




RF Test Report

Test Report Number	PFT-23012462-LC-FCC-IC-RF-DXX
FCC ID IC Applicant Applicant Address Product Name Model (s) Date of Receipt Date of Test Report Issue Date Test Standards Test Result	2ALBDPT40Q 23259-PT40Q Pacific Track, LLC 1300 Bristol Street North, Newport Beach, CA 92660 Telematics Device PT40-Q 03/24/2023 04/04/2023- 04/12/2023 04/27/2023 47 CFR Part 15.249 RSS 210 Issue10, Amd April 2020 PASS
	Issued by: Vista Compliance Laboratories 1261 Puerta Del Sol, San Clemente, CA 92673 USA www.vista-compliance.com
 <hr/> Devin Tai (Test Engineer)	 <hr/> David Zhang (Technical Manager)
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REVISION HISTORY

Report Number	Version	Description	Issued Date
PFT-23012462-LC-FCC-IC-RF-DXX	01	Initial report	04/27/2023

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1 Test Summary

Test Item	Test Requirement	Test Method	Result
Antenna Requirement	47 CFR Part 15.203	ANSI C63.10 (2013)	Pass
Fundamental Field Strength	47 CFR Part 15.249 (a) RSS210 (B10) RSS-Gen (8.9,8.10)	ANSI C63.10 (2013) RSS- GEN Issue 5 Amd 2 Feb 2021	Pass
Radiated Emissions	47 CFR Part 15.249 (a) 47 CFR Part 15.209 RSS-Gen (8.9,8.10)	ANSI C63.10 (2013) RSS- GEN Issue 5 Amd 2 Feb 2021	Pass
Occupied Bandwidth	47 CFR Part 15.215 (c) RSS-Gen (6.7)	ANSI C63.10 (2013) RSS- GEN Issue 5 Amd 2 Feb 2021	Pass
AC Power Line Conducted Emissions	47 CFR Part 15.207 RSS-GEN 8.8	ANSI C63.10 (2013) RSS- GEN Issue 5 Amd 2 Feb 2021	N/A

Note: N/A: Not applicable, EUT powered by DC 12V from vehicle power system.

2 General Information

2.1 Applicant

Applicant	Pacific Track, LLC
Applicant address	1300 Bristol Street North, Suite 100, Newport Beach, CA, 92660
Manufacturer	Pacific Track, LLC
Manufacturer Address	1300 Bristol Street North, Suite 100, Newport Beach, CA, 92660

2.2 Product information

Product Name	Telematics Device
Product Description	Telematics Device
Model Number	PT40-Q
Family Models	N/A
Serial Number	Q1-A4444
Frequency Band	BLE: 2402-2480MHz LTE Cat-M1 Band 2: 1850.7-1909.3MHz LTE Cat-M1 Band 4: 1710.7-1754.3MHz LTE Cat-M1 Band 5: 824.7-836.5MHz LTE Cat-M1 Band 12: 699.7-715.3MHz LTE Cat-M1 Band 13: 777.7-786.3MHz
Type of modulation	BT_LE: GFSK LTE Cat-M1: QPSK/16QAM
Equipment Class	BT_LE: DXX LTE Cat-M1: PCB
Antenna Information	BLE - On board PCB trace antenna, gain: 2 dBi LTE Cat-M1 - On board PIFA antenna, gain: -2.2 dBi
Clock Frequencies	N/A
Input Power	DC 12.0V (EUT obtains power from Vehicle power system)
Power Adapter Manufacturer/Model	N/A
Power Adapter SN	N/A
Hardware version	N/A
Software version	N/A
Additional Info	N/A

2.3 Test standard and method

Test standard	47 CFR Part 15.249 RSS 210 Issue10, Amd April 2020
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	23.2°C	57.5%	996 mbar
Radiated Emission Testing	23.2°C	57.5%	996 mbar

4 Modification of EUT / Deviations from Standards

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

5 Test Configuration and Operation

5.1 EUT Test Configuration

The EUT is powered by DC12V (USB-C) and connects to Laptop via USB-C cable for testing purpose and for sending command to EUT to set different transmission modes in terms of radio mode bandwidth, power level, test channel, etc.

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
TeraTerm	Set the EUT into different BLE mode, to change channel, modulation, power level, etc.

5.2 Supporting Equipment

Description	Manufacturer	Model #	Serial #	Remark
Laptop	Dell	Inspiron 15 3000	72YPMJ2	-
DC Power Adapter	WERKER	WK12V1000	MRG05	-
12 Vdc Battery	Ascent Battery Supply, LLC	DURACELL ULTRA	N/A	-

Description	Qty	Length (m)	Shielding (Y/N)	Core(s)	Remark
USB-C	1	1	-	-	-

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 Antenna Requirement

7.1.1 Requirement

Per § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

7.1.2 Result

Analysis:

- EUT has a PCB trace antenna on the main board. This meets the requirement of permanent attachment.

Conclusion:

- EUT complies with antenna requirement in § 15.203.

7.2 Radiated Emissions Measurement

7.2.1 Requirement

§ 15.249 (a), RSS-210 B.10

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

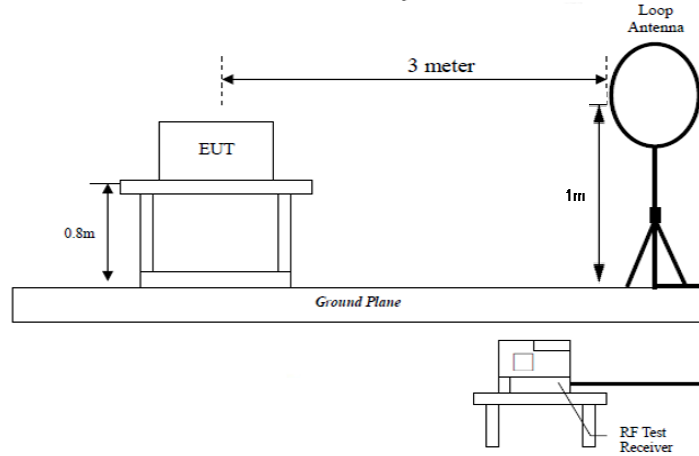
In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency Range	Field strength of fundamental (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

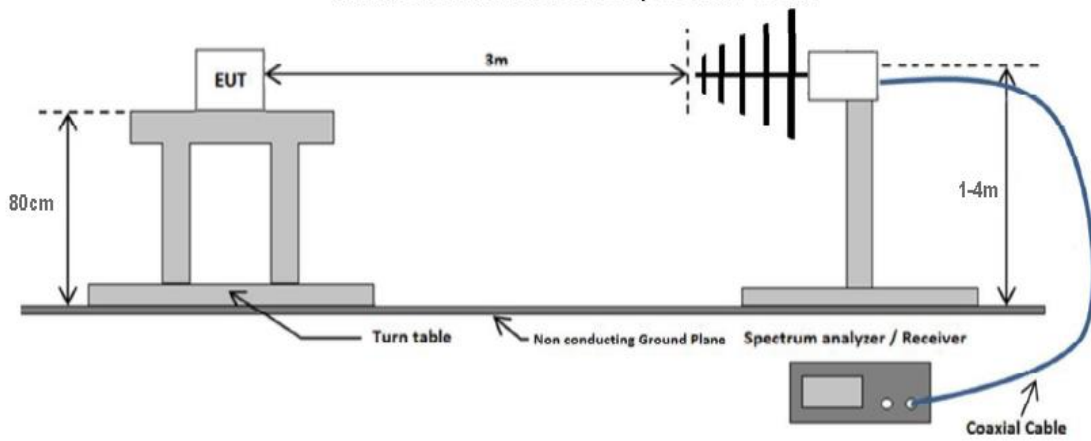
Note: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

7.2.2 Test Setup

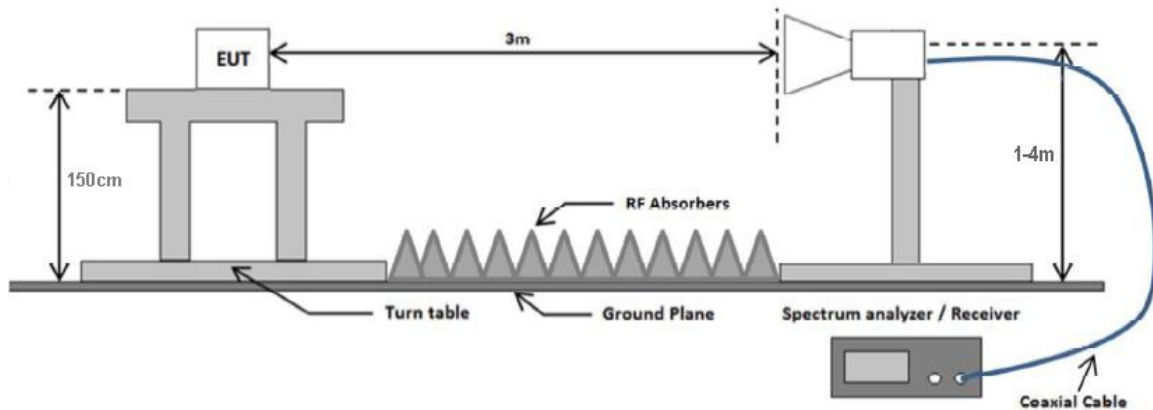
Radiated emissions test setup 9KHz - 30MHz



Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



7.2.3 Test Procedure

According to section 6 radiated spurious emission measurements in ANSI C63.10-2013, Boresight antenna mast was used during the scanning to point to EUT to maximize the emission. The process will be repeated in 3 EUT orientations.

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 300 Hz for frequency below 150KHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 kHz for frequency between 150KHz – 30MHz.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz 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.

7.2.4 Test Result

Field strength of Fundamental Test result

BLE_1M

Low Channel: 2402 MHz												
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	2402	59.28	6.72	27.85	93.85	Peak	V	259	133	114	-20.15	Pass
2	2402	50.99	6.72	27.85	85.56	Average	V	259	133	94	-8.44	Pass
3	2402	54.79	6.72	27.85	89.36	Peak	H	351	9	114	-24.64	Pass
4	2402	46.26	6.72	27.85	80.83	Average	H	351	9	94	-13.17	Pass
Mid Channel: 2440 MHz												
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	2440	54.54	6.78	27.89	89.21	Peak	V	166	289	114	-24.79	Pass
2	2440	46.84	6.78	27.89	81.51	Average	V	166	289	94	-12.49	Pass
3	2440	51.09	6.78	27.89	85.76	Peak	H	385	77	114	-28.24	Pass
4	2440	43.15	6.78	27.89	77.82	Average	H	385	77	94	-16.18	Pass
High Channel: 2480 MHz												
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	2480	55.73	6.83	28.08	90.64	Peak	V	169	35	114	-23.36	Pass
2	2480	47.32	6.83	28.08	82.23	Average	V	169	35	94	-11.77	Pass
3	2480	50.52	6.83	28.08	85.43	Peak	H	251	120	114	-28.57	Pass
4	2480	41.33	6.83	28.08	76.24	Average	H	251	120	94	-17.76	Pass

BLE_2M

Low Channel: 2402 MHz												
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	2402	58.12	6.72	27.85	92.69	Peak	V	241	9	114	-21.31	Pass
2	2402	48.77	6.72	27.85	83.34	Average	V	241	9	94	-10.66	Pass
3	2402	54.41	6.72	27.85	88.98	Peak	H	200	67	114	-25.02	Pass
4	2402	45.44	6.72	27.85	80.01	Average	H	200	67	94	-13.99	Pass
Mid Channel: 2440 MHz												
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	2440	56.8	6.78	27.89	91.47	Peak	V	270	319	114	-22.53	Pass
2	2440	48.05	6.78	27.89	82.72	Average	V	270	319	94	-11.28	Pass
3	2440	51.17	6.78	27.89	85.84	Peak	H	267	19	114	-28.16	Pass
4	2440	42.34	6.78	27.89	77.01	Average	H	267	19	94	-16.99	Pass
High Channel: 2480 MHz												
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	2480	54.95	6.83	28.08	89.86	Peak	V	190	139	114	-24.14	Pass
2	2480	45.28	6.83	28.08	80.19	Average	V	190	139	94	-13.81	Pass
3	2480	51.73	6.83	28.08	86.64	Peak	H	399	195	114	-27.36	Pass
4	2480	42.47	6.83	28.08	77.38	Average	H	399	195	94	-16.62	Pass

Remarks:

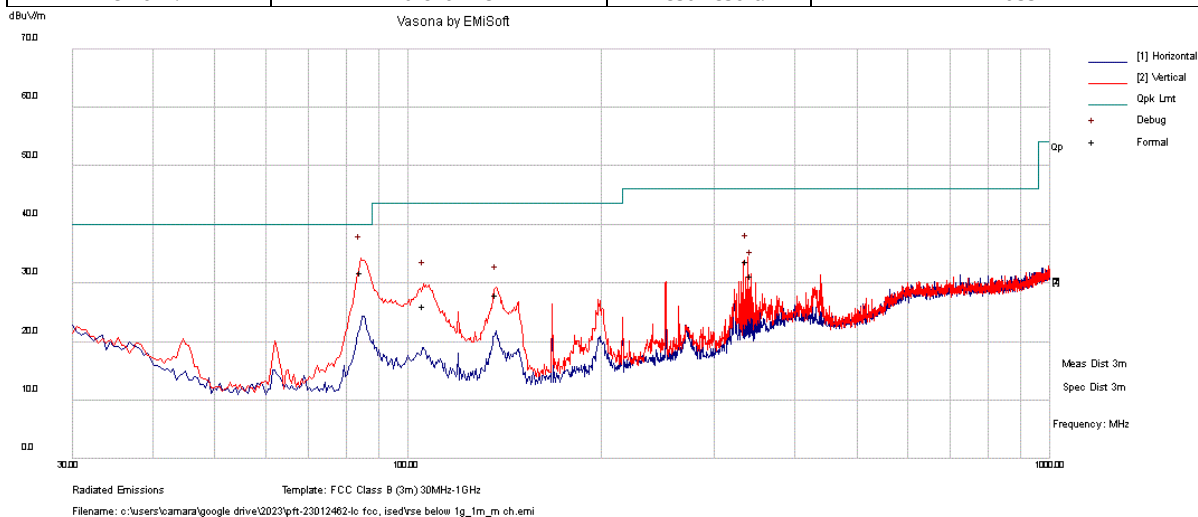
1. Level (dBuV/m) = Raw (dBuV) + Cable loss(dB) + AF (dB/m).
2. AF (dB/m) = Antenna Factor (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

Radiated Emission between 9KHz – 30MHz test result.

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

RADIATED EMISSIONS BELOW 1 GHZ

Test Standard:	FCC15.249, 15.209, RSS 210	Mode:	BLE_1M
Frequency Range:	30 MHz - 1 GHz	Test Date:	04/06/2023
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Mid channel	Test Result:	Pass



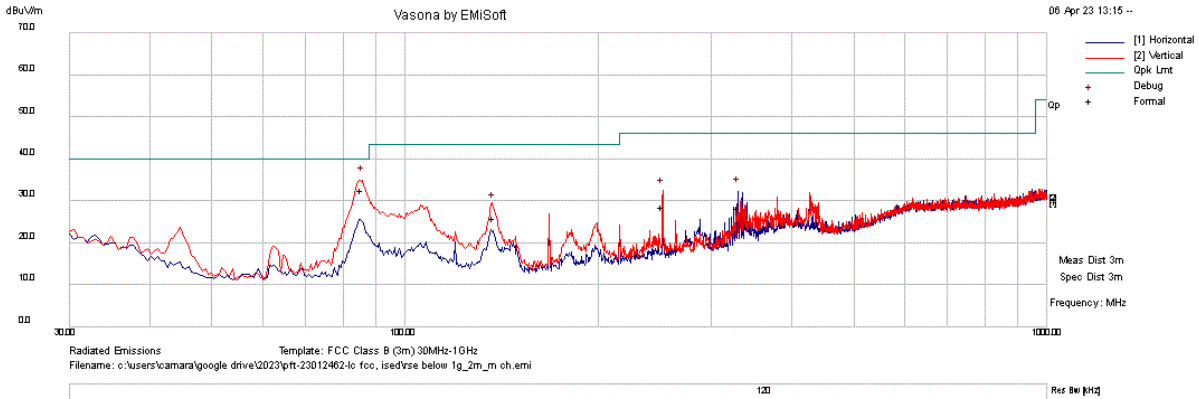
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	84.532	48.8	3.4	-20.2	32	Quasi Max	V	131	96	40	-8	Pass
2	337.636	39.7	6	-11.8	33.9	Quasi Max	V	136	144	46	-12.1	Pass
3	105.711	41.5	3.7	-18.9	26.3	Quasi Max	V	127	136	43.5	-17.2	Pass
4	137.358	42	4.1	-18.1	28	Quasi Max	V	100	296	43.5	-15.5	Pass
5	342.94	36.9	6	-11.5	31.4	Quasi Max	V	112	144	46	-14.6	Pass

Remarks:

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

RADIATED EMISSIONS BELOW 1 GHZ

Test Standard:	FCC15.249, 15.209, RSS 210	Mode:	BLE_2M
Frequency Range:	30 MHz - 1 GHz	Test Date:	04/06/2023
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Mid channel	Test Result:	Pass



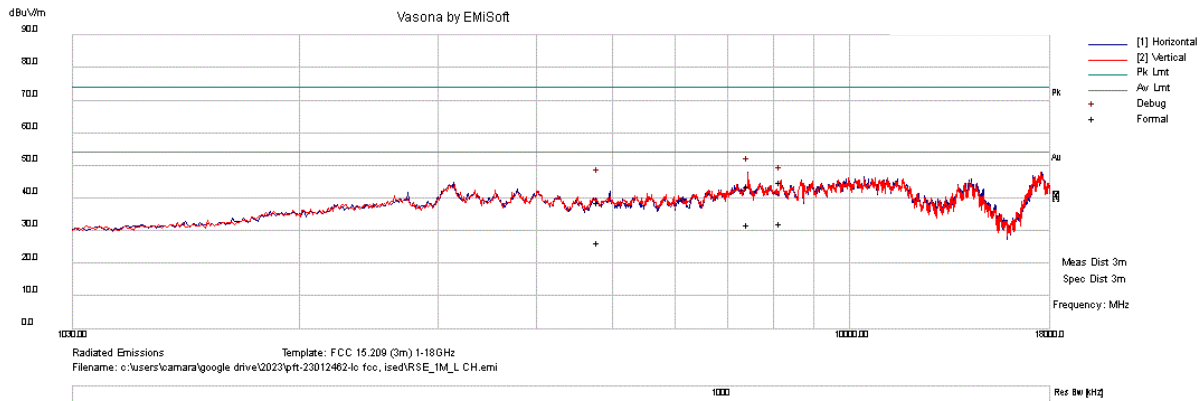
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	85.641	49.4	3.4	-20.2	32.6	Quasi Max	V	136	90	40	-7.4	Pass
2	330.043	34.8	5.9	-12.3	28.4	Quasi Max	V	149	130	46	-17.6	Pass
3	252.058	37.9	5.3	-14.6	28.6	Quasi Max	V	108	11	46	-17.4	Pass
4	85.641	49.4	3.4	-20.2	32.6	Quasi Max	V	136	90	40	-7.4	Pass

Remarks:

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

RADIATED EMISSIONS 1 - 18 GHZ

Test Standard:	FCC15.249, 15.209, RSS 210	Mode:	BLE_1M
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/04/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Low Channel	Test Result:	Pass



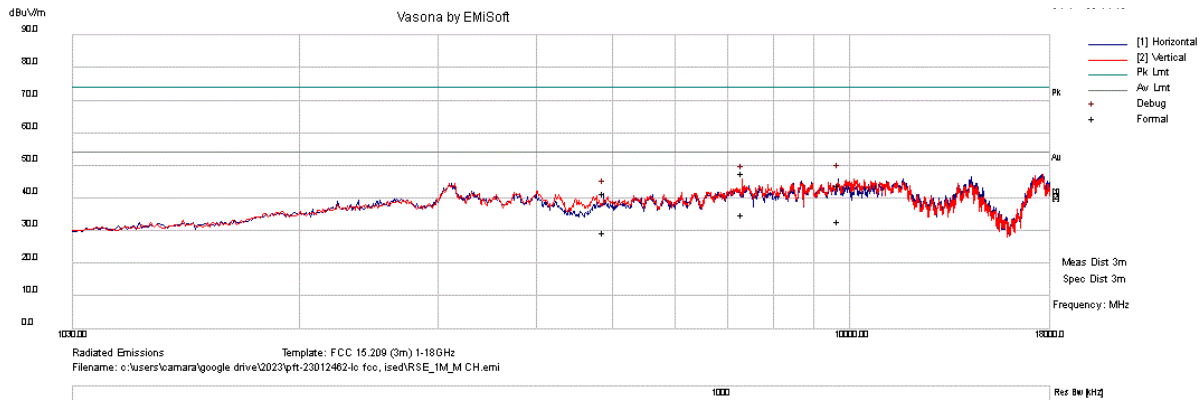
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7434.225	36	13.2	-5.6	43.6	Peak Max	H	252	205	74	-30.4	Pass
2	8191.161	36.2	14.2	-5.5	44.8	Peak Max	V	129	134	74	-29.2	Pass
3	4804.665	34.3	9.1	-4.5	38.9	Peak Max	H	131	124	74	-35.1	Pass
4	7434.225	24.4	13.2	-5.6	31.9	Average Max	H	252	205	54	-22.1	Pass
5	8191.161	23.6	14.2	-5.5	32.3	Average Max	V	129	134	54	-21.7	Pass
6	4804.665	21.7	9.1	-4.5	26.3	Average Max	H	131	124	54	-27.7	Pass

Remarks:

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

RADIATED EMISSIONS 1 - 18 GHZ

Test Standard:	FCC15.249, 15.209, RSS 210	Mode:	BLE_1M
Frequency Range:	1 GHz – 18 GHz	Test Date:	04/04/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Mid Channel	Test Result:	Pass



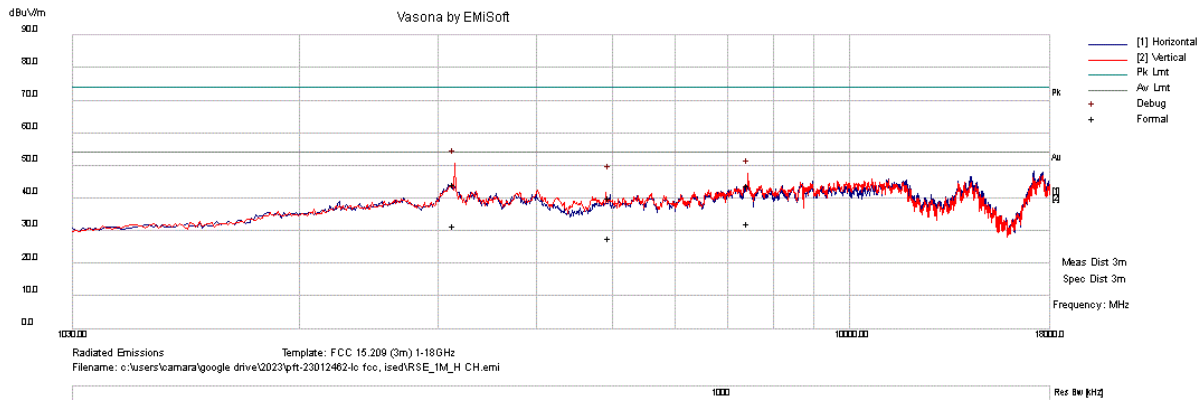
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	9685.818	33	16.1	-5.1	44	Peak Max	H	103	232	74	-30	Pass
2	7319.111	40.2	12.9	-5.5	47.6	Peak Max	V	237	128	74	-26.4	Pass
3	4880.31	37.7	9.3	-5.5	41.5	Peak Max	H	154	58	74	-32.5	Pass
4	9685.818	21.8	16.1	-5.1	32.8	Average Max	H	103	232	54	-21.2	Pass
5	7319.111	27.8	12.9	-5.5	35.2	Average Max	V	237	128	54	-18.8	Pass
6	4880.31	25.6	9.3	-5.5	29.4	Average Max	H	154	58	54	-24.6	Pass

Remarks:

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

RADIATED EMISSIONS 1 - 18 GHZ

Test Standard:	FCC15.249, 15.209, RSS 210	Mode:	BLE_1M
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/04/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	High Channel	Test Result:	Pass



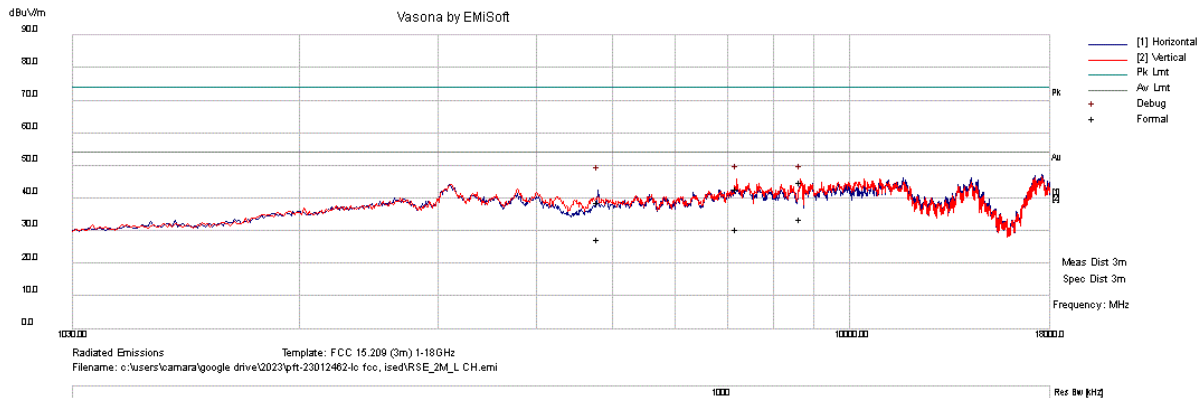
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	3149.675	39.7	7.8	-3.4	44.1	Peak Max	V	377	98	74	-29.9	Pass
2	7437.863	36.4	13.2	-5.6	44	Peak Max	V	173	170	74	-30	Pass
3	4960.305	37.4	9.5	-6.6	40.3	Peak Max	H	273	40	74	-33.7	Pass
4	3149.675	27.1	7.8	-3.4	31.5	Average Max	V	377	98	54	-22.5	Pass
5	7437.863	24.7	13.2	-5.6	32.3	Average Max	V	173	170	54	-21.7	Pass
6	4960.305	25	9.5	-6.6	27.9	Average Max	H	273	40	54	-26.1	Pass

Remarks:

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

RADIATED EMISSIONS 1 - 18 GHZ

Test Standard:	FCC15.249, 15.209, RSS 210	Mode:	BLE_2M
Frequency Range:	1 GHz – 18 GHz	Test Date:	04/04/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Low Channel	Test Result:	Pass



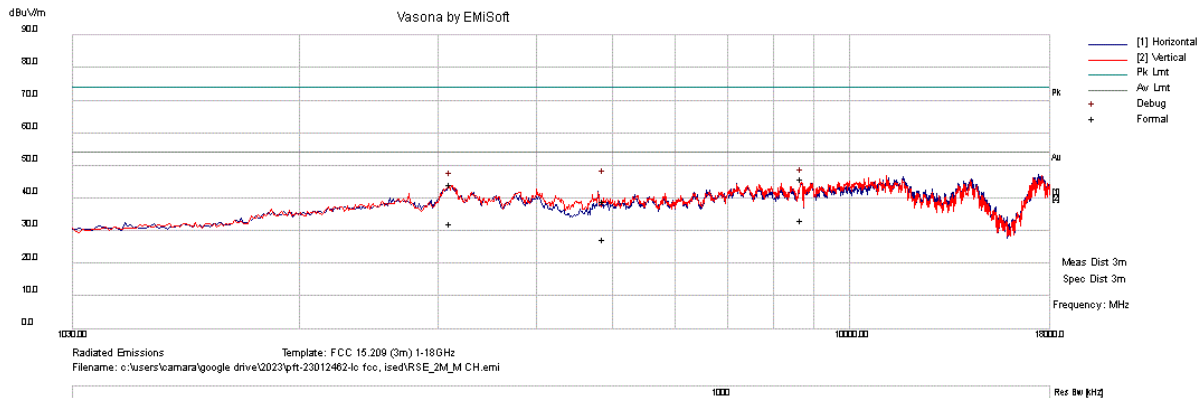
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	7207.07	35.8	12.7	-5.6	42.9	Peak Max	V	153	251	74	-31.1	Pass
2	8675.931	34.7	16.1	-5.7	45.1	Peak Max	V	269	262	74	-28.9	Pass
3	4804.388	34.1	9.1	-4.5	38.7	Peak Max	H	141	214	74	-35.3	Pass
4	7207.07	23.6	12.7	-5.6	30.7	Average Max	V	153	251	54	-23.3	Pass
5	8675.931	23.3	16.1	-5.7	33.7	Average Max	V	269	262	54	-20.3	Pass
6	4804.388	22.9	9.1	-4.5	27.5	Average Max	H	141	214	54	-26.5	Pass

Remarks:

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

RADIATED EMISSIONS 1 - 18 GHZ

Test Standard:	FCC15.249, 15.209, RSS 210	Mode:	BLE_2M
Frequency Range:	1 GHz – 18 GHz	Test Date:	04/04/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	Mid Channel	Test Result:	Pass



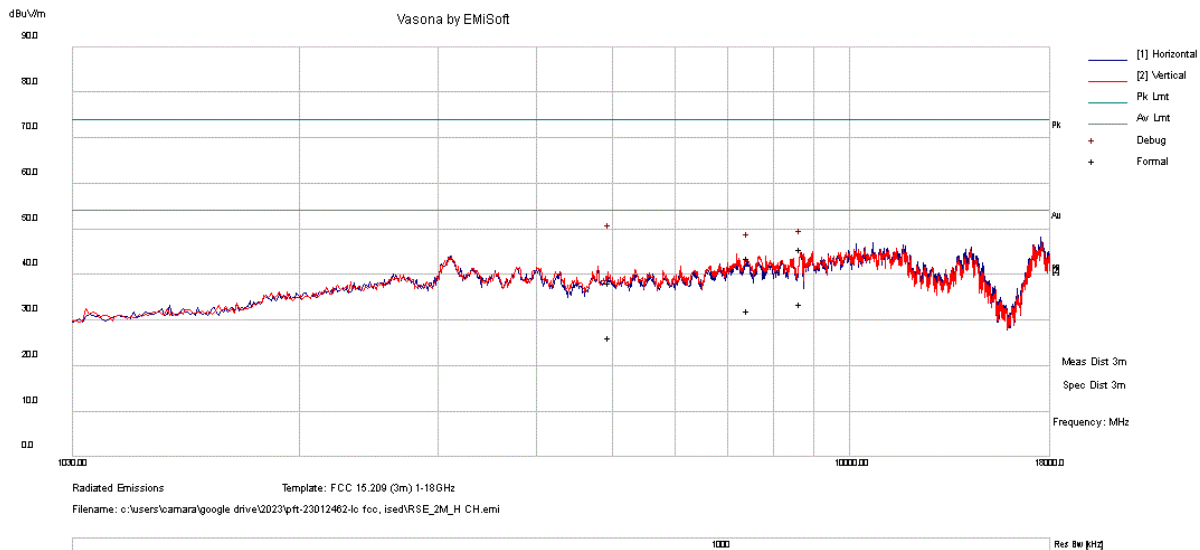
No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	8697.706	35.3	16.3	-5.7	45.9	Peak Max	V	150	170	74	-28.1	Pass
2	4878.08	35.3	9.3	-5.4	39.2	Peak Max	V	195	324	74	-34.8	Pass
3	3117.729	38.3	7.8	-1.6	44.5	Peak Max	V	319	139	74	-29.5	Pass
4	8697.706	22.8	16.3	-5.7	33.4	Average Max	V	150	170	54	-20.6	Pass
5	4878.08	23.8	9.3	-5.4	27.7	Average Max	V	195	324	54	-26.3	Pass
6	3117.729	26.2	7.8	-1.6	32.4	Average Max	V	319	139	54	-21.6	Pass

Remarks:

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

RADIATED EMISSIONS 1 - 18 GHZ

Test Standard:	FCC15.249, 15.209, RSS 210	Mode:	BLE_2M
Frequency Range:	1 GHz - 18 GHz	Test Date:	04/04/2023
Antenna Type/Polarity:	Horn/Hor & Ver	Test Personnel:	Devin Tai
Remark:	High Channel	Test Result:	Pass



No.	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
1	4961.943	35.4	9.5	-6.7	38.2	Peak Max	H	204	221	74	-35.8	Pass
2	8675.776	35.4	16.1	-5.7	45.7	Peak Max	V	318	144	74	-28.3	Pass
3	7439.113	36.2	13.2	-5.6	43.8	Peak Max	V	350	360	74	-30.2	Pass
4	4961.943	23.5	9.5	-6.7	26.3	Average Max	H	204	221	54	-27.7	Pass
5	8675.776	23.4	16.1	-5.7	33.7	Average Max	V	318	144	54	-20.3	Pass
6	7439.113	24.6	13.2	-5.6	32.2	Average Max	V	350	360	54	-21.8	Pass

Remarks:

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

Radiated Emission between 18GHz – 40GHz test result

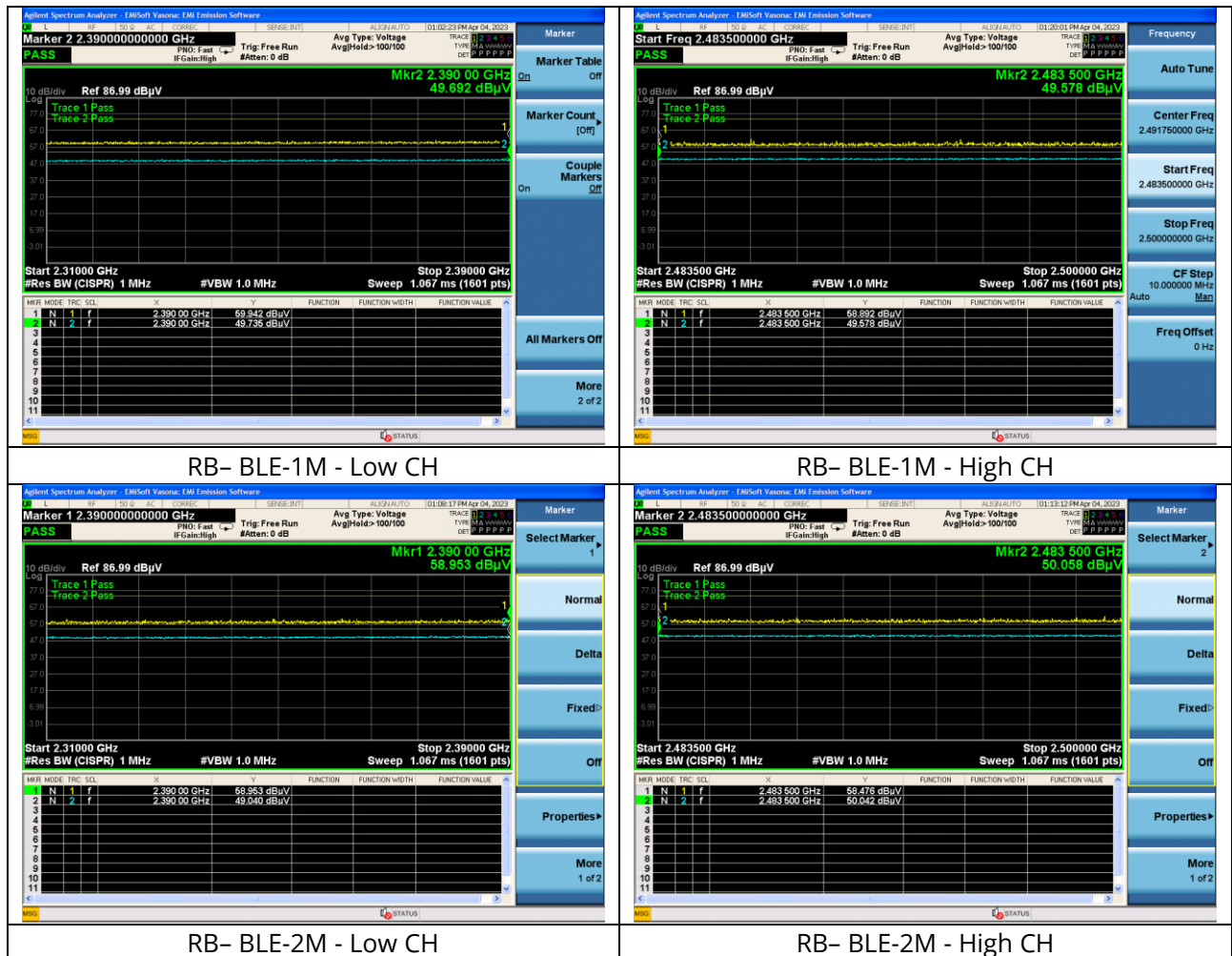
Note: no substantial emission is found other than the noise floor. Different modes have been verified.

Radiated Restricted Band Measurement Result

Test result:

Mode	Frequency (MHz)	Level (dBuV/m)	Measurement Type	Limit (dBuV/m)	Margin (dB)	Pass/Fail
BLE_1M	2390	59.94	Peak Max	74	-14.06	Pass
	2483.5	58.89	Peak Max	74	-15.11	Pass
	2390	49.74	Average Max	54	-4.26	Pass
	2483.5	49.58	Average Max	54	-4.42	Pass
BLE_2M	2390	58.95	Peak Max	74	-15.05	Pass
	2483.5	58.48	Peak Max	74	-15.52	Pass
	2390	49.04	Average Max	54	-4.96	Pass
	2483.5	50.04	Average Max	54	-3.96	Pass

Test Plots



7.3 Occupied Bandwidth

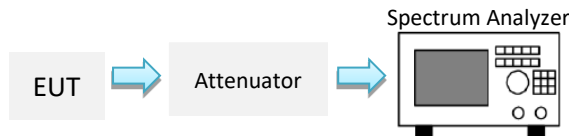
7.3.1 Requirement

Per § 15.215 (c), RSS Gen 6.7

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

No limitation requirement, reference only.

7.3.2 Test setup



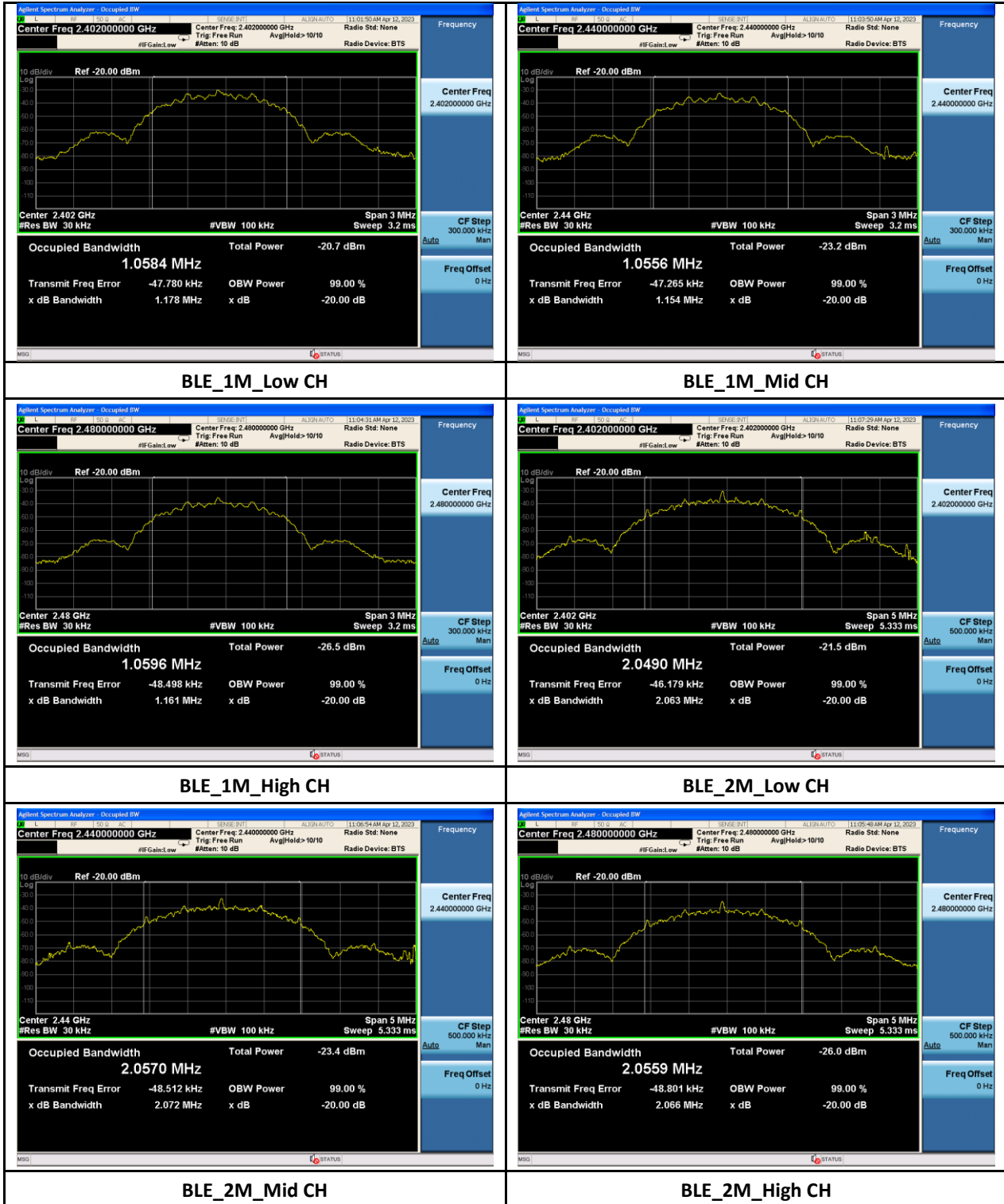
7.3.3 Test Procedure

1. Set RBW = 1% to 5% of the actual occupied BW.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Span = large enough to capture all products of the modulation process
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

7.3.4 Test Result

Mode	Data rate	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Verdict
BLE	1Mbps	2402	1.178	1.058	Reference only
		2440	1.154	1.056	Reference only
		2480	1.161	1.060	Reference only
	1Mbps	2402	2.073	2.049	Reference only
		2440	2.072	2.057	Reference only
		2480	2.066	2.056	Reference only

7.3.5 Test Plots



8 EUT and Test Setup Photos



EUT _ Front View



EUT _ Rear View



EUT _ Bottom view



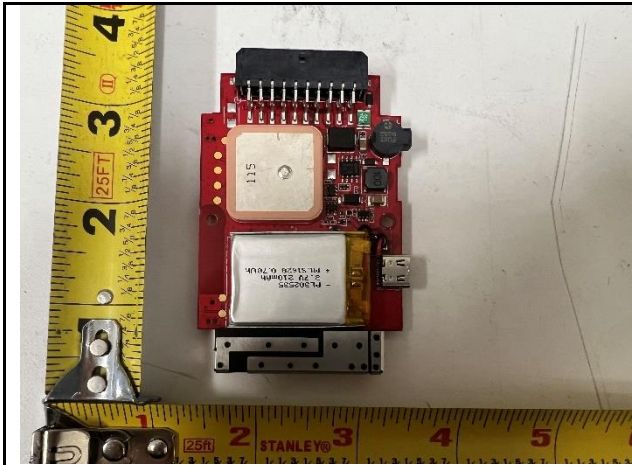
EUT _ Top view



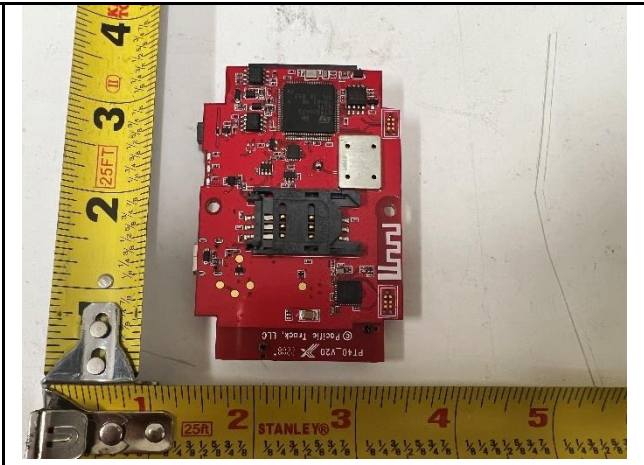
EUT _ Left view



EUT _ Right view



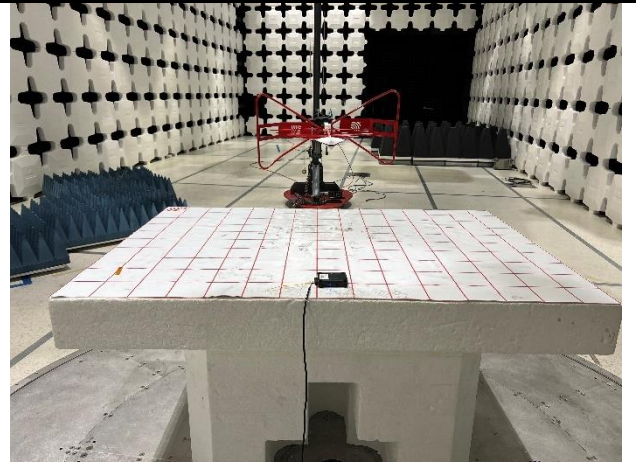
Mainboard _Front View



Mainboard _Rear 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	10/18/2023
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A	N/A
Spectrum Analyzer	Keysight	N9020A	MY50110074	06/09/2022	06/09/2023
EMC Test Receiver	R&S	ESL6	100230	06/07/2022	06/07/2023
LISN (9KHz – 30MHz)	EMCO	3816/2	9705-1066	07/12/2022	07/12/2023
Bi-Log Antenna	ETS-Lindgren	3142E	217921	07/19/2022	07/19/2023
Horn Antenna (1-18GHz)	Electro-Metrics	EM-6961	6292	07/21/2022	07/21/2023
Horn Antenna (18-40GHz)	Com-Power	AH-840	101109	07/21/2022	07/21/2023
Preamplifier	RF Bay, Inc.	LPA-10-20	11180621	07/16/2022	07/16/2023
True RMS Multi-meter	UNI-T	UT181A	C173014829	06/07/2022	06/07/2023
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	06/07/2022	06/07/2023
RF Attenuator	Pasternack	PE7005-3	VL061	07/16/2022	07/16/2023
Preamplifier 100KHz - 40GHz	Aeroflex	33711-392-77150-11	064	07/16/2022	07/16/2023
EM Center Control	ETS-Lindgren	7006-001	160136	N/A	N/A
Turn Table	ETS-Lindgren	2181-3.03	VL002	N/A	N/A
Boresight Antenna Tower	ETS-Lindgren	2171B	VL003	N/A	N/A
Loop Antenna (9k-30MHz)	Com-Power	AL-130	121012	06/10/2022	06/10/2023
RE test cable(below 6GHz)	Vista	RE-6GHz-01	RE-6GHz-01	07/16/2022	07/16/2023
RE test cable (1-18GHz)	PhaseTrack	II-240	RE-18GHz-01	07/16/2022	07/16/2023
RE test cable (>18GHz)	Sucoflex	104	344903/4	07/16/2022	07/16/2023
Pulse limiter	Com-Power	LIT-930A	531727	07/16/2022	07/16/2023
CE test cable #1	FIRST RF	FRF-C-1002-001	CE-6GHz-01	07/16/2022	07/16/2023
CE test cable#2	FIRST RF	FRF-C-1002-001	CE-6GHz-02	07/16/2022	07/16/2023

Note:

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

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