

# TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.209 and subpart B;  
RSS-210 issue 8 section 2.5.1, RSS-Gen issue 3,  
ICES-003 Issue 5:2012

FOR:

**Paradox Security Systems**  
**Proximity reader and Keypad**  
**Model: R915**  
**FCC ID:KDYDGPR915**  
**IC:2438A-DGPR915**

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested.  
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## 1 Applicant information

**Client name:** Paradox Security Systems  
**Address:** 780 Industriel BLVD, St-Eustache, QC, J7R 5V3, Canada  
**Telephone:** 450-491-7444  
**Fax:** 450-491-1095  
**E-mail:** nimrodh@paradox.com  
**Contact name:** Mr. Nimrod Herman

## 2 Equipment under test attributes

**Product name:** Proximity reader and Keypad  
**Product type:** Transceiver  
**Model(s):** R915  
**Serial number:** 12B304EB  
**Hardware version:** 671-2122-020  
**Software release:** V1.01  
**Receipt date:** 28-Jul-14

## 3 Manufacturer information

**Manufacturer name:** Paradox Security Systems  
**Address:** 780 Industriel BLVD, St-Eustache, QC, J7R 5V3, Canada  
**Telephone:** 450-491-7444  
**Fax:** 450-491-1095  
**E-Mail:** nimrodh@paradox.com  
**Contact name:** Mr. Nimrod Herman

## 4 Test details

**Project ID:** 25767  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 28-Jul-14  
**Test completed:** 30-Jul-14  
**Test specification(s):** FCC 47CFR part 15, subpart C, §15.209;  
RSS-210 issue 8 section 2.5.1, RSS-Gen issue 3 Table 6

## 5 Tests summary

| Test                                                                   | Status |
|------------------------------------------------------------------------|--------|
| <b>Transmitter characteristics</b>                                     |        |
| FCC section 15.209, RSS-Gen section 7.2.5, Field strength of emissions | Pass   |
| FCC section 15.207(a) / RSS-Gen, Section 7.2.4, Conducted emission     | Pass   |
| FCC section 15.203, RSS-Gen section 7.1.2, Antenna requirement         | Pass   |
| RSS-Gen, Section 4.6.1, Occupied bandwidth                             | Tested |
| <b>Unintentional emissions</b>                                         |        |
| Section 15.107, Conducted emission at AC power port                    | Pass   |
| Section 15.109, Radiated emission                                      | Pass   |

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.  
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

This test report supersedes the previously issued test report identified by Doc ID:PARRAD\_FCC.25767.

|                     | Name and Title                               | Date           | Signature                                                                             |
|---------------------|----------------------------------------------|----------------|---------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mr. V. Einem, test engineer                  | July 30, 2014  |  |
| <b>Reviewed by:</b> | Mrs. M. Cherniavsky, certification engineer  | August 6, 2014 |  |
| <b>Approved by:</b> | Mr. M. Nikishin, EMC and Radio group manager | August 6, 2014 |  |

## 6 EUT description

### 6.1 General information

The EUT is a proximity reader and keypad operating at 125 kHz. The device utilizes the internal printed antenna, the gain is not defined.

### 6.2 Ports and lines

| Port type | Port description | Connected from        | Connected to  | Qty. | Cable type | Cable length, m |
|-----------|------------------|-----------------------|---------------|------|------------|-----------------|
| Power     | 16 V AC          | Mains via transformer | Control panel |      | Unshielded | 1.5             |
| Signal    | Signal +DC power | Control panel         | EUT           | 1    | Unshielded | 10              |

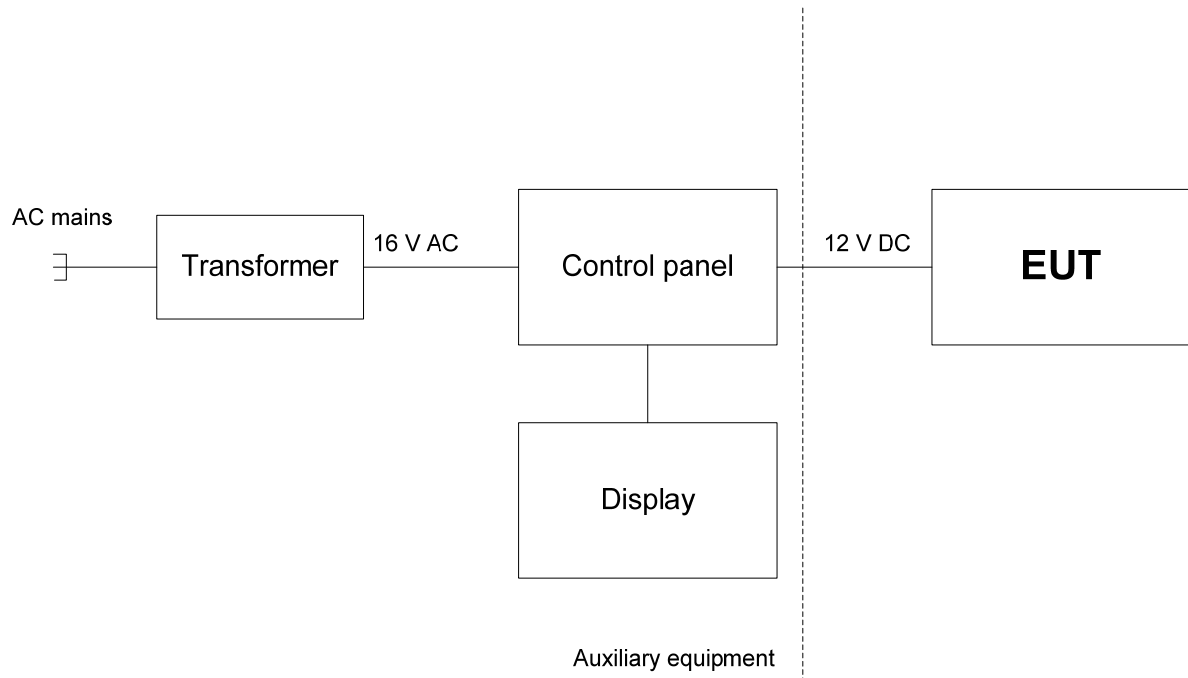
### 6.3 Support and test equipment

| Description   | Manufacturer | Model number | Serial number |
|---------------|--------------|--------------|---------------|
| Control Panel | Paradox      | TM50         | AT00018032    |

### 6.4 Changes made in EUT

No changes were performed in the EUT during the testing.

## 6.5 Test configuration



|                            |                               |                                                                           |                             |
|----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.4                                                |                             |
| <b>Test mode:</b>          |                               | Compliance                                                                | <b>Verdict:</b> PASS        |
| <b>Date(s):</b>            |                               | 28-Jul-14                                                                 |                             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                            | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                           |                             |

## 7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 requirements

### 7.1 Field strength of emissions

#### 7.1.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given Table 7.1.1 and Table 7.1.2.

Table 7.1.1 Radiated fundamental emission limits

| Fundamental frequency, kHz | Field strength at 3 m, dB(μV/m) |         |
|----------------------------|---------------------------------|---------|
|                            | Peak                            | Average |
| 125                        | 125.69                          | 105.69  |

Table 7.1.2 Radiated spurious emissions limits

| Frequency, MHz                  | Field strength at 3 m, dB(μV/m) |                 |                 |
|---------------------------------|---------------------------------|-----------------|-----------------|
|                                 | Within restricted bands         |                 |                 |
|                                 | Peak                            | Quasi Peak      | Average         |
| 0.009 – 0.090                   | 148.5 – 128.5                   | NA              | 128.5 – 108.5** |
| 0.090 – 0.110                   | NA                              | 108.5 – 106.8** | NA              |
| 0.110 – 0.490                   | 126.8 – 113.8                   | NA              | 106.8 – 93.8**  |
| 0.490 – 1.705                   | NA                              | 73.8 – 63.0**   | NA              |
| 1.705 – 30.0*                   |                                 | 69.5            |                 |
| 30 – 88                         |                                 | 40.0            |                 |
| 88 – 216                        |                                 | 43.5            |                 |
| 216 – 960                       |                                 | 46.0            |                 |
| 960 - 1000                      |                                 | 54.0            |                 |
| 1000 – 10 <sup>m</sup> harmonic | 74.0                            | NA              | 54.0            |

\*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log (S_1/S_2),$$

where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

\*\* - The limit decreases linearly with the logarithm of frequency.

#### 7.1.2 Test procedure for fundamental and spurious emission field strength measurements in 9 kHz to 30 MHz

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and the performance check was conducted.

7.1.2.2 The specified frequency range was investigated with a loop antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna was rotated around its vertical axis. The measuring antenna polarization was switched from vertical to horizontal.

7.1.2.3 The worst test results (the lowest margins) were recorded in Table 7.1.3 and shown in the associated plots.

#### 7.1.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.1.3.1 The EUT was set up as shown in Figure 7.1.2, energized and the performance check was conducted.

7.1.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.1.3.3 The worst test results (the lowest margins) were recorded in Table 7.1.4 and shown in the associated plots.

|                            |                               |                                                                           |                             |
|----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.4                                                |                             |
| <b>Test mode:</b>          |                               | Compliance                                                                | <b>Verdict:</b> PASS        |
| <b>Date(s):</b>            |                               | 28-Jul-14                                                                 |                             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                            | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                           |                             |

Figure 7.1.1 Setup for spurious emission field strength measurements below 30 MHz

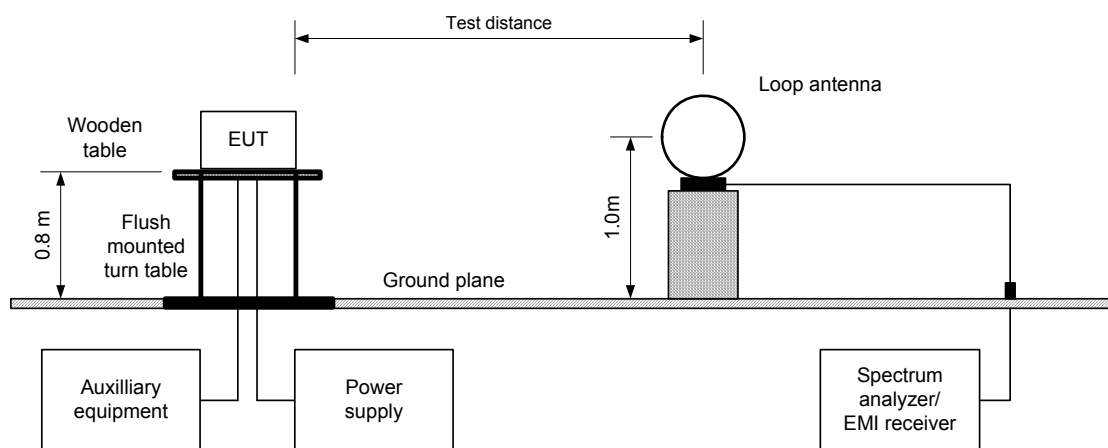
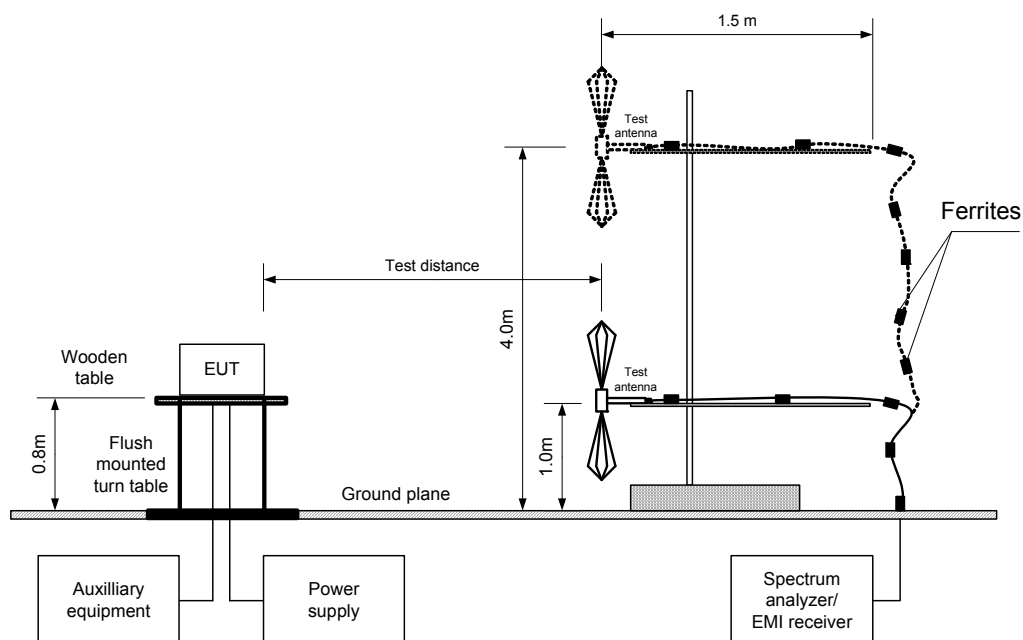


Figure 7.1.2 Setup for spurious emission field strength measurements above 30 MHz







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|                            |                               |                                                                           |                             |
|----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.4                                                |                             |
| <b>Test mode:</b>          |                               | Compliance                                                                | <b>Verdict:</b> PASS        |
| <b>Date(s):</b>            |                               | 28-Jul-14                                                                 |                             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                            | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                           |                             |

**Table 7.1.3 Field strength of fundamental emission**

TEST DISTANCE: 3 m  
 TEST SITE: Semi Anechoic chamber  
 EUT POSITION: Typical (Vertical)  
 MODULATING SIGNAL: RFID  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1 kHz (9 kHz – 150 kHz)  
 9.0 kHz (150 kHz – 30 MHz)  
 120 kHz (30 MHz – 1000 MHz)  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)

| F, kHz | Antenna  |           | Azimuth, degrees* | Peak field strength |                 |              | Average field strength |                 |              | Verdict |
|--------|----------|-----------|-------------------|---------------------|-----------------|--------------|------------------------|-----------------|--------------|---------|
|        | Pol.     | Height, m |                   | Measured, dB(μV/m)  | Limit, dB(μV/m) | Margin, dB** | Measured, dB(μV/m)     | Limit, dB(μV/m) | Margin, dB** |         |
| 127.0  | Vertical | 1.0       | 0                 | 73.2                | 125.69          | -52.49       | 72.4                   | 105.69          | -33.29       | Pass    |

\*- EUT front panel refers to 0 degrees position of turntable.

\*\* - Margin (dB) = measured result - specification limit.

**Reference numbers of test equipment used**

|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 0446 | HL 0521 | HL 4353 | HL 4722 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.



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|                            |                               |                                                                           |                             |
|----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.4                                                |                             |
| <b>Test mode:</b>          |                               | Compliance                                                                | <b>Verdict:</b> PASS        |
| <b>Date(s):</b>            |                               | 28-Jul-14                                                                 |                             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                            | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                           |                             |

Table 7.1.4 Field strength of spurious emissions

TEST DISTANCE: 3 m  
TEST SITE: Semi Anechoic chamber  
EUT POSITION: Typical (Vertical)  
MODULATING SIGNAL: RFID  
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz  
DETECTOR USED: Peak  
RESOLUTION BANDWIDTH: 1 kHz (9 kHz – 150 kHz)  
9.0 kHz (150 kHz – 30 MHz)  
120 kHz (30 MHz – 1000 MHz)  
VIDEO BANDWIDTH: ≥ Resolution bandwidth  
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
Biconilog (30 MHz – 1000 MHz)

| Frequency, MHz | Peak emission, dB(μV/m) | Quasi-peak                  |                 |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-------------------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
|                |                         | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* |                      |                   |                                |         |
| 5.1677         | 53.53                   | 50.13                       | 69.5            | -19.37      | Vertical             | 1.0               | 0                              | Pass    |
| 33.507         | 35.38                   | 31.42                       | 40.0            | -8.58       | Vertical             | 1.0               | 34                             |         |
| 38.602         | 40.22                   | 37.69                       | 40.0            | -2.31       | Vertical             | 1.0               | 0                              |         |
| 44.033         | 33.31                   | 29.58                       | 40.0            | -10.42      | Vertical             | 1.0               | 345                            |         |
| 47.612         | 32.26                   | 29.63                       | 40.0            | -10.37      | Vertical             | 1.0               | 123                            |         |

\*- Margin = Measured emission - specification limit.

\*\* - EUT front panel refer to 0 degrees position of turntable.

**Reference numbers of test equipment used**

|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0446 | HL 0521 | HL 0604 | HL 4353 | HL 4722 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.



|                     |                                                                    |                         |  |                      |      |
|---------------------|--------------------------------------------------------------------|-------------------------|--|----------------------|------|
| Test specification: | Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions |                         |  |                      |      |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                         |                         |  |                      |      |
| Test mode:          | Compliance                                                         | Verdict:                |  |                      | PASS |
| Date(s):            | 28-Jul-14                                                          |                         |  |                      |      |
| Temperature: 26 °C  | Air Pressure: 1010 hPa                                             | Relative Humidity: 42 % |  | Power Supply: 12 VDC |      |
| Remarks:            |                                                                    |                         |  |                      |      |

Table 7.1.5 Restricted bands according to FCC 15, Section 205

| MHz               | MHz                 | MHz                   | MHz             | MHz           | GHz           |
|-------------------|---------------------|-----------------------|-----------------|---------------|---------------|
| 0.09 - 0.11       | 8.37625 - 8.38675   | 73 - 74.6             | 399.9 - 410     | 2690 - 2900   | 10.6 - 12.7   |
| 0.495 - 0.505     | 8.41425 - 8.41475   | 74.8 - 75.2           | 608 - 614       | 3260 - 3267   | 13.25 - 13.4  |
| 2.1735 - 2.1905   | 12.290 - 12.293     | 108 - 121.94          | 960 - 1240      | 3332 - 3339   | 14.47 - 14.5  |
| 4.125 - 4.128     | 12.51975 - 12.52025 | 123 - 138             | 1300 - 1427     | 3345.8 - 3358 | 15.35 - 16.2  |
| 4.17725 - 4.17775 | 12.57675 - 12.57725 | 149.9 - 150.05        | 1435 - 1626.5   | 3600 - 4400   | 17.7 - 21.4   |
| 4.20725 - 4.20775 | 13.36 - 13.41       | 156.52475 - 156.52525 | 1645.5 - 1646.5 | 4500 - 5150   | 22.01 - 23.12 |
| 6.215 - 6.218     | 16.420 - 16.423     | 156.7 - 156.9         | 1660 - 1710     | 5350 - 5460   | 23.6 - 24     |
| 6.26775 - 6.26825 | 16.69475 - 16.69525 | 162.0125 - 167.17     | 1718.8 - 1722.2 | 7250 - 7750   | 31.2 - 31.8   |
| 6.31175 - 6.31225 | 16.80425 - 16.80475 | 167.72 - 173.2        | 2200 - 2300     | 8025 - 8500   | 36.43 - 36.5  |
| 8.291 - 8.294     | 25.5 - 25.67        | 240 - 285             | 2310 - 2390     | 9000 - 9200   | Above 38.6    |
| 8.362 - 8.366     | 37.5 - 38.25        | 322 - 335.4           | 2483.5 - 2500   | 9300 - 9500   |               |

Table 7.1.6 Restricted bands according to RSS-Gen, Table 3

| MHz               | MHz                 | MHz                   | MHz             | MHz           | GHz           |
|-------------------|---------------------|-----------------------|-----------------|---------------|---------------|
| 0.09 - 0.11       | 8.291 - 8.294       | 16.80425 - 16.80475   | 399.9 - 410     | 3260 - 3267   | 10.6 - 12.7   |
| 2.1735 - 2.190    | 8.362 - 8.366       | 25.5 - 25.67          | 608 - 614       | 3332 - 3339   | 13.25 - 13.4  |
| 3.020 - 3.026     | 8.37625 - 8.38675   | 37.5 - 38.25          | 960 - 1427      | 3345.8 - 3358 | 14.47 - 14.5  |
| 4.125 - 4.128     | 8.41425 - 8.41475   | 73 - 74.6             | 1435 - 1626.5   | 3500 - 4400   | 15.35 - 16.2  |
| 4.17725 - 4.17775 | 12.290 - 12.293     | 74.8 - 75.2           | 1645.5 - 1646.5 | 4500 - 5150   | 17.7 - 21.4   |
| 4.20725 - 4.20775 | 12.51975 - 12.52025 | 108 - 138             | 1660 - 1710     | 5350 - 5460   | 22.01 - 23.12 |
| 5.677 - 5.683     | 12.57675 - 12.57725 | 156.52475 - 156.52525 | 1718.8 - 1722.2 | 7250 - 7750   | 23.6 - 24.0   |
| 6.215 - 6.218     | 13.36 - 13.41       | 156.7 - 156.9         | 2200 - 2300     | 8025 - 8500   | 31.2 - 31.8   |
| 6.26775 - 6.26825 | 16.42 - 16.423      | 240 - 285             | 2310 - 2390     | 9000 - 9200   | 36.43 - 36.5  |
| 6.31175 - 6.31225 | 16.69475 - 16.69525 | 322 - 335.4           | 2655 - 2900     | 9300 - 9500   | Above 38.6    |

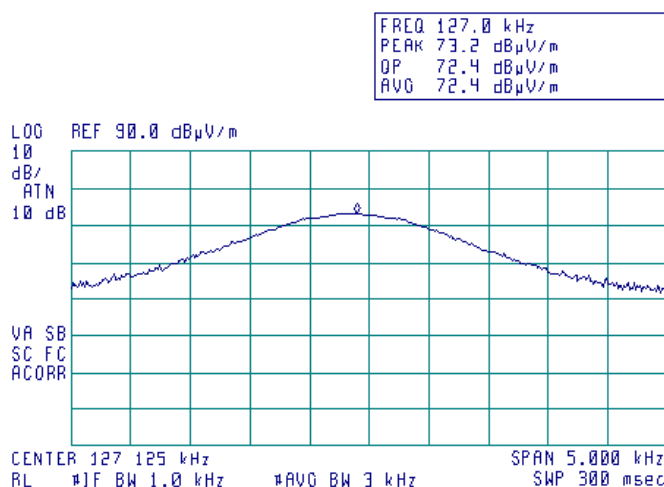


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|                            |                               |                                                                           |                             |
|----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.4                                                |                             |
| <b>Test mode:</b>          |                               | Compliance                                                                | <b>Verdict:</b> PASS        |
| <b>Date(s):</b>            |                               | 28-Jul-14                                                                 |                             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                            | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                           |                             |

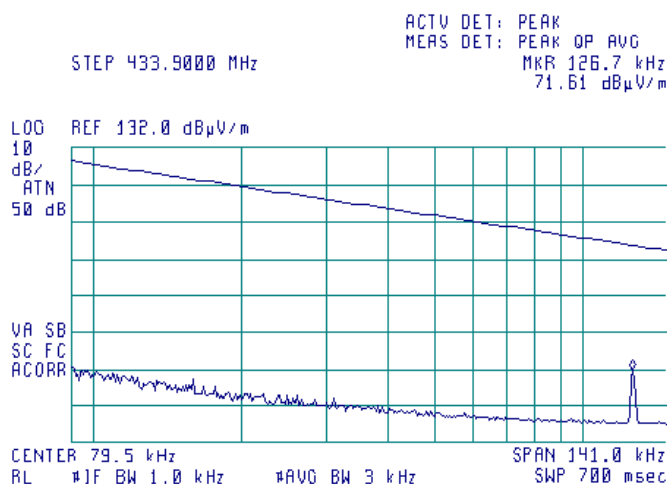
#### Plot 7.1.1 Radiated emission measurements at the fundamental frequency

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Typical (Vertical)



#### Plot 7.1.2 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Typical (Vertical)



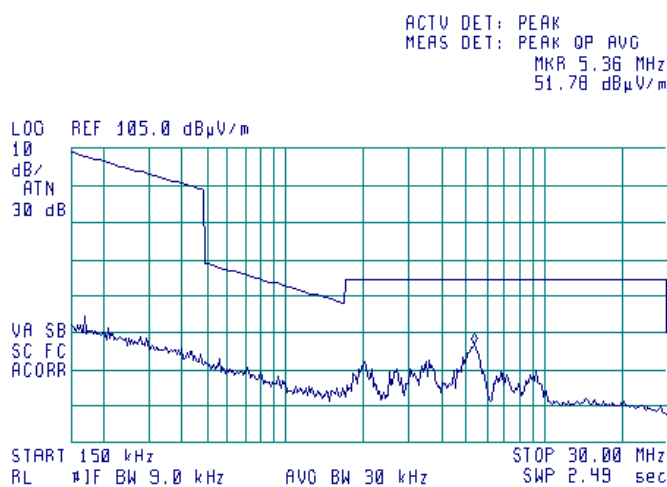


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|                            |                               |                                                                           |                             |
|----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.4                                                |                             |
| <b>Test mode:</b>          |                               | Compliance                                                                | <b>Verdict:</b> PASS        |
| <b>Date(s):</b>            |                               | 28-Jul-14                                                                 |                             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                            | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                           |                             |

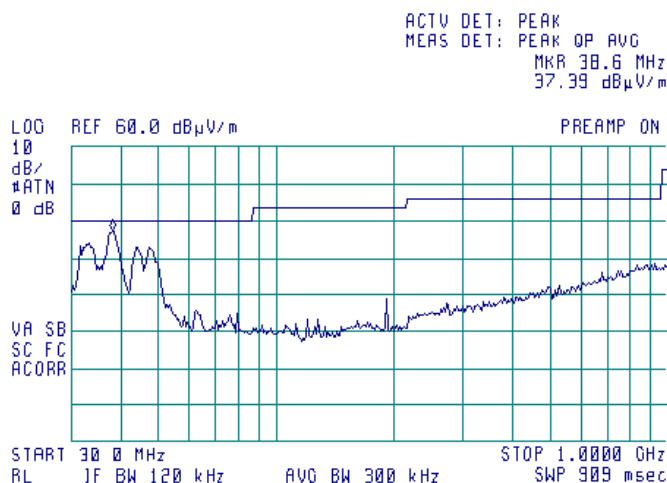
**Plot 7.1.3 Radiated emission measurements from 0.15 to 30 MHz**

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Typical (Vertical)



**Plot 7.1.4 Radiated emission measurements from 30 to 1000 MHz**

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Typical (Vertical)



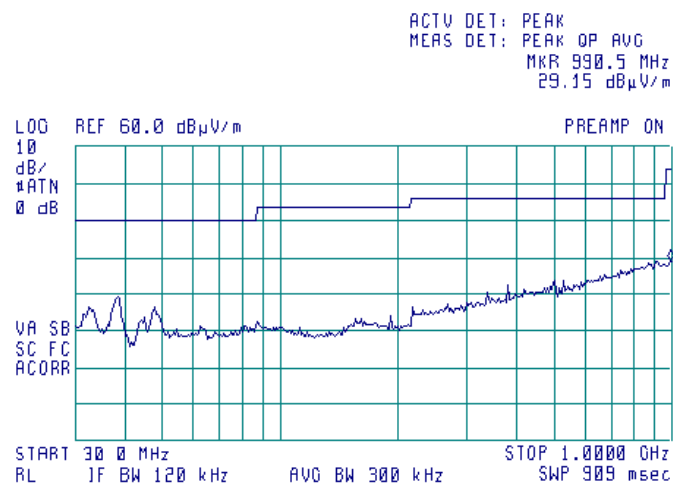


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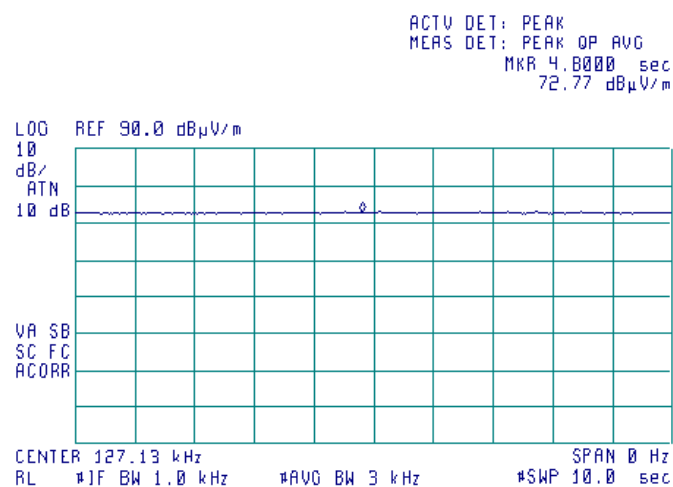
|                     |                                                                    |                         |                      |
|---------------------|--------------------------------------------------------------------|-------------------------|----------------------|
| Test specification: | Section 15.209 / RSS-210, Tables 2, 3, Field strength of emissions |                         |                      |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                         |                         |                      |
| Test mode:          | Compliance                                                         | Verdict:                | PASS                 |
| Date(s):            | 28-Jul-14                                                          |                         |                      |
| Temperature: 26 °C  | Air Pressure: 1010 hPa                                             | Relative Humidity: 42 % | Power Supply: 12 VDC |
| Remarks:            |                                                                    |                         |                      |

#### Plot 7.1.5 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: Typical (Vertical)



#### Plot 7.1.6 Transmission pulse duration



|                            |                               |                                                                                |                             |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>FCC Part 15, Section 203 / RSS-Gen, Section 7.1.2, Antenna requirements</b> |                             |
| <b>Test procedure:</b>     |                               | Visual inspection/supplier declaration                                         |                             |
| <b>Test mode:</b>          |                               | Compliance                                                                     | <b>Verdict:</b> PASS        |
| <b>Date(s):</b>            |                               | 29-Jul-14                                                                      |                             |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                                 | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                                |                             |

## 7.2 Antenna requirements

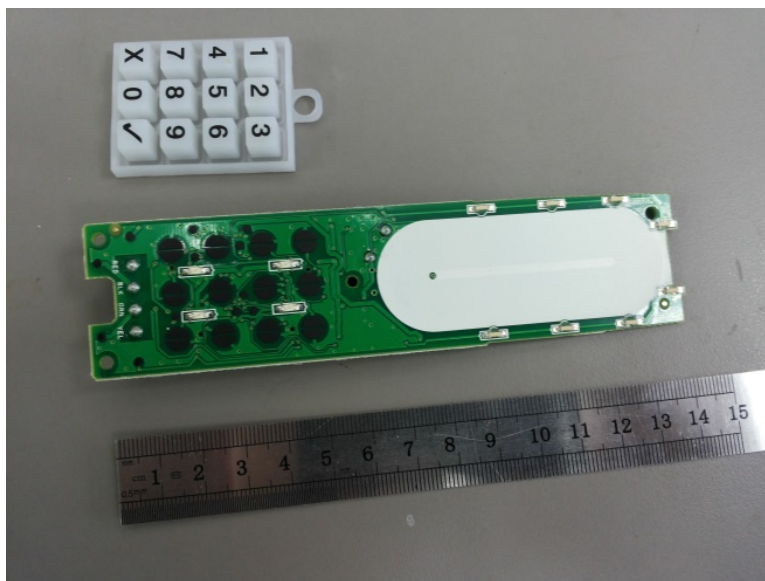
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.2.1.

Table 7.2.1 Antenna requirements

| Requirement                                        | Rationale         | Verdict |
|----------------------------------------------------|-------------------|---------|
| The transmitter antenna is permanently attached    | Visual inspection | Comply  |
| The transmitter employs a unique antenna connector | NA                |         |
| The transmitter requires professional installation | NA                |         |

Photograph 7.2.1 Antenna assembly





|                            |                               |                                                   |                             |
|----------------------------|-------------------------------|---------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>RSS-Gen, Section 4.6.1, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.7                        |                             |
| <b>Test mode:</b>          |                               | Compliance                                        | <b>Verdict:</b> PASS        |
| <b>Date(s):</b>            |                               | 30-Jul-14                                         |                             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1008 hPa | <b>Relative Humidity:</b> 51 %                    | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                   |                             |

## 7.3 Occupied bandwidth test

### 7.3.1 General

This test was performed to measure transmitter occupied bandwidth not specified by the standard.

### 7.3.2 Test procedure

**7.3.2.1** The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

**7.3.2.2** The EUT was set to transmit modulated carrier at maximum data rate.

**7.3.2.3** The transmitter bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.3.1 and the associated plots.

**Figure 7.3.1 Occupied bandwidth test setup**







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|                            |                               |                                                   |                             |
|----------------------------|-------------------------------|---------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>RSS-Gen, Section 4.6.1, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.7                        |                             |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                   | <b>PASS</b>                 |
| <b>Date(s):</b>            | 30-Jul-14                     |                                                   |                             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1008 hPa | <b>Relative Humidity:</b> 51 %                    | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                   |                             |

Table 7.3.1 Occupied bandwidth test results

DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 1 kHz  
 VIDEO BANDWIDTH: 3 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 20 dBc / 99%  
 MODULATION: RF ID  
 MODULATING SIGNAL: ID code

| Carrier frequency, kHz | Occupied bandwidth 20 dBc, kHz | Occupied bandwidth 99%, kHz | Margin, kHz | Verdict |
|------------------------|--------------------------------|-----------------------------|-------------|---------|
| 127.49                 | 2.546                          | 2.1585                      | NA          | Tested  |

## Reference numbers of test equipment used

|         |  |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|--|
| HL 3818 |  |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|--|

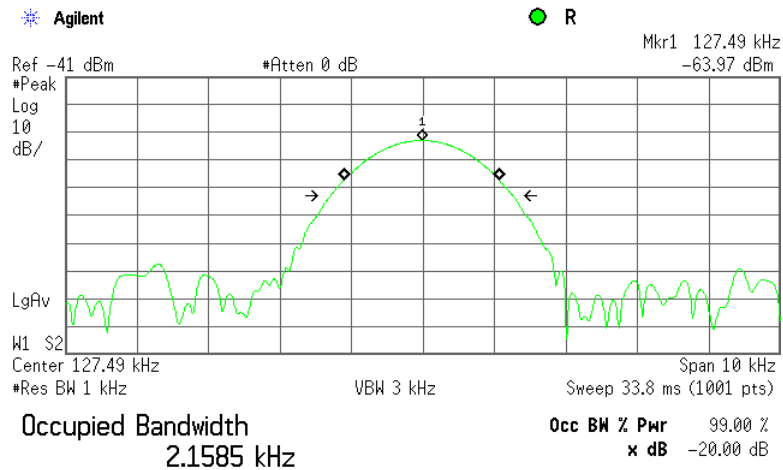
Full description is given in Appendix A.



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|                     |                        |                                            |                      |
|---------------------|------------------------|--------------------------------------------|----------------------|
| Test specification: |                        | RSS-Gen, Section 4.6.1, Occupied bandwidth |                      |
| Test procedure:     |                        | ANSI C63.4, Section 13.1.7                 |                      |
| Test mode:          |                        | Compliance                                 | Verdict: PASS        |
| Date(s):            |                        | 30-Jul-14                                  |                      |
| Temperature: 26 °C  | Air Pressure: 1008 hPa | Relative Humidity: 51 %                    | Power Supply: 12 VDC |
| Remarks:            |                        |                                            |                      |

Plot 7.3.1 Occupied bandwidth test result



Transmit Freq Error -17.781 Hz  
Occupied Bandwidth 2.546 kHz\*

|                            |                               |                                                                       |                              |
|----------------------------|-------------------------------|-----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.207(a) / RSS-Gen, Section 7.2.4, Conducted emission</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.3                                            |                              |
| <b>Test mode:</b>          |                               | Compliance                                                            | <b>Verdict:</b> PASS         |
| <b>Date(s):</b>            |                               | 29-Jul-14                                                             |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                        | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                       |                              |

## 7.4 Conducted emissions

### 7.4.1 General

This test was performed to measure common mode conducted emissions at the EUT power port. The specification test limits are given in Table 7.4.1.

Table 7.4.1 Limits for conducted emissions

| Frequency, MHz | Class B limit, dB(μV) |          | Class A limit, dB(μV) |      |
|----------------|-----------------------|----------|-----------------------|------|
|                | QP                    | AVRG     | QP                    | AVRG |
| 0.15 - 0.5     | 66 - 56*              | 56 - 46* | 79                    | 66   |
| 0.5 - 5.0      | 56                    | 46       | 73                    | 60   |
| 5.0 - 30       | 60                    | 50       | 73                    | 60   |

\* The limit decreases linearly with the logarithm of frequency.

### 7.4.2 Test procedure

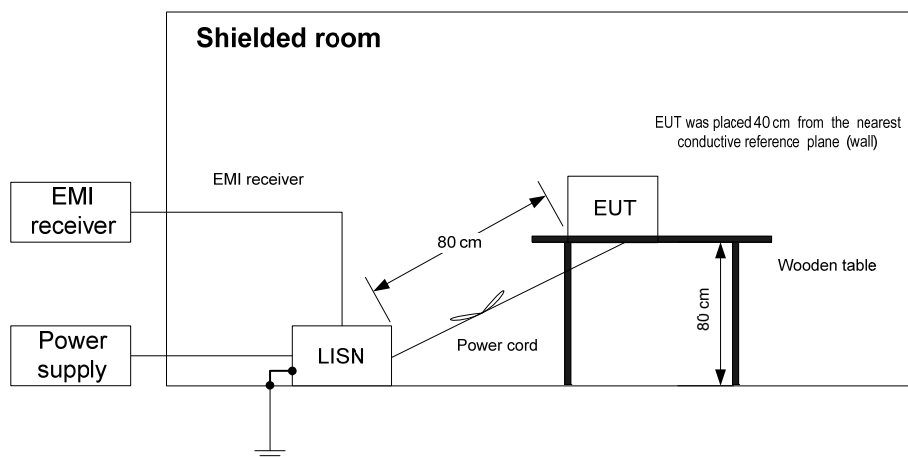
7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the EUT performance was checked.

7.4.2.2 The measurements were performed at the EUT power terminals with the LISN, connected to the EMI receiver in the frequency range referred to in Table 7.4.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

7.4.2.3 The position of the EUT cables was varied to find the highest emission.

7.4.2.4 The worst test results with respect to the limits were recorded in Table 7.4.2 and shown in the associated plots.

Figure 7.4.1 Setup for conducted emission measurements, table-top EUT





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|                            |                               |                                                                       |                              |
|----------------------------|-------------------------------|-----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.207(a) / RSS-Gen, Section 7.2.4, Conducted emission</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.3                                            |                              |
| <b>Test mode:</b>          |                               | Compliance                                                            | <b>Verdict:</b> PASS         |
| <b>Date(s):</b>            |                               | 29-Jul-14                                                             |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                        | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                       |                              |

Table 7.4.2 Conducted emission test results

LINE: AC mains  
 EUT OPERATING MODE: Transmit  
 EUT SET UP: TABLE-TOP  
 TEST SITE: SHIELDED ROOM  
 FREQUENCY RANGE: 150 kHz - 30 MHz  
 RESOLUTION BANDWIDTH: 9 kHz

| Frequency, MHz | Peak emission, dB(μV) | Quasi-peak                |               |             | Average                   |               |             | Line ID | Verdict |
|----------------|-----------------------|---------------------------|---------------|-------------|---------------------------|---------------|-------------|---------|---------|
|                |                       | Measured emission, dB(μV) | Limit, dB(μV) | Margin, dB* | Measured emission, dB(μV) | Limit, dB(μV) | Margin, dB* |         |         |
| 0.173131       | 53.59                 | 46.06                     | 64.87         | -18.81      | 15.97                     | 54.87         | -38.90      | L1      | Pass    |
| 0.192289       | 50.39                 | 43.10                     | 63.95         | -20.85      | 13.27                     | 53.95         | -40.68      |         |         |
| 0.223774       | 45.02                 | 38.28                     | 62.74         | -24.46      | 9.74                      | 52.74         | -43.00      |         |         |
| 15.999348      | 31.84                 | 31.22                     | 60.00         | -28.78      | 31.72                     | 50.00         | -18.28      |         |         |
| 0.150950       | 56.82                 | 49.15                     | 65.95         | -16.80      | 18.34                     | 55.95         | -37.61      | L2      | Pass    |
| 0.179030       | 54.29                 | 46.08                     | 64.58         | -18.50      | 15.43                     | 54.58         | -39.15      |         |         |
| 0.205336       | 50.06                 | 41.85                     | 63.45         | -21.60      | 12.62                     | 53.45         | -40.83      |         |         |
| 0.255288       | 44.44                 | 35.46                     | 61.63         | -26.17      | 6.98                      | 51.63         | -44.65      |         |         |

\*- Margin = Measured emission - specification limit.

**Reference numbers of test equipment used**

|         |         |         |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|
| HL 2888 | HL 3612 | HL 4778 |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|

Full description is given in Appendix A.

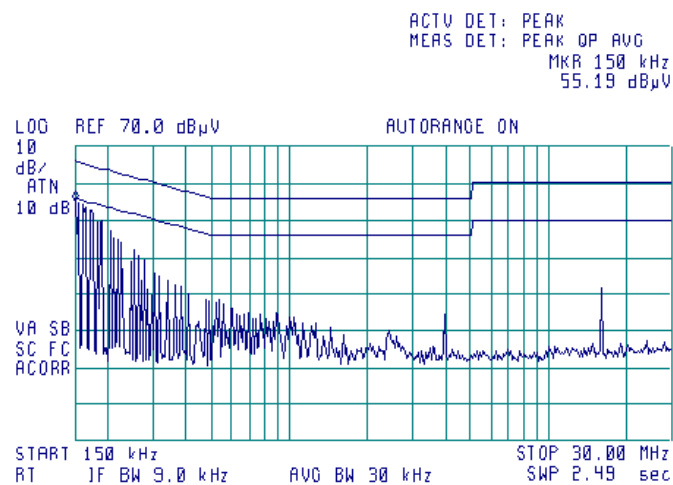


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|                            |                               |                                                                       |                              |
|----------------------------|-------------------------------|-----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.207(a) / RSS-Gen, Section 7.2.4, Conducted emission</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Section 13.1.3                                            |                              |
| <b>Test mode:</b>          |                               | Compliance                                                            | <b>Verdict:</b> PASS         |
| <b>Date(s):</b>            |                               | 29-Jul-14                                                             |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                        | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                       |                              |

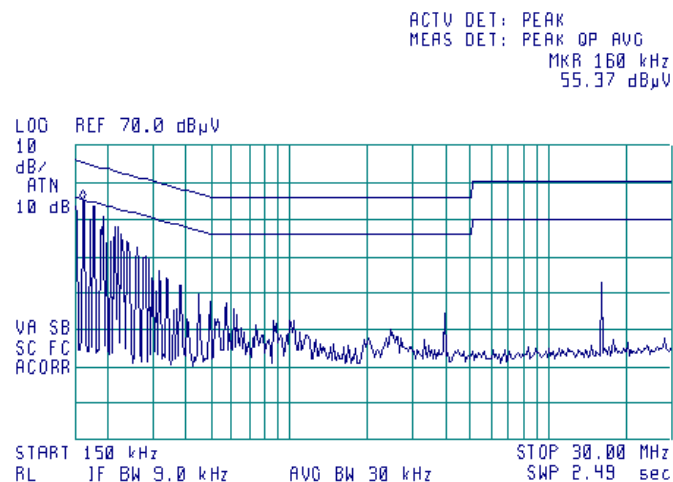
#### Plot 7.4.1 Conducted emission measurements

LINE: L1  
EUT OPERATING MODE: Transmit  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



#### Plot 7.4.2 Conducted emission measurements

LINE: L2  
EUT OPERATING MODE: Transmit  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



|                            |                               |                                                            |                              |
|----------------------------|-------------------------------|------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.107, Conducted emission at AC power port</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Sections 11.5 and 12.1.3                       |                              |
| <b>Test mode:</b>          |                               | Compliance                                                 | <b>Verdict:</b> PASS         |
| <b>Date(s):</b>            |                               | 29-Jul-14                                                  |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 44 %                             | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                            |                              |

## 8 Unintentional emissions

### 8.1 Conducted emissions

#### 8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Limits for conducted emissions

| Frequency,<br>MHz | Class B limit, dB( $\mu$ V) |          | Class A limit, dB( $\mu$ V) |      |
|-------------------|-----------------------------|----------|-----------------------------|------|
|                   | QP                          | AVRG     | QP                          | AVRG |
| 0.15 - 0.5        | 66 - 56*                    | 56 - 46* | 79                          | 66   |
| 0.5 - 5.0         | 56                          | 46       | 73                          | 60   |
| 5.0 - 30          | 60                          | 50       | 73                          | 60   |

\* - The limit decreases linearly with the logarithm of frequency.

#### 8.1.2 Test procedure

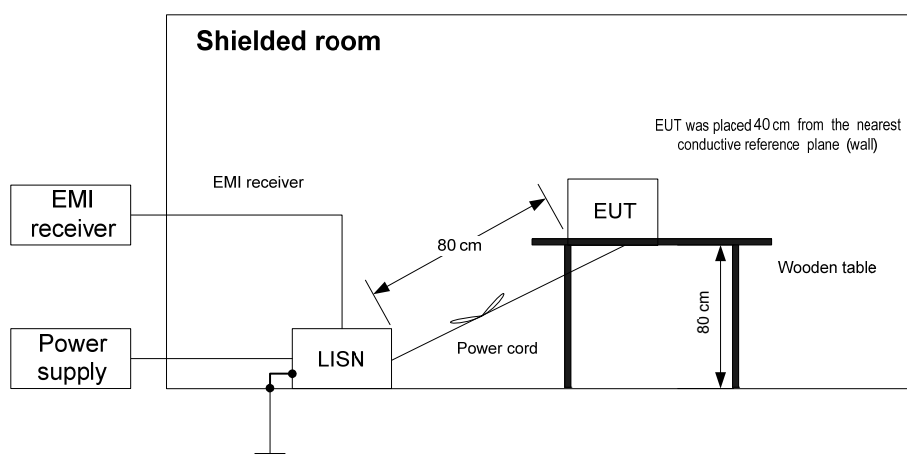
8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.

8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.

8.1.2.3 The position of the device cables was varied to determine maximum emission level.

8.1.2.4 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

Figure 8.1.1 Setup for conducted emission measurements, table-top equipment



|                            |                               |                                                            |                              |
|----------------------------|-------------------------------|------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.107, Conducted emission at AC power port</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Sections 11.5 and 12.1.3                       |                              |
| <b>Test mode:</b>          |                               | Compliance                                                 | <b>Verdict:</b> PASS         |
| <b>Date(s):</b>            |                               | 29-Jul-14                                                  |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 44 %                             | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                            |                              |

Photograph 8.1.1 Setup for conducted emission measurements



Photograph 8.1.2 Setup for conducted emission measurements





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|                            |                               |                                                            |                              |
|----------------------------|-------------------------------|------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.107, Conducted emission at AC power port</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Sections 11.5 and 12.1.3                       |                              |
| <b>Test mode:</b>          |                               | Compliance                                                 | <b>Verdict:</b> PASS         |
| <b>Date(s):</b>            |                               | 29-Jul-14                                                  |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 44 %                             | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                            |                              |

Table 8.1.2 Conducted emission test results

LINE: AC mains  
EUT OPERATING MODE: Standby/Receive  
EUT SET UP: TABLE-TOP  
TEST SITE: SHIELDED ROOM  
FREQUENCY RANGE: 150 kHz - 30 MHz  
RESOLUTION BANDWIDTH: 9 kHz

| Frequency, MHz | Peak emission, dB(μV) | Quasi-peak                |               |             | Average                   |               |             | Line ID | Verdict |
|----------------|-----------------------|---------------------------|---------------|-------------|---------------------------|---------------|-------------|---------|---------|
|                |                       | Measured emission, dB(μV) | Limit, dB(μV) | Margin, dB* | Measured emission, dB(μV) | Limit, dB(μV) | Margin, dB* |         |         |
| 0.173131       | 53.59                 | 46.06                     | 64.87         | -18.81      | 15.97                     | 54.87         | -38.90      | L1      | Pass    |
| 0.192289       | 50.39                 | 43.10                     | 63.95         | -20.85      | 13.27                     | 53.95         | -40.68      |         |         |
| 0.223774       | 45.02                 | 38.28                     | 62.74         | -24.46      | 9.74                      | 52.74         | -43.00      |         |         |
| 15.999348      | 31.84                 | 31.22                     | 60.00         | -28.78      | 31.72                     | 50.00         | -18.28      |         |         |
| 0.150950       | 56.82                 | 49.15                     | 65.95         | -16.80      | 18.34                     | 55.95         | -37.61      | L2      | Pass    |
| 0.179030       | 54.29                 | 46.08                     | 64.58         | -18.50      | 15.43                     | 54.58         | -39.15      |         |         |
| 0.205336       | 50.06                 | 41.85                     | 63.45         | -21.60      | 12.62                     | 53.45         | -40.83      |         |         |
| 0.255288       | 44.44                 | 35.46                     | 61.63         | -26.17      | 6.98                      | 51.63         | -44.65      |         |         |

\*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

|         |         |         |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|
| HL 2888 | HL 3612 | HL 4778 |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|

Full description is given in Appendix A.



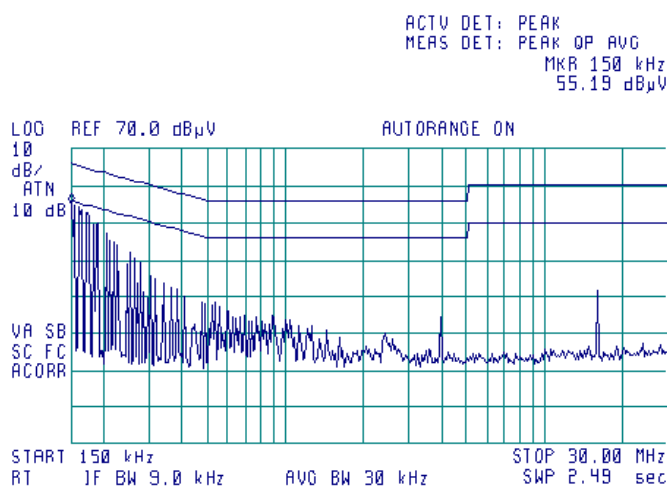


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|                     |                        |                                                     |                       |
|---------------------|------------------------|-----------------------------------------------------|-----------------------|
| Test specification: |                        | Section 15.107, Conducted emission at AC power port |                       |
| Test procedure:     |                        | ANSI C63.4, Sections 11.5 and 12.1.3                |                       |
| Test mode:          |                        | Compliance                                          | Verdict: PASS         |
| Date(s):            |                        | 29-Jul-14                                           |                       |
| Temperature: 25 °C  | Air Pressure: 1010 hPa | Relative Humidity: 44 %                             | Power Supply: 120 VAC |
| Remarks:            |                        |                                                     |                       |

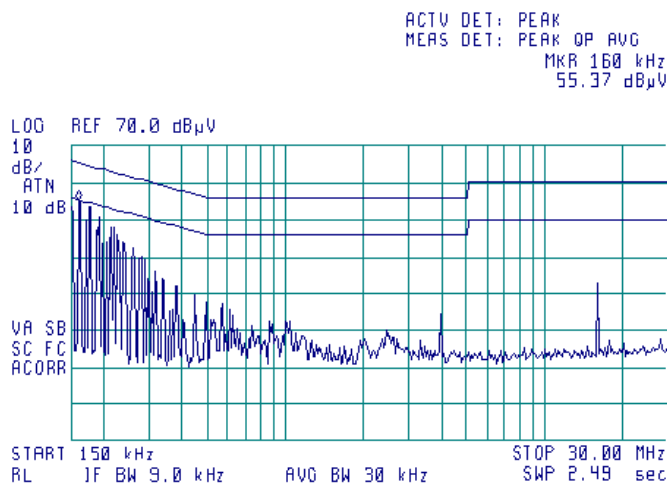
Plot 8.1.1 Conducted emission measurements

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Standby/Receive  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



Plot 8.1.2 Conducted emission measurements

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Standby/Receive  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



|                     |                                                                                                   |                         |                      |
|---------------------|---------------------------------------------------------------------------------------------------|-------------------------|----------------------|
| Test specification: | FCC Part 15, Section 109 / RSS-Gen, Section 6.1/ ICES-003 Section 6.2, Class B, Radiated emission |                         |                      |
| Test procedure:     | ANSI C63.4, Sections 11.6 and 12.1.4                                                              |                         |                      |
| Test mode:          | Compliance                                                                                        | Verdict:                | PASS                 |
| Date(s):            | 28-Jul-14                                                                                         |                         |                      |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                                            | Relative Humidity: 42 % | Power Supply: 12 VDC |
| Remarks:            |                                                                                                   |                         |                      |

## 8.2 Radiated emission measurements

### 8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1, Table 8.2.2.

Table 8.2.1 Radiated emission limits according to FCC Part 15, Section 109 and ICES-003, Section 6.2

| Frequency, MHz                   | Class B limit, dB(μV/m) |              | Class A limit, dB(μV/m) |              |
|----------------------------------|-------------------------|--------------|-------------------------|--------------|
|                                  | 10 m distance           | 3 m distance | 10 m distance           | 3 m distance |
| 30 - 88                          | 29.5*                   | 40.0         | 39.0                    | 49.5*        |
| 88 - 216                         | 33.0*                   | 43.5         | 43.5                    | 54.0*        |
| 216 - 960                        | 35.5*                   | 46.0         | 46.4                    | 56.9*        |
| 960 - 5 <sup>th</sup> harmonic** | 43.5*                   | 54.0         | 49.5                    | 60.0*        |

\* - The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows:  $\text{Lim}_{S_2} = \text{Lim}_{S_1} + 20 \log(S_1/S_2)$ , where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

Table 8.2.2 Radiated emission limits according to RSS-Gen, Section 6.1

| Frequency, MHz                   | Field strength limit at 3 m test distance, dB(μV/m) |
|----------------------------------|-----------------------------------------------------|
| 30 - 88                          | 40.0                                                |
| 88 - 216                         | 43.5                                                |
| 216 - 960                        | 46.0                                                |
| 960 - 3 <sup>rd</sup> harmonic** | 54.0                                                |

\*\* - harmonic of the highest frequency the EUT generates, uses, operates or tunes to.

### 8.2.2 Test procedure

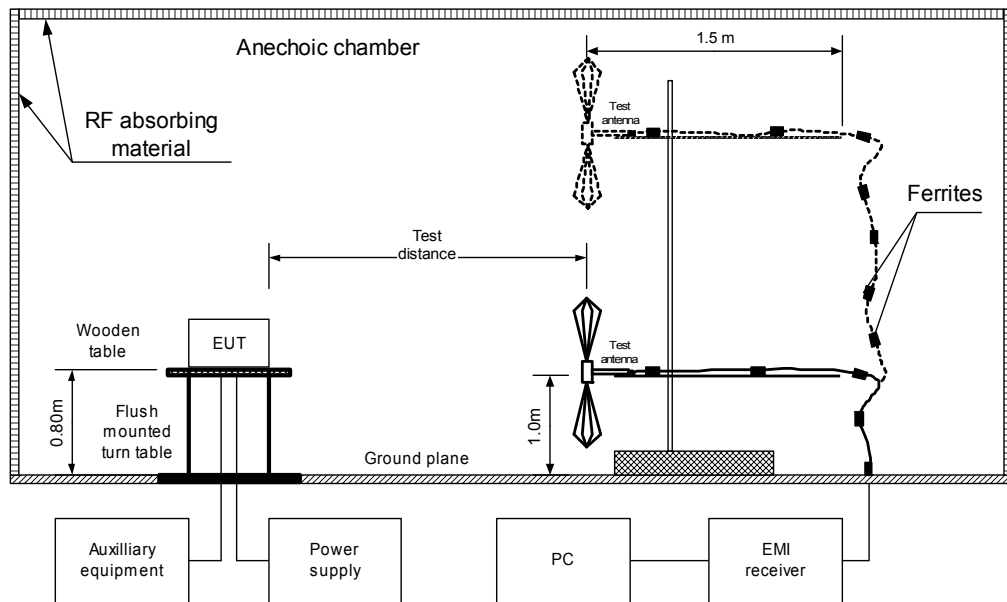
8.2.2.1 The EUT was set up as shown in Figure 8.2.1 and associated photograph/s, energized and the performance check was conducted.

8.2.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

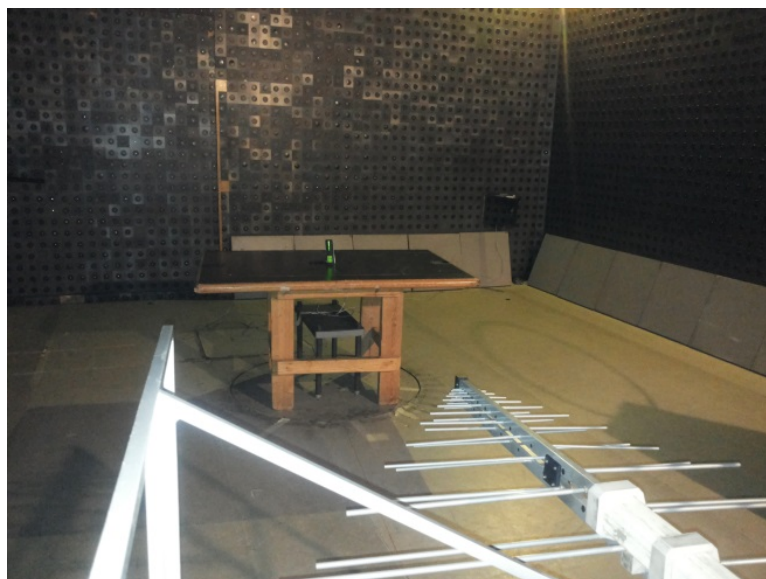
8.2.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.

|                            |                               |                                                                                                          |                             |
|----------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>FCC Part 15, Section 109 / RSS-Gen, Section 6.1/ ICES-003 Section 6.2, Class B, Radiated emission</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Sections 11.6 and 12.1.4                                                                     |                             |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                                                          | <b>PASS</b>                 |
| <b>Date(s):</b>            | 28-Jul-14                     |                                                                                                          |                             |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                                                           | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                                                          |                             |

**Figure 8.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment**



**Photograph 8.2.1 Setup for radiated emission measurements**



|                            |                               |                                                                                                          |                             |
|----------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b> |                               | <b>FCC Part 15, Section 109 / RSS-Gen, Section 6.1/ ICES-003 Section 6.2, Class B, Radiated emission</b> |                             |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Sections 11.6 and 12.1.4                                                                     |                             |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                                                          | <b>PASS</b>                 |
| <b>Date(s):</b>            | 28-Jul-14                     |                                                                                                          |                             |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 42 %                                                                           | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                               |                                                                                                          |                             |

Photograph 8.2.2 Setup for radiated emission measurements, EUT close view





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|                            |                                                                                                          |                                |                             |
|----------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b> | <b>FCC Part 15, Section 109 / RSS-Gen, Section 6.1/ ICES-003 Section 6.2, Class B, Radiated emission</b> |                                |                             |
| <b>Test procedure:</b>     | ANSI C63.4, Sections 11.6 and 12.1.4                                                                     |                                |                             |
| <b>Test mode:</b>          | Compliance                                                                                               | <b>Verdict: PASS</b>           |                             |
| <b>Date(s):</b>            | 28-Jul-14                                                                                                |                                |                             |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa                                                                            | <b>Relative Humidity:</b> 42 % | <b>Power Supply:</b> 12 VDC |
| <b>Remarks:</b>            |                                                                                                          |                                |                             |

Table 8.2.3 Radiated emission test results

EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Stand-by / Receive  
TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
FREQUENCY RANGE: 30 MHz – 1000 MHz  
RESOLUTION BANDWIDTH: 120 kHz

| Frequency, MHz | Peak emission, dB(μV/m) | Quasi-peak                  |                 |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-------------------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
|                |                         | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* |                      |                   |                                |         |
| 33.507         | 35.38                   | 31.42                       | 40.0            | -8.58       | Vertical             | 1.0               | 34                             | Pass    |
| 38.602         | 40.22                   | 37.69                       | 40.0            | -2.31       | Vertical             | 1.0               | 0                              |         |
| 44.033         | 33.31                   | 29.58                       | 40.0            | -10.42      | Vertical             | 1.0               | 345                            |         |
| 47.612         | 32.26                   | 29.63                       | 40.0            | -10.37      | Vertical             | 1.0               | 123                            |         |

## Reference numbers of test equipment used

|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 0604 | HL 0521 | HL 4353 | HL 4722 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.

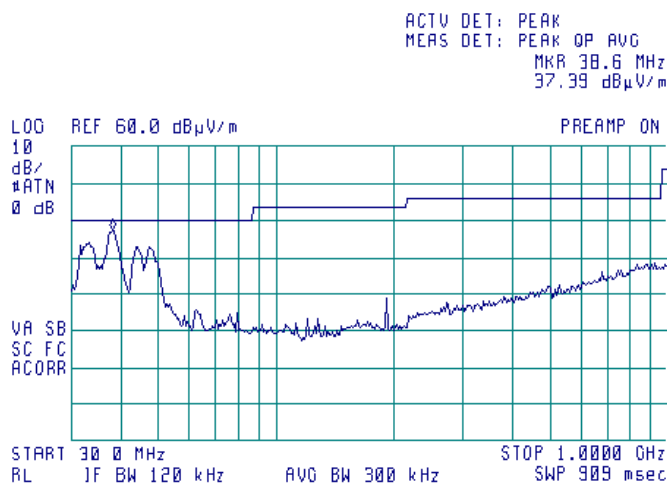


HERMON LABORATORIES

|                     |                                                                                                   |                         |                      |
|---------------------|---------------------------------------------------------------------------------------------------|-------------------------|----------------------|
| Test specification: | FCC Part 15, Section 109 / RSS-Gen, Section 6.1/ ICES-003 Section 6.2, Class B, Radiated emission |                         |                      |
| Test procedure:     | ANSI C63.4, Sections 11.6 and 12.1.4                                                              |                         |                      |
| Test mode:          | Compliance                                                                                        | Verdict:                | PASS                 |
| Date(s):            | 28-Jul-14                                                                                         |                         |                      |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                                            | Relative Humidity: 42 % | Power Supply: 12 VDC |
| Remarks:            |                                                                                                   |                         |                      |

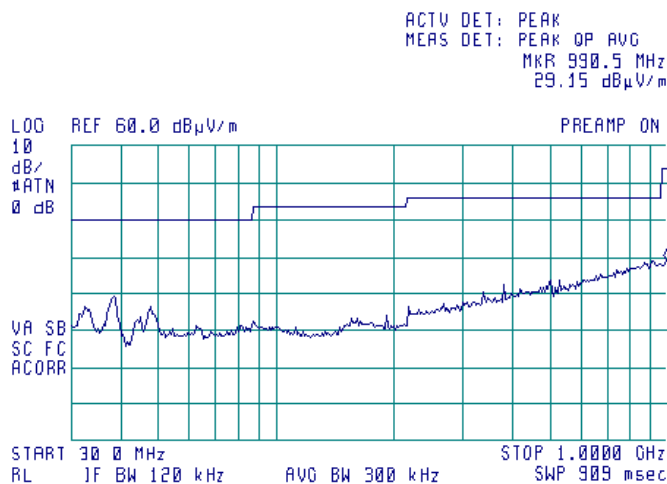
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m



Plot 8.2.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m



## 9 APPENDIX A Test equipment and ancillaries used for tests

| HL No | Description                                                                   | Manufacturer         | Model         | Ser. No.                           | Last Cal./ Check | Due Cal./ Check |
|-------|-------------------------------------------------------------------------------|----------------------|---------------|------------------------------------|------------------|-----------------|
| 0446  | Antenna, Loop, Active, 10 kHz - 30 MHz                                        | EMCO                 | 6502          | 2857                               | 21-Jan-14        | 21-Jan-15       |
| 0521  | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz         | Hewlett Packard      | 8546A         | 3617A<br>00319,<br>3448A002<br>53  | 28-Oct-13        | 28-Oct-14       |
| 0604  | Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz                       | EMCO                 | 3141          | 9611-1011                          | 22-May-14        | 22-May-15       |
| 2888  | LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1 | Rolf Heine           | NNB-2/16Z     | 02/10018                           | 24-Mar-14        | 24-Mar-15       |
| 3612  | Cable RF, 17.5 m, N type-N type                                               | Teldor               | RG-214/U      | NA                                 | 05-Dec-13        | 05-Dec-14       |
| 3818  | PSA Series Spectrum Analyzer, 3 Hz- 44 GHz                                    | Agilent Technologies | E4446A        | MY482502<br>88                     | 20-May-14        | 20-May-15       |
| 4353  | Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M            | MegaPhase            | NC29-N1N1-244 | 12025101<br>003                    | 16-Mar-14        | 16-Mar-15       |
| 4722  | Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M            | MegaPhase            | NC29-N1N1-244 | 51228701<br>001                    | 01-May-14        | 01-May-15       |
| 4778  | EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777                         | Hewlett Packard      | 8542E         | 30807A00<br>262,<br>3427A001<br>23 | 06-Nov-13        | 06-Nov-14       |

## 10 APPENDIX B Measurement uncertainties

### Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

| Test description                                                                                     | Expanded uncertainty                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conducted emissions with LISN                                                                        | 9 kHz to 150 kHz: $\pm 3.9$ dB<br>150 kHz to 30 MHz: $\pm 3.8$ dB                                                                                                                                                                                                                                            |
| Radiated emissions at 3 m measuring distance<br>Horizontal polarization<br><br>Vertical polarization | Biconilog antenna: $\pm 5.3$ dB<br>Biconical antenna: $\pm 5.0$ dB<br>Log periodic antenna: $\pm 5.3$ dB<br>Double ridged horn antenna: $\pm 5.3$ dB<br>Biconilog antenna: $\pm 6.0$ dB<br>Biconical antenna: $\pm 5.7$ dB<br>Log periodic antenna: $\pm 6.0$ dB<br>Double ridged horn antenna: $\pm 6.0$ dB |
| Conducted emissions at RF antenna connector                                                          | 9 kHz to 2.9 GHz: $\pm 2.6$ dB<br>2.9 GHz to 6.46 GHz: $\pm 3.5$ dB<br>6.46 GHz to 13.2 GHz: $\pm 4.3$ dB<br>13.2 GHz to 22.0 GHz: $\pm 5.0$ dB<br>22.0 GHz to 26.8 GHz: $\pm 5.5$ dB<br>26.8 GHz to 40.0 GHz: $\pm 4.8$ dB                                                                                  |
| Duty cycle, timing (Tx ON / OFF) and average factor measurements                                     | $\pm 1.0$ %                                                                                                                                                                                                                                                                                                  |
| Occupied bandwidth                                                                                   | $\pm 8.0$ %                                                                                                                                                                                                                                                                                                  |

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.



## **11 APPENDIX C Test laboratory description**

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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Person for contact: Mr. Alex Usoskin, CEO.

## **12 APPENDIX D Specification references**

|                         |                                                                                                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC 47CFR part 15: 2013 | Radio Frequency Devices                                                                                                                                             |
| ANSI C63.2: 1996        | American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications                                            |
| ANSI C63.4: 2003        | 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 |
| RSS-210 Issue 8: 2010   | Low Power Licence- Exempt Radiocommunication Devices                                                                                                                |
| RSS-Gen Issue 3: 2010   | General Requirements and Information for the Certification of Radiocommunication Equipment                                                                          |
| ICES-003 issue 5:2012   | Information Technology Equipment (ITE) – Limits and methods of measurement                                                                                          |

### 13 APPENDIX E Test equipment correction factors

Antenna factor  
Active loop antenna  
Model 6502, S/N 2857, HL 0446

| Frequency,<br>MHz | Magnetic antenna factor,<br>dB | Electric antenna factor,<br>dB |
|-------------------|--------------------------------|--------------------------------|
| 0.009             | -32.8                          | 18.7                           |
| 0.010             | -33.8                          | 17.7                           |
| 0.020             | -38.3                          | 13.2                           |
| 0.050             | -41.1                          | 10.4                           |
| 0.075             | -41.3                          | 10.2                           |
| 0.100             | -41.6                          | 9.9                            |
| 0.150             | -41.7                          | 9.8                            |
| 0.250             | -41.6                          | 9.9                            |
| 0.500             | -41.8                          | 9.8                            |
| 0.750             | -41.9                          | 9.7                            |
| 1.000             | -41.4                          | 10.1                           |
| 2.000             | -41.5                          | 10.0                           |
| 3.000             | -41.4                          | 10.2                           |
| 4.000             | -41.4                          | 10.1                           |
| 5.000             | -41.5                          | 10.1                           |
| 10.000            | -41.9                          | 9.6                            |
| 15.000            | -41.9                          | 9.6                            |
| 20.000            | -42.2                          | 9.3                            |
| 25.000            | -42.8                          | 8.7                            |
| 30.000            | -44.0                          | 7.5                            |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

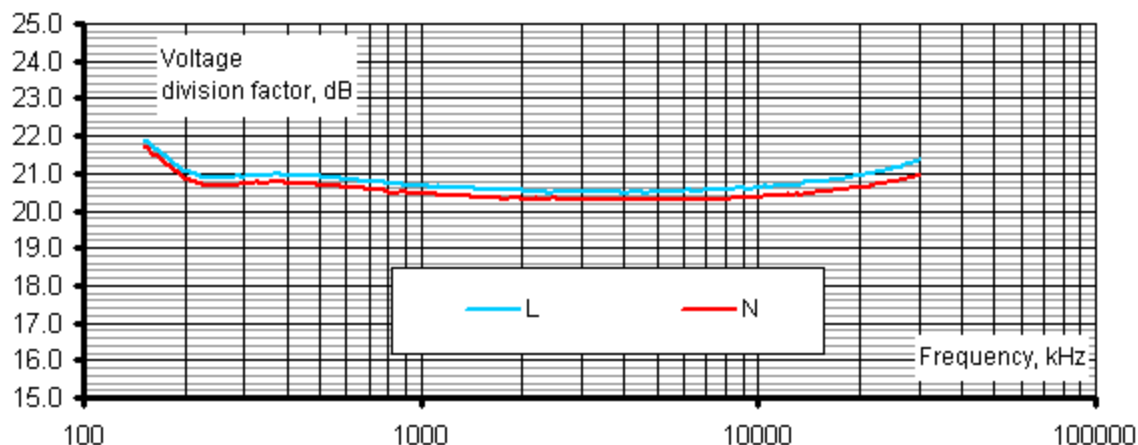
**Antenna factor**  
**Biconilog antenna EMCO Model 3141**  
**Ser.No.1011, HL 0604**

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|-------------------|----------------------------|-------------------|----------------------------|
| 26                | 7.8                        | 580               | 20.6                       | 1320              | 27.8                       |
| 28                | 7.8                        | 600               | 21.3                       | 1340              | 28.3                       |
| 30                | 7.8                        | 620               | 21.5                       | 1360              | 28.2                       |
| 40                | 7.2                        | 640               | 21.2                       | 1380              | 27.9                       |
| 60                | 7.1                        | 660               | 21.4                       | 1400              | 27.9                       |
| 70                | 8.5                        | 680               | 21.9                       | 1420              | 27.9                       |
| 80                | 9.4                        | 700               | 22.2                       | 1440              | 27.8                       |
| 90                | 9.8                        | 720               | 22.2                       | 1460              | 27.8                       |
| 100               | 9.7                        | 740               | 22.1                       | 1480              | 28.0                       |
| 110               | 9.3                        | 760               | 22.3                       | 1500              | 28.5                       |
| 120               | 8.8                        | 780               | 22.6                       | 1520              | 28.9                       |
| 130               | 8.7                        | 800               | 22.7                       | 1540              | 29.6                       |
| 140               | 9.2                        | 820               | 22.9                       | 1560              | 29.8                       |
| 150               | 9.8                        | 840               | 23.1                       | 1580              | 29.6                       |
| 160               | 10.2                       | 860               | 23.4                       | 1600              | 29.5                       |
| 170               | 10.4                       | 880               | 23.8                       | 1620              | 29.3                       |
| 180               | 10.4                       | 900               | 24.1                       | 1640              | 29.2                       |
| 190               | 10.3                       | 920               | 24.1                       | 1660              | 29.4                       |
| 200               | 10.6                       | 940               | 24.0                       | 1680              | 29.6                       |
| 220               | 11.6                       | 960               | 24.1                       | 1700              | 29.8                       |
| 240               | 12.4                       | 980               | 24.5                       | 1720              | 30.3                       |
| 260               | 12.8                       | 1000              | 24.9                       | 1740              | 30.8                       |
| 280               | 13.7                       | 1020              | 25.0                       | 1760              | 31.1                       |
| 300               | 14.7                       | 1040              | 25.2                       | 1780              | 31.0                       |
| 320               | 15.2                       | 1060              | 25.4                       | 1800              | 30.9                       |
| 340               | 15.4                       | 1080              | 25.6                       | 1820              | 30.7                       |
| 360               | 16.1                       | 1100              | 25.7                       | 1840              | 30.6                       |
| 380               | 16.4                       | 1120              | 26.0                       | 1860              | 30.6                       |
| 400               | 16.6                       | 1140              | 26.4                       | 1880              | 30.6                       |
| 420               | 16.7                       | 1160              | 27.0                       | 1900              | 30.6                       |
| 440               | 17.0                       | 1180              | 27.0                       | 1920              | 30.7                       |
| 460               | 17.7                       | 1200              | 26.7                       | 1940              | 30.9                       |
| 480               | 18.1                       | 1220              | 26.5                       | 1960              | 31.2                       |
| 500               | 18.5                       | 1240              | 26.5                       | 1980              | 31.6                       |
| 520               | 19.1                       | 1260              | 26.5                       | 2000              | 32.0                       |
| 540               | 19.5                       | 1280              | 26.6                       |                   |                            |
| 560               | 19.8                       | 1300              | 27.0                       |                   |                            |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field strength in dB( $\mu$ V/m).

**Correction factor**  
**Line impedance stabilization network**  
**Model NNB-2/16Z, Rolf Heine, HL 2888**

| Frequency, kHz | Correction factor, dB |       |
|----------------|-----------------------|-------|
|                | L                     | N     |
| 150            | 21.92                 | 21.74 |
| 170            | 21.52                 | 21.36 |
| 200            | 21.06                 | 20.85 |
| 250            | 20.88                 | 20.68 |
| 300            | 20.92                 | 20.70 |
| 350            | 20.96                 | 20.77 |
| 400            | 20.96                 | 20.74 |
| 500            | 20.92                 | 20.69 |
| 600            | 20.85                 | 20.63 |
| 700            | 20.78                 | 20.58 |
| 800            | 20.73                 | 20.52 |
| 900            | 20.68                 | 20.50 |
| 1000           | 20.67                 | 20.45 |
| 1200           | 20.61                 | 20.43 |
| 1500           | 20.56                 | 20.33 |
| 2000           | 20.54                 | 20.32 |
| 2500           | 20.51                 | 20.33 |
| 3000           | 20.53                 | 20.29 |
| 4000           | 20.46                 | 20.30 |
| 5000           | 20.53                 | 20.33 |
| 7000           | 20.54                 | 20.32 |
| 10000          | 20.62                 | 20.36 |
| 15000          | 20.78                 | 20.49 |
| 20000          | 20.94                 | 20.63 |
| 30000          | 21.37                 | 20.95 |



**Cable loss**  
Cable coaxial, RG-214/U, N type-N type, 17 m  
Teldor, HL 3612

| Frequency, MHz | Cable loss, dB |
|----------------|----------------|
| 0.1            | 0.05           |
| 0.5            | 0.07           |
| 1              | 0.10           |
| 3              | 0.22           |
| 5              | 0.29           |
| 10             | 0.39           |
| 30             | 0.68           |
| 50             | 0.90           |
| 100            | 1.27           |
| 150            | 1.58           |
| 200            | 1.80           |
| 250            | 2.12           |
| 300            | 2.36           |
| 350            | 2.60           |
| 400            | 2.82           |
| 450            | 2.99           |
| 500            | 3.23           |
| 550            | 3.40           |
| 600            | 3.56           |
| 650            | 3.71           |
| 700            | 3.90           |
| 750            | 4.04           |
| 800            | 4.23           |
| 850            | 4.39           |
| 900            | 4.55           |
| 950            | 4.65           |
| 1000           | 4.79           |

**Cable loss**  
**Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,**  
**NC29-N1N1-244S/N 12025101 003,**  
**HL 4353**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 50                | 0.20              | 9000              | 2.71              |
| 100               | 0.27              | 9500              | 2.81              |
| 300               | 0.47              | 10000             | 2.90              |
| 500               | 0.61              | 10500             | 2.97              |
| 1000              | 0.87              | 11000             | 3.06              |
| 1500              | 1.07              | 11500             | 3.13              |
| 2000              | 1.24              | 12000             | 3.20              |
| 2500              | 1.39              | 12500             | 3.26              |
| 3000              | 1.53              | 13000             | 3.34              |
| 3500              | 1.65              | 13500             | 3.39              |
| 4000              | 1.77              | 14000             | 3.47              |
| 4500              | 1.89              | 14500             | 3.54              |
| 5000              | 1.99              | 15000             | 3.62              |
| 5500              | 2.07              | 15500             | 3.69              |
| 6000              | 2.20              | 16000             | 3.76              |
| 6500              | 2.30              | 16500             | 3.83              |
| 7000              | 2.39              | 17000             | 3.86              |
| 7500              | 2.51              | 17500             | 3.94              |
| 8000              | 2.58              | 18000             | 4.02              |
| 8500              | 2.65              |                   |                   |

**Cable loss**  
**Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,**  
**NC29-N1N1-244, S/N 51228701 001**  
**HL 4722**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 50                | 0.22              | 9000              | 2.93              |
| 100               | 0.30              | 9500              | 3.06              |
| 300               | 0.52              | 10000             | 3.16              |
| 500               | 0.66              | 10500             | 3.20              |
| 1000              | 0.93              | 11000             | 3.34              |
| 1500              | 1.15              | 11500             | 3.39              |
| 2000              | 1.33              | 12000             | 3.48              |
| 2500              | 1.49              | 12500             | 3.55              |
| 3000              | 1.64              | 13000             | 3.66              |
| 3500              | 1.77              | 13500             | 3.75              |
| 4000              | 1.90              | 14000             | 3.76              |
| 4500              | 2.03              | 14500             | 3.87              |
| 5000              | 2.17              | 15000             | 3.98              |
| 5500              | 2.30              | 15500             | 4.01              |
| 6000              | 2.39              | 16000             | 4.14              |
| 6500              | 2.51              | 16500             | 4.15              |
| 7000              | 2.59              | 17000             | 4.32              |
| 7500              | 2.67              | 17500             | 4.36              |
| 8000              | 2.76              | 18000             | 4.38              |
| 8500              | 2.84              |                   |                   |

## 14 APPENDIX F Abbreviations and acronyms

|                |                                             |
|----------------|---------------------------------------------|
| A              | ampere                                      |
| AC             | alternating current                         |
| A/m            | ampere per meter                            |
| AVRG           | average (detector)                          |
| cm             | centimeter                                  |
| dB             | decibel                                     |
| dBm            | decibel referred to one milliwatt           |
| dB( $\mu$ V)   | decibel referred to one microvolt           |
| dB( $\mu$ V/m) | decibel referred to one microvolt per meter |
| dB( $\mu$ A)   | decibel referred to one microampere         |
| DC             | direct current                              |
| EIRP           | equivalent isotropically radiated power     |
| ERP            | effective radiated power                    |
| EUT            | equipment under test                        |
| F              | frequency                                   |
| GHz            | gigahertz                                   |
| GND            | ground                                      |
| H              | height                                      |
| HL             | Hermon laboratories                         |
| Hz             | hertz                                       |
| k              | kilo                                        |
| kHz            | kilohertz                                   |
| LO             | local oscillator                            |
| m              | meter                                       |
| MHz            | megahertz                                   |
| min            | minute                                      |
| mm             | millimeter                                  |
| ms             | millisecond                                 |
| $\mu$ s        | microsecond                                 |
| NA             | not applicable                              |
| OATS           | open area test site                         |
| $\Omega$       | Ohm                                         |
| PS             | power supply                                |
| ppm            | part per million ( $10^{-6}$ )              |
| QP             | quasi-peak                                  |
| RE             | radiated emission                           |
| RF             | radio frequency                             |
| rms            | root mean square                            |
| Rx             | receive                                     |
| s              | second                                      |
| T              | temperature                                 |
| Tx             | transmit                                    |
| V              | volt                                        |

END OF DOCUMENT