

RADIO TEST REPORT

REPORT NUMBER: M2310030-7 V2**TEST STANDARD: FCC PART 15 SUBPART C
SECTION 15.247****CLIENT: METSO AUSTRALIA PTY LTD****DEVICE: WIRELESS WEAR SENSOR****MODEL: WEARSENSE HUGGER
SENSOR****FCC ID: 2BFPRMM1774190****DATE OF ISSUE: 1 JULY 2024**

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REVISION TABLE

Version	Sec/Para Changed	Change Made	Date
1		Initial issue of document	05/04/2024
2		Peak Antenna Gain updated from 0dBi to 0.5dBi	1/07/2024



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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 Antenna Requirement.....	10
6.2	§15.205 Restricted Bands of Operation	10
6.3	§15.207 Conducted Limits.....	10
6.4	§15.209 Radiated Emission Limits; General Requirements.....	10
6.5	§15.247(a)(2) 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) 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) 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	18
6.7.7	Transmitter Spurious Emissions: 1 - 18 GHz.....	21
6.7.8	Transmitter Spurious Emissions: 18 – 26 GHz.....	27
6.8	§15.247(d) Band Edge Emission Measurements.....	30
6.9	§15.247(e) Power Spectral Density.....	32
6.9.1	Test procedure.....	32
6.9.2	Limits.....	32
6.9.3	Results	32
6.10	§15.247(i) Maximum Permissible Exposure.....	34



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6.11	§15.215 Occupied Bandwidth – 99% power	34
6.11.1	Test procedure.....	34
6.11.2	Limits.....	34
6.11.3	Results	34

GRAPHS

Graph 6-1: 6 dB bandwidth, 2405 MHz	11
Graph 6-2: 6 dB bandwidth, 2445 MHz	11
Graph 6-3: 6 dB bandwidth, 2480 MHz	12
Graph 6-4: Maximum EIRP, 2405 MHz	13
Graph 6-5: Maximum EIRP, 2445 MHz	13
Graph 6-6: Maximum EIRP, 2480MHz	14
Graph 6-7: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2405 MHz	17
Graph 6-8: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2445 MHz	17
Graph 6-9: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2480 MHz	18
Graph 6-10: Transmitter Spurious Emissions, 30 – 1000 MHz, 2405 MHz	18
Graph 6-11: Transmitter Spurious Emissions, 30 – 1000 MHz, 2445 MHz	19
Graph 6-12: Transmitter Spurious Emissions, 30 – 1000 MHz, 2480 MHz	20
Graph 6-13: Transmitter Spurious Emissions, 1 – 18 GHz, 2405 MHz, Peak	21
Graph 6-14: Transmitter Spurious Emissions, 1 – 18 GHz, 2445 MHz, Peak	22
Graph 6-15: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Peak	23
Graph 6-16: Transmitter Spurious Emissions, 1 – 18 GHz, 2405 MHz, Average	24
Graph 6-17: Transmitter Spurious Emissions, 1 – 18 GHz, 2445 MHz, Average	25
Graph 6-18: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Average	26
Graph 6-19: Transmitter Spurious Emissions, 18 – 26 GHz, 2405 MHz, Peak	27
Graph 6-20: Transmitter Spurious Emissions, 18 – 26 GHz, 2445 MHz, Peak	27
Graph 6-21: Transmitter Spurious Emissions, 18 – 26 GHz, 2480 MHz, Peak	28
Graph 6-22: Transmitter Spurious Emissions, 18 – 26 GHz, 2405 MHz, Average	28
Graph 6-23: Transmitter Spurious Emissions, 18 – 26 GHz, 2445 MHz, Average	29
Graph 6-24: Transmitter Spurious Emissions, 18 – 26 GHz, 2480 MHz, Average	29
Graph 6-25: Band Edge Emission, Lower Band-edge	30
Graph 6-26: Band Edge Emission, Upper Band-edge, Peak	31
Graph 6-27: Band Edge Emission, Upper Band-edge, Average	31
Graph 6-28: Radiated - Power Spectral Density, 2405 MHz	32
Graph 6-29: Radiated - Power Spectral Density, 2445 MHz	33
Graph 6-30: Radiated - Power Spectral Density, 2480 MHz	33
Graph 6-31: Occupied bandwidth, 2405 MHz	34
Graph 6-32: Occupied bandwidth, 2445 MHz	35
Graph 6-33: Occupied bandwidth, 2480 MHz	35

TABLES

Table 6-1: 6 dB Bandwidth	10
Table 6-2: Maximum peak power	12
Table 6-3: 100 kHz reference level measurement	16
Table 6-4: Transmitter Spurious Emissions, 30 – 1000 MHz, 2405 MHz	19
Table 6-5: Transmitter Spurious Emissions, 30 – 1000 MHz, 2445 MHz	19
Table 6-6: Transmitter Spurious Emissions, 30 – 1000 MHz, 2480 MHz	20
Table 6-7: Transmitter Spurious Emissions, 1 – 18 GHz, 2405 MHz, Peak	21
Table 6-8: Transmitter Spurious Emissions, 1 – 18 GHz, 2445 MHz, Peak	22
Table 6-9: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Peak	23
Table 6-10: Transmitter Spurious Emissions, 1 – 18 GHz, 2405 MHz, Average	24
Table 6-11: Transmitter Spurious Emissions, 1 – 18 GHz, 2445 MHz, Average	25
Table 6-12: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Average	26
Table 6-13: Band Edge Emission, Lower Band-edge	30
Table 6-14: Band Edge Emission, Upper Band-edge	31
Table 6-15: Power spectral density	32
Table 6-16: Occupied Bandwidth	34

TEST CERTIFICATE

Device: Wireless Wear Sensor
Model: WearSense Hugger Sensor
Serial Number: Sample C2
Manufacturer: Metso Australia Pty Ltd

Radio: 802.15.4 (STM32WB Chipset, ST Microelectronics)
FCC ID: FCC ID: 2BFPRMM1774190

Tested for: Metso Australia Pty Ltd
Address: Level 2, 1110 Hay Street, Perth Australia 6005
Contact: Piero Velletri
Phone Number: +61 8 9420 5555
Email: Piero.velletri@metso.com

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

Result: The Wireless Wear Sensor complied with the applicable requirements
of the above standards. Refer to Report M2310030-7 v2 for full details.


Test Date: 23-25 January 2024

Issue Date: 1 July 2024

Test Engineer: 
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.*

Authorised Signatory: 
Ian Paul Ng
Senior Test Engineer

Issued by: EMC Technologies Pty. Ltd.,
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RADIO TEST REPORT

1 TEST SUMMARY

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



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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)	01/09/2023	01/09/2026	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: 2021 (A-310)	20/09/2022	20/09/2024	2 Year ^{*2}
	SUNOL JB6 Sn: A012312 (A-363)	26/07/2022	26/07/2024	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)	30/04/2021	30/04/2024	3 Year ^{*1}
Cables ^{*3}	Huber & Suhner Sucoflex 104A Sn: 503061/4A (C-463)	10/11/2023	10/11/2024	1 Year ^{*1}
	Huber & Suhner Sucoflex 104A Sn: 507100 /4A (C-478)	10/11/2023	10/11/2024	1 Year ^{*1}
	Huber & Suhner Sucoflex 104A Sn: 27319 (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 a wireless online wear monitoring system that can be fitted to any metallic or ceramic liner independent of the attachment system in use. It monitors wear in real time and tells you when to change liners.

5.1 EUT (Transmitter) Details

Radio:	ST Microelectronics STM32WB
Type:	2.4GHz Transceiver (802.15.4)
Frequency band:	2400 – 2483.5 MHz
Number of Channels:	16
Operating Frequency:	Lowest Channel: 2405 MHz (CH 11) Middle Channel: 2445 MHz (CH 19) Highest Channel: 2480 MHz (CH 26)
Modulation:	O-QPSK
Nominal Bandwidth:	5 MHz
Data Rate:	250 kbit/s
Antenna Model/Type:	P/N: 2450AT18A100, Johanson Technology 2.4GHz Mini Antenna SMT
Antenna Peak Gain:	0.5 dBi

5.2 EUT (Host) Details

Test Sample:	Wireless Wear Sensor
Model:	WearSense Hugger Sensor
Serial Number:	Sample C2
Supply Rating:	3.6V 1/2 AA Lithium battery (built in), Non-rechargeable

5.3 Test Configuration

Testing was performed with the EUT's Transceiver set to transmit continuously at Lowest Channel (2405 MHz), Middle Channel (2445 MHz) and Highest Channel (2480 MHz). STM32CubeMonitor-RF software was used to configure the device and transmitter power level was set to **+2 dBm**.

5.4 Modifications

No modifications were required to achieve compliance.

5.5 Deviations from the Standard

No deviation from the standard.



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6 RESULTS

6.1 §15.203 Antenna Requirement

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

Antenna Brand: Johanson Technology

Antenna Type: 2.4GHz Mini Antenna SMT, P/N: 2450AT18A100

Antenna Peak Gain: 0.5 dBi

Connector: Not Applicable

The above installation will prevent any unauthorised switching of antennas.

6.2 §15.205 Restricted Bands of Operation

The provisions of the §15.205 restricted bands of operation and §15.209 radiated emissions limits have been met, refer to section 6.7

6.3 §15.207 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 Radiated Emission Limits; General Requirements

The provisions of the §15.205 restricted bands of operation and §15.209 radiated emissions limits have been met, refer to section 6.7

6.5 §15.247(a)(2) 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)
2405	1450	≥ 500
2445	1450	≥ 500
2480	1440	≥ 500



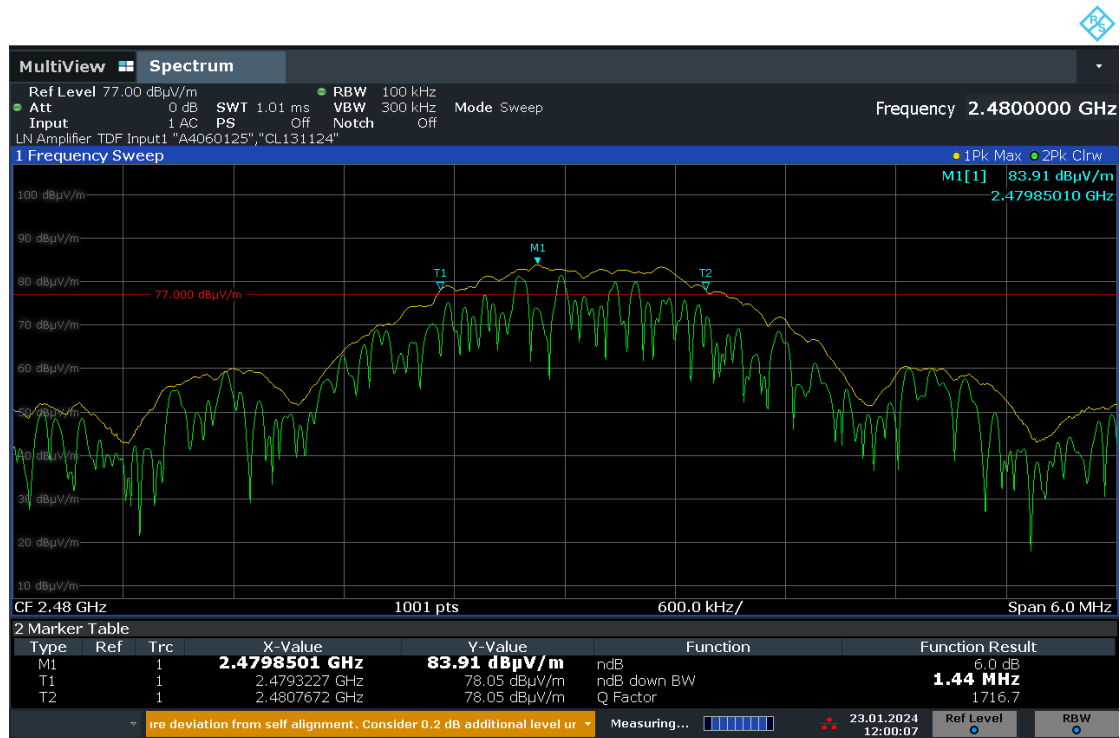
11:49:59 23.01.2024

Graph 6-1: 6 dB bandwidth, 2405 MHz



12:13:16 23.01.2024

Graph 6-2: 6 dB bandwidth, 2445 MHz



12:00:08 23.01.2024

Graph 6-3: 6 dB bandwidth, 2480 MHz

6.6 §15.247(b)(3) 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

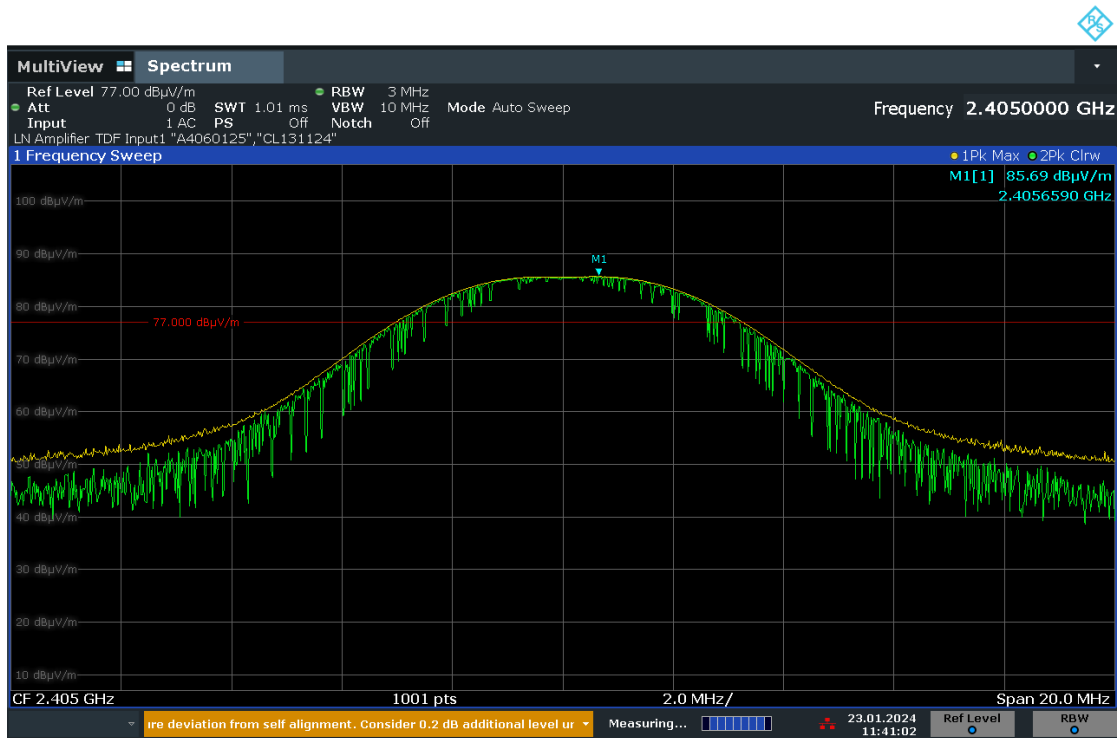
The maximum peak conducted output power at 2400-2483.5 MHz is 1 Watt or 30 dBm.

6.6.3 Results

Table 6-2: Maximum peak power

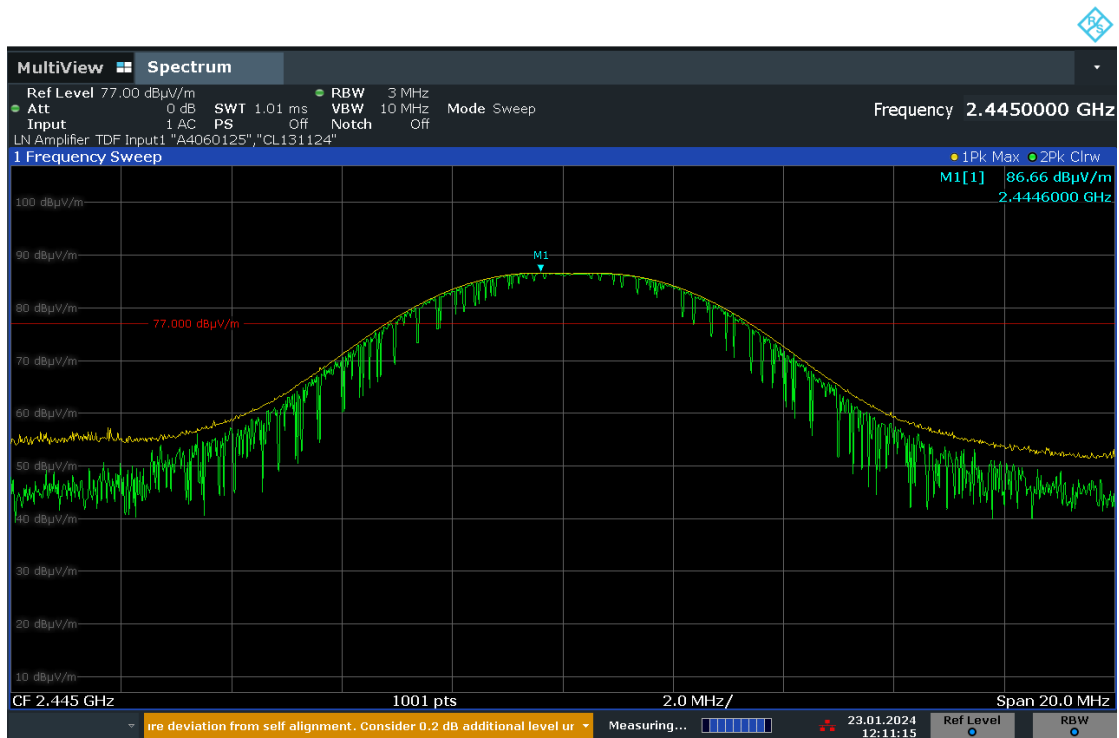
Freq. (MHz)	E-Field @ 3 m (dBμV/m)	EIRP (dBm)	Antenna Gain (dBi)	Equivalent Conducted Output Power (dBm)	Limit (dBm)	Results
2405	85.69	-9.54	0.5	-10.04	30	Complied
2445	86.66	-8.57	0.5	-9.07	30	Complied
2480	86.98	-8.25	0.5	-8.75	30	Complied

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



11:41:03 23.01.2024

Graph 6-4: Maximum EIRP, 2405 MHz



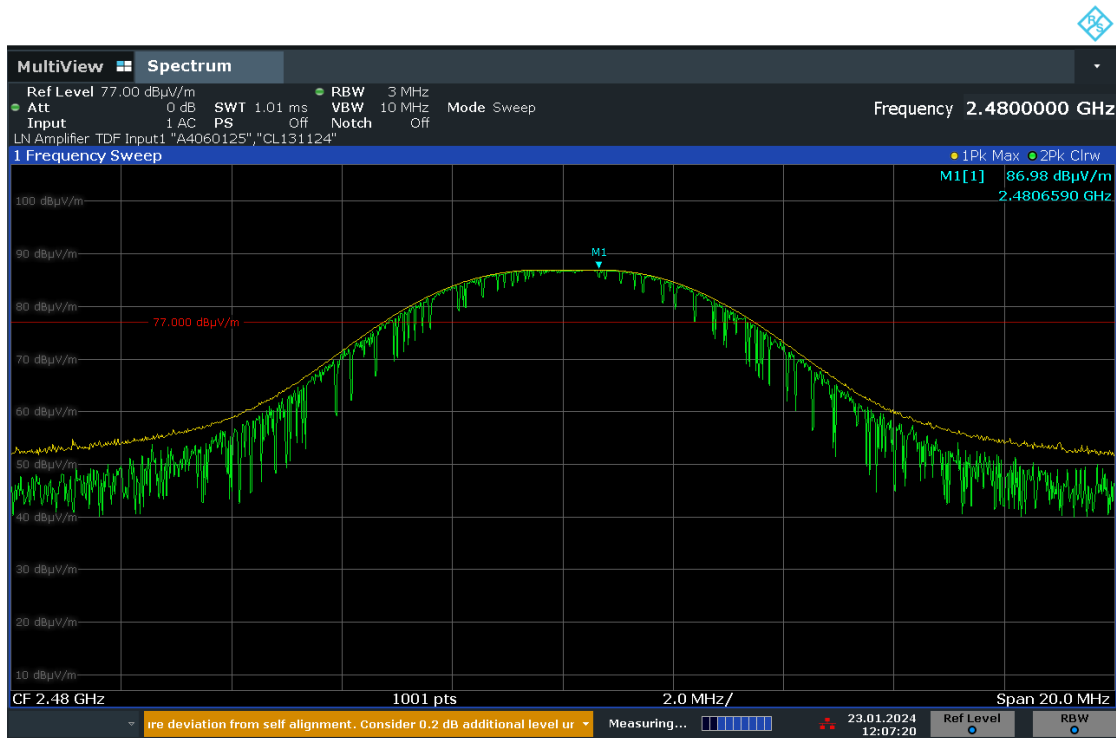
12:11:16 23.01.2024

Graph 6-5: Maximum EIRP, 2445 MHz



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12:07:21 23.01.2024

Graph 6-6: Maximum EIRP, 2480MHz

6.7 §15.247(d) 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.

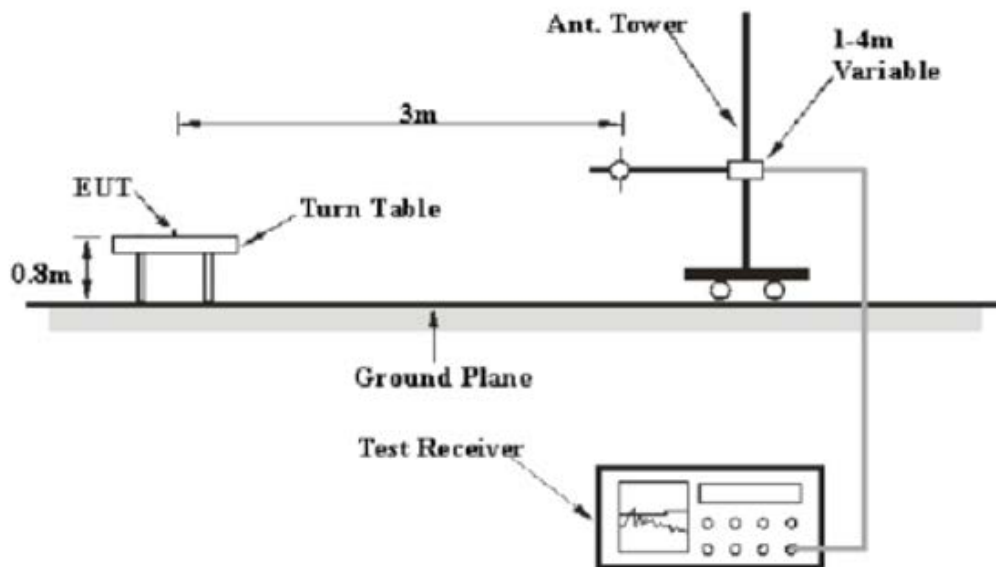
The sample was slowly rotated with the spectrum analyser set to Max-Hold. This was performed for at least two antenna heights. When an emission was located, it was positively identified, and its maximum level was found by rotating the automated turntable and by varying the antenna height. For below 1000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

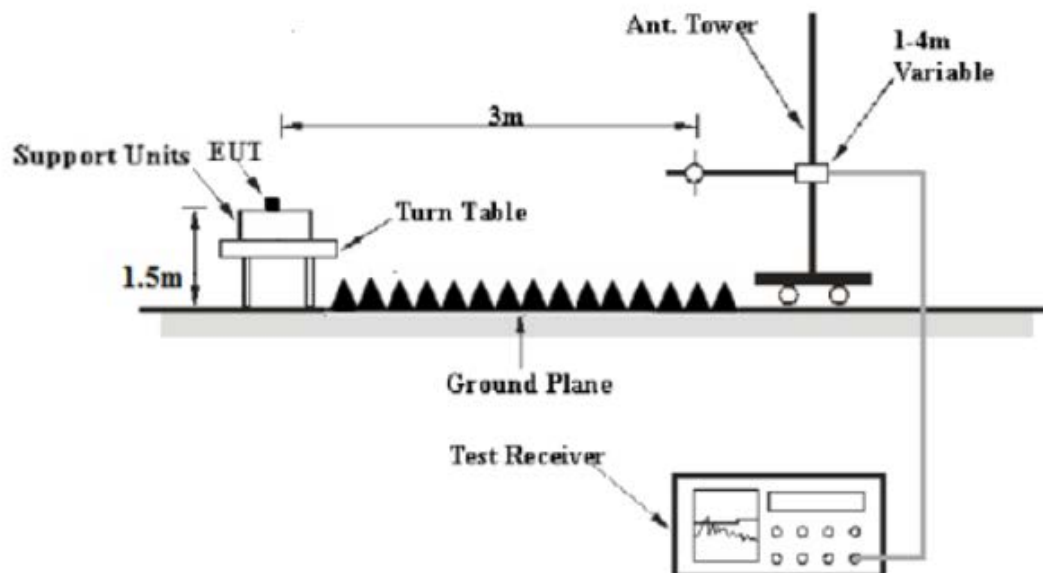
The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical polarisations of the measurement antenna.

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.

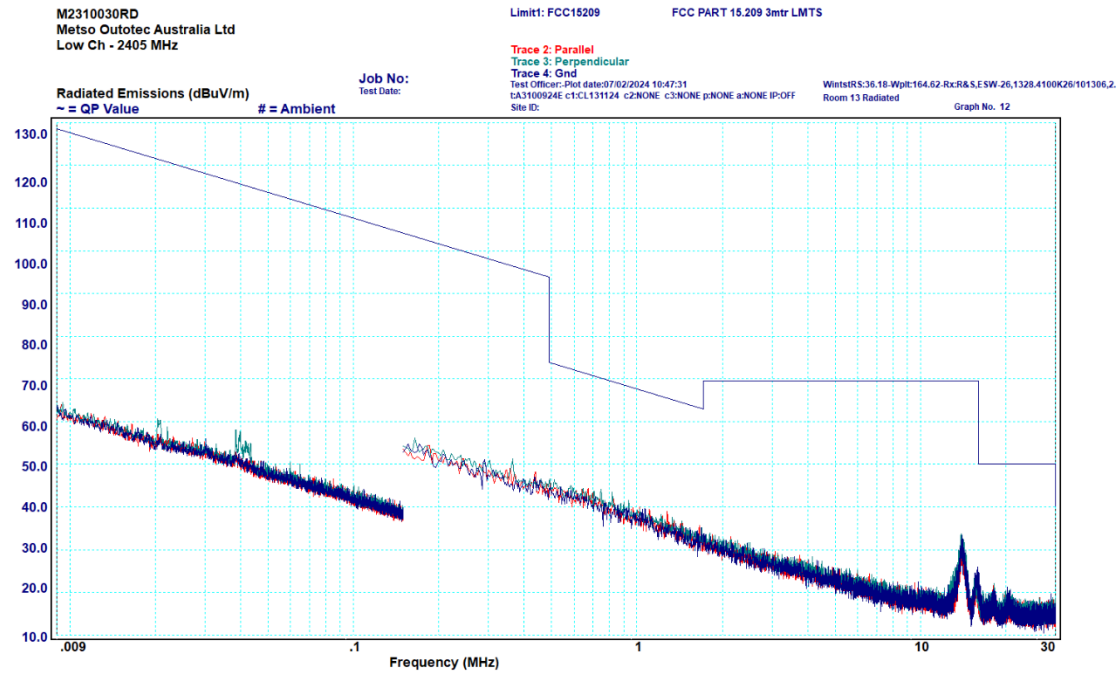
The in-band peak PSD in 100 kHz bandwidth were measured on all three channels. The maximum PSD level was used to establish the limit. However, the general limits of §15.209 apply for the restricted bands of operation defined in §15.205.

Table 6-3: 100 kHz reference level measurement

Freq. (MHz)	Peak at 3 m (dB μ V/m)	Established Limit @ 3 m (dB μ V/m)
2480	83.89	63.89

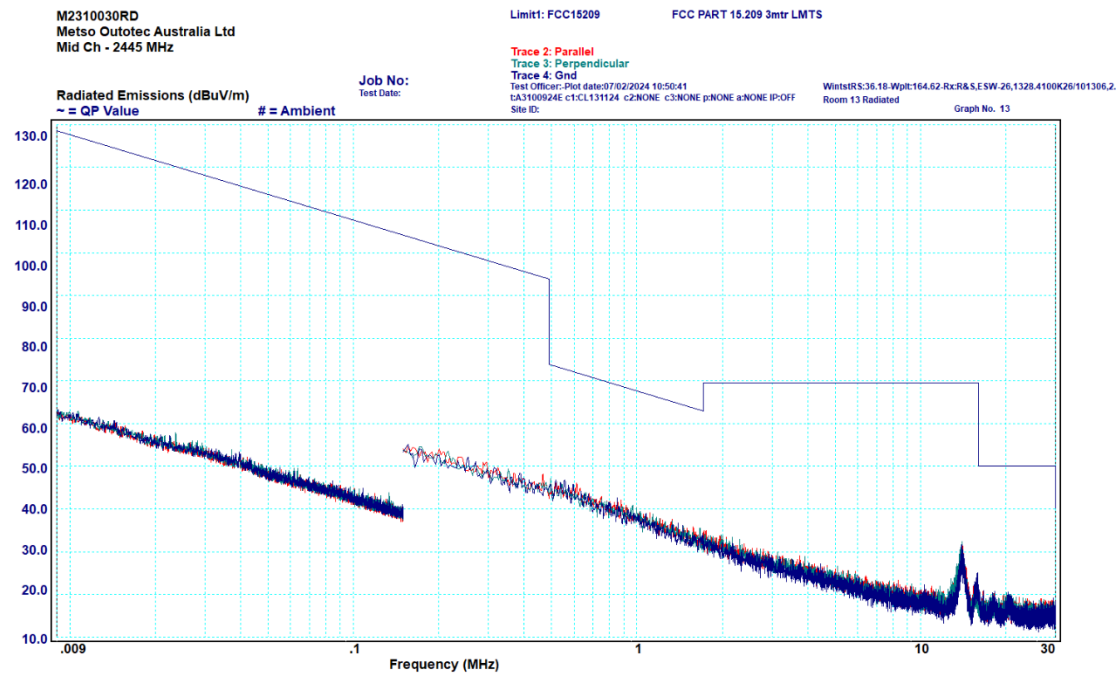
6.7.5 Transmitter Spurious Emissions: 9 kHz to 30 MHz

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



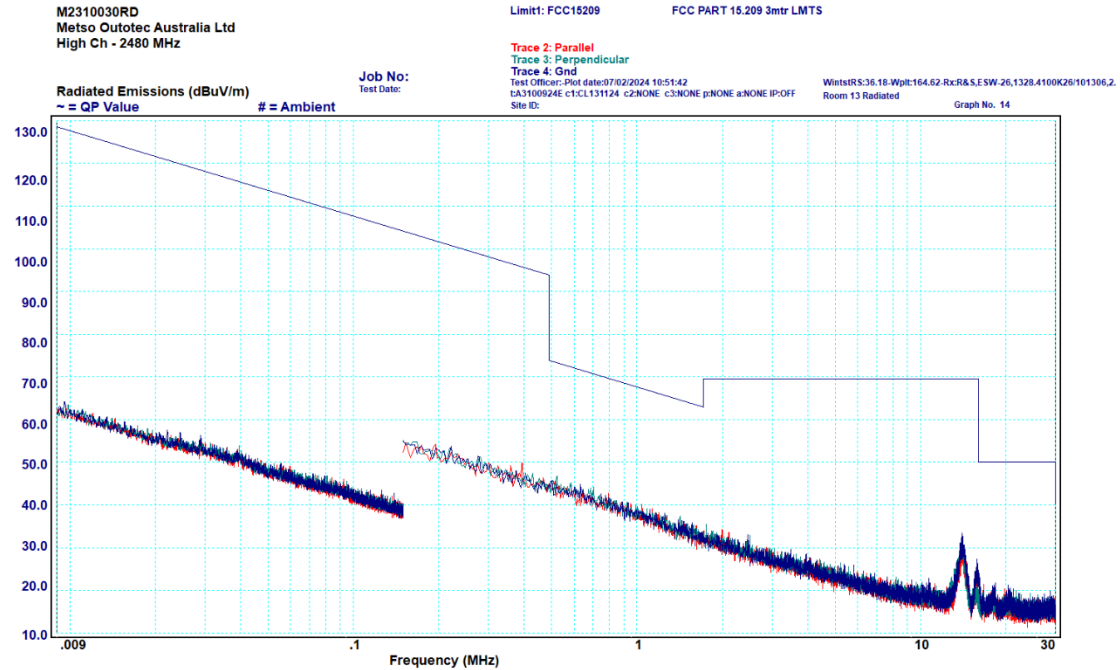
Graph 6-7: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2405 MHz

No peaks were measured within 10 dB of the limit.



Graph 6-8: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2445 MHz

No peaks were measured within 10 dB of the limit.

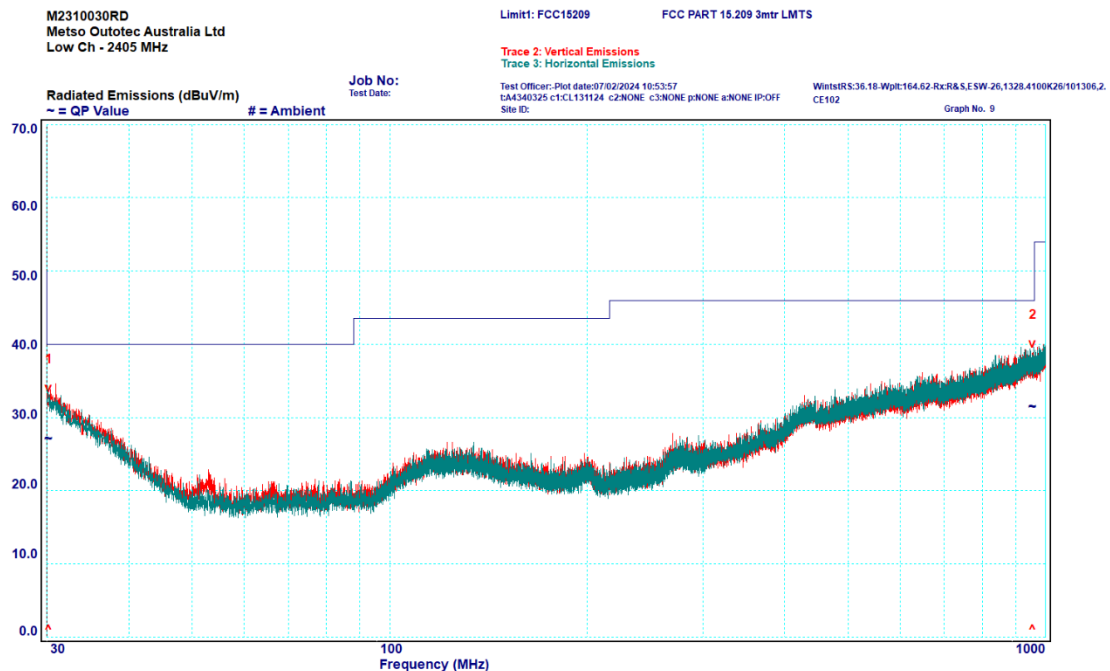


Graph 6-9: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 2480 MHz

No peaks were measured within 10 dB of the limit.

6.7.6 Transmitter Spurious Emissions: 30 - 1000 MHz

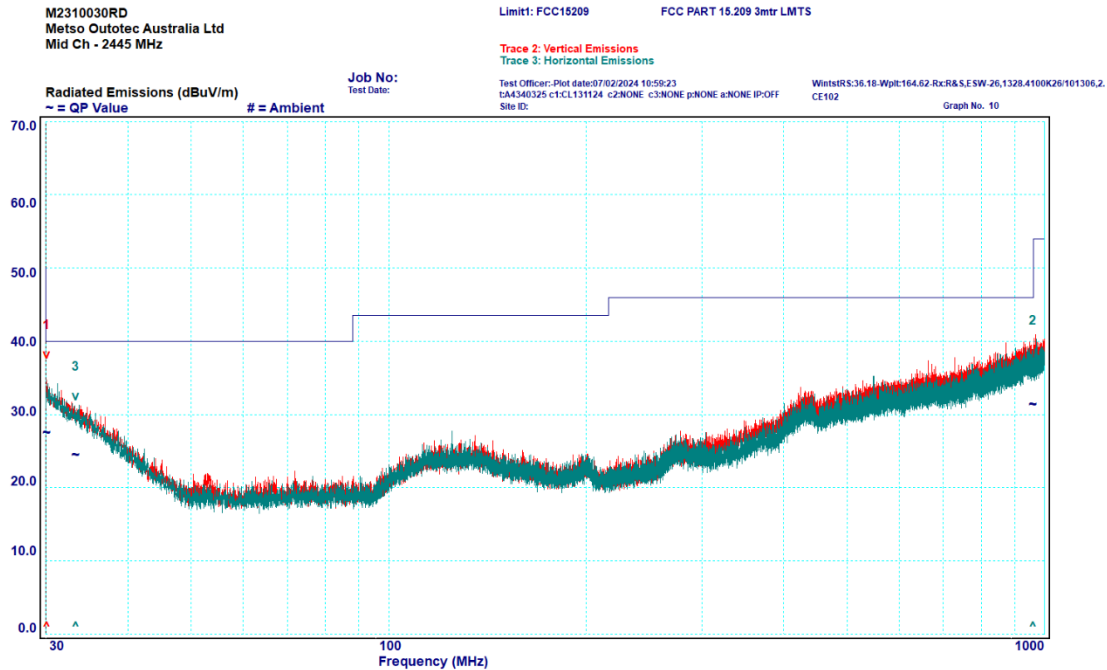
All emissions measured in the frequency band 30 – 1000 MHz complied with the requirements of the standard.



Graph 6-10: Transmitter Spurious Emissions, 30 – 1000 MHz, 2405 MHz

Table 6-4: Transmitter Spurious Emissions, 30 – 1000 MHz, 2405 MHz

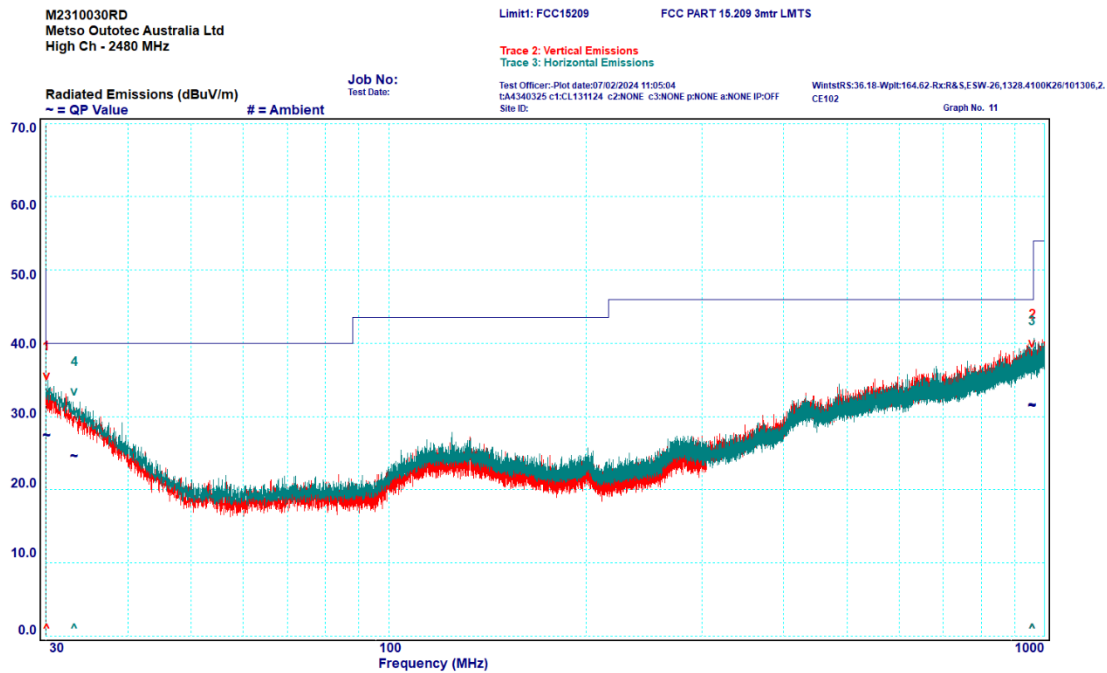
Peak	Frequency (MHz)	Polarisation	Quasi-Peak		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1	30.2	Vertical	27.6	40	-12.4
2	954.84	Vertical	31.9	46	-14.1



Graph 6-11: Transmitter Spurious Emissions, 30 – 1000 MHz, 2445 MHz

Table 6-5: Transmitter Spurious Emissions, 30 – 1000 MHz, 2445 MHz

Peak	Frequency (MHz)	Polarisation	Quasi-Peak		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1	30.1	Vertical	28	40	-12
2	959.16	Horizontal	31.9	46	-14.1
3	33.3	Horizontal	25	40	-15



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

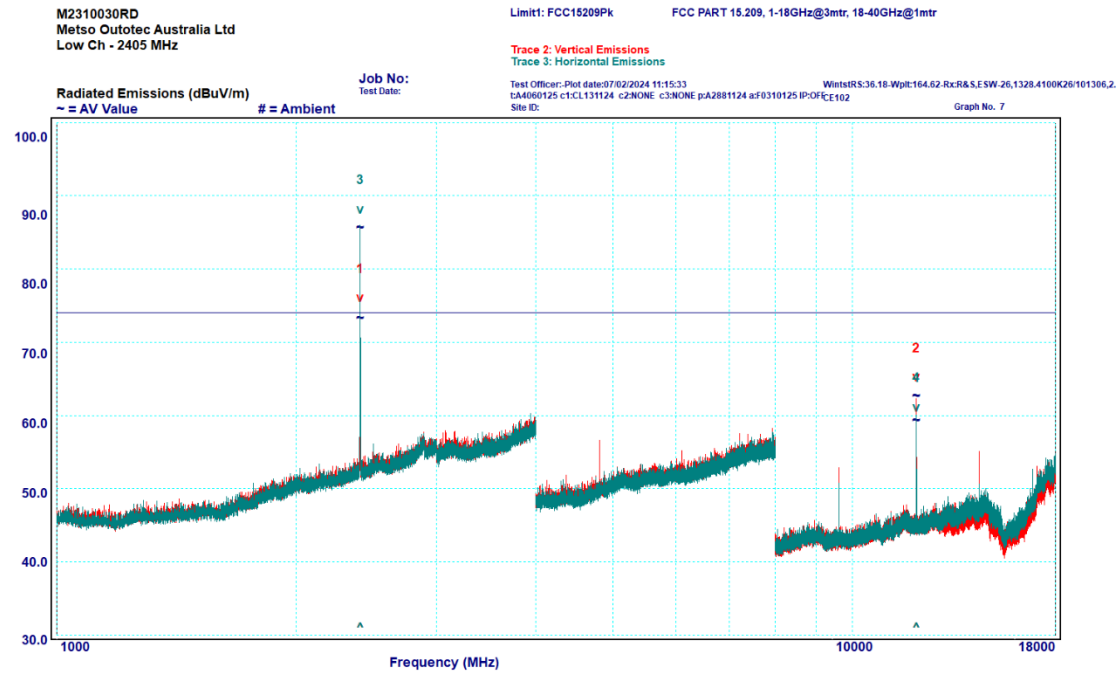
Table 6-6: Transmitter Spurious Emissions, 30 – 1000 MHz, 2480 MHz

Peak	Frequency (MHz)	Polarisation	Quasi-Peak		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1	30.1	Vertical	27.9	40	-12.1
2	957.87	Vertical	32	46	-14
3	956.88	Horizontal	32	46	-14
4	33.16	Horizontal	25	40	-15

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:

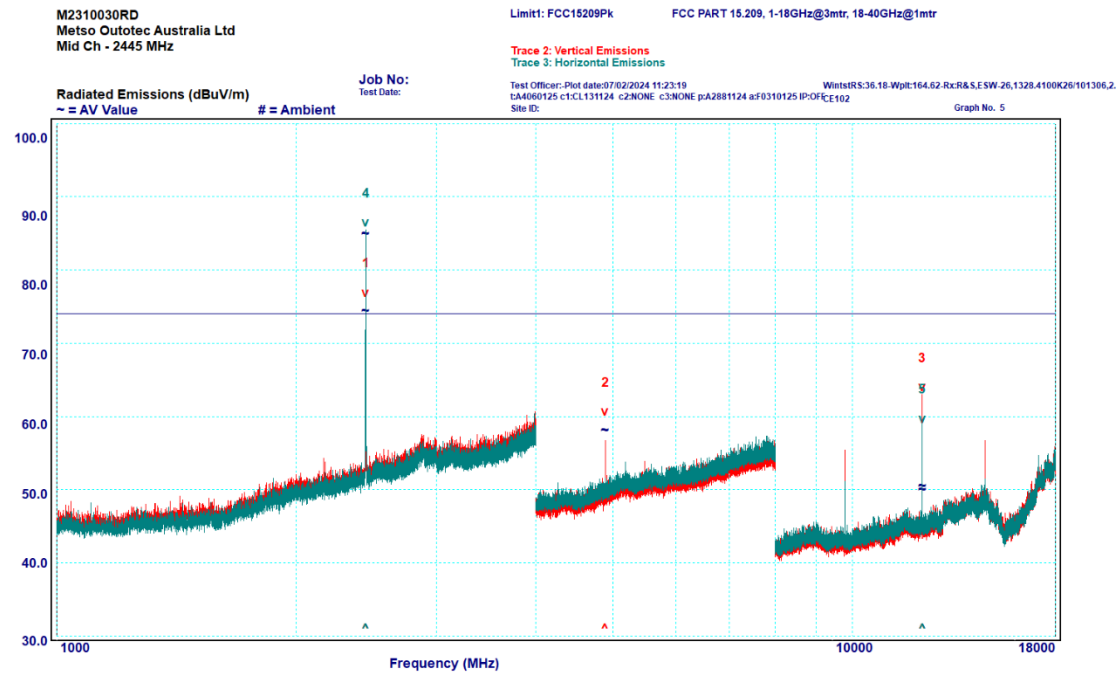


Graph 6-13: Transmitter Spurious Emissions, 1 – 18 GHz, 2405 MHz, Peak

Table 6-7: Transmitter Spurious Emissions, 1 – 18 GHz, 2405 MHz, Peak

Peak	Frequency (MHz)	Polarisation	Peak		
			Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1*	2404.68	Vertical	N/A	N/A	N/A
2	12027.67	Vertical	63.2	74	-10.8
3*	2405.54	Horizontal	N/A	N/A	N/A
4	12023.06	Horizontal	59.8	74	-14.2

*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, 2445 MHz, Peak

Table 6-8: Transmitter Spurious Emissions, 1 – 18 GHz, 2445 MHz, Peak

Peak	Frequency (MHz)	Polarisation	Peak		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2444.69	Vertical	N/A	N/A	N/A
2	4889.32	Vertical	58.6	74	-15.4
3	12227.63	Vertical	51	74	-23
4*	2445.51	Horizontal	N/A	N/A	N/A
5	12227.86	Horizontal	50.5	74	-23.5

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

M2310030RD
Metso Outotec Australia Ltd
High Ch - 2480 MHz

Limit1: FCC15209Pk

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

Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

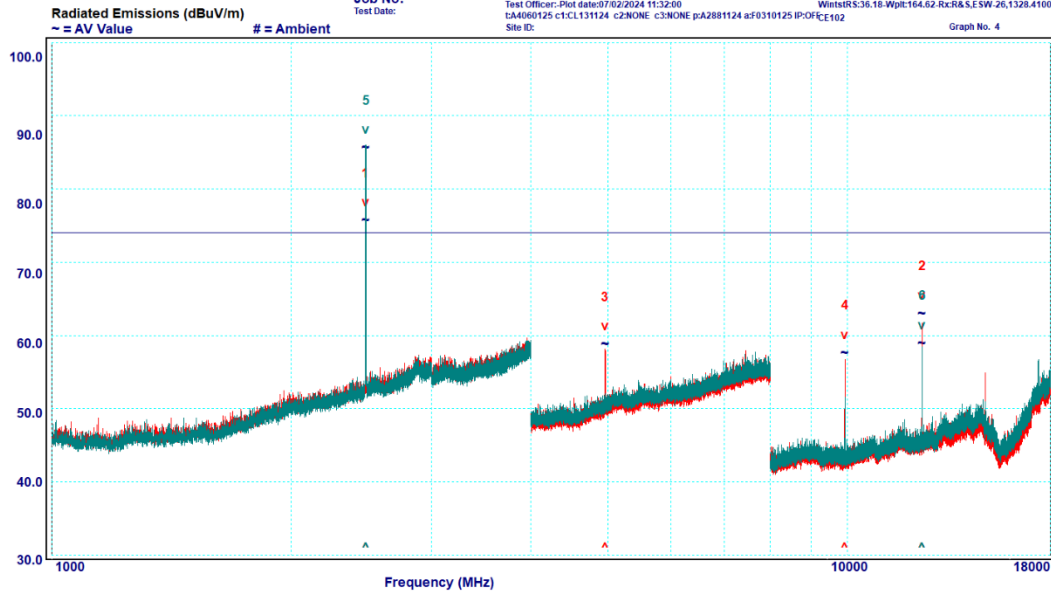
Test Officer: Plot date: 07/02/2024 11:32:00

WintRS:36.18-WpRt:164.62-Rx:R&S,ESW-26,1328,4100K26/101306.2

SA4060125 c1:CL131124 c2:NONE c3:NONE pA2881124 af0310125 IP:OFFCE102

Site ID:

Graph No. 4



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

Table 6-9: 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*	2479.61	Vertical	N/A	N/A	N/A
2	12398.28	Vertical	63.4	74	-10.6
3	4959.21	Vertical	59.2	74	-14.8
4**	9918.5	Vertical	58.1	63.89	-5.79
5*	2480.51	Horizontal	N/A	N/A	N/A
6	12402.81	Horizontal	59.4	74	-14.6

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

**Note: -20 dBc Peak limit applied for nonrestricted bands.

Average Measurement:

M2310030RD
Metso Outotec Australia Ltd
Low Ch - 2405 MHz

Limit1: FCC15209Av

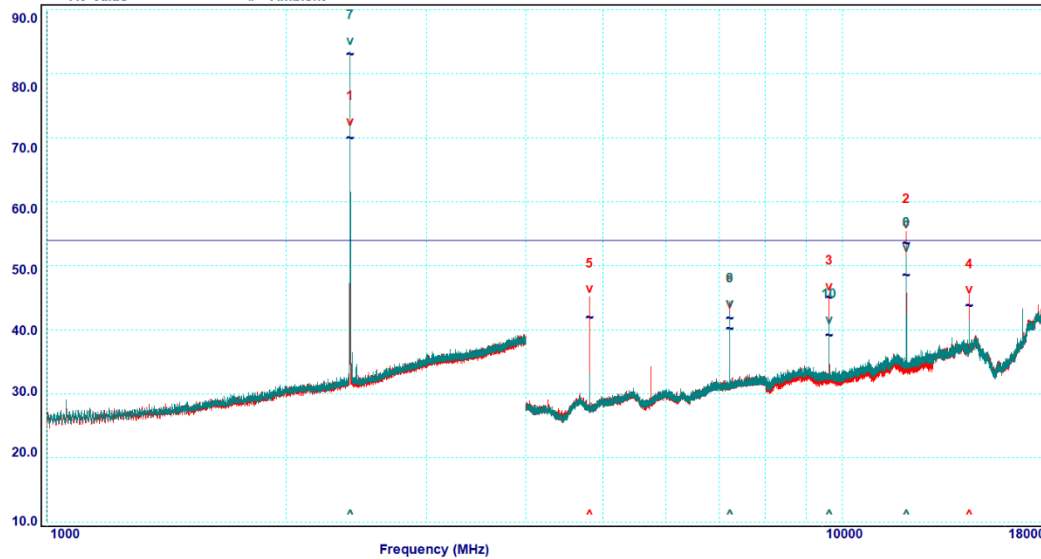
FCC PART 15.209, 1-18GHz@3mtr, 18-40GHz@1mtr

Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

Radiated Emissions (dBuV/m)
~ = AV Value # = Ambient

Job No:
Test Date:

Test Office: Plot date: 07/02/2024 13:17:49 WintSR5:36.18-Wp1:164.62-Rx:RA.S.E.SW.26,1328.4100K26/101306.2
tA4060125 c1:CL131124 c2:NONE c3:NONE pA2881124 aF0310125 IP:OFFCE102
Site ID: Graph No. 8



Graph 6-16: Transmitter Spurious Emissions, 1 – 18 GHz, 2405 MHz, Average

Table 6-10: Transmitter Spurious Emissions, 1 – 18 GHz, 2405 MHz, Average

Peak	Frequency (MHz)	Polarisation	Average		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2404.98	Vertical	N/A	N/A	N/A
2	12023.22	Vertical	53.9	54	-0.1
3	9618.34	Vertical	45.5	54	-8.5
4	14427.74	Vertical	44.2	54	-9.8
5	4809.12	Vertical	42.4	54	-11.6
6	7214.18	Vertical	42.2	54	-11.8
7*	2405.15	Horizontal	N/A	N/A	N/A
8	12023.18	Horizontal	48.9	54	-5.1
9	7214.12	Horizontal	40.6	54	-13.4
10	9618.39	Horizontal	39.6	54	-14.4

*Note: Peaks 1 and 7 are the fundamental transmission and not subject to the spurious emissions limit of the standard.

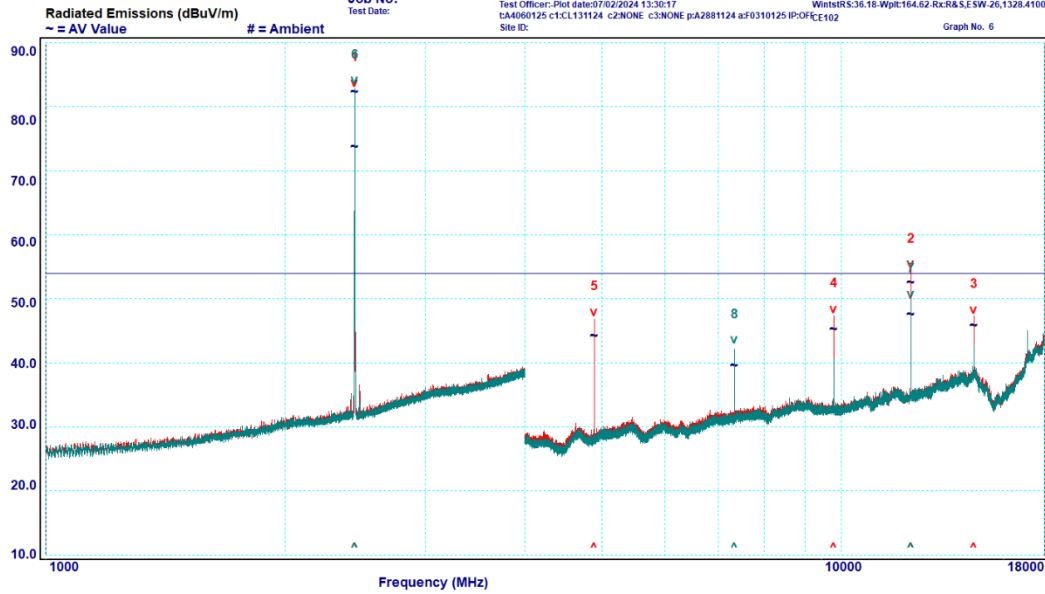
M2310030RD
Metso Outotec Australia Ltd
Mid Ch - 2445 MHz

Limit1: FCC15208Av

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

Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

Test Officer: Plot date: 07/02/2024 13:30:17
cA4060125 c1:CL131124 c2:NONE c3:NONE pA2881124 af0310125 IP:OFFICE102
Site ID: WintRS:36.18-Wpnt:164.62-Rx:R&S,ESW-26,1328.4100K26/101306.2
Graph No. 6

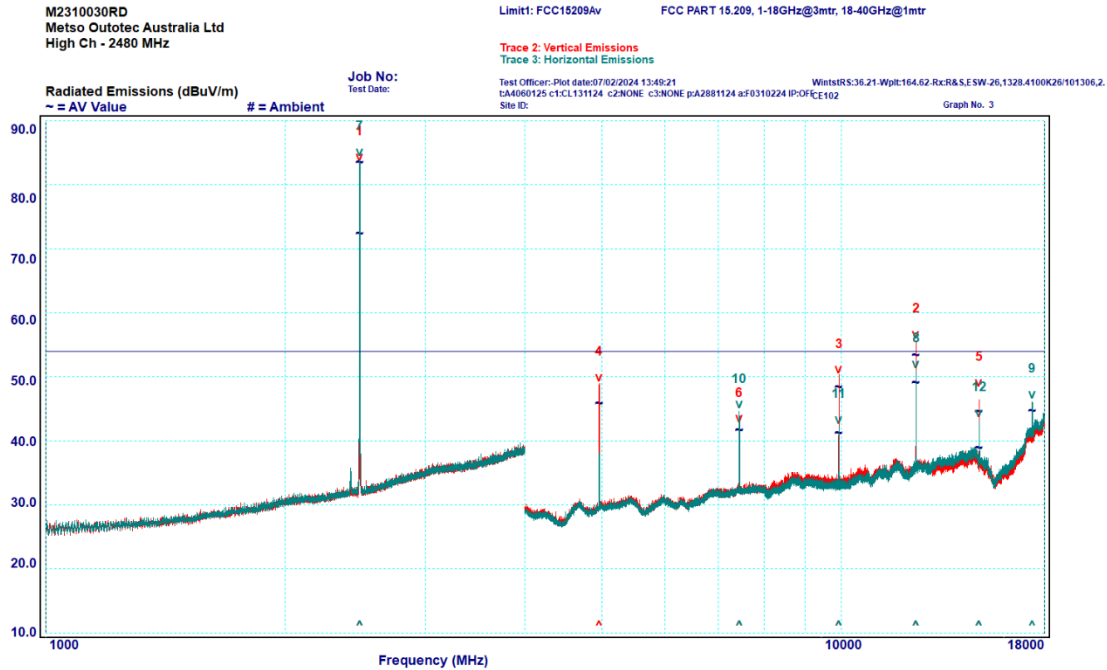


Graph 6-17: Transmitter Spurious Emissions, 1 – 18 GHz, 2445 MHz, Average

Table 6-11: Transmitter Spurious Emissions, 1 – 18 GHz, 2445 MHz, Average

Peak	Frequency (MHz)	Polarisation	Average		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2445.18	Vertical	N/A	N/A	N/A
2	12223.17	Vertical	53	54	-1
3	14667.57	Vertical	46.3	54	-7.7
4	9778.28	Vertical	45.7	54	-8.3
5	4889.19	Vertical	44.7	54	-9.3
6*	2445.18	Horizontal	N/A	N/A	N/A
7	12223.29	Horizontal	48.1	54	-5.9
8	7334.06	Horizontal	40.1	54	-13.9

*Note: Peaks 1 and 6 are the fundamental transmission and not subject to the spurious emissions limit of the standard.



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

Table 6-12: Transmitter Spurious Emissions, 1 – 18 GHz, 2480 MHz, Average

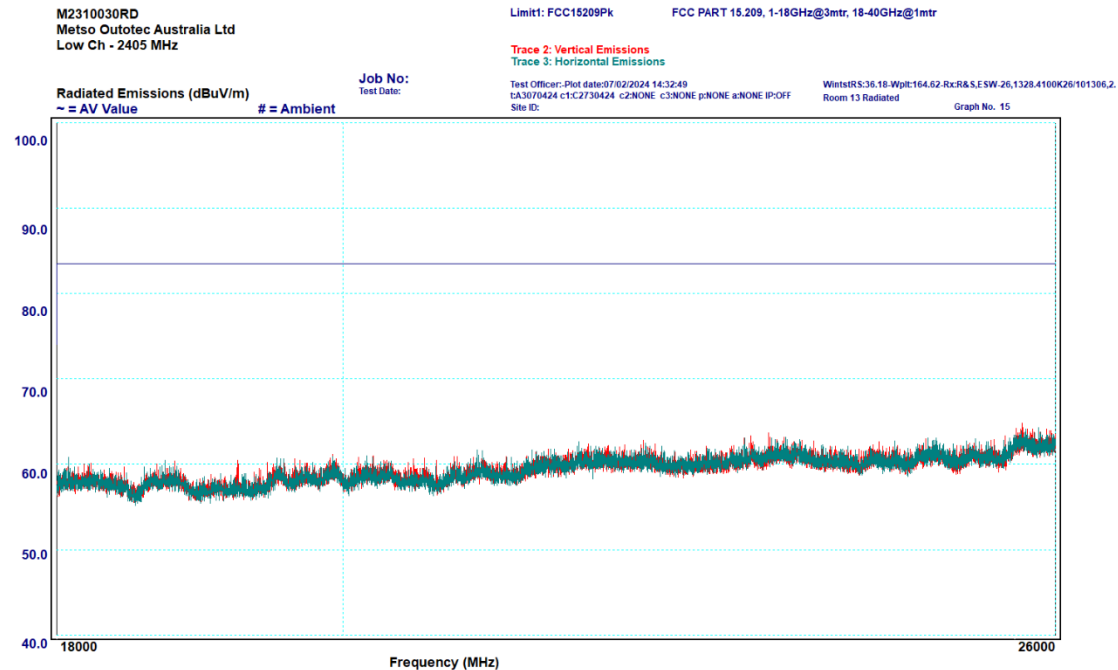
Peak	Frequency (MHz)	Polarisation	Average		
			Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1*	2480.19	Vertical	N/A	N/A	N/A
2	12398.41	Vertical	53.8	54	-0.2
3	9918.48	Vertical	48.9	54	-5.1
4	4959.18	Vertical	46.3	54	-7.7
5	14877.55	Vertical	45.1	54	-8.9
6	7439.11	Vertical	42.1	54	-11.9
7*	2480	Horizontal	N/A	N/A	N/A
8	12398.25	Horizontal	49.6	54	-4.4
9	17357.5	Horizontal	45.1	54	-8.9
10	7439.11	Horizontal	42.2	54	-11.8
11	9918.42	Horizontal	41.7	54	-12.3
12	14877.85	Horizontal	39.3	54	-14.7

*Note: Peaks 1 and 7 are the fundamental transmission and not subject to the spurious emissions limit of the standard.

6.7.8 Transmitter Spurious Emissions: 18 – 26 GHz

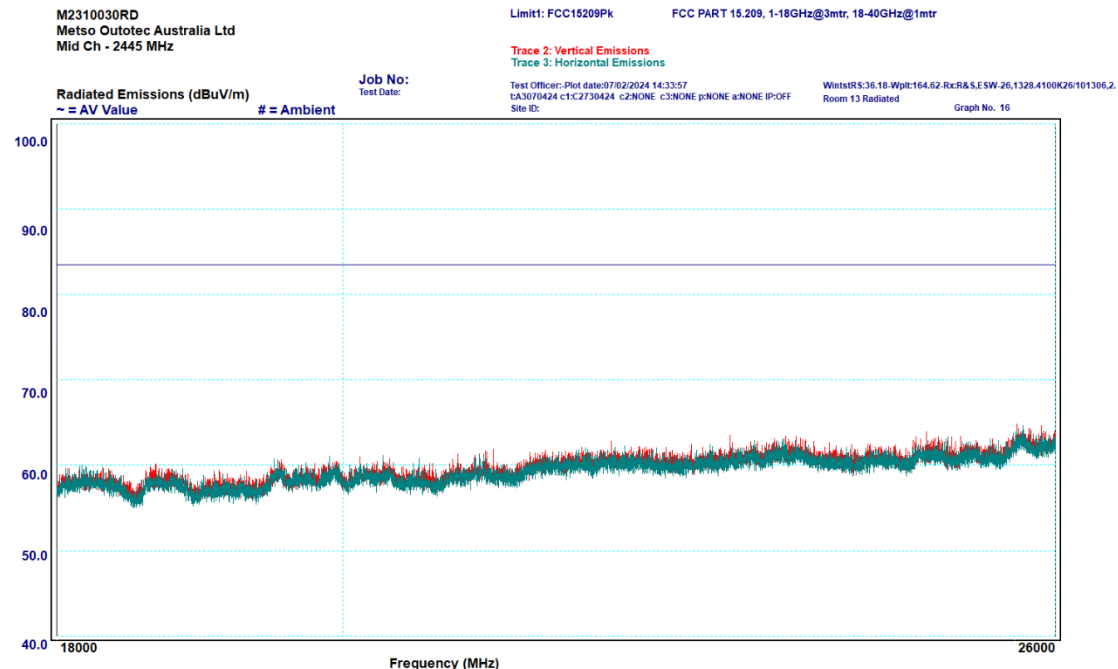
All emissions measured in the frequency band 18 – 26 GHz complied with the requirements of the standard.

Peak Measurement:



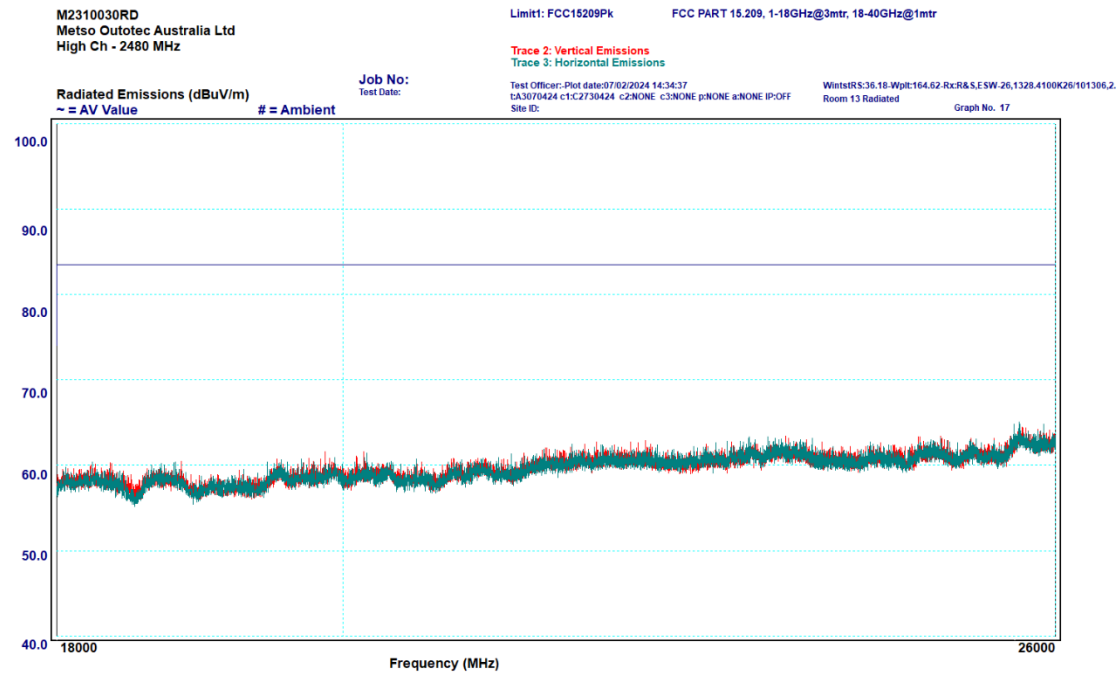
Graph 6-19: Transmitter Spurious Emissions, 18 – 26 GHz, 2405 MHz, Peak

No peaks were measured within 10 dB of the limit.



Graph 6-20: Transmitter Spurious Emissions, 18 – 26 GHz, 2445 MHz, Peak

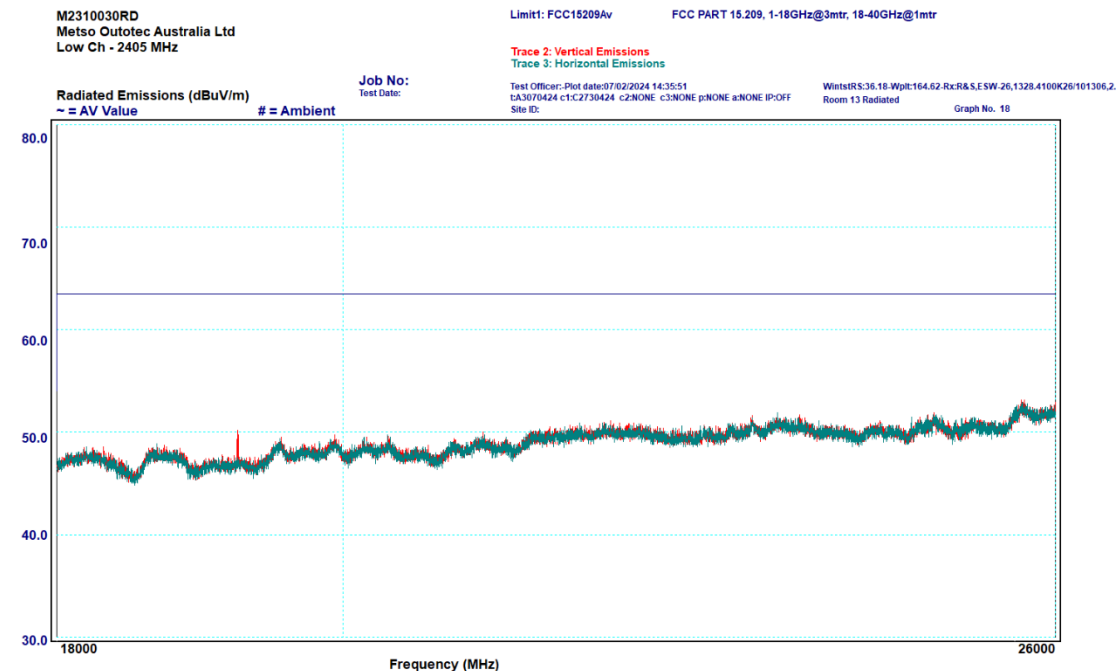
No peaks were measured within 10 dB of the limit.



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, 2405 MHz, Average

No peaks were measured within 10 dB of the limit.

M2310030RD
Metso Outotec Australia Ltd
Mid Ch - 2445 MHz

Limit1: FCC15209Av

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

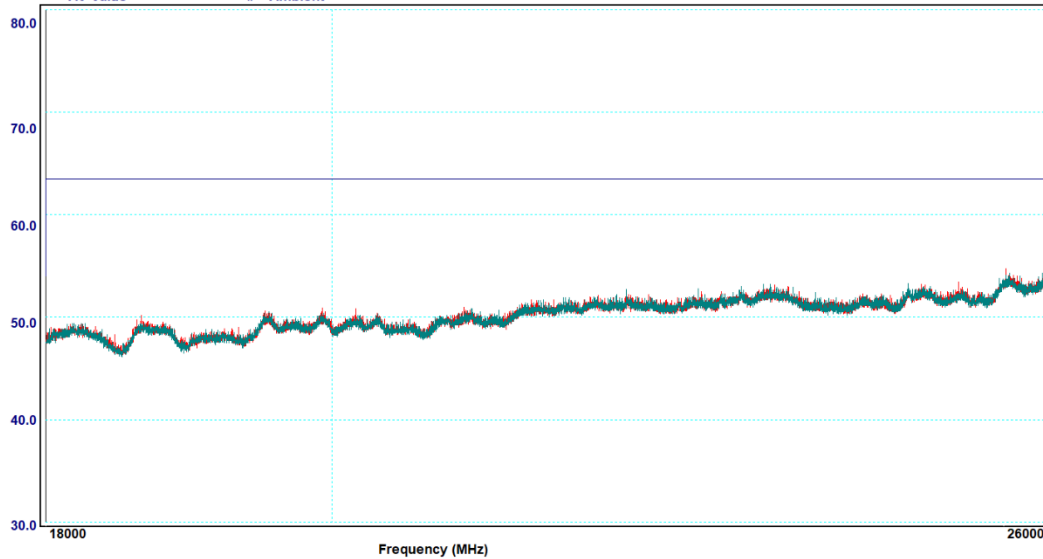
Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

Radiated Emissions (dBuV/m)
~ = AV Value # = Ambient

Job No:
Test Date:

Test Officer: Plot date: 07/02/2024 14:37:03
tA3070424 c1:C2730424 c2:NONE c3:NONE p:NONE a:NONE IP:OFF
Site ID:

WintSRs:36.18-WpIt:164.62-Rx:R&S,ESW-26,1328.4100K26/101306.2
Room 13 Radiated Graph No. 19



Graph 6-23: Transmitter Spurious Emissions, 18 – 26 GHz, 2445 MHz, Average

No peaks were measured within 10 dB of the limit.

M2310030RD
Metso Outotec Australia Ltd
High Ch - 2480 MHz

Limit1: FCC15209Av

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

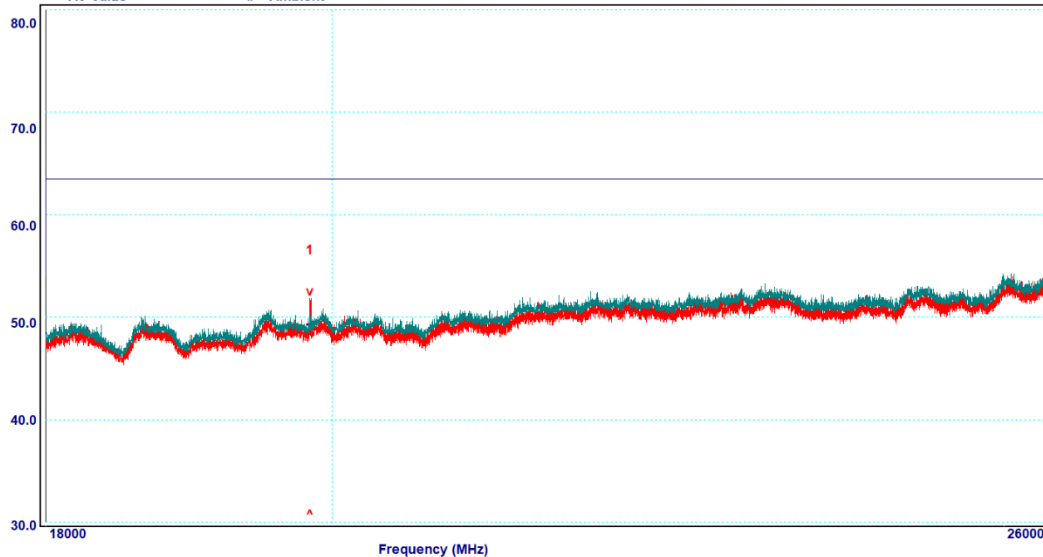
Trace 2: Vertical Emissions
Trace 3: Horizontal Emissions

Radiated Emissions (dBuV/m)
~ = AV Value # = Ambient

Job No:
Test Date:

Test Officer: Plot date: 07/02/2024 14:37:45
tA3070424 c1:C2730424 c2:NONE c3:NONE p:NONE a:NONE IP:OFF
Site ID:

WintSRs:36.18-WpIt:164.62-Rx:R&S,ESW-26,1328.4100K26/101306.2
Room 13 Radiated Graph No. 20



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

No peaks were measured within 10 dB of the limit.

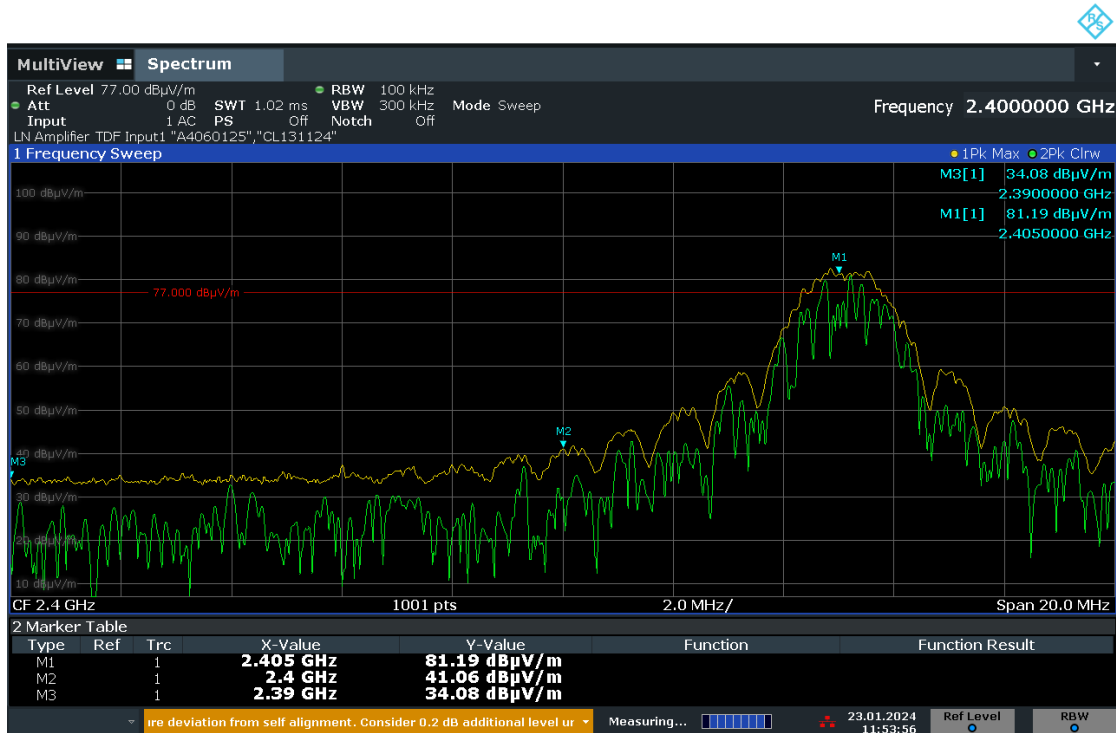


Accreditation No.5292

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6.8 §15.247(d) 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.

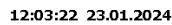


11:53:57 23.01.2024

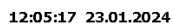
Graph 6-25: Band Edge Emission, Lower Band-edge

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

Marker	Measurement Type	Freq (MHz)	Measurement (dBμV/m)	Limit (dBμV/m)	Result
M2	Peak	2400	41.06	63.89	Complied



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



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

Table 6-14: Band Edge Emission, Upper Band-edge

Measurement Type	Freq (MHz)	Measurement (dBμV/m)	Limit (dBμV/m)	Result
Peak	2483.5	56.70	74	Complied
Average	2483.5	49.92	54	Complied

6.9 §15.247(e) 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

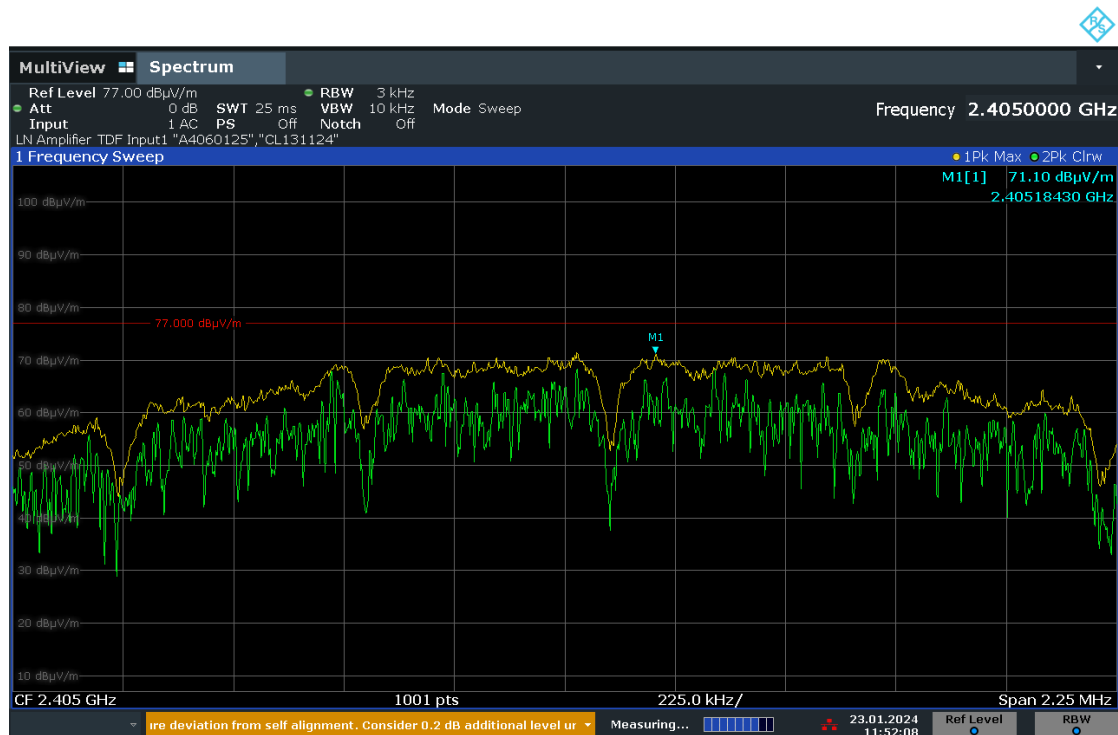
The maximum peak conducted power spectral density (PSD) is 8 dBm per 3 kHz.

6.9.3 Results

Table 6-15: Power spectral density

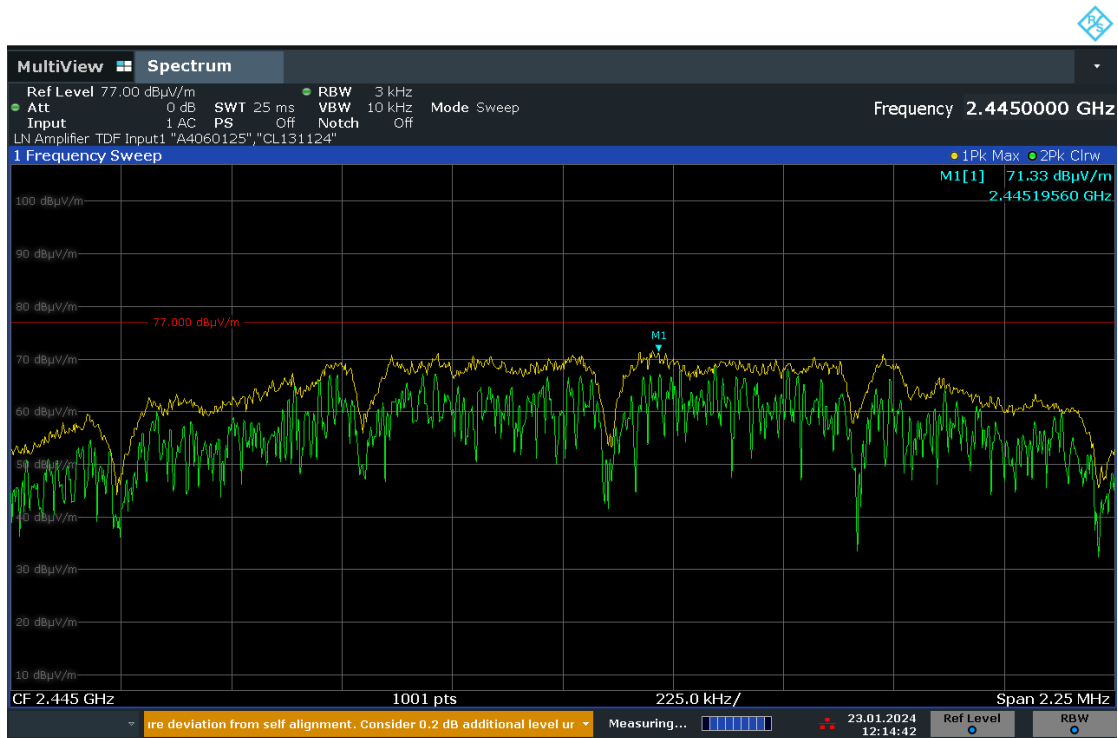
Freq. (MHz)	E-Field @ 3 m (dBμV/m)	EIRP (dBm)	Antenna Gain (dBi)	Equivalent Conducted Output PSD (dBm)	Limit (dBm)	Results
2405	71.10	-24.13	0.5	-24.63	8	Complied
2445	71.33	-23.90	0.5	-24.4	8	Complied
2480	72.28	-22.95	0.5	-23.45	8	Complied

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



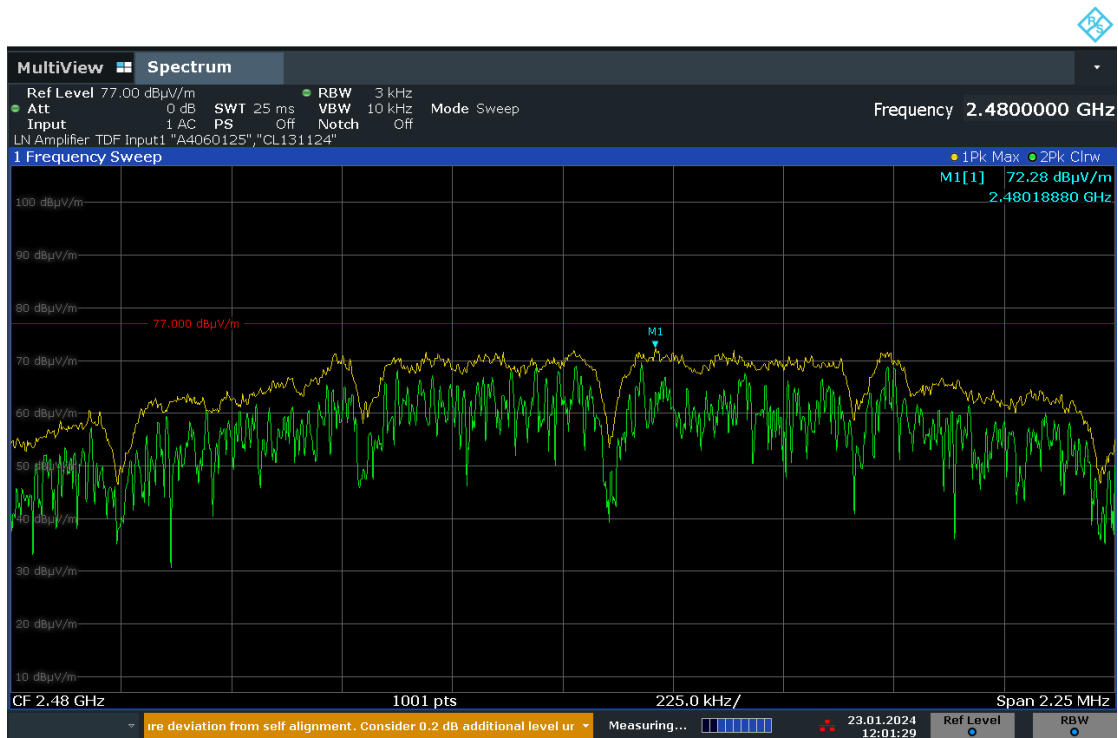
11:52:08 23.01.2024

Graph 6-28: Radiated - Power Spectral Density, 2405 MHz



12:14:43 23.01.2024

Graph 6-29: Radiated - Power Spectral Density, 2445 MHz



12:01:30 23.01.2024

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

6.10 §15.247(i) Maximum Permissible Exposure

The EUT complied with the applicable maximum permissible exposure levels. Refer to EMC Technologies report M2310030-4 and M2310030-5.

6.11 §15.215 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

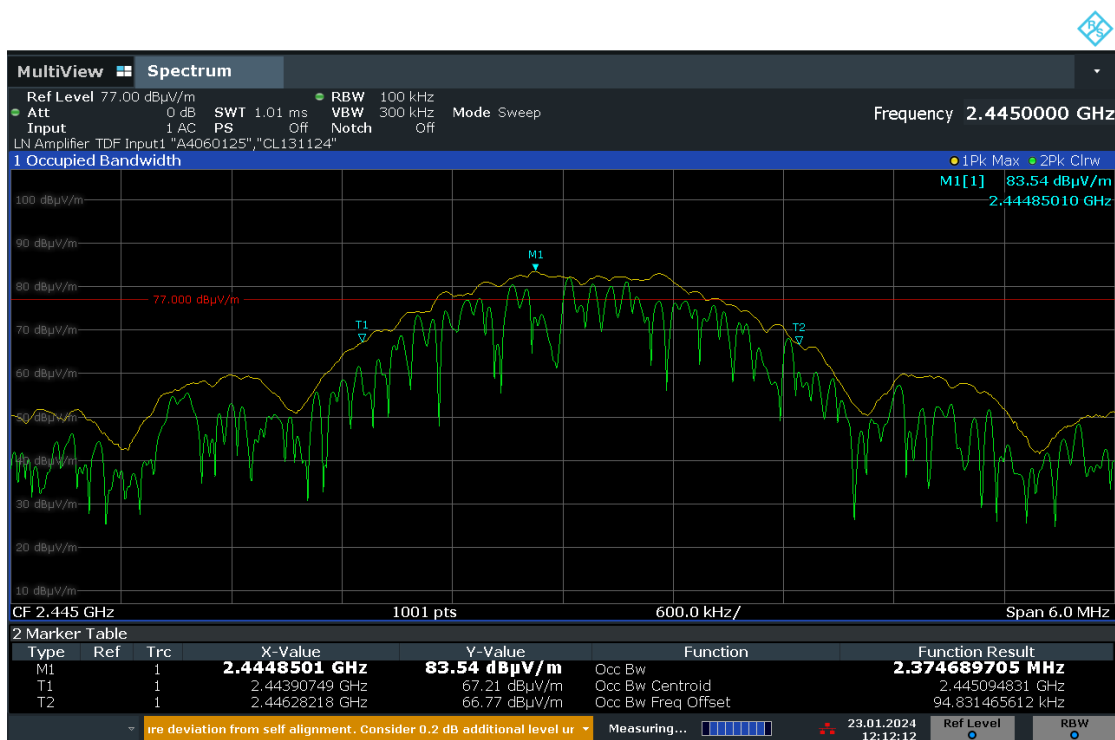
Table 6-16: Occupied Bandwidth

Freq. (MHz)	99% Bandwidth (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	Result
2405	2.384	2.40391	2.40629	Complied
2445	2.374	2.44390	2.44628	Complied
2480	2.379	2.47891	2.48129	Complied



11:48:50 23.01.2024

Graph 6-31: Occupied bandwidth, 2405 MHz



12:12:13 23.01.2024

Graph 6-32: Occupied bandwidth, 2445 MHz



11:59:03 23.01.2024

Graph 6-33: Occupied bandwidth, 2480 MHz

END OF REPORT