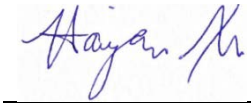
Test Report

Bureau Veritas Consumer Product Services

Report No	EW0235-2 Issue 3
Client	Hanchett Entry Systems, Inc.
Address	10027 S. 51st Street, Suite 102, Phoenix AZ 85044
Product Description	RFID Reader Module
FCC ID	VC3-DR100V3
IC	7160A-DR100V3
PMN	DR100-V3
Model/HVIN	DR100-V3
FVIN	N/A
HMN	DR100
Equipment Type	Part 15 Low Power Communication Device Transmitter
Equipment Code	DXX
Standards	CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 10 Annex B.6
Test Dates	Jun 28, 2022 to Feb 22, 2023
FCC Test Firm DN	US1028
Canada CABID	US0106

Prepared by



Haiyan Xu – Wireless Engineer

Authorized by

Yunus Faziloglu – Wireless Manager

Issue Date: Mar 16, 2023

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Form Final Report REV 12-07-15

Summary and Test Methodology

This test report supports a "Limited Modular Approval" certification application for the RFID Reader Module (Model: DR100-V3) operating pursuant to:

CFR Title 47 FCC Part 15.225, ISED Canada RSS-210 Issue 10 Annex B.6

This report contains test data for the 13.56MHz RFID radio portion of this EUT.

The EUT is the RFID Reader Module (Model: DR100-V3). It communicates reading activity to a remote unit over the 2.4GHz band. It was tested inside the Aperio V3 Wireless Door Relay (Host Model: DR100). The RFID Reader Module (Model: DR100-V3) also contains a 125kHz RFID radio and a Zigbee radio. 13.56MHz transmitter has an integral antenna. The Host Model DR100 operating voltage is 24VDC, and the RFID Reader Module (Model: DR100-V3) operating voltage is 3VDC.
In addition, DR100 host includes a previously certified Bluetooth Low Energy module with FCC ID: Y88-MBM1CC2640 and IC: 9504A-MBM1CC2640.
Lowest clock frequency in the device (used/generated): 32.768kHz

A support laptop was used to control the RFID transmitter. PuTTy (software) was used on this laptop to enable/disable transmitters and set transmission channels.
For spurious emissions, 13.56MHz RFID radio was tested with unmodulated carrier due to the fact that modulated mode had large mutes between pulses making it unsuitable for maximizing emissions. For fundamental field strength and 99% emission bandwidth measurements, unmodulated carrier was used to maximize the fundamental, but final measurements were performed with modulation enabled.

EUT was supplied with an "RFID windmill" test fixture to present RFID tags to the EUT during unintentional emissions testing in order to simulate normal operation of periodic tag reading. This fixture was not exercised during radio testing.

All tests were performed in accordance with the following measurement procedures:
ANSI C63.10-2013
RSS-Gen Issue 5

Following bandwidths were used during 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

If peak measurements were below the applicable limit, QPk measurements were not performed.

The environmental conditions during testing are documented on the associated data tables.
We found that the product complied with the requirements above without modification. Test sample was received in good condition.

Compliance Statement

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	The antenna for this device is an integral 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.
6.7				99% emission bandwidth plot is provided.

Modifications Required for Compliance

None.

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

Test setup and procedures can be found on the next page.

Radiated Emissions Table

Date: 28-Jun-22 **Company:** Assa Abloy **Work Order:** W0235
Engineer: Ryan M. Brown **EUT Desc:** DR100 Door Relay **EUT Operating Voltage/Frequency:** 24V DC
Temp: 23.3 **Humidity:** 47% **Pressure:** 1011
Frequency Range: 13.56 MHz Fundamental **Measurement Distance:** 3 m
Notes: Peak Readings **EUT Max Freq:** 2480

Antenna Polarization (0° - 90°)	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 Limit (dBµV/m)	FCC 15.209 Margin (dB)	FCC 15.209 Result (Pass/Fail)
Para	13.56	55.5	29.0	38.6	0.3	65.4	---	---	---	124.0	-58.6	Pass
Perp	13.56	58.0	29.0	38.6	0.3	67.9	---	---	---	124.0	-56.1	Pass
Para to Floor	13.56	48.2	29.0	38.6	0.3	58.1	---	---	---	124.0	-65.9	Pass

Table Result: Pass by -56.1 dB ***Worst Freq:*** 13.56 MHz

Test Site: EMI Chamber 2 **Cable 1:** Asset #2682 **Cable 2:** Asset #2610 **Cable 3:** Asset # 2474
Analyzer: 2093 **Preamp:** 8447F_2 **Antenna:** Sm Loop (high) **Preselector:** ---
CSoft Radiated Emissions Calculator v 1.017.222
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Throughout this report, limit conversion below 30MHz is done by using the square of an inverse linear distance extrapolation factor (40 dB/decade) as allowed in FCC 15.31(f)(2).
Limit(3m) = Limit(30m) + 40*log(30/3) = Limit(30m) + 40
Limit (3m) = Limit (300m) + 40*log(300/3) = Limit (300m) + 80

Emission mask defined in 15.225 (a)-(d) was not necessary since the highest 13.56MHz fundamental of 67.9dBuV/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.

Test Equipment Used

Rev. 6/20/2022

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2093 MXE EMI Receiver	20Hz-26.5GHz	N9038A	Agilent	MY51210181	2093	I	3/7/2023	3/7/2022
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
EMI Chamber 2	719150	2762A-7	A-0015	30-1000MHz	1686	I	12/5/2022	12/5/2020
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
8447F Rental PA	9KHz-1.3GHz	84477F	HP	3113A05395		II	10/18/2022	10/18/2021
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Small Loop	10kHz-30MHz	PLA-130/A	ARA	1024	755	I	8/25/2022	8/25/2020
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	11/23/2022	11/23/2020
Asset #2657		1235C97	Control Company	200435369	2657	I	7/23/2022	7/23/2020
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2474	9KHz-18GHz		MegaPhase			II	11/9/2022	11/9/2021
Asset #2610	9KHz-18GHz		Pasternack			II	3/16/2023	3/16/2022
Asset #2682	9KHz-18GHz		Pasternack			II	6/17/2023	6/17/2022

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

Radiated Spurious Emissions

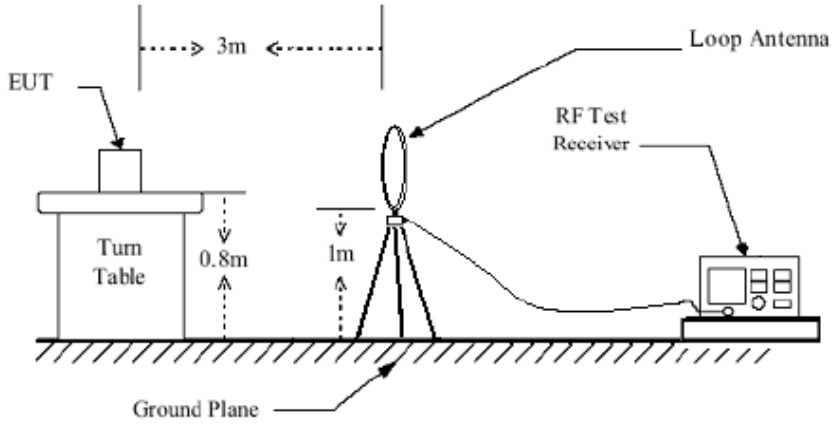
Test Procedures

a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber.

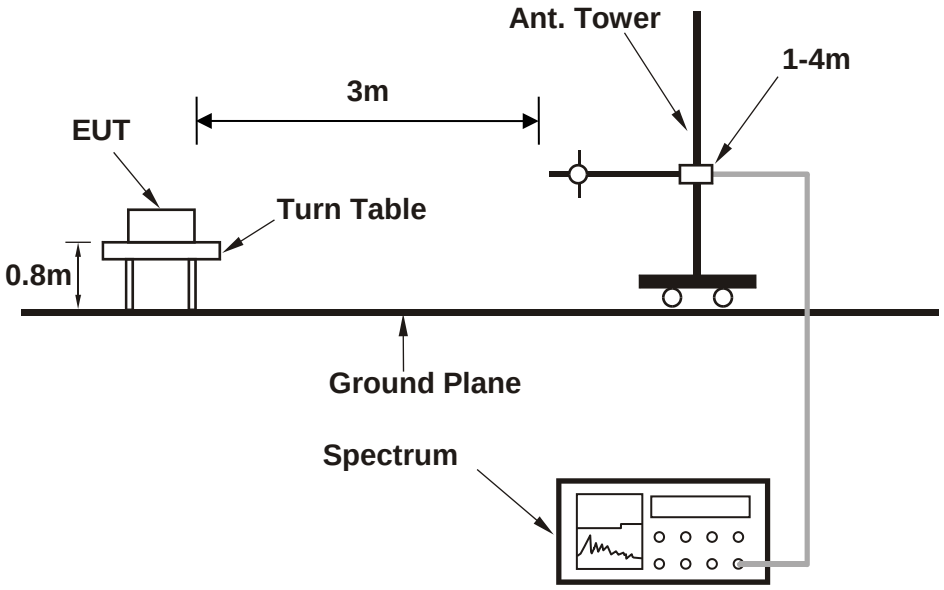
b. For below 30MHz, a loop antenna with its lowest point 1m above the ground was placed 3m away from the EUT and it was rotated 0 and 90 degrees around its vertical axis.

c. In 30MHz-1GHz range, a BiConiLog antenna was mounted on a variable-height antenna tower and placed 3m away from the EUT. Antenna height was varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were investigated. The table was rotated 360 degrees to determine the position of the highest radiation.

Setup below 30MHz



Setup for 30MHz - 1GHz

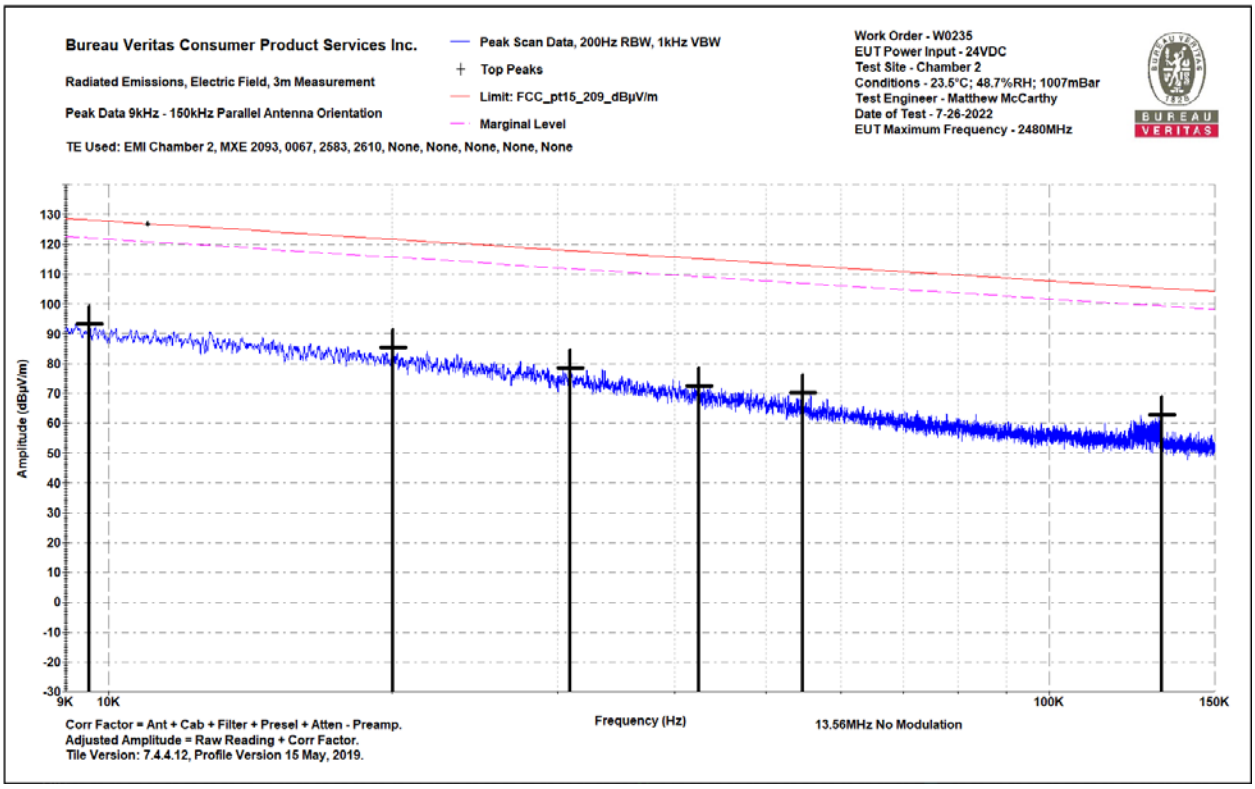


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions, Electric Field, 3m Measurement
Top Peaks Parallel 9-150kHz
Notes:
13.56MHz No Modulation
0

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 23.5°C; 48.7%RH; 1007mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-26-2022

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)
0.009536	26.7	66.5	93.2	128	-34.8	PASS	-34.8	105
0.020051	23.3	62.2	85.4	121.6	-36.1	PASS		150
0.030933	19.8	58.8	78.6	117.8	-39.2	PASS		150
0.042445	16.3	56.2	72.6	115.1	-42.5	PASS		330
0.05468	15.8	54.3	70.1	112.8	-42.8	PASS		135
0.131695	12.7	50.1	62.8	105.2	-42.4	PASS		225

9KHz – 150KHz Parallel



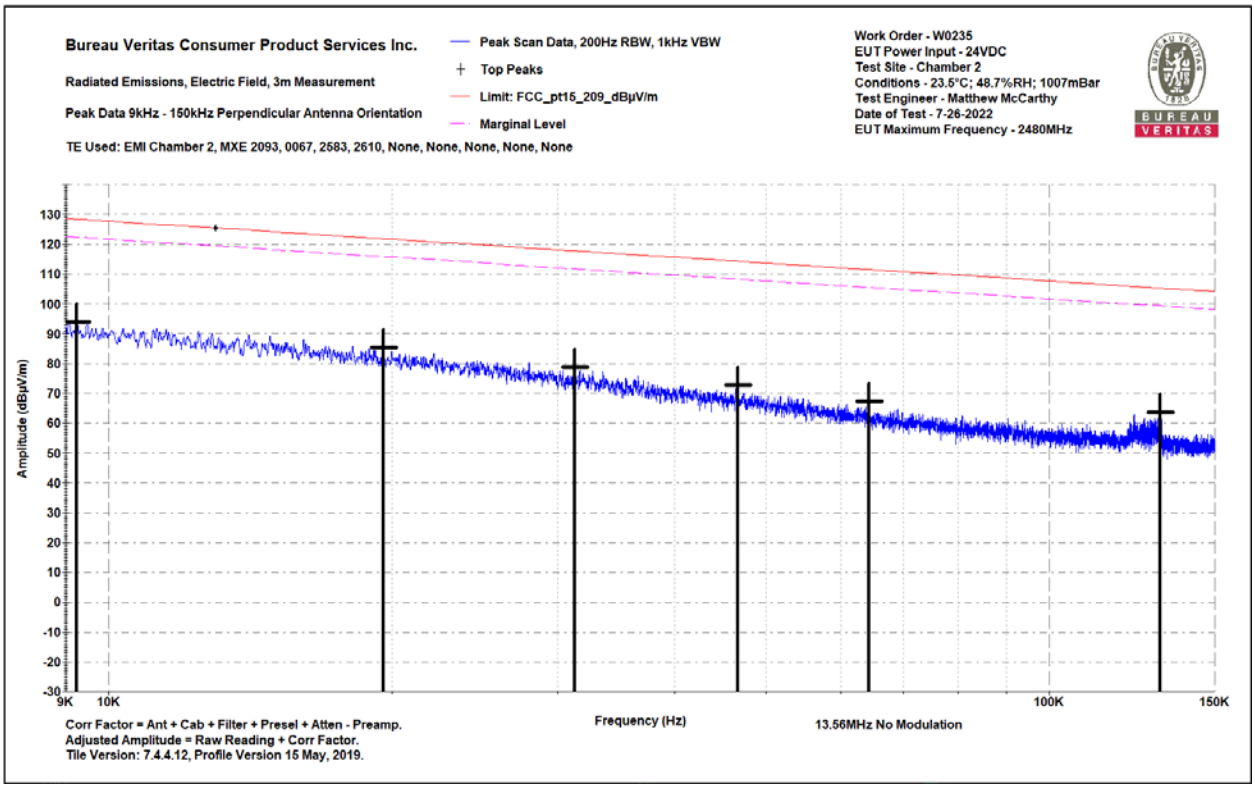
9KHz – 150KHz Parallel

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions, Electric Field, 3m Measurement
Top Peaks Perpendicular 9-150kHz
Notes:
13.56MHz No Modulation
0

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 23.5°C; 48.7%RH; 1007mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-26-2022

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)
0.009247	27.2	66.8	94	128.3	-34.3	PASS	-34.3	45
0.019579	22.9	62.4	85.2	121.8	-36.5	PASS		195
0.031267	20.1	58.7	78.8	117.7	-38.9	PASS		345
0.046696	17.1	55.6	72.8	114.3	-41.5	PASS		180
0.064325	14.5	52.8	67.3	111.5	-44.2	PASS		225
0.131307	13.5	50.1	63.5	105.2	-41.7	PASS		105

9KHz – 150KHz Perpendicular



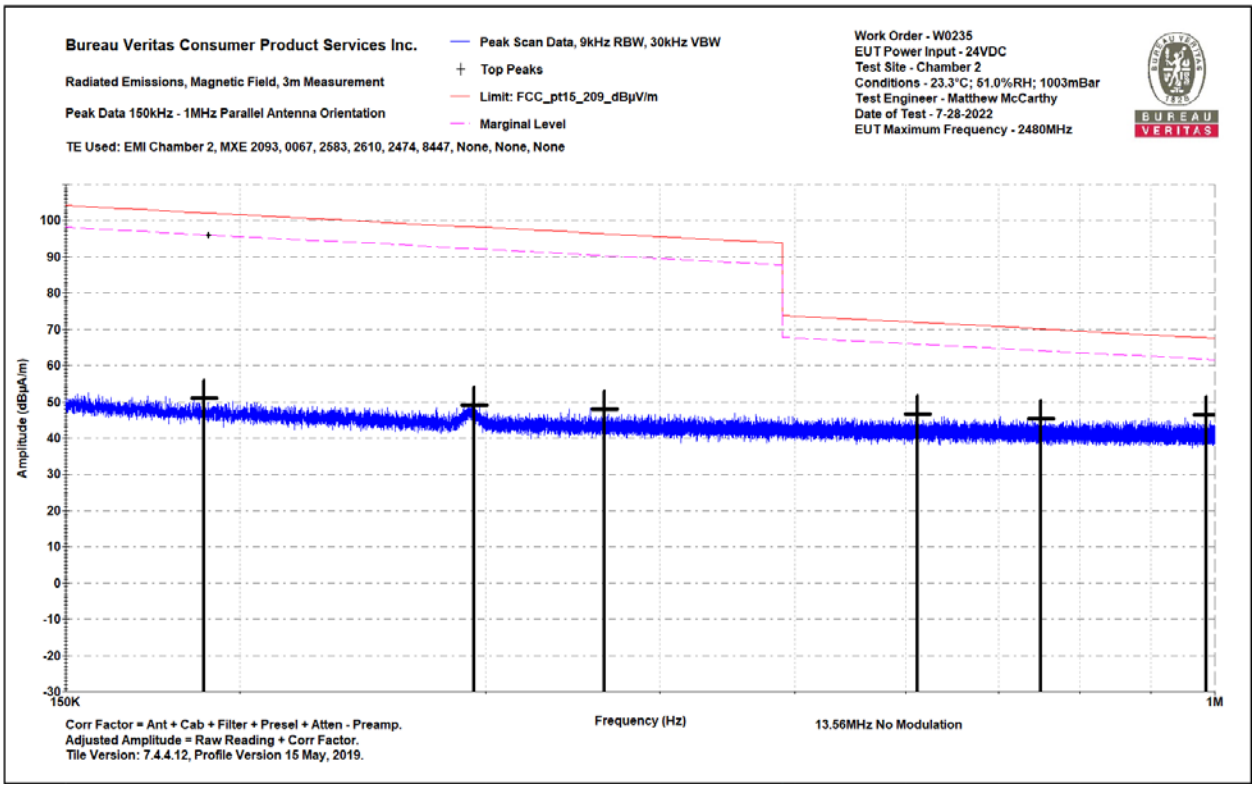
9KHz – 150KHz Perpendicular

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Parallel 150-1000kHz
Notes:
13.56MHz No Modulation
0

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 23.3°C; 51.0%RH; 1003mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-28-2022

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)
0.189	30.8	20.1	50.9	102.1	-51.2	PASS		15
0.294	29.7	19.4	49.1	98.2	-49.2	PASS		330
0.365	28.8	19.2	48	96.4	-48.3	PASS		195
0.612	27.5	19.1	46.7	71.9	-25.2	PASS		165
0.75	26.3	19.2	45.5	70.1	-24.6	PASS		165
0.986	27.3	19.2	46.5	67.7	-21.2	PASS	-21.2	255

0.15 - 1MHz Parallel



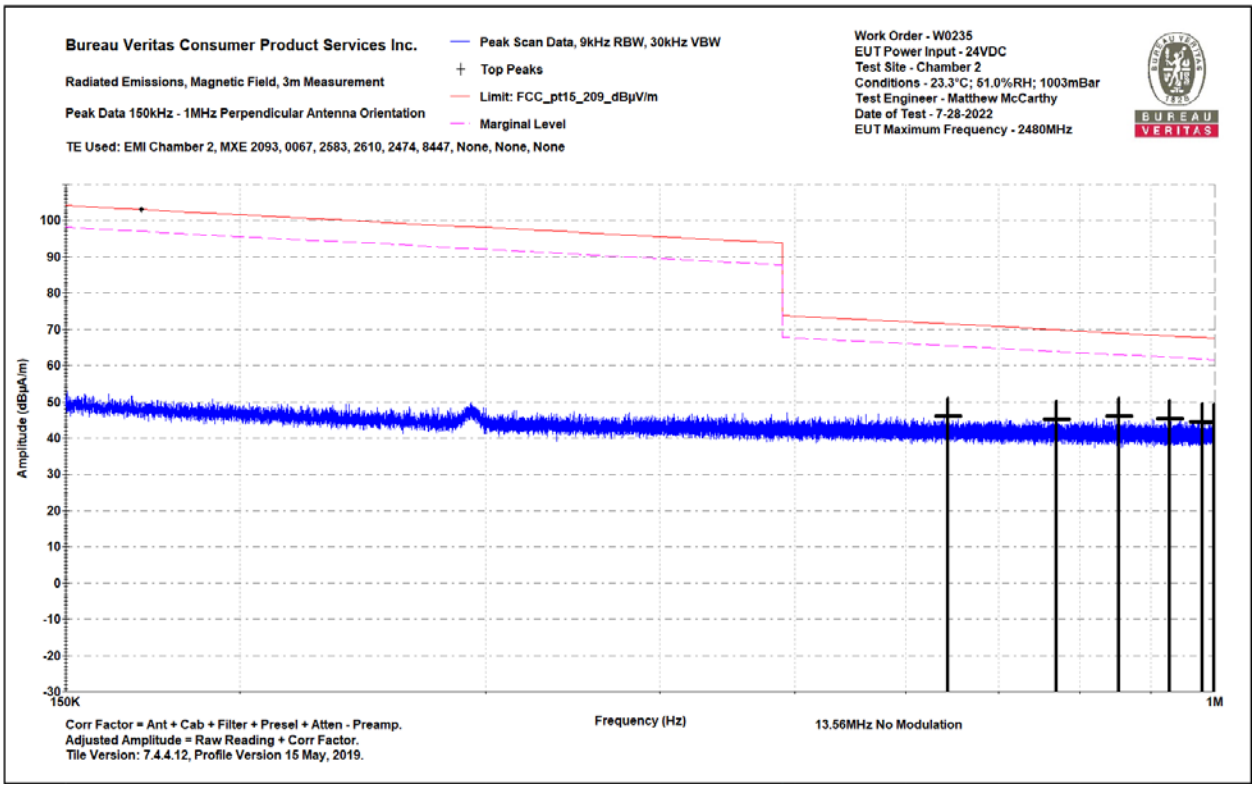
0.15 - 1MHz Parallel

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Perpendicular 150-1000kHz
Notes:
13.56MHz No Modulation
0

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 23.3°C; 51.0%RH; 1003mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-28-2022

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)
0.644	26.8	19.1	45.9	71.5	-25.5	PASS		165
0.77	26	19.2	45.2	69.9	-24.7	PASS		30
0.853	26.8	19.2	46	69	-23	PASS		225
0.928	26.1	19.2	45.3	68.3	-23	PASS	-23	210
0.98	25.3	19.2	44.5	67.8	-23.3	PASS		0
0.999	25.1	19.2	44.3	67.6	-23.3	PASS		165

0.15 – 1MHz Perpendicular



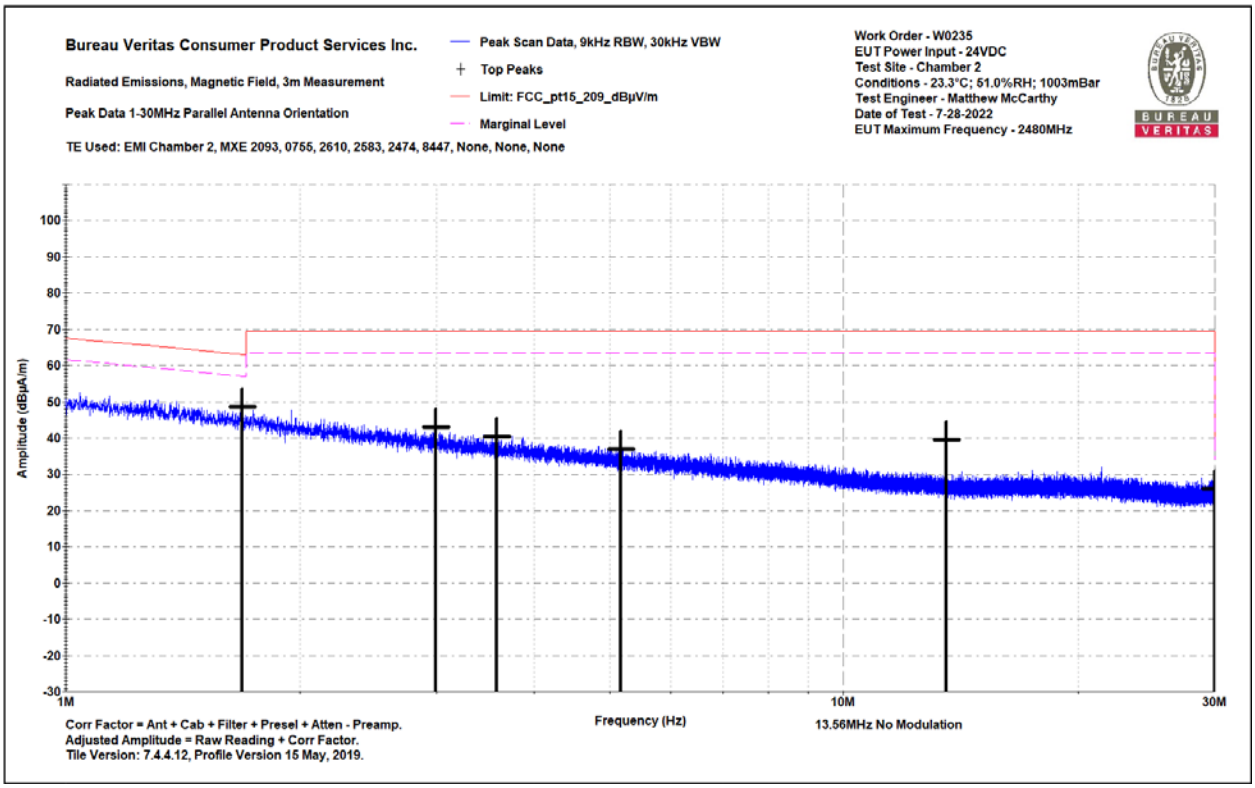
0.15 – 1MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Parallel 1-30MHz
Notes:
13.56MHz No Modulation
0

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 23.3°C; 51.0%RH; 1003mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-28-2022

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)
1.687	24.8	23.9	48.7	63.1	-14.4	PASS		300
2.993	24.5	18.6	43.1	69.5	-26.4	PASS		285
3.582	23.2	17.4	40.5	69.5	-29	PASS		135
5.169	22.7	14.4	37	69.5	-32.5	PASS		195
13.558	29.6	9.9	39.5	69.5	-30	PASS		300
30	17.9	8.1	26	40	-14	PASS	-14	195

1 - 30MHz Parallel



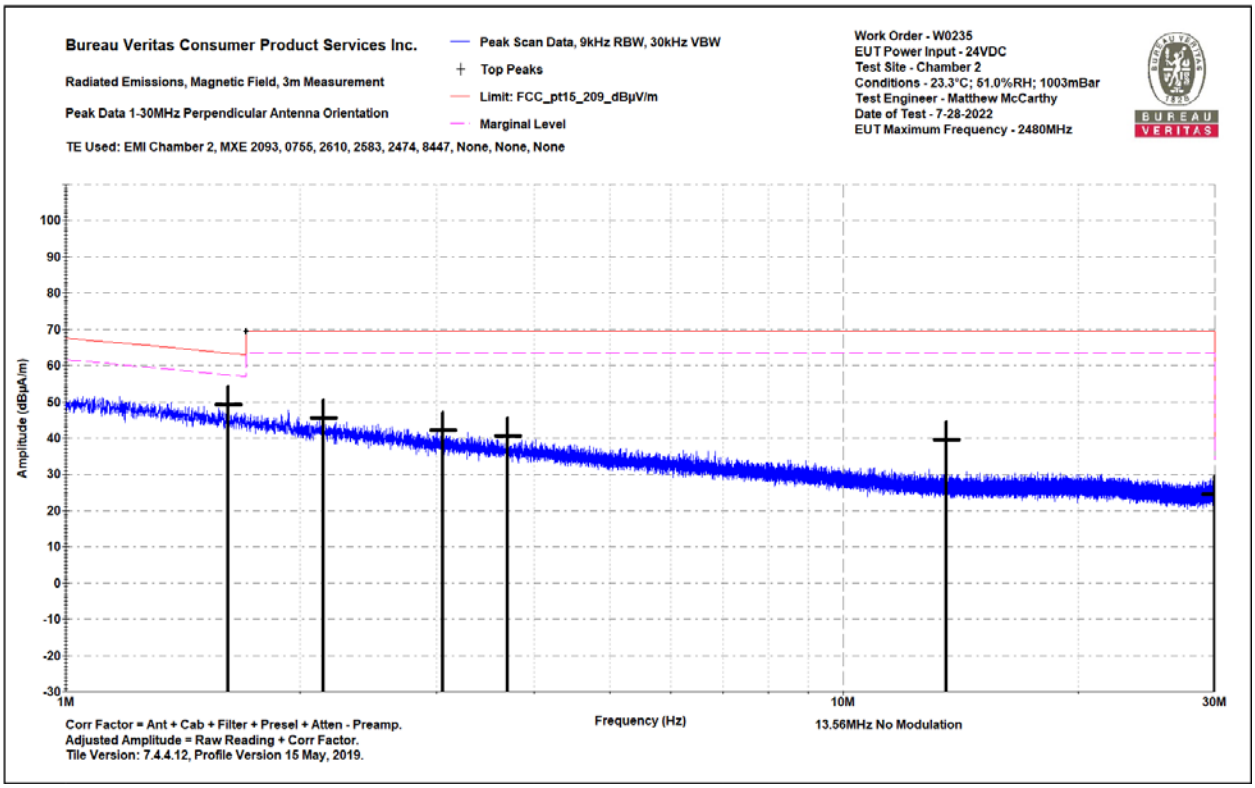
1 - 30MHz Parallel

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Magnetic Field 3m Distance
Top Peaks Perpendicular 1-30MHz
Notes:
13.56MHz No Modulation
0

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 23.3°C; 51.0%RH; 1003mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-28-2022

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)
1.616	24.9	24.3	49.2	63.4	-14.2	PASS	-14.2	30
2.146	24	21.5	45.6	69.5	-24	PASS		45
3.055	23.7	18.5	42.1	69.5	-27.4	PASS		15
3.695	23.6	17.1	40.7	69.5	-28.9	PASS		150
13.559	29.6	9.9	39.5	69.5	-30	PASS		345
30	16.3	8.1	24.4	40	-15.6	PASS		210

1 - 30MHz Perpendicular

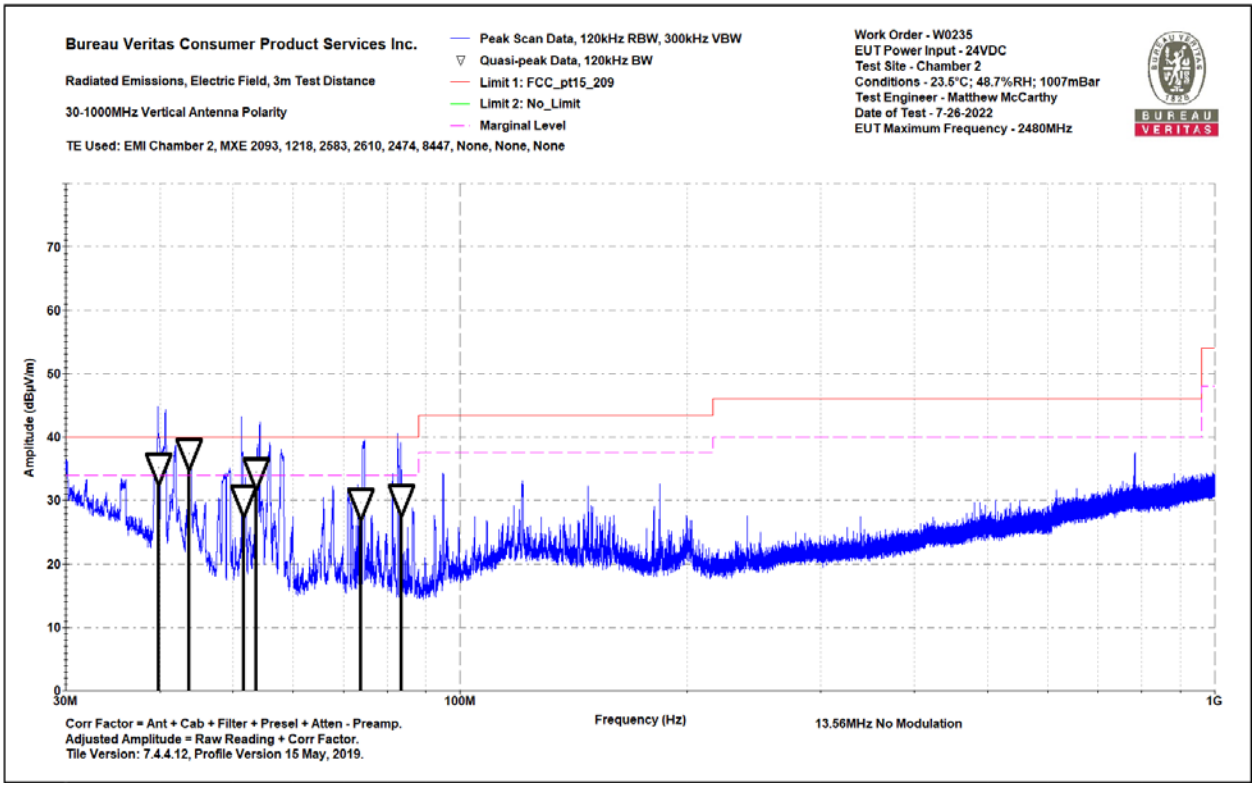


1 - 30MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.	Work Order - W0235
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 24VDC
30-1000MHz Vertical Data	Test Site - Chamber 2
Notes:	Conditions - 23.5°C; 48.7%RH; 1007mBar
13.56MHz No Modulation	Test Engineer - Matthew McCarthy
0	Date of Test - 7-26-2022

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)
39.795	40.8	-5.6	35.2	40	-4.8	PASS		118	10
43.764	45.7	-8.2	37.5	40	-2.5	PASS	-2.5	108	25
51.673	41.9	-11.7	30.2	40	-9.8	PASS		175	65
53.633	46.5	-12.1	34.4	40	-5.6	PASS		125	294
73.881	41.2	-11.6	29.6	40	-10.4	PASS		216	25
83.506	42.3	-12.1	30.3	40	-9.7	PASS		157	18

30 - 1000MHz Vertical

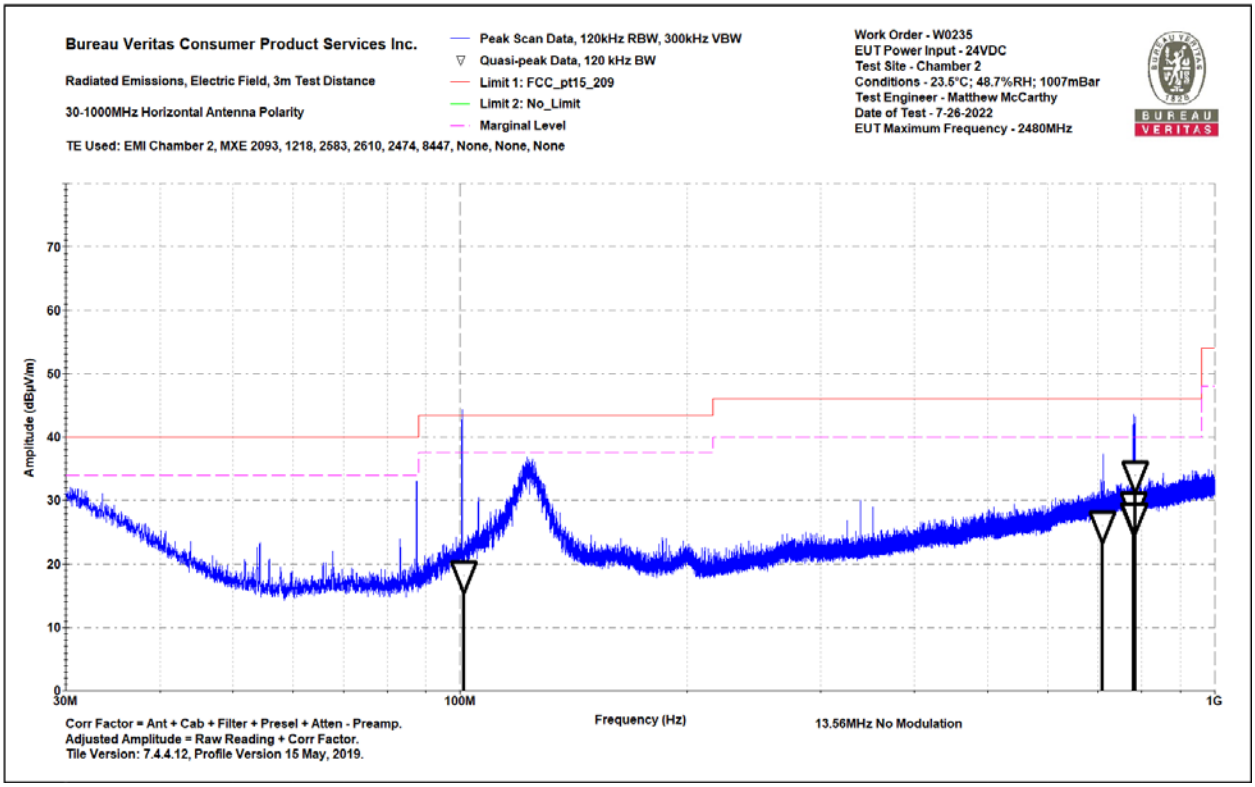


30 - 1000MHz Vertical

Bureau Veritas Consumer Product Services Inc.	Work Order - W0235
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 24VDC
30-1000MHz Horizontal Data	Test Site - Chamber 2
Notes:	Conditions - 23.5°C; 48.7%RH; 1007mBar
13.56MHz No Modulation	Test Engineer - Matthew McCarthy
0	Date of Test - 7-26-2022

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)
101.212	27.3	-9.1	18.2	43.5	-25.3	PASS		223	296
709.925	24.2	2	26.1	46	-19.9	PASS		225	69
779.726	25.6	3.4	29	46	-17	PASS		110	45
779.958	23.8	3.4	27.3	46	-18.7	PASS		104	20
782.301	24	3.4	27.4	46	-18.6	PASS		193	32
785.381	30.6	3.3	33.9	46	-12.1	PASS	-12.1	147	296

30 - 1000MHz Horizontal



30 - 1000MHz Horizontal

Rev. 8/17/2022

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2093 MXE EMI Receiver	20Hz-26.5GHz	N9038A	Agilent	MY51210181	2093	I	3/7/2023	3/7/2022
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
EMI Chamber 2	719150	2762A-7	A-0015	30-1000MHz	1686	I	12/5/2022	12/5/2020
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
8447F Rental PA	9KHz-1.3GHz	84477F	HP	3113A05395		II	10/18/2022	10/18/2021
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Red-Brown Bilog	30-2000MHz	JB1	Sunol	A0032406	1218	I	4/28/2023	4/28/2021
Small Loop	10kHz-30MHz	PLA-130/A	ARA	1024	755	I	8/25/2022	8/25/2020
Large Loop	20Hz-5MHz	6511	EMCO	9704-1154	67	I	8/21/2022	8/21/2020
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	11/23/2022	11/23/2020
Asset #2656		1235C97	Control Company	200435359	2656	I	8/23/2022	7/23/2020
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2474	9KHz-18GHz		MegaPhase			II	11/9/2022	11/9/2021
Asset #2610	9KHz-18GHz		Pasternack			II	3/16/2023	3/16/2022
Asset #2583	9KHz-18GHz		Pasternack			II	2/17/2023	2/17/2022

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

Test Equipment Used

AC Line Conducted Emissions

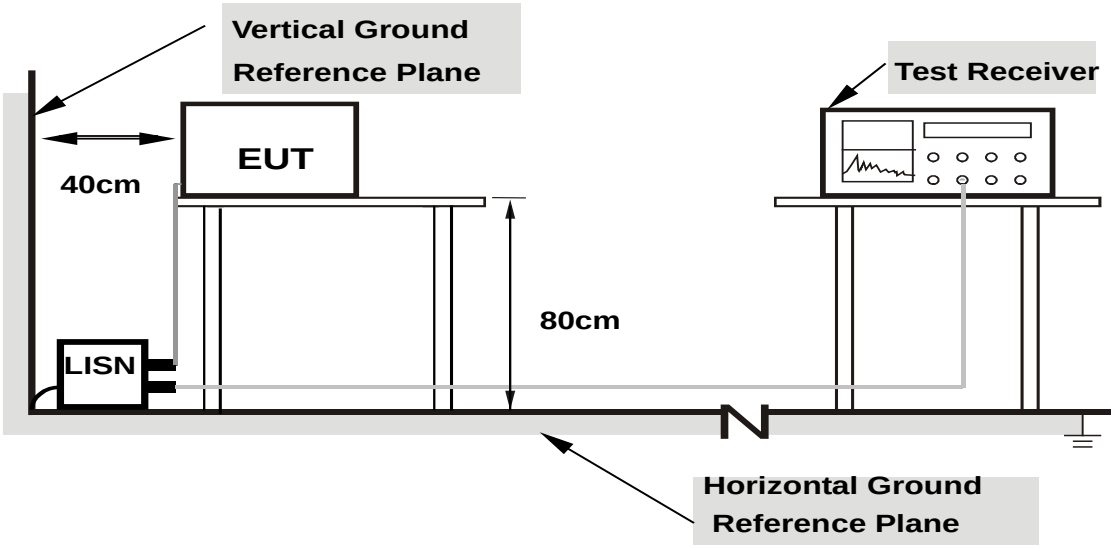
Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded. RBW of 9kHz and VBW of 30kHz were used during measurement.

Setup



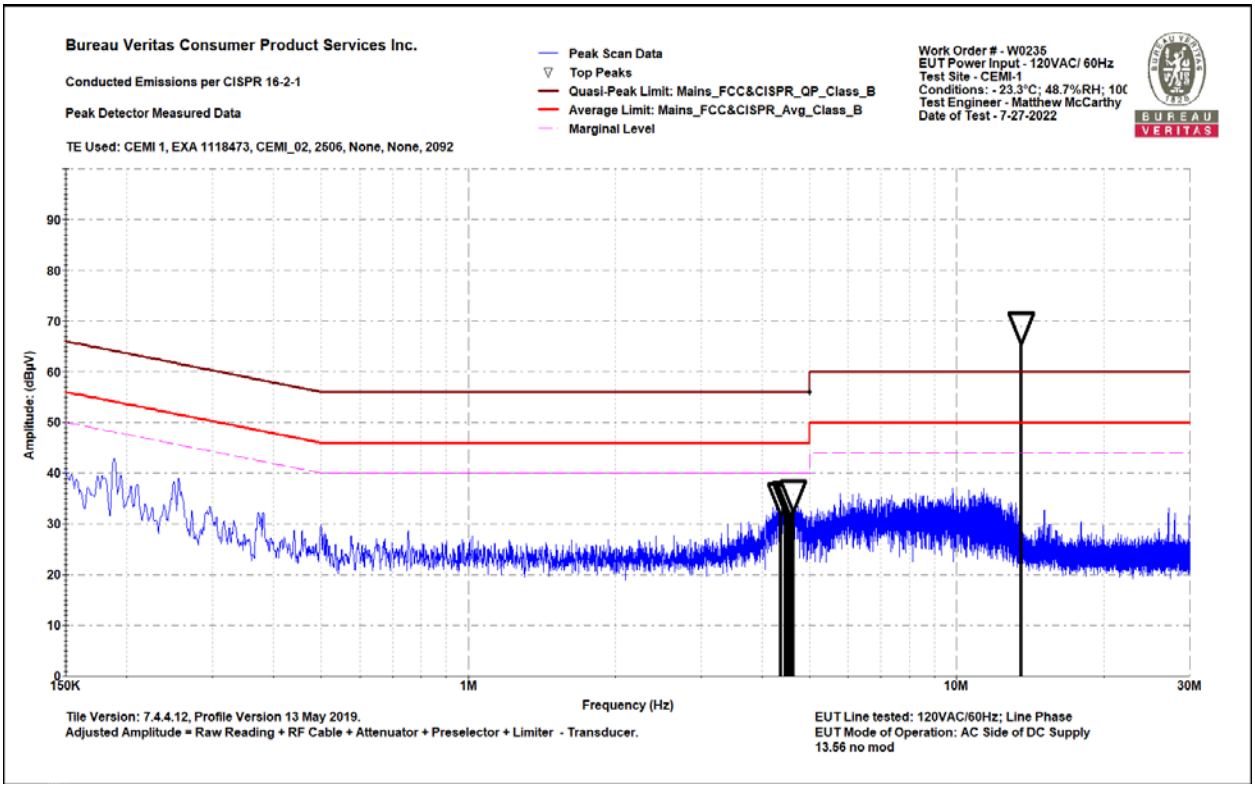
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Line Phase
EUT Mode of Operation: AC Side of DC Supply
13.56 no mod

Work Order # - W0235
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-1
Conditions: - 23.3°C; 48.7%RH; 1006mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-27-2022

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Margin to Avg Limit (dB)	Pk to Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
4.366	14.7	20.4	35.2	56	-20.8	PASS		46	-10.8	PASS	
4.466	15.1	20.4	35.6	56	-20.4	PASS		46	-10.4	PASS	
4.511	14.3	20.4	34.8	56	-21.2	PASS		46	-11.2	PASS	
4.561	14.6	20.4	35.1	56	-20.9	PASS		46	-10.9	PASS	
4.624	15.3	20.4	35.8	56	-20.2	PASS		46	-10.2	PASS	
13.56	48.4	20.5	69	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

0.15 - 30MHz Line Peak (with production antenna)



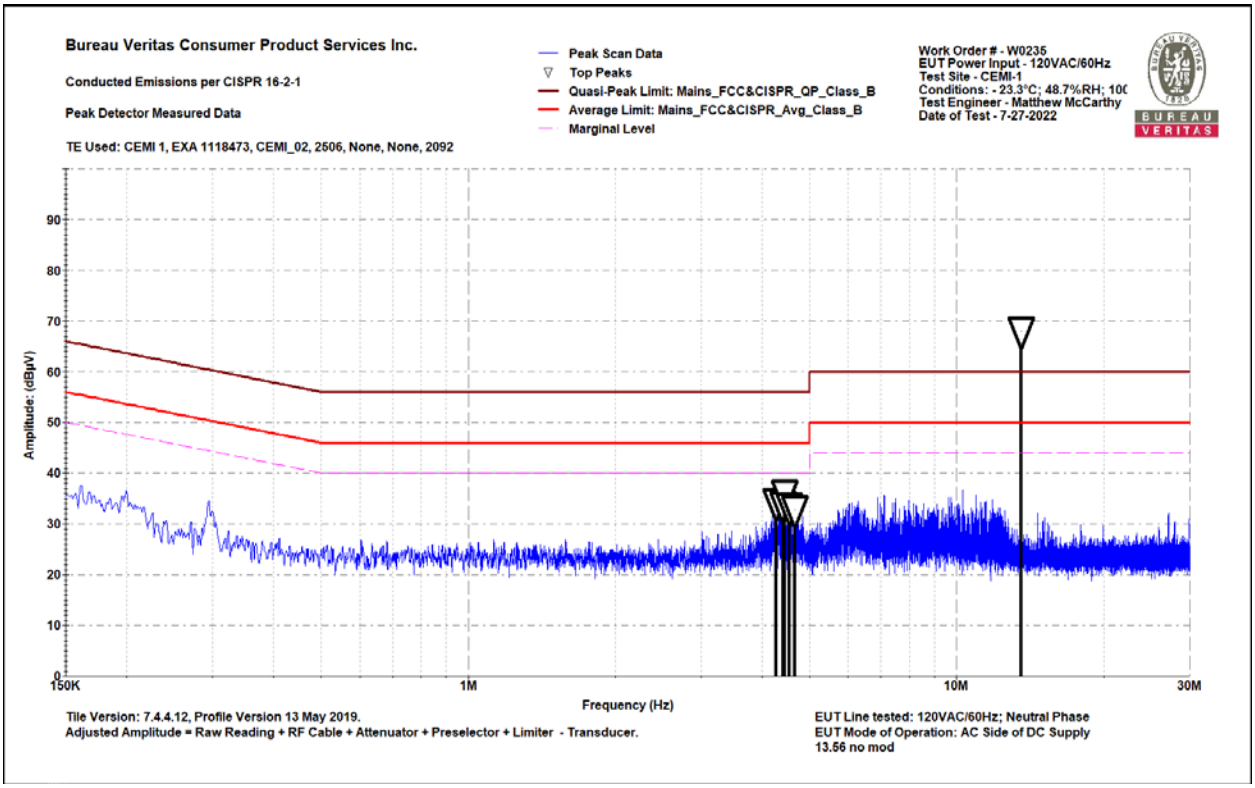
0.15 - 30MHz Line Peak (with production antenna)

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Neutral Phase
EUT Mode of Operation: AC Side of DC Supply
13.56 no mod

Work Order # - W0235
EUT Power Input - 120VAC/60Hz
Test Site - CEMI-1
Conditions: - 23.3°C; 48.7%RH; 1006mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-27-2022

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Margin to Avg Limit (dB)	Pk to Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
4.272	13.7	20.4	34.2	56	-21.8	PASS		46	-11.8	PASS	
4.405	13.1	20.4	33.5	56	-22.5	PASS		46	-12.5	PASS	
4.449	15.4	20.4	35.8	56	-20.2	PASS		46	-10.2	PASS	
4.538	12.8	20.4	33.2	56	-22.8	PASS		46	-12.8	PASS	
4.665	12.4	20.4	32.8	56	-23.2	PASS		46	-13.2	PASS	
13.56	47.4	20.5	67.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

0.15 – 30MHz Neutral Peak (with production antenna)



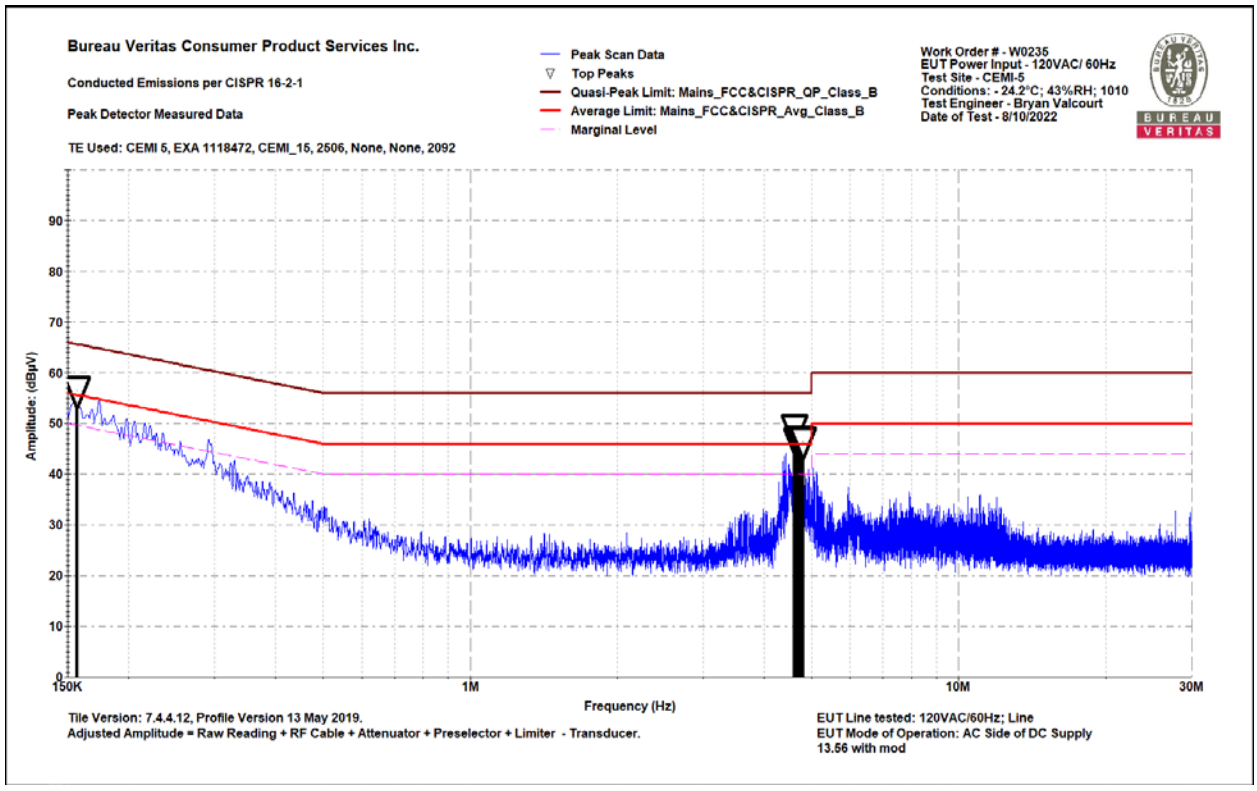
0.15 – 30MHz Neutral Peak (with production antenna)

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Line
EUT Mode of Operation: AC Side of DC Supply
13.56 with mod

Work Order # - W0235
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-5
Conditions: - 24.2°C; 43%RH; 1010mBar
Test Engineer - Bryan Valcourt
Date of Test - 8/10/2022

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.157	36.1	20.3	56.4	65.6	-9.2	PASS	
4.617	28.4	20.6	48.9	56	-7.1	PASS	-7.1
4.66	25.7	20.6	46.2	56	-9.8	PASS	
4.709	26.1	20.6	46.6	56	-9.4	PASS	
4.747	26.1	20.6	46.6	56	-9.4	PASS	
4.8	25.8	20.6	46.4	56	-9.6	PASS	

0.15 - 30MHz Line Peak (with dummy load)



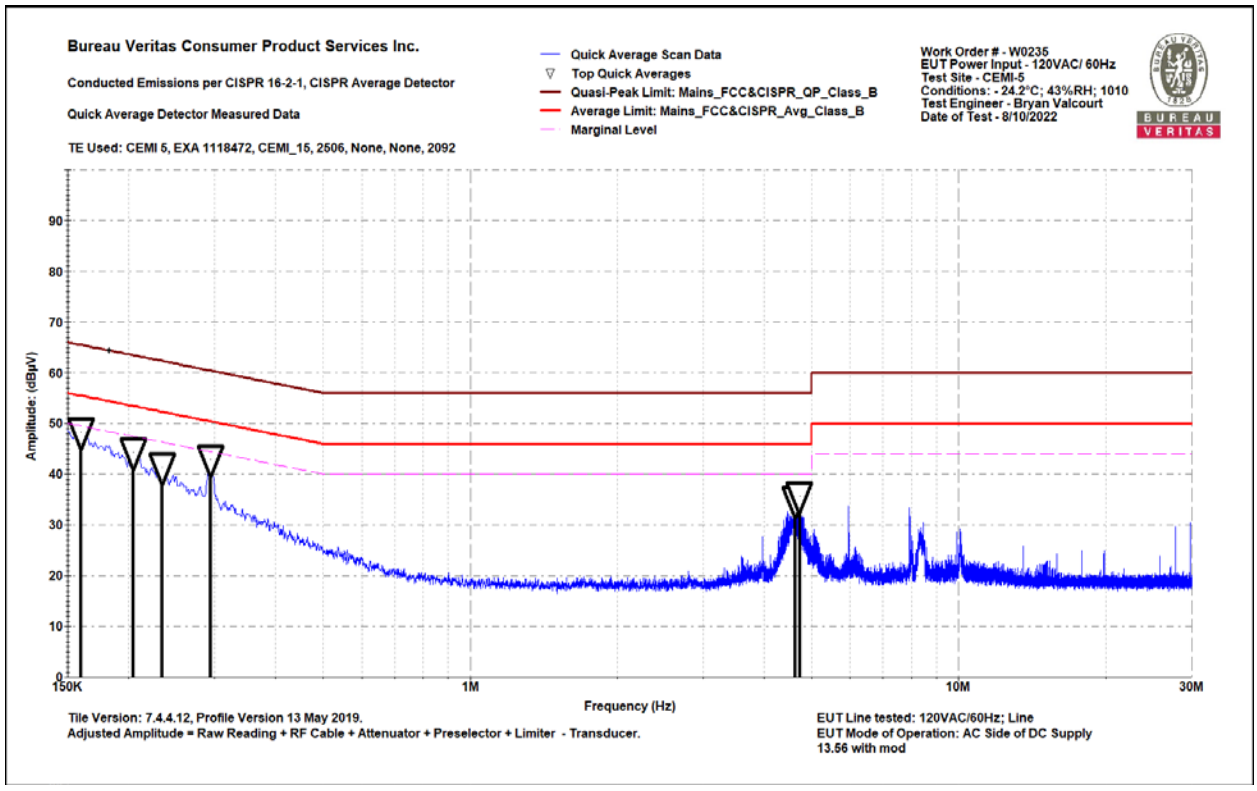
0.15 - 30MHz Line Peak (with dummy load)

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
Quick Average Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Line
EUT Mode of Operation: AC Side of DC Supply
13.56 with mod

Work Order # - W0235
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-5
Conditions: - 24.2°C; 43%RH; 1010mBar
Test Engineer - Bryan Valcourt
Date of Test - 8/10/2022

Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
0.16	27.9	20.3	48.2	55.5	-7.3	PASS	-7.3
0.204	24	20.3	44.3	53.4	-9.1	PASS	
0.234	21.1	20.3	41.4	52.3	-10.9	PASS	
0.294	22.6	20.3	42.9	50.4	-7.6	PASS	
4.629	14.2	20.6	34.8	46	-11.2	PASS	
4.724	15.1	20.6	35.6	46	-10.4	PASS	

0.15 - 30MHz Line Average (with dummy load)



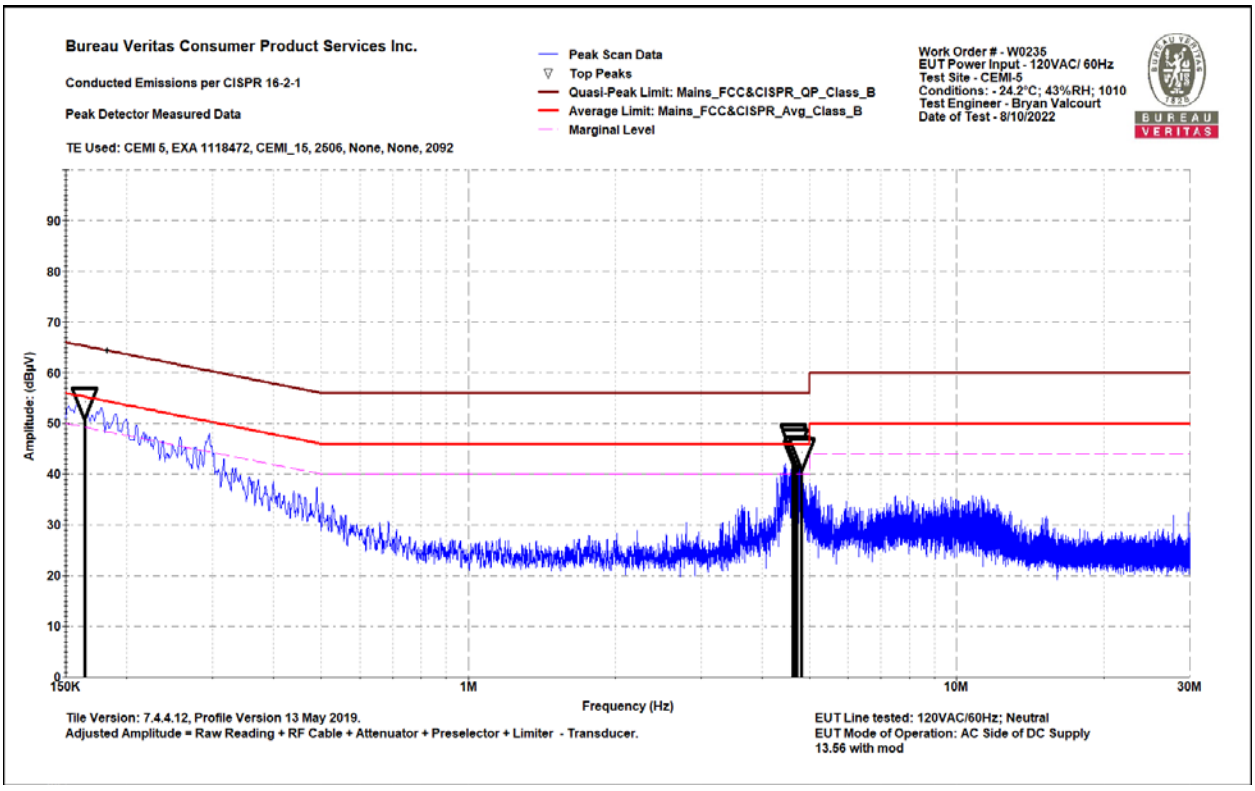
0.15 - 30MHz Line Average (with dummy load)

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Neutral
EUT Mode of Operation: AC Side of DC Supply
13.56 with mod

Work Order # - W0235
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-5
Conditions: - 24.2°C; 43%RH; 1010mBar
Test Engineer - Bryan Valcourt
Date of Test - 8/10/2022

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.164	34	20.3	54.2	65.3	-11	PASS	
4.625	26.5	20.5	47	56	-9	PASS	-9
4.655	25.5	20.6	46.1	56	-9.9	PASS	
4.694	23.3	20.6	43.9	56	-12.1	PASS	
4.719	24.2	20.6	44.8	56	-11.2	PASS	
4.813	23.8	20.6	44.3	56	-11.7	PASS	

0.15 – 30MHz Neutral Peak (with dummy load)



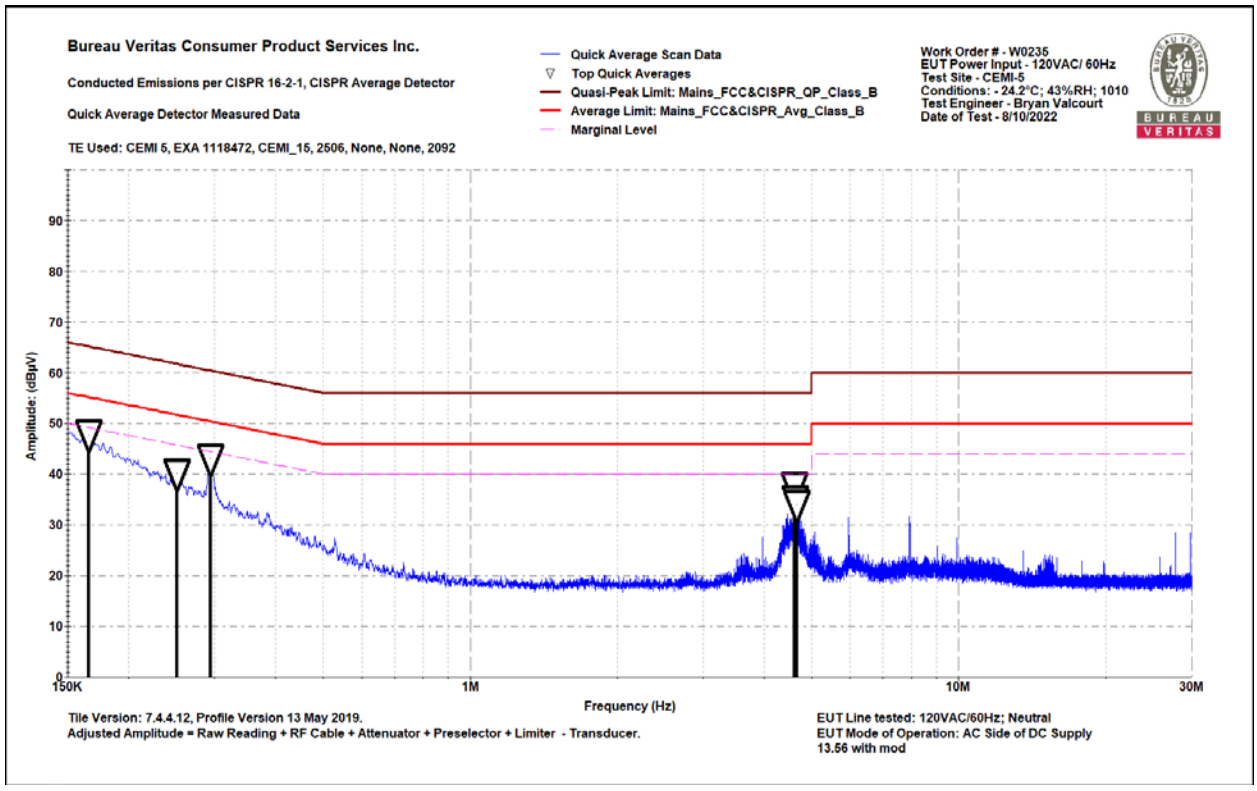
0.15 – 30MHz Neutral Peak (with dummy load)

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
Quick Average Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Neutral
EUT Mode of Operation: AC Side of DC Supply
13.56 with mod

Work Order # - W0235
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-5
Conditions: - 24.2°C; 43%RH; 1010mBar
Test Engineer - Bryan Valcourt
Date of Test - 8/10/2022

Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
0.166	27.5	20.3	47.8	55.2	-7.4	PASS	
0.251	19.8	20.3	40.1	51.7	-11.6	PASS	
0.294	22.8	20.3	43.1	50.4	-7.3	PASS	-7.3
4.606	16.9	20.5	37.5	46	-8.5	PASS	
4.636	14.4	20.6	34.9	46	-11.1	PASS	
4.665	13.5	20.6	34.1	46	-11.9	PASS	

0.15 – 30MHz Neutral Average (with dummy load)



0.15 – 30MHz Neutral Average (with dummy load)

Rev. 8/26/2022

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1118472)	9KHz-26.5GHz	N9010A-526;K	AT	MY51170010	1118472	I	10/27/2022	10/27/2021
Rental EXA Signal Analyzer(1118473)	9KHz-26.5GHz	N9010A-526;N	AT	MY51170076	1118473	I	8/5/2022	8/5/2021

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	10/25/2022	10/25/2021

Conducted Test Sites (Mains / Telco)	FCC Code	VCCI Code	Cat	Calibration Due	Calibrated on
CEMI 1	719150	A-0015	III	NA	N/A
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	11/23/2022	11/23/2020
Asset #2657	1235C97	Control Company	200435369	2657	I	8/18/2025	8/18/2022
Asset #2657	1235C97	Control Company	200435369	2657	I	8/23/2022	7/23/2020

Cables	Range	Mfr	Cat	Calibration Due	Calibrated on
CEMI-02	9kHz - 2GHz	C-S	II	2/17/2023	2/17/2022
CEMI-15	9kHz - 2GHz	C-S	II	2/17/2023	2/17/2022

Attenuators	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
20dB ATT(A#2506)	9kHz-2GHz	PE7014-20	Pasternack	2016	2506	II	8/3/2023	8/3/2022
20dB ATT(A#2506)	9kHz-2GHz	PE7014-20	Pasternack	2016	2506	II	8/4/2022	8/4/2021

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

Test Equipment Used

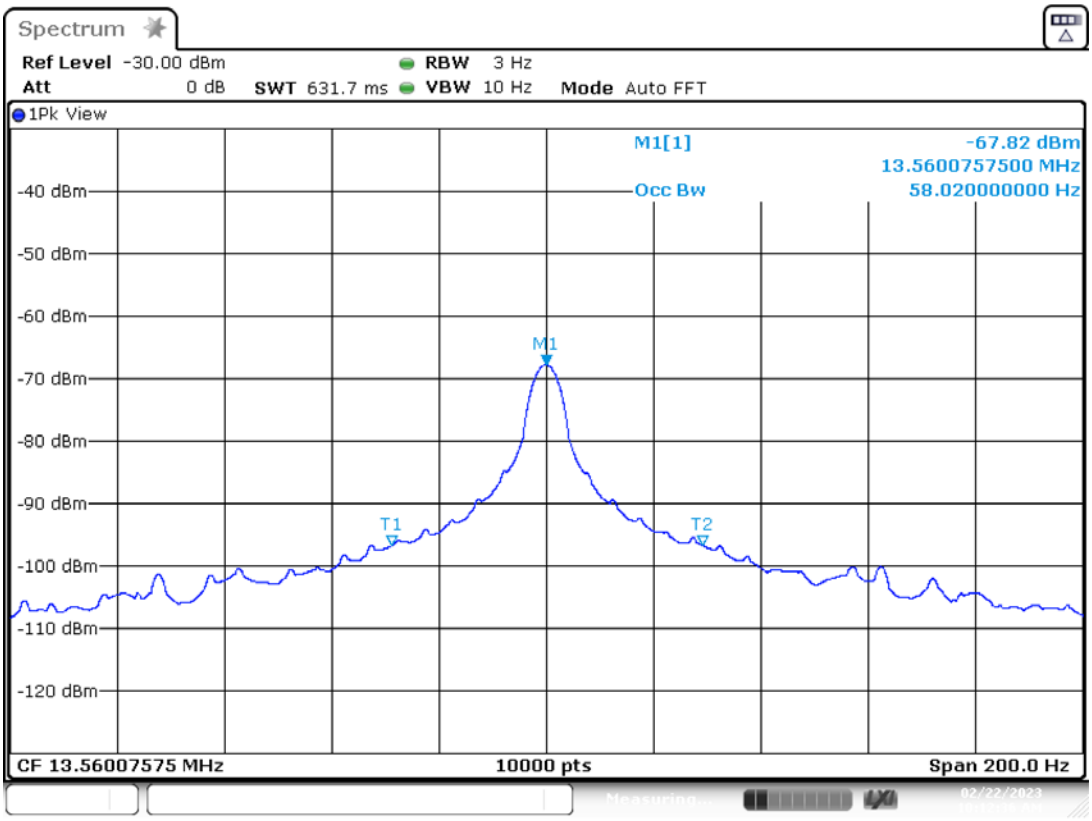
99% Occupied Bandwidth

REQUIREMENT

When an occupied bandwidth is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is its 99% emission bandwidth, as calculated or measured. [RSS-GEN Issue 5 Section 6.7].

RESULT:

The plot below was generated using a peak max hold detector.
99% OBW = 58.02Hz



Date: 22.FEB.2023 10:12:36

Test Equipment Used

Rev. 2/17/2023								
Spectrum Analyzers / Receivers /Preselectors	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
FSV40 Spectrum Analyzer	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	10/11/2023	10/11/2022
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	1/18/2025	1/18/2023
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2594	9KHz-40GHz		Carlisle			II	1/17/2024	1/17/2023
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.								

Temperature Stability

Limit: The frequency tolerance of the carrier signal shall be maintained within ±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. [FCC 15.225]

Measurements were performed in accordance with ANSI C63.10:2013 section 6.8. Measurements were taken at startup, 2 minutes, 5, minutes, and 10 minutes after the EUT was energized. The worst-case measurements were documented.

MEASUREMENTS / RESULTS

13.56MHz * 0.01% = 1356Hz Allowable tolerance

Frequency Stability Under Extreme Conditions					
Date: 11/22/2022				**Work Order:**	
Engineer: Ryan M. Brown					
Nominal Voltage: 24VDC	**Min Voltage:**	20.4VDC	**Max Voltage:**	27.6VDC	
Temperature	**Voltage**	**Amplitude**	**Amplitude Delta**	**Frequency**	**Frequency Delta**
°C	**V**	**(dBm)**	**(dB)**	**(MHz)**	**(MHz)**
-20C	Nominal	-45.08	-1.10	13.56007	0.000070
-10C	Nominal	-44.18	-0.20	13.56008	0.000080
0C	Nominal	-43.71	0.27	13.56008	0.000080
10C	Nominal	-44.00	-0.02	13.560140	0.000140
Nominal (20C)	Minimum	-45.68	-1.70	13.560080	0.000080
	Nominal	-43.98	Reference	13.560000	Reference
	Maximum	-45.65	-1.67	13.560070	0.000070
30C	Nominal	-45.80	-1.82	13.560070	0.000070
40C	Nominal	-45.94	-1.96	13.560060	0.000060
50C	Nominal	-46.21	-2.23	13.560050	0.000050
Test Site: 1645		**Antenna:** 2347		**Analyzer:** FSV40	
		Cable 1: 2595		**DC Supply:** KPS3010D	

Test Equipment Used

Rev. 7/25/2022								
Spectrum Analyzers / Receivers /Preselectors	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
FSV40 Spectrum Analyzer	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	10/11/2023	10/11/2022
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Temp/Humidity Chamber #18		EPX-2H	Espec	137664	1645	I	1/3/2023	1/3/2022
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2595	9KHz-40GHz		Carlisle			II	1/21/2023	1/21/2022
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Magnetic Loop Prob	DC-3GHz	100C	Beehive Electronics	3038	2347	I	2/23/2024	2/23/2022
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.								

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).

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
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		

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Document Revision History

Issue No.	Summary of Changes	Date Issued	Prepared by	Approved by
1	Original Release	Jan 3, 2023	HX	YF
2	Added Radiated and Conducted Emissions Data Revised 99% OBW Data	Feb 22, 2023	RMB	YF
3	Updates to address TCB comments: Measurement procedures listed on Pg 3 Limit conversion definitions below 30MHz added to Pg 5 RSE procedure and setup details added to Pg 6 PLCE procedure and setup details added to Pg 16	Mar 16, 2023	RMB	YF

END OF REPORT