

# Test report

323348-1R2TRFWL

Date of issue: September 11, 2017

Applicant: Encinitas Labs, Inc.

Product: Retail Sensor Platform

Model: RSP9800

Model variant: RSP9003

FCC ID: 2ALVR-9271

IC Registration number: 22664-9271

Specifications:

◆ FCC 47 CFR Part 15 Subpart C, §15.247

Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz

◆ RSS-247, Issue 2, February 2017

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

#### Test location

|              |                             |
|--------------|-----------------------------|
| Company name | Nemko USA, Inc.             |
| Address      | 2210 Faraday Ave, Suite 150 |
| City         | Carlsbad                    |
| State        | California                  |
| Postal code  | 92008                       |
| Country      | USA                         |
| Telephone    | +1 760 444 3500             |
| Website      | www.nemko.com               |
| Site number  | FCC: US5058; IC: 2040B      |

|                    |                       |
|--------------------|-----------------------|
| Tested by          | Mark Phillips         |
| Reviewed by        | James Morris          |
| Review date        | September 12, 2017    |
| Reviewer signature | <i>James E Morris</i> |

#### Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.

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## Section 1. Report summary

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### 1.1 Applicant and manufacturer

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|                 |                             |
|-----------------|-----------------------------|
| Company name    | Encinitas Labs, Inc.        |
| Address         | 2386 Faraday Ave, Suite 140 |
| City            | Carlsbad                    |
| State           | CA                          |
| Postal/Zip code | 92008                       |
| Country         | U.S.A.                      |

### 1.2 Test specifications

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|                                              |                                                                                                                              |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| FCC 47 CFR Part 15, Subpart C, Clause 15.247 | Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz                                                                 |
| RSS-247, Issue 2, February 2017              | Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |

### 1.3 Test methods

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|                  |                                                                                                                                                                      |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI C64.3-2014  | 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 |
| ANSI C63.10-2013 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices                                                                       |

### 1.4 Statement of compliance

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In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

### 1.5 Exclusions

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None

### 1.6 Test report revision history

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| Revision # | Details of changes made to test report |
|------------|----------------------------------------|
| TRF        | Original report issued                 |
| R1TRF      | Updated according to review comment    |
| R2TRF      | Corrected setup description            |

## Section 2. Summary of test results

### 2.1 FCC Part 15 Subpart C, general requirements test results

| Part       | Test description              | Verdict           |
|------------|-------------------------------|-------------------|
| §15.207(a) | Conducted limits              | Pass              |
| §15.31(e)  | Variation of power source     | Not tested        |
| §15.203    | Antenna requirement           | Pass <sup>2</sup> |
| §15.205    | Restricted bands of operation | Pass              |

Notes: <sup>1</sup> Test also performed with fully charged batteries in addition of AC supply voltage variation.

<sup>2</sup> The Antennas for model 9003 are located within the protective cover of EUT.

### 2.2 FCC Part 15 Subpart C, intentional radiators test results

| Part               | Test description                                                                                                           | Verdict        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------|----------------|
| §15.247(a)(1)      | 20 dB bandwidth of the hopping channel                                                                                     | Pass           |
| §15.247(a)(1)(i)   | Frequency hopping systems operating in the 902–928 MHz band                                                                | Pass           |
| §15.247(a)(1)(ii)  | Frequency hopping systems operating in the 5725–5850 MHz band                                                              | Not applicable |
| §15.247(a)(1)(iii) | Frequency hopping systems operating in the 2400–2483.5 MHz band                                                            | Not applicable |
| §15.247(a)(2)      | Minimum 6 dB bandwidth for systems using digital modulation techniques                                                     | Not applicable |
| §15.247(b)(1)      | Maximum peak output power of frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band        | Not applicable |
| §15.247(b)(2)      | Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band                                   | Pass           |
| §15.247(b)(3)      | Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands | Not applicable |
| §15.247(c)(1)      | Fixed point-to-point operation with directional antenna gains greater than 6 dBi                                           | Not applicable |
| §15.247(c)(2)      | Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams                                    | Not applicable |
| §15.247(d)         | Spurious emissions                                                                                                         | Pass           |
| §15.247(e)         | Power spectral density for digitally modulated devices                                                                     | Not applicable |
| §15.247(f)         | Time of occupancy for hybrid systems                                                                                       | Not applicable |

### 2.3 IC RSS-GEN, Issue 4, test results

| Part  | Test description                                                         | Verdict        |
|-------|--------------------------------------------------------------------------|----------------|
| 7.1.2 | Receiver radiated emission limits                                        | Not applicable |
| 7.1.3 | Receiver conducted emission limits                                       | Not applicable |
| 8.8   | Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus | Pass           |
| 8.10  | Restricted Frequency Bands                                               | Pass           |

Notes: <sup>1</sup> According to sections 5.2 and 5.3 of RSS-Gen, Issue 4 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

## 2.4 IC RSS-247, Issue 2, test results

| Part    | Test description                                                                       | Verdict        |
|---------|----------------------------------------------------------------------------------------|----------------|
| 5.1     | Frequency hopping systems (FHSs)                                                       |                |
| 5.1 (1) | Bandwidth of a frequency hopping channel                                               | Pass           |
| 5.1 (2) | Minimum channel spacing for frequency hopping systems                                  | Pass           |
| 5.1 (3) | Frequency hopping systems operating in the 902–928 MHz band                            | Pass           |
| 5.1 (4) | Frequency hopping systems operating in the 2400–2483.5 MHz band                        | Not applicable |
| 5.1 (5) | Frequency hopping systems operating in the 5725–5850 MHz band                          | Not applicable |
| 5.2     | Digital modulation systems                                                             |                |
| 5.2 (1) | Minimum 6 dB bandwidth                                                                 | Not applicable |
| 5.2 (2) | Maximum power spectral density                                                         | Not applicable |
| 5.3     | Hybrid systems                                                                         |                |
| 5.3 (1) | Digital modulation turned off                                                          | Not applicable |
| 5.3 (2) | Frequency hopping turned off                                                           | Not applicable |
| 5.4     | Transmitter output power and e.i.r.p. requirements                                     |                |
| 5.4 (1) | Frequency hopping systems operating in the 902–928 MHz band                            | Pass           |
| 5.4 (2) | Frequency hopping systems operating in the 2400–2483.5 MHz band                        | Not applicable |
| 5.4 (3) | Frequency hopping systems operating in the 5725–5850 MHz                               | Not applicable |
| 5.4 (4) | Systems employing digital modulation techniques                                        | Not applicable |
| 5.4 (5) | Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band                       | Not applicable |
| 5.4 (6) | Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams | Not applicable |
| 5.5     | Unwanted Emissions                                                                     | Pass           |

Notes: EUT is FHSS in the 902-928 MHz band

## Section 3. Equipment under test (EUT) details

### 3.1 Sample information

|                        |                |
|------------------------|----------------|
| Receipt date           | March 13, 2017 |
| Nemko sample ID number | 323348#1       |

### 3.2 EUT information

|               |                                            |
|---------------|--------------------------------------------|
| Product name  | Retail RFID Sensor Platform                |
| Model         | RSP9800                                    |
| Model variant | RSP9003                                    |
| Serial number | RSP-edab22 (RSP9800), RSP-ed7967 (RSP9003) |

### 3.3 Technical information

|                                         |                                                                                                                                                                                                                                  |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicant IC company number             | 22664                                                                                                                                                                                                                            |
| IC UPN number                           | RSP9800                                                                                                                                                                                                                          |
| All used IC test site(s) Reg. number    | 2040B-3                                                                                                                                                                                                                          |
| RSS number and Issue number             | RSS-247, Issue 2                                                                                                                                                                                                                 |
| Frequency band                          | 902-928 MHz                                                                                                                                                                                                                      |
| Frequency Min (MHz)                     | 902.75                                                                                                                                                                                                                           |
| Frequency Max (MHz)                     | 927.25                                                                                                                                                                                                                           |
| RF power Min (W), Conducted/ERP/EIRP    | N/A                                                                                                                                                                                                                              |
| RF power Max (W), Conducted/ERP/EIRP    | 0.91 W                                                                                                                                                                                                                           |
| Field strength, Units @ distance        | N/A                                                                                                                                                                                                                              |
| Measured BW (kHz) (20 dB)               | 400.8 kHz                                                                                                                                                                                                                        |
| Calculated BW (kHz), as per TRC-43      | N/A                                                                                                                                                                                                                              |
| Type of modulation                      | ASK                                                                                                                                                                                                                              |
| Emission classification (F1D, G1D, D1D) | A2D                                                                                                                                                                                                                              |
| Transmitter spurious, Units @ distance  | 61.5 dBuV/m Pk, 56.21 dBuV/m Avg at 3m                                                                                                                                                                                           |
| Power requirements                      | Power over Ethernet (37 – 57 VDC)                                                                                                                                                                                                |
| Antenna information                     | The EUT is professionally installed.                                                                                                                                                                                             |
| Antennas                                | 6dBi (RSP9003, Internal, Linear Polarization)<br>7dBi (RSP9800, External, Dual Linear Polarization)<br>9dBi (RSP9800, External, Circular Polarization)<br>RF Output Power Reduced same amount for Higher Gain Antenna over 6dBi. |

### 3.4 Product description and theory of operation

The RSP9003 is an integrated UHF RFID reader and antenna. The RSP9800 is a variant of the RSP9003 with an external antenna. It uses RFID to track retail inventory. It uses ASK modulation and operates in the 902 – 928 MHz band.

### 3.5 EUT exercise details

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Depends on test cases, the EUT is set either to fixed channel (L/M/H) or frequency hopping mode, using test mode. The RSP9003 was tested with a 6dBi dual linear internal antenna. The RSP9800 was tested with both 9dBi circular and a 7dBi linear external antenna.

### 3.6 EUT setup diagram

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Please refer to separate photo exhibit for details.

### 3.7 EUT sub assemblies

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Table 3.7-1: EUT sub assemblies

| Description                         | Brand name        | Model/Part number | Serial number |
|-------------------------------------|-------------------|-------------------|---------------|
| Antenna (6dBi Dual Linear Internal) | Encinitas Labs    | 9005              | ENG01         |
| Antenna (9dBi Circular external)    | MTI Wireless Edge | MT-262006         | 101731        |
| Antenna (7dBi Linear external)      | Times-7           | A8060             | 160826125     |

## Section 4. Engineering considerations

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### 4.1 Modifications incorporated in the EUT

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Conductive coating applied to interior of RSP9800 chassis to pass Radiated Spurious Emissions.

### 4.2 Technical judgment

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None

### 4.3 Deviations from laboratory tests procedures

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No deviations were made from laboratory procedures.

## Section 5. Test conditions

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### 5.1 Atmospheric conditions

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|                   |               |
|-------------------|---------------|
| Temperature       | 15–30 °C      |
| Relative humidity | 20–75 %       |
| Air pressure      | 860–1060 mbar |

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

### 5.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.

## Section 6. Measurement uncertainty

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### 6.1 Uncertainty of measurement

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Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of  $K = 2$  with 95% certainty.

| Test name                         | Measurement uncertainty, dB |
|-----------------------------------|-----------------------------|
| All antenna port measurements     | 0.55                        |
| Conducted spurious emissions      | 1.13                        |
| Radiated spurious emissions       | 3.78                        |
| AC power line conducted emissions | 3.55                        |

## Section 7. Test equipment

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### 7.1 Test equipment list

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Table 7.1-1: Equipment list

| Asset Tag | Description                    | Manufacturer    | Model    | Serial #  | Last Cal    | Next Cal    |
|-----------|--------------------------------|-----------------|----------|-----------|-------------|-------------|
| 752       | Antenna, DRWG                  | EMCO            | 3115     | 9609-4943 | 04-May-2016 | 04-May-2017 |
| E1019     | Two Line V-Network             | Rohde & Schwarz | ENV216   | 101045    | 15-Jun-2016 | 15-Jun-2017 |
| E1026     | EMI Test Receiver 9kHz to 7GHz | Rohde & Schwarz | ESCI 7   | 100800    | 17-Mar-2016 | 17-Apr-2017 |
| 1480      | Antenna, Bilog                 | Schaffner-Chase | CBL6111C | 2572      | 21-Jul-2016 | 21-Jul-2017 |
| E1120     | Signal and Spectrum Analyzer   | Rohde & Schwarz | FSV40    | 101395    | 25-May-2016 | 25-May-2017 |
| E1121     | EMI Test Receiver              | Rohde & Schwarz | ESU 40   | 100064    | 28-Apr-2016 | 28-Apr-2017 |

Note: NCR - no calibration required, VOU - verify on use

## Section 8. Testing data

### 8.1 FCC 15.247(a) (1) and RSS-247 5.1(1) 20 dB bandwidth of the hopping channel

#### 8.1.1 Definitions and limits

##### FCC and IC:

- (a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:
- (1) 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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
- (i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

#### 8.1.2 Test summary

|               |                |                   |           |
|---------------|----------------|-------------------|-----------|
| Test date     | March 13, 2017 | Temperature       | 20 °C     |
| Test engineer | Mark Phillips  | Air pressure      | 1005 mbar |
| Verdict       | Pass           | Relative humidity | 60%       |

#### 8.1.3 Observations, settings and special notes

Spectrum analyser settings:

|                      |                                             |
|----------------------|---------------------------------------------|
| Resolution bandwidth | 1–5 % of Channel BW (no wider than 100 kHz) |
| Video bandwidth      | $\geq 3 \times \text{RBW}$                  |
| Frequency span       | 2 – 5 times OBW                             |
| Detector mode        | Peak                                        |
| Trace mode           | Max Hold                                    |

Tested with RF Test Board.

#### 8.1.4 Test data

Table 8.1-1: 20 dB bandwidth results

| Modulation | Frequency, MHz | 20 dB bandwidth, kHz | Channel Bandwidth, kHz | Margin, kHz |
|------------|----------------|----------------------|------------------------|-------------|
| ASK        | 902.75         | 399.4                | 500                    | 100.6       |
|            | 914.75         | 400.8                | 500                    | 99.2        |
|            | 927.25         | 399.4                | 500                    | 100.6       |

**Section 8**  
**Test name**  
**Specification**

Testing data  
 FCC 15.247(a)(1) and RSS-247 5.1(1) 20 dB bandwidth of the hopping channel  
 FCC 15 Subpart C and RSS-247, Issue 1

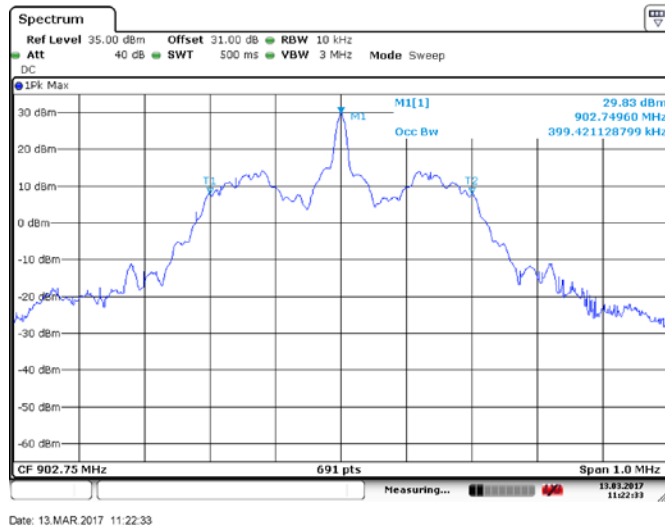


Figure 8.1-1: 20 dB bandwidth, 902.75MHz

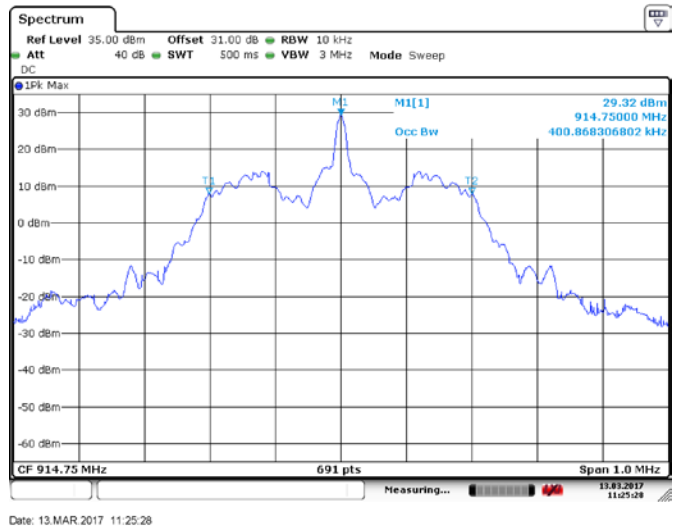


Figure 8.1-2: 20 dB bandwidth, 914.75MHz

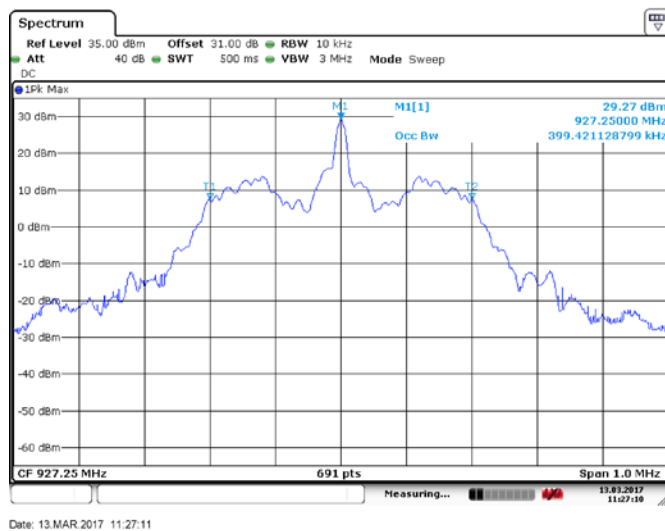


Figure 8.1-3: 20 dB bandwidth, 927.25MHz

## 8.2 FCC 15.247(b) and RSS-247 5.4 (4) Transmitter output power and e.i.r.p. requirements

### 8.2.1 Definitions and limits

**FCC:**

- (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
- (2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
  - (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**IC:**

5.4 Transmitter Output Power and Equivalent Isotropically Radiated Power (E.I.R.P.) Requirements

- (1) For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

### 8.2.2 Test summary

|               |                |                   |           |
|---------------|----------------|-------------------|-----------|
| Test date     | March 13, 2017 | Temperature       | 20 °C     |
| Test engineer | Mark Phillips  | Air pressure      | 1005 mbar |
| Verdict       | Pass           | Relative humidity | 60 %      |

### 8.2.3 Observations, settings and special notes

Tested with RF Conducted, using 6dBi antenna setting as worst case - highest conducted power. RF Output Power Reduced same amount for Higher Gain Antenna over 6dBi by professional installation.

RF output from 1 port at a time, all 4 ports check to find the worst case (highest power).

## 8.2.4 Test data

Table 8.2-1: Output power measurements results – RF1

| Power Source | Frequency, MHz | Conducted output power, dBm |       | Margin, dB | Max Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|--------------|----------------|-----------------------------|-------|------------|-----------------------|-----------|-----------------|-----------------|
|              |                | Measured                    | Limit |            |                       |           |                 |                 |
| PoE          | 902.75         | 29.50                       | 30    | 0.50       | 6                     | 35.50     | 36              | 0.50            |
|              | 914.75         | 29.58                       | 30    | 0.42       | 6                     | 35.58     | 36              | 0.42            |
|              | 927.25         | 29.12                       | 30    | 0.82       | 6                     | 35.12     | 36              | 0.82            |

Table 8.2-2: Output power measurements results – RF3

| Power Source | Frequency, MHz | Conducted output power, dBm |       | Margin, dB | Max Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|--------------|----------------|-----------------------------|-------|------------|-----------------------|-----------|-----------------|-----------------|
|              |                | Measured                    | Limit |            |                       |           |                 |                 |
| PoE          | 902.75         | 28.42                       | 30    | 1.58       | 6                     | 34.42     | 36              | 1.58            |
|              | 914.75         | 28.69                       | 30    | 1.31       | 6                     | 34.69     | 36              | 1.31            |
|              | 927.25         | 29.02                       | 30    | 0.98       | 6                     | 35.02     | 36              | 0.98            |

Table 8.2-3: Output power measurements results – RF2

| Power Source | Frequency, MHz | Conducted output power, dBm |       | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|--------------|----------------|-----------------------------|-------|------------|-------------------|-----------|-----------------|-----------------|
|              |                | Measured                    | Limit |            |                   |           |                 |                 |
| PoE          | 902.75         | 29.89                       | 30    | 0.11       | 6                 | 35.89     | 36              | 0.11            |
|              | 914.75         | 29.19                       | 30    | 0.81       | 6                 | 35.19     | 36              | 0.81            |
|              | 927.25         | 28.92                       | 30    | 0.08       | 6                 | 28.69     | 36              | 0.08            |

Table 8.2-4: Output power measurements results – RF0

| Power Source | Frequency, MHz | Conducted output power, dBm |       | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|--------------|----------------|-----------------------------|-------|------------|-------------------|-----------|-----------------|-----------------|
|              |                | Measured                    | Limit |            |                   |           |                 |                 |
| PoE          | 902.75         | 29.59                       | 30    | 0.41       | 6                 | 35.59     | 36              | 0.41            |
|              | 914.75         | 29.39                       | 30    | 0.61       | 6                 | 35.39     | 36              | 0.61            |
|              | 927.25         | 29.48                       | 30    | 0.52       | 6                 | 35.48     | 36              | 0.52            |

## 8.3 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) emissions

### 8.3.1 Definitions and limits

#### FCC:

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 this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

#### IC:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

(a) Fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands except for apparatus complying under RSS-287;

(b) Unwanted emissions that fall into restricted bands shall comply with the limits specified in RSS-Gen; and

(c) Unwanted emissions that do not fall within the restricted frequency bands shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Table 8.3-1: FCC §15.209 and RSS-Gen – Radiated emission limits

| Frequency,<br>MHz | Field strength of emissions |                                 | Measurement distance, m |
|-------------------|-----------------------------|---------------------------------|-------------------------|
|                   | µV/m                        | dBµV/m                          |                         |
| 0.009–0.490       | 2400/F                      | $67.6 - 20 \times \log_{10}(F)$ | 300                     |
| 0.490–1.705       | 24000/F                     | $87.6 - 20 \times \log_{10}(F)$ | 30                      |
| 1.705–30.0        | 30                          | 29.5                            | 30                      |
| 30–88             | 100                         | 40.0                            | 3                       |
| 88–216            | 150                         | 43.5                            | 3                       |
| 216–960           | 200                         | 46.0                            | 3                       |
| above 960         | 500                         | 54.0                            | 3                       |

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.3-2: IC restricted frequency bands

| MHz             | MHz                 | MHz           | GHz         |
|-----------------|---------------------|---------------|-------------|
| 0.090–0.110     | 12.51975–12.52025   | 399.9–410     | 5.35–5.46   |
| 2.1735–2.1905   | 12.57675–12.57725   | 608–614       | 7.25–7.75   |
| 3.020–3.026     | 13.36–13.41         | 960–1427      | 8.025–8.5   |
| 4.125–4.128     | 16.42–16.423        | 1435–1626.5   | 9.0–9.2     |
| 4.17725–4.17775 | 16.69475–16.69525   | 1645.5–1646.5 | 9.3–9.5     |
| 4.20725–4.20775 | 16.80425–16.80475   | 1660–1710     | 10.6–12.7   |
| 5.677–5.683     | 25.5–25.67          | 1718.8–1722.2 | 13.25–13.4  |
| 6.215–6.218     | 37.5–38.25          | 2200–2300     | 14.47–14.5  |
| 6.26775–6.26825 | 73–74.6             | 2310–2390     | 15.35–16.2  |
| 6.31175–6.31225 | 74.8–75.2           | 2655–2900     | 17.7–21.4   |
| 8.291–8.294     | 108–138             | 3260–3267     | 22.01–23.12 |
| 8.362–8.366     | 156.52475–156.52525 | 3332–3339     | 23.6–24.0   |
| 8.37625–8.38675 | 156.7–156.9         | 3345.8–3358   | 31.2–31.8   |
| 8.41425–8.41475 | 240–285             | 3500–4400     | 36.43–36.5  |
| 12.29–12.293    | 322–335.4           | 4500–5150     | Above 38.6  |

Note: Certain frequency bands listed in Table 8.3-2 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Table 8.3-3: FCC restricted frequency bands

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090–0.110       | 16.42–16.423        | 399.9–410     | 4.5–5.15    |
| 0.495–0.505       | 16.69475–16.69525   | 608–614       | 5.35–5.46   |
| 2.1735–2.1905     | 16.80425–16.80475   | 960–1240      | 7.25–7.75   |
| 4.125–4.128       | 25.5–25.67          | 1300–1427     | 8.025–8.5   |
| 4.17725–4.17775   | 37.5–38.25          | 1435–1626.5   | 9.0–9.2     |
| 4.20725–4.20775   | 73–74.6             | 1645.5–1646.5 | 9.3–9.5     |
| 6.215–6.218       | 74.8–75.2           | 1660–1710     | 10.6–12.7   |
| 6.26775–6.26825   | 108–121.94          | 1718.8–1722.2 | 13.25–13.4  |
| 6.31175–6.31225   | 123–138             | 2200–2300     | 14.47–14.5  |
| 8.291–8.294       | 149.9–150.05        | 2310–2390     | 15.35–16.2  |
| 8.362–8.366       | 156.52475–156.52525 | 2483.5–2500   | 17.7–21.4   |
| 8.37625–8.38675   | 156.7–156.9         | 2690–2900     | 22.01–23.12 |
| 8.41425–8.41475   | 162.0125–167.17     | 3260–3267     | 23.6–24.0   |
| 12.29–12.293      | 167.72–173.2        | 3332–3339     | 31.2–31.8   |
| 12.51975–12.52025 | 240–285             | 3345.8–3358   | 36.43–36.5  |
| 12.57675–12.57725 | 322–335.4           | 3600–4400     | Above 38.6  |
| 13.36–13.41       |                     |               |             |

### 8.3.2 Test summary

|               |                |                   |           |
|---------------|----------------|-------------------|-----------|
| Test date     | March 13, 2017 | Temperature       | 20 °C     |
| Test engineer | Mark Phillips  | Air pressure      | 1005 mbar |
| Verdict       | Pass           | Relative humidity | 56 %      |

### 8.3.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic.  
EUT was set to transmit continuously.  
Radiated measurements were performed at a distance of 3 m.  
Since fundamental power was tested using average method, the spurious emissions limit is –30 dBc/100 kHz

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

|                       |          |
|-----------------------|----------|
| Resolution bandwidth: | 100 kHz  |
| Video bandwidth:      | 300 kHz  |
| Detector mode:        | Peak     |
| Trace mode:           | Max Hold |

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

|                       |          |
|-----------------------|----------|
| Resolution bandwidth: | 1 MHz    |
| Video bandwidth:      | 3 MHz    |
| Detector mode:        | Peak     |
| Trace mode:           | Max Hold |

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

|                       |          |
|-----------------------|----------|
| Resolution bandwidth: | 1 MHz    |
| Video bandwidth:      | 10 Hz    |
| Detector mode:        | Peak     |
| Trace mode:           | Max Hold |

Spectrum analyser settings for conducted spurious emissions measurements:

|                       |          |
|-----------------------|----------|
| Resolution bandwidth: | 100 kHz  |
| Video bandwidth:      | 300 kHz  |
| Detector mode:        | Peak     |
| Trace mode:           | Max Hold |

### 8.3.4 Test data

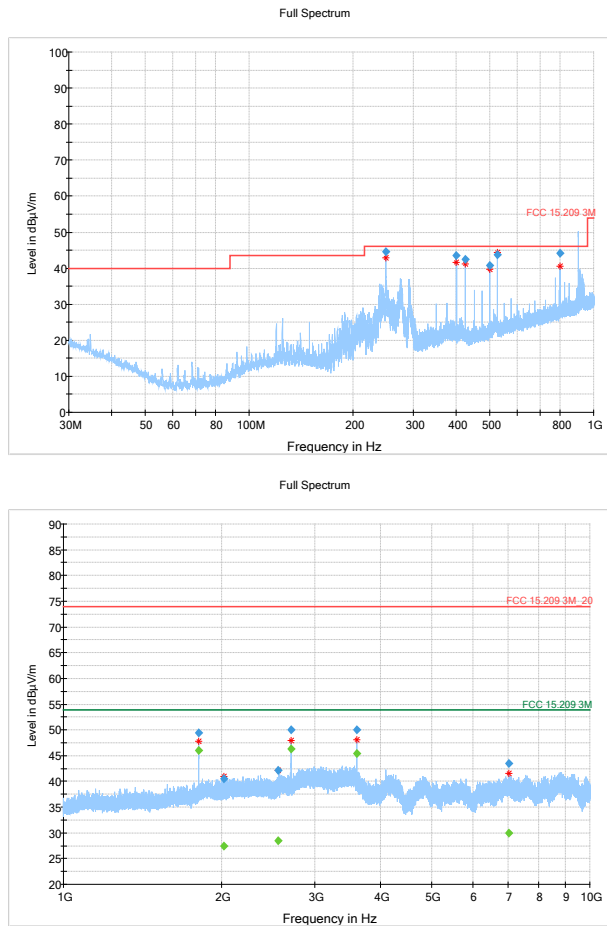


Figure 8.3.1: RSP 9800 Radiated spurious emissions, low channel, Dual Linear Antenna

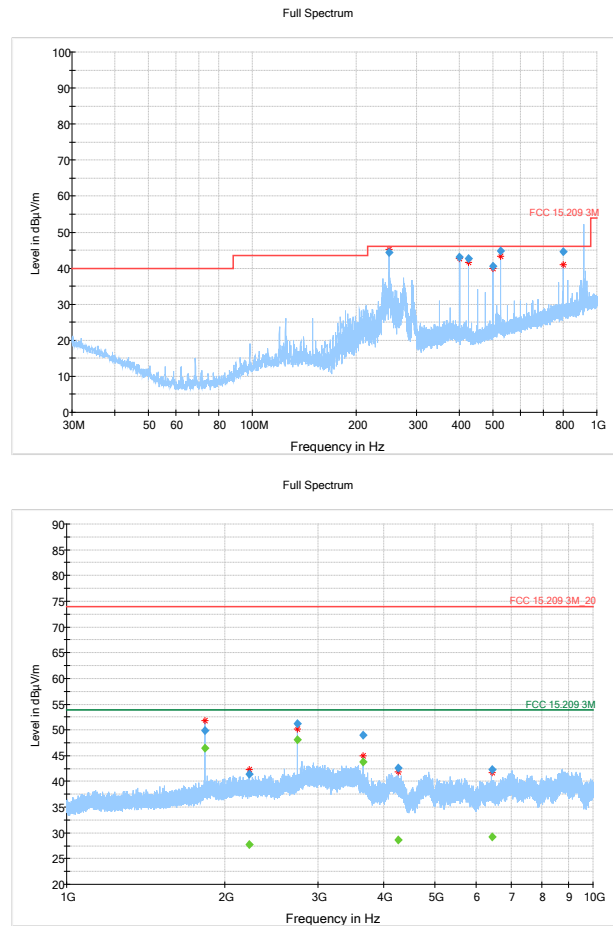


Figure 8.3.2: RSP 9800 Radiated spurious emissions, mid channel, Dual Linear Antenna

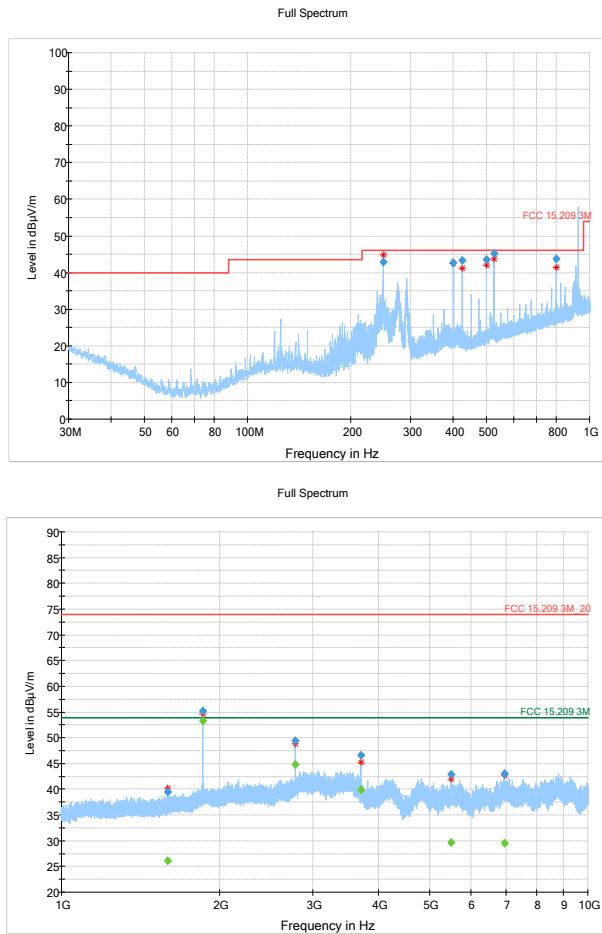


Figure 8.3.3: RSP 9800 Radiated spurious emissions, high channel, Dual Linear Antenna

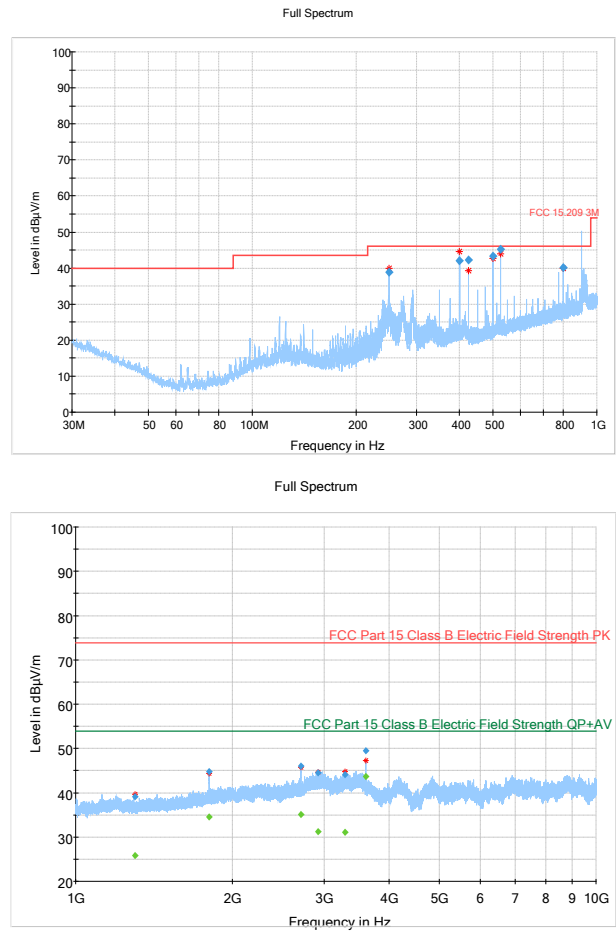


Figure 8.3.4: RSP 9800 Radiated spurious emissions, low channel, Circular Antenna

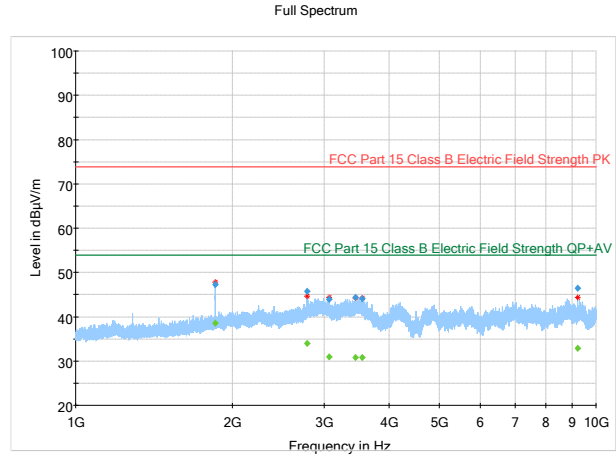
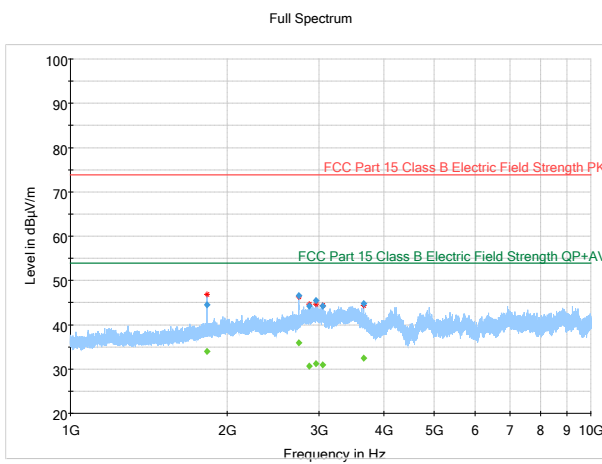
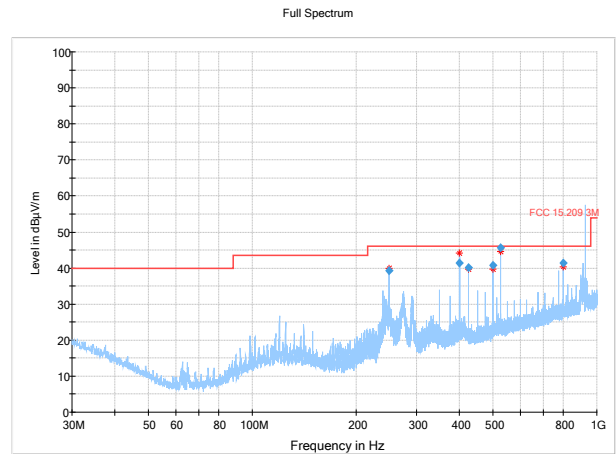
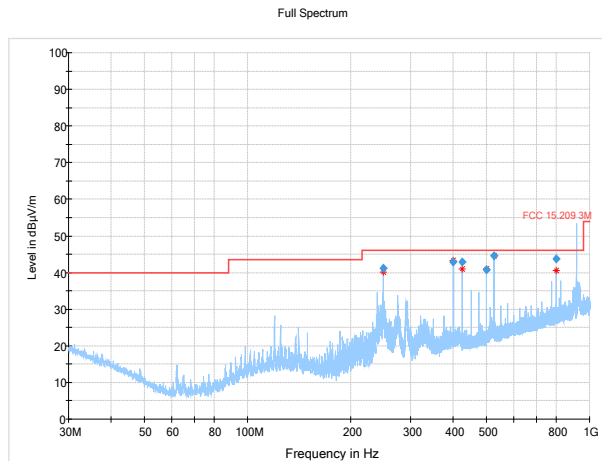


Figure 8.3.5: RSP 9800 Radiated spurious emissions, mid channel, Circular Antenna

Figure 8.3.6: RSP 9800 Radiated spurious emissions, high channel, Circular Antenna

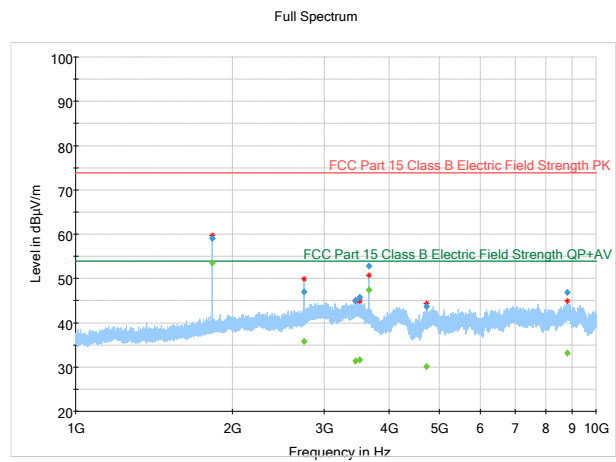
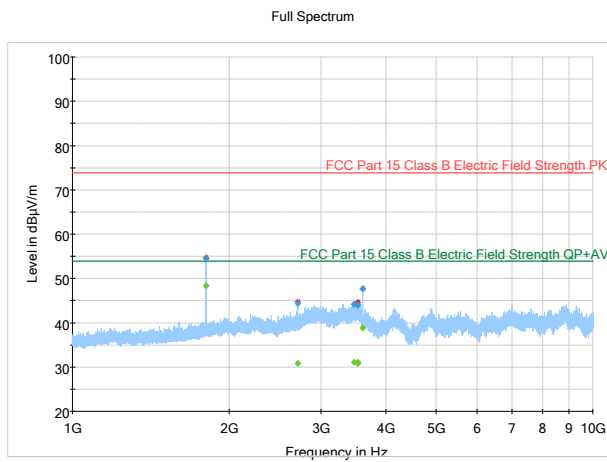
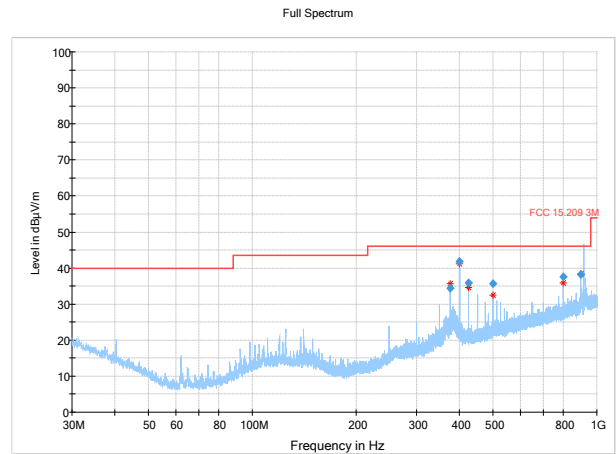
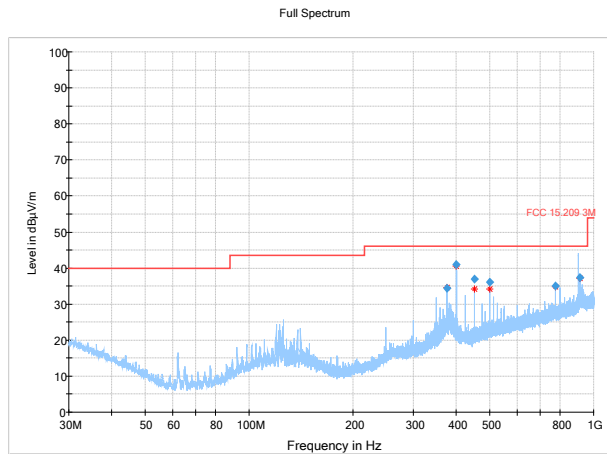


Figure 8.3.7: RSP 9003 Radiated spurious emissions, Low channel

Figure 8.3.8: RSP 9003 Radiated spurious emissions, Mid channel

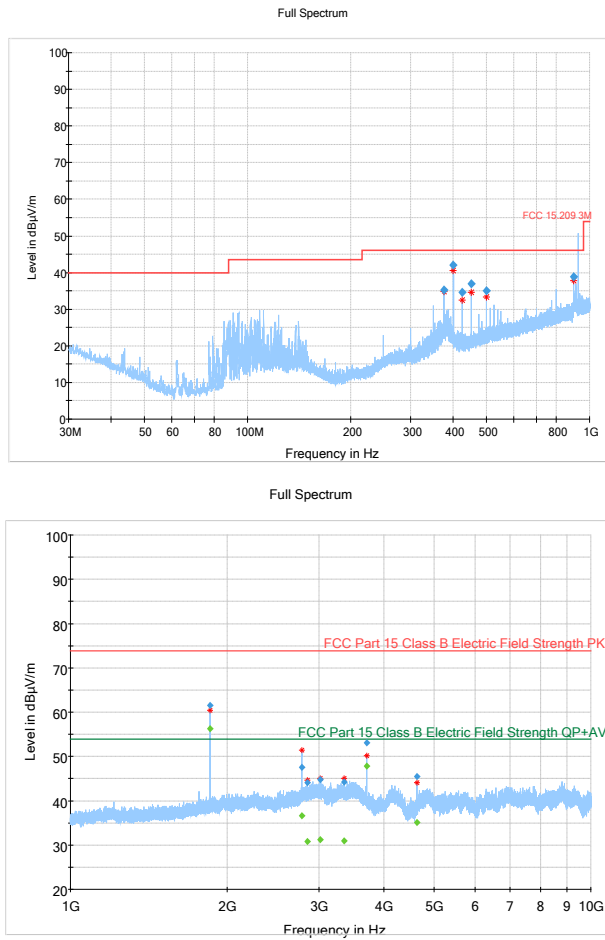


Figure 8.3.9: RSP 9003 Radiated spurious emissions, High channel

Peaks within 902-928MHz are transmitter fundamentals.

Table 8.3-4: RSP 9800 Radiated field strength measurement results for low channel, Dual Linear Antenna

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 250.007500      | 44.64              | 46.00          | 1.36        | 5000.0          | 120.000         | 103.1       | H   | 13.0          |
| 399.995000      | 43.43              | 46.00          | 2.57        | 5000.0          | 120.000         | 112.8       | V   | 250.0         |
| 425.012500      | 42.50              | 46.00          | 3.50        | 5000.0          | 120.000         | 126.8       | V   | 25.0          |
| 499.993500      | 40.74              | 46.00          | 5.26        | 5000.0          | 120.000         | 300.7       | H   | 25.0          |
| 525.019500      | 43.82              | 46.00          | 2.18        | 5000.0          | 120.000         | 112.8       | V   | 320.0         |
| 800.014500      | 44.16              | 46.00          | 1.84        | 5000.0          | 120.000         | 112.7       | H   | 40.0          |

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 1805.593333     | ---              | 46.02            | 53.90          | 7.88        | 5000.0          | 1000.000        | 274.9       | V   | 92.0          |
| 1805.593333     | 49.41            | ---              | 73.90          | 24.49       | 5000.0          | 1000.000        | 274.9       | V   | 92.0          |
| 2018.340000     | ---              | 27.47            | 53.90          | 26.43       | 5000.0          | 1000.000        | 196.0       | V   | 132.0         |
| 2018.340000     | 40.54            | ---              | 73.90          | 33.36       | 5000.0          | 1000.000        | 196.0       | V   | 132.0         |
| 2560.373333     | 42.18            | ---              | 73.90          | 31.72       | 5000.0          | 1000.000        | 227.4       | V   | 133.0         |
| 2560.373333     | ---              | 28.54            | 53.90          | 25.36       | 5000.0          | 1000.000        | 227.4       | V   | 133.0         |
| 2708.173333     | ---              | 46.28            | 53.90          | 7.62        | 5000.0          | 1000.000        | 156.1       | H   | 45.0          |
| 2708.173333     | 50.09            | ---              | 73.90          | 23.81       | 5000.0          | 1000.000        | 156.1       | H   | 45.0          |
| 3611.080000     | ---              | 45.36            | 53.90          | 8.54        | 5000.0          | 1000.000        | 230.4       | H   | 39.0          |
| 3611.080000     | 50.04            | ---              | 73.90          | 23.86       | 5000.0          | 1000.000        | 230.4       | H   | 39.0          |
| 7018.946667     | 43.50            | ---              | 73.90          | 30.40       | 5000.0          | 1000.000        | 247.5       | H   | 177.0         |
| 7018.946667     | ---              | 29.90            | 53.90          | 24.00       | 5000.0          | 1000.000        | 247.5       | H   | 177.0         |

Table 8.3-5: RSP 9800 Radiated field strength measurement results for Mid channel, Dual Linear Antenna

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 250.007500      | 44.41              | 46.00          | 1.59        | 5000.0          | 120.000         | 107.2       | H   | 10.0          |
| 399.986500      | 43.07              | 46.00          | 2.93        | 5000.0          | 120.000         | 129.8       | V   | 261.0         |
| 425.012500      | 42.69              | 46.00          | 3.31        | 5000.0          | 120.000         | 119.0       | V   | 44.0          |
| 499.993500      | 40.62              | 46.00          | 5.38        | 5000.0          | 120.000         | 247.3       | H   | 331.0         |
| 525.019500      | 44.71              | 46.00          | 1.29        | 5000.0          | 120.000         | 101.8       | V   | 314.0         |
| 800.014500      | 44.56              | 46.00          | 1.44        | 5000.0          | 120.000         | 100.0       | H   | 50.0          |

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 1829.373333     | 49.87            | ---              | 73.90          | 24.03       | 5000.0          | 1000.000        | 131.5       | H   | 67.0          |
| 1829.373333     | ---              | 46.45            | 53.90          | 7.45        | 5000.0          | 1000.000        | 131.5       | H   | 67.0          |
| 2221.413333     | ---              | 27.76            | 53.90          | 26.14       | 5000.0          | 1000.000        | 138.6       | V   | 205.0         |
| 2221.413333     | 41.41            | ---              | 73.90          | 32.49       | 5000.0          | 1000.000        | 138.6       | V   | 205.0         |
| 2744.453333     | 51.28            | ---              | 73.90          | 22.62       | 5000.0          | 1000.000        | 128.8       | H   | 50.0          |
| 2744.453333     | ---              | 48.05            | 53.90          | 5.85        | 5000.0          | 1000.000        | 128.8       | H   | 50.0          |
| 3658.866667     | ---              | 43.79            | 53.90          | 10.11       | 5000.0          | 1000.000        | 229.2       | H   | 40.0          |
| 3658.866667     | 48.94            | ---              | 73.90          | 24.96       | 5000.0          | 1000.000        | 229.2       | H   | 40.0          |
| 4265.640000     | 42.57            | ---              | 73.90          | 31.33       | 5000.0          | 1000.000        | 191.5       | V   | 92.0          |
| 4265.640000     | ---              | 28.62            | 53.90          | 25.28       | 5000.0          | 1000.000        | 191.5       | V   | 92.0          |
| 6423.986667     | 42.24            | ---              | 73.90          | 31.66       | 5000.0          | 1000.000        | 135.2       | H   | 32.0          |
| 6423.986667     | ---              | 29.27            | 53.90          | 24.63       | 5000.0          | 1000.000        | 135.2       | H   | 32.0          |

Table 8.3-6: RSP 9800 Radiated field strength measurement results for High channel, Dual Linear Antenna

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 250.016000      | 42.86              | 46.00          | 3.14        | 5000.0          | 120.000         | 120.5       | H   | 265.0         |
| 399.986500      | 42.77              | 46.00          | 3.23        | 5000.0          | 120.000         | 112.7       | V   | 14.0          |
| 425.004000      | 43.34              | 46.00          | 2.66        | 5000.0          | 120.000         | 116.6       | V   | 31.0          |
| 499.993500      | 43.46              | 46.00          | 2.54        | 5000.0          | 120.000         | 106.0       | V   | 309.0         |
| 525.011000      | 45.13              | 46.00          | 0.87        | 5000.0          | 120.000         | 104.2       | V   | 318.0         |
| 799.974500      | 43.78              | 46.00          | 2.22        | 5000.0          | 120.000         | 106.7       | H   | 45.0          |

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 1592.513333     | 39.49            | ---              | 73.90          | 34.41       | 5000.0          | 1000.000        | 136.6       | H   | 4.0           |
| 1592.513333     | ---              | 26.08            | 53.90          | 27.82       | 5000.0          | 1000.000        | 136.6       | H   | 4.0           |
| 1854.646667     | ---              | 53.33            | 53.90          | 0.57        | 5000.0          | 1000.000        | 156.1       | V   | 5.0           |
| 1854.646667     | 55.17            | ---              | 73.90          | 18.73       | 5000.0          | 1000.000        | 156.1       | V   | 5.0           |
| 2781.893333     | 49.46            | ---              | 73.90          | 24.44       | 5000.0          | 1000.000        | 138.3       | V   | 53.0          |
| 2781.893333     | ---              | 44.85            | 53.90          | 9.05        | 5000.0          | 1000.000        | 138.3       | V   | 53.0          |
| 3709.213333     | ---              | 39.94            | 53.90          | 13.96       | 5000.0          | 1000.000        | 101.7       | V   | 73.0          |
| 3709.213333     | 46.61            | ---              | 73.90          | 27.29       | 5000.0          | 1000.000        | 101.7       | V   | 73.0          |
| 5500.253333     | 42.83            | ---              | 73.90          | 31.07       | 5000.0          | 1000.000        | 146.5       | H   | 62.0          |
| 5500.253333     | ---              | 29.71            | 53.90          | 24.19       | 5000.0          | 1000.000        | 146.5       | H   | 62.0          |
| 6938.306667     | 42.99            | ---              | 73.90          | 30.91       | 5000.0          | 1000.000        | 114.0       | H   | 5.0           |
| 6938.306667     | ---              | 29.53            | 53.90          | 24.37       | 5000.0          | 1000.000        | 114.0       | H   | 5.0           |

Table 8.3-7: RSP 9800 Radiated field strength measurement results for low channel, Circular Antenna

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 250.016000      | 38.86              | 46.00          | 7.14        | 5000.0          | 120.000         | 110.8       | H   | 223.0         |
| 399.986500      | 42.12              | 46.00          | 3.88        | 5000.0          | 120.000         | 104.4       | H   | 0.0           |
| 425.004000      | 42.22              | 46.00          | 3.78        | 5000.0          | 120.000         | 99.0        | H   | 0.0           |
| 499.993500      | 43.28              | 46.00          | 2.72        | 5000.0          | 120.000         | 102.0       | V   | 247.0         |
| 525.019500      | 45.26              | 46.00          | 0.74        | 5000.0          | 120.000         | 107.3       | V   | 234.0         |
| 799.974500      | 40.07              | 46.00          | 5.93        | 5000.0          | 120.000         | 107.6       | H   | 304.0         |

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 1299.840000     | 39.09            | ---              | 73.90          | 34.81       | 5000.0          | 1000.000        | 342.5       | H   | 100.0         |
| 1299.840000     | ---              | 25.82            | 53.90          | 28.08       | 5000.0          | 1000.000        | 342.5       | H   | 100.0         |
| 1805.280000     | 44.75            | ---              | 73.90          | 29.15       | 5000.0          | 1000.000        | 197.0       | V   | 341.0         |
| 1805.280000     | ---              | 34.59            | 53.90          | 19.31       | 5000.0          | 1000.000        | 197.0       | V   | 341.0         |
| 2708.086667     | ---              | 35.02            | 53.90          | 18.88       | 5000.0          | 1000.000        | 168.3       | V   | 261.0         |
| 2708.086667     | 45.97            | ---              | 73.90          | 27.93       | 5000.0          | 1000.000        | 168.3       | V   | 261.0         |
| 2924.360000     | ---              | 31.28            | 53.90          | 22.62       | 5000.0          | 1000.000        | 401.3       | H   | 259.0         |
| 2924.360000     | 44.45            | ---              | 73.90          | 29.45       | 5000.0          | 1000.000        | 401.3       | H   | 259.0         |
| 3294.766667     | 44.15            | ---              | 73.90          | 29.75       | 5000.0          | 1000.000        | 219.4       | H   | 324.0         |
| 3294.766667     | ---              | 31.02            | 53.90          | 22.88       | 5000.0          | 1000.000        | 219.4       | H   | 324.0         |
| 3611.080000     | 49.54            | ---              | 73.90          | 24.36       | 5000.0          | 1000.000        | 139.6       | H   | 101.0         |
| 3611.080000     | ---              | 43.67            | 53.90          | 10.23       | 5000.0          | 1000.000        | 139.6       | H   | 101.0         |

Table 8.3-8: RSP 9800 Radiated field strength measurement results for Mid channel, Circular Antenna

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 250.016000      | 41.13              | 46.00          | 4.87        | 5000.0          | 120.000         | 102.0       | H   | 206.0         |
| 399.986500      | 42.98              | 46.00          | 3.02        | 5000.0          | 120.000         | 124.4       | V   | 245.0         |
| 425.012500      | 42.92              | 46.00          | 3.08        | 5000.0          | 120.000         | 119.3       | V   | 244.0         |
| 499.993500      | 40.74              | 46.00          | 5.26        | 5000.0          | 120.000         | 107.8       | V   | 152.0         |
| 525.011000      | 44.54              | 46.00          | 1.46        | 5000.0          | 120.000         | 112.2       | V   | 144.0         |
| 800.014500      | 43.77              | 46.00          | 2.23        | 5000.0          | 120.000         | 106.6       | H   | 40.0          |

| Frequency (MHz) | MaxPeak (dBμV/m) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 1829.686667     | 44.53            | ---              | 73.90          | 29.37       | 5000.0          | 1000.000        | 333.1       | H   | 201.0         |
| 1829.686667     | ---              | 33.94            | 53.90          | 19.96       | 5000.0          | 1000.000        | 333.1       | H   | 201.0         |
| 2744.366667     | ---              | 35.91            | 53.90          | 17.99       | 5000.0          | 1000.000        | 185.0       | V   | 0.0           |
| 2744.366667     | 46.58            | ---              | 73.90          | 27.32       | 5000.0          | 1000.000        | 185.0       | V   | 0.0           |
| 2879.686667     | 44.25            | ---              | 73.90          | 29.65       | 5000.0          | 1000.000        | 310.0       | V   | 101.0         |
| 2879.686667     | ---              | 30.64            | 53.90          | 23.26       | 5000.0          | 1000.000        | 310.0       | V   | 101.0         |
| 2962.073333     | ---              | 31.17            | 53.90          | 22.73       | 5000.0          | 1000.000        | 342.7       | H   | 41.0          |
| 2962.073333     | 45.53            | ---              | 73.90          | 28.37       | 5000.0          | 1000.000        | 342.7       | H   | 41.0          |
| 3052.620000     | ---              | 30.99            | 53.90          | 22.91       | 5000.0          | 1000.000        | 370.9       | H   | 162.0         |
| 3052.620000     | 44.29            | ---              | 73.90          | 29.61       | 5000.0          | 1000.000        | 370.9       | H   | 162.0         |
| 3658.893333     | ---              | 32.47            | 53.90          | 21.43       | 5000.0          | 1000.000        | 385.3       | H   | 82.0          |
| 3658.893333     | 44.72            | ---              | 73.90          | 29.18       | 5000.0          | 1000.000        | 385.3       | H   | 82.0          |

Table 8.3-9: RSP 9800 Radiated field strength measurement results for High channel, Circular Antenna

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 249.976000      | 39.18              | 46.00          | 6.82        | 5000.0          | 120.000         | 131.3       | H   | 212.0         |
| 399.986500      | 41.45              | 46.00          | 4.55        | 5000.0          | 120.000         | 103.0       | H   | 0.0           |
| 425.004000      | 40.05              | 46.00          | 5.95        | 5000.0          | 120.000         | 100.0       | H   | 0.0           |
| 499.993500      | 40.86              | 46.00          | 5.14        | 5000.0          | 120.000         | 250.2       | H   | 294.0         |
| 525.011000      | 45.62              | 46.00          | 0.38        | 5000.0          | 120.000         | 106.8       | V   | 244.0         |
| 799.974500      | 41.48              | 46.00          | 4.52        | 5000.0          | 120.000         | 99.0        | H   | 288.0         |

| Frequency (MHz) | MaxPeak (dBμV/m) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 1854.560000     | ---              | 38.48            | 53.90          | 15.42       | 5000.0          | 1000.000        | 121.5       | H   | 16.0          |
| 1854.560000     | 47.26            | ---              | 73.90          | 26.64       | 5000.0          | 1000.000        | 121.5       | H   | 16.0          |
| 2781.806667     | 45.72            | ---              | 73.90          | 28.18       | 5000.0          | 1000.000        | 103.8       | V   | 264.0         |
| 2781.806667     | ---              | 33.91            | 53.90          | 19.99       | 5000.0          | 1000.000        | 103.8       | V   | 264.0         |
| 3067.706667     | ---              | 30.87            | 53.90          | 23.03       | 5000.0          | 1000.000        | 401.0       | H   | 183.0         |
| 3067.706667     | 43.94            | ---              | 73.90          | 29.96       | 5000.0          | 1000.000        | 401.0       | H   | 183.0         |
| 3444.206667     | ---              | 30.75            | 53.90          | 23.15       | 5000.0          | 1000.000        | 273.6       | V   | 302.0         |
| 3444.206667     | 44.40            | ---              | 73.90          | 29.50       | 5000.0          | 1000.000        | 273.6       | V   | 302.0         |
| 3550.426667     | ---              | 30.80            | 53.90          | 23.10       | 5000.0          | 1000.000        | 315.2       | H   | 343.0         |
| 3550.426667     | 44.12            | ---              | 73.90          | 29.78       | 5000.0          | 1000.000        | 315.2       | H   | 343.0         |
| 9220.813333     | 46.45            | ---              | 73.90          | 27.45       | 5000.0          | 1000.000        | 401.0       | V   | 243.0         |
| 9220.813333     | ---              | 32.86            | 53.90          | 21.04       | 5000.0          | 1000.000        | 401.0       | V   | 243.0         |

Table 8.3-10: RSP 9003 Radiated field strength measurement results for Low Channel

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 375.009000      | 34.46              | 46.00          | 11.54       | 5000.0          | 120.000         | 107.2       | H   | 305.0         |
| 400.026500      | 41.05              | 46.00          | 4.95        | 5000.0          | 120.000         | 118.5       | V   | 26.0          |
| 450.030000      | 36.97              | 46.00          | 9.03        | 5000.0          | 120.000         | 178.7       | H   | 309.0         |
| 499.993500      | 36.00              | 46.00          | 10.00       | 5000.0          | 120.000         | 103.5       | V   | 66.0          |
| 775.077000      | 35.11              | 46.00          | 10.89       | 5000.0          | 120.000         | 298.3       | H   | 218.0         |
| 912.557500      | 37.27              | 46.00          | 8.73        | 5000.0          | 120.000         | 132.7       | H   | 138.0         |

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 1805.680000     | ---              | 48.43            | 53.90          | 5.47        | 5000.0          | 1000.000        | 278.0       | H   | 42.0          |
| 1805.680000     | 54.46            | ---              | 73.90          | 19.44       | 5000.0          | 1000.000        | 278.0       | H   | 42.0          |
| 2708.313333     | 44.32            | ---              | 73.90          | 29.58       | 5000.0          | 1000.000        | 102.8       | H   | 16.0          |
| 2708.313333     | ---              | 30.73            | 53.90          | 23.17       | 5000.0          | 1000.000        | 102.8       | H   | 16.0          |
| 3477.353333     | 44.07            | ---              | 73.90          | 29.83       | 5000.0          | 1000.000        | 336.0       | H   | 162.0         |
| 3477.353333     | ---              | 31.04            | 53.90          | 22.86       | 5000.0          | 1000.000        | 336.0       | H   | 162.0         |
| 3532.546667     | 44.09            | ---              | 73.90          | 29.81       | 5000.0          | 1000.000        | 299.0       | H   | 0.0           |
| 3532.546667     | ---              | 30.83            | 53.90          | 23.07       | 5000.0          | 1000.000        | 299.0       | H   | 0.0           |
| 3538.126667     | 43.89            | ---              | 73.90          | 30.01       | 5000.0          | 1000.000        | 364.2       | H   | 342.0         |
| 3538.126667     | ---              | 31.05            | 53.90          | 22.85       | 5000.0          | 1000.000        | 364.2       | H   | 342.0         |
| 3610.866667     | ---              | 38.89            | 53.90          | 15.01       | 5000.0          | 1000.000        | 283.1       | H   | 321.0         |
| 3610.866667     | 47.71            | ---              | 73.90          | 26.19       | 5000.0          | 1000.000        | 283.1       | H   | 321.0         |

Table 8.3-11: RSP 9003 Radiated field strength measurement results for Mid Channel

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 375.009000      | 34.39              | 46.00          | 11.61       | 5000.0          | 120.000         | 227.7       | H   | 289.0         | 19.3       |
| 399.986500      | 41.72              | 46.00          | 4.28        | 5000.0          | 120.000         | 129.4       | V   | 18.0          | 19.9       |
| 425.012500      | 35.78              | 46.00          | 10.22       | 5000.0          | 120.000         | 117.0       | V   | 56.0          | 20.6       |
| 499.993500      | 35.63              | 46.00          | 10.37       | 5000.0          | 120.000         | 114.3       | V   | 58.0          | 22.1       |
| 800.014500      | 37.66              | 46.00          | 8.34        | 5000.0          | 120.000         | 110.0       | H   | 317.0         | 27.1       |
| 898.478000      | 38.28              | 46.00          | 7.72        | 5000.0          | 120.000         | 270.3       | H   | 337.0         | 28.3       |

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 1829.686667     | ---              | 53.48            | 53.90          | 0.42        | 5000.0          | 1000.000        | 297.7       | H   | 40.0          |
| 1829.686667     | 59.01            | ---              | 73.90          | 14.89       | 5000.0          | 1000.000        | 297.7       | H   | 40.0          |
| 2744.140000     | 46.94            | ---              | 73.90          | 26.96       | 5000.0          | 1000.000        | 99.0        | H   | 15.0          |
| 2744.140000     | ---              | 35.74            | 53.90          | 18.16       | 5000.0          | 1000.000        | 99.0        | H   | 15.0          |
| 3446.880000     | 45.04            | ---              | 73.90          | 28.86       | 5000.0          | 1000.000        | 401.0       | H   | 302.0         |
| 3446.880000     | ---              | 31.37            | 53.90          | 22.53       | 5000.0          | 1000.000        | 401.0       | H   | 302.0         |
| 3510.533333     | 45.79            | ---              | 73.90          | 28.11       | 5000.0          | 1000.000        | 393.3       | V   | 122.0         |
| 3510.533333     | ---              | 31.60            | 53.90          | 22.30       | 5000.0          | 1000.000        | 393.3       | V   | 122.0         |
| 3659.080000     | 52.79            | ---              | 73.90          | 21.11       | 5000.0          | 1000.000        | 200.1       | H   | 82.0          |
| 3659.080000     | ---              | 47.39            | 53.90          | 6.51        | 5000.0          | 1000.000        | 200.1       | H   | 82.0          |
| 4722.546667     | 43.63            | ---              | 73.90          | 30.27       | 5000.0          | 1000.000        | 355.5       | H   | 282.0         |
| 4722.546667     | ---              | 30.16            | 53.90          | 23.74       | 5000.0          | 1000.000        | 355.5       | H   | 282.0         |
| 8805.426667     | 46.81            | ---              | 73.90          | 27.09       | 5000.0          | 1000.000        | 338.8       | V   | 61.0          |
| 8805.426667     | ---              | 33.19            | 53.90          | 20.71       | 5000.0          | 1000.000        | 338.8       | V   | 61.0          |

Table 8.3-12: RSP 9003 Radiated field strength measurement results for High channel

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 375.009000      | 35.29              | 46.00          | 10.71       | 5000.0          | 120.000         | 124.0       | V   | 0.0           |
| 399.986500      | 42.14              | 46.00          | 3.86        | 5000.0          | 120.000         | 129.7       | V   | 356.0         |
| 425.012500      | 34.69              | 46.00          | 11.31       | 5000.0          | 120.000         | 130.5       | V   | 50.0          |
| 450.030000      | 37.00              | 46.00          | 9.00        | 5000.0          | 120.000         | 173.3       | H   | 294.0         |
| 500.033500      | 35.12              | 46.00          | 10.88       | 5000.0          | 120.000         | 103.4       | V   | 78.0          |
| 898.606500      | 38.79              | 46.00          | 7.21        | 5000.0          | 120.000         | 187.3       | H   | 180.0         |

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Comment                |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------------------|
| 1854.560000     | 61.50            | ---              | 73.90          | 12.40       | 5000.0          | 1000.000        | 284.1       | H   | 42.0          | Not In Restricted Band |
| 1854.560000     | ---              | 56.21            | 53.90          | -2.31       | 5000.0          | 1000.000        | 284.1       | H   | 42.0          |                        |
| 2781.806667     | ---              | 36.65            | 53.90          | 17.25       | 5000.0          | 1000.000        | 99.0        | H   | 16.0          |                        |
| 2781.806667     | 47.48            | ---              | 73.90          | 26.43       | 5000.0          | 1000.000        | 99.0        | H   | 16.0          |                        |
| 2851.040000     | ---              | 30.85            | 53.90          | 23.05       | 5000.0          | 1000.000        | 287.1       | H   | 280.0         |                        |
| 2851.040000     | 44.10            | ---              | 73.90          | 29.80       | 5000.0          | 1000.000        | 287.1       | H   | 280.0         |                        |
| 3016.633333     | 44.75            | ---              | 73.90          | 29.15       | 5000.0          | 1000.000        | 310.7       | H   | 0.0           |                        |
| 3016.633333     | ---              | 31.28            | 53.90          | 22.62       | 5000.0          | 1000.000        | 310.7       | H   | 0.0           |                        |
| 3351.946667     | ---              | 30.94            | 53.90          | 22.96       | 5000.0          | 1000.000        | 320.9       | V   | 281.0         |                        |
| 3351.946667     | 44.20            | ---              | 73.90          | 29.70       | 5000.0          | 1000.000        | 320.9       | V   | 281.0         |                        |
| 3709.000000     | 53.13            | ---              | 73.90          | 20.77       | 5000.0          | 1000.000        | 211.7       | H   | 41.0          |                        |
| 3709.000000     | ---              | 47.89            | 53.90          | 6.01        | 5000.0          | 1000.000        | 211.7       | H   | 41.0          |                        |
| 4636.360000     | 45.50            | ---              | 73.90          | 28.40       | 5000.0          | 1000.000        | 163.6       | H   | 222.0         |                        |
| 4636.360000     | ---              | 35.03            | 53.90          | 18.87       | 5000.0          | 1000.000        | 163.6       | H   | 222.0         |                        |

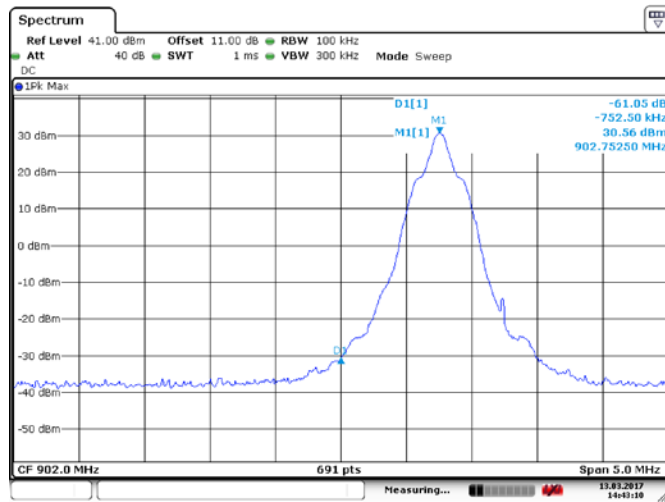


Figure 8.3.10: Low Bandedge Measurement

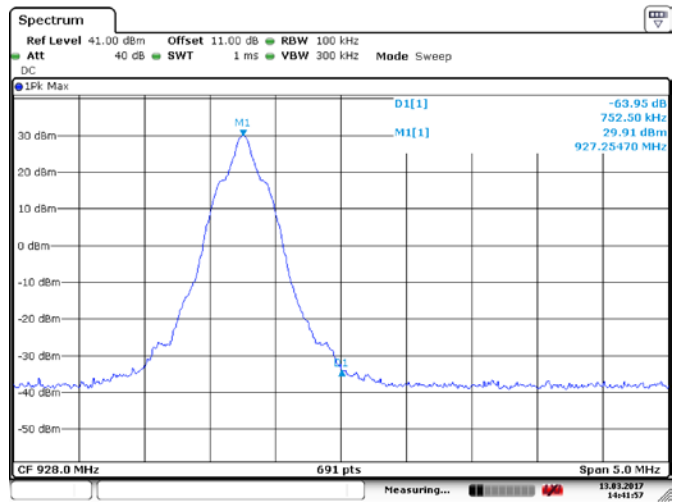


Figure 8.3.11: High Bandedge Measurement

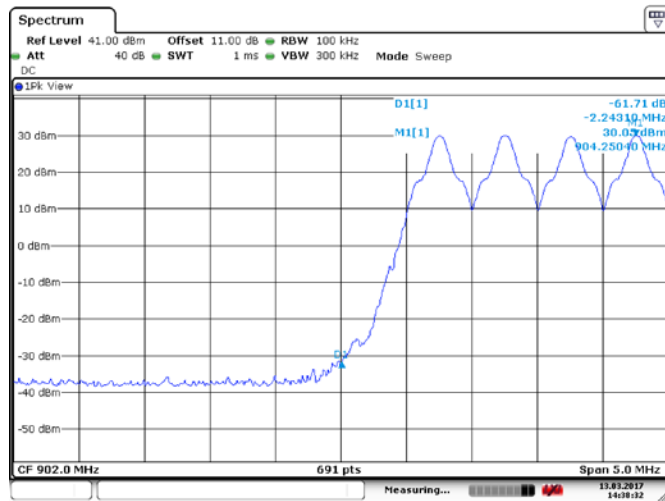


Figure 8.3.12: Low Bandedge Measurement, hopping

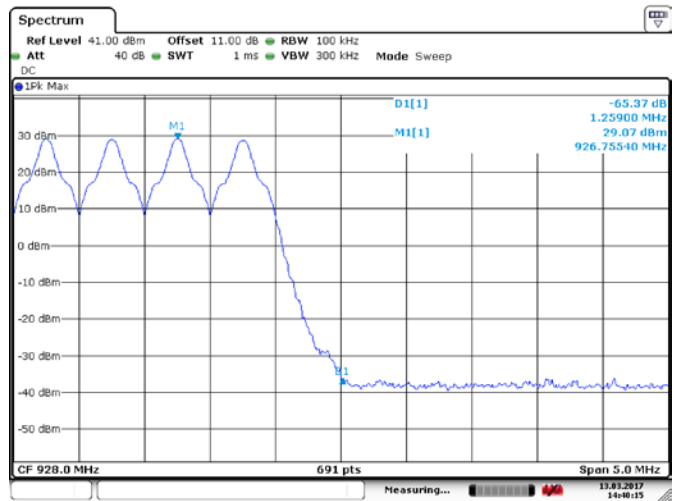


Figure 8.3.13: High Bandedge Measurement, hopping

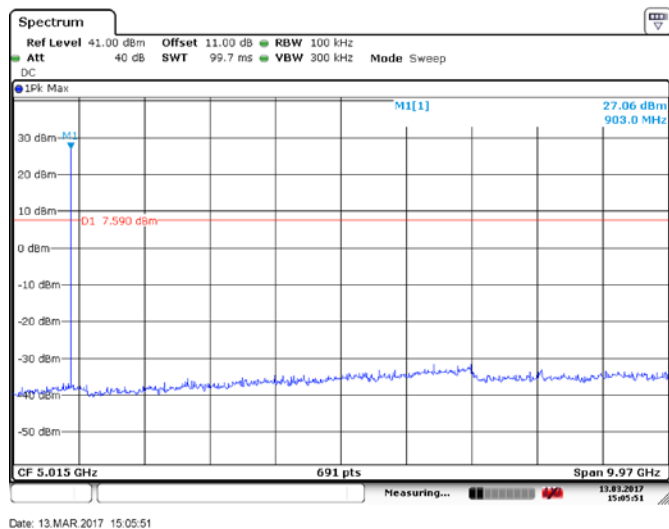


Figure 8.3.14: Conducted spurious emissions, low channel

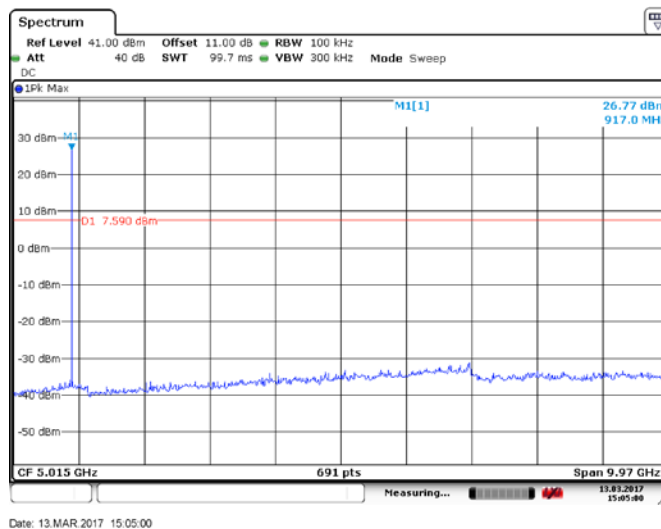


Figure 8.3.15: Conducted spurious emissions, mid channel

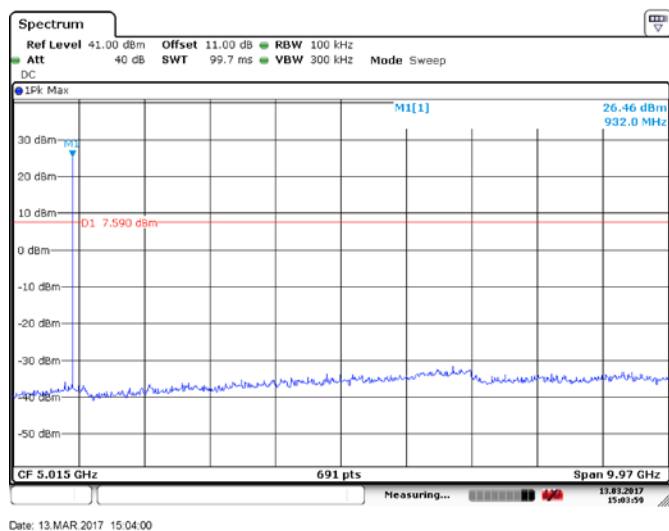


Figure 8.3.16: Conducted spurious emissions, high channel

Peaks within 902-928MHz are transmitter fundamentals.

## 8.4 FCC 15.247(a)(1)(i) and RSS-247 5.1(3) Frequency hopping systems in the 902-928MHz

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### 8.4.1 Definitions and limits

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**FCC:**

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz..

**IC:**

For FHSs in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz.

### 8.4.2 Test summary

---

|               |                |                   |           |
|---------------|----------------|-------------------|-----------|
| Test date     | March 13, 2017 | Temperature       | 20 °C     |
| Test engineer | Mark Phillips  | Air pressure      | 1004 mbar |
| Verdict       | Pass           | Relative humidity | 56 %      |

### 8.4.3 Observations, settings and special notes

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The test was performed using EUT set to normal hopping operation.

#### 8.4.4 Test data

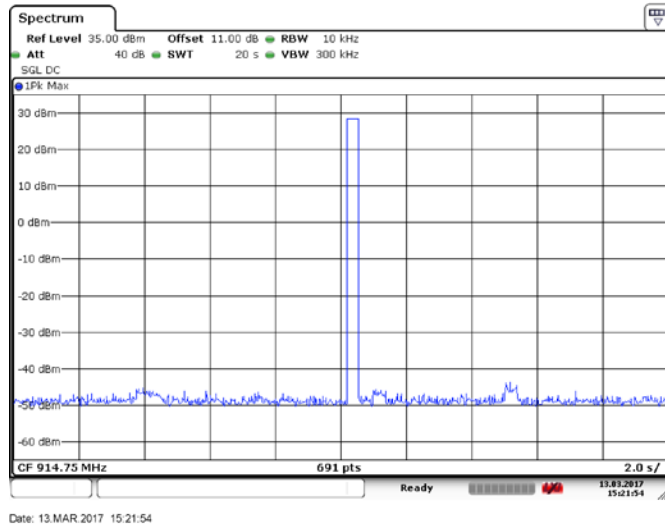


Diagram 8.4-1: Pulse count in 10s, 914.75MHz

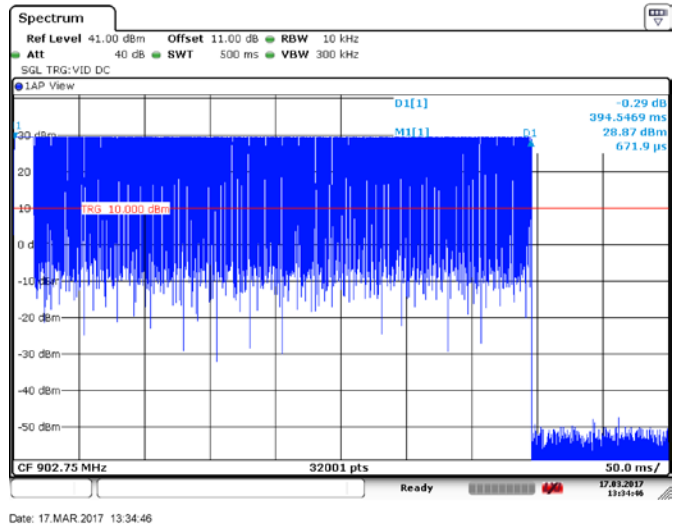


Diagram 8.4-2: Pulse width, 914.75MHz

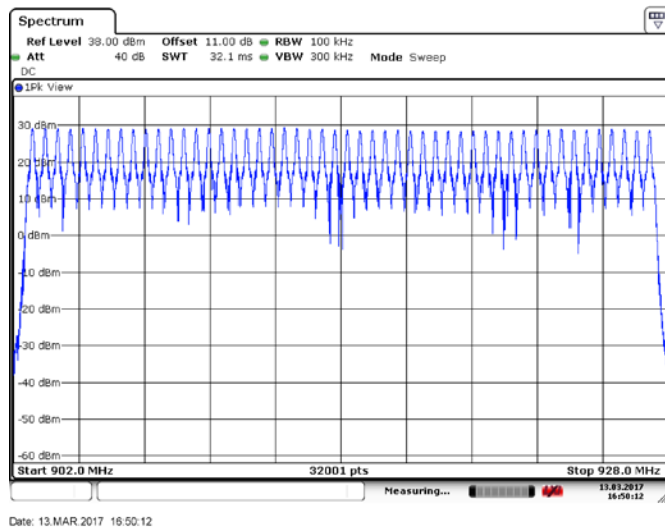


Diagram 8.4-3: Hopping channels 50

Table 8.4-1: Time of occupancy

| Frequency MHz | Pulse count in 10s | Pulse width (ms) | Time of occupancy<br>Time (ms) | Limit (ms) | Margin (ms) |
|---------------|--------------------|------------------|--------------------------------|------------|-------------|
| 914.75        | 1                  | 394.54           | 394.54                         | 400        | 0.46        |

Table 8.4: Hopping Frequencies

| Minimum Hopping Frequencies | Measured Hopping Frequencies | Result |
|-----------------------------|------------------------------|--------|
| 25                          | 50                           | Pass   |

## 8.5 FCC 15.247(a) (1) and RSS-247 5.1(2) Carrier frequency separation

### 8.5.1 Definitions and limits

**FCC and IC:**

- (a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:
- (1) 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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 8.5.2 Test summary

|               |                |                   |           |
|---------------|----------------|-------------------|-----------|
| Test date     | March 13, 2017 | Temperature       | 20 °C     |
| Test engineer | Mark Phillips  | Air pressure      | 1003 mbar |
| Verdict       | Pass           | Relative humidity | 55 %      |

### 8.5.3 Observations, settings and special notes

Spectrum analyser settings:

|                      |          |
|----------------------|----------|
| Resolution bandwidth | 100 kHz  |
| Video bandwidth      | ≥ RBW    |
| Frequency span       | 4 MHz    |
| Detector mode        | Peak     |
| Trace mode           | Max Hold |

RF Conducted Test

### 8.5.4 Test data

Table 8.5-1: Hopping Frequency Separation

| Modulation | Frequency, kHz | Minimum, kHz (20dB OBW) | Margin, kHz |
|------------|----------------|-------------------------|-------------|
| ASK        | 500.0          | 400.8                   | 99.2        |

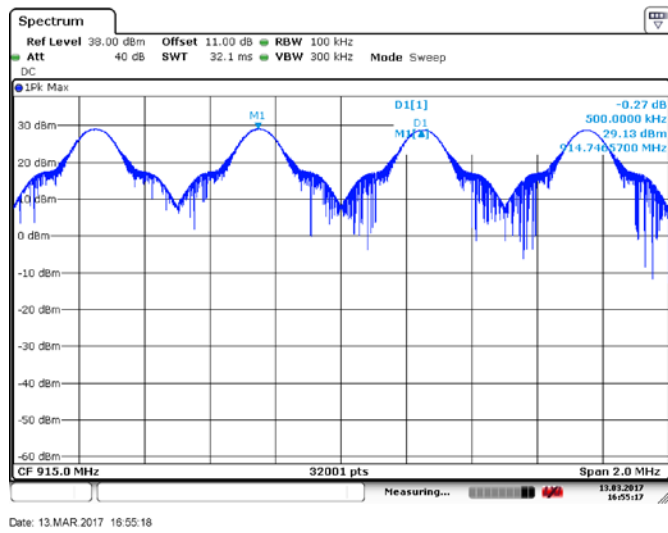


Figure 8.5-1: Hopping Frequency Separation

## 8.6 FCC 15.207(a) AC power line conducted emissions limits

### 8.6.1 Definitions and limits

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50  $\Omega$  line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

The conducted emissions shall be measured with a 50  $\Omega$ /50  $\mu$ H line impedance stabilization network (LISN).

Table 8.6-1: Conducted emissions limit

| Frequency of emission<br>(MHz) | Conducted limit (dB $\mu$ V) |           |
|--------------------------------|------------------------------|-----------|
|                                | Quasi-peak                   | Average   |
| 0.15–0.5                       | 66 to 56*                    | 56 to 46* |
| 0.5–5                          | 56                           | 46        |
| 5–30                           | 60                           | 50        |

Note: \* - Decreases with the logarithm of the frequency.

### 8.6.2 Test summary

|               |                |                   |           |
|---------------|----------------|-------------------|-----------|
| Test date     | March 13, 2017 | Temperature       | 20 °C     |
| Test engineer | Mark Phillips  | Air pressure      | 1004 mbar |
| Verdict       | Pass           | Relative humidity | 56 %      |

### 8.6.3 Observations, settings and special notes

This is tested with Low CH TX on.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Test receiver settings:

|                      |                                                                  |
|----------------------|------------------------------------------------------------------|
| Frequency span       | 150 kHz to 30 MHz                                                |
| Detector mode        | Peak and Average (preview mode); Quasi-Peak (final measurements) |
| Resolution bandwidth | 9 kHz                                                            |
| Video bandwidth      | 30 kHz                                                           |
| Trace mode           | Max Hold                                                         |
| Measurement time     | 1000 ms                                                          |

## 8.6.4 Test data

Plot 8.6-1: RSP 9003 Conducted emissions

Full Spectrum

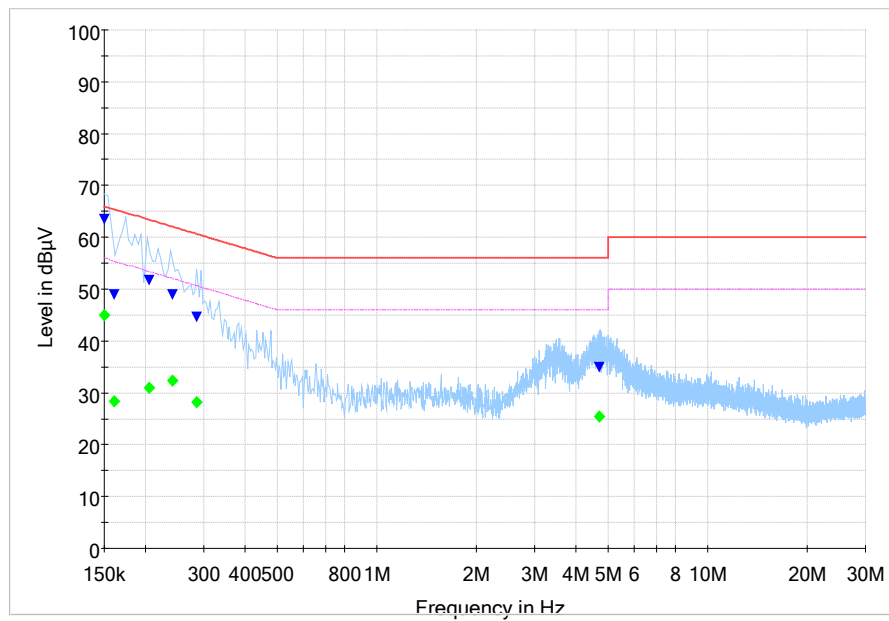
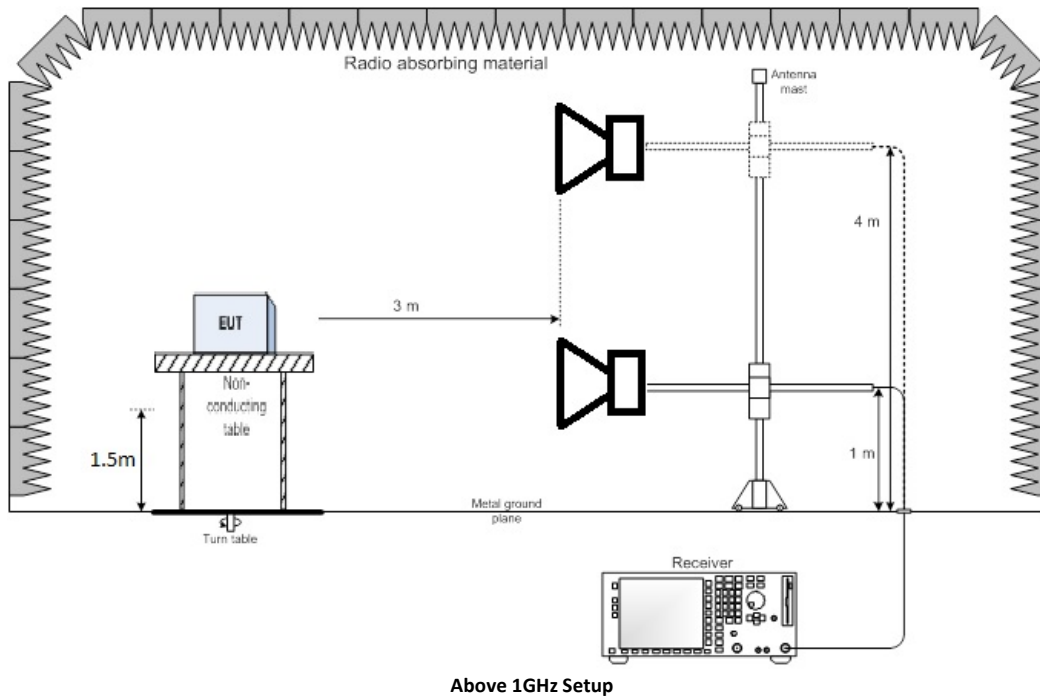
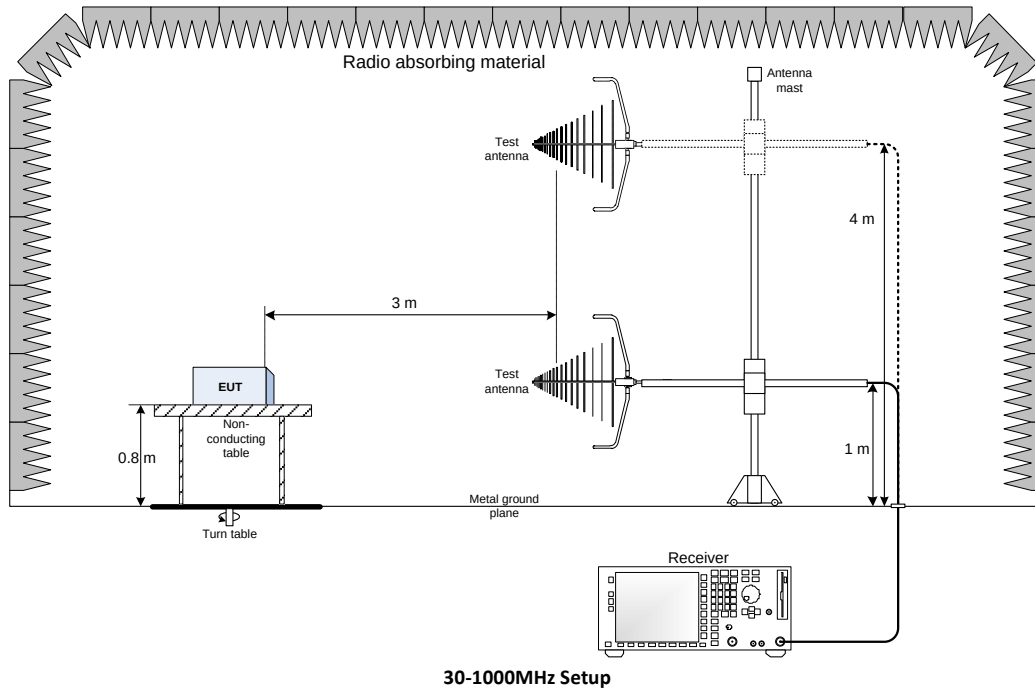


Table 8.6-2: RSP 9003 Quasi-Peak and Average conducted emissions results

| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter |
|-----------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|--------|
| 0.150000        | ---              | 44.98          | 56.00        | 11.02       | 5000.0          | 9.000           | L1   | ON     |
| 0.150000        | 63.50            | ---            | 66.00        | 2.50        | 5000.0          | 9.000           | L1   | ON     |
| 0.160500        | 49.03            | ---            | 65.44        | 16.40       | 5000.0          | 9.000           | N    | ON     |
| 0.160500        | ---              | 28.44          | 55.44        | 27.00       | 5000.0          | 9.000           | N    | ON     |
| 0.204500        | 51.79            | ---            | 63.43        | 11.64       | 5000.0          | 9.000           | N    | ON     |
| 0.204500        | ---              | 31.00          | 53.43        | 22.43       | 5000.0          | 9.000           | N    | ON     |
| 0.240500        | 49.01            | ---            | 62.08        | 13.07       | 5000.0          | 9.000           | N    | ON     |
| 0.240500        | ---              | 32.35          | 52.08        | 19.72       | 5000.0          | 9.000           | N    | ON     |
| 0.284500        | 44.71            | ---            | 60.68        | 15.98       | 5000.0          | 9.000           | N    | ON     |
| 0.284500        | ---              | 28.22          | 50.68        | 22.47       | 5000.0          | 9.000           | N    | ON     |
| 4.696500        | ---              | 25.45          | 46.00        | 20.55       | 5000.0          | 9.000           | L1   | ON     |
| 4.696500        | 34.97            | ---            | 56.00        | 21.03       | 5000.0          | 9.000           | L1   | ON     |

## Section 9. Block diagrams of test set-ups

### 9.1 Radiated emissions set-up



# End of Report