

RADIO TEST REPORT

REPORT NUMBER: M2404009-4

**TEST STANDARD: FCC PART 15 SUBPART C
SECTION 15.247**

ISED RSS-247 SECTION 5.0

**CLIENT: REDARC ELECTRONICS PTY
LTD**

**DEVICE: TOW-PRO LINK™ ELECTRIC
TRAILER BRAKE
CONTROLLER MAIN UNIT**

MODEL: EBRHX-MU-NA

FCC ID: 2BAH6-EBRHXMUNA

IC: 30290-EBRHXMUNA

DATE OF ISSUE: 17 JULY 2024

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the client or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.



Accredited for compliance with ISO/IEC 17025 – Testing. The results of tests, calibration and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

This document shall not be reproduced except in full.

REVISION TABLE

Version	Sec/Para Changed	Change Made	Date
1		Initial issue of document	17/07/2024



This document shall not be reproduced except in full.

CONTENTS

1	Test Summary	7
2	Test Facility	7
2.1	General	7
2.2	Test Laboratory/Accreditations	7
3	Test Equipment Calibration	8
4	Measurement Uncertainty	8
5	Device Details.....	9
5.1	EUT (Transmitter) Details	9
5.2	EUT (Host) Details	9
5.3	Test Configuration	9
5.4	Modifications	9
5.5	Deviations from the Standard	9
6	Results.....	10
6.1	§15.203/ RSS-Gen 6.8 Antenna Requirement	10
6.2	§15.205/ RSS-Gen 8.10/ RSS-247 3.3 Restricted Bands of Operation	10
6.3	§15.207/ RSS-Gen 8.8 Conducted Limits	10
6.4	§15.209/ RSS-Gen 8.9 Radiated Emission Limits; General Requirements	10
6.5	§15.247(a)(2)/ RSS-247 5.2(a) 6 dB bandwidth	10
6.5.1	Test Procedure	10
6.5.2	Limits.....	10
6.5.3	Results	10
6.6	§15.247(b)(3)/ RSS-247 5.4(d) Peak Output Power	12
6.6.1	Test Procedure	12
6.6.2	Limits.....	12
6.6.3	Results	12
6.7	§15.247(d)/ RSS-247 5.5 Out-of-Band/Spurious Emissions	14
6.7.1	Test procedure	14
6.7.2	Test setup	15
6.7.3	Evaluation of field strength.....	16
6.7.4	Limits.....	16
6.7.5	Transmitter Spurious Emissions: 9 kHz to 30 MHz	17
6.7.6	Transmitter Spurious Emissions: 30 - 1000 MHz	19
6.7.7	Transmitter Spurious Emissions: 1 - 18 GHz.....	22
6.7.8	Transmitter Spurious Emissions: 18 – 26 GHz.....	28
6.8	§15.247(d)/ RSS-247 5.5 Band Edge Emission Measurements	32
6.9	§15.247(e)/ RSS-247 5.2(b) Power Spectral Density.....	34
6.9.1	Test procedure	34
6.9.2	Limits.....	34
6.9.3	Results	34
6.10	§15.247(i)/ RSS-Gen 3.4/RSS-102 Maximum Permissible Exposure	36

6.11	§15.215/ RSS-Gen 6.7 Occupied Bandwidth – 99% power	36
6.11.1	Test procedure	36
6.11.2	Limits	36
6.11.3	Results	36

GRAPHS

Graph 6-1: 6 dB bandwidth, 2402 MHz	11
Graph 6-2: 6 dB bandwidth, 2440 MHz	11
Graph 6-3: 6 dB bandwidth, 2480 MHz	12
Graph 6-4: Maximum EIRP, 2402 MHz	13
Graph 6-5: Maximum EIRP, 2440 MHz	13
Graph 6-6: Maximum EIRP, 2480MHz	14
Graph 6-7: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2402 MHz	17
Graph 6-8: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2440 MHz	17
Graph 6-9: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2480 MHz	18
Graph 6-10: Transmitter Spurious Emissions, 30 – 1000 MHz, 2402 MHz	19
Graph 6-11: Transmitter Spurious Emissions, 30 – 1000 MHz, 2440 MHz	20
Graph 6-12: Transmitter Spurious Emissions, 30 – 1000 MHz, 2480 MHz	21
Graph 6-13: Transmitter Spurious Emissions, 1 – 18 GHz, 2402 MHz, Peak	22
Graph 6-14: Transmitter Spurious Emissions, 1 – 18 GHz, 2440 MHz, Peak	23
Graph 6-15: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Peak	24
Graph 6-16: Transmitter Spurious Emissions, 1 – 18 GHz, 2402 MHz, Average	25
Graph 6-17: Transmitter Spurious Emissions, 1 – 18 GHz, 2440 MHz, Average	26
Graph 6-18: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Average	27
Graph 6-19: Transmitter Spurious Emissions, 18 – 26 GHz, 2402 MHz, Peak	28
Graph 6-20: Transmitter Spurious Emissions, 18 – 26 GHz, 2440 MHz, Peak	28
Graph 6-21: Transmitter Spurious Emissions, 18 – 26 GHz, 2480 MHz, Peak	29
Graph 6-22: Transmitter Spurious Emissions, 18 – 26 GHz, 2402 MHz, Average	30
Graph 6-23: Transmitter Spurious Emissions, 18 – 26 GHz, 2440 MHz, Average	30
Graph 6-24: Transmitter Spurious Emissions, 18 – 26 GHz, 2480 MHz, Average	31
Graph 6-25: Band Edge Emission, Lower Band-edge	32
Graph 6-26: Band Edge Emission, Upper Band-edge, Peak	33
Graph 6-27: Band Edge Emission, Upper Band-edge, Average	33
Graph 6-28: Radiated - Power Spectral Density, 2402 MHz	34
Graph 6-29: Radiated - Power Spectral Density, 2440 MHz	35
Graph 6-30: Radiated - Power Spectral Density, 2480 MHz	35
Graph 6-31: Occupied bandwidth, 2402 MHz	36
Graph 6-32: Occupied bandwidth, 2440 MHz	37
Graph 6-33: Occupied bandwidth, 2480 MHz	37

TABLES

Table 6-1: 6 dB Bandwidth	10
Table 6-2: Maximum peak power	12
Table 6-3: Transmitter Spurious Emissions, 30 - 1000 MHz, 2402 MHz	19
Table 6-4: Transmitter Spurious Emissions, 30 – 1000 MHz, 2440 MHz	20
Table 6-5: Transmitter Spurious Emissions, 30 – 1000 MHz, 2480 MHz	21
Table 6-6: Transmitter Spurious Emissions, 1 – 18 GHz, 2402 MHz, Peak	22
Table 6-7: Transmitter Spurious Emissions, 1 – 18 GHz, 2440 MHz, Peak	23
Table 6-8: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Peak	24
Table 6-9: Transmitter Spurious Emissions, 1 – 18 GHz, 2402 MHz, Average	25
Table 6-10: Transmitter Spurious Emissions, 1 – 18 GHz, 2440 MHz, Average	26
Table 6-11: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Average	27
Table 6-12: Band Edge Emission, Lower Band-edge	32
Table 6-13: Band Edge Emission, Upper Band-edge	33
Table 6-14: Power spectral density	34
Table 6-15: Occupied Bandwidth	36

TEST CERTIFICATE

Device: TOW-PRO LINK™ Electric Trailer Brake Controller Main Unit
Model: EBRHX-MU-NA
Serial Number: 2402279999-7333
Sample Number: S01467
PCB Version: PCB3360-3
Manufacturer: REDARC Electronics Pty Ltd

Radio: Bluetooth Low Energy (Nordic nRF52833)
FCC ID: 2BAH6-EBRHXMUNA
IC: 30290-EBRHXMUNA

Tested for: REDARC Electronics Pty Ltd
Address: 23 Brodie Rd Adelaide Australia 5160
Contact: Simon Gallasch
Phone Number: +61 8 7093 3732
Email: sgallasch@redarc.com.au

Standard: FCC Part 15, Subpart C, Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ISED RSS-247, Issue 3, Section 5 Standard specifications for frequency hopping systems and digital transmission systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

Result: The TOW-PRO LINK™ Electric Trailer Brake Controller Main Unit complied with the applicable requirements of the above standards. Refer to Report M2404009-4 for full details.

Test Date: 7-8 May 2023

Issue Date: 17 July 2024

Test Engineers: 
Ashish Nath


Ian Paul Ng

Attestation: *I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*

Authorized Signatory: 
Ian Paul Ng
Senior Test Engineer

Issued by: EMC Technologies Pty. Ltd.,
176 Harrick Road, Keilor Park, VIC, 3042, Australia.
Phone: +61 3 9365 1000

E-mail: emc-general@emctech.com.au

Web: www.emctech.com.au



Accreditation No.5292

This document shall not be reproduced except in full.

RADIO TEST REPORT

1 TEST SUMMARY

Sec.	Description	FCC	ISED	Result(s)
6.1	Antenna Requirement	§15.203	RSS-Gen 6.8	Complied
6.2	Restricted Bands of Operation	§15.205	RSS-Gen 8.10	Complied
6.3	Conducted Limits	§15.207	RSS-Gen 8.8	Not Applicable
6.4	Radiated emission limits; general requirements	§15.209	RSS-Gen 8.9	Complied
6.5	6 dB Bandwidth	§15.247(a)(2)	RSS-247 5.2(a)	Complied
6.6	Peak Output Power	§15.247(b)(3)	RSS-247 5.4(d)	Complied
6.7	Out-of-Band/Spurious Emissions	§15.247(d)	RSS-247 5.5	Complied
6.8	Band-Edge Emission Measurements	§15.247(d)	RSS-247 5.5	Complied
6.9	Power spectral density	§15.247(e)	RSS-247 5.2(b)	Complied
6.10	Maximum Permissible Exposure	§15.247(i)	RSS-102	Complied
6.11	Occupied Bandwidth – 99% power	§15.215	RSS-Gen 6.7	Complied

2 TEST FACILITY

2.1 General

EMC Technologies Pty Ltd is accredited by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies Pty Ltd has also been designated as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 and 18 of the FCC Commission's rules – **Registration Number 494713 & Designation number AU0001.**

EMC Technologies Pty Ltd is also an ISED Canada recognized testing laboratory – **ISED company number: 3569B and CAB identifier number: AU0001.**

2.2 Test Laboratory/Accreditations

NATA is the Australian National laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Institute (NMI) and an internal quality system similar to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A²LA).

All testing in this report has been conducted in accordance with EMC Technologies' scope of NATA accreditation to ISO 17025 for both testing and calibration and ISO 17020 for Inspection – **Accreditation Number 5292.**

The current full scope of accreditation can be found on the NATA website: www.nata.com.au

3 TEST EQUIPMENT CALIBRATION

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Keysight Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI) or in-house. All equipment calibration is traceable to Australian national standards at the National Measurements Institute.

Equipment Type	Make/Model/Serial Number	Last Cal. dd/mm/yyyy	Due Date dd/mm/yyyy	Cal. Interval
Chamber	Frankonia SAC-3-2 (R-144)	25/03/2024	25/03/2027	3 Year ^{*1}
EMI Receiver	R&S ESW26 Sn: 101306 (R-143)	02/08/2023	02/08/2024	1 Year ^{*2}
Antennas	EMCO 6502 Active Loop Antenna Sn: 9311-2801 (A-231)	28/02/2023	28/02/2025	2 Year ^{*2}
	SUNAR JB1 Biconilog hybrid Antenna Sn. A052518 (A-434)	14/03/2023	14/03/2025	2 Year ^{*2}
	EMCO 3115 Horn Antenna Sn: 9501-4398 (A-406)	10/01/2022	10/01/2025	3 Year ^{*1}
	ETS-Lindgren 3160-09 Horn Antenna Sn: 66032 (A307)	18/01/2024	18/01/2027	3 Year ^{*1}
Cables ^{*3}	Huber & Suhner Sucoflex 104A Sn: 503061/4A (CL131124)	10/11/2023	10/11/2024	1 Year ^{*1}
	Huber & Suhner Sucoflex 102 Sn: 27319/2 (C-273)	22/01/2024	22/01/2025	1 Year ^{*1}

Note *1. Internal NATA calibration.

Note *2. External NATA / A2LA calibration.

Note *3. Cables are verified before measurements are taken.

4 MEASUREMENT UNCERTAINTY

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

Radiated Emissions:	9 kHz to 30 MHz	±4.1 dB
	30 MHz to 300 MHz	±5.1 dB
	300 MHz to 1000 MHz	±4.7 dB
	1 GHz to 18 GHz	±4.6 dB
	18 GHz to 40 GHz	±4.6 dB
Peak Output Power:		±1.5 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Application of measurement uncertainty for this report:

The referenced uncertainty standard specifies that determination of compliance shall be based on measurements without considering measurement instrumentation uncertainty. However, the measurement uncertainty shall appear in the test report.

5 Device Details

(Information supplied by the Client)

The device is an Electric Trailer Brake Controller Main unit.

5.1 EUT (Transmitter) Details

Radio:	Nordic Semiconductor nRF52833
Type:	Bluetooth Low Energy (BLE)
Frequency band:	2402 – 2480 MHz
Number of Channels:	40
Operating Frequency:	Low Channel: 2402 MHz Mid Channel: 2440 MHz High Channel: 2480 MHz
Modulation:	Gaussian Frequency Shift Modulation (GFSK)
Nominal Bandwidth:	2 MHz
Data Rate:	2Mbit/s
Antenna Model/Type:	Molex 479480001 2.4GHz SMT MID Chip Antenna
Antenna Peak Gain:	3.7 dBi @ 2.4 GHz

5.2 EUT (Host) Details

Test Sample:	TOW-PRO LINK™ Electric Trailer Brake Controller Main Unit
Model:	EBRHX-MU-NA
Serial Number:	2402279999-7333
Sample Number:	S01467
PCB Version:	PCB3360-3
Supply Rating:	12VDC

5.3 Test Configuration

Testing was performed with the EUT's Transceiver set to transmit continuously at Low Channel (2402 MHz), Mid Channel (2440 MHz) and High Channel (2480 MHz). Manufacturer has set the output power to **+7 dBm**.

5.4 Modifications

No modifications were required to achieve compliance.

5.5 Deviations from the Standard

No deviation from the standard.



Accreditation No.5292

This document shall not be reproduced except in full.

6 RESULTS

6.1 §15.203/ RSS-Gen 6.8 Antenna Requirement

The test sample's Bluetooth Transceiver incorporates a surface mount Antenna and cannot be replaced by another type.

Antenna Brand: Molex

Antenna Type: 2.4GHz MID SMT Antenna (479480001)

Antenna Peak Gain: 3.7 dBi @ 2.4 GHz

Connector: Not Applicable

The above installation will prevent any unauthorized switching of antennas.

6.2 §15.205/ RSS-Gen 8.10/ RSS-247 3.3 Restricted Bands of Operation

The provisions of the §15.205/ RSS-Gen 8.10/ RSS-247 3.3 restricted bands of operation and §15.209 radiated emissions limits have been met, refer to section 6.7

6.3 §15.207/ RSS-Gen 8.8 Conducted Limits

The device is battery DC powered and does not connect directly or indirectly to the AC mains network. Test was not applicable.

6.4 §15.209/ RSS-Gen 8.9 Radiated Emission Limits; General Requirements

The provisions of the §15.205/ RSS-Gen 8.10/ RSS-247 3.3 restricted bands of operation and §15.209/ RSS-Gen 8.9 radiated emissions limits have been met, refer to section 6.7

6.5 §15.247(a)(2)/ RSS-247 5.2(a) 6 dB bandwidth

6.5.1 Test Procedure

The tests were performed in accordance with ANSI C63.10: 2013 Clause 11.8 DTS bandwidth.

The 6 dB bandwidth was measured while the device was transmitting with typical modulation applied. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised when measuring the bandwidth.

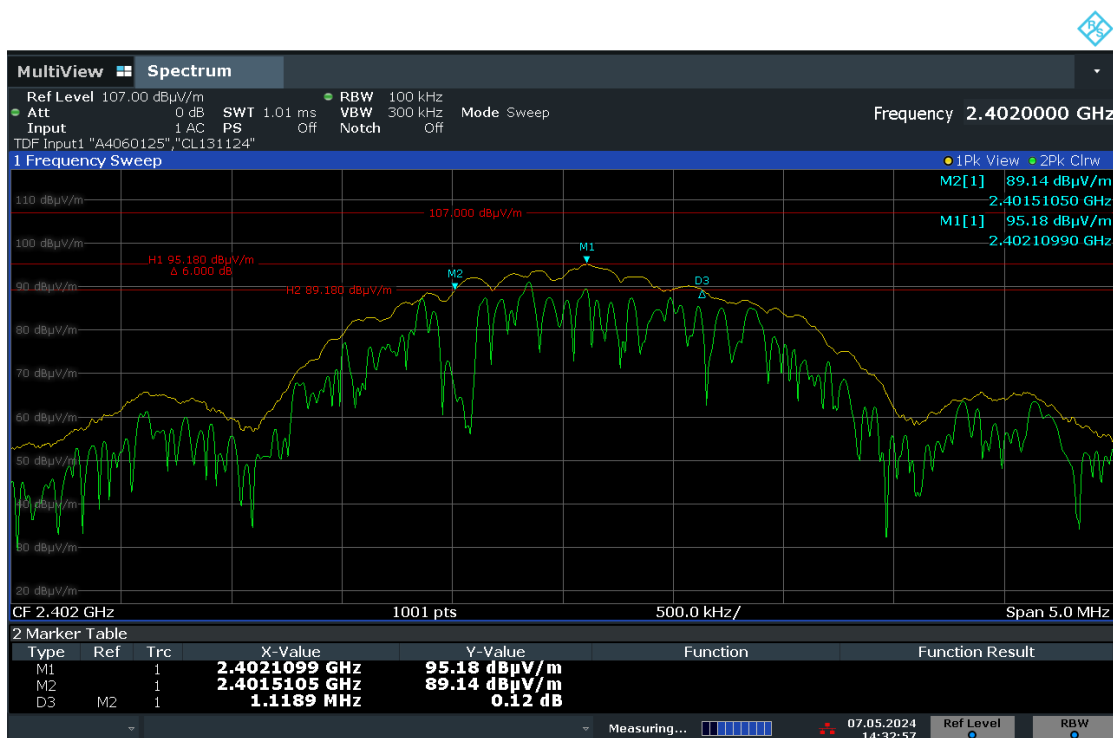
6.5.2 Limits

In the band 2400-2483.5MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

6.5.3 Results

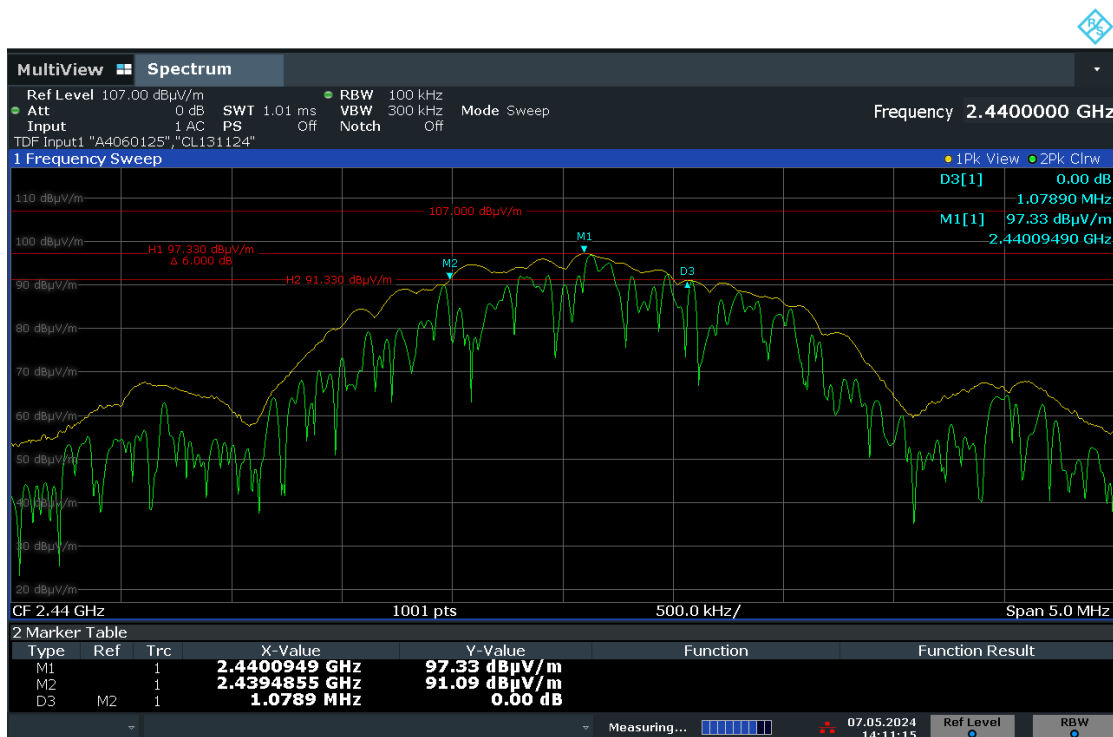
Table 6-1: 6 dB Bandwidth

Frequency (MHz)	6 dB Bandwidth (kHz)	Limit (kHz)
2402	1118.9	≥ 500
2440	1078.9	≥ 500
2480	1203.8	≥ 500



14:32:58 07.05.2024

Graph 6-1: 6 dB bandwidth, 2402 MHz



14:11:16 07.05.2024

Graph 6-2: 6 dB bandwidth, 2440 MHz



13:22:30 07.05.2024

Graph 6-3: 6 dB bandwidth, 2480 MHz

6.6 §15.247(b)(3)/ RSS-247 5.4(d) Peak Output Power

6.6.1 Test Procedure

The maximum peak conducted output power was measured in accordance with ANSI C63.10: 2013 clause 11.9.1.1.

6.6.2 Limits

The maximum peak conducted output power at 2400-2483.5 MHz is 1 Watt or 30 dBm.

6.6.3 Results

Table 6-2: Maximum peak power

Freq. (MHz)	E-Field @ 3 m (dBμV/m)	EIRP (dBm)	Antenna Gain (dBi)	Equivalent Conducted Output Power (dBm)	Limit (dBm)	Results
2402	96.57	1.34	3.7	-2.36	30	Complied
2440	98.85	3.62	3.7	-0.08	30	Complied
2480	101.89	6.66	3.7	2.96	30	Complied

The measured radiated field strength is converted to equivalent conducted output power for checking compliance (KDB 558074 D01 Section 3).



14:19:11 07.05.2024

Graph 6-4: Maximum EIRP, 2402 MHz



13:55:57 07.05.2024

Graph 6-5: Maximum EIRP, 2440 MHz



13:42:08 07.05.2024

Graph 6-6: Maximum EIRP, 2480MHz

6.7 §15.247(d)/ RSS-247 5.5 Out-of-Band/Spurious Emissions

6.7.1 Test procedure

Radiated out-of-band/spurious emissions measurements were performed in a semi-anechoic chamber compliant with ANSI C63.4: 2014.

The test frequency range was sub-divided into smaller bands with the defined resolution bandwidths to permit reliable display and identification of emissions.

Frequency range (MHz)	Measurement Bandwidth (kHz)	Measurement Distance (m)	Antenna
0.009 to 0.150	0.2	3	0.6 metre loop antenna
0.150 to 30	9	3	
30 to 1000	120	3	
1000 to 18 000	1000	3	Standard gain or broadband horn
18 000 to 40 000	1000	1	

EUT was set at a height of 0.8 m for measurements below 1000 MHz and set at a height of 1.5 m for measurements above 1000 MHz.

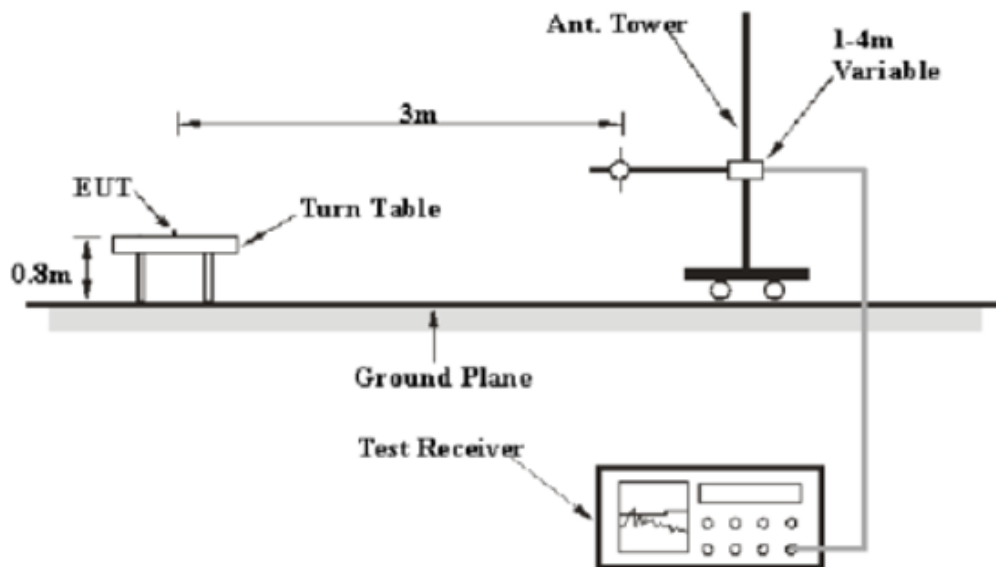
The sample was slowly rotated with the spectrum analyser set to Max-Hold. This was performed for at least two antenna heights. When an emission was located, it was positively identified, and its maximum level was found by rotating the automated turntable and by varying the antenna height. For below 1000 MHz the emissions were measured with a Quasi-Peak detector, and for above 1000 MHz the emissions were measured with Peak and Average detectors.

Measurements on the worst axis are presented.

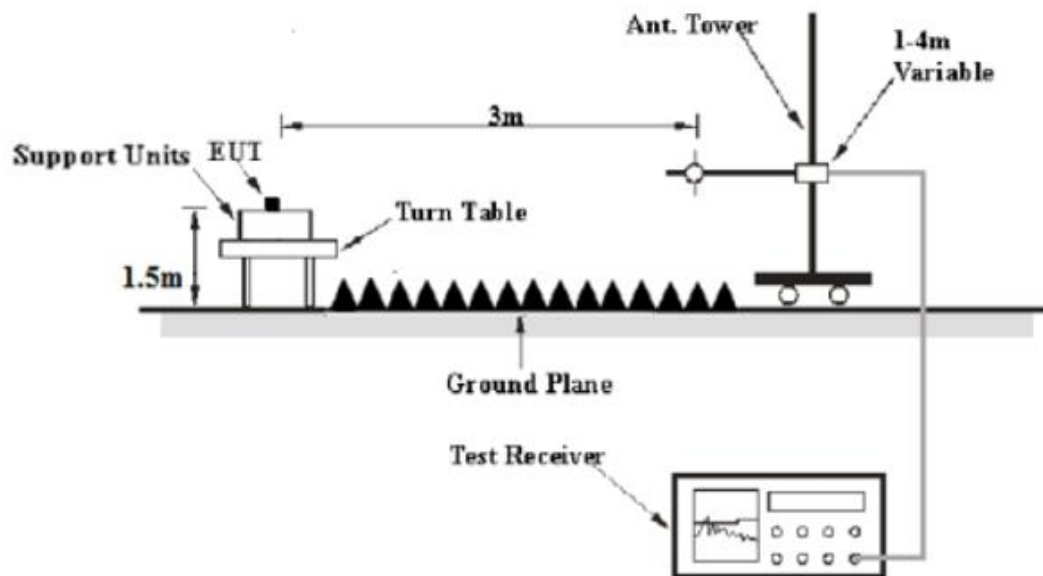
The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical polarisations of the measurement antenna.

6.7.2 Test setup

Below 1 GHz:



Above 1GHz:



6.7.3 Evaluation of field strength

Field strengths were calculated automatically by the software using pre-stored calibration data. The method of calculation is shown below:

$$E = V + AF - G + L$$

Where: E = Radiated Field Strength in dB μ V/m.

V = EMI Receiver Voltage in dB μ V.

AF = Antenna Factor in dB/m (stored as a data array).

G = Preamplifier Gain in dB (stored as a data array).

L = Cable loss in dB (stored as a data array of Insertion Loss versus frequency).

6.7.4 Limits

The limit applied is in accordance with the out-of-band/spurious emissions limit defined in §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The in-band peak PSD in 100 kHz bandwidth were measured on all three channels. The maximum PSD level was used to establish the limit. However, the general limits of §15.209 apply for the restricted bands of operation defined in §15.205.

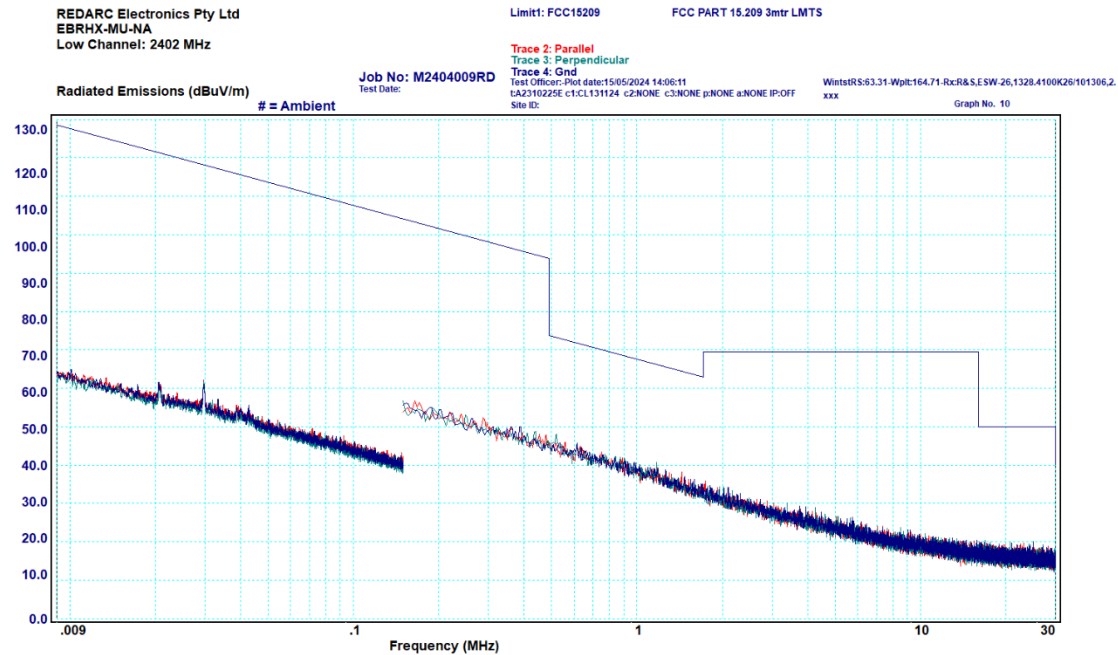


Accreditation No.5292

This document shall not be reproduced except in full.

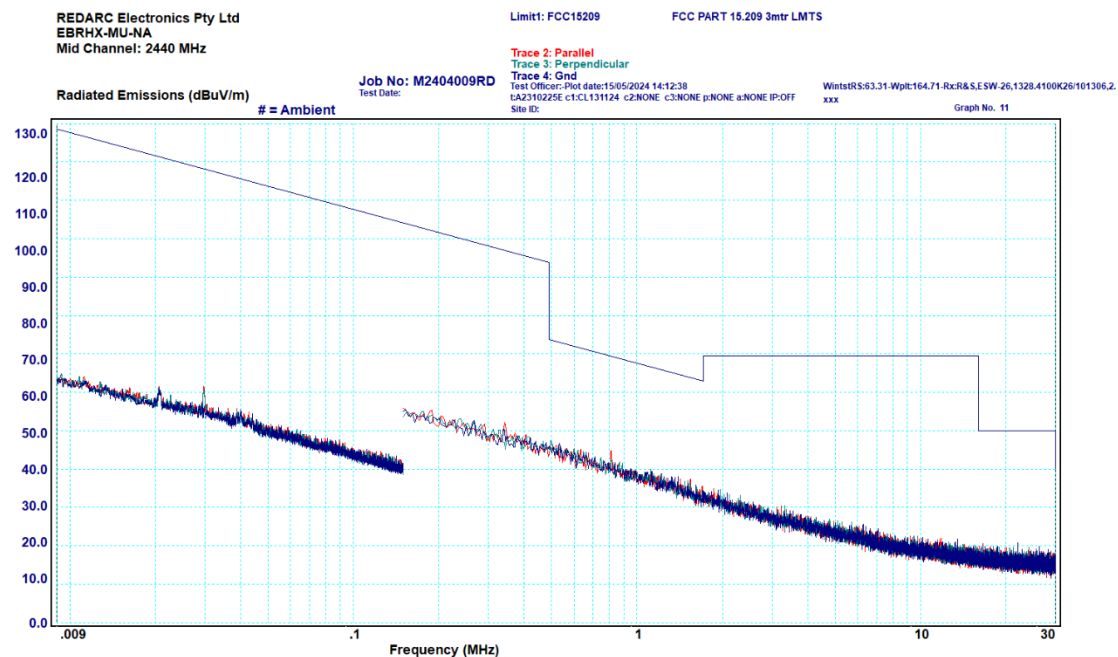
6.7.5 Transmitter Spurious Emissions: 9 kHz to 30 MHz

All emissions measured in the frequency band 9kHz - 30MHz complied with the requirements of the standard.



Graph 6-7: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2402 MHz

No peaks were measured within 10 dB of the limit.



Graph 6-8: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2440 MHz

No peaks were measured within 10 dB of the limit.

REDARC Electronics Pty Ltd
EBRHX-MU-NA
High Channel: 2480 MHz

Limit1: FCC15209

FCC PART 15.209 3mtr LMTS

Job No: M2404009RD

Test Date:

Trace 2: Parallel

Trace 3: Perpendicular

Trace 4: Gnd

Test Officer: Plot date: 15/05/2024 14:18:46

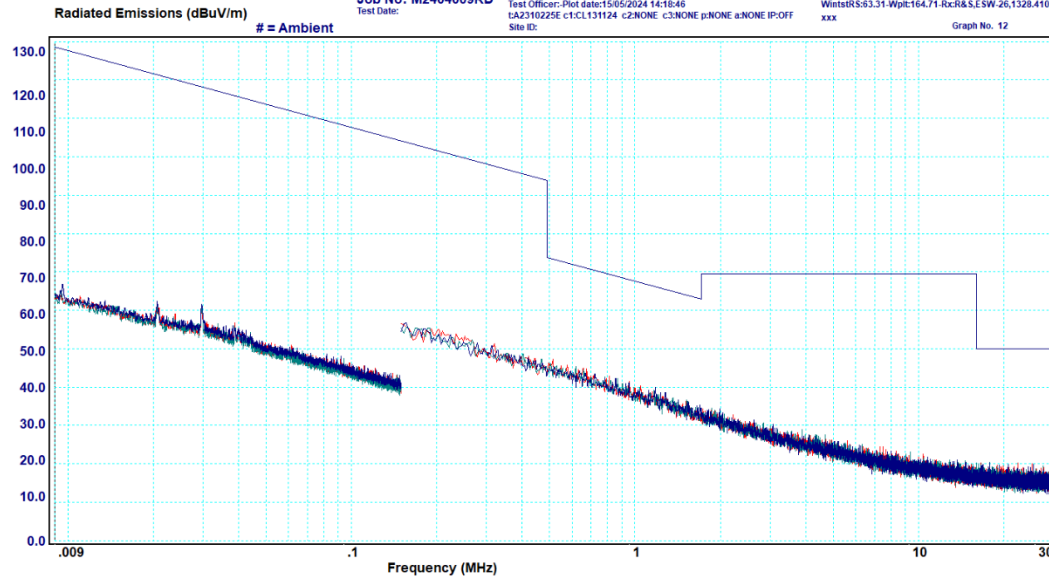
IAZ310225E c1:CL131124 c2:NONE c3:NONE p:NONE a:NONE IP:OFF

Site ID:

WintSR5:53.31 WpItt164.71 RxC&S:ESW-26.1328.4100K26/101306.2

xxx

Graph No. 12

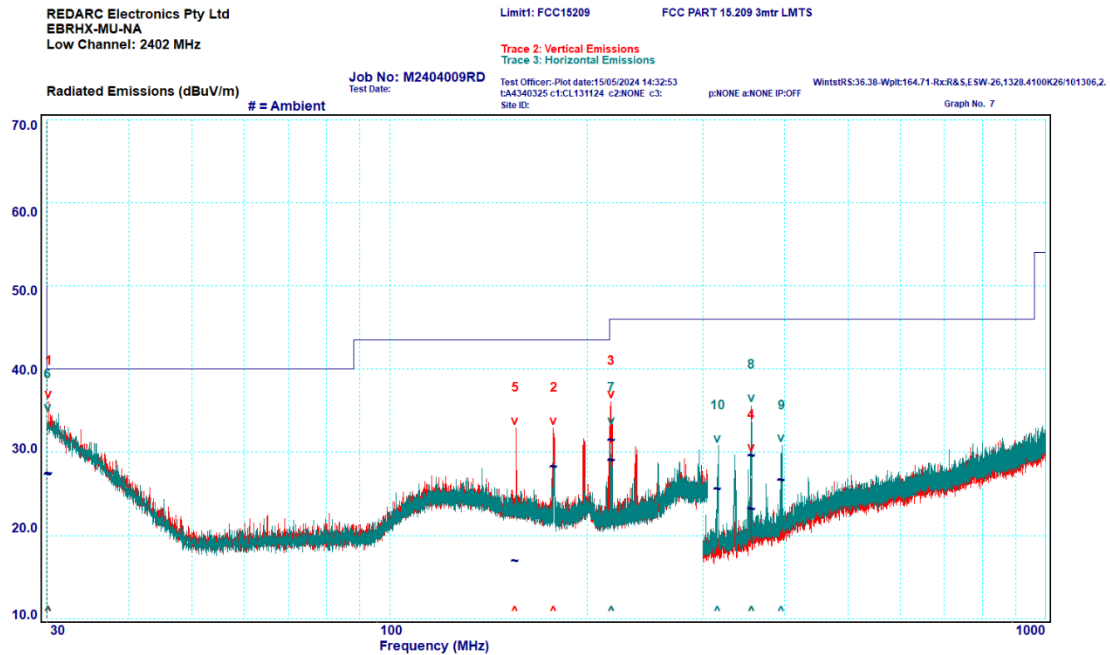


Graph 6-9: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2480 MHz

No peaks were measured within 10 dB of the limit.

6.7.6 Transmitter Spurious Emissions: 30 - 1000 MHz

All emissions measured in the frequency band 30 – 1000 MHz complied with the requirements of the standard.



Graph 6-10: Transmitter Spurious Emissions, 30 – 1000 MHz, 2402 MHz

Table 6-3: Transmitter Spurious Emissions, 30 - 1000 MHz, 2402 MHz

Peak	Frequency (MHz)	Polarisation	Quasi-Peak		
			Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1	30.22	Vertical	27.9	40	-12.1
2	177.77	Vertical	28.7	43.5	-14.8
3	217.6	Vertical	29.5	46	-16.5
4	355.76	Vertical	23.6	46	-22.4
5	155.39	Vertical	17.4	43.5	-26.1
6	30.1	Horizontal	27.8	40	-12.2
7	217.66	Horizontal	31.9	46	-14.1
8	355.76	Horizontal	30	46	-16
9	395.24	Horizontal	27.1	46	-18.9
10	316.19	Horizontal	26	46	-20

REDARC Electronics Pty Ltd
EBRHX-MU-NA
Mid Channel: 2440 MHz

Limit1: FCC15209

FCC PART 15.209 3mtr LMTS

Job No: M2404009RD

Test Date:

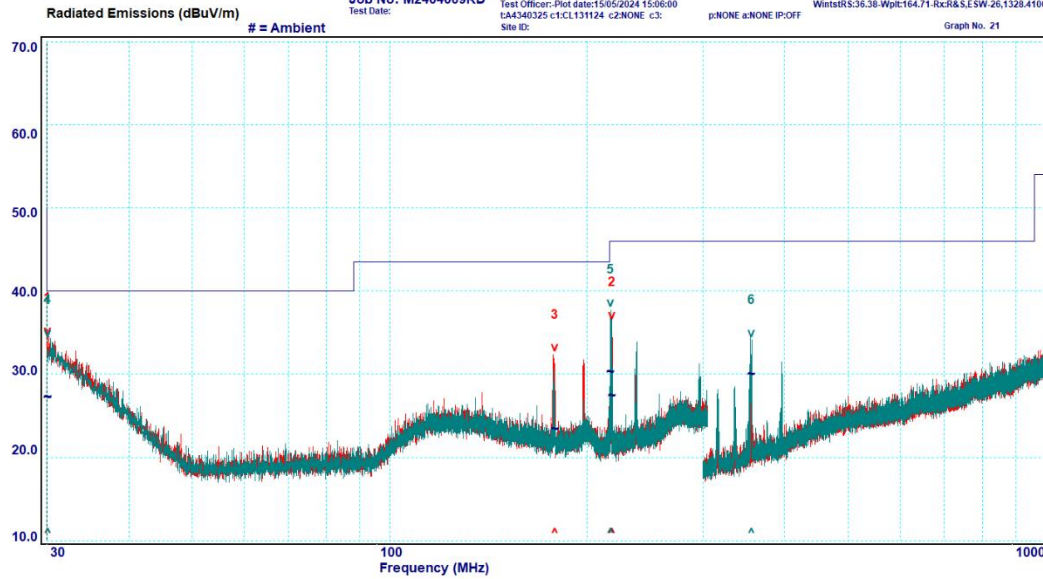
Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

Test Officer: Plot date: 15/05/2024 15:06:00
IA4340325 c1:CL131124 c2:NONE c3:
Site ID:

p:NONE a:NONE IP:OFF

WintSR3:36.38-WpIt164.71-RcR&S:ESW-26,1328.4100K26/101306.2

Graph No. 21



Graph 6-11: Transmitter Spurious Emissions, 30 – 1000 MHz, 2440 MHz

Table 6-4: Transmitter Spurious Emissions, 30 – 1000 MHz, 2440 MHz

Peak	Frequency (MHz)	Polarisation	Quasi-Peak		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1	30.1	Vertical	27.8	40	-12.2
2	218.15	Vertical	27.9	46	-18.1
3	178.53	Vertical	23.9	43.5	-19.6
4	30.1	Horizontal	27.8	40	-12.2
5	216.94	Horizontal	30.7	46	-15.3
6	355.86	Horizontal	30.5	46	-15.5

REDARC Electronics Pty Ltd
EBRHX-MU-NA
High Channel: 2480 MHz

Limit1: FCC15209

FCC PART 15.209 3mtr LMTS

Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

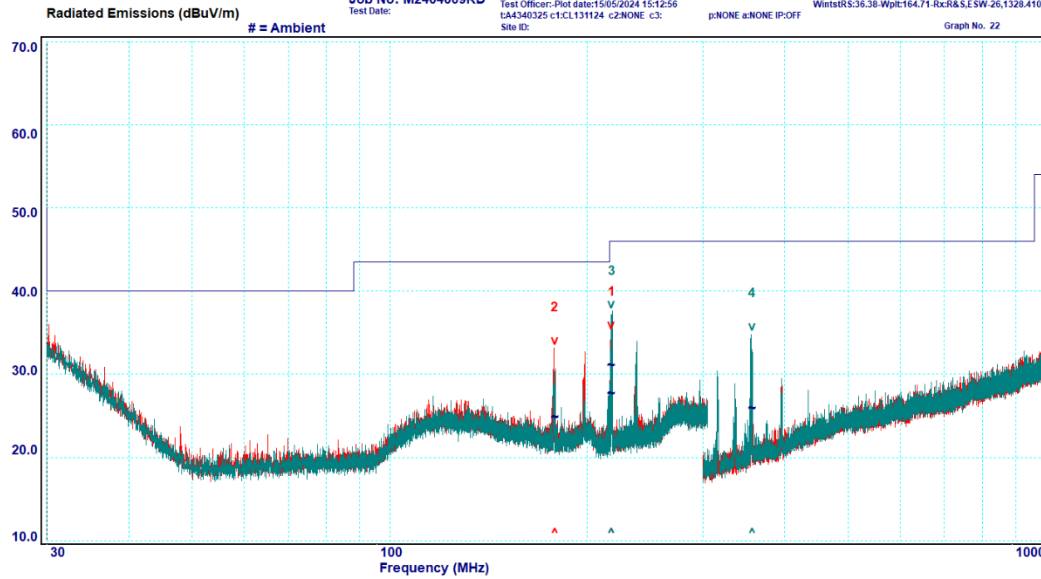
Job No: M2404009RD
Test Date:

Test Officer: Plot date: 15/05/2024 15:12:56
IA4340325 c1:CL131124 c2:NONE c3:
Site ID:

p:NONE a:NONE IP:OFF

WintSR3:36.38-WpIt:164.71-RxR&S:ESW-26,1328.4100K26/101306.2

Graph No. 22



Graph 6-12: Transmitter Spurious Emissions, 30 – 1000 MHz, 2480 MHz

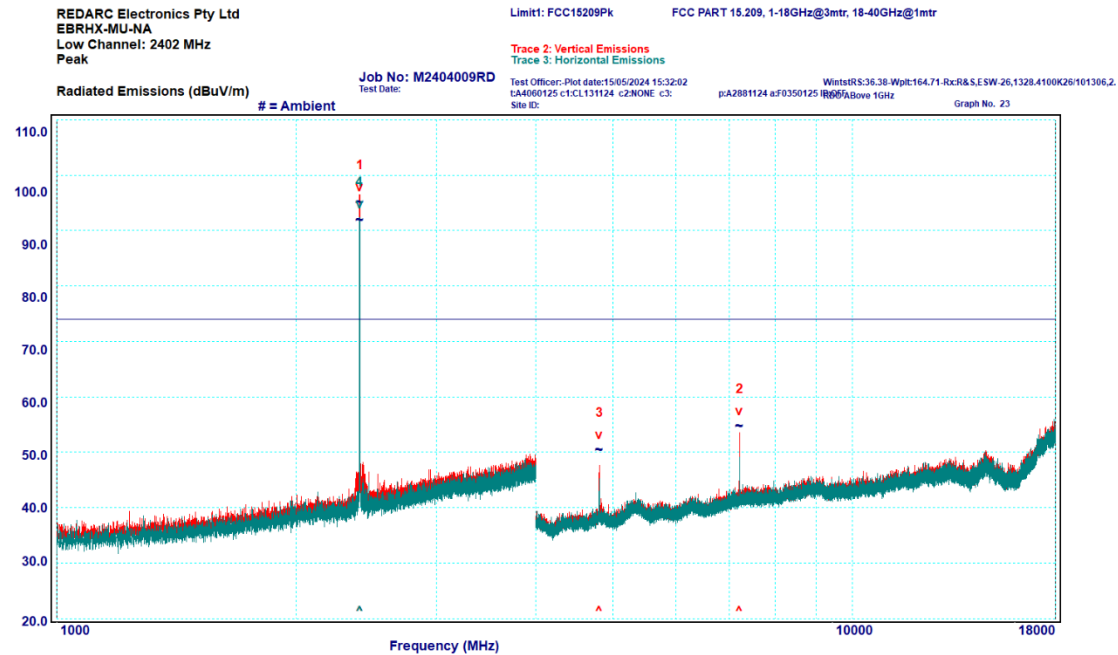
Table 6-5: Transmitter Spurious Emissions, 30 – 1000 MHz, 2480 MHz

Peak	Frequency (MHz)	Polarisation	Quasi-Peak		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1	217.89	Vertical	28.1	46	-17.9
2	178.48	Vertical	25.4	43.5	-18.1
3	217.86	Horizontal	31.6	46	-14.4
4	356.65	Horizontal	26.4	46	-19.6

6.7.7 Transmitter Spurious Emissions: 1 - 18 GHz

All emissions measured in the frequency band 1 – 18 GHz complied with the requirements of the standard.

Peak Measurement:

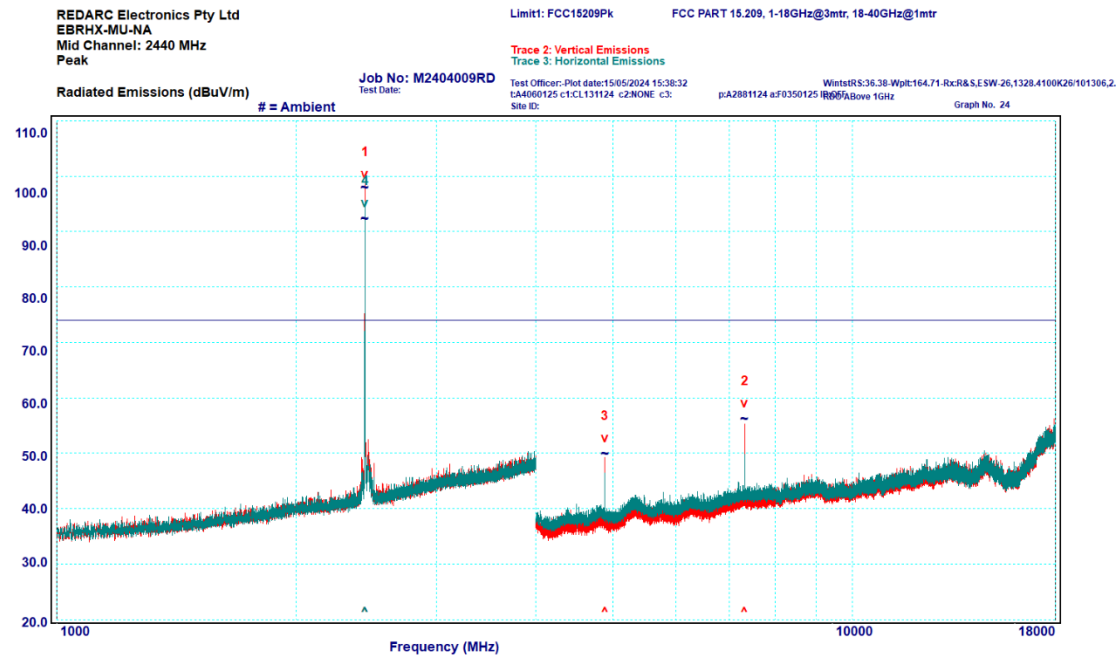


Graph 6-13: Transmitter Spurious Emissions, 1 – 18 GHz, 2402 MHz, Peak

Table 6-6: Transmitter Spurious Emissions, 1 – 18 GHz, 2402 MHz, Peak

Peak	Frequency (MHz)	Polarisation	Peak		
			Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1*	2402.26	Vertical	N/A	N/A	N/A
2	7207.7	Vertical	55.1	74	-18.9
3	4805.12	Vertical	50.8	74	-23.2
4*	2401.6	Horizontal	N/A	N/A	N/A

*Note: Peaks above the limit are the fundamental transmission and not subject to the spurious emissions limit of the standard



Graph 6-14: Transmitter Spurious Emissions, 1 – 18 GHz, 2440 MHz, Peak

Table 6-7: Transmitter Spurious Emissions, 1 – 18 GHz, 2440 MHz, Peak

Peak	Frequency (MHz)	Polarisation	Peak		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2440.51	Vertical	N/A	N/A	N/A
2	7318.87	Vertical	56.6	74	-17.4
3	4881.07	Vertical	50.4	74	-23.6
4*	2440	Horizontal	N/A	N/A	N/A

*Note: Peaks above the limit are the fundamental transmission and not subject to the spurious emissions limit of the standard

REDARC Electronics Pty Ltd
EBRHX-MU-NA
High Channel: 2480 MHz
Peak

Limit1: FCC15208Pk

FCC PART 15.209, 1-18GHz@3mtr, 18-40GHz@1mtr

Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

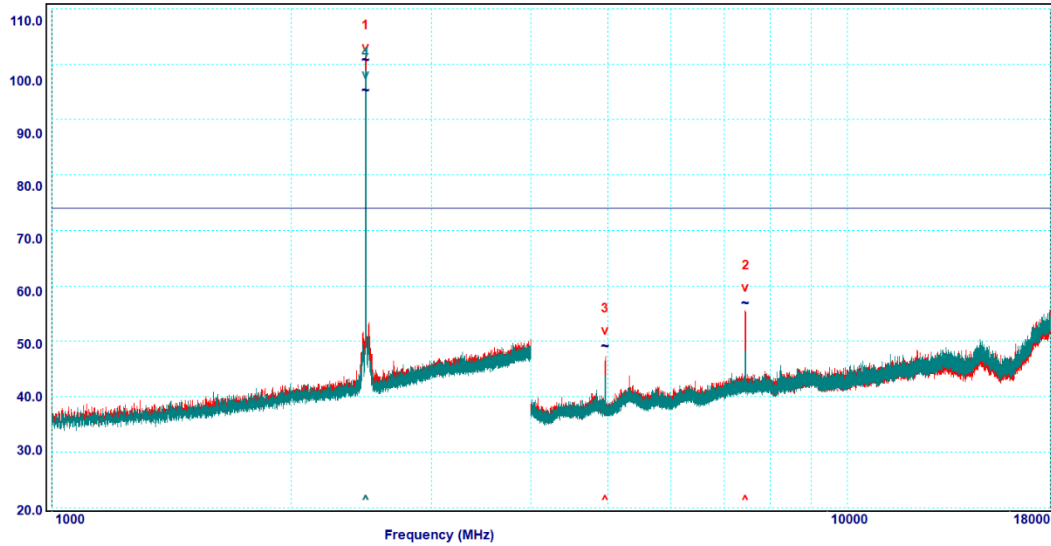
Job No: M2404009RD
Test Date:

Test Officer: Plot date: 15/05/2024 15:45:53
IA4000125 c1:CL131124 c2:NONE c3:

WintSR:36.38 WpIt:164.71 RcxR&S:ESW-26,1328.4100K26/101306.2
p:A2881124 a:F0350125 R60A Above 1GHz

Radiated Emissions (dBuV/m)

= Ambient



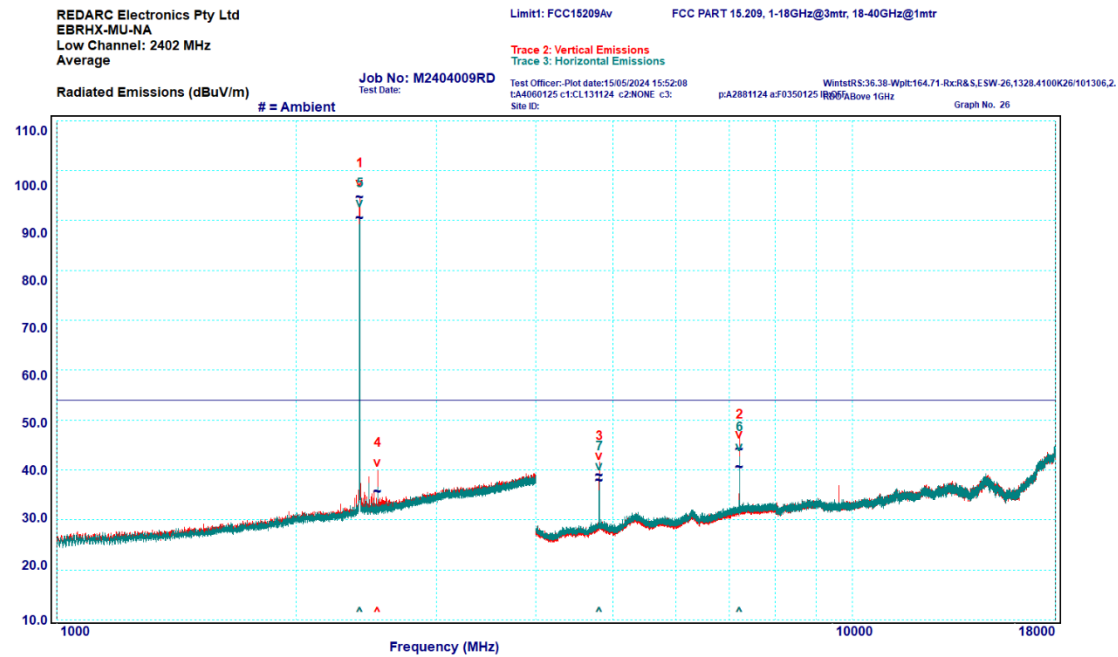
Graph 6-15: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Peak

Table 6-8: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Peak

Peak	Frequency (MHz)	Polarisation	Peak		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2480.1	Vertical	N/A	N/A	N/A
2	7441.73	Vertical	57.3	74	-16.7
3	4959.25	Vertical	49.5	74	-24.5
4*	2480	Horizontal	N/A	N/A	N/A

*Note: Peaks above the limit are the fundamental transmission and not subject to the spurious emissions limit of the standard

Average Measurement:



Graph 6-16: Transmitter Spurious Emissions, 1 – 18 GHz, 2402 MHz, Average

Table 6-9: Transmitter Spurious Emissions, 1 – 18 GHz, 2402 MHz, Average

Peak	Frequency (MHz)	Polarisation	Average		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2402.2	Vertical	N/A	N/A	N/A
2	7207.34	Vertical	44.6	54	-9.4
3	4804.22	Vertical	39.4	54	-14.6
4	2530.18	Vertical	36.1	54	-17.9
5*	2402.15	Horizontal	N/A	N/A	N/A
6	7207.3	Horizontal	41	54	-13
7	4804.27	Horizontal	38.3	54	-15.7

*Note: Peaks above the limit are the fundamental transmission and not subject to the spurious emissions limit of the standard

REDARC Electronics Pty Ltd
EBRHX-MU-NA
Mid Channel: 2440 MHz
Average

Limit1: FCC15208Av

FCC PART 15.209, 1-18GHz@3mtr, 18-40GHz@1mtr

Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

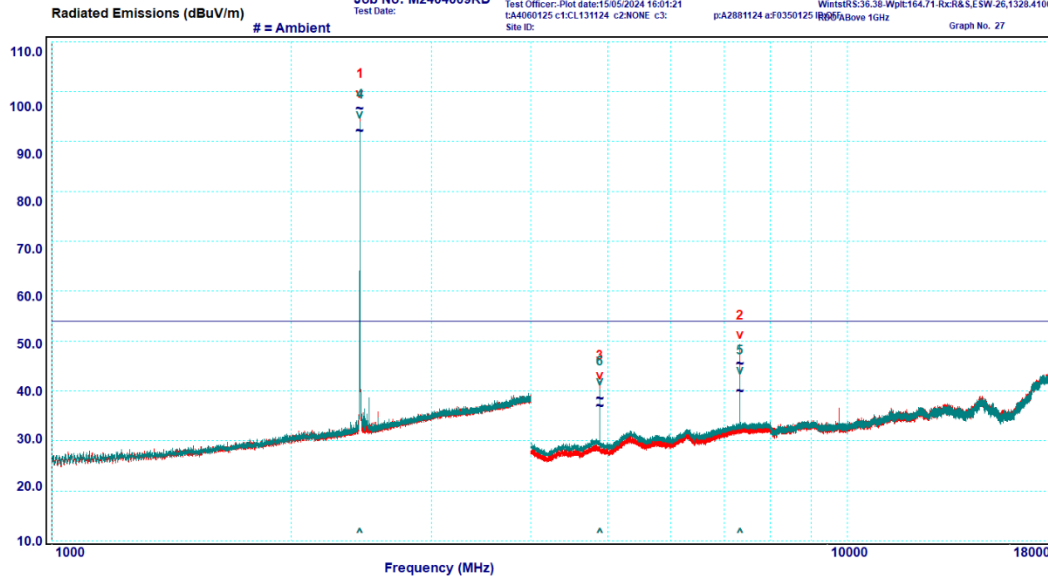
Job No: M2404009RD

Test Date:

Test Officer: Plot date: 15/05/2024 16:01:21
IA4000125 c1:CL131124 c2:NONE c3:

WintSR:36.38-WpIt:164.71-Rx:R&S:ESW-26,1328.4100K26/101306.2
p:A2881124 a:F0350125 R:00A Above 1GHz

Graph No. 27



Graph 6-17: Transmitter Spurious Emissions, 1 – 18 GHz, 2440 MHz, Average

Table 6-10: Transmitter Spurious Emissions, 1 – 18 GHz, 2440 MHz, Average

Peak	Frequency (MHz)	Polarisation	Average		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2440.18	Vertical	N/A	N/A	N/A
2	7321.57	Vertical	46	54	-8
3	4881.17	Vertical	38.9	54	-15.1
4*	2440	Horizontal	N/A	N/A	N/A
5	7321.47	Horizontal	40.4	54	-13.6
6	4881.25	Horizontal	37.4	54	-16.6

*Note: Peaks above the limit are the fundamental transmission and not subject to the spurious emissions limit of the standard

REDARC Electronics Pty Ltd
EBRHX-MU-NA
High Channel: 2480 MHz
Average

Limit1: FCC15208Av

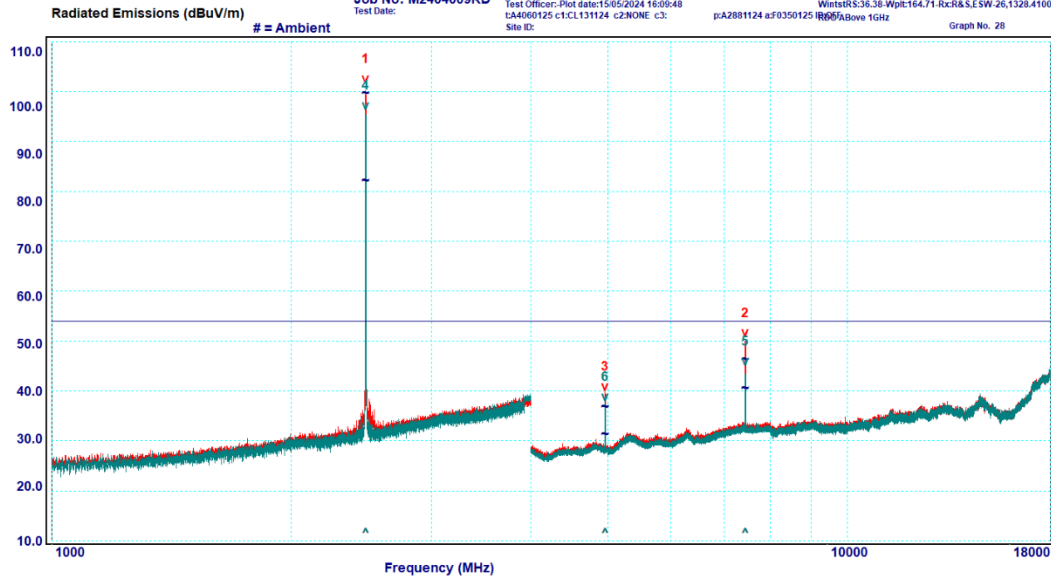
FCC PART 15.209, 1-18GHz@3mtr, 18-40GHz@1mtr

Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

Job No: M2404009RD
Test Date:

Test Officer: Plot date: 15/05/2024 16:09:48
IA4000125 c1:CL131124 c2:NONE c3:

WintSR:36.38-WpIt:164.71-RxR&S:ESW-26,1328.4100K26/101306.2
p:A2881124 a:F0350125 R:00Above 1GHz
Site ID: Graph No. 28



Graph 6-18: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Average

Table 6-11: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Average

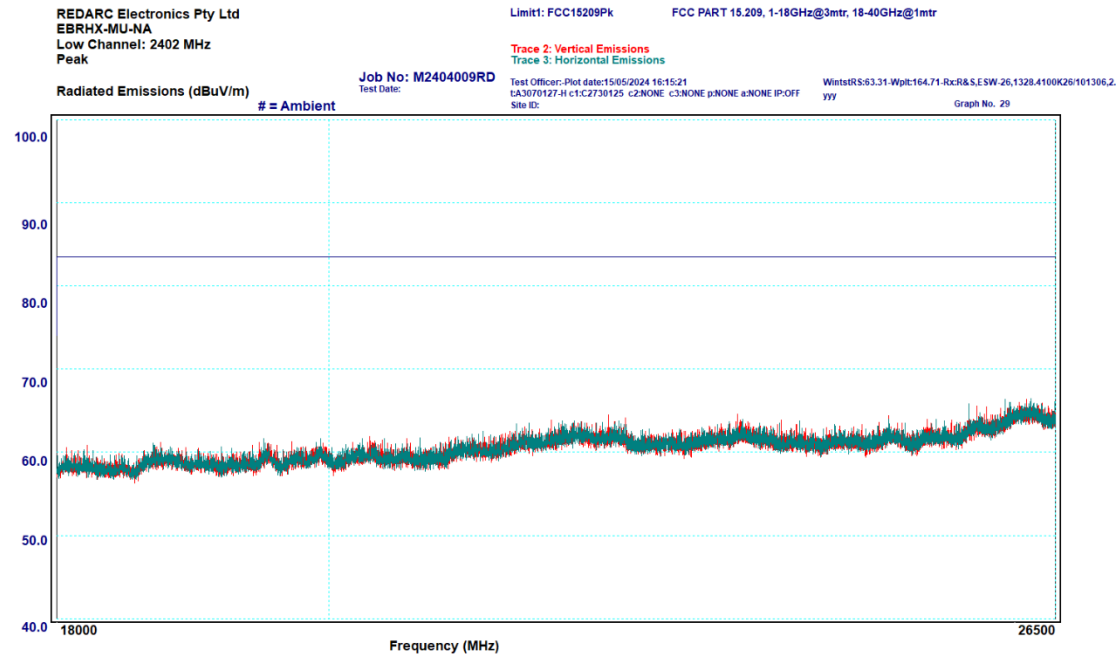
Peak	Frequency (MHz)	Polarisation	Average		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2480.18	Vertical	N/A	N/A	N/A
2	7439.04	Vertical	46.8	54	-7.2
3	4959.24	Vertical	37.3	54	-16.7
4*	2480.17	Horizontal	N/A	N/A	N/A
5	7438.98	Horizontal	41	54	-13
6	4959.25	Horizontal	31.8	54	-22.2

*Note: Peaks above the limit are the fundamental transmission and not subject to the spurious emissions limit of the standard

6.7.8 Transmitter Spurious Emissions: 18 – 26 GHz

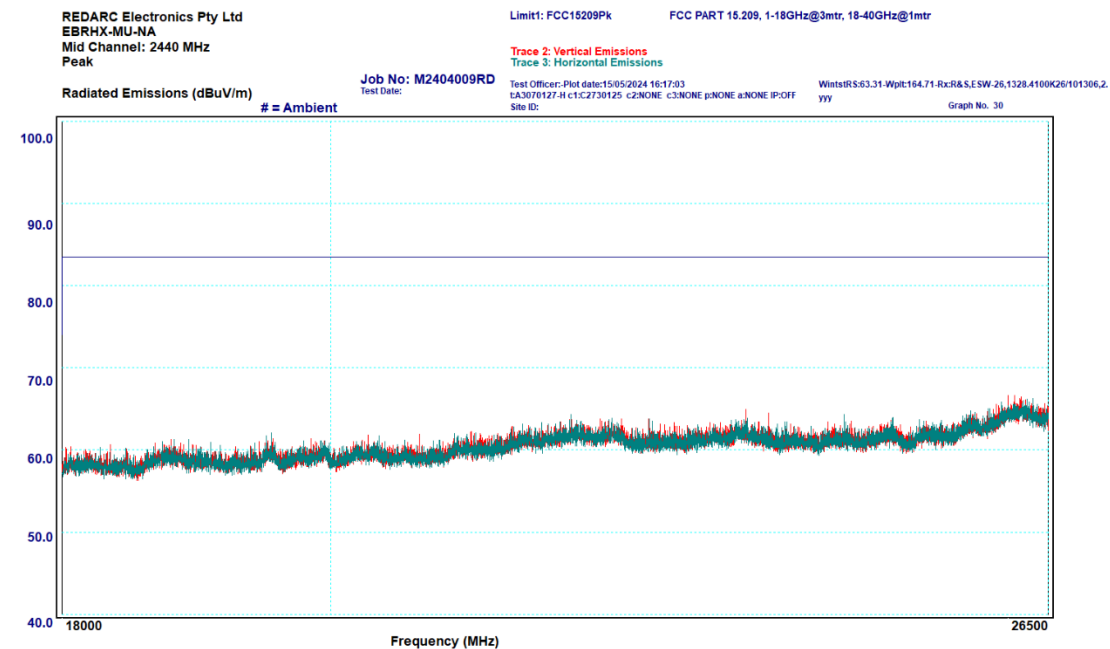
All emissions measured in the frequency band 18 – 26 GHz complied with the requirements of the standard.

Peak Measurement:



Graph 6-19: Transmitter Spurious Emissions, 18 – 26 GHz, 2402 MHz, Peak

No peaks were measured within 10 dB of the limit.



Graph 6-20: Transmitter Spurious Emissions, 18 – 26 GHz, 2440 MHz, Peak

No peaks were measured within 10 dB of the limit.

REDARC Electronics Pty Ltd
EBRHX-MU-NA
High Channel: 2480 MHz
Peak

Limit1: FCC15209Pk

FCC PART 15.209, 1-18GHz@3mtr, 18-40GHz@1mtr

Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

Job No: M2404009RD

Test Date:

Test Officer: Plot date: 15/05/2024 16:19:04

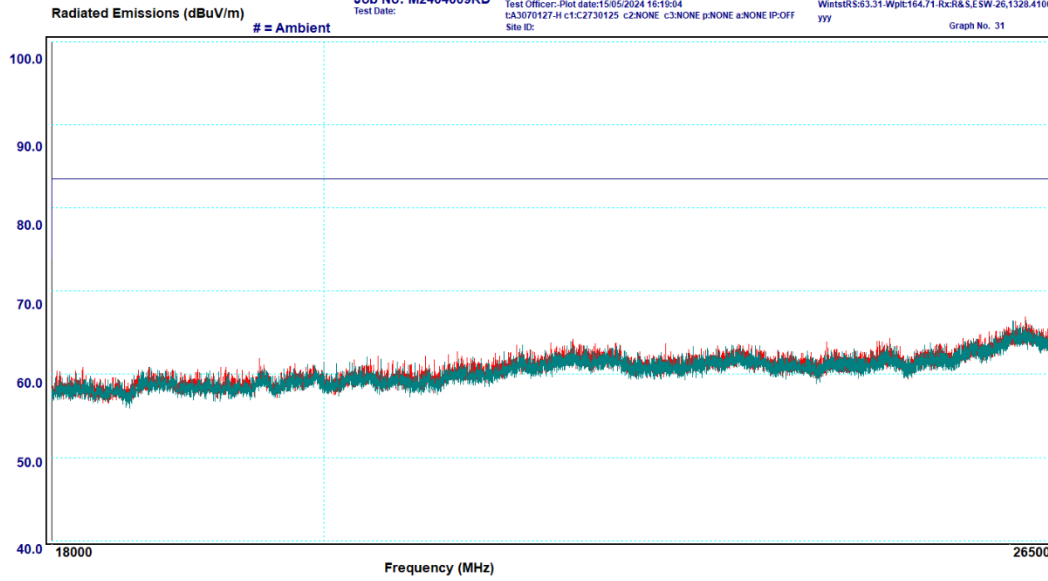
EA3070127-H c1:C2730125 c2:NONE c3:NONE p:NONE a:NONE IP:OFF

Site ID:

WintSR: S3.31 WpIt: 164.71 RcxR&S: ESW-26,1328.4100K26/101306.2

yyy

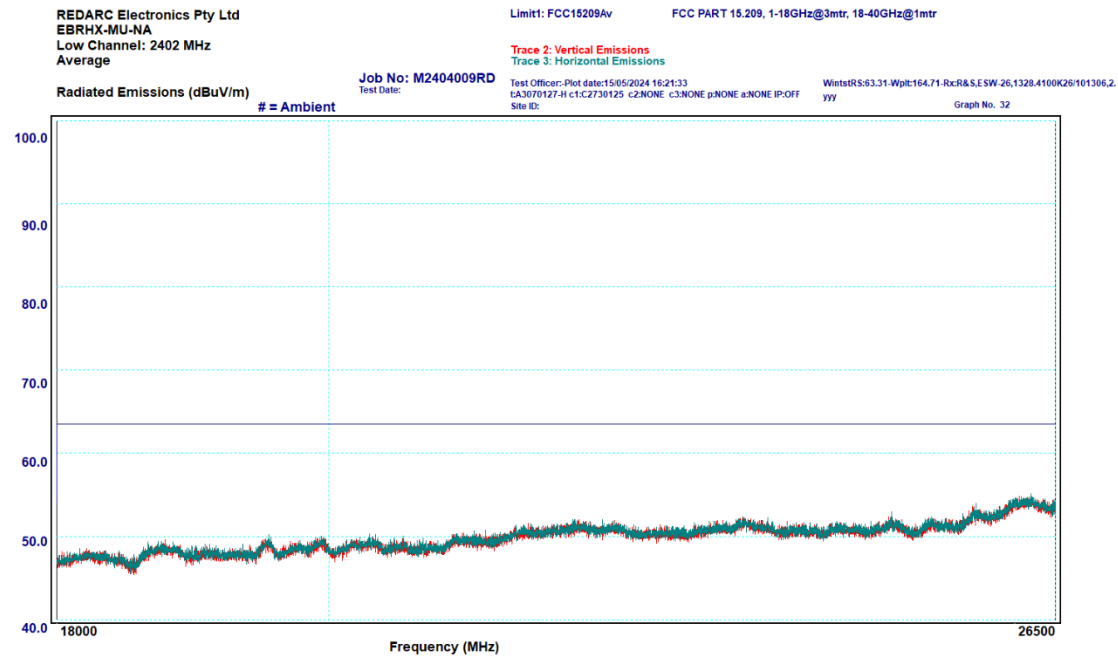
Graph No. 31



Graph 6-21: Transmitter Spurious Emissions, 18 – 26 GHz, 2480 MHz, Peak

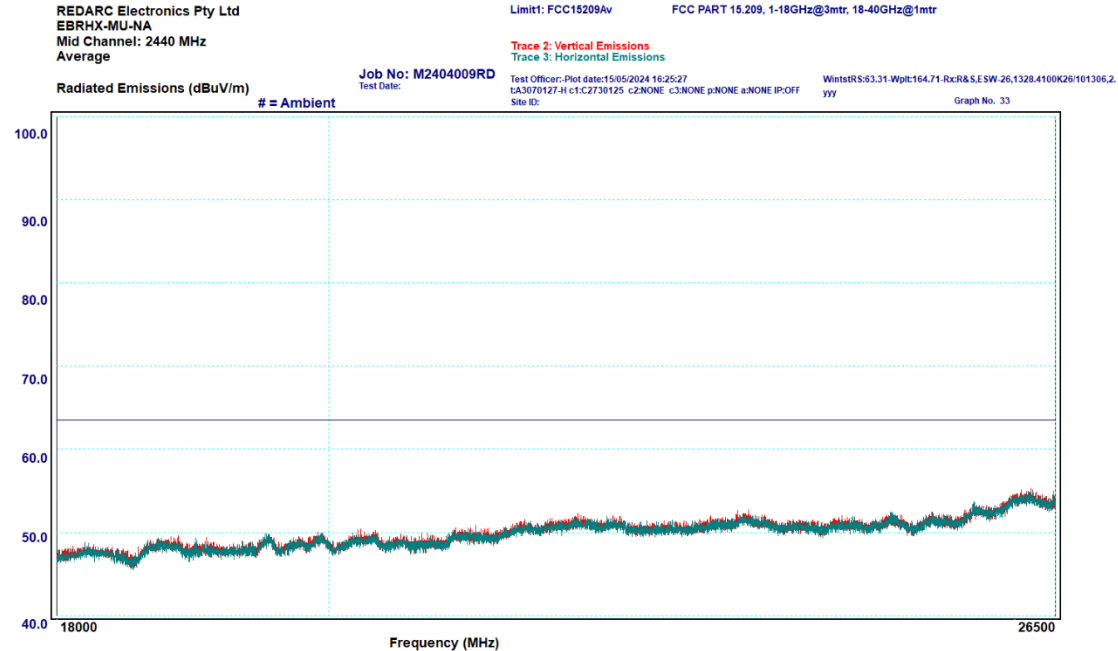
No peaks were measured within 10 dB of the limit.

Average Measurement:



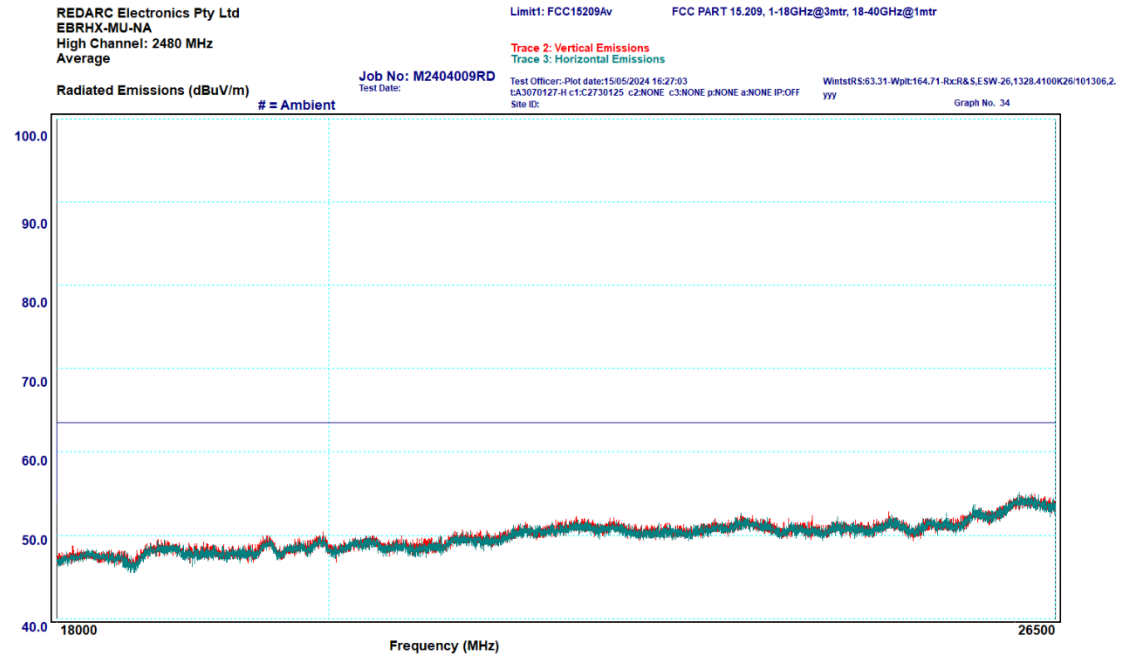
Graph 6-22: Transmitter Spurious Emissions, 18 – 26 GHz, 2402 MHz, Average

No peaks were measured within 10 dB of the limit.



Graph 6-23: Transmitter Spurious Emissions, 18 – 26 GHz, 2440 MHz, Average

No peaks were measured within 10 dB of the limit.

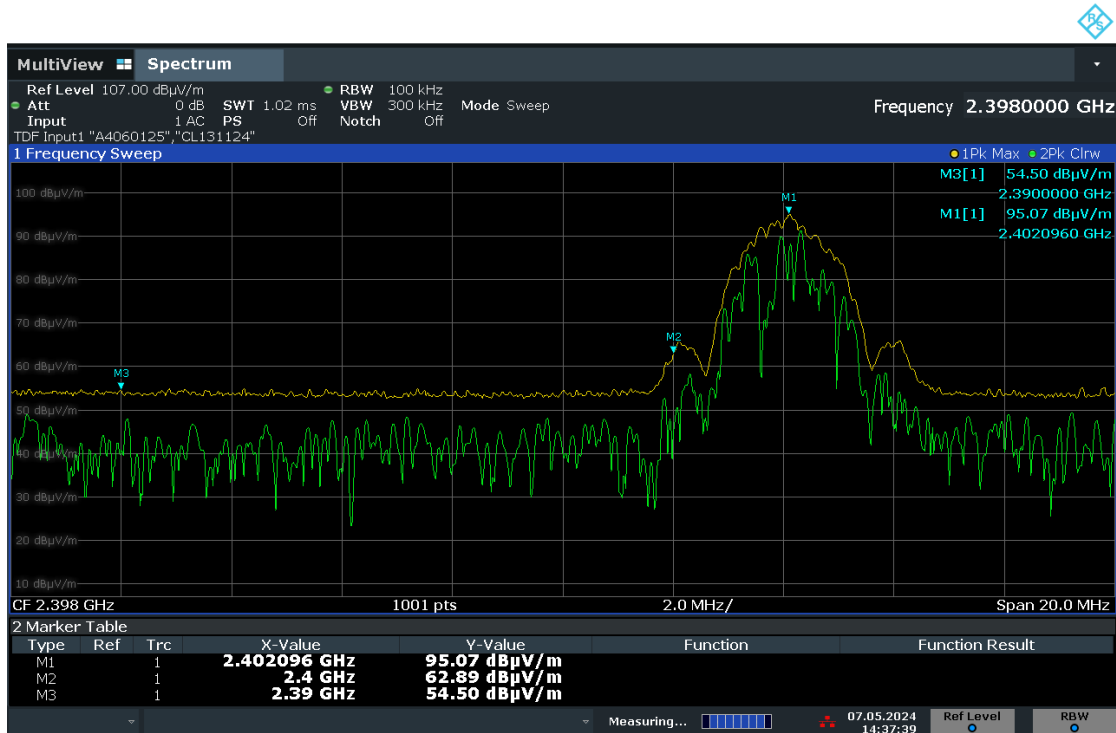


Graph 6-24: Transmitter Spurious Emissions, 18 – 26 GHz, 2480 MHz, Average

No peaks were measured within 10 dB of the limit.

6.8 §15.247(d)/ RSS-247 5.5 Band Edge Emission Measurements

Band-edge radiated measurements were done in accordance with ANSI C63.10 clause 6.10. All emissions measured near the lower and higher band edge complied with the requirements of §15.247/ RSS-247 5.0.

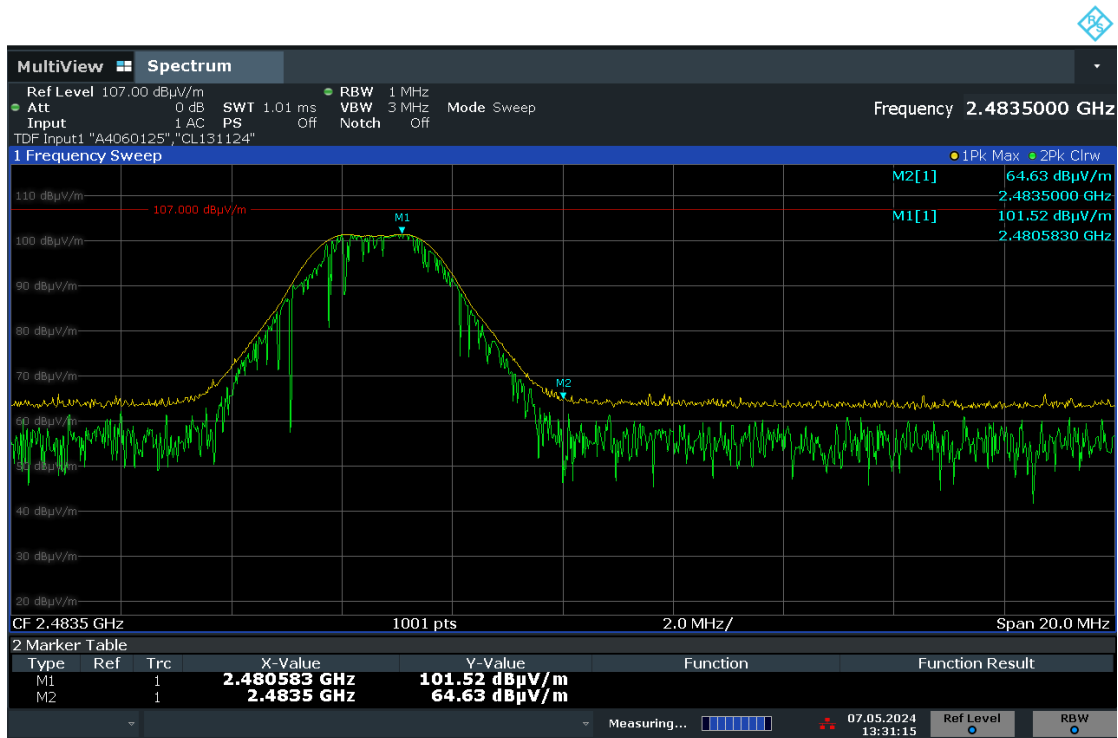


14:37:40 07.05.2024

Graph 6-25: Band Edge Emission, Lower Band-edge

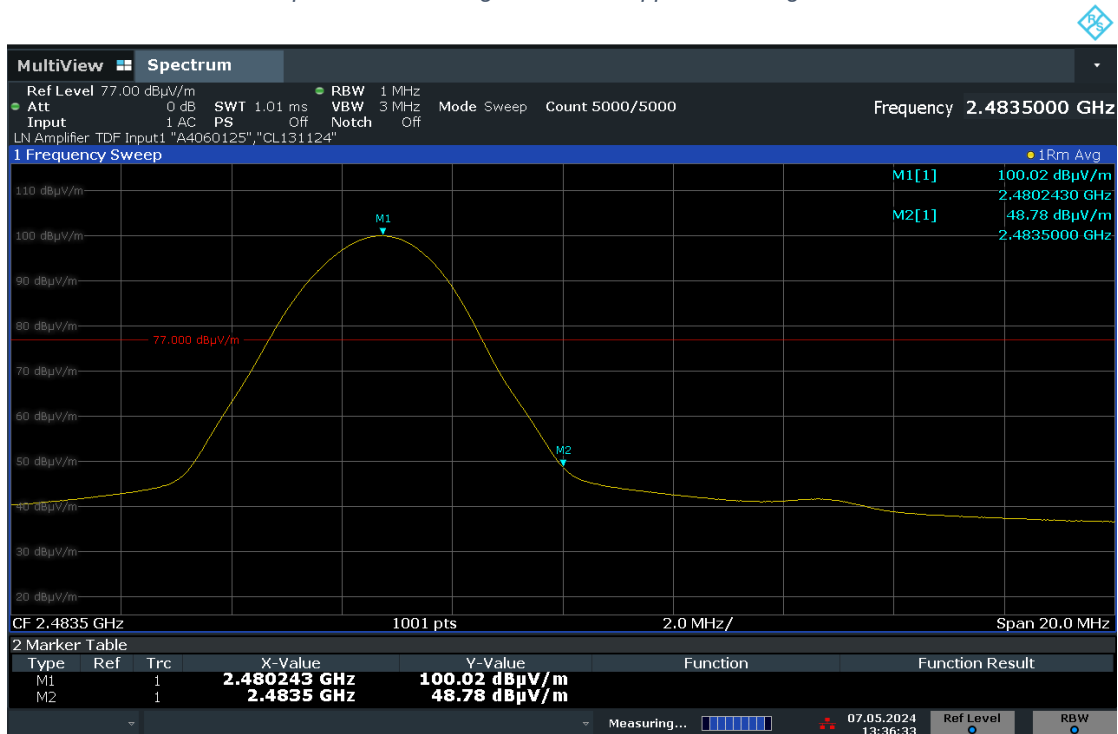
Table 6-12: Band Edge Emission, Lower Band-edge

Measurement Type	Freq (MHz)	Measurement (dBμV/m)	Limit (dBμV/m)	Result
Peak	2400	62.89	74	Complied



13:31:16 07.05.2024

Graph 6-26: Band Edge Emission, Upper Band-edge, Peak



13:36:34 07.05.2024

Graph 6-27: Band Edge Emission, Upper Band-edge, Average

Table 6-13: Band Edge Emission, Upper Band-edge

Measurement Type	Freq (MHz)	Measurement (dBμV/m)	Limit (dBμV/m)	Result
Peak	2483.5	64.63	74	Complied
Average	2483.5	48.78	54	Complied

6.9 §15.247(e)/ RSS-247 5.2(b) Power Spectral Density

6.9.1 Test procedure

Maximum power spectral density level in the fundamental emission was measured in accordance with ANSI C63.10: 2013 Clause 11.10

6.9.2 Limits

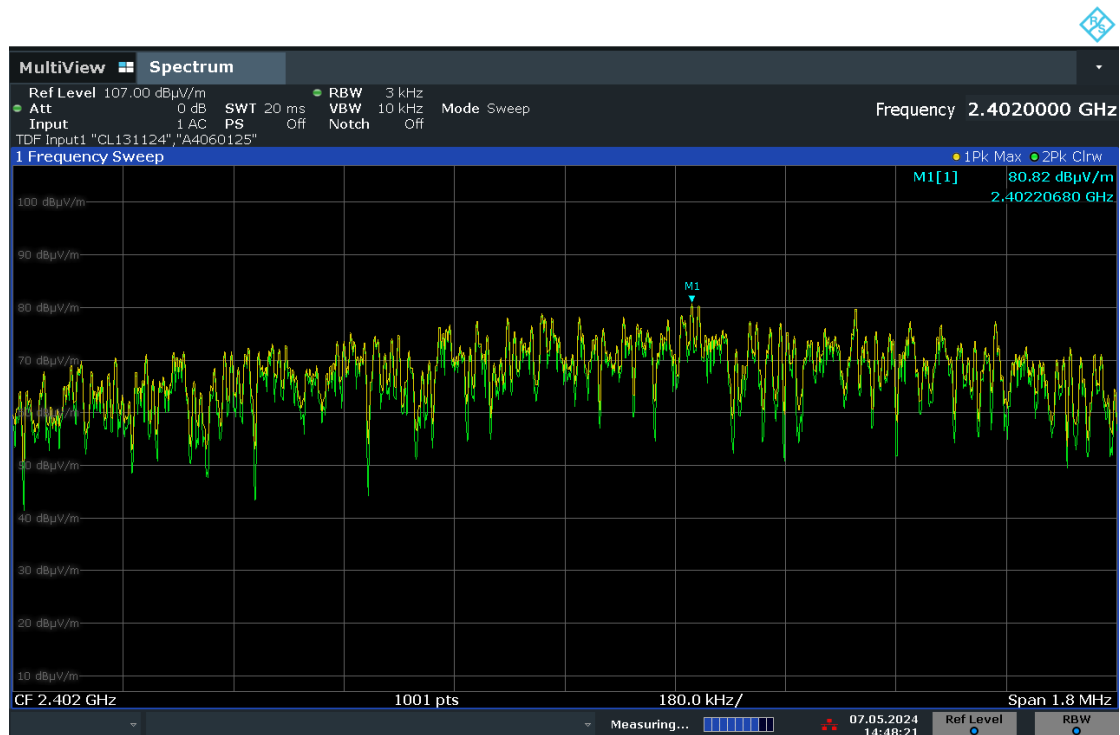
The maximum peak conducted power spectral density (PSD) is 8 dBm per 3 kHz.

6.9.3 Results

Table 6-14: Power spectral density

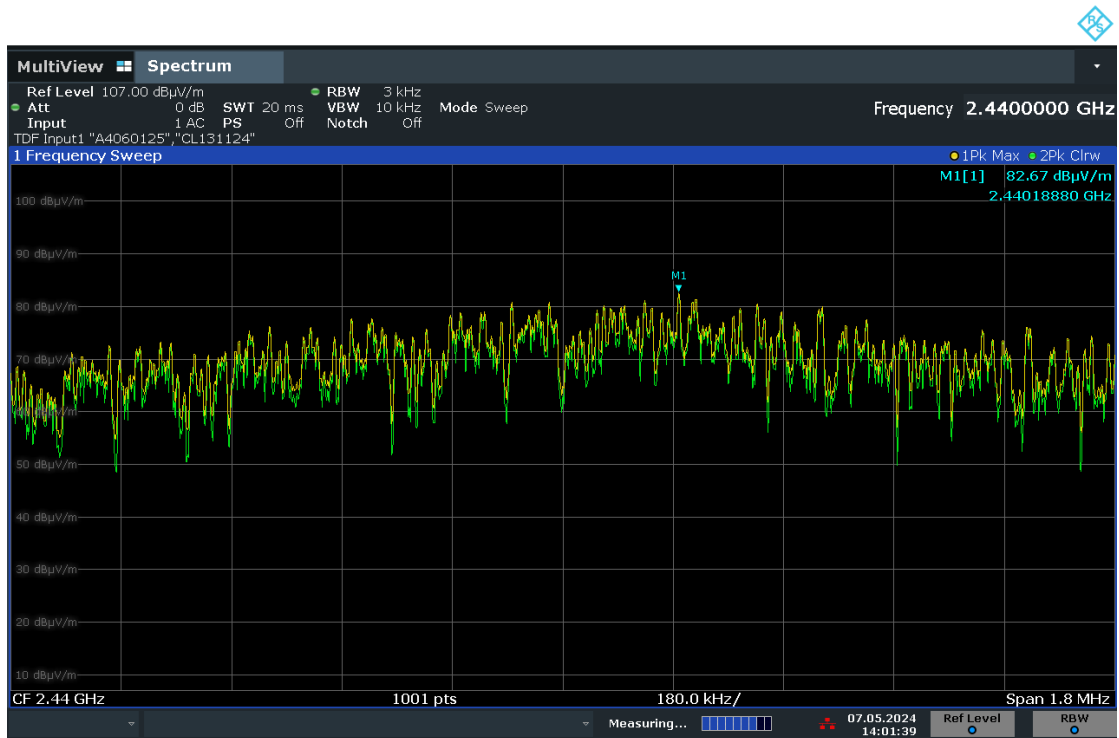
Freq. (MHz)	E-Field @ 3 m (dBμV/m)	EIRP (dBm)	Antenna Gain (dBi)	Equivalent Conducted Output PSD (dBm)	Limit (dBm)	Results
2402	80.82	-14.41	3.7	-18.11	8	Complied
2440	82.67	-12.56	3.7	-16.26	8	Complied
2480	86.39	-8.84	3.7	-12.54	8	Complied

The measured radiated field strength is converted to equivalent conducted output power for checking compliance (KDB 558074 D01 Section 3).



14:48:22 07.05.2024

Graph 6-28: Radiated - Power Spectral Density, 2402 MHz



14:01:40 07.05.2024

Graph 6-29: Radiated - Power Spectral Density, 2440 MHz



13:26:30 07.05.2024

Graph 6-30: Radiated - Power Spectral Density, 2480 MHz



This document shall not be reproduced except in full.

6.10 §15.247(i)/ RSS-Gen 3.4/RSS-102 Maximum Permissible Exposure

The EUT complied with the applicable maximum permissible exposure levels. Refer to EMC Technologies report M2404009-2 and M2404009-3.

6.11 §15.215/ RSS-Gen 6.7 Occupied Bandwidth – 99% power

6.11.1 Test procedure

The bandwidth containing 99% power of the transmitted signal was measured using the procedure from ANSI C63.10 section 6.9.

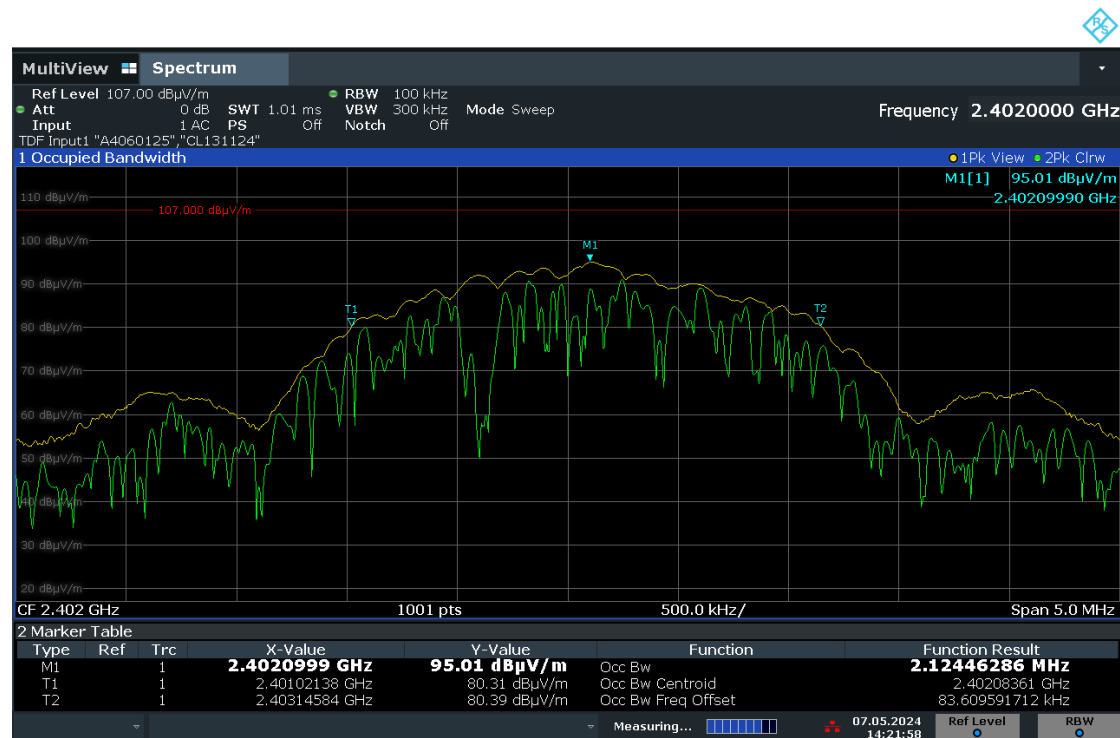
6.11.2 Limits

The 99% power should be contained within the frequency band 2400 – 2483.5 MHz.

6.11.3 Results

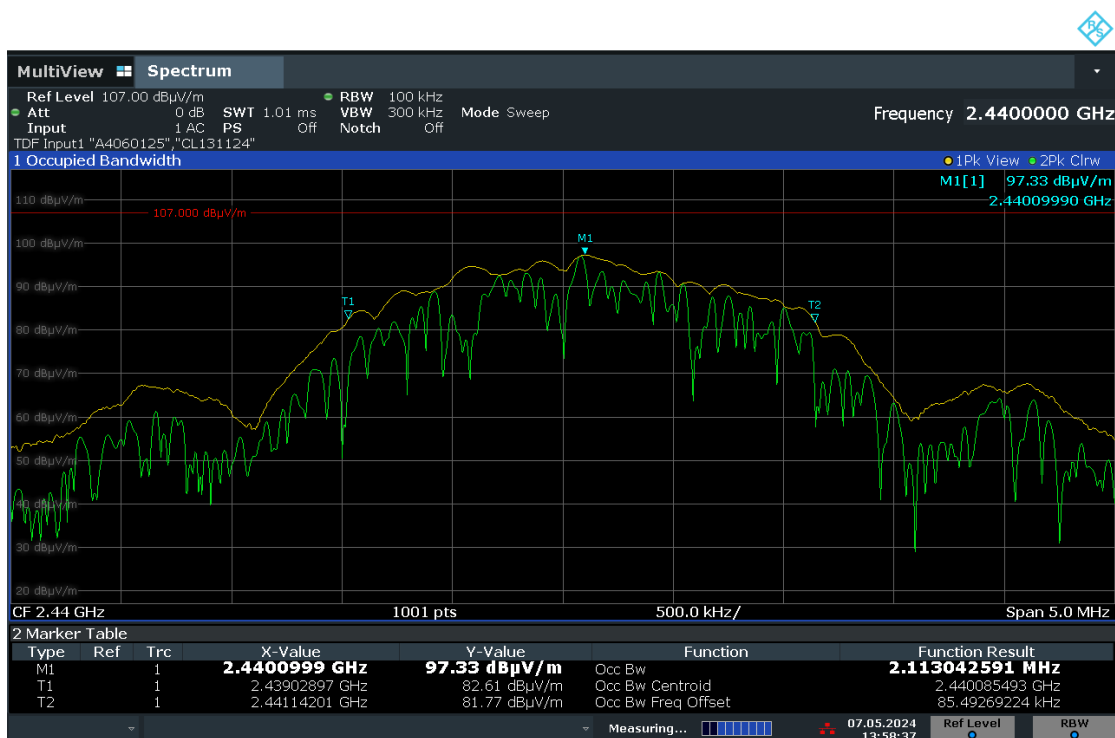
Table 6-15: Occupied Bandwidth

Freq. (MHz)	99% Bandwidth (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	Result
2402	2.1244	2401.021	2403.145	Complied
2440	2.1130	2439.028	2441.142	Complied
2480	2.0974	2479.024	2481.121	Complied



14:21:59 07.05.2024

Graph 6-31: Occupied bandwidth, 2402 MHz



13:58:37 07.05.2024

Graph 6-32: Occupied bandwidth, 2440 MHz



13:11:48 07.05.2024

Graph 6-33: Occupied bandwidth, 2480 MHz

END OF REPORT