



Solutions

TEST REPORT

Test Report No.: UL-RPT-RP-15660843-316

Customer* : TQ-Systems GmbH
Model No. / PMN* : HPR DISPLAY V03
HVIN* : HPR DISPLAY V03
FCC ID* : 2ANFF-Q103
ISED Certification No.* : 23072-Q103
Technology : *Bluetooth – Low Energy*
Test Standard(s) : **FCC Parts 15.209(a) & 15.247**
ISED RSS-247 ISSUE 4
ISED RSS-GEN ISSUE 5+A1+A2

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 1.0
5. Result of the tested sample: **Pass**
6. All information marked with a (*) were provided by customer / applicant or authorized representative

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Title: Laboratory Engineer
Date: 21 August 2025

Approved by: Rachid Acharkaoui
Title: Operations Manager
Date: 21 August 2025



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

Customer Information

Company Name:	TQ-Systems GmbH
Address:	Gut Delling, Muehlstrasse 2, 82229 Seefeld, Germany

Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	21/08/2025	Initial Version	--

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1 Attestation of Test Results

1.1 Description of EUT

The equipment under test was a Wireless central control unit of e-bike system supporting Bluetooth Low Energy and ANT+ operations in 2400-2483.5MHz ISM band.

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 4 July 2025
Specification Title:	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
Site Registration:	FCC: 399704, ISEDC: 22511
FCC Lab. Designation No.:	DE0019
ISEDC CABID:	DE0008
Location of Testing:	Hedelfinger Strasse. 61,70327 Stuttgart, GERMANY
Test Dates:	10 June 2025 to 21 June 2025

1.3 Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
Part 15.35(c)	-	Transmitter Duty Cycle	Note 1
N/A	RSS-Gen 6.7	Transmitter 99% Occupied Bandwidth	Reporting purpose
Part 15.247(a)(2)	RSS-Gen 6.7 / RSS-247 5.2(a)	Transmitter Minimum 6 dB Bandwidth	
Part 15.247(b)(3)	RSS-Gen 6.12 / RSS-247 5.4(d)	Transmitter Maximum Peak Output Power	
Part 15.247(e)	RSS-247 5.2(b)	Transmitter Power Spectral Density	Note 2
Part 15.247(d)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Conducted Emissions	Note 3
Part 15.247(d) & 15.209(a)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Band Edge Conducted Emissions	Note 3
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	Note 4
Key to Results  = Complied  = Did not comply N.P. = Not Performed N/A = Not Applicable			

Note(s):

1. 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. In accordance with ANSI C63.10 Section 11.10.1, PSD measurements are not required if the maximum conducted output power is less than the PSD limit of 8 dBm / 3 kHz. The PSD level is therefore deemed to be equal to the measured output power.
3. The Spurious emission measurements were performed Radiated and therefore conducted emissions were not required.
4. Not applicable for battery powered device.

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 Hedelfinger Strasse. 61,70327 Stuttgart, GERMANY. 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.

SR1	X
SR9	X
SR7/8	

UL International Germany GmbH is accredited by the DAkkS. DAkkS 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 FCC:	ANSI C63.10-2020
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
Reference ISED:	ANSI C63.10-2020 + Cor. 1-2023 + C63.10a-2024 + Errata to C63.10a-2024
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices - Corrigendum 1 American National Standard for Procedures for Compliance Testing of Unlicensed Wireless Devices - Amendment 1 Errata to American National Standard for Procedures for Compliance Testing of Unlicensed Wireless Devices - Amendment 1

2.3 Calibration and Uncertainty

Measuring Instrument Calibration

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.

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	Confidence Level (%)	Calculated Uncertainty
Conducted Maximum Peak Output Power	95%	±0.59 dB
Radiated Spurious Emissions	95%	±3.10 dB
Band Edge Radiated Emissions	95%	±3.10 dB
Transmitter Duty Cycle	95%	±3.4%
Minimum 6 dB Bandwidth	95%	±0.87 %
Spectral Power Density	95%	±0.59 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 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	36
460	Deisel	Turntable	DT 4250 S	n/a	n/a	n/a
695	Schwarzbeck	Antenna, Trilog Broadband	VULB 9163	01691	30/11/2023	36
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	22/08/2022	36
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
607	Schwarzbeck	Antenna broadband horn antenna	BBHA 9170	9170-561	13/05/2024	36
669	Rohde & Schwarz	EMI Test Receiver	ESW 44	103087	21/12/2023	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 9

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
625	Schwarzbeck	Antenna, H-field	HFSL 7101	109	lab verification only relative measurements	n/a
637	Rohde & Schwarz	Spectrum Analyser	FSV40	101587	12/07/2023	39
-/-	Testo	Thermo-Hygrometer	608-H1	07	lab verification	n/a
645	Weiss Umwelttechnik	Climatic Chamber	LabEvent T/110/70/3	5822619794 0010	lab verification	n/a
327	SPS	AC/DC power distribution system	PAS 5000	A2464 00/1 0200	lab verification	n/a
-/-	Huber & Suhner	SUCOTEST	ST-18	-/-	lab verification	n/a

Test Measurement Software/Firmware Used:

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	11.30.00

3 Equipment Under Test (EUT)

3.1 Identification of Equipment Under Test (EUT)

Brand Name:	TQ
Model Name or Number / PMN:	HPR DISPLAY V03
HVIN:	HPR DISPLAY V03
Test Sample Serial Number:	EUT3 (<i>Conducted sample #1</i>)
Hardware Version:	HPR-DIS03
Software Version:	HPR-DIS03_DTM
FVIN	N/A
FCC ID:	2ANFF-Q103
ISED Canada Certification Number:	23072-Q103
Date of Receipt:	27 May 2025

Brand Name:	TQ
Model Name or Number / PMN:	HPR DISPLAY V03
HVIN:	HPR DISPLAY V03
Test Sample Serial Number:	EUT1 (<i>Radiated sample #1</i>)
Hardware Version:	HPR-DIS03
Software Version:	HPR-DIS03_DTM
FVIN	N/A
FCC ID:	2ANFF-Q103
ISED Canada Certification Number:	23072-Q103
Date of Receipt:	27 May 2025

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):	13.2 VDC		
Maximum Conducted Output Power:	1.75 dBm		
Transmit Frequency Range:	2402 MHz 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 Antennas

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

Frequency Range (MHz)	Antenna Gain (dBi)
2400-2480	-0.7

3.5 Description of Test Setup

Support Equipment

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

Description:	-/-
Brand Name:	-/-
Model Name or Number:	-/-
Serial Number:	-/-

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

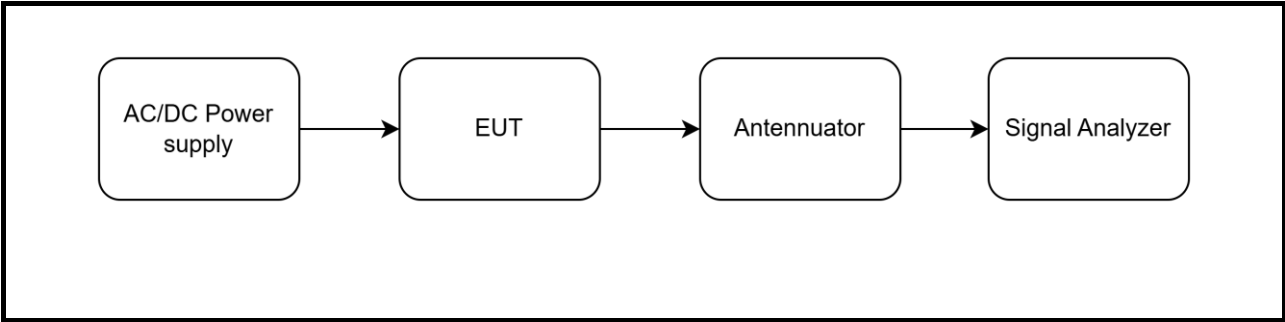
The EUT was tested in the following configuration(s):

- Controlled in test mode using the button on the EUT according to instruction 'HPR-DISP03.DCB.EMV-Test-Setup.0003.docx' supplied by the customer. The up and down button of the remote were used to enable a continuous transmission and to select the test channels as required.
- The EUT was powered by 13.2VDC from an AC to DC Power Supply. The input was connected to a 120 VAC 60 Hz single phase mains supply.
- Transmitter radiated spurious emissions tests were performed with the EUT transmitting in LE1M mode as this was found to transmit the highest power and had the widest bandwidth.
- Before starting final radiated spurious emission measurements "worst case verification" with the EUT in Standing-position & Laying-position was performed by Lab.
- EUT in Laying position was found to be the worst case therefore this report includes relevant results.
- There were no active ports to terminate.

Test Setup Diagrams

Conducted Tests:

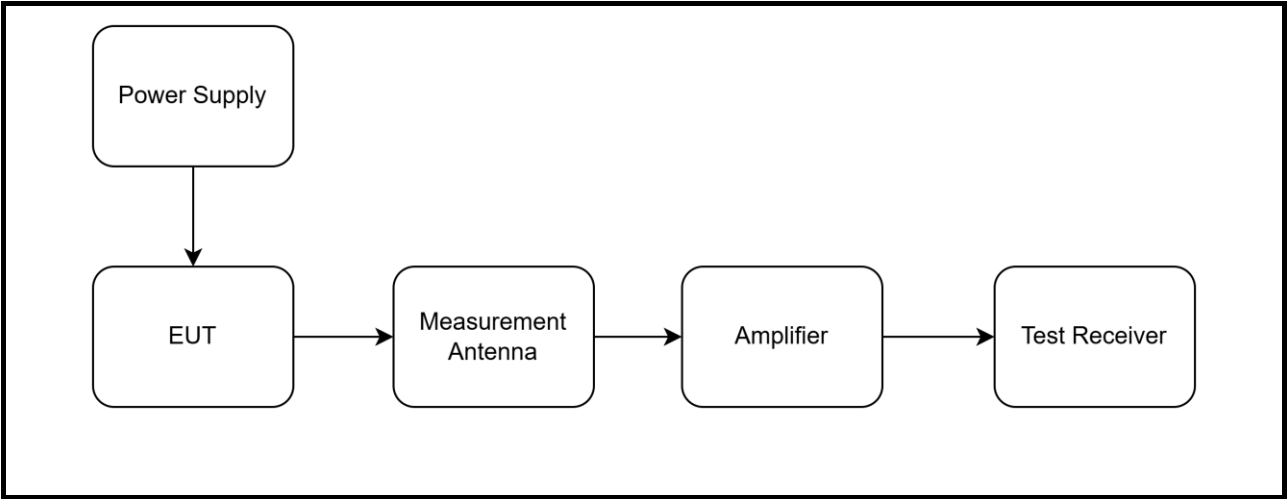
Test Setup for Transmitter Minimum 6 dB Bandwidth, Duty Cycle & Maximum Peak Output Power



Test Setup Diagrams (continued)

Radiated Tests:

Test Setup for Transmitter Radiated Emissions



4 Antenna Port Test Results

4.1 Transmitter Duty Cycle

Test Summary:

Test Engineer:	Yixiang Lin	Test Date:	10 June 2025
Test Sample Serial Number:	EUT3		

FCC Reference:	Part 15.35(c)
Test Method Used:	FCC KDB 558074 Section 6 referencing ANSI C63.10 Section 11.6

Environmental Conditions:

Temperature (°C):	24.6
Relative Humidity (%):	53.1

Note(s):

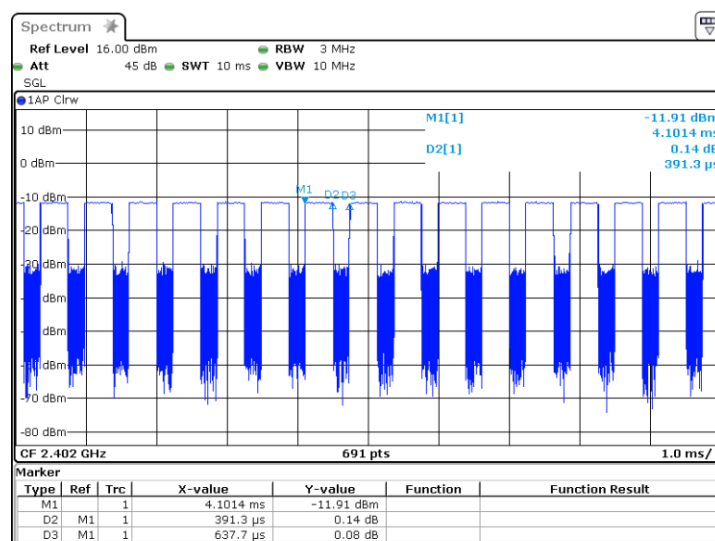
- In order to assist with the determination of the average level of spurious emissions field strength in LE1M mode, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a spectrum/signal analyser in the time domain and calculated by using the following calculation:

$$10 \log (1 / (\text{On Time} / [\text{Period or } 100 \text{ ms whichever is the lesser}])).$$

$$\text{LE duty cycle: } 10 \log (1 / (391.3 \mu\text{s} / 637.7 \mu\text{s})) = 2.12 \text{ dB}$$

Results: LE1M

Pulse Duration (μs)	Period (μs)	Duty Cycle (dB)
391.3	637.7	2.12



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4.2 Transmitter 99% Occupied Bandwidth

Test Summary:

Test Engineer:	Omar EL Moghrabi	Test Date:	10 June 2025
Test Sample Serial Number:	EUT3		

FCC Reference:	N/A
ISED Canada Reference:	RSS-Gen 6.7
Test Method Used:	RSS-Gen 6.7 and Notes below

Environmental Conditions:

Temperature (°C):	24.1
Relative Humidity (%):	51.0

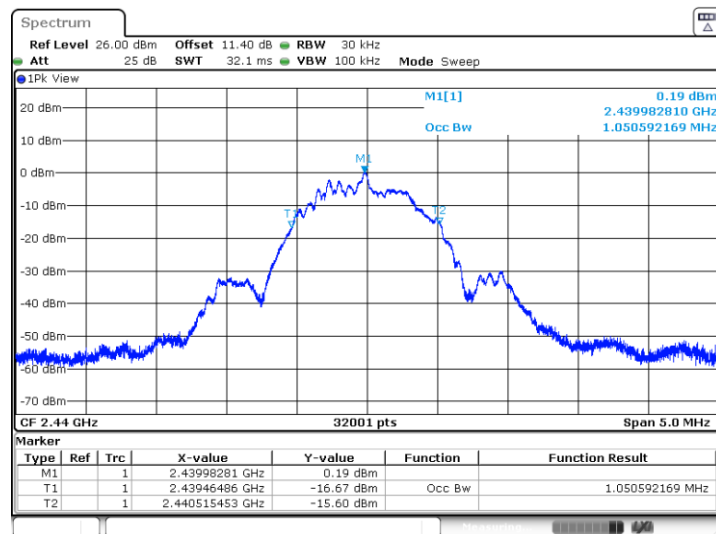
Note(s):

1. The 99% emission bandwidth was measured using the signal analyser occupied bandwidth function. The resolution bandwidth was set in the range of 1% to 5% of the occupied bandwidth and the video bandwidth set to 3 times the resolution bandwidth. The span was set to capture all products of the modulation process including emission skirts.
2. The measurement was performed outside of accreditation.
3. Example plots of each modulation on middle channel, for one antenna configuration, can be seen below to show setting parameters comply with testing method/procedure. All other plots are archived on the UL IT server and available for inspection if required.
4. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.

Therefore, total a reference level offset 11.40 dB was added to each of the at the tested frequencies conducted plots.

Transmitter 99% Occupied Bandwidth (continued)**Results: LE1M**

Channel	99% Occupied Bandwidth (kHz)
Bottom	1050
Middle	1051
Top	1049

**Middle Channel**

4.3 Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Yixiang Lin	Test Date:	10 June 2025
Test Sample Serial Number:	EUT3		

FCC Reference:	Part 15.247(a)(2)
ISED Canada Reference:	RSS-Gen 6.7 / RSS-247 5.2(a)
Test Method Used:	FCC KDB 558074 Section 8.2 referencing ANSI C63.10 Section 11.8.1

Environmental Conditions:

Temperature (°C):	24.6
Relative Humidity (%):	53.1

Note(s):

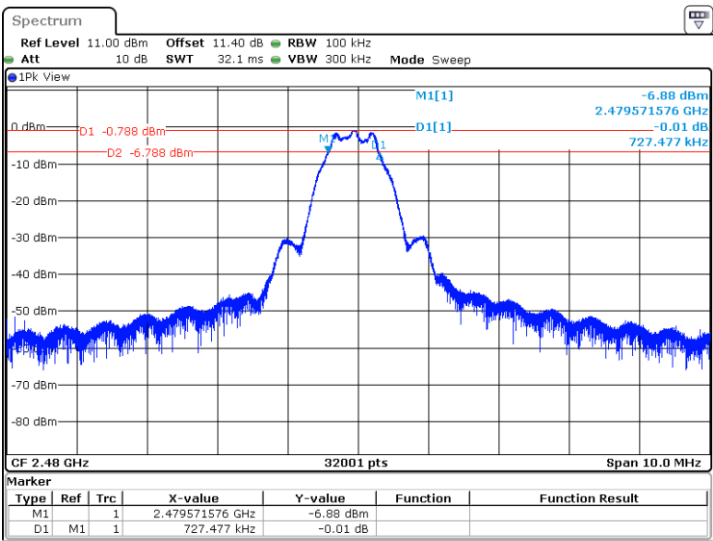
1. 6 dB DTS bandwidth tests were performed using a signal analyser in accordance with ANSI C63.10 Section 11.8.1 Option 1 measurement procedure. The signal analyser resolution bandwidth shall set in the range of 1% to 5% of the OBW but not less than 100 kHz.
2. The signal analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The DTS bandwidth was measured at 6 dB down from the peak of the signal.
3. Example plots of each modulation on top channel, for one antenna configuration, can be seen below to show setting parameters comply with testing method/procedure. All other plots are archived on the UL IT server and available for inspection if required.
4. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.

Therefore, total a reference level offset 11.40 dB was added to each of the at the tested frequencies conducted plots.

Transmitter Minimum 6 dB Bandwidth (continued)

Results: LE1M

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	745.602	≥500	245.60	Complied
Middle	729.665	≥500	229.67	Complied
Top	727.477	≥500	227.48	Complied



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Top Channel

4.4 Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Yixiang Lin	Test Date:	10 June 2025
Test Sample Serial Number:	EUT3		

FCC Reference:	Part 15.247(b)(3)
ISED Canada Reference:	RSS-Gen 6.12 / RSS-247 5.4(d)
Test Method Used:	FCC KDB 558074 Section 8.3.1.1 referencing ANSI C63.10 Section 11.9.1.1 and Notes below

Environmental Conditions:

Temperature (°C):	24.6
Relative Humidity (%):	53.1

Note(s):

1. Conducted power tests were performed using a signal analyser in accordance with ANSI C63.10 Section 11.9.1.1 with the RBW $\geq$ DTS bandwidth procedure.
2. The signal analyser resolution bandwidth was set to 3 MHz and video bandwidth of 10 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 10 MHz. A marker was placed at the peak of the signal and the results recorded in the tables below.
3. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.

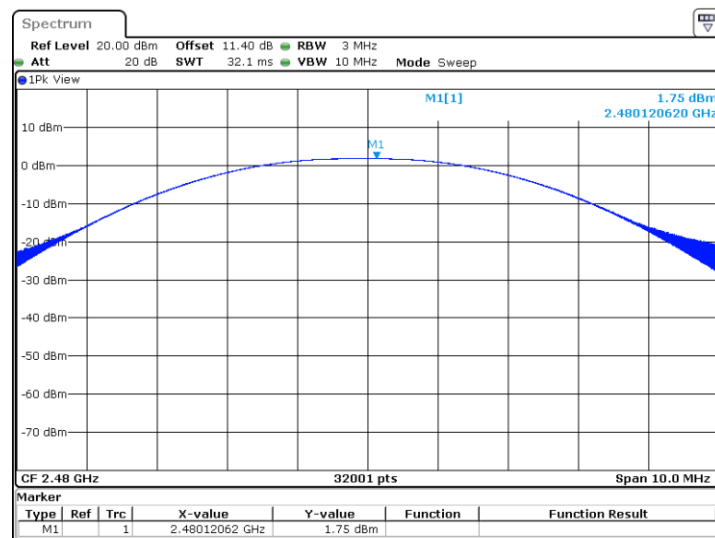
Therefore, total a reference level offset 11.40 dB was added to each of the at the tested frequencies conducted plots.

4. The conducted power was added to the declared antenna gain to obtain the EIRP.
5. Example plots of each modulation on top channel, for one antenna configuration, can be seen below to show setting parameters comply with testing method/procedure. All other plots are archived on the UL IT server and available for inspection if required.

Transmitter Maximum Peak Output Power (continued)**Results: LE1M**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	1.18	30.0	28.82	Complied
Middle	1.67	30.0	28.33	Complied
Top	1.75	30.0	28.25	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	1.18	-0.7	0.48	36	35.52	Complied
Middle	1.67	-0.7	0.97	36	35.03	Complied
Top	1.75	-0.7	1.05	36	34.95	Complied

**Top Channel**

5 Radiated Test Results

5.1 Transmitter Radiated Emissions <1 GHz

Test Summary:

Test Engineer:	Yixiang Lin	Test Date:	10 June 2025
Test Sample Serial Number:	EUT1		

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):	24.9
Relative Humidity (%):	40.0

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 top 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 1603665) 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 measured value 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. FCC rule part 15.209(a) specifies limits at 300 m / 30 m in $\mu\text{V/m}$ but RSS GEN specifies limits at 300 m / 30 m in $\mu\text{A/m}$. The relevant limits are the same after accounting for E-field to H-field correction. 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, the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table). According to Notice 2020-DRS0023 converting the magnetic field strength into electrical field strength using the following equation while considering free space impedance of 377Ω results in a factor of 51.5 dB Ω .

$$AF^E [\text{dB}(\text{m}^{-1})] = AF^H [\text{dB}(\Omega^{-1}\text{m}^{-1})] + Z_0[\text{dB}\Omega]$$

For example, the measurement frequency X kHz resulted in a level of Y dB $\mu\text{V/m}$, which is equivalent to $Y - 51.5 = Z$ dB $\mu\text{A/m}$, which has the same margin, W dB, to the corresponding RSS-GEN Section 8.9, Table 6 limit as it has to the 15.209(a) limit.

6. 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.
7. The measured values at 3 m were extrapolated to the required measurement distances of 300 m and 30 m and compared the specified limits at those distances as follows:
 - 9 kHz- 490 kHz: measured value extrapolated from 3 m to 300 m by subtracting 80 dB at 40 dB /decade.
 - 490 kHz-30 MHz: measured value extrapolated from 3 m to 30 m by subtracting 40 dB at 40 dB /decade.
8. Measurements from 30 MHz to 1 GHz were performed in a semi-anechoic chamber (Asset Number 1603665) 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.
9. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was configured as follows: During 9 kHz to 150 kHz tests, 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 490 kHz, the resolution bandwidth was set to 10 kHz and video bandwidth 30 kHz. An average detector was used and trace mode was Max Hold. For 490 kHz to 30 MHz, the resolution bandwidth was set to 10 kHz and video bandwidth 30 kHz. A peak detector was used and 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.
10. 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.

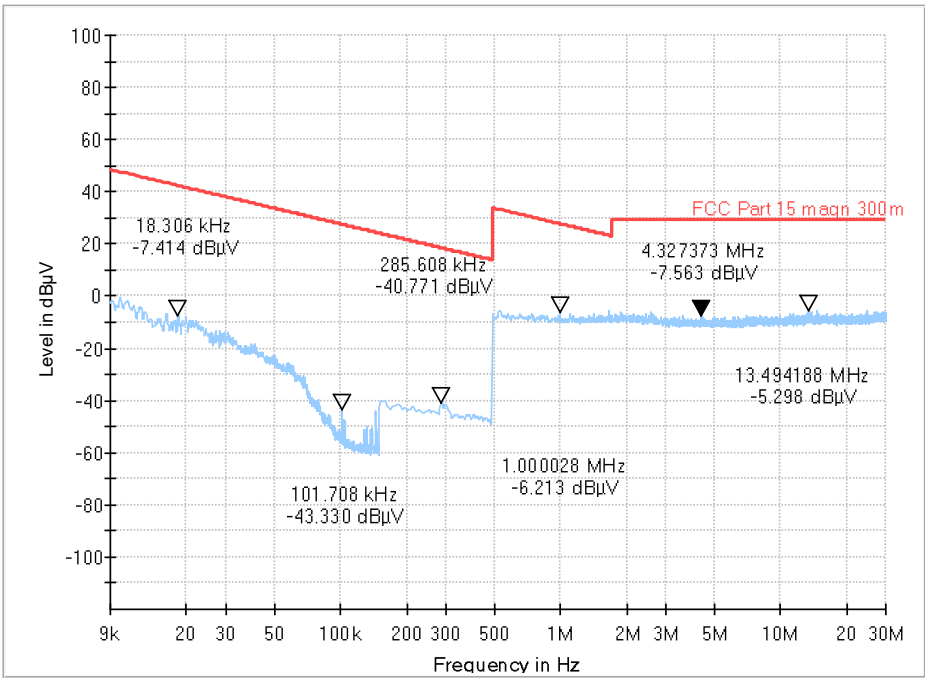
Transmitter Radiated Emissions (continued)

Results: Quasi-Peak / Top Channel / LE1M

9kHz to 30MHz

Frequency (MHz)	Antenna Polarity	Level@3m (dBμV/m)	Level extrapolated (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
No critical emissions were detected						

Full Spectrum

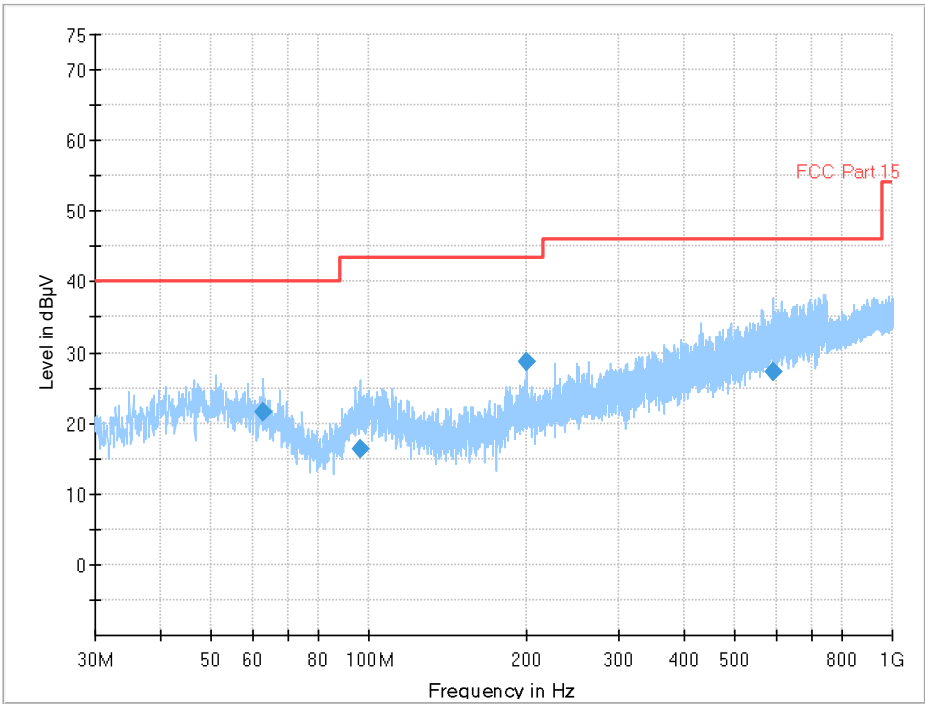


Transmitter Radiated Emissions (continued)

Results: Quasi-Peak / Top Channel / LE1M

30MHz to 1 GHz

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
62.940000	Vertical	21.49	40.00	18.51	Complied
96.060000	Vertical	16.43	43.50	27.07	Complied
199.965000	Vertical	28.81	43.50	14.69	Complied
591.875000	Vertical	27.24	46.00	18.76	Complied



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

5.2 Transmitter Radiated Emissions >1 GHz

Test Summary:

Test Engineer:	Yixiang Lin	Test Date:	21 June 2025
Test Sample Serial Number:	EUT1		

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 40 GHz

Environmental Conditions:

Temperature (°C):	24.9
Relative Humidity (%):	40.0

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 above 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top 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. 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
5. *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.
6. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number 1603665) 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.
7. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number 1603665) 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.
8. 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.
9. The reference level for the emission in the non-restricted band was established by following ANSI C63.10 Section 11.11.2 procedure.
10. **20 dBc limit applies in non-restricted band as the conducted output power measurements were performed using a peak detector.
11. In accordance with ANSI C63.10-2020 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.

12. For frequency range between 18 GHz and 40 GHz, on the pre-scan plots were investigated and found to be below system noise floor.

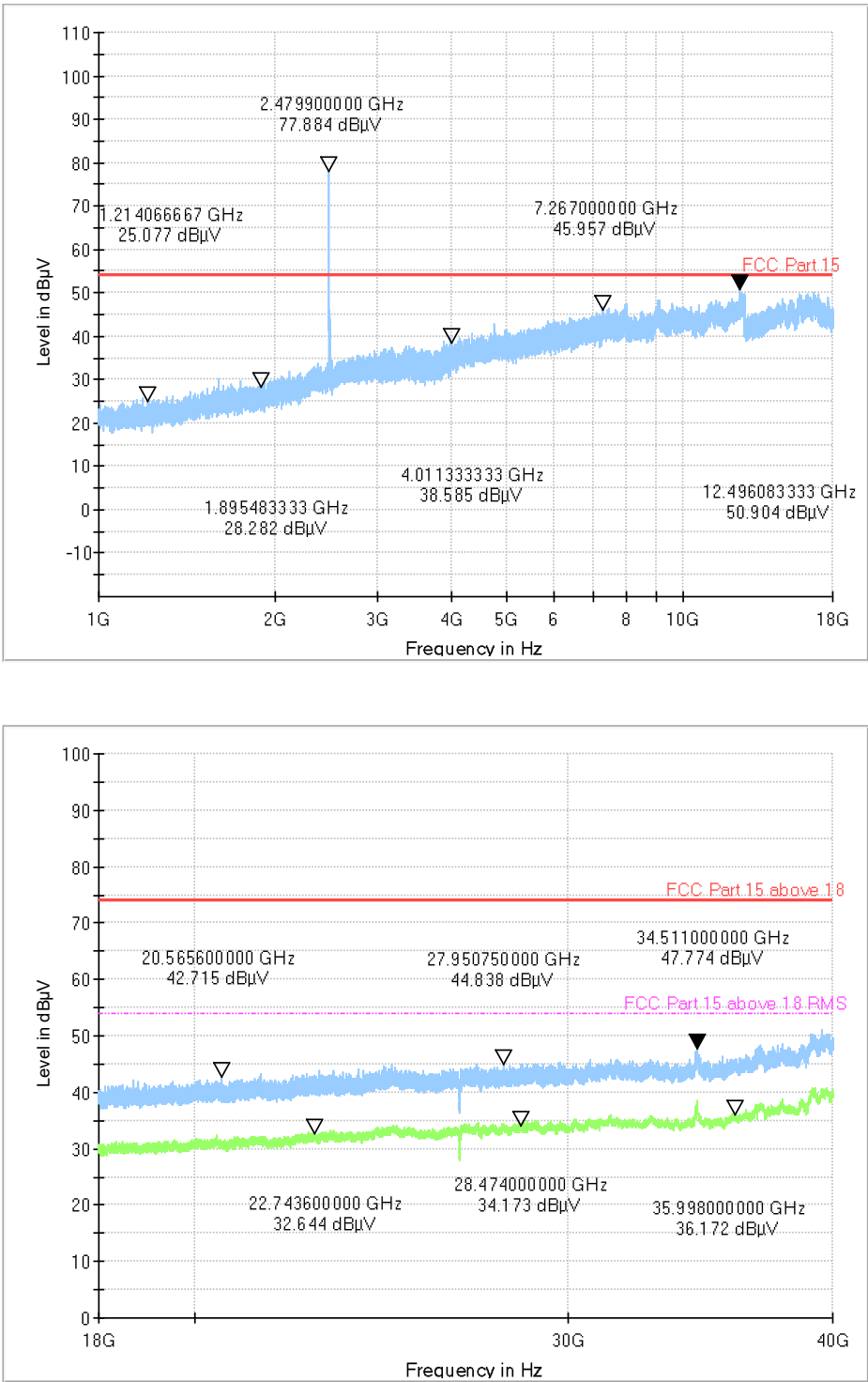
Results: Top Channel / Peak / LE1M

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
No critical emissions were detected					

Results: Top Channel / Average / LE1M

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
No critical emissions were detected					

Transmitter Radiated Emissions (continued)



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

5.3 Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Yixiang Lin	Test Date:	20 June 2025
Test Sample Serial Number:	EUT1		

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

Environmental Conditions:

Temperature (°C):	24.9
Relative Humidity (%):	40.0

Transmitter Band Edge Radiated Emissions (continued)**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 a 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 trace averaging over 300 sweeps. 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.
5. * -20 dBc limit.
6. **As the EUT had a duty cycle < 98% the duty cycle correction factor has been applied to the LE1M average result. The corrected level is shown below:

$$\text{Average result} + \text{duty cycle} = \text{Corrected level}$$

Transmitter Band Edge Radiated Emissions (continued)**Results: Peak / LE1M****Results: Lower Band Edge / Peak**

Frequency (MHz)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)	Result
2399.50	36.33	63.378*	-36.33	Complied
2400.00	38.21	63.378*	-38.21	Complied

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

Frequency (MHz)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)	Result
2341.528	44.04	74.00	29.96	Complied

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

Frequency (MHz)	Level (dBμV/m)	Duty cycle correction (dB)	Corrected Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2331.938	32.30	2.12	34.42**	54.0	19.58	Complied

Results: Upper Band Edge / Peak

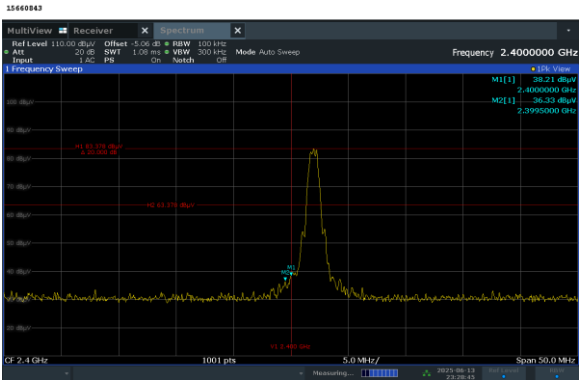
Frequency (MHz)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)	Result
2483.50	46.30	74.00	27.70	Complied
2483.66	46.76	74.00	27.24	Complied

Results: Upper Band Edge / Average

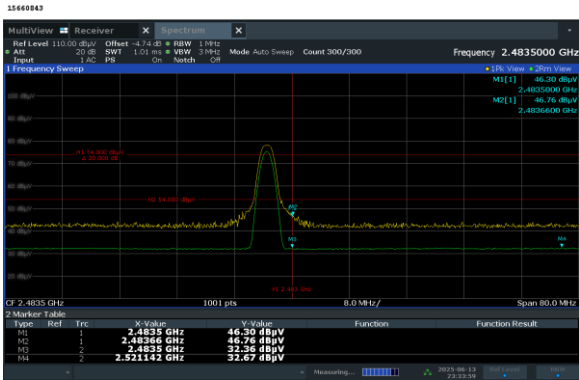
Frequency (MHz)	Level (dBμV/m)	Duty cycle correction (dB)	Corrected Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.50	32.36	2.12	34.48**	54.0	19.52	Complied
2521.14	32.67	2.12	34.79**	54.0	19.21	Complied

Transmitter Band Edge Radiated Emissions (continued)

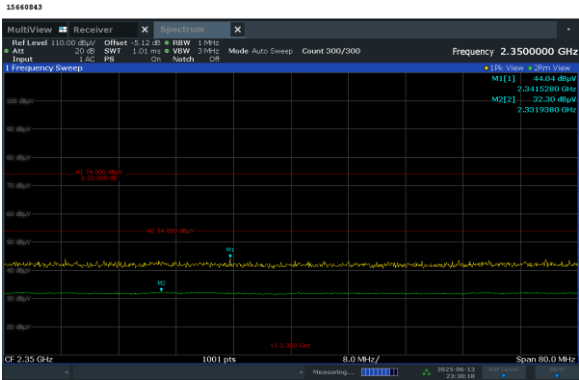
Results: LE



Lower Band Edge



Upper Band Edge



2310 MHz to 2390 MHz Restricted Band

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