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RF Test Report

Test Report Number	HME-23111361-LC-FCC-IC-RF-5G
FCC ID	BYM1409
IC	1860A-1409
Applicant	HM Electronics, Inc.
Applicant Address	2848 Whiptail Loop, Carlsbad, CA 92010 USA
Product Name	Wireless Beltpack
Model (s)	1409
Date of Receipt	11/13/2023
Date of Test	11/16/2023 – 11/20/2023
Report Issue Date	12/05/2023
Test Standards	47CFR Part 15.407 RSS-247 Issue 3, Aug 2023
Test Result	**PASS**

Issued by:

Vista Compliance Laboratories
1261 Puerta Del Sol, San Clemente, CA 92673 USA
www.vista-compliance.com

Minoush Niknam (Test Engineer)	**David Zhang (Technical Manager)**

REVISION HISTORY

Report Number	Version	Description	Issued Date
HME-23111361-LC-FCC-IC-RF-5G	Original	Initial report	12/05/2023

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1 Test Summary

Test Item	Test Requirement	Test Method	Result
Antenna Requirement	47CFR Part 15.203	N/A	N/A
26 dB Bandwidth	47CFR Part 15.407 (a) RSS-247 Issue 3, Aug 2023	ANSI C63.10 (2013)	N/A
Occupied Bandwidth	47CFR Part 15.407 (a) RSS-247 Issue 3, Aug 2023	ANSI C63.10 (2013) RSS-Gen Issue 5, Mar 2019	N/A
Maximum Conducted Output Power	47CFR Part 15.407 (a) RSS-247 Issue 3, Aug 2023	ANSI C63.10 (2013)	N/A
Power Spectral Density	47CFR Part 15.407 (a) RSS-247 Issue 3, Aug 2023	ANSI C63.10 (2013)	N/A
Radiated Band-Edge into Restricted Frequency Bands	47CFR Part 15.407 (a) RSS-247 Issue 3, Aug 2023	ANSI C63.10 (2013)	N/A
Radiated Spurious Emission	47CFR Part 15.407 (a) RSS-247 Issue 3, Aug 2023	ANSI C63.10 (2013)	Pass
AC Power Line Conducted Emissions	47CFR Part 15.407 (a) RSS-247 Issue 3, Aug 2023	ANSI C63.10 (2013) RSS-Gen Issue 5, Mar 2019	N/A

Note: This product was certified for FCC/ISED. Testing in this report is for class II permissive change due to the change of 5GHz antennas (new UNII antennas, part number: W3713-2904237, W3714-2904383). Only Radiated emission were tested in this report, for the other test item, please see the original test report under FCC ID: BYM1409 and ISED ID: 1860A-1409.

2 General Information

2.1 Applicant

Applicant	HM Electronics, Inc.
Applicant Address	2848 Whiptail Loop, Carlsbad, CA 92010 USA
Manufacturer	HM Electronics, Inc.
Manufacturer Address	2848 Whiptail Loop, Carlsbad, CA 92010 USA

2.2 Product information

Product Name	Wireless Beltpack
Model Number	1409
Family Models	N/A
Serial Number	085DC44F 2023-11
Frequency Band	BLE: 2402-2480MHz 5Ghz-20MHz: 5180-5240MHz, 5260-5320MHz, 5500-5720MHz, 5745-5825MHz
Type of modulation	BLE: GFSK 5GHz: OFDM
Equipment Class	NII
Antenna Information	BLE: Internal PCB antenna, 2.5 dBi gain 5GHz: 2 x Embedded omni-directional antenna, 2.8 dBi gain
Clock Frequencies	N/A
Input Power	3.6VDC (battery), 5V/3A (USB-C adapter)
Power Adapter Manufacturer/Model	N/A
Power Adapter SN	N/A
Hardware version	N/A
Software version	N/A
Simultaneous Transmission	BLE and 5GHz can transmit simultaneously
Additional Info	EUT has two 5GHz antennas, but these two antennas do not transmit simultaneously. EUT is re-evaluated due to 5GHz antenna change.

2.3 Test standard and method

Test standard	47 CFR Part 15.407 RSS-247 Issue 3, Aug 2023
Test method	ANSI C63.10-2013 558074 D01 15.247 Meas Guidance v05r02

3 Test Site Information

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
RF Testing	23.5°C	58.2%	996 mbar
Radiated Emission Testing	23.5°C	58.2%	996 mbar

4 Modification of EUT / Deviations from Standards

N/A

5 Test Configuration and Operation

5.1 EUT Test Configuration

The EUT is an engineering test sample loaded with RF testing firmware specifically designed to support the RF TX/RX measurement in different aspects.

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
Putty.exe 0.63	Set Wi-Fi radio to different test mode

5.2 Supporting Equipment

Description	Manufacturer	Model #	Serial #	Remark
USB-C adapter	CHOETECH	TC0003	N/A	Provide by client
Laptop	ASUS	P29G	34917771602	Remote access

6 Uncertainty of Measurement

Test item	Measurement Uncertainty (dB)
RF Output Power (Conducted)	±1.2 dB
Power Spectral Density	±0.9 dB
Unwanted Emission (conducted)	±2.6 dB
Occupied Channel Bandwidth	±5 %
Radiated Emission (9KHz-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

7 Test Results

7.1 Radiated Spurious Emission

7.1.1 Requirement

§ 15.407 (b)

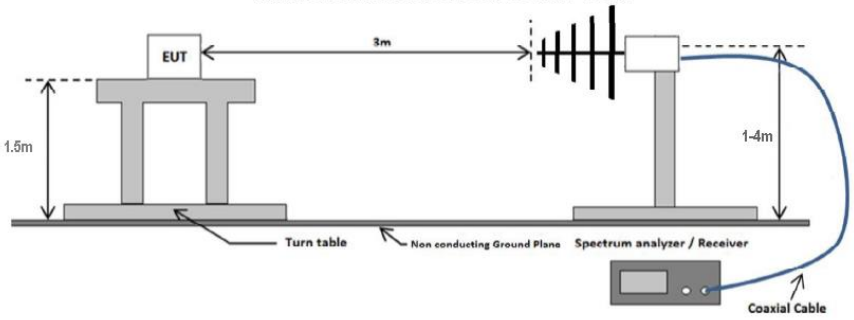
1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.
4) For transmitters operating in the 5.725-5.825 GHz band: all emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
5) Restricted band, emission must also comply with the radiated emission limits specified in 15.209

Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

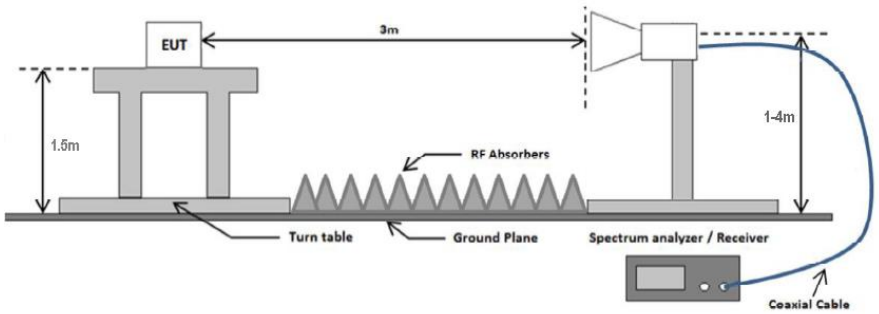
Frequency Range (MHZ)	Field Strength (μV/m)	Measurement Distance (m)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 960	200	3
Above 960	500	3

7.1.2 Test Setup

Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



7.1.3 Test Procedure

According to subclause 12.7, radiated spurious emission measurements, in ANSI C63.10-2013:

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 300Hz for frequencies below 150kHz.
4) The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10kHz for frequency between 150kHz-30MHz.
5) The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection at frequency between 30MHz-1GHz.
6) The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with peak detection for peak and average measurement at frequency above 1GHz.
7) Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

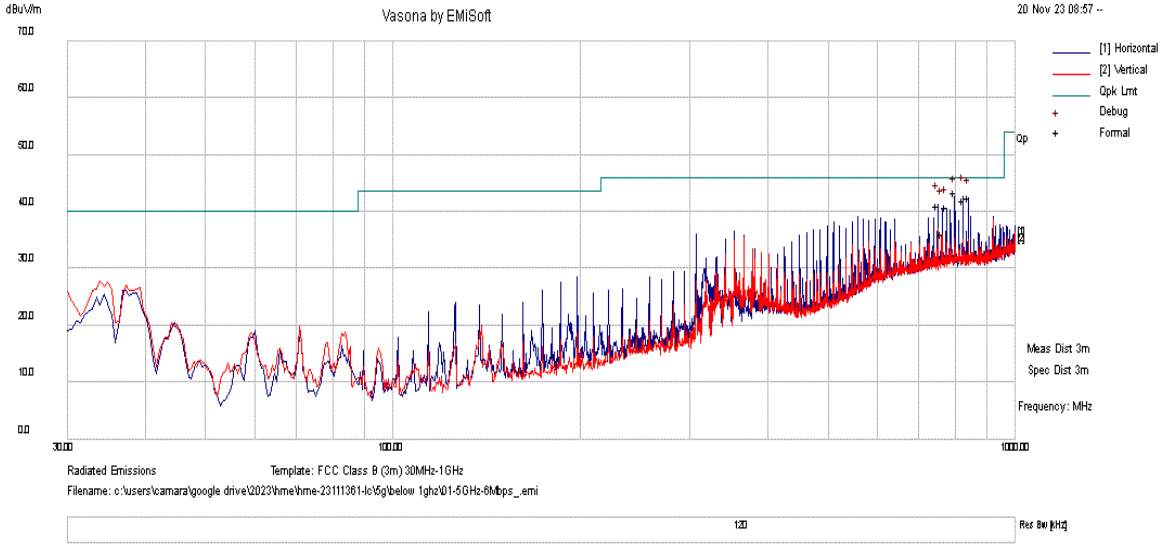
7.1.4 Test Result

Radiated Emission between 9KHz – 30MHz test result

Note: no substantial emission is found other than the noise floor. Different modes have been verified.

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	15.209, 15.247, RSS-247	Mode:	Low Channel-5180 MHz
Frequency Range:	30 MHz - 1 GHz	Test Date:	11/20/2023
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



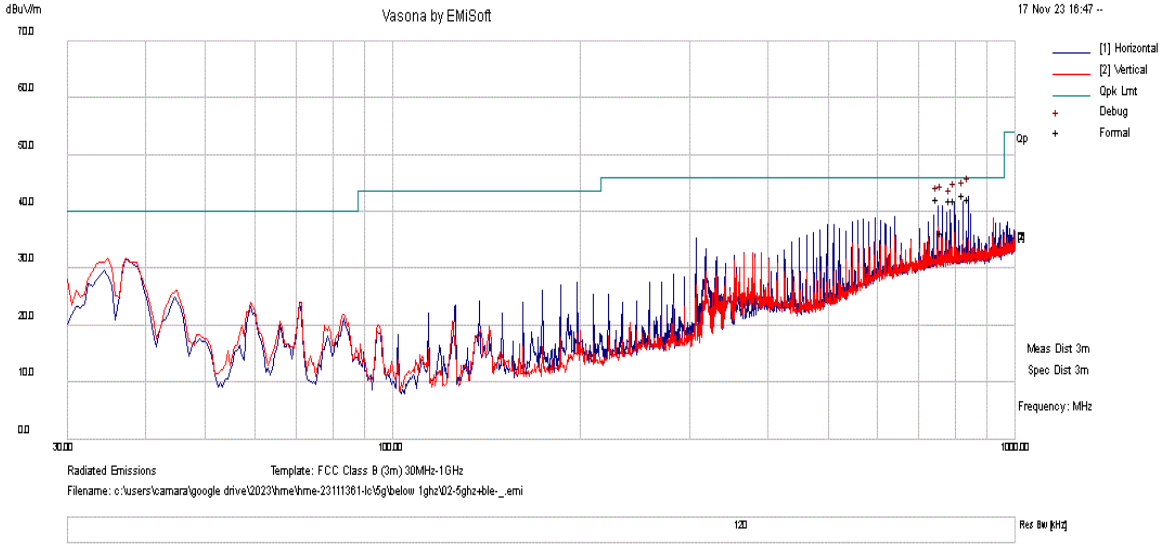
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	823.33	34.17	7.33	0.58	42.09	Quasi Max	H	131	0	46.00	-3.91	Pass
2	798.75	35.73	7.24	0.52	43.49	Quasi Max	H	104	0	46.00	-2.51	Pass
3	840.0	34.57	7.40	0.62	42.58	Quasi Max	H	137	176	46.00	-3.42	Pass
4	750.02	33.76	7.28	-0.03	41.01	Quasi Max	H	200	41	46.00	-4.99	Pass
5	774.18	33.43	7.26	0.25	40.94	Quasi Max	H	100	342	46.00	-5.06	Pass
6	762.48	28.87	7.27	0.11	36.26	Quasi Max	H	100	314	46.00	-9.74	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)

RADIATED SPURIOUS EMISSION BELOW 1GHZ

Test Standard:	15.209, 15.247	Mode:	5GHz+BLE Co-located
Frequency Range:	30 MHz - 1 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



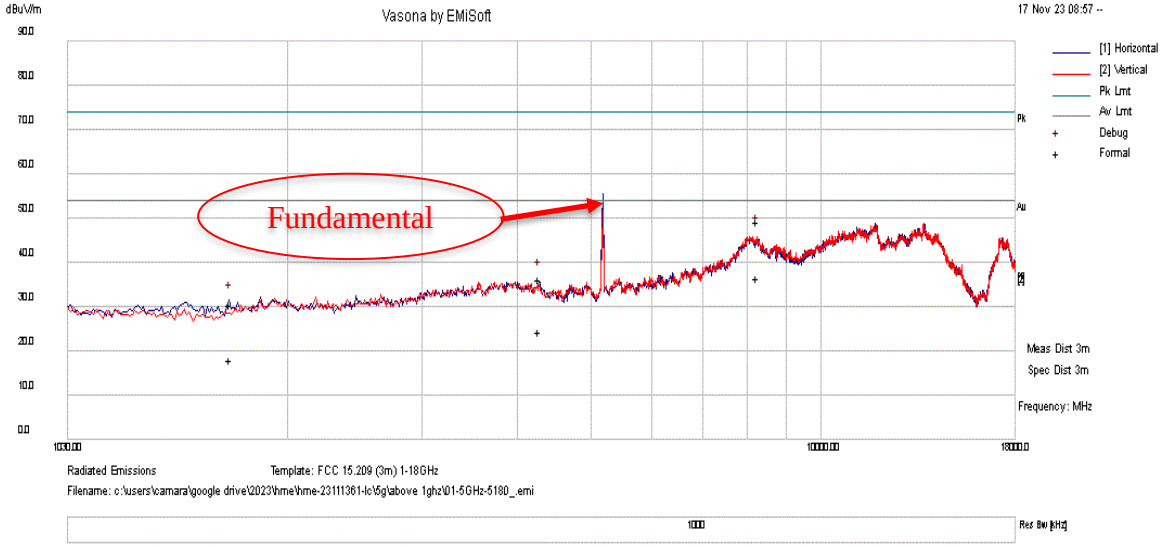
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	840.0	34.17	7.40	0.62	42.18	Quasi Max	H	122	360	46.00	-3.82	Pass
2	823.33	35.04	7.33	0.58	42.96	Quasi Max	H	180	0	46.00	-3.04	Pass
3	798.74	34.24	7.24	0.52	42.00	Quasi Max	H	149	21	46.00	-4.00	Pass
4	762.24	29.10	7.27	0.11	36.48	Quasi Max	H	135	353	46.00	-9.52	Pass
5	750.01	34.98	7.28	-0.03	42.23	Quasi Max	H	210	34	46.00	-3.77	Pass
6	785.98	34.44	7.25	0.38	42.07	Quasi Max	H	100	41	46.00	-3.93	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)

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5180 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



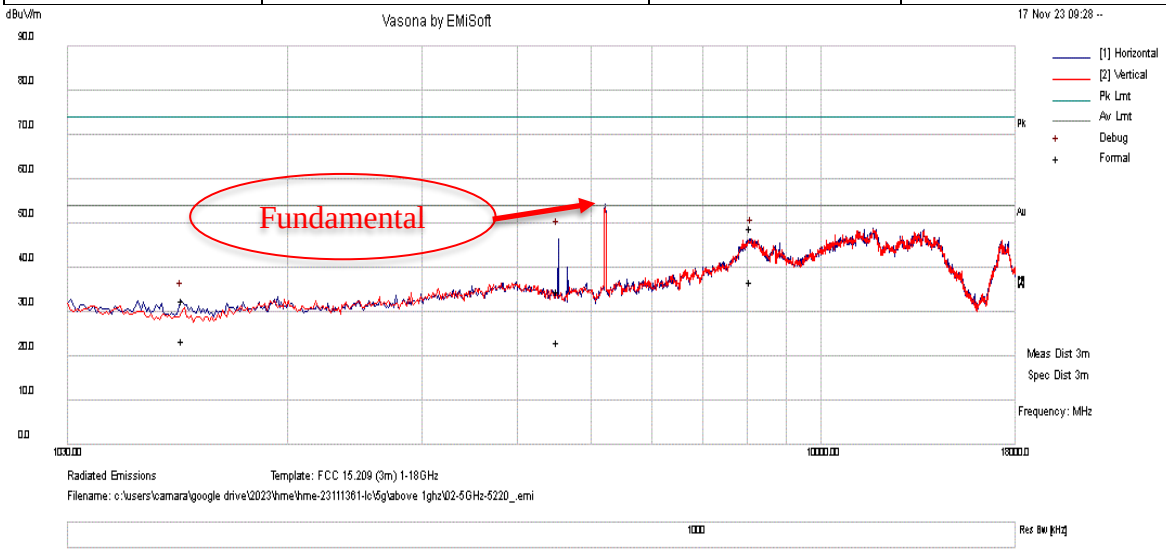
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8261.93	19.64	14.16	15.50	49.31	Peak Max	V	224	23	74.00	-24.69	Pass
2	4276.36	21.97	9.46	4.89	36.33	Peak Max	H	241	314	74.00	-37.68	Pass
3	1682.64	26.28	5.79	-1.57	30.49	Peak Max	V	343	346	74.00	-43.51	Pass
4	8261.93	6.72	14.16	15.50	36.39	Average Max	V	224	23	54.00	-17.61	Pass
5	4276.36	10.03	9.46	4.89	24.39	Average Max	H	241	314	54.00	-29.61	Pass
6	1682.64	13.90	5.79	-1.57	18.12	Average Max	V	343	346	54.00	-35.88	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5220 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



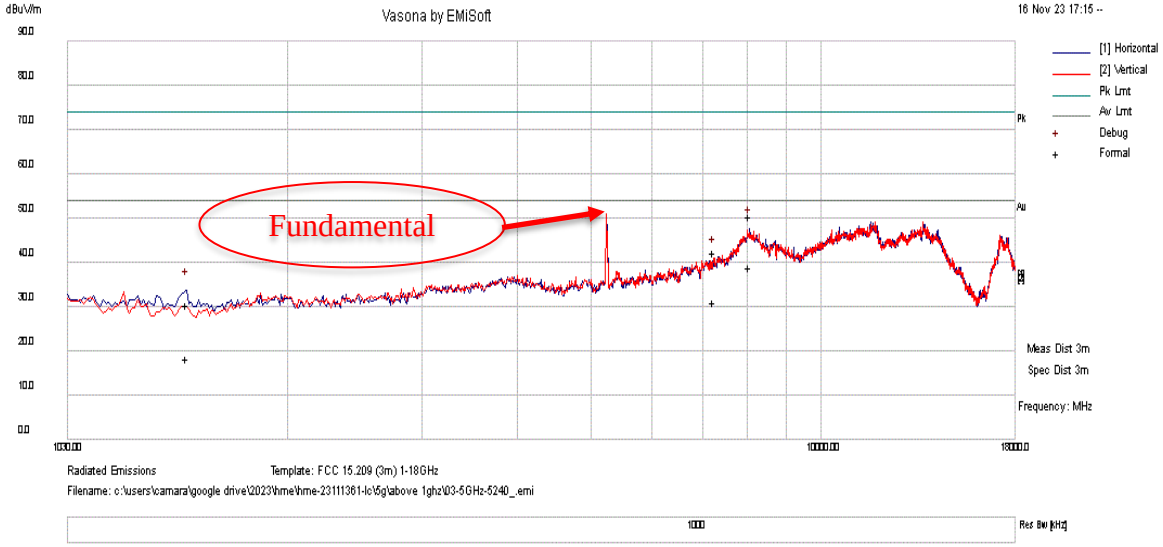
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8113.44	19.08	14.22	15.70	48.99	Peak Max	V	200	172	74.00	-25.01	Pass
2	4530.98	20.67	8.60	5.38	34.65	Peak Max	H	172	110	74.00	-39.35	Pass
3	1458.04	28.98	5.16	-1.63	32.51	Peak Max	H	244	6	74.00	-41.49	Pass
4	8113.44	6.83	14.22	15.70	36.75	Average Max	V	200	172	54.00	-17.25	Pass
5	4530.98	9.18	8.60	5.38	23.17	Average Max	H	172	110	54.00	-30.83	Pass
6	1458.04	20.06	5.16	-1.63	23.59	Average Max	H	244	6	54.00	-30.41	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5240 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



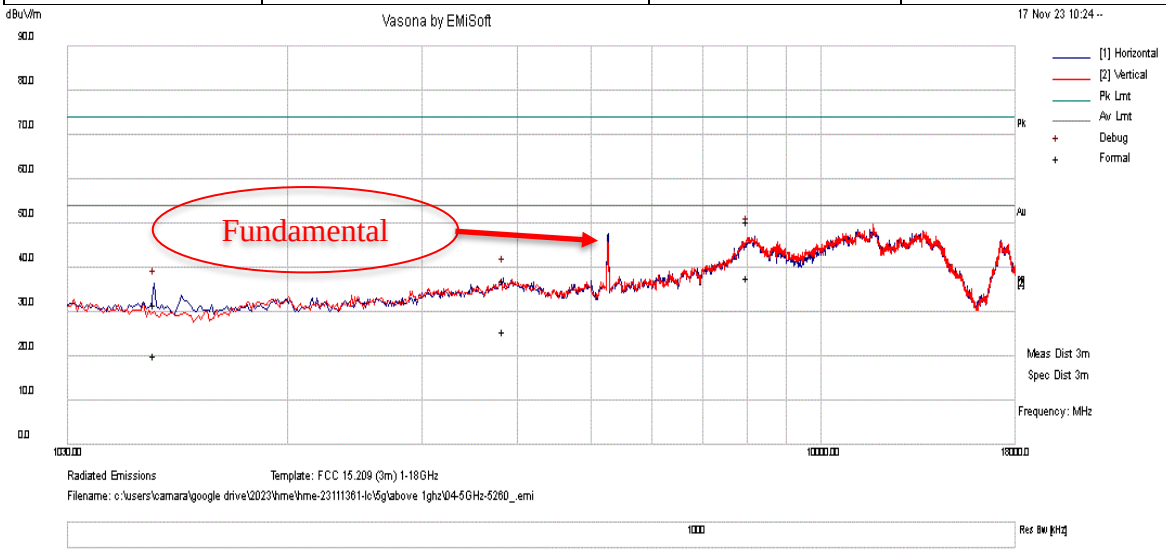
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8061.2	20.34	14.24	15.80	50.38	Peak Max	H	309	104	74.00	-23.62	Pass
2	7247.85	20.20	12.70	9.42	42.31	Peak Max	V	0	282	74.00	-31.69	Pass
3	1477.44	27.00	5.20	-1.72	30.47	Peak Max	H	106	18	74.00	-43.53	Pass
4	8061.2	8.77	14.24	15.80	38.81	Average Max	H	309	104	54.00	-15.19	Pass
5	7247.85	8.80	12.70	9.42	30.92	Average Max	V	0	282	54.00	-23.08	Pass
6	1477.44	14.86	5.20	-1.72	18.34	Average Max	H	106	18	54.00	-35.66	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5260 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



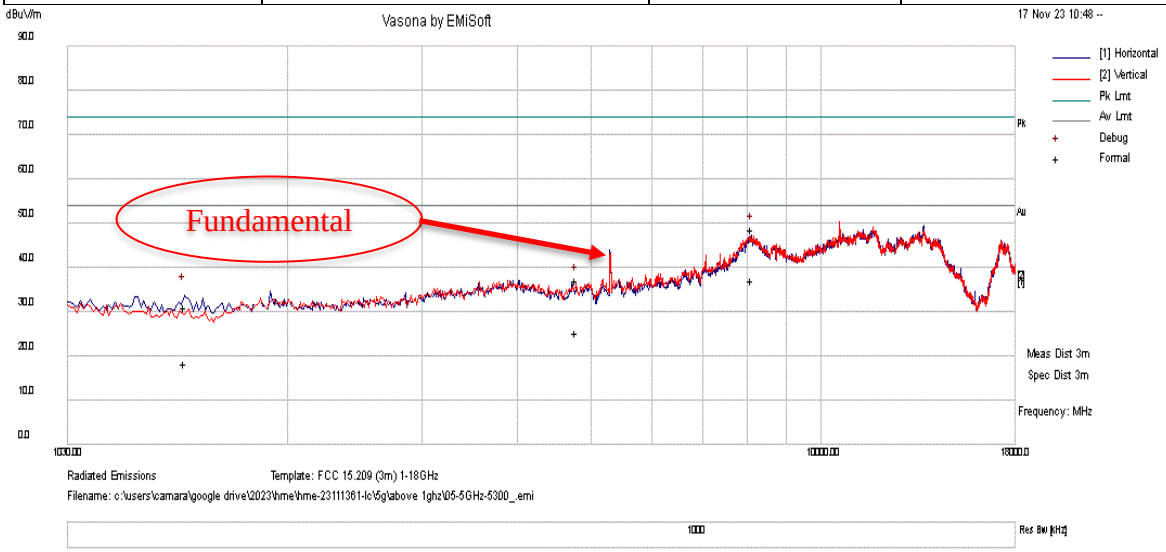
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0.00	0.00	Pass
2	8029.77	20.24	14.26	15.84	50.33	Peak Max	V	103	170	74.00	-23.67	Pass
3	3842.26	22.47	9.24	5.48	37.19	Peak Max	H	237	327	74.00	-36.81	Pass
4	1338.52	27.97	4.95	-1.29	31.62	Peak Max	H	122	139	74.00	-42.38	Pass
5	8029.77	7.68	14.26	15.84	37.78	Average Max	V	103	170	54.00	-16.22	Pass
6	3842.26	10.86	9.24	5.48	25.58	Average Max	H	237	327	54.00	-28.42	Pass
7	1338.52	16.46	4.95	-1.29	20.12	Average Max	H	122	139	54.00	-33.89	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5300 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



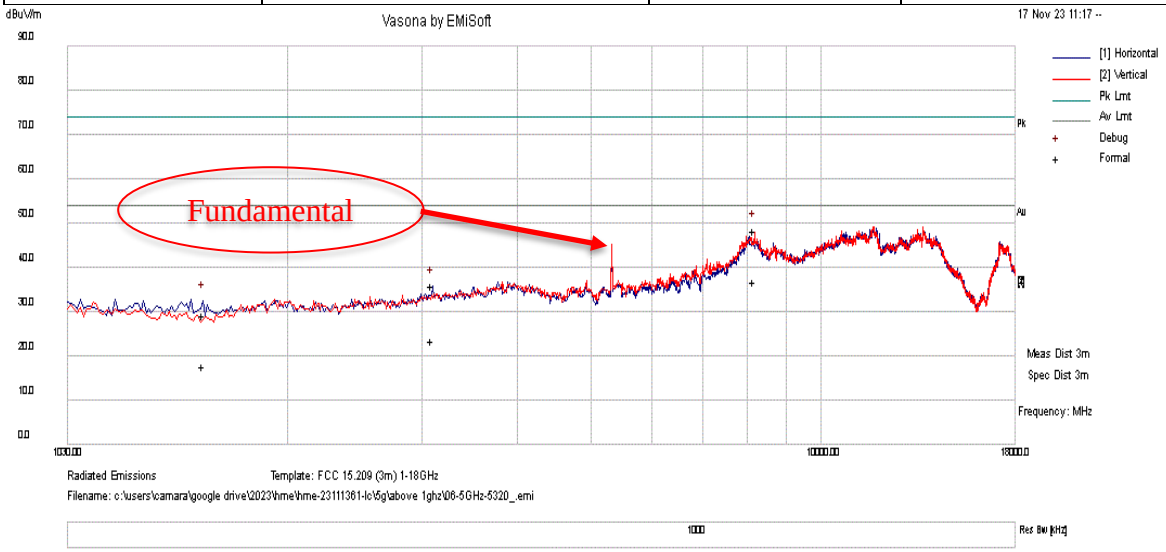
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8124.42	18.67	14.21	15.68	48.56	Peak Max	H	219	11	74.00	-25.44	Pass
2	4791.19	22.01	9.11	6.01	37.12	Peak Max	V	218	96	74.00	-36.88	Pass
3	1466.96	27.62	5.18	-1.67	31.13	Peak Max	H	341	106	74.00	-42.87	Pass
4	8124.42	7.16	14.21	15.68	37.05	Average Max	H	219	11	54.00	-16.95	Pass
5	4791.19	10.10	9.11	6.01	25.21	Average Max	V	218	96	54.00	-28.79	Pass
6	1466.96	14.85	5.18	-1.67	18.35	Average Max	H	341	106	54.00	-35.65	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5320 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



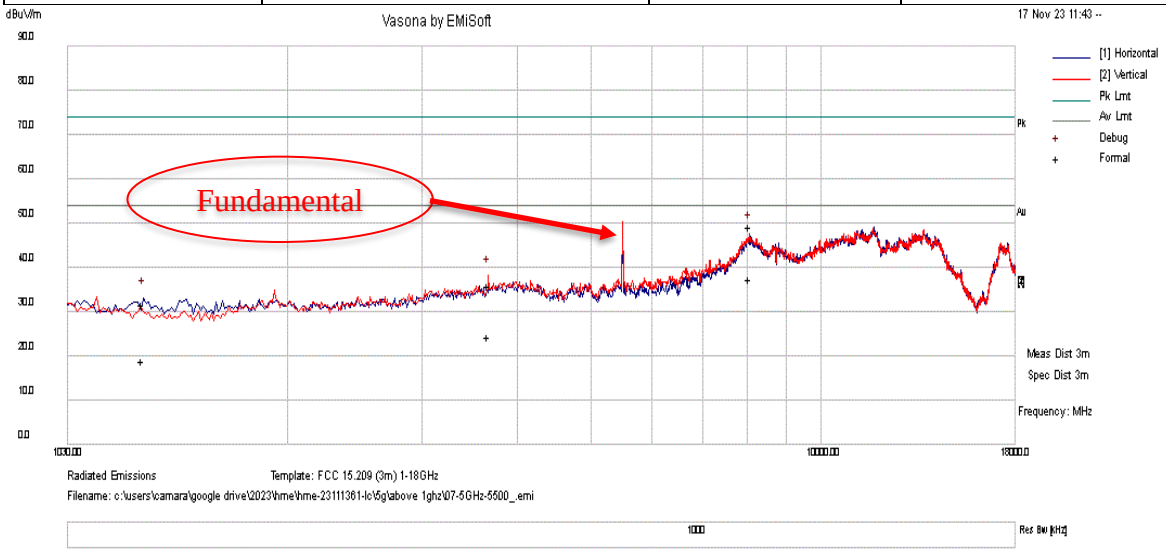
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8187.94	18.55	14.19	15.61	48.35	Peak Max	V	225	155	74.00	-25.66	Pass
2	3098.96	25.06	7.71	3.16	35.94	Peak Max	H	146	324	74.00	-38.06	Pass
3	1551.26	25.55	5.40	-1.76	29.19	Peak Max	H	240	208	74.00	-44.81	Pass
4	8187.94	7.11	14.19	15.61	36.90	Average Max	V	225	155	54.00	-17.10	Pass
5	3098.96	12.65	7.71	3.16	23.53	Average Max	H	146	324	54.00	-30.47	Pass
6	1551.26	13.93	5.40	-1.76	17.57	Average Max	H	240	208	54.00	-36.44	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5500 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



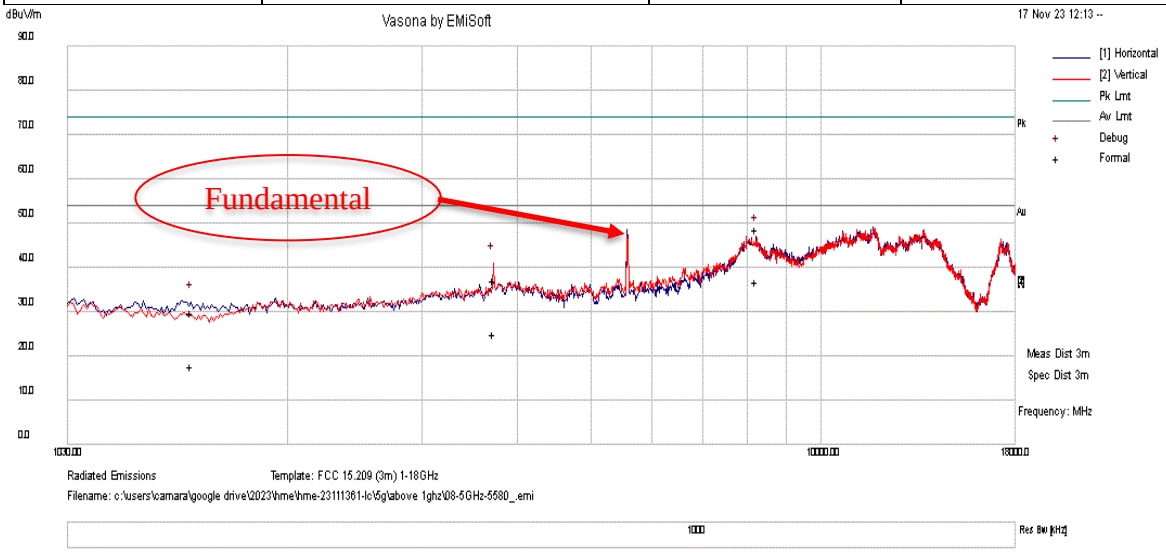
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8072.06	19.33	14.24	15.78	49.34	Peak Max	V	217	214	74.00	-24.66	Pass
2	3671.74	22.58	8.63	4.64	35.85	Peak Max	V	231	10	74.00	-38.15	Pass
3	1293.07	27.93	4.86	-1.08	31.71	Peak Max	H	163	112	74.00	-42.29	Pass
4	8072.06	7.24	14.24	15.78	37.26	Average Max	V	217	214	54.00	-16.74	Pass
5	3671.74	11.15	8.63	4.64	24.42	Average Max	V	231	10	54.00	-29.58	Pass
6	1293.07	15.23	4.86	-1.08	19.01	Average Max	H	163	112	54.00	-34.99	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5580 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



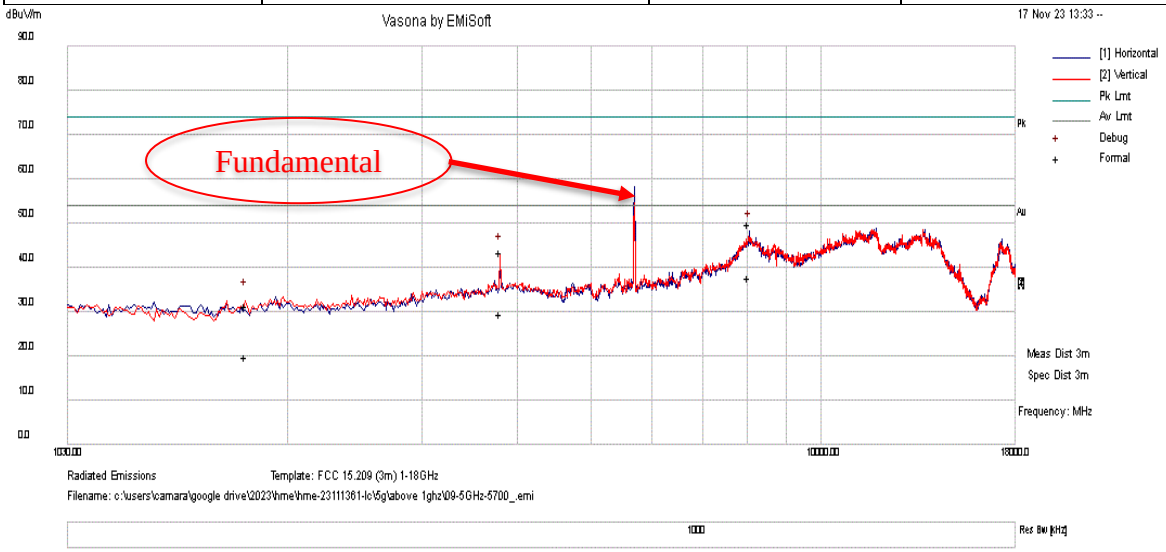
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8230.11	18.76	14.17	15.62	48.54	Peak Max	H	396	83	74.00	-25.46	Pass
2	3725.2	23.55	8.75	4.89	37.19	Peak Max	V	159	346	74.00	-36.81	Pass
3	1495.91	26.54	5.23	-1.80	29.96	Peak Max	V	103	159	74.00	-44.04	Pass
4	8230.11	7.02	14.17	15.62	36.80	Average Max	H	396	83	54.00	-17.20	Pass
5	3725.2	11.34	8.75	4.89	24.98	Average Max	V	159	346	54.00	-29.02	Pass
6	1495.91	14.35	5.23	-1.80	17.77	Average Max	V	103	159	54.00	-36.23	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5700 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



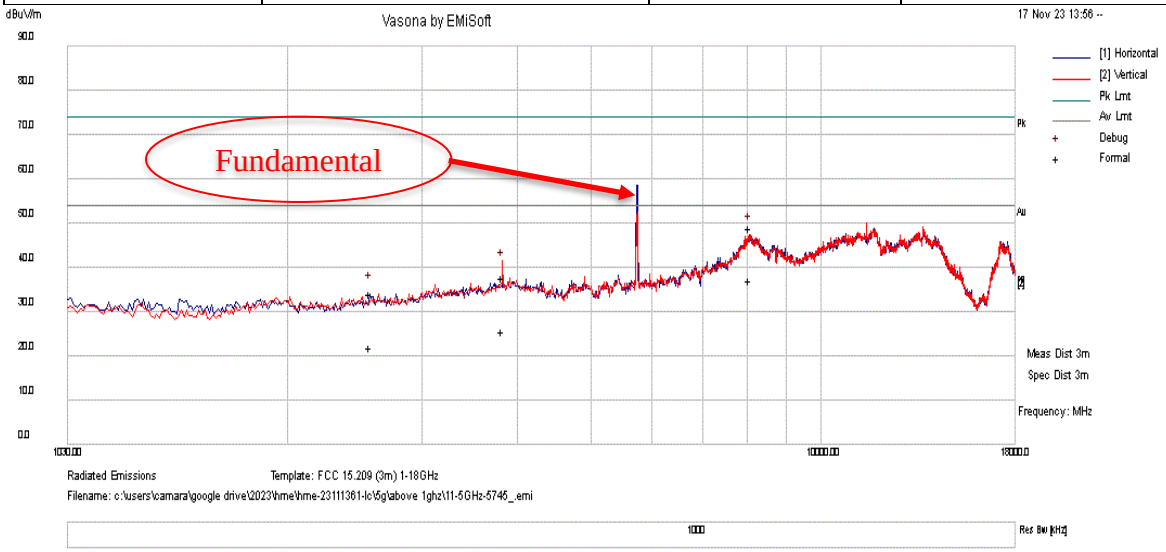
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8060.69	19.80	14.24	15.80	49.84	Peak Max	H	369	165	74.00	-24.16	Pass
2	3800.0	29.19	9.05	5.33	43.56	Peak Max	V	210	129	74.00	-30.44	Pass
3	1763.1	26.27	6.00	-0.81	31.47	Peak Max	V	193	162	74.00	-42.53	Pass
4	8060.69	7.74	14.24	15.80	37.78	Average Max	H	369	165	54.00	-16.22	Pass
5	3800.0	15.15	9.05	5.33	29.53	Average Max	V	210	129	54.00	-24.48	Pass
6	1763.1	14.70	6.00	-0.81	19.89	Average Max	V	193	162	54.00	-34.11	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5745 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



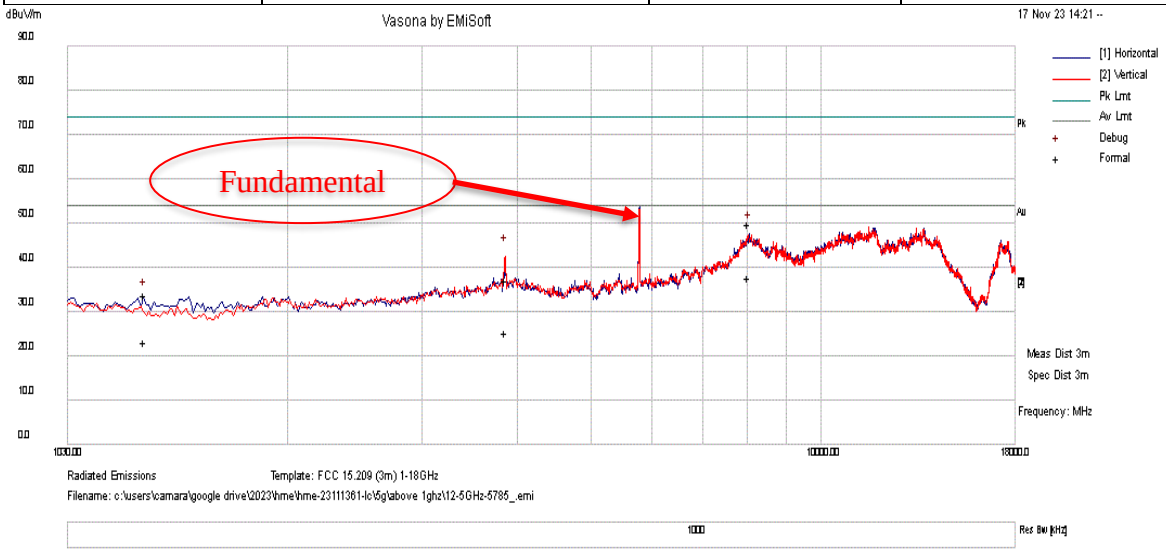
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8081.41	18.95	14.23	15.76	48.94	Peak Max	V	316	175	74.00	-25.07	Pass
2	3834.43	23.10	9.21	5.45	37.75	Peak Max	V	223	258	74.00	-36.25	Pass
3	2567.86	25.92	6.96	1.03	33.92	Peak Max	H	123	212	74.00	-40.08	Pass
4	8081.41	7.22	14.23	15.76	37.21	Average Max	V	316	175	54.00	-16.79	Pass
5	3834.43	10.85	9.21	5.45	25.50	Average Max	V	223	258	54.00	-28.50	Pass
6	2567.86	14.07	6.96	1.03	22.06	Average Max	H	123	212	54.00	-31.94	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5785 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



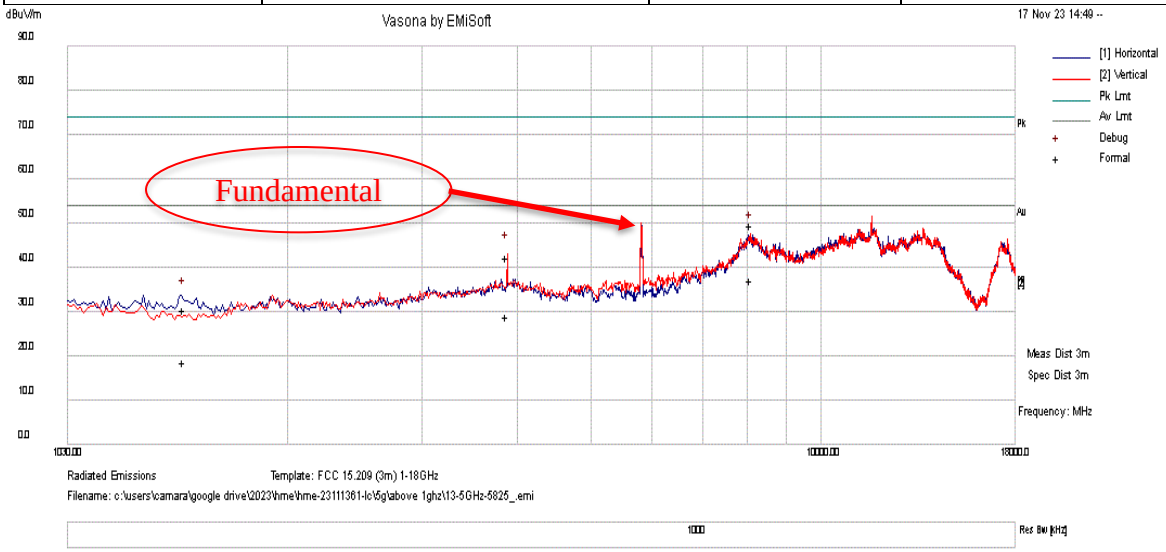
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8060.81	19.77	14.24	15.80	49.81	Peak Max	H	274	285	74.00	-24.19	Pass
2	3862.04	22.29	9.33	5.51	37.13	Peak Max	V	261	228	74.00	-36.87	Pass
3	1301.62	29.92	4.88	-1.09	33.71	Peak Max	H	159	0	74.00	-40.29	Pass
4	8060.81	7.57	14.24	15.80	37.61	Average Max	H	274	285	54.00	-16.39	Pass
5	3862.04	10.47	9.33	5.51	25.31	Average Max	V	261	228	54.00	-28.69	Pass
6	1301.62	19.38	4.88	-1.09	23.17	Average Max	H	159	0	54.00	-30.83	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5825 MHz
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	5825 MHz	Test Result:	Pass



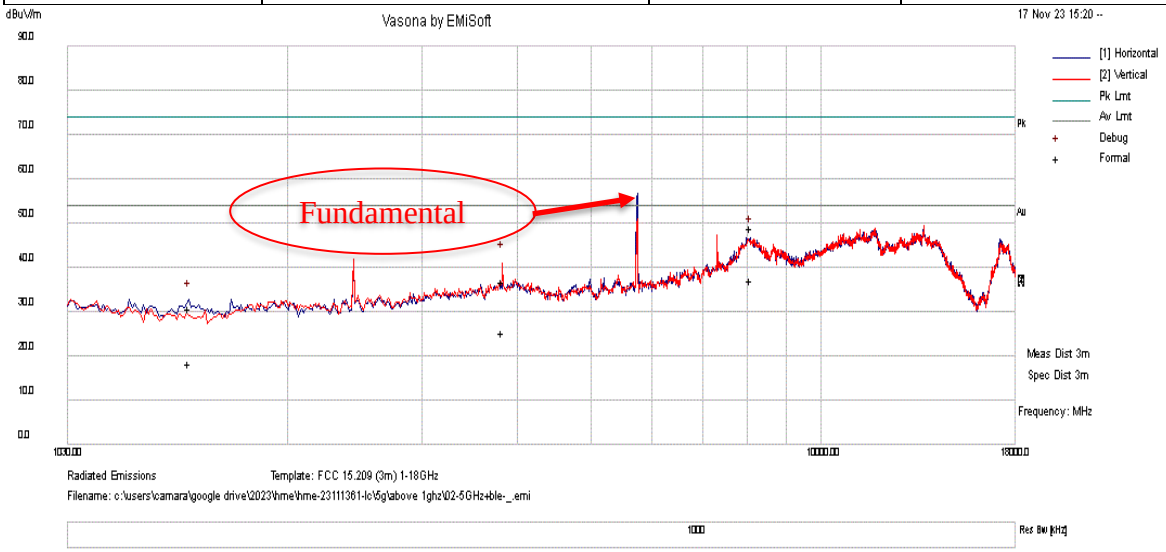
No.	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8094.49	19.43	14.23	15.73	49.38	Peak Max	V	324	348	74.00	-24.62	Pass
2	3883.00	27.20	9.43	5.51	42.15	Peak Max	V	144	211	74.00	-31.85	Pass
3	1463.43	27.01	5.17	-1.66	30.53	Peak Max	V	155	352	74.00	-43.47	Pass
4	8094.49	7.13	14.23	15.73	37.08	Average Max	V	324	348	54.00	-16.92	Pass
5	3883.00	13.96	9.43	5.51	28.90	Average Max	V	144	211	54.00	-25.10	Pass
6	1463.43	15.20	5.17	-1.66	18.71	Average Max	V	155	352	54.00	-35.29	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)
4. Emission at 500 MHz is fundamental emission.

RADIATED SPURIOUS EMISSION ABOVE 1GHZ

Test Standard:	15.209, 15.247	Mode:	5GHz+ BLE Co-located
Frequency Range:	1 GHz - 18 GHz	Test Date:	11/17/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Minoush Niknam
Remark:	N/A	Test Result:	Pass



No.	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
1	8094.89	18.83	14.23	15.73	48.78	Peak Max	H	316	27	74.00	-25.22	Pass
2	3829.07	22.13	9.18	5.43	36.74	Peak Max	V	240	317	74.00	-37.26	Pass
3	1487.4	27.13	5.21	-1.77	30.57	Peak Max	H	358	146	74.00	-43.43	Pass
4	8094.89	7.15	14.23	15.73	37.11	Average Max	H	316	27	54.00	-16.89	Pass
5	3829.07	10.72	9.18	5.43	25.33	Average Max	V	240	317	54.00	-28.67	Pass
6	1487.4	14.84	5.21	-1.77	18.29	Average Max	H	358	146	54.00	-35.71	Pass

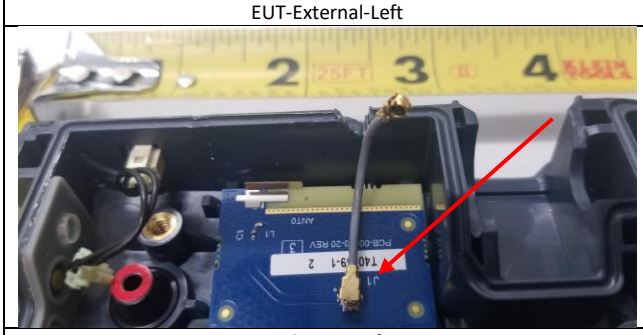
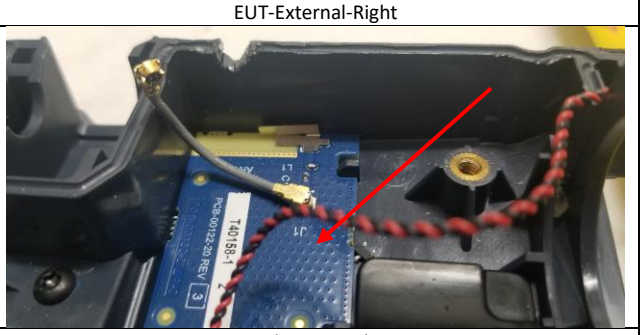
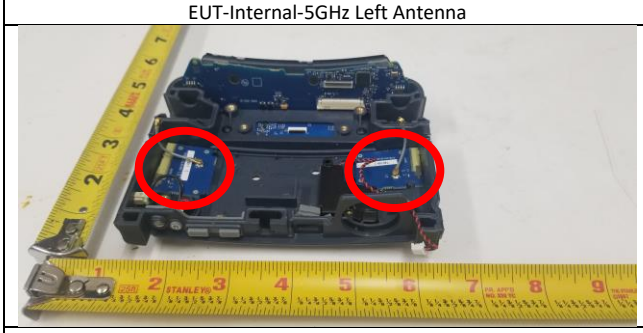
Remarks:

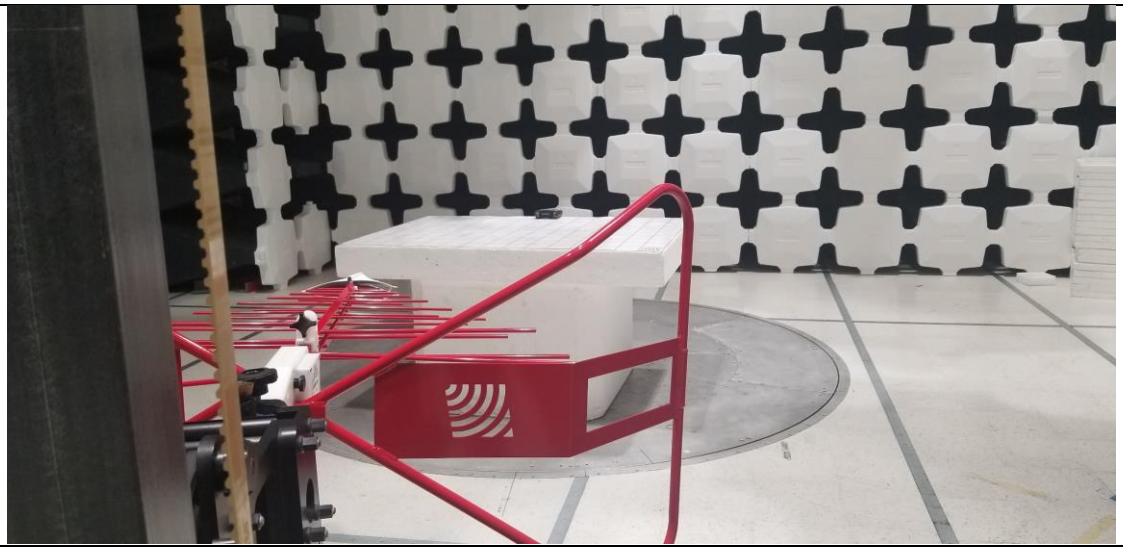
1. Level (dBuV) = Raw (dBuV) + Cable loss(dB) + AF (dB).
2. AF(dB) = Antenna Factor (dB) - Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. Emission at 500 MHz is fundamental emission.

18GHz – 40GHz test result

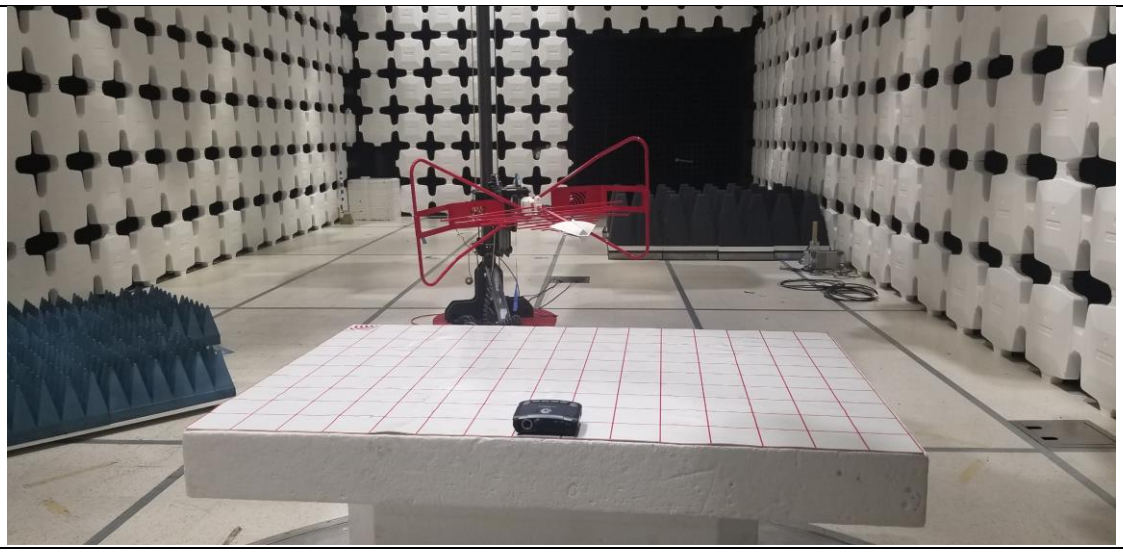
Note: no substantial emission is found other than the noise floor.

8 EUT and Test Setup Photos

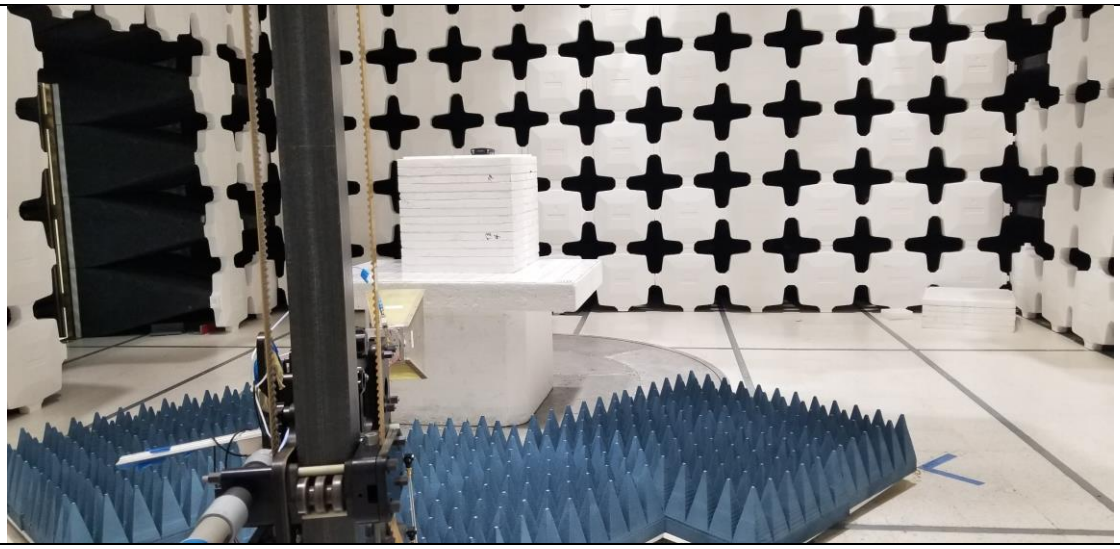
	
EUT-External-Top	EUT-External-Bottom
	
EUT-External-Front	EUT-External-Back
	
EUT-External-Left	EUT-External-Right
	
EUT-Internal-5GHz Left Antenna	EUT-Internal-5GHz Right Antenna
	
EUT-Internal-Top View	



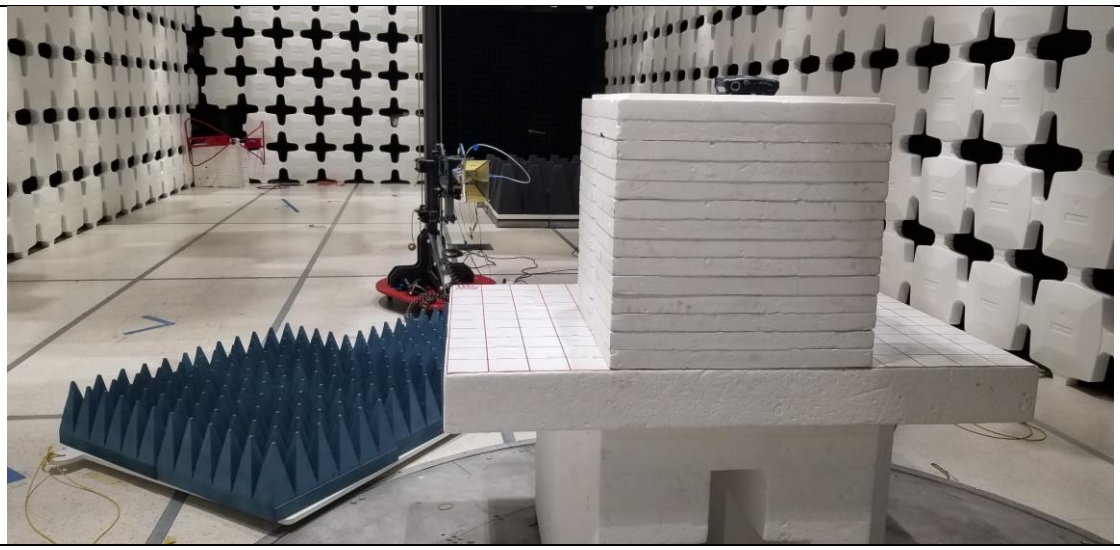
Radiated Emission Test below 1GHz Front View



Radiated Emission Test below 1GHz Rear View



Radiated Emission Test above 1GHz Front View



Radiated Emission Test above 1GHz Rear View

9 Test Instrument List

Equipment	Manufacturer	Model	Instrument Number	Cal. Date	Cal. Due
Semi-Anechoic Chamber	ETS-Lindgren	10M	VL001	10/18/2022	10/18/2024
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A1)	N/A1)
Spectrum Analyzer	Keysight	N9020A	MY50110074	06/09/2023	06/09/2024
EMC Test Receiver	R&S	ESL6	100230	06/07/2023	06/07/2024
LISN (9KHz – 30MHz)	EMCO	3816/2	9705-1066	07/12/2023	07/12/2024
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
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	06/07/2023	06/07/2024
RF Attenuator	Pasternack	PE7005-3	VL061	07/16/2023	07/16/2024
Preamplifier 100KHz - 40GHz	Aeroflex	33711-392-77150-11	064	07/16/2023	07/16/2024
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	06/09/2023	06/09/2024
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
USB RF Power Sensor	ETS-Lindgren	7002-006	SN 00151268	06/07/2023	06/07/2024
Agilent Signal Generator	MXG N5182A	N5182A	US47080548	06/07/2023	06/07/2024
Power Splitter/Combiner	Mini-Circuits	ZFSC-2-9G+	VL052	N/A1)	N/A1)
Power Splitter/Combiner	Mini-Circuits	ZFSC-2-9G+	VL053	N/A1)	N/A1)
Power Splitter/Combiner	Mini-Circuits	ZFSC-2-9G+	VL054	N/A1)	N/A1)
Power Splitter/Combiner	Mini-Circuits	ZFSC-2-9G+	VL055	N/A1)	N/A1)
Wideband Communication	R&S	CMW500	147508	05/10/2023	05/10/2024

Note:

1) This equipment is not for measurement purpose and only require functional verification. Calibration is not required.

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