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# EMC COMPLIANCE REPORT
*In accordance with:*
CFR47 FCC Part 15, Subpart C

## EPREP Pty Ltd

## GL950X

## EPREP sample preparation workstation

REPORT: E1705-0915-3 Rev1
DATE: June, 2017

This report replaces the previously issued report E1705-0915-3. *Please refer to section 2 of this report for details of any previously issued reports.*

# Certificate of Compliance

## EMC Bayswater Test Report: E1705-0915-3 Rev1
## Issue Date: June, 2017

| | |
|---|---|
| **Test Sample(s):** | EPREP sample preparation workstation |
| **Model No:** | GL950X |
| **Serial No:** | 1000101 |
| **Part No:** | 01-01000-01 |

**Client Details:**

Mr. Mark Wardle
EPREP Pty Ltd
14/35 Dunlop Rd
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**Test Specification:** CFR47 FCC Part 15, Subpart C

**Results Summary:**

| | |
|---|---|
| 15.209 - Maximum Fundamental Field Strength | ***Complied*** |
| 15.209 - Radiated Spurious Emissions | ***Complied*** |
| 15.207 - Conducted Emissions | ***Complied*** |

**Test Date(s):** 5th to 24th of May, 2017

**Test House (Issued By)**

EMC Bayswater Pty Ltd
18/88 Merrindale Drive
Croydon South
Victoria, 3136
Australia

FCC Registration number: 419968

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This is to certify that the necessary measurements were made by EMC Bayswater Pty Ltd, and that the EPREP Pty Ltd, GL950X EPREP sample preparation workstation (Serial No: 1000101), has been tested in accordance with requirements contained in the appropriate commission regulations.

| Prepared & tested by: | Tested by: | Tested by: | Approved by: | |
|---|---|---|---|---|
|  |  |  |  | 21/06/2017 13:31 |
| Neville L.Patabendige (Senior Test Engineer) | Fabio D'Amico (EMC Test Officer) | Alvin Tan (EMC Test Officer) | Clint Finch (Manager) | Date |

# EMC Compliance Report
*for*
# EPREP Pty Ltd

## Contents

## 1. Introduction

Electromagnetic Compatibility (EMC) tests were performed on a EPREP Pty Ltd, GL950X, EPREP sample preparation workstation in accordance with the requirements of Title 47 of the standard CFR47 FCC Part 15, Subpart C.

## 2. Test Report Revision History

E1705-0915-3 – Original EMC test report issued on 16/06/2017.
E1705-0914 Rev1 – Table 7, Frequency column heading was changed from “Frequency (MHz)” to “Frequency (kHz)”. Tables 16, 17 and 18, Frequency column heading was changed from “Frequency (kHz)” to “Frequency (MHz)”. The font size of the customer address was changed from ‘9pt’ to ‘10pt’ on page 2.

## 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 guarantees 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, 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 constitute fraud and shall nullify the document.

## 4. Summary of Results

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

| FCC sections | Test | Result |
|---|---|---|
| 15.209 | Maximum Fundamental Field Strength - RFID | Complied by at least 55.8dB |
| 15.209 | Radiated Emissions – RFID/Bluetooth | Complied by 2.1dB |
| 15.207 | AC Power line Conducted Emissions | Complied by 14.6dB |

Table 1: Summary of test results - EPREP sample preparation workstation – RFID

*Note: The RFID and Bluetooth transmitters were continuously operated in active mode during the testing.*

# 5. Product Sample, Configuration & Modifications

## 5.1. EUT Description

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

| | | |
|---|---|---|
| Product: | EPREP sample preparation workstation | |
| Model No: | GL950X | |
| Part No: | 01-01000-01 | |
| Serial No: | 1000101 | |
| Firmware: | M:= 2017050201, P:= 2017042601 | |
| Software: | 2017052501 | |
| Dimensions: | 695mm x 1370mm x 720mm (Length x Width x Height) | |
| Weight: | 70kg | |
| EUT Type: | Table Top | |
| Power Specifications | 24VDC via plug pack with 2 x 12VDC battery backup | |
| | Description: | AC/DC Switching Adaptor |
| | Manufacturer: | Mean Well |
| | Model: | GST220A24 |
| | Serial: | EB69M91589 |
| | Input: | 100-240VAC, 50/60Hz, 4.0A |
| | Output: | 24V ~9.2A, 221W Max |
| | Comment: | None |
| Orientation: | The EUT is typically used in one orientation only | |

*(Customer supplied product information)*

| | | |
|---|---|---|
| RFID module: | Manufacturer: | Priority 1 Design |
| | Model: | RFIDRW-E-232 |
| | Software: | None stated |
| | Firmware: | 305 |
| | FCC ID: | None |
| | IC ID: | None |
| Transmitter Specification: | Channel Type: | RFID |
| | Frequency range: | 124kHz to 140kHz |
| | Channel: | Single channel |
| | Modulation | None Stated |
| | Antenna Type: | Coil Antenna 22mm |
| | Antenna Gain: | None stated |
| | Maximum power: | None stated |
| | Maximum payload | None stated |
| | Environment: | 0°C to 85°C (Operating Temperature Range) |
| Comment: | Information are based on the datasheet provided by manufacturer (MAN-RFIDRW-E-232, Revision D, November 15, 2010) | |

| | | |
|---|---|---|
| Bluetooth module: | Manufacturer: | Microchip Technology Inc |
| | Model: | RN-41 |
| | FW: | None stated |
| | FCC ID: | T9JRN41-3 |
| | IC ID: | 6514A-RN413 |
| | MAC ID: | 000666869374 |
| | Version: | 2.1 |
| Transmitter Specification: | Class: | 1 |
| | Frequency range: | 2402MHz to 2480MHz |
| | Modulation | None stated |
| | Antenna Type: | Ceramic Chip |
| | Antenna Gain: | None stated |
| | Maximum power: | 18.97dBm |
| | Maximum payload | None stated |
| | Environment: | -40°C to 85°C (Operating Temperature Range) |
| Comment: | Information are based on the datasheet provided by manufacturer (RN41/RN41N, DS50002280A, 2014) | |

*(Customer supplied product information)*

*(Refer to photographs in Appendix B for views of the EUT)*

### 5.2. Product description

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

"The product will be used in laboratories for preparing various liquid samples for later analysis. It will never be used in the home."

*(Customer supplied product description information)*

### 5.3. Support Equipment

| | | |
|---|---|---|
| Support Equipment: 1 | Description: | Control tablet |
| | Manufacturer: | Microsoft |
| | Model: | Surface Pro |
| | Serial number: | 071578764753 |

### 5.4. Product operating modes

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

"Communication mode: Bluetooth / USB
All axis running, wash pump: on/off"

*(Customer supplied product operating mode information)*

### 5.5. Product operating mode for testing

As declared by the customer, the product operating mode for testing as follows:

"For specific RFID testing a "tool scan" should be performed. This move scans the tools continuously until the user aborts. The test software will periodically fail a read, this is due to the lack of error checking. It is not an instrument failure."

The RFID and Bluetooth transmitters were continuously operated in active mode during the testing and the robotic arm operation was halted (activating “break” button in the laptop computer running ““Project1” test software).

## 5.6. Configuration

The EUT was either configured by the customer or configured using the customer’s instructions:

The EUT was powered by a 24VDC via an external AC/DC PSU which in turn was connected to 120VAC, 60Hz mains supply. The EUT was configured to communicate by Bluetooth via a non conductive RF link with the support equipment Bluetooth device (Microsoft Surface Pro Tablet) for all testing. This was achieved by configuring the Bluetooth connection then connecting the USB communication cable. The USB port was physically terminated at Microsoft Surface Pro Tablet but not used for communication or operation. Three (3) of the RS232 ports were looped back with a 1.8m long cable. Digital IO ports were looped back with a 2m long cable. “Project1” test software was supplied by customer to initiate EUT operation testing in Tool scan mode but aborted the movement of robotic arm (the motors were not operated during testing).

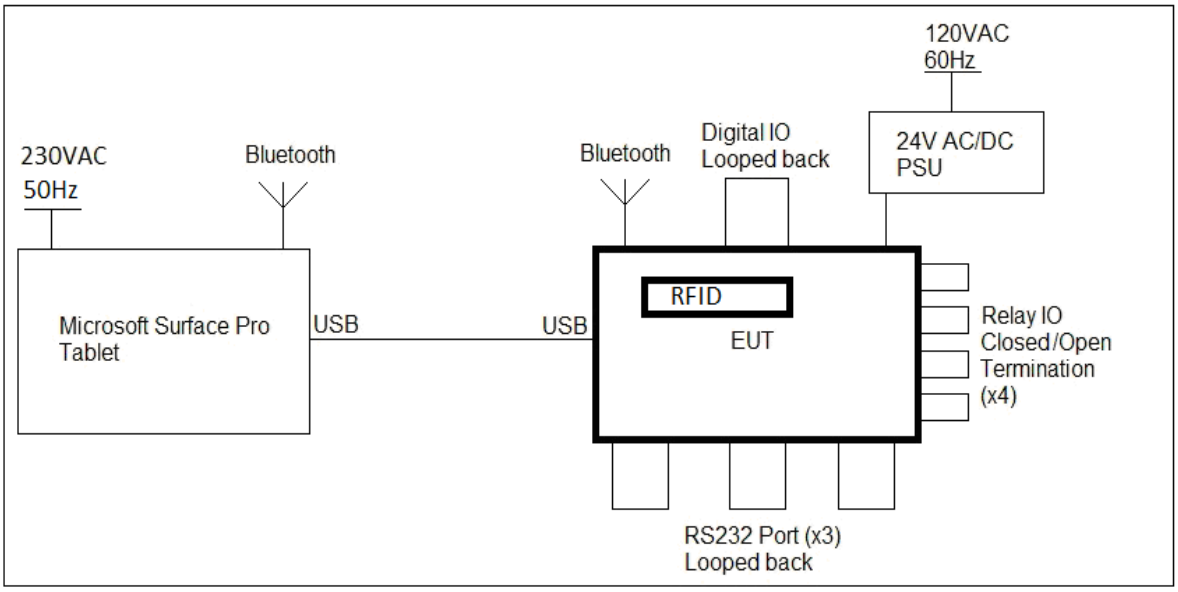



Table 2: Block diagram of EUT test configuration with Host

Additional radiated emissions measurements were performed with RFID module standalone. The module was supplied with 12VDC using a laboratory power supply. The customer supplied 3 separate loop antennas tuned to 124kHz, 134kHz and 140kHz for testing.

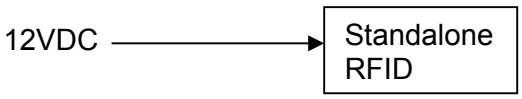



Table 3: Block diagram of test configuration – RFID module standalone

| Port | Cable type | Length (m) | Cable Brand | Cable Model | Termination |
|---|---|---|---|---|---|
| 24VDC PSU | 4 core Non-shielded | 1.0 | Mean Well | GST220A24-R7B | EUT |
| AC Mains | 3 core Non-shielded | 2.0 | Pirelli | N14108 | Mains to 24VDC PSU |
| USB | 4 core Shielded | 2.0 | CNC Tech | 102-1030-BL-F0200 | Microsoft Surface Pro |
| Relay IO - NO | 2 core Non-shielded | 2.0 | Powertech | WH-3049 | Open Termination |
| Relay IO - NO | 2 core Non-shielded | 2.0 | Powertech | WH-3049 | Closed Termination |
| Relay IO - NC | 2 core Non-shielded | 2.0 | Powertech | WH-3049 | Open Termination |
| Relay IO - NC | 2 core Non-shielded | 2.0 | Powertech | WH-3049 | Closed Termination |
| Digital IO | 9 core Shielded | 2.0 | Electus | WC7534 | Loop Back Termination |
| RS232 x 3 | 9 core Shielded | 1.8 | Digitech | WC7534 | Loop Back Termination |

Table 4: List of ports, loads and cable lengths used for testing

## 5.7. Modifications

The following modification was made by the customer to the EUT to comply with requirement of EN 61326-1: 2013, ETSI EN 301 489-1 V2.1.1 (2017-02), ETSI EN 301 489-3 V1.6.1 (2013-08) and ETSI EN 301 489-17 V3.1.1 (2017-02) for Electrostatic Discharge (ESD) testing.

❶ The enclosure side panel for inputs and outputs ports of the EUT was changed from a "Powder Coated" finish to "Stainless Steel" Side Panel.

*(Refer to photograph 16 in Annex A for views of the modification)*

| Test report | Test | Modification ❶ |
|---|---|---|
| E1705-0915-1 | Electromagnetic Radiation Disturbance | × |
| | Mains Terminal Disturbance Voltage | × |
| | Radiated Emissions | × |
| | Conducted Emissions | × |
| | Harmonic Current Emissions | × |
| | Voltage Change, Fluctuation and Flicker | × |
| | Electromagnetic Field (Radiated Electromagnetic Immunity) | × |
| | Conducted RF (Radio Frequency Continuous Conducted) | × |
| | Power Frequency Magnetic Field | × |
| | Burst/EFT | ✓ |
| | Surge | ✓ |
| | Voltage Dips and Interruptions | ✓ |
| | Electrostatic Discharge (ESD) | ✓ |
| E1705-0915-2 | Radiated Emissions | × |
| | Conducted Emissions | × |
| E1705-0915-3 | Maximum Fundamental Field Strength | × |
| | Radiated Spurious Emissions | × |
| | AC Power line Conducted Emissions | × |
| E1705-0915-4 | Transmitter Maximum Fundamental Field strength | × |
| | Transmitter Unwanted emissions | × |
| | Transmitter Frequency Stability | × |
| | AC Power Line Conducted Emissions | × |
| E1705-0915-5 | Operating Frequency Range | × |
| | Modulation bandwidth | × |
| | Transmitter H-field requirements | × |
| | Transmitter radiated spurious domain emission limits < 30 MHz | × |
| | Transmitter radiated spurious domain emission limits > 30 MHz | × |
| E1705-0915-6 | Transmitter Maximum EIRP | × |
| | Transmitter Spurious emissions | × |
| | Operating Frequency (normal and extreme test conditions) | × |

✓ = Modification fitted, × = Modification not fitted

Table 5: 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

Radiated emissions measurements were taken in the indoor Open Area Test Site (iOATS) facility at EMC Bayswater Pty Ltd, located at 18/88 Merrindale Drive, Croydon South, Victoria, 3136, Australia.

Conducted Emissions measurements were taken in a standard shielded enclosure at EMC Bayswater Pty Ltd, located at 18/88 Merrindale Drive, Croydon South, Victoria, 3136, Australia.

EMC Bayswater Pty Ltd's FCC registration number is 419968.

## 6.2. Test Equipment

Refer to Appendix A for the measurement instrument list.

## 7. Referenced Standards

CFR47 FCC Part 15, Subpart C

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.

# 8. Maximum Fundamental Field Strength (FCC Part 15.209)

## 8.1. Test Procedure

Maximum field strength was 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 polystyrene support at a height of 0.8m above the ground reference plane. The measuring antenna was located at a distance of 3m from the EUT. The spectrum analyser peak detector was set to MAX-HOLD and the range selected continuously scanned with 300Hz RBW and 1kHz VBW. The antenna height was fixed at 1 meter and the turntable slowly rotated. The EUT was also orientated in each of the X, Y and Z-axis, in-turn in order to find the worst-case emission arrangement.

Plots of the accumulated measurement data for X, Y and Z antenna orientations, including all transducer correction factors 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 1 to 4 in Annex C for views of the test configuration)*

## 8.2. Limits

The EUT shall meet the limits in the following table:

| 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 9kHz to 90kHz, 110kHz to 490kHz and above 1000MHz. 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 6: Limits for Radiated Emissions at distance of 3m – FCC Part 15.209 General limits

### 8.3. Test Results

Maximum Fundamental Field Strength measurements are tabulated below.

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

EPREP sample preparation workstation (RFID with host)

| Antenna Orientation | Frequency (kHz) | Result Peak (dBμV/m) | Limit Average (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|
| X | 130.767 | 49.5 | 105.3 | **-55.8*** |
| Y | 130.686 | 46.4 | 105.3 | -58.9 |
| Z | 130.742 | 43.9 | 105.3 | -61.4 |

**Worst-case emissions*

*Note: Peak measurements were below the Average limit (110kHz to 490kHz band), therefore average measurements were not performed and measured peak values were compared with average limit (worst-case) to determine the compliance.*

Table 7: Maximum Fundamental Field Strength - EPREP sample preparation workstation – RFID

Additional testing of standalone RFID module

RFID Module with 134kHz coil antenna – standalone

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

| Antenna Orientation | EUT Orientation | Frequency (kHz) | Result Peak (dBμV/m) | Limit Average (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|---|
| X | X | 134.675 | 76.0 | 105.0 | **-29.0*** |
| | Y | 134.685 | 76.0 | 105.0 | **-29.0*** |
| | Z | 134.665 | 66.8 | 105.0 | -38.2 |
| Y | X | 134.705 | 72.5 | 105.0 | -32.5 |
| | Y | 134.705 | 72.5 | 105.0 | -32.5 |
| | Z | 134.675 | 52.5 | 105.0 | -52.5 |
| Z | X | 134.655 | 68.9 | 105.0 | -36.1 |
| | Y | 134.675 | 68.9 | 105.0 | -36.1 |
| | Z | 134.655 | 67.9 | 105.0 | -37.1 |

**Worst-case emissions*

*Note: Peak measurements were below the Average limit (110kHz to 490kHz band), therefore average measurements were not performed and measured peak values were compared with average limit (worst-case) to determine the compliance.*

Table 8: Maximum Fundamental Field Strength – RFID module standalone - 134kHz

RFID Module with 124kHz coil antenna – standalone

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

| Antenna Orientation | EUT Orientation | Frequency (kHz) | Result Peak (dBμV/m) | Limit Average (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|---|
| X | X | 124.038 | 75.8 | 105.7 | -29.9 |
| | Y | 124.039 | 72.4 | 105.7 | -33.3 |
| | Z | 124.038 | 67.7 | 105.7 | -38.0 |
| Y | X | 124.038 | 76.1 | 105.7 | **-29.6*** |
| | Y | 124.029 | 71.2 | 105.7 | -34.5 |
| | Z | 124.038 | 67.1 | 105.7 | -38.6 |
| Z | X | 124.029 | 67.1 | 105.7 | -38.6 |
| | Y | 124.038 | 52.7 | 105.7 | -53.0 |
| | Z | 124.029 | 66.9 | 105.7 | -38.8 |

**Worst-case emission*

*Note: Peak measurements were below the Average limit (110kHz to 490kHz band), therefore average measurements were not performed and measured peak values were compared with average limit (worst-case) to determine the compliance.*

Table 9: Maximum Fundamental Field Strength - RFID module standalone - 124kHz

RFID Module with 140kHz coil antenna – standalone

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

| Antenna Orientation | EUT Orientation | Frequency (kHz) | Result Peak (dBμV/m) | Limit Average (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|---|
| X | X | 140.663 | 75.5 | 104.6 | **-29.1*** |
| | Y | 140.635 | 75.3 | 104.6 | -29.3 |
| | Z | 140.635 | 66.5 | 104.6 | -38.1 |
| Y | X | 140.654 | 72.0 | 104.6 | -32.6 |
| | Y | 140.635 | 71.8 | 104.6 | -32.8 |
| | Z | 140.635 | 52.4 | 104.6 | -52.2 |
| Z | X | 140.635 | 67.8 | 104.6 | -36.8 |
| | Y | 140.625 | 67.9 | 104.6 | -36.7 |
| | Z | 140.625 | 67.7 | 104.6 | -36.9 |

**Worst-case emission*

*Note: Peak measurements were below the Average limit (110kHz to 490kHz band), therefore average measurements were not performed and measured peak values were compared with average limit (worst-case) to determine the compliance.*

Table 10: Maximum Fundamental Field Strength - RFID module standalone - 140kHz

The measurement uncertainty was calculated at ±4.3dB for measurements between 9kHz and 30MHz. 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: | 19 to 21°C |
| Humidity: | 43 to 47% |

Table 11: Climatic conditions

**Comments:** The maximum Fundamental Field Strength measurements were below the permissible Spurious and general intentional radiator limits, Peak emissions were below the applicable limits.

**Assessment:** The EUT complied with the Radiated Emissions requirements of CFR47 FCC Part 15, Subpart C Section 15.209.

# 9. Radiated Spurious Emissions – FCC Part 15.209

## 9.1. Test Procedure

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

Radiated Emissions were measured 3 metres (from 9kHz to 1GHz) 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 above the ground plane.

In the frequency range of 9kHz to 30MHz, an Active loop antenna was used. For X, Y and Z 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 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 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 200 Hz (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 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 120kHz.

In the frequency range 1GHz to 18GHz 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 1MHz 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 1 second with a number of repetitions to ensure a minimum observation time of 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 1MHz. 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.

| 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 | 6 to 8 | 30.00 | 3 | 1.61 | 1 | 0.54 |
| AH SAS-585 | 8 to 12 | 30.00 | 3 | 1.61 | 1 | 0.54 |
| AH SAS-586 | 12 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 1: Worst case Maximum size of measuring envelope for Horn antennas

In the frequency range 18GHz to 25GHz a Horn antenna was used and an area of 1m 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 and position was varied depending upon the EUT dimensions to ensure complete illumination of the EUT 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) to find the worst-case emission arrangement. Peak and CISPR Average measurements were then performed using a measuring time of 1 second with a number of repetitions to ensure a minimum observation time of 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 1MHz.

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 1 to 7 in Annex C for views of the test configuration)*

## 9.2. Limits

As per section 15.209 (Radiated emissions, general requirements) the EUT is required to meet the limits that permit the highest field strength of the two sections in the following table:

| 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 12: Limits for Radiated Spurious Emissions at distance of 3m

## 9.3. 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.2)*

EPREP sample preparation workstation (RFID/Bluetooth with host)

| Antenna Orientation | Frequency (MHz) | Result peak (dBμV/m) | Limit Quasi-peak/ Average (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|
| X | 0.172 | 59.7 | 102.9 | -43.2 |
| | 0.390 | 50.7 | 95.8 | -45.1 |
| | 0.524 | 48.8 | 73.2 | **-24.4*** |
| | 18.435 | 24.6 | 69.5 | -44.9 |
| | 19.530 | 22.7 | 69.5 | -46.8 |
| | 27.794 | 27.4 | 69.5 | -42.1 |
| Y | 16.488 | 27.0 | 69.5 | -42.5 |
| | 18.123 | 31.0 | 69.5 | -38.5 |
| | 18.311 | 31.9 | 69.5 | -37.6 |
| | 18.793 | 30.6 | 69.5 | -38.9 |
| | 24.055 | 24.6 | 69.5 | -44.9 |
| | 28.295 | 24.8 | 69.5 | -44.7 |
| Z | 0.166 | 61.3 | 103.2 | -41.9 |
| | 0.499 | 47.9 | 73.6 | -25.7 |
| | 0.720 | 45.1 | 70.5 | -25.4 |
| | 18.451 | 24.3 | 69.5 | -45.2 |
| | 21.481 | 22.9 | 69.5 | -46.6 |
| | 27.269 | 28.5 | 69.5 | -41.0 |

**Worst-case emission*

Table 13: Radiated Spurious Emissions – 9kHz to 30MHz

| Antenna polarisation | Frequency (MHz) | Result Quasi-peak (dBμV/m) | Limit Quasi-peak (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|
| Horizontal | 60.652 | 32.2 | 40.0 | -7.8 |
| | 79.664 | 33.5 | 40.0 | -6.5 |
| | 99.210 | 37.7 | 43.5 | -5.8 |
| | 110.268 | 39.7 | 43.5 | -3.8$^{+}$ |
| | 111.286 | 39.6 | 43.5 | -4.0$^{+}$ |
| | 455.976 | 39.2 | 46.0 | -6.8 |
| Vertical | 39.603 | 35.3 | 40.0 | -4.7 |
| | 39.894 | 37.0 | 40.0 | **-3.0***$^{+}$ |
| | 40.137 | 35.2 | 40.0 | -4.8 |
| | 60.507 | 30.9 | 40.0 | -9.1 |
| | 77.773 | 30.6 | 40.0 | -9.4 |
| | 87.812 | 29.5 | 40.0 | -10.5 |
| | 111.626 | 36.7 | 43.5 | -6.8 |
| | 320.030 | 36.7 | 46.0 | -9.3 |
| | 455.976 | 38.0 | 46.0 | -8.0 |

**Worst-case emission, $^{+}$refer to measurement uncertainty statement*

Table 14: Radiated Spurious Emissions – 30MHz to 1GHz

| 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 | 1614.380 | 43.0 | 74.0 | -31.0 | 1614.380 | 38.4 | 54.0 | -25.8 |
| | 1626.080 | 41.7 | 74.0 | -32.3 | 1626.080 | 36.6 | 54.0 | -26.0 |
| | 4843.680 | 53.4 | 74.0 | -20.6 | 4843.680 | 51.7 | 54.0 | -2.3 |
| | 7379.920 | 47.0 | 74.0 | -27.0 | 7379.920 | 45.7 | 54.0 | -8.3 |
| | 9656.200 | 48.7 | 74.0 | -25.3 | 9656.200 | 47.1 | 54.0 | -6.9 |
| | 9684.280 | 55.2 | 74.0 | -18.8 | 9684.280 | 51.9 | 54.0 | **-2.1*+** |
| | 9858.880 | 50.7 | 74.0 | -23.3 | 9858.880 | 47.7 | 54.0 | -6.3 |
| | 9920.440 | 52.8 | 74.0 | -21.2 | 9920.440 | 47.8 | 54.0 | -6.2 |
| | 12206.320 | 46.8 | 74.0 | -27.2 | 12206.320 | 42.7 | 54.0 | -11.3 |
| | 14639.380 | 52.3 | 74.0 | -21.7 | 14640.940 | 50.1 | 54.0 | -3.9+ |
| Vertical | 1621.660 | 43.3 | 74.0 | -30.7 | 1619.060 | 37.7 | 54.0 | -16.3 |
| | 1631.020 | 42.8 | 74.0 | -31.2 | 1623.740 | 37.5 | 54.0 | -16.5 |
| | 4844.160 | 52.9 | 74.0 | -21.1 | 4844.160 | 51.2 | 54.0 | -2.8+ |
| | 7259.440 | 52.5 | 74.0 | -21.5 | 7259.440 | 51.2 | 54.0 | -2.8+ |
| | 7437.520 | 44.6 | 74.0 | -29.4 | 7437.440 | 41.4 | 54.0 | -12.6 |
| | 9260.520 | 49.6 | 74.0 | -24.4 | 9660.160 | 43.6 | 54.0 | -10.4 |
| | 9739.360 | 50.2 | 74.0 | -23.8 | 9739.360 | 44.8 | 54.0 | -9.2 |
| | 12104.560 | 47.6 | 74.0 | -26.4 | 12106.000 | 43.1 | 54.0 | -10.9 |
| | 14568.400 | 50.6 | 74.0 | -23.4 | 14568.400 | 47.8 | 54.0 | -6.2 |

**Worst-case emission, +refer to measurement uncertainty statement*

Table 15: Radiated Spurious Emissions – 1GHz to 25GHz

Additional testing of standalone RFID module worst-case test results

RFID Module with 134kHz coil antenna – standalone

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

| Antenna Orientation | EUT Orientation | Frequency (MHz) | Result Peak (dBμV/m) | Limit Quasi-peak/ Average (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|---|
| X | X | 21.811 | 19.3 | 69.5 | -50.2 |
| | | 28.551 | 22.5 | 69.5 | -47.0 |
| | | 28.836 | 22.6 | 69.5 | **-46.9** |
| | | 29.071 | 22.3 | 69.5 | -47.2 |
| | | 29.351 | 21.6 | 69.5 | -47.9 |
| | | 29.633 | 21.2 | 69.5 | -48.3 |

**Worst-case emission*

Table 16: Radiated Spurious Emissions – 9kHz to 30MHz

RFID Module with 124kHz coil antenna – standalone

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

| Antenna Orientation | EUT Orientation | Frequency (MHz) | Result Peak (dBμV/m) | Limit Quasi-peak/ Average (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|---|
| Y | X | 23.470 | 19.5 | 69.5 | -50.0 |
| | | 26.516 | 19.8 | 69.5 | -49.7 |
| | | 27.750 | 19.9 | 69.5 | -49.6 |
| | | 29.484 | 19.8 | 69.5 | -49.7 |
| | | 29.734 | 20.2 | 69.5 | -49.3 |
| | | 29.981 | 20.7 | 69.5 | **-48.8*** |

**Worst-case emission*

Table 17: Radiated Spurious Emissions – 9kHz to 30MHz

RFID Module with 140kHz coil antenna – standalone

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

| Antenna Orientation | EUT Orientation | Frequency (MHz) | Result Peak (dBμV/m) | Limit Quasi-peak/ Average (dBμV/m) | Delta limit (dB) |
|---|---|---|---|---|---|
| X | X | 26.163 | 18.4 | 69.5 | -51.1 |
| | | 28.430 | 18.2 | 69.5 | -51.3 |
| | | 28.983 | 18.7 | 69.5 | -50.8 |
| | | 29.257 | 19.4 | 69.5 | -50.1 |
| | | 29.531 | 20.4 | 69.5 | **-49.1*** |
| | | 29.827 | 20.0 | 69.5 | -49.5 |

**Worst-case emission*

Table 18: Radiated Spurious Emissions – 9kHz to 30MHz

The measurement uncertainty was calculated at ±4.3dB for 9kHz to 30MHz measurements, ±4.7dB for 30MHz to 1GHz measurements and ±5.3dB for measurements above 1GHz. 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: | 19 to 21°C |
| Humidity: | 43 to 47% |

Table 19: 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:

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

**Comments:** All Spurious Emissions measurements were below the permissible Spurious and general intentional radiator limits for the Average/Quasi peak detector and the peak detector emissions were below the peak limit.

**Assessment:** The EUT complied with the Radiated Spurious Emissions requirements of CFR47 FCC Part 15, Subpart C 15.209

# 10. Conducted Emissions – FCC Part 15.207

## 10.1. Test Procedure

The Conducted Emissions was performed in accordance with the section 6.2 of ANSI C63.10 - 2013.

The EUT was positioned 0.4m from the vertical ground reference plane (chamber wall) and 0.8m above a horizontal ground reference plane (chamber floor) with the mains cable connected to the power port of a LISN, located 0.8 metres away. The measuring port of the LISN was connected to the measuring receiver. In order to avoid unwanted ambient signals, power to the LISN was supplied via power line filters fitted to the shielded enclosure wall.

The mains flexible cord provided by the manufacturer is required to be 1m long for these measurements. If the manufacturer supplies a non-removable power lead, in excess of 1m, the cable in excess of 1m is folded at the centre into a bundle no longer than 0.4m in length.

Preview scan measurements were performed using a peak and an average detector of the EMI receiver with a resolution bandwidth of 9kHz. The scan measurements frequency step size of the EMI receiver was set to less then half of the resolution bandwidth.The final quasi-peak and CISPR average measurements were performed at spot frequencies where the preview peak or average emission was close to, or exceeded the applicable limit line with a receiver bandwidth of 6dB and a resolution bandwidth of 9kHz. The final measurements were performed using a measuring time of no less than 15 seconds.

Both the active and neutral lines were measured, in turn. Plots of the accumulated measurement data for both active and neutral terminals, 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 photograph 8 in Annex C for a view of the test configuration)*

## 10.2. Limits

The EUT shall meet the limits in the following table:

| Frequency Range (MHz) | Limits (dBµV) | |
|---|---|---|
| | Quasi-Peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.5 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |
| NOTE 1 The lower limit shall apply at the transition frequencies.<br>NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz. | | |

Table 20: Limits for Conducted Emissions at the mains ports

## 10.3. Test Results

Conducted Emissions measurements are tabulated below. Quasi-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.3)*

| Quasi - Peak Measurements | | | | Average Measurements | | | |
|---|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **Result (dBμV)** | **Limit (dBμV)** | **Delta Limit (dB)** | **Frequency (MHz)** | **Result (dBμV)** | **Limit (dBμV)** | **Delta Limit (dB)** |
| 0.150 | 42.6 | 66.0 | -23.4 | 0.170 | 36.2 | 55.0 | -18.8 |
| 0.166 | 40.4 | 65.2 | -24.8 | 0.174 | 34.2 | 54.8 | -20.6 |
| 0.338 | 39.0 | 59.3 | -20.3 | 0.334 | 29.1 | 49.4 | -20.3 |
| 0.362 | 38.7 | 58.7 | -20.0 | 0.358 | 29.3 | 48.8 | -19.5 |
| 0.574 | 35.6 | 56.0 | -20.4 | 0.630 | 25.4 | 46.0 | -20.6 |
| 1.510 | 34.1 | 56.0 | -21.9 | 1.556 | 26.0 | 46.0 | -20.0 |
| 1.880 | 33.6 | 56.0 | -22.4 | 1.864 | 26.2 | 46.0 | -19.8 |
| 2.500 | 35.8 | 56.0 | -20.2 | 2.524 | 26.9 | 46.0 | -19.1 |
| 3.910 | 34.8 | 56.0 | -21.2 | 3.988 | 26.1 | 46.0 | -19.9 |
| 6.810 | 40.3 | 60.0 | -19.7 | 6.796 | 32.7 | 50.0 | -17.3 |
| 9.990 | 42.2 | 60.0 | -17.8 | 10.196 | 34.4 | 50.0 | -15.6 |
| 11.700 | 43.1 | 60.0 | -16.9 | 11.676 | 35.3 | 50.0 | -14.7 |
| 14.300 | 43.7 | 60.0 | -16.3 | 14.592 | 35.4 | 50.0 | **-14.6*** |
| 14.600 | 43.9 | 60.0 | -16.1 | 15.080 | 35.4 | 50.0 | **-14.6*** |
| 15.100 | 43.6 | 60.0 | -16.4 | 15.564 | 35.4 | 50.0 | **-14.6*** |
| 20.500 | 40.7 | 60.0 | -19.3 | 19.464 | 31.5 | 50.0 | -18.5 |
| 24.400 | 44.1 | 60.0 | -15.9 | 24.364 | 33.7 | 50.0 | -16.3 |
| 24.900 | 43.8 | 60.0 | -16.2 | 24.844 | 33.6 | 50.0 | -16.4 |
| 25.300 | 45.0 | 60.0 | **-15.0*** | 25.340 | 33.3 | 50.0 | -16.7 |
| 26.800 | 39.9 | 60.0 | -20.2 | 29.264 | 30.5 | 50.0 | -19.5 |

** Worst-case emissions*

Table 21: Conducted Emissions – Active Line – RFID/Bluetooth TX mode

| Quasi - Peak Measurements | | | | Average Measurements | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Result (dBμV) | Limit (dBμV) | Delta Limit (dB) | Frequency (MHz) | Result (dBμV) | Limit (dBμV) | Delta Limit (dB) |
| 0.150 | 45.3 | 66.0 | -20.7 | 0.174 | 33.7 | 54.8 | -21.1 |
| 0.174 | 40.5 | 64.8 | -24.3 | 0.230 | 23.8 | 52.4 | -28.6 |
| 0.318 | 36.0 | 59.8 | -23.8 | 0.350 | 27.7 | 49.0 | -21.3 |
| 0.402 | 38.4 | 57.8 | **-19.4*** | 0.470 | 22.4 | 46.5 | -24.1 |
| 0.470 | 32.9 | 56.5 | -23.6 | 0.514 | 25.8 | 46.0 | -20.2 |
| 1.128 | 30.3 | 56.0 | -25.7 | 1.132 | 21.3 | 46.0 | -24.7 |
| 1.544 | 32.4 | 56.0 | -23.6 | 1.516 | 26.2 | 46.0 | -19.8 |
| 1.836 | 34.9 | 56.0 | -21.1 | 1.856 | 26.1 | 46.0 | -19.9 |
| 3.016 | 34.4 | 56.0 | -21.6 | 3.496 | 26.9 | 46.0 | -19.1 |
| 4.700 | 35.3 | 56.0 | -20.7 | 4.872 | 28.5 | 46.0 | **-17.5*** |
| 6.616 | 37.5 | 60.0 | -22.5 | 6.616 | 30.4 | 50.0 | -19.6 |
| 9.820 | 36.5 | 60.0 | -23.5 | 10.024 | 28.4 | 50.0 | -21.6 |
| 14.600 | 37.4 | 60.0 | -22.6 | 14.896 | 28.9 | 50.0 | -21.1 |
| 14.868 | 38.0 | 60.0 | -22.0 | 15.328 | 29.9 | 50.0 | -20.1 |
| 15.084 | 38.4 | 60.0 | -21.6 | 15.816 | 30.9 | 50.0 | -19.1 |
| 15.172 | 38.8 | 60.0 | -21.2 | 16.100 | 31.6 | 50.0 | -18.4 |
| 15.768 | 39.1 | 60.0 | -20.9 | 16.332 | 30.9 | 50.0 | -19.1 |
| 16.148 | 39.2 | 60.0 | -20.8 | 17.344 | 28.8 | 50.0 | -21.2 |
| 17.724 | 37.1 | 60.0 | -22.9 | 17.844 | 29.1 | 50.0 | -20.9 |
| 25.180 | 34.2 | 60.0 | -25.8 | 24.664 | 24.4 | 50.0 | -25.6 |

**Worst-case emissions*

Table 22: Conducted Emissions – Neutral Line – RFID/Bluetooth TX mode

The measurement uncertainty was calculated at ±2.9dB. 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: | 16 to 17°C |
| Humidity: | 59% |

Table 23: Climatic conditions

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

$$V = V_{QP/AV} + VLISN + L_C + L_T$$

Where:

| | | |
|---|---|---|
| V | = | Corrected Voltage Amplitude in dBµV |
| $V_{QP/AV}$ | = | Measured Voltage (Quasi Peak or Average) in dBµV |
| VLISN | = | Line Impedance Stabilization Network Factor in dB |
| $L_C$ | = | Cable/attenuator Loss in dB |
| $L_T$ | = | Transient Protection Network Loss in dB |

Example calculation:

$$V = V_{QP} + VLISN + L_C + L_T$$
$$V = 15\ dB\mu V + 10.1dB + 11.5dB + 10.1dB$$
$$V = 46.7\ dB\mu V$$

**Comments:** Conducted Emissions measurements were below the specified limit.

**Assessment:** The EUT complied with the Conducted Emissions requirements of CFR47 FCC Part 15, Subpart C.

## 11. Conclusion

The EPREP Pty Ltd, GL950X, EPREP sample preparation workstation complied with the applicable requirements of CFR47 FCC Part 15, Subpart C sections 15.207 and 15.209.

# Appendix A – Test Equipment

| Inv | Equipment | Make | Model No | Serial No | Calibration | |
|---|---|---|---|---|---|---|
| | | | | | Due | Type |
| **Radiated Disturbance (Radiated Emissions) 9kHz to 30MHz** | | | | | | |
| 0024 | Loop Antenna | EMCO | 6502 | 2620 | May-18 | I |
| 0818 | ANALYSER, EMI Receiver | Rohde & Schwarz | ESIB 40 | 100295 | Sep-17 | E |
| 0932 | CONTROLLER, Position | Sunol Sciences | SC104V-3 | 081006-1 | N/A | V |
| 0933 | TURNTABLE | Sunol Sciences | SM46C | 081006-2 | N/A | V |
| 1143 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84287041 | SN MY058/4PA | Jan-18 | I |
| 1144 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84279564 | SN MY055/4PA | Jan-18 | I |
| 1155 | Hygrometer, Temp, Humidity | DigiTech | QM7312 | - | Jun-17 | I |
| 0666 | ENCLOSURE, Semi-Anechoic, No 1 | RFI Industries | S800 iOATS | 1229 | Jul-17 | I |
| SW007 | EMC Measurement Software | Rohde & Schwarz | EMC 32 | Version 8.53.0 | N/A | V |
| **Radiated Disturbance (Radiated Emissions) 30MHz to 1GHz** | | | | | | |
| 0818 | ANALYSER, EMI Receiver | Rohde & Schwarz | ESIB 40 | 100295 | Sep-17 | E |
| 1217 | ANALYSER, EMI Receiver | Rohde & Schwarz | ESU40 | 100182 | Mar-18 | E |
| 0932 | CONTROLLER, Position | Sunol Sciences | SC104V-3 | 081006-1 | N/A | V |
| 0933 | TURNTABLE | Sunol Sciences | SM46C | 081006-2 | N/A | V |
| 0934 | MAST, Antenna | Sunol Sciences | TLT2 | 081006-5 | N/A | V |
| 0935 | ANTENNA, Biconilog | Sunol Sciences | JB5 | A07116 | Jan-19 | E |
| 0718 | ATTENUATOR, 6dB | JFW | 50FPE-006 | - | Jan-20 | I |
| 1143 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84287041 | SN MY058/4PA | Jan-18 | I |
| 1144 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84279564 | SN MY055/4PA | Jan-18 | I |
| 1155 | Hygrometer, Temp, Humidity | DigiTech | QM7312 | - | Jun-17 | I |
| 0666 | ENCLOSURE, Semi-Anechoic, No 1 | RFI Industries | S800 iOATS | 1229 | Jul-17 | I |
| SW007 | EMC Measurement Software | Rohde & Schwarz | EMC 32 | Version 8.53.0 | N/A | V |

*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*

| Inv | Equipment | Make | Model No | Serial No | Calibration | |
|---|---|---|---|---|---|---|
| | | | | | Due | Type |
| | | | | | | |
| **Radiated Disturbance (Radiated Emissions) 1GHz to 25GHz** | | | | | | |
| 1217 | ANALYSER, EMI Receiver | Rohde & Schwarz | ESU40 | 100182 | Mar-18 | E |
| 0933 | TURNTABLE | Sunol Sciences | SM46C | 081006-2 | N/A | V |
| 0934 | MAST, Antenna | Sunol Sciences | TLT2 | 081006-5 | N/A | V |
| 1143 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84287041 | SN MY058/4PA | Jan-18 | I |
| 1144 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84279564 | SN MY055/4PA | Jan-18 | I |
| 1146 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84287043 | SN MY054/4PA | Jan-18 | I |
| 0559 | PRE-AMP, Microwave, 18GHz | Miteq | AFS8 | 605305 | Nov-17 | I |
| 1064 | PRE-AMP, Microwave, 26GHz | Miteq | AFS33 | 1696371 | Jan-18 | V |
| 0633 | ANTENNA, Double Ridge Horn | EMCO | 3115 | 9712-5369 | Aug-18 | I |
| 1193 | Standard Gain Horn Antenna - 5.85GHz to 8.2GHz | A.H. Systems, inc | SAS-584 | 186 | Feb-18 | E |
| 1194 | Standard Gain Horn Antenna - 8.2GHz to 12.4GHz | A.H. Systems, inc | SAS-585 | 224 | Feb-18 | E |
| 1195 | Standard Gain Horn Antenna - 12.4GHz to 18.0GHz | A.H. Systems, inc | SAS-586 | 195 | Feb-18 | E |
| 1196 | Standard Gain Horn Antenna - 18.0GHz to 26.5GHz | A.H. Systems, inc | SAS-587 | 181 | Feb-18 | E |
| 1197 | Standard Gain Horn Antenna - 26.5GHz to 40.0GHz | A.H. Systems, inc | SAS-588 | 163 | Feb-18 | E |
| 1155 | Hygrometer, Temp, Humidity | DigiTech | QM7312 | - | Jun-17 | I |
| 0666 | ENCLOSURE, Semi-Anechoic, No 1 | RFI Industries | S800 iOATS | 1229 | Jul-17 | I |
| SW007 | EMC Measurement Software | Rohde & Schwarz | EMC 32 | Version 8.53.0 | N/A | N/A |
| **Conducted Emissions** | | | | | | |
| 0954 | ANALYSER, EMI Receiver | Rohde+Schwarz | ESCI 3 | 100196 | Jun-17 | E |
| 0047 | LISN, Single Phase, 50uH/50 Ohm | EMCO | 3850/2 | 9010-1005 | Jan-19 | E |
| 0048 | LISN, Single Phase, 50uH/50 Ohm | EMCO | 3850/2 | 9105-1006 | Dec-17 | E |
| 0722 | ATTENUATOR, 10dB | JFW | 50FPE-010 | 722 | Oct-18 | I |
| 1148 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84287047 | SN MY059/4PA | Jan-18 | I |
| 1149 | CABLE, Coax, Sucoflex 104PA | Huber + Suhner | 84287049 | SN MY053/4PA | Jan-18 | I |
| 0358 | LIMITER, Transient, 9k-200M | Hewlett Packard | 11947A | 3107A01832 | May-17 | I |
| 1154 | HYGROMETER, Temp, Humidity | DigiTech | QM7312 | - | Jun-17 | I |
| 1130 | Generator, Variable speed drive controller | Yaskawa electric mfg. Co., ltd | CIMR-H5.5G2-10 | | - | V |
| 1131 | Generator, AC Drive unit and AC generator | Mecc Alte Apa | CT 3-SB/2 | 658519 | - | V |
| 0441 | ENCLOSURE, Shielded, No 5 | RFI Industries | TC800-20 | 933 | - | V |
| SW007 | EMC Measurement Software | Rohde & Schwarz | EMC 32 | Version 6.30.10 | 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 | EUT – External views |
| A | 2 | |
| A | 3 | |
| A | 4 | |
| A | 5 | |
| A | 6 | |
| A | 7 | |
| A | 8 | |
| A | 9 | |
| A | 10 | |
| A | 11 | EUT – External AC/DC power adapter |
| A | 12 | |
| A | 13 | |
| A | 14 | EUT – Tool rack (with RFID tags) |
| A | 15 | EUT – RFID tag |
| A | 16 | EUT – Modification |
| A | 17 | AE – Customer supplied Microsoft Surface Pro tablet |
| A | 18 | |
| B | 1 | EUT – Internal views |
| B | 2 | |
| B | 3 | |
| B | 4 | |
| B | 5 | |
| B | 6 | |
| B | 7 | |
| B | 8 | |
| B | 9 | |
| B | 10 | |
| B | 11 | |
| B | 12 | |
| B | 13 | |
| B | 14 | |
| B | 15 | |
| B | 16 | |
| B | 17 | |
| B | 18 | |
| B | 19 | |
| B | 20 | |
| B | 21 | |

| Annex | Number | Photograph Description |
|---|---|---|
| B | 22 | EUT – RFID module |
| B | 23 | EUT – Robotic arm upper RFID antenna |
| B | 24 | EUT – Robotic arm lower RFID antenna |
| B | 25 | EUT – Bluetooth module |
| C | 1 | Radiated measurements – EUT Orientation |
| C | 2 | Radiated measurements – 9kHz to 30MHz – X Antenna orientation |
| C | 3 | Radiated measurements – 9kHz to 30MHz – Y Antenna orientation |
| C | 4 | Radiated measurements – 9kHz to 30MHz – Z Antenna orientation |
| C | 5 | Radiated measurements – 30MHz to 1000MHz |
| C | 6 | Radiated measurements – 1GHz to 18GHz |
| C | 7 | Radiated measurements – 18GHz to 25GHz |
| C | 8 | AC power port Conducted measurements |
| C | 9 | Radiated measurements – RFID Standalone – X EUT Orientation |
| C | 10 | Radiated measurements – RFID Standalone – Y EUT Orientation |
| C | 11 | Radiated measurements – RFID Standalone – Z EUT Orientation |
| C | 12 | Radiated measurements – RFID Standalone – 9kHz to 30MHz – X Antenna orientation |
| C | 13 | Radiated measurements – RFID Standalone – 9kHz to 30MHz – Y Antenna orientation |
| C | 14 | Radiated measurements – RFID Standalone – 9kHz to 30MHz – Z Antenna orientation |

| | | |
|---|---|---|
| EUT Internal Photographs | - | EMC Bayswater Test Report E1705-0915-3 Annex A |
| EUT External Photographs | - | EMC Bayswater Test Report E1705-0915-3 Annex B |
| Test set-up & EUT Orientations Photographs | - | EMC Bayswater Test Report E1705-0915-3 Annex C |

# Appendix C – Measurement Graphs –- EPREP sample preparation workstation

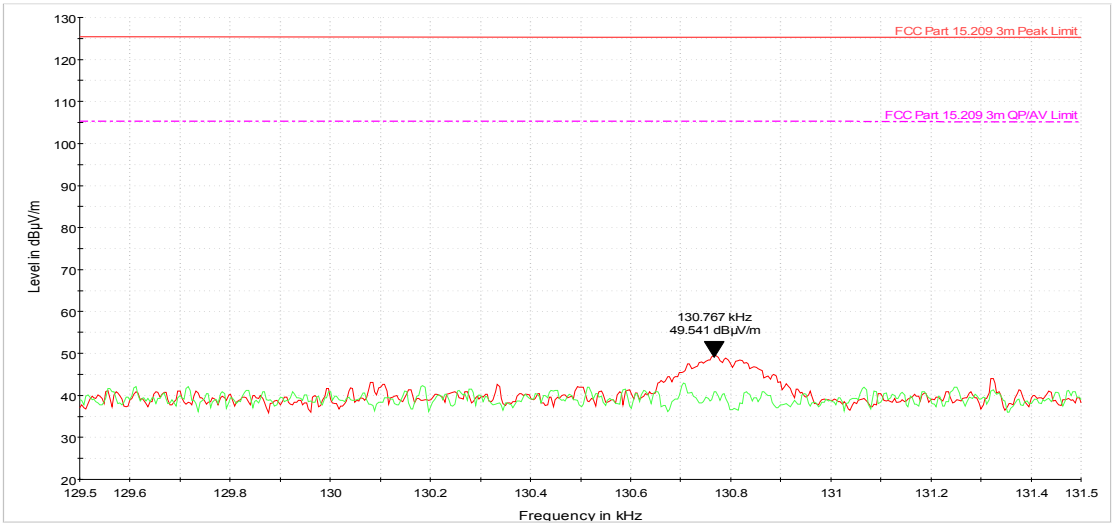
## Appendix C.1 - Maximum Fundamental Field Strength - RFID

| No. | Test | Graph Description |
|---|---|---|
| 1 | Maximum Fundamental Field Strength | X measurement antenna polarisation |
| 2 | | Y measurement antenna polarisation |
| 3 | | Z measurement antenna polarisation |

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



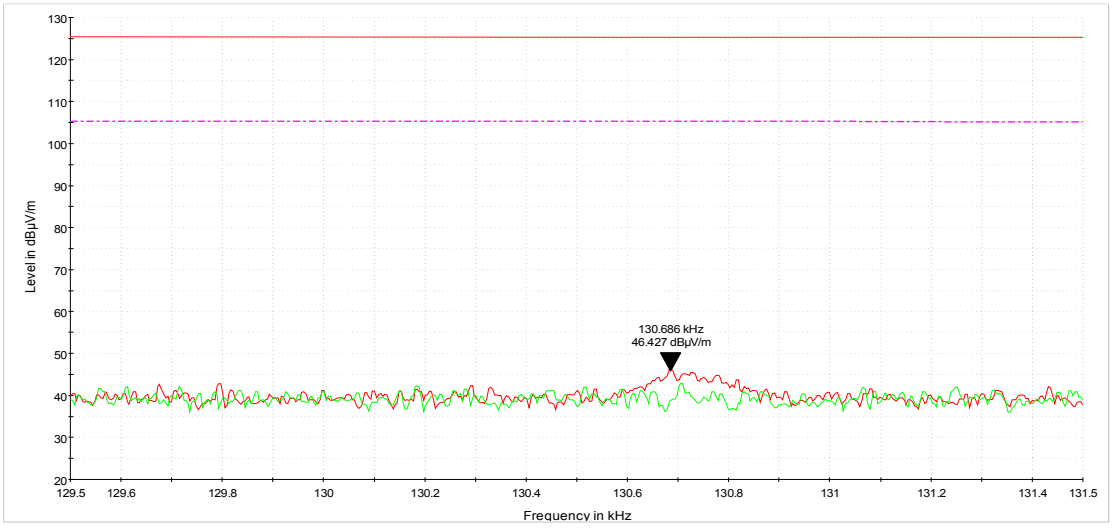



Graph 1

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



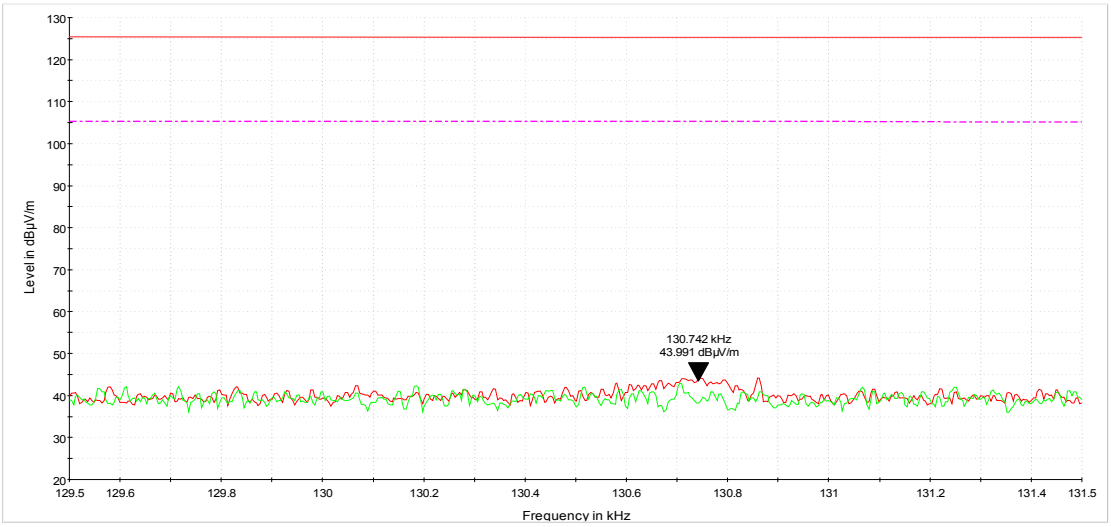



Graph 2

**EMC Bayswater Pty. Ltd.**

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT




MaxPeak-MaxHold-PK+ Ambient FCC Part 15.209 3m QP/AV Limit FCC Part 15.209 3m Peak Limit



Graph 3

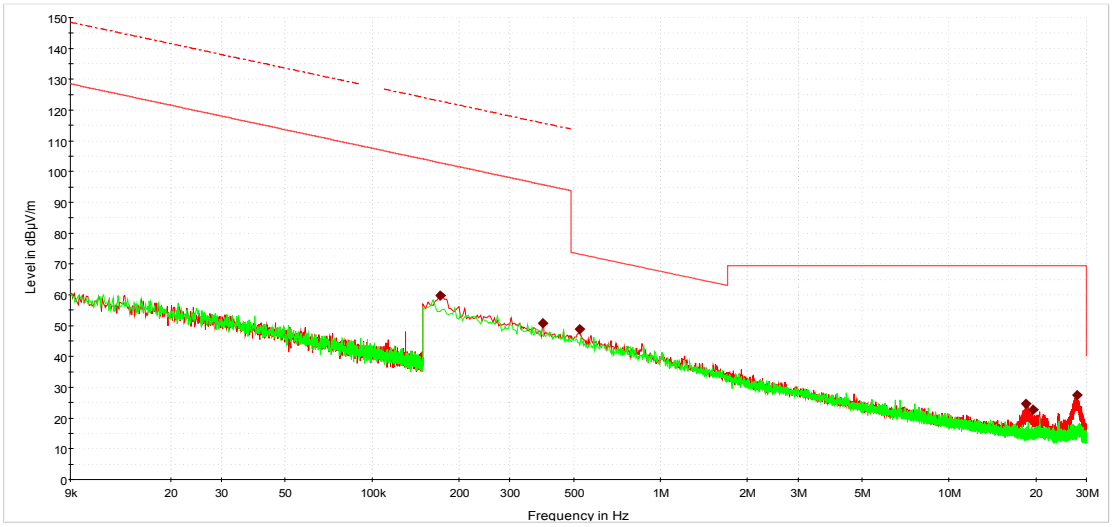
## Appendix C.2 – Radiated Spurious Emissions - EPREP sample preparation workstation

| No. | Test | Graph Description |
|---|---|---|
| 4 | Radiated Spurious Emissions | X measurement antenna polarisation – 9kHz to 30MHz |
| 5 | | Y measurement antenna polarisation – 9kHz to 30MHz |
| 6 | | Z measurement antenna polarisation – 9kHz to 30MHz |
| 7 | | Horizontal measurement antenna polarisation – 30MHz to 1GHz |
| 8 | | Horizontal measurement antenna polarisation – 1GHz to 6GHz |
| 9 | | Horizontal measurement antenna polarisation – 5.85GHz to 8.2GHz |
| 10 | | Horizontal measurement antenna polarisation – 8.2GHz to 12.4GHz |
| 11 | | Horizontal measurement antenna polarisation – 12.4GHz to 18GHz |
| 12 | | Horizontal measurement antenna polarisation – 18GHz to 25GHz – position 1 |
| 13 | | Horizontal measurement antenna polarisation – 18GHz to 25GHz – position 2 |
| 14 | | Vertical measurement antenna polarisation – 30MHz to 1GHz |
| 15 | | Vertical measurement antenna polarisation – 1GHz to 6GHz |
| 16 | | Vertical measurement antenna polarisation – 5.85GHz to 8.2GHz |
| 17 | | Vertical measurement antenna polarisation – 8.2GHz to 12.4GHz |
| 18 | | Vertical measurement antenna polarisation – 12.4GHz to 18GHz |
| 19 | | Vertical measurement antenna polarisation – 18GHz to 25GHz – position 1 |
| 20 | | Vertical measurement antenna polarisation – 18GHz to 25GHz – position 2 |

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – 9kHz to 30MHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



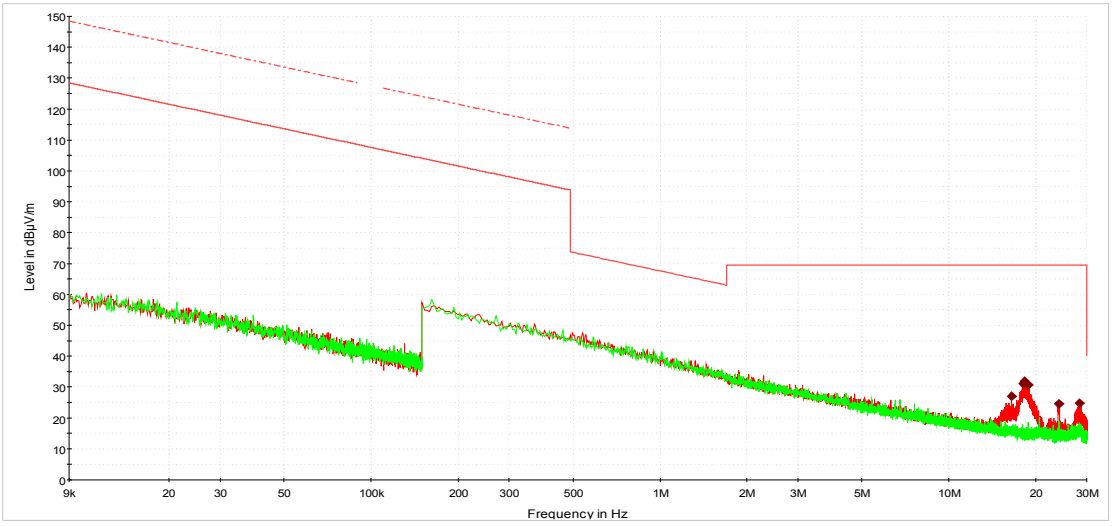



Graph 4

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – 9kHz to 30MHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



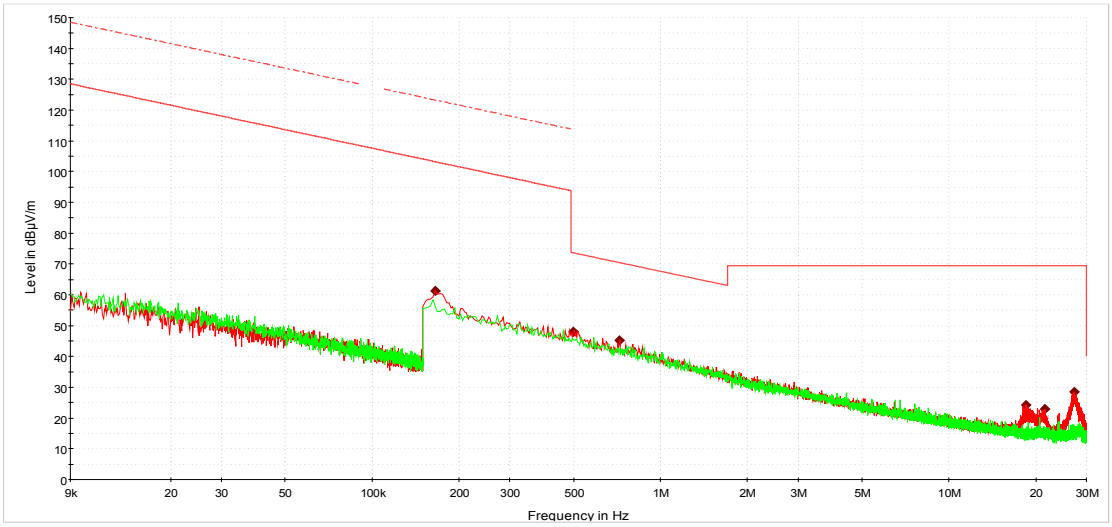



Graph 5

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – 9kHz to 30MHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT






Graph 6

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Horizontal antenna polarisation – 30MHz to 1GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL

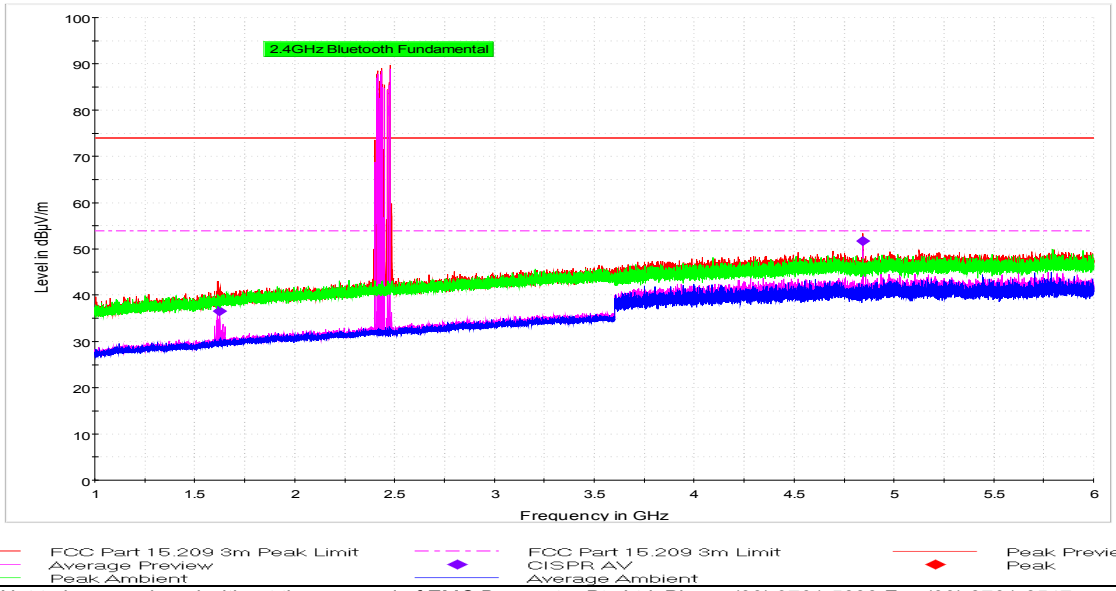



Graph 7

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Horizontal antenna polarisation – 1GHz to 6GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



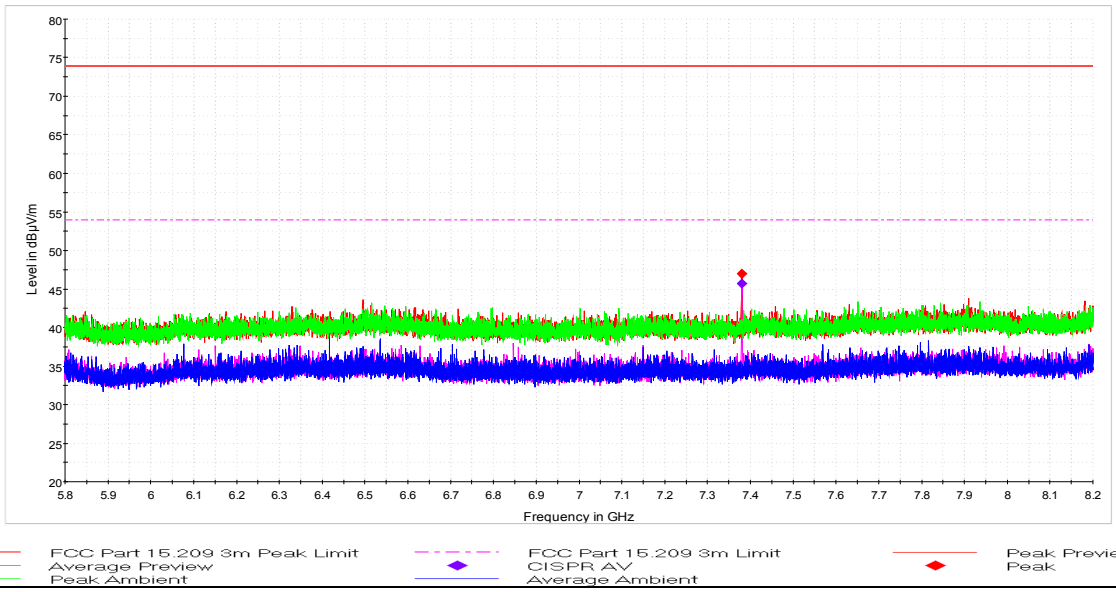



Graph 8

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Horizontal antenna polarisation – 5.85GHz to 8.2GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



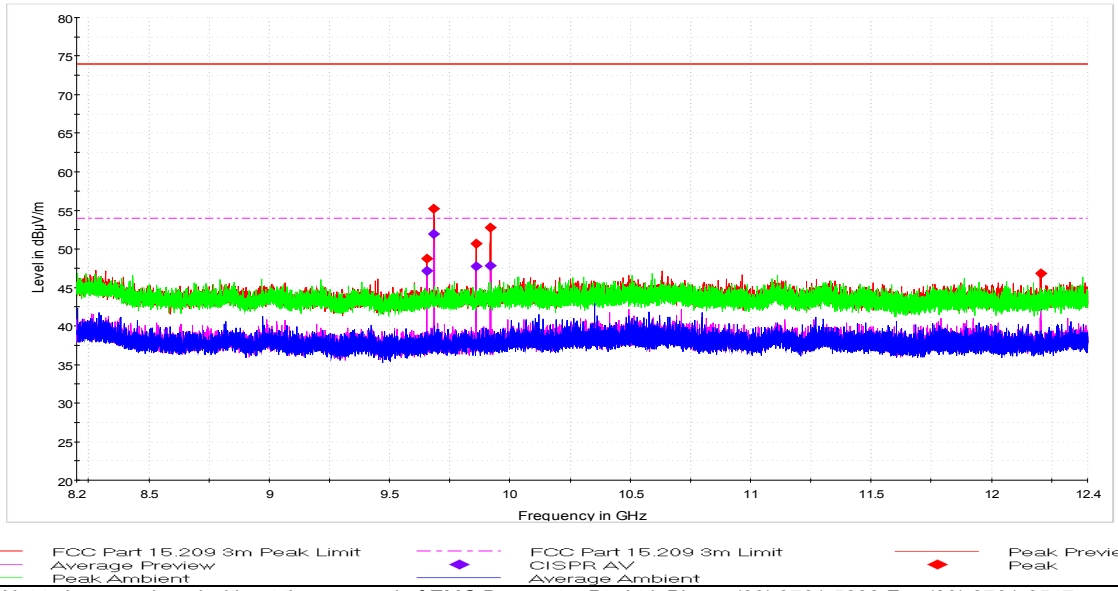



Graph 9

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Horizontal antenna polarisation – 8.2GHz to 12.4GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



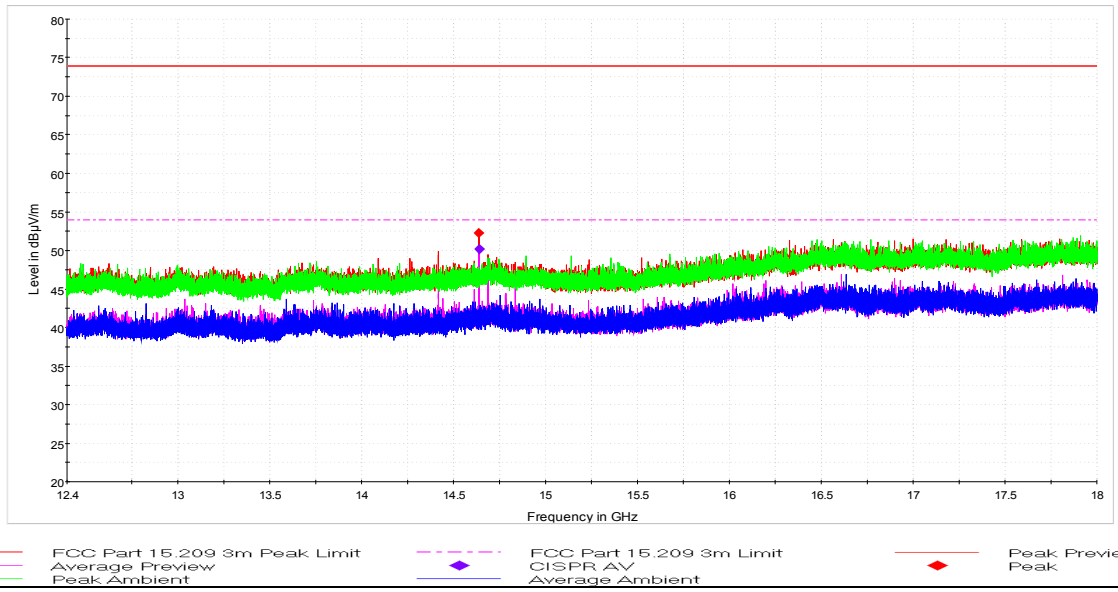



Graph 10

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Horizontal antenna polarisation – 12.4GHz to 18GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT





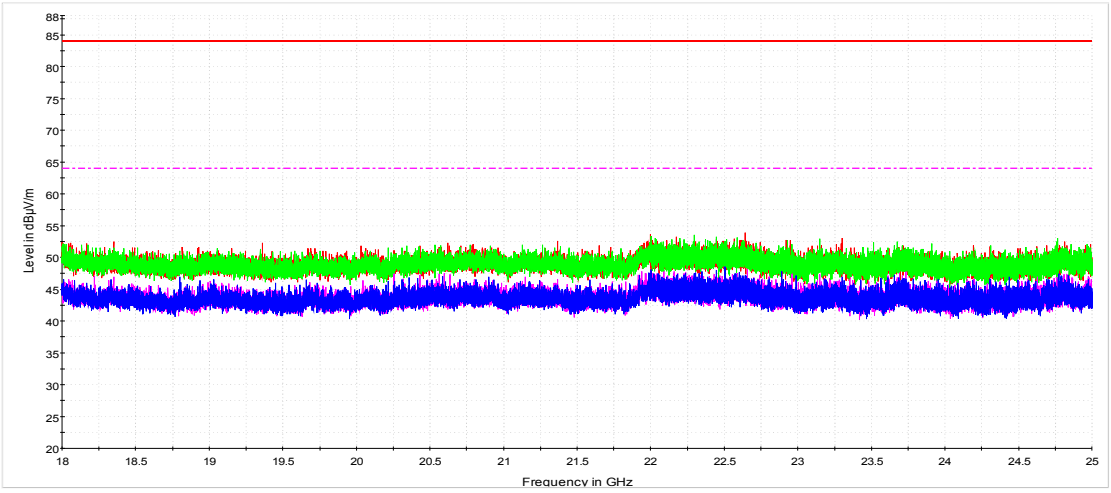

Graph 11

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Horizontal antenna polarisation – 18GHz to 25GHz – Position 1**

Job Number: E1705-0915-3 Rev1

Test Engineer: AT





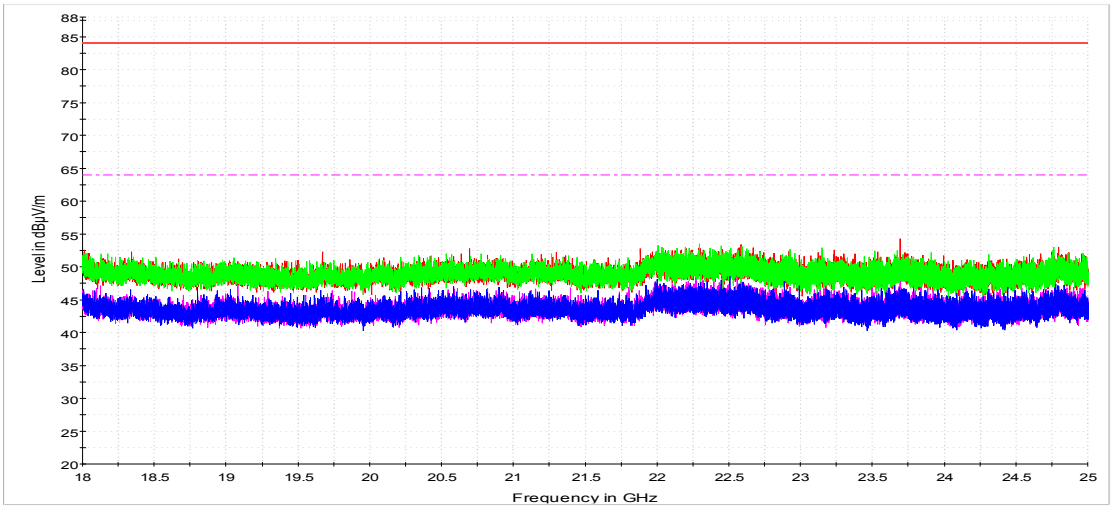

Graph 12

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Horizontal antenna polarisation – 18GHz to 25GHz – Position 2**

Job Number: E1705-0915-3 Rev1

Test Engineer: AT



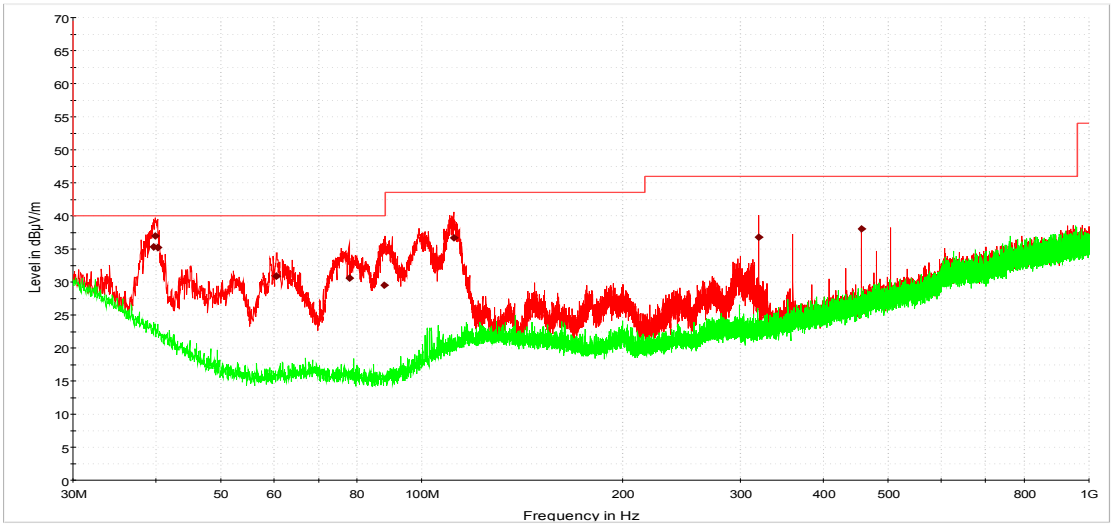



Graph 13

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Vertical antenna polarisation – 30MHz to 1GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



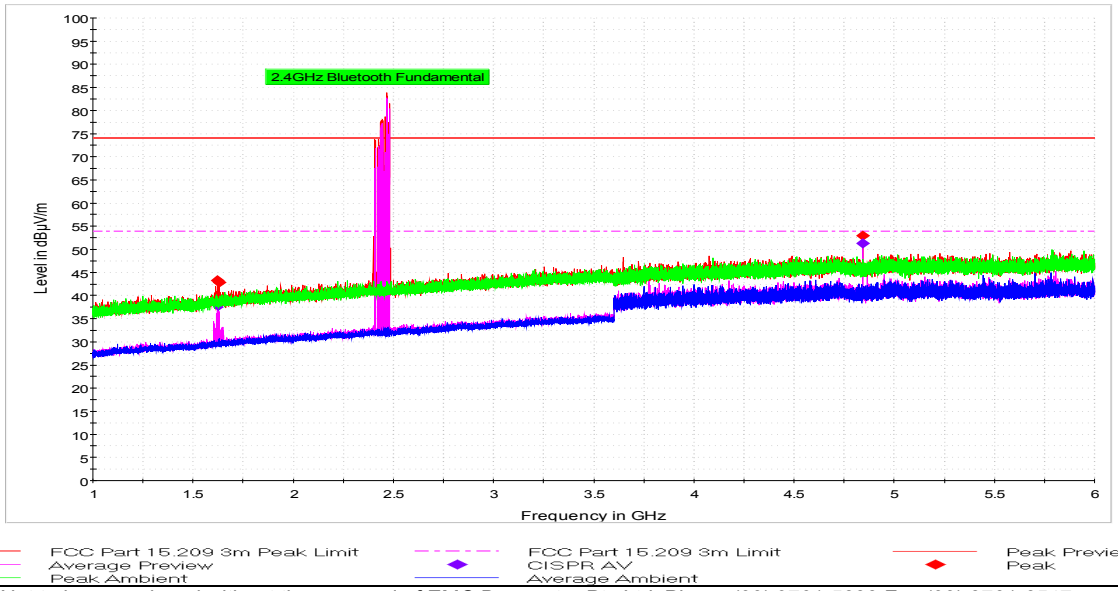



Graph 14

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Vertical antenna polarisation – 1GHz to 6GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



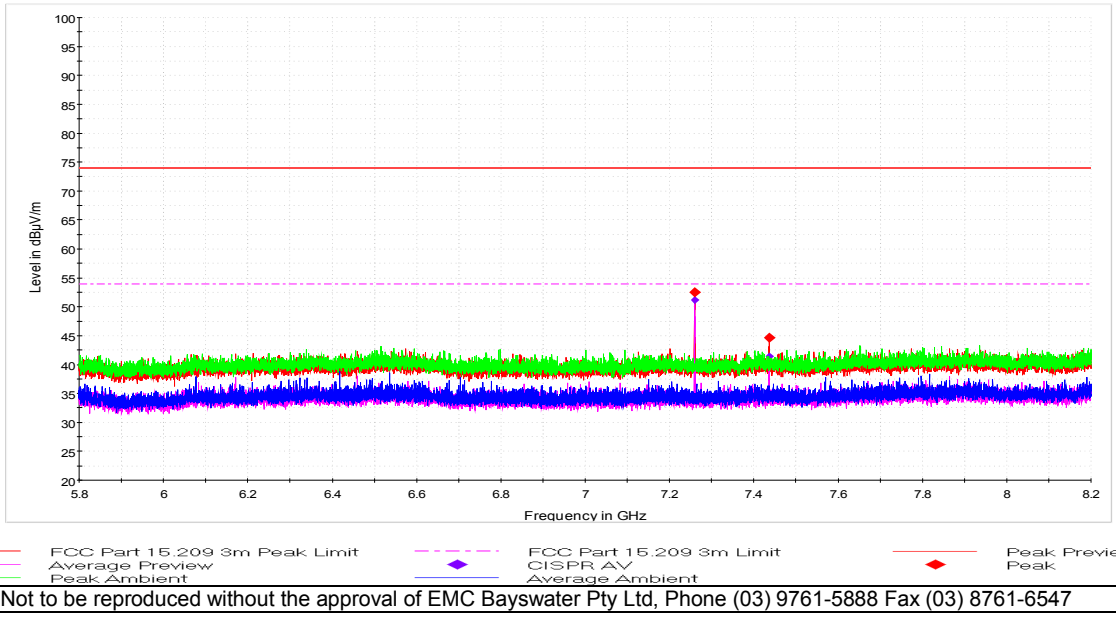



Graph 15

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Vertical antenna polarisation – 5.85GHz to 8.2GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



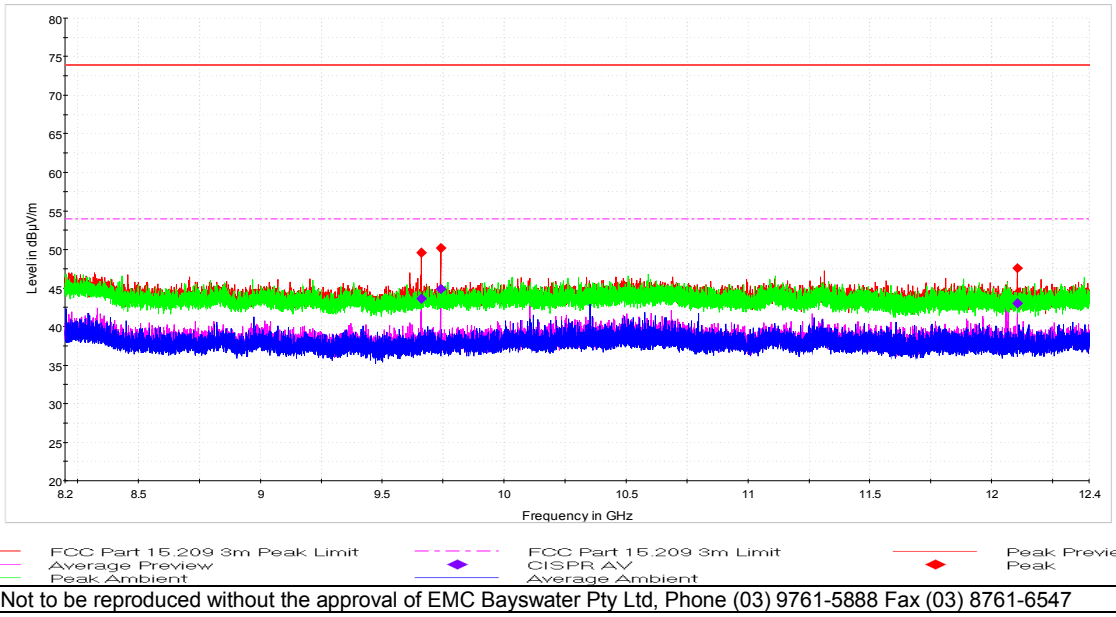



Graph 16

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Vertical antenna polarisation – 8.2GHz to 12.4GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



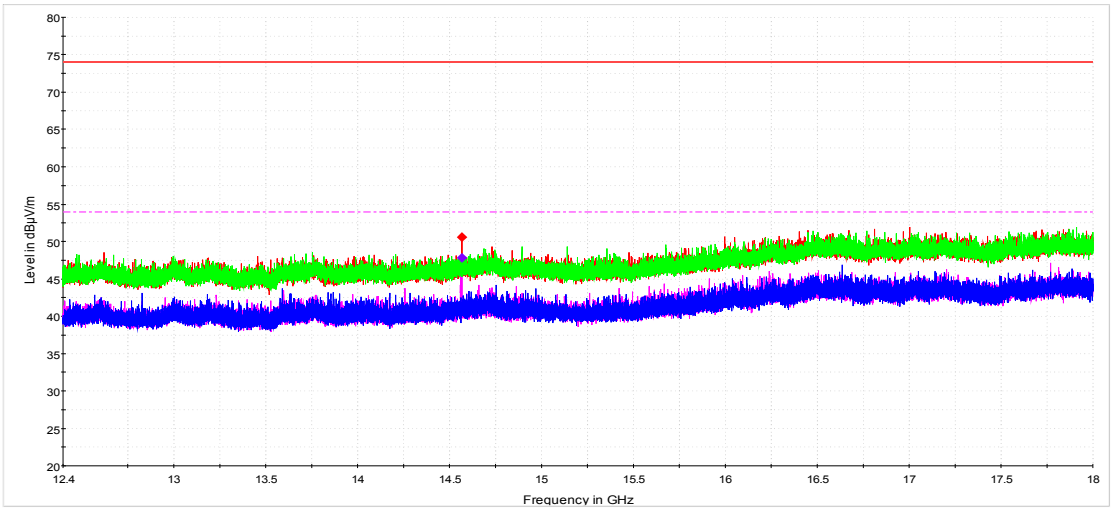



Graph 17

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Vertical antenna polarisation – 12.4GHz to 18GHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT



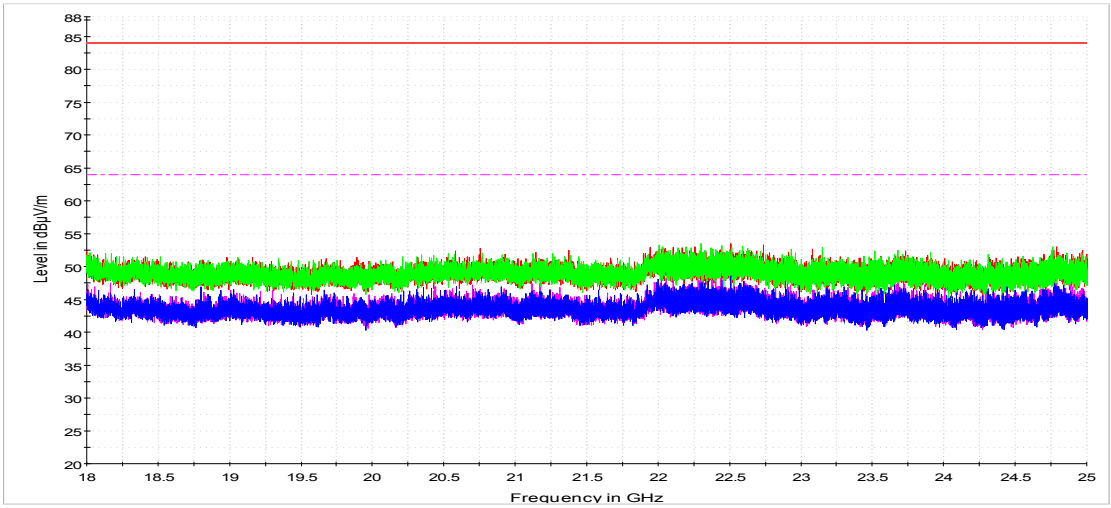



Graph 18

## EMC Bayswater Pty. Ltd.

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Vertical antenna polarisation – 18GHz to 25GHz – Position 1**

Job Number: E1705-0915-3 Rev1
Test Engineer: AT





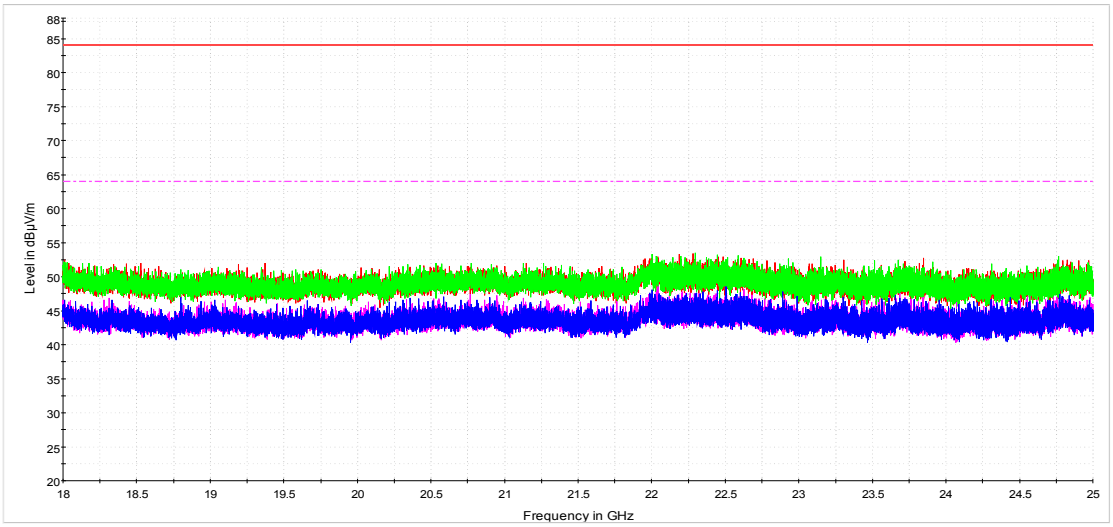

Graph 19

**EMC Bayswater Pty. Ltd.**

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Vertical antenna polarisation – 18GHz to 25GHz – Position 2**

Job Number: E1705-0915-3 Rev1

Test Engineer: AT






Graph 20

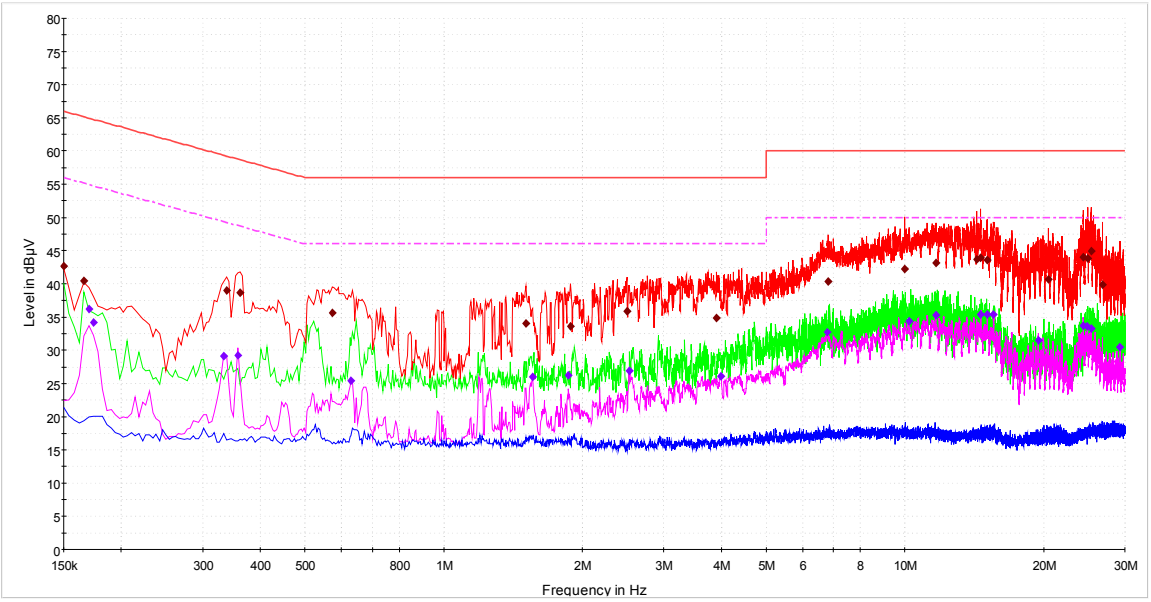
## Appendix C.3 – Conducted Emissions - EPREP sample preparation workstation

| No. | Test | Graph Description |
|---|---|---|
| 21 | Conducted Emissions | Active Line - RFID/Bluetooth TX mode |
| 22 | | Neutral Line - RFID/Bluetooth TX mode |

**EMC Bayswater Pty. Ltd.**

**Conducted Emissions – RFID/Bluetooth TX mode**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Active Line**

Job Number: E1705-0915-3 Rev1
Test Engineer: FD



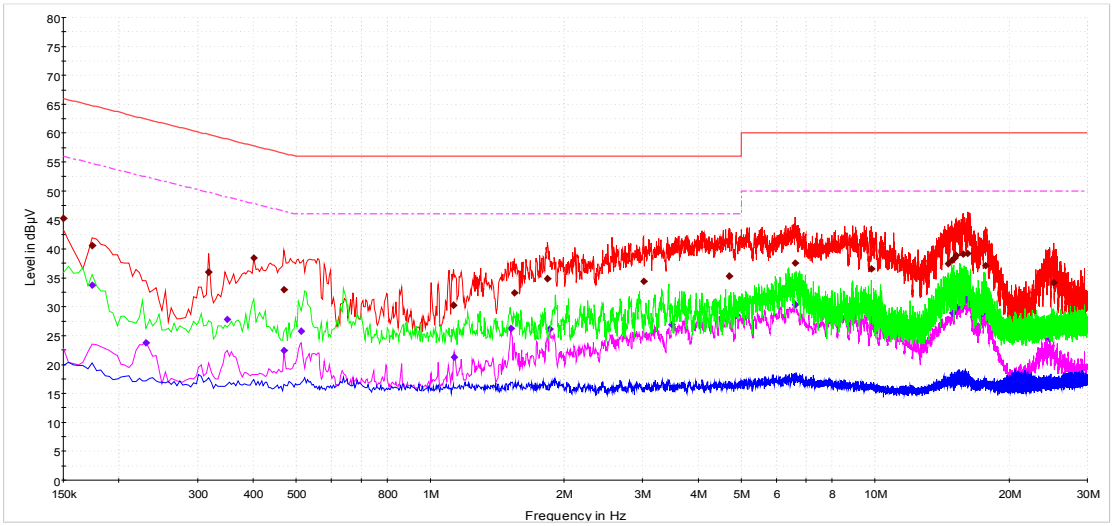



Graph 21

**EMC Bayswater Pty. Ltd.**

**Conducted Emissions – RFID/Bluetooth TX mode**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Neutral Line**

Job Number: E1705-0915-3 Rev1
Test Engineer: FD






Graph 22

# Appendix D – Measurement Graphs – RFID Module with 134kHz coil antenna standalone

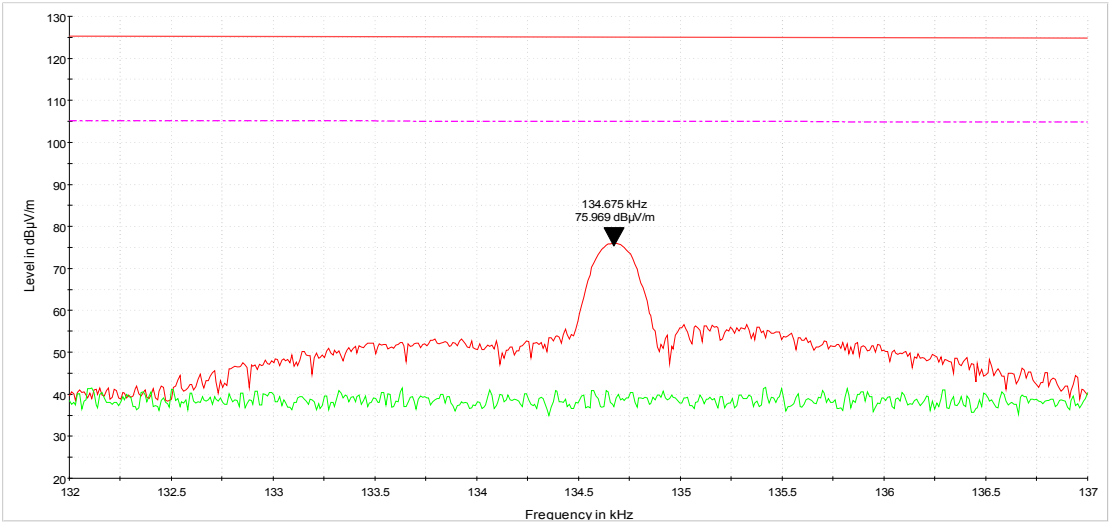
## Appendix D.1 - Maximum Fundamental Field Strength

| No. | Test | Graph Description |
|---|---|---|
| 23 | Maximum Fundamental Field Strength | X measurement antenna polarisation – X EUT orientation |
| 24 | | X measurement antenna polarisation – Y EUT orientation |
| 25 | | X measurement antenna polarisation – Z EUT orientation |
| 26 | | Y measurement antenna polarisation – X EUT orientation |
| 27 | | Y measurement antenna polarisation – Y EUT orientation |
| 28 | | Y measurement antenna polarisation – Z EUT orientation |
| 29 | | Z measurement antenna polarisation – X EUT orientation |
| 30 | | Z measurement antenna polarisation – Y EUT orientation |
| 31 | | Z measurement antenna polarisation – Z EUT orientation |

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – X EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



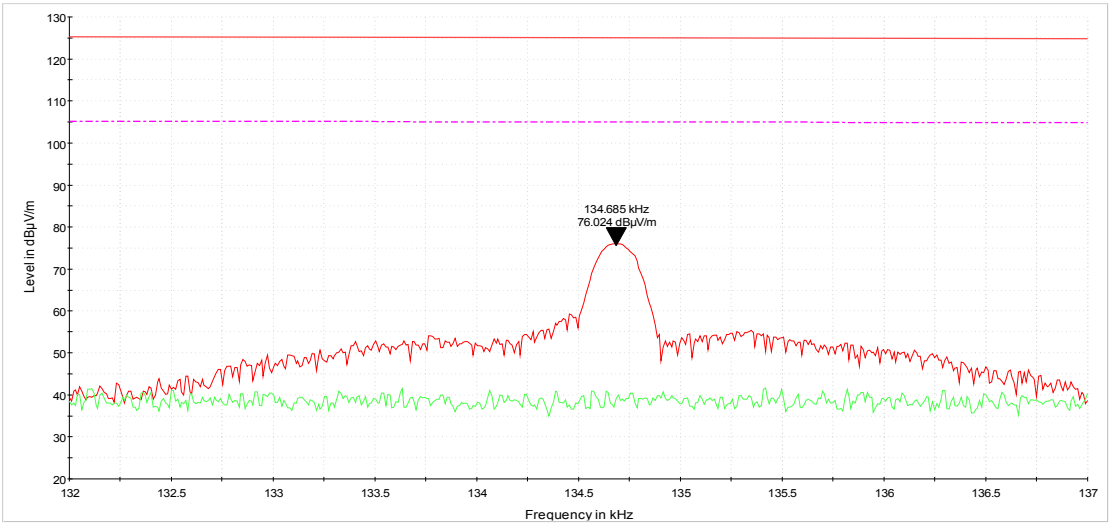



Graph 23

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



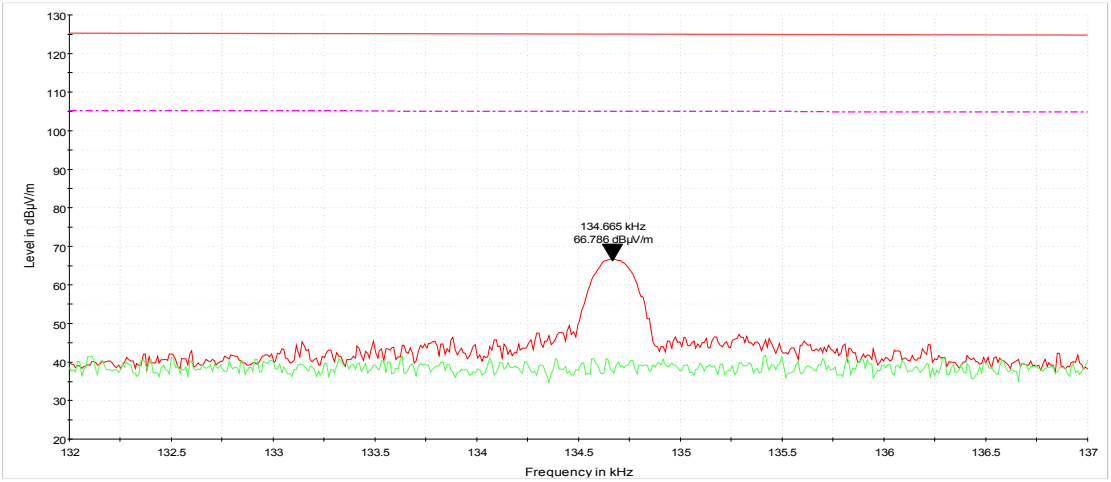



Graph 24

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



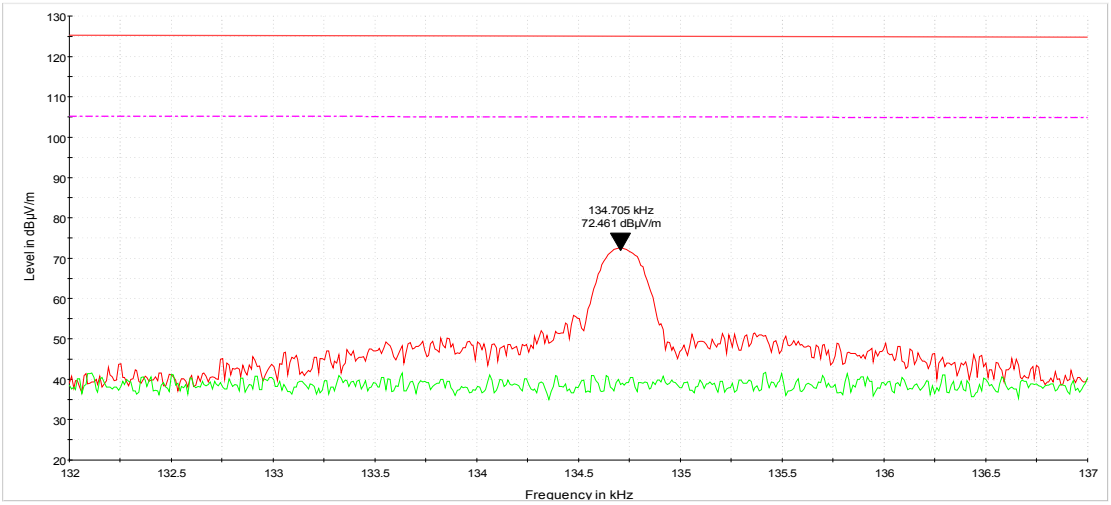



Graph 25

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – X EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



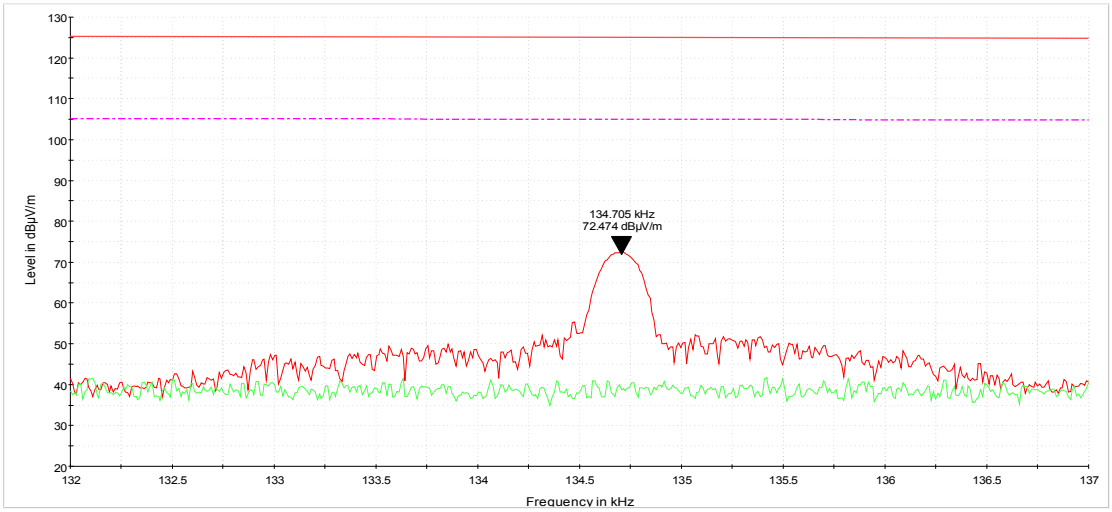



Graph 26

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



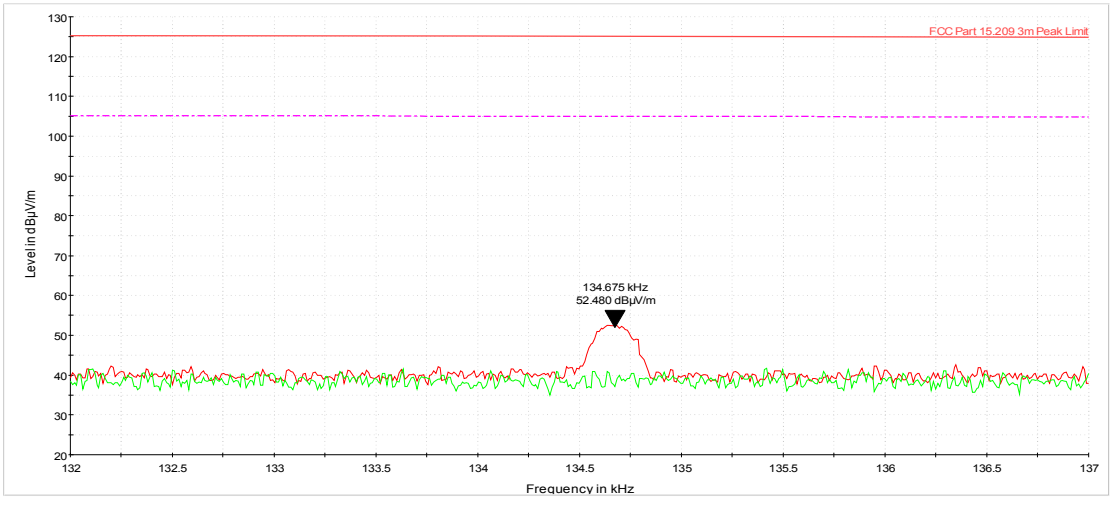



Graph 27

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



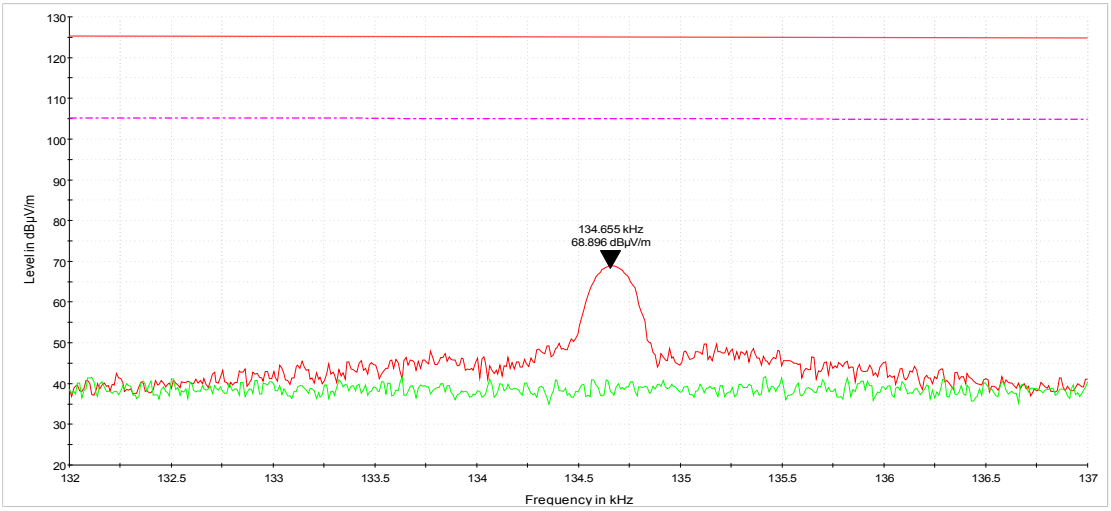



Graph 28

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – X EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



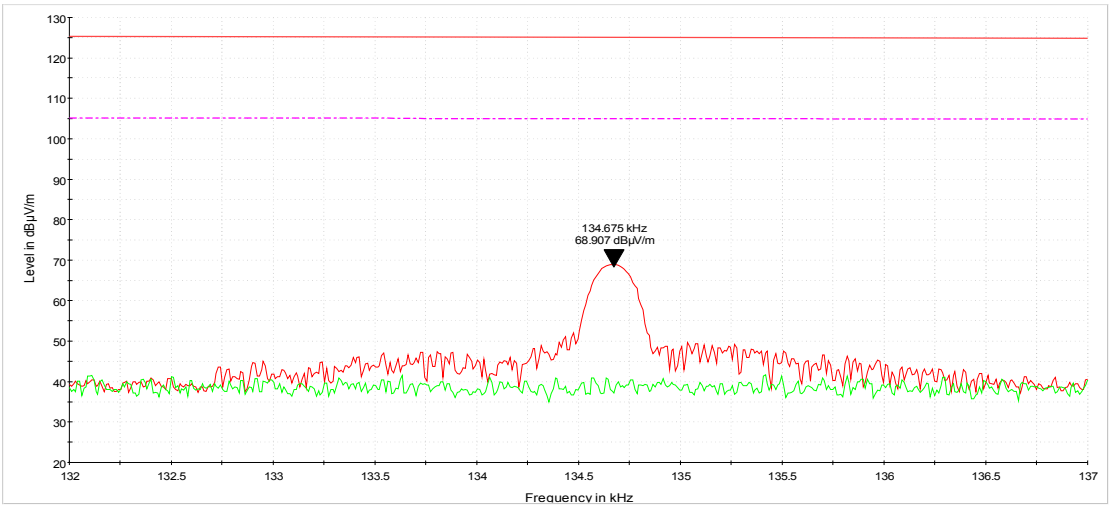



Graph 29

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL





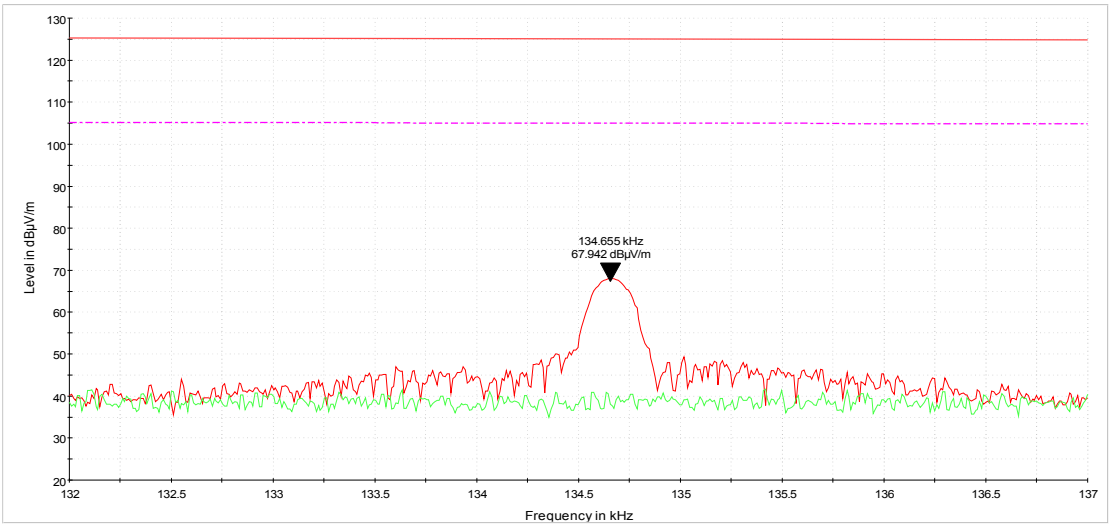

Graph 30

**EMC Bayswater Pty. Ltd.**

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1

Test Engineer: NL




MaxPeak-MaxHold-PK+ Ambient FCC Part 15.209 3m QP/AV Limit FCC Part 15.209 3m Peak Limit



Graph 31

## Appendix D.2 – Radiated Spurious Emissions

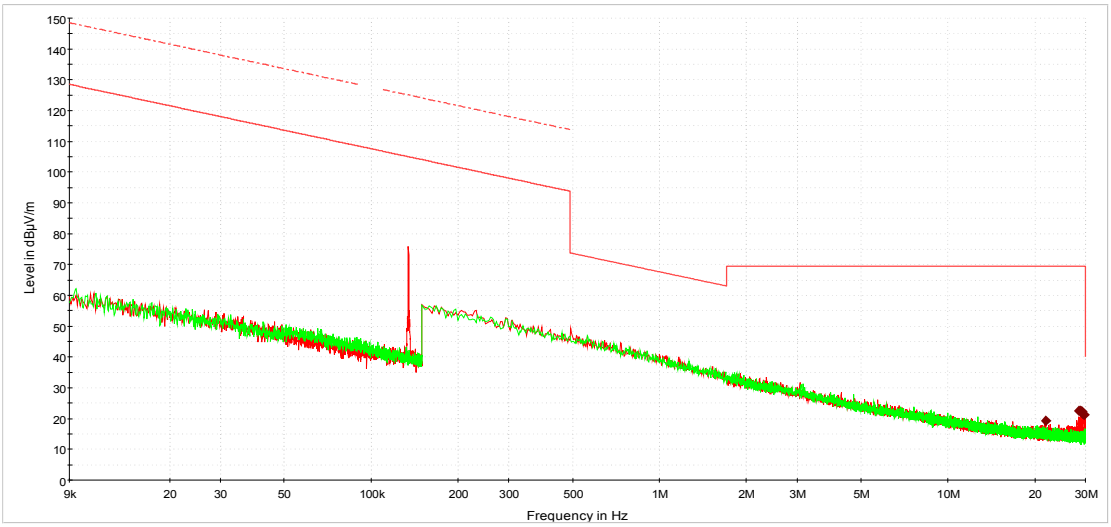
| No. | Test | Graph Description |
|---|---|---|
| 32 | Radiated Spurious Emissions | RFID Module standalone – 134kHz – 9kHz to 30MHz |

**EMC Bayswater Pty. Ltd.**

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – 9kHz to 30MHz**
**RFID module standalone – 134kHz**

Job Number: E1705-0915-3 Rev1

Test Engineer: NL






Graph 32

# Appendix E – Measurement Graphs – RFID Module with 124kHz coil antenna standalone

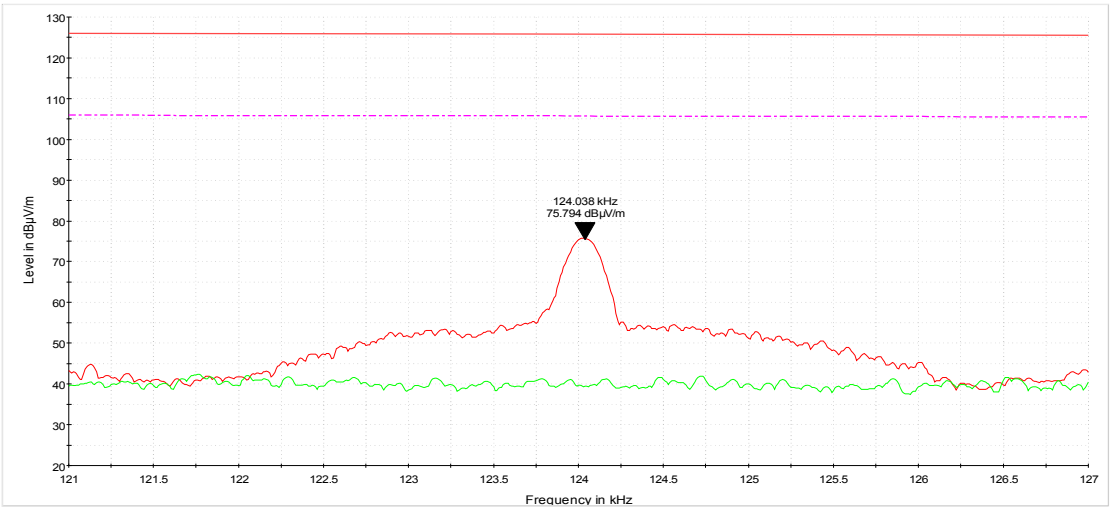
## Appendix E.1 - Maximum Fundamental Field Strength

| No. | Test | Graph Description |
|---|---|---|
| 33 | Maximum Fundamental Field Strength | X measurement antenna polarisation – X EUT orientation |
| 34 | | X measurement antenna polarisation – Y EUT orientation |
| 35 | | X measurement antenna polarisation – Z EUT orientation |
| 36 | | Y measurement antenna polarisation – X EUT orientation |
| 37 | | Y measurement antenna polarisation – Y EUT orientation |
| 38 | | Y measurement antenna polarisation – Z EUT orientation |
| 39 | | Z measurement antenna polarisation – X EUT orientation |
| 40 | | Z measurement antenna polarisation – Y EUT orientation |
| 41 | | Z measurement antenna polarisation – Z EUT orientation |

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – X EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



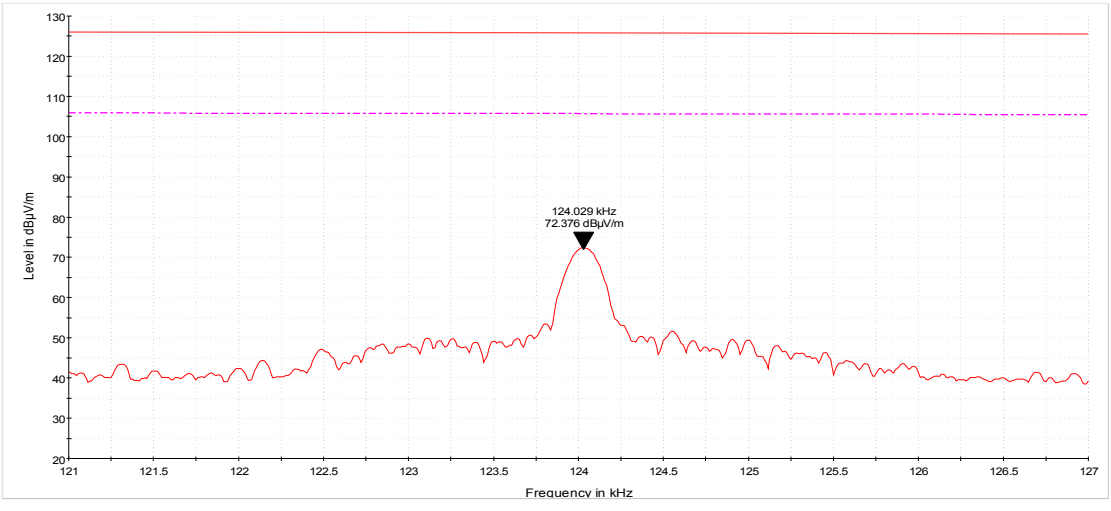



Graph 33

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



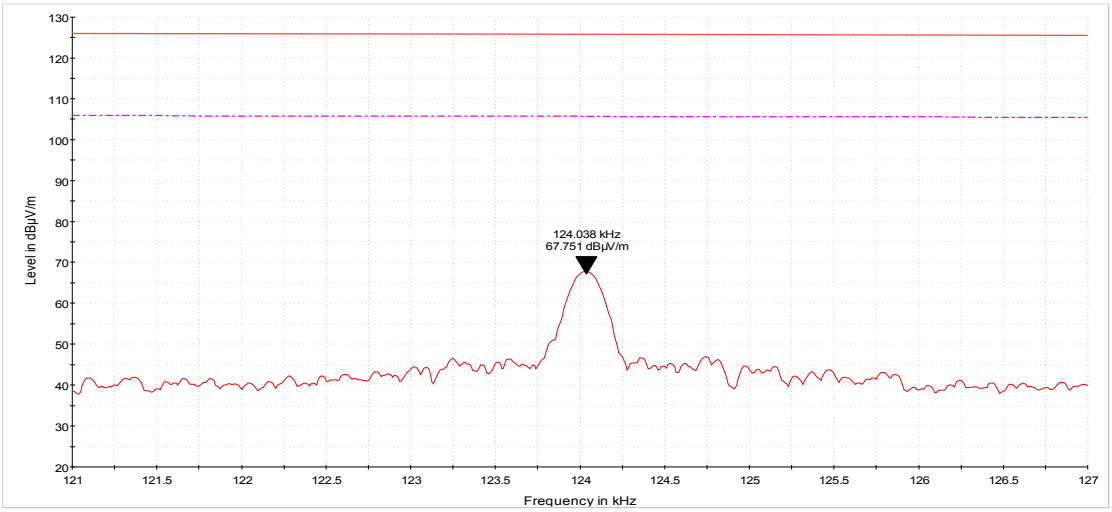



Graph 34

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



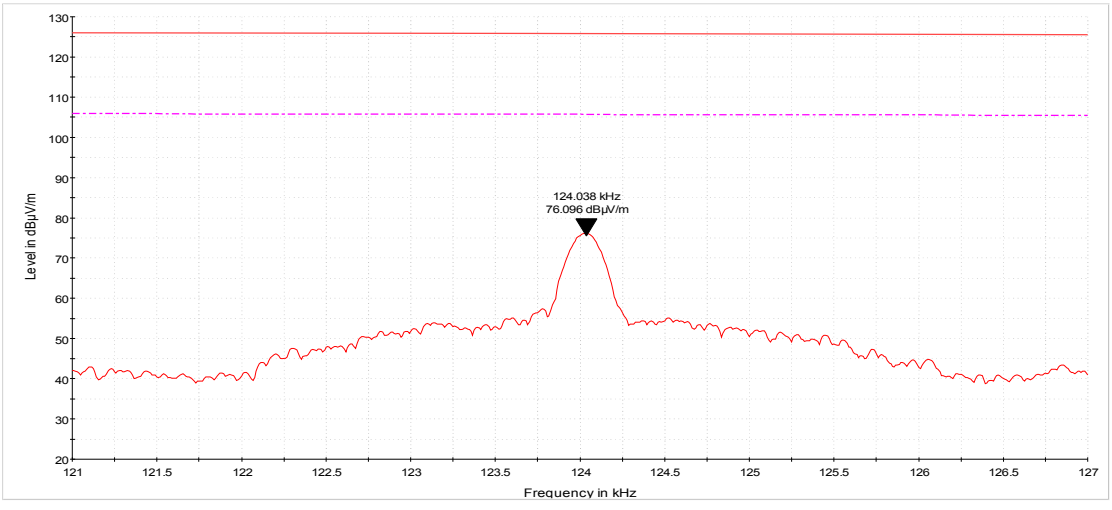



Graph 35

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – X EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



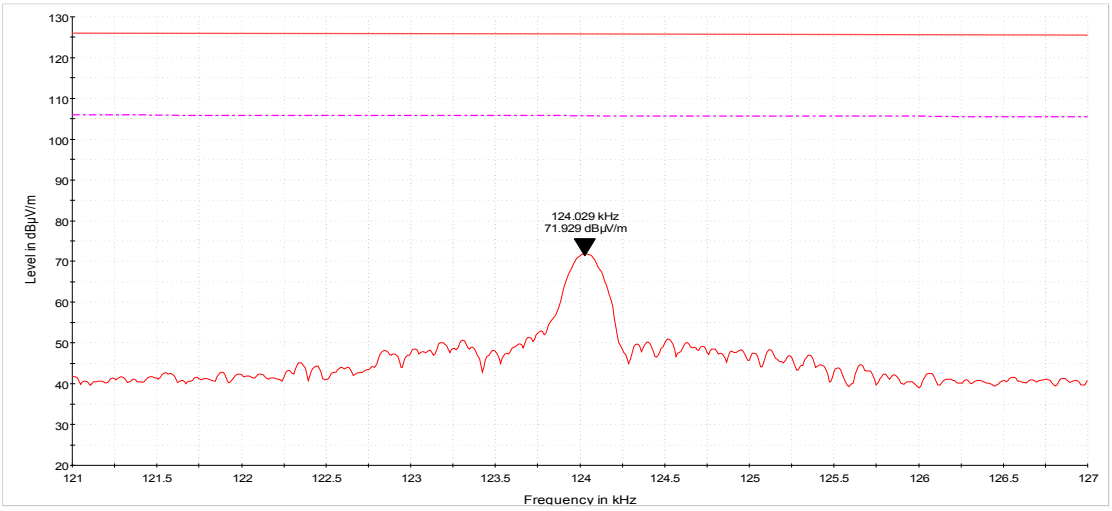



Graph 36

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



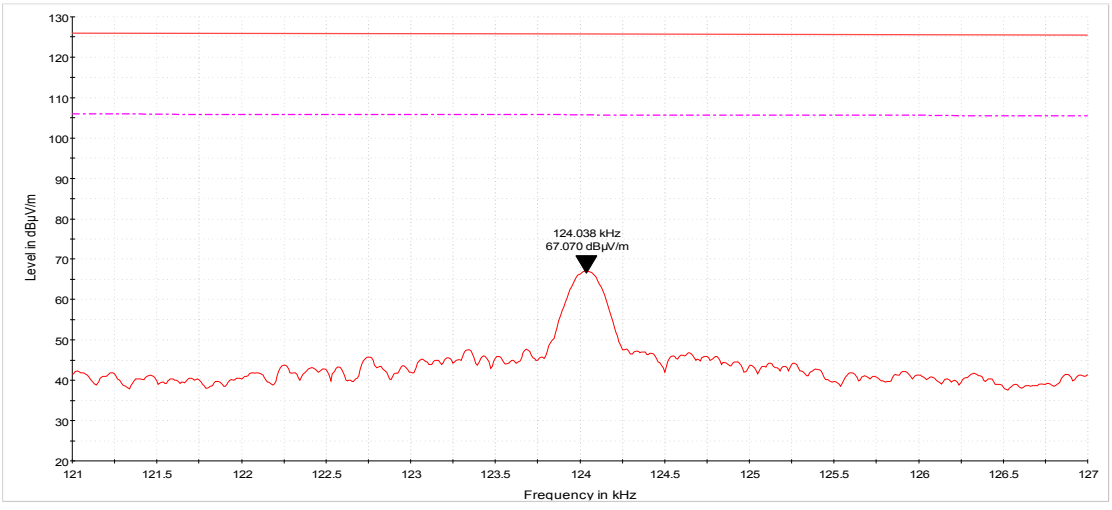



Graph 37

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



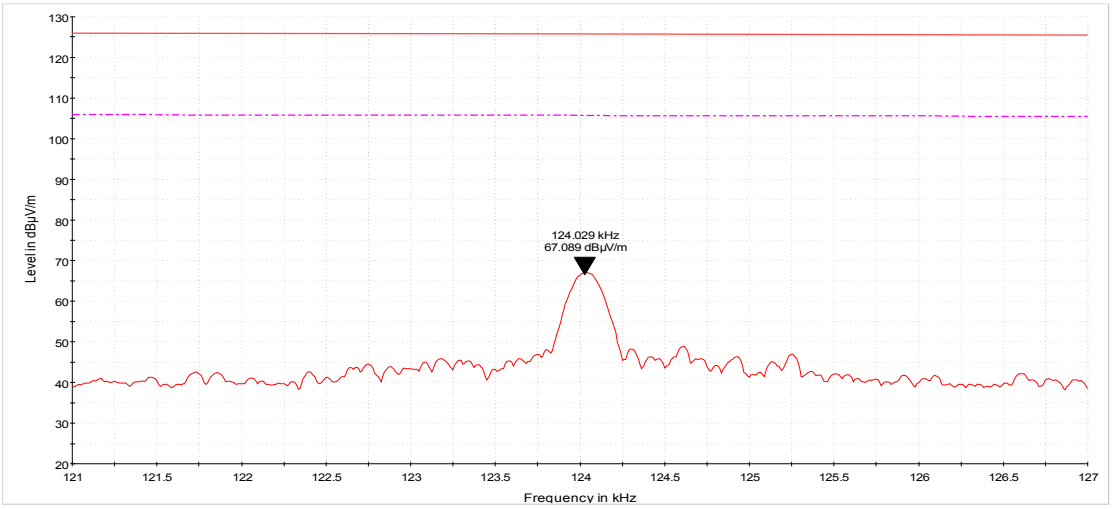



Graph 38

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – X EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



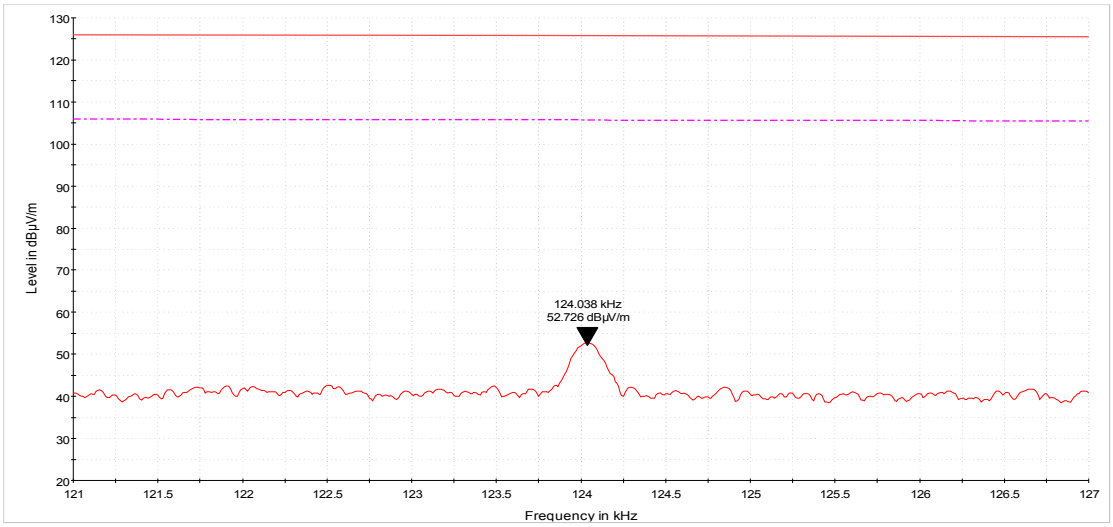



Graph 39

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL





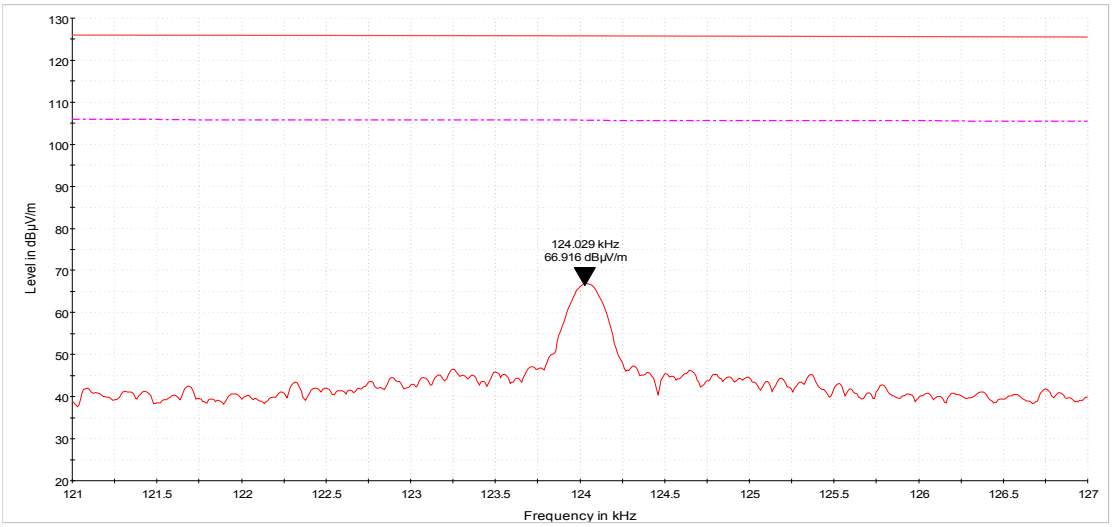

Graph 40

**EMC Bayswater Pty. Ltd.**

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1

Test Engineer: NL




MaxPeak-MaxHold-PK+ Ambient FCC Part 15.209 3m QP/AV Limit FCC Part 15.209 3m Peak Limit



Graph 41

## Appendix E.2 – Radiated Spurious Emissions

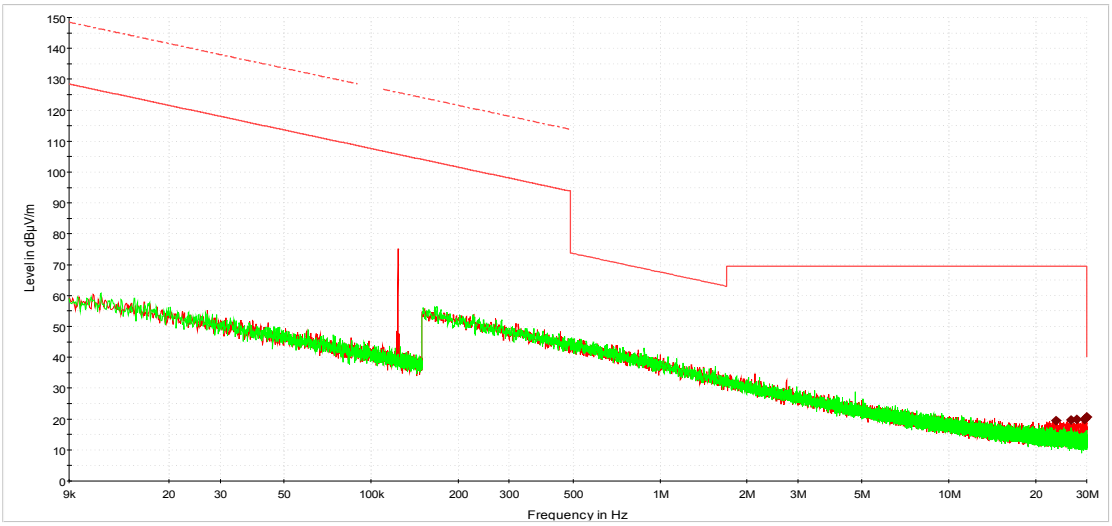
| No. | Test | Graph Description |
|---|---|---|
| 42 | Radiated Spurious Emissions | RFID Module standalone – 124kHz – 9kHz to 30MHz |

**EMC Bayswater Pty. Ltd.**

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – 9kHz to 30MHz**
**RFID module standalone – 124kHz**

Job Number: E1705-0915-3 Rev1

Test Engineer: NL






Graph 42

# Appendix F – Measurement Graphs – RFID Module with 140kHz coil antenna standalone

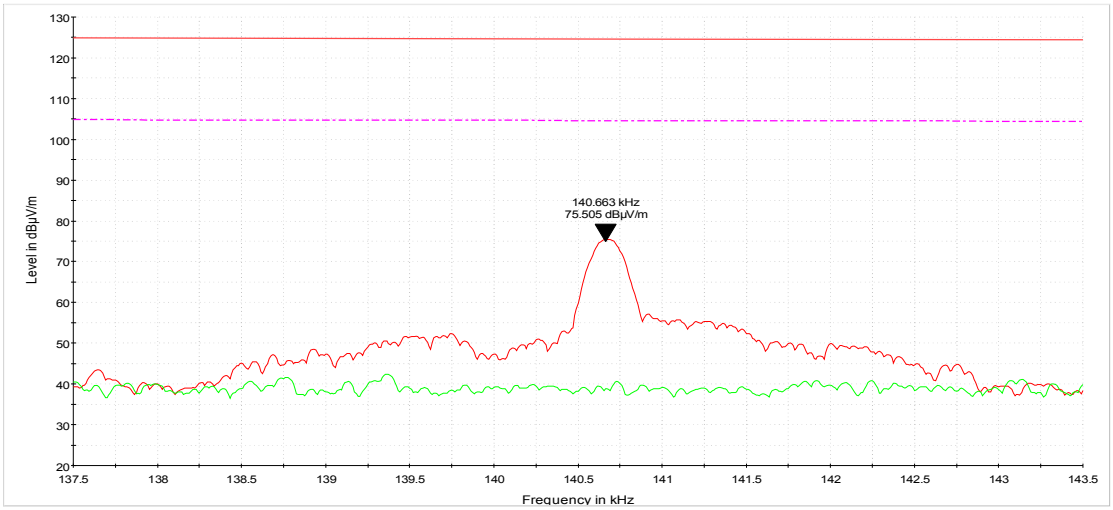
## Appendix F.1 - Maximum Fundamental Field Strength

| No. | Test | Graph Description |
|---|---|---|
| 43 | Maximum Fundamental Field Strength | X measurement antenna polarisation – X EUT orientation |
| 44 | | X measurement antenna polarisation – Y EUT orientation |
| 45 | | X measurement antenna polarisation – Z EUT orientation |
| 46 | | Y measurement antenna polarisation – X EUT orientation |
| 47 | | Y measurement antenna polarisation – Y EUT orientation |
| 48 | | Y measurement antenna polarisation – Z EUT orientation |
| 49 | | Z measurement antenna polarisation – X EUT orientation |
| 50 | | Z measurement antenna polarisation – Y EUT orientation |
| 51 | | Z measurement antenna polarisation – Z EUT orientation |

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – X EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



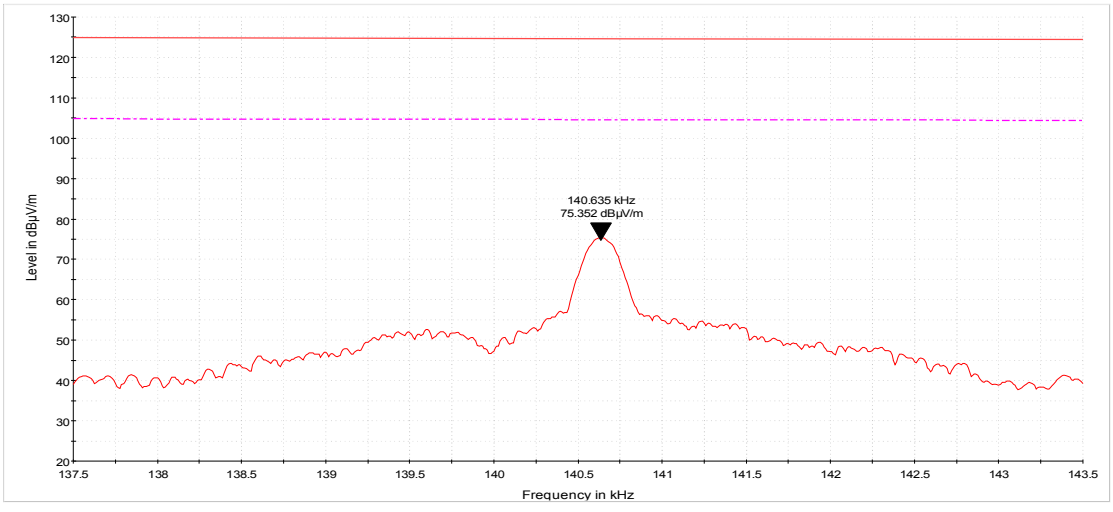



Graph 43

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



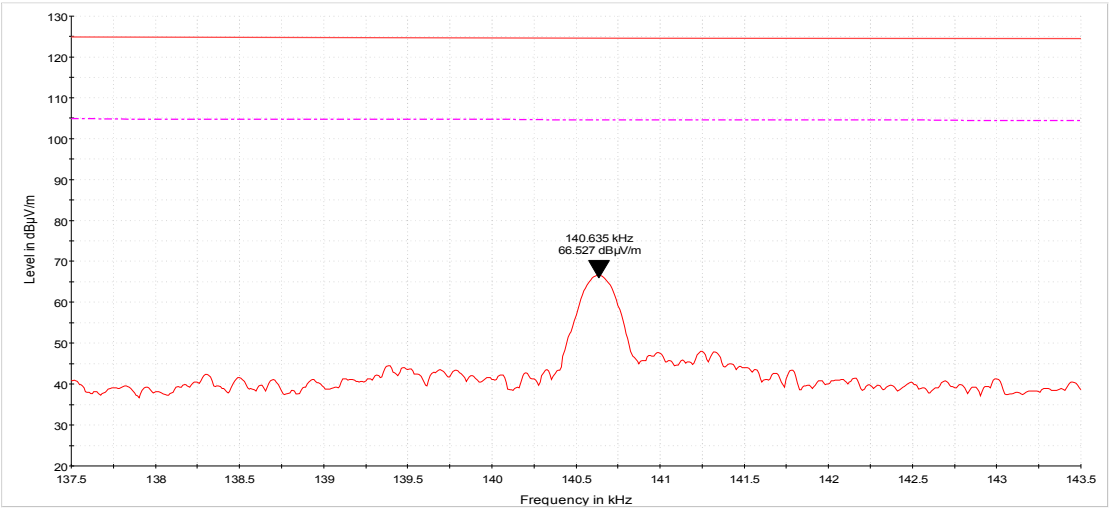



Graph 44

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



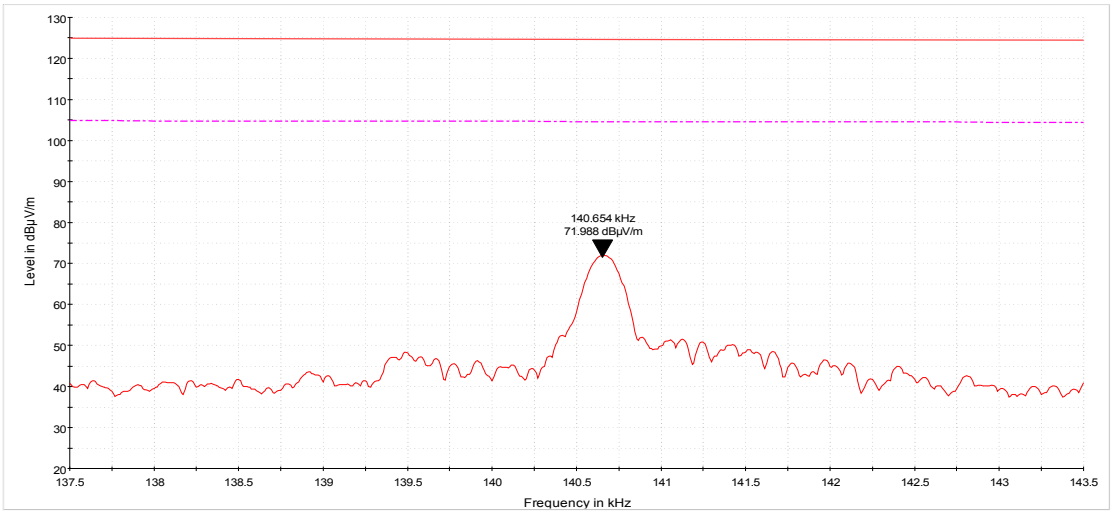



Graph 45

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – X EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



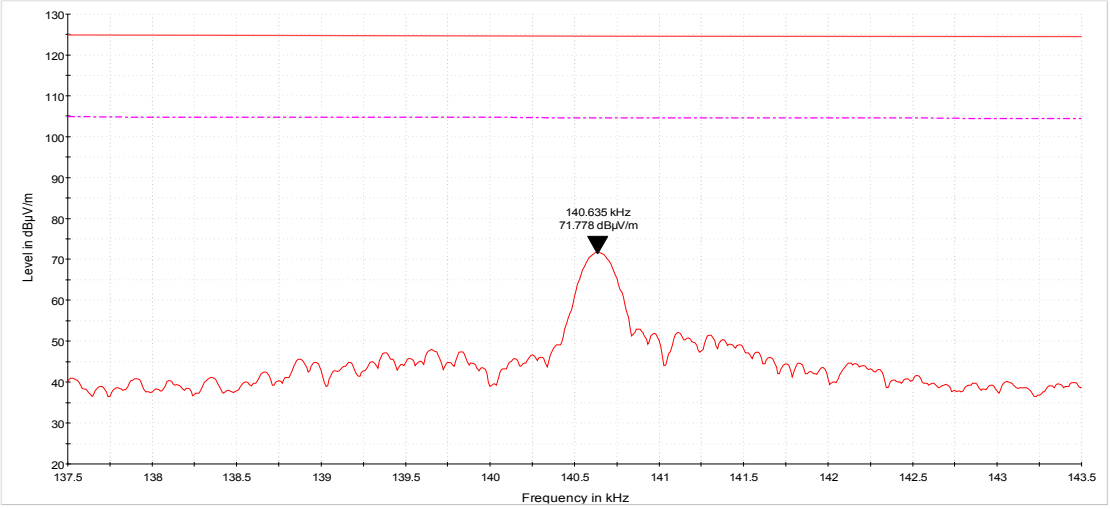



Graph 46

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



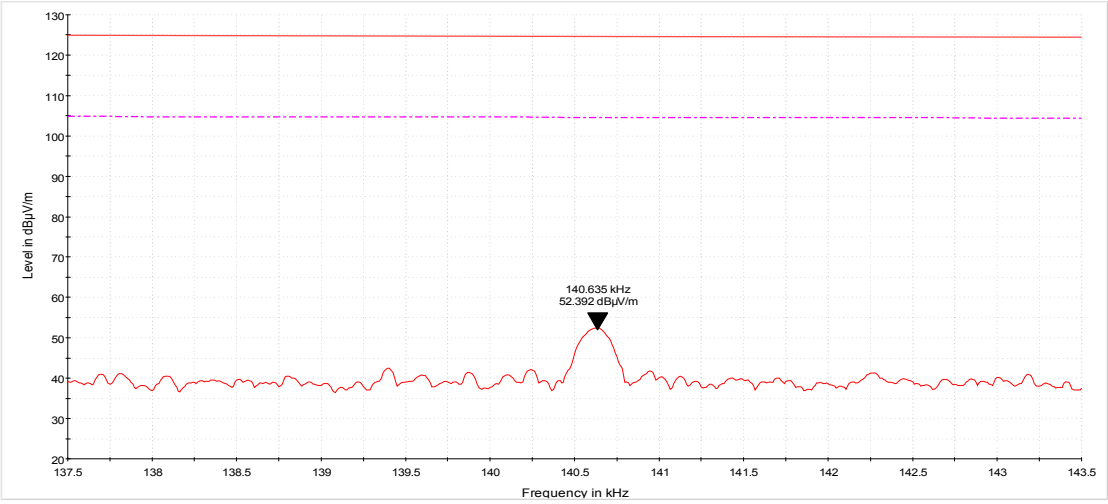



Graph 47

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Y measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



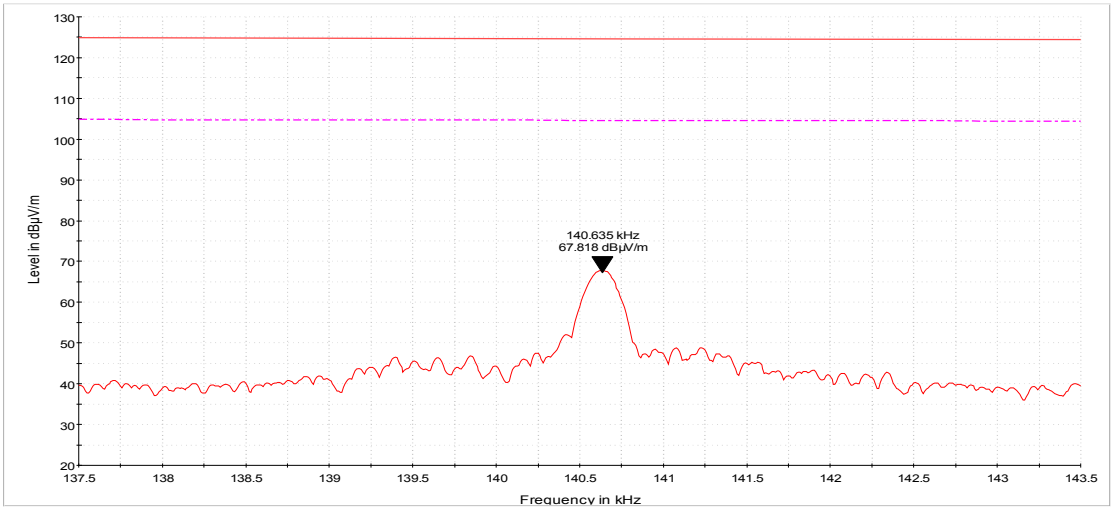



Graph 48

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – X EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL



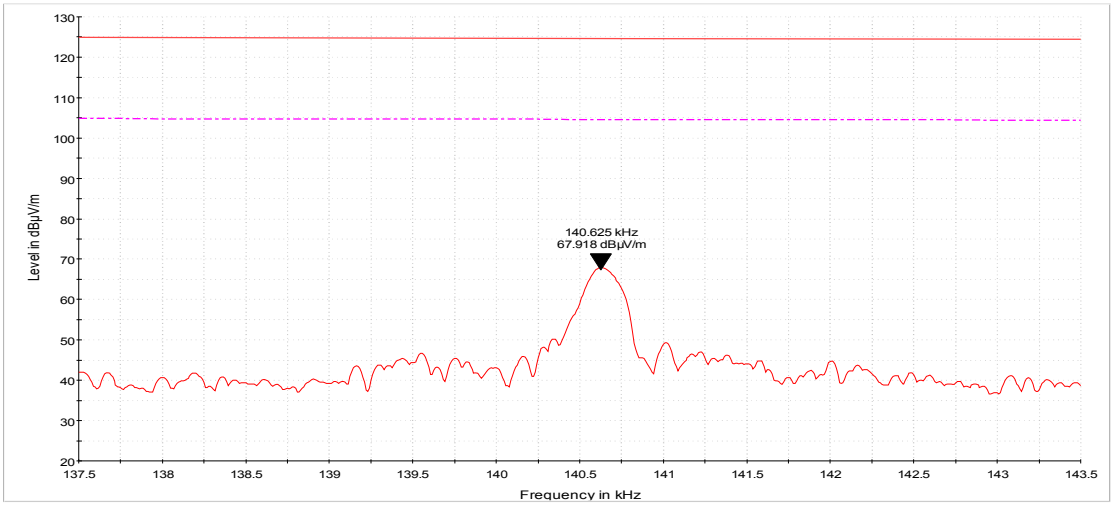



Graph 49

## EMC Bayswater Pty. Ltd.

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – Y EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1
Test Engineer: NL





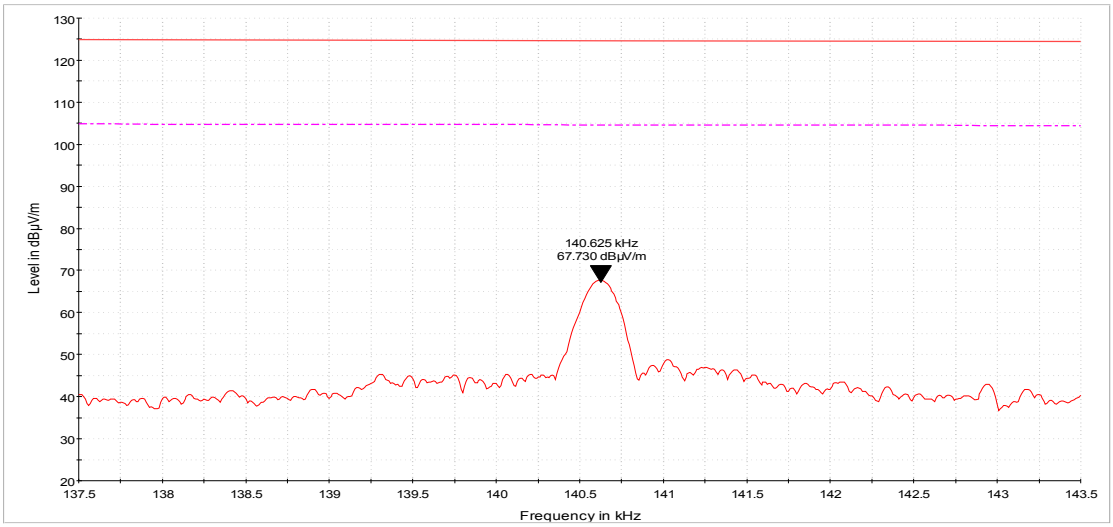

Graph 50

**EMC Bayswater Pty. Ltd.**

**Maximum Fundamental Field Strength - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**Z measurement antenna polarisation – Z EUT Orientation – RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1

Test Engineer: NL






Graph 51

## Appendix F.2 – Radiated Spurious Emissions

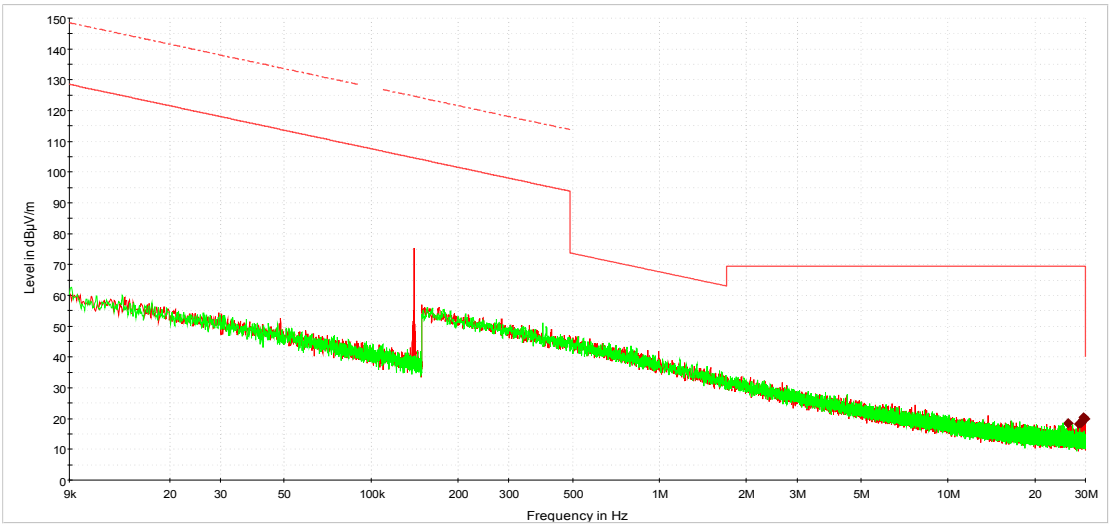
| No. | Test | Graph Description |
|---|---|---|
| 52 | Radiated Spurious Emissions | RFID Module standalone – 140kHz – 9kHz to 30MHz |

**EMC Bayswater Pty. Ltd.**

**Radiated Spurious Emission - FCC Part 15.209**
**EPREP Pty Ltd - GL950X - EPREP sample preparation workstation**
**X measurement antenna polarisation – 9kHz to 30MHz**
**RFID module standalone – 140kHz**

Job Number: E1705-0915-3 Rev1

Test Engineer: NL




MaxPeak-MaxHold-PK+ FCC Part 15.209 3m QP/AV Limit FCC Part 15.209 3m Peak Limit Ambient Peak Average



Graph 52