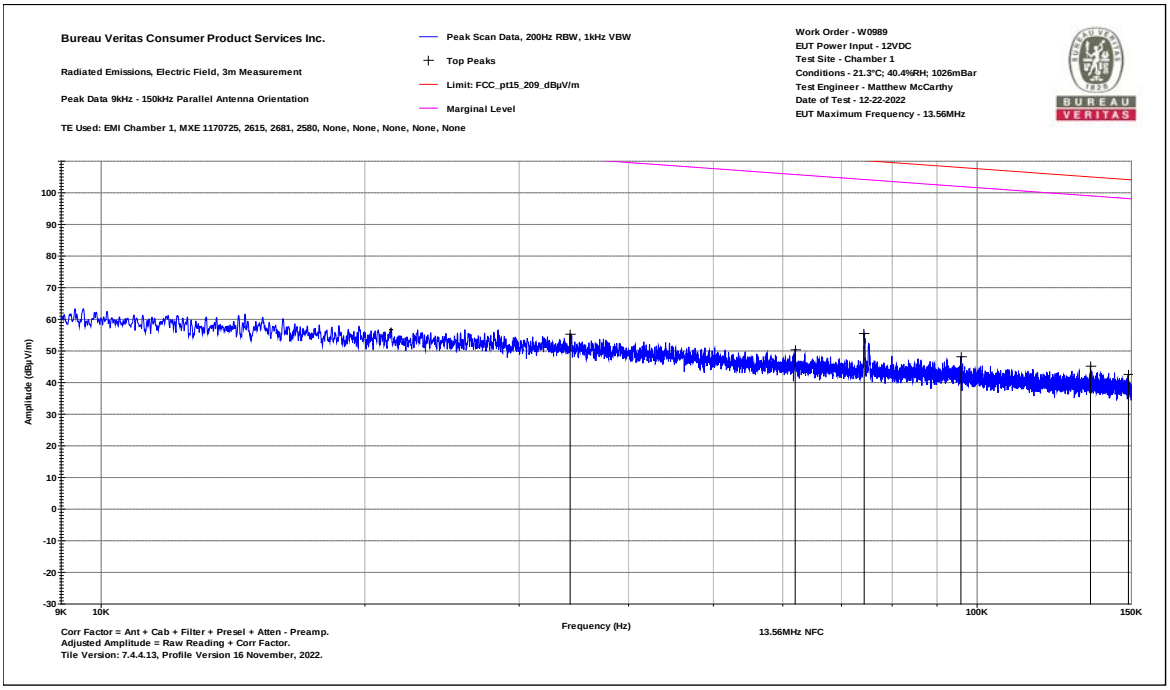
MEASUREMENTS / RESULTS

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions, Electric Field, 3m Measurement
Top Peaks Parallel 9-150kHz
Notes:
13.56MHz NFC

Work Order - W0989
EUT Power Input - 12VDC
Test Site - Chamber 1
Conditions - 21.3°C; 40.4%RH; 1026mBar
Test Engineer - Matthew McCarthy
Date of Test - 12-22-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim: FCC_pt15_209_dBµV/m (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.034306	42.3	12.9	55.3	116.9	-61.6	PASS		150
0.061995	39.8	10.6	50.4	111.8	-61.4	PASS		330
0.074318	45	10.4	55.4	110.2	-54.8	PASS	-54.8	165
0.095831	37.9	10.3	48.1	108	-59.9	PASS		15
0.134719	35.1	10.1	45.1	105	-59.9	PASS		225
0.14884	32.4	10.1	42.5	104.2	-61.7	PASS		150

9kHz – 150kHz Parallel



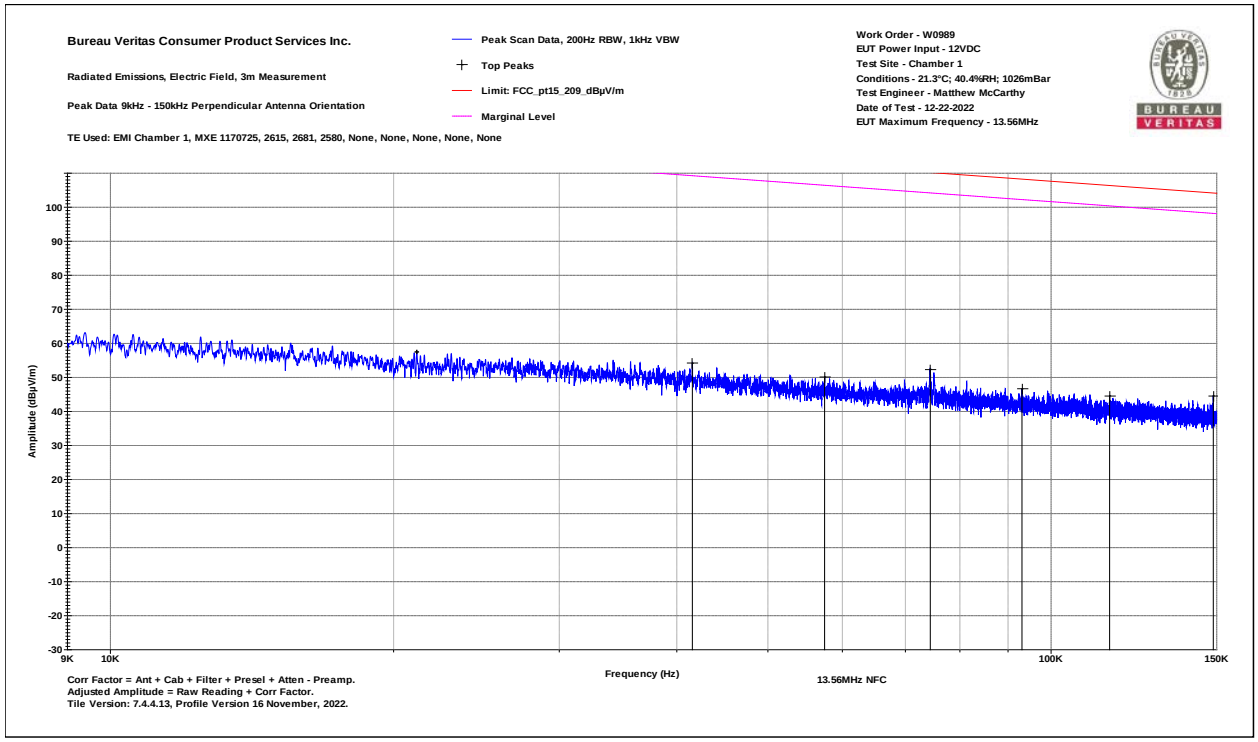
9kHz – 150kHz Parallel Plot

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions, Electric Field, 3m Measurement
Top Peaks Perpendicular 9-150kHz
Notes:
13.56MHz NFC

Work Order - W0989
EUT Power Input - 12VDC
Test Site - Chamber 1
Conditions - 21.3°C; 40.4%RH; 1026mBar
Test Engineer - Matthew McCarthy
Date of Test - 12-22-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim: FCC_pt15_209_dBµV/m (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.041557	42.1	12.1	54.2	115.3	-61.1	PASS		300
0.057448	39.3	10.8	50.1	112.4	-62.3	PASS		345
0.074403	42	10.4	52.4	110.2	-57.8	PASS	-57.8	105
0.093121	36.2	10.4	46.6	108.2	-61.6	PASS		345
0.115395	34.5	10.1	44.6	106.4	-61.8	PASS		255
0.148738	34.5	10.1	44.6	104.2	-59.6	PASS		75

9kHz – 150kHz Perpendicular



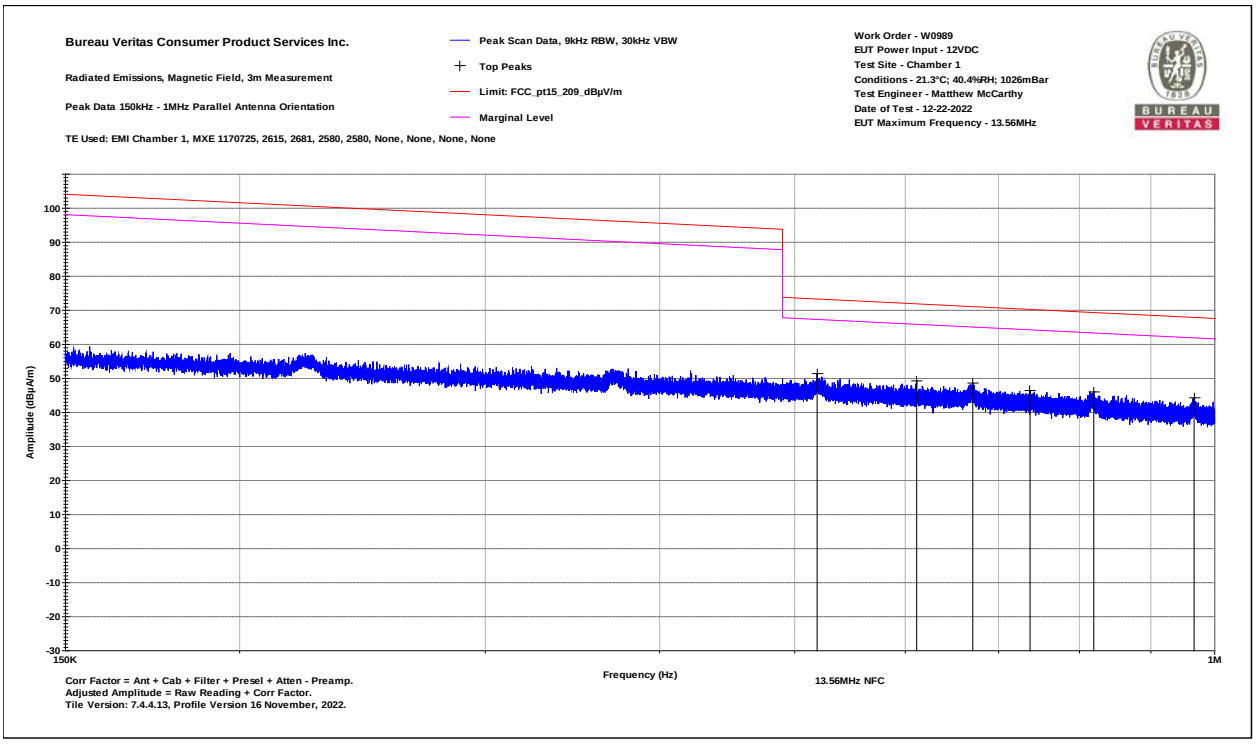
9kHz – 150kHz Perpendicular Plot

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Parallel 150-1000kHz
Notes:
13.56MHz NFC

Work Order - W0989
EUT Power Input - 12VDC
Test Site - Chamber 1
Conditions - 21.3°C; 40.4%RH; 1026mBar
Test Engineer - Matthew McCarthy
Date of Test - 12-22-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/s)	Adjusted Peak Amplitude (dBµA/m)	Lim: FCC_pt15_209_dBµV/m (dBµA/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.519	41.1	10.2	51.4	73.3	-22	PASS	-22	180
0.611	39	10.3	49.3	71.9	-22.6	PASS		105
0.671	38.1	10.4	48.5	71.1	-22.6	PASS		195
0.737	35.9	10.4	46.4	70.3	-23.9	PASS		75
0.819	35.6	10.4	46	69.3	-23.3	PASS		330
0.967	33.6	10.7	44.2	67.9	-23.7	PASS		45

0.15MHz – 1MHz Parallel



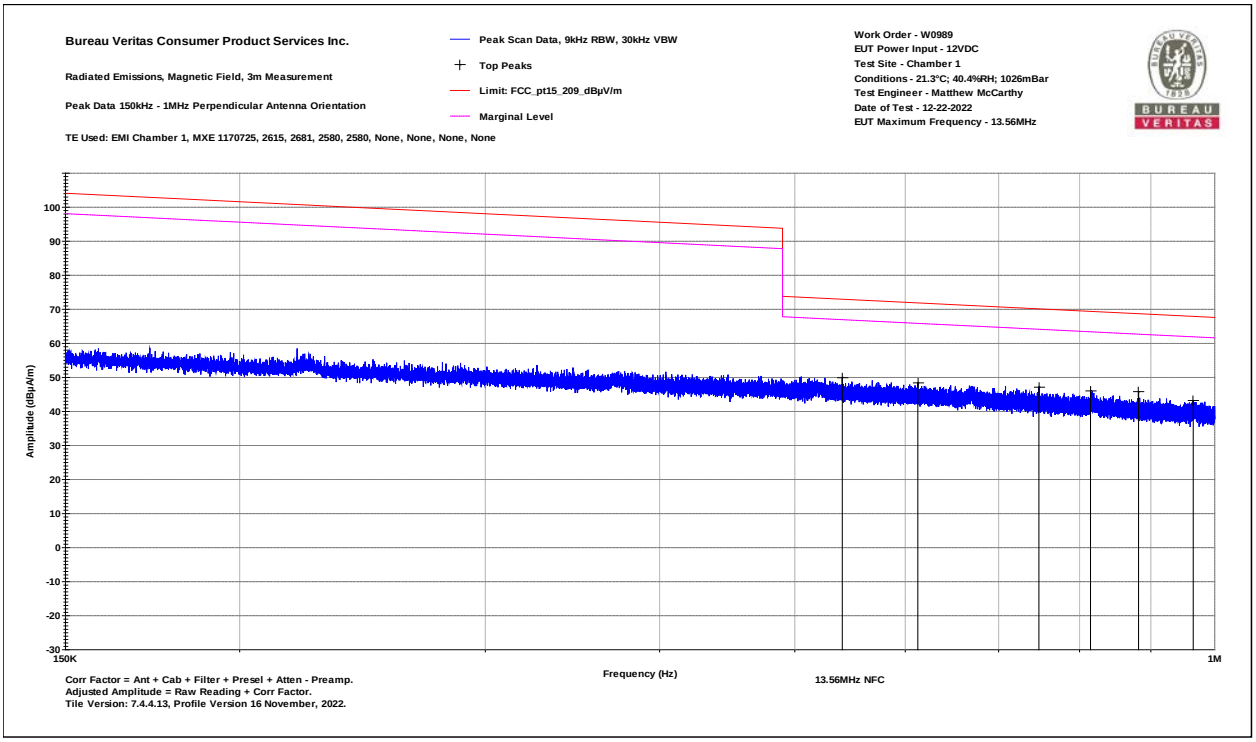
0.15MHz – 1MHz Parallel Plot

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Perpendicular 150-1000kHz
Notes:
13.56MHz NFC

Work Order - W0989
EUT Power Input - 12VDC
Test Site - Chamber 1
Conditions - 21.3°C; 40.4%RH; 1026mBar
Test Engineer - Matthew McCarthy
Date of Test - 12-22-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/s)	Adjusted Peak Amplitude (dBµA/m)	Lim: FCC_pt15_209_dBµV/m (dBµA/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.541	39.7	10.3	50	73	-23	PASS		270
0.613	38.1	10.3	48.4	71.9	-23.5	PASS		240
0.748	36.8	10.4	47.2	70.1	-23	PASS	-23	75
0.815	35.7	10.4	46.1	69.4	-23.3	PASS		270
0.882	35.2	10.5	45.7	68.7	-23	PASS		135
0.965	32.5	10.7	43.2	67.9	-24.7	PASS		300

0.15MHz – 1MHz Perpendicular



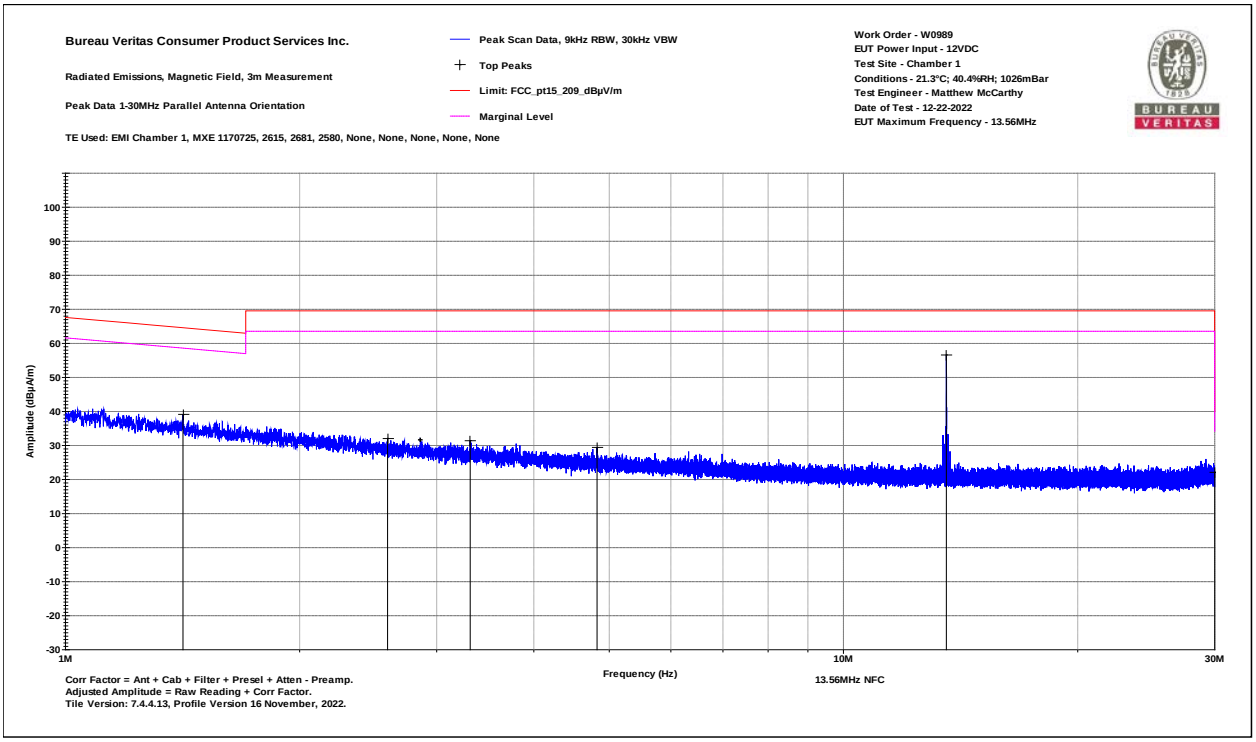
0.15MHz – 1MHz Perpendicular Plot

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Parallel 1-30MHz
Notes:
13.56MHz NFC

Work Order - W0989
EUT Power Input - 12VDC
Test Site - Chamber 1
Conditions - 21.3°C; 40.4%RH; 1026mBar
Test Engineer - Matthew McCarthy
Date of Test - 12-22-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/s)	Adjusted Peak Amplitude (dBµA/m)	Lim: FCC_pt15_209_dBµV/m (dBµA/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
1.416	28.4	10.6	39.1	64.6	-25.5	PASS		15
2.594	21.6	10.5	32.1	69.5	-37.5	PASS		210
3.313	20.9	10.6	31.4	69.5	-38.1	PASS		225
4.822	18.7	10.7	29.4	69.5	-40.2	PASS		300
13.56	45.7	10.9	56.6	69.5	-13	PASS	-13	240
30	14.1	8	22.1	40	-17.9	PASS		300

1MHz – 30MHz Parallel



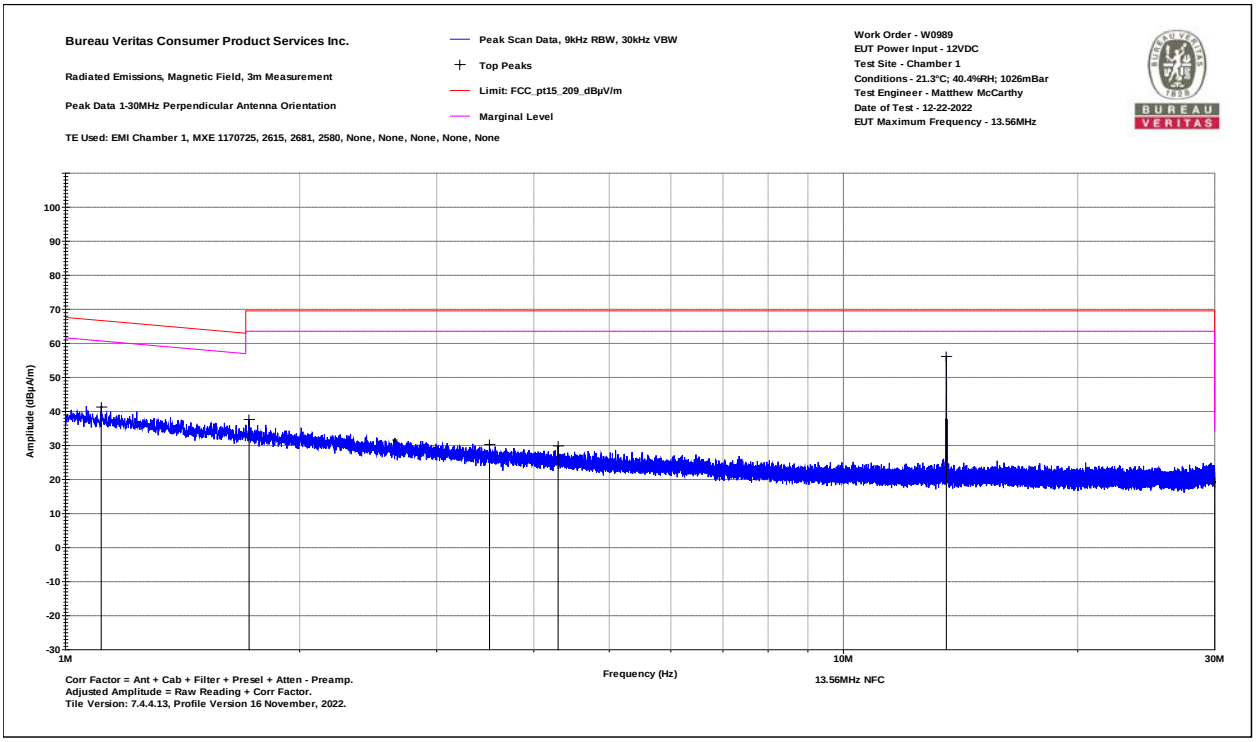
1MHz – 30MHz Parallel Plot

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Perpendicular 1-30MHz
Notes:
13.56MHz NFC

Work Order - W0989
EUT Power Input - 12VDC
Test Site - Chamber 1
Conditions - 21.3°C; 40.4%RH; 1026mBar
Test Engineer - Matthew McCarthy
Date of Test - 12-22-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/s)	Adjusted Peak Amplitude (dBµA/m)	Lim: FCC_pt15_209_dBµV/m (dBµA/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
1.112	30.6	10.7	41.3	66.7	-25.4	PASS		90
1.722	27.1	10.6	37.6	69.5	-31.9	PASS		345
3.508	19.6	10.6	30.2	69.5	-39.4	PASS		30
4.298	19.2	10.6	29.8	69.5	-39.7	PASS		285
13.561	45.3	10.9	56.2	69.5	-13.4	PASS	-13.4	0
30	11.4	8	19.4	40	-20.6	PASS		0

1MHz – 30MHz Perpendicular

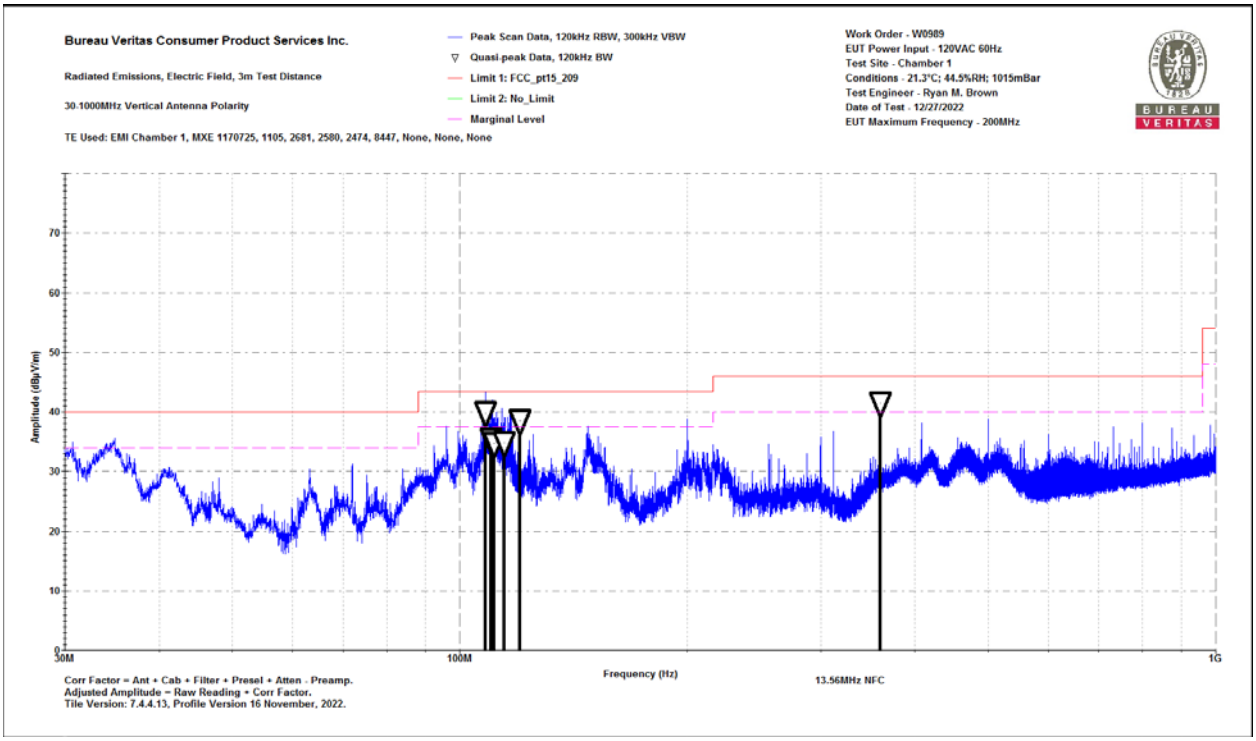


1MHz – 30MHz Perpendicular Plot

Bureau Veritas Consumer Product Services Inc.	Work Order - W0989
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 120VAC 60Hz
30-1000MHz Vertical Data	Test Site - Chamber 1
Notes:	Conditions - 21.3°C; 44.5%RH; 1015mBar
13.56MHz NFC	Test Engineer - Ryan M. Brown
0	Date of Test - 12/27/2022

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
107.972	49	-9.2	39.8	43.5	-3.7	PASS	-3.7	100	95
109.972	44.2	-8.8	35.4	43.5	-8.1	PASS		125	245
110.971	43.2	-8.6	34.7	43.5	-8.8	PASS		125	274
114.432	42.9	-8.1	34.8	43.5	-8.7	PASS		111	260
120.015	46.1	-7.5	38.6	43.5	-4.9	PASS		100	290
359.963	46.7	-5.3	41.4	46	-4.6	PASS		165	155

30-1000MHz Vertical

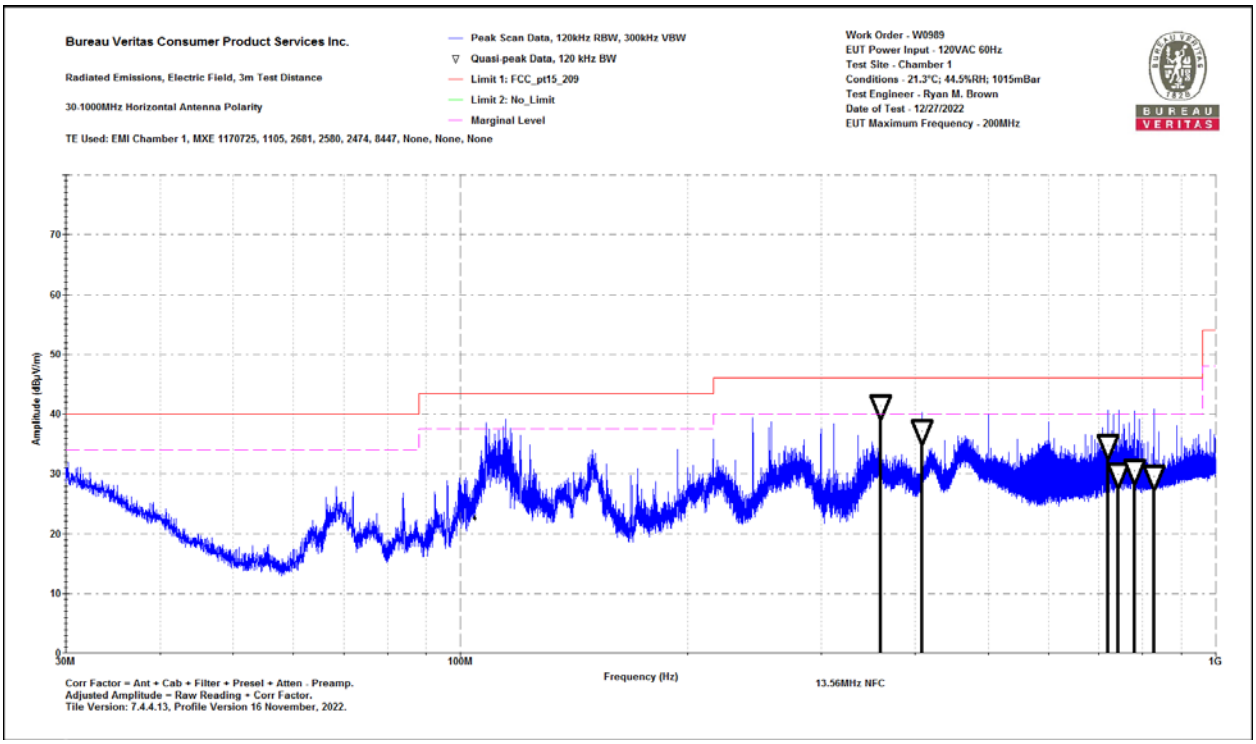


30-1000MHz Vertical Plot

Bureau Veritas Consumer Product Services Inc.	Work Order - W0989
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 120VAC 60Hz
30-1000MHz Horizontal Data	Test Site - Chamber 1
Notes:	Conditions - 21.3°C; 44.5%RH; 1015mBar
13.56MHz NFC	Test Engineer - Ryan M. Brown
0	Date of Test - 12/27/2022

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dbµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
360.044	46.7	-5.3	41.3	46	-4.7	PASS	-4.7	100	34
408.058	42	-4.8	37.2	46	-8.8	PASS		112	81
720.342	34.2	0.4	34.7	46	-11.3	PASS		100	307
742.781	29.1	0.9	29.9	46	-16.1	PASS		125	68
780.229	29	1.5	30.5	46	-15.5	PASS		125	304
828.19	27	2.5	29.5	46	-16.5	PASS		100	232

30-1000MHz Horizontal

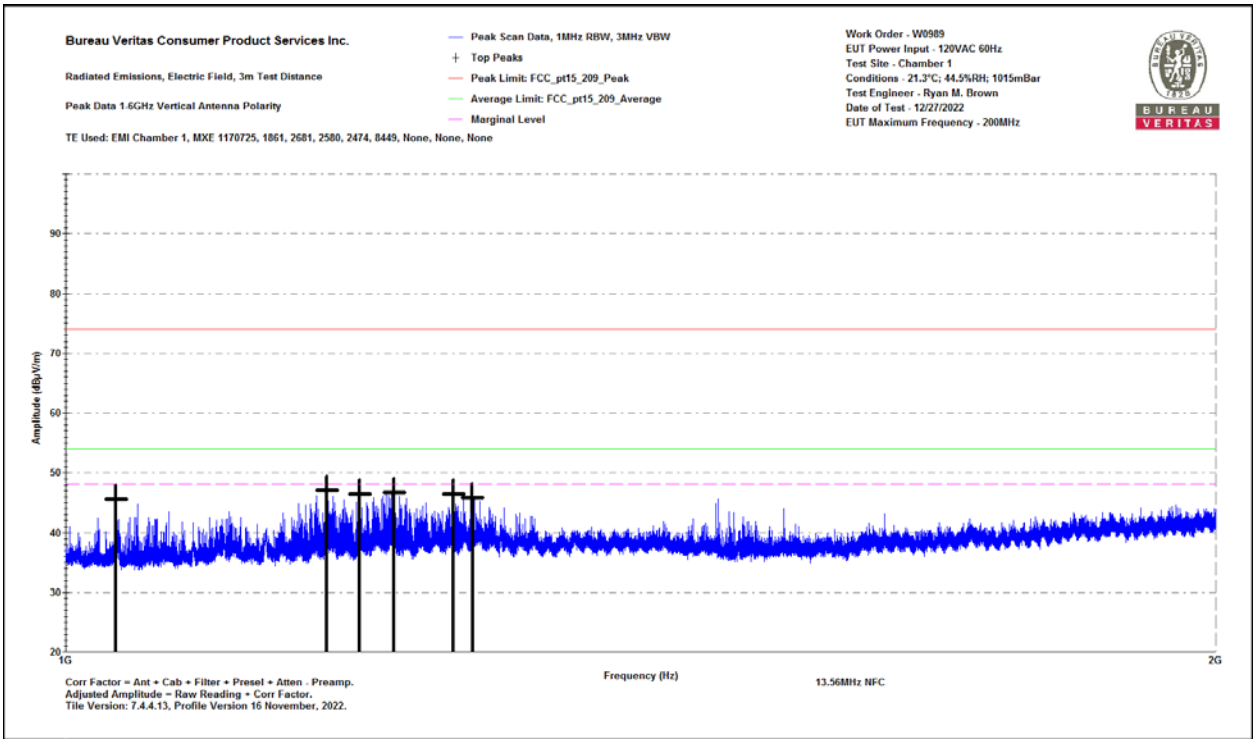


30-1000MHz Horizontal Plot

Bureau Veritas Consumer Product Services Inc.	Work Order - W0989
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 120VAC 60Hz
Top Peaks Vertical 1-6GHz	Test Site - Chamber 1
Notes:	Conditions - 21.3°C; 44.5%RH; 1015mBar
13.56MHz NFC	Test Engineer - Ryan M. Brown
0	Date of Test - 12/27/2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Average Limit (dB)	Average Limit Test Result (Pass/Fail)	Average Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1030.42	56.2	-10.6	45.6	74	-28.4	PASS		54	-8.4	PASS		100	310
1170.5	55.9	-8.8	47.1	74	-26.9	PASS	-26.9	54	-6.9	PASS	-6.9	100	262
1193.7	54.9	-8.3	46.5	74	-27.5	PASS		54	-7.5	PASS		100	286
1218.53	54.8	-8.2	46.6	74	-27.4	PASS		54	-7.4	PASS		100	189
1263.35	53.9	-7.5	46.4	74	-27.6	PASS		54	-7.6	PASS		100	286
1277.75	52.9	-7.1	45.8	74	-28.2	PASS		54	-8.2	PASS		100	237

1-2GHz Vertical

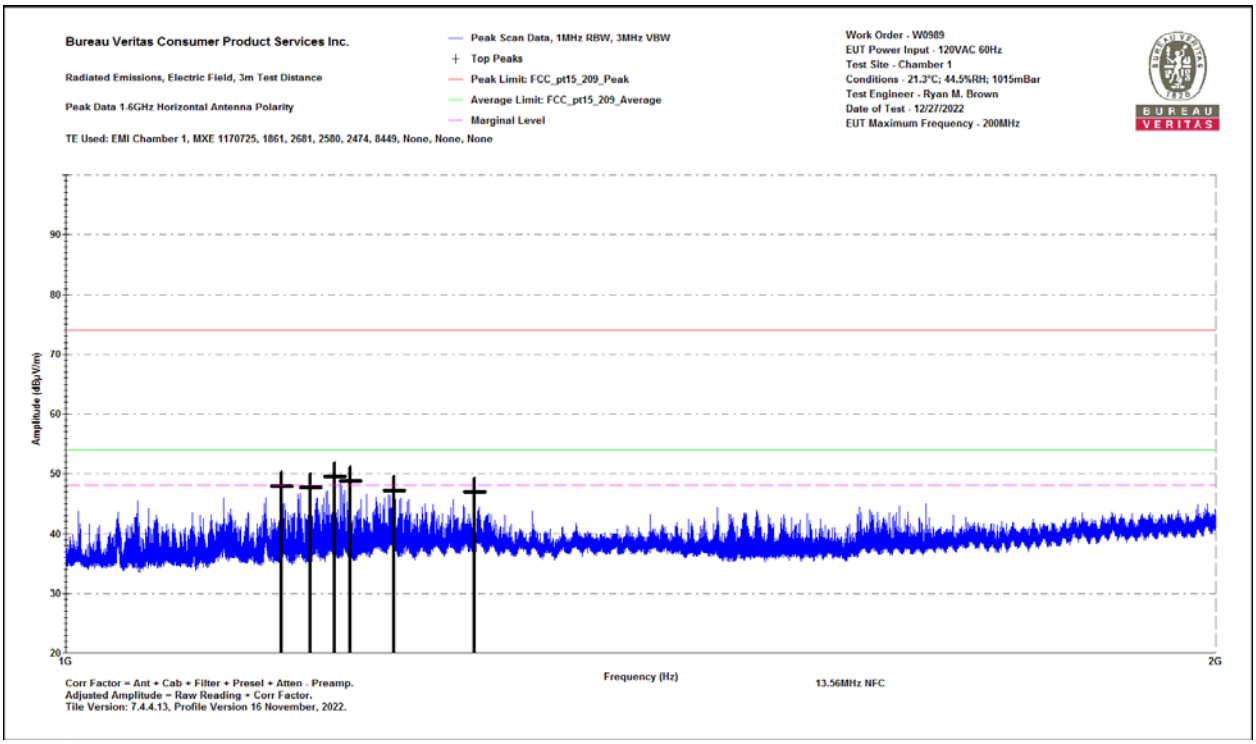


1-2GHz Vertical Plot

Bureau Veritas Consumer Product Services Inc.	Work Order - W0989
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 120VAC 60Hz
Top Peaks Horizontal 1-6GHz	Test Site - Chamber 1
Notes:	Conditions - 21.3°C; 44.5%RH; 1015mBar
13.56MHz NFC	Test Engineer - Ryan M. Brown
0	Date of Test - 12/27/2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1138.9	57.1	-9.2	47.9	74	-26.1	PASS		54	-6.1	PASS		100	0
1158.9	56.7	-9	47.7	74	-26.3	PASS		54	-6.3	PASS		100	0
1175.9	58.2	-8.7	49.5	74	-24.5	PASS	-24.5	54	-4.5	PASS	-4.5	100	0
1186.9	57.2	-8.5	48.7	74	-25.3	PASS		54	-5.3	PASS		100	0
1218.65	55.4	-8.2	47.2	74	-26.8	PASS		54	-6.8	PASS		300	214
1279.08	54	-7.1	46.9	74	-27.1	PASS		54	-7.1	PASS		300	285

1-2GHz Horizontal



1-2GHz Horizontal Plot

Rev. 12/29/2022

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	2/3/2023	2/3/2022
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	11/29/2024	11/29/2022
EMI Chamber 1	719150	2762A-6	A-0015	1-18GHz	1685	I	12/29/2024	12/29/2022
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
8449B HF Preamp	1-18GHz	8449B	Agilent	1149055		II	11/1/2023	11/1/2022
8447F Rental PA	9KHz-1.3GHz	84477F	HP	3113A05395		II	10/17/2023	10/17/2022
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Red-White Bilog	30-2000MHz	JB1	Sunol	A091604-1	1105	I	10/25/2023	11/25/2021
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	4/26/2023	4/26/2021
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	12/23/2022	11/23/2020
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientifi	C3166-1	831	I	12/15/2025	12/15/2022
Asset #2657		1235C97	Control Company	200435369	2657	I	8/18/2025	8/18/2022
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2474	9KHz-18GHz		MegaPhase			II	11/1/2023	11/1/2022
Asset #2580	9KHz-18GHz		Pasternack			II	1/21/2023	1/21/2022
Asset #2681	9KHz-18GHz		Pasternack			II	12/13/2023	12/13/2022

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Test Equipment Used for Fundamental and Radiated Emissions Measurements

AC Line Conducted Emissions

LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dBµV)	Average limit (dBµV)
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. [47 CFR 15.207(a)]

MEASUREMENTS / RESULTS

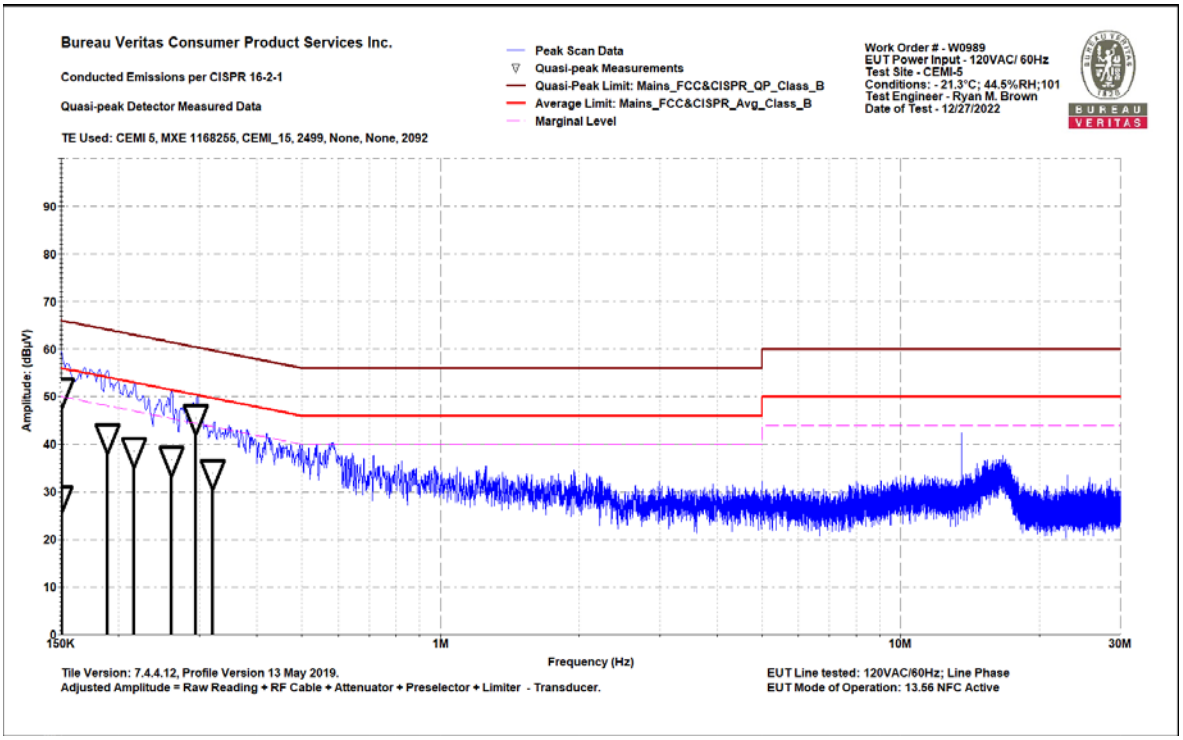
Measurements performed with antenna in place:

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Quasi-peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Line Phase
EUT Mode of Operation: 13.56 NFC Active

Work Order # - W0989
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-5
Conditions: - 21.3°C; 44.5%RH;1015 mBar
Test Engineer - Ryan M. Brown
Date of Test - 12/27/2022

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB)	Adjusted QP Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to QP Limit (dB)	QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
0.151	31.196	19.9	51	66	-14.9	PASS		56	-4.9	PASS	
0.189	21.627	19.9	41.5	64.1	-22.6	PASS		54.1	-12.6	PASS	
0.216	18.7	19.9	38.6	63	-24.4	PASS		53	-14.4	PASS	
0.261	16.876	19.8	36.7	61.4	-24.7	PASS		51.4	-14.7	PASS	
0.295	25.747	19.8	45.6	60.4	-14.8	PASS	-14.8	50.4	-4.8	PASS	-4.8
0.32	14.101	19.8	33.9	59.7	-25.8	PASS		49.7	-15.8	PASS	

0.15-30MHz Line



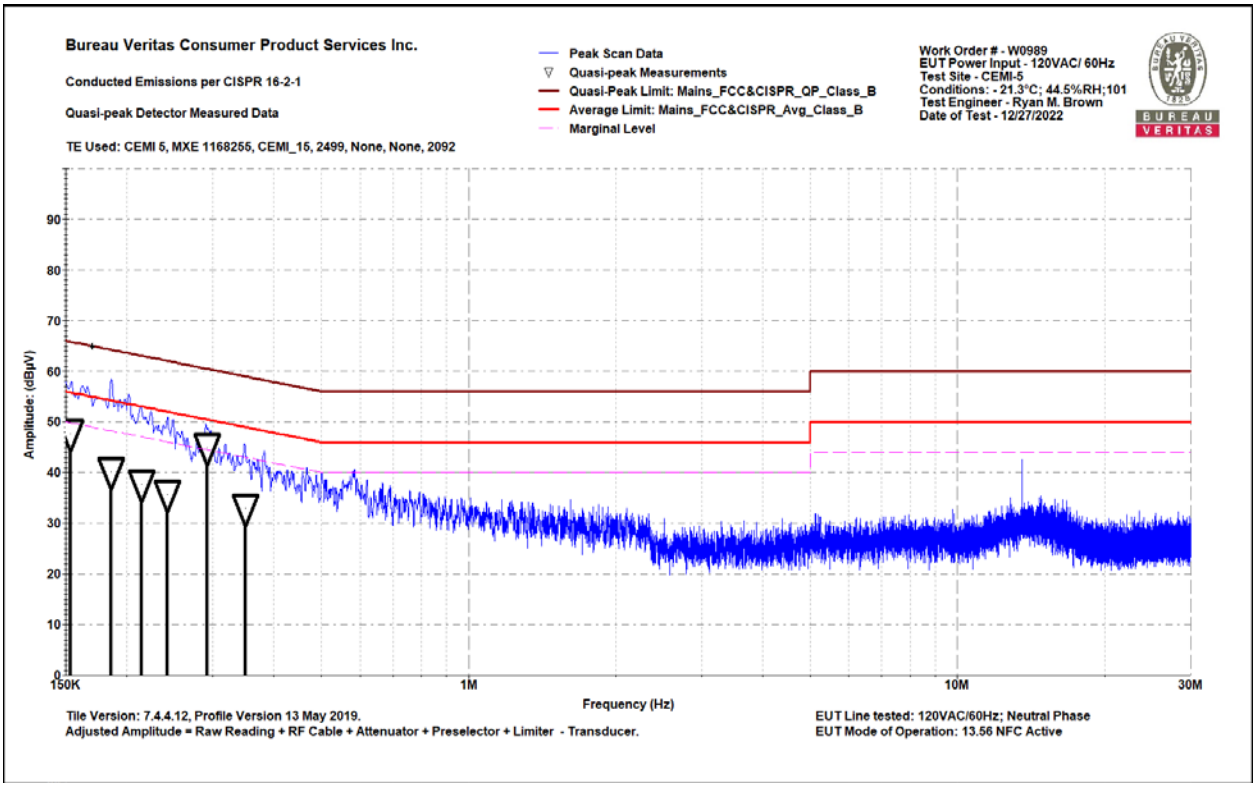
0.15-30MHz Line

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Quasi-peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Neutral Phase
EUT Mode of Operation: 13.56 NFC Active

Work Order # - W0989
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-5
Conditions: - 21.3°C; 44.5%RH;1015 mBar
Test Engineer - Ryan M. Brown
Date of Test - 12/27/2022

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB)	Adjusted QP Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to QP Limit (dB)	QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
0.154	27.815	19.8	47.7	65.8	-18.2	PASS		55.8	-8.2	PASS	
0.186	20.259	19.8	40.1	64.2	-24.1	PASS		54.2	-14.1	PASS	
0.215	17.773	19.9	37.6	63	-25.4	PASS		53	-15.4	PASS	
0.242	15.799	19.9	35.7	62	-26.4	PASS		52	-16.4	PASS	
0.292	25.043	19.8	44.9	60.5	-15.6	PASS	-15.6	50.5	-5.6	PASS	-5.6
0.349	13.126	19.8	32.9	59	-26	PASS		49	-16	PASS	

0.15-30MHz Neutral



0.15-30MHz Neutral

Rev. 12/29/2022

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1168255)	20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	8/12/2023	8/12/2022
LISNs/Measurement Probes	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
LISN Asset 2092	9KHz-30MHz	NNLK 8121	Schwarzbeck	NNLK 8121-662	2092	I	10/31/2023	10/31/2022
Conducted Test Sites (Mains / Telco)	**FCC Code**		**VCCI Code**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI 5	719150		A-0015			III	NA	N/A
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	12/15/2025	12/15/2022
Asset #2657		1235C97	Control Company	200435369	2657	I	8/18/2025	8/18/2022
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI-15	9kHz - 2GHz		C-S			II	2/17/2023	2/17/2022
Attenuators	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
20dB20W Attenuator(A#2499)	9KHz-4GHz	766-20	Narda	8710	2499	II	11/23/2023	11/23/2022

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Test Equipment Used

Measurement Uncertainty

The listed uncertainties are the worst-case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results. Values for measurement uncertainty are calculated per ETSI TR 100 028 (2001). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Conducted Emissions NIST CISPR	 3.9dB 3.6dB	 N/A 3.6dB (Ucispr)
Radio frequency (@ 2.4GHz)	3.23×10^{-8}	1×10^{-7}
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation: • Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	 3.4% 0.3dB	 5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		

Document Revision History

Issue No.	Summary of Changes	Date Issued	Prepared by	Approved by
1	Original Release	Feb 23, 2023	RMB	YF

-- END OF REPORT --