



Solutions

TEST REPORT

Test Report No.: UL-RPT-RP-15158661-1116

Applicant * : EUROTECH SPA

Model No. * : RC1032

FCC ID / ISED IC: * : FCC ID: UKMRC1032
IC: 21442-RC1032

Technology * : WLAN 2.4 GHz (802.11 b, g, n)

Test Standard(s) : **FCC Parts 15.207 15.209(a) & 15.247**
Innovation, Science and Economic Development Canada
RSS-247 Issue 3 August 2023
RSS-Gen Issue 5, April 2018 Amendment 2 (February 2021)
For details of applied tests refer to test result summary

1. This test report shall not be reproduced in full or partial, without the written approval of UL International Germany GmbH.
2. The results in this report apply only to the sample tested.
3. The test results in this report are traceable to the national or international standards.
4. **Test Report Version 1.2 supersede Version 1.1 with immediate effect**
Test Report No. UL-RPT-RP-15158661-1116 Version 1.2, Issue Date 14 February 2025 replaces
Test Report No. UL-RPT-RP-15158661-1116 Version 1.1, Issue Date 10 February 2025, which is no longer valid.
5. Result of the tested sample: **Pass**
6. All information marked with a (*) were provided by customer / applicant or authorized representative

Yixiang Lin

Prepared by: Yixiang Lin
Title: Project Engineer
Date: 14 February 2025

Faiq Khan

Approved by: Muhammad Faiq Khan
Title: Project Engineer
Date: 14 February 2025



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D-PL-19381-02-00

This laboratory is accredited by DAkkS.
The tests reported herein have been performed in
accordance with its' terms of accreditation.

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1. Customer Information *

1.1. Applicant Information

Company Name:	EUROTECH SPA
Company Address:	Via FRATELLI SOLARI 3/A AMARO, Udine 33020 Italy
Contact Person:	Omar Toniutti
Contact E-Mail Address:	omar.toniutti@eurotech.com
Contact Phone No.:	-/-

1.2. Manufacturer Information

Company Name:	EUROTECH SPA
Company Address:	Via FRATELLI SOLARI 3/A AMARO, Udine 33020 Italy
Contact Person:	Omar Toniutti
Contact E-Mail Address:	omar.toniutti@eurotech.com
Contact Phone No.:	-/-

2. Summary of Testing

2.1. General Information

Applied Standards

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR 15.207 15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 15.209
Specification Reference:	RSS-Gen Issue 5, April 2018 Amendment 2 (February 2021)
Specification Title:	General Requirements for Compliance of Radio Apparatus
Specification Reference:	RSS-247 Issue 3 August 2023
Specification Title:	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices




Location

Location of Testing:	UL International Germany GmbH Hedelfinger Strasse. 61, 70327 Stuttgart, GERMANY
Site Registration:	FCC: 399704, ISEDC: 22511
FCC Lab. Designation No.:	DE0019
ISEDC CABID:	DE0008



Date Information

Order Date:	26 January 2024
EUT arrived:	15 July 2024
Test Dates:	18 July 2024 to 26 July 2024
EUT returned:	-/-

2.2. Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
Part 15.35(c)	N/A	Transmitter Duty Cycle	Note 2
N/A	RSS-Gen 6.7	Transmitter 99% Occupied Bandwidth	N.P.
Part 15.247(a)(2)	RSS-Gen 6.7 / RSS-247 5.2(a)	Transmitter Minimum 6 dB Bandwidth	N.P.
Part 15.247(b)(3)	RSS-Gen 6.12 / RSS-247 5.4(d)	Transmitter Maximum Peak Output Power	N.P.
Part 15.247(e)	RSS-247 5.2(b)	Transmitter Power Spectral Density	N.P.
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	
Part 15.207	RSS-Gen 8.8	Transmitter AC Conducted Emissions	

Key to Results

 = Complied  = Did not comply N.P. = NOT PERFORMED N.A. = NOT APPLICABLE

Note(s):

1. The test was performed partially because the module is already certified and the tests were performed for C2PC which concerns the antenna change and installation on a specific host.
2. The measurement was performed to assist in the calculation of the level of the emissions. The EUT cannot transmit continuously and sweep triggering/signal gating cannot be implemented.

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	FCC KDB 558074 D01 DTS 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
Reference:	FCC KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

2.4. 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.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT) *

Brand Name:	EUROTECH
Model Name or Number:	RC1032
Serial Number:	B54292 900002
HMN:	RECELL-10-32
HVIN:	RC1032
FVIN:	/
FCC ID:	UKMRC1032
ISED Certification Number:	21442-RC1032

3.2. Description of EUT *

The EUT is the BT/WiFi Module installed in specific host (ReliaCELL 10-32).

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing *

Category of Equipment:	WLAN 2.4 GHz (IEEE 802.11b, g, n)		
Type of Radio Device:	Transceiver		
Power Supply Requirement(s):	Nominal	5V DC	
Tested Data rate:	802.11b	1/2/5.5/11 Mbps	
	802.11g	6/9/12/18/24/36/48/54 Mbps	
	802.11n20	MCS1 to MCS7 (MIMO)	
	802.11n40	MCS1 to MCS7 (MIMO)	
Modulation Type:	DSSS, OFDM		
Nominal Channel Bandwidth:	20 MHz, 40 MHz		
Maximum RF Output Power:	20.432 dBm		
Declared Antenna Gain:	2400 MHz		
	4.71dBi		
Antenna Type:	External Dipole Antenna		
Antenna Details:	Quectel YEWN001AA		
Number of Antenna:	1		
Transmit Frequency Range:	2400 MHz to 2483.5 MHz		
Transmit Channels Tested: BW 20MHz	Channel ID	Channel Number	Frequency (MHz)
	Bottom	1	2412

3.5. Support Equipment

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

A. Support Equipment (In-house)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	-/-	-/-	-/-	-/-

B. Support Equipment (Manufacturer supplied) *

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Host CPU Unit	Eurotech	ReliaGATE-15a-14 Rev.A	Host CPU-1
2	AC/DC Adaptor	Sunny	SYS1541-2424 Input: 100-240 VAC, 50-60 Hz, 1.0 A Output: 24 VDC, 1.0 A	-/-
3	Extension Card for ReliaCELL-10-32	Eurotech	BRD3123_001A1	Extension Card-0R2
4	8-port Gb LAN switch	Netgear	GS608	-/-
5	Laptop with QRCT	HP	HP ZBook 15U G6 (Intel Core i7; 8th Gen)	CAM02WKS452/5CG9518S1M

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

☒ Transmitter / Modulated Carrier Continuous Transmissions Mode WLAN 2.4 GHz:

- 802.11b | 20 MHz | No-HT | 1 Mbps | Bottom Channel |

As a C2PC application, tests were performed on Bottom channel only, based on worst case result from pre-scan test.

4.2. Configuration and Peripherals

- The customer supplied document containing the setup instructions RC1032-RF-TEST-FCC-B03.pdf was used for configuration.

EUT Power Supply:

- The host was powered with 120 V AC 60 Hz, and EUT powered by the host.
- For AC conducted line emissions measurement the host was powered via AC/DC power adapter. The measurements were carried out with 120 VAC /60 Hz & 240 VAC/60 Hz.

Test Mode Activation:

- The EUT can be installed into a host unit and a test laptop via ethernet cable supplied by the customer is used to control the EUT.
- The test modes were activated by Qualcomm Radio Control Tool.

Radiated Measurements:

- Before starting final radiated spurious emission measurements "worst case verification" with the EUT in Standing-position & Laying-position was performed by Lab.
- The EUT in Standing-position was found to be the worst case, with vertical antennas orientation.
- The radiated measurements below 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the loop antenna height was set to 80 cm.
- The radiated measurements above 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the antenna height varies from 1 to 4 m over the measurement frequency range.
- R&S® EMC32 V11.30.00 Software was used for the Radiated spurious emission measurements.
- The continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and EUT was transmitting with different duty cycles w.r.t to different modes. Duty Cycle Correction Factors (as mentioned below) were added to all average measurements respectively according to the modes used to compensate as if it was transmitting with 100% duty cycle.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 6 *Measurement Uncertainty* for details.

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

5.1.1. Transmitter AC Conducted Spurious Emissions**Test Summary:**

Test Engineers:	Abbas Al-Hussainy	Test Dates:	18 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 7/8		

FCC Reference:	Part 15.207
ISED Reference:	RSS-GEN 8.8
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

Environmental Conditions:

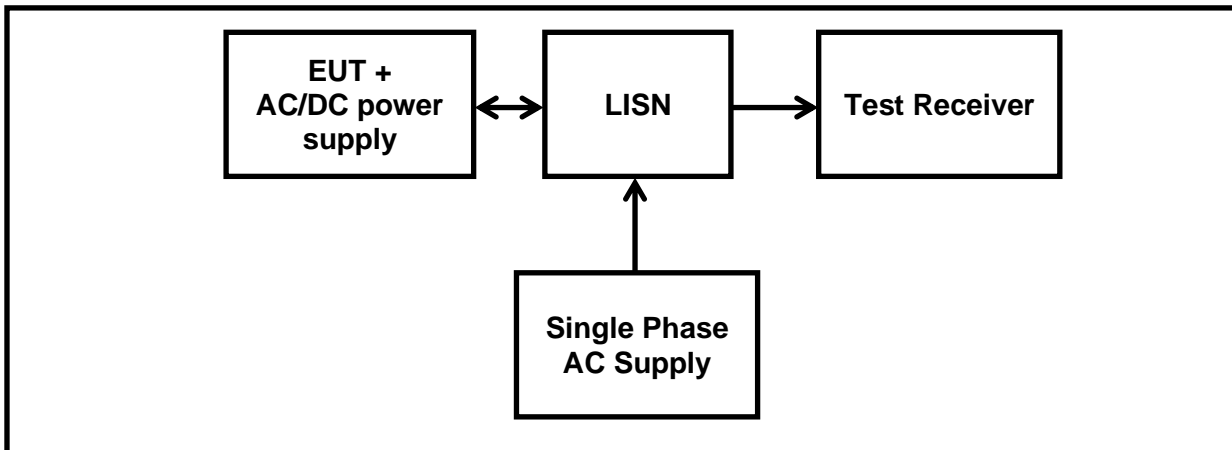
Temperature (°C):	22.2
Relative Humidity (%):	42.6

Settings of the Instrument

Detector	Quasi Peak/ Average
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Note(s):

1. The EUT was plugged into an AC/DC switching adaptor. The switching Adaptor was connected to 120 VAC / 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the 100-240 VAC~50/60 Hz power supply.
3. The EUT was configured with the following modes w.r.t output power:
b-Mode | 1Mbps | Power Level 17 | UNII-1 | Channel 1: 2412 MHz
4. Pre-scans were performed, and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
5. The final measured value, for the given emission, in the table below incorporates the cable loss.
6. 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.
7. Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 80 cm above the reference ground plane and in a distance of 40 cm from the vertical ground plane at the edge of the table.
8. Measurement software used: Toyo EMI Software; CE measurement software EP5/CE Ver 4.0.1.

Transmitter AC Conducted Spurious Emissions (continued)**Test Setup:**

Transmitter AC Conducted Spurious Emissions (continued)**Results: 802.11b / 20 MHz / 1Mbps / PWR 17 / CH1****Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.24588	Live	46.90	61.90	15.00	Complied
0.54891	Live	29.20	56.00	26.80	Complied
1.16088	Live	17.50	56.00	38.50	Complied
2.14844	Live	16.50	56.00	39.50	Complied
11.50126	Live	13.30	60.00	46.70	Complied
6.82304	Live	29.60	60.00	30.40	Complied

Results: Live / Average / 120 VAC 60 Hz

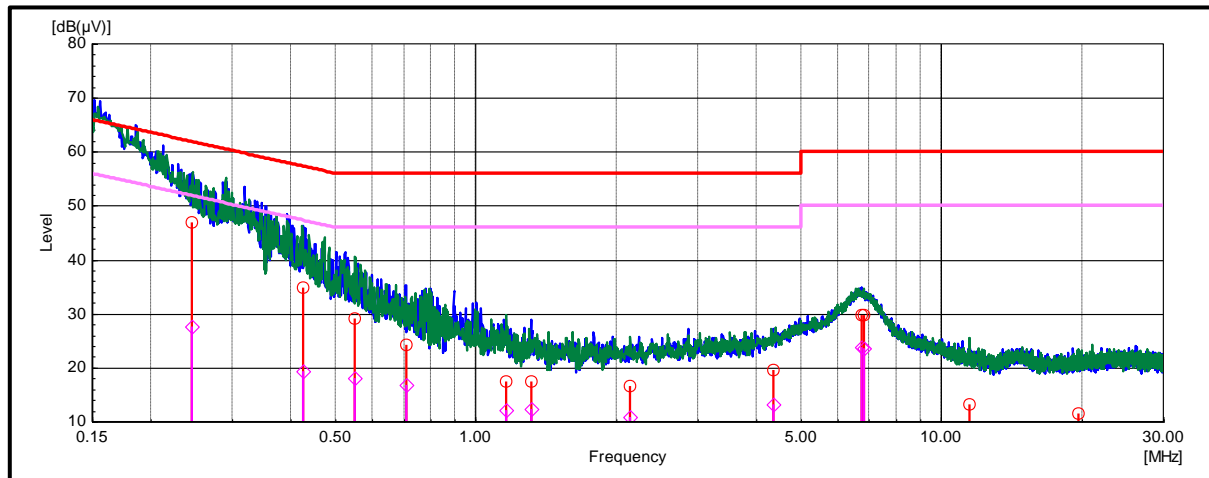
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.24588	Live	27.60	51.90	24.30	Complied
0.54891	Live	18.00	46.00	28.00	Complied
1.16088	Live	12.00	46.00	34.00	Complied
2.14844	Live	10.90	46.00	35.10	Complied
11.50126	Live	8.70	50.00	41.30	Complied
6.82304	Live	23.60	50.00	26.40	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: 802.11b / 20 MHz / 1Mbps / PWR 17 / CH1****Results: Neutral / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.42623	Neutral	34.80	57.30	22.50	Complied
0.70954	Neutral	24.20	56.00	31.80	Complied
1.31986	Neutral	17.50	56.00	38.50	Complied
4.36301	Neutral	19.50	56.00	36.50	Complied
19.77088	Neutral	11.40	60.00	48.60	Complied
6.76097	Neutral	29.80	60.00	30.20	Complied

Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.42623	Neutral	19.40	47.30	27.90	Complied
0.70954	Neutral	16.80	46.00	29.20	Complied
1.31986	Neutral	12.40	46.00	33.60	Complied
4.36301	Neutral	13.20	46.00	32.80	Complied
19.77088	Neutral	7.20	50.00	42.80	Complied
6.76097	Neutral	23.70	50.00	26.30	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: 802.11b / 20 MHz / 1Mbps / PWR 17 / CH1****Plot: Live & Neutral Line / 120 VAC 60 Hz**

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

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)**Results: 802.11b / 20 MHz / 1Mbps / PWR 17 / CH1****Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.18182	Live	58.30	64.40	6.10	Complied
0.23026	Live	51.20	62.40	11.20	Complied
0.42356	Live	33.80	57.40	23.60	Complied
0.93354	Live	22.50	56.00	33.50	Complied
2.28852	Live	21.30	56.00	34.70	Complied
7.4139	Live	26.10	60.00	33.90	Complied

Results: Live / Average / 240 VAC 60 Hz

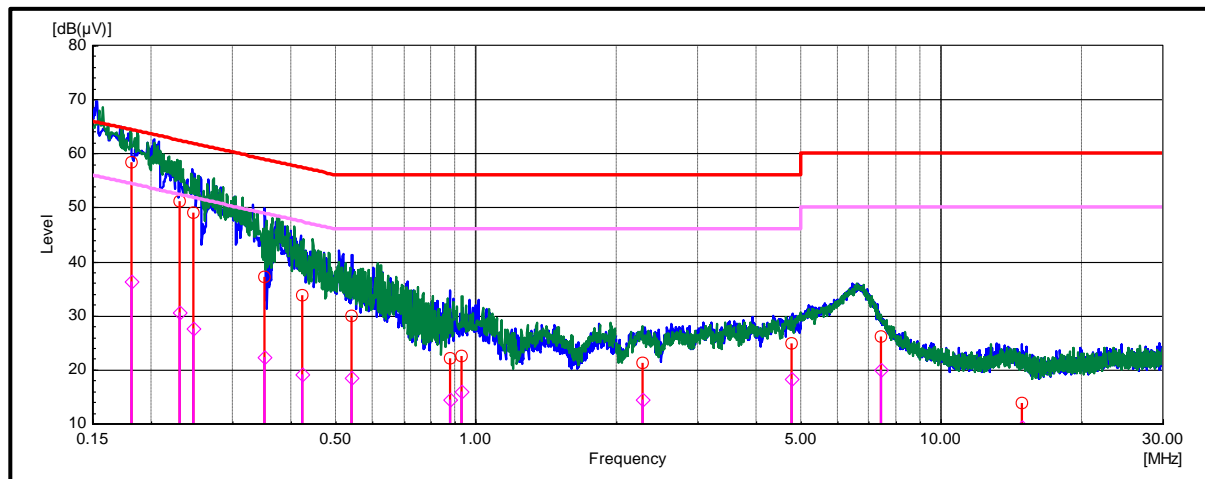
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.18182	Live	36.20	54.40	18.20	Complied
0.23026	Live	30.60	52.40	21.80	Complied
0.42356	Live	19.00	47.40	28.40	Complied
0.93354	Live	16.00	46.00	30.00	Complied
2.28852	Live	14.50	46.00	31.50	Complied
7.4139	Live	20.10	50.00	29.90	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.24676	Neutral	49.10	61.90	12.80	Complied
0.35158	Neutral	37.10	58.90	21.80	Complied
0.54188	Neutral	29.90	56.00	26.10	Complied
0.88168	Neutral	22.10	56.00	33.90	Complied
4.78098	Neutral	24.90	56.00	31.10	Complied
14.93392	Neutral	13.80	60.00	46.20	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: Neutral / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.24676	Neutral	27.60	51.90	24.30	0.24676
0.35158	Neutral	22.30	48.90	26.60	0.35158
0.54188	Neutral	18.50	46.00	27.50	0.54188
0.88168	Neutral	14.40	46.00	31.60	0.88168
4.78098	Neutral	18.30	46.00	27.70	4.78098
14.93392	Neutral	9.40	50.00	40.60	14.93392

Plot: Live & Neutral Line / 240 VAC 60 Hz

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

Result: Pass

5.1.2. Transmitter Duty Cycle**Test Summary:**

Test Engineer:	Abbas Al-Hussainy	Test Date:	25 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 1/2		

FCC Reference:	Part 15.35(c)
Test Method Used:	FCC KDB 789033 D02 Section II.B.2.b)

Environmental Conditions:

Temperature (°C):	24.9
Relative Humidity (%):	49

Notes:

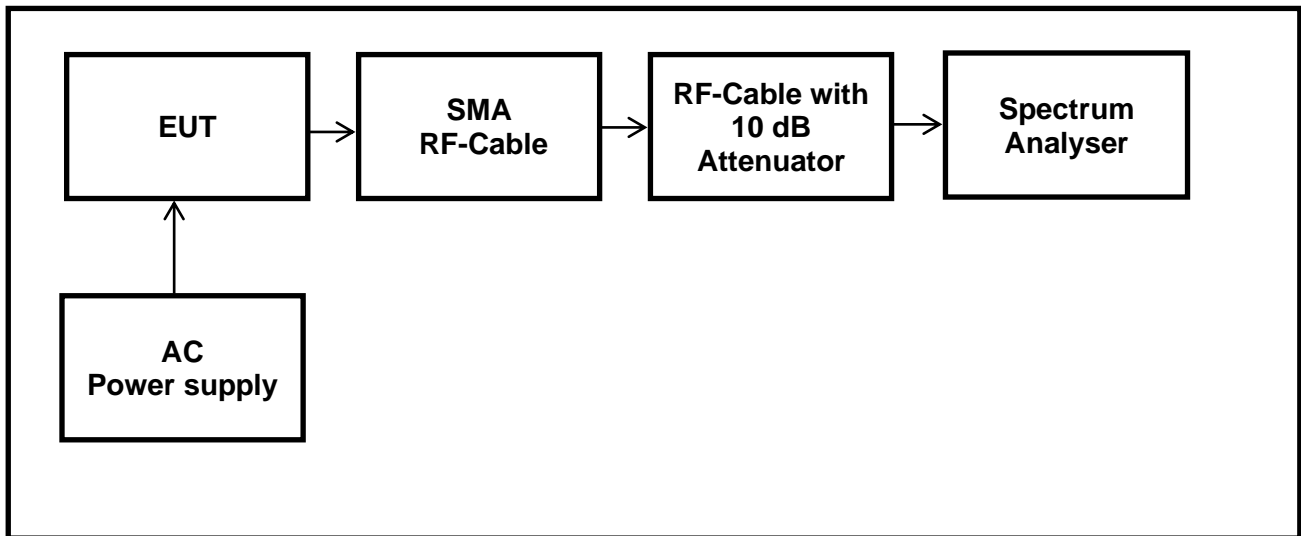
- The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by using the following calculation:

$$\text{Duty Cycle (\%)} = 100 \times [\text{On Time } (T_{ON})] / [\text{Period}(T_{ON} + T_{OFF}) \text{ or } 100\text{ms whichever is the lesser}]$$

$$\text{Duty Cycle Correction Factor} = 10 \log 1 / [\text{On Time } (T_{ON})] / [\text{Period}(T_{ON} + T_{OFF}) \text{ or } 100\text{ms whichever is the lesser}]$$

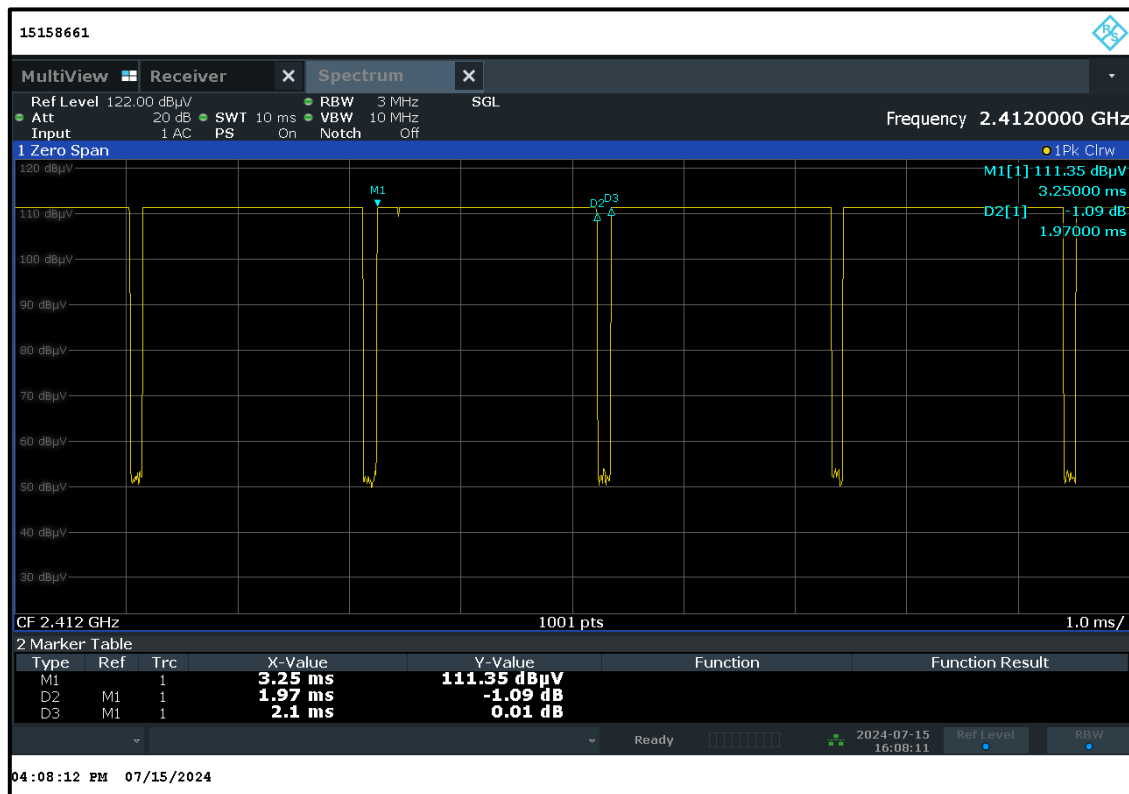
	2.4GHz	DCCF
b-mode	1 Mbps	0.28

- The duty cycle was measured with radiated method, total a reference level offset 13.10 dB was added to each of the at the tested frequencies plots.

Transmitter Duty Cycle (continued)**Test Setup (AC Power Supply):**

Transmitter Duty Cycle (continued)**Results: AC Power Supply / 802.11b / 20 MHz / 1 Mbps / PWR 17**

Pulse On Time (T _{ON}) (ms)	Pulse Period (T _{ON} + T _{OFF}) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
1.97	2.1	93.81	0.28

**Result: Pass**

5.1.3. Transmitter Radiated Emissions**Test Summary:**

Test Engineer:	Muhammad Faiq Khan	Test Date:	26 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 1/2		

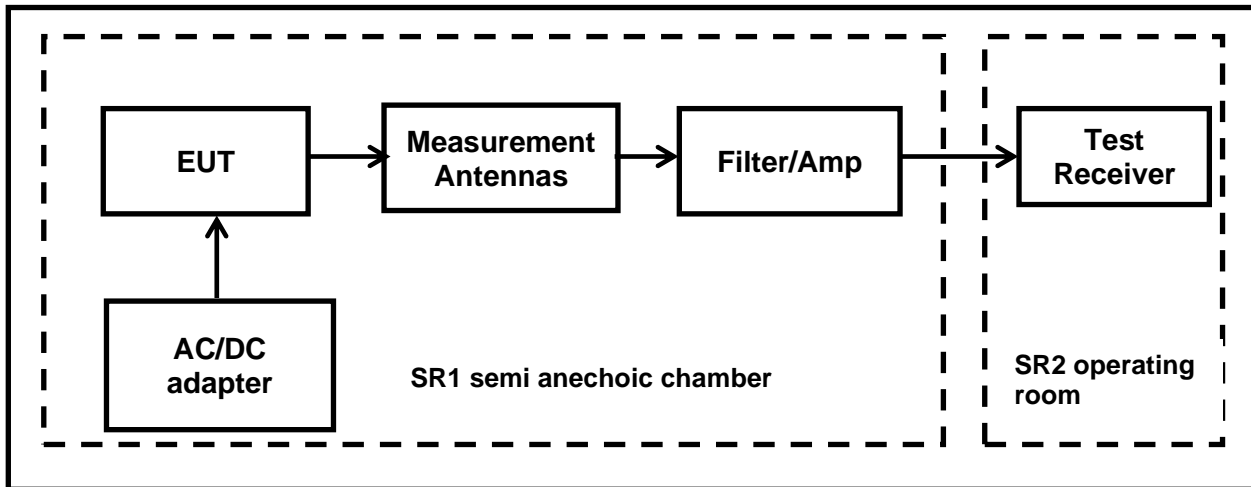
FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5
Frequency Range	9 kHz to 30 MHz

Environmental Conditions:

Temperature (°C):	23.4
Relative Humidity (%):	44.1

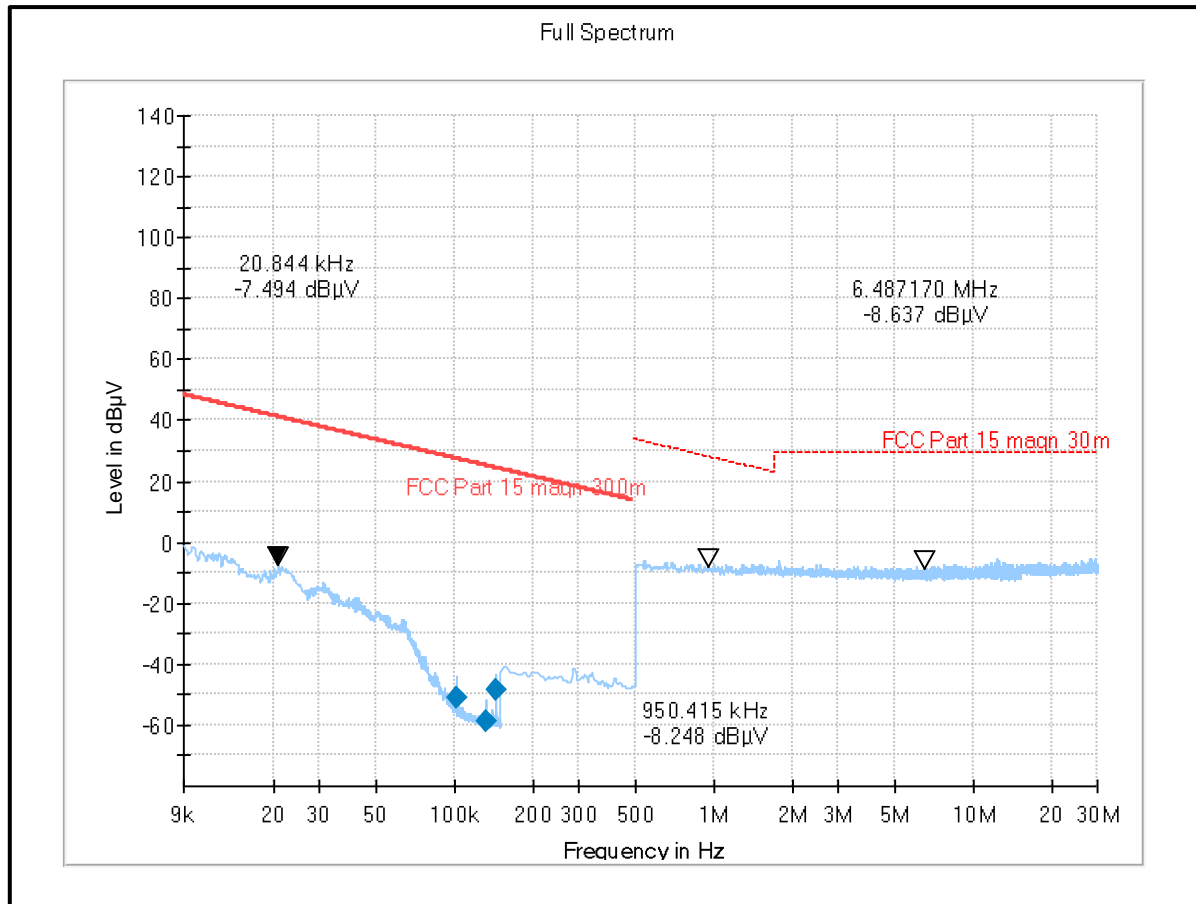
Notes:

- In accordance with FCC KDB 414788 D01 Radiated Test Site & ANSI C63.10 clause 5.2 an alternative test site that can demonstrate equivalence to an open area test site may be used. Therefore, the measurement was performed in a Semi Anechoic Chamber. (The OATS / SAC comparison data is available upon request).
- The limits are specified at a test distances of 30 and 300 metres. However, as specified in FCC Section 15.31 (f)(2) & ANSI C63.10 clause 6.4.3, measurements may be performed at a closer distance and the measured level extrapolated to the specified measurement distance using the method described in clauses 6.4.4, specifically sub-clause 6.4.4.1 which specifies that the measured level shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 40 dB/decade.
Therefore, measurements were performed at a measurement distance of 3 m.
- Therefore, the measurement results in plot are extrapolated to a measurement distance of 300 or 30 m.
 - 9 kHz- 490 kHz: limits extrapolated from 3 m to 300 m by subtracting 80 dB at 40 dB /decade.
 - 490 kHz-1705 kHz: limits extrapolated from 3 m to 30 m by subtracting 40 dB at 40 dB /decade.
- Measurements below 30 MHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. The measurement loop antenna height was 100 cm.
- The radiated emissions measurements were performed with the EUT set to the following worst-case mode.
 - WLAN 2.4 GHz | b-Mode | 20 MHz | 1 Mbps | Bottom channel | PWR 17
- The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
- Pre-scans were performed, and markers placed on the highest measured levels. The test receiver was set to:
 - Frequency range: 9 kHz-150 kHz: RBW: 300 Hz / VBW: 1 kHz
 - Frequency range: 150 kHz – 30 MHz: RBW: 10 kHz /VBW: 30 kHz
 - Detector: Peak detector
 - Trace Mode: Max Hold

Transmitter Radiated Emissions (continued)**Test Setup:**

Transmitter Radiated Emissions (continued)**Results: 802.11b / 20 MHz / 1Mbps / Bottom Channel / PWR xx dBm**

Frequency (MHz)	Loop Antenna Orientation	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
All emissions below more than 20 dB from Margin					

Plot: 9 kHz – 30 MHz: Results: 802.11b / 20 MHz / 1Mbps / Bottom Channel / PWR 17 dBm**Result: Pass**

Transmitter Radiated Emissions (continued)**Test Summary:**

Test Engineer:	Muhammad Faiq Khan	Test Date:	26 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 1/2		

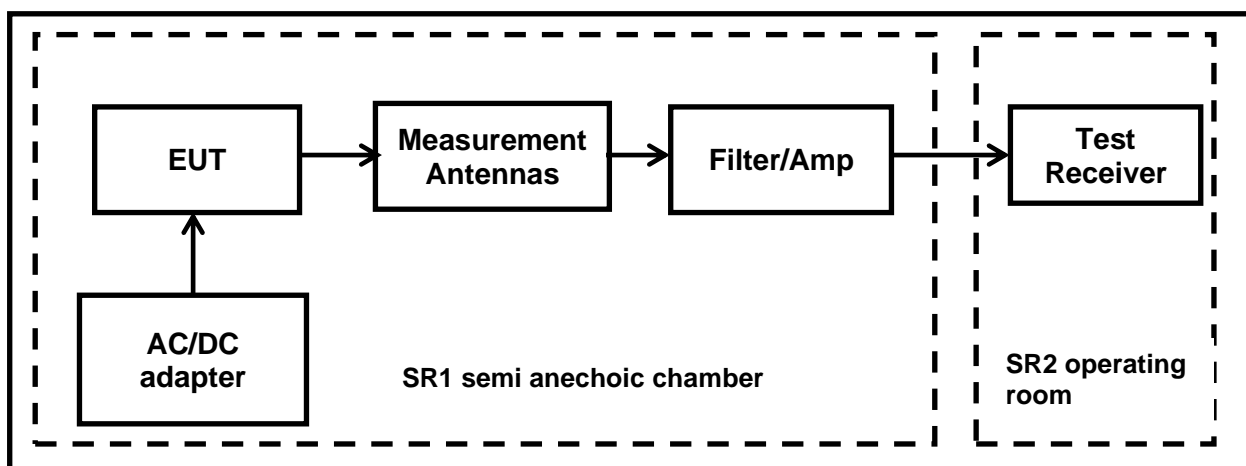
FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	23.4
Relative Humidity (%):	44.1

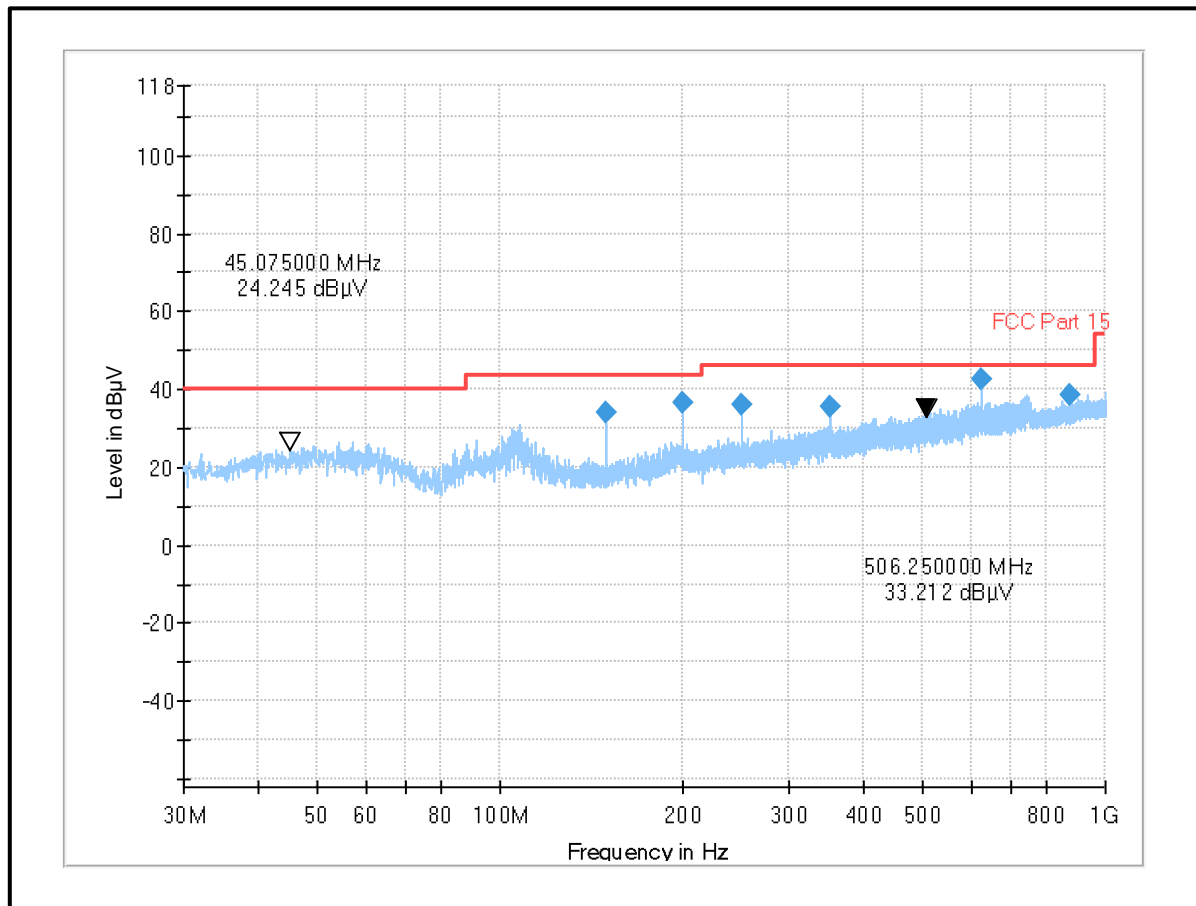
Note(s):

- 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.
- The radiated emissions measurements were performed with the EUT set to the following worst-case mode.
 - WLAN 2.4 GHz | b-Mode | 20 MHz | 1 Mbps | Bottom channel | PWR 17
- Pre-scans were performed, and markers placed on the highest measured levels. 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.
- Final measurements were performed on the marker frequencies. The results entered in the table below incorporates the calibrated antenna factor and cable loss. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span big enough to see the whole emission.
- The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.

Test Setup:

Transmitter Radiated Emissions (continued)**Results: 802.11b / 20 MHz / 1Mbps / Bottom Channel / PWR 17**

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
150.015000	Horizontal	34.20	43.50	9.30	Complied
200.010000	Horizontal	36.46	43.50	7.04	Complied
250.005000	Horizontal	36.28	46.00	9.72	Complied
350.000000	Horizontal	35.32	46.00	10.68	Complied
625.000000	Horizontal	42.79	46.00	3.21	Complied
874.958333	Horizontal	38.55	46.00	7.45	Complied

Plot: 30 MHz – 1GHz: 802.11b / 20 MHz / 1Mbps / Bottom Channel / PWR 17**Result: Pass**

Transmitter Radiated Emissions (continued)**Test Summary:**

Test Engineer:	Muhammad Faiq Khan	Test Date:	26 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 1/2		

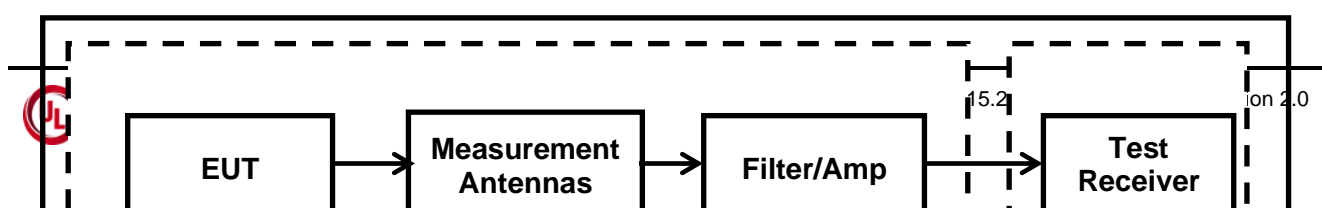
FCC Reference:	Parts 15.247(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	FCC KDB 558074 Sections 8.1 c)3), 8.5 & 8.6 referencing ANSI C63.10 Sections 6.3, 6.6, 11.11 & 11.12
Frequency Range:	1 GHz to 25 GHz

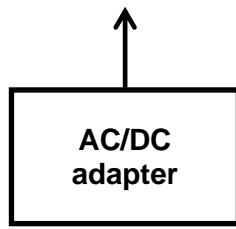
Environmental Conditions:

Temperature (°C):	21.6 to 23.4
Relative Humidity (%):	44.1 to 47.6

Notes:

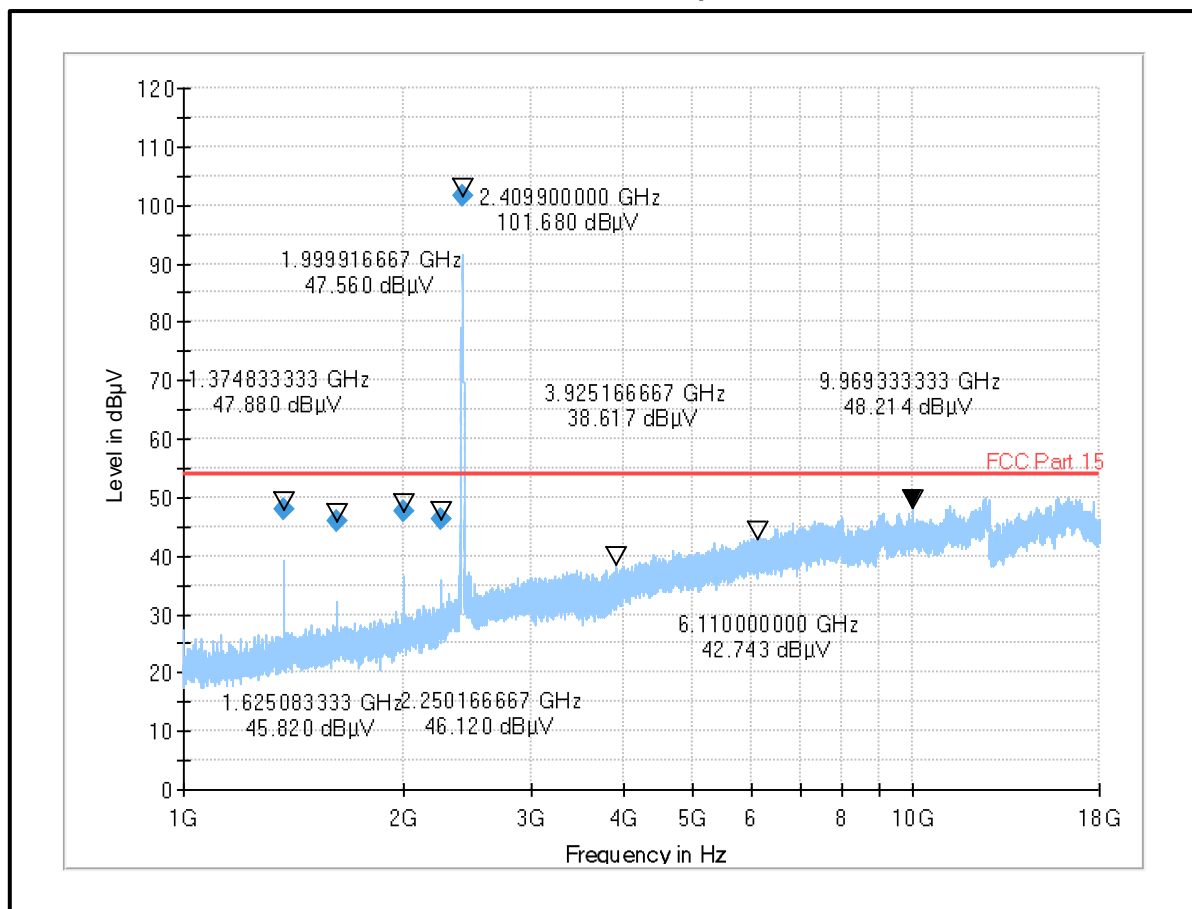
- Pre-scans above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 m above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with absorber on the floor at a distance of 3 m. 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 m to 4 m.
- The radiated measurements were performed with the EUT set to the following worst-case mode w.r.t output power.
 - WLAN 2.4 GHz | b-Mode | 20 MHz | 1 Mbps | PWR 17
- 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.
- The emissions shown at frequencies approximately 2.4 GHz to 2.4835 GHz on the 1 GHz to 18 GHz plots are the EUT fundamental for the tested channel.
- The Non-Restricted Band Emissions were performed in accordance with ANSI C63.10 Section 11.11 As the maximum peak conducted output power was previously measured, in accordance with ANSI C63.10 Section 11.11.1(a) measurements were performed with peak detector and -20 dBc limit applied.
- The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
- For frequency range between 1 GHz and 18 GHz, the final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
- In accordance with ANSI C63.10-2013 Section 5.3.3 & 6.5.3 measurements above 18 GHz were performed at closer distance (1 m); because at specified measurement distance (3m) for compliance the instrumentation noise floor was typically close to the radiated emission limit.

Transmitter Radiated Emissions (continued)**Test Setup:**



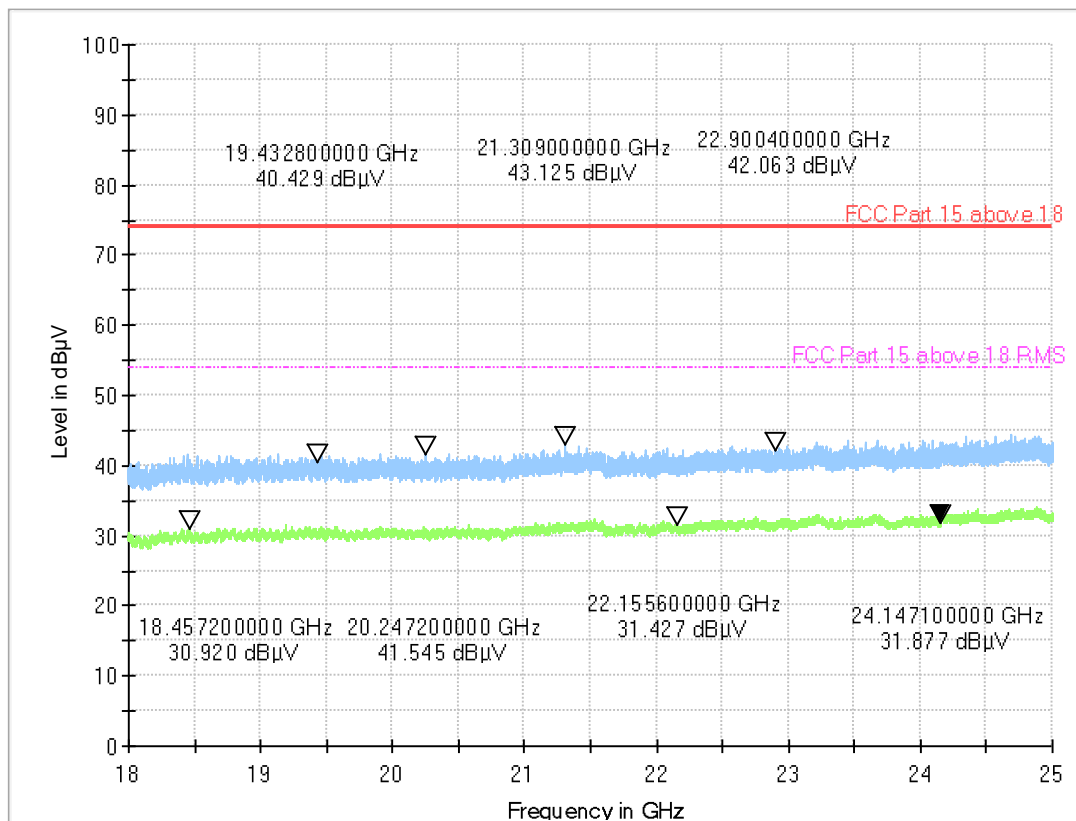
Transmitter Radiated Emissions (continued)**Results: 802.11b / 20 MHz / 1 Mbps / Bottom Channel / PWR 17****Non-Restricted band**

Frequency (MHz)	Antenna Polarization	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
1374.833333	Vertical	47.88	54.00	6.12	Complied
1625.083333	Vertical	45.82	54.00	8.18	Complied
1999.916667	Vertical	47.56	54.00	6.44	Complied
2250.166667	Vertical	46.12	54.00	7.88	Complied

Plot: 1 GHz – 18 GHz: 802.11b / 20 MHz / 1 Mbps / Bottom Channel / PWR 17**Result: Pass**

Transmitter Radiated Emissions (continued)**Results: 802.11b / 20 MHz / 1 Mbps / Bottom Channel / PWR 17**

Frequency (MHz)	Antenna Polarization	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: 18 GHz – 25 GHz: 802.11b / 20 MHz / 1 Mbps / Bottom Channel / PWR 17**Result: Pass**

5.1.4. Transmitter Band Edge Radiated Emissions**Test Summary:**

Test Engineer:	Muhammad Faiq Khan	Test Date:	26 July 2024
Test Sample Serial Number:	B54292 900002		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d), 15.209(a) & 15.205(a)
ISED Canada Reference:	RSS-Gen 6.13 / RSS-247 5.5
Test Method Used:	DTS emissions in non-restricted frequency bands: FCC KDB 558074 Section 8.5 referencing ANSI C63.10:2013 Sections 11.11
	DTS emissions in restricted frequency bands: FCC KDB 558074 Section 8.6 referencing ANSI C63.10:2013 Sections 11.12
	ANSI C63.10:2013 Sections 6.10.4, 6.10.5

Environmental Conditions:

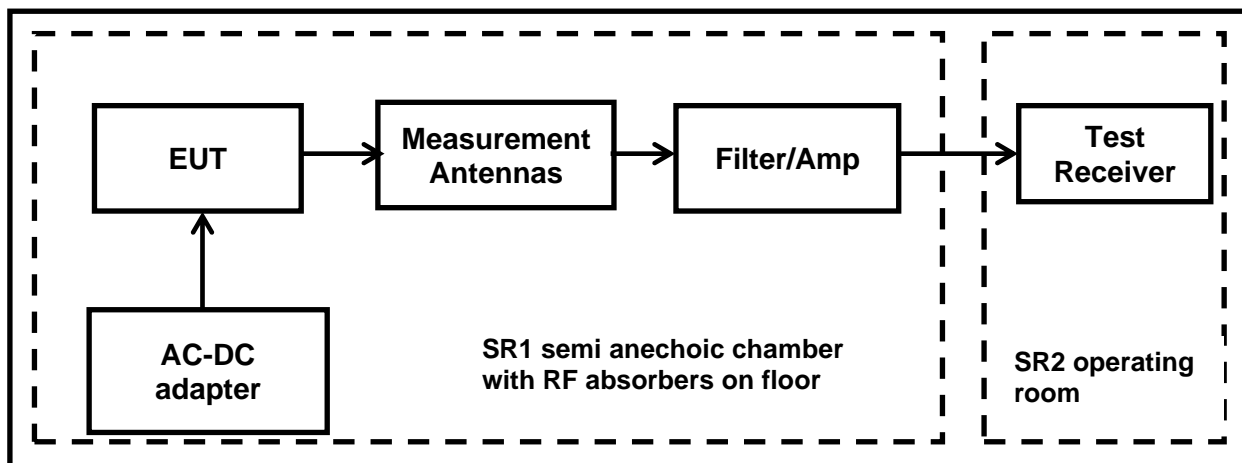
Temperature (°C):	21.6 to 22.4
Relative Humidity (%):	44.3 to 47.6

Note(s):

1. The measurements were in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m
2. As the lower band edge falls within a non-restricted band, measurements were performed in accordance with FCC KDB 558074 Section 8.5 referencing ANSI C63.10 Section 11.11. Since maximum conducted (Peak) output power was previously measured in accordance with ANSI C63.10 Section 11.11.1(a) lower band edge measurement was performed with a peak detector and the -20 dBc limit applied.
3. As the lower band edge falls within a non-restricted band, only peak measurements are required. 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 300 sweeps 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. Marker frequencies and levels were recorded.
4. The restricted band peak measurements were performed in accordance with ANSI C63.10 Section 11.12.2.4.
5. As the EUT continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and the duty cycle is constant (duty cycle variations are less than $\pm 2\%$), the restricted band average measurements were performed in accordance with ANSI C63.10 Section 11.12.2.5.2.
6. As the upper band edge falls within 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. A RMS detector in power averaging mode was used. 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 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.

Transmitter Band Edge Radiated Emissions (continued)**Note(s): (continued)**

7. 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 their respective detectors. Markers were placed on the highest point on each trace.
8. The measurement was performed only at the worst-case data rates for each mode as follows.
 - b-mode 1 Mbps | PWR 17
9. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
10. ** As the continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and EUT was transmitting with different duty cycles w.r.t to different modes. Duty Cycle Correction Factors (as mentioned below) were added to all average measurements respectively according to the modes used to compensate as if it was transmitting with 100% duty cycle.
 - Duty Cycle Correction Factor for b-mode 1 Mbps: Duty cycle more than 98%

Test Setup:

Transmitter Band Edge Radiated Emissions (Continued)**Results: AC-DC Power Supply / 802.11b / 20 MHz / 1 Mbps / PWR 17****Results: Lower Band Edge / Peak**

Frequency (MHz)	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
2398.002	60.20	80.622	20.42	Complied
2400.000	51.62	80.622	29.00	Complied

Results: Lower Band Edge / 2310 to 2390 MHz Restricted Band / Peak

Frequency (MHz)	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
2389.988	50.14	74.00	23.86	Complied

Results: Lower Band Edge / 2310 to 2390 MHz Restricted Band / Average

Frequency (MHz)	Level (dB μ V/m)	Duty cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2389.960	39.09	0.28	39.37**	54.0	14.63	Complied

Results: Upper Band Edge / Peak

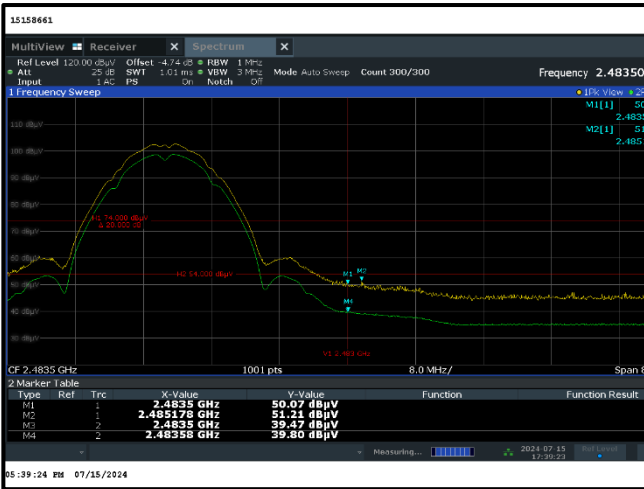
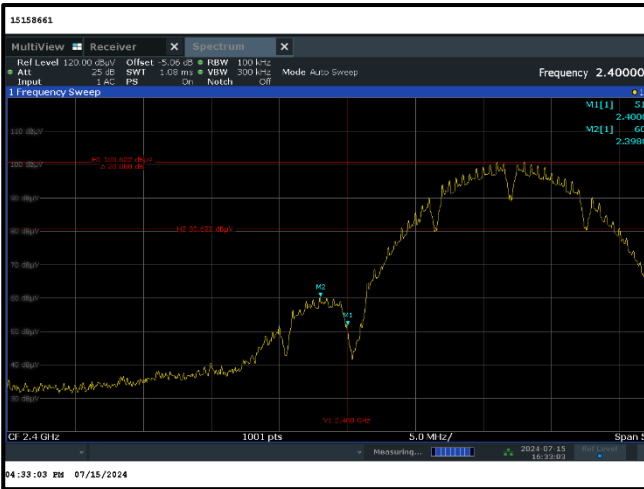
Frequency (MHz)	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
2483.50	50.07	74.00	23.93	Complied
2485.178	51.21	74.00	22.79	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2483.50	39.47	0.28	39.75**	54.0	14.25	Complied
2483.58	39.80	0.28	40.08**	54.0	13.92	Complied

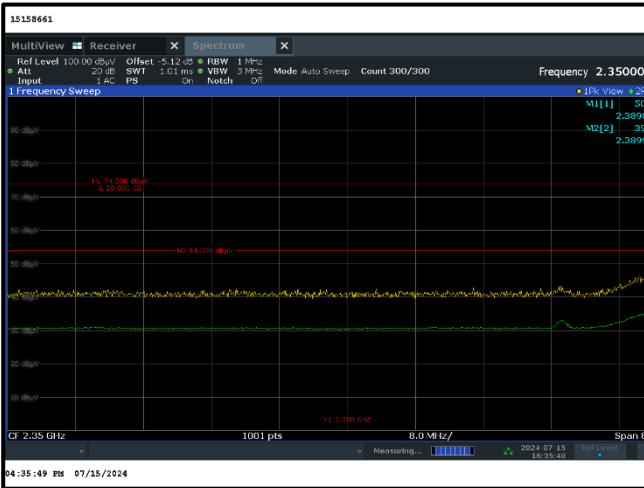
Transmitter Band Edge Radiated Emissions (Continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 1 Mbps / PWR 17



Lower Band Edge Peak Measurement

Upper Band Edge Measurement



Restricted Band Edge Measurement

Result: Pass

6. Measurement Uncertainty

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

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

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	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	95%	± 2.49 dB
Radiated Spurious Emissions	95%	± 3.10 dB
Band Edge Radiated Emissions	95%	± 3.10 dB
Transmitter Duty Cycle	95%	$\pm 3.4\%$

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.

7. Used equipment

Test site: SR 1/2

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
1	Rohde & Schwarz	Antenna, Loop	HFH2-Z2	831247/012	18/07/2023	36
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	18/07/2023	24
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	18/07/2022	24
460	Deisel	Turntable	DT 4250 S	n/a	n/a	n/a
495	Schwarzbeck	Antenna, Trilog Broadband	VULB 9163	01691	30/11/2023	36
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	16/08/2022	36
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
591	Rohde & Schwarz	Receiver	ESU 40	100244/040	09/07/2024	12
669	Rohde & Schwarz	EMI Test Receiver	ESW 44	103087	13/07/2023	24
607	Schwarzbeck	Antenna broadband horn antenna	BBHA 9170	9170-561	13/05/2024	36
608	Rohde & Schwarz	Switch Matrix	OSP 120	101227	lab verification	n/a
628	Maturo	Antenna mast	CAM 4.0-P	224/19590716	n/a	n/a
629	Maturo	Kippeinrichtung	KE 2.5-R-M	MAT002	n/a	n/a
-/-	Testo	Thermo-Hygrometer	608-H1	01	lab verification	n/a
328	SPS	AC/DC power distribution system	PAS 5000	A2464 00/2 0200	lab verification	n/a
1603665	Siemens Matsushita Components	semi-anechoic chamber SR1/ 2	-/-	B83117-A1421-T161	n/a	n/a
681	Maturo	Antenna mast, tilting	BAM4.5-P	402/0718.1	n/a	n/a

Test site: SR 7/8

ID	Manufacturer	Type	Model	Serial No.	Calibration Date	Cal. Cycle
22	Rohde & Schwarz	Artificial Mains	ESH3-Z5	831767/014	09.07.2024	12
23	Rohde & Schwarz	Artificial Mains	ESH3-Z5	831767/013	09.07.2024	12
349	Rohde & Schwarz	Receiver, EMI Test	ESIB7	836697/009	09.07.2024	12

8. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
1.1	1	Cover	Model No. updated
	6	2.2	Notes updated
	8	3.1	EUT information updated
	10	4.1, 4.2	Notes updated
	36	7	Equipment list updated
Test Report Version 1.2 supersede Version 1.1 with immediate effect Test Report No. UL-RPT-RP-15158661-1116 Version 1.2, Issue Date 14 February 2025 replaces Test Report No. UL-RPT-RP-15158661-1116 Version 1.1, Issue Date 10 February 2025, which is no longer valid.			
1.2	Page No(s)	Clause	Details
	7	3.1	EUT Information updated
	10	4.1	Notes updated
	16, 18	5.1.1	Typo corrected

--- END OF REPORT ---