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# RADIO COMPLIANCE REPORT
# Certification Test Report
# *In accordance with:*
# CFR47 FCC Part 15, Subpart C, 15.247

## Gallagher Group Ltd

## eS1

## eShepherd Neckband

FCC ID: M5V-G040804

REPORT: E2401-1734-1 Rev1
DATE: February, 2024

*This report replaces the previously issued report E2401-1734-1*
*Please refer to section 2 of this report for details of any previously issued reports*

Accreditation Number: 18553
Accredited for compliance with ISO/IEC 17025 - Testing

# Certificate of Compliance
## Certification Compliance Report
### EMC Bayswater Test Report: E2401-1734-1 Rev1
### Issue Date: February, 2024

| | |
|---|---|
| **Test Sample(s):** | eShepherd Neckband |
| **Model No:** | eS1 |
| **Serial No:** | 2619268061, 2587181265 |
| **FCC ID:** | M5V-G040804 |
| **Customer Details:** | Mr Hayden Goble<br>Gallagher Group Ltd<br>181 Kahikatea Drive, Melville,<br>Hamilton 3206<br>New Zealand<br>Phone No: +64 800 731 500<br>e-mail: Hayden.goble@gallagher.com |
| **Test Specification:** | CFR47 FCC Part 15, Subpart C, 15.247 |

| **Results Summary:** | | |
|---|---|---|
| | 15.203 - Antenna requirement | ***Complied*** |
| | 15.247 (b)(3) - Maximum Output Power | ***Complied*** |
| | 15.247 (d) - Out-of-Band Emissions - – 100kHz, -20dBc | ***Complied*** |
| | 15.247 (d) - Emissions on the Band edge | ***Complied*** |
| | 15.247 (d), 15.209 - Radiated emissions in Restricted bands | ***Complied*** |
| | 15.247 (e) - Power Spectral Density | ***Complied*** |
| | 15.247 (i) - Radio frequency hazard | ***Complied*** |
| | 15.247 (a)(1) - Channel Separation | ***Complied*** |
| | 15.247 (f) - Channel Occupancy Time | ***Complied*** |
| | 15.109 - Radiated Emissions (Receiver Mode) | ***Complied – Class B*** |
| | 15.207 – Conducted Emissions | ***Not Applicable**** |
| | **Internal battery powered device, does not connect to AC mains* | |

| | |
|---|---|
| **Test Date(s):** | 24th to 29th of January, 2024 |
| **Test House (Issued By):** | EMC Bayswater Pty Ltd<br>18/88 Merrindale Drive<br>Croydon South<br>Victoria 3136<br>Australia<br><br>FCC Accredited Test Firm Registration number: 527798<br>FCC Accredited Test Firm Designation number: AU0004<br><br>Phone No: +61 3 9761 5888 e-mail: sales@emcbayswater.com.au<br>Fax No: +61 3 8761 6547 Web: www.emcbayswater.com.au/ |

This is to certify that the necessary measurements were made by EMC Bayswater Pty Ltd, and that the modified Gallagher Group Ltd, eS1, eShepherd Neckband, has been tested in accordance with requirements contained in the appropriate commission regulations..

| Prepared & tested by: | Approved by: | |
|---|---|---|
| | | 28/02/2024 16:56 |
| Adnan Zaman<br>(EMC Test Engineer) | Neville Liyanapatabendige<br>(Manager) | Date |

# Radio Compliance Report
*for*
# Gallagher Group Ltd

## Contents

## 1. Introduction

Electromagnetic Compatibility (EMC) tests were performed on a modified Gallagher Group Ltd, eS1, eShepherd Neckband in accordance with the requirements of Title 47 of the standard CFR47 FCC Part 15, Subpart C, 15.247.

## 2. Test Report Revision History

| ISSUE | DATE | SECTIONS AFFECTED | AUTHORISED BY |
|---|---|---|---|
| E2401-1734-1 | 13/02/24 | Original | Neville Liyanapatabendige (Manager) |
| E2401-1734-1 Rev1 | 28/02/24 | 1. As per customer request, FCC ID was updated.<br>2. As per customer request, EUT internal LoRa module (without shield) photograph was included.<br>3. "Customer supplied the EUT with fully charged new battery for testing" statement was included in the 5.6 configuration section of the report. | Neville Liyanapatabendige (Manager) |

## 3. Report Information

EMC Bayswater Pty Ltd reports apply only to the specific samples tested under the stated test conditions. All samples tested were in good operating condition throughout the entire test program unless otherwise stated. EMC Bayswater Pty Ltd does not in any way guarantee the later performance of the product/equipment. It is the manufacturer's responsibility to ensure that additional production units of the tested model are manufactured with identical electrical and mechanical components. EMC Bayswater Pty Ltd shall have no liability for any deductions, inference or generalisations drawn by the clients or others from EMC Bayswater Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Bayswater Pty Ltd. This report shall not be reproduced except in full (with the exception of the certificate on page 2) without the written approval of EMC Bayswater Pty Ltd. This document may be altered or revised by EMC Bayswater Pty Ltd personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by EMC Bayswater Pty Ltd will nullify the document.

## 4. Summary of Results

The modified EUT complied with applicable requirements of CFR47 FCC Part 15, Subpart C, 15.247. Worst-case results are tabled as follows:

| FCC Part 15 sections | Test | Result |
|---|---|---|
| 15.203 | Antenna Requirement | Complied[#1] |
| 15.247 (a)(1) | 20dB Bandwidth | 142kHz[#2] |
| 15.247 (b)(3) | Maximum conducted output power | Complied by 14.2dB |
| 15.247 (d) | Out-of-Band Emissions – 100kHz, -30dBc | Complied by at least > 6dB |
| 15.247 (d) | Emissions on the Band edge | Complied by > 20dB |
| 15.247 (d), 15.209 | Radiated emissions in Restricted bands | Complied by 1.1dB[+] |
| 15.247 (e) | Power Spectral Density | Complied by 3.1dB[+] |
| 15.109 | Radiated Emissions (Receiver Mode) | Complied with quasi-peak limit by 8.5dB |
| | | Complied with peak limit by > 20dB |
| | | Complied with average limit by > 20dB |
| 15.247 | Number of Hopping Frequencies | 8[#2] |
| 15.247 (f) | Channel Occupancy Time | Complied |
| 15.247 (a)(1) | Channel Separation | Complied |
| | Occupied Bandwidth (99% Emission Bandwidth) | 125kHz[#2] |

*[+]Refer to relevant section for statement of Measurement Uncertainty*

*[#1]The Antenna is permanently attached, internal to the device*

*[#2]Informaive only. There is not limits defined for the Hybrid system*

Table 1: Summary of test results

# 5. Product Sample Details

## 5.1. EUT Description

The EUT (Equipment Under Test), as supplied by the client, is described as follows:

| | | |
|---|---|---|
| Product: | eShepherd Neckband | |
| Model No: | eS1 | |
| Part No: | G040804 | |
| Serial No: | 2619268061, 2587181265 | |
| Firmware: | 8.x.xxx | |
| | | |
| Power Specifications: | Battery Powered LiFePO4, 3.2V, 12000mAH | |
| Dimensions: | Not supplied | |
| Weight: | Not supplied | |
| EUT Type: | Tested as table top. | |
| | | |
| Transmitter Details: | Description: | IC MODULE LORA TRANSCEIVER 915MHz RFM95CW-915S2R |
| | Type: | RFM95CW-915S2R |
| | Modulation: | LoRa – Semtech proprietary chirp spread-spectrum digital modulation |
| | Modulation Technology: | Hybrid System |
| | Frequency Range: | 902.4MHz to 903.8MHz |
| | Max power: | +14dBm |
| | Antenna: | PCB type |
| | Antenna Gain: | 0dBi |
| | FCC ID: | 2ASE0RFM95C |

*(Customer supplied product information)*

*(Refer to photographs in Annex A & B for views of the EUT)*

## 5.2. Product description

The EUT (Equipment Under Test) has been described by the customer as follows:

“Neckband is located around the neck of a farm animal, typically beef cattle. It determines its location by GPS/GNSS and compares it to programmed ‘virtual fences’. If the animal attempts to cross a virtual fence the product first issues an audible warning. If the animal continues moving in the wrong direction the product applies an aversive electrical stimulus (series of HV pulses). It periodically transmits status to a base station and receives an acknowledgement and optional additional information.

The product contains FCC certified Wi-Fi module (FCC ID: 2AC7Z - ESPC3MINI1) is used by Gallagher authorised personnel only for testing and troubleshooting purposes. The LoRa and Wi-Fi module are not operated concurrently and is out of scope for this report.”

(Customer supplied product description information)

The highest fundamental frequency generated or used within the EUT, or the highest frequency at which it operates as specified by the customer is 903.8MHz.

### 5.3. Support Equipment

| | | |
|---|---|---|
| Support Equipment 1: | Description: | Laptop |
| | Manufacturer: | DELL |
| | Model No: | Latitude 7420 |
| | Serial No: | Not stated |
| Support Equipment 2: | Description: | Power supply |
| | Manufacturer: | TENMA |
| | Model No: | 72-10480 |
| | Serial No: | 202108070789 |
| Support Equipment 3: | Description: | 1k Ohms Resistive Load |
| | Manufacturer: | NA |
| | Model No: | NA |
| | Serial No: | NA |

### 5.4. Product operating modes

The customer described the product normal operation modes as the following:

"The animal is near a virtual fence, and the product remains active, monitors position and animal movement, and applies audio and aversive stimulus pulses as required. The product transmits status by LoRa packet (<0.4s) to the base station at >10min intervals (programmed time slots) typically every 10 minutes. The base station sends an acknowledgement and optionally additional information such as new virtual fence information or operating parameters."

*(Customer supplied product operating mode information)*

### 5.5. Product operating mode for testing

"Radio transmitter testing – Product was put into test mode of continuous LoRa random-data transmission, or repeating LoRa packet transmissions with short separation. Nominal frequency 903MHz, US band-boundary channels at 902.4MHz and 903.8MHz.

Receiver Mode testing – Product was put into receive-only mode. A repeating sequence of audio and pulse events at approx. 2 second intervals represented accelerated normal operation for purpose of measurement position scanning (turntable etc)."

### 5.6. Configuration

The EUT was either configured by the customer or configured using the customer's instructions.

The product is battery powered and it does not normally have any cable connections. For testing a serial cable was connected from the product to a PC running a control program (Bandchat). The cable was fitted with numerous ferrites close to the product so as not to affect measurements. Customer supplied additional sample (serial no. 2587181265) with antenna port for Conducted method testing. Customer supplied the EUT with fully charged new battery for testing.

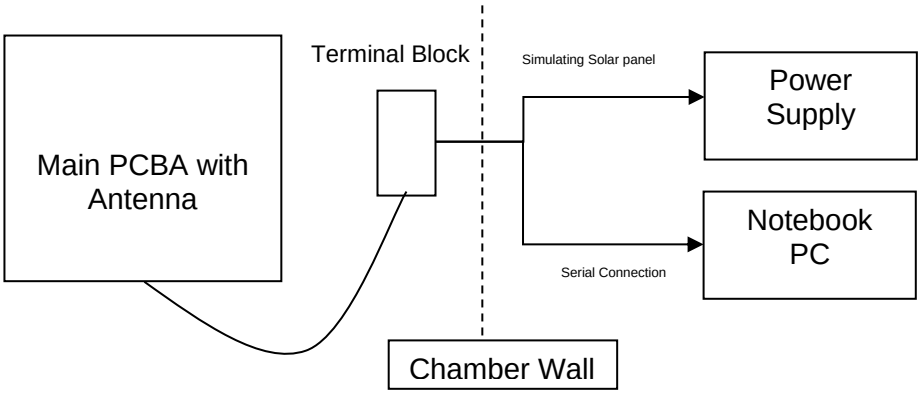



Figure 1: Customer supplied block diagram of EUT test configuration

| Port | Cable type | Cable Brand | Cable Model | Length | Termination |
|---|---|---|---|---|---|
| Serial debug port (for test access only, not part of normal configuration) | Short 3-wire non shielded patch cable from PCB to outside of product. | Generic | Ribbon cable | 50mm | 2x8 pin 1.27mm pitch header |
| (As above) | DC extension cable from above patch cable to power supply simulating Solar input. | Generic | Shielded multi-core | 9m | Power supply |
| | Serial extension cable from above patch cable to control PC – fitted with multiple ferrites | | | | USB-to-Serial adapter at PC end |

Table 2: List of ports and associated cables/terminations used for testing.

### 5.7. Modifications

The following modifications were made by the customer to the EUT to comply with Radiated emissions in Restricted bands testing:

❶ The EUT maximum transmit power was reduced from 18dBm to 15.8dBm to comply with Radiated emissions in Restricted bands.

| Test | Modification |
|---|---|
| | ❶ |
| 20dB Bandwidth | ✓ |
| Maximum conducted output power | ✓ |
| Out-of-Band Emissions – 100kHz, -30dBc | ✓ |
| Emissions on the Band edge | ✓ |
| Radiated emissions in Restricted bands | ✓ |
| Power Spectral Density | ✓ |
| Radiated Emissions (Receiver Mode) | × |
| Number of Hopping Frequencies | × |
| Channel Occupancy Time | × |
| Channel Separation | × |
| Occupied Bandwidth (99% Emission Bandwidth) | ✓ |

✓Modification fitted × Modification not fitted

Table 3: Summary of fitted modifications per test

*EMC Bayswater takes no responsibility for any modifications made to the EUT specifically to achieve EMC compliance and hence these modifications may only be satisfactory for that purpose under the stated EUT test conditions. The customer must check that the proposed modifications meet all the product design, functional, safety or other compliance requirements. The customer elected not to re-test any of the previously completed tests (unless otherwise indicated in the table). EMC Bayswater takes no responsibility for any adverse EMC performance of the unrepeated tests that may occur due to the modifications fitted.*

## 6. Test Facility & Equipment

### 6.1. Test Facility

Tests were performed at the indoor Open Area Test Site (iOATS) at EMC Bayswater Pty Ltd, located at 18/88 Merrindale Drive, Croydon South, Victoria, 3136, Australia.

EMC Bayswater Pty Ltd FCC Test Firm registration number is 527798.

EMC Bayswater Pty Ltd FCC Test Firm Designation number is AU0004.

### 6.2. Test Equipment

Refer to Appendix A for the measurement instrument list.

## 7. Referenced Standards

CFR47 FCC Part 15, Subpart C, 15.247

CFR47 FCC Part 15, Subpart B

ANSI C63.10 - 2013
American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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.

FCC KDB - 558074 D01 15.247 Meas Guidance v05r02

## 8. Referenced Documents

Test Plan
None

# 9. Antenna Requirement – FCC Part 15.203

## 9.1. Requirements

As per section 15.203 of CFR47 FCC Part 15, Subpart C, 15.247:

- An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

## 9.2. Result

The EUT uses permanent, internally attached PCB track Antenna. Therefore, the EUT complied with the antenna requirements of CFR47 FCC Part 15, Subpart C, 15.247 Section 15.203.

# 10. 20dB Bandwidth – FCC 15.247 (a) (1)

## 10.1. Test Procedure

The 20dB Bandwidth measurement was performed in accordance with the section 6.9.2 of ANSI C63.10 - 2013.

20dB Bandwidth measurements were performed at the antenna port (Conducted method). The transmitter output was connected to a spectrum analyzer through a suitable attenuator. The spectrum analyser was tuned to the fundamental (transmit frequency) of the transmitter bottom, centre and top channels with 3kHz RBW and 10kHz VBW using the peak detector and a suitable span to allow accurate measurements whilst capturing the full intentional transmission including side lobes. The resultant bandwidth measurement was recorded.

*(Refer to photographs in Annex C for views of the test configuration)*

## 10.2. Limits

No limits are defined in CFR47 FCC Part 15, Subpart C, 15.247.

## 10.3. Test Results

20dB Bandwidth measurements are tabulated below:

*(Refer to graphs in Appendix C.1)*

| Transmit Operating Frequency (MHz) | -20dBc Lower Frequency (MHz) | -20dBc Upper Frequency (MHz) | Occupied Channel Bandwidth (kHz) |
|---|---|---|---|
| 902.4 (Bottom Channel) | 902.332 | 902.472 | 140 |
| 903 (Middle Channel) | 902.929 | 903.070 | 141 |
| 903.8 (Top Channel) | 903.728 | 903.870 | 142 |

Table 4: 20dB Bandwidth – Hybrid mode

The measurement uncertainty was calculated as follows:

| Measurement Parameter | Calculated measurement uncertainty |
|---|---|
| Operating Frequency | ±10.5kHz |
| Bandwidth | ±14.96kHz |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 51% |
| Atmospheric pressure: | 1010.8 to 1011.5hPa |

Table 5: Climatic conditions

**Notes:** The transmitter was continuously transmitting in Hybrid mode.

**Assessment:** The measured 20dB Bandwidth is 142 kHz (informative only).

# 11. Occupied Channel Bandwidth (99% Emission Bandwidth)

## 11.1. Test Procedure

The 99% emission Bandwidth was performed in accordance with the section 6.9.3 of ANSI C63.10 - 2013.

99% Emission Bandwidth measurements were performed at the antenna port (Conducted method). The transmitter output was connected to a spectrum analyzer through a suitable attenuator. The spectrum analyzer centre frequency was tuned to the fundamental (transmit frequency) of the transmitter with the span of the analyzer was set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth (RBW) was set to 1% to 5% of the occupied bandwidth and video bandwidth (VBW) was set to three times the RBW.

A peak detector, maxhold function (worst case) was used to measure the occupied bandwidth, using the built-in 99% occupied bandwidth measurement function of the receiver. The resultant bandwidth measurement was recorded.

*(Refer to photographs in Annex C for views of the test configuration)*

## 11.2. Requirements

No limits are defined in CFR47 FCC Part 15, Subpart C, 15.247.

## 11.3. Test Results

Occupied Bandwidth measurements are tabulated below:

*(Refer to graph in Appendix C.5)*

| Transmit Operating Frequency (MHz) | 99%BW Lower Frequency (MHz) | 99%BW Upper Frequency (MHz) | Occupied Channel Bandwidth (kHz) |
|---|---|---|---|
| 902.4 (Bottom Channel) | 902.338 | 902.462 | 124 |
| 903 (Middle Channel) | 902.938 | 903.063 | 125 |
| 903.8 (Top Channel) | 903.738 | 903.863 | 125 |

Table 6: Occupied Bandwidth – Hybrid mode

The measurement uncertainty was calculated as follows:

| Measurement Parameter | Calculated measurement uncertainty |
|---|---|
| Operating Frequency | ±10.5kHz |
| Bandwidth | ±14.96kHz |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 51% |
| Atmospheric pressure: | 1010.8 to 1011.5hPa |

Table 7: Climatic conditions

**Notes:** The transmitter was continuously transmitting in Hybrid mode.

**Assessment:** The measured Occupied bandwidth (99% Emission Bandwidth) is 125 kHz (informative only).

# 12. Maximum conducted (average) output power– FCC 15.247 (b)(3)

## 12.1. Test Procedure

The Maximum conducted (average) output power measurements were performed in accordance with ANSI C63.10 - 2013.

The EUT was tested on the lowest, middle and highest channels using a fast power sensor (wideband RF power meter) with sample speed of 1 MS/s. The power sensor was directly connected the antenna port of the EUT via a suitable attenuator.. All the applicable correction factors such as attenuator loss were included into the RF power sensor correction factors. The RF power sensor was used with commercially available compliant software as listed in the test equipment list of this report.

*(Refer to photographs in Annex C for views of the test configuration)*

## 12.2. Limits

For systems using digital modulation techniques:

| Transmit operating frequency (MHz) | Output Power (W) | Output Power (dBm) | e.i.r.p (W) | e.i.r.p (dBm) |
|---|---|---|---|---|
| 902 – 928 | 1 | 30 | 4 | 36 |

Table 8: Limits – Transmitter maximum peak output power

## 12.3. Test Results

The worst-case maximum output power measurements are tabulated below:

| Channel | Frequency (MHz) | Measured Power (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|---|
| Bottom | 902.4 | 15.8 | 30 | -14.2 | Complied |
| Middle | 903 | 15.8 | 30 | -14.2 | Complied |
| Top | 903.8 | 15.8 | 30 | -14.2 | Complied |

Table 9: Results for Maximum Conducted Output Power – Hybrid mode

The measurement uncertainty was calculated at ±4.83dB. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of approximately *k=2* which gives a level of confidence of approximately 95%.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 51% |
| Atmospheric pressure: | 1010.8 to 1011.5hPa |

Table 10: Climatic Conditions

**Notes:** The transmitter maximum output power was below the specified limit for the specified operating frequency.

The transmitter was continuously transmitting in Hybrid mode.

**Assessment:** The EUT complied with the Maximum conducted (average) output power requirements of CFR47 FCC Part 15, Subpart C, 15.247 (b)(3).

# 13. Radiated emissions in Restricted bands – 15.247 (d), 15.209

## 13.1. Requirements

As per section 15.247(d) of 47 CFR Part 15 Subpart C:

- Radiated emissions which fall in the restricted bands, as defined in section 15.205(a) of 47 CFR Part 15 Subpart C, must also comply with the radiated emission limits specified in section15.209(a) of 47 CFR Part 15 Subpart C (see §15.205(c) of 47 CFR Part 15 Subpart C).

As per section 47 CFR Part 15 Subpart C section 15.209 (Radiated emissions, general requirements) the EUT is required to meet the limits that permit the highest field strength of the following table for the radiated emissions which fall in the restricted bands, as defined in section 15.205(a) of 47 CFR Part 15 Subpart C:

| Frequency Range (MHz) | Limits at 3m (dBµV/m) |
|---|---|
| 0.009 to 0.490 | 128.5 to 93.8 |
| 0.490 to 1.705 | 73.8 to 62.9 |
| 1.705 to 30.0 | 69.5 |
| 30.0 to 88 | 40.0 |
| 88.0 to 216.0 | 43.5 |
| 216.0 to 960.0 | 46.0 |
| Above 960 | 54.0 |
| NOTE: The lower limit shall apply at the transition frequency. | |

*Note 1: as per CFR FCC Part 15 section15.209 (d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector*

*Note 2: as per CFR FCC Part 15.35 (b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.*

Table 11: Limits for Radiated Spurious Emissions at distance of 3m – Restricted Bands

## 13.2. Test Procedure

The Radiated Emissions were performed in accordance with the section 11.12 of ANSI C63.10 - 2013.

Radiated Emissions were measured 3 metres (from 9kHz to 25GHz) away from the EUT in the iOATS (indoor Open Area Test Site) facility, which is an ANSI C63.4 compliant semi-anechoic chamber with ground plane. The EUT was placed on a non-conductive support at a height of 0.8m (9kHz to 1GHz) and 1.5m (1GHz to 25GHz) above the ground plane.

In the frequency range of 9kHz to 30MHz, an Active loop antenna was used. For X (Parallel), Y (Perpendicular) and Z (Ground-Parallel) antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 1m fixed height, and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 200Hz (9kHz to 150kHz), 9kHz (150kHz to 30MHz) and a video bandwidth of 30kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emission was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 200Hz (9kHz to 150kHz) and 9kHz (150kHz to 30MHz).

In the frequency range of 30MHz to 1GHz, a Biconilog antenna was used. For both horizontal and vertical antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 4 different fixed height positions and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 120kHz and a video bandwidth of 300kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emission was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and varying the height of the antenna between 1 and 4 metres to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 120kHz.

In the frequency range 1.0GHz to 26.5GHz a Horn antenna was used and an area of 3m x 3.6m was covered between the antenna and the EUT using RF absorbing material with a rated attenuation more than 20dB over the frequency range. The height of the horn antenna was varied using the antenna bore-sighting technique and the turntable slowly rotated to maximise the emissions. For both horizontal and vertical antenna polarizations, the Peak and Average preview measurements were performed with a resolution bandwidth of 1 MHz and a video bandwidth of 3MHz. Peak and average emissions that exceeded the applicable limit or were close to the applicable limit were investigated further. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and the antenna height varied (if applicable, using the antenna bore-sighting technique) to find the worst-case emission arrangement. Peak and CISPR Average measurements were then performed using a

measuring time of no less than 15 seconds, the maximum emission level in the observed duration was recorded as the final result. The final peak and CISPR Average measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 1 MHz. Peak and Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line with the EUT rotation and antenna height varied (if applicable, using the antenna bore-sighting technique) to produce the highest emission.

Plots of the accumulated measurement data for both horizontal and vertical antenna polarizations, including all transducer and other measuring system correction factors were produced using commercially available compliant software (as listed in the test equipment list of this report).

*(Refer to photographs in Annex C for views of the test configuration)*

### 13.3. Test Results

Transmitter Spurious Emissions measurements are detailed as follows:

*(Refer to graphs in Appendix C.3)*

| **Operating Channel: Bottom, Middle and Top** | | | | |
|---|---|---|---|---|
| **Measurement Antenna Polarisation** | **Frequency (MHz)** | **Result peak (dBµV/m)** | **Limit Quasi-peak/ Average (dBµV/m)** | **Delta limit (dB)** |
| X | Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | |
| Y | Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | |
| Z | Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | |

Table 12: Transmitter Spurious Emissions – 9kHz to 30MHz

| **Operating Channel: Bottom** | | | | |
|---|---|---|---|---|
| **Measurement Antenna Polarisation** | **Frequency (MHz)** | **Result Quasi-peak (dBµV/m)** | **Limit Quasi-peak (dBµV/m)** | **Delta limit (dB)** |
| Horizontal | 37.760 | 20.1 | 40.0 | -19.9 |
| | 124.721 | 18.6 | 43.5 | -24.9 |
| | 613.116 | 28.4 | 46.0 | **-17.6*** |
| Vertical | 37.615 | 20.2 | 40.0 | -19.8 |
| | 125.157 | 18.5 | 43.5 | -25.0 |
| | 610.060 | 28.3 | 46.0 | -17.7 |

**Worst-case emissions*

Table 13: Transmitter Spurious Emissions – 30MHz to 1GHz – Hybrid mode

| Operating Channel: Middle and Top | | | | |
|---|---|---|---|---|
| **Measurement Antenna Polarisation** | **Frequency (MHz)** | **Result Quasi-peak (dBµV/m)** | **Limit Quasi-peak (dBµV/m)** | **Delta limit (dB)** |
| Horizontal | Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | |
| Vertical | Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | |

Table 14: Transmitter Spurious Emissions – 30MHz to 1GHz – Hybrid mode

| Operating Channel: Bottom, (902.4MHz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Measurement Antenna Polarisation** | **Peak Measurements** | | | | **Average Measurements** | | | |
| | **Frequency (MHz)** | **Result (dBµV/m)** | **Limit (dBµV/m)** | **Delta Limit (dB)** | **Frequency (MHz)** | **Result (dBµV/m)** | **Limit (dBµV/m)** | **Delta Limit (dB)** |
| Horizontal | 5414.400 | 54.1 | 74.0 | -19.9 | 2707.160 | 44.5 | 54.0 | -9.5 |
| | All other Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | | 5414.640 | 51.0 | 54.0 | -3.0+ |
| | | | | | 9023.734 | 47.9 | 54.0 | -6.1 |
| Vertical | 5414.400 | 55.6 | 74.0 | **-18.4*** | 2707.420 | 43.9 | 54.0 | -10.1 |
| | All other Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | | 5414.400 | 52.5 | 54.0 | **-1.5*+** |
| | | | | | 9024.454 | 46.9 | 54.0 | -7.1 |

**Worst-case emissions, +Refer to measurement uncertainty statement*

Table 15: Transmitter Spurious Emissions – 1GHz to 10GHz – Hybrid mode

| Operating Channel: Middle, (903MHz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Measurement Antenna Polarisation** | **Peak Measurements** | | | | **Average Measurements** | | | |
| | **Frequency (MHz)** | **Result (dBµV/m)** | **Limit (dBµV/m)** | **Delta Limit (dB)** | **Frequency (MHz)** | **Result (dBµV/m)** | **Limit (dBµV/m)** | **Delta Limit (dB)** |
| Horizontal | 5417.520 | 54.5 | 74.0 | -19.5 | 2708.980 | 44.5 | 54.0 | -9.5 |
| | All other Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | | 5417.760 | 51.4 | 54.0 | -2.6+ |
| | | | | | 9029.494 | 45.1 | 54.0 | -8.9 |
| Vertical | 5418.240 | 56.1 | 74.0 | **-17.9*** | 2708.980 | 43.8 | 54.0 | -10.2 |
| | All other Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | | 5418.000 | 52.9 | 54.0 | **-1.1*+** |
| | | | | | 9030.214 | 48.8 | 54.0 | -5.2 |

**Worst-case emissions, +Refer to measurement uncertainty statement*

Table 16: Transmitter Spurious Emissions – 1GHz to 10GHz – Hybrid mode

| Operating Channel: Top, (903.8MHz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Measurement Antenna Polarisation | Peak Measurements | | | | Average Measurements | | | |
| | Frequency (MHz) | Result (dBµV/m) | Limit (dBµV/m) | Delta Limit (dB) | Frequency (MHz) | Result (dBµV/m) | Limit (dBµV/m) | Delta Limit (dB) |
| Horizontal | 5422.320 | 55.0 | 74.0 | -19.0 | 2711.580 | 43.7 | 54.0 | -10.3 |
| | All other Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | | 5422.560 | 51.4 | 54.0 | -2.6+ |
| | | | | | 9037.773 | 47.2 | 54.0 | -6.8 |
| Vertical | 5422.560 | 55.9 | 74.0 | **-18.1*** | 2711.580 | 42.8 | 54.0 | -11.2 |
| | All other Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | | 5422.560 | 52.1 | 54.0 | **-1.9*+** |
| | | | | | 9037.413 | 46.5 | 54.0 | -7.5 |

**Worst-case emissions, +Refer to measurement uncertainty statement*

Table 17: Transmitter Spurious Emissions – 1GHz to 10GHz – Hybrid mode

The measurement uncertainty was calculated as follows:

| Measurement frequency range | Calculated measurement uncertainty |
|---|---|
| 30MHz to 1GHz | ±4.65dB |
| 1GHz to 6GHz | ±4.83dB |
| 6GHz to 18GHz | ±4.49dB |
| 18GHz to 26.5GHz | ±4.46dB |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 56% |
| Atmospheric pressure: | 1007.4 to 1011.5hPa |

Table 18: Climatic conditions

**Calculation:** The above results are based upon the following calculation:

$$E = V_{QP/PK/AV} + AF - G_{Amp} + L_C$$

Where:

$E$ = E-field in dBµV/m
$V_{QP/PK/AV}$ = Measured Voltage (Quasi Peak, Peak or Average) in dBµV
$AF$ = Antenna Factor in dB(/m)
$L_C$ = Cable and attenuator Loss in dB
$G_{Amp}$ = Pre Amplifier Voltage Gain in dB

Example calculation:

$E = V_{PK} + AF - G_{Amp} + L_C$
$E$ = 30dBµV + 12dB/m - 0dB + 2.3dB
$E$ = 44.3 dBµV/m

**Notes:** All Transmitter Radiated spurious emissions in restricted bands measurements were below the specified limits.

Radiated Emissions measurements were made up to the 10th harmonic.

The transmitter was continuously transmitting in Hybrid mode.

**Assessment:** The EUT complied with the Radiated emissions in Restricted bands requirements of CFR47 FCC Part 15, Subpart C, 15.247 (d).

# 14. Out of Band emissions (100kHz, -30dBc) - FCC 15.247 (d)

## 14.1. Test Procedure

The Out of band emissions in non-restricted bands were performed in accordance with the section 11.11 of ANSI C63.10 – 2013.

Measurements were performed at the antenna port.

The transmitter output was connected to a spectrum analyzer through a suitable attenuator (Conducted method). The out of band emissions were measured by spectrum analyzer with 100kHz RBW and 300kHz VBW using the peak detector. All measuring system correction factors (attenuators and cables) were used to get a true measurement.

Reference and emission level measurements were performed as per section 11.11.2 and 11.11.3 of ANSI ANSI C63.10 - 2013.

*(Refer to photographs in Annex C for views of the test configuration)*

## 14.2. Limits

As per section 15.247(d) of 47 CFR Part 15 Subpart C:

- 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of section 15.247 of 47 CFR Part 15 Subpart C, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section 15.209(a) of 47 CFR Part 15 Subpart C is not required. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a) of 47 CFR Part 15 Subpart C, must also comply with the radiated emission limits specified in section15.209(a) of 47 CFR Part 15 Subpart C (see §15.205(c) of 47 CFR Part 15 Subpart C).

The measured highest fundamental channel PSD in 100kHz was +16.5dBm

| Frequency Range (MHz) | Limits (dBm) |
|---|---|
| 30MHz and 10GHz | -13.5 |

Table 19: Limits for Unwanted Emissions - -30dBc (Non-restricted bands)

### 14.3. Test Results

Unwanted emissions measurements are detailed as follows:

*(Refer to graphs in Appendix C.3)*

| Channel | Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Delta limit (dB) |
|---|---|---|---|---|
| Bottom | Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | |
| Middle | Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | |
| Top | Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed | | | |

Table 20: Transmitter Out of Band emissions - -30dBc/100kHz – Hybrid mode

The measurement uncertainty was calculated as follows:

| Measurement frequency range | Calculated measurement uncertainty |
|---|---|
| 30MHz to 1GHz | ±4.65dB |
| 1GHz to 6GHz | ±4.83dB |
| 6GHz to 18GHz | ±4.49dB |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%. The referenced uncertainty standard specifies that determination of compliance shall be based on measurements without taking into account measurement uncertainty. However, the measurement uncertainty shall appear in the test report.

**Notes:** All Transmitter Out of Band emissions measurements were below the specified limits (-30dBc).

Radiated measurements were made up to the 10$^{th}$ harmonic.

The transmitter was continuously transmitting in Hybrid mode.

**Assessment:** The EUT complied with the Out of Band emissions (100kHz, -30dBc) requirements of CFR47 FCC Part 15, Subpart C, 15.247 (d).

# 15. Emissions on the Band edge – FCC 15.247 (d)

## 15.1. Test Procedure

The Band edge Measurement (100kHz, -30dB from fc) was performed in accordance with the section 11.11 and 11.13 of ANSI C63.10 – 2013.

Conducted measurements were performed within 2 MHz of the authorised lower and higher band-edge.

At the lowest channel, 99% Occupied Band Width of the fundamental channel emission was within 2 MHz of the authorised Lower band edge therefore Marker-delta method was used. Unwanted emission at the lower and higher band-edge were performed as per section 6.10.4 of ANSI C63.10 - 2013. At authorised-band band edge where the requiring band-edge emission attenuation is -30dB in a 100kHz bandwidth relative to the highest fundamental channel PSD in 100kHz, measurements were performed as per as section 6.10.4 of ANSI C63.10 - 2013.

*(Refer to photographs in Annex C for views of the test configuration)*

## 15.2. Limits

Band edge in Non-restricted Bands

As per CFR47 FCC Part 15, Subpart C, 15.247 (d) the EUT shall meet the requirements that in any given 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 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The measured highest fundamental channel PSD in 100kHz was +16.5dBm

| Band edge Frequencies | Limits (dBm) |
|---|---|
| Lower Edge (902MHz) | -13.5 |
| Higher Edge (928MHz) | |

Table 21: Limits for Band edge - -30dBc (Non-restricted bands)

### 15.3. Test Results

Band edge measurements are detailed as follows:

*(Refer to graphs in Appendix C.2)*

| Operating Channel: Bottom (902.4MHz) | | | |
|---|---|---|---|
| **Frequency (MHz)** | **Result Peak Power Spectral Density (dBm/100kHz)** | **Limit Peak Power Spectral Density (dBm/100kHz)** | **Delta limit (dB)** |
| 901.953 | -37.7 | -13.5 | **-24.2*** |
| 901.999 | -39.2 | -13.5 | -25.7 |

**Worst-case emissions*

Table 22: Transmitter Emissions on the Band edge – Low end – Hybrid Mode (Hopping OFF)

| Operating Channel: Top (903.8MHz) | | | |
|---|---|---|---|
| **Frequency (MHz)** | **Result Peak Power Spectral Density (dBm/100kHz)** | **Limit Peak Power Spectral Density (dBm/100kHz)** | **Delta limit (dB)** |
| 928.000 | -41.5 | -13.5 | -28.0 |

Table 23: Transmitter Emissions on the Band edge – High end – Hybrid Mode (Hopping OFF)

| Operating Channel: Bottom (902.4MHz) | | | |
|---|---|---|---|
| **Frequency (MHz)** | **Result Peak Power Spectral Density (dBm/100kHz)** | **Limit Peak Power Spectral Density (dBm/100kHz)** | **Delta limit (dB)** |
| 901.860 | -37.1 | -13.5 | **-23.6*** |
| 902.000 | -40.6 | -13.5 | -27.1 |

**Worst-case emissions*

Table 24: Transmitter Emissions on the Band edge – Low end – Hybrid Mode (Hopping ON)

| Operating Channel: Top (903.8MHz) | | | |
|---|---|---|---|
| **Frequency (MHz)** | **Result Peak Power Spectral Density (dBm/100kHz)** | **Limit Peak Power Spectral Density (dBm/100kHz)** | **Delta limit (dB)** |
| 928.000 | -41.4 | -13.5 | -27.9 |

Table 25: Transmitter Emissions on the Band edge – High end – Hybrid Mode (Hopping ON)

The measurement uncertainty was calculated as follows:

| Measurement frequency range | Calculated measurement uncertainty |
|---|---|
| 30MHz to 10GHz | ±1.4dB |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 51% |
| Atmospheric pressure: | 1010.8 to 1011.5hPa |

Table 26: Climatic conditions

**Notes:** All Band edge measurements were below the specified limits.

The transmitter was continuously transmitting in Hybrid mode.

**Assessment:** The EUT complied with the Transmitter Emissions on the Band edge requirements of CFR47 FCC Part 15, Subpart C, 15.247 (d).

# 16. Power Spectral Density – FCC 15.247 (e)

## 16.1. Test Procedure

The Power Spectral Density was performed in accordance with the section 11.10.3 of ANSI C63.10 - 2013.

The transmitter output was connected to a spectrum analyzer through a suitable attenuator (Conducted method). The Power Spectral density was measured in a 3kHz bandwidth of the fundamental frequency by spectrum analyzer with 3kHz RBW and 30kHz VBW using the power averaging (RMS) detector and a suitable span (at least 1.5 times of OBW) and number of measurement points (≥ 2 x span/RBW) to allow accurate measurements. Measurement was performed with trace averaging over (RMS) mode over a 100 traces and used the peak marker function to determine the maximum amplitude level.. An offset for the measurement path insertion loss (e.g. attenuators and cables) was used to get a true measurement.

*(Refer to photographs in Annex C for views of the test configuration)*

## 16.2. Limits

As specified in Section 15.247(f), a hybrid system must comply with the power density standard of 8 dBm in any 3 kHz band when the frequency hopping function is turned off.

| Transmit operating frequency (MHz) | Limit |
|---|---|
| 902 – 928 | 8dBm/3kHz |

Table 27: Power Spectral Density limits

## 16.3. Test Results

Power Spectral Density measurements are tabulated below:

*(Refer to graphs in Appendix C.4)*

| Channel | Frequency (MHz) | Measured Power (dBm) | Limit (dBm/3kHz) | Margin (dB) | Result |
|---|---|---|---|---|---|
| Bottom | 902.403 | +4.9 | 8.0 | **-3.1*+** | Complied |
| Middle | 903.016 | +4.8 | 8.0 | -3.2+ | Complied |
| Top | 903.783 | +4.4 | 8.0 | -3.6+ | Complied |

**Worst-case emissions, +Refer to measurement uncertainty statement*

Table 28: Results for Power Spectral Density – 3kHz RBW

The measurement uncertainty was calculated at ±1.4dB. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of approximately *k=2* which gives a level of confidence of approximately 95%.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 51% |
| Atmospheric pressure: | 1010.8 to 1011.5hPa |

Table 29: Climatic conditions

**Notes:** All Power Spectral Density measurements were below the specified limits.

The transmitter was continuously transmitting (the frequency hopping function was turned off).

**Assessment:** The EUT complied with the Power Spectral Density requirements of CFR47 FCC Part 15, Subpart C, 15.247 (e).

# 17. Number of Hopping Frequencies

## 17.1. Limits

For a hybrid system, the number of hopping frequencies limits are not defined in CFR47 FCC Part 15, Subpart C, 15.247.

## 17.2. Test Procedure

The Number of Hopping Frequencies measurement was performed in accordance with the section 7.8.3 of ANSI C63.10 – 2013.

The Number of Hopping Frequencies measurements were performed at the antenna port (Conducted method). The transmitter output was connected to a spectrum analyzer through a suitable attenuator. The spectrum analyser was tuned to the fundamental (transmit frequency) of the transmitter centre channel with 30kHz RBW and 100kHz VBW using the peak detector and a suitable span to allow accurate measurements.

*(Refer to photographs in Annex C for views of the test configuration)*

## 17.3. Test Results

Number of hopping frequencies measured is tabulated below:

*(Refer to graph in Appendix C.7)*

| Frequency (MHz) | Measured number of channels |
|---|---|
| 902.4MHz to 903.8MHz | 8 |

Table 30: Measurement results of the Number of Hopping channels

The measurement uncertainty was calculated as follows:

| Measurement Parameter | Calculated measurement uncertainty |
|---|---|
| Operating Frequency | ±10.5kHz |
| Bandwidth | ±14.96kHz |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 51% |
| Atmospheric pressure: | 1010.8 to 1011.5hPa |

Table 31: Climatic conditions

**Notes:** There is no minimum number of hopping channels requirements for hybrid system.

**Assessment:** Number of Hopping frequencies measured is 8 (Informative only).

# 18. Channel Occupancy Time

## 18.1. Limits

The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

## 18.2. Test Procedure

The Channel Occupancy Time measurement was performed in accordance with the section 7.8.4 of ANSI C63.10 – 2013.

The Channel Occupancy Time measurements were performed at the antenna port (Conducted method). The transmitter output was connected to a spectrum analyzer through a suitable attenuator. The spectrum analyser was tuned to the fundamental (transmit frequency) of the transmitter bottom channel with zero span, 100kHz RBW and 300kHz VBW using the peak detector. The marker delta function was used to measure the occupancy time.

*(Refer to photographs in Annex C for views of the test configuration)*

## 18.3. Test Results

Channel occupancy time measurements are tabulated below:

*(Refer to photographs in Annex C for views of the test configuration)*

| Transmit frequency (MHz) | Measured duration (s) | Limit – Maximum duration (s) | Result |
|---|---|---|---|
| 902.4 | 0.38 | 0.4* | Complied |

**maximum 0.4 second average occupancy time in 3.2seconds (8 channels x 0.4second)*

Tale 32: Measurement results of channel occupation time

The measurement uncertainty was calculated as follows:

| Measurement Parameter | Calculated measurement uncertainty |
|---|---|
| Operating Frequency | ±10.5kHz |
| Bandwidth | ±14.96kHz |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 51% |
| Atmospheric pressure: | 1010.8 to 1011.5hPa |

Table 33: Climatic conditions

**Notes:** The transmitter was continuously transmitting in Hybrid mode with the direct sequence or digital modulation operation turned-off.

**Assessment:** The EUT complied with the Channel Occupancy Time requirements of CFR47 FCC Part 15, Subpart C, 15.247 (f).

# 19. Channel Separation

## 19.1. Limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

## 19.2. Test Procedure

The Channel Separation measurement was performed in accordance with the section 7.8.2 of ANSI C63.10 – 2013.

The Channel Occupancy measurements were performed at the antenna port (Conducted method). The transmitter output was connected to a spectrum analyzer through a suitable attenuator. The marker delta function of the analyser was used to measure the frequency separation between two adjacent channels.

*(Refer to photographs in Annex C for views of the test configuration)*

## 19.3. Test Results

Channel separation measurements are tabulated below:

*(Refer to photographs in Annex C for views of the test configuration)*

| Measured Separation (kHz) | Limit > 25kHz or 20dB BW (kHz) | Result |
|---|---|---|
| 199 | > 142 (20dB BW) | Complied |

Table 34: Measurement results of channel occupation

| Climatic Conditions | |
|---|---|
| Temperature: | 22.5 to 24°C |
| Humidity: | 50 to 51% |
| Atmospheric pressure: | 1010.8 to 1011.5hPa |

Table 35: Climatic conditions

The measurement uncertainty was calculated as follows:

| Measurement Parameter | Calculated measurement uncertainty |
|---|---|
| Operating Frequency | ±10.5kHz |
| Bandwidth | ±14.96kHz |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

**Notes:** The transmitter was continuously transmitting in Hybrid mode.

**Assessment:** The EUT complied with the Channel Separation requirements of CFR47 FCC Part 15, Subpart C, 15.247 (a)(1).

# 20. Radiated Emissions (Receiver Mode) – 15.109

## 20.1. Test Procedure

Radiated Emissions were measured 3 metres away from the EUT in the iOATS (indoor Open Area Test Site) facility, which is an ANSI C63.4 compliant semi-anechoic chamber with ground plane. The EUT was placed on a non-conductive table, at a height of 0.8m above the ground plane.

In the frequency range of 30MHz to 1GHz, a Biconilog antenna was used. For both horizontal and vertical antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 4 different fixed height positions and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 120 kHz and a video bandwidth of 300 kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emissions was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and varying the height of the antenna between 1 and 4 metres to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 120 kHz.

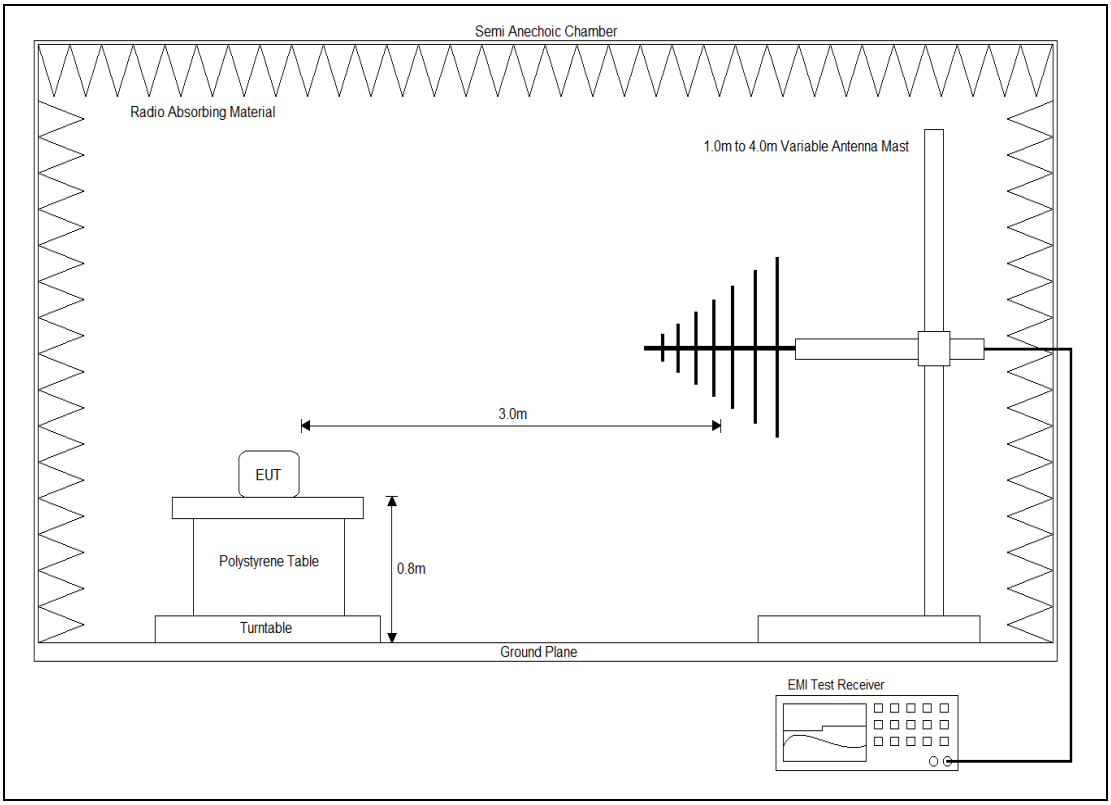



Figure 2: Test setup – 30MHz to 1GHz

In the frequency range 1GHz to 5GHz a Horn antenna was used and an area of 3m x 3m was covered between the antenna and the EUT using RF absorbing material with a rated attenuation more than 20dB over the frequency range. The height of the horn antenna was varied using the antenna bore-sighting technique and the turntable slowly

rotated to maximise the emissions. For both horizontal and vertical antenna polarizations, the Peak and Average preview measurements were performed with a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz. Peak and average emissions that exceeded the applicable limit or were close to the applicable limit were investigated further. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and the antenna height varied (if applicable, using the antenna bore-sighting technique) to find the worst-case emission arrangement. Peak and CISPR Average measurements were then performed using a measuring time of no less than 15 seconds, the maximum emission level in the observed duration was recorded as the final result. The final peak and CISPR Average measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 1 MHz. Peak and Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line with the EUT rotation and antenna height varied (if applicable, using the antenna bore-sighting technique) to produce the highest emission.

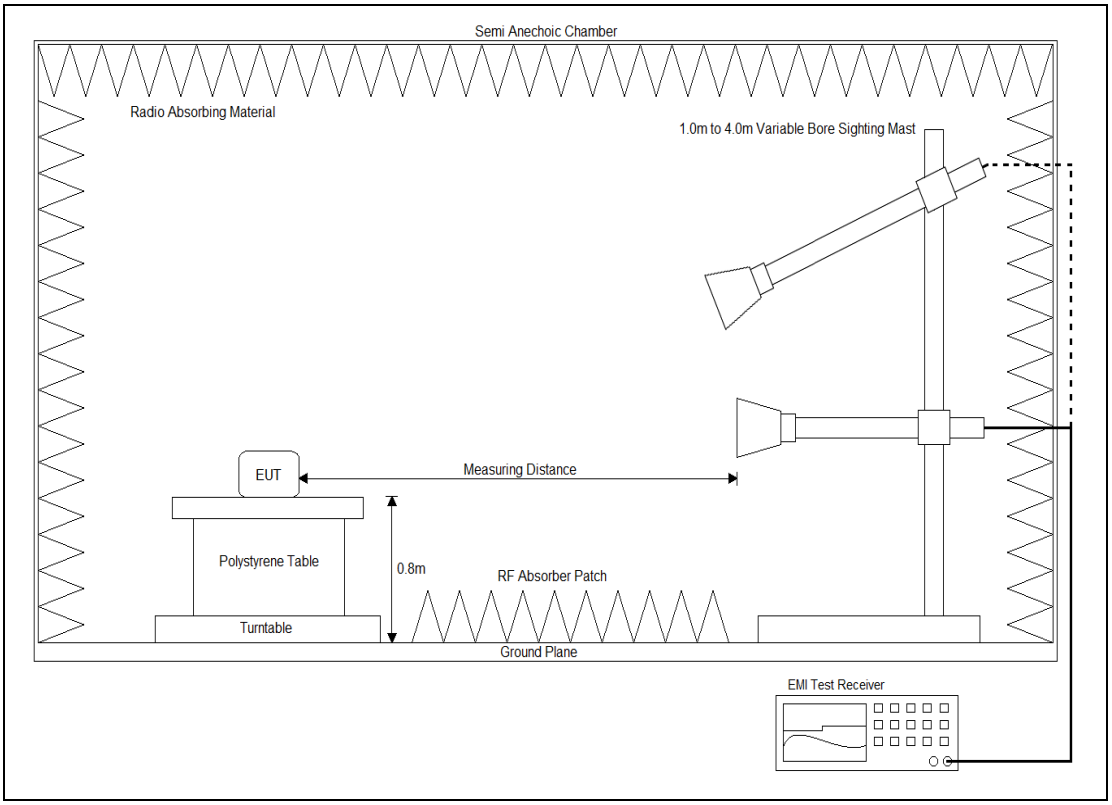



Figure 3: Test setup – above 1GHz

| Horn | Frequency (GHz) | Degrees | Measuring Distance (m) | Illumination (m) | Measuring Distance (m) | Illumination (m) |
|---|---|---|---|---|---|---|
| EMCO 3115 | 1 to 2 | 55.00 | 3 | 3.12 | 1 | 1.04 |
| | 2 to 4 | 50.00 | 3 | 2.80 | 1 | 0.93 |
| | 4 to 6 | 34.00 | 3 | 1.83 | 1 | 0.61 |
| AH SAS-584 | 5.8 to 8.2 | 30.00 | 3 | 1.61 | 1 | 0.54 |
| AH SAS-585 | 8.2 to 12.4 | 30.00 | 3 | 1.61 | 1 | 0.54 |
| AH SAS-586 | 12.4 to 18 | 30.00 | 3 | 1.61 | 1 | 0.54 |
| AH SAS 587 | 18 to 26.5 | 30.00 | 3 | 1.61 | 1 | 0.54 |
| AH SAS 588 | 26.5 to 40 | 31.00 | 3 | 1.66 | 1 | 0.55 |

Table 36: Worst case Maximum size of measuring envelope for Horn antennas

Plots of the accumulated measurement data for both horizontal and vertical antenna polarizations, including all transducer and other measuring system correction factors were produced using commercially available compliant software (as listed in the test equipment list of this report).

*(Refer to photographs in Annex C for views of the test configuration)*

## 20.2.Limits

### 20.2.1. CFR 47 FCC Part 15 Class B Limit

The EUT shall meet the limits in the following table:

| Frequency Range (MHz) | Measuring distance | Limits (dBµV/m) | |
|---|---|---|---|
| | | Quasi-Peak | |
| 30 to 88 | 3m | 40.0 | |
| 88 to 216 | 3m | 43.5 | |
| 216 to 960 | 3m | 46.0 | |
| 960 to 1000 | 3m | 54.0 | |
| **Frequency Range (GHz)** | **Measuring distance** | **Limits (dBµV/m)** | |
| | | **Average** | **Peak** |
| 1.0 to 26.5 | 3m | 54.0 | 74.0 |
| 26.5 to 40.0 | 1m | 64.0 | 84.0 |
| 26.5 to 40.0 | 0.5m | 70.0 | 90.0 |
| NOTE The lower limit shall apply at the transition frequency. | | | |

Table 37: Limits for Radiated Emissions of Class B equipment

## 20.3.Test Results

Radiated Emissions measurements are tabulated below. For below 1GHz measurements, Quasi-peak measurements were performed at spot frequencies where the peak emission was close to, or exceeded the applicable limit line. For above 1GHz measurements, Peak or CISPR Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line.

*(Refer to graphs in Appendix C.6)*

| Measurement Antenna Polarisation | Frequency (MHz) | Result peak (dBµV/m) | Limit Quasi-peak (dBµV/m) | Delta limit (dB) |
|---|---|---|---|---|
| Horizontal | 30.631 | 26.1 | 40.0 | -13.9 |
| | 32.328 | 24.6 | 40.0 | -15.4 |
| | 485.512 | 25.1 | 46.0 | -20.9 |
| | 630.915 | 28.9 | 46.0 | -17.1 |
| | 794.894 | 31.0 | 46.0 | -15.0 |
| | 858.720 | 31.5 | 46.0 | -14.5 |
| Vertical | 30.340 | 31.5 | 40.0 | **-8.5*** |
| | 31.067 | 29.3 | 40.0 | -10.7 |
| | 31.746 | 27.2 | 40.0 | -12.8 |
| | 32.862 | 24.4 | 40.0 | -15.6 |
| | 260.133 | 18.5 | 46.0 | -27.5 |
| | 440.116 | 23.2 | 46.0 | -22.8 |

**Worst-case emission*

Table 38: Radiated Emissions – (30MHz to 1GHz)

| Measurement Antenna Polarisation | Peak Measurements | | | | Average Measurements | | | |
|---|---|---|---|---|---|---|---|---|
| | Frequency (MHz) | Result (dBµV/m) | Limit (dBµV/m) | Delta Limit (dB) | Frequency (MHz) | Result (dBµV/m) | Limit (dBµV/m) | Delta Limit (dB) |
| Horizontal | Peak emissions were not above the measurements system noise floor or at least 20dB below the limit | | | | Average emissions were not above the measurements system noise floor or at least 20dB below the limit | | | |
| Vertical | Peak emissions were not above the measurements system noise floor or at least 20dB below the limit | | | | Average emissions were not above the measurements system noise floor or at least 20dB below the limit | | | |

Table 39: Radiated Emissions – (1GHz to 5GHz)

The measurement uncertainty was calculated as follows:

| Measurement frequency range | Calculated measurement uncertainty |
|---|---|
| 30MHz to 1GHz | ±4.65dB |
| 1GHz to 6GHz | ±4.83dB |

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%. The referenced uncertainty standard specifies that determination of compliance shall be based on measurements without taking into account measurement uncertainty. However, the measurement uncertainty shall appear in the test report.

| Climatic Conditions | |
|---|---|
| Temperature: | 22.9 to 23°C |
| Humidity: | 50% |
| Atmospheric pressure: | 1008.6 to 1009.0hPa |

Table 40: Climatic conditions

**Calculation:** The above results are based upon the following calculation:

$$E = V_{QP/PK/AV} + AF - G_{Amp} + L_C$$

Where:

| | | |
|---|---|---|
| E | = | E-field in dBμV/m |
| $V_{QP/PK/AV}$ | = | Measured Voltage (Quasi Peak, Peak or Average) in dBμV |
| AF | = | Antenna Factor in dB(/m) |
| $L_C$ | = | Cable and attenuator Loss in dB |
| $G_{Amp}$ | = | Pre Amplifier Voltage Gain in dB |

Example calculation:

$E = V_{QP} + AF - G_{Amp} + L_C$
$E = 30dB\mu V + 12dB/m - 0dB + 2.3dB$
$E = 44.3\ dB\mu V/m$

**Notes:** All Radiated Emissions measured were below the FCC Class B limits.

If the highest frequency generated or used within the device or on which the device operates or tunes is between 500MHz and 1000MHz, the upper frequency of measurement range should be 5000MHz.

The highest frequency of the EUT as specified by the customer is 903.8MHz as such measurements up to 5GHz were taken.

**Assessment:** The EUT complied with the Radiated Emissions (Receiver Mode) requirements of CFR47 FCC Part 15, Subpart B section 15.109.

## 21. Conclusion

The modified Gallagher Group Ltd, eS1, eShepherd Neckband complied with the applicable requirements of CFR47 FCC Part 15, Subpart C, 15.247 and CFR47 FCC Part 15, Subpart B section 15.109.

# Appendix A – Test Equipment

| Inv. | Equipment | Make | Model No. | Serial No. | Calibration | | |
|---|---|---|---|---|---|---|---|
| | | | | | Interval | Due | Type |
| **Power Spectral Density, Bandwidth, Non-Restricted Transmitter Spurious, Hopping Parameters and Band-edge** | | | | | | | |
| 1217 | ANALYSER, EMI Receiver | Rohde & Schwarz | ESU40 | 100182 | 1 year | Jun-24 | E |
| 0715 | ATTENUATOR, 20dB | JFW | 50HF-020N | | 3 years | Dec-24 | I |
| 1155 | Hygrometer, Temp, Humidity | DigiTech | QM7312 | - | 2 years | Jul-25 | I |
| **Maximum Output Power** | | | | | | | |
| 1243 | RF Power meter Sensor, USB | Dare!! Intruments | RPR3006W | 17100015SN084 | 2 years | Jun-24 | E |
| 0715 | ATTENUATOR, 20dB | JFW | 50HF-020N | | 3 years | Dec-24 | I |
| 1155 | Hygrometer, Temp, Humidity | DigiTech | QM7312 | - | 2 years | Jul-25 | I |
| SW027 | Dare!! Instruments RadiPower Software | Dare!! Instruments | Radimation | Version 2017.2.9 | N/A | N/A | N/A |
| **Transmitter Spurious Emissions and Radiated Emissions (Receiver Mode)** | | | | | | | |
| 1217 | ANALYSER, EMI Receiver | Rohde & Schwarz | ESU40 | 100182 | 1 year | Jun-24 | E |
| 0932 | CONTROLLER, Position | Sunol Sciences | SC104V-3 | 081006-1 | N/A | N/A | V |
| 0933 | TURNTABLE | Sunol Sciences | SM46C | 081006-2 | N/A | N/A | V |
| 0934 | MAST, Antenna | Sunol Sciences | TLT2 | 081006-5 | N/A | N/A | V |
| 0935 | ANTENNA, Biconilog | Sunol Sciences | JB5 | A071106 | 2 years | May-25 | E |
| 0718 | ATTENUATOR, 6dB | JFW | 50FPE-006 | - | 1 year | Jan-25 | I |
| 0989 | CABLE, Coax, Sucoflex 104A | Huber+Suhner | 44454/4A | C357 | 1 year | Jan-25 | I |
| 1145 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84279564 | SN MY056/4PA | 1 year | Jan-25 | I |
| 0024 | ANTENNA, Active Loop | EMCO | 6502 | 2620 | 2 years | Feb-25 | I |
| 0559 | PRE-AMP, Microwave, 18GHz | Miteq | AFS8 | 605305 | 1 year | Apr-24 | I |
| 0633 | ANTENNA, Double Ridge Horn | EMCO | 3115 | 9712-5369 | 3 years | Aug-24 | I |
| 1238 | CABLE, Coax, Sucoflex 126 E | Huber + Suhner | 10422876 | SN 8000495/126E | 1 year | Jan-25 | I |
| 1193 | Standard Gain Horn Antenna - 5.85GHz to 8.2GHz | A.H. Systems, inc | SAS-584 | 186 | 1 year | May-24 | E |
| 1194 | Standard Gain Horn Antenna - 8.2GHz to 12.4GHz | A.H. Systems, inc | SAS-585 | 224 | 1 year | May-24 | E |
| 0711 | ATTENUATOR, 10dB | JFW | 50HF-010N | | 3 years | Dec-24 | I |
| 1250 | FILTER, Hi-Pass | K&L Microwave, Inc | 41H10-00033 | 3 | 2 years | Oct-24 | V |
| 1155 | Hygrometer, Temp, Humidity | DigiTech | QM7312 | - | 2 years | Jul-25 | I |
| 0666 | Enclosure, Semi-Anechoic, No 1 | RFI Industries | S800 iOATS | 1229 | 3 years | Aug-25 | I |
| SW007 | EMC Measurement Software | Rohde & Schwarz | EMC 32 | Version 8.53.0 | N/A | N/A | N/A |

*V: Verification of operation against an internal reference*
*I: Internal calibration against a traceable standard*
*E: External calibration by a NATA or MRA equivalent endorsed facility*
*N/A: Not Applicable*

# Appendix B – Photographs

| Annex | Number | Photograph Description |
|---|---|---|
| A | 1 to 10 | EUT – External views |
| B | 1 to 23 | EUT – Internal views |
| B | 24 | EUT – View of the PCB trace antenna |
| B | 25 | EUT – View of the sample with temporary SMA antenna port connector for Conducted method testing. |
| B | 26 | |
| B | 27 | |
| C | 1 | Radiated measurements – EUT X Orientation |
| C | 2 | Radiated measurements – EUT Y Orientation |
| C | 3 | Radiated measurements – EUT Z Orientation |
| C | 4 | Radiated measurements – 9kHz to 30MHz – X Antenna orientation |
| C | 5 | Radiated measurements – 9kHz to 30MHz – Y Antenna orientation |
| C | 6 | Radiated measurements – 9kHz to 30MHz – Z Antenna orientation |
| C | 7 | Radiated measurements – below 1GHz |
| C | 8 | Radiated measurements – above 1GHz |
| C | 9 | Receiver Mode – Test configuration |
| C | 10 | |
| C | 11 | Conducted measurements |
| C | 12 | Conducted measurements – Power Meter Measurements |

| | |
|---|---|
| EUT External Photographs | EMC Bayswater Test Report E2401-1734-1 Rev1 Annex A |
| EUT Internal Photographs | EMC Bayswater Test Report E2401-1734-1 Rev1 Annex B |
| EUT Orientations & Test Configurations Photographs | EMC Bayswater Test Report E2401-1734-1 Rev1 Annex C |

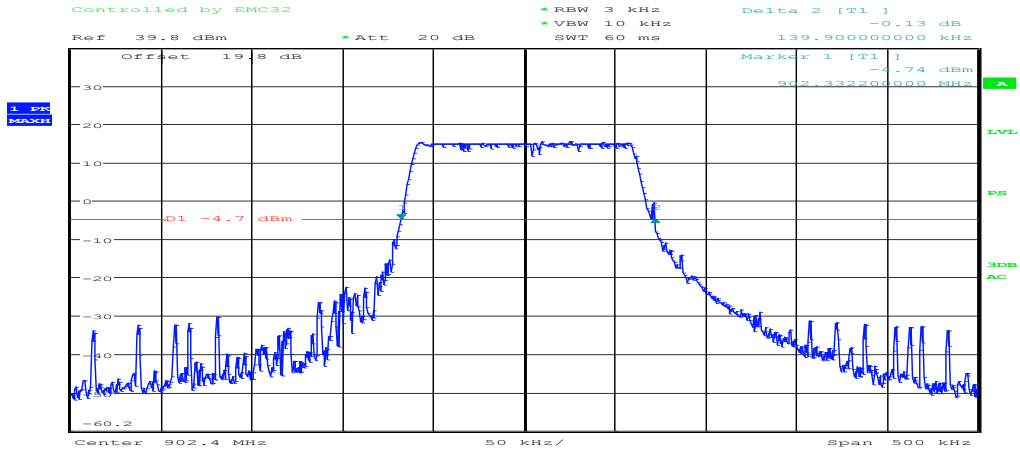
# Appendix C.1 – Measurement Graphs – 20dB Bandwidth - 15.247 (a)(1)

| No. | Test | Graph Description |
|---|---|---|
| 1 | 20dB Bandwidth | 902.4MHz Channel |
| 2 | | 903MHz Channel |
| 3 | | 903.8MHz Channel |

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - 20dB Bandwidth**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



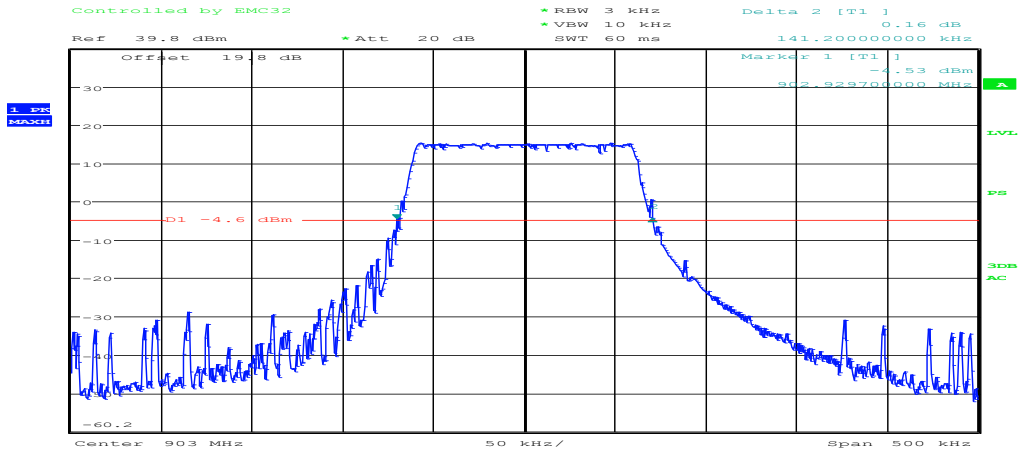



Graph 1

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - 20dB Bandwidth**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



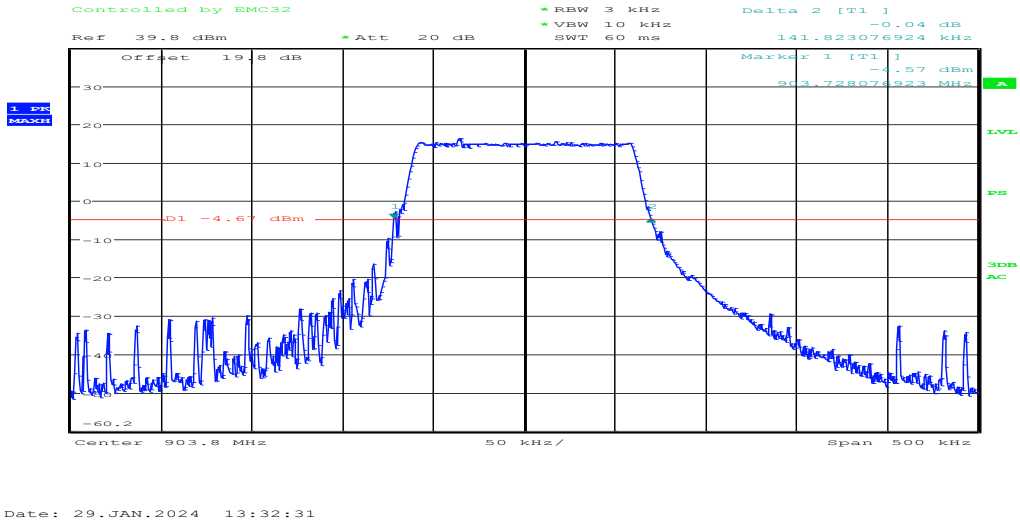



Graph 2

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - 20dB Bandwidth**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ






Graph 3

## Appendix C.2 – Measurement Graphs – Band Edge - 15.247 (d)

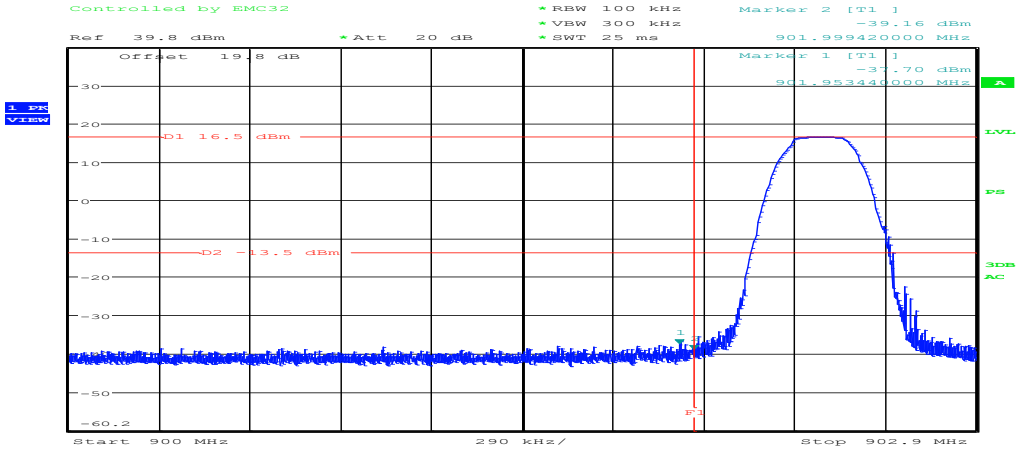
| No. | Test | Graph Description |
|---|---|---|
| 4 | Band edge Measurement – Hybrid Mode (Hopping OFF) | 902.4MHz Channel (Non-restricted Band – Bandedge) |
| 5 | | 903.8MHz Channel (Non-restricted Band – Bandedge) |
| 6 | Band edge Measurement – Hybrid Mode (Hopping ON) | 902.4MHz Channel (Non-restricted Band – Bandedge) |
| 7 | | 903.8MHz Channel (Non-restricted Band – Bandedge) |

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Band edge Measurement (100kHz, -30dB from fc)**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel (Non-restricted Band – Bandedge)**
**Hybrid Mode (Hopping OFF)**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ





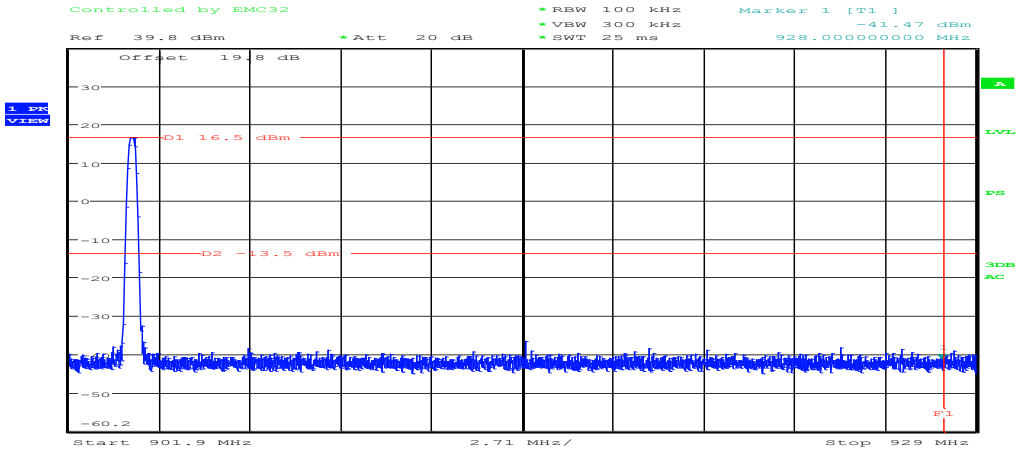

Graph 4

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Band edge Measurement (100kHz, -30dB from fc)**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel (Non-restricted Band – Bandedge)**
**Hybrid Mode (Hopping OFF)**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ



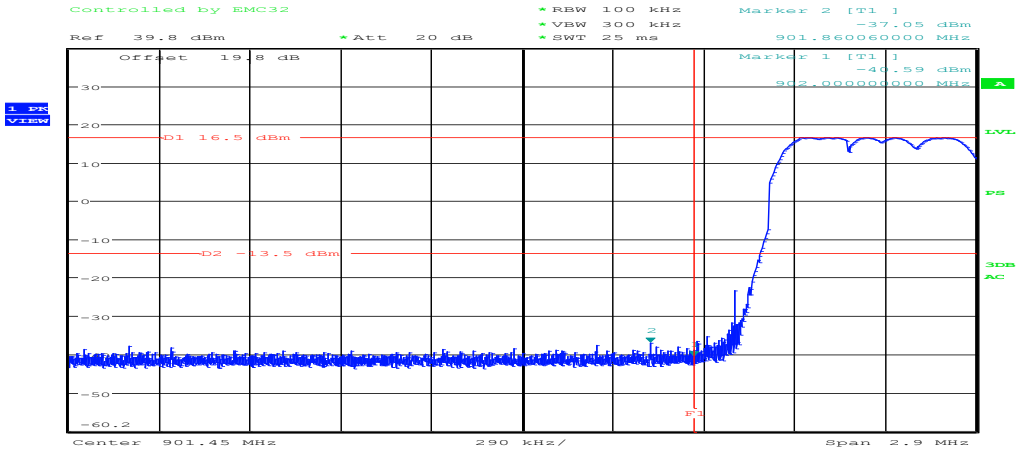



Graph 5

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Band edge Measurement (100kHz, -30dB from fc)**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel (Non-restricted Band – Bandedge)**
**Hybrid Mode (Hopping ON)**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



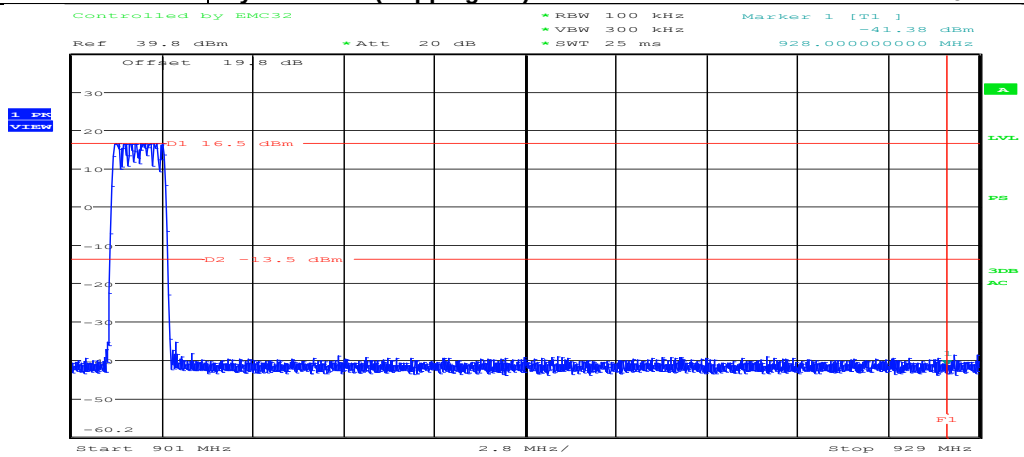



Graph 6

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Band edge Measurement (100kHz, -30dB from fc)**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel (Non-restricted Band – Bandedge)**
**Hybrid Mode (Hopping ON)**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ






Graph 7

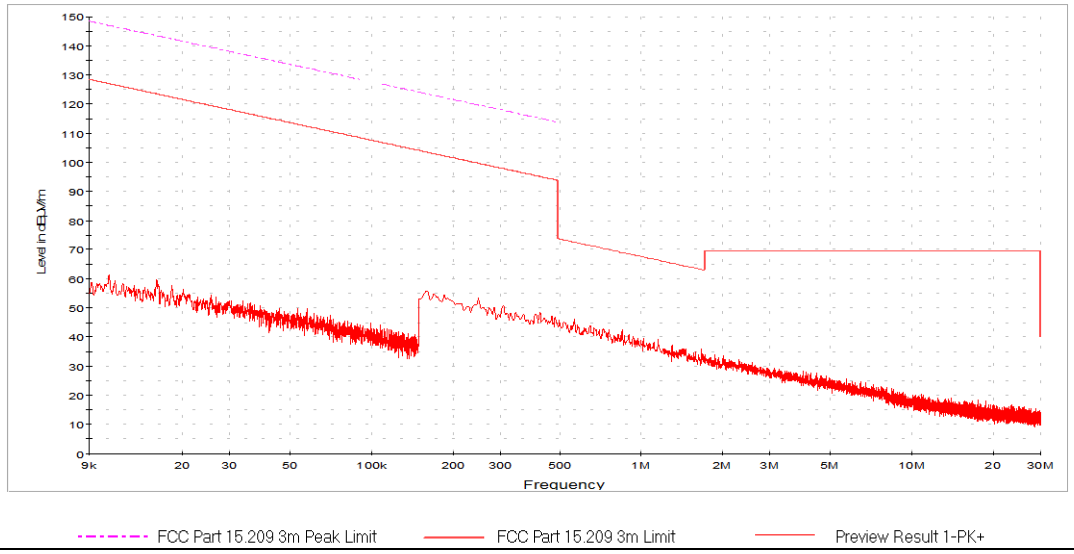
## Appendix C.3 – Measurement Graphs – Transmitter Spurious – FCC 15.247 (d), 15.209

| No. | Test | Graph Description |
|---|---|---|
| 8 | 9kHz to 30MHz Restricted Bands | 902.4MHz Channel, Antenna X |
| 9 | | 902.4MHz Channel, Antenna Y |
| 10 | | 902.4MHz Channel, Antenna Z |
| 11 | | 903MHz Channel, Antenna X |
| 12 | | 903MHz Channel, Antenna Y |
| 13 | | 903MHz Channel, Antenna Z |
| 14 | | 903.8MHz Channel, Antenna X |
| 15 | | 903.8MHz Channel, Antenna Y |
| 16 | | 903.8MHz Channel, Antenna Z |
| 17 | 30MHz to 1GHz Restricted Bands | 902.4MHz Channel, Antenna Horizontal |
| 18 | | 902.4MHz Channel, Antenna Vertical |
| 19 | | 903MHz Channel, Antenna Horizontal |
| 20 | | 903MHz Channel, Antenna Vertical |
| 21 | | 903.8MHz Channel, Antenna Horizontal |
| 22 | | 903.8MHz Channel, Antenna Vertical |
| 23 | 1GHz to 1.3GHz Restricted Bands | 902.4MHz Channel, Antenna Horizontal |
| 24 | | 902.4MHz Channel, Antenna Vertical |
| 25 | | 903MHz Channel, Antenna Horizontal |
| 26 | | 903MHz Channel, Antenna Vertical |
| 27 | | 903.8MHz Channel, Antenna Horizontal |
| 28 | | 903.8MHz Channel, Antenna Vertical |
| 29 | 1.3GHz to 6GHz Restricted Bands | 902.4MHz Channel, Antenna Horizontal |
| 30 | | 902.4MHz Channel, Antenna Vertical |
| 31 | | 903MHz Channel, Antenna Horizontal |
| 32 | | 903MHz Channel, Antenna Vertical |
| 33 | | 903.8MHz Channel, Antenna Horizontal |
| 34 | | 903.8MHz Channel, Antenna Vertical |
| 35 | 5.8GHz to 8.2GHz Restricted Bands | 902.4MHz Channel, Antenna Horizontal |
| 36 | | 902.4MHz Channel, Antenna Vertical |
| 37 | | 903MHz Channel, Antenna Horizontal |
| 38 | | 903MHz Channel, Antenna Vertical |
| 39 | | 903.8MHz Channel, Antenna Horizontal |
| 40 | | 903.8MHz Channel, Antenna Vertical |
| 41 | 8.2GHz to 10GHz Restricted Bands | 902.4MHz Channel, Antenna Horizontal |
| 42 | | 902.4MHz Channel, Antenna Vertical |
| 43 | | 903MHz Channel, Antenna Horizontal |
| 44 | | 903MHz Channel, Antenna Vertical |
| 45 | | 903.8MHz Channel, Antenna Horizontal |
| 46 | | 903.8MHz Channel, Antenna Vertical |
| 47 | 30MHz to 1GHz Non-Restricted Bands | 902.4MHz Channel |
| 48 | | 903MHz Channel |
| 49 | | 903.8MHz Channel |
| 50 | 1GHz to 5GHz Non-Restricted Bands | 902.4MHz Channel |
| 51 | | 903MHz Channel |
| 52 | | 903.8MHz Channel |
| 53 | 5GHz to 10GHz Non-Restricted Bands | 902.4MHz Channel |
| 54 | | 903MHz Channel |
| 55 | | 903.8MHz Channel |

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 9kHz to 30MHz - X Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



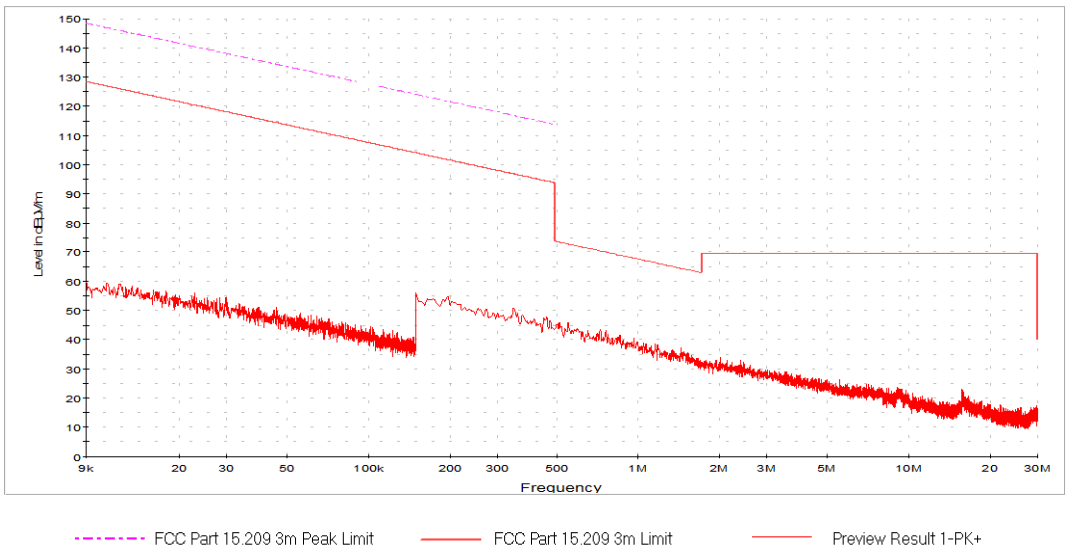



Graph 8

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 9kHz to 30MHz - Y Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



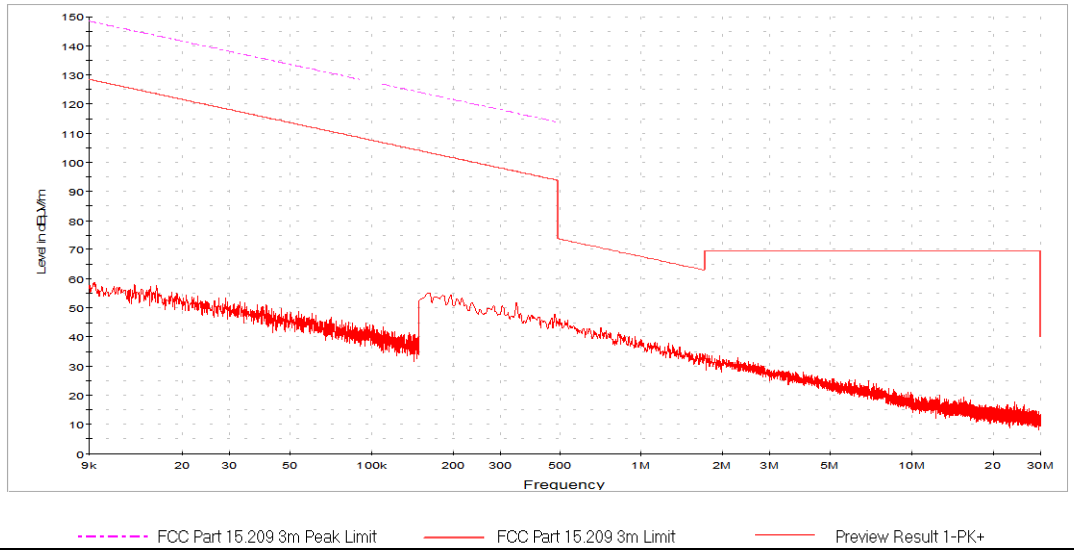



Graph 9

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 9kHz to 30MHz - Z Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



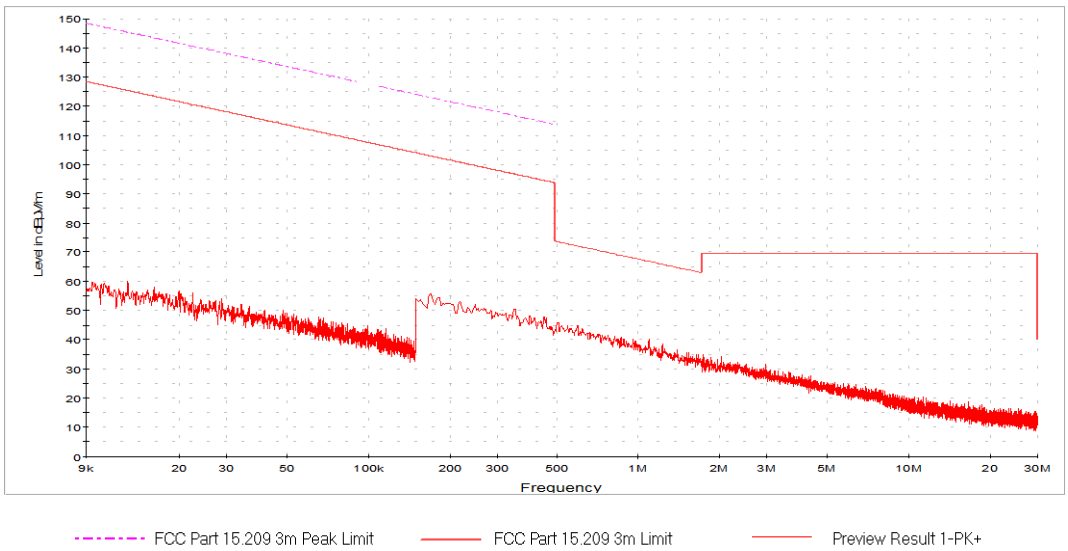



Graph 10

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 9kHz to 30MHz - X Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



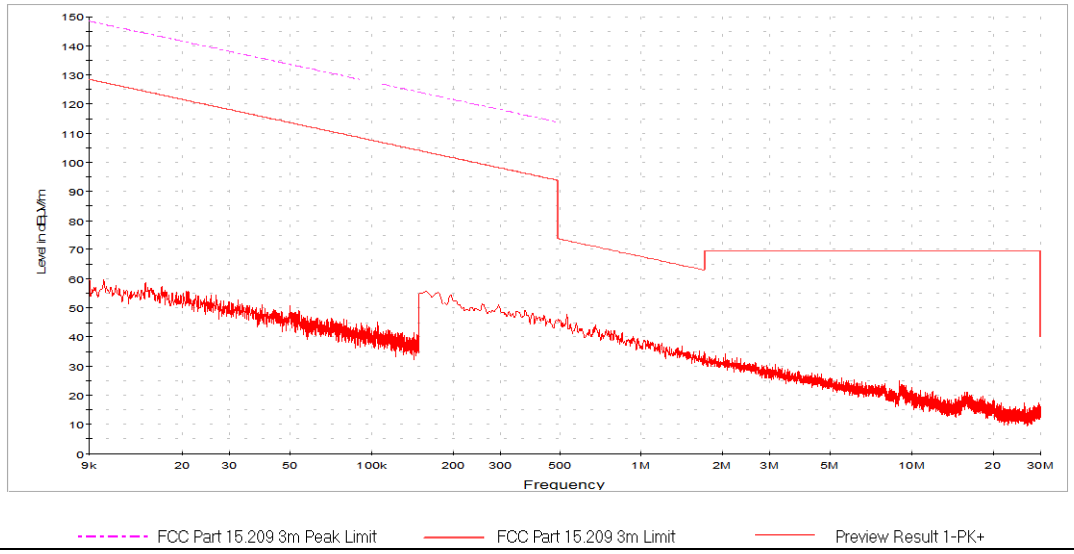



Graph 11

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 9kHz to 30MHz - Y Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



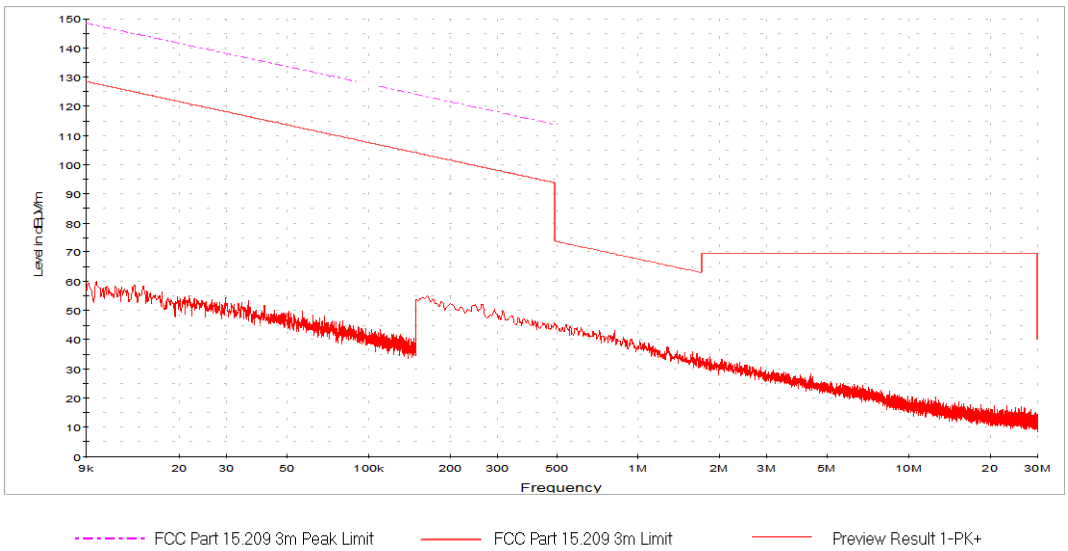



Graph 12

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 9kHz to 30MHz - Z Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



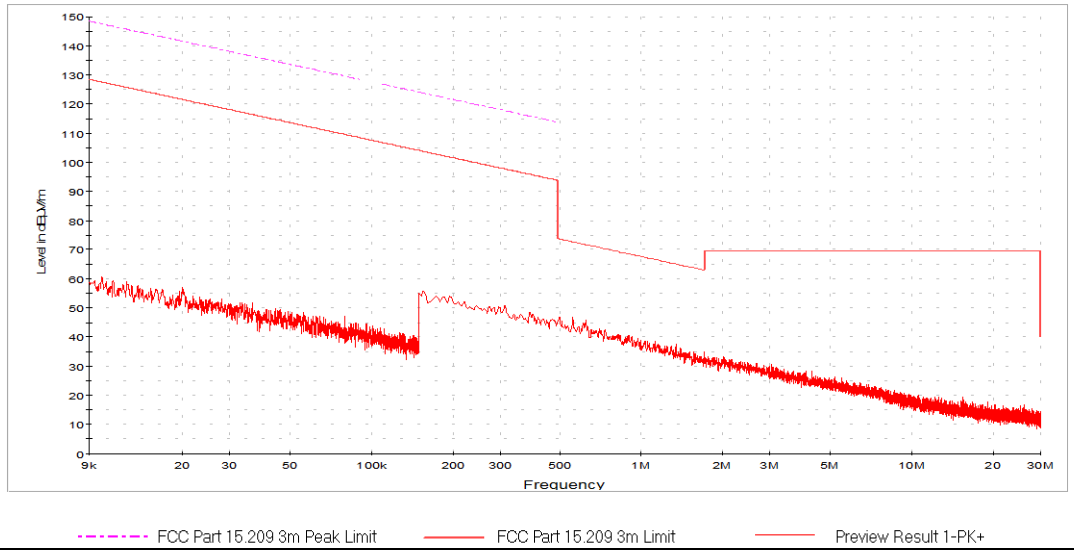



Graph 13

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 9kHz to 30MHz - X Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



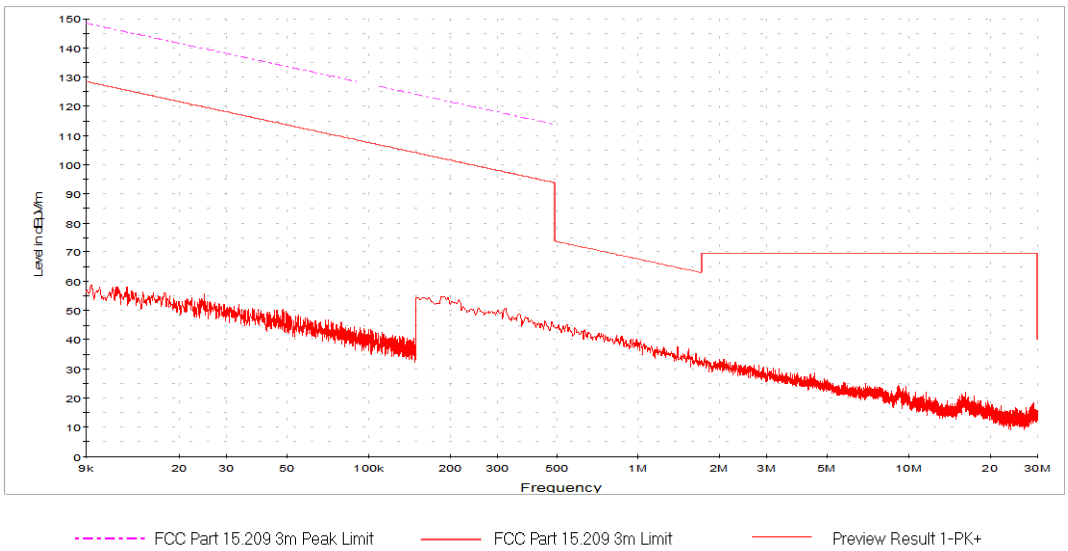



Graph 14

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 9kHz to 30MHz - Y Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



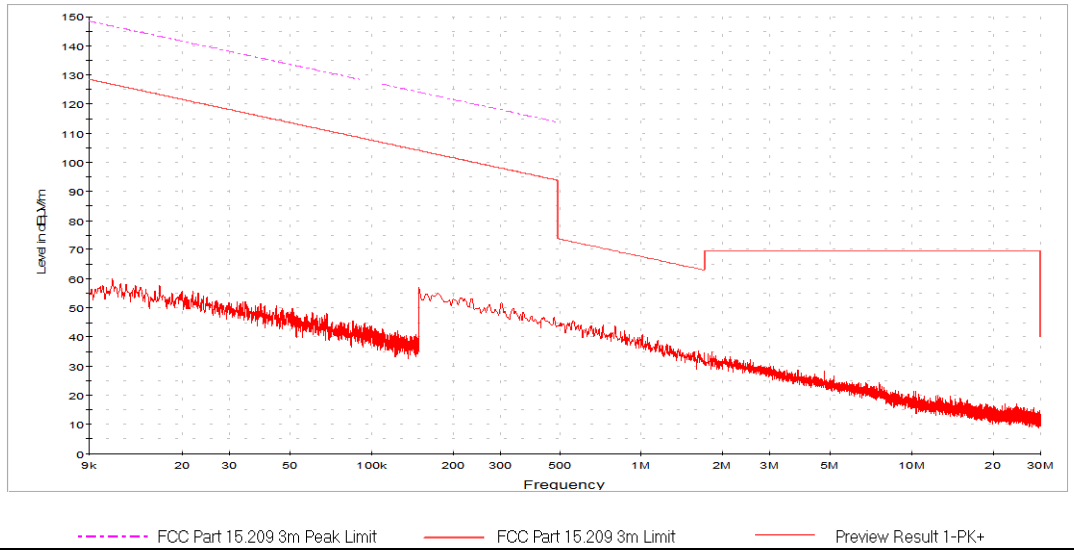



Graph 15

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 9kHz to 30MHz - Z Antenna Orientation**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |



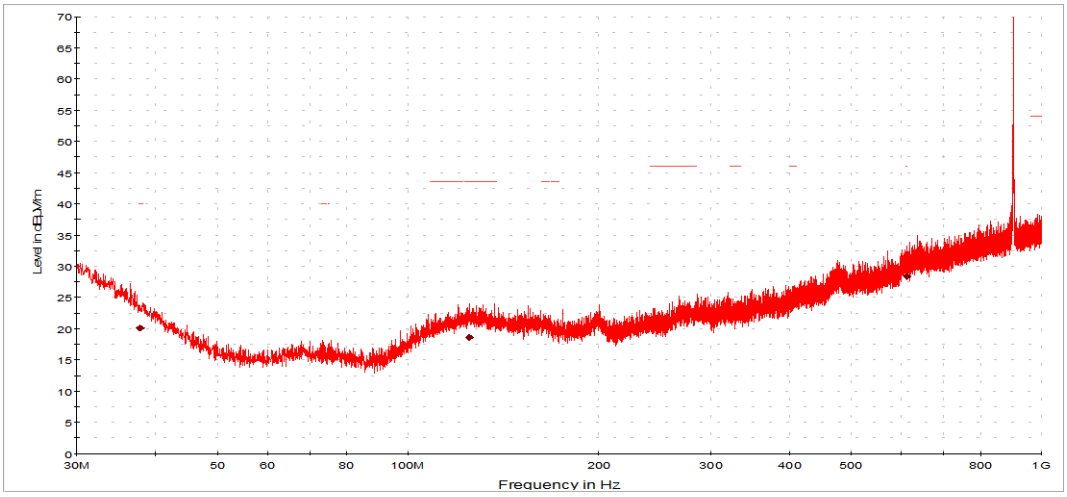



Graph 16

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 30MHz to 1GHz**
**Horizontal Antenna Orientation**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |



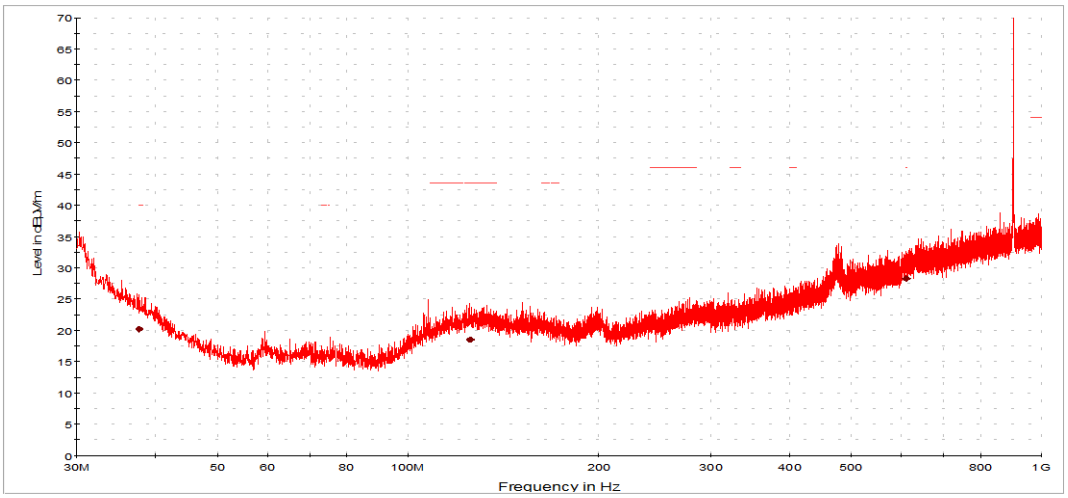



Graph 17

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 30MHz to 1GHz**
**Vertical Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



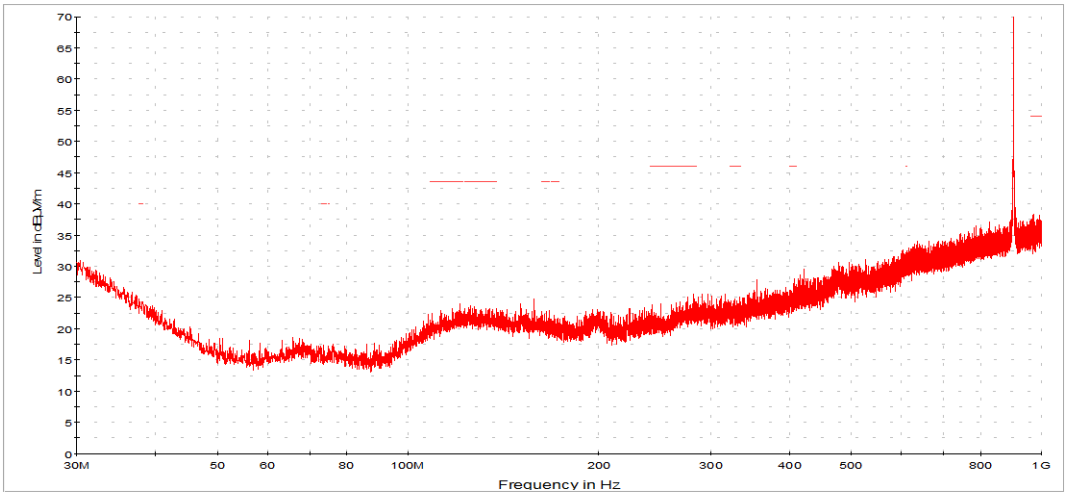



Graph 18

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 30MHz to 1GHz**
**Horizontal Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



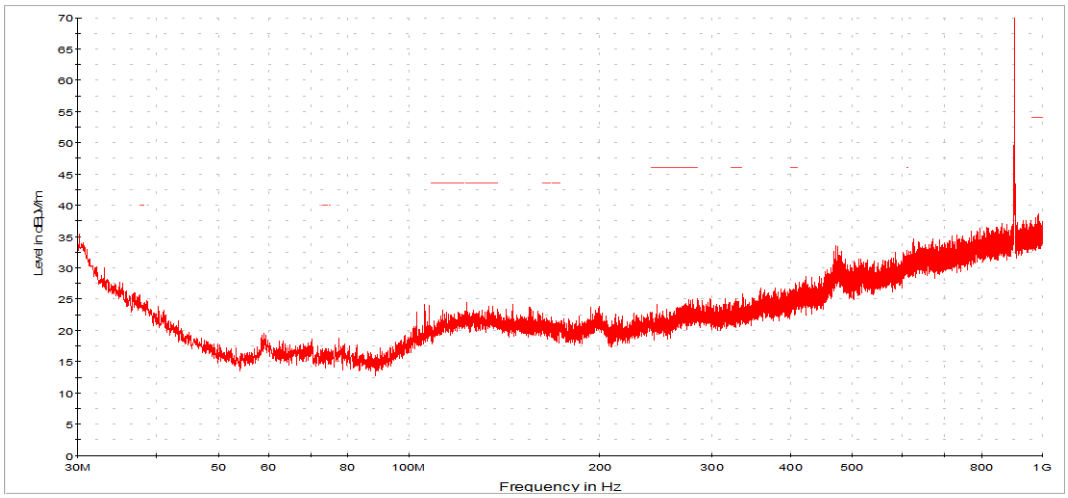



Graph 19

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 30MHz to 1GHz**
**Vertical Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



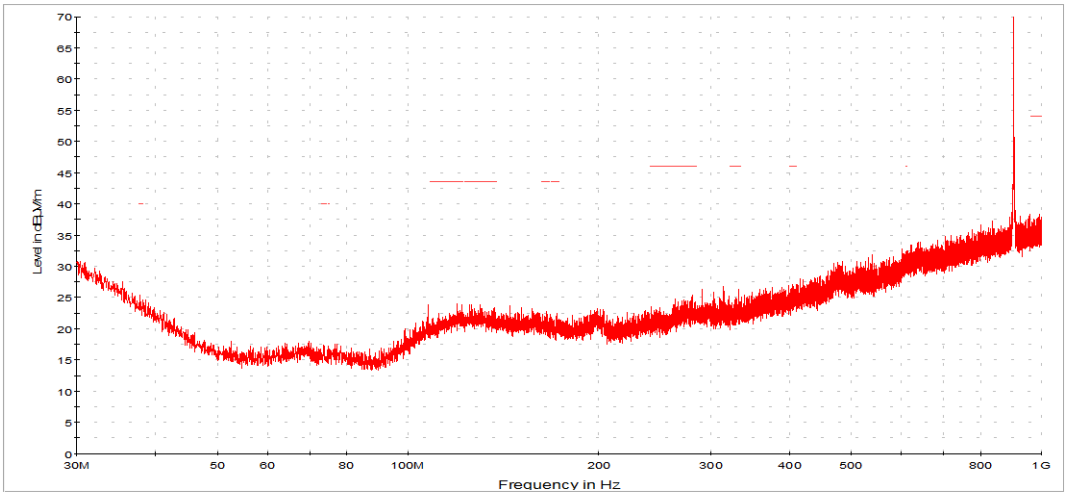



Graph 20

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 30MHz to 1GHz**
**Horizontal Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



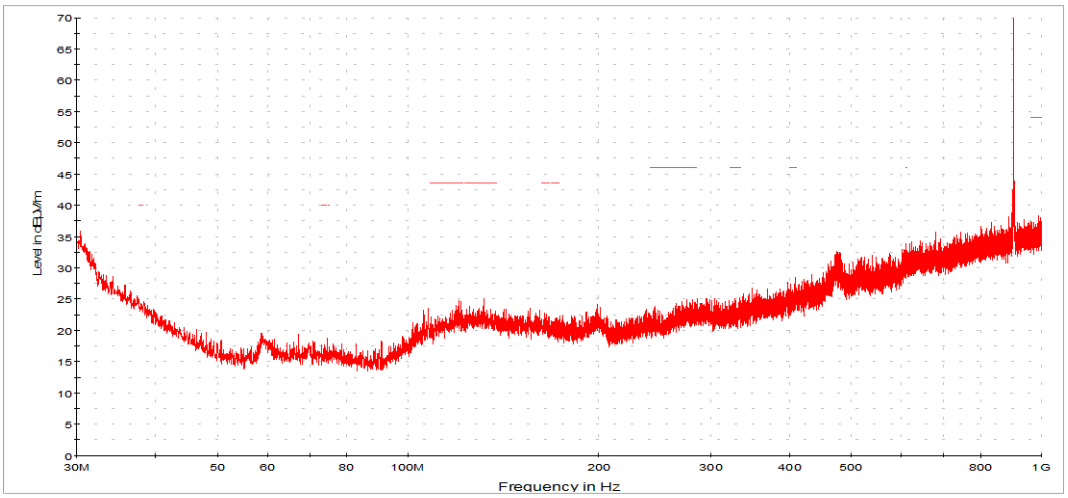



Graph 21

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 30MHz to 1GHz**
**Vertical Antenna Orientation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



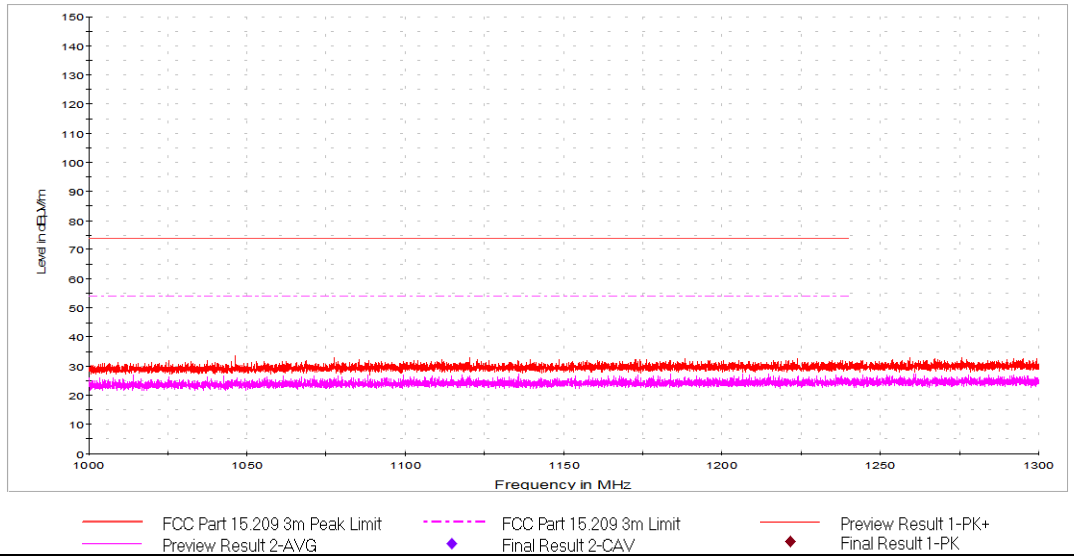



Graph 22

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 1GHz to 1.3GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



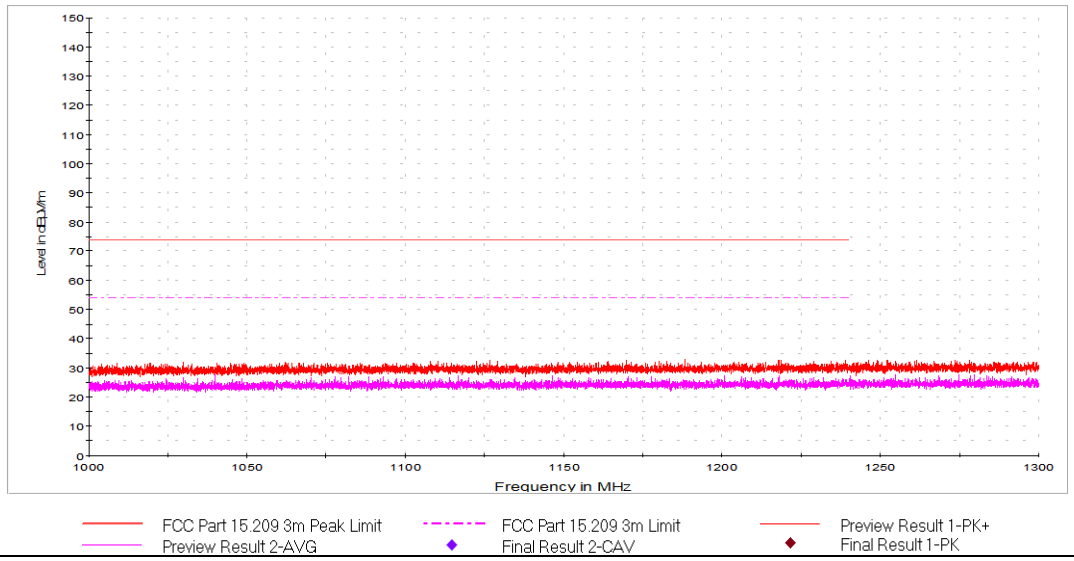



Graph 23

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 1GHz to 1.3GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



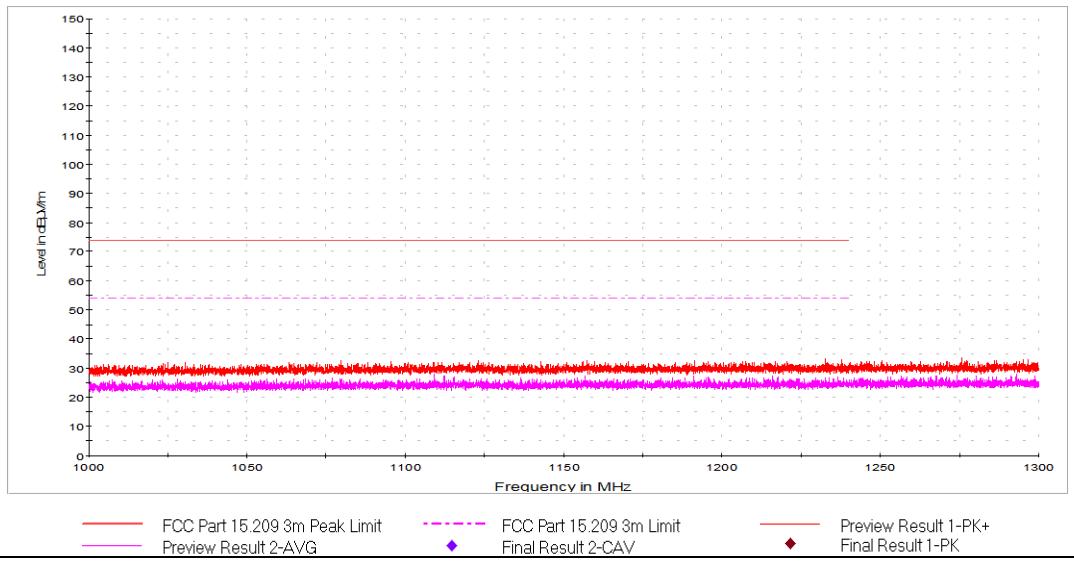



Graph 24

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 1GHz to 1.3GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



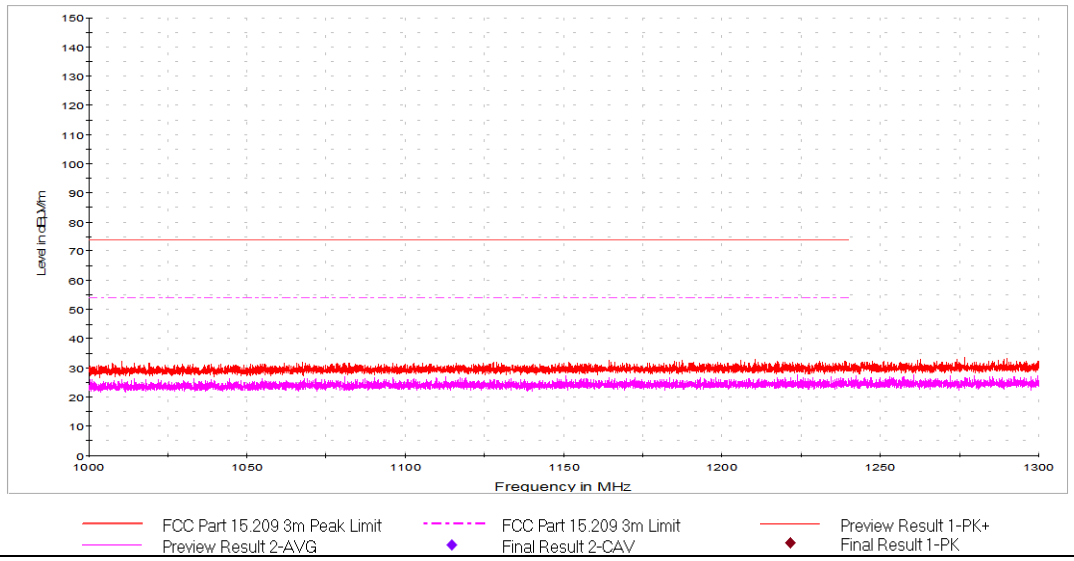



Graph 25

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 1GHz to 1.3GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



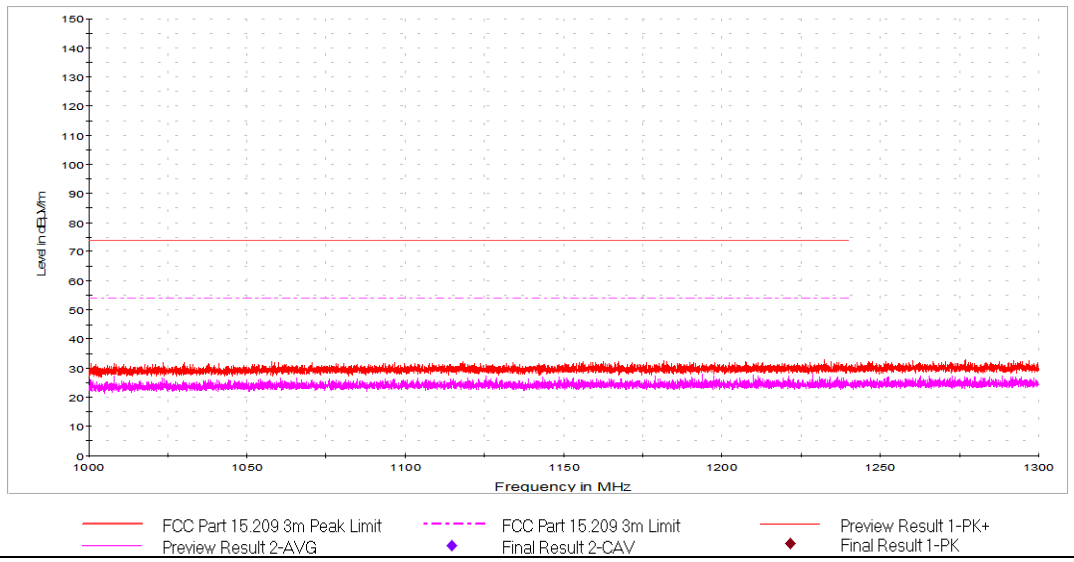



Graph 26

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 1GHz to 1.3GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



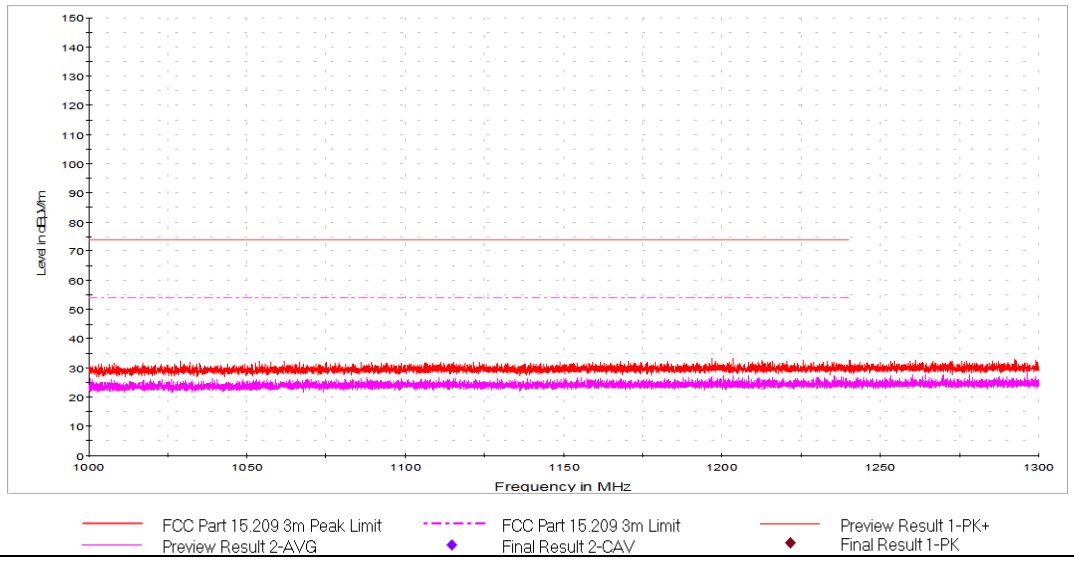



Graph 27

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 1GHz to 1.3GHz**
**Vertical Antenna Polarisation**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |



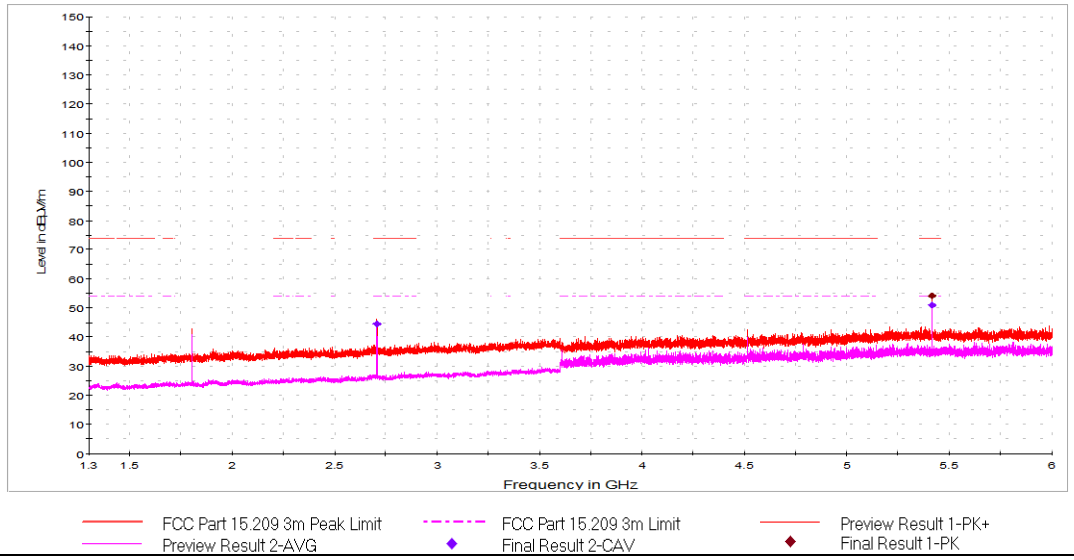



Graph 28

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 1.3GHz to 6GHz**
**Horizontal Antenna Polarisation**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |



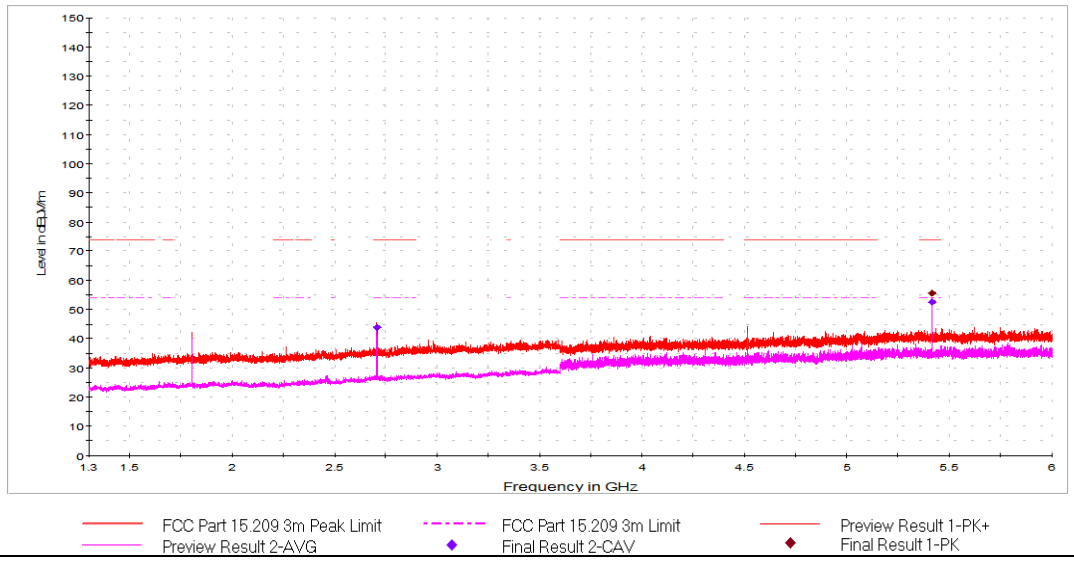



Graph 29

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 1.3GHz to 6GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



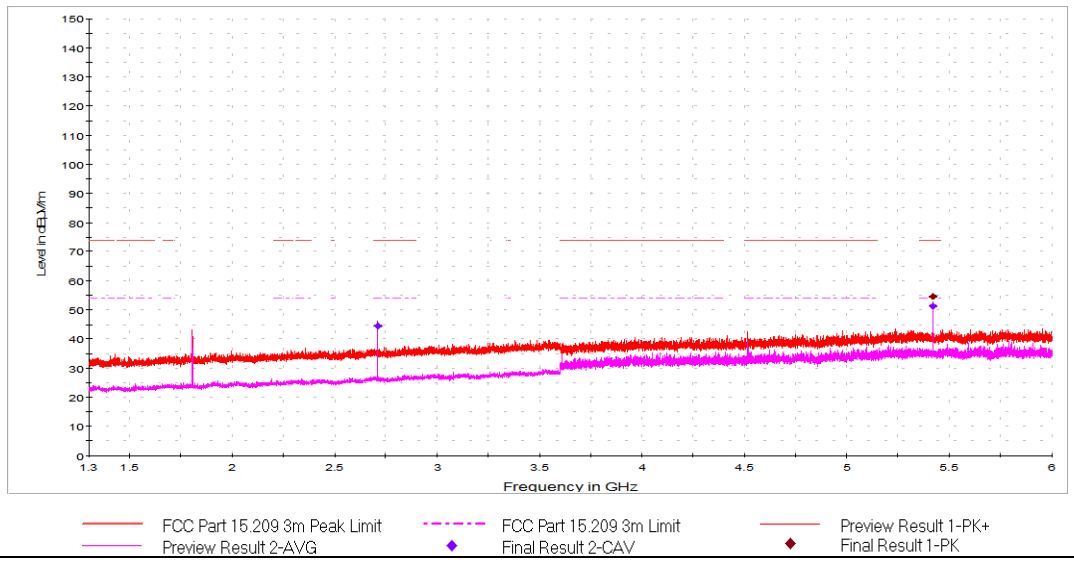



Graph 30

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 1.3GHz to 6GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



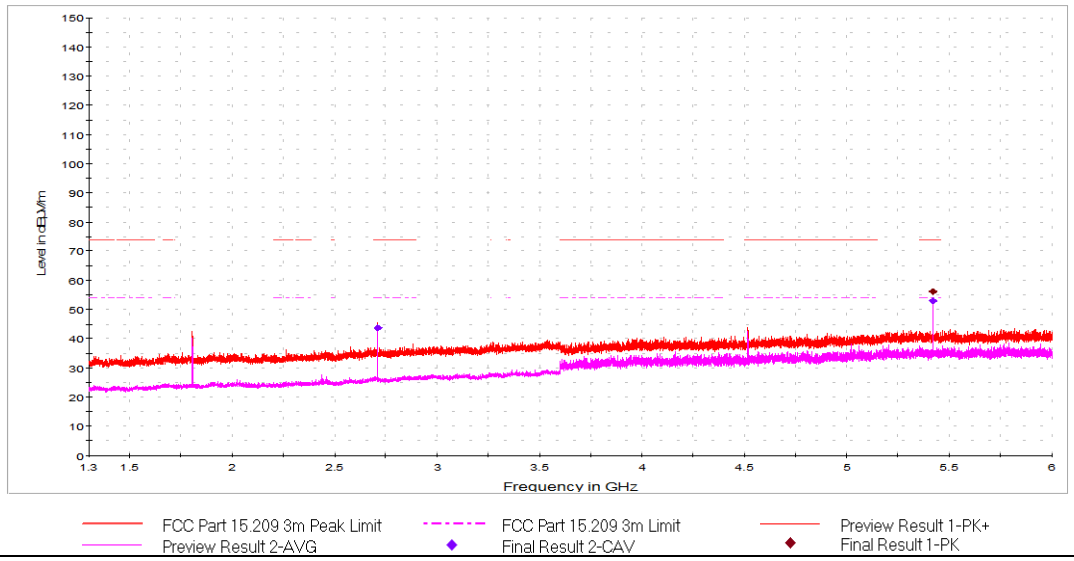



Graph 31

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 1.3GHz to 6GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



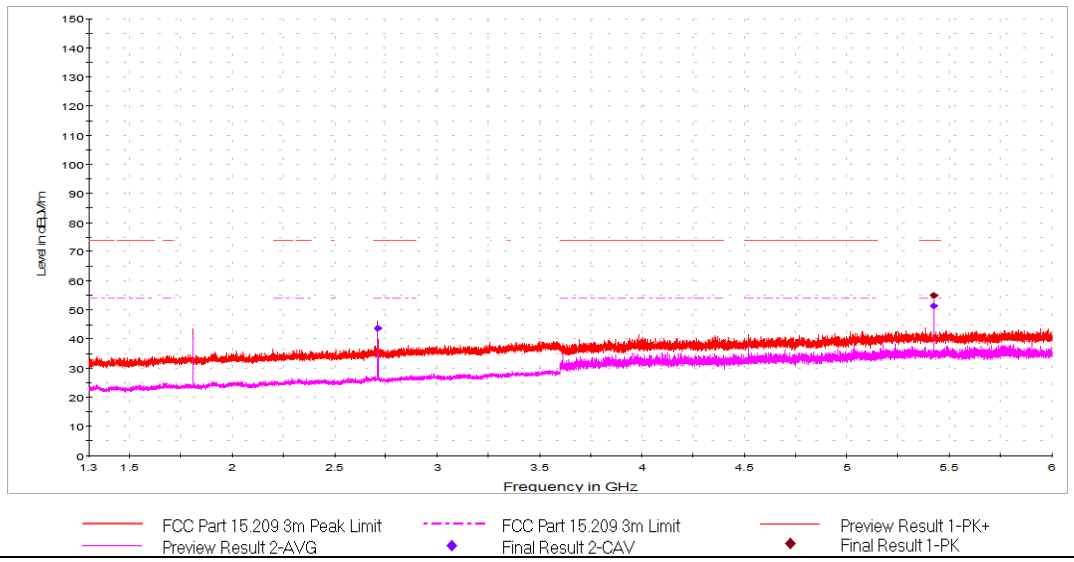



Graph 32

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 1.3GHz to 6GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



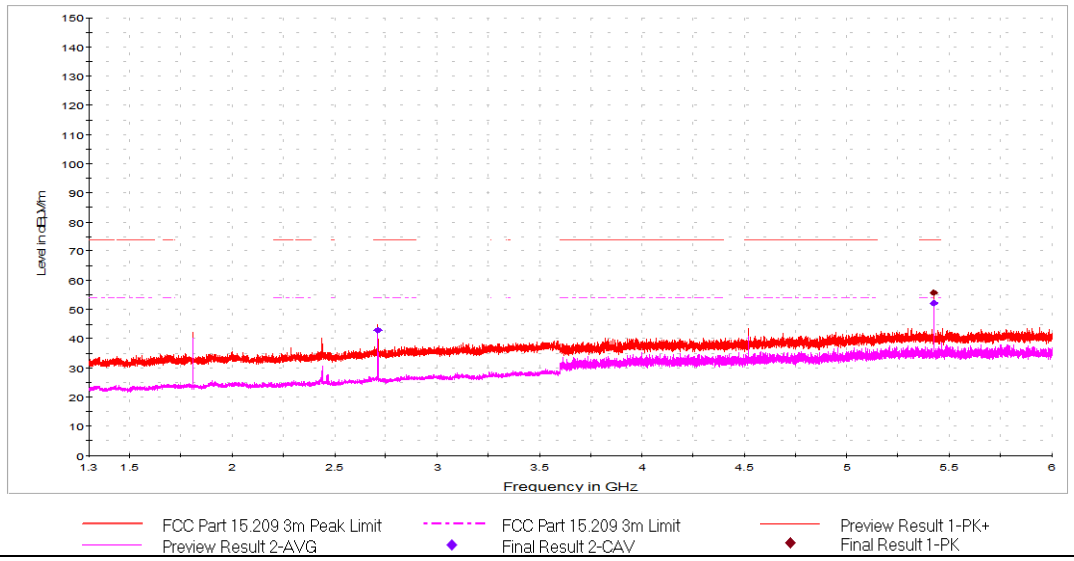



Graph 33

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 1.3GHz to 6GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



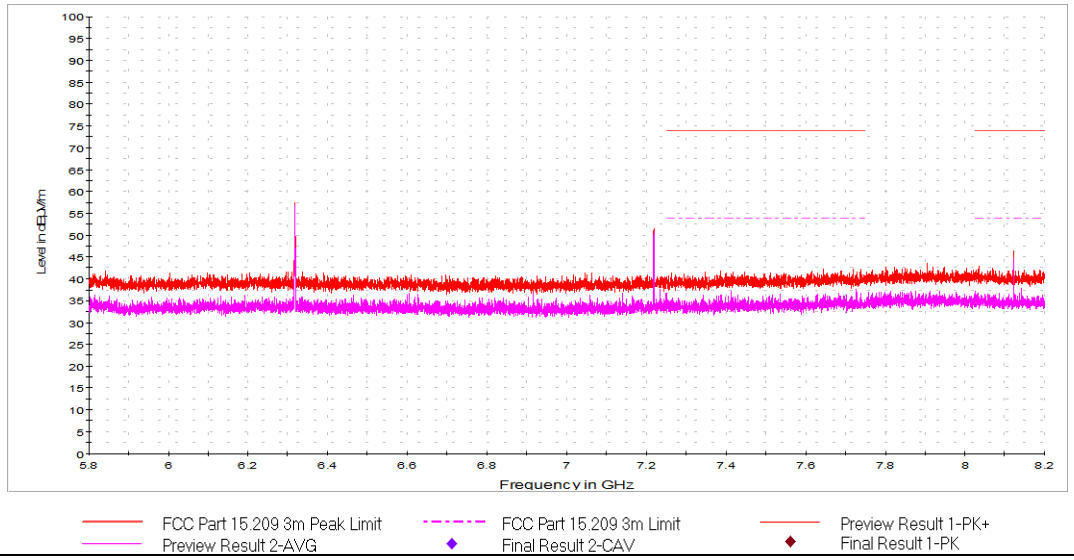



Graph 34

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 5.8GHz to 8.2GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



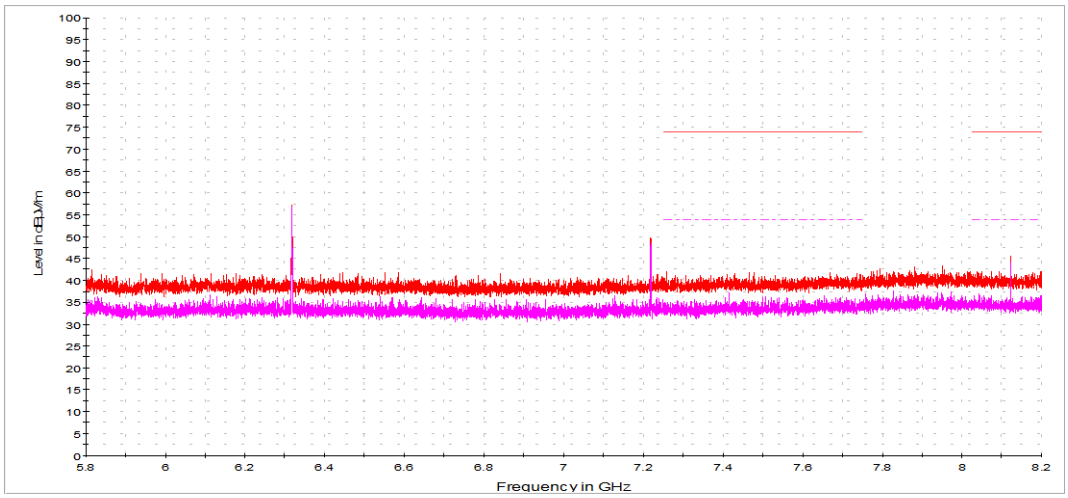



Graph 35

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 5.8GHz to 8.2GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



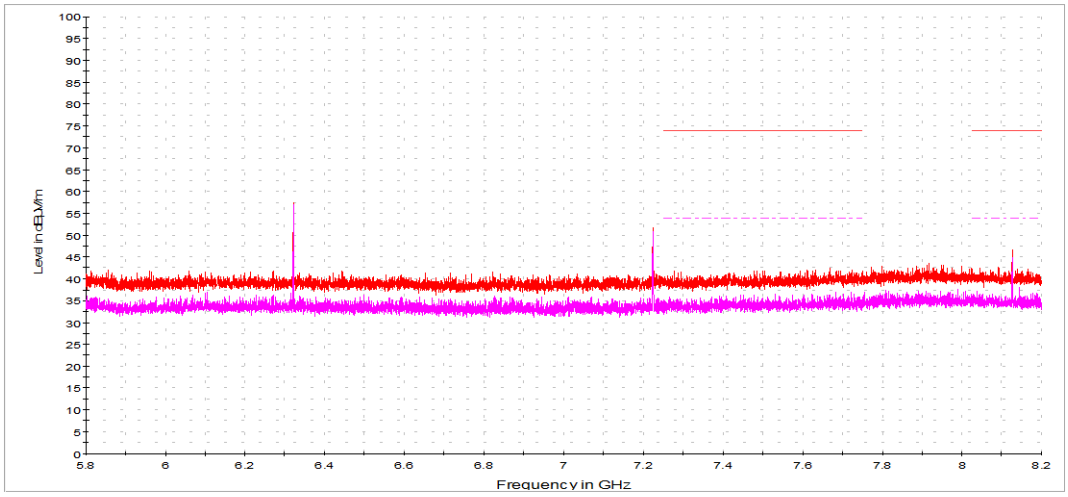



Graph 36

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 5.8GHz to 8.2GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



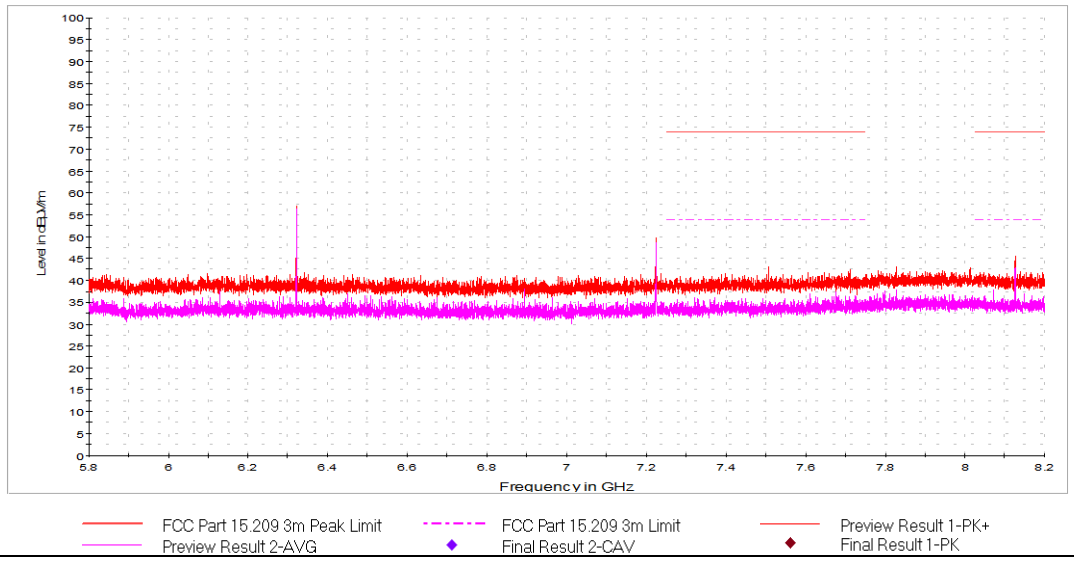



Graph 37

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 5.8GHz to 8.2GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



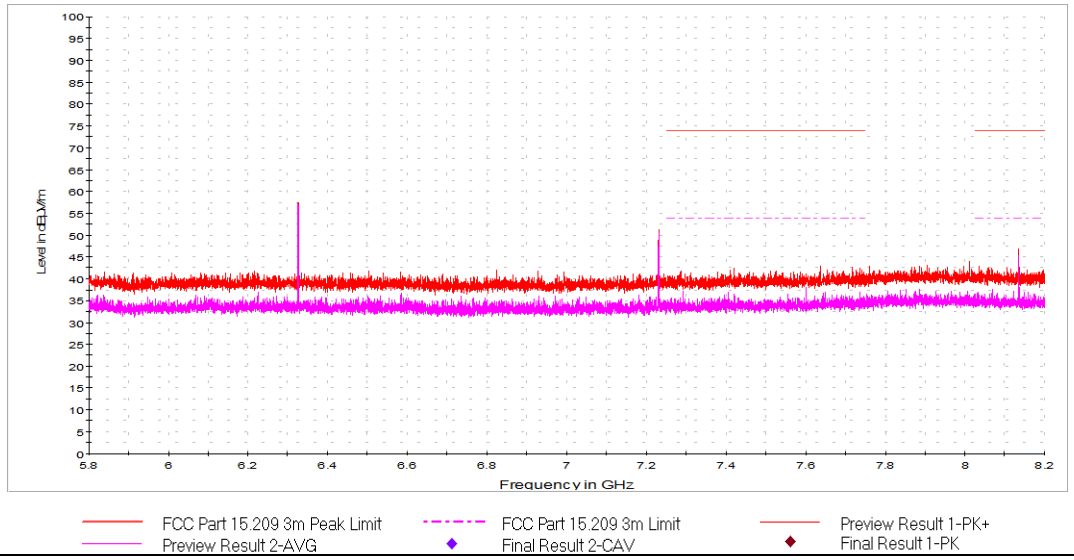



Graph 38

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 5.8GHz to 8.2GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



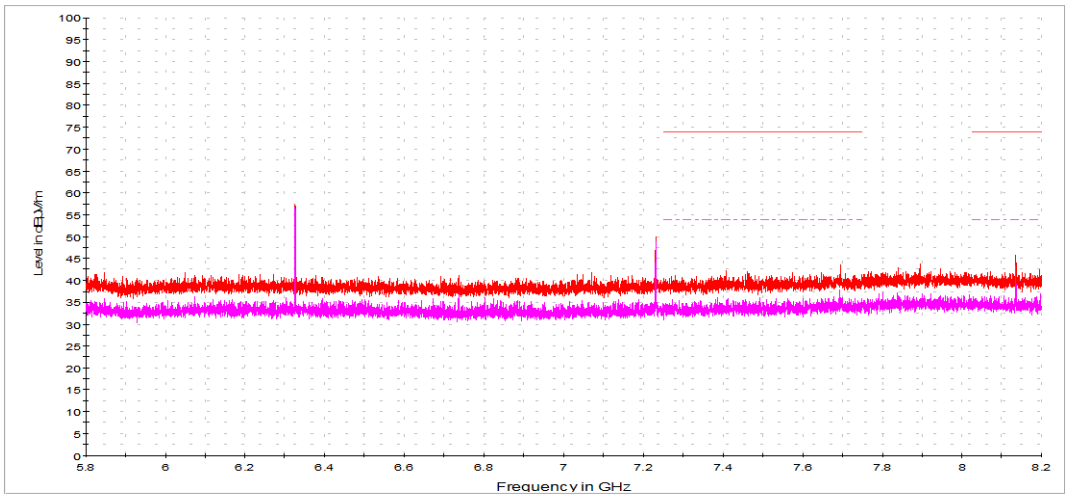



Graph 39

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 5.8GHz to 8.2GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



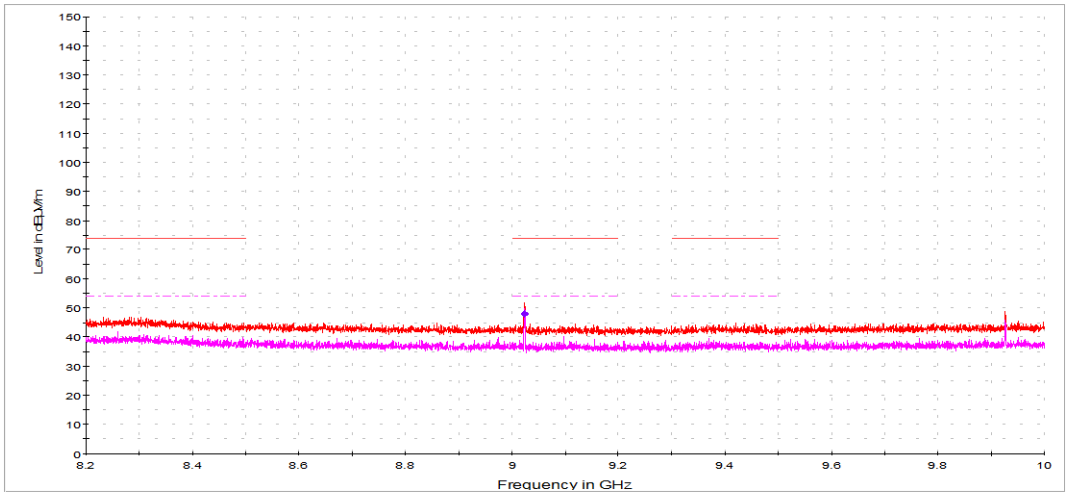



Graph 40

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 8.2GHz to 10GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



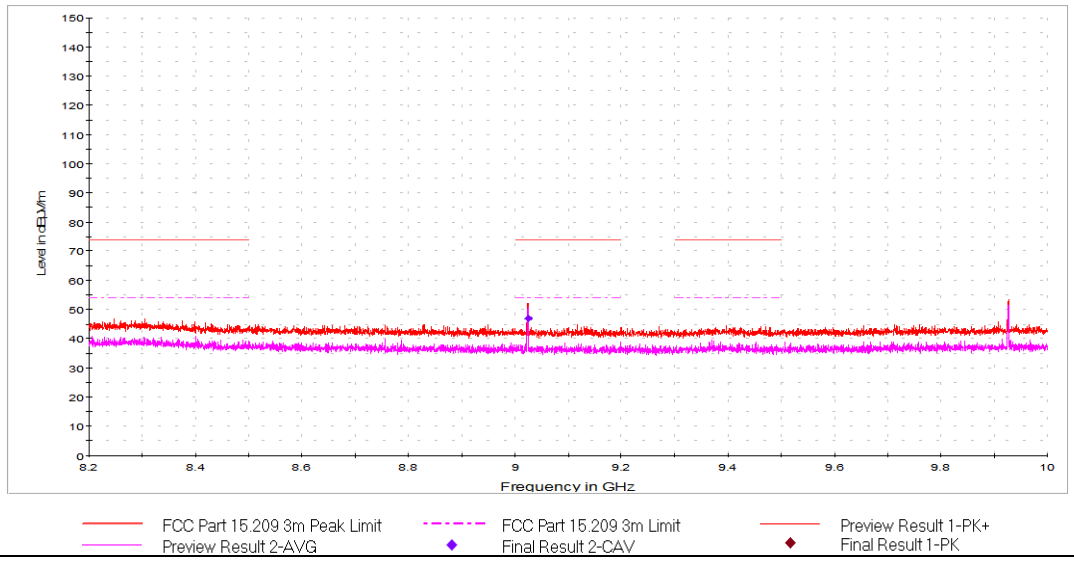



Graph 41

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 8.2GHz to 10GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



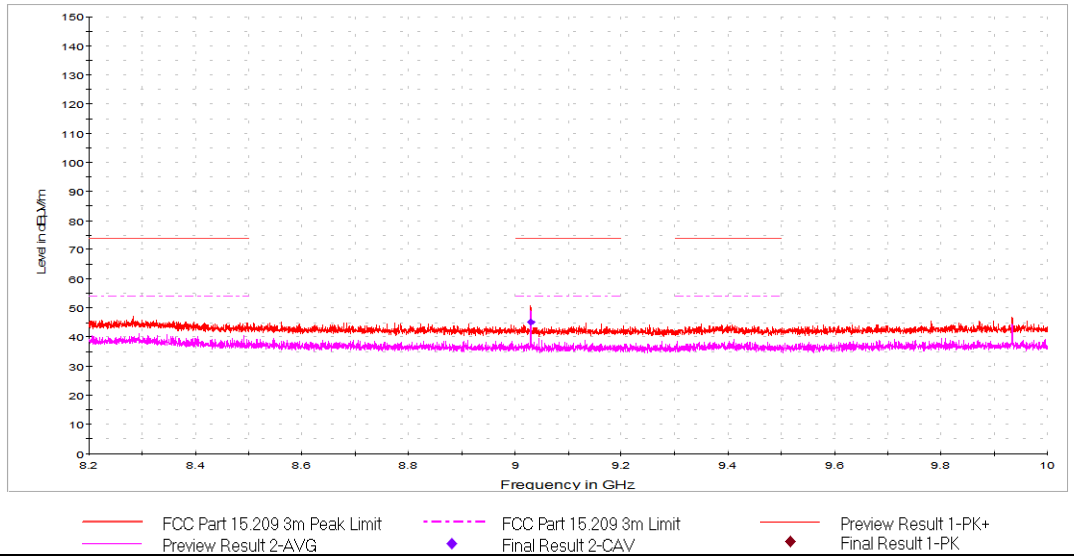



Graph 42

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 8.2GHz to 10GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



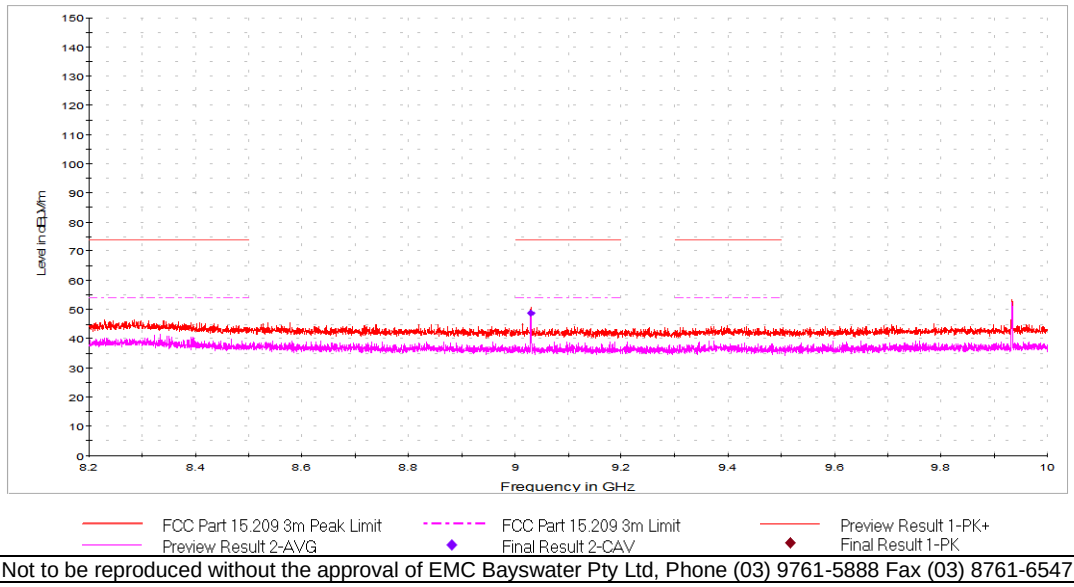



Graph 43

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 8.2GHz to 10GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



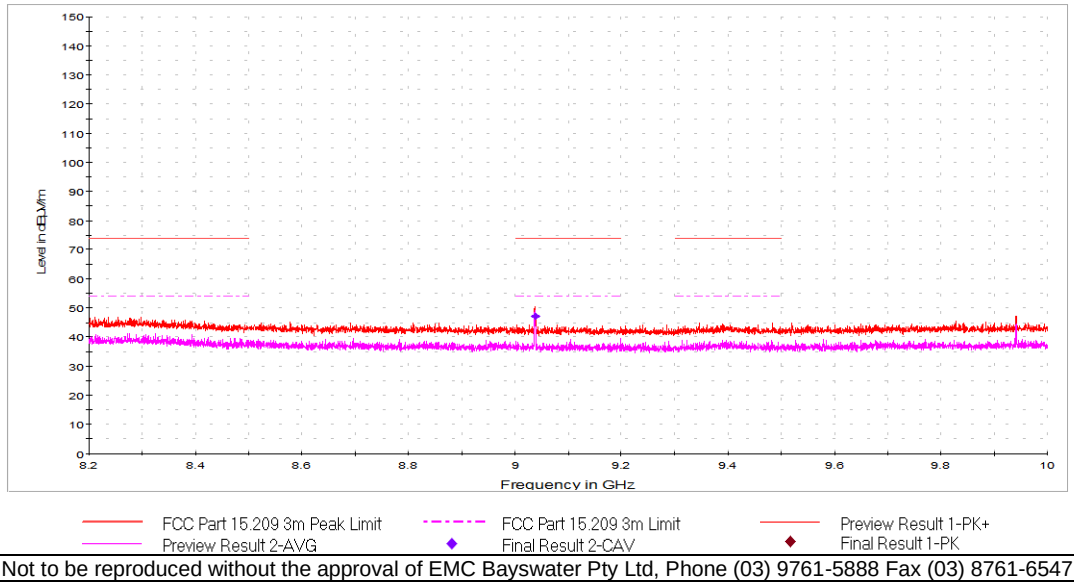



Graph 44

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 8.2GHz to 10GHz**
**Horizontal Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



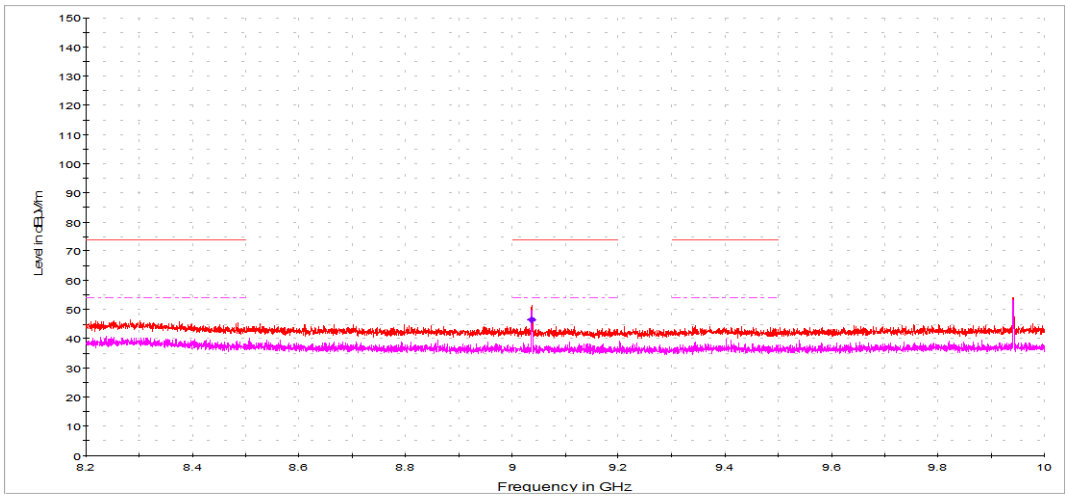



Graph 45

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 8.2GHz to 10GHz**
**Vertical Antenna Polarisation**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



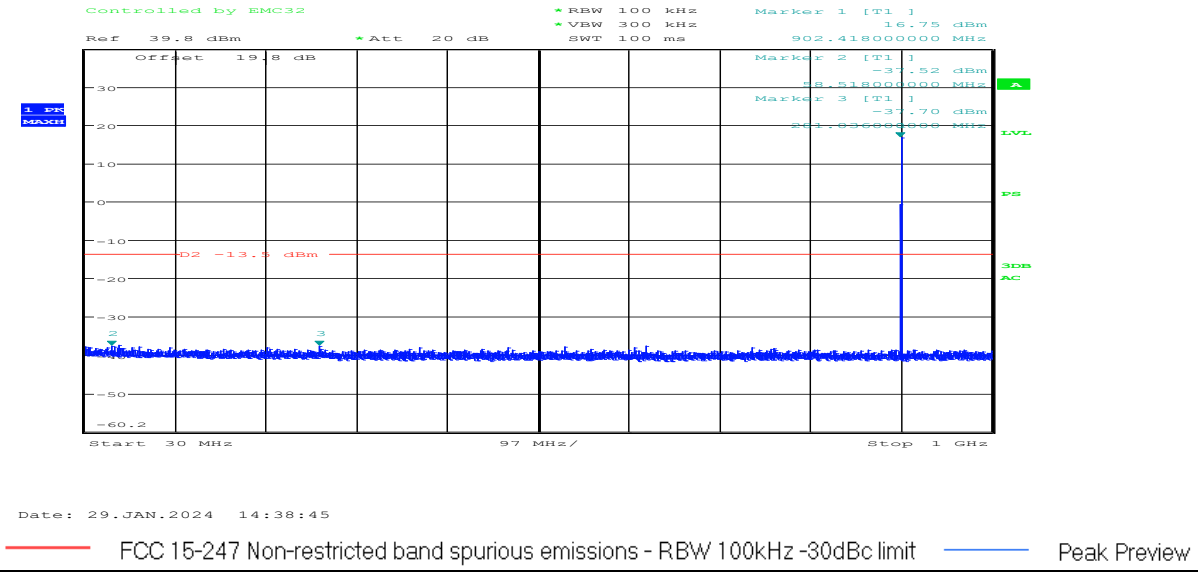



Graph 46

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 30MHz to 1GHz**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ






Graph 47

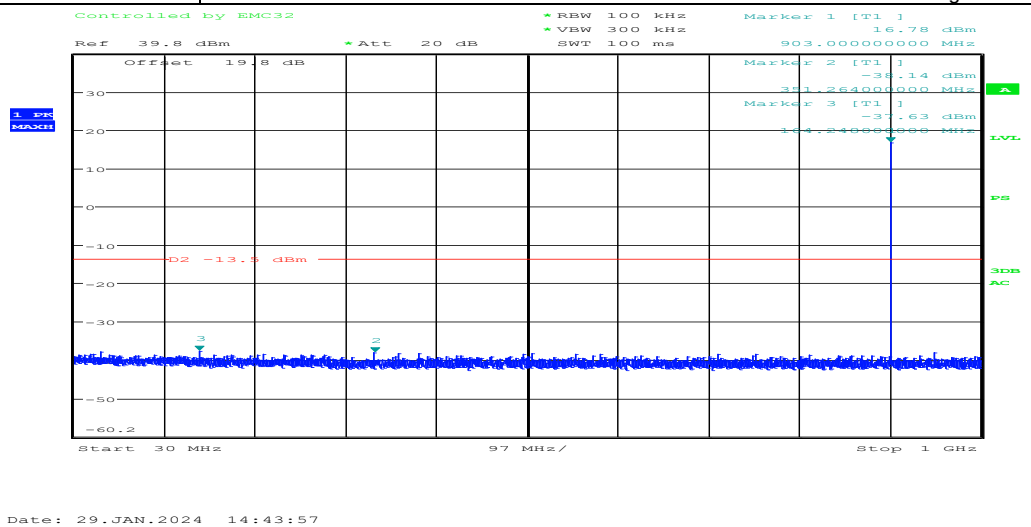
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**903MHz Channel – 30MHz to 1GHz**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




FCC 15-247 Non-restricted band spurious emissions - RBW 100kHz -30dBc limit — Peak Preview



Graph 48

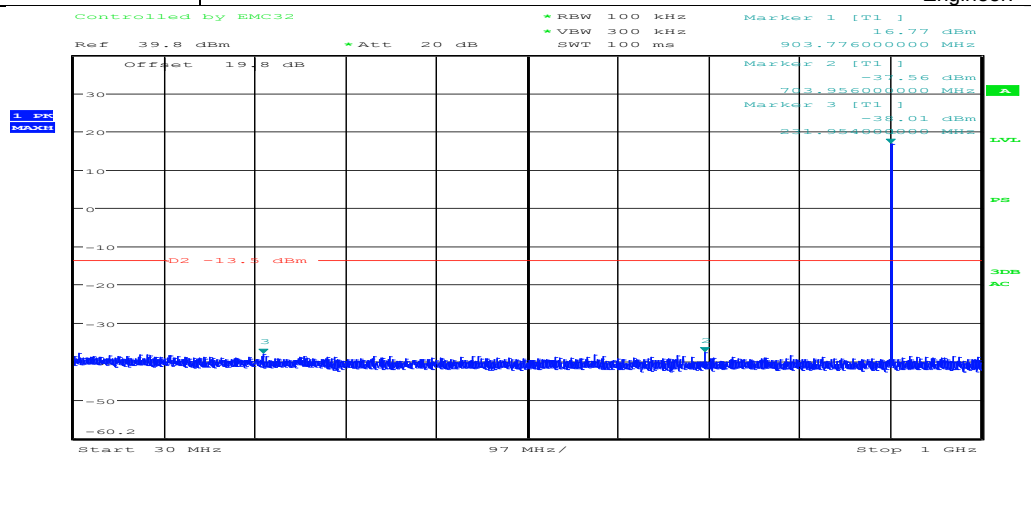
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**903.8MHz Channel – 30MHz to 1GHz**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




FCC 15-247 Non-restricted band spurious emissions - RBW 100kHz -30dBc limit — Peak Preview



Graph 49

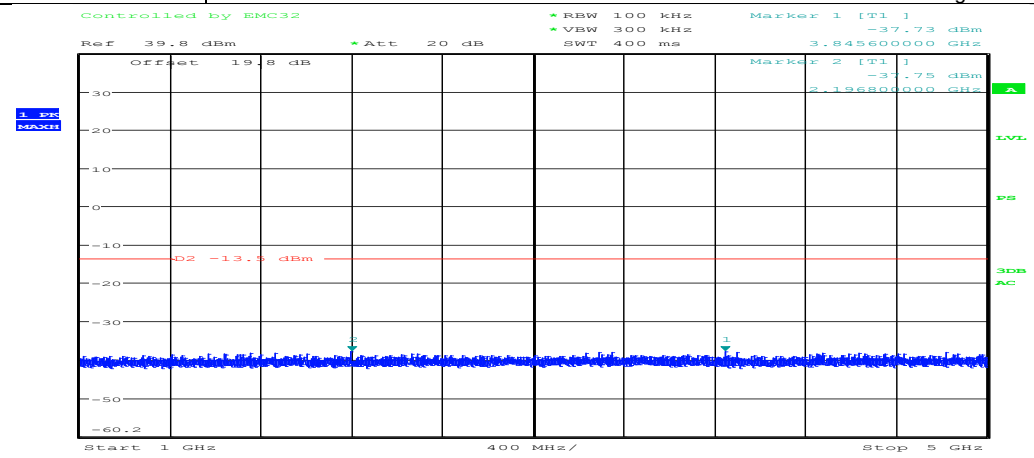
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**902.4MHz Channel – 1GHz to 5GHz**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




Date: 29.JAN.2024 14:40:56

FCC 15-247 Non-restricted band spurious emissions - RBW 100kHz -30dBc limit — Peak Preview



Graph 50

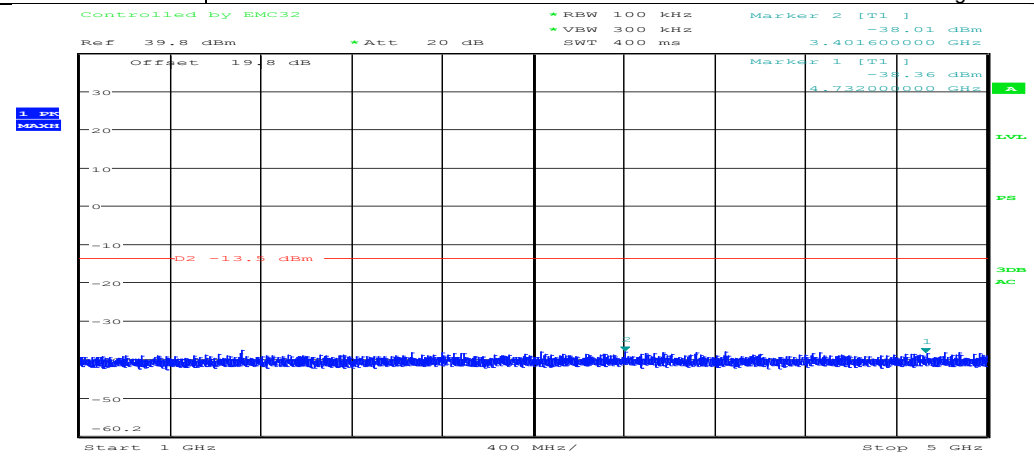
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**903MHz Channel – 1GHz to 5GHz**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




Date: 29.JAN.2024 14:45:01

FCC 15-247 Non-restricted band spurious emissions - RBW 100kHz -30dBc limit — Peak Preview



Graph 51

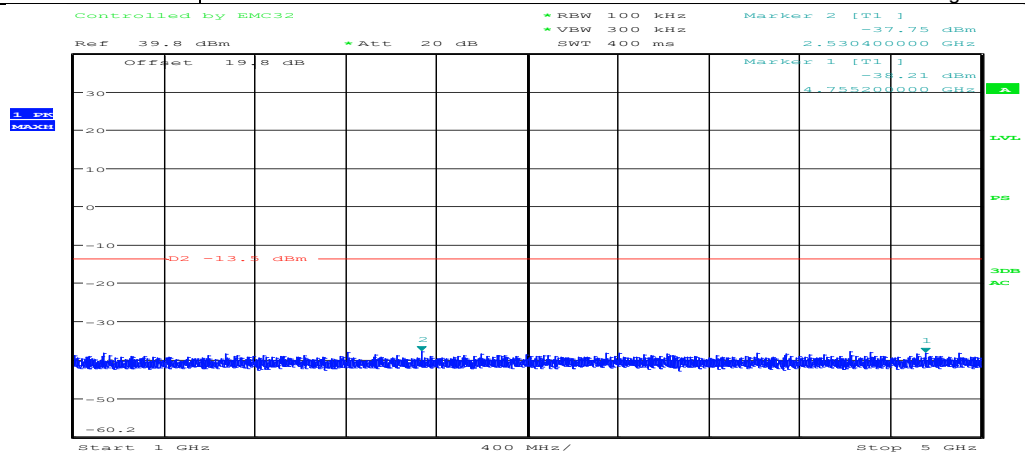
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**903.8MHz Channel – 1GHz to 5GHz**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




Date: 29.JAN.2024 14:51:20

FCC 15-247 Non-restricted band spurious emissions - RBW 100kHz -30dBc limit — Peak Preview



Graph 52

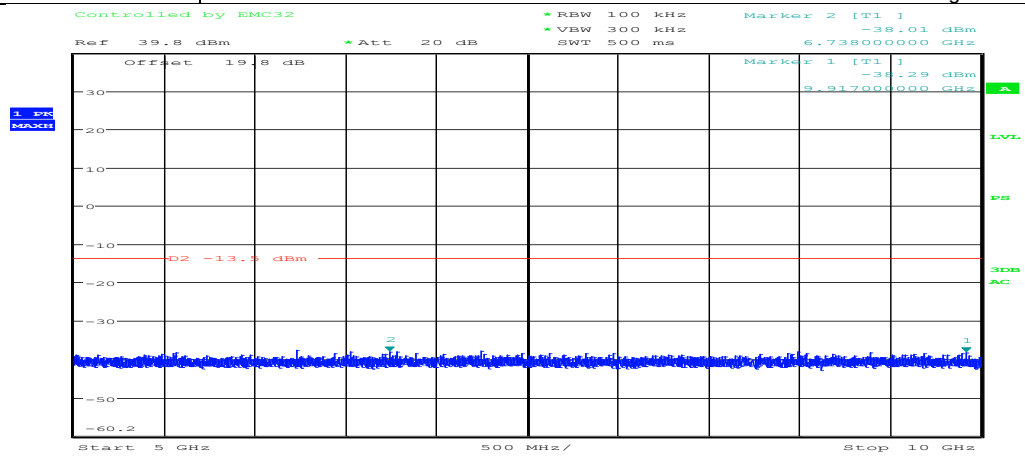
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**902.4MHz Channel – 5GHz to 10GHz**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




Date: 29.JAN.2024 14:41:54

FCC 15-247 Non-restricted band spurious emissions - RBW 100kHz -30dBc limit — Peak Preview



Graph 53

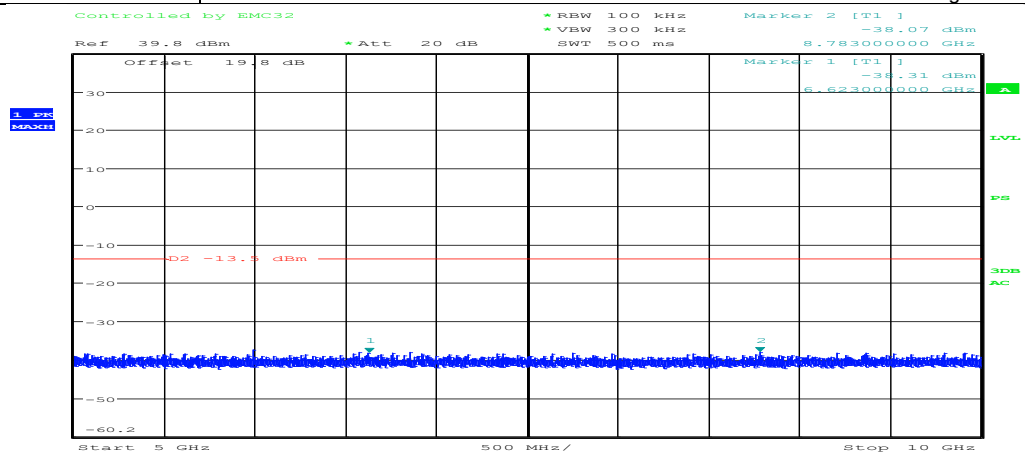
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**903MHz Channel – 5GHz to 10GHz**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




Date: 29.JAN.2024 14:45:59

FCC 15-247 Non-restricted band spurious emissions - RBW 100kHz -30dBc limit — Peak Preview



Graph 54

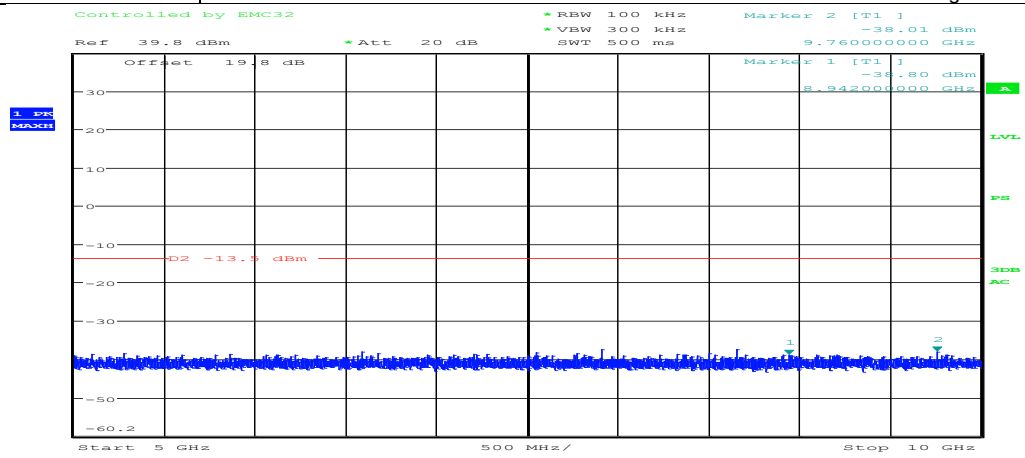
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Non-Restricted bands**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**903.8MHz Channel – 5GHz to 10GHz**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




Date: 29.JAN.2024 14:51:49

FCC 15-247 Non-restricted band spurious emissions - RBW 100kHz -30dBc limit — Peak Preview



Graph 55

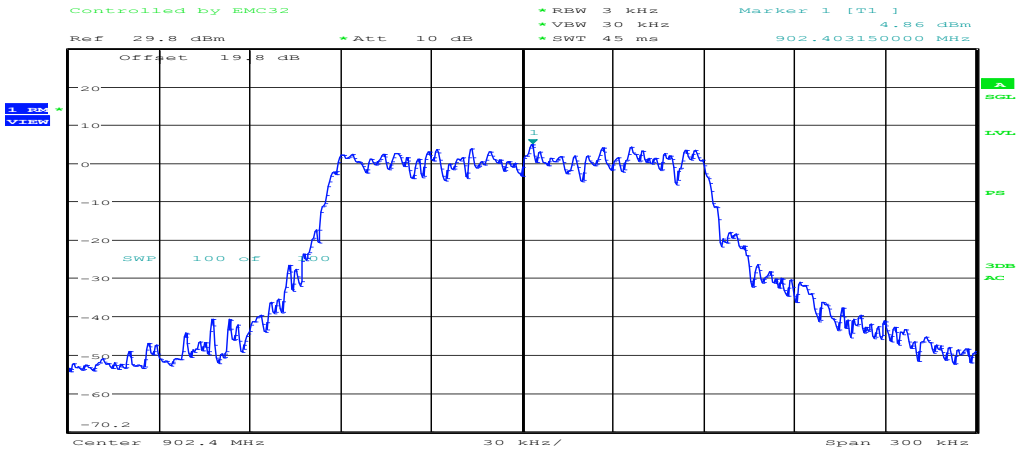
# Appendix C.4 – Measurement Graphs – Power Spectral Density – FCC 15.247 (e)

| No. | Test | Graph Description |
|---|---|---|
| 56 | Power Spectral Density – 3kHz RBW | 902.4MHz Channel |
| 57 | | 903MHz Channel |
| 58 | | 903.8MHz Channel |
| 59 | Power Spectral Density – 100kHz RBW (Informative only) | 902.4MHz Channel |
| 60 | | 903MHz Channel |
| 61 | | 903.8MHz Channel |

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 3kHz RBW**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



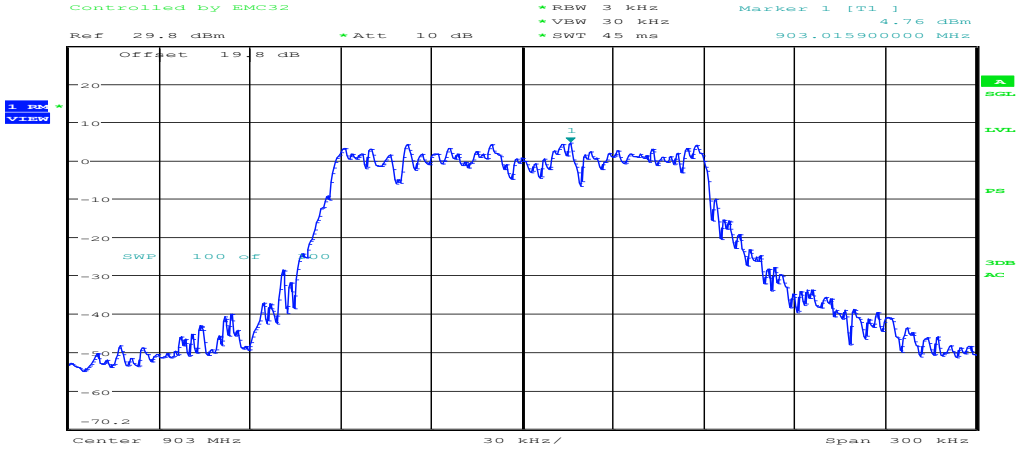



Graph 56

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 3kHz RBW**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



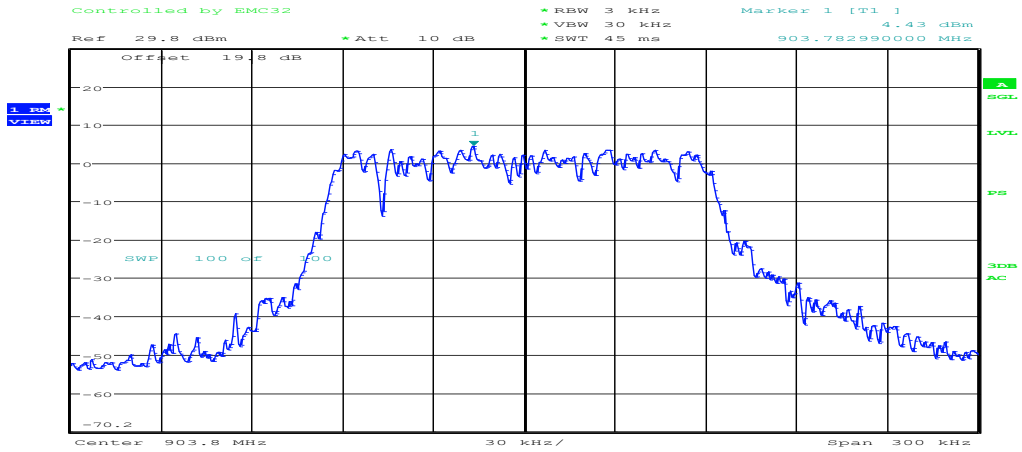



Graph 57

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 3kHz RBW**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



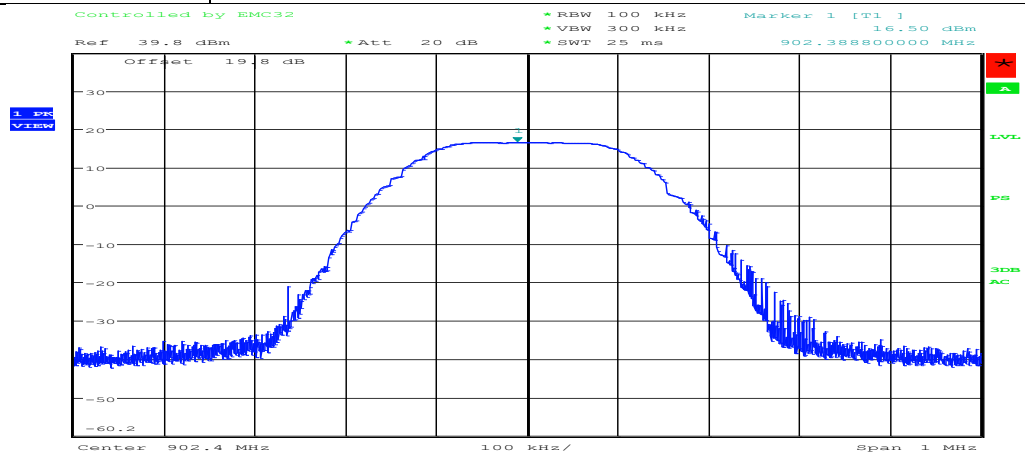



Graph 58

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**902.4MHz Channel – 100kHz RBW**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



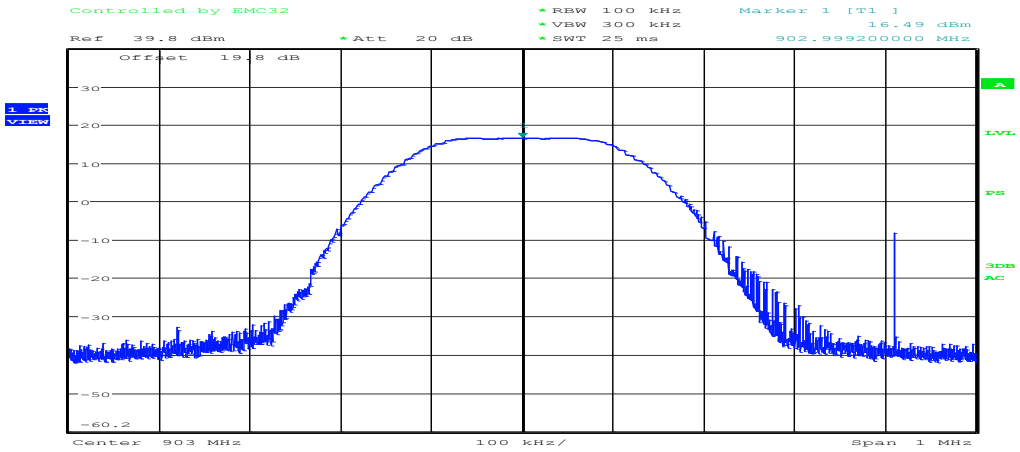



Graph 59

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903MHz Channel – 100kHz RBW**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ



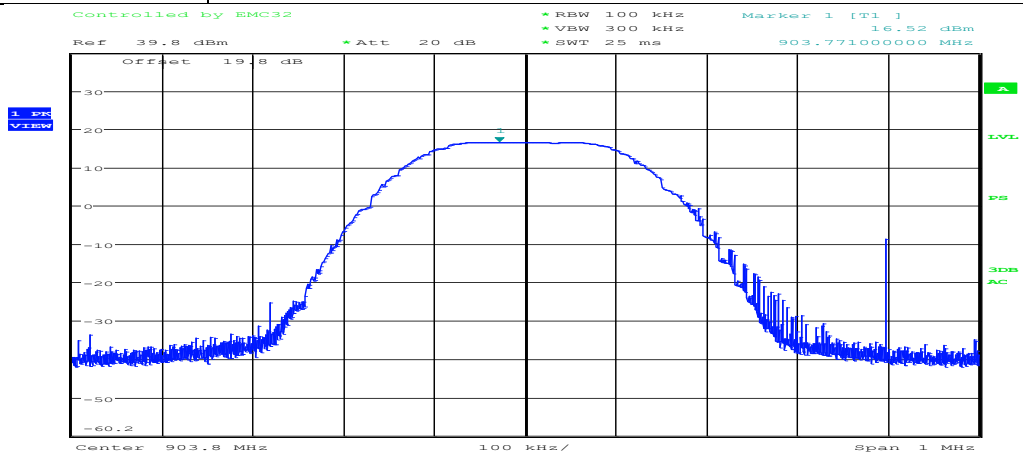



Graph 60

## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density**
**Gallagher Group Ltd - eS1 - eShepherd Neckband**
**903.8MHz Channel – 100kHz RBW**

Job Number: E2401-1734-1 Rev1
Test Engineer: AZ






Graph 61

# Appendix C.5 – Occupied Bandwidth (99% Emission Bandwidth)

| No. | Test | Graph Description |
|---|---|---|
| 62 | Occupied Bandwidth (99% Emission Bandwidth) | 902.4MHz Channel |
| 63 | | 903MHz Channel |
| 64 | | 903.8MHz Channel |

## EMC Bayswater Pty. Ltd.

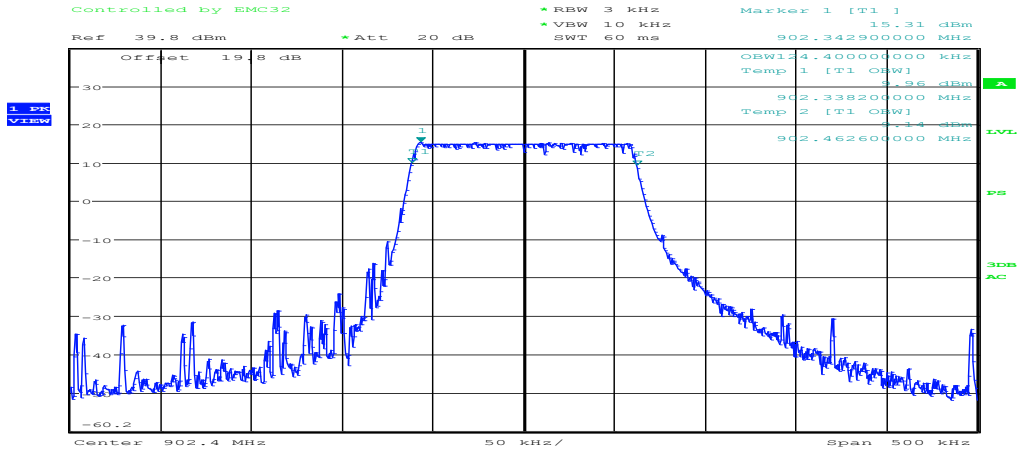
**CFR47 FCC Part 15, Subpart C, 15.247 - Occupied Bandwidth (99% Emission Bandwidth)**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**902.4MHz Channel**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




Date: 29.JAN.2024 13:23:30



Graph 62

## EMC Bayswater Pty. Ltd.

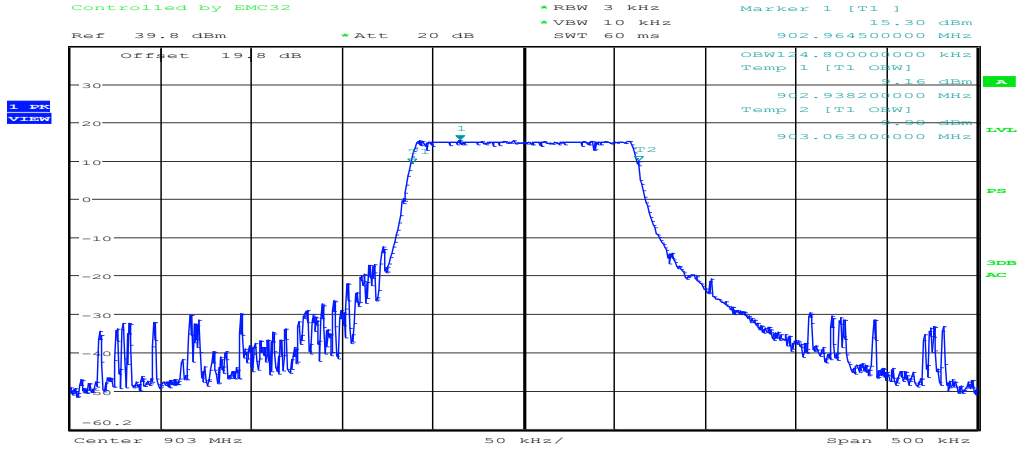
**CFR47 FCC Part 15, Subpart C, 15.247 - Occupied Bandwidth (99% Emission Bandwidth)**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**903MHz Channel**

Job Number: E2401-1734-1 Rev1

Test Engineer: AZ




Date: 29.JAN.2024 13:20:39



Graph 63

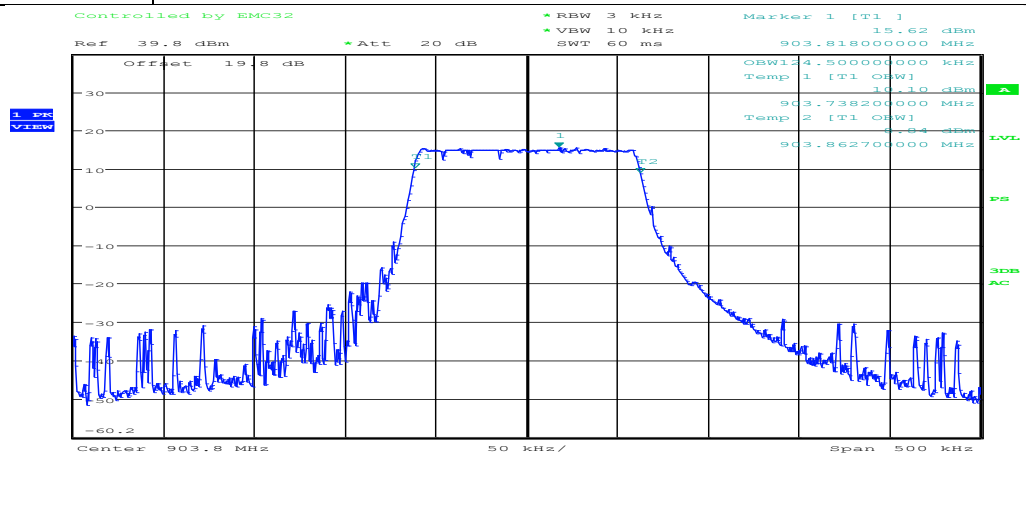
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Occupied Bandwidth (99% Emission Bandwidth)**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**903.8MHz Channel**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |






Graph 64

# Appendix C.6 – Radiated Emissions (Receiver Mode)

| No. | Test | Graph Description |
|---|---|---|
| 65 | Radiated Emissions – 30MHz to 1000MHz | Horizontal Antenna Polarisation |
| 66 | | Vertical Antenna Polarisation |
| 67 | Radiated Emissions – 1GHz to 5GHz | Horizontal Antenna Polarisation |
| 68 | | Vertical Antenna Polarisation |

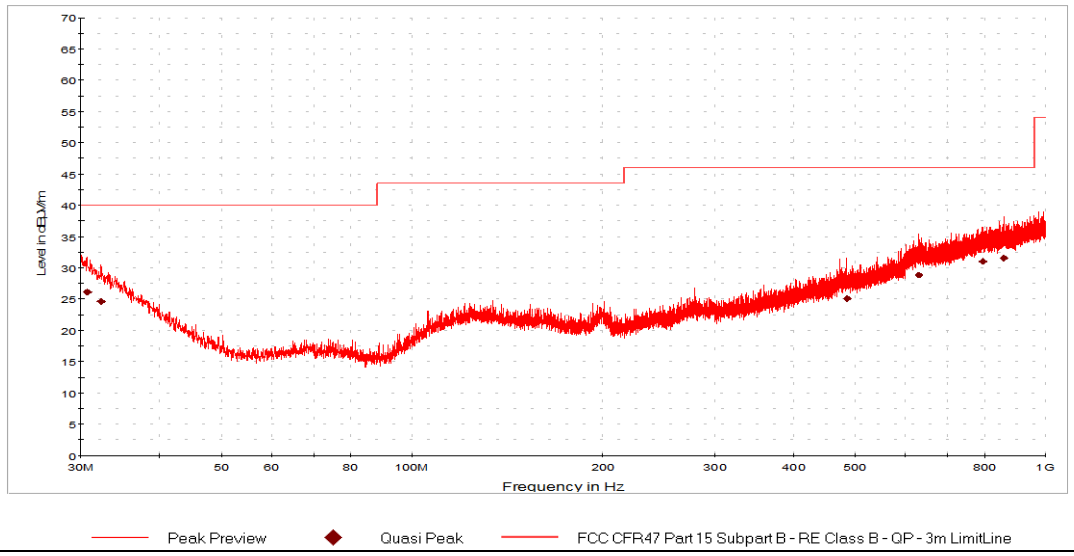
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated Emissions (Receiver Mode)**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**Horizontal Antenna Polarisation – 30MHz to 1000MHz**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |






Graph 65

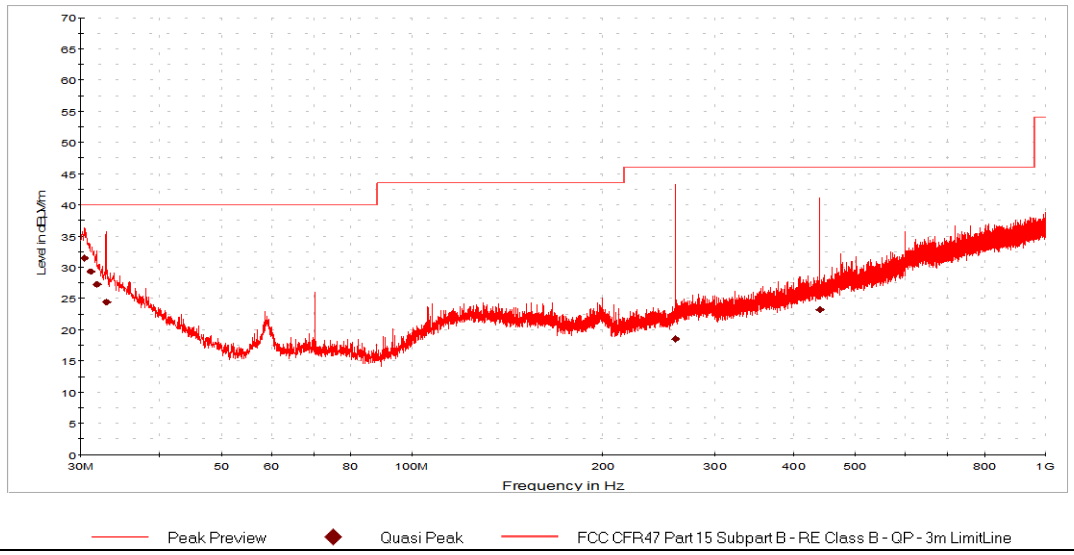
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated Emissions (Receiver Mode)**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**Vertical Antenna Polarisation – 30MHz to 1000MHz**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |






Graph 66

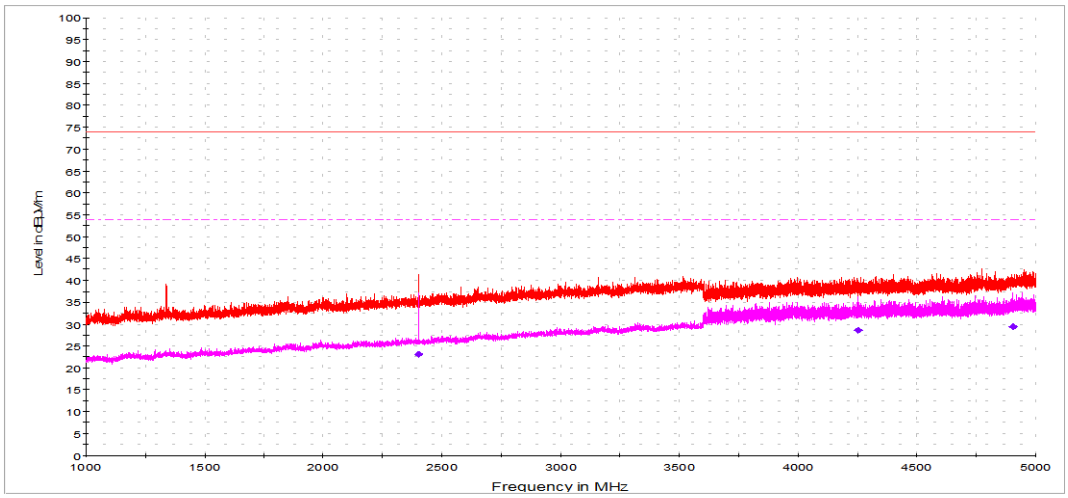
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated Emissions (Receiver Mode)**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**Horizontal Antenna Polarisation – 1GHz to 5GHz**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |






Graph 67

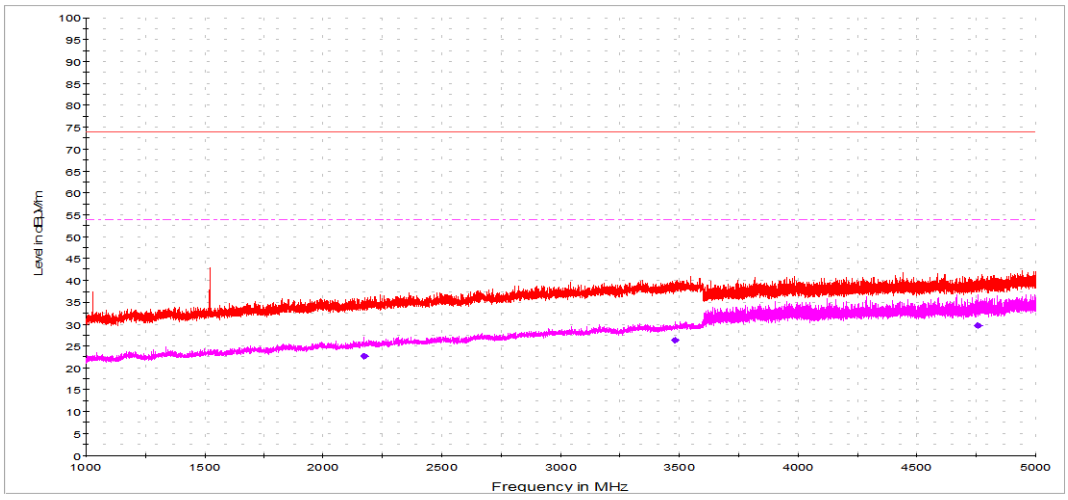
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247 - Radiated Emissions (Receiver Mode)**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**Vertical Antenna Polarisation – 1GHz to 5GHz**

| | |
|---|---|
| Job Number: | E2401-1734-1 Rev1 |
| Test Engineer: | AZ |






Graph 68

# Appendix C.7 – Frequency Hopping Parameters

| No. | Test / Graph Description |
|---|---|
| 69 | Chanel Occupancy Time |
| 70 | |
| 71 | Channel Separation |
| 72 | Number of Hopping Frequencies |

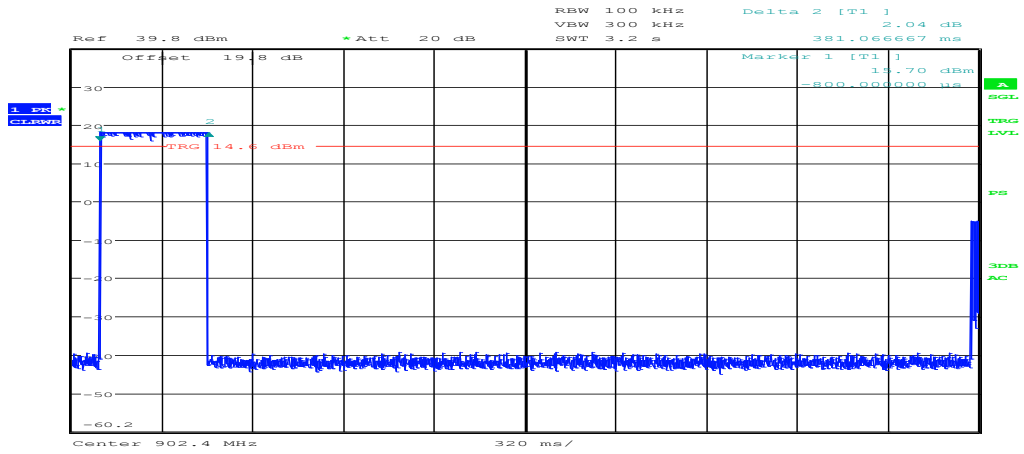
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**Channel Occupancy Time**

Job Number: E2401-1734-1 Rev1
Test Engineer: NL




Date: 24.JAN.2024 12:37:46



Graph 69

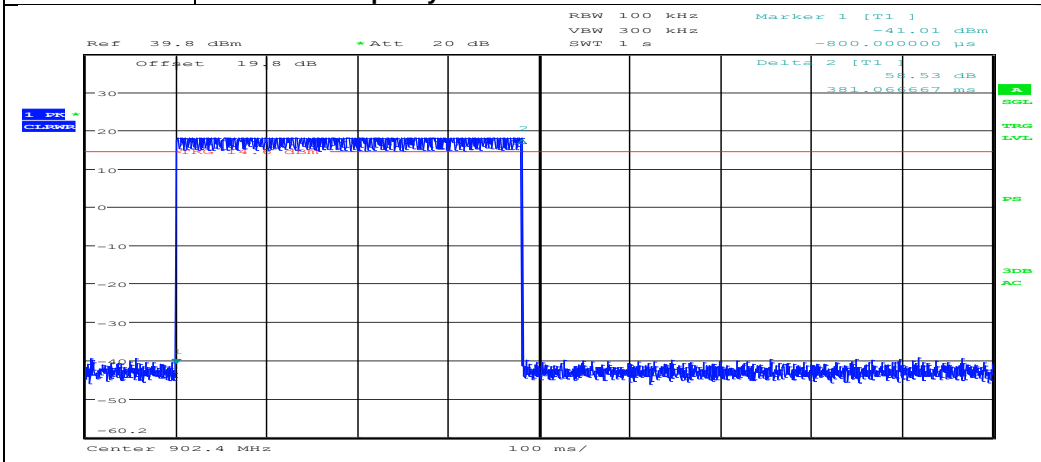
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**Channel Occupancy Time**

Job Number: E2401-1734-1 Rev1
Test Engineer: NL




Date: 24.JAN.2024 12:38:43



Graph 70

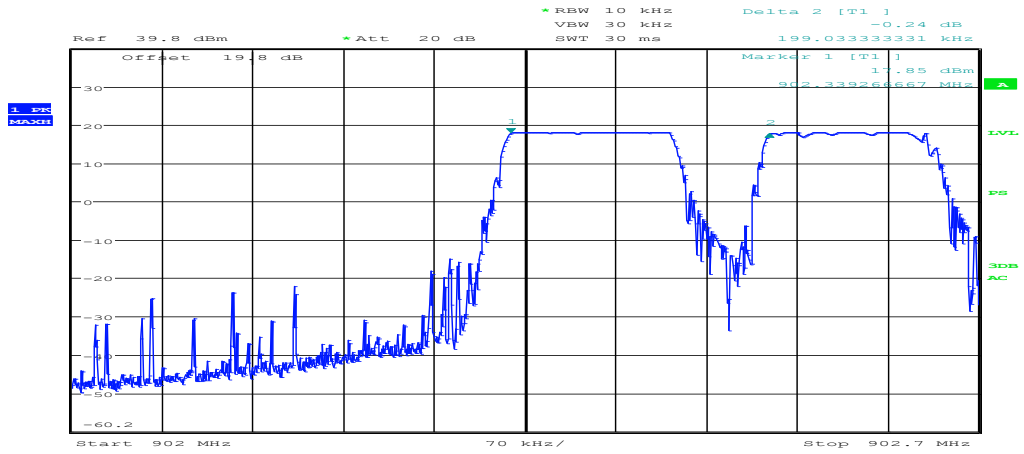
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**Channel Separation**

Job Number: E2401-1734-1 Rev1
Test Engineer: NL






Graph 71

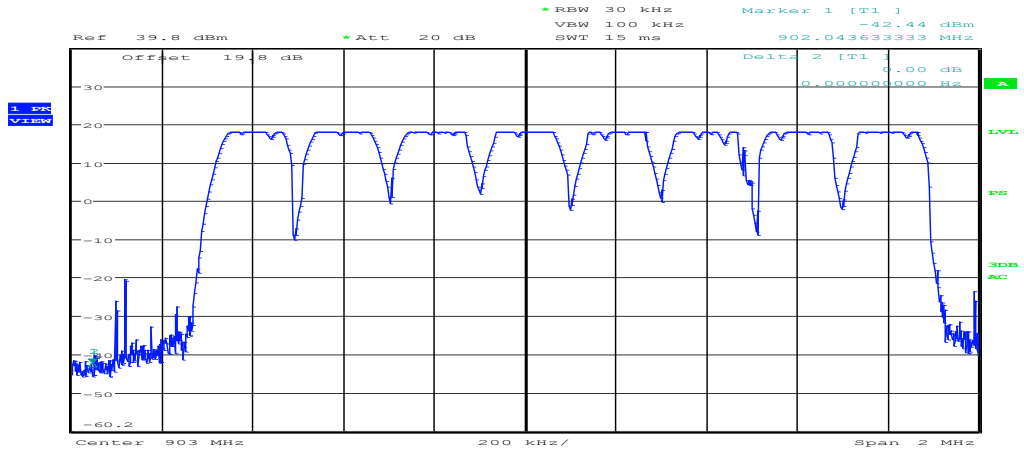
## EMC Bayswater Pty. Ltd.

**CFR47 FCC Part 15, Subpart C, 15.247**

**Gallagher Group Ltd - eS1 - eShepherd Neckband**

**Number of Hopping Frequencies**

Job Number: E2401-1734-1 Rev1
Test Engineer: NL






Graph 72