TEST REPORT

Test Report No. : UL-RPT-RP14777092-216A

Customer	:	Cyden Limited
Model No. / HVIN	:	6036
PMN	:	Skin i-expert
FCC ID	:	2BAZ9-6036
ISED Certification No.	:	IC: 30469-6036
Technology	:	*Bluetooth* – Low Energy
Test Standard(s)	:	FCC Parts 15.209(a) & 15.247 Innovation, Science and Economic Development Canada RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 February 2021
Test Laboratory	:	UL International (UK) Ltd, Basingstoke, Hampshire, RG24 8AH, United Kingdom

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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 2.0 supersedes all previous versions.

Date of Issue: 26 June 2023

Checked by:

Ben Mercer
Lead Project Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
RF Operations Leader, Radio Laboratory

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Customer Information

Company Name:	Cyden Limited
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Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	22/06/2023	Initial Version	Ben Mercer
2.0	26/06/2023	Antenna gain updated	Ben Mercer

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1 Attestation of Test Results

1.1 Description of EUT

The equipment under test was an IPL hair removal device containing a Bluetooth LE and 2.4 GHz WLAN transciever.

1.2 General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.247
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-247 Issue 2 February 2017
Specification Title:	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
Site Registration:	FCC: 685609, ISEDC: 20903
FCC Lab. Designation No.:	UK2011
ISEDC CABID:	UK0001
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, G24 8AH, United Kingdom
Test Dates:	10 May 2023 to 11 May 2023

1.3 Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
Part 15.247(d) & 15.209(a)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Radiated Emissions	✓
Part 15.247(d) & 15.209(a)	RSS-Gen 6.13 / RSS-247 5.5	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 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	-

UL International (UK) Ltd is accredited by the United Kingdom Accreditation Service (UKAS). UKAS is one of the signatories to the International Laboratory Accreditation Co-operation (ILAC) Arrangement for the mutual recognition of test reports. The tests reported herein have been performed in accordance with its terms of accreditation.

2.2 Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 558074 D01 15.247 Meas Guidance v05r02, April 2, 2019
Title:	Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC Rules

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

The decision rule applied is based upon the accuracy method criteria. The measurement uncertainty is met and the result is considered in conformance with the requirement criteria if the observed value is within the prescribed limit.

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
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 Radiated Emissions Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2023	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	05 Sep 2023	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	19 May 2023	12
A3154	Pre-Amplifier	Com Power	PAM-103	18020012	18 Aug 2023	12
A3179	Pre-Amplifier	Hewlett Packard	8449B	3008A00934	14 Sep 2023	12
A222867	Pre-Amplifier	Atlantic Microwave	A-LNAKX-380116-S5S5	220705002	26 Aug 2023	12
A2896	Pre-Amplifier	Schwarzbeck	BBV 9721	9721 - 023	01 Mar 2024	12
A3165	Antenna	ETS-Lindgren	6502	00224383	13 Apr 2024	12
A3161	Antenna	Teseq	CBL6111D	50859	04 Jun 2023	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	22 Aug 2023	12
A3139	Antenna	Schwarzbeck	HWRD750	00027	22 Aug 2023	12
A2895	Antenna	Schwarzbeck	BBHA 9170	9170-728	27 Feb 2024	12
A2924	Attenuator	AtlanTecRF	AN18W5-20	832828#7	26 Jan 2024	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	26 Jan 2024	12
A3085	Low Pass Filter	AtlanTecRF	AFL-02000	18051600014	26 Jan 2024	12
A3093	High Pass Filter	AtlanTecRF	AFH-03000	18051800077	26 Jan 2024	12
A3095	High Pass Filter	AtlanTecRF	AFH-07000	18051600012	26 Jan 2024	12

Test Equipment Used for Transmitter Band Edge Radiated Emissions Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2023	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	05 Sep 2023	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	19 May 2023	12
A3179	Pre-Amplifier	Hewlett Packard	8449B	3008A00934	14 Sep 2023	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	22 Aug 2023	12
A2924	Attenuator	AtlanTecRF	AN18W5-20	832828#7	26 Jan 2024	12
A2523	Attenuator	AtlanTecRF	AN18W5-10	832827#1	26 Jan 2024	12

3 Equipment Under Test (EUT)

3.1 Identification of Equipment Under Test (EUT)

Brand Name:	Braun
Model Name or Number / HVIN:	6036
PMN:	Skin i-expert
Test Sample Serial Number:	W100C24309060 *(Radiated sample #1)*
Hardware Version:	CA10-1108 v00
Software Version:	CS02-1103 : Victoria 3.0 (WiFi) - Handset Software : (v1.01)
Firmware Version:	Test firmware provided by module manufacturer
FCC ID:	2BAZ9-6036
ISED Canada Certification No.:	IC: 30469-6036

3.2 Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3 Additional Information Related to Testing

Technology Tested:	*Bluetooth* Low Energy (Digital Transmission System)		
Type of Unit:	Transceiver		
Channel Spacing:	2 MHz		
Modulation:	GFSK		
Data Rate: LE	1 Mbps		
Power Supply Requirement(s):	Nominal	120 VAC 60 Hz	
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	37	2402
	Middle	38	2440
	Top	39	2480

3.4 Description of Available Antenna

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

Frequency Range (MHz)	Antenna Gain (dBi)
2400-2480	2.5

3.5 Description of Test Setup

Support Equipment

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

Description:	IoT Dev-Board
Brand Name:	HELTEC
Model Name or Number:	HTIT-WB32LA
Serial Number:	Not marked or stated

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	XPS 15
Serial Number:	9XZMNF2

Operating Modes

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

- Transmitting at maximum power in *Bluetooth* LE mode with modulation, maximum possible data length available and Pseudorandom Bit Sequence 9.

Configuration and Peripherals

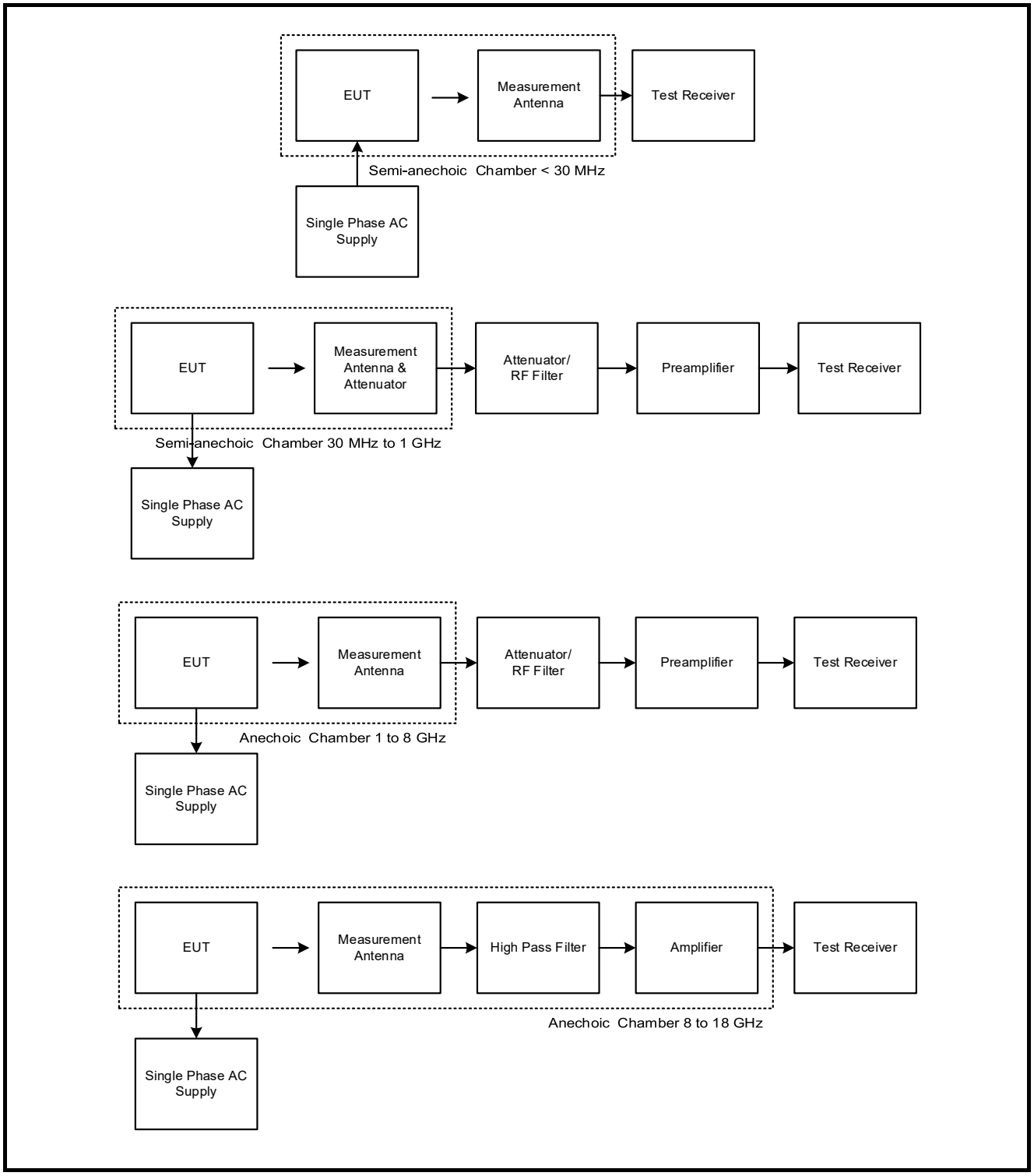
The EUT was tested in the following configuration(s):

- Controlled in test mode using a set of commands entered by the customer into a terminal application on the test laptop. The commands were used to enable a continuous transmission and to select the test channels as required.
- Transmitter radiated emissions were performed with the EUT in the position that produced worst case with respect to emissions. The EUT was connected to 120 VAC 60 Hz single phase mains supply.

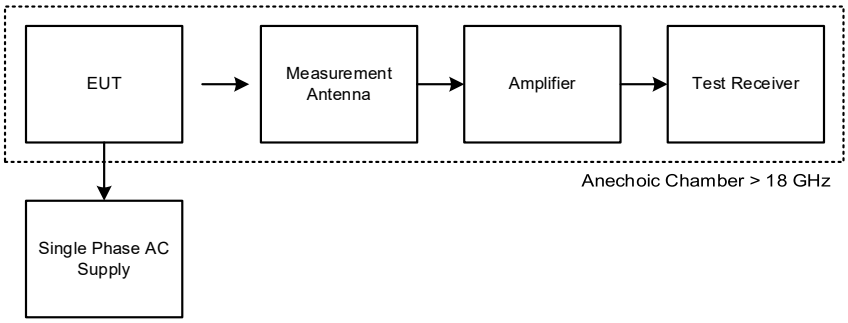
Test Setup Diagrams

Radiated Tests:

Test Setup for Transmitter Radiated Emissions



Test Setup Diagrams (continued)



4 Radiated Test Results

4.1 Transmitter Radiated Emissions <1 GHz

Test Summary:

Test Engineer:	Jose Bayona	**Test Date:**	11 May 2023
Test Sample Serial Number:	W100C24309060		

FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
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):	23
Relative Humidity (%):	45

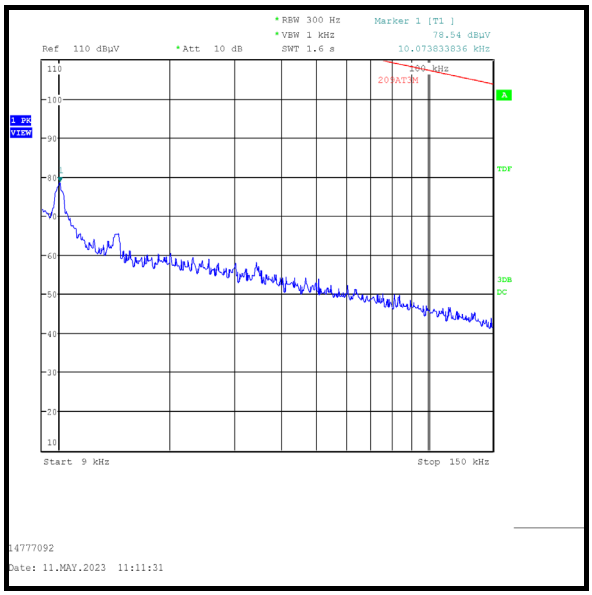
Note(s):

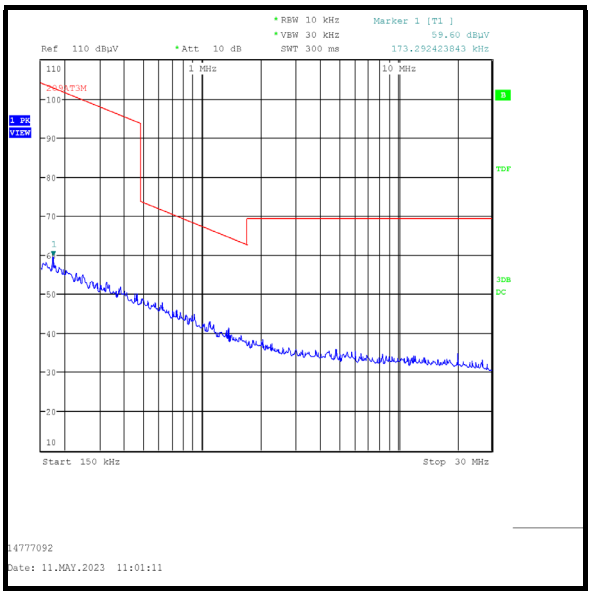
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the middle channel only.
3. All other emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
4. Measurements below 30 MHz were performed in a semi-anechoic chamber (Asset Number K0001) at 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. The limit was extrapolated to 3 metres in accordance with ANSI C63.10 clause 6.4.3 using the method described in clause 6.4.4.2. ANSI C63.10 clause 5.2 states an alternative test site that can demonstrate equivalence to an open area test site may be used for measurements below 30 MHz. Therefore, measurements were performed in a semi-anechoic chamber. The correlation data between semi-anechoic chamber and an open field test site is available upon request.
5. Measurements from 30 MHz to 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.
6. 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.
7. Final measurements were performed on the marker frequencies and the results entered into the table below. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span wide enough to see the whole emission.

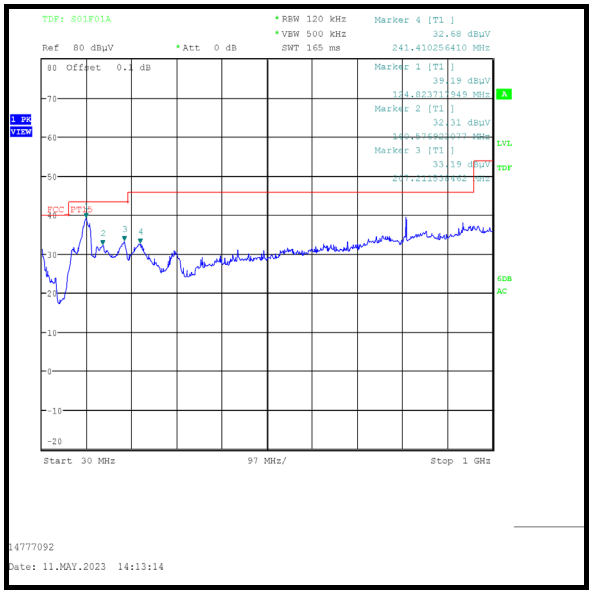
Transmitter Radiated Emissions (continued)

Results: Quasi-Peak / Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
131.474	Vertical	36.5	43.5	7.0	Complied
168.398	Vertical	28.9	43.5	14.6	Complied
240.589	Horizontal	30.1	46.0	15.9	Complied







Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.

4.2 Transmitter Radiated Emissions >1 GHz

Test Summary:

Test Engineer:	Jose Bayona	**Test Dates:**	11 May 2023 & 12 May 2023
Test Sample Serial Number:	W100C24309060		

FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	FCC KDB 558074 Sections 8.1 c)3), 8.5 & 8.6 referencing ANSI C63.10 Sections 6.3, 6.6, 11.11 & 11.12
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	45

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
3. The emission shown on the 1 GHz to 3 GHz plot is the EUT fundamental.
4. *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 not necessary to perform an average measurement.
5. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0001) 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.
6. Final measurements above 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 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.
7. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto. Peak and average measurements were performed with their own appropriate detectors during the pre-scan measurements.
8. Final measurements were performed on the marker frequencies and the results entered into the table below. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto, with and span wide enough to see the whole emission.

Transmitter Radiated Emissions (continued)

Results: Bottom Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
4804.296	Vertical	46.5	54.0*	7.5	Complied

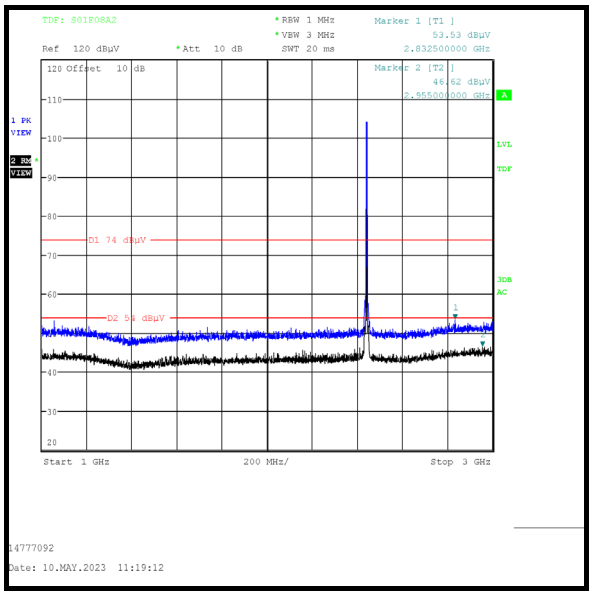
Results: Middle Channel

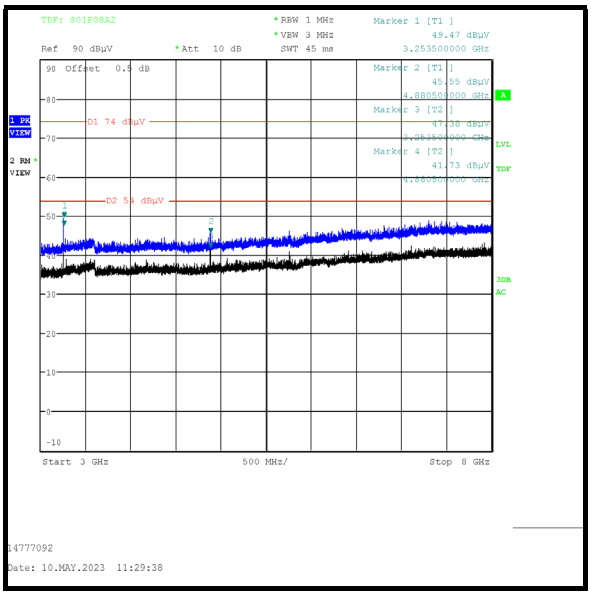
Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
4880.149	Vertical	47.4	54.0*	6.6	Complied

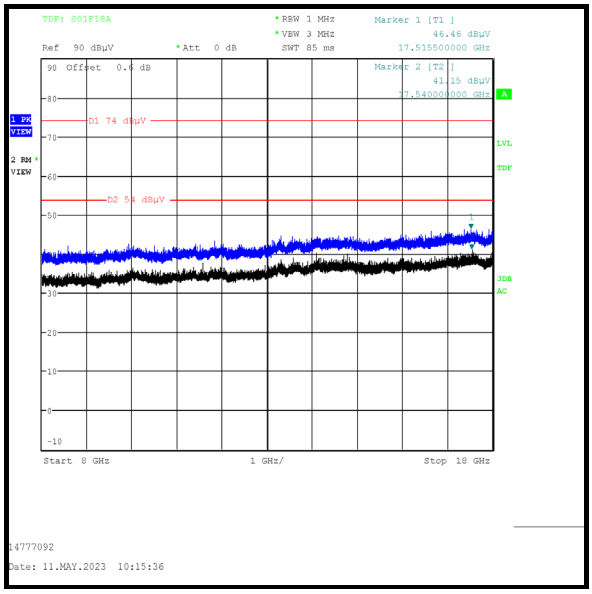
Results: Top Channel

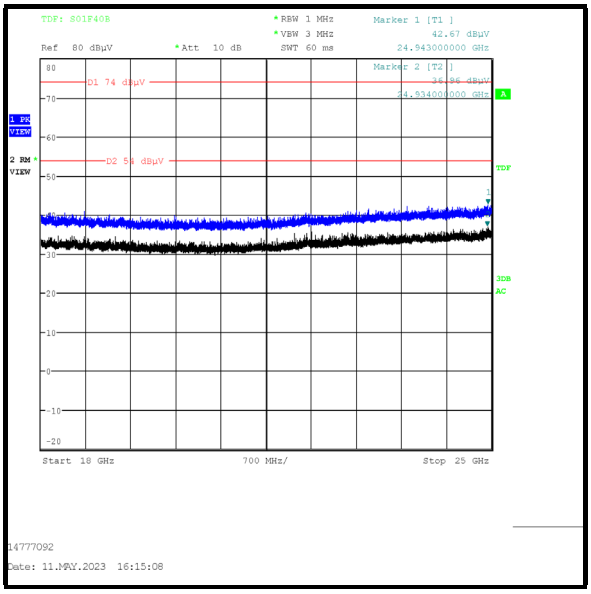
Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
4959.48	Vertical	48.1	54.0*	5.9	Complied

Transmitter Radiated Emissions (continued)









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

4.3 Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Jose Bayona	**Test Date:**	10 May 2023
Test Sample Serial Number:	W100C24309060		

FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 / RSS-247 5.5
Test Method Used:	KDB 558074 Section 8.7 referencing ANSI C63.10 Sections 11.11, 11.12 & 11.13

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	45

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. As the lower band edge is adjacent to a non-restricted band, only peak measurements are required. In accordance with ANSI C63.10 Section 11.11.1, the test method in Section 11.11.3 was followed: the test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker and corresponding reference level line were placed on the peak of the carrier. As the maximum peak conducted output power was measured using an peak detector in accordance with ANSI C63.10 Section 11.9.1.1 an out-of-band limit line was placed 20 dB (ANSI C63.10 Section 11.11.1(a)) below the peak level. A marker was placed on the band edge spot frequencies. Marker frequency and levels were recorded.
3. As the upper band edge is adjacent to a restricted band, both peak and average measurements were recorded by placing a marker at the edge of the band. For peak measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. For average measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. An RMS detector was used, sweep time was set to auto and trace mode was Max Hold. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
4. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with peak and RMS detectors respectively. Markers were placed on the highest point on each trace.

Transmitter Band Edge Radiated Emissions (continued)

Results: Lower Band Edge

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2394.792	Horizontal	52.8	83.2	30.4	Complied
2400	Horizontal	50.9	83.2	32.3	Complied

Results: Upper Band Edge / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Horizontal	54.7	74.0	19.3	Complied
2488.388	Horizontal	57.6	74.0	16.4	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Horizontal	45.4	54.0	8.6	Complied
2488.708	Horizontal	52.4	54.0	1.6	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Peak

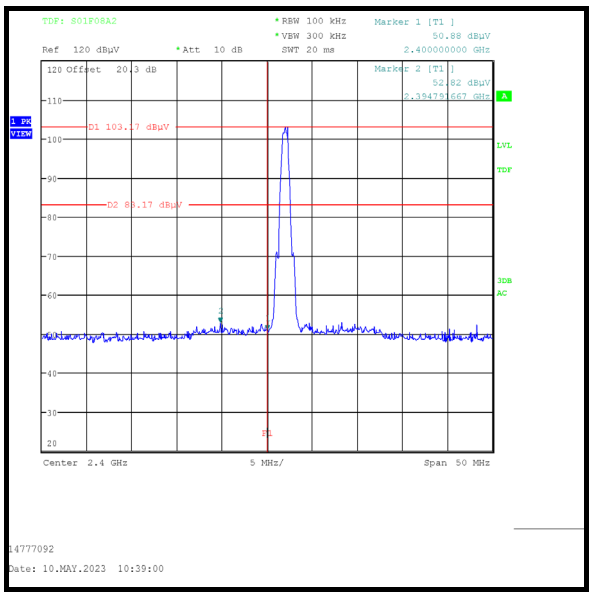
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2390.000	Horizontal	53.8	74.0	20.2	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Average

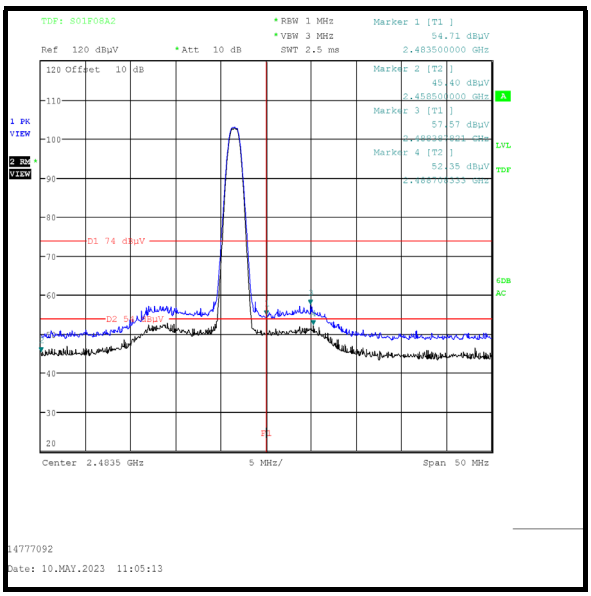
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2390.000	Horizontal	47.6	54.0	6.4	Complied

Transmitter Band Edge Radiated Emissions (continued)

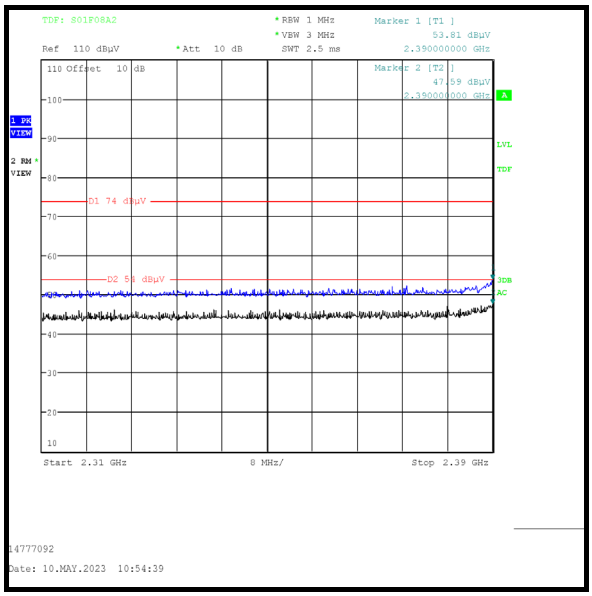
Results:



Lower Band Edge



Upper Band Edge



2310 MHz to 2390 MHz Restricted Band

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