# Radio Test Report

## Eptura Inc.
## Meeting Room Screen
## Room V3.0

47 CFR Part 15.209 Effective Date 1st October 2023
DXX: Part 15 Low Power Communication Device Transmitter
Test Date: 10th January 2024 to 2nd February 2024
Report Number: 02-14529-8-24 Issue 01

The testing was carried out by Kiwa Electrical Compliance, an independent test house, at their test facility located at:


***Kiwa Electrical Compliance***
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This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF communiqué dated April 2017).

Arnolds Court, Arnolds Farm Lane, Mountnessing, Brentwood Essex, CM13 1UT

# Certificate of Test 14529-8

The equipment noted below has been fully tested by Kiwa Electrical Compliance and, where appropriate, conforms to the relevant subpart of 47 CFR Part 15C. This is a certificate of test only and should not be confused with an equipment authorisation. Other standards may also apply.

| | |
|---|---|
| Equipment: | Meeting Room Screen |
| Model Number: | Room V3.0 |
| Unique Serial Number: | 201702R01245000134A. 201702R01235000115A (for AC powerline conducted emissions) |
| Applicant: | Eptura Inc.<br>950 East Paces Ferry Road<br>NE, Suite 800<br>Atlanta<br>GA 30326<br>USA |
| Proposed FCC ID | 2BGPFV3ROOMSCREEN |
| Full measurement results are detailed in Report Number: | 02-14529-8-24 Issue 01 |
| Test Standards: | 47 CFR Part 15.209 Effective Date 1st October 2023<br>DXX: Part 15 Low Power Communication Device Transmitter |

NOTE:
Certain tests were not performed based upon applicant's declarations. Certain other requirements are subject to applicant's declaration only and have not been tested/verified. For details refer to section 3 of this report. This report pertains to the 125 kHz RFID functionality of the device only.

DEVIATIONS:
No deviations have been applied.

This certificate relates only to the unit tested as identified by a unique serial number and in the condition at the time it was tested. It does not relate to any other similar equipment and performance of the product before or after the test cannot be guaranteed. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of unit not meeting the intentions of the standard or the requirements of the Federal Regulations, particularly under different conditions to those during testing. Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Date of Test: 10th January 2024 to 2nd February 2024

Test Engineer: Chee-Wah Yeung

Chee-Wah Yeung
Digitally signed by: Chee-Wah Yeung
DN: CN = Chee-Wah Yeung email = chee-wah.yeung@kiwa.com C = GB OU = Kiwa Electrical Compliance
Date: 2024.06.07 11:08:08 Z

Approved By: Radio Approvals Manager

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DN: CN = Daniel Sims email = Daniel.Sims@kiwa.com C = GB O = Kiwa Electrical Compliance - Brentwood
Date: 2024.06.07 09:38:49 Z

Customer Representative:

ilac-MRA UKAS TESTING 2360

# 1 Contents

# 2 Equipment under test (EUT)

## 2.1 Equipment specification

| | | |
|---|---|---|
| Applicant | Eptura Inc.<br>950 East Paces Ferry Road<br>NE, Suite 800<br>Atlanta, GA 30326<br>USA | |
| | | |
| Manufacturer of EUT | Eptura Inc. | |
| Full Name of EUT | Meeting Room Screen | |
| Model Number of EUT | Room V3.0 | |
| Serial Number of EUT | 201702R01245000134A, 201702R01235000115A (for AC powerline conducted emissions) | |
| Date Received | 3rd January 2024 | |
| Date of Test: | 10th January 2024 to 2nd February 2024 | |
| Purpose of Test | To demonstrate design compliance to the relevant rules of Chapter 47 of the Code of Federal Regulations. | |
| Date Report Issued | 15th February 2024 | |
| | | |
| Main Function | Meeting room touch screen device | |
| Information Specification | Height | 182 mm |
| | Width | 247 mm |
| | Depth | 30 mm |
| | Weight | 798 g |
| | Voltage | Not Specified |
| | Current | Not Specified |
| EUT Supplied PSU | Manufacturer | KSPower |
| | Model number | KS39DU-1200300CB |
| | Serial number | E1-20230603006 |
| | Input voltage | 100-240 V 50/60 Hz |
| | Input current | 2.0 A |
| | Output | 12 Vdc, 3.0 A |

## 2.2 Configurations for testing

| General Parameters | |
|---|---|
| EUT Normal use position | Wall mount/kiosk mount |
| Choice of model(s) for type tests | Room V3.0 |
| Antenna details | 2 internal antennas:<br>-Wi-Fi/ BT (Gain: 2 dBi)<br>-RFID 125 kHz & 13.56 MHz (Gain: 0 dBi) |
| Antenna port | No |
| Baseband Data port (yes/no)? | No |
| Highest Signal generated in EUT | 2480 MHz |
| Lowest Signal generated in EUT | 10 kHz |
| Hardware Version (HVIN) | 1.1 |
| Software Version | Settings App: V2.0.40<br>HAL App: 1.6.22<br>Room App: 3.0.0.1 |
| Firmware Version (FVIN) | 11.24.01.24 |
| Type of Equipment | Standalone |
| Technology Type | RFID (125 kHz & 13.56 MHz) / Wi-Fi / BT |
| Geo-location (yes/no) | No |
| TX Parameters | |
| Alignment range – transmitter | 125 kHz |
| EUT Declared Modulation Parameters | Not Specified |
| EUT Declared Power level | Not Specified |
| EUT Declared Signal Bandwidths | Not Specified |
| EUT Declared Channel Spacing's | Not Channelized |
| EUT Declared Duty Cycle | Not Specified |
| Unmodulated carrier available? | No |
| Declared frequency stability | Not Specified |
| RX Parameters | |
| Alignment range – receiver | 125 kHz |
| EUT Declared RX Signal Bandwidth | Not Specified |
| Receiver Signal Level (RSL) | Not Specified |
| Method of Monitoring Receiver BER | Not Specified |
| FCC Parameters | |
| FCC Transmitter Class | DXX: Part 15 Low Power Communication Device Transmitter |

## 2.3 Functional description

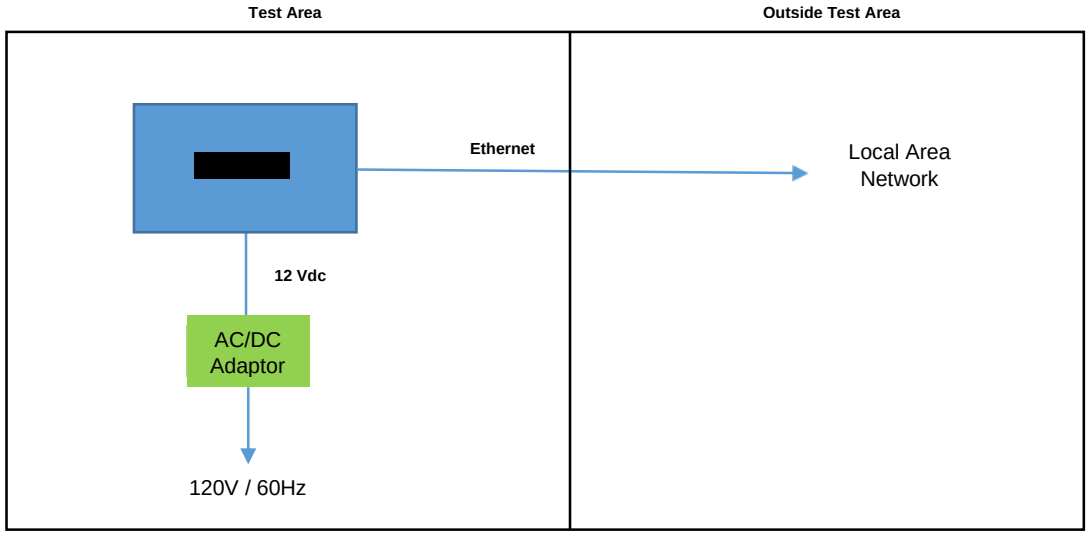
The V3 is a Wall Mounted Android Touch Screen Terminal in an ABS/PC plastic housing with 10.1” 1280x800 dot IPS TFT LCD and multitouch projected capacitive touch screen with toughened glass. It has an internal 2.4GHz Wi-Fi/BT module and an internal RFID Card Reader operating at both 13.56MHz and 125kHz. The low voltage directive compliant V3 is powered by POE via the RJ45 LAN port (with option of 12Vdc jack plug power input when Wi-Fi is used not LAN). Its average power consumption is 7W. A metal plate covers I/O ports, with only the RJ45 LAN and DC ports exposed for use. There is a diffused LED light guide to denote unit availability status.

## 2.4 Modes of operation

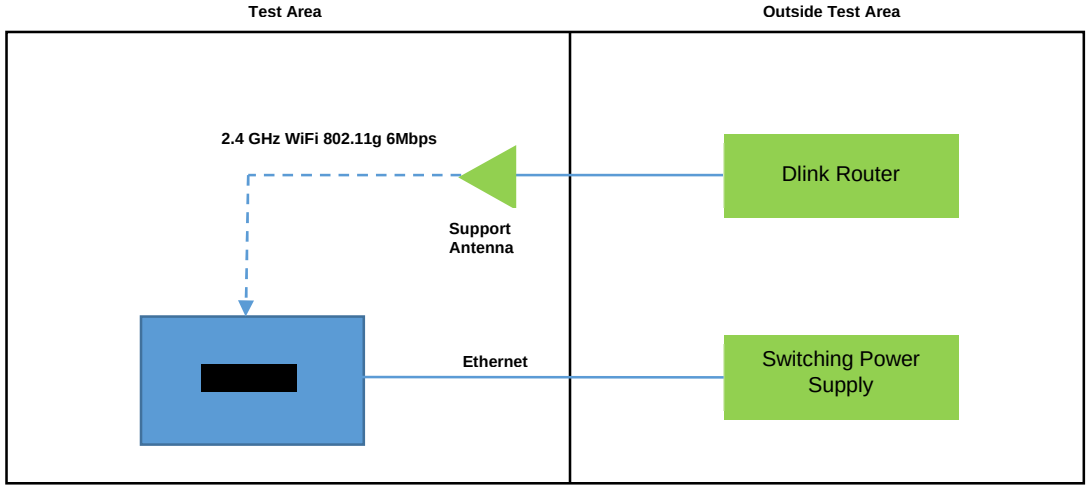
| Mode Reference | Description | Used for testing |
|---|---|---|
| Mode 1 | Repeatedly Transmitting 125 kHz & 13.56 MHz RFID (125 kHz Card presented) and data via 2.4 GHz WiFI CH6 (2437 MHz) 802.11g 6Mbps | Yes |
| Mode 2 | Repeatedly Transmitting 125 kHz & 13.56 MHz RFID (125 kHz Card not presented) and data via 2.4 GHz WiFI CH6 (2437 MHz) 802.11g 6Mbps | Yes |
| Mode 3 | Repeatedly Transmitting 125kHz & 13.56MHz RFID (125 kHz Card) PoE with Ethernet to KEC Network playing Video via YouTube | Yes |
| Mode 4 | Repeatedly Transmitting 125kHz & 13.56MHz RFID (125 kHz Card) AC/DC Adaptor with Ethernet to KEC Network playing Video via YouTube | Yes |

## 2.5 Emissions configuration

### 2.5.1 AC/DC Adaptor Emissions configuration




### 2.5.2 PoE Emissions configuration




The EUT could be powered 2 ways ‘PoE’ or using the supplied ‘AC/DC Adaptor’. The AC/DC Adaptor supplied 12 Vdc to the EUT and when used during testing the Ethernet port was connect to the LAN.

Two RFID card were provided for testing. The ‘Haltest’ App was opened and ‘Loop Test’ started and with card presented and not-present initially. The ‘HID iCLASS DG’ card (Card 2) had higher emissions then the other 13.56 MHz card (Plane – Card 1) and without card and was therefore used during emissions testing. The EUT also had 125 kHz RFID, the 125 kHz and 13.56 MHz was repeatedly transmitting even in the absence of their respective RFID cards. When the card(s) were present the amplitude and duty cycle of the signals changed.

The ‘YouTube’ App was also running during testing with a video streaming. When testing with the AC/DC Adaptor configuration it was streaming via direct connection to LAN and for the PoE configuration in the chamber it was streaming via Wi-Fi to router outside of the chamber. The Wi-Fi was set to the middle channel (2437 MHz) 802.11g 6Mbps which was worst case.

### 2.5.3 Signal leads

| Port Name | Cable Type | Connected |
|---|---|---|
| DC Power | 2 core, Unscreened | Yes |
| Ethernet (PoE) | 8 core, Unscreened | Yes |

# 3 Summary of test results

The Room V3.0 was tested for compliance to the following standard(s):

47 CFR Part 15.209
Effective Date 1st October 2023
DXX: Part 15 Low Power Communication Device Transmitter

Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of equipment not meeting the intentions of the standard or the essential requirements of the directive, particularly under different conditions to those during testing. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

| Title | References | Results |
|---|---|---|
| **Transmitter Tests** | | |
| 1. AC power line conducted emissions | 47 CFR Part 15C Part 15.207 | PASSED |
| 2. Radiated emissions 9 - 150 kHz | 47 CFR Part 15C Part 15.209 & 15.33(a) | PASSED |
| 3. Radiated emissions 150 kHz - 30 MHz | 47 CFR Part 15C Part 15.209 & 15.33(a) | PASSED |
| 4. Radiated emissions 30 MHz -1 GHz | 47 CFR Part 15C Part 15.209 | PASSED |
| 5. Radiated emissions above 1 GHz | 47 CFR Part 15C Part 15.209 & 15.33(a) | PASSED[1] |
| 6. Intentional radiator field strength | 47 CFR Part 15C Part 15.209 | PASSED |
| 7. Band edge compliance | 47 CFR Part 15C Part 15.205 | NOT APPLICABLE[2] |
| 8. Occupied bandwidth | 47 CFR Part 15C Part 15.215(c) | PASSED |
| 9. Duty Cycle | 47 CFR Part 15C Part 15.35 | PASSED |
| 10. Duty Cycle | 47 CFR Part 15C Part 15.35 | PASSED |

[1] Frequency range investigated up to 25 GHz based on ten times the highest frequency internally generated of 2480 MHz.
[2] There are no additional requirements for ‘Band Edge Compliance’ for 125 kHz RFID other than those specified in 47 CFR Part 15C Part 15.209.

# 4 Specifications

The tests were performed and operated in accordance with Kiwa Electrical Compliance procedures and the relevant standards listed below.

## 4.1 Relevant standards

| Ref. | Standard Number | Version | Description |
|---|---|---|---|
| 4.1.1 | 47 CFR Part 15C | 2023 | Federal Communications Commission PART 15 – RADIO FREQUENCY DEVICES |
| 4.1.2 | ANSI C63.10 | 2013 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |
| 4.1.3 | ANSI C63.4 | 2014 | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |

## 4.2 Deviations

No deviations were applied.

## 4.3 Tests at extremes of temperature & voltage

The following test conditions were used to simulate testing at nominal or extremes.

| Temperature Test Conditions | | Voltage Test Conditions | |
|---|---|---|---|
| T nominal | 20 °C | V nominal | 12V DC |
| T minimum | -20 °C | V minimum | 10.2V DC |
| T maximum | 50 °C | V maximum | 13.8V DC |

Extremes of voltage are based on nominal +/-15%.
The ambient test conditions of humidity and pressure in the laboratory were as specified in each specific test section within this report

## 4.4 Test fixtures

In order to measure RF parameters at temperature extremes, the EUT was tested in a temperature controlled chamber as follows:

A test fixture was used for testing.

# 5 Tests, methods and results

## 5.1 AC power line conducted emissions

### 5.1.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.207 [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 6.2 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.207 [Reference 4.1.1 of this report]

### 5.1.2 Configuration of EUT

The EUT was placed on a wooden table 0.8m above the ground plane and connected to a LISN via a 1m mains cable.

Details of the Peripheral and Ancillary Equipment connected for this test are listed in section 10.

The EUT was operated in Mode 3 and Mode 4.

### 5.1.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted in the 'Test Equipment' Section. Measurements were made on the live and neutral conductors using both average and quasi-peak detection.

At least 6 signals within 20dB and/or all signals within 10dB of the limit were investigated.

Tests were performed in Test Site H.

### 5.1.4 Test equipment

E642, F238, LPE222

See Section 9 for more details

### 5.1.5 Test results

Temperature of test environment 16°C
Humidity of test environment 57%
Pressure of test environment 100kPa

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | RFID |

| Plot refs |
|---|
| 14529-8 Cond 1 AC Live 150k-30M Average |
| 14529-8 Cond 1 AC Live 150k-30M Quasi-Peak |
| 14529-8 Cond 1 AC Neutral 150k-30M Average |
| 14529-8 Cond 1 AC Neutral 150k-30M Quasi-Peak |

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | AC/DC Adaptor |
| Channel Spacing | Non Channelized |
| Mod Scheme | RFID |

| Plot refs |
|---|
| 14529-8 Cond 2 AC Live 150k-30M Average |
| 14529-8 Cond 2 AC Live 150k-30M Quasi-Peak |
| 14529-8 Cond 2 AC Neutral 150k-30M Average |
| 14529-8 Cond 2 AC Neutral 150k-30M Quasi-Peak |

**Table of signals measured for Cond 1 PoE Live 150k-30M**

| Signal No. | Freq (MHz) | Peak Amp (dBuV) | QP Amp (dBuV) | QP -Lim (dB) | AV Amp (dBuV) | AV -Lim (dB) |
|---|---|---|---|---|---|---|
| 1 | 0.176 | 47.9 | 45.3 | -19.4 | 41.3 | -13.4 |
| 2 | 0.528 | 44.1 | 42.8 | -13.2 | 31.4 | -14.6 |
| 3 | 0.617 | 39.9 | 38.8 | -17.2 | 31.3 | -14.7 |
| 4 | 0.705 | 42.2 | 40.6 | -15.4 | 36.5 | -9.5 |
| 5 | 16.228 | 41.3 | 39.5 | -20.5 | 33.0 | -17.0 |
| 6 | 18.425 | 41.7 | 39.6 | -20.4 | 35.3 | -14.7 |
| 7 | 20.258 | 49.2 | 47.5 | -12.5 | 44.7 | -5.3 |
| 8 | 26.348 | 50.4 | 49.6 | -10.4 | 44.5 | -5.5 |
| 9 | 29.402 | 51.9 | 50.6 | -9.4 | 47.0 | -3.0 |

## Table of signals measured for Cond 1 PoE Neutral 150k-30M

| Signal No. | Freq (MHz) | Peak Amp (dBuV) | QP Amp (dBuV) | QP -Lim (dB) | AV Amp (dBuV) | AV -Lim (dB) |
|---|---|---|---|---|---|---|
| 1 | 0.176 | 48.2 | 46.3 | -18.4 | 42.2 | -12.5 |
| 2 | 0.528 | 47.5 | 44.7 | -11.3 | 33.1 | -12.9 |
| 3 | 0.704 | 42.9 | 41.8 | -14.2 | 36.9 | -9.1 |
| 4 | 14.031 | 40.0 | 38.3 | -21.7 | 33.5 | -16.5 |
| 5 | 16.228 | 42.5 | 39.8 | -20.2 | 35.9 | -14.1 |
| 6 | 18.424 | 42.1 | 40.2 | -19.8 | 35.9 | -14.1 |
| 7 | 19.709 | 42.8 | 43.8 | -16.2 | 40.5 | -9.5 |
| 8 | 20.381 | 47.8 | 47.0 | -13.0 | 44.4 | -5.6 |
| 9 | 20.808 | 50.6 | 49.3 | -10.7 | 45.3 | -4.7 |
| 10 | 25.679 | 51.0 | 50.6 | -9.4 | 47.3 | -2.7 |
| 11 | 28.734 | 51.7 | 50.3 | -9.7 | 45.2 | -4.8 |

## Table of signals measured for Cond 2 AC Live 150k-30M

| Signal No. | Freq (MHz) | Peak Amp (dBuV) | QP Amp (dBuV) | QP -Lim (dB) | AV Amp (dBuV) | AV -Lim (dB) |
|---|---|---|---|---|---|---|
| 1 | 9.771 | 37.0 | 34.5 | -25.5 | 28.8 | -21.2 |

## Table of signals measured for Cond 2 AC Neutral 150k-30M

| Signal No. | Freq (MHz) | Peak Amp (dBuV) | QP Amp (dBuV) | QP -Lim (dB) | AV Amp (dBuV) | AV -Lim (dB) |
|---|---|---|---|---|---|---|
| 1 | 0.452 | 38.0 | 35.2 | -21.6 | 26.9 | -19.9 |
| 2 | 9.308 | 39.9 | 36.6 | -23.4 | 30.7 | -19.3 |

No discernible difference was noted in emissions between channels (exploratory measurements); therefore the final measurements are presented for TX mid channel mode only.

Peak detector “Max held” Analyser plots against the Quasi-Peak / Average limit line(s) can be found in Section 6 of this report. Only results within 20dB of limits have been reported.

**LIMITS:**
15.207: as given in the above tables / drawn on the respective plots.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows: UE70 9kHz to 150kHz ±3.76dB, UE71 150kHz to 30MHz ±3.4dB

## 5.2 Radiated emissions 9 - 150 kHz

### 5.2.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.209 & 15.33(a) [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 6.4 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.209 [Reference 4.1.1 of this report]

### 5.2.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was rotated in all three orthogonal planes. Following investigation there did not appear to be any difference when EUT was powered by PoE or using the supplied AC/DC Adaptor, therefore the EUT was operated in Mode 1.

### 5.2.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below.

Measurements were made in a semi-anechoic chamber (pre-scan) with any final measurements required performed on an OATS without a ground plane. The antenna was placed 1m above the ground. The equipment was rotated 360 degrees to record the worst case emissions.

At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.

Tests were performed using Test Site M.

### 5.2.4 Test equipment

E411, E624, TMS81, ZSW1

See Section 9 for more details

### 5.2.5 Test results

| | |
|---|---|
| Temperature of test environment | 16°C |
| Humidity of test environment | 61% |
| Pressure of test environment | 101kPa |

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | With Card |

| Plot refs |
|---|
| 14529-8 Rad 1 9k-150kHz Para |
| 14529-8 Rad 1 9k-150kHz Perp |

Peak detector “Max held” Analyser plots against the Quasi-Peak / Average limit line(s) can be found in Section 6 of this report.

**LIMITS:**
15.209 limits are applicable in the restricted bands of 15.205 with the relevant detector.

n.b. the general limits of 15.209 are as drawn on the respective plots.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
9kHz - 30MHz ±3.9dB

## 5.3 Radiated emissions 150 kHz - 30 MHz

### 5.3.1 Test methods

| | |
|---|---|
| Test Requirements: | 47 CFR Part 15C Part 15.209 & 15.33(a) [Reference 4.1.1 of this report] |
| Test Method: | ANSI C63.10 Clause 6.4 [Reference 4.1.2 of this report] |
| Limits: | 47 CFR Part 15C Part 15.209 [Reference 4.1.1 of this report] |

### 5.3.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was rotated in all three orthogonal planes. Following investigation there did not appear to be any difference when EUT was powered by PoE or using the supplied AC/DC Adaptor, therefore the EUT was operated in Mode 1.

### 5.3.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below.

Measurements were made in a semi-anechoic chamber (pre-scan) with any final measurements required performed on an OATS without a ground plane. The antenna was placed 1m above the ground. The equipment was rotated 360 degrees to record the worst case emissions.

At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.

Tests were performed using Test Site M.

### 5.3.4 Test equipment

E411, E624, TMS81, ZSW1

See Section 9 for more details

### 5.3.5 Test results

| | |
|---|---|
| Temperature of test environment | 16°C |
| Humidity of test environment | 61% |
| Pressure of test environment | 101kPa |

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | With Card |

| Plot refs |
|---|
| 14529-8 Rad 1 150k-30MHz Para |
| 14529-8 Rad 1 150k-30MHz Perp |

Peak detector “Max held” Analyser plots against the Quasi-Peak / Average limit line(s) can be found in Section 6 of this report.

**LIMITS:**
15.209 limits are applicable in the restricted bands of 15.205 with the relevant detector.

n.b. the general limits of 15.209 are as drawn on the respective plots.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
9kHz - 30MHz ±3.9dB

## 5.4 Radiated emissions 30 MHz -1 GHz

### 5.4.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.209 [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 6.5 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Clause 15.209 [Reference 4.1.1 of this report]

### 5.4.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was rotated in all three orthogonal planes. Following investigation there did not appear to be any difference when EUT was powered by PoE or using the supplied AC/DC Adaptor, therefore the EUT was operated in Mode 1.

### 5.4.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. The equipment was rotated 360 degrees and the antenna scanned 1 – 4 metres in both horizontal and vertical polarisations to record the worst case emissions.

At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.

Tests were performed using Test Site M.

### 5.4.4 Test equipment

E411, E624, E743, LPE364, NSA-M, ZSW1

See Section 9 for more details

### 5.4.5 Test results

Temperature of test environment 16°C
Humidity of test environment 67%
Pressure of test environment 102kPa

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | With Card |

| Plot refs |
|---|
| 14529-8 Rad 1 VHF Horiz |
| 14529-8 Rad 1 VHF Vert |
| 14529-8 Rad 1 UHF Horiz |
| 14529-8 Rad 1 UHF Vert |

**Table of signals measured for Horizontal Signal List**

| Signal No. | Freq (MHz) | Peak Amp (dBuV/m) | QP Amp (dBuV/m) | QP -Lim (dB) |
|---|---|---|---|---|
| 1 | 51.450 | 30.4 | 24.3 | -15.7 |
| 2 | 72.004 | 24.4 | 20.4 | -19.6 |
| 3 | 125.004 | 29.5 | 25.7 | -17.8 |
| 4 | 192.102 | 31.9 | 24.1 | -19.4 |
| 5 | 204.041 | 33.6 | 27.0 | -16.5 |
| 6 | 216.029 | 33.1 | 26.4 | -19.6 |
| 7 | 226.774 | 35.3 | 31.8 | -14.2 |
| 8 | 250.005 | 32.7 | 28.6 | -17.4 |
| 9 | 375.013 | 42.5 | 41.0 | -5.0 |
| 10 | 468.006 | 38.2 | 31.6 | -14.4 |
| 11 | 479.973 | 38.3 | 31.3 | -14.7 |

| | | | | |
|---|---|---|---|---|
| 12 | 492.027 | 37.9 | 31.2 | -14.8 |
| 13 | 499.997 | 35.9 | 31.7 | -14.3 |
| 14 | 504.062 | 36.1 | 27.4 | -18.6 |
| 15 | 529.143 | 37.3 | 34.1 | -11.9 |
| 16 | 576.075 | 37.7 | 29.6 | -16.4 |
| 17 | 588.075 | 37.1 | 28.8 | -17.2 |
| 18 | 604.690 | 34.7 | 28.9 | -17.1 |
| 19 | 612.223 | 33.4 | 27.6 | -18.4 |
| 20 | 624.994 | 40.6 | 37.4 | -8.6 |
| 21 | 646.997 | 36.0 | 29.6 | -16.4 |
| 22 | 651.512 | 39.2 | 34.0 | -12.0 |
| 23 | 720.740 | 35.7 | 29.3 | -16.7 |
| 24 | 750.017 | 40.9 | 36.2 | -9.8 |
| 25 | 755.917 | 42.7 | 39.6 | -6.4 |
| 26 | 854.889 | 36.5 | 30.6 | -15.4 |
| 27 | 874.992 | 46.3 | 44.1 | -1.9 |

## Table of signals measured for Vertical Signal List

| Signal No. | Freq (MHz) | Peak Amp (dBuV/m) | QP Amp (dBuV/m) | QP -Lim (dB) |
|---|---|---|---|---|
| 1 | 67.794 | 41.1 | 36.9 | -3.1 |
| 2 | 70.450 | 38.5 | 33.4 | -6.6 |
| 3 | 71.833 | 40.9 | 36.1 | -3.9 |
| 4 | 72.912 | 37.5 | 32.0 | -8.0 |
| 5 | 75.591 | 41.0 | 36.1 | -3.9 |
| 6 | 77.530 | 37.1 | 31.7 | -8.3 |
| 7 | 79.509 | 35.8 | 29.8 | -10.2 |
| 8 | 81.445 | 36.1 | 30.4 | -9.6 |
| 9 | 84.052 | 35.2 | 30.6 | -9.4 |
| 10 | 87.590 | 33.6 | 28.8 | -11.2 |
| 11 | 94.884 | 32.0 | 25.7 | -17.8 |
| 12 | 99.984 | 35.0 | 29.2 | -14.3 |
| 13 | 102.943 | 37.3 | 30.7 | -12.8 |
| 14 | 105.402 | 34.1 | 28.8 | -14.7 |
| 15 | 109.104 | 35.6 | 29.4 | -14.1 |
| 16 | 121.721 | 31.5 | 25.2 | -18.3 |
| 17 | 144.002 | 34.1 | 27.4 | -16.1 |
| 18 | 151.184 | 43.6 | 38.6 | -4.9 |
| 19 | 156.004 | 37.1 | 30.4 | -13.1 |
| 20 | 168.074 | 39.9 | 34.0 | -9.5 |
| 21 | 176.155 | 31.2 | 25.3 | -18.2 |
| 22 | 179.999 | 42.5 | 37.2 | -6.3 |
| 23 | 189.827 | 37.0 | 32.9 | -10.6 |
| 24 | 191.993 | 46.3 | 40.7 | -2.8 |
| 25 | 199.313 | 35.3 | 30.2 | -13.3 |
| 26 | 203.962 | 44.7 | 38.6 | -4.9 |
| 27 | 211.646 | 34.3 | 27.8 | -15.7 |
| 28 | 215.989 | 41.4 | 35.1 | -8.4 |
| 29 | 222.911 | 31.8 | 26.8 | -19.2 |
| 30 | 226.772 | 40.1 | 36.7 | -9.3 |
| 31 | 228.143 | 33.6 | 26.8 | -19.2 |
| 32 | 240.061 | 34.1 | 26.8 | -19.2 |
| 33 | 250.013 | 32.9 | 28.6 | -17.4 |
| 34 | 375.007 | 35.0 | 31.7 | -14.3 |

| | | | | |
|---|---|---|---|---|
| 35 | 604.740 | 39.0 | 35.1 | -10.9 |
| 36 | 625.013 | 42.6 | 40.3 | -5.7 |
| 37 | 651.536 | 40.2 | 34.6 | -11.4 |
| 38 | 680.322 | 37.9 | 33.9 | -12.1 |
| 39 | 750.016 | 40.4 | 36.6 | -9.4 |
| 40 | 755.919 | 41.9 | 38.0 | -8.0 |
| 41 | 859.591 | 36.9 | 30.6 | -15.4 |
| 42 | 875.017 | 37.9 | 32.9 | -13.1 |
| 43 | 933.251 | 37.9 | 32.0 | -14.0 |
| 44 | 957.396 | 37.2 | 31.8 | -14.2 |

Peak detector “Max held” Analyser plots against the Quasi-Peak / Average limit line(s) can be found in Section 6 of this report.

**LIMITS:**

15.209 limits are applicable in the restricted bands of 15.205 with the relevant detector.
15.231(b)/(e) limits are applicable elsewhere, although 15.209 limits may be used where these allow a higher field strength.

n.b. the general limits of 15.209 are as drawn on the respective plots.

These results show that the EUT has PASSED this test.
The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
30MHz - 1000MHz ±6.1dB

## 5.5 Radiated emissions above 1 GHz

### 5.5.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.209 & 15.33(a) [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 6.6 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.209 [Reference 4.1.1 of this report]

### 5.5.2 Configuration of EUT

The EUT was placed on a 1.5 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was rotated in all three orthogonal planes. Following investigation there did not appear to be any difference when EUT was powered by PoE or using the supplied AC/DC Adaptor, therefore the EUT was operated in Mode 1.

### 5.5.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. Measurements were made in a semi-anechoic chamber with appropriate absorbing material for use in this range. The EUT was raised and antenna was placed 1.5m above the ground in line with the EUT, which was rotated through 360 degrees to record the worst case emissions. A measurement distance of 3m was used between the test range 1GHz - 6GHz, 1.2m was used in the test range 6-18GHz and 0.3m was used in the test range 18-25GHz. Tests were performed in Test Site B.

### 5.5.4 Test equipment

E412, E428, E429, E856, E904, E972, TMS78, TMS79

See Section 9 for more details

### 5.5.5 Test results

Temperature of test environment 16°C
Humidity of test environment 69%
Pressure of test environment 104kPa

Setup Table

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | RFID |

| Spurious Frequency (MHz) | Measured Peak Level (dBµV/m) | Difference to Peak Limit (dB) | Measured Average Level (dBµV/m) | Difference to Average Limit (dB) | EUT Polarisation | Antenna Polarisation |
|---|---|---|---|---|---|---|
| 1124.99 | 45.1 | -28.9 | 39.3 | -14.7 | Upright | Horizontal |
| 1360.674 | 51.2 | -22.8 | 38.2 | -15.8 | Upright | Vertical |
| 1436.241 | 47.4 | -26.6 | 34.8 | -19.2 | Upright | Horizontal |
| 1436.247 | 55.1 | -18.9 | 43.2 | -10.8 | Upright | Vertical |
| 1511.841 | 50 | -24 | 41.6 | -12.4 | Upright | Vertical |
| 1511.847 | 49.1 | -24.9 | 35.7 | -18.3 | Upright | Horizontal |
| 1587.431 | 43.5 | -30.5 | 35.7 | -18.3 | Upright | Horizontal |
| 1587.431 | 46.5 | -27.5 | 36.4 | -17.6 | Upright | Vertical |
| 1663.024 | 47 | -27 | 37.9 | -16.1 | Upright | Horizontal |
| 1663.024 | 53.2 | -20.8 | 47.5 | -6.5 | Upright | Vertical |
| 3888.063 | 49.04 | -24.96 | 37.14 | -16.86 | Upright | Horizontal |
| 3888.162 | 47.84 | -26.16 | 35.24 | -18.76 | Upright | Vertical |
| 11755.096 | 50.12 | -23.88 | 37.22 | -16.78 | Upright | Horizontal |
| 12128.398 | 48.11 | -25.89 | 36.41 | -17.59 | Upright | Vertical |
| 12271.995 | 50.17 | -23.83 | 37.37 | -16.63 | Upright | Horizontal |

| Plots |
|---|
| 14529-6 Rad 1 1-2GHz Horiz |
| 14529-6 Rad 1 1-2GHz Vert |
| 14529-6 Rad 1 2-3GHz Horiz |
| 14529-6 Rad 1 2-3GHz Vert |
| 14529-6 Rad 1 3-5GHz Horiz |
| 14529-6 Rad 1 3-5GHz Vert |
| 14529-6 Rad 1 5-6GHz Horiz |
| 14529-6 Rad 1 5-6GHz Vert |
| 14529-6 Rad 1 6-7.77GHz Horiz |
| 14529-6 Rad 1 6-7.77GHz Vert |
| 14529-6 Rad 1 7.77-10GHz Horiz |
| 14529-6 Rad 1 7.77-10GHz Vert |
| 14529-6 Rad 1 10-12_4GHz Horiz |
| 14529-6 Rad 1 10-12_4GHz Vert |
| 14529-6 Rad 1 12-15GHz Horiz |
| 14529-6 Rad 1 12-15GHz Vert |
| 14529-6 Rad 1 15-18GHz Horiz |
| 14529-6 Rad 1 15-18GHz Vert |
| 14529-6 Rad 1 18-22GHz Horiz |
| 14529-6 Rad 1 18-22GHz Vert |
| 14529-6 Rad 1 22-25GHz Horiz |
| 14529-6 Rad 1 22-25GHz Vert |

Peak detector “Max held” Analyser plots against the Average limit line can be found in Section 6 of this report.

Note: The client requested worst case channel from WiFi module report to be tested which was Mid channel (2437 MHz) were tested, plots are for illustrative purposes only in this report.

**LIMITS:**
15.209 limits are applicable in the restricted bands of 15.205 with the relevant detector.
15.231(b)/(e) limits are applicable elsewhere, although 15.209 limits may be used where these allow a higher field strength.

n.b. the general limits of 15.209 are as drawn on the respective plots.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
1 – 18 GHz ±3.5dB, 18 – 25 GHz ±3.9dB.

## 5.6 Intentional radiator field strength

### 5.6.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.209 [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 6.5/6.6 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.209 & 15.35 [Reference 4.1.1 of this report]

### 5.6.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The antenna was scanned 1-4m in height in both Horizontal and Vertical polarisations. The EUT was rotated in all three orthogonal planes. The EUT was operated in Mode 1.

### 5.6.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. Measurements were made in a semi-anechoic chamber. The antenna was placed 1m above the ground. The equipment was rotated 360 degrees and emissions maximised to record the worst case emissions.

Measurements were made at Site M and OATS.

### 5.6.4 Test equipment

E411, E624, TMS81, ZSW1

See Section 9 for more details.

### 5.6.5 Test results

Temperature of test environment 16°C
Humidity of test environment 61%
Pressure of test environment 101kPa

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | RFID |

| | Single channel |
|---|---|
| Peak Level (dBµV/m) @ 3 m distance | 54.67 |
| Plot reference | 14529-8 Radiated H-Field 125 kHz |
| Antenna Polarisation | Perpendicular |
| EUT Polarisation | Upright |

Analyser plots can be found in Section 6 of this report.

**LIMITS:**

15.209 limit is 2400/F(kHz) µV/m @ 300 m.
F = 125 kHz.
2400/125 = 19.2 µV/m @ 300 m.
19.2 µV/m = 25.67 dBµV/m @ 300 m.

The 3 m measurement can be extrapolated to 300 m as specified in 15.31(f)(2) by subtracting 40 dB/decade to give: -
54.67-80 = -25.33 dBµV/m @ 300 m.
These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
<± 3.9 dB

## 5.7 Band edge compliance

NOT APPLICABLE: There are no additional requirements for ‘Band Edge Compliance’ for 125 kHz RFID other than those specified in 47 CFR Part 15C Part 15.209.

## 5.8 Occupied bandwidth

### 5.8.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.215(c) [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 6.9 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.215(c) [Reference 4.1.1 of this report]

### 5.8.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was operated in Mode 1 and Mode 2.

### 5.8.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below. A 120kHz RBW, 3x VBW, auto sweep time and max hold settings were used for the 20 dB bandwidth.

Tests were performed using Test Site M.

### 5.8.4 Test equipment

E411, E624, TMS81, ZSW1

See Section 9 for more details

### 5.8.5 Test results

Temperature of test environment 16°C
Humidity of test environment 61%
Pressure of test environment 101kPa

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | RFID (with Card) |

| | Single channel |
|---|---|
| 20 dB Bandwidth (Hz) Nominal Temp & Volts | 308.399 |
| Plot for 20 dB Bandwidth (MHz) Nominal Temp & Volts | 14529-8 20dB BW with 125 kHz Card_RBW 50 Hz |

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | RFID (Without Card) |

| | Single channel |
|---|---|
| 20 dB Bandwidth (Hz) Nominal Temp & Volts | 456.879 |
| Plot for 20 dB Bandwidth (MHz) Nominal Temp & Volts | 14529-8 20dB BW without 125 kHz Card_RBW 50 Hz |

Analyser plots for the 20 dB bandwidth can be found in Section 6 of this report.

**LIMITS:**
15.215(c) it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
<± 1.9 %

## 5.9 Duty Cycle

### 5.9.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.35 [Reference 4.1.1 of this report]
Test Method: See 5.9.3 of this report
Limits: 47 CFR Part 15C Part 15.35 [Reference 4.1.1 of this report]

### 5.9.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was operated in Mode 1.

### 5.9.3 Test procedure

A zero span was set on the analyser with the frequency set to the fundamental frequency of the EUT. Suitable triggering was also set and the TX on time and repetition times were evaluated and plotted. Tests were performed using Test Site M.

### 5.9.4 Test equipment

E411, E624, TMS81, ZSW1

See Section 9 for more details

### 5.9.5 Test results

Temperature of test environment 16°C
Humidity of test environment 61%
Pressure of test environment 101kPa

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | With Card RFID |

| | Single channel |
|---|---|
| TX on time (ms) | 884.57 |
| TX on Plot filename | 14529-8 Duty Cycle 125 kHz with card |
| TX repetition time (s) | 0.898607 |
| Calculated TX Duty cycle (%) | 98.437503 |

| | |
|---|---|
| Single channel | 125 kHz |
| Power Level | PoE |
| Channel Spacing | Non Channelized |
| Mod Scheme | without Card RFID |

| | Single channel |
|---|---|
| TX on time (mS) | 446.25 |
| TX on Plot filename | 14529-8 Duty Cycle 125 kHz without card |
| TX repetition time (S) | 1.4554 |
| Calculated TX Duty cycle (%) | 30.661749 |

Analyser plots for the dwell time and duty cycle can be found in Section 6 of this report.

**LIMITS:**

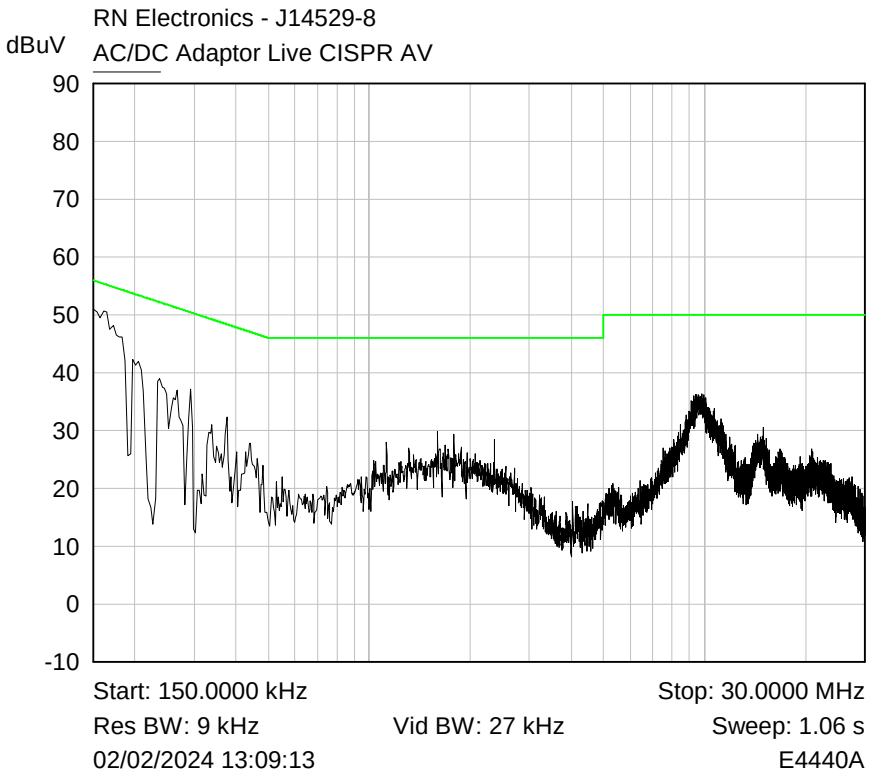
No Limits apply, however, when using an average detector duty cycle correction is allowed per 15.35.

These results show that the EUT has PASSED this test.

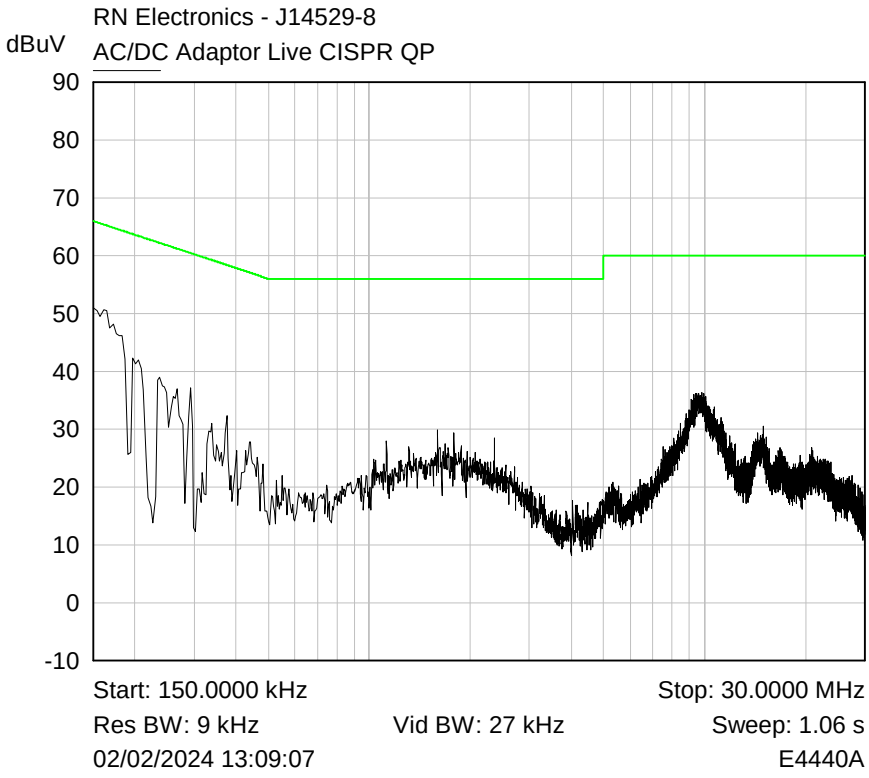
The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
2.57 ms

# 6 Plots/Graphical results

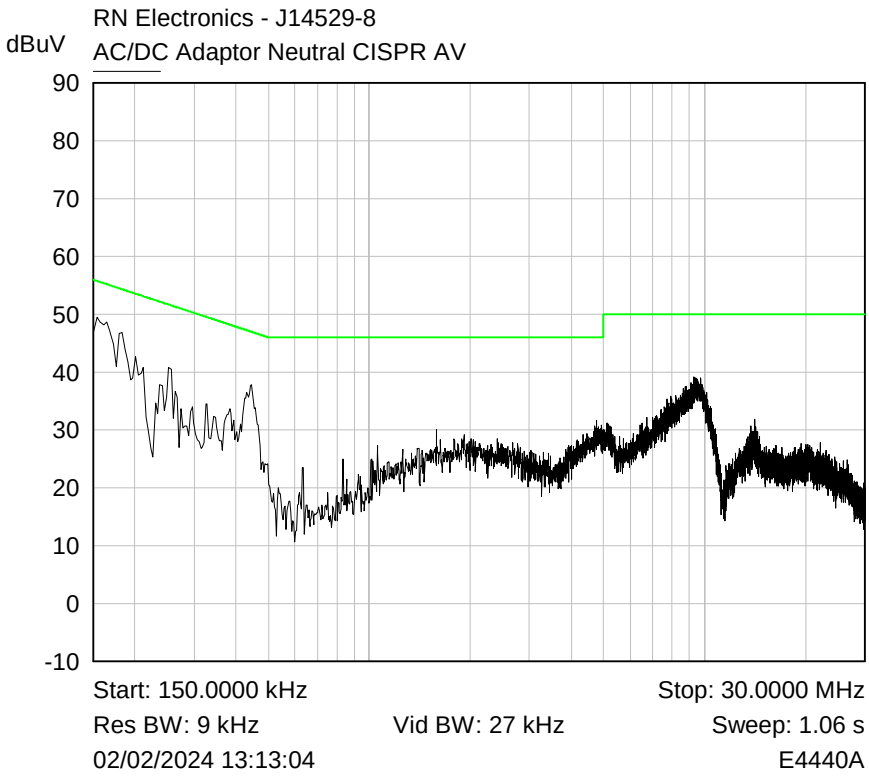
## 6.1 AC powerline conducted emission



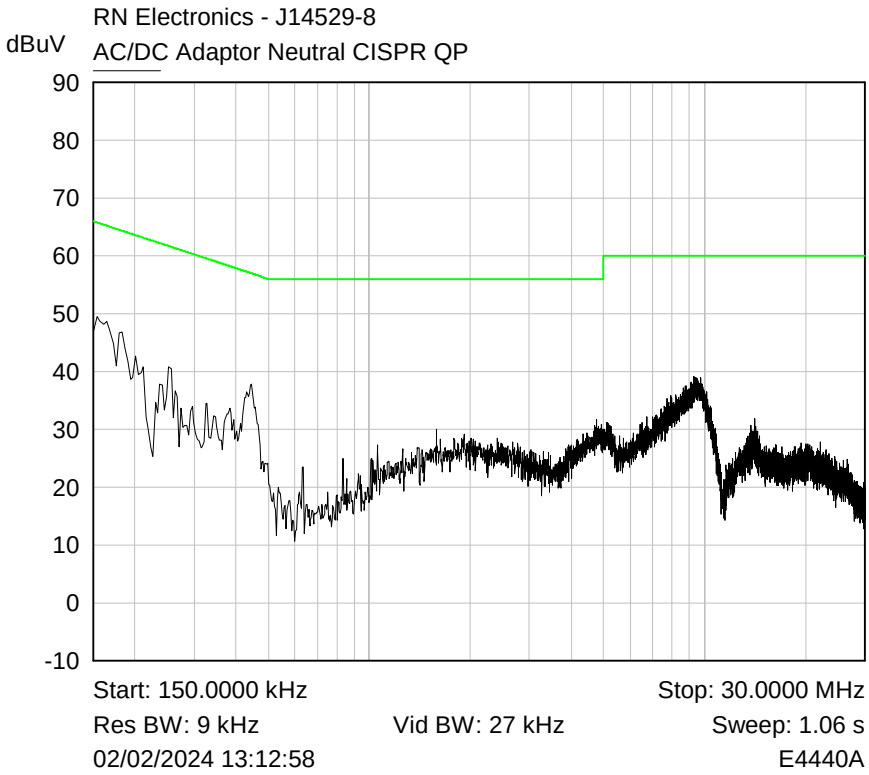

**Peak emissions 150 kHz - 30 MHz on the live terminal against the average limit line.**




**Peak emissions 150 kHz - 30 MHz on the live terminal against the quasi-peak limit line.**

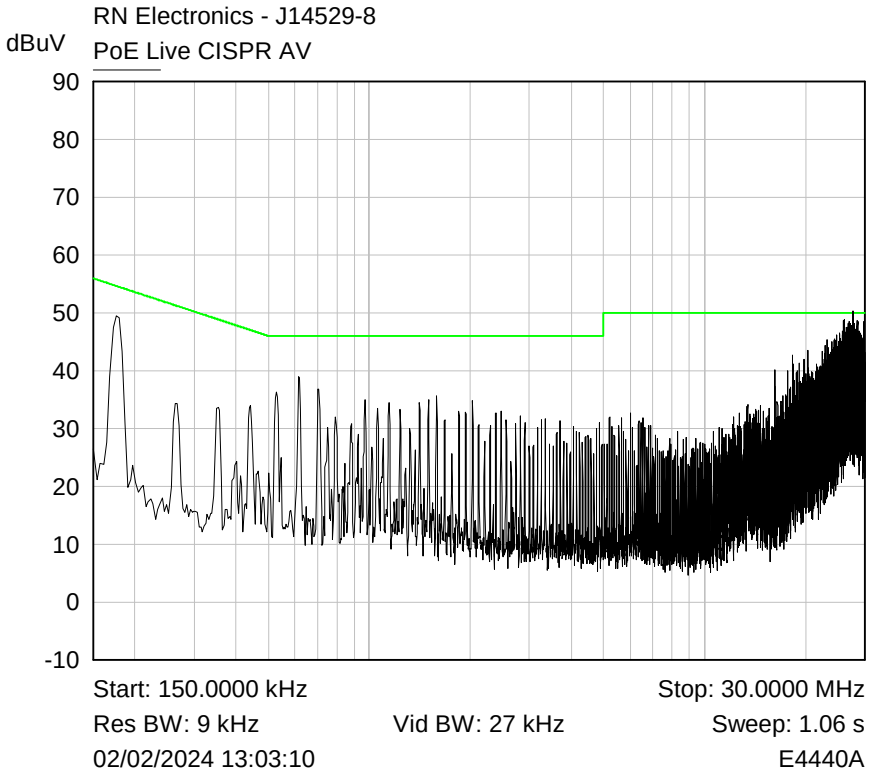



**Peak emissions 150 kHz - 30 MHz on the neutral terminal against the average limit line.**

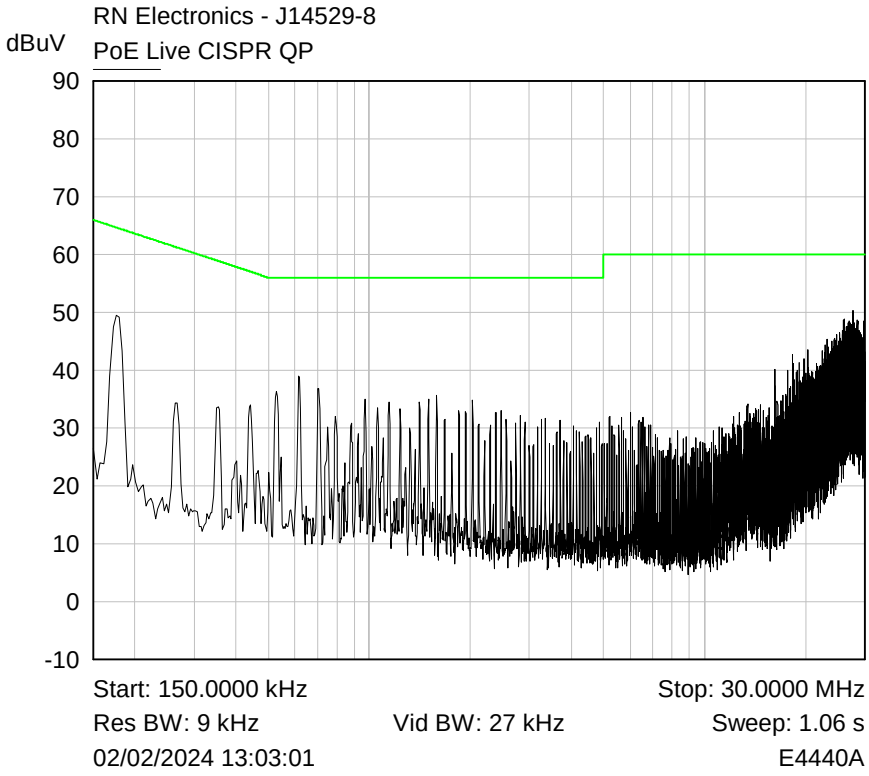



**Peak emissions 150 kHz - 30 MHz on the neutral terminal against the quasi-peak limit line.**

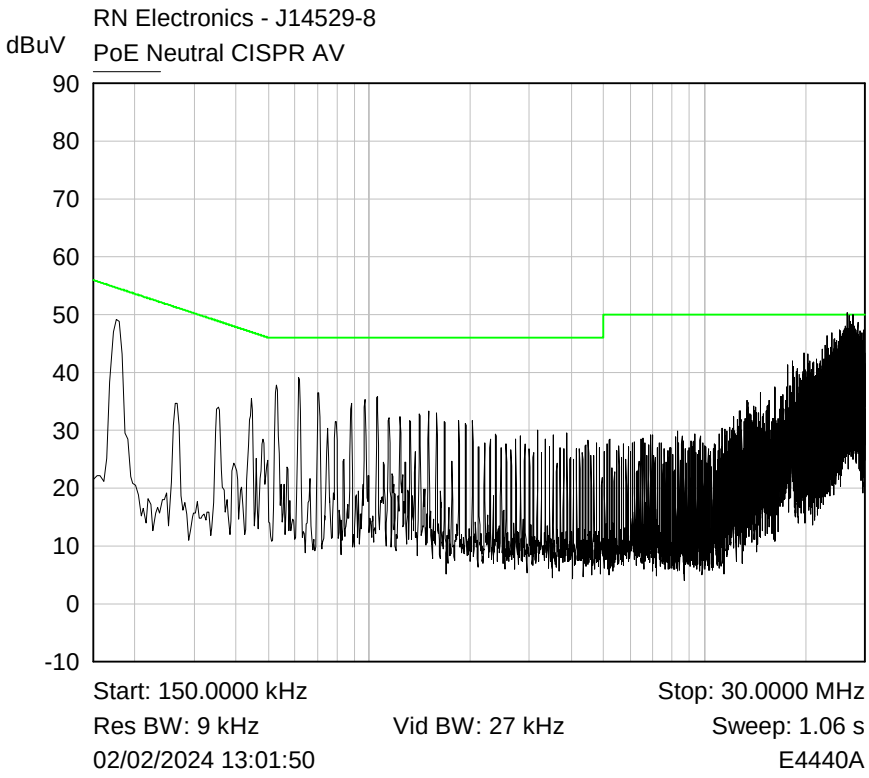
## 6.2 PoE conducted emission



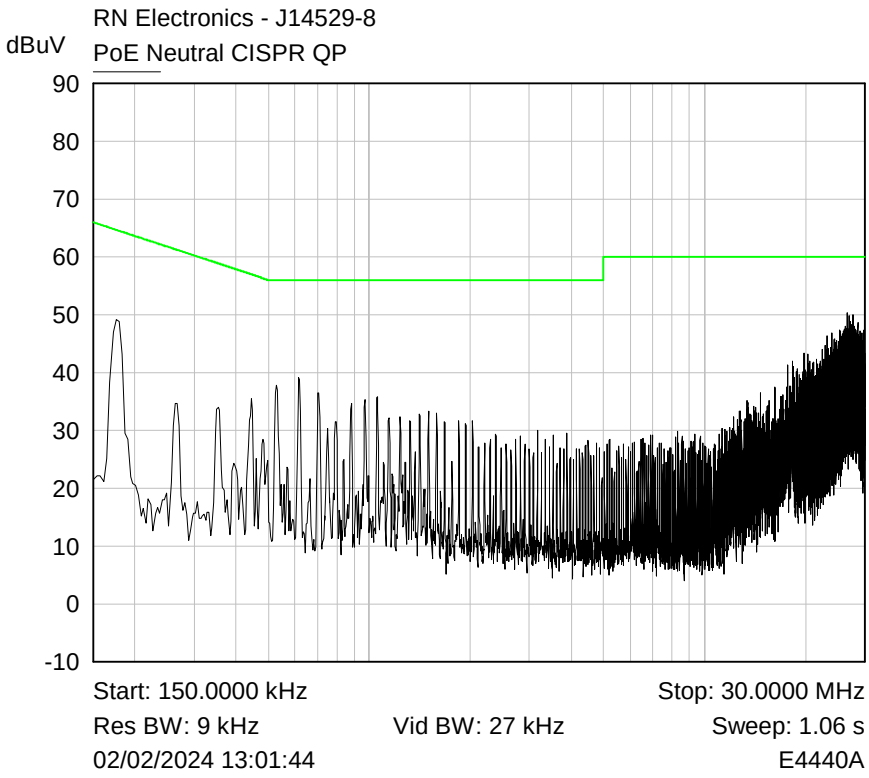

**Peak emissions 150 kHz - 30 MHz on the live terminal against the average limit line.**




**Peak emissions 150 kHz - 30 MHz on the live terminal against the quasi-peak limit line.**



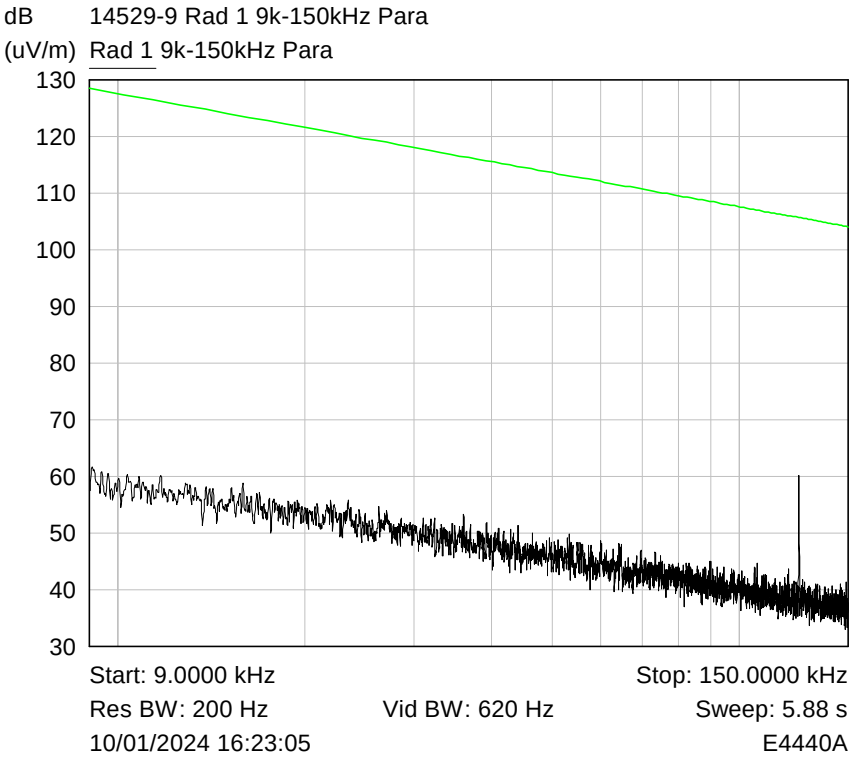

**Peak emissions 150 kHz - 30 MHz on the neutral terminal against the average limit line.**



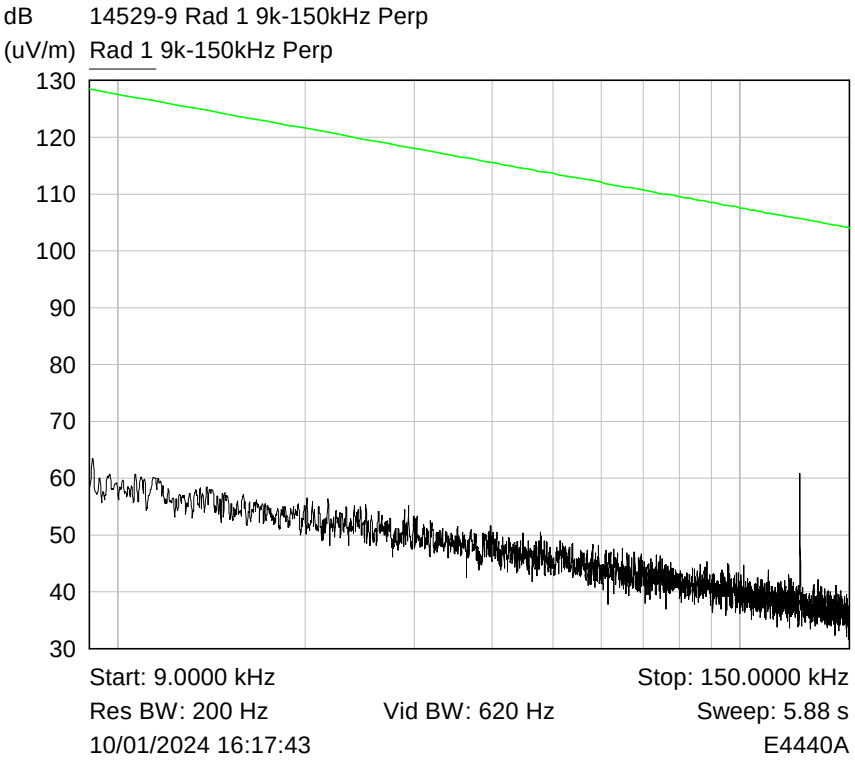

**Peak emissions 150 kHz - 30 MHz on the neutral terminal against the quasi-peak limit line.**

## 6.3 TX Unwanted radiated emissions 9-150kHz

RF Parameters: Power PoE, Channel Spacing Non Channelized, Modulation with 125 kHz
Card Present, Channel 125 kHz



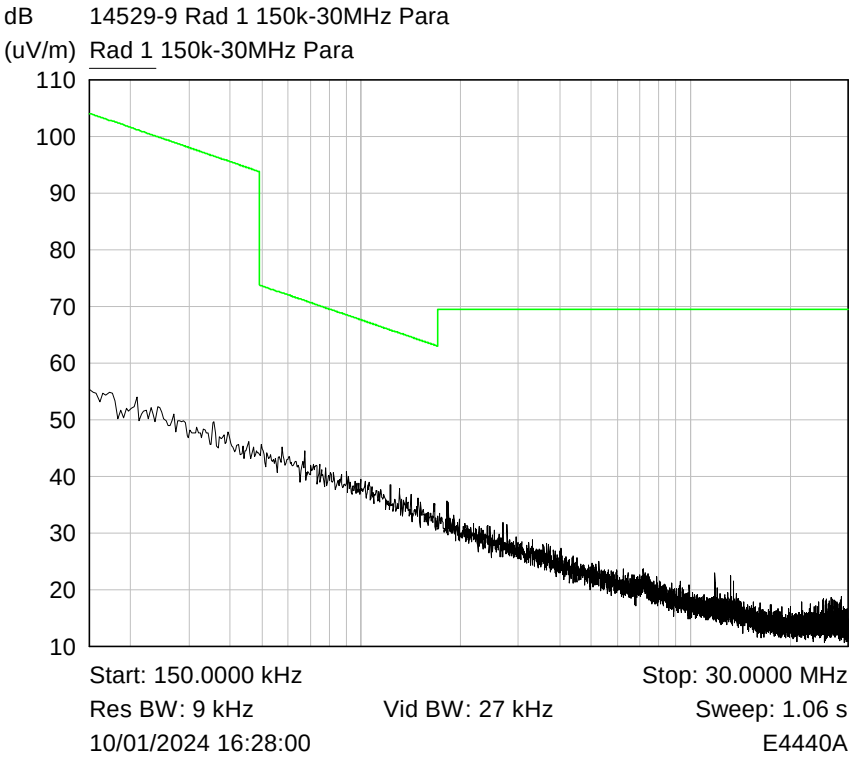

Plot of 9k-150kHz Parallel
Note: Signal on plot is 125 kHz intentional transmission



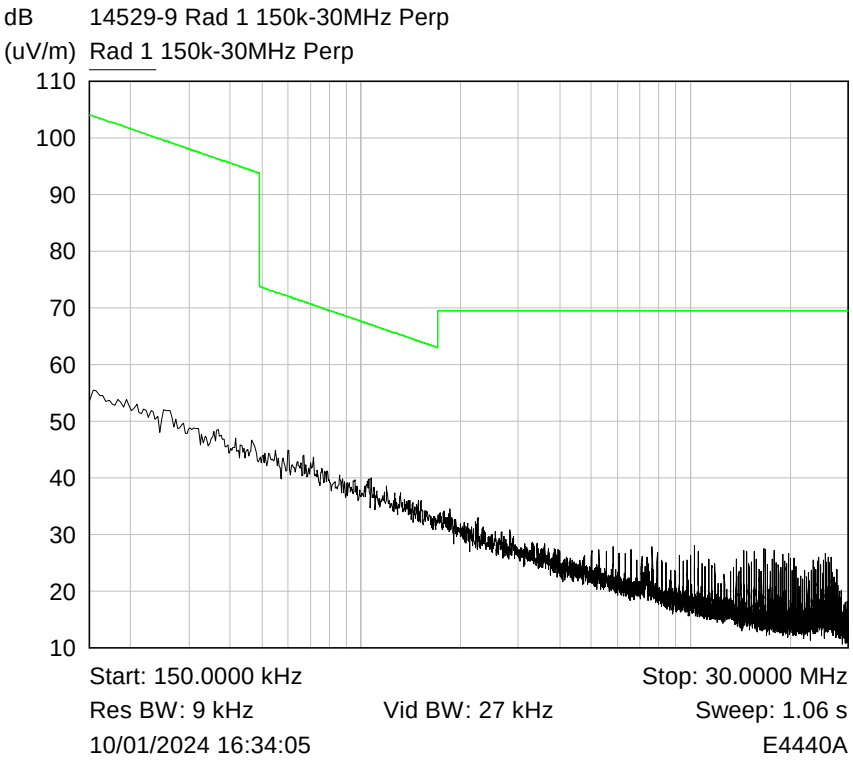

Plot of 9k-150kHz Perpendicular
Note: Signal on plot is 125 kHz intentional transmission

## 6.4 TX Unwanted radiated emissions 150kHz-30MHz

RF Parameters: Power PoE, Channel Spacing Non Channelized, Modulation with 125 kHz Card Present, Channel 125 kHz



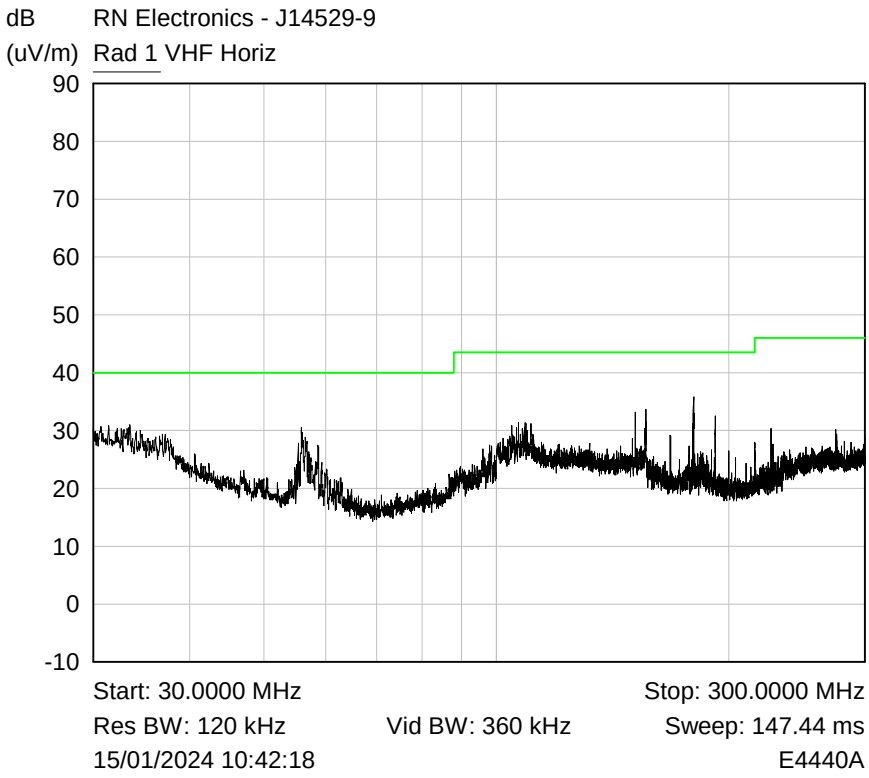

Plot of 150kHz-30MHz Parallel



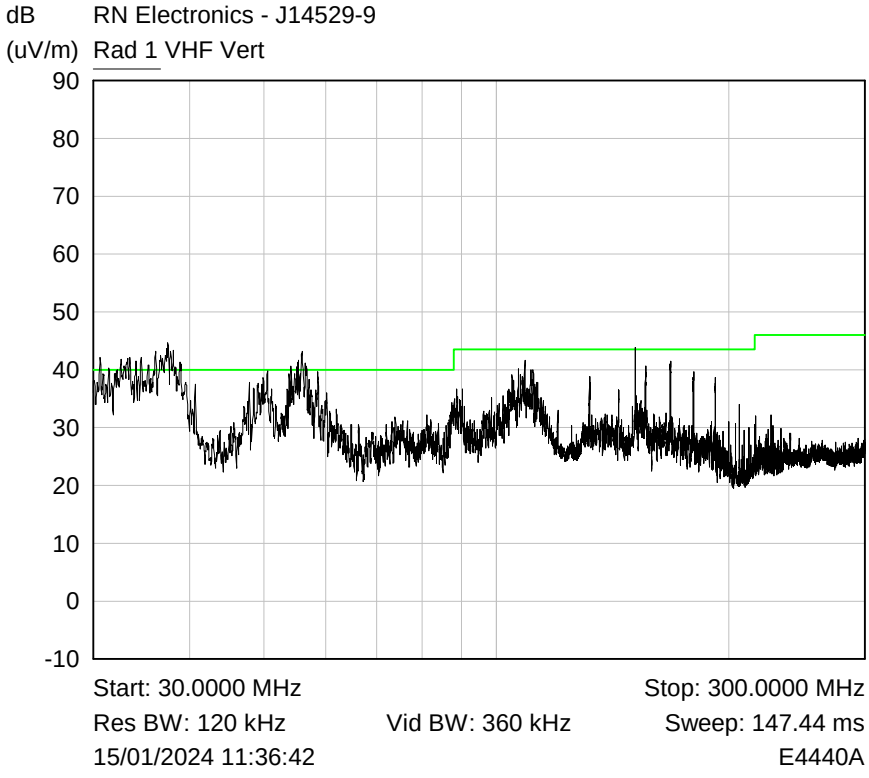

Plot of 150kHz-30MHz Perpendicular

## 6.5 Radiated emissions 30 MHz-1 GHz

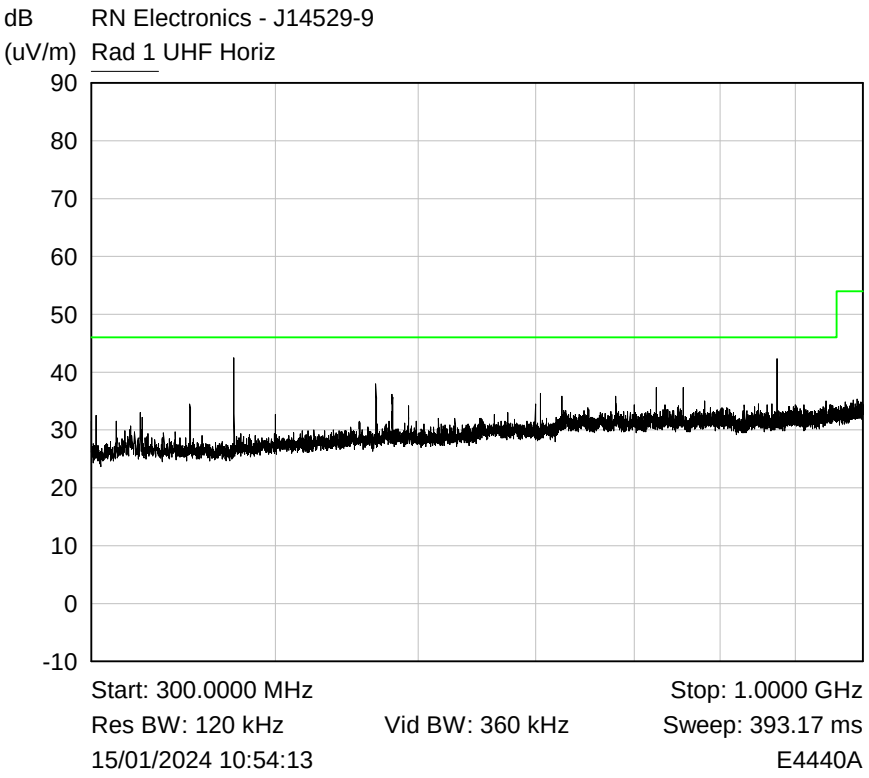
RF Parameters: Power PoE, Channel Spacing Non Channelized, Modulation RFID, Channel 125 kHz



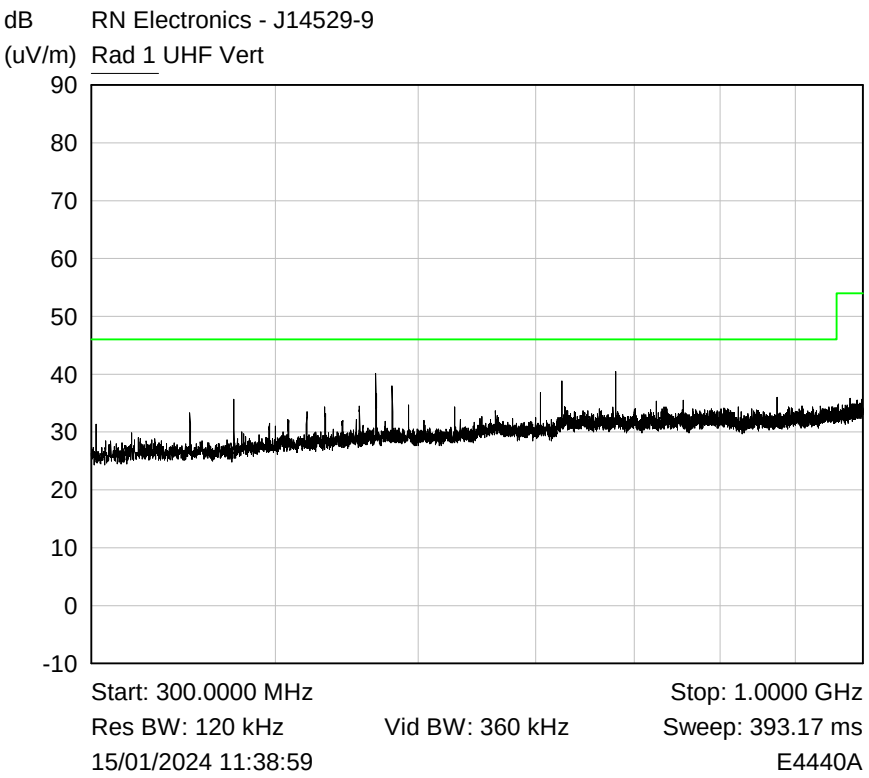

Plot of Peak emissions for VHF Horizontal against the QP limit line.




Plot of Peak emissions for VHF Vertical against the QP limit line.



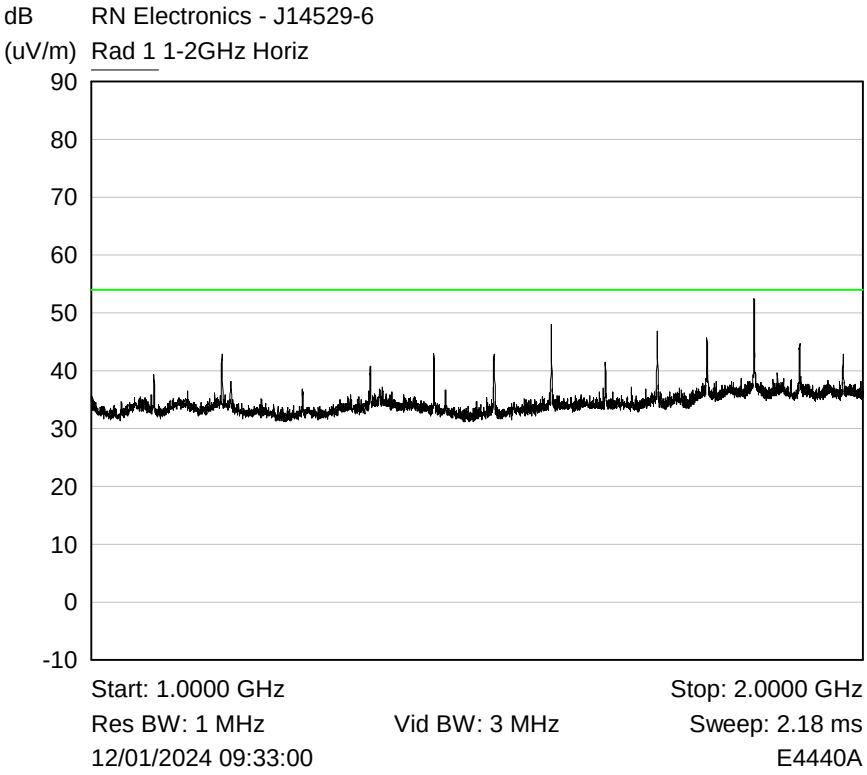

Plot of Peak emissions for UHF Horizontal against the QP limit line.

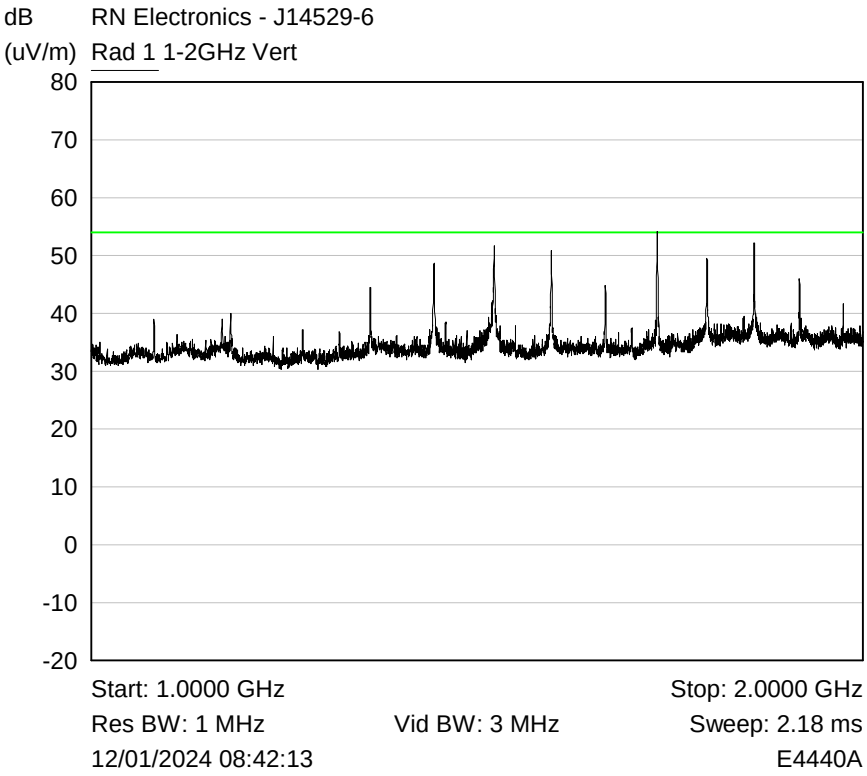


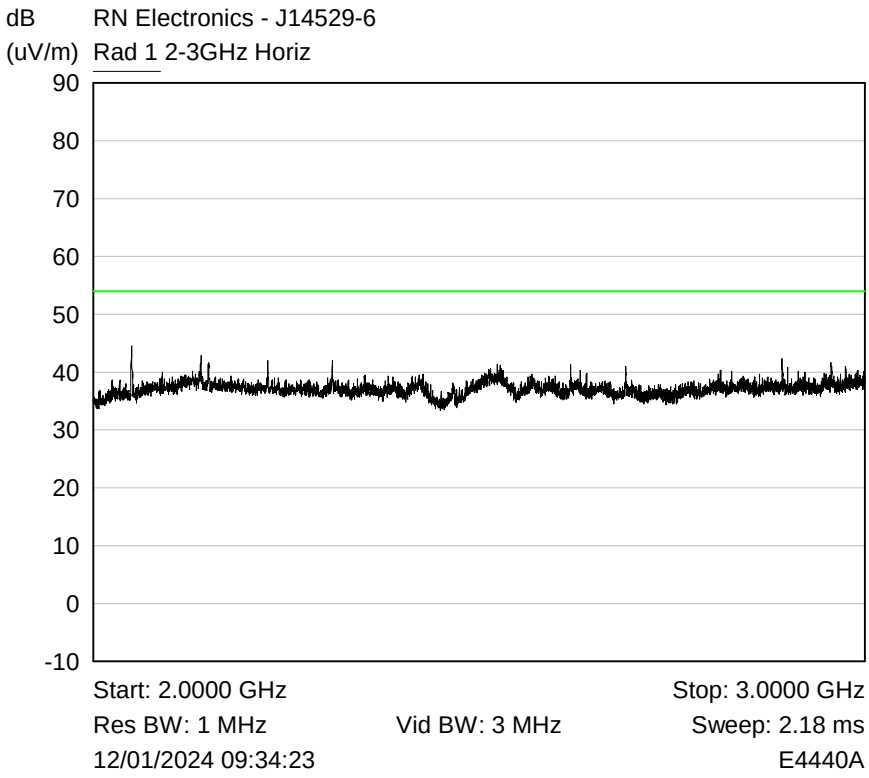

Plot of Peak emissions for UHF Vertical against the QP limit line.

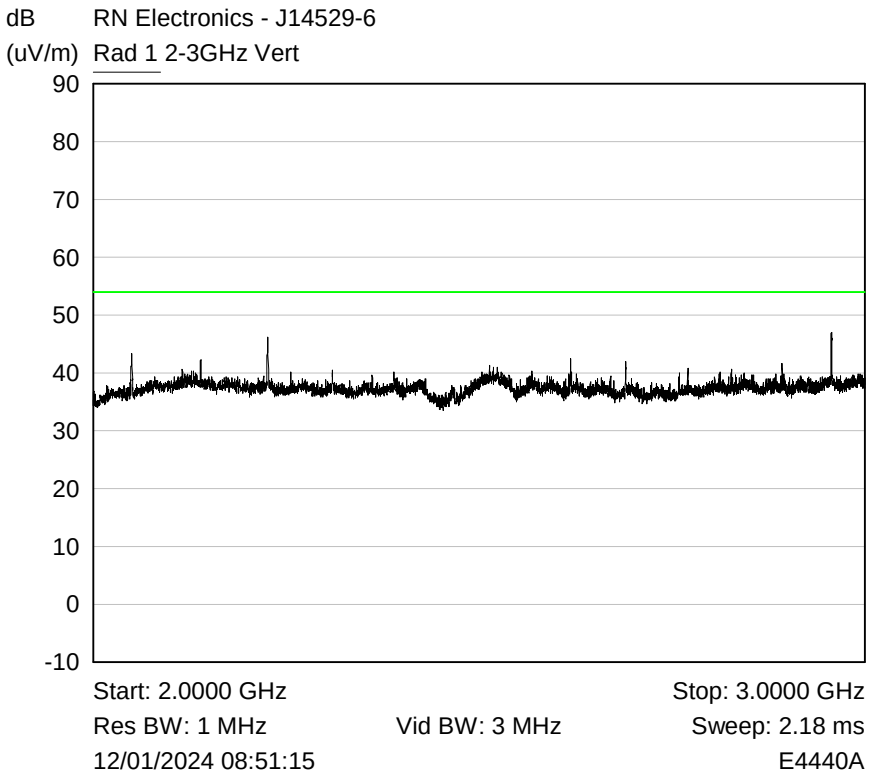
## 6.6 Radiated emissions above 1 GHz

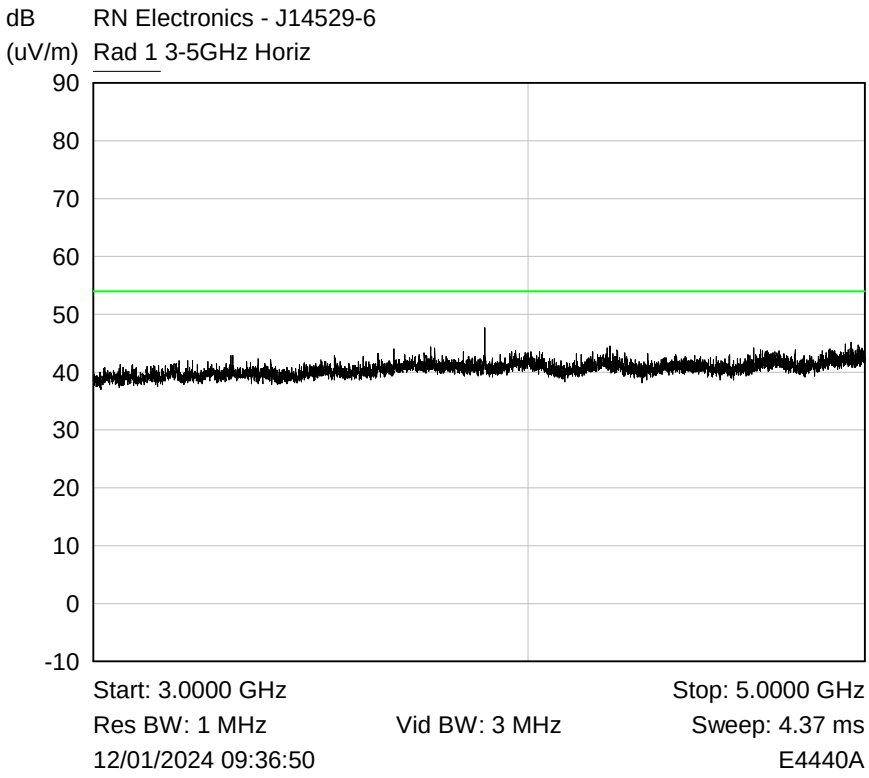
RF Parameters: Power PoE, Channel Spacing Non Channelized, Modulation RFID, Channel 125 kHz

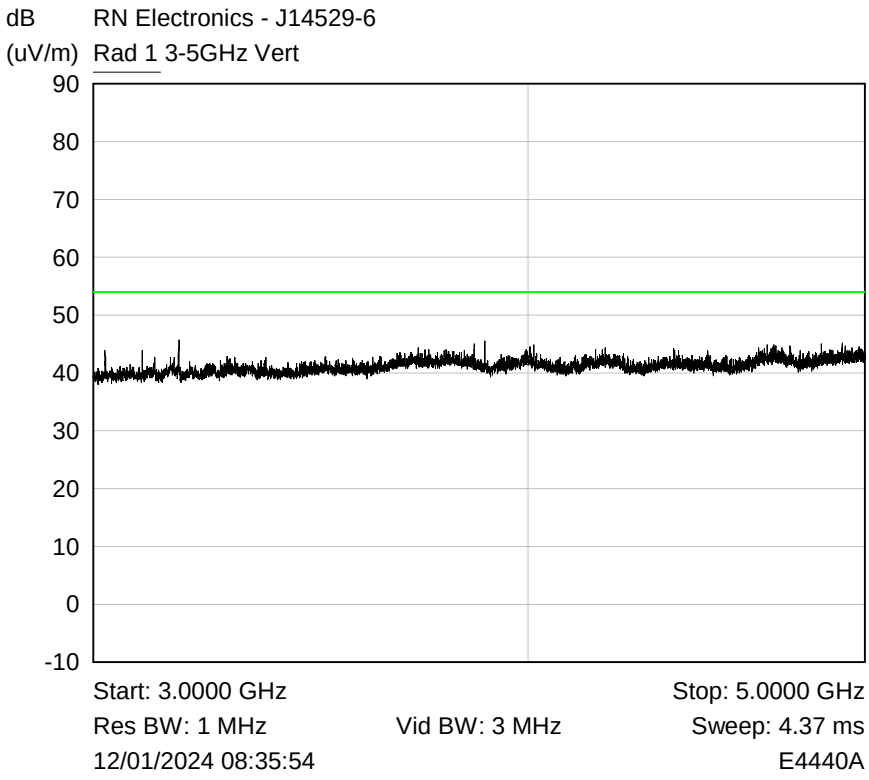


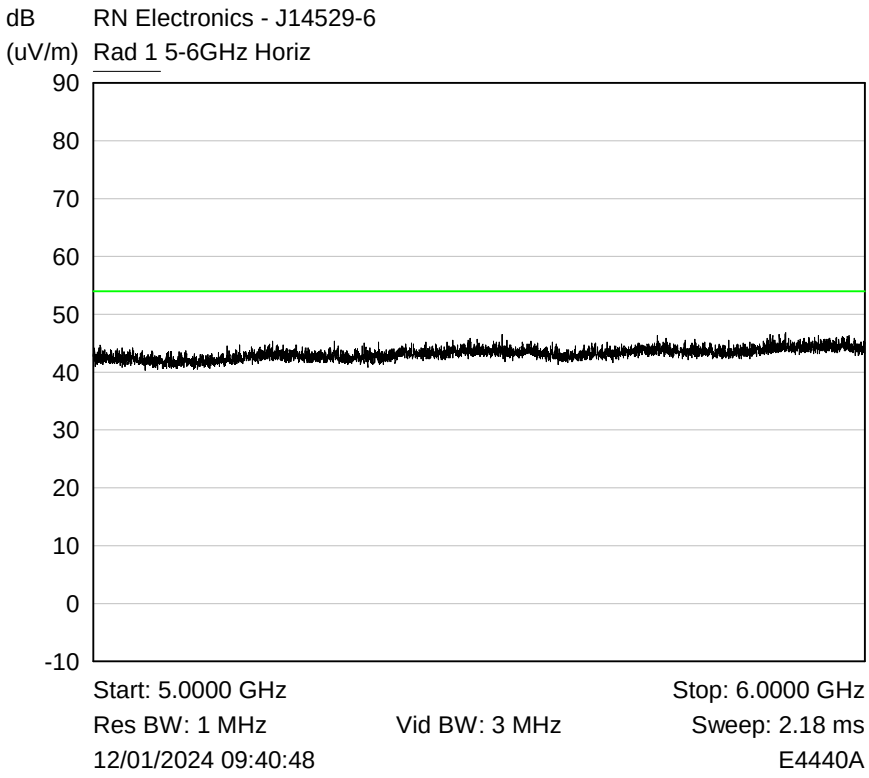



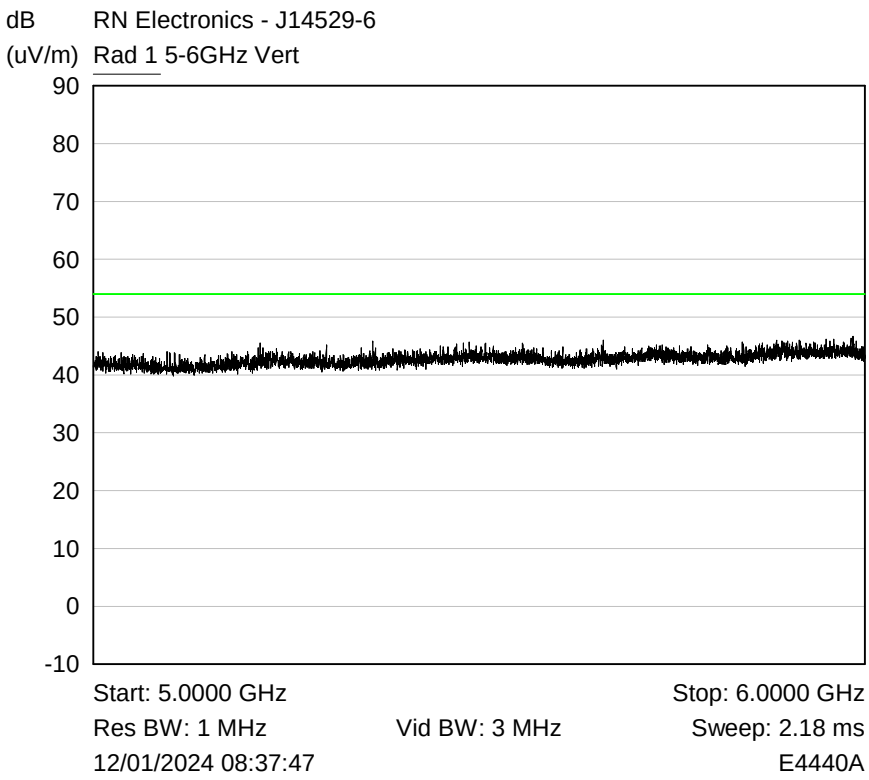

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 2-3GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 2.0000 GHz
Stop: 3.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 2.18 ms
12/01/2024 09:34:23
E4440A

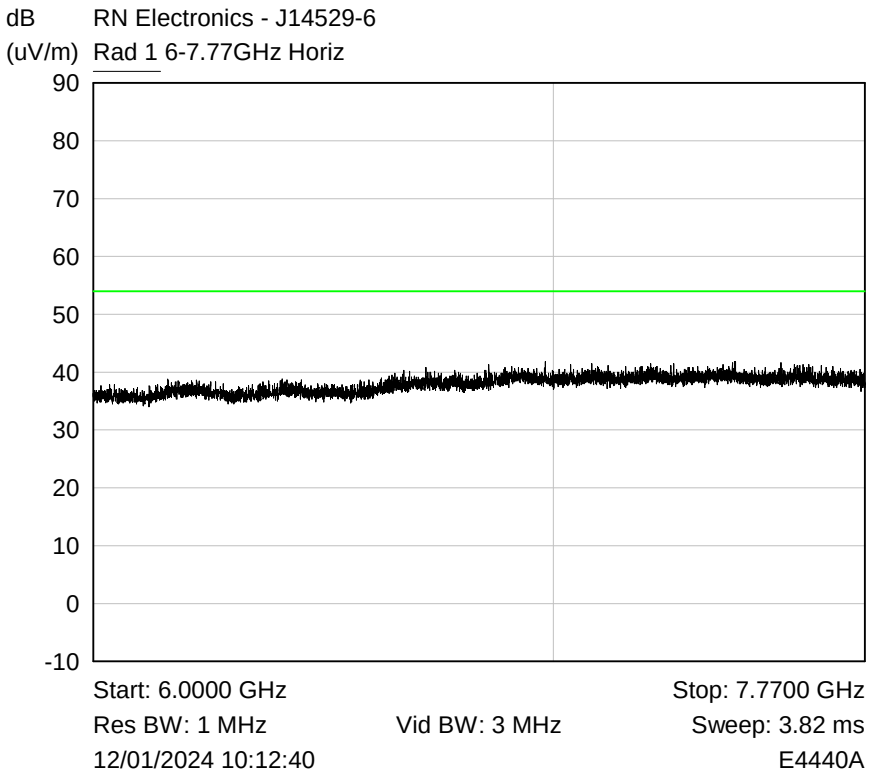

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 2-3GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 2.0000 GHz
Stop: 3.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 2.18 ms
12/01/2024 08:51:15
E4440A

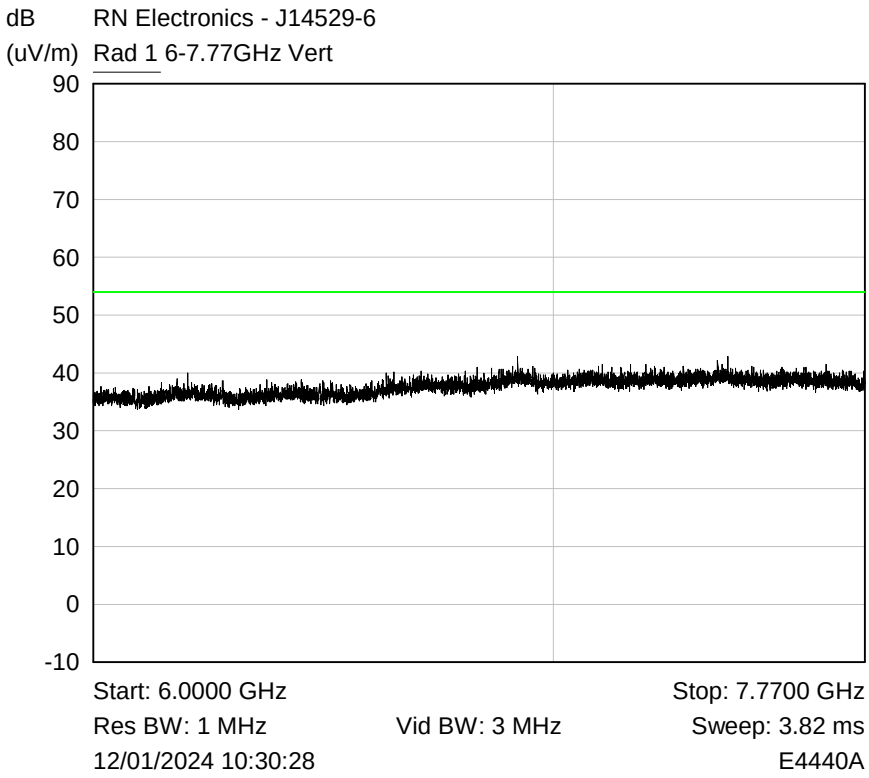

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 3-5GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 3.0000 GHz
Stop: 5.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 4.37 ms
12/01/2024 09:36:50
E4440A

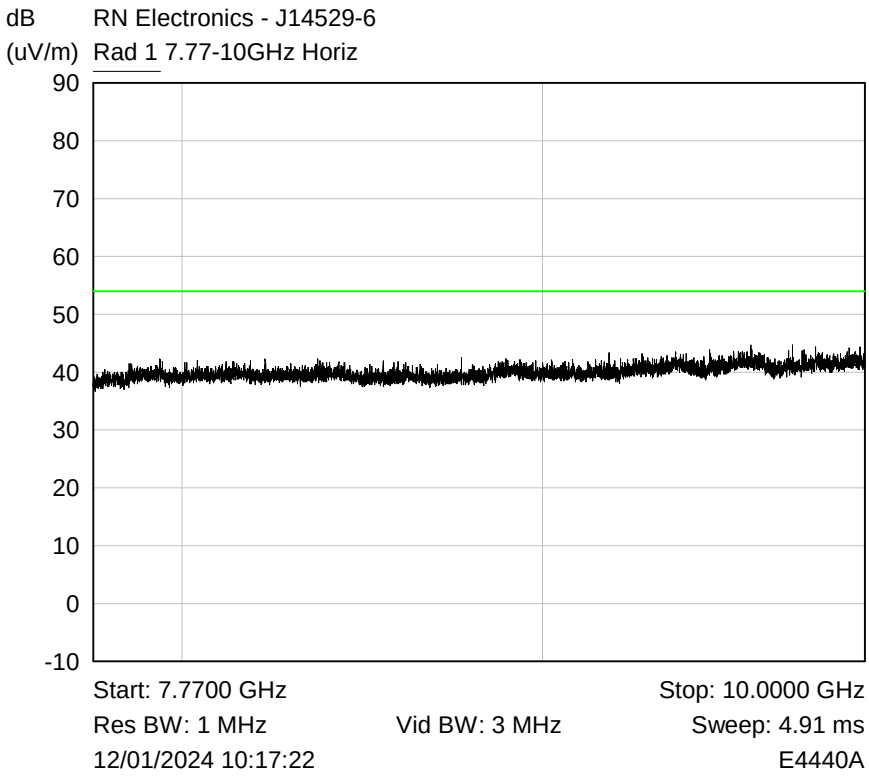

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 3-5GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 3.0000 GHz
Stop: 5.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 4.37 ms
12/01/2024 08:35:54
E4440A

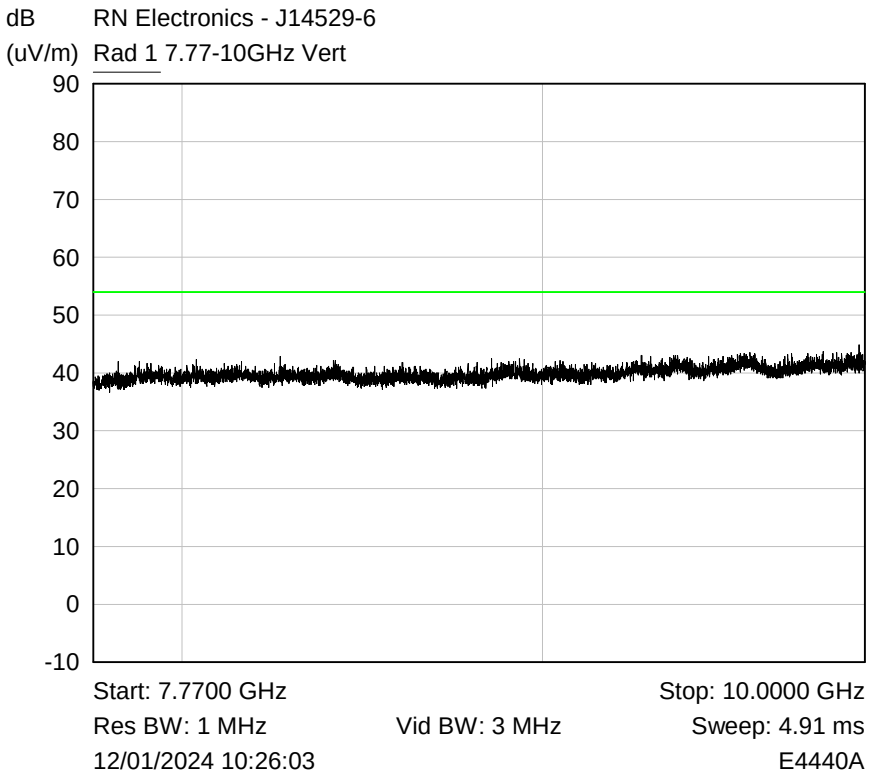

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 5-6GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 5.0000 GHz
Stop: 6.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 2.18 ms
12/01/2024 09:40:48
E4440A

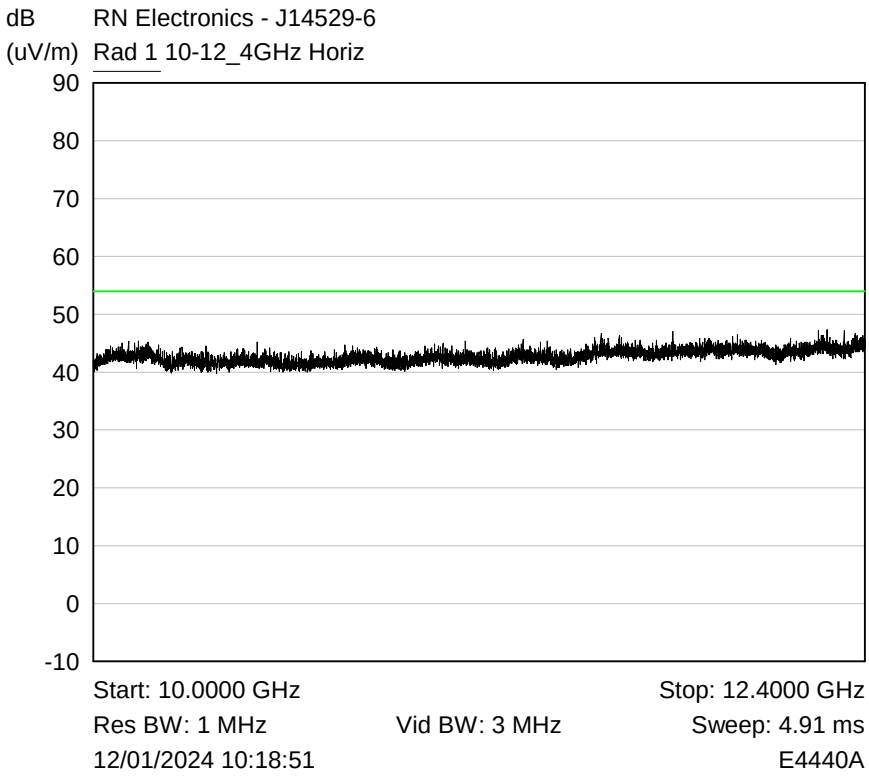

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 5-6GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 5.0000 GHz
Stop: 6.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 2.18 ms
12/01/2024 08:37:47
E4440A

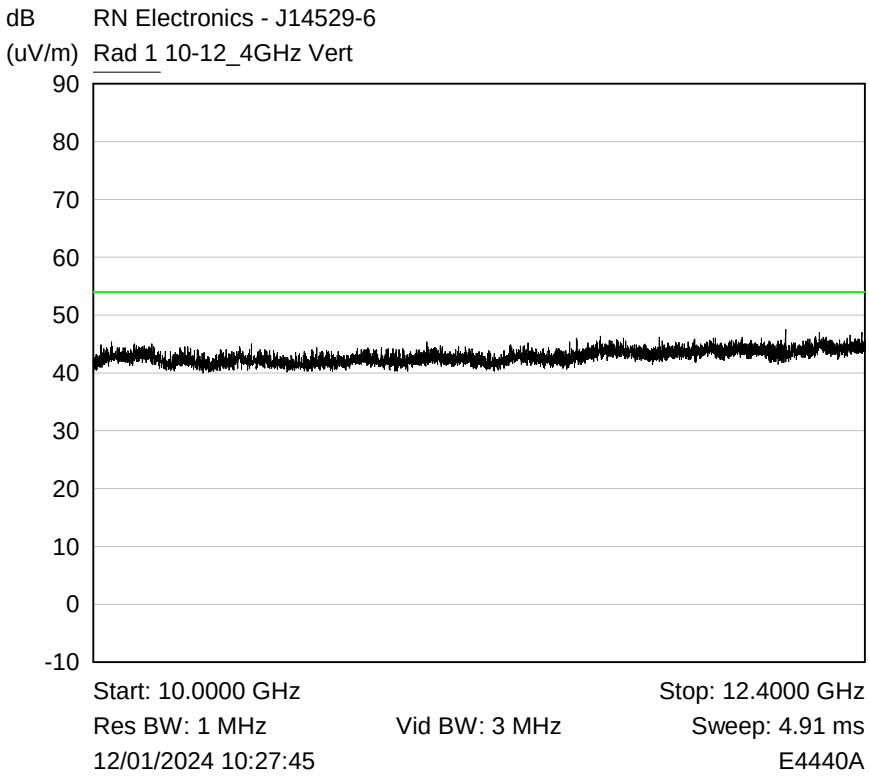


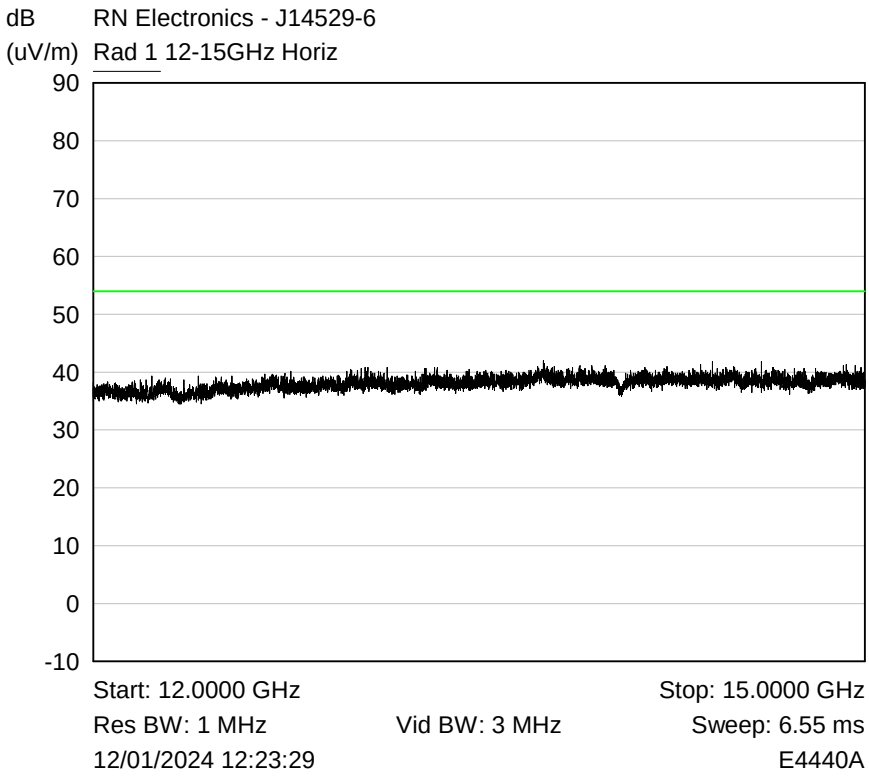



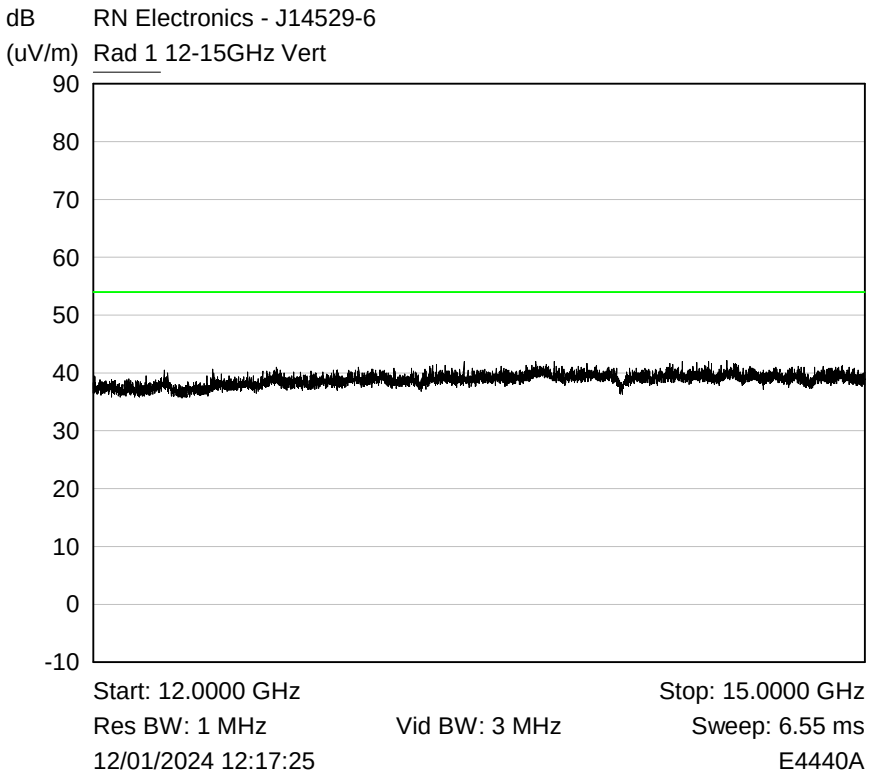

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 7.77-10GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 7.7700 GHz
Stop: 10.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 4.91 ms
12/01/2024 10:17:22
E4440A

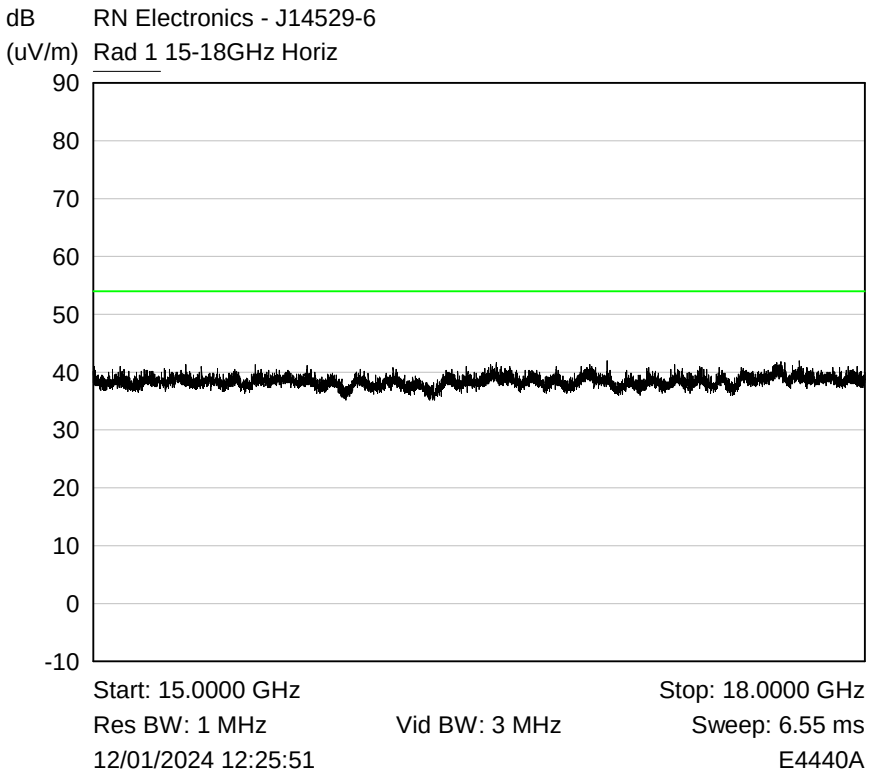

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 7.77-10GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 7.7700 GHz
Stop: 10.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 4.91 ms
12/01/2024 10:26:03
E4440A

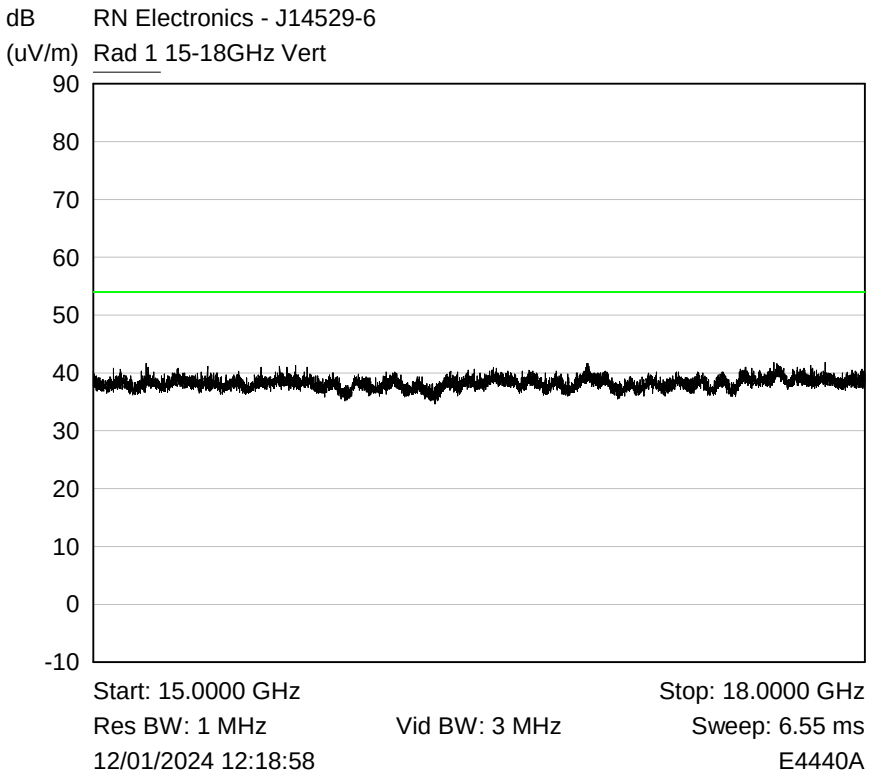

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 10-12_4GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 10.0000 GHz
Stop: 12.4000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 4.91 ms
12/01/2024 10:18:51
E4440A

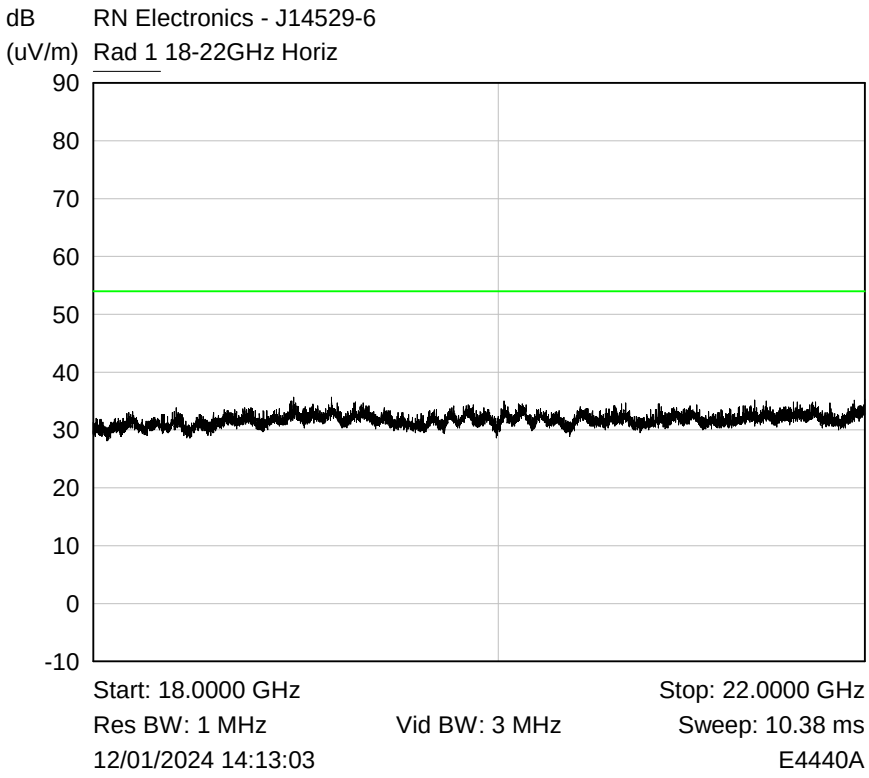

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 10-12_4GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 10.0000 GHz
Stop: 12.4000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 4.91 ms
12/01/2024 10:27:45
E4440A

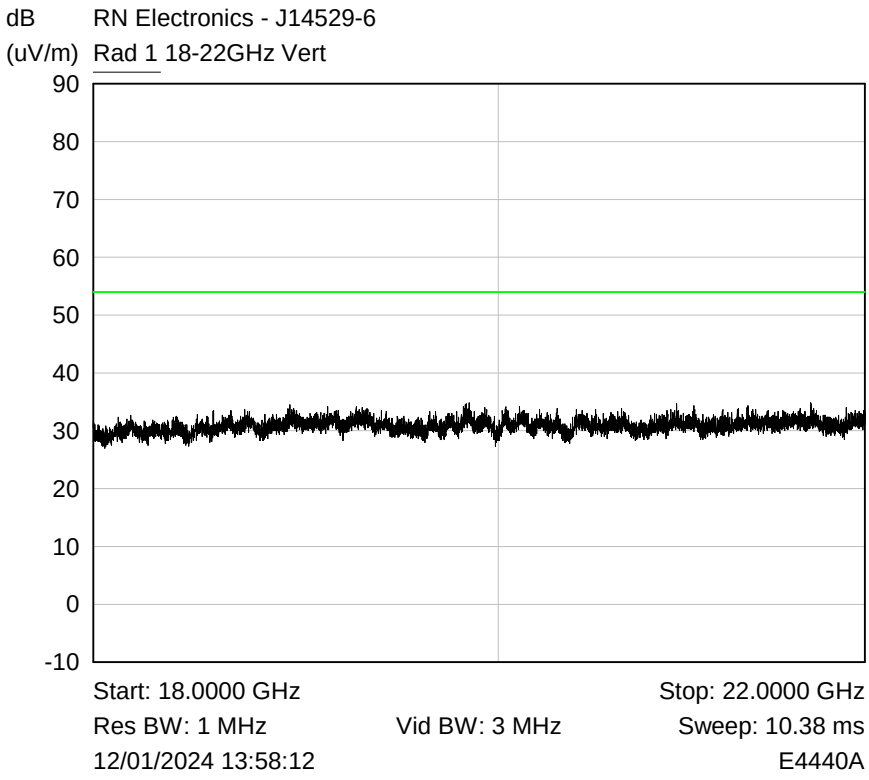

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 12-15GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 12.0000 GHz
Stop: 15.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 6.55 ms
12/01/2024 12:23:29
E4440A

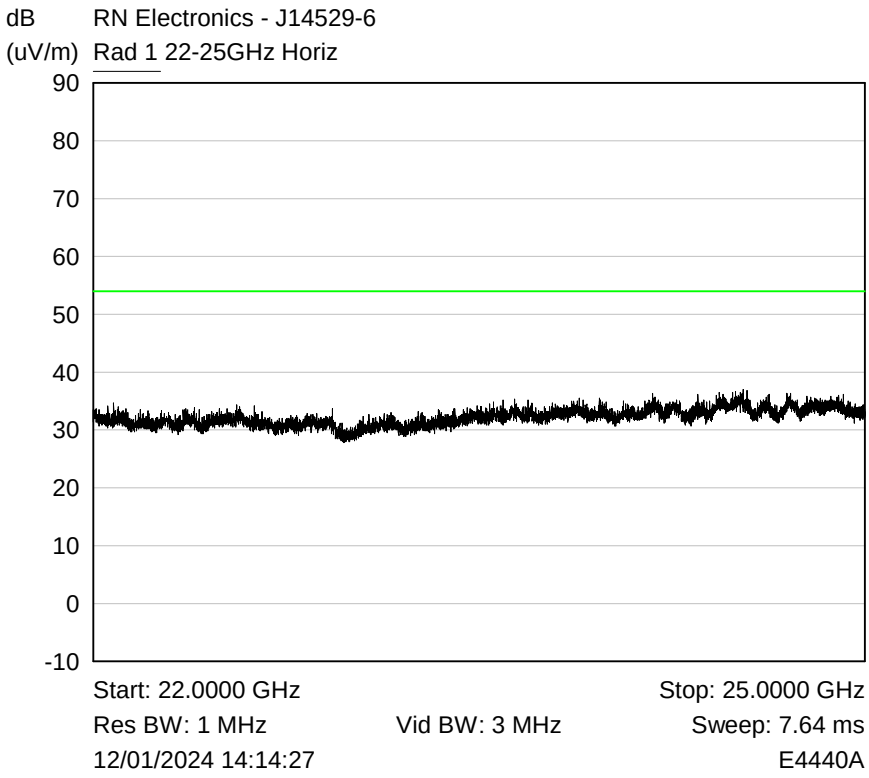

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 12-15GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 12.0000 GHz
Stop: 15.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 6.55 ms
12/01/2024 12:17:25
E4440A

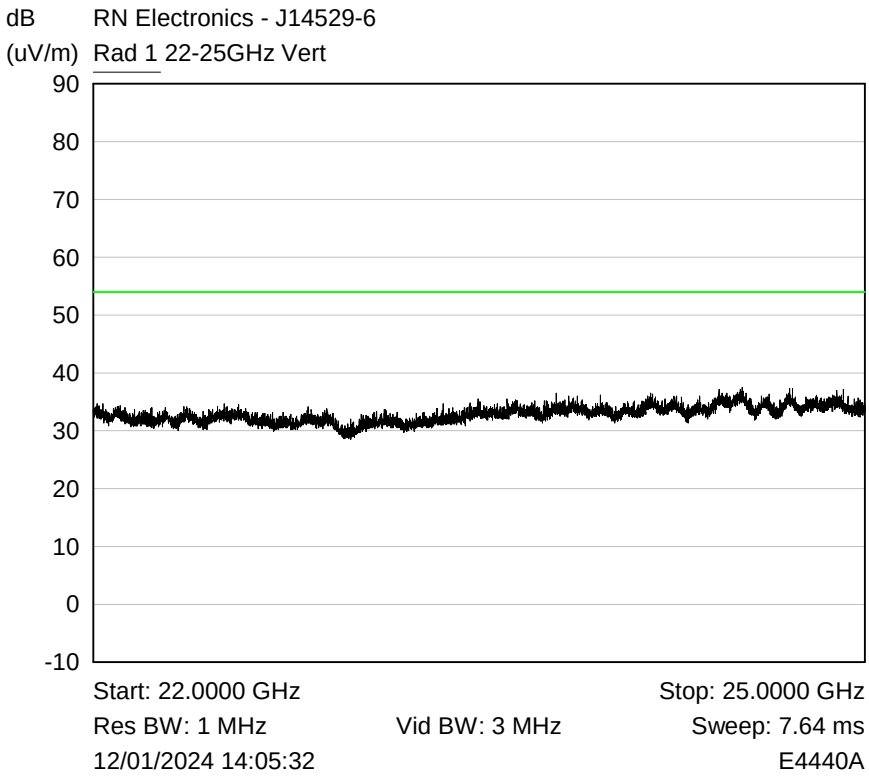

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 15-18GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 15.0000 GHz
Stop: 18.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 6.55 ms
12/01/2024 12:25:51
E4440A


dB
(uV/m)
RN Electronics - J14529-6
Rad 1 15-18GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 15.0000 GHz
Stop: 18.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 6.55 ms
12/01/2024 12:18:58
E4440A


dB
(uV/m)
RN Electronics - J14529-6
Rad 1 18-22GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 18.0000 GHz
Stop: 22.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 10.38 ms
12/01/2024 14:13:03
E4440A

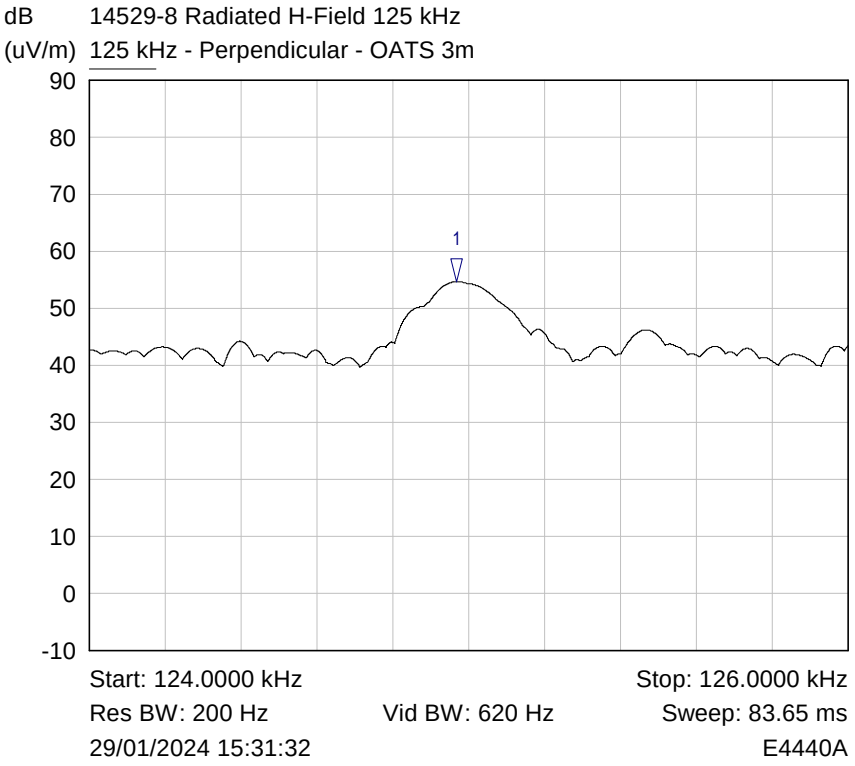

dB
(uV/m)
RN Electronics - J14529-6
Rad 1 18-22GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 18.0000 GHz
Stop: 22.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 10.38 ms
12/01/2024 13:58:12
E4440A


dB
(uV/m)
RN Electronics - J14529-6
Rad 1 22-25GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 22.0000 GHz
Stop: 25.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 7.64 ms
12/01/2024 14:14:27
E4440A


dB
(uV/m)
RN Electronics - J14529-6
Rad 1 22-25GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 22.0000 GHz
Stop: 25.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 7.64 ms
12/01/2024 14:05:32
E4440A

## 6.7 Intentional radiator field strength

RF Parameters: Power PoE, Channel Spacing Non Channelized, Modulation RFID (with Card), Channel 125 kHz

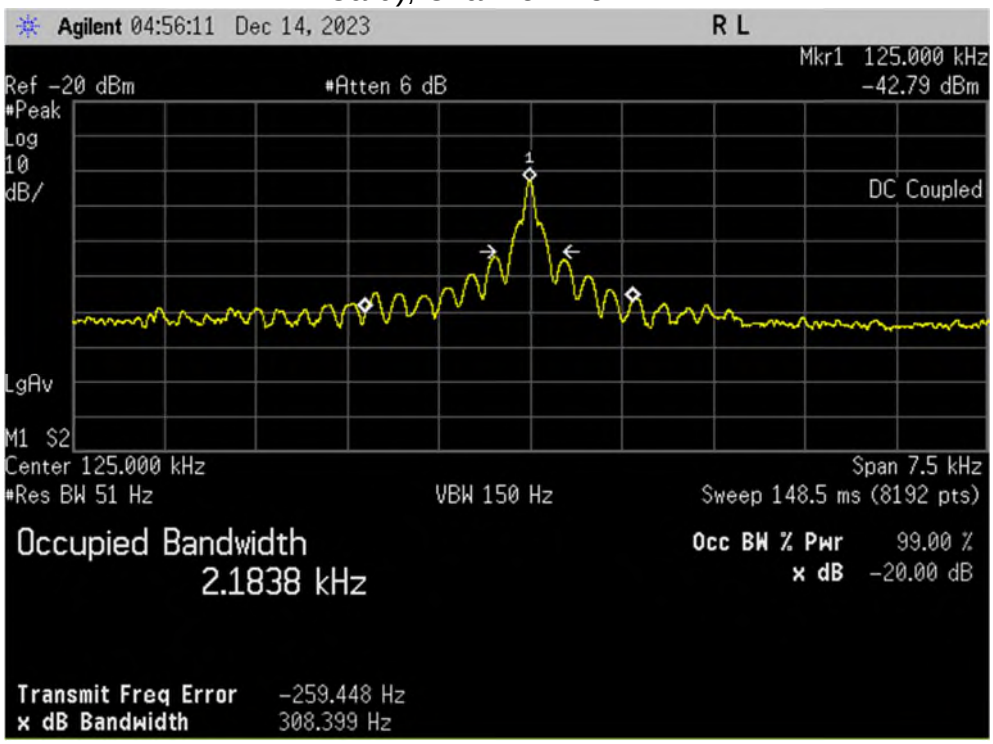



| Mkr | Trace | X-Axis | Value | Notes |
|---|---|---|---|---|
| 1 | 125 kHz - Perpendicular - OATS 3m | 124.9682 kHz | 54.67 dB(uV/m) | |

Maximised field strength plot reference at 3 metre distance

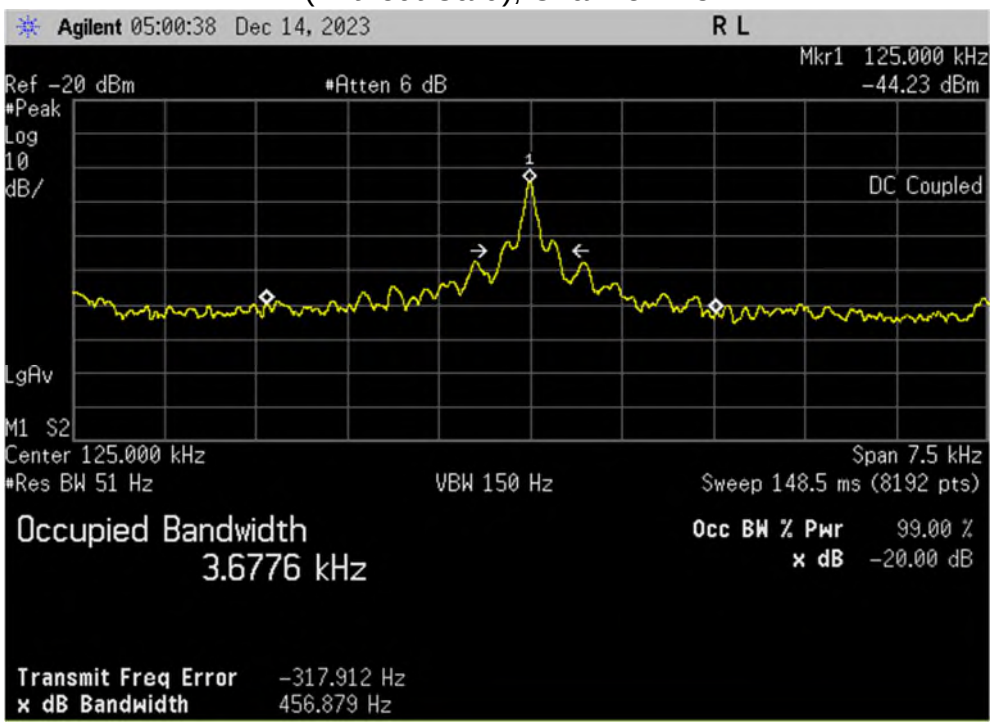
## 6.8 Occupied bandwidth

RF Parameters: Power PoE, Channel Spacing Non Channelized, Modulation RFID (with Card), Channel 125 kHz




Plot for 20 dB Bandwidth (Hz) Nominal Temp & Volts

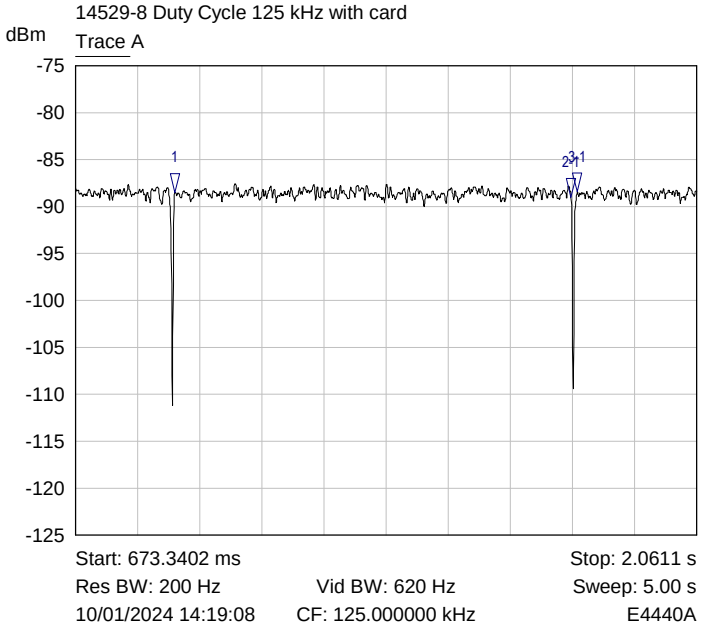
RF Parameters: Band - kHz, Power PoE, Channel Spacing Non Channelized, Modulation RFID (Without Card), Channel 125 kHz




Plot for 20 dB Bandwidth (Hz) Nominal Temp & Volts

## 6.9 Duty Cycle

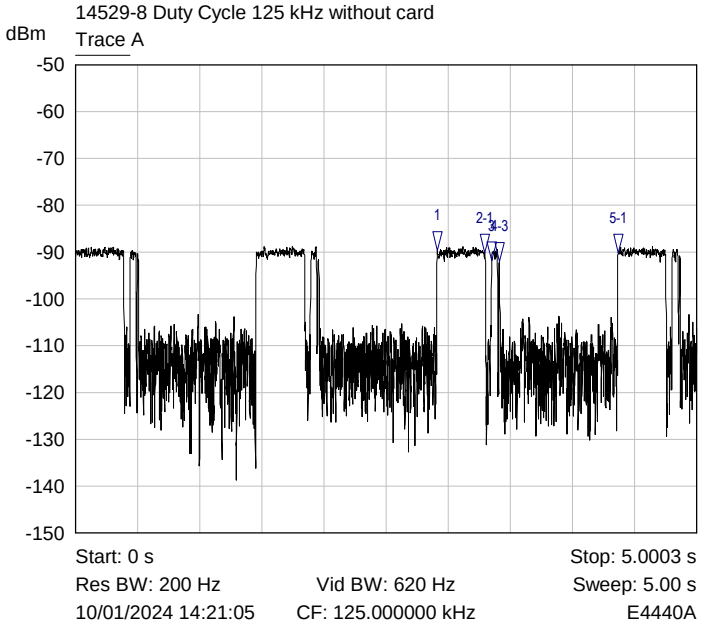
RF Parameters: Power PoE, Channel Spacing Non Channelized, Modulation With Card RFID




| Mkr | Trace | X-Axis | Value | Notes |
|---|---|---|---|---|
| 1 | Trace A | 896.1651 ms | -88.47 dBm | |
| 2-1 | Trace A | 884.5662 ms | -0.51 dB | |
| 3-1 | Trace A | 898.6069 ms | 0.03 dB | |

TX on time (mS)

RF Parameters: Band 119-140 kHz, Power PoE, Channel Spacing Non Channelized, Modulation without Card RFID




| Mkr | Trace | X-Axis | Value | Notes |
|---|---|---|---|---|
| 1 | Trace A | 2.9125 s | -89.64 dBm | |
| 2-1 | Trace A | 382.1521 ms | -0.55 dB | |
| 3 | Trace A | 3.3484 s | -91.79 dBm | |
| 4-3 | Trace A | 64.0990 ms | -0.27 dB | |
| 5-1 | Trace A | 1.4554 s | -0.50 dB | |

TX on time (mS)

# 7 Explanatory Notes

## 7.1 Explanation of Table of Signals Measured

Measurements are made as required by the standard. These measurements are made and recorded using detectors, either peak, quasi peak or average dependant on the test. A table of results has been given following the relevant plots. This table looks similar to the one illustrated below dependant on the measurements required by the test: -

| Signal No. | Freq (MHz) | Peak Amp (dBuV) | Pk – Lim 1 (dB) | QP Amp (dBuV) | QP - Lim1 (dB) | Av Amp (dBuV) | Av - Lim1 (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 12345 | 54.9 | -10.5 | 48 | -12.6 | 37.6 | -14.4 |

Column One - Labelled Signal No. is an incremental number that the receiver has given to each signal that has been measured.

Column Two - Labelled Freq (MHz) is the approximate frequency of the signal received.

Column Three - Labelled Peak Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the peak detector.

Column Four - Labelled Pk - Lim1 (dB) is the difference in level from the peak signal given to the active limit line. If this column appears in the table the peak detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Column Five - Labelled QP Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the quasi-peak detector.

Column Six - Labelled QP - Lim1 (dB) is the difference in level from the quasi-peak signal given to the active limit line. If this column appears in the table the quasi-peak detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Column Seven - Labelled Av Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the average detector.

Column Eight - Labelled Av - Lim1 (dB) is the difference in level from the average signal given to the active limit line. If this column appears in the table the average detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Only signals highlighted in red are deemed to exceed the limit of the detector required.

## 7.2 Explanation of limit line calculations for radiated measurements

The limits given in the test standard are normally expressed as absolute values (e.g. in μV/m at a specified distance), whereas the measured values are expressed as peak, quasi peak or average values in dBμV/m referenced to the measuring instrument inputs. RN Electronics calibrate the test set-up to account for any path losses, antenna gains, etc. so that the value read at the receiver relates directly to the absolute value required, except that it is expressed in dB relative to one microVolt and may need to take account of any alternative measuring distance used. Examples:

(a) limit of 500 μV/m equates to 20.log (500) = 54 dB μV/m.

(b) limit of 300 μV/m at 10m equates to 20.log (300 . 10/3) = 60 dB μV/m at 3m

(c) limit of 30 μV/m at 30m, but below 30MHz, equates to 20.log(30) + 40.log(30/3) = 69.5 dBμV/m at 3m, as extrapolation factor below 30MHz is 40dB/decade per 15.31(f)(2).

The measurement receiver used for emissions testing, performs the field strength (FS) calculations automatically. The receiver combines the signal amplitude (RA), Antenna Factor (AF) and Cable Loss (CL) factors for the frequency to be measured.

Example calculation: - FS = RA + AF + CL.

| Receiver amplitude (RA) | Antenna factor (3m) (AF) | Cable loss (CL) | Field strength result (3m) (FS) |
|---|---|---|---|
| 20dBuV | 25 dB | 3 dB | 48dBuV/m |

**Additional calculation examples per ANSI C63.10 clause 9.4 – 9.6 equations 21, 22, 25 & 26:**

**Equation 21**: $E_{Linear} = 10^{((E_{log}-120)/20)}$
And therefore equation 21 transposed is: $E_{Log} = 20xLog(E_{Linear}) +120$
Where:
$E_{Linear}$ is the field strength of the emission in V/m
$E_{Log}$ is the field strength of the emissions in dBµV/m

**Equation 22**: $EIRP = E_{Meas} + 20log(d_{Meas}) -104.7$
Where:
EIRP is equivalent isotropically radiated power in dBm
$E_{Meas}$ is the field strength of the emission at the measurement distance in dBµV/m
$d_{Meas}$ is the measurement distance in metres

**Equation 25**: $PD = EIRP_{Linear} / 4\pi d^2$
And therefore equation 25 transposed is: $EIRP_{Linear} = PD \times 4\pi d^2$
Where:
PD is the power density at distance specified by the limit, in $W/m^2$
$EIRP_{Linear}$ is the equivalent isotropically radiated power in Watts
d is the distance at which the power density limit is specified in metres

**Equation 26**: $PD = E^2_{Speclimit} / 377$
And therefore equation 26 transposed is: $E_{Spec\ limit} = \sqrt{(PD \times 377)}$
Where:
PD is the power density at distance specified by the limit, in $W/m^2$
$E_{spec\ limit}$ is the field strength at the distance specified by the limit in V/m

**Example:**
Radiated spurious emissions limit at 3metres of $90pW/cm^2$.
$90pW/cm^2 \times 100^2 = 0.9\ \mu W/m^2$ = (EIRP Linear)

Equation 25 transposed: $0.9 \times 10^{-6} \times 4 \times \pi \times 3^2 = 0.0001017876$ W
And
Equation 26 transposed: $E_{Spec\ limit} = \sqrt{(0.9x10^{-6} \times 377)} = 0.01842$ V/m.
And
Equation 21 transposed: $E_{Log} = 20Log(0.01842) +120 = 85.3dB\mu V/m$ @ 3m.

# 8 Photographs

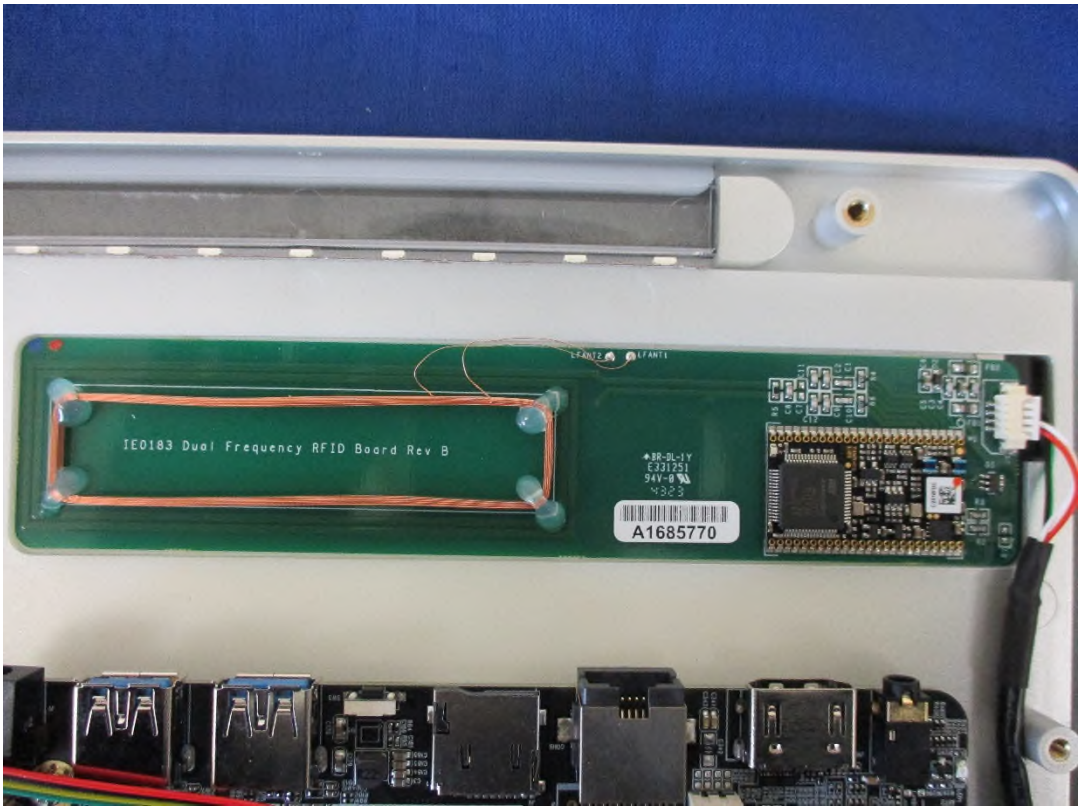
## 8.1 EUT Front View


## 8.2 EUT Reverse Angle

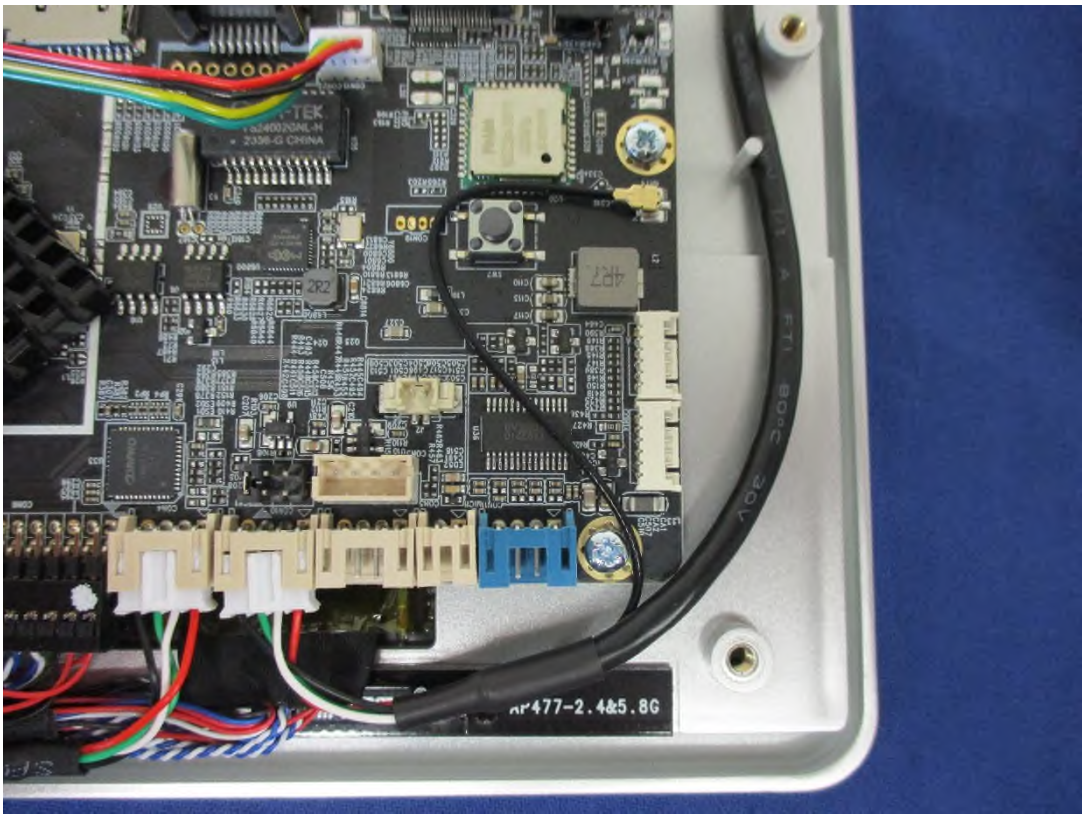

## 8.3 EUT Left side View

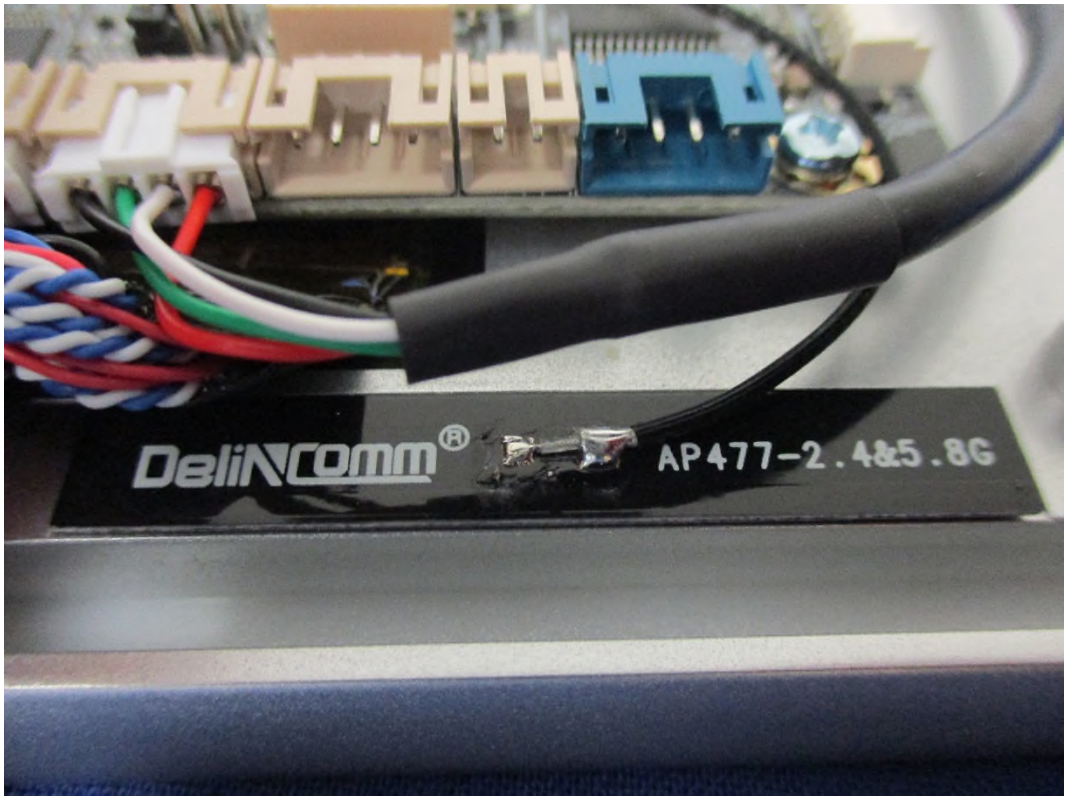

## 8.4 EUT Right side View

## 8.5 EUT Antenna Port




**125 kHz & 13.56 MHz Antenna**

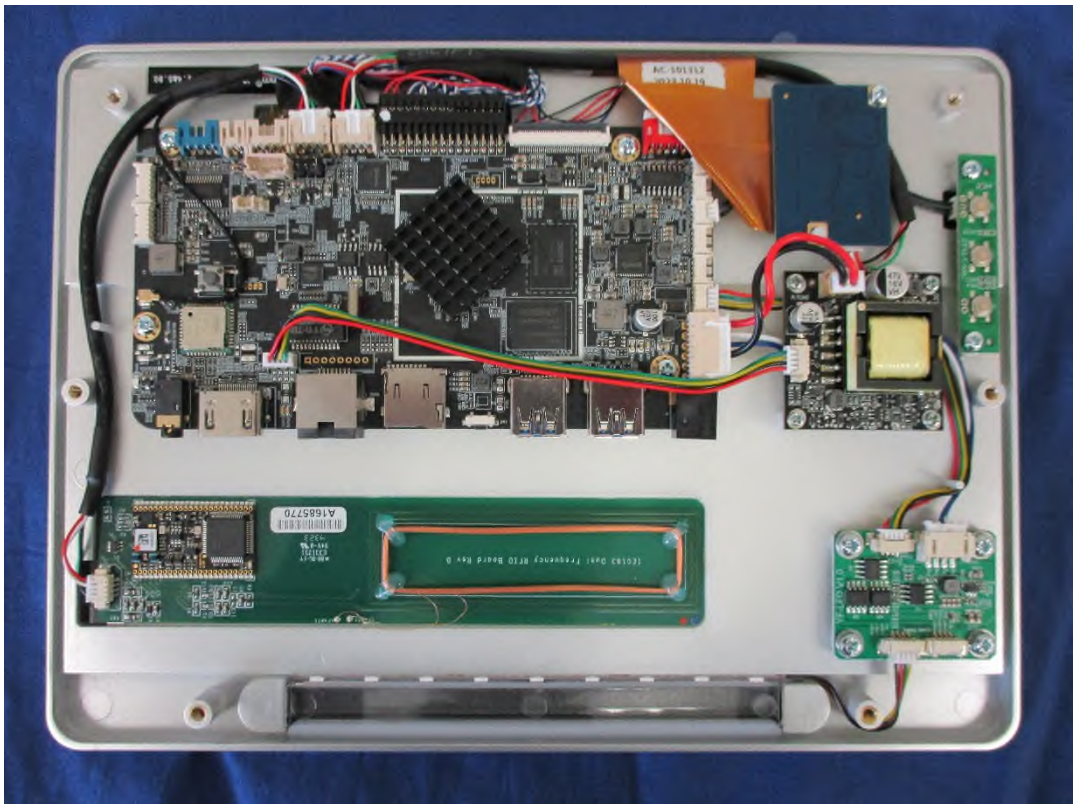


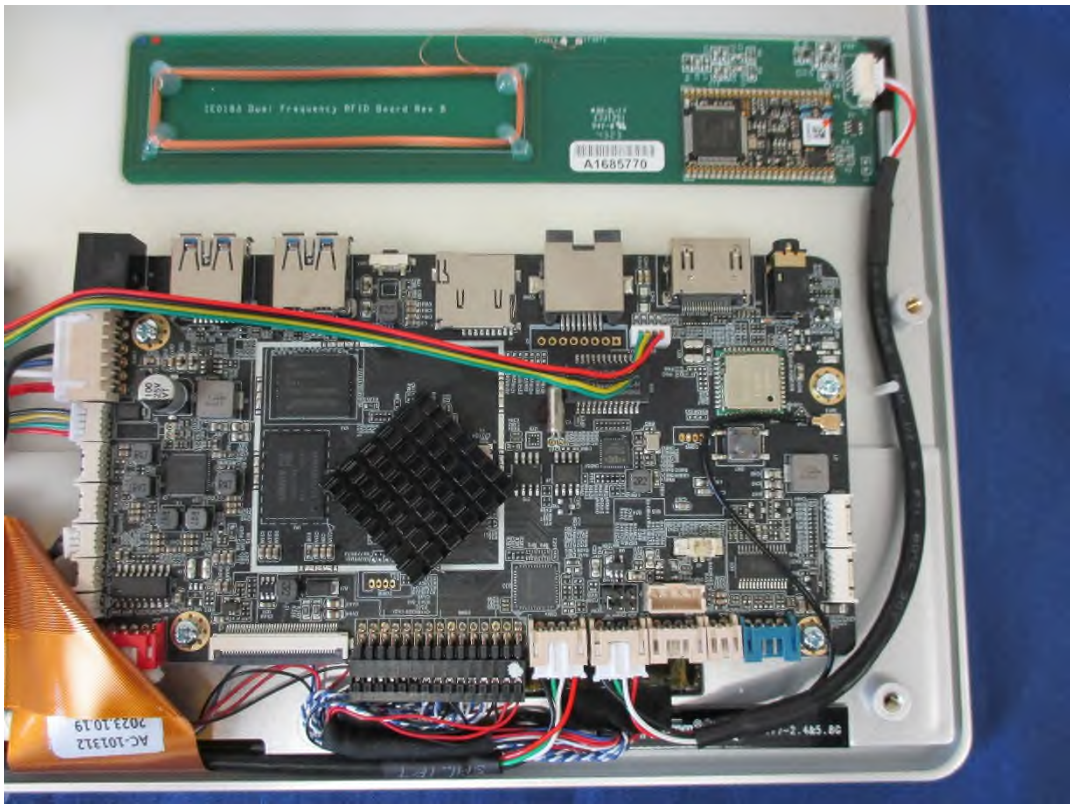



**2.4 GHz Antenna**

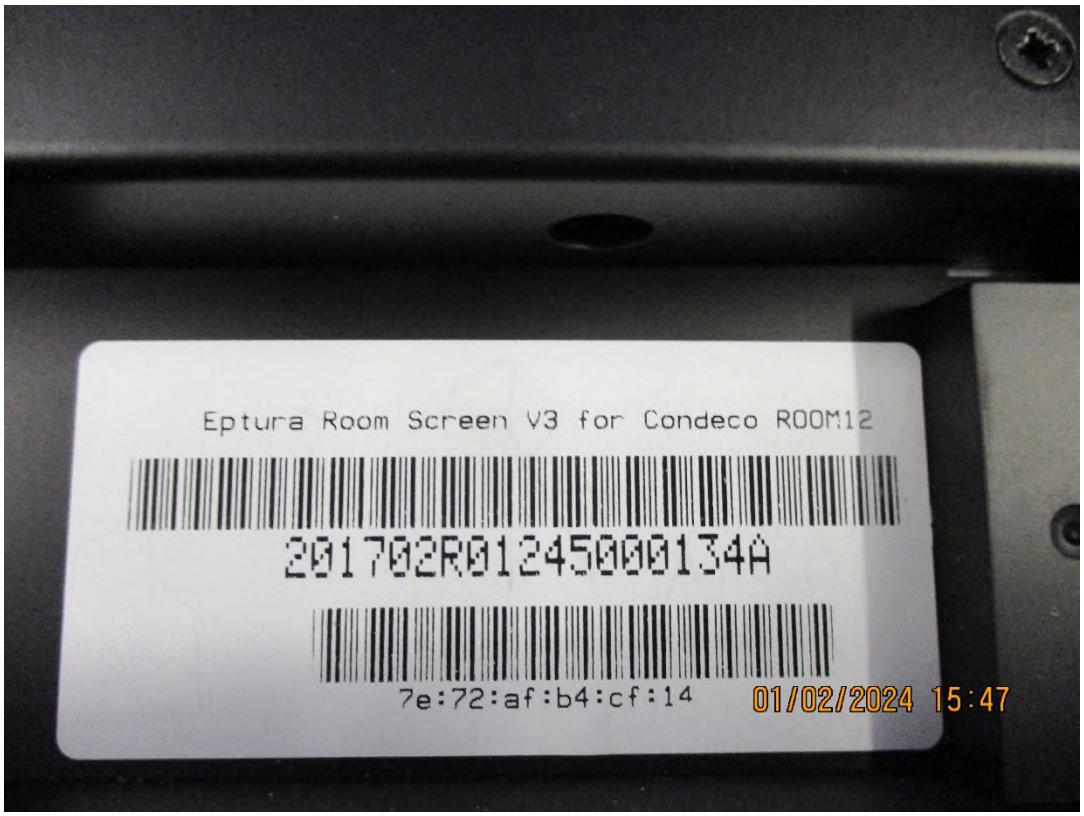
## 8.6 EUT Display & Controls

## 8.7 EUT Internal photos



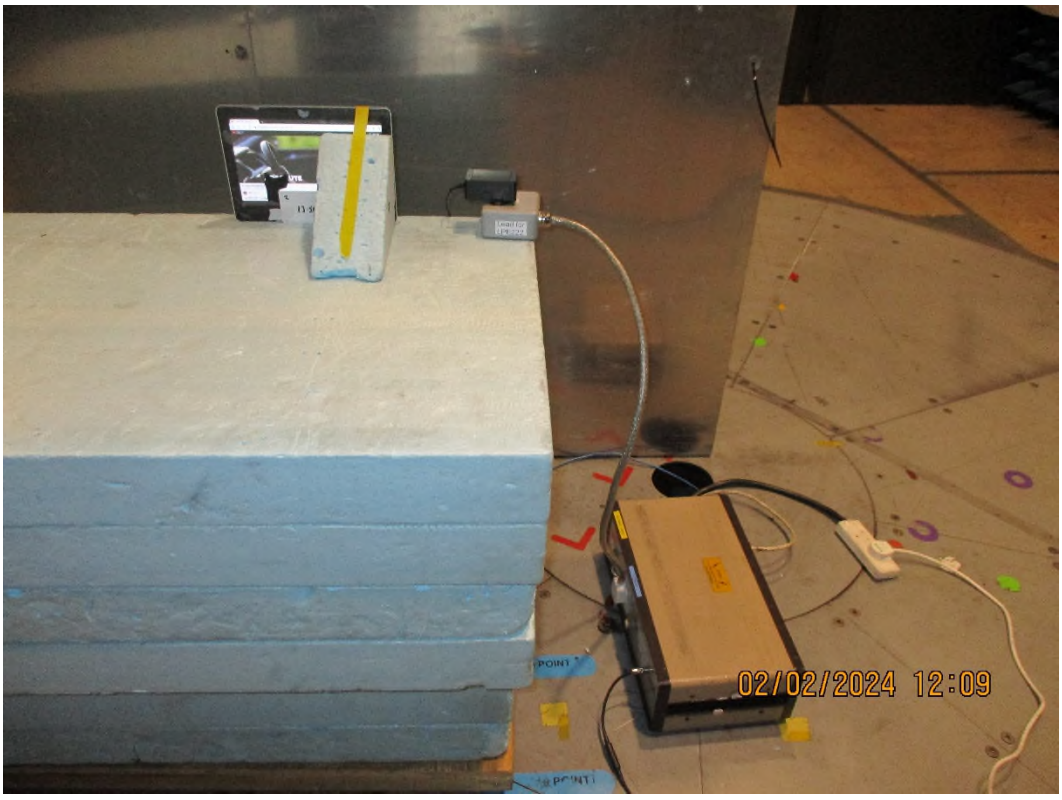


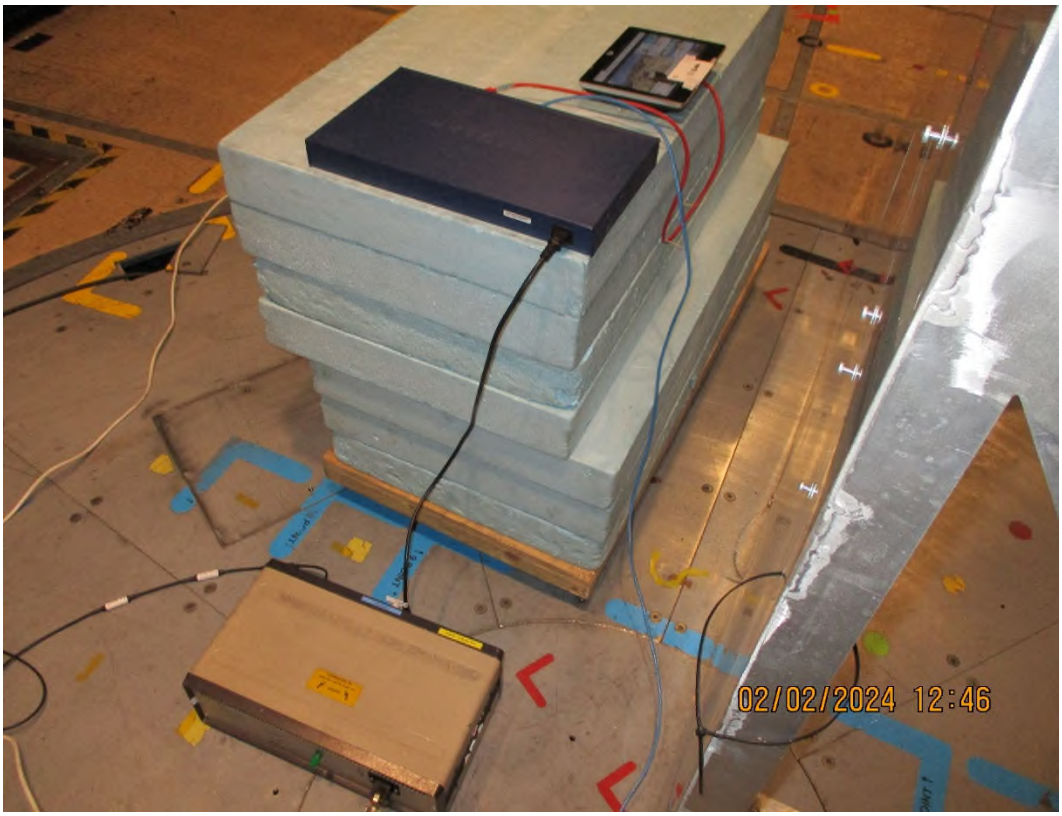
## 8.8 EUT ID Label



## 8.9 EUT Chassis

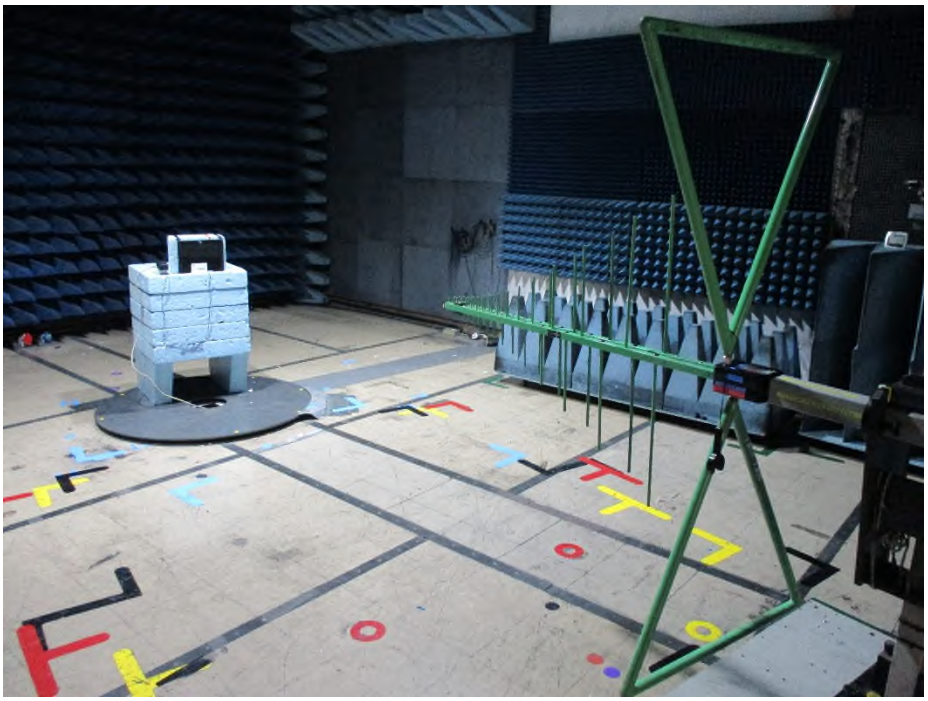

## 8.10 AC Power line and PoE conducted emissions



## 8.11 Radiated emissions 9 kHz – 30 MHz


## 8.12 Radiated emissions 30 – 1000 MHz

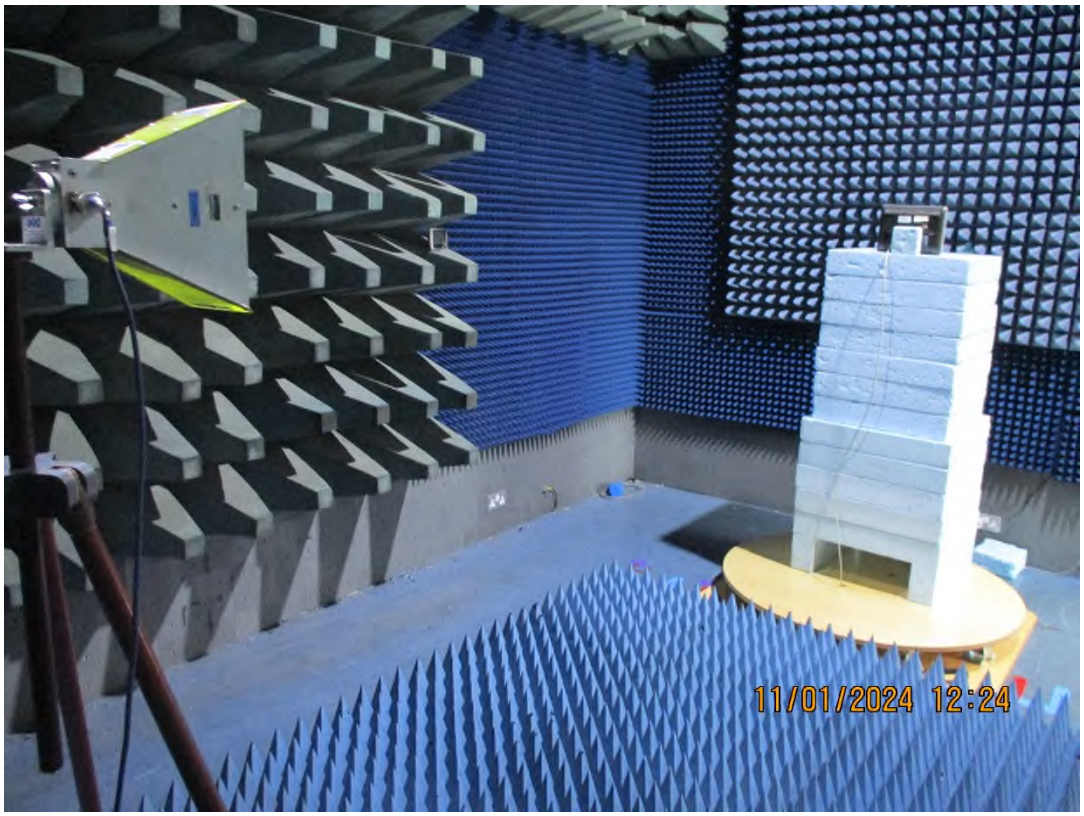


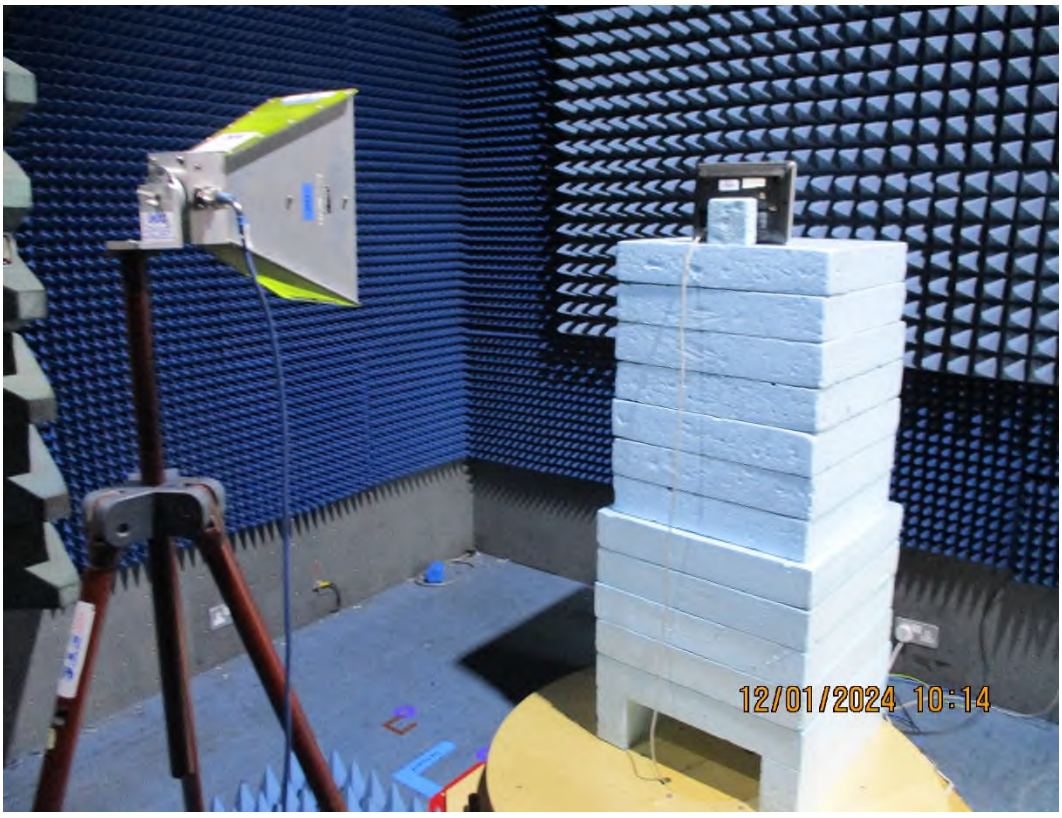

**Upright Position**

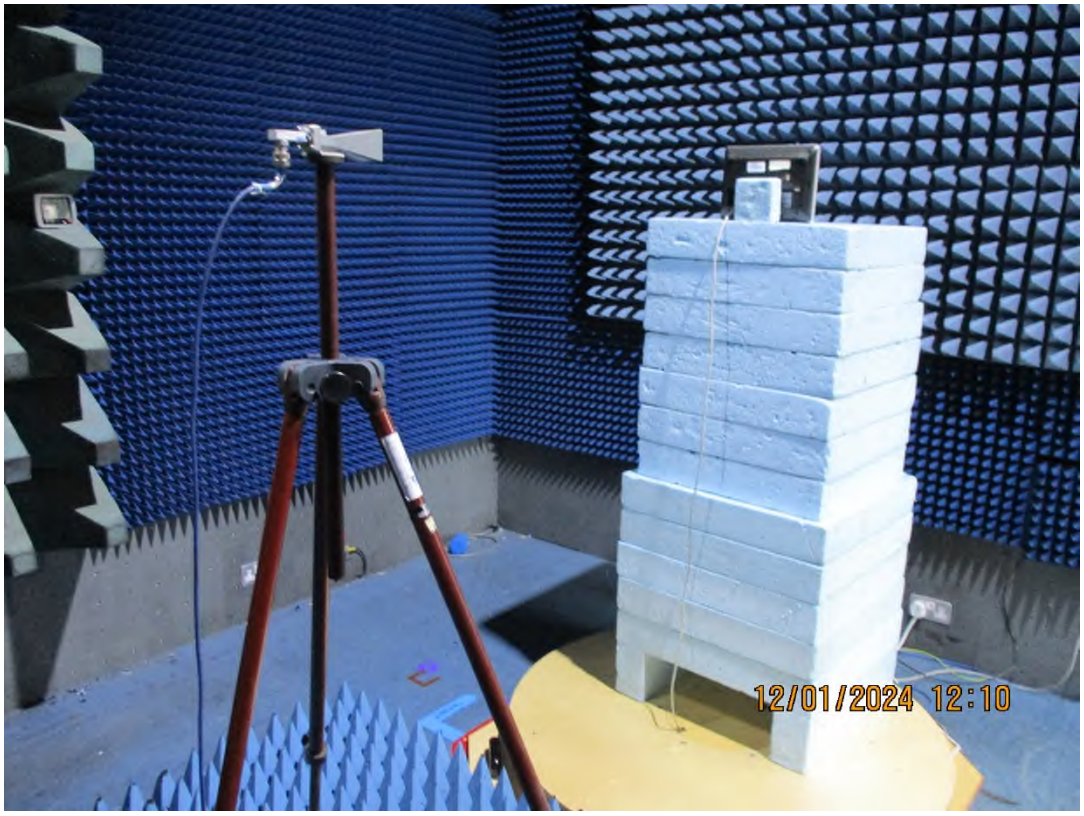

**Side Position**

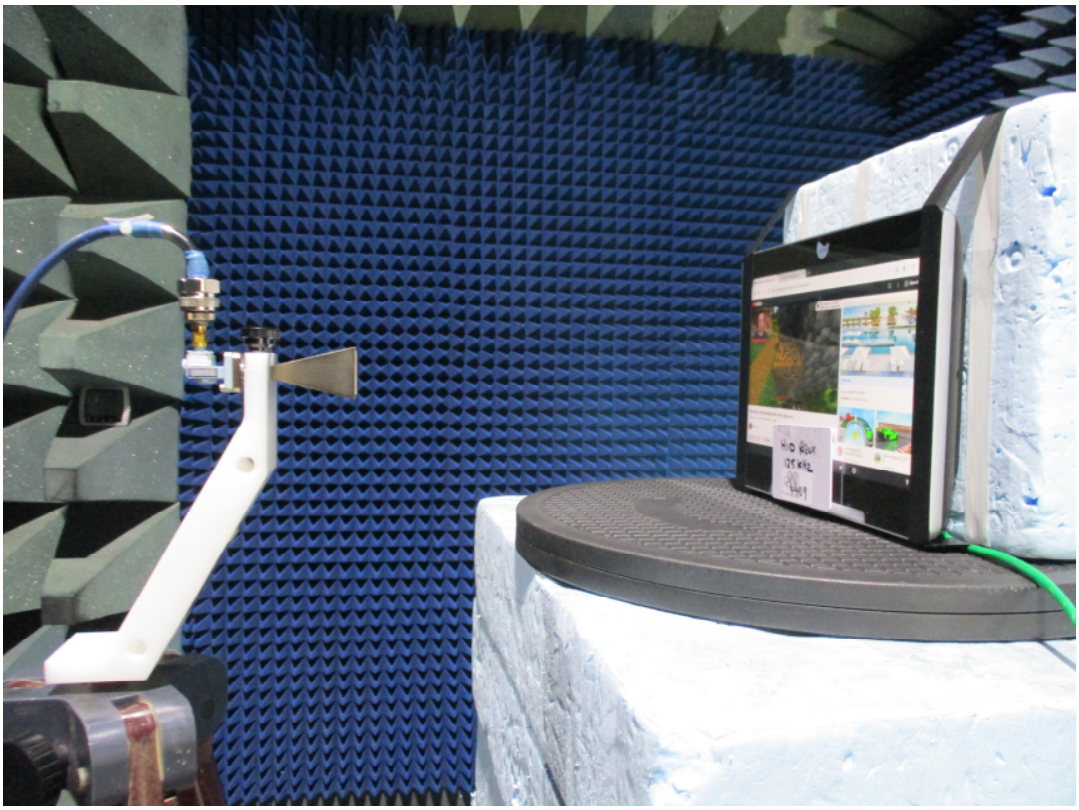

**Flat Position**

## 8.13 Radiated emissions above 1 GHz




12/01/2024 12:10



## 8.14 Radiated emission diagrams

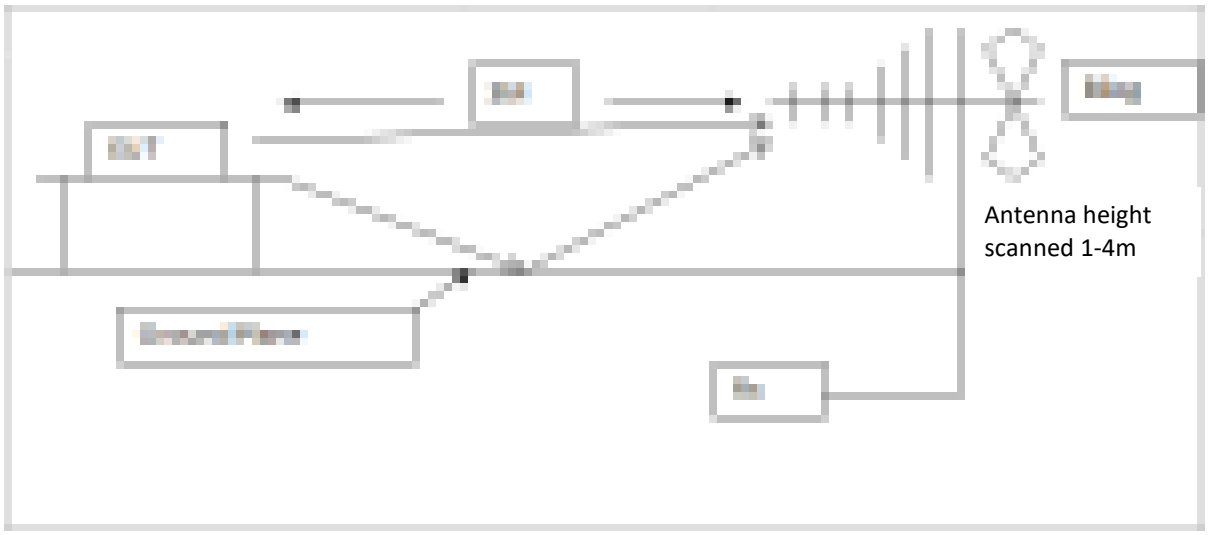



**Diagram of the radiated emissions test setup 30 - 1000 MHz**

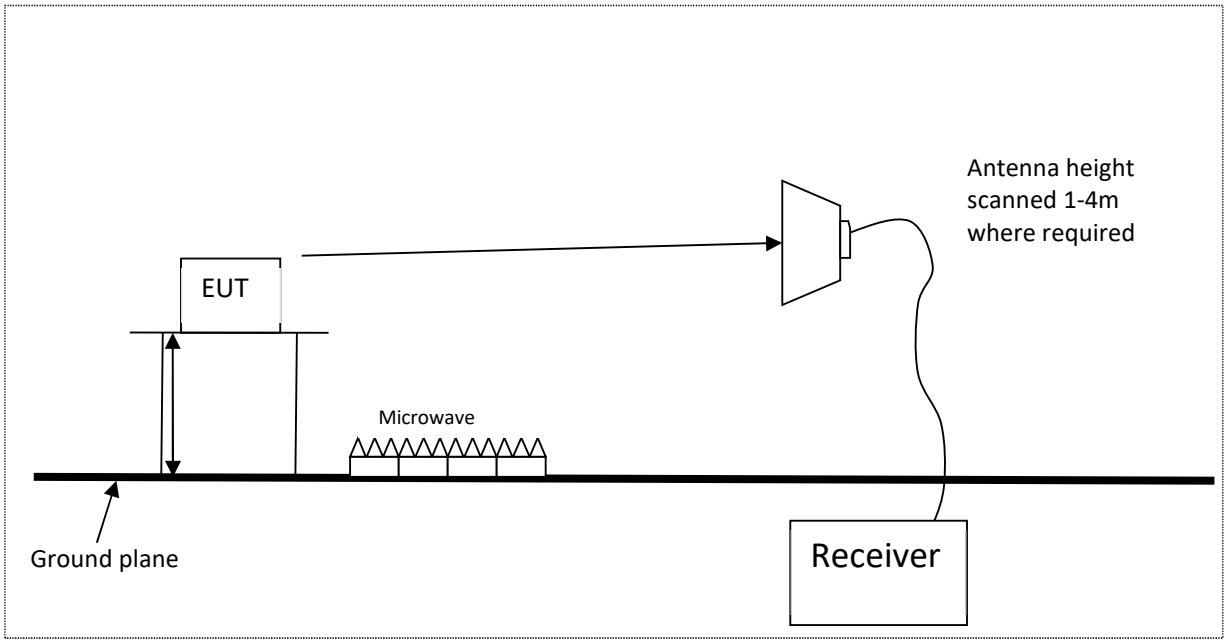



**Diagram of the radiated emissions test setup above 1GHz**

## 8.15 AC powerline conducted emission diagram

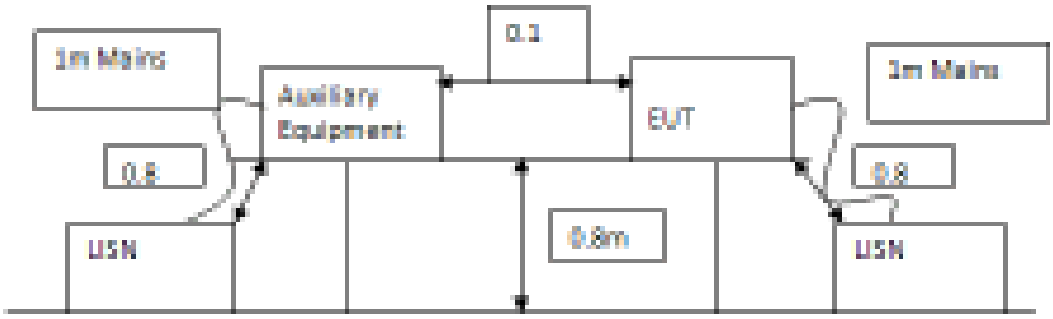



**Diagram of the AC conducted emissions test setup**

# 9 Test equipment calibration list

The following is a list of the test equipment used by Kiwa Electrical Compliance to test the unit detailed within this report. In line with our procedures, the equipment was within calibration for the period during which testing was carried out.

| RN No. | Model No. | Description | Manufacturer | Calibration date | Cal period |
|---|---|---|---|---|---|
| E411 | N9039A | 9 kHz - 1 GHz RF Filter Section | Agilent Technologies | 05-Jul-2023 | 12 months |
| E412 | E4440A | PSA 3 Hz - 26.5 GHz | Agilent Technologies | 22-Sep-2023 | 24 months |
| E428 | HF906 | Horn Antenna 1 - 18 GHz | Rohde & Schwarz | 23-May-2023 | 36 months |
| E429 | - | Filter Box 5 Switch Filters 0.91 GHz - 16.3 GHz | RN Electronics | 21-Aug-2023 | 12 months |
| E624 | E4440A | PSA 3 Hz - 26.5 GHz | Agilent Technologies | 06-Jul-2023 | 24 months |
| E642 | E4440A | PSA 3 Hz - 26.5 GHz | Agilent Technologies | 24-Nov-2023 | 24 months |
| E743 | 2017 4/2dB | Attenuator 4/2dB 30-1000MHz | RN Electronics | 15-Mar-2023 | 12 months |
| E856 | N9039A | 9 kHz - 1 GHz RF Filter Section | Agilent Technologies | 24-Nov-2023 | 12 months |
| E904 | 5086-7805 | Pre-Amplifier 1GHz - 26.5GHz | Hewlett Packard | 03-May-2023 | 12 months |
| E972 | WRCGV10 | Filter Band Reject 2400 to 2483.5 MHz | Wainwright Instruments | 03-Apr-2023 | 12 months |
| F238 | N9039A | 9 kHz - 1 GHz RF Filter Section | Agilent Technologies | 23-Aug-2023 | 12 months |
| LPE222 | MN2050 | LISN Artificial Mains Network | Chase | 15-May-2023 | 12 months |
| LPE364 | CBL6112A | Antenna BiLog 30MHz - 2GHz | Chase Electronics Ltd | 28-Mar-2022 | 36 months |
| NSA-M | NSA - M | NSA - Site M | RN Electronics | 29-Nov-2021 | 36 months |
| TMS78 | 3160-08 | Horn Std Gain 12.4 - 18 GHz | ETS Systems | 05-Oct-2023 | 12 months |
| TMS79 | 3160-09 | Horn Std Gain 18 - 26.5 GHz | ETS Systems | 23-May-2023 | 12 months |
| TMS81 | 6502 | Antenna Active Loop | EMCO | 17-Aug-2023 | 24 months |
| ZSW1 | V2.5.2 | Measurement Software Suite | RN Electronics | Not Applicable | |

# 10 Auxiliary and peripheral equipment

## 10.1 Customer supplied equipment

| Item No. | Model No. | Description | Manufacturer | Serial No. |
|---|---|---|---|---|
| 1 | PSA16U-480(POR) | Switch Power Supply | Phihong | P04805817B1 |

## 10.2 Kiwa Electrical Compliance supplied equipment

| RN No. | Model No. | Description | Manufacturer | Serial No |
|---|---|---|---|---|
| N473 | DIR-855 | Wireless N Quadband Gigabit Router | D-Link | F3RR29B003035 |
| None | FS728TP | 24 port PoE smart switch | Netgear | 0026F2905125 |

# 11 Condition of the equipment tested

In order for the EUT to produce the results shown within this report the following modifications, if any, were implemented.

## 11.1 Modifications before test

No modifications were made before test by Kiwa Electrical Compliance..

## 11.2 Modifications during test

No modifications were made during test by Kiwa Electrical Compliance..

# 12 Description of test sites

Site A Radio Laboratory and Anechoic Chamber

Site B Semi-Anechoic Chamber and Control Room
FCC Registration No. 293246, ISED Registration No. 5612A-4

Site C Transient Laboratory

Site D Screened Room (Conducted Immunity)

Site E Screened Room (Control Room for Site D)

Site F Screened Room (Conducted Emissions)

Site G Screened Room (Control Room for Site H)

Site H 3m Semi-Anechoic Chamber (indoor OATS)
FCC Registration No. 293246, ISED Registration No. 5612A-2, VCCI Registration No. 4065

Site J Transient Laboratory

Site K Screened Room (Control Room for Site M)

Site M 3m Semi-Anechoic Chamber (indoor OATS)
FCC Registration No. 293246, ISED Registration No. 5612A-3

Site N Radio Laboratory

Site Q Fully-Anechoic Chamber

Site OATS 3m and 10m Open Area Test Site
FCC Registration No. 293246, ISED Registration No. 5612A-1

Site R Screened Room (Conducted Immunity)

Site S Safety Laboratory

Site T Transient Laboratory

CAB identifier as issued by Innovation, Science and Economic Development Canada is UK0002
CAB identifier as issued by FCC is UK2015

# 13 Abbreviations and units

| | |
|---|---|
| % | Percent |
| λ | Wavelength |
| µA/m | microAmps per metre |
| µV | microVolts |
| µW | microWatts |
| AC | Alternating Current |
| ACK | ACKnowledgement |
| ACP | Adjacent Channel Power |
| AFA | Adaptive Frequency Agility |
| ALSE | Absorber Lined Screened Enclosure |
| AM | Amplitude Modulation |
| Amb | Ambient |
| ANSI | American National Standards Institute |
| ATPC | Automatic Transmit Power Control |
| AVG | Average |
| AWGN | Additive White Gaussian Noise |
| BER | Bit Error Rate |
| BPSK | Binary Phase Shift Keying |
| BT | BlueTooth |
| BLE | BlueTooth Low Energy |
| BW | Bandwidth |
| ºC | Degrees Celsius |
| C/I | Carrier / Interferer |
| CAC | Channel Availability Check |
| CCA | Clear Channel Assessment |
| CEPT | European Conference of Postal and Telecommunications Administrations |
| CFR | Code of Federal Regulations |
| CISPR | Comité International Spécial des Perturbations Radioélectriques |
| cm | centimetre |
| COFDM | Coherent OFDM |
| COT | Channel Occupancy Time |
| CS | Channel Spacing |
| CW | Continuous Wave |
| DAA | Detect And Avoid |
| dB | deciBels |
| dBµA/m | deciBels relative to 1µA/m |
| dBµV | deciBels relative to 1µV |
| dBµV/m | deciBels relative to 1µV/m |
| dBc | deciBels relative to Carrier |
| dBd | deciBels relative to dipole gain |
| dBi | deciBels relative to isotropic gain |
| dBm | deciBels relative to 1mW |
| dBr | deciBels relative to a maximum value |
| dBW | deciBels relative to 1W |
| DC | Direct Current |
| DFS | Dynamic Frequency Selection |
| DMO | Dynamic Modulation Order |
| DSSS | Direct Sequence Spread Spectrum |
| DTA | Digital Transmission Analyser |
| EIRP | Equivalent Isotropic Radiated Power |
| emf | electromotive force |
| ERC | European Radiocommunications Committee |
| ERP | Effective Radiated Power |
| ETSI | European Telecommunications Standards Institute |
| EU | European Union |
| EUT | Equipment Under Test |
| FCC | Federal Communications Commission |
| FER | Frame Error Rate |
| FHSS | Frequency Hopping Spread Spectrum |
| FM | Frequency Modulation |
| FSK | Frequency Shift Keying |
| FSS | Fixed Satellite Service |
| g | Grams |
| GHz | GigaHertz |
| GNSS | Global Navigation Satellite System |
| GPS | Global Positioning System |
| Hz | Hertz |
| IEEE | Institute of Electrical and Electronics Engineers |
| IF | Intermediate Frequency |
| ISED | Innovation Science and Economic Development |
| ITU | International Telecommunications Union |
| KDB | Knowledge DataBase |

| | |
|---|---|
| kg | kilogram |
| kHz | kiloHertz |
| kPa | Kilopascal |
| LBT | Listen Before Talk |
| LISN | Line Impedance Stabilisation Network |
| LNA | Low Noise Amplifier |
| LNB | Low Noise Block |
| LO | Local Oscillator |
| m | metre |
| mA | milliAmps |
| max | maximum |
| Mbit/s | MegaBits per second |
| MCS | Modulation and Coding Scheme |
| MHz | MegaHertz |
| mic | Microphone |
| MIMO | Multiple Input, Multiple Output |
| min | minimum |
| mm | millimetres |
| ms | milliseconds |
| mW | milliWatts |
| NA | Not Applicable |
| NFC | Near Field Communications |
| nom | Nominal |
| nW | nanoWatt |
| OATS | Open Area Test Site |
| OBW | Occupied Band Width |
| OCW | Occupied Channel Width |
| OFDM | Orthogonal Frequency Division Multiplexing |
| OOB | Out Of Band |
| ppm | Parts per million |
| PER | Packet Error Rate |
| PK | Peak |
| PMR | Private Mobile Radio |
| PRBS | Pseudo Random Bit Sequence |
| PRF | Pulse Repetition Frequency |
| PSD | Power Spectral Density |
| PSU | Power Supply Unit |
| pW | picoWatts |
| QAM | Quadrature Amplitude Modulation |
| QP | Quasi Peak |
| QPSK | Quadrature Phase Shift Keying |
| RBW | Resolution Band Width |
| RED | Radio Equipment Directive |
| R&TTE | Radio and Telecommunication Terminal Equipment |
| Ref | Reference |
| RF | Radio Frequency |
| RFC | Remote Frequency Control |
| RFID | Radio Frequency IDentification |
| RLAN | Radio Local Area Network |
| RMS | Root Mean Square |
| RNSS | Radio Navigation Satellite Service |
| RSL | Received Signal Level |
| RSSI | Received Signal Strength Indicator |
| RTP | Room Temperature and Pressure |
| RTPC | Remote Transmit Power Control |
| Rx | Receiver |
| s | Seconds |
| SINAD | Signal to Noise And Distortion |
| SRD | Short Range Device |
| Tx | Transmitter |
| UKAS | United Kingdom Accreditation Service |
| UKCA | United Kingdom Conformity Assessed |
| UKRER | United Kingdom Radio Equipment Regulations |
| UHF | Ultra High Frequency |
| U-NII | Unlicensed National Information Infrastructure |
| USB | Universal Serial Bus |
| UWB | Ultra Wide Band |
| V | Volts |
| V/m | Volts per metre |
| VBW | Video Band Width |
| VHF | Very High Frequency |
| VSAT | Very Small Aperture Terminal |
| W | Watts |

====== END OF TEST REPORT ======