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RADIO TEST REPORT

REPORT NUMBER: M2306030-7

TEST STANDARD: (PARTIAL)

**FCC PART 15 SUBPART C
SECTION 15.247**

CLIENT: MESHED PTY LTD

DEVICE: N-COUNTER

MODEL: --

FCC ID: AU792U13A16858

DATE OF ISSUE: 18 OCTOBER 2023

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REVISION TABLE

| Version | Sec/Para Changed | Change Made | Date |
|---------|------------------|---------------------------|------------|
| 1 | | Initial issue of document | 18/10/2023 |
| | | | |
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TEST CERTIFICATE

Device: n-Counter
Model: --
Serial Number: 03F271
PCB Version: nCounter V3 Rev 1.2
Firmware Version: Firmware: 4.1.6-debug-mbed60800
Library: 4.1.4-debug-mbed60800
MTS-Lora: 4.1.4-debug-mbed60800

Radio Module: 902.3 – 914.9 MHz LoRa (Multi-Tech Systems, Inc., MTXDOT-NA1)
FCC ID: AU792U13A16858


Tested for: Meshed Pty Ltd
Address: 4/655 Pacific Hwy, St Leonards, NSW 2065, Australia
Contact: Ashay Dhamdhare
Phone: +61 410 986 697
Email: ashay@meshed.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 – Partial, §15.203, §15.209, §15.247(b) & (d)


Result: The n-Counter complied with the applicable requirements of the above standards. Refer to Report M2306030-7 for full details.

Test Date(s): 9-10 October 2023; 12-13 October 2023

Issue Date: 18 October 2023

Test Engineer(s): 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: 
Shabbir Ahmed
Technical Director

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RADIO TEST REPORT

1 TEST SUMMARY

| Sec. | Description | FCC | Result(s) |
|------|------------------------------------------------|---------------|-----------|
| 6.1 | Antenna Requirement | §15.203 | Complied |
| 6.2 | Peak Output Power | §15.247(b)(3) | Complied |
| 6.3 | Radiated emission limits; general requirements | §15.209 | Complied |
| 6.4 | Out-of-Band/Spurious Emissions | §15.247(d) | Complied |
| 6.5 | Band-Edge Emission Measurements | §15.247(d) | 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) | 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: A061917 (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 |
| Cables* ³ | Huber & Suhner Sucoflex 104A Sn: 503061/4A (CL131123) | 25/11/2022 | 25/11/2023 | 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 Wi-Fi hotspot smart phone counting device with LoRa transceiver.

5.1 EUT (Transmitter) Details

| | |
|-----------------------------|-----------------------------------------------------------------------------|
| Radio: | Multi-Tech Systems, Inc., MTXDOT-NA1 |
| FCC ID: | AU792U13A16858 |
| Frequency band: | 902.3 – 914.9 MHz |
| Number of Channels: | 8 |
| Operating Frequency: | Low Channel: 902.3 MHz Mid Channel: 908.5 MHz High Channel: 914.9 MHz |
| Modulation: | LoRa |
| Nominal Bandwidth: | 125 kHz |
| Data Rate: | LoRa |
| Antenna: | Linx Technologies, ANT-916-HETH ¼-wave Monopole |
| Antenna Peak Gain: | 6.4 dBi |

5.2 EUT (Host) Details

| | |
|--------------------------|------------------------------------------------------------------------------------------------------|
| Test Sample: | n-Counter |
| Model: | -- |
| Serial Number: | 03F271 |
| PCB Version: | nCounter V3 Rev 1.2 |
| Firmware Version: | Firmware: 4.1.6-debug-mbed60800 Library: 4.1.4-debug-mbed60800 MTS-Lora: 4.1.4-debug-mbed60800 |
| Supply Rating: | Powered via laptop USB DC Input: 5VDC, 1A, 5.0W |

5.3 Test Configuration

Testing was performed with the EUT's Transceiver set to transmit continuously at Low Channel (902.3 MHz), Mid Channel (908.5 MHz) and High Channel (914.9 MHz).

5.4 Modifications

No modifications were required to achieve compliance.

5.5 Deviations from the Standard

No deviation from the standard.

6 RESULTS

6.1 §15.203 Antenna Requirement

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

Antenna Brand: Linx Technologies
Antenna Type: ANT-916-HETH, ¼-wave Monopole
Antenna Peak Gain: 6.4 dBi
Connector: Not Applicable

The above installation will prevent any unauthorised switching of antennas.

6.2 §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 6.4.

6.3 §15.247(b)(3) Peak Output Power

6.3.1 Test Procedure

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

6.3.2 Limits

The maximum peak conducted output power at 902 - 928 MHz is 1 Watt or 30 dBm.

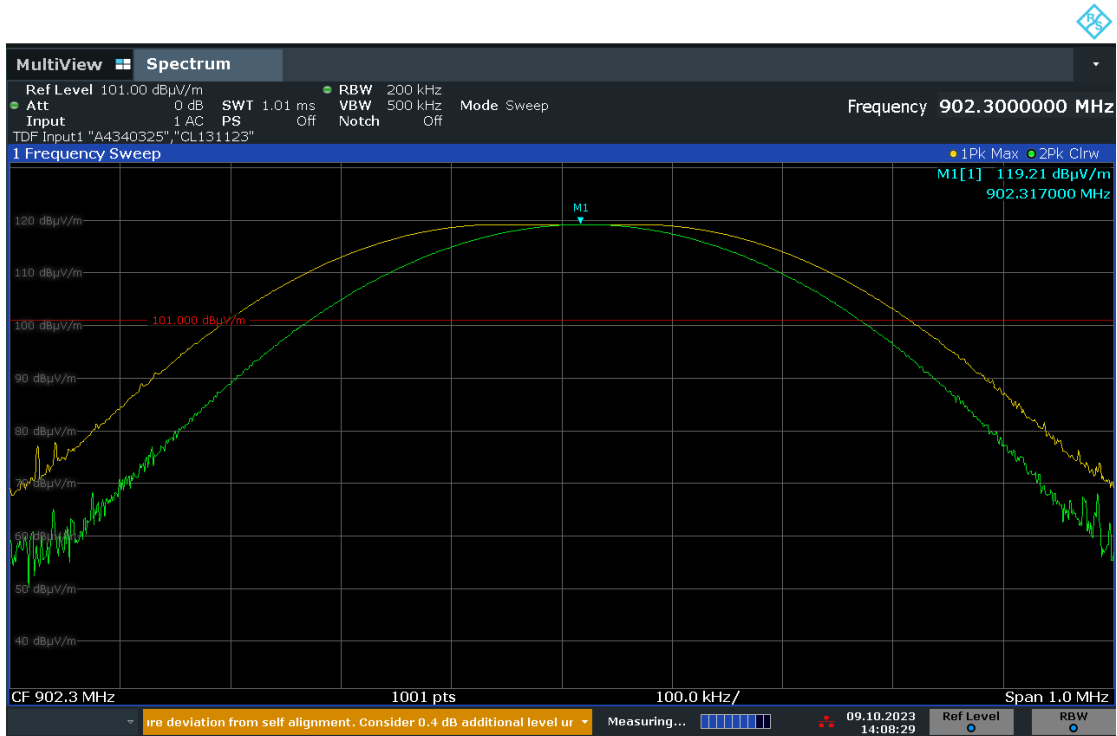
6.3.3 Results

Table 6-1: Maximum peak power

| Freq. (MHz) | E-Field @ 3 m (dBµV/m) | EIRP (dBm) | Antenna Gain (dBi) | Equivalent Conducted Output Power (dBm) | Limit (dBm) | Results |
|-------------|------------------------|------------|--------------------|-----------------------------------------|-------------|----------|
| 902.3 | 119.21 | 23.98 | 6.4* | 17.58 | 29.6* | Complied |
| 908.5 | 119.37 | 24.14 | 6.4* | 17.74 | 29.6* | Complied |
| 914.9 | 119.57 | 24.34 | 6.4* | 17.94 | 29.6* | Complied |

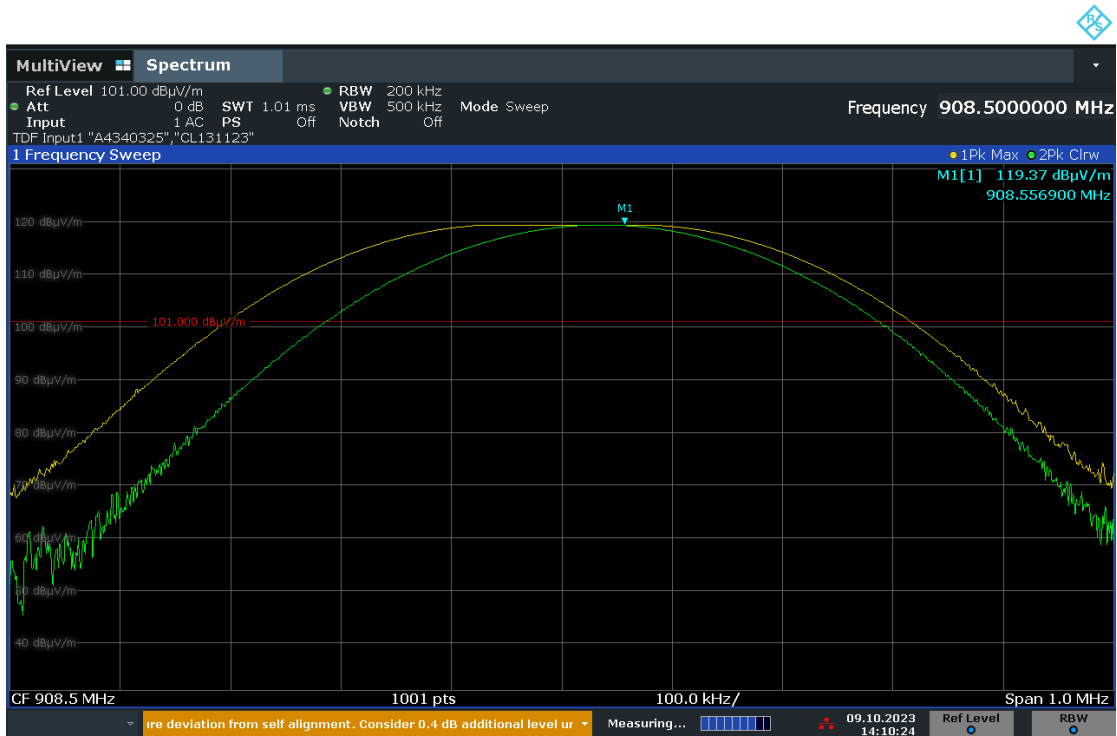
The measured radiated field strength is converted to equivalent conducted output power for checking compliance (KDB 558074 D01 Section 3).

*Note: As per §15.247(b)(4), if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



14:08:30 09.10.2023

Graph 6-1: Maximum EIRP, 902.3 MHz



14:10:24 09.10.2023

Graph 6-2: Maximum EIRP, 908.5 MHz



14:12:16 09.10.2023

Graph 6-3: Maximum EIRP, 914.9 MHz

6.4 §15.247(d) Out-of-Band/Spurious Emissions

6.4.1 Test procedure

Radiated 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.

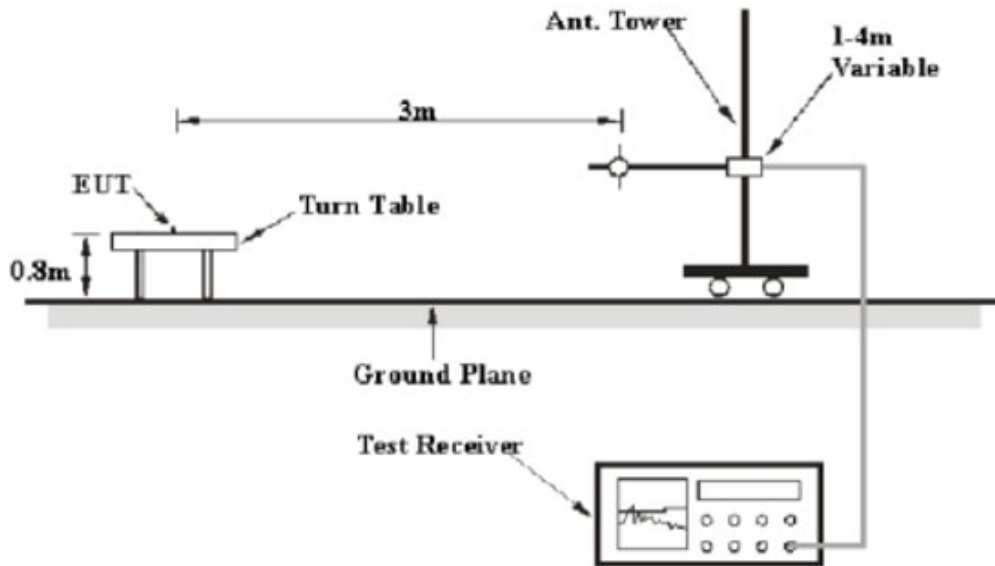
The sample was slowly rotated with the spectrum analyser set to Max-Hold. This was performed for at least two antenna heights. When an emission was located, it was positively identified, and its maximum level was found by rotating the automated turntable and by varying the antenna height. For below 1000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

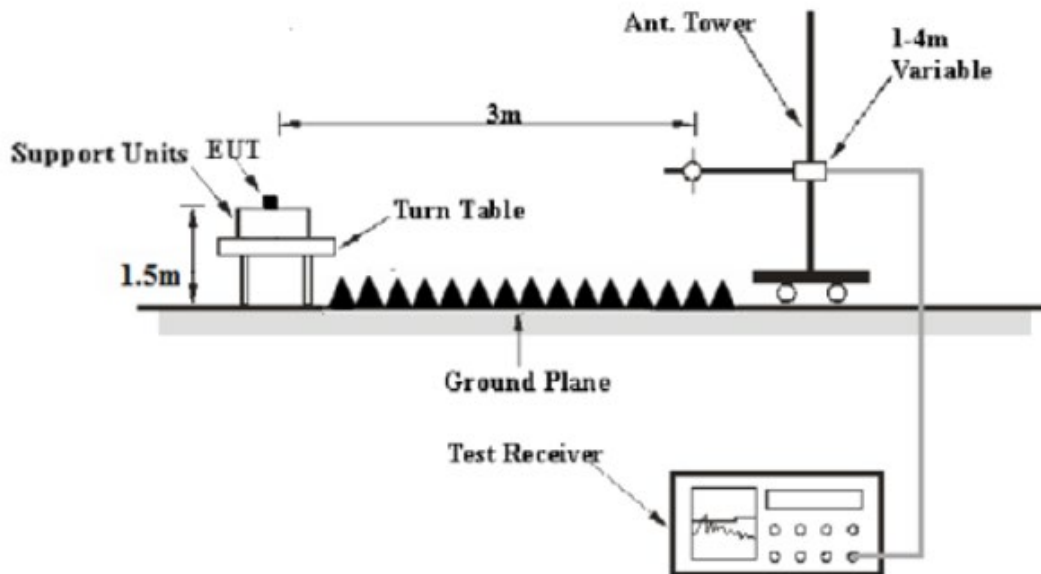
The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical polarisations of the measurement antenna.

6.4.2 Test setup

Below 1 GHz:



Above 1GHz:



6.4.3 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).

6.4.4 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.

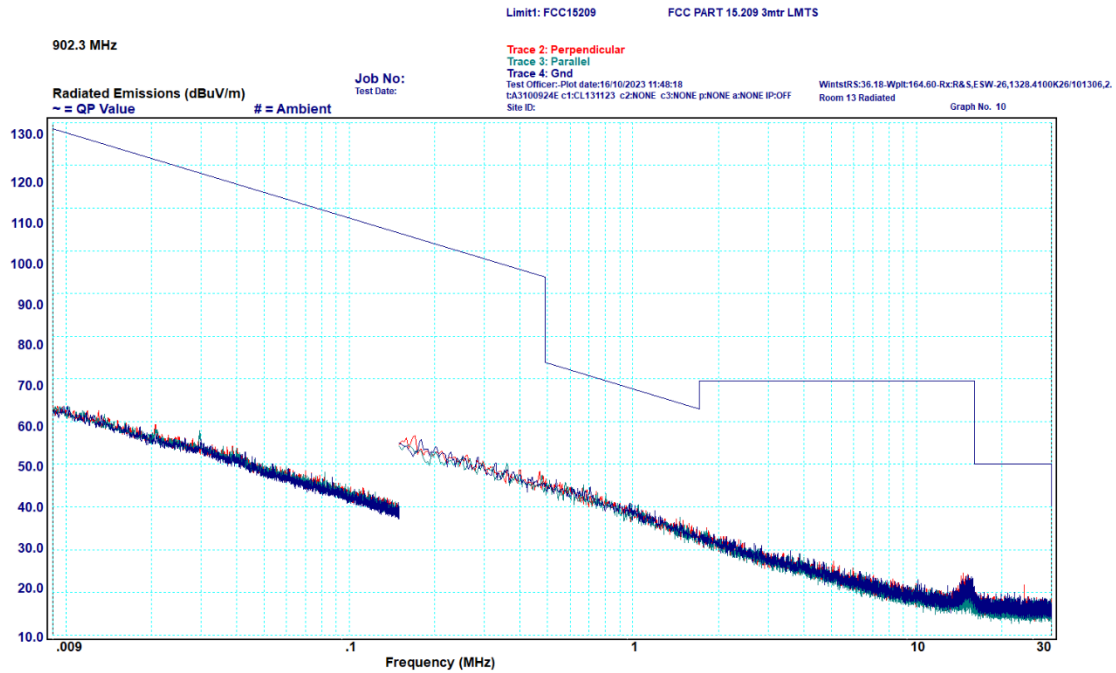
The in-band peak PSD in 100 kHz bandwidth were measured on all three channels. The maximum PSD level was used to establish the limit. However, the general limits of §15.209 apply for the restricted bands of operation defined in §15.205.

Table 6-2: 100 kHz reference level measurement

| Freq. (MHz) | Peak at 3 m (dB μ V/m) | Established Limit @ 3 m (dB μ V/m) |
|-------------|----------------------------|----------------------------------------|
| 914.9 | 119.58 | 99.58 |

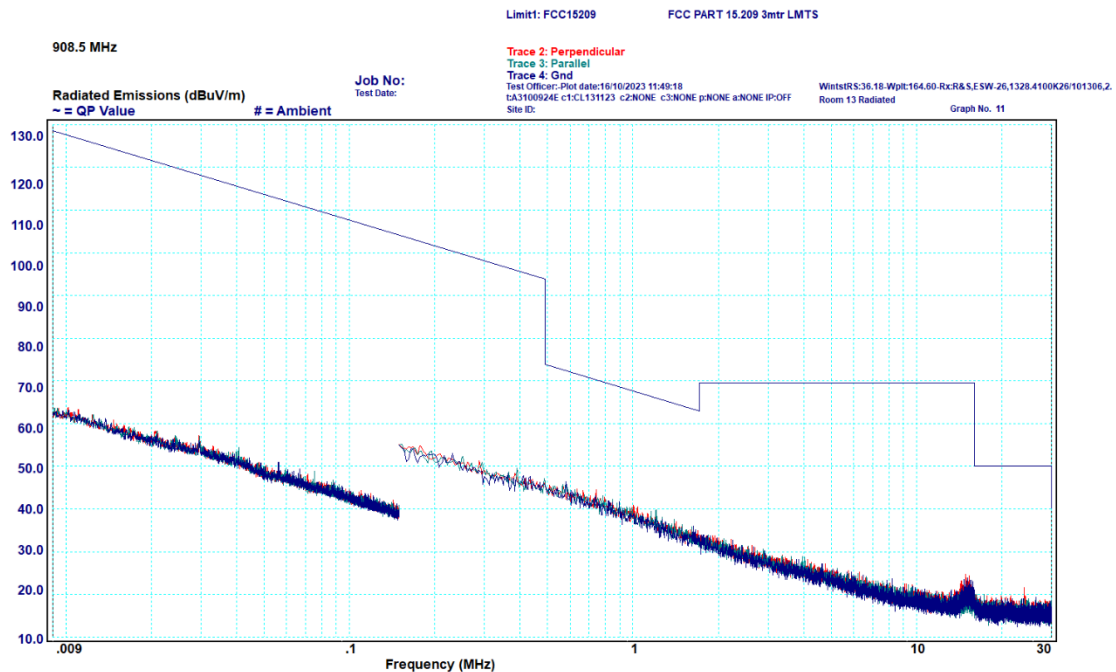
6.4.5 Transmitter Spurious Emissions: 9 kHz to 30 MHz

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



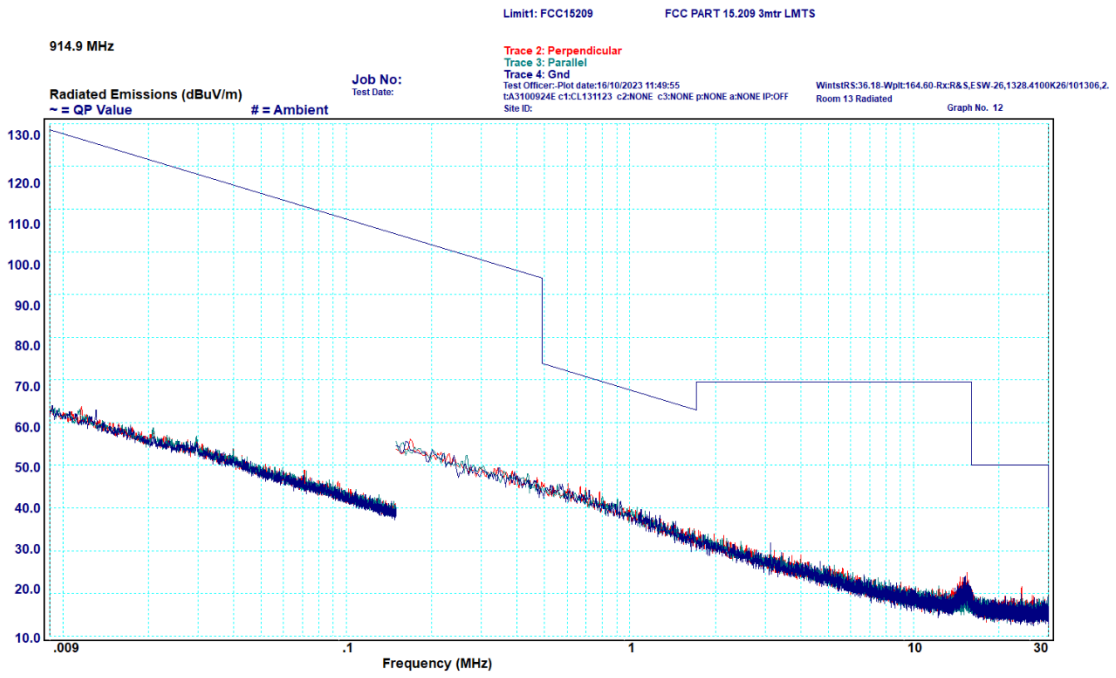
Graph 6-4: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 902.3 MHz

No peaks were measured within 10 dB of the limit.



Graph 6-5: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 908.5 MHz

No peaks were measured within 10 dB of the limit.

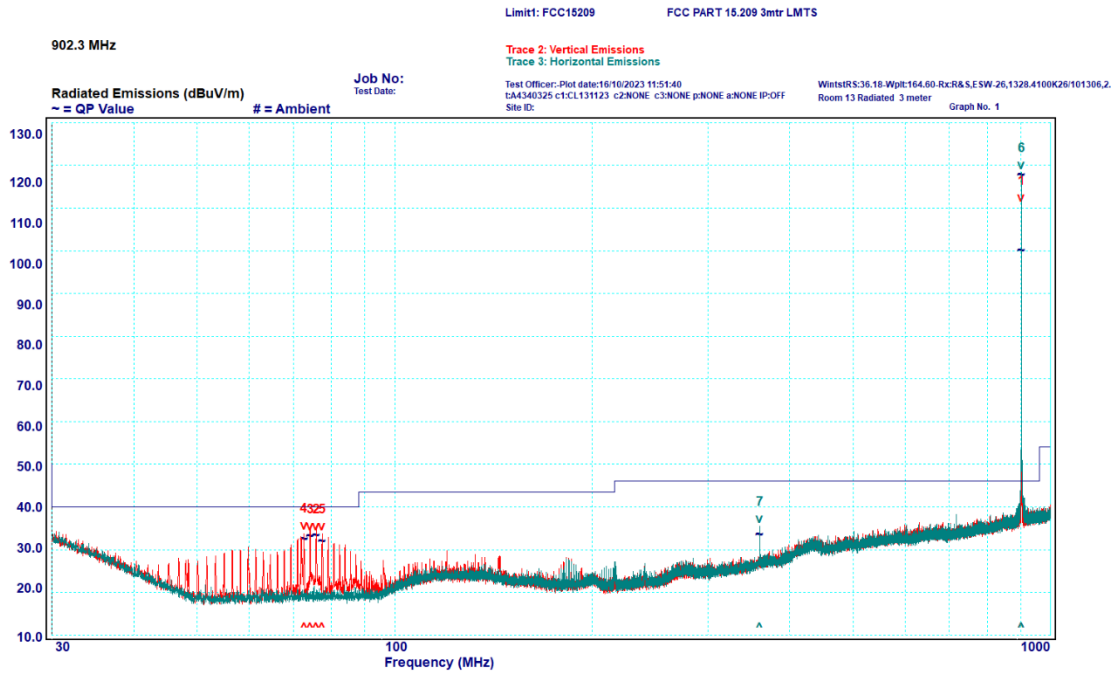


Graph 6-6: Transmitter Spurious Emissions, 9 kHz – 30 MHz, 914.9 MHz

No peaks were measured within 10 dB of the limit.

6.4.6 Transmitter Spurious Emissions: 30 - 1000 MHz

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

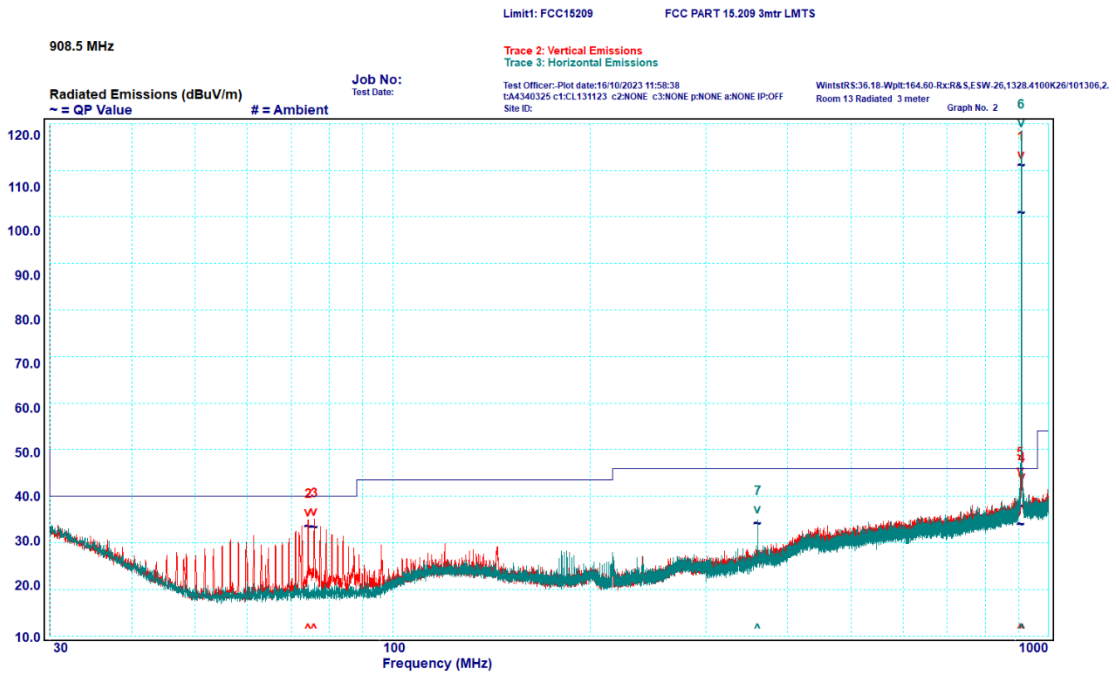


Graph 6-7: Transmitter Spurious Emissions, 30 – 1000 MHz, 902.3 MHz

Table 6-3: Transmitter Spurious Emissions, 30 – 1000 MHz, 902.3 MHz

| Peak | Frequency (MHz) | Polarisation | Quasi-Peak | | |
|------|-----------------|--------------|----------------|----------------|-------------|
| | | | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
| 1* | 902.34 | Vertical | N/A | N/A | N/A |
| 2 | 75.93 | Vertical | 33.8 | 40 | -6.2 |
| 3 | 74.34 | Vertical | 33.6 | 40 | -6.4 |
| 4 | 72.7 | Vertical | 33 | 40 | -7 |
| 5 | 77.54 | Vertical | 32.4 | 40 | -7.6 |
| 6* | 902.31 | Horizontal | N/A | N/A | N/A |
| 7 | 360 | Vertical | 34 | 46 | -12 |

*Note: Fundamental transmissions

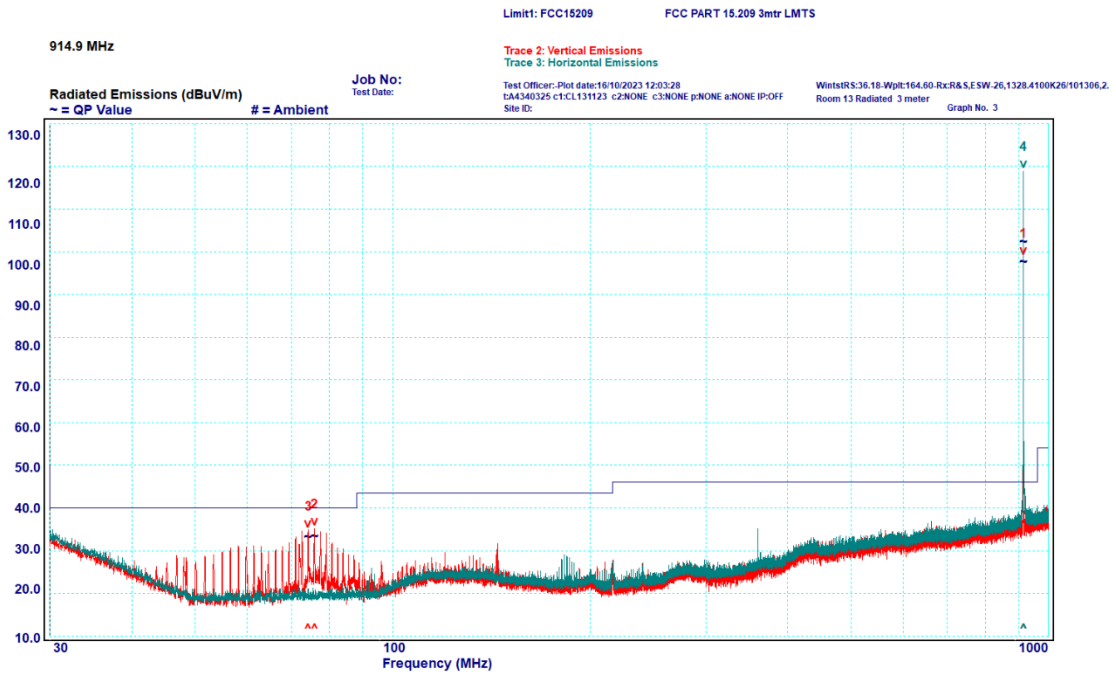


Graph 6-8: Transmitter Spurious Emissions, 30 – 1000 MHz, 908.5 MHz

Table 6-4: Transmitter Spurious Emissions, 30 – 1000 MHz, 908.5 MHz

| Peak | Frequency (MHz) | Polarisation | Quasi-Peak | | |
|------|-----------------|--------------|----------------------|----------------------|-------------|
| | | | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
| 1* | 908.45 | Vertical | N/A | N/A | N/A |
| 2 | 74.32 | Vertical | 33.9 | 40 | -6.1 |
| 3 | 75.92 | Vertical | 33.8 | 40 | -6.2 |
| 4 | 910.67 | Vertical | 38.3 | 46 | -7.7 |
| 5 | 905.06 | Vertical | 34.4 | 46 | -11.6 |
| 6* | 908.55 | Horizontal | N/A | N/A | N/A |
| 7 | 360.04 | Horizontal | 34.6 | 46 | -11.4 |

*Note: Fundamental transmissions



Graph 6-9: Transmitter Spurious Emissions, 30 – 1000 MHz, 914.9 MHz

Table 6-5: Transmitter Spurious Emissions, 30 – 1000 MHz, 914.9 MHz

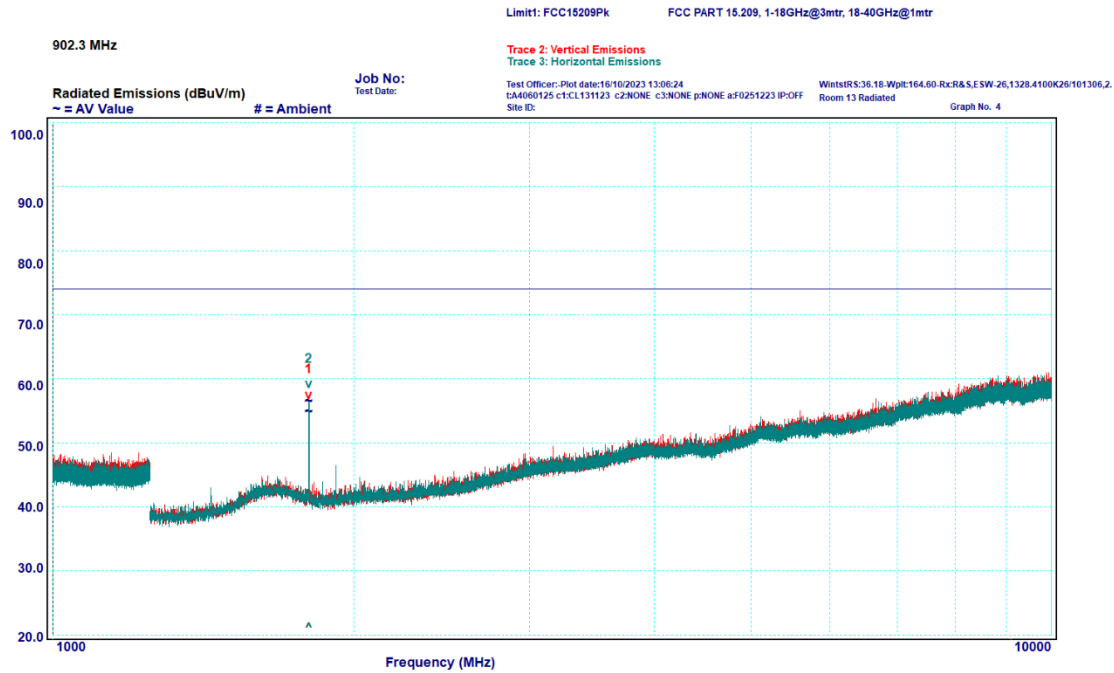
| Peak | Frequency (MHz) | Polarisation | Quasi-Peak | | |
|------|-----------------|--------------|----------------------|----------------------|-------------|
| | | | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
| 1* | 914.85 | Vertical | N/A | N/A | N/A |
| 2 | 75.98 | Vertical | 33.8 | 40 | -6.2 |
| 3 | 74.34 | Vertical | 33.6 | 40 | -6.4 |
| 4* | 914.95 | Horizontal | N/A | N/A | N/A |

*Note: Fundamental transmissions

6.4.7 Transmitter Spurious Emissions: 1 - 10 GHz

All emissions measured in the frequency band 1 – 10 GHz complied with the requirements of the standard.

Peak Measurement:

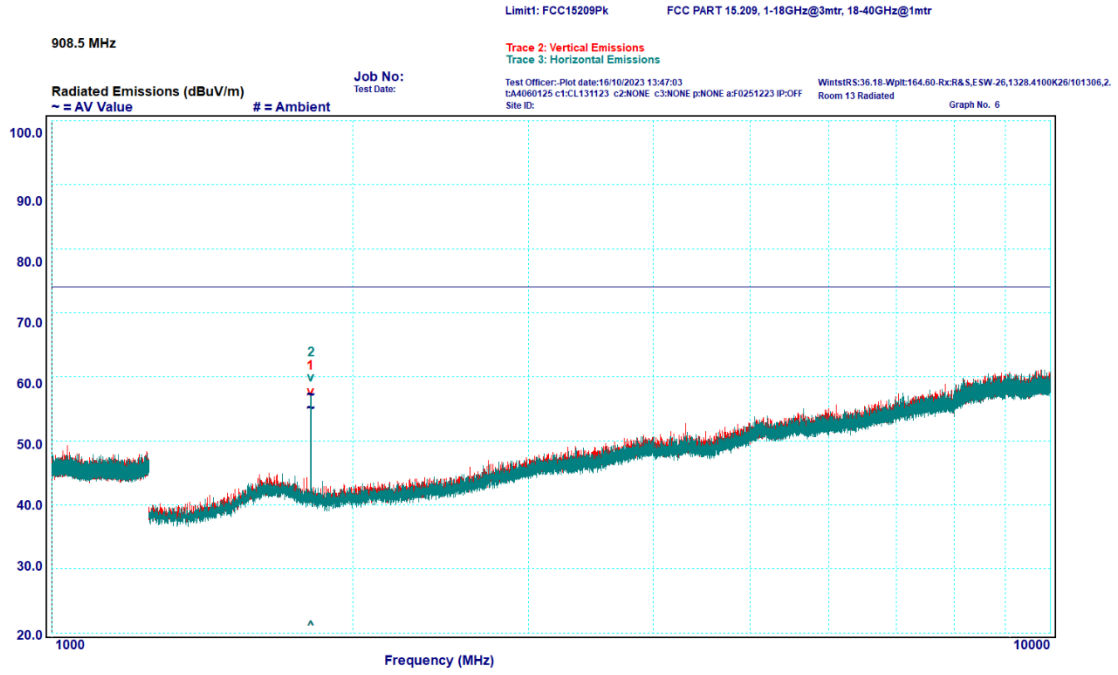


Graph 6-10: Transmitter Spurious Emissions, 1 – 10 GHz, 902.3 MHz, Peak

Table 6-6: Transmitter Spurious Emissions, 1 – 10 GHz, 902.3 MHz, Peak

| Peak | Frequency (MHz) | Polarisation | Peak | | |
|------|-----------------|--------------|----------------|----------------|-------------|
| | | | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
| 1* | 1804.63 | Vertical | 55.4 | 99.58 | -43.85 |
| 2* | 1804.42 | Horizontal | 57.0 | 99.58 | -42.25 |

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

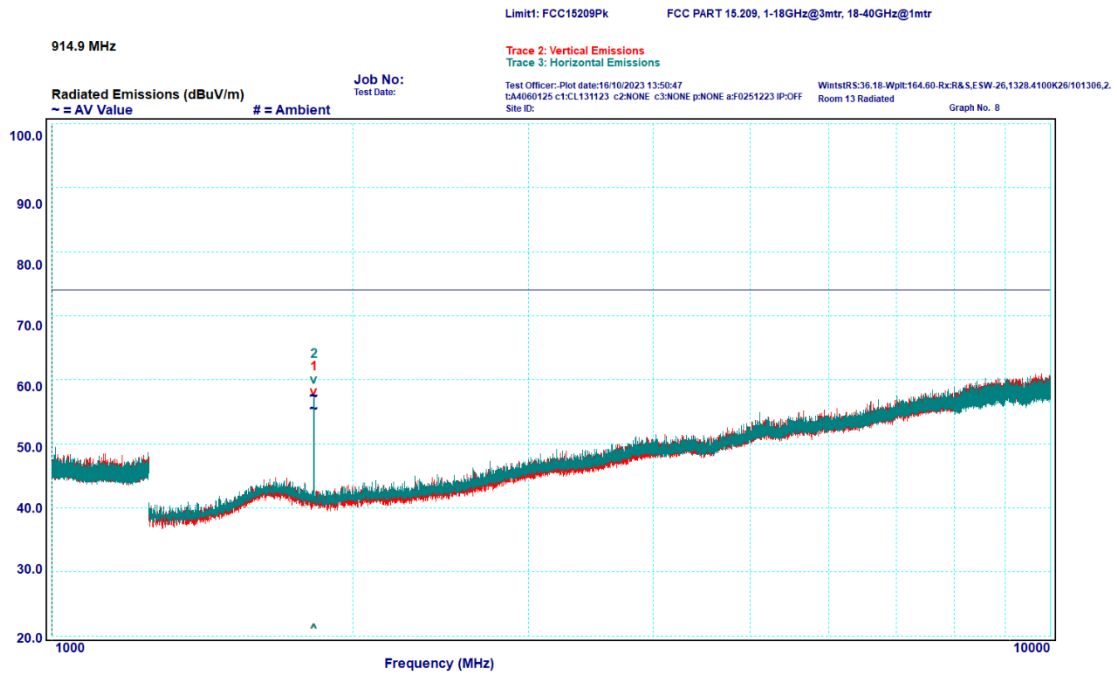


Graph 6-11: Transmitter Spurious Emissions, 1 – 10 GHz, 908.5 MHz, Peak

Table 6-7: Transmitter Spurious Emissions, 1 – 10 GHz, 908.5 MHz, Peak

| Peak | Frequency (MHz) | Polarisation | Peak | | |
|------|-----------------|--------------|----------------------|----------------------|-------------|
| | | | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
| 1* | 1816.91 | Vertical | 55.6 | 99.58 | -43.98 |
| 2* | 1817.13 | Horizontal | 57.7 | 99.58 | -41.88 |

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



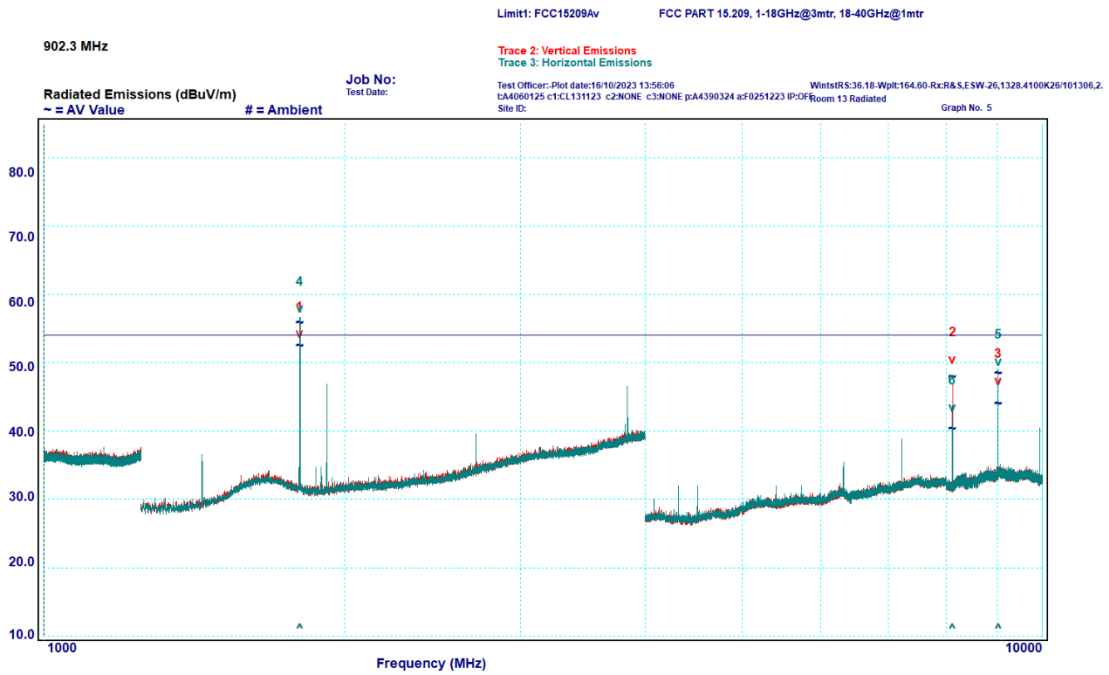
Graph 6-12: Transmitter Spurious Emissions, 1 – 10 GHz, 914.9 MHz, Peak

Table 6-8: Transmitter Spurious Emissions, 1 – 10 GHz, 914.9 MHz, Peak

| Peak | Frequency (MHz) | Polarisation | Peak | | |
|------|-----------------|--------------|----------------------|----------------------|-------------|
| | | | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
| 1* | 1829.87 | Vertical | 56.0 | 99.58 | -43.58 |
| 2* | 1830.00 | Horizontal | 57.9 | 99.58 | -41.68 |

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

Average Measurement:

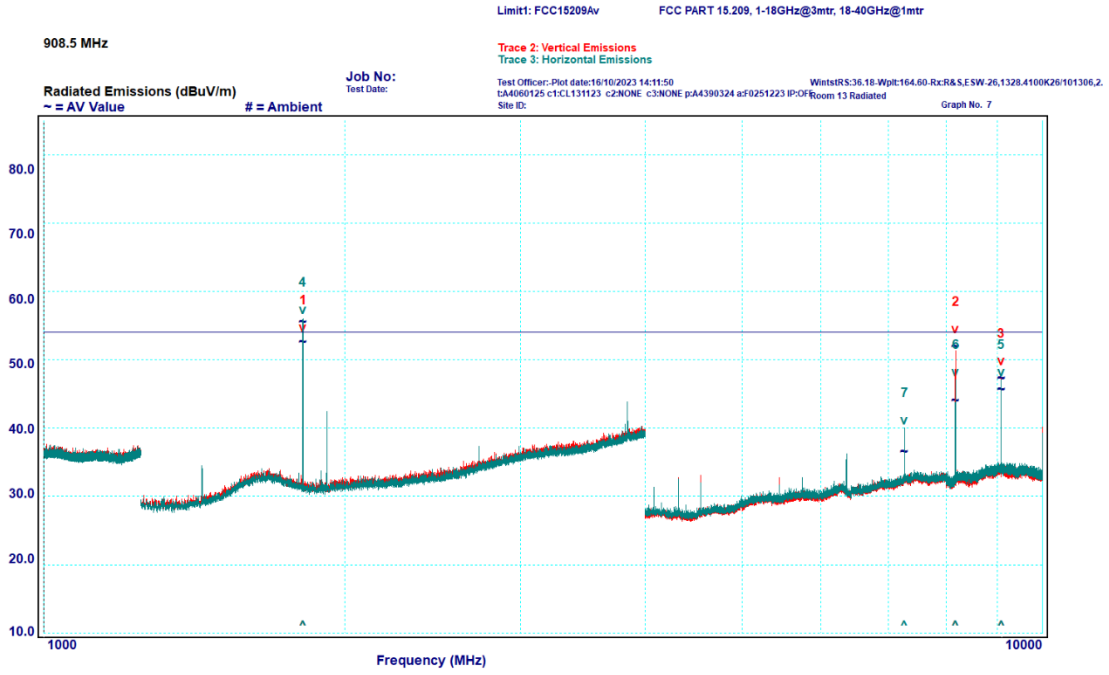


Graph 6-13: Transmitter Spurious Emissions, 1 – 10 GHz, 902.3 MHz, Average

Table 6-9: Transmitter Spurious Emissions, 1 – 10 GHz, 902.3 MHz, Average

| Peak | Frequency (MHz) | Polarisation | Average | | |
|------|-----------------|--------------|----------------------|----------------------|-------------|
| | | | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
| 1* | 1804.68 | Vertical | N/A | N/A | N/A |
| 2 | 8120.52 | Vertical | 48.4 | 54 | -5.6 |
| 3 | 9022.36 | Vertical | 44.5 | 54 | -9.5 |
| 4* | 1804.57 | Horizontal | N/A | N/A | N/A |
| 5 | 9023.17 | Horizontal | 48.9 | 54 | -5.1 |
| 6 | 8120.07 | Horizontal | 40.8 | 54 | -13.2 |

*Note: -20 dBc Peak limit applied for nonrestricted bands as per 15.247(d)

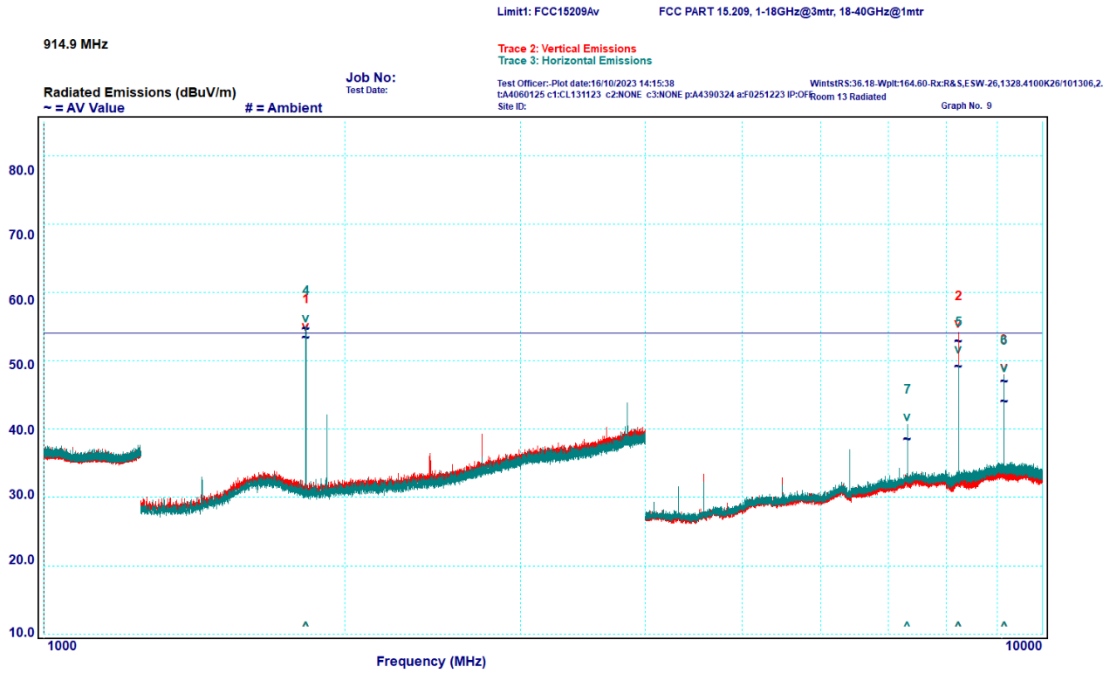


Graph 6-14: Transmitter Spurious Emissions, 1 – 10 GHz, 908.5 MHz, Average

Table 6-10: Transmitter Spurious Emissions, 1 – 10 GHz, 908.5 MHz, Average

| Peak | Frequency (MHz) | Polarisation | Average | | |
|------|-----------------|--------------|----------------------|----------------------|-------------|
| | | | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
| 1* | 1817.14 | Vertical | N/A | N/A | N/A |
| 2 | 8176.58 | Vertical | 52.4 | 54 | -1.6 |
| 3 | 9085.13 | Vertical | 47.8 | 54 | -6.2 |
| 4* | 1816.86 | Horizontal | N/A | N/A | N/A |
| 5 | 9084.44 | Horizontal | 46.1 | 54 | -7.9 |
| 6 | 8175.9 | Horizontal | 44.5 | 54 | -9.5 |
| 7 | 7267.57 | Horizontal | 37 | 54 | -17 |

*Note: -20 dBc Peak limit applied for nonrestricted bands as per 15.247(d)



Graph 6-15: Transmitter Spurious Emissions, 1 – 10 GHz, 914.9 MHz, Average

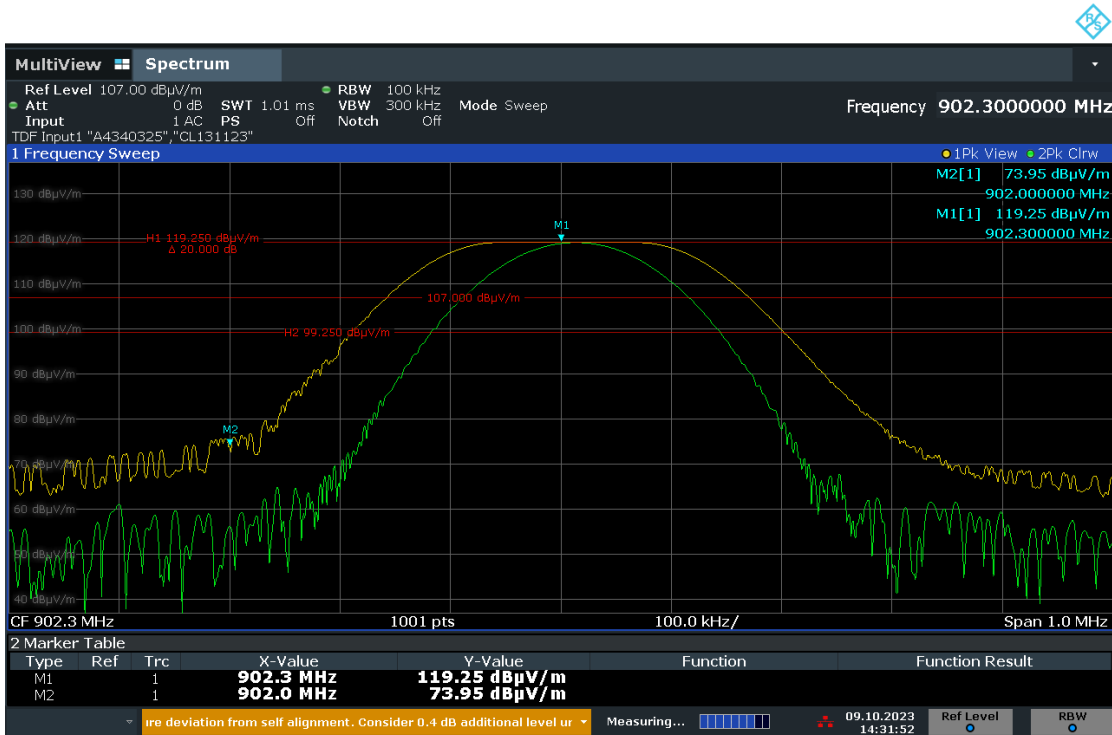
Table 6-11: Transmitter Spurious Emissions, 1 – 10 GHz, 914.9 MHz, Average

| Peak | Frequency (MHz) | Polarisation | Average | | |
|------|-----------------|--------------|----------------------|----------------------|-------------|
| | | | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
| 1* | 1829.73 | Vertical | N/A | N/A | N/A |
| 2 | 8233.72 | Vertical | 53.3 | 54 | -0.7 |
| 3 | 9149.4 | Vertical | 47.4 | 54 | -6.6 |
| 4* | 1829.72 | Horizontal | N/A | N/A | N/A |
| 5 | 8233.72 | Horizontal | 49.6 | 54 | -4.4 |
| 6 | 9148.93 | Horizontal | 44.6 | 54 | -9.4 |
| 7 | 7319.37 | Horizontal | 39 | 54 | -15 |

*Note: -20 dBc Peak limit applied for nonrestricted bands as per 15.247(d)

6.5 §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.

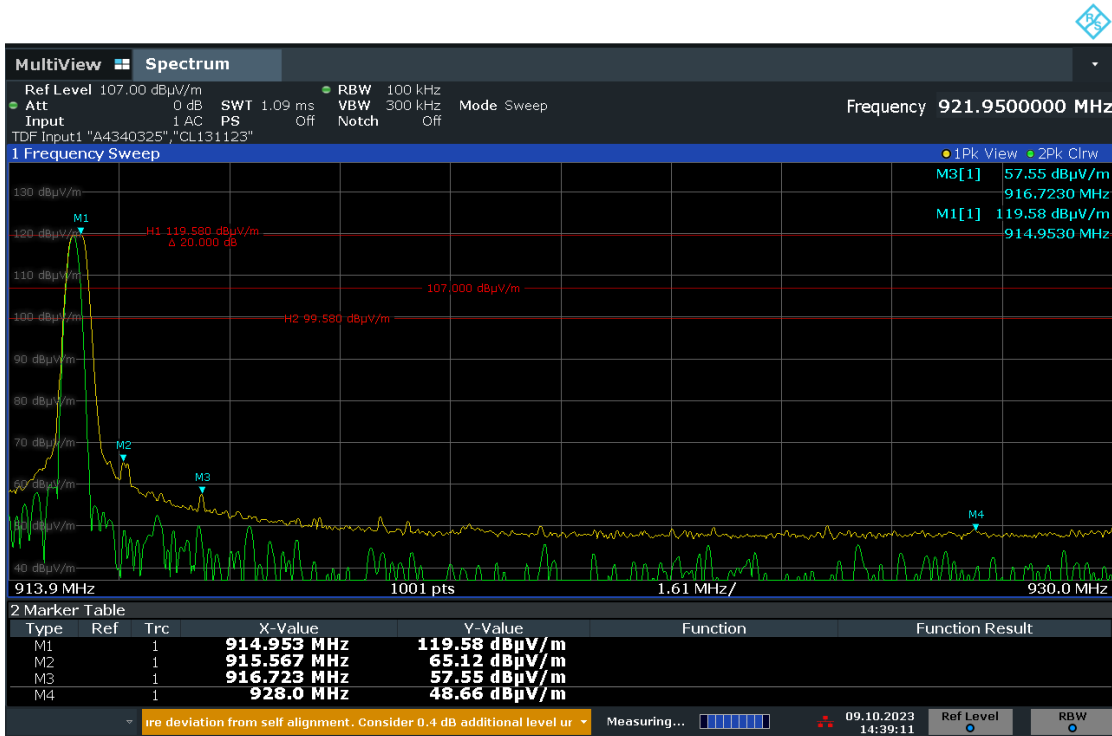


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Graph 6-16: Band Edge Emission, Lower Band-edge, 902 MHz

Table 6-12: Band Edge Emission, Lower Band-edge, 902 MHz

| Marker | Measurement Type | Freq (MHz) | Measurement (dBµV/m) | Limit (dBµV/m) | Result |
|--------|------------------|------------|----------------------|----------------|----------|
| M2 | Peak | 902 | 73.95 | 99.58 | Complied |



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Graph 6-17: Band Edge Emission, Upper Band-edge, 928 MHz

Table 6-13: Band Edge Emission, Upper Band-edge, 928 MHz

| Marker | Measurement Type | Freq (MHz) | Measurement (dBµV/m) | Limit (dBµV/m) | Result |
|--------|------------------|------------|----------------------|----------------|----------|
| M4 | Peak | 928 | 48.66 | 99.58 | Complied |

END OF REPORT