TEST REPORT

Test Report No. : UL-RPT-RP15101847-616A

Manufacturer	:	Luminary ROLI Ltd.
Model No. / HVIN	:	SBB01
PMN	:	Seaboard Block M
FCC ID	:	2AFT3-SB01
ISED Certification No.	:	20629-SB01
Technology		*Bluetooth* LE / ShockBurst
Test Standard(s)	:	FCC Parts 15.209(a) & 15.249, Industry Canada RSS-210 Issue 10 April 2020 & RSS-Gen Issue 5 February 2021

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 3.0 supersedes all previous versions.

Date of Issue: 21 March 2024

Checked by:

Ben Mercer
Lead Project Engineer, Radio Laboratory

Issued by :

Sarah Williams
RF Operations Leader, Radio Laboratory

5772

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UL International (UK) Ltd

Unit 1-4 Horizon, Kingsland Business Park, Wade Road, Basingstoke, Hampshire, RG24 8AH, UK
Telephone: +44 (0)1256 312000
Facsimile: +44 (0)1256 312001

Customer Information

Company Name:	Luminary ROLI Ltd.
Address:	326 - 327 Stean Street, London, E8 4ED, United Kingdom

Manufacturer Information

Company Name:	Luminary ROLI Ltd.
Address:	326 - 327 Stean Street, London, E8 4ED, United Kingdom

Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	26/02/2024	Initial Version	Ben Mercer
2.0	20/03/2024	FCC & ISED IDs updated	Ben Mercer
3.0	21/03/2024	Updated requested by TCB/FCB	Ben Mercer

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1. Attestation of Test Results

1.1. Description of EUT

The equipment under test (EUT) was an expressive MIDI controller containing a *Bluetooth* LE / ShockBurst transciever.

1.2. General Information

Specification Reference:	47CFR15.249
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.249
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.209
Specification Reference:	RSS-Gen Issue 5 February 2021
Specification Title:	General Requirements for Compliance of Radio Apparatus
Specification Reference:	RSS-210 Issue 10 April 2020
Specification Title:	Licence –exempt Radio Apparatus: Category I Equipment.
FCC Site Registration:	685609
ISEDC Site Registration:	20903
FCC Lab. Designation No.:	UK2011
ISEDC CABID:	UK0001
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	29 January 2024 to 20 February 2024

1.3. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.249(a)(e)	RSS-Gen 6.12 / RSS-210 B.10(a)	Transmitter Fundamental Field Strength	✓
Part 15.249(a)(d)(e) / 15.209(a)	RSS-Gen 6.13 / RSS-210 B.10(a)(b)	Transmitter Radiated Emissions	✓
Part 15.249(d) / 15.209(a)	RSS-Gen 6.13 / RSS-210 B.10(b)	Transmitter Band Edge Radiated Emissions	✓
Key to Results ✓ = Complied ✗ = Did not comply			

1.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

2 Summary of Testing

2.1 Facilities and Accreditation

The test site and measurement facilities used to collect data are located at Unit 3 & 4 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom. The following table identifies which facilities were utilised for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

Site 1	X
Site 2	-
Site 17	X
Site 32	-
Site 33	-

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2.2 Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

2.3 Calibration and Uncertainty

Measuring Instrument Calibration

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

Measurement Uncertainty & Decision Rule

Overview

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

Decision Rule

Measurement system instrumentation shall be used with an accuracy specification meeting the accuracy specification limits according to IEC/IECEE OD-5014.

As applicable, unless specified otherwise in this quotation, the compliance “Decision Rule” is based on Simple Acceptance. If the measured value is on the limit, the result is defined as a pass. In this case the risk of a false positive is 50%. For further information regarding risk assessment refer to ILAC G8:09/2019.

Measurement Uncertainty

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Fundamental Field Strength	2400 MHz to 2483.5 MHz	95%	±3.16 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	±5.32 dB
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±3.30 dB
Radiated Spurious Emissions	1 GHz to 25 GHz	95%	±3.16 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

2.4 Test and Measurement Equipment

Test Equipment Used for Transmitter Fundamental Field Strength & Band Edge Radiated Emissions

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	27 Dec 2024	12
K0017	3m RSE Chamber	MVG Industries	N/A	N/A	09 Nov 2024	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	20 Nov 2024	12
A2863	Pre Amplifier	Agilent	8449B	3008A02100	30 Oct 2024	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120B653	06 Nov 2024	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	25 Jan 2025	12

Test Equipment Used for Transmitter Radiated Emissions Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	27 Dec 2024	12
K0017	3m RSE Chamber	MVG Industries	N/A	N/A	09 Nov 2024	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	20 Nov 2024	12
A3167	Pre Amplifier	Com-Power	PAM-103	18020010	31 Oct 2024	12
A2863	Pre Amplifier	Agilent	8449B	3008A02100	30 Oct 2024	12
A223628	Pre Amplifier	Atlantic Microwave	A-LNAKX-380116-S5S5	210837001	14 Nov 2024	12
A3265	Pre Amplifier	Schwarzbeck	BBV 9721	9721-069	27 Nov 2024	12
A3161	Antenna	Teseq	CBL6111D	50859	25 Sep 2024	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	29 Nov 2024	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120B653	06 Nov 2024	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	06 Nov 2024	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	25 Jan 2025	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	25 Jan 2025	12
A3036	Low Pass Filter	AtlanTecRF	AFL-02000	15062902848	25 Jan 2025	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	25 Jan 2025	12
K0001	3m RSE Chamber	MVG Industries	N/A	N/A	06 Sep 2024	12
M236226	Test Receiver	Rohde & Schwarz	ESW26	103134	21 Apr 2024	12
M2040	Thermohygrometer	Testo	608-H1	45124934	08 Feb 2024	12
A3165	Magnetic Loop Antenna	ETS-Lindgren	6502	00224383	13 Apr 2024	12
A3010	Attenuator	AtlanTecRF	AN18-06	208801#5	27 Apr 2024	12
A231925	Antenna	Teseq, Inc	CBL6111D	63584	27 Apr 2024	12

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	ROLI
Model Number / HVIN:	SBB01
PMN:	Seaboard Block M
Test Sample Serial Number:	SBB 42 *(Radiated Sample)*
Hardware Version:	V10
Software Version:	1.3.8-1342-gab308f7
FCC ID:	2AFT3-SB01
ISED Canada Certification Number:	20629-SB01
Date of Receipt:	29 January 2024

3.2. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3. Additional Information Related to Testing

Tested Technology:	*Bluetooth* / ShockBurst		
Power Supply Requirement:	Nominal	3.7 VDC	
Type of Unit:	Transceiver		
Channel Spacing:	2 MHz		
Modulation:	GFSK		
Data Rate (Mbps):	*Bluetooth* LE: 1		
	ShockBurst: 2		
Transmit Frequency Range:	2402 to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	37	2402
	Middle	17	2440
	Top	39	2480

3.4 Description of Available Antenna

The radio utilizes an internal antenna, with the following maximum gain:

Manufacturer	Model Number	Type	Frequency Range (MHz)	Antenna Gain (dBi)
Antenova	SRCW004	Chip	2400 to 2483.5	2.5

3.5 Description of Test Setup

Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Laptop
Brand Name:	Lenovo
Model Name or Number:	L440
Serial Number:	R9-019EA1 14/04

Description:	USB to DNA Cable
Brand Name:	FTDI
Model Name or Number:	Not marked or stated
Serial Number:	FTGXRCY9

Operating Modes

The EUT was tested in the following operating mode(s):

- Transmitting in *Bluetooth* LE 1M test mode at -4 dBm power setting on bottom, middle or top channel as required.
- Transmitting in ShockBurst 2M test mode at -8 dBm power setting on bottom, middle or top channel as required.

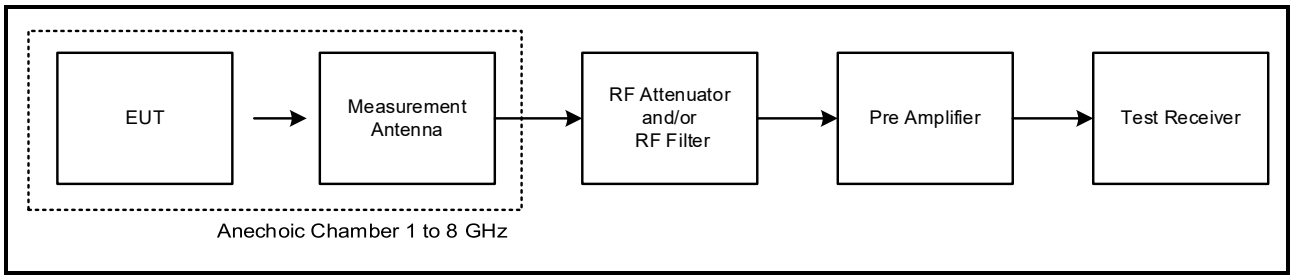
Configuration and Peripherals

The EUT was tested in the following configuration(s):

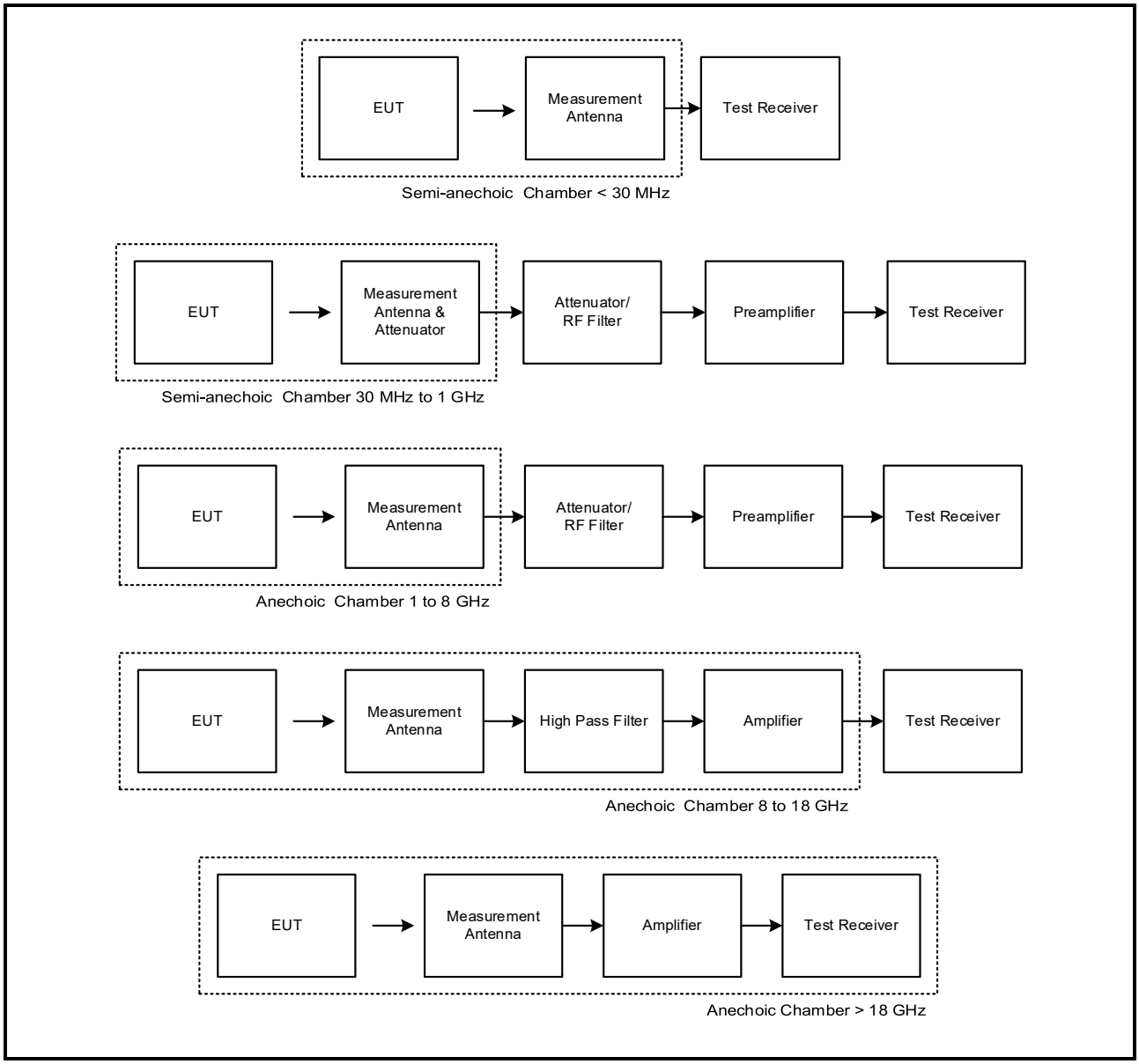
- A test laptop with the customer's terminal application was used to place the EUT into *Bluetooth* LE and ShockBurst test modes via a USB to DNA cable. Once configured, thetest laptop and cable were removed.
- The terminal application was used to enable continuous transmission and to select the test channels, output power setting & packet types as required.
- Radiated spurious emissions were performed with the EUT in the worst case orientation/position. Tests were performed with the EUT powered from its fully charged internal battery. No ports were terminated.
- Radiated spurious emissions were performed with the EUT configured for *Bluetooth* LE. Preliminary investigation was performed on both *Bluetooth* LE and ShockBurst modes, and *Bluetooth* LE was found to be the worst case.

Test Setup Diagrams

Test Setup for Transmitter Fundamental Field Strength & Band Edge Radiated Emissions



Test Setup for Transmitter Radiated Emissions



4 Radiated Test Results

4.1. Transmitter Fundamental Field Strength

Test Summary:

Test Engineer:	John Ferdinand	**Test Dates:**	29 January 2024 tp 20 February 2024
Test Sample Serial Number:	SBB 42		

ISED Canada Reference:	RSS-Gen 6.12 / RSS-210 B.10(a)
Test Method Used:	ANSI C63.10 Section 6.6 & 7.5

Environmental Conditions:

Temperature (°C):	21 to 22
Relative Humidity (%):	40 to 41

Note(s):

1. The final measured value in the tables below incorporates the calibrated antenna factor and cable loss.
2. Measurements were performed in a fully-anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
3. Pre-scans were performed and markers placed on the highest measured levels and results entered into the table below. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
4. *A duty cycle correction factor was applied to measured peak levels to obtain the average result. See Annex A for more detail.

Transmitter Fundamental Field Strength (continued)

Results: *Bluetooth* LE / 1M

Results: Bottom Channel / Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2401.969	Horizontal	97.1	114.0	16.9	Complied

Results: Bottom Channel / Average

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2401.969	Horizontal	81.2*	94.0	12.9	Complied

Results: Middle Channel / Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2440.000	Horizontal	96.2	114.0	17.8	Complied

Results: Middle Channel / Average

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2440.000	Horizontal	80.3*	94.0	13.7	Complied

Results: Top Channel / Peak

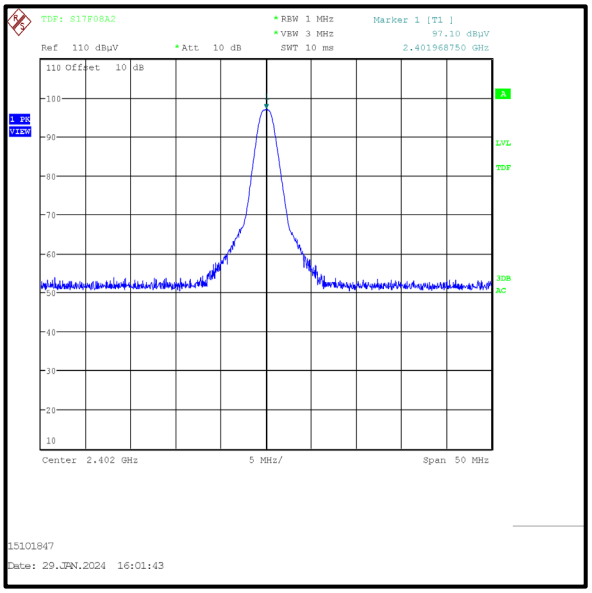
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2480.000	Horizontal	94.4	114.0	19.6	Complied

Results: Top Channel / Average

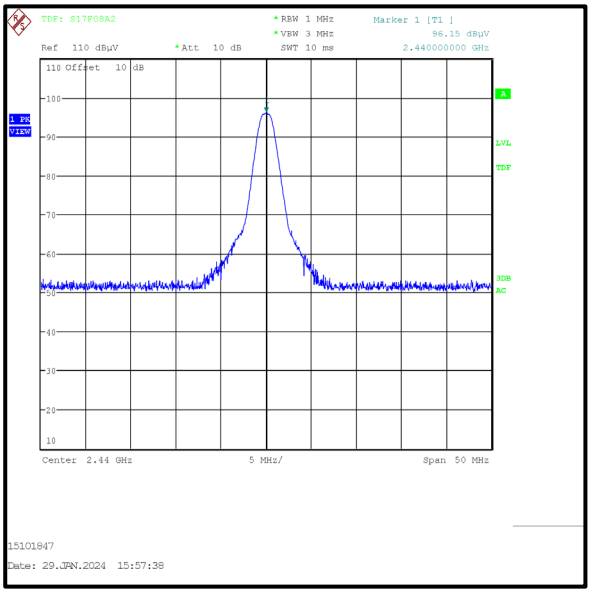
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2480.000	Horizontal	78.5*	94.0	15.5	Complied

Transmitter Fundamental Field Strength (continued)

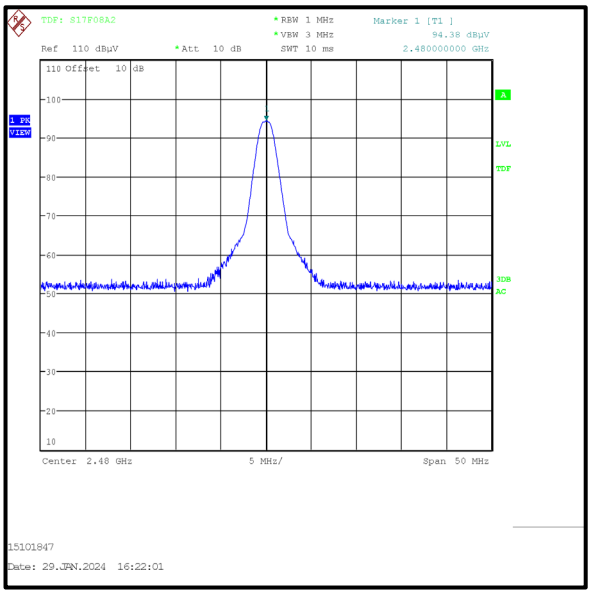
Results: *Bluetooth* LE / 1M



Bottom Channel



Middle Channel



Top Channel

Transmitter Fundamental Field Strength (continued)

Results: ShockBurst / 2M

Results: Bottom Channel / Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2402.000	Horizontal	92.7	114.0	21.3	Complied

Results: Bottom Channel / Average

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2402.000	Horizontal	76.8*	94.0	17.2	Complied

Results: Middle Channel / Peak

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2440.000	Horizontal	92.1	114.0	21.9	Complied

Results: Middle Channel / Average

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2440.000	Horizontal	76.2*	94.0	17.8	Complied

Results: Top Channel / Peak

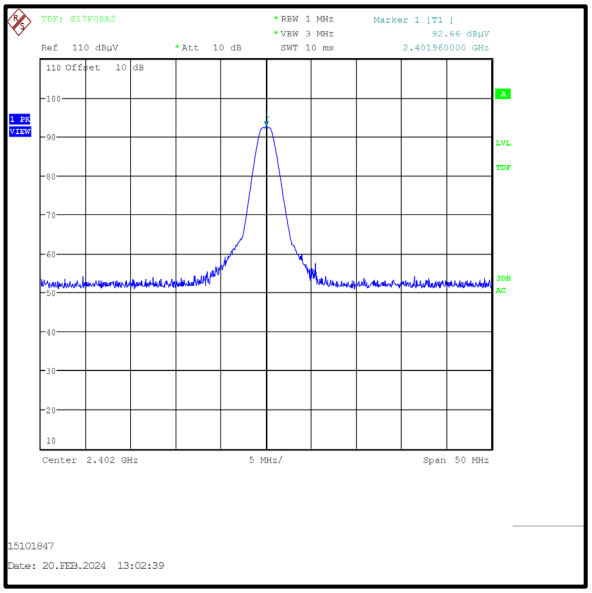
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2480.000	Horizontal	90.5	114.0	23.5	Complied

Results: Top Channel / Average

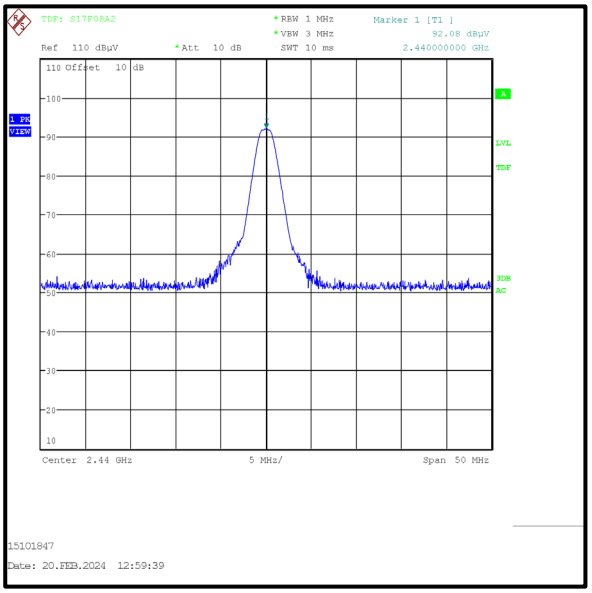
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2480.000	Horizontal	74.6*	94.0	19.4	Complied

Transmitter Fundamental Field Strength (continued)

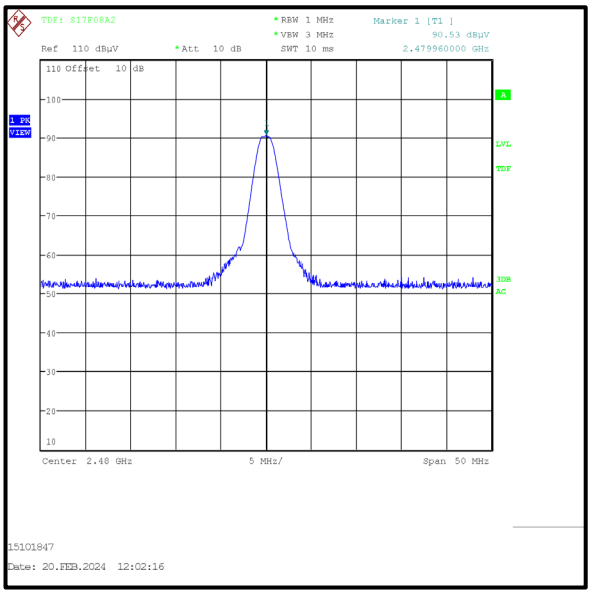
Results: ShockBurst / 2M



Bottom Channel



Middle Channel



Top Channel

4.2. Transmitter Radiated Emissions <1GHz

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	29 January 2024 & 30 January 2024
Test Sample Serial Number:	SBB 42		

FCC Reference:	Parts 15.249(a)(d)(e) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13, 8.9 & 8.10 / RSS-210 B.10(b)
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5
Frequency Range	9 kHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	40

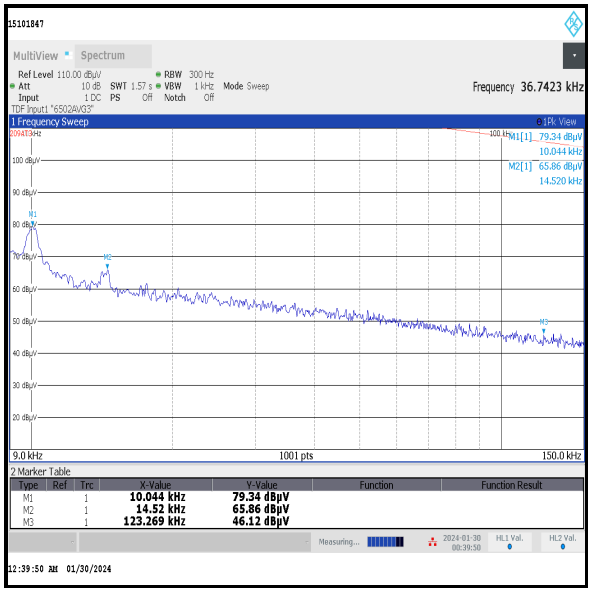
Note(s):

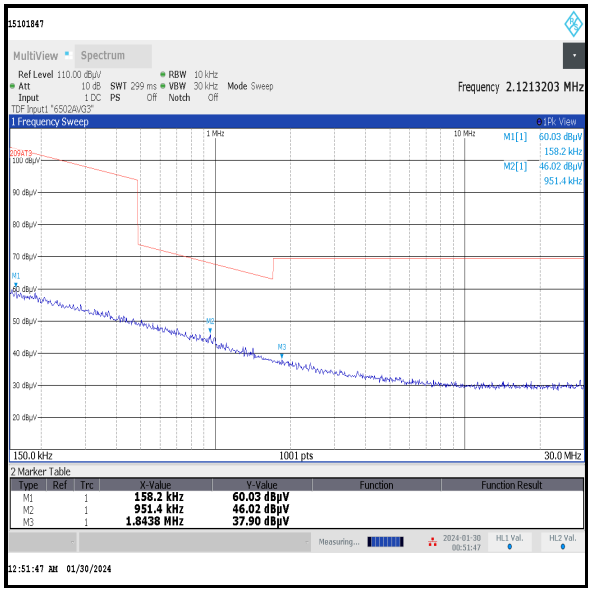
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the middle channel only.
3. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was configured as follows: For 9 kHz to 150 kHz, the resolution bandwidth was set to 300 Hz and video bandwidth 1 kHz. A peak detector was used and trace mode was Max Hold. For 150 kHz to 30 MHz, the resolution bandwidth was set to 10 kHz and video bandwidth 30 kHz, trace mode was Max Hold. For 30 MHz to 1 GHz, the resolution bandwidth was set to 120 kHz and video bandwidth 500 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
6. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-Gen Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X kHz resulted in a level of Y dBµV/m, which is equivalent to Y - 51.5 = Z dBµA/m, which has the same margin, W dB, to the corresponding RSS-Gen Table 6 limit as it has to the 15.209(a) limit.

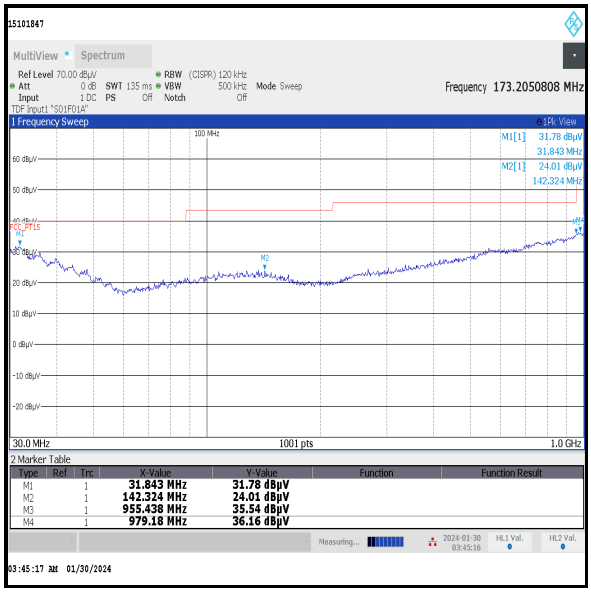
Transmitter Radiated Emissions (continued)

Results: Quasi-Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
955.438	Vertical	35.5	46.0	10.5	Complied







4.3 Transmitter Radiated Emissions >1 GHz

Test Summary:

Test Engineer:	John Ferdinand	**Test Date:**	30 January 2024
Test Sample Serial Number:	SBB 42		

FCC Reference:	Parts 15.249(a)(d)(e) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13, 8.9 & 8.10 / RSS-210 B.10(b)
Test Method Used:	ANSI C63.10 Sections 6.3, 6.6, 7.5, 11.11 & 11.12
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	41

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The emission shown on the 1 GHz to 3 GHz plot at approximately 2440 MHz is the EUT fundamental.
3. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and a marker placed on the highest measured level. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
6. *In accordance with ANSI C63.10 Section 6.6.4.3 (Note 1), if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

Transmitter Radiated Emissions (continued)

Results: Peak / Bottom Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
4803.850	Vertical	52.7	54.0*	1.3	Complied

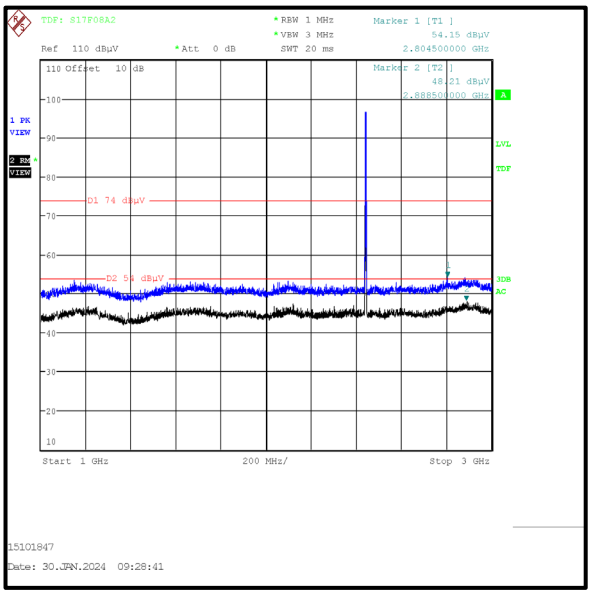
Results: Peak / Middle Channel

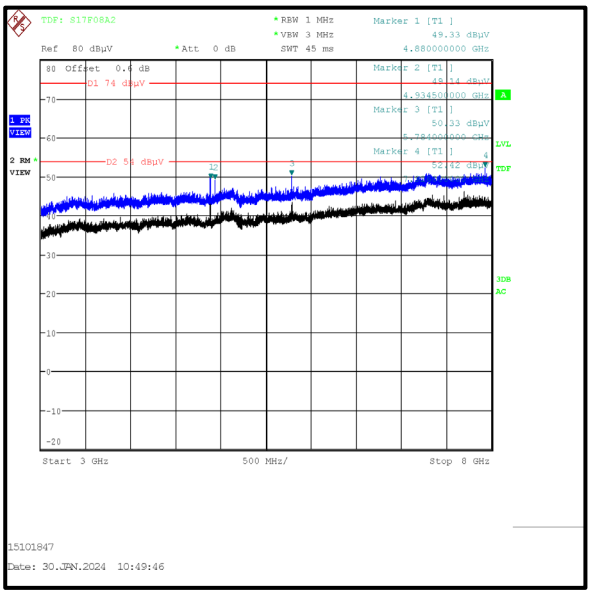
Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
4879.525	Vertical	52.5	54.0*	1.5	Complied
4934.150	Vertical	49.5	54.0*	4.5	Complied

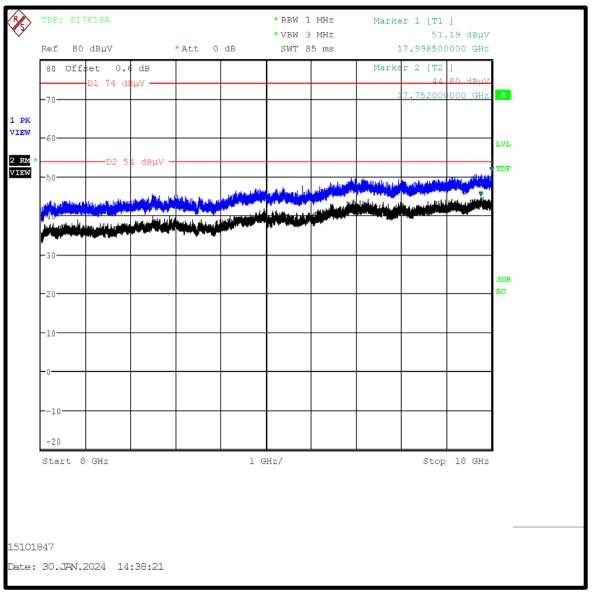
Results: Peak / Top Channel

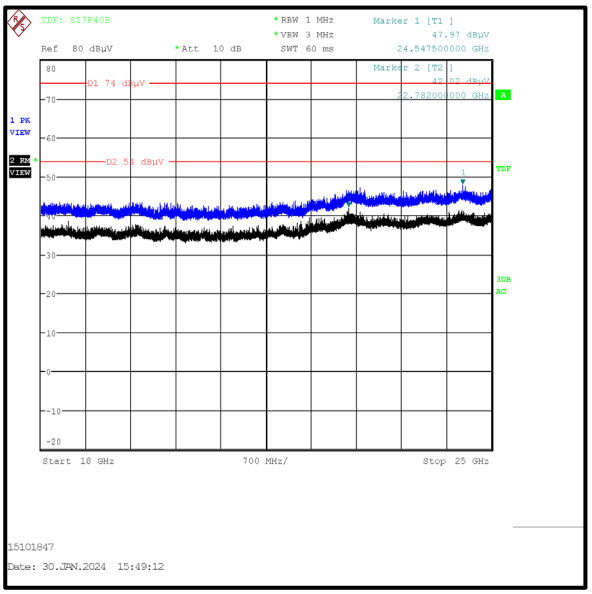
Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
4959.616	Vertical	52.2	54.0*	1.8	Complied

Transmitter Radiated Emissions (continued)









Note: These plots are pre-scans for indication purposes only. For final measurements, see accompanying tables.

4.4 Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	John Ferdinand	**Test Dates:**	06 February 2024 to 20 Febraury 2024
Test Sample Serial Number:	SBB 42		

FCC Reference:	Parts 15.249(d) & 15.209
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-210 A2.9(a)(b)
Test Method Used:	ANSI C63.10 Section 6.10.4, 6.10.5 & 7.5

Environmental Conditions:

Temperature (°C):	21 to 23
Relative Humidity (%):	40

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. In accordance with Part 15.249(d) & RSS-210 B.10(b), all emissions outside of the specified frequency band shall be attenuated by at least 50 dBc or the general radiated emission limits in Part 15.209 & RSS-Gen 8.10, whichever has less attenuation.
3. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz. The sweep time was set to auto. Peak and average measurements were performed with their respective detectors. Markers were placed on the band edge spot frequencies.
4. The lower average band edge measurements were performed using the test method detailed in ANSI C63.10 Section 6.10.5 which exceeded the limits. The measurements were repeated using the marker-delta method in accordance with ANSI C63.10 Section 6.10.6. An in-band field strength measurement was initially performed. A second measurement was performed using a reduced RBW of 120 kHz which is 1% of the 12 MHz span. The amplitude delta between the peak of the fundamental emission and the emission level at each band edge was recorded. The delta was subtracted from the initial in-band field strength level to obtain the corrected average band edge levels.

Transmitter Band Edge Radiated Emissions (continued)

Results: *Bluetooth* LE / 1M

Results: Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400	Horizontal	66.6	74.0	7.4	Complied
2483.5	Horizontal	56.1	74.0	17.9	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Antenna Polarity	Fundamental Peak Emission Level (dBµV/m)	Fundamental and Band Edge Delta (dB)	Corrected Average Level (dBµV/m)
2400	Horizontal	96.1	47.7	48.4

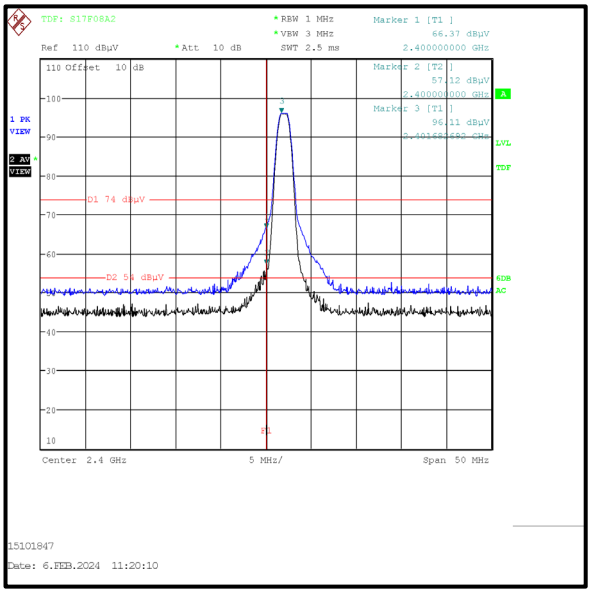
Frequency (MHz)	Antenna Polarity	Corrected Average Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400	Horizontal	48.4	54.0	5.6	Complied

Results: Upper Band Edge / Average

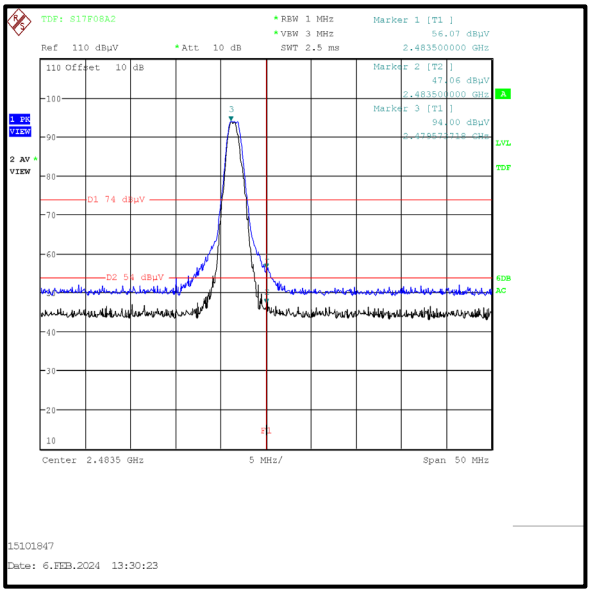
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Horizontal	47.1	54.0	6.9	Complied

Transmitter Band Edge Radiated Emissions (continued)

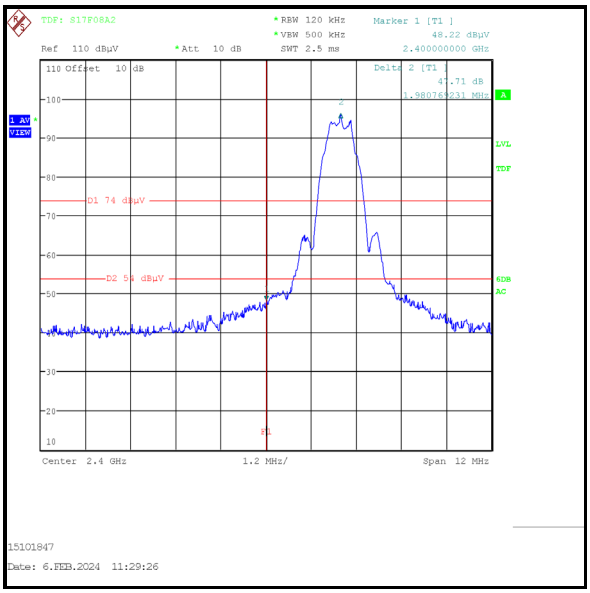
Results: *Bluetooth* LE / 1M



Lower Band Edge



Upper Band Edge



Lower Band Edge Average Measurement – Marker Delta method

Transmitter Band Edge Radiated Emissions (continued)

Results: ShockBurst / 2M

Results: Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400	Horizontal	64.4	74.0	9.6	Complied
2483.5	Horizontal	54.3	74.0	19.7	Complied
2483.740	Horizontal	54.7	74.0	19.3	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Antenna Polarity	Fundamental Peak Emission Level (dBµV/m)	Fundamental and Band Edge Delta (dB)	Corrected Average Level (dBµV/m)
2399.962	Horizontal	92.5	40.9	51.6
2400	Horizontal	92.5	41.8	50.7

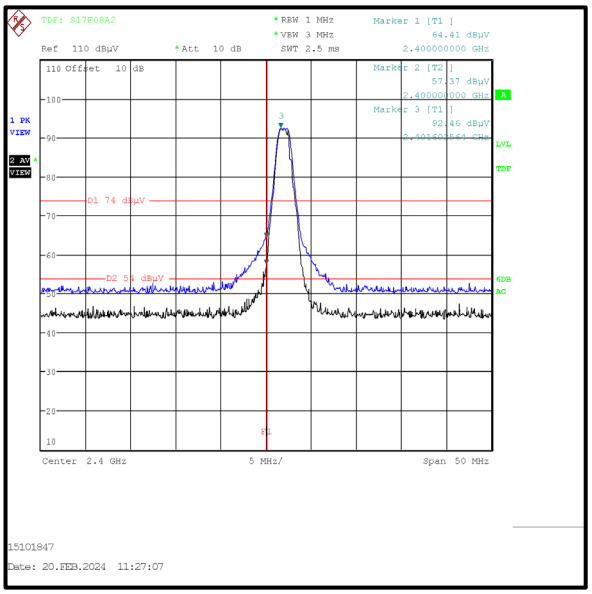
Frequency (MHz)	Antenna Polarity	Corrected Average Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2399.962	Horizontal	51.6	54.0	2.4	Complied
2400	Horizontal	50.7	54.0	3.3	Complied

Results: Upper Band Edge / Average

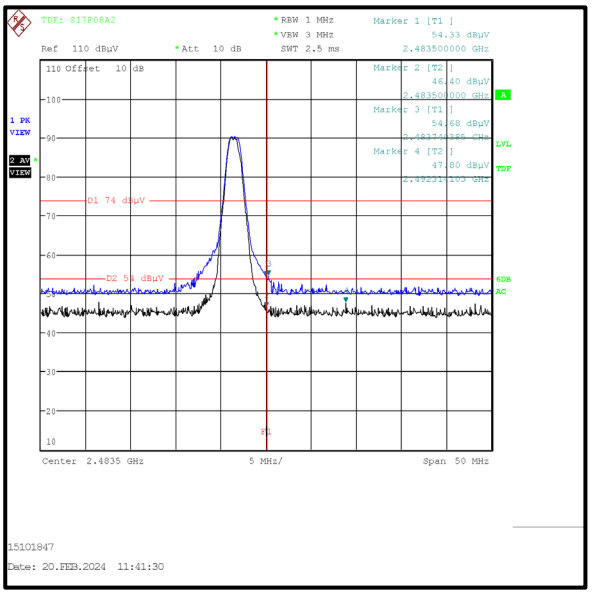
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Horizontal	46.4	54.0	7.6	Complied
2492.314	Horizontal	47.8	54.0	6.2	Complied

Transmitter Band Edge Radiated Emissions (continued)

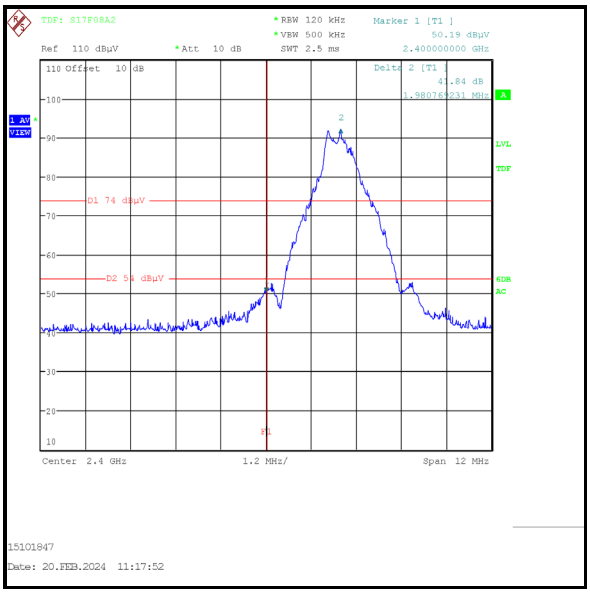
Results: ShockBurst / 2M



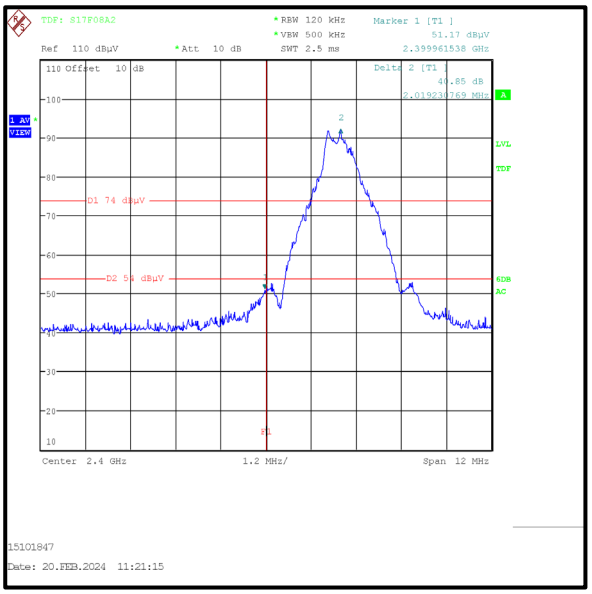
Lower Band Edge



Upper Band Edge



Lower Band Edge Average Measurement – Marker Delta method – Marker 1



Lower Band Edge Average Measurement – Marker Delta method – Marker 2

Annex A – Duty Cycle Correction

During real world use, the EUT transmits MIDI data over *Bluetooth* LE / ShockBurst when a note is played and when a note is modulated.

The worst-case scenario would be achieved when 10 notes are played and modulated simultaneously. In this scenario, the customer declared a duty cycle of 16% over a 100 ms period, based on internal measurements.

In accordance with ANSI C63.10 Section 7.5, the duty cycle correction was calculated as follows:

$$20*\log(0.16) = 15.9\ dB$$

--- END OF REPORT ---