

EMC Test Report

Test Report Number	ORM-24052853-LC-FCC-EMC
Applicant	OrthoRPM Inc.
FCC ID	2BGUM-ORTHORPM
Applicant Address	674 Second Street, Encinitas, CA, 92024
Product Name	OrthoRPM Hand Grip Trainer
Model (s)	OrthoRPM
Date of Receipt	07/08/24
Date of Test	07/11/2024-07/12/2024
Report Issue Date	07/25/2024
Test Standards	47 CFR Part 15, Subpart B
Test Result	PASS
	Issued by: Vista Compliance Laboratories 1261 Puerta Del Sol, San Clemente, CA 92673 USA www.vista-compliance.com
 <hr/> Minoush Niknam (Test Engineer)	 <hr/> David Zhang (Technical Manager)

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Report #

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REVISION HISTORY

Report Number	Version	Description	Issued Date
ORM-24052853-LC-FCC-EMC	01	Initial report	07/11/2024

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1 Test Summary

Test Item	Test Requirement	Test Method	Result
AC Power line Conducted Emissions	47 CFR Part 15, Subpart B	ANSI C63.4: 2014	Pass
Radiated Emissions Below 1GHz	47 CFR Part 15, Subpart B	ANSI C63.4: 2014	Pass
Radiated Emissions Above 1GHz	47 CFR Part 15, Subpart B	ANSI C63.4: 2014	Pass

2 General Information

2.1 Applicant

Applicant	OrthoRPM Inc.
Applicant address	674 Second Street, Encinitas, CA, 92024
Manufacturer	OrthoRPM Inc.
Manufacturer Address	674 Second Street, Encinitas, CA, 92024

2.2 Product information

Product Name	OrthoRPM Hand Grip Trainer
Model Number	OrthoRPM
Family Models	N/A
Serial Number	ORM-24052853-LC-E001
Frequency Band	2402-2480MHz (Bluetooth BLE)
Type of modulation	GFSK
Equipment Class	JAB
Antenna Information	N/A
Clock Frequencies	N/A
Input Power	Internal battery: 3.7 VDC, 200 mAh, 0.7 Wh USB-C input (for charging)
Simultaneous Transmission	N/A
Hardware Version	N/A
Software Version	N/A
Additional Info	OrthoRPM is a Bio-Engineering class 1 medical device. It integrates a certified module, U-blox Nordic BMD-350-A-R (FCC ID: 2AA9B05). EUT is a wireless handheld device for strengthening hand muscles. It tracks and shares the progress of the patient over time with a hand therapist. It is powered by a rechargeable lithium-ion battery.

2.3 Test standard and method

Test standard	47 CFR Part 15, Subpart B
Test method	ANSI C63.4: 2014

Lab performing tests	Vista Laboratories, Inc.
Lab Address	1261 Puerta Del Sol, San Clemente, CA 92673 USA
Phone Number	+1 (949) 393-1123
Website	www.vista-compliance.com

Test Condition	Temperature	Humidity	Atmospheric Pressure
EMC Testing	23.5°C	58.2%	996 mbar

3 Modification of EUT / Deviations from Standards

N/A

4 Test Configuration and Operation

4.1 EUT Test Configuration

EUT is a wireless handheld device for strengthening hand muscles which is powered by a rechargeable lithium-Ion battery. Battery life can be extended by draining it regularly. USP-C cable is used to charge the battery.

The following software was used for testing and to monitor EUT performance

Software	Description
EMISoft Vasona	EMC/RF Spurious emission test software used during testing

4.2 Supporting Equipment

Description	Manufacturer	Model #	Serial #	Remark
USB-C Cable	N/A	AWM E345428 STYLE	N/A	Charging the lithium-Ion battery

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5 Uncertainty of Measurement

Test item	Measurement Uncertainty (dB)
AC Conducted Emissions (150K-30MHz)	±3.5 dB
Radiated Emission (30MHz-1GHz)	±4.6 dB
Radiated Emission (1-18GHz)	±4.9 dB
Radiated Emission (18-40GHz)	±3.5 dB

6 Test Results

6.1 AC Power Line Conducted Emissions

6.1.1 Requirement

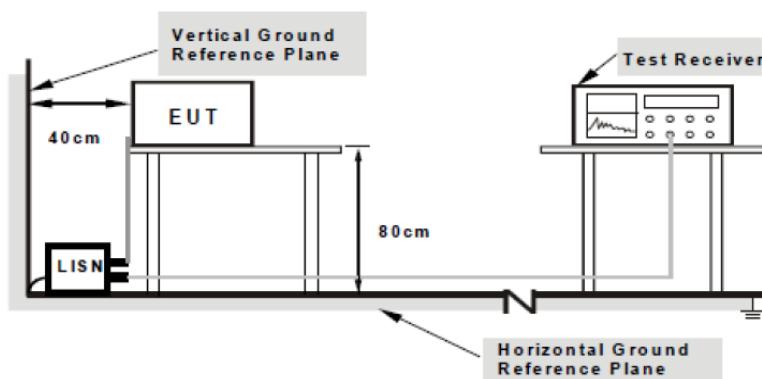
Per § 15.107 (a), ICES-003, except for Class A digital device, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms' line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Limits for Conducted Emissions at the DC Ports

Section	Frequency ranges (MHz)	Limit (dBuV)	
		QP	Average
Class B devices	0.15 – 0.5	66 – 56	56 - 46
	0.5 – 5	56	46
	5 - 30	60	50

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.1.2 Test Setup



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

6.1.3 Test Procedure

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a $50\Omega/5\mu\text{H}$ EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment was powered separately from another main supply.
5. The EUT was switched on and allowed to warm up to its normal operating condition.
6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
7. High peaks, relative to the limit line, were then selected.
8. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.
9. All possible modes of operation were investigated. Only the worst-case emissions were measured and reported. All other emissions were relatively insignificant.

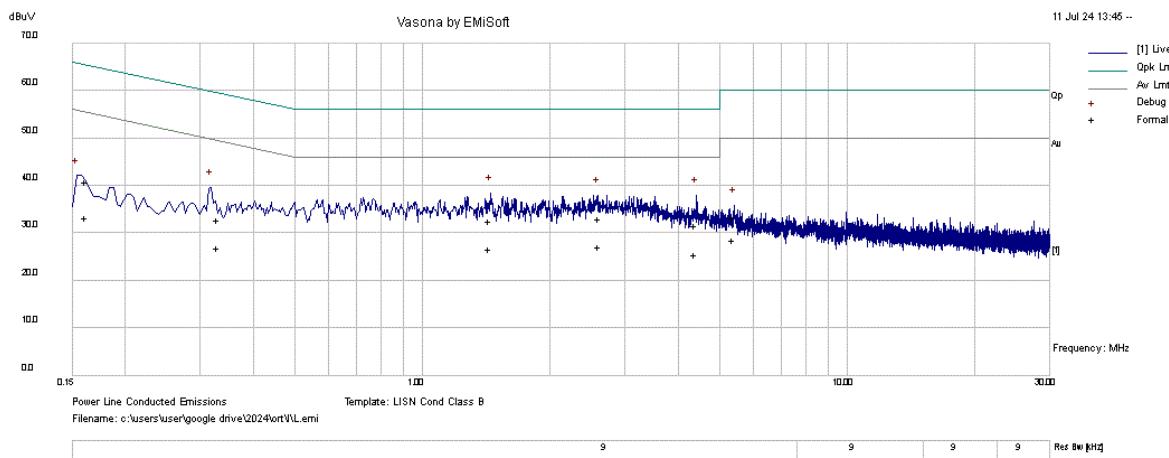
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6.1.4 Test Result

CONDUCTED EMISSIONS

Test Standard:	LISN B Cond Class B	Mode:	Normal Operation
Frequency Range:	0.15 - 30MHz	Test Date:	07/11/2024
Line:	Live	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass/Fail
1.439	22.2	10.2	0.1	32.5	Quasi Peak	Live	56.0	-23.5	Pass
2.602	22.6	10.3	0.1	33.0	Quasi Peak	Live	56.0	-23.0	Pass
4.401	21.1	10.4	0.1	31.6	Quasi Peak	Live	56.0	-24.4	Pass
0.33	22.7	10.1	0.1	32.9	Quasi Peak	Live	59.4	-26.5	Pass
0.161	30.5	10.1	0.2	40.8	Quasi Peak	Live	65.4	-24.6	Pass
5.412	22.8	10.4	0.2	33.3	Quasi Peak	Live	60.0	-26.7	Pass
1.439	16.4	10.2	0.1	26.7	Average	Live	46.0	-19.3	Pass
2.602	16.8	10.3	0.1	27.2	Average	Live	46.0	-18.8	Pass
4.401	15.2	10.4	0.1	25.7	Average	Live	46.0	-20.3	Pass
0.33	16.8	10.1	0.1	27.0	Average	Live	49.4	-22.5	Pass
0.161	23.0	10.1	0.2	33.3	Average	Live	55.4	-22.1	Pass
5.412	18.0	10.4	0.2	28.6	Average	Live	50.0	-21.4	pass

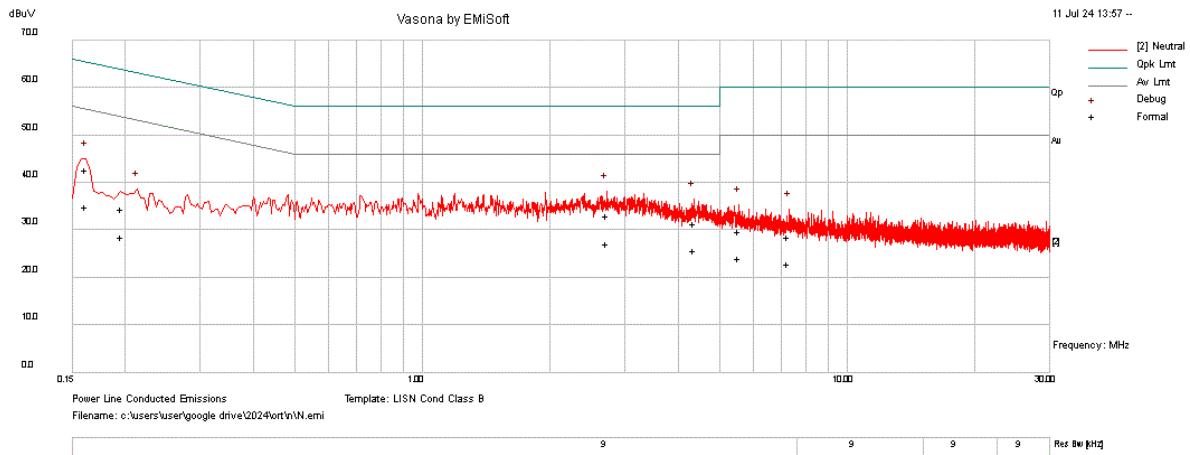
Remarks:

1. Level (dBuV) = Raw (dBuV) + Cable loss(dB) + Factor (dB).
2. Margin = Level (dBuV/m) - Limit value(dBuV/m)

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Test Standard:	LISN B Cond Class B	Mode:	Normal Operation
Frequency Range:	0.15 - 30MHz	Test Date:	07/11/2024
Line:	Neutral	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass/Fail
2.73	22.6	10.3	0.1	33	Quasi Peak	Neutral	56	-23	Pass
4.366	21.1	10.4	0.1	31.5	Quasi Peak	Neutral	56	-24.5	Pass
0.162	32.4	10.1	0.2	42.7	Quasi Peak	Neutral	65.4	-22.7	Pass
0.196	24.3	10.1	0.2	34.6	Quasi Peak	Neutral	63.8	-29.2	Pass
5.554	19.2	10.4	0.2	29.8	Quasi Peak	Neutral	60	-30.2	Pass
7.285	18	10.5	0.2	28.7	Quasi Peak	Neutral	60	-31.3	Pass
2.73	16.8	10.3	0.1	27.2	Average	Neutral	46	-18.8	Pass
4.366	15.2	10.4	0.1	25.7	Average	Neutral	46	-20.3	Pass
0.162	24.8	10.1	0.2	35.1	Average	Neutral	55.4	-20.3	Pass
0.196	18.4	10.1	0.2	28.6	Average	Neutral	53.8	-25.1	Pass
5.554	13.5	10.4	0.2	24.1	Average	Neutral	50	-25.9	Pass
7.285	12.3	10.5	0.2	22.9	Average	Neutral	50	-27.1	pass

Remarks:

1. Level (dBuV) = Raw (dBuV) + Cable loss(dB) + Factor (dB).
2. Margin = Level (dBuV/m) - Limit value(dBuV/m)

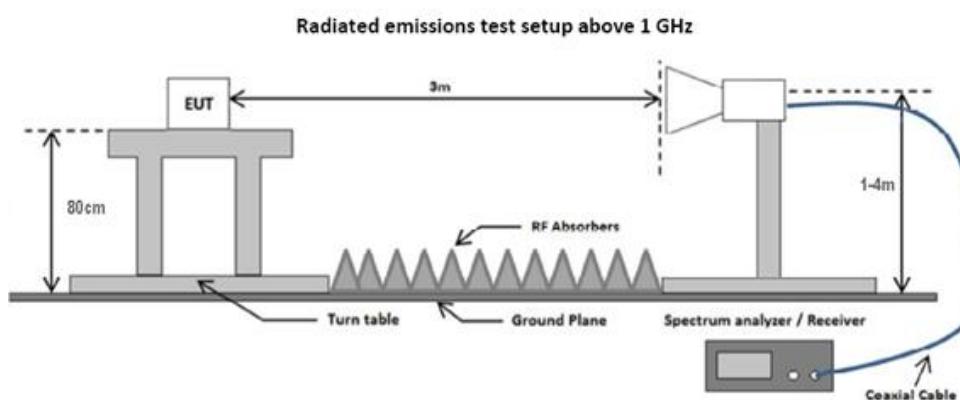
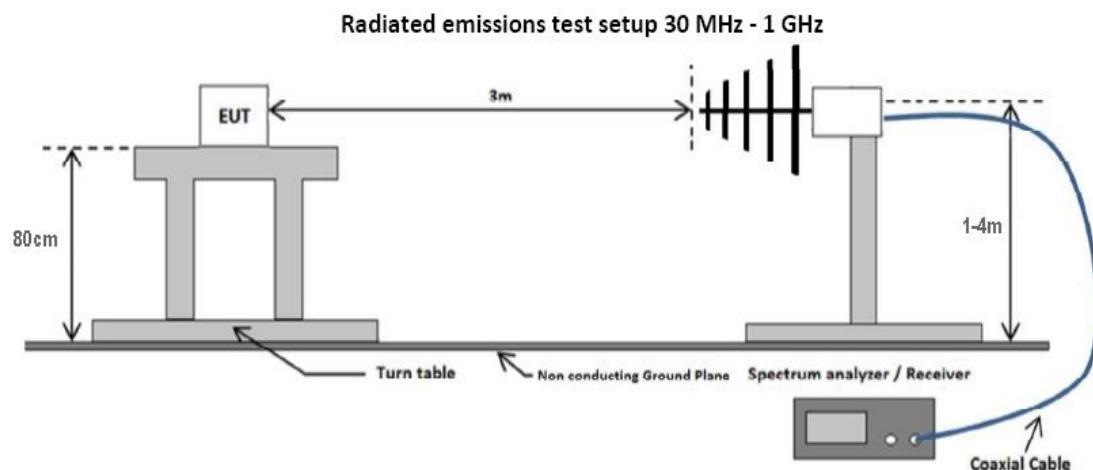
6.2 Radiated Emissions

6.2.1 Requirement

Per § 15.109 (a), ICES-003, except for Class A digital device, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength (μ V/m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

6.2.2 Test Setup



6.2.3 Test Procedure

The procedure is according to ANSI C63.4: 2014. The following are the steps.

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
 - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
 - b. The EUT was then rotated to the direction that gave the maximum emission.
 - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-Peak detection at frequency below 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.

The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.

5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

The frequency range covered was from 30MHz to 6GHz. A broadband antenna was used from 30MHz to 1GHz and a horn antenna above 1GHz.

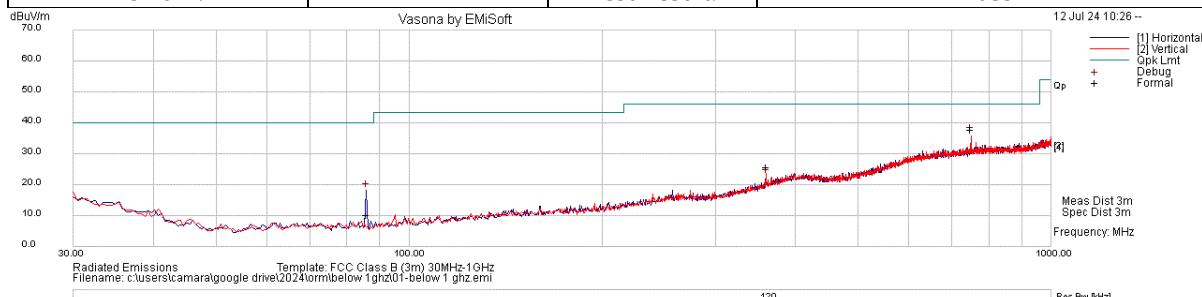
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6.2.4 Test Result

RADIATED EMISSIONS BELOW 1 GHZ

Test Standard:	15.109	Mode:	Normal Operation
Frequency Range:	30 MHz - 1 GHz	Test Date:	07/12/2024
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss dB	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
750.049	30.5	7.3	0	37.8	Quasi Max	V	271	268	46	-8.2	Pass
85.750	27.7	3.4	-20.7	10.4	Quasi Max	V	342	8	40	-29.6	Pass
359.757	29.5	6.1	-9.8	25.8	Quasi Max	V	100	327	46	-20.2	Pass

Remarks:

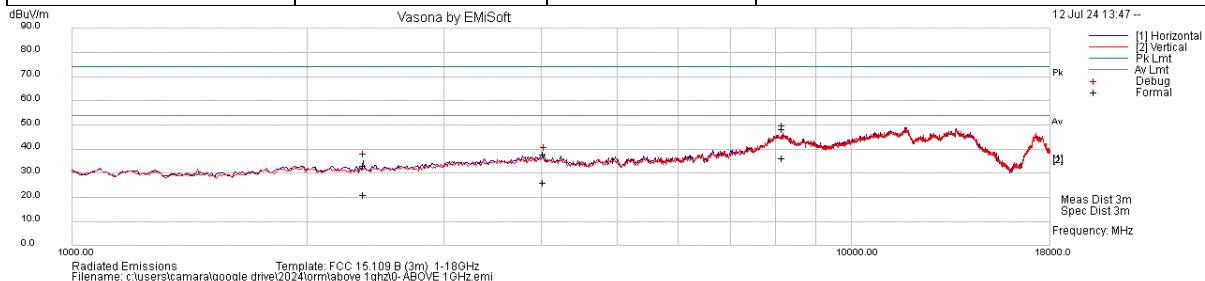
1. Level (dBuV) = Raw (dBuV) + Cable loss(dB) + AF (dB).
2. AF (dB) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

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RADIATED EMISSIONS ABOVE 1 GHZ

Test Standard:	15.109	Mode:	Normal Operation
Frequency Range:	1 GHz - 18 GHz	Test Date:	07/12/2024
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
8161.955	18.4	14.2	15.6	48.3	Peak Max	H	174	124	74	-25.7	Pass
4028.329	22.7	9.9	5.1	37.7	Peak Max	H	368	321	74	-36.3	Pass
2361.882	26.3	6.7	0.3	33.2	Peak Max	H	337	299	74	-40.8	Pass
8161.955	6.5	14.2	15.6	36.3	Average Max	H	174	124	54	-17.7	Pass
4028.329	10.9	9.9	5.1	26	Average Max	H	368	321	54	-28	Pass
2361.882	14.3	6.7	0.3	21.2	Average Max	H	337	299	54	-32.8	Pass

Remarks:

1. Level (dBuV) = Raw (dBuV) + Cable loss(dB) + AF (dB).
2. AF(dB) = Antenna Factor (dB) – Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

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7 EUT and Test Setup Photos

See FCC exhibits

8 Test Instrument List

Equipment	Manufacturer	Model	Instrument Number	Cal. Date	Cal. Due
Semi-Anechoic Chamber	ETS-Lindgren	10M	VL001	10/18/2023	10/18/2024
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A1)	N/A1)
Spectrum Analyzer	Keysight	N9020A	MY50110074	05/15/2024	05/15/2025
EMC Test Receiver	R&S	ESL6	100230	05/14/2024	05/14/2025
LISN (9KHz – 30MHz)	EMCO	3816/2	9705-1066	05/28/2024	05/28/2025
Bi-Log Antenna	ETS-Lindgren	3142E	217921	07/19/2023	07/19/2024
Horn Antenna (1-18GHz)	Electro-Metrics	EM-6961	6292	07/21/2023	07/21/2024
Horn Antenna (18-40GHz)	Com-Power	AH-840	101109	07/21/2023	07/21/2024
Preamplifier	RF Bay, Inc.	LPA-10-20	11180621	07/16/2023	07/16/2024
True RMS Multi-meter	UNI-T	UT181A	C173014829	05/15/2024	05/15/2025
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	05/17/2024	05/17/2025
RF Attenuator	Pasternack	PE7005-3	VL061	N/A2)	N/A2)
EM Center Control	ETS-Lindgren	7006-001	160136	N/A1)	N/A1)
Turn Table	ETS-Lindgren	2181-3.03	VL002	N/A1)	N/A1)
Boresight Antenna Tower	ETS-Lindgren	2171B	VL003	N/A1)	N/A1)
Loop Antenna (9k-30MHz)	Com-Power	AL-130	121012	05/17/2024	05/17/2025
RE test cable (below 6GHz)	Vista	RE-6GHz-01	RE-6GHz-01	07/16/2023	07/16/2024
RE test cable (1-18GHz)	PhaseTrack	II-240	RE-18GHz-01	07/16/2023	07/16/2024
RE test cable (>18GHz)	Sucoflex	104	344903/4	07/16/2023	07/16/2024
Pulse limiter	Com-Power	LIT-930A	531727	07/16/2023	07/16/2024
CE test cable #1	FIRST RF	FRF-C-1002-001	CE-6GHz-01	07/16/2023	07/16/2024
CE test cable#2	FIRST RF	FRF-C-1002-001	CE-6GHz-02	07/16/2023	07/16/2024

Note:

- 1) This equipment is not for measurement purpose and only require functional verification. Calibration is not required.
- 2) This equipment is part of test system that to be calibrated as a system. It's verified together with the test system prior to testing.

---END---