TEST REPORT

Applicant	Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda
Address	Rua Hungria, 888, 8th Floor Sao Paulo SP, 01455000 - Brazil

FCC ID	2AKJ4-IDFACEFPM
ISED Canada IC	22235-IDFACEFPM
Product Description	Facial Recognition Access Controller with 13.56MHz RFID
PMN Model/HVIN FVIN	IDFACEFPM IDFACEFPM N/A
Additional Models	None
Date of tests	Jun 19 to Sep 27, 2023
FCC Test Firm DN Canada CABID	US1028 US0106

The tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart C, Section 15.225**
☒ **ISED Canada RSS-210 Issue 10 Annex B.6**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by	Approved by
Bryan Valcourt EMC Engineer	Yunus Faziloglu Wireless Manager
	
Report Issue Date: Oct 6, 2023	Issue Number: 1

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
1	Original release	Oct 6, 2023

1 SUMMARY OF TEST RESULTS

EUT was tested against the following requirements:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.225), RSS-210				
STANDARD SECTION		TEST TYPE AND LIMIT	APPLICABLE	RESULT
47 CFR	RSS			
15.207	Gen 8.8	AC Power Line Conducted Emissions	Y	PASS
15.205 15.209	Gen 8.9 Gen 8.10	Radiated Spurious Emissions	Y	PASS
15.225(a)	210 Annex B.6 (a)(i)	Fundamental Field Strength	Y	PASS
15.225(b)-(d)	210 Annex B.6 (a)(ii)-(iv)	Emission mask	Y	PASS
15.225(e)	210 Annex B.6 (b)	Frequency Tolerance	Y	PASS
--	Gen 6.7	99% Occupied Bandwidth	Y	PASS
15.203	Gen 6.8	Antenna Requirement	Y	PASS

2 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.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

NOMINAL VOLTAGE	12VDC
MODULATION TYPES	ASK
DATA RATES	106k baud
OPERATING FREQUENCY	13.56MHz
EUT Power Setting	Maximum (default)
FUNDAMENTAL FIELD STRENGTH	59.9dBuV/m at 3m
ANTENNA TYPE	Integrated air coil antenna

EUT Ports:									
Port Label	**Port Type**	**No. of ports**	**No. Populated**	**Cable Type**	**Shielded**	**Ferrites**	**Length**	**Max Length**	**In/Out Type**
Power In (on EAM)	2 Pin	1	1	Copper Wire	No	No	3m	3m	In
Wiegand Input and Output (on EAM)	5 Pin	1	1	Copper Wire	No	No	3m	3m	In
Relay, Door Sensor and Pish Button (on EAM)	6 Pin	1	1	Copper Wire	No	No	3m	3m	In
Power Out for ID Face (on EAM)	4 Pin	1	1	Copper Wire	No	No	3m	3m	In
Power In (on ID Face)	4 Pin	1	1	Copper Wire	No	No	3m	3m	In
Ethernet (on ID Face)	Ethernet	1	1	Copper Wire	No	No	3m	3m	In
Communications Line (on ID Face)	8 Pin Connector	1	1	Copper Wire	No	No	3m	3m	In
USB	USB	1	0	USB	Yes	No	3	5	For Programming Only

Lowest clock frequency in the device (used/generated): 0.032768MHz

Highest clock frequency in the device (used/generated): 1080MHz

NOTES:

1. For a more detailed description of the EUT, please refer to the manufacturer's specifications or the user's manual.
2. For photos of the EUT, please refer to External and Internal Photos exhibits.

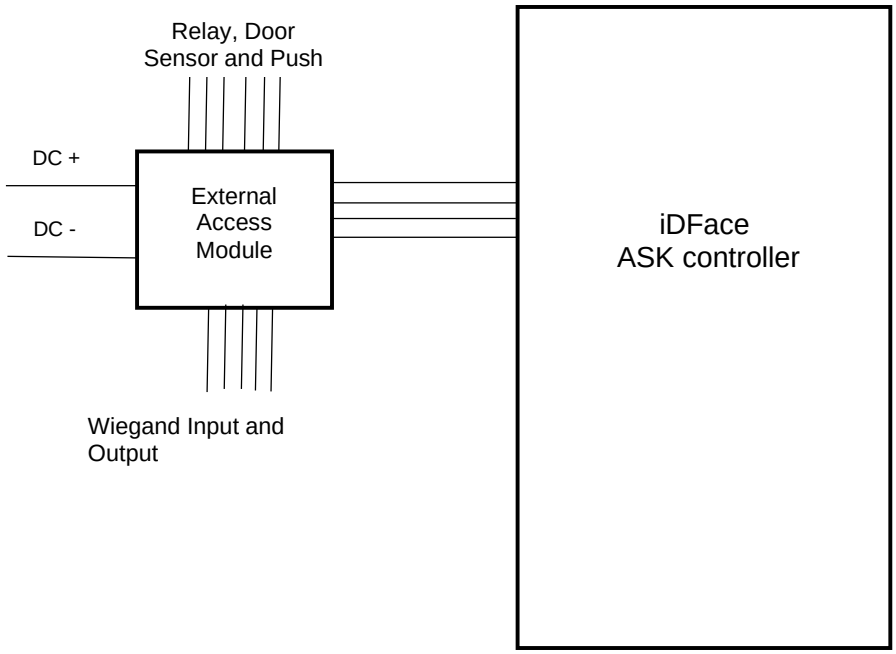
3.2 DESCRIPTION OF TEST MODES

EUT operates at a single channel at 13.56MHz. EUT was powered by an AC to DC power adapter. EUT starts transmitting as soon as powered up.

EUT configuration modes:

TEST MODE	DESCRIPTION
A	Continuous Transmit at 106k baud (Duty-cycle: 100%)

EUT SETUP BLOCK DIAGRAMS



Following channels/modes were selected for the applicable tests below.

TEST	TEST MODE	AVAILABLE CHANNELS	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)	Notes
FFS	A	1	1	ASK	106k baud	1
FT	A	1	1	ASK	106k baud	1
OBW	A	1	1	ASK	106k baud	1
RSE<1G	A	1	1	ASK	106k baud	1
RSE≥1G	A	1	1	ASK	106k baud	1
PLCE	A	1	1	ASK	106k baud	1, 2

Note 1: EUT was tested in its single installation orientation as seen in the test setup photos exhibit.
Note 2: Tested with both production antenna and dummy load.
FFS: Fundamental Field Strength
FT: Frequency Tolerance
OBW: 99% Occupied Bandwidth
RSE<1G: Radiated Spurious Emissions Below 1GHz
RSE≥1G: Radiated Spurious Emissions Above 1GHz
PLCE: Power Line Conducted Emissions

TEST CONDITIONS:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TESTED BY	DATE OF TEST
FFS	23.1°C, 50.2% RH, 1010mbar	BV	Jun 29, 2023
RSE	22.9°C, 51.6% RH, 1012mbar 23.1°C, 52.8% RH, 1016mbar 22.6°C, 50.2% RH, 1016mbar	BV	Jun 19, 2023 Jun 20, 2023 Jun 22, 2023
OBW	20.2°C, 50.9% RH, 909mbar	BV	Sep 27, 2023
FT	24.5°C, 48.3% RH, 1004mbar	BV	Aug 2, 2023
PLCE	22.8°C, 51.1% RH, 1016mbar 24.4°C, 48.5% RH, 1005mbar	BV	Jun 20, 2023 Jul 20, 2023

3.3 MEASUREMENT PROCEDURES USED

All tests were performed in accordance with the following measurement procedures:

ANSI C63.10-2013

RSS-Gen Issue 5

3.4 DESCRIPTION OF SUPPORT EQUIPMENT

Support Equipment	Model #	Serial #
None		

4 TEST RESULTS

4.1 AC LINE CONDUCTED EMISSIONS

4.1.1 LIMITS

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBµV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

NOTE: 1. Lower limit applies at the transition frequencies.

2. Limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.1.2 TEST EQUIPMENT USED

Rev. 9/22/2023

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 2708	9KHz-30MHz	LI-220C	Com-Power	20070054	2708	I	2/7/2024	2/7/2023
Conducted Test Sites (Mains / Telco)	**FCC Code**		**VCCI Code**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI 1	719150		A-0015			III	NA	N/A
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
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	2/14/2024	2/14/2023
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
20dB ATT(A#2506)	9kHz-2GHz	PE7014-20	Pasternack	2016	2506	II	8/3/2023	8/3/2022

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

4.1.3 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.

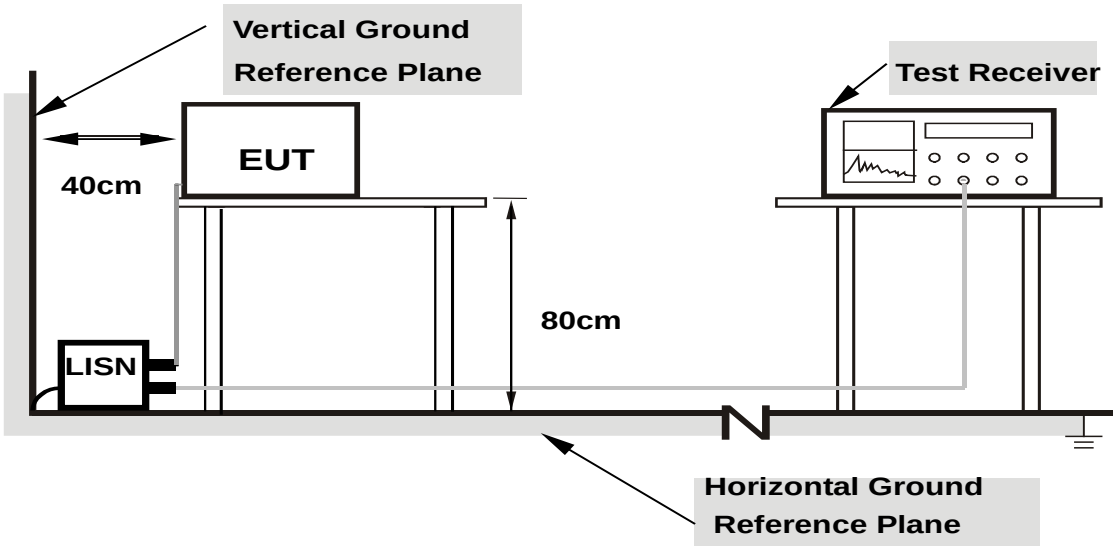
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

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.

4.1.4 DEVIATIONS

No deviations from the standard.

4.1.5 TEST 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

For the actual test configuration, please refer to Test Setup Photos exhibit.

4.1.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.

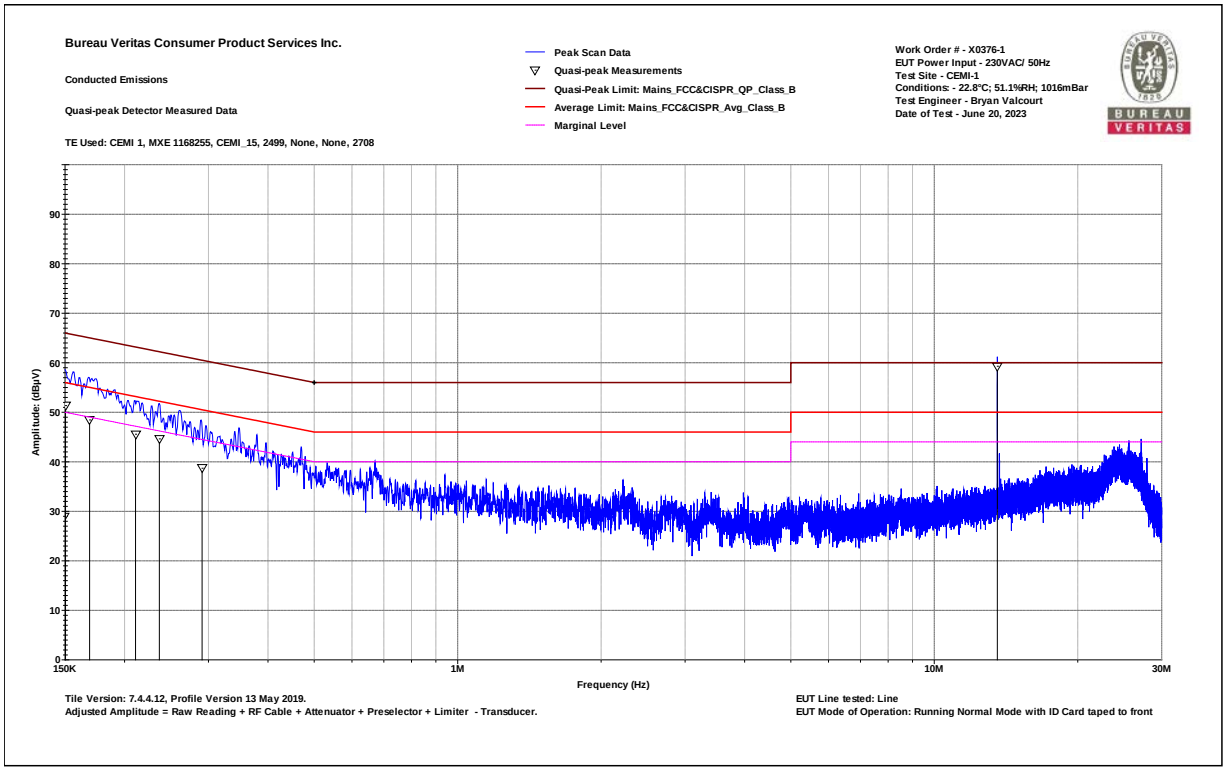
4.1.7 TEST RESULTS

EUT antenna in place

Bureau Veritas Consumer Product Services Inc.	Work Order # - X0376-1
Conducted Emissions	EUT Power Input - 230VAC/ 50Hz
Quasi-peak Detector Data	Test Site - CEMI-1
Notes:	Conditions: - 22.8°C; 51.1%RH; 1016mBar
	Test Engineer - Bryan Valcourt
EUT Line tested: Line	Date of Test - June 20, 2023
EUT Mode of Operation: Running Normal Mode with ID Card taped to front	

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)
0.15	31.334	20	51.3	66	-14.6	PASS	-14.6
0.169	28.397	20	48.4	65	-16.6	PASS	
0.211	25.488	20.1	45.6	63.2	-17.6	PASS	
0.237	24.498	20.1	44.6	62.2	-17.6	PASS	
0.291	18.579	20.1	38.7	60.5	-21.8	PASS	
13.562	Fundamental						

Line Quasi Peak Table

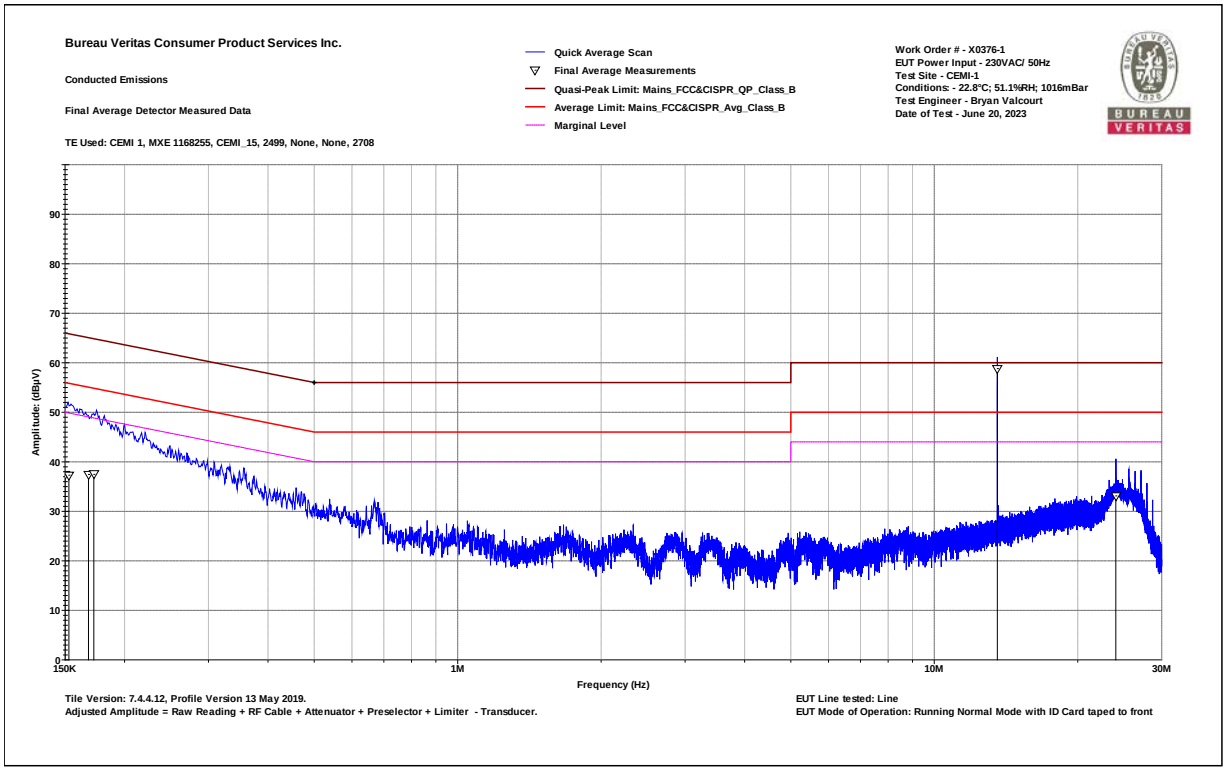


Line Quasi Peak Graph

Bureau Veritas Consumer Product Services Inc.	Work Order # - X0376-1
Conducted Emissions	EUT Power Input - 230VAC/ 50Hz
Final Average Detector Data	Test Site - CEMI-1
Notes:	Conditions: - 22.8°C; 51.1%RH; 1016mBar
EUT Line tested: Line	Test Engineer - Bryan Valcourt
EUT Mode of Operation: Running Normal Mode with ID Card taped to front	Date of Test - June 20, 2023

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)
0.15	17.3	20	37.3	56	-18.7	PASS	
0.153	17.3	20	37.3	55.8	-18.5	PASS	
0.168	17.4	20	37.4	55.1	-17.6	PASS	
0.172	17.4	20	37.5	54.8	-17.4	PASS	
13.562	Fundamental						
24.04	12.6	20.5	33.1	50	-16.9	PASS	-16.9

Line Average Table

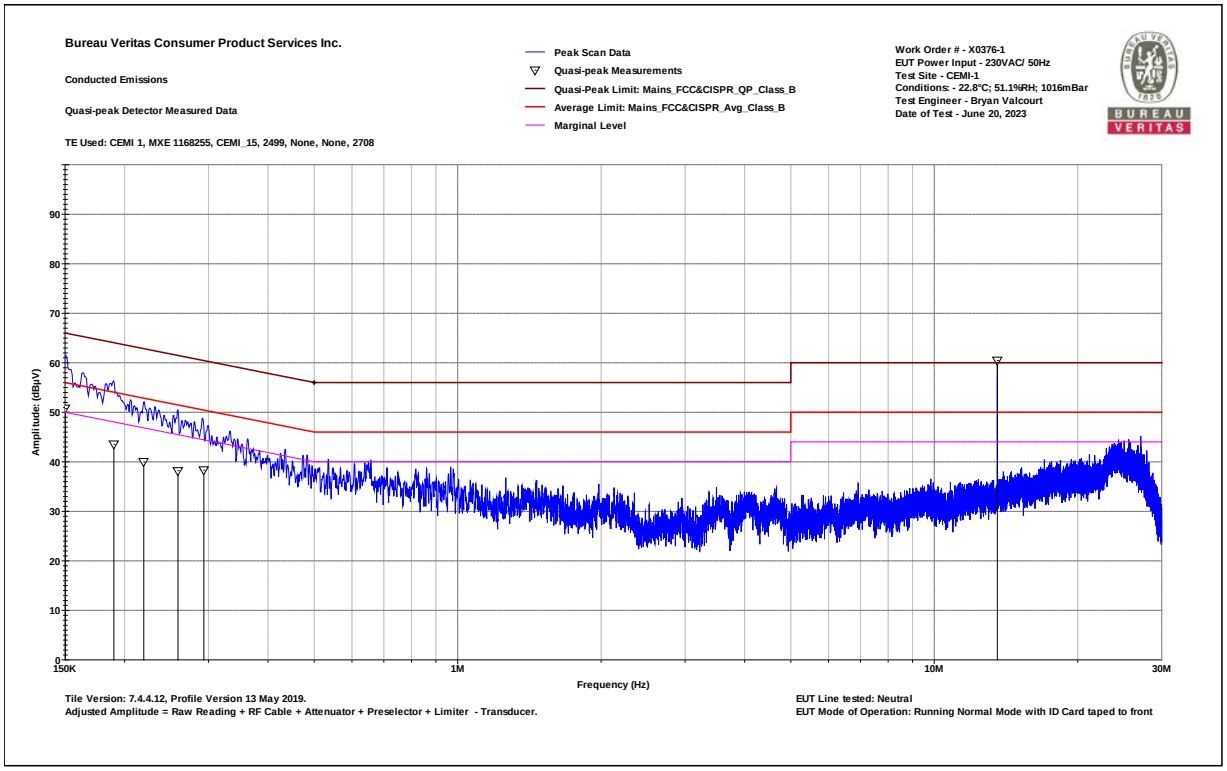


Line Average Graph

Bureau Veritas Consumer Product Services Inc.	Work Order # - X0376-1
Conducted Emissions	EUT Power Input - 230VAC/ 50Hz
Quasi-peak Detector Data	Test Site - CEMI-1
Notes:	Conditions: - 22.8°C; 51.1%RH; 1016mBar
EUT Line tested: Neutral	Test Engineer - Bryan Valcourt
EUT Mode of Operation: Running Normal Mode with ID Card taped to front	Date of Test - June 20, 2023

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)
0.15	30.753	20	50.7	66	-15.2	PASS	-15.2
0.19	23.472	20	43.5	64	-20.5	PASS	
0.219	19.885	20.1	40	62.8	-22.9	PASS	
0.259	18.12	20.1	38.2	61.5	-23.3	PASS	
0.293	18.206	20.1	38.3	60.4	-22.1	PASS	
13.561	Fundamental						

Neutral Quasi Peak Table

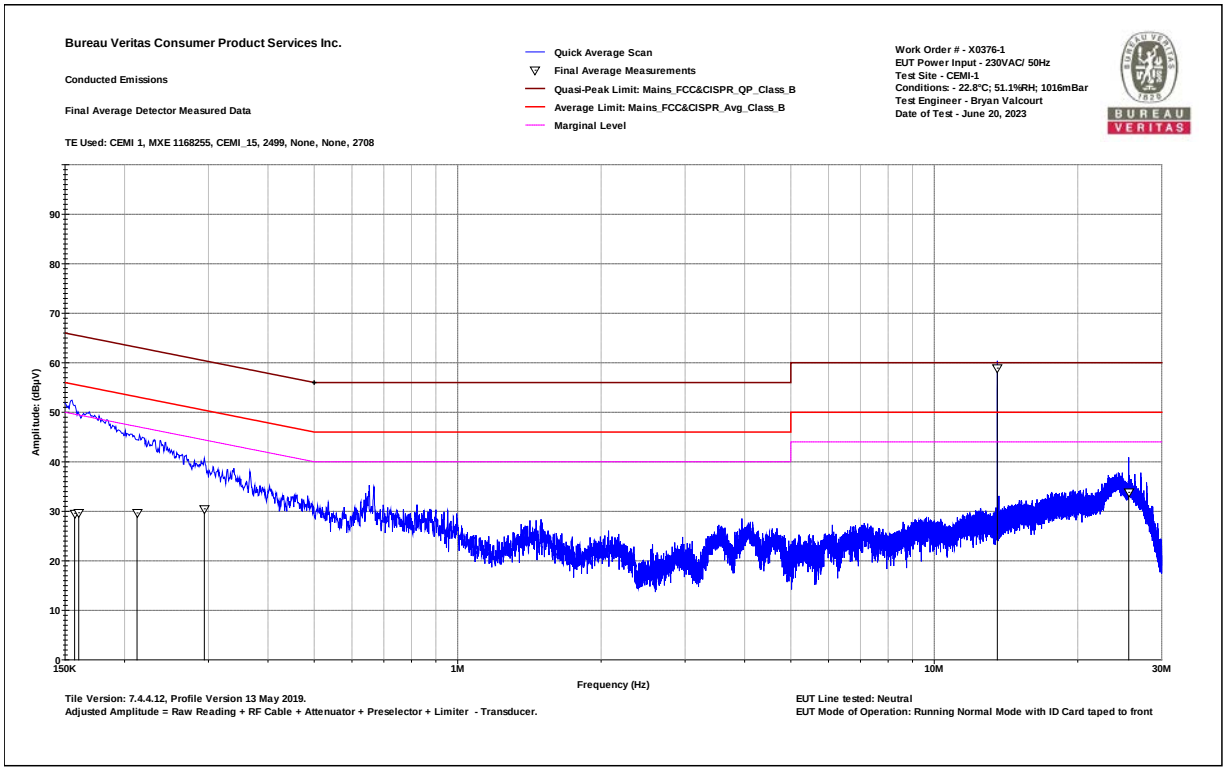


Neutral Quasi Peak Graph

Bureau Veritas Consumer Product Services Inc.	Work Order # - X0376-1
Conducted Emissions	EUT Power Input - 230VAC/ 50Hz
Final Average Detector Data	Test Site - CEMI-1
Notes:	Conditions: - 22.8°C; 51.1%RH; 1016mBar
EUT Line tested: Neutral	Test Engineer - Bryan Valcourt
EUT Mode of Operation: Running Normal Mode with ID Card taped to front	Date of Test - June 20, 2023

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)
0.157	9.6	20	29.6	55.6	-26	PASS	
0.16	9.7	20	29.7	55.4	-25.7	PASS	
0.212	9.6	20.1	29.7	53.1	-23.5	PASS	
0.294	10.4	20.1	30.5	50.4	-19.9	PASS	
13.561	Fundamental						
25.58	13.2	20.7	33.8	50	-16.2	PASS	-16.2

Neutral Average Table



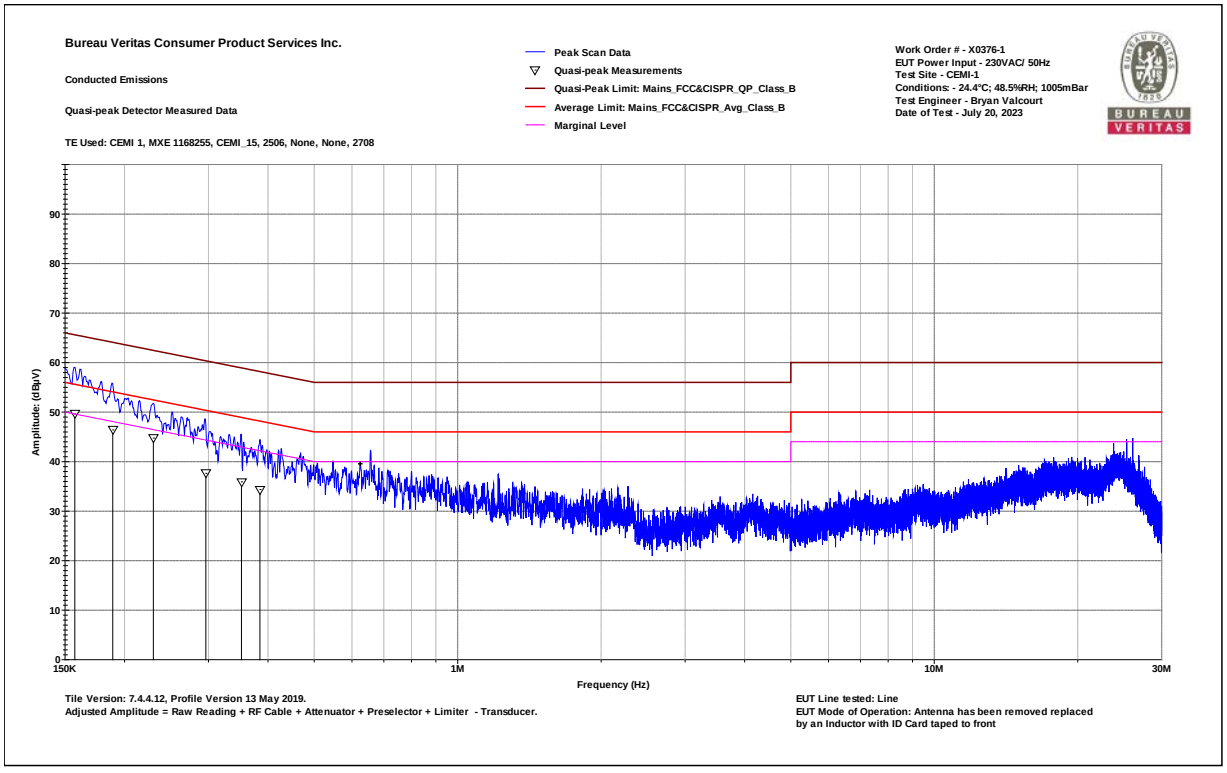
Neutral Average Graph

EUT antenna replaced with dummy load

Bureau Veritas Consumer Product Services Inc.	Work Order # - X0376-1
Conducted Emissions	EUT Power Input - 230VAC/ 50Hz
Quasi-peak Detector Data	Test Site - CEMI-1
Notes:	Conditions: - 24.4°C; 48.5%RH; 1005mBar
EUT Line tested: Line	Test Engineer - Bryan Valcourt
EUT Mode of Operation: Antenna replaced with dummy load	Date of Test - July 20, 2023

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)
0.157	29.369	20.2	49.6	65.6	-16	PASS	-16
0.189	26.092	20.3	46.4	64.1	-17.7	PASS	
0.23	24.401	20.4	44.8	62.5	-17.7	PASS	
0.296	17.211	20.4	37.6	60.3	-22.7	PASS	
0.352	15.469	20.4	35.9	58.9	-23	PASS	
0.385	13.89	20.5	34.4	58.2	-23.8	PASS	

Line Quasi Peak Table

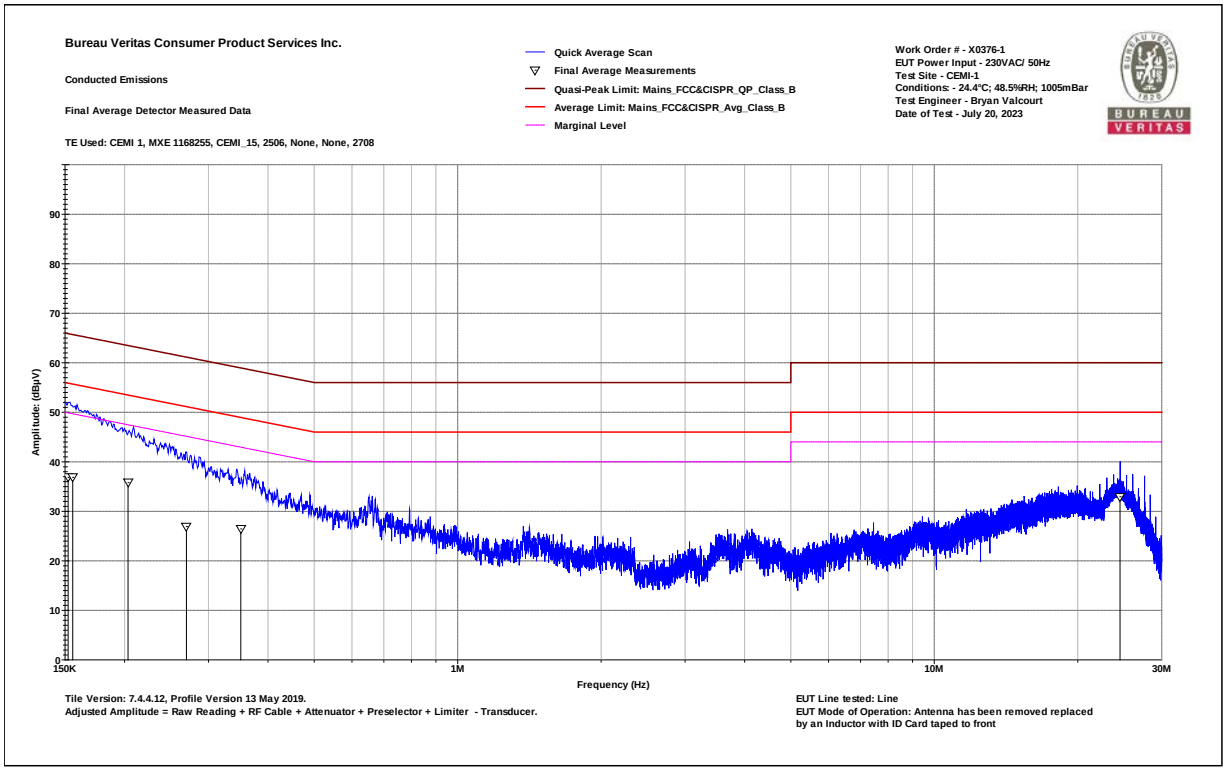


Line Quasi Peak Graph

Bureau Veritas Consumer Product Services Inc.	Work Order # - X0376-1
Conducted Emissions	EUT Power Input - 230VAC/ 50Hz
Final Average Detector Data	Test Site - CEMI-1
Notes:	Conditions: - 24.4°C; 48.5%RH; 1005mBar
EUT Line tested: Line	Test Engineer - Bryan Valcourt
EUT Mode of Operation: Antenna replaced with dummy load	Date of Test - July 20, 2023

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)
0.152	16.6	20.2	36.9	55.9	-19	PASS	
0.156	16.6	20.2	36.9	55.7	-18.8	PASS	
0.203	15.4	20.3	35.8	53.5	-17.7	PASS	
0.27	6.5	20.4	26.9	51.1	-24.2	PASS	
0.351	6	20.4	26.4	48.9	-22.5	PASS	
24.533	12.2	20.8	32.9	50	-17.1	PASS	-17.1

Line Average Table

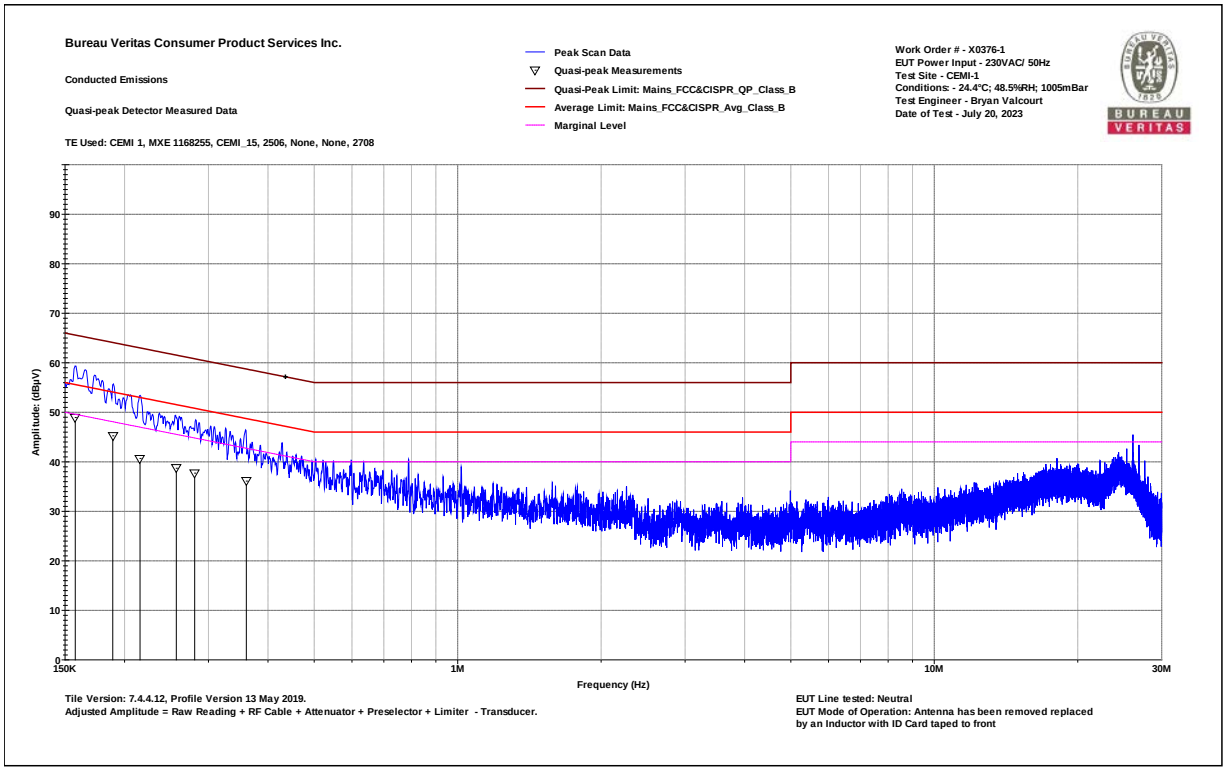


Line Average Graph

Bureau Veritas Consumer Product Services Inc.	Work Order # - X0376-1
Conducted Emissions	EUT Power Input - 230VAC/ 50Hz
Quasi-peak Detector Data	Test Site - CEMI-1
Notes:	Conditions: - 24.4°C; 48.5%RH; 1005mBar
EUT Line tested: Neutral	Test Engineer - Bryan Valcourt
EUT Mode of Operation: Antenna replaced with dummy load	Date of Test - July 20, 2023

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)
0.158	28.714	20.2	48.9	65.6	-16.7	PASS	-16.7
0.189	24.956	20.3	45.2	64.1	-18.8	PASS	
0.216	20.367	20.3	40.7	63	-22.3	PASS	
0.257	18.337	20.4	38.7	61.5	-22.8	PASS	
0.281	17.331	20.4	37.7	60.8	-23.1	PASS	
0.36	15.676	20.4	36.1	58.7	-22.6	PASS	

Neutral Quasi Peak Table

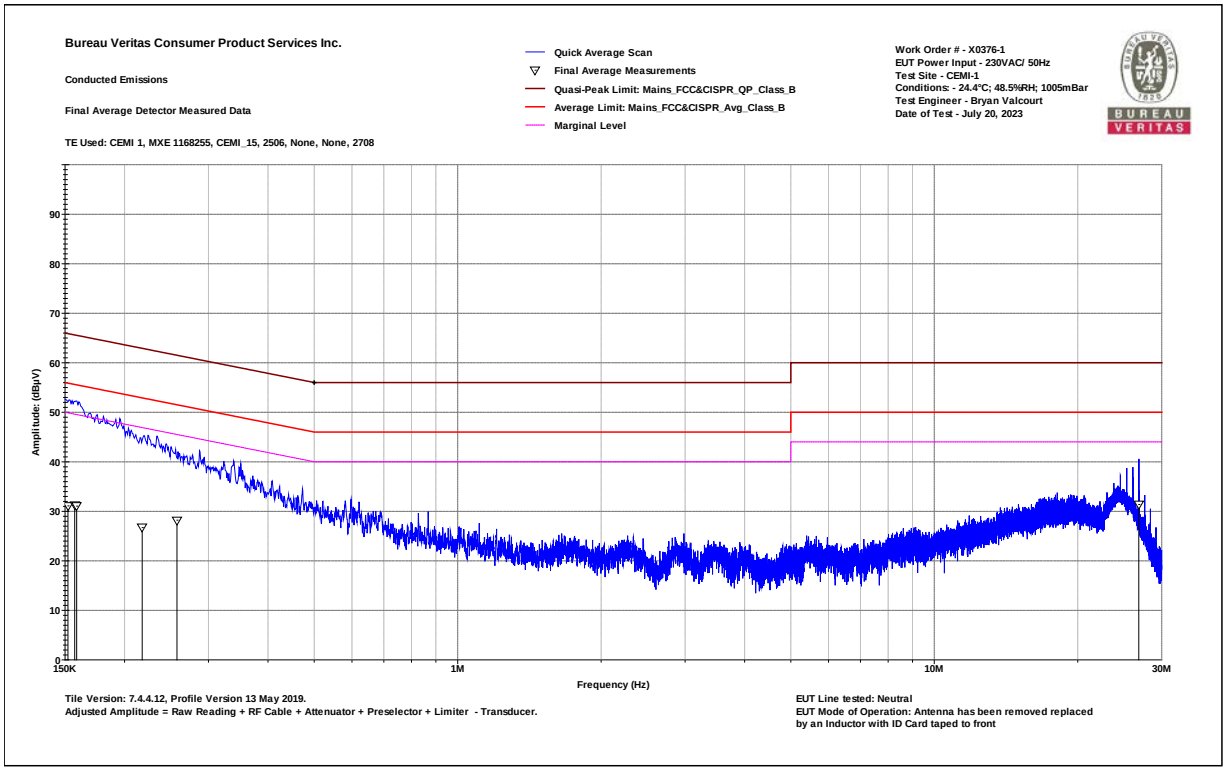


Neutral Quasi Peak Graph

Bureau Veritas Consumer Product Services Inc.	Work Order # - X0376-1
Conducted Emissions	EUT Power Input - 230VAC/ 50Hz
Final Average Detector Data	Test Site - CEMI-1
Notes:	Conditions: - 24.4°C; 48.5%RH; 1005mBar
EUT Line tested: Neutral	Test Engineer - Bryan Valcourt
EUT Mode of Operation: Antenna replaced with dummy load	Date of Test - July 20, 2023

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)
0.152	10.9	20.2	31.1	55.9	-24.8	PASS	
0.157	11	20.2	31.2	55.6	-24.4	PASS	
0.159	10.8	20.2	31	55.5	-24.5	PASS	
0.218	6.4	20.3	26.7	52.9	-26.2	PASS	
0.258	7.8	20.4	28.2	51.5	-23.3	PASS	
26.857	10.4	21	31.4	50	-18.6	PASS	-18.6

Neutral Average Table



Neutral Average Graph

4.2 FUNDAMENTAL FIELD STRENGTH AND EMISSION MASK

4.2.1 LIMITS

Fundamental Field Strength:
The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Emission Mask:
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.
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.
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 FCC 15.209 and RSS-Gen.

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

4.2.2 TEST SETUP

Same as radiated spurious emissions setup below 30MHz (Section 4.3.5).

4.2.3 TEST EQUIPMENT USED

Rev. 10/4/2023

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	12/28/2024	12/28/2022
EMI Chamber 2	719150	2762A-7	A-0015	1-18GHz	1686	I	12/28/2024	12/28/2022

pectrum Analyzers / Receivers /Preselecto	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2093 MXE EMI Receiver	20Hz-26.5GHz	N9038A	Agilent	MY51210181	2093	I	3/30/2024	3/30/2023

Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Small Loop	10kHz-30MHz	PLA-130/A	ARA	1024	755	I	9/12/2024	9/12/2022

Cables	Range	Mfr	Cat	Calibration Due	Calibrated on
Asset #2466	9KHz-18GHz	MegaPhase	II	11/1/2023	11/1/2022
Asset #2608	9KHz-18GHz	Pasternack	II	11/1/2023	11/1/2022
Asset #2682	9KHz-18GHz	Pasternack	II	10/6/2023	10/6/2022

Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
8447F Rental PA	9KHz-1.3GHz	84477F	HP	3113A05395		II	10/17/2023	10/17/2022

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

4.2.4 TEST PROCEDURES

Same as Section 4.3.3.

4.2.5 DEVIATIONS

No deviations from the standard.

4.2.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.

4.2.7 TEST RESULTS

Measurement Distance		3m							
Orientation	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)
Parallel	13.56	50.3	9.6	59.9	69.5	-9.6	Pass	-9.6	0
Perpendicular	13.56	47.7	9.6	57.3	69.5	-12.2	Pass		69
Parallel to Floor	13.56	42.1	9.6	51.7	69.5	-17.8	Pass		182

Test Date: Jun 29, 2023

Emission mask defined in 15.225 (a)-(d) was not necessary since the maximum 13.56MHz fundamental of 59.9dBuV/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.

4.3 RADIATED SPURIOUS EMISSIONS

4.3.1 LIMITS

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emissions limits specified in Section 15.209(a).

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
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

NOTE:

1. Lower limit applies at the transition frequencies.
2. dBµV/m = 20*log(µV/m).
3. As specified in 15.35(b), for frequencies above 1000MHz, field strength limits are based on the use of measurement instrumentation employing an average detector function. However, there is also a limit on the peak level of the emissions that is 20 dB above the maximum permitted average emission limit.
4. 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
5. 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.

4.3.2 TEST EQUIPMENT USED

Rev. 10/4/2023

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	12/28/2024	12/28/2022
EMI Chamber 2	719150	2762A-7	A-0015	1-18GHz	1686	I	12/28/2024	12/28/2022

pectrum Analyzers / Receivers /Preselecto	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2093 MXE EMI Receiver	20Hz-26.5GHz	N9038A	Agilent	MY51210181	2093	I	3/30/2024	3/30/2023

Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Large Loop	20Hz-5MHz	6511	EMCO	9704-1154	67	I	8/22/2024	8/22/2022
Small Loop	10kHz-30MHz	PLA-130/A	ARA	1024	755	I	9/12/2024	9/12/2022
Red-White Bilog	30-2000MHz	JB1	Sunol	A091604-1	1105	I	10/25/2023	10/25/2021
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	3/27/2025	3/27/2023

Cables	Range	Mfr	Cat	Calibration Due	Calibrated on
Asset #2466	9KHz-18GHz	MegaPhase	II	11/1/2023	11/1/2022
Asset #2608	9KHz-18GHz	Pasternack	II	11/1/2023	11/1/2022
Asset #2682	9KHz-18GHz	Pasternack	II	10/6/2023	10/6/2022

Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2311 PA	1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/17/2023	10/17/2022
2111 HF Preamp	0.5-18GHz	PAM-118A	COM-POWER	551063	2111	II	10/25/2023	10/25/2022
8447F Rental PA	9KHz-1.3GHz	84477F	HP	3113A05395		II	10/17/2023	10/17/2022

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

4.3.3 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.

d. In 1GHz-6GHz range, a horn 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.

e. Following bandwidths were used during emissions testing:

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

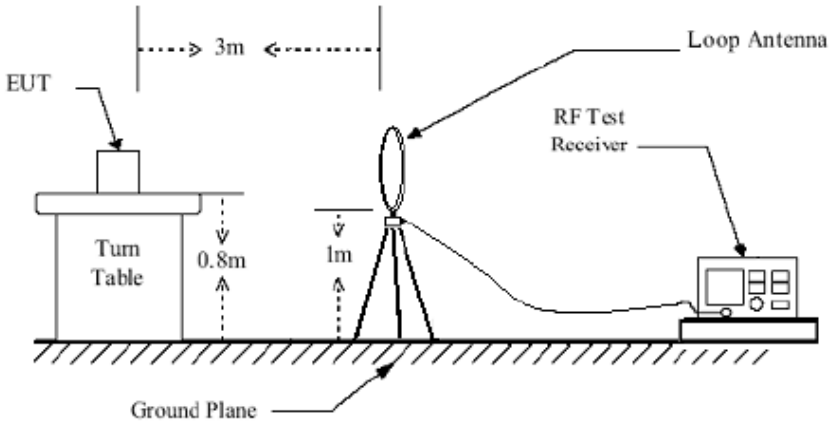
Per FCC §15.209(d), limits §15.209(a) are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. If peak measurements in these frequency bands were below the applicable limits, QPk and RMS measurements were not performed.

4.3.4 DEVIATIONS

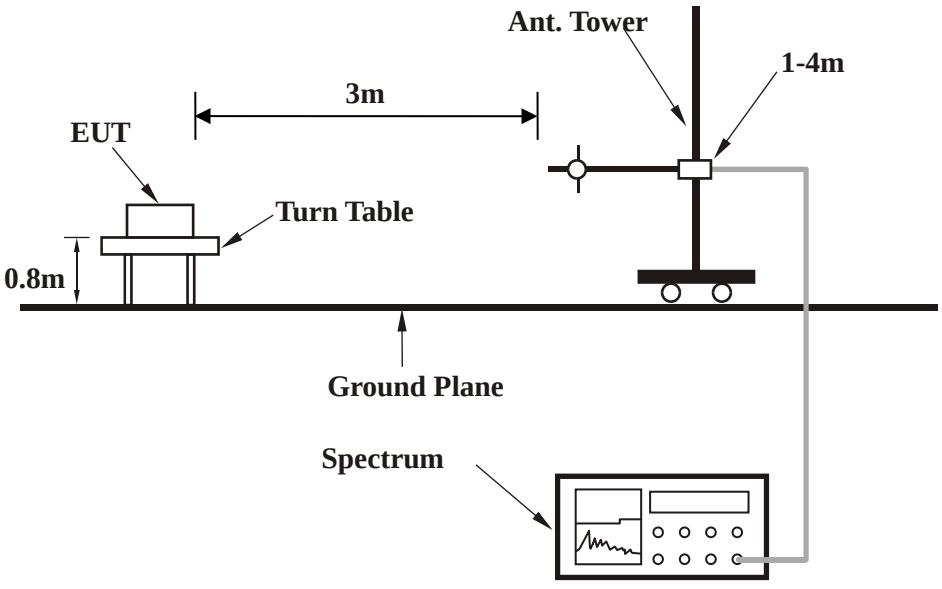
No deviations from the standard.

4.3.5 TEST SETUP

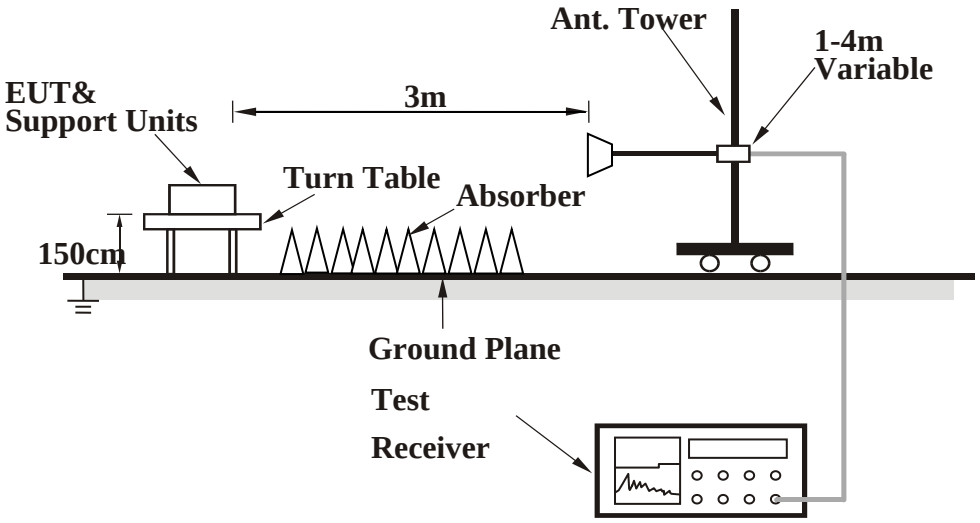
Below 30MHz Test Setup



30MHz - 1GHz Test Setup



1GHz – 6GHz Test Setup



Note: For the actual test configuration, please refer to the Test Setup Photos exhibit.

4.3.6 EUT OPERATING CONDITIONS

EUT was operated according to the manufacturer's specifications.

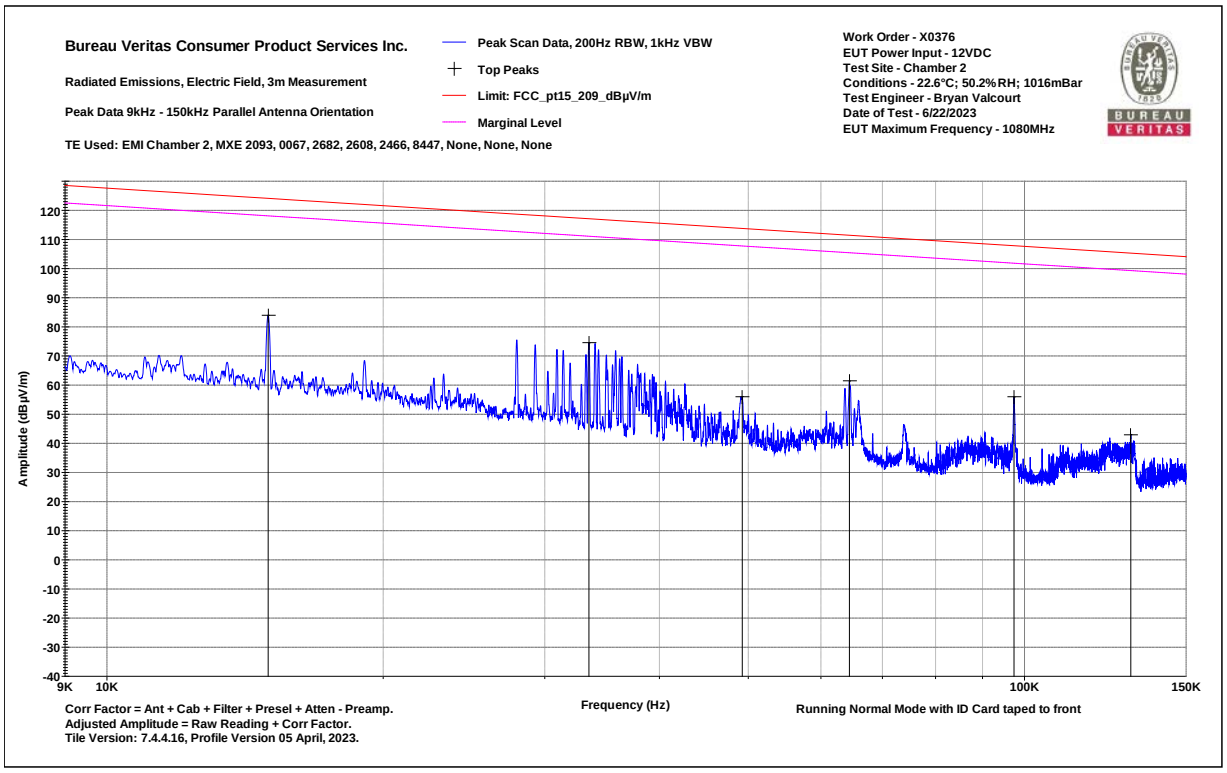
4.3.7 TEST RESULTS

Emissions below 1GHz

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions, Electric Field, 3m Measurement
Top Peaks Parallel 9-150kHz
Notes:
Running Normal Mode with ID Card taped to front

Work Order - X0376
EUT Power Input - 12VDC
Test Site - Chamber 2
Conditions - 22.6°C; 50.2%RH; 1016mBar
Test Engineer - Bryan Valcourt
Date of Test - 6/22/2023

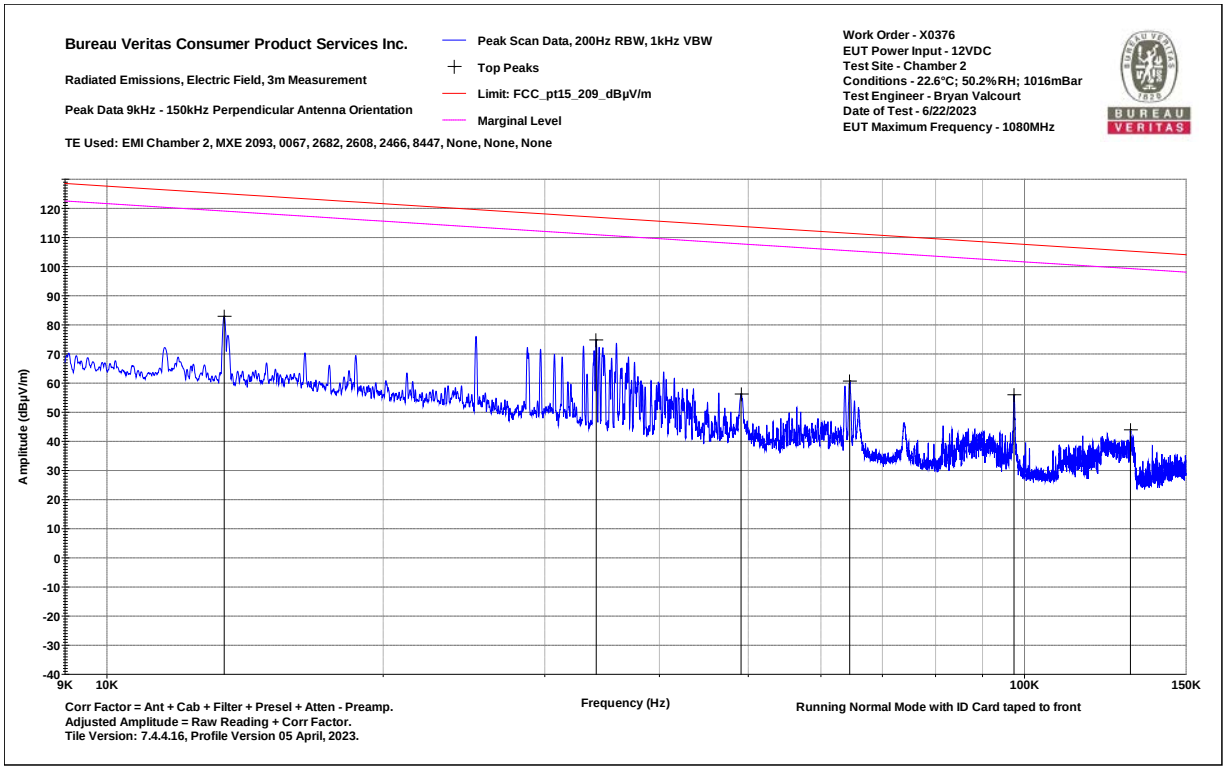
Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim: FCC_pt15_209_ dBµV/m (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
0.014985	49	34.9	83.9	124.1	-40.2	PASS	-40.2	135
0.033516	45.8	28.6	74.5	117.1	-42.6	PASS		225
0.049252	30.3	25.8	56	113.8	-57.7	PASS		135
0.064445	38.3	23.1	61.4	111.4	-50.1	PASS		135
0.097411	35	20.9	55.9	107.8	-52	PASS		345
0.130581	22.7	20.3	43	105.3	-62.3	PASS		225



9-150 kHz Parallel

Bureau Veritas Consumer Product Services Inc.	Work Order - X0376
Radiated Emissions, Electric Field, 3m Measurement	EUT Power Input - 12VDC
Top Peaks Perpendicular 9-150kHz	Test Site - Chamber 2
Notes:	Conditions - 22.6°C; 50.2%RH; 1016mBar
Running Normal Mode with ID Card taped to front	Test Engineer - Bryan Valcourt
	Date of Test - 6/22/2023

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)
0.01342	47.3	35.6	82.9	125.1	-42.1	PASS	-42.1	15
0.034137	46.3	28.5	74.8	116.9	-42.1	PASS		105
0.049097	30.4	25.8	56.2	113.8	-57.6	PASS		60
0.064487	37.7	23	60.8	111.4	-50.7	PASS		165
0.097407	35.1	20.9	56	107.8	-51.9	PASS		315
0.130461	23.7	20.3	44	105.3	-61.3	PASS		225

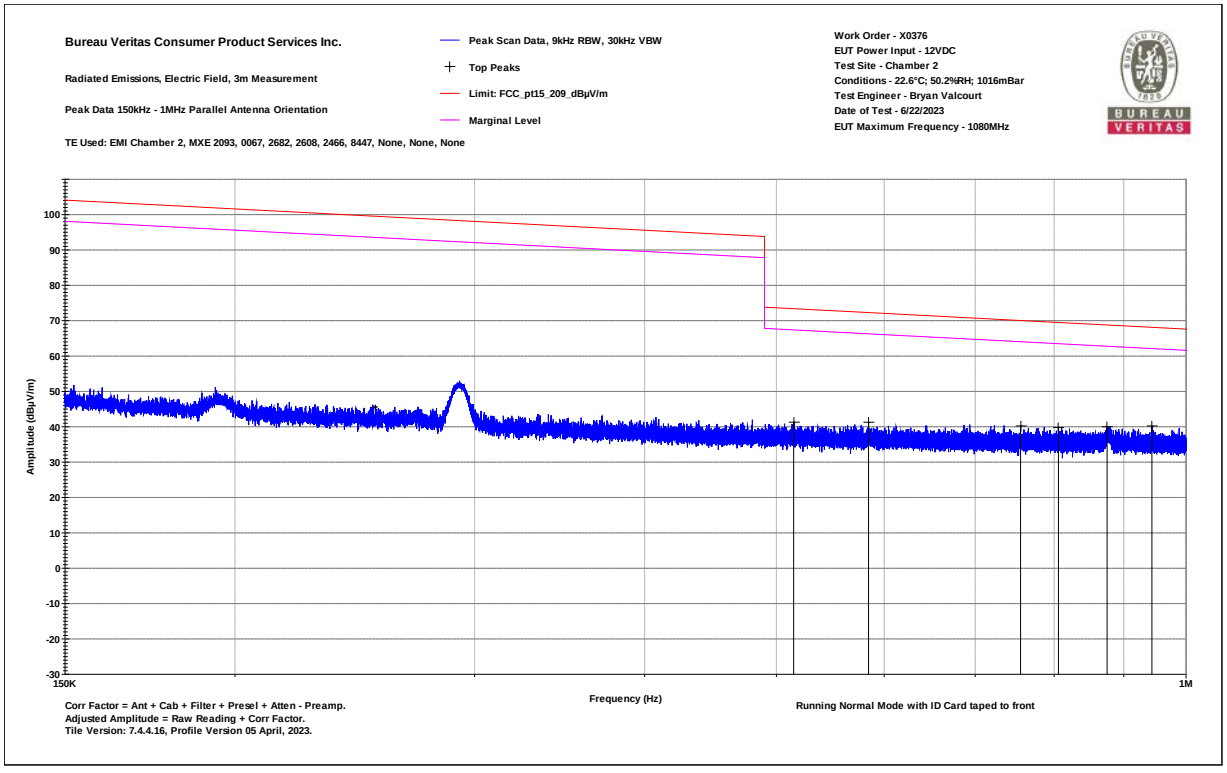


9-150 kHz Perpendicular

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Parallel 150-1000kHz
Notes:
Running Normal Mode with ID Card taped to front

Work Order - X0376
EUT Power Input - 12VDC
Test Site - Chamber 2
Conditions - 22.6°C; 50.2%RH; 1016mBar
Test Engineer - Bryan Valcourt
Date of Test - 6/22/2023

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)
0.515	22.5	18.8	41.3	73.4	-32.1	PASS		75
0.584	22.4	18.8	41.2	72.3	-31.1	PASS		60
0.756	21.5	18.8	40.3	70.1	-29.8	PASS		165
0.806	21	18.7	39.7	69.5	-29.7	PASS		195
0.875	21.2	18.8	39.9	68.8	-28.8	PASS		30
0.944	21.4	18.8	40.2	68.1	-27.9	PASS	-27.9	150

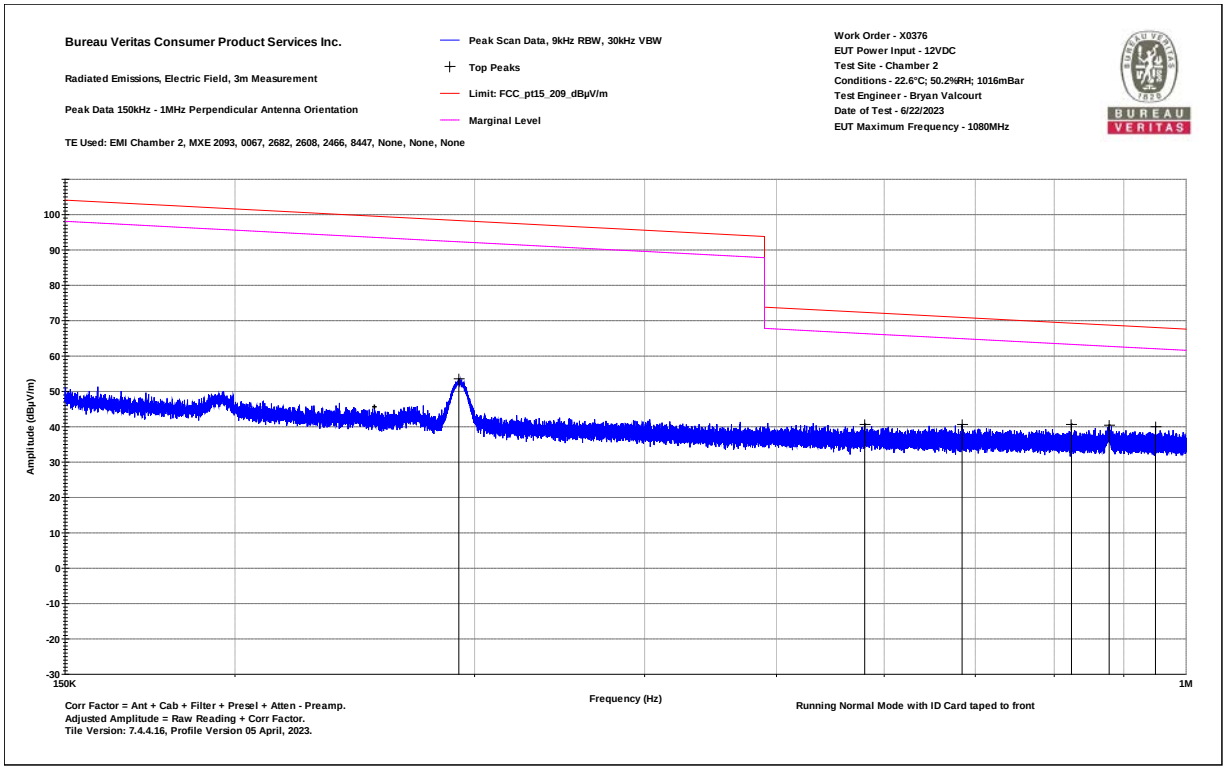


0.15-1MHz Parallel

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Perpendicular 150-1000kHz
Notes:
Running Normal Mode with ID Card taped to front

Work Order - X0376
EUT Power Input - 12VDC
Test Site - Chamber 2
Conditions - 22.6°C; 50.2%RH; 1016mBar
Test Engineer - Bryan Valcourt
Date of Test - 6/22/2023

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)
0.292	34.5	19	53.5	98.3	-44.8	PASS		300
0.581	21.9	18.8	40.7	72.4	-31.6	PASS		195
0.685	21.9	18.7	40.6	70.9	-30.3	PASS		270
0.824	22	18.7	40.7	69.3	-28.6	PASS		195
0.878	21.8	18.8	40.5	68.7	-28.2	PASS		300
0.95	21.3	18.8	40.1	68.1	-28	PASS	-28	180

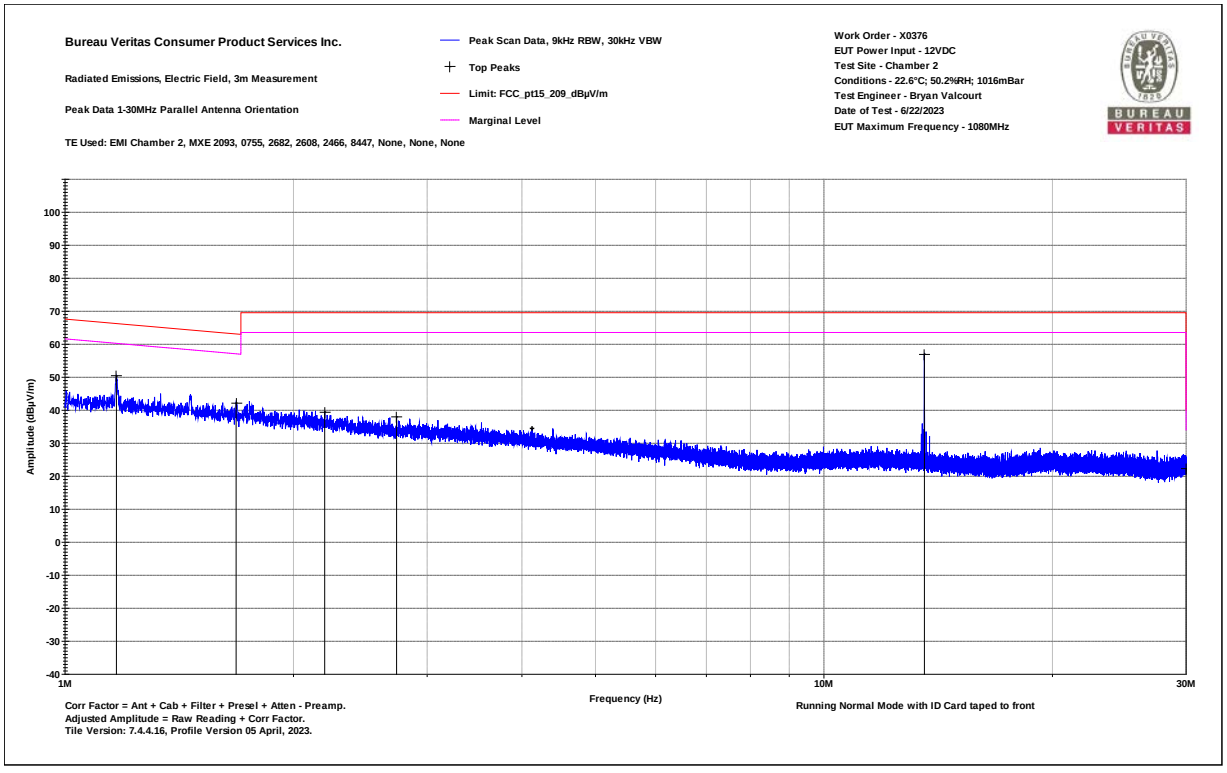


0.15-1MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Parallel 1-30MHz
Notes:
Running Normal Mode with ID Card taped to front

Work Order - X0376
EUT Power Input - 12VDC
Test Site - Chamber 2
Conditions - 22.6°C; 50.2%RH; 1016mBar
Test Engineer - Bryan Valcourt
Date of Test - 6/22/2023

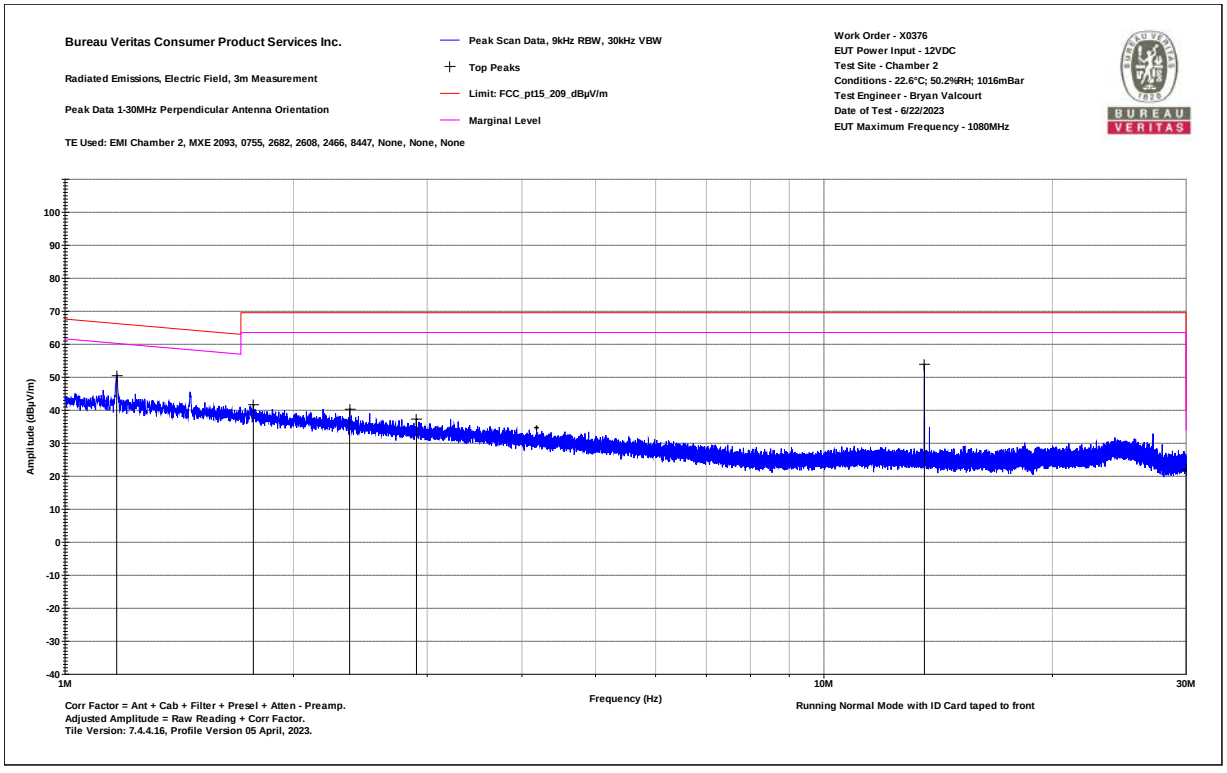
Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim: FCC_pt15_209_ dBµV/m (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
1.169	23.8	26.6	50.3	66.3	-15.9	PASS		345
1.681	18.5	23.7	42.2	63.1	-20.9	PASS		300
2.198	18.2	21.3	39.5	69.5	-30	PASS		105
2.735	18.5	19.5	38	69.5	-31.6	PASS		0
13.561	47.4	9.6	57	69.5	-12.6	PASS	-12.6	0
30	13.8	8.4	22.3	40	-17.7	PASS		165



1-30MHz Parallel

Bureau Veritas Consumer Product Services Inc.	Work Order - X0376
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 12VDC
Top Peaks Perpendicular 1-30MHz	Test Site - Chamber 2
Notes:	Conditions - 22.6°C; 50.2%RH; 1016mBar
Running Normal Mode with ID Card taped to front	Test Engineer - Bryan Valcourt
	Date of Test - 6/22/2023

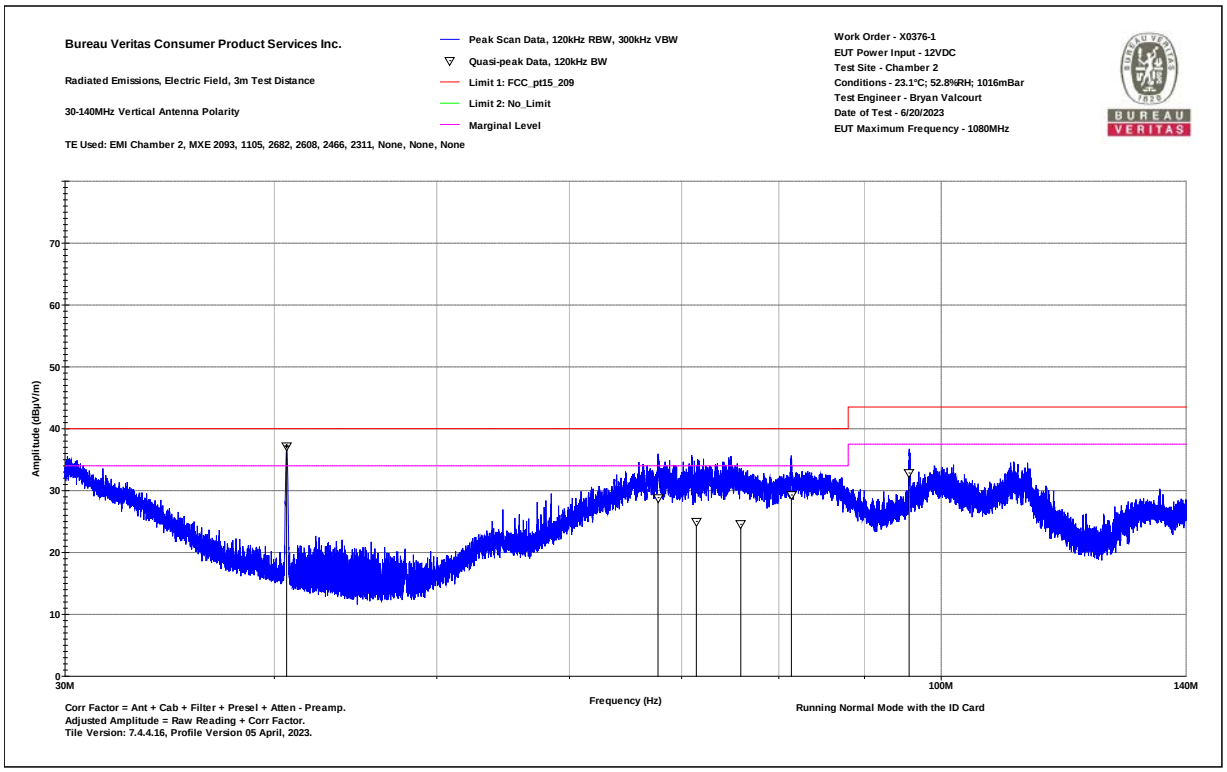
Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim: FCC_pt15_209_ dBµV/m (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Margin (dB)	EUT Azimuth (degrees)
1.17	24	26.6	50.5	66.2	-15.7	PASS		45
1.771	18.4	23.2	41.6	69.5	-28	PASS		60
2.372	19.6	20.7	40.3	69.5	-29.2	PASS		45
2.905	18.3	19	37.2	69.5	-32.3	PASS		300
13.561	44.3	9.6	53.9	69.5	-15.7	PASS	-15.7	75
30	13.6	8.4	22	40	-18	PASS		75



1-30MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.	Work Order - X0376-1
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 12VDC
30-140MHz Vertical Data	Test Site - Chamber 2
Notes:	Conditions - 23.1°C; 52.8%RH; 1016mBar
Running Normal Mode with the ID Card	Test Engineer - Bryan Valcourt
	Date of Test - 6/20/2023

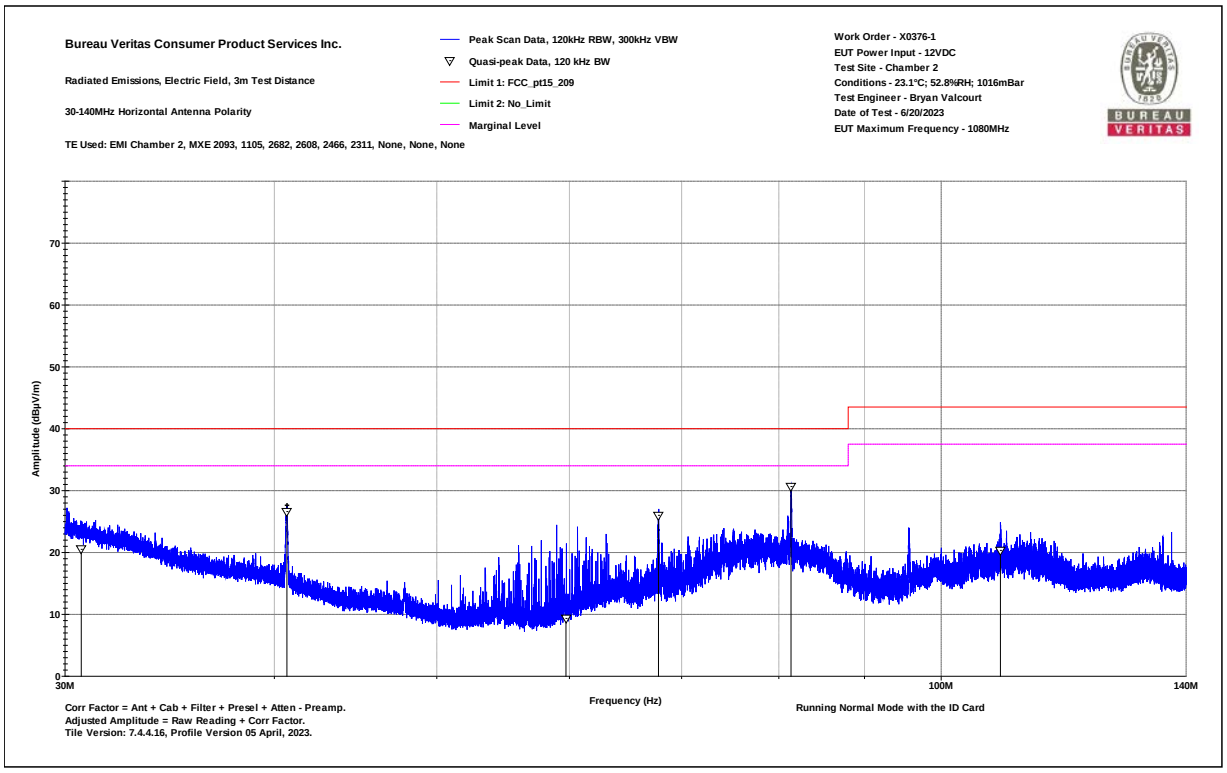
Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
40.68	52.7	-15.6	37.2	40	-2.8	PASS	-2.8	102	266
67.761	50.4	-21.5	28.8	40	-11.2	PASS		115	108
71.427	46.5	-21.5	25	40	-15	PASS		100	136
75.931	46.1	-21.5	24.5	40	-15.5	PASS		104	147
81.394	51.1	-21.9	29.3	40	-10.7	PASS		116	189
95.683	53.6	-20.8	32.8	43.5	-10.7	PASS		115	186



30-140MHz Vertical

Bureau Veritas Consumer Product Services Inc.	Work Order - X0376-1
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 12VDC
30-140MHz Horizontal Data	Test Site - Chamber 2
Notes:	Conditions - 23.1°C; 52.8%RH; 1016mBar
Running Normal Mode with the ID Card	Test Engineer - Bryan Valcourt
	Date of Test - 6/20/2023

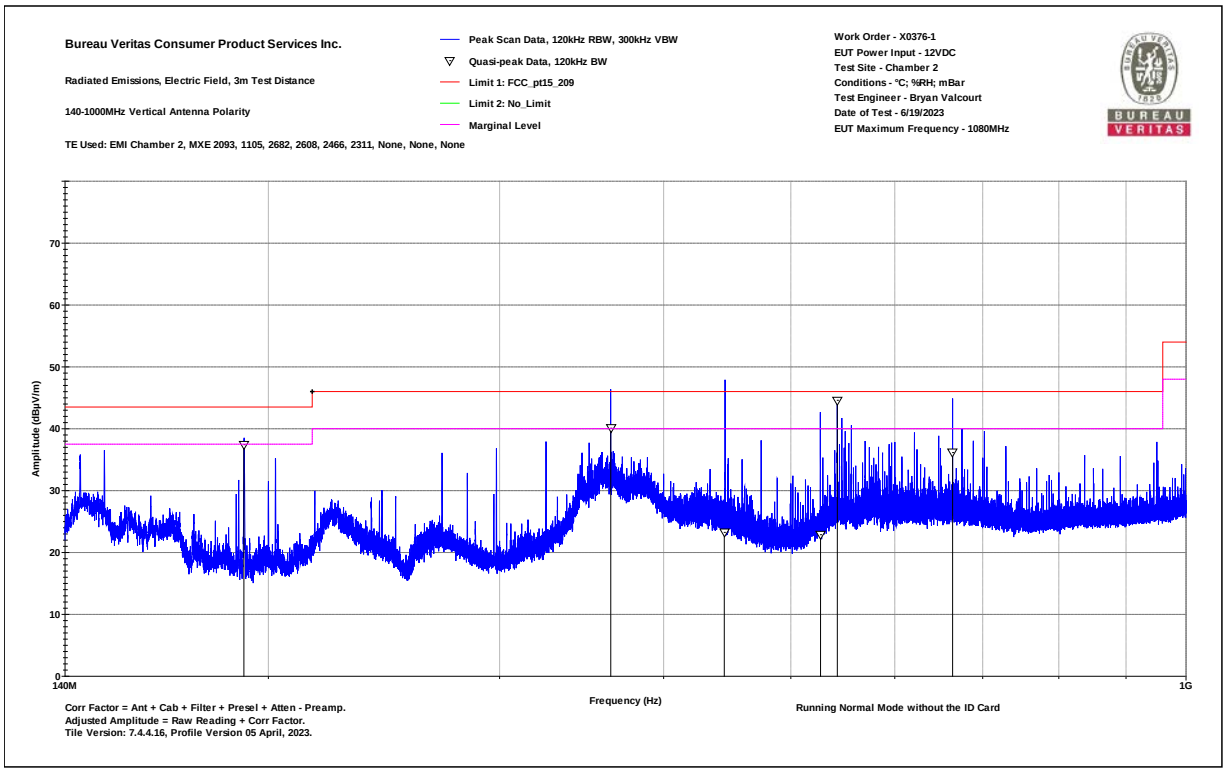
Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dbµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.676	28.7	-8.2	20.5	40	-19.5	PASS		232	155
40.699	42.2	-15.6	26.6	40	-13.4	PASS		252	0
59.713	31.4	-22.1	9.3	40	-30.7	PASS		236	18
67.808	47.5	-21.5	26	40	-14	PASS		225	155
81.357	52.5	-21.9	30.6	40	-9.4	PASS	-9.4	225	0
108.48	37.5	-17.2	20.3	43.5	-23.2	PASS		175	4



30-140MHz Horizontal

Bureau Veritas Consumer Product Services Inc.	Work Order - X0376-1
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 12VDC
140-1000MHz Vertical Data	Test Site - Chamber 2
Notes:	Conditions - °C; %RH; mBar
Running Normal Mode without the ID Card	Test Engineer - Bryan Valcourt
	Date of Test - 6/19/2023

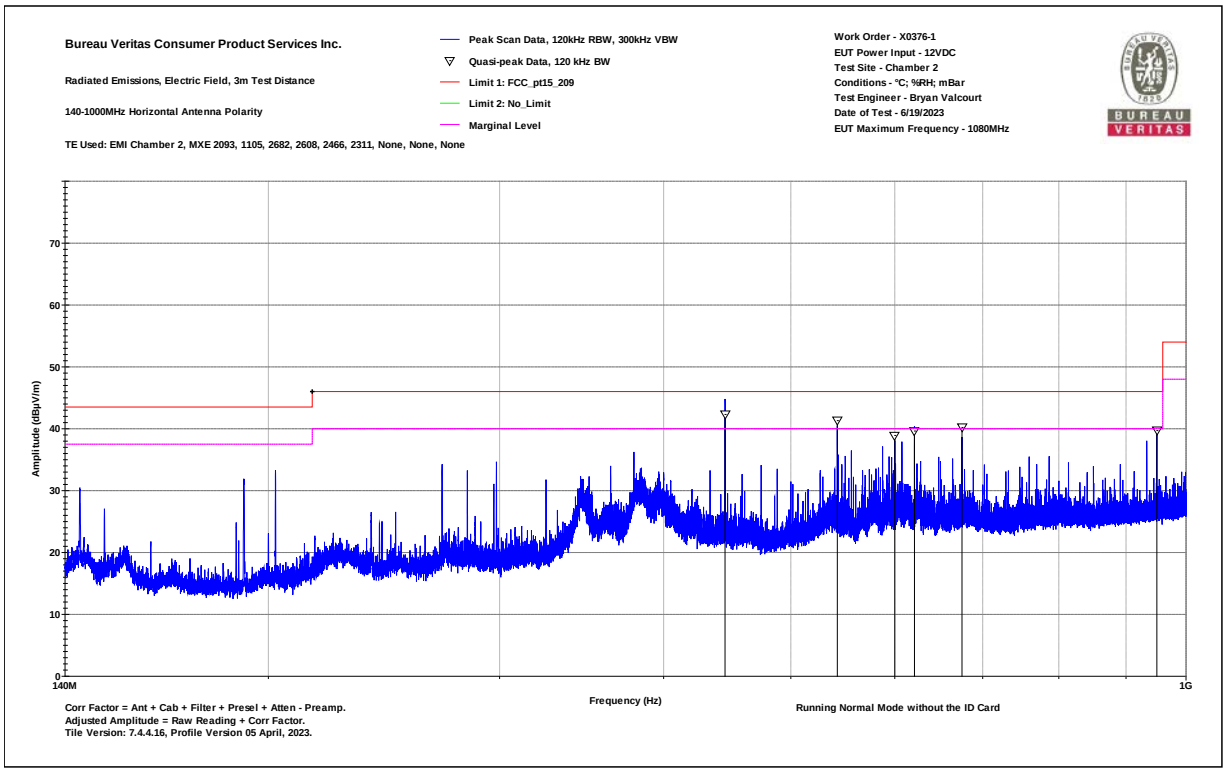
Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
191.604	54.7	-17.2	37.4	43.5	-6.1	PASS		100	284
364.584	52.8	-12.7	40.1	46	-5.9	PASS		134	11
444.908	34.3	-11	23.2	46	-22.8	PASS		125	323
526.711	32.3	-9.5	22.9	46	-23.1	PASS		175	338
542.448	53.5	-8.9	44.6	46	-1.4	PASS	-1.4	102	117
664.062	42.8	-6.7	36.1	46	-9.9	PASS		106	66



140-1000MHz Vertical

Bureau Veritas Consumer Product Services Inc.	Work Order - X0376-1
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 12VDC
140-1000MHz Horizontal Data	Test Site - Chamber 2
Notes:	Conditions - °C; %RH; mBar
Running Normal Mode without the ID Card	Test Engineer - Bryan Valcourt
	Date of Test - 6/19/2023

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)
445.51	53.3	-11	42.3	46	-3.7	PASS	-3.7	100	200
542.443	50.2	-8.9	41.3	46	-4.7	PASS		174	152
600.037	47	-8.1	38.9	46	-7.1	PASS		154	127
621.056	47.4	-7.8	39.6	46	-6.4	PASS		157	130
675.037	46.7	-6.5	40.2	46	-5.8	PASS		125	115
950.062	41.9	-2.2	39.7	46	-6.3	PASS		143	304

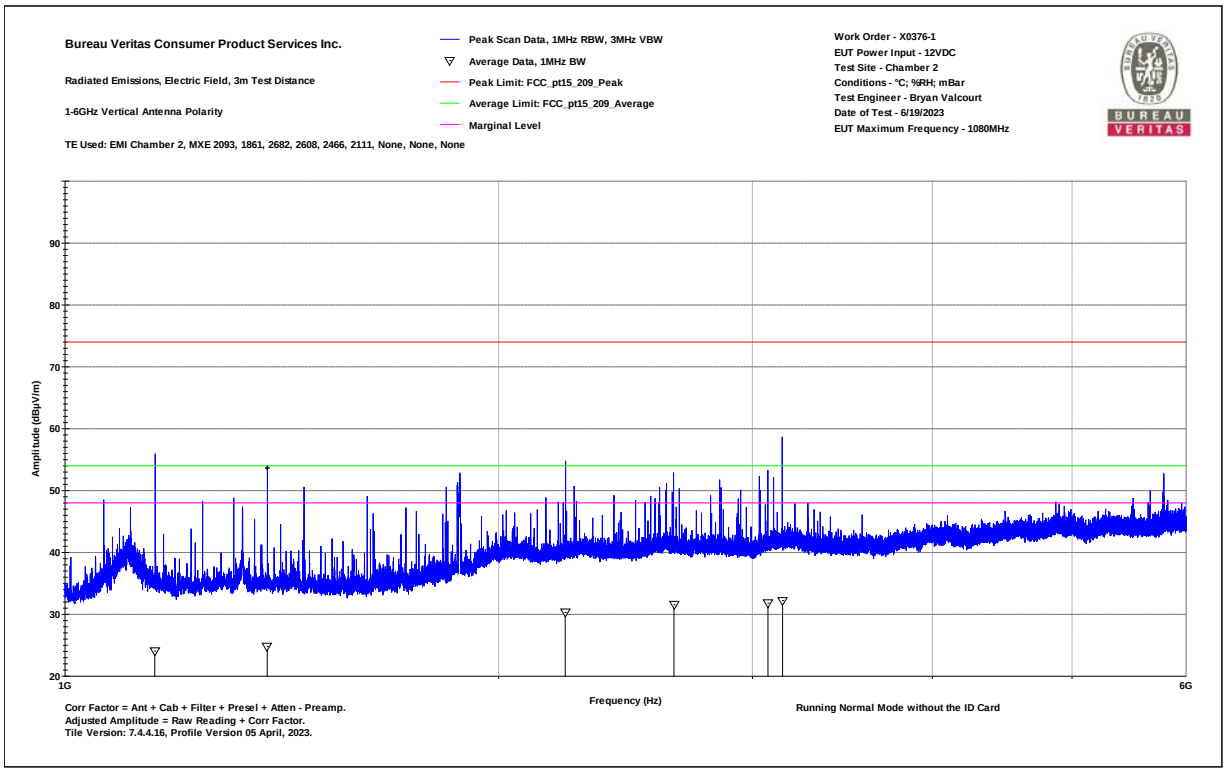


140-1000MHz Horizontal

Emissions above 1GHz

Bureau Veritas Consumer Product Services Inc.	Work Order - X0376-1
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 12VDC
1-6GHz Vertical Data	Test Site - Chamber 2
Notes:	Conditions - °C; %RH; mBar
Running Normal Mode without the ID Card	Test Engineer - Bryan Valcourt
	Date of Test - 6/19/2023

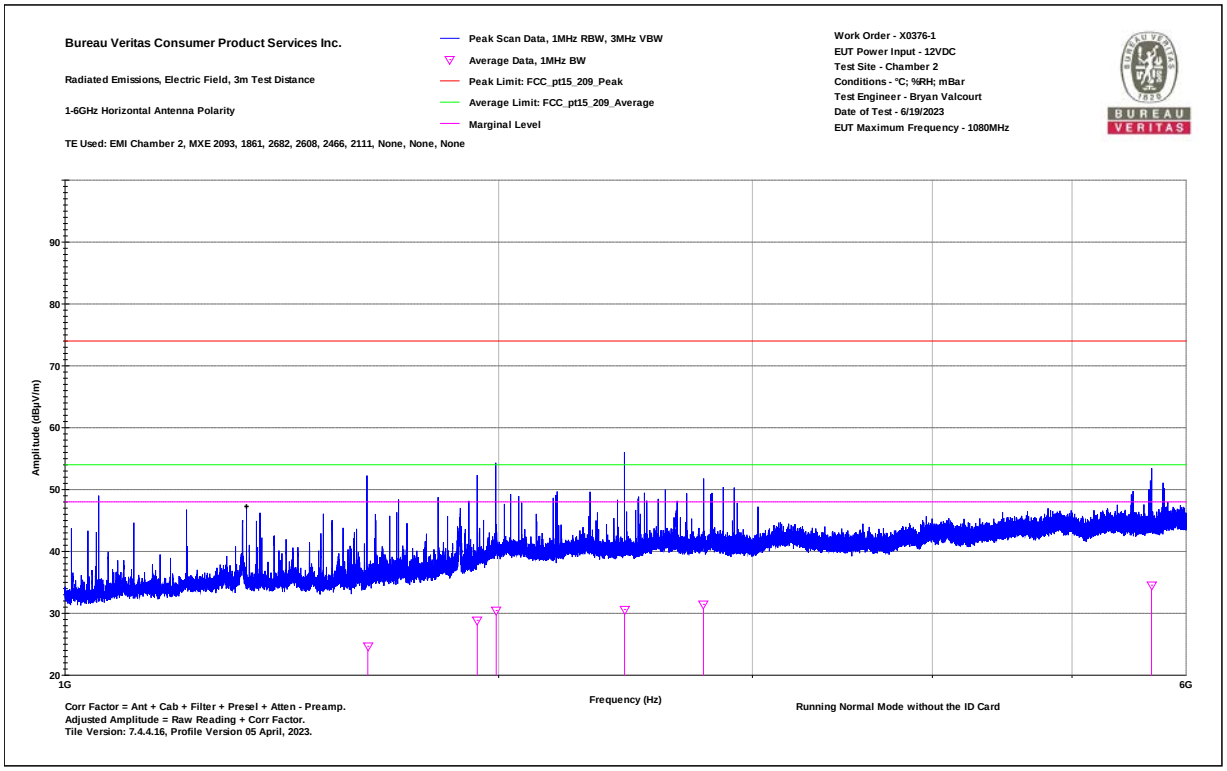
Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1154.3	66.9	35	-10.9	56	74	-18	PASS		24	54	-30	PASS		175	128
1381.7	63.6	34.7	-9.9	53.7	74	-20.3	PASS		24.8	54	-29.2	PASS		100	235
2224.4	60.6	36.1	-5.8	54.8	74	-19.2	PASS		30.3	54	-23.7	PASS		300	172
2646.5	58.1	36.8	-5.3	52.8	74	-21.2	PASS		31.5	54	-22.5	PASS		113	261
3075.9	58.7	37.2	-5.4	53.3	74	-20.7	PASS		31.8	54	-22.2	PASS		125	18
3148.2	63.6	37.1	-4.9	58.7	74	-15.3	PASS	-15.3	32.2	54	-21.8	PASS	-21.8	196	223



1-6GHz Vertical

Bureau Veritas Consumer Product Services Inc.	Work Order - X0376-1
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 12VDC
1-6GHz Horizontal Data	Test Site - Chamber 2
Notes:	Conditions - °C; %RH; mBar
Running Normal Mode without the ID Card	Test Engineer - Bryan Valcourt
	Date of Test - 6/19/2023

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1622.5	62.3	34.7	-10	52.3	74	-21.7	PASS		24.7	54	-29.3	PASS		275	247
1932.6	58.8	35.3	-6.5	52.3	74	-21.7	PASS		28.9	54	-25.1	PASS		284	217
1992	59.5	35.6	-5.2	54.3	74	-19.7	PASS		30.4	54	-23.6	PASS		300	236
2445.8	62	36.6	-6	56	74	-18	PASS	-18	30.6	54	-23.4	PASS		225	235
2774.4	57.1	36.8	-5.3	51.8	74	-22.2	PASS		31.4	54	-22.6	PASS		195	271
5677.7	55.1	36.1	-1.6	53.5	74	-20.5	PASS		34.5	54	-19.5	PASS	-19.5	275	104



1-6GHz Horizontal

4.4 99% OCCUPIED BANDWIDTH

4.4.1 LIMITS

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].

4.4.2 TEST SETUP

Same as radiated spurious emissions setup below 30MHz (Section 4.3.5).

4.4.3 TEST EQUIPMENT USED

Rev. 9/1/2023

Cables	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Asset #2596	9KHz-40GHz		Carlisle			II	4/20/2024	4/20/2023
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

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

4.4.4 TEST PROCEDURES

Per RSS-Gen Issue 5 Section 6.7.

4.4.5 DEVIATIONS

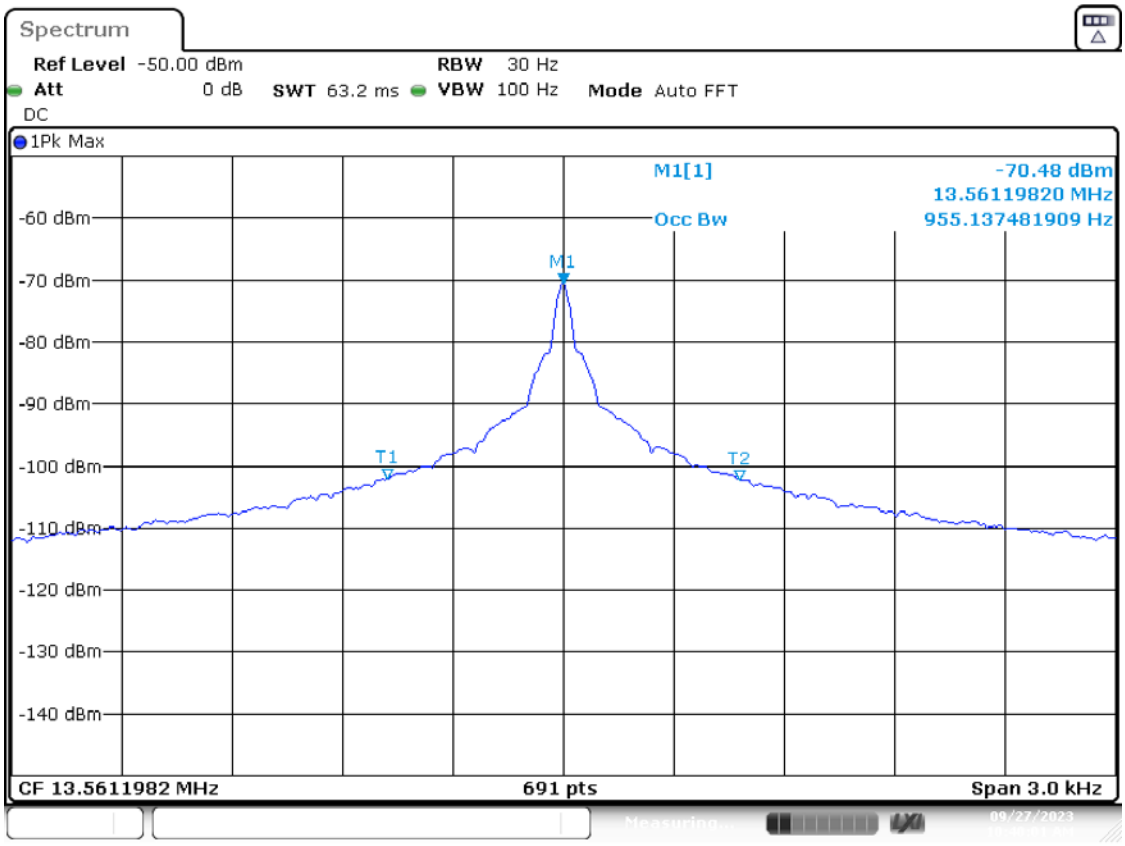
No deviations from the standard.

4.4.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer’s specifications.

4.4.7 TEST RESULTS

Measured 99% OBW: 955.1Hz



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4.5 FREQUENCY TOLERANCE

4.5.1 LIMITS

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 °C to + 50 °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 °C. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.5.2 TEST SETUP

EUT placed in the climatic chamber. Measurement loop placed inside the chamber close to the EUT and connected to the spectrum analyzer outside the chamber.

4.5.3 TEST EQUIPMENT USED

Rev. 8/30/2023								
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
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Temp/Humidity Chamber #18		EPX-2H	Espec	137664	1645	I	1/3/2024	1/3/2023
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2595	9KHz-40GHz		Carlisle			II	1/17/2024	1/17/2023
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.								

4.5.4 TEST PROCEDURES

Per ANSI C63.10 - 2013 Section 6.8.

4.5.5 DEVIATIONS

No deviations from the standard.

4.5.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer’s specifications

4.5.7 TEST RESULTS

Measurements were recorded at startup, 2 minutes, 5 minutes, and 10 minutes after the EUT was energized. Worst-case measurements are shown in the data table below.

Frequency Stability Under Extreme Conditions								
Date:	8/2/2023				**Work Order:**	X0376-1		
Engineer:	Bryan Valcourt							
Nominal Voltage:	12VDC	**Min Voltage:**	10.2VDC	**Max Voltage:**	13.8VDC			
Temperature		**Voltage**	**Amplitude**	**Amplitude Delta**	**Frequency**	**Frequency Delta**	**Limit**	**Result**
°C		**V**	**(dBm)**	**(dB)**	**(MHz)**	**(MHz)**	**(MHz)**	
-20C		Nominal	-74.87	-2.07	13.561397	0.000107	0.001356	Pass
-10C		Nominal	-75.13	-2.33	13.561396	0.000106	0.001356	Pass
0C		Nominal	-75.06	-2.26	13.561374	0.000084	0.001356	Pass
10C		Nominal	-75.05	-2.25	13.561361	0.000071	0.001356	Pass
Nominal (20C)		Minimum	-73.19	-0.39	13.561295	0.000005	0.001356	Pass
		Nominal	-72.80	Reference	13.561290	Reference	--	--
		Maximum	-73.21	-0.41	13.561298	0.000008	0.001356	Pass
30C		Nominal	-75.98	-3.18	13.562008	0.000718	0.001356	Pass
40C		Nominal	-75.43	-2.63	13.562110	0.000820	0.001356	Pass
50C		Nominal	-75.06	-2.26	13.561310	0.000020	0.001356	Pass
Test Site:	1645		**Antenna:**	2347				
Cable 1:	2595		**Analyzer:**	FSV40				

Maximum Frequency Deviation: ±0.000820MHz
Limit: ±0.001356MHz

Result: PASS

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the Test Setup Photos exhibit.

6 APPENDIX A – MODIFICATIONS

Following modification was needed during testing:

Ferrite #044164281 was installed on Ethernet and Power Supply cables.

---END OF REPORT---