

# TEST REPORT

**ACCORDING TO: FCC 47 CFR PART 15 subpart C, section 15.249; subpart B and  
RSS-210 issue 8 Annex 2; CES-003 Issue 5:2012**

**FOR:**

**Afimilk Agricultural Cooperative Ltd.  
Wireless Reader**

**Brand name: AfiAct II Reader**

**Part number: 4256000**

**FCC ID: JER4256000**

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:** Afimilk Agricultural Cooperative Ltd.  
**Address:** Kibbutz Afikim 1514800, Israel  
**Telephone:** +972 4675 4811  
**Fax:** +972 4675 1862  
**E-mail:** ram@afimilk.co.il  
**Contact name:** Mr. Ram Tal

## 2 Equipment under test attributes

**Product name:** Wireless reader  
**Product type:** AfiAct II Reader  
**Part number:** 4256000  
**Serial number:** 00018  
**Hardware version:** 2.1  
**Software release:** 010605  
**Receipt date** 5/17/2013

## 3 Manufacturer information

**Manufacturer name:** Afimilk Agricultural Cooperative Ltd.  
**Address:** Kibbutz Afikim 1514800, Israel  
**Telephone:** +972 4675 4811  
**Fax:** +972 4675 1862  
**E-Mail:** ram@afimilk.co.il  
**Contact name:** Mr. Ram Tal

## 4 Test details

**Project ID:** 24077  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 5/17/2013  
**Test completed:** 6/18/2013  
**Test specification(s):** FCC 47 CFR Part 15, subpart C, §15.249; subpart B  
RSS-210 issue 8 Annex 2; , RSS-Gen issue 3, ICES-003 issue 5:2012

## 5 Tests summary

| Test                                                                                              | Status |
|---------------------------------------------------------------------------------------------------|--------|
| <b>Transmitter characteristics</b>                                                                |        |
| Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions                           | Pass   |
| Section 15.249(d)/RSS-210, section A2.9, Band edge emissions                                      | Pass   |
| Section 15.207(a) / RSS-Gen, section 7.2.4, Conducted emission                                    | Pass   |
| Section 15.203 / RSS-Gen, Section 7.1.2, Antenna requirement                                      | Pass   |
| Section 15.215(c) / RSS-Gen, Section 4.6, Occupied bandwidth                                      | Pass   |
| <b>Unintentional emissions</b>                                                                    |        |
| FCC Part 15, Section 107 / RSS-Gen, Section 7.2.4, Conducted emission at AC power port            | Pass   |
| FCC Part 15, Section 109 / RSS-Gen, Section 6.1, ICES-003, Section 6.2 class B, 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.

|                     | Name and Title                               | Date           | Signature                                                                             |
|---------------------|----------------------------------------------|----------------|---------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mrs. E. Pitt, test engineer                  | June 18, 2013  |  |
| <b>Reviewed by:</b> | Mrs. M. Cherniavsky, certification engineer  | July 21, 2013  |  |
| <b>Approved by:</b> | Mr. M. Nikishin, EMC and Radio group manager | August 4, 2013 |  |

## 6 EUT description

### 6.1 General information

The EUT is a reader operating in 906-927.5 MHz. It contains an approved Mini-PCI adapter operating in 2412-2462 MHz, FCC ID:MK8CPX-05-WLM54G.

### 6.2 EUT modules and sub-assemblies

| Description  | Manufacturer | Model or P/N  | Hardware rev. | Serial number |
|--------------|--------------|---------------|---------------|---------------|
| Wi-Fi Module | Compex       | WLM54G        | NA            | 23189434      |
| Host Board   | Gateworks    | GW2387 Laguna | NA            | 505209        |

### 6.3 Ports and lines

| Port type | Port description | Conn. from  | Conn. to    | Qty. | Cable type | Cable length, m |
|-----------|------------------|-------------|-------------|------|------------|-----------------|
| Power     | AC               | AC mains    | Transformer | 1    | Unshielded | 2               |
| Power     | AC               | Transformer | EUT         | 1    | Unshielded | 5               |
| Telecom   | Ethernet         | EUT         | Laptop      | 1    | FTP        | 5               |

### 6.4 Support and test equipment

| Description | Manufacturer | Model number | Serial number |
|-------------|--------------|--------------|---------------|
| Laptop      | IBM          | 1858-69G     | L3-LV361      |

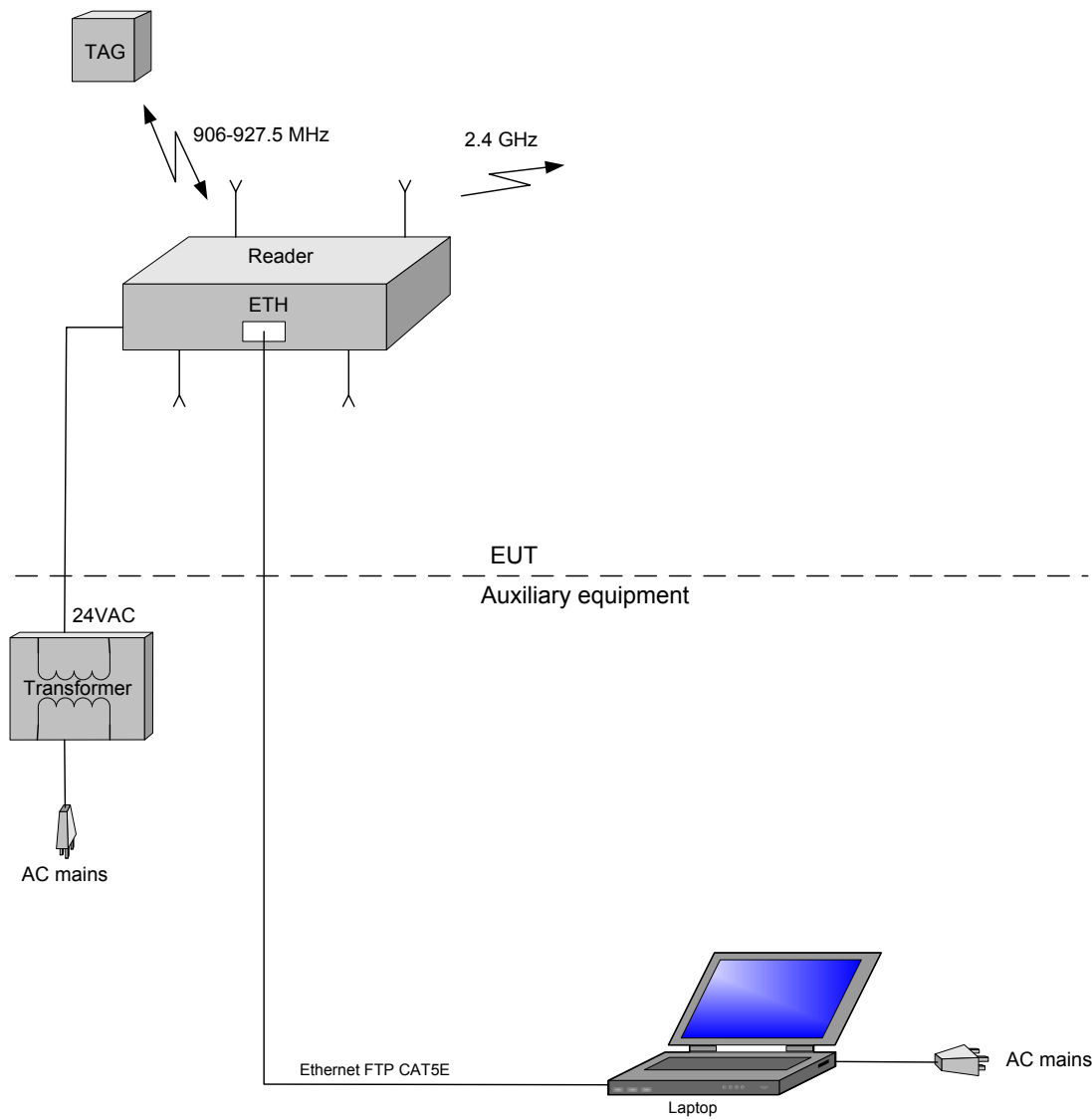
### 6.5 Changes made in EUT

To withstand the standard requirements the following changes were performed in the EUT:

1. A ceramic 0402 68pF capacitor was added on the Host Board's upper MiniPCI between legs "Clock" and "ground".
2. Two ferrite beads P/N 2661480002 manufactured by FairRite were installed: one - at the JTAG flat cable and one - at the AC cable.

It is manufacturer responsibility to implement the change in the production version of the EUT. In any case the test report applies to the tested item only.

## 6.6 Test configuration



## 6.7 Transmitter characteristics

|                                                         |                                                                                                          |                                    |                         |                                                     |                                                               |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------|-----------------------------------------------------|---------------------------------------------------------------|
| <b>Type of equipment</b>                                |                                                                                                          |                                    |                         |                                                     |                                                               |
| <b>V</b>                                                | Stand-alone (Equipment with or without its own control provisions)                                       |                                    |                         |                                                     |                                                               |
|                                                         | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) |                                    |                         |                                                     |                                                               |
|                                                         | Plug-in card (Equipment intended for a variety of host systems)                                          |                                    |                         |                                                     |                                                               |
| <b>Assigned frequency range</b>                         |                                                                                                          | 902 - 928 MHz                      |                         |                                                     |                                                               |
| <b>Operating frequency range</b>                        |                                                                                                          | 906.0 – 927.5 MHz                  |                         |                                                     |                                                               |
| <b>Maximum field strength</b>                           |                                                                                                          | 93.2 dB(μV/m) at 3 m test distance |                         |                                                     |                                                               |
| <b>Is transmitter output power variable?</b>            |                                                                                                          | <b>V</b>                           | No                      |                                                     |                                                               |
|                                                         |                                                                                                          |                                    | Yes                     | continuous variable                                 |                                                               |
|                                                         |                                                                                                          |                                    |                         | stepped variable with stepsize, software controlled | dB                                                            |
|                                                         |                                                                                                          |                                    |                         | Maximum field strength                              | 93.2 dB(μV/m) at 3 m test distance                            |
| <b>Antenna connection</b>                               |                                                                                                          |                                    |                         |                                                     |                                                               |
| unique coupling                                         | <b>V</b>                                                                                                 | standard connector                 | Integral                | <b>V</b>                                            | with temporary RF connector<br>without temporary RF connector |
| <b>Antenna/s technical characteristics</b>              |                                                                                                          |                                    |                         |                                                     |                                                               |
| Type                                                    | Manufacturer                                                                                             |                                    | Model number            |                                                     | Gain                                                          |
| Integral                                                | D-Link                                                                                                   |                                    | ANT-916-CW-HW           |                                                     | 0 dBi                                                         |
| <b>Transmitter aggregate data rate/s</b>                |                                                                                                          | 80 kbps                            |                         |                                                     |                                                               |
| <b>Type of modulation</b>                               |                                                                                                          | 2GFSK                              |                         |                                                     |                                                               |
| <b>Transmitter duty cycle supplied for test</b>         |                                                                                                          | 100%                               |                         |                                                     |                                                               |
| <b>Transmitter power source</b>                         |                                                                                                          |                                    |                         |                                                     |                                                               |
|                                                         | Battery                                                                                                  | <b>Nominal rated voltage</b>       |                         | Battery type                                        |                                                               |
|                                                         | DC                                                                                                       | <b>Nominal rated voltage</b>       |                         |                                                     |                                                               |
| <b>V</b>                                                | AC mains                                                                                                 | <b>Nominal rated voltage</b>       | 24 VAC from transformer | Frequency                                           | 50 Hz                                                         |
| <b>Common power source for transmitter and receiver</b> |                                                                                                          |                                    |                         | <b>V</b>                                            | yes      no                                                   |

|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <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 in Table 7.1.1, Table 7.1.2, Table 7.1.3.

Table 7.1.1 Radiated fundamental emission limits

| Fundamental frequency, MHz | Field strength at 3 m, dB(μV/m) |
|----------------------------|---------------------------------|
|                            | Quasi-Peak                      |
| 902 – 928                  | 94                              |

Table 7.1.2 Harmonics limits

| Fundamental frequency, MHz | Field strength at 3 m, dB(μV/m) |         |
|----------------------------|---------------------------------|---------|
|                            | Peak                            | Average |
| 902 – 928                  | 74.0                            | 54.0    |

Table 7.1.3 Radiated spurious emissions limits (other than harmonics)

| Frequency, MHz | Field strength at 3 m, dB(μV/m)* |                 |                 |                                          |
|----------------|----------------------------------|-----------------|-----------------|------------------------------------------|
|                | Peak                             | Quasi Peak      | Average         | Attenuation below carrier                |
| 0.009 – 0.090  | 148.5 – 128.5                    | NA              | 128.5 – 108.5** | 50 dBc (whichever is the less stringent) |
| 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            |                 |                                          |
| Above 1000     | 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.

Note: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.



|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

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

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 antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

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

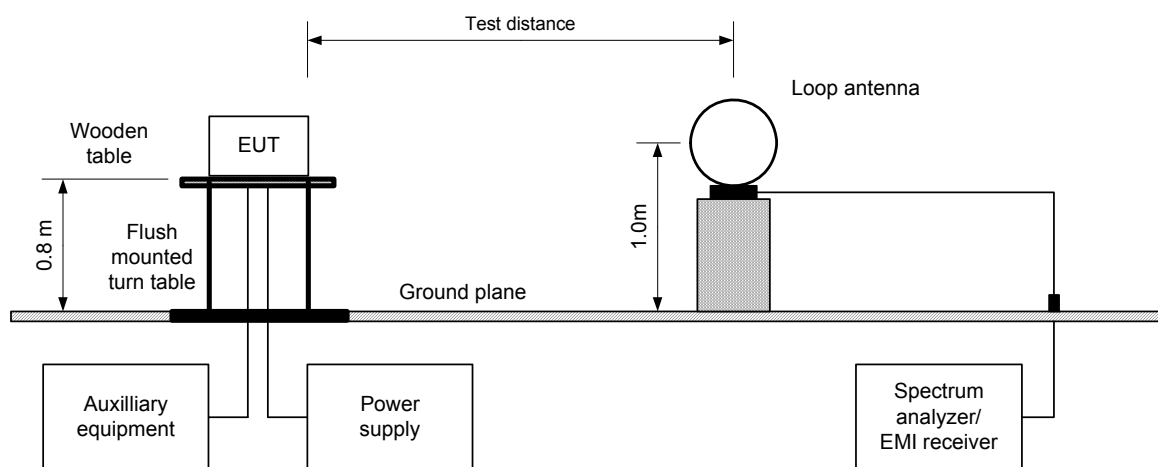
### 7.1.3 Test procedure for spurious emission field strength measurements above 30 MHz

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.

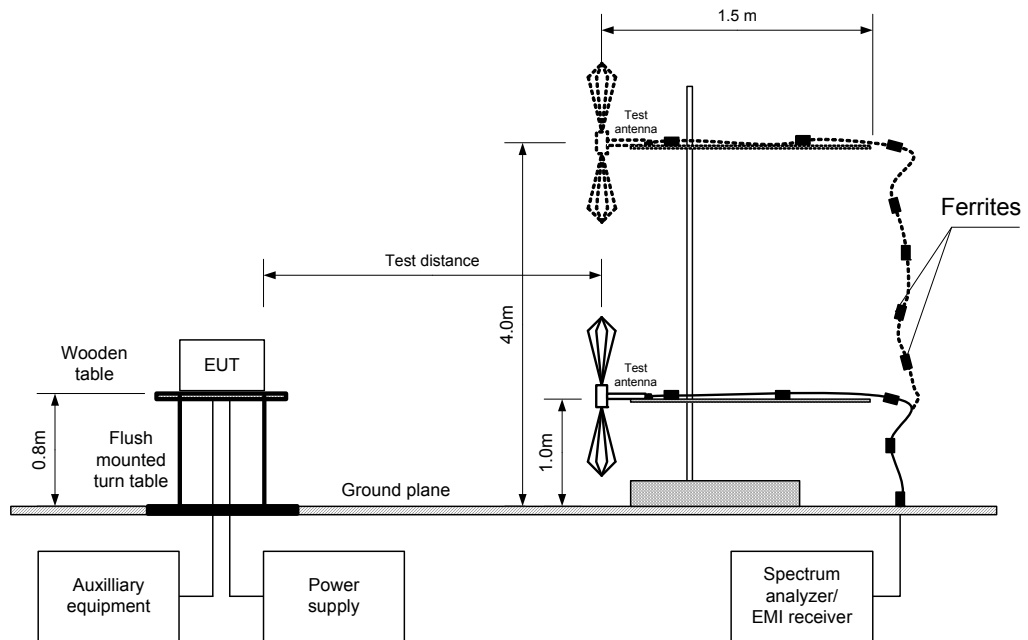
7.1.3.3 The worst test results (the lowest margins) were recorded in the associated tables and shown in the associated plots

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



|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

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



|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

Table 7.1.4 Field strength of fundamental emission and spurious emissions

|                                    |                                                                                                                    |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| TEST DISTANCE:                     | 3 m                                                                                                                |
| EUT POSITION:                      | Typical (Vertical)                                                                                                 |
| MODULATION:                        | 2GFSK                                                                                                              |
| TRANSMITTER OUTPUT POWER SETTINGS: | 4                                                                                                                  |
| INVESTIGATED FREQUENCY RANGE:      | 0.009 – 9300 MHz                                                                                                   |
| DETECTOR USED:                     | Peak                                                                                                               |
| RESOLUTION BANDWIDTH:              | 1.0 kHz (9 kHz – 150 kHz)<br>9.0 kHz (150 kHz – 30 MHz)<br>120 kHz (30 MHz – 1000 MHz)<br>1.0 MHz (above 1000 MHz) |
| VIDEO BANDWIDTH:                   | ≥ Resolution bandwidth                                                                                             |
| TEST ANTENNA TYPE:                 | Active loop (9 kHz – 30 MHz)<br>Biconilog (30 MHz – 1000 MHz)<br>Double ridged guide (above 1000 MHz)              |

**Fundamental emission**

| Frequency, MHz | Antenna |           | Azimuth, degrees* | Peak emission, dB(μV/m) | Quasi-peak                  |                 |              | Verdict |
|----------------|---------|-----------|-------------------|-------------------------|-----------------------------|-----------------|--------------|---------|
|                | Pol.    | Height, m |                   |                         | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB** |         |
| 906.0          | V       | 1.1       | 0                 | 96.70                   | 93.20                       | 94              | -0.80        | Pass    |
| 916.1          | V       | 1.1       | 0                 | 96.38                   | 92.54                       | 94              | -1.46        | Pass    |
| 927.5          | V       | 1.1       | 20                | 96.55                   | 93.21                       | 94              | -0.79        | Pass    |

**Spurious emission**

| 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* |                      |                   |                                |         |
| 200            | 43.4                    | 41.7                        | 43.5            | -1.8        | H                    | 1.2               | 179                            | Pass    |
| 250            | 40.6                    | 39.2                        | 46.0            | -6.8        | H                    | 1.1               | 190                            |         |
| 300            | 42.7                    | 41.1                        | 46.0            | -4.9        | H                    | 1.2               | 183                            |         |
| 375            | 42.0                    | 40.6                        | 46.0            | -5.4        | H                    | 1.0               | 94                             |         |
| 625            | 44.0                    | 43.1                        | 46.0            | -2.9        | V                    | 1.0               | 282                            |         |
| 800            | 42.0                    | 40.8                        | 46.0            | -5.2        | V                    | 1.0               | 270                            |         |

| F, MHz             | Antenna |           | Azimuth, degrees* | Peak field strength |                 |              | Avr factor, dB | 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** |         |
| Spurious emissions |         |           |                   |                     |                 |              |                |                        |                 |              |         |
| 1340               | V       | 1.0       | 0                 | 47.06               | 74              | -26.94       | NA             | 45.2                   | 54              | -8.8         | Pass    |

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

\*\* - Margin, dB = Measured (calculated) value, dB(μV/m) - Limit, dB(μV/m).



HERMON LABORATORIES

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Date of Issue: 4-Aug-13

|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

Table 7.1.5 Average factor calculation

| Transmission pulse |            | Transmission burst |            | Transmission train duration, ms | Average factor, dB |
|--------------------|------------|--------------------|------------|---------------------------------|--------------------|
| Duration, ms       | Period, ms | Duration, ms       | Period, ms |                                 |                    |
| 2.983              | NA         | NA                 | NA         | NA                              | NA                 |

\*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left( \frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{\text{Train duration}} \times \text{Number of bursts within pulse train} \right)$$

for pulse train longer than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left( \frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{100 \text{ ms}} \times \text{Number of bursts within 100 ms} \right)$$

**Reference numbers of test equipment used**

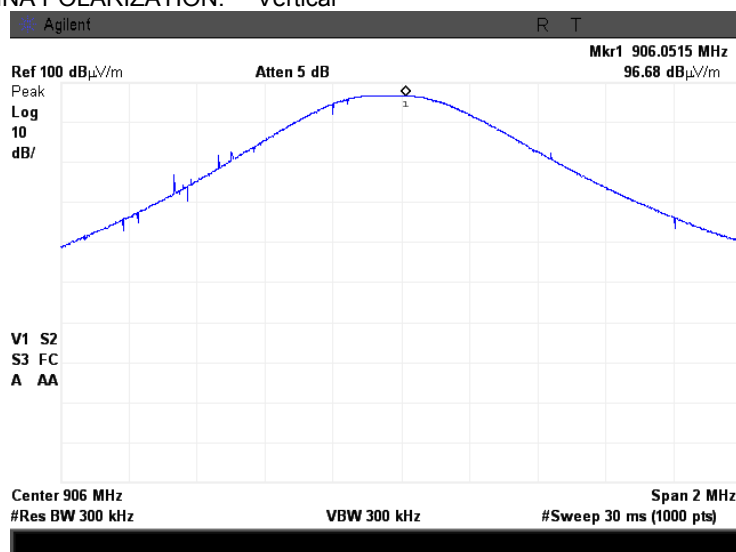
|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0604 | HL 1984 | HL 2871 | HL 2909 | HL 4353 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.

|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

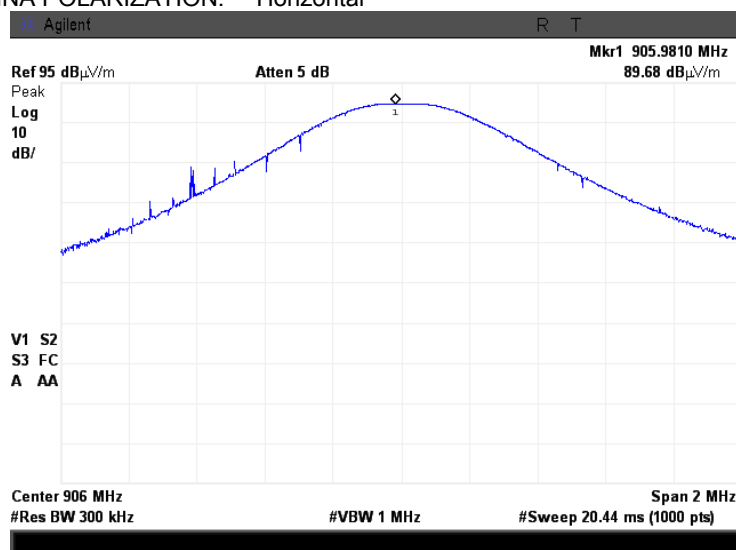
#### Plot 7.1.1 Radiated emission measurements at the low fundamental frequency

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical



#### Plot 7.1.2 Radiated emission measurements at the low fundamental frequency

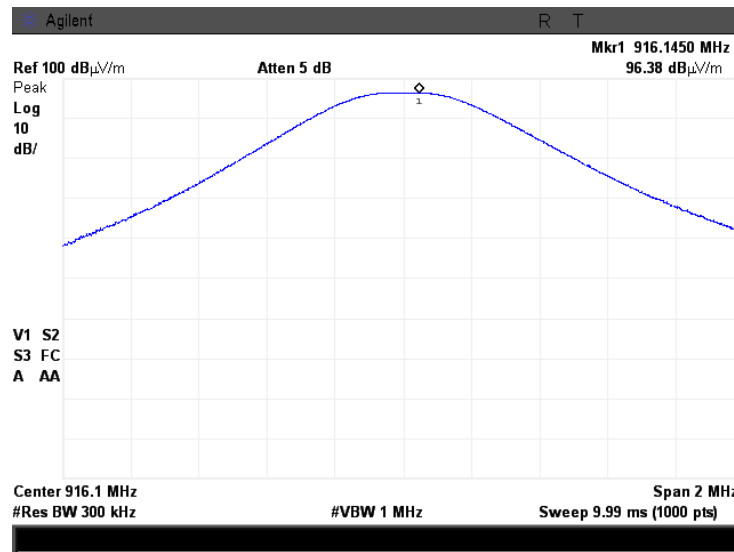
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal



|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

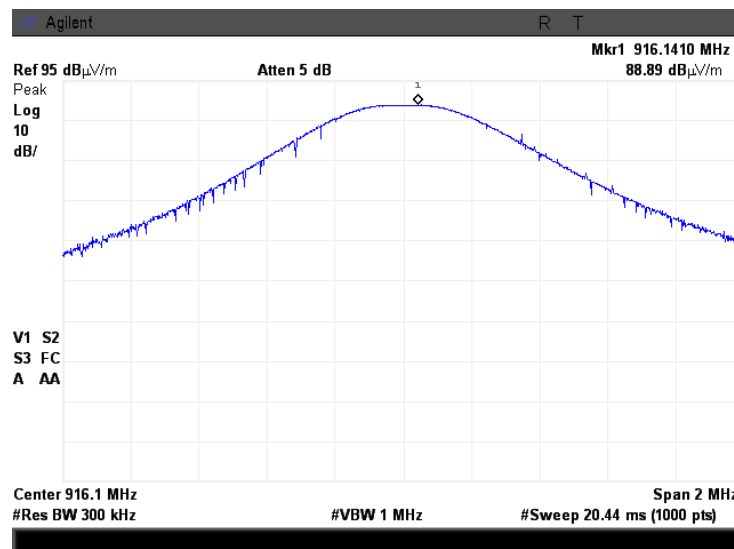
**Plot 7.1.3 Radiated emission measurements at mid fundamental frequency**

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical



**Plot 7.1.4 Radiated emission measurements at the mid fundamental frequency**

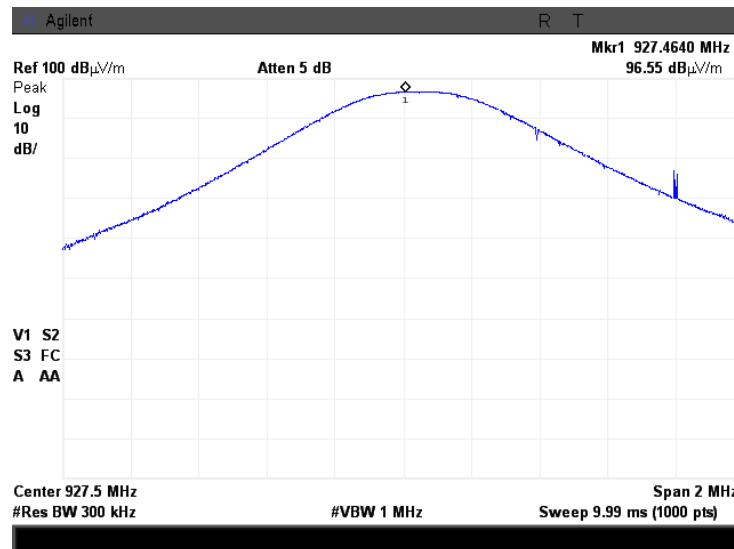
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal



|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

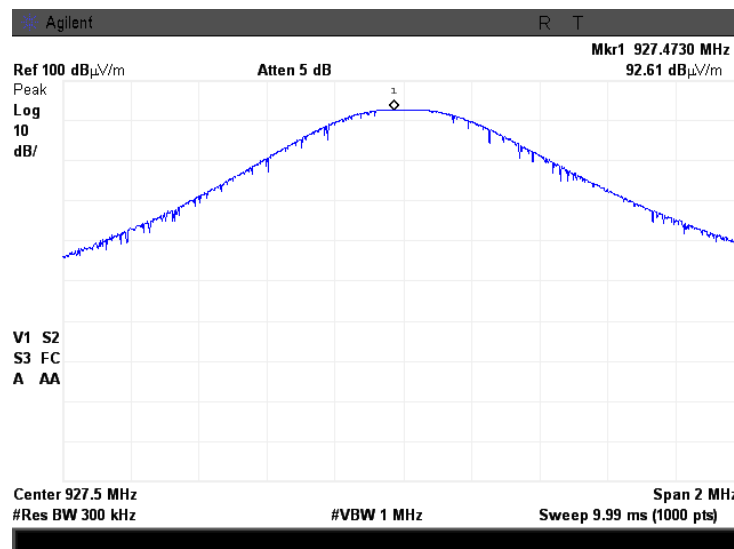
**Plot 7.1.5 Radiated emission measurements at high fundamental frequency**

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical



**Plot 7.1.6 Radiated emission measurements at the high fundamental frequency**

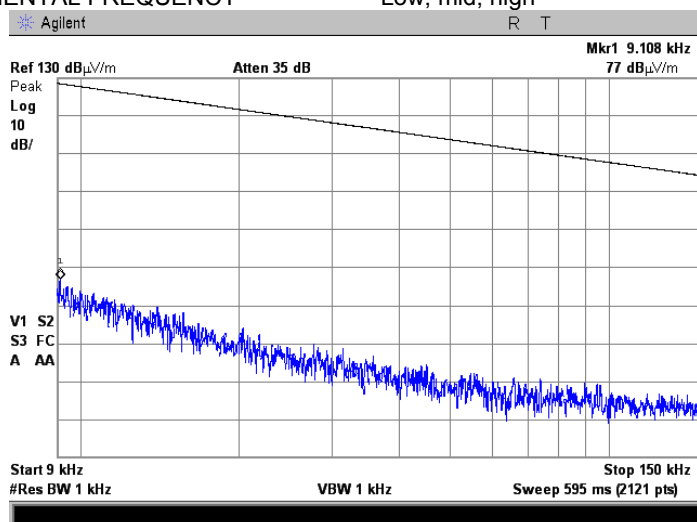
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal



|                     |                                                                         |                         |                       |
|---------------------|-------------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                              |                         |                       |
| Test mode:          | Compliance                                                              | Verdict:                | PASS                  |
| Date(s):            | 5/24/2013 - 6/18/2013                                                   |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1012 hPa                                                  | Relative Humidity: 49 % | Power Supply: 120 VAC |
| Remarks:            |                                                                         |                         |                       |

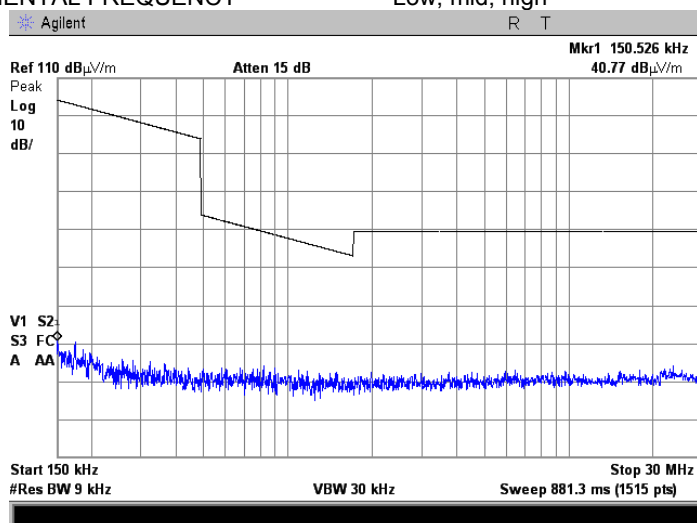
Plot 7.1.7 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber  
EUT POSITION: Typical (Vertical)  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
FUNDAMENTAL FREQUENCY: Low, mid, high



Plot 7.1.8 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE: Semi anechoic chamber  
EUT POSITION: Typical (Vertical)  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
FUNDAMENTAL FREQUENCY: Low, mid, high

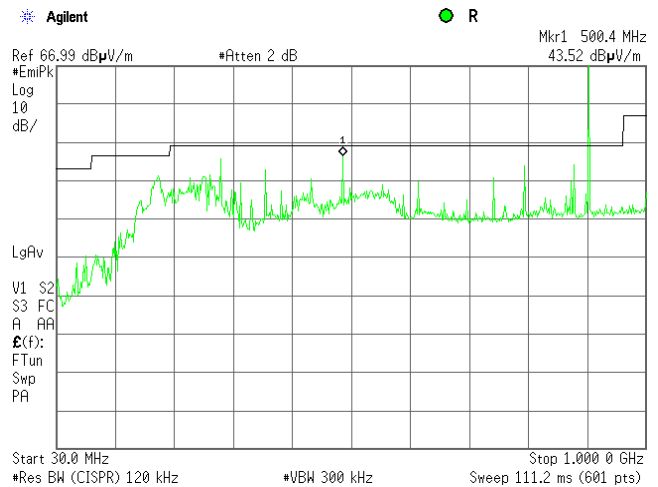
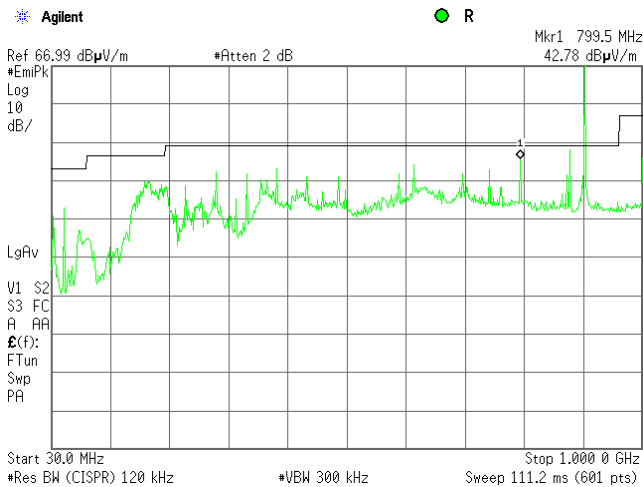




|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

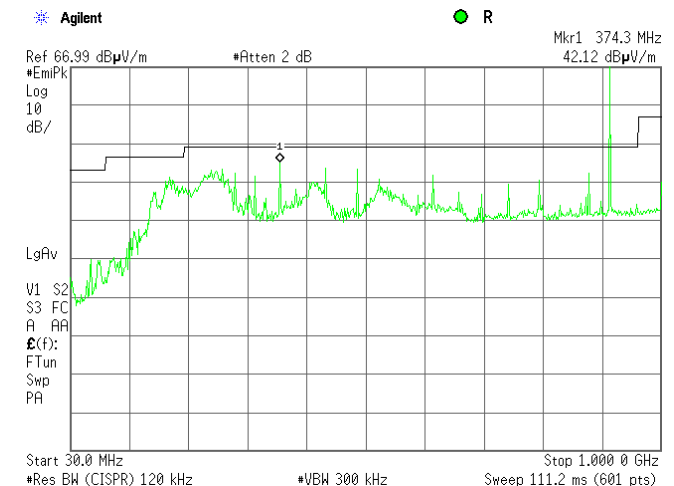
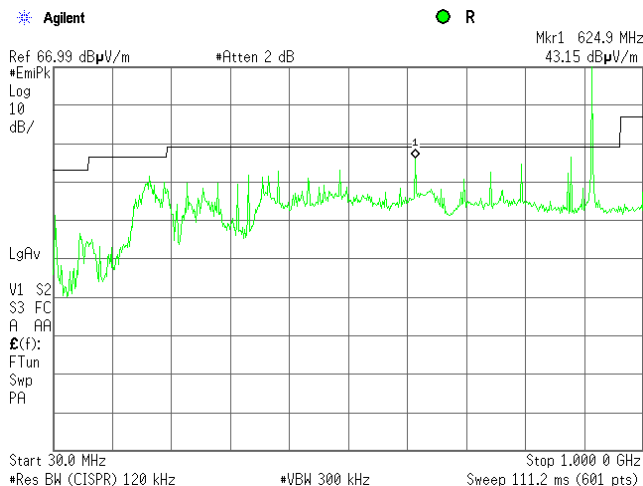
#### Plot 7.1.9 Radiated emission measurements from 30 to 1000 MHz at low frequency

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



#### Plot 7.1.10 Radiated emission measurements from 30 to 1000 MHz at mid frequency

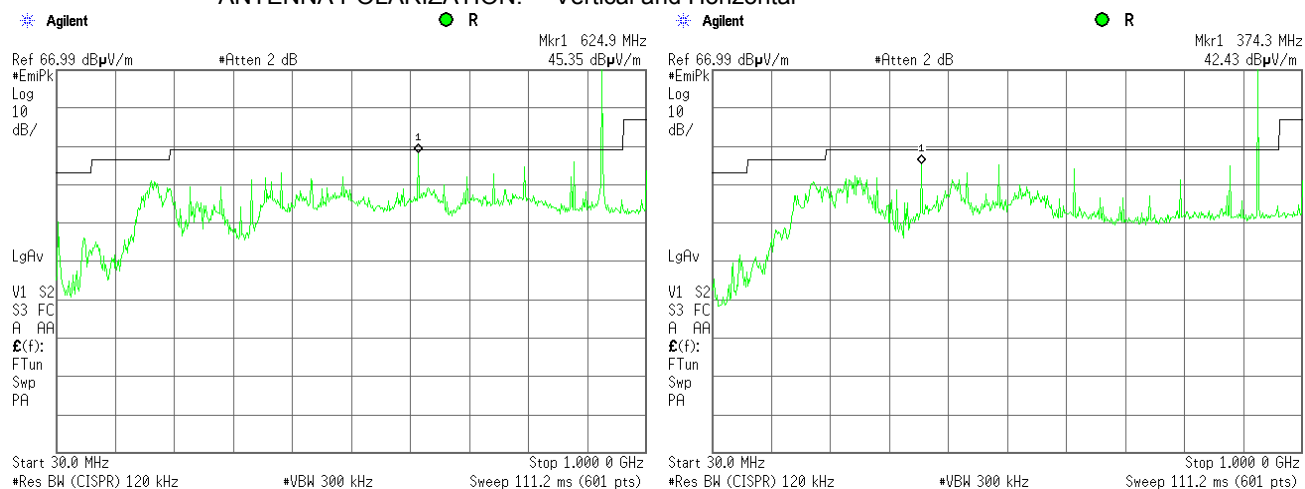
TEST SITE: Semi anechoic chamber  
EUT POSITION: Typical (Vertical)  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



|                            |                               |                                                                                |                              |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(a)(d)/RSS-210, section A2.9, 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>            |                               | 5/24/2013 - 6/18/2013                                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                                 | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                |                              |

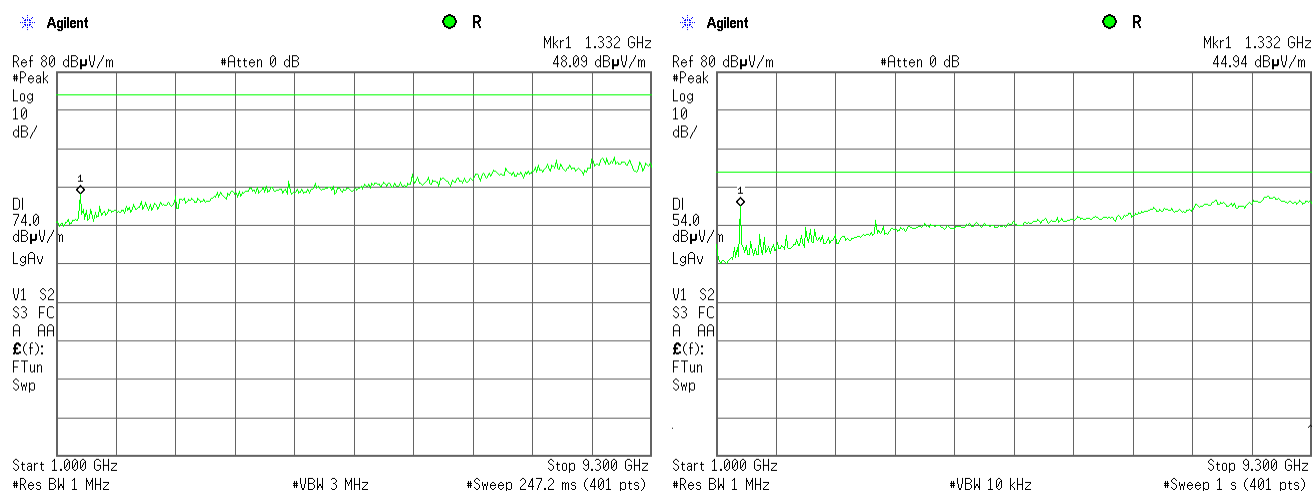
**Plot 7.1.11 Radiated emission measurements from 30 to 1000 MHz at high frequency**

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



**Plot 7.1.12 Radiated emission measurements from 1.0 to 9.3 MHz at low, mid and high frequency**

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

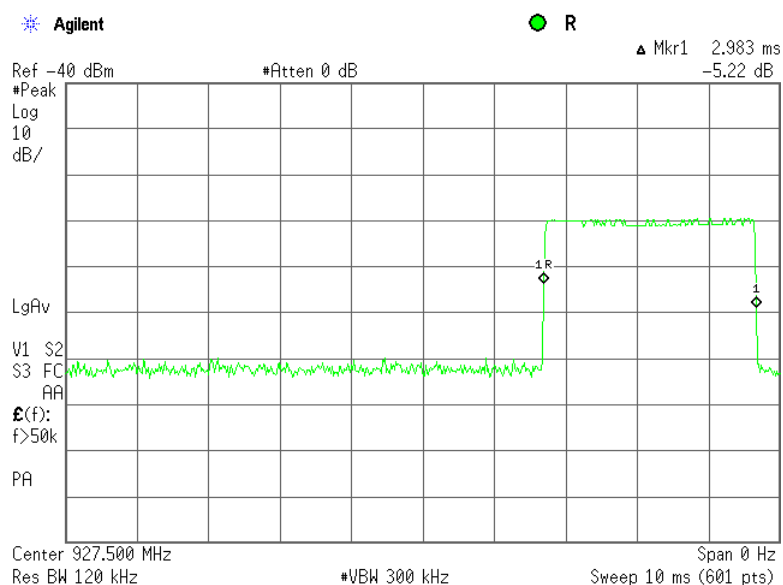




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|                     |                        |                                                                         |                       |
|---------------------|------------------------|-------------------------------------------------------------------------|-----------------------|
| Test specification: |                        | Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions |                       |
| Test procedure:     |                        | ANSI C63.4, Section 13.1.4                                              |                       |
| Test mode:          |                        | Compliance                                                              | Verdict: PASS         |
| Date(s):            |                        | 5/24/2013 - 6/18/2013                                                   |                       |
| Temperature: 25 °C  | Air Pressure: 1012 hPa | Relative Humidity: 49 %                                                 | Power Supply: 120 VAC |
| Remarks:            |                        |                                                                         |                       |

Plot 7.1.13 Transmission pulse duration





|                            |                               |                                                                     |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(d)/RSS-210, section A2.9, Band edge 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>            |                               | 5/24/2013 - 6/4/2013                                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                     |                              |

## 7.2 Band edge emission

### 7.2.1 General

This test was performed to verify the EUT band edge emission including all associated side bands was attenuated at least 50 dB below the unmodulated carrier level or below the general spurious emission limit. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Band edge emission limits

| Frequency band,<br>MHz | Field strength limit at 3 m, dBμV/m |      | Attenuation below carrier,<br>dBc |
|------------------------|-------------------------------------|------|-----------------------------------|
|                        | Peak                                | QP   |                                   |
| 902.000 - 928.000      | NA                                  | 46.0 | 50                                |

### 7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the performance check was conducted.

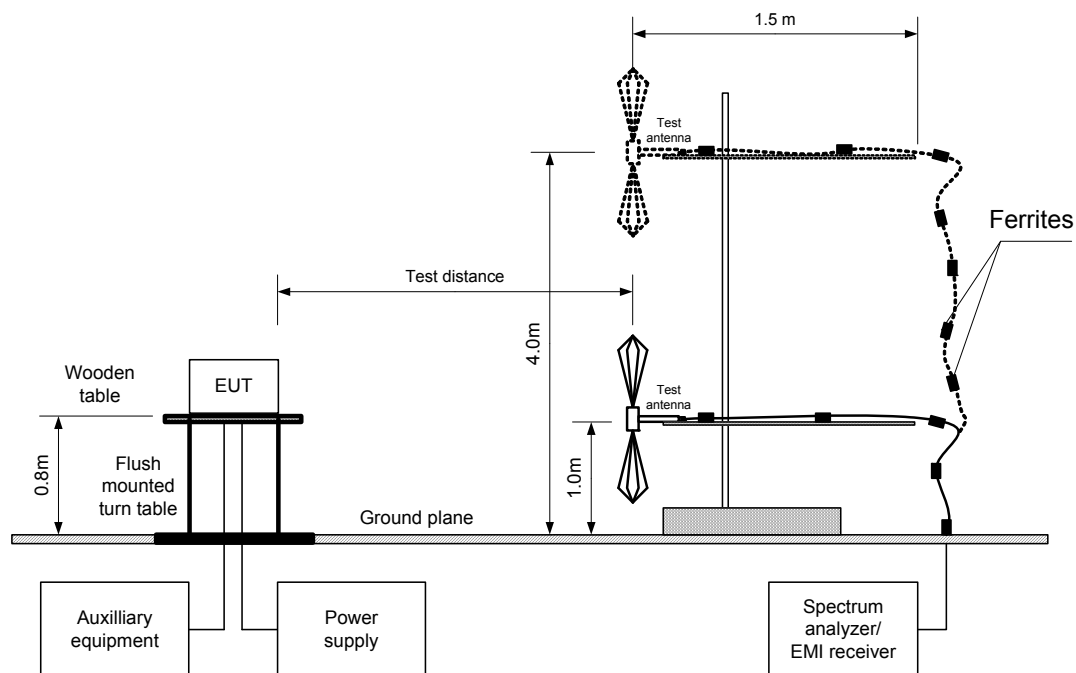
7.2.2.2 The spectrum analyzer frequency span was set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.2.2.3 The frequency of modulation envelope points beyond which power level drops below the band edge emission limit was measured.

7.2.2.4 The test results were recorded in Table 7.2.2 and shown in the associated plots.

|                            |                               |                                                                     |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(d)/RSS-210, section A2.9, Band edge 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>            |                               | 5/24/2013 - 6/4/2013                                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                     |                              |

Figure 7.2.1 Band edge emission measurement set up





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|                            |                               |                                                                     |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(d)/RSS-210, section A2.9, Band edge 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>            |                               | 5/24/2013 - 6/4/2013                                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                     |                              |

**Table 7.2.2 Band edge emission test results**

OPERATING FREQUENCY RANGE: 902-928 MHz  
 DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 120 kHz  
 VIDEO BANDWIDTH: 300 kHz  
 MODULATION: 2GFSK  
 BIT RATE: 80 kbps  
 TRANSMITTER OUTPUT POWER SETTINGS: 4  
 ATTENUATION BELOW CARRIER: 50 dBc

| Modulation envelope |                | Measured peak emission, dBµV/m | Attenuation below the carrier dB | QP limit, dBµV/m | Margin, dB * | Verdict |
|---------------------|----------------|--------------------------------|----------------------------------|------------------|--------------|---------|
| Edge                | Frequency, MHz |                                |                                  |                  |              |         |
| Low                 | 902            | 36.1                           | 60.42                            | 46               | -9.90        | Pass    |
| High                | 928            | 44.76                          | 51.39                            | 46               | -1.24        | Pass    |

\* - Margin = measured value– limit

**Reference numbers of test equipment used**

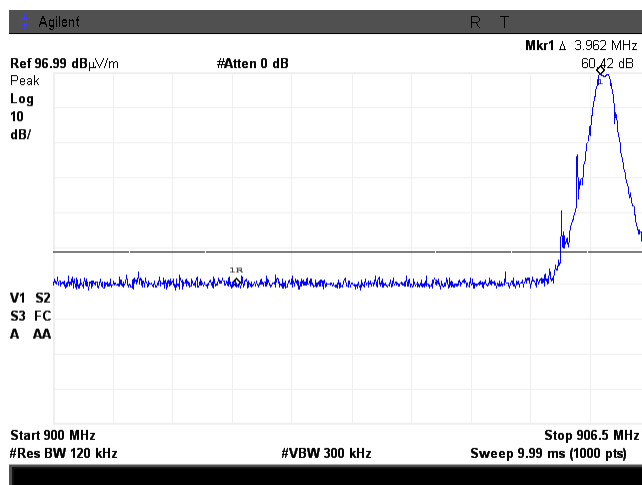
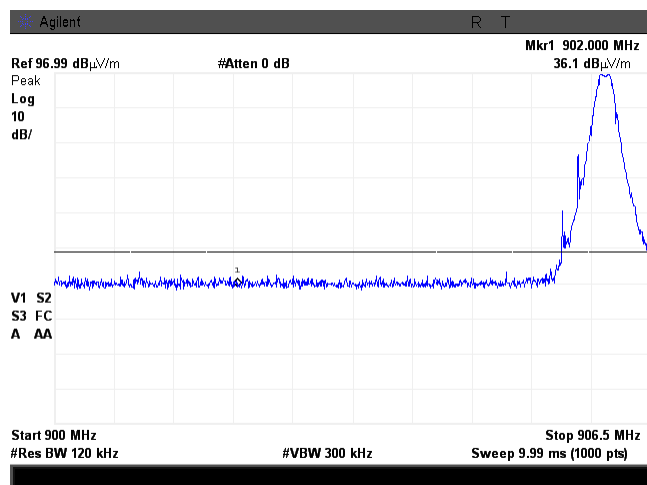
|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 0604 | HL 2780 | HL 2871 | HL 4353 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.

|                            |                               |                                                                     |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.249(d)/RSS-210, section A2.9, Band edge 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>            |                               | 5/24/2013 - 6/4/2013                                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1012 hPa | <b>Relative Humidity:</b> 49 %                                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                     |                              |

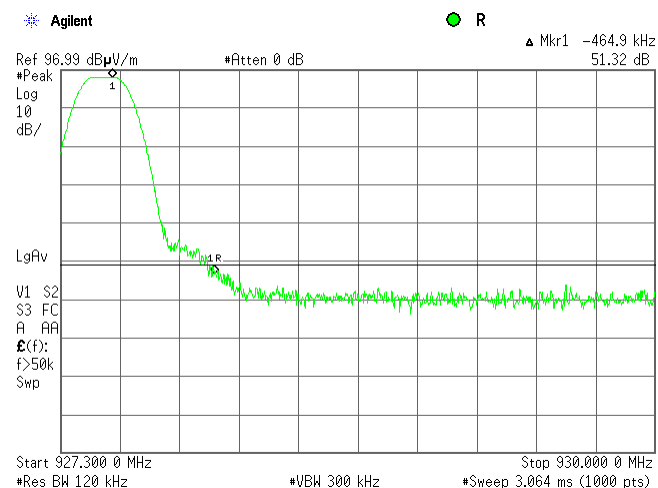
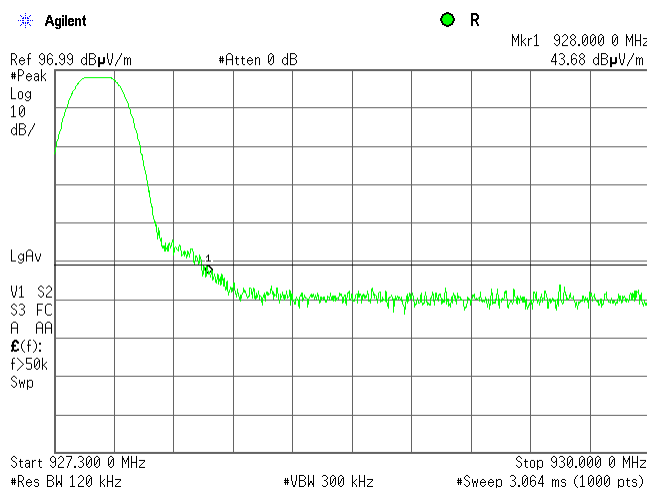
### Plot 7.2.1 Low band edge emission test result

TEST SITE: Semi Anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



### Plot 7.2.2 High band edge emission test result

TEST SITE: Semi Anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal





|                            |                               |                                                                       |                              |
|----------------------------|-------------------------------|-----------------------------------------------------------------------|------------------------------|
| <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>            |                               | 6/17/2013                                                             |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 39 %                                        | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                       |                              |

## 7.3 Conducted emissions

### 7.3.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.3.1.

**Table 7.3.1 Limits for conducted emissions**

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

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

### 7.3.2 Test procedure

**7.3.2.1** The EUT was set up as shown in Figure 7.3.1 and associated photographs, energized and the performance check was conducted.

**7.3.2.2** The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.3.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

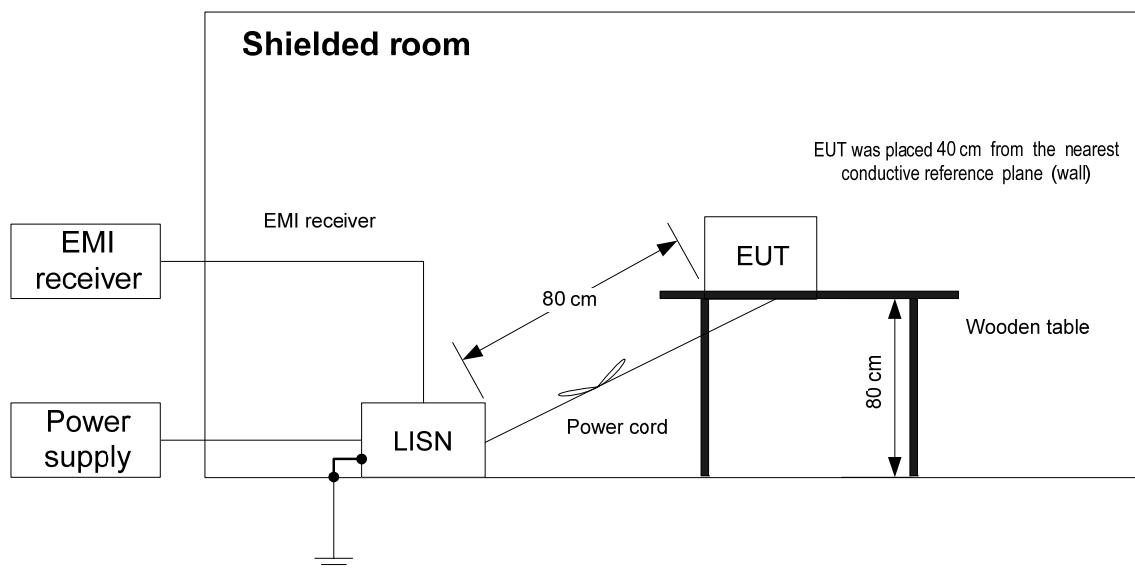
**7.3.2.3** The position of the device cables was varied to determine maximum emission level.

**7.3.2.4** The worst test results (the lowest margins) were recorded in Table 7.3.2 and shown in the associated plots.



|                            |                               |                                                                       |                              |
|----------------------------|-------------------------------|-----------------------------------------------------------------------|------------------------------|
| <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>            |                               | 6/17/2013                                                             |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 39 %                                        | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                       |                              |

Figure 7.3.1 Setup for conducted emission measurements, table-top equipment





|                            |                               |                                                                       |                              |
|----------------------------|-------------------------------|-----------------------------------------------------------------------|------------------------------|
| <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>            |                               | 6/17/2013                                                             |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 39 %                                        | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                       |                              |

Table 7.3.2 Conducted emission test results

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

| Frequency,<br>MHz                       | Peak<br>emission,<br>dB(μV) | Quasi-peak                      |                  |                | Average                         |                  |                | Line ID | Verdict |
|-----------------------------------------|-----------------------------|---------------------------------|------------------|----------------|---------------------------------|------------------|----------------|---------|---------|
|                                         |                             | Measured<br>emission,<br>dB(μV) | Limit,<br>dB(μV) | Margin,<br>dB* | Measured<br>emission,<br>dB(μV) | Limit,<br>dB(μV) | Margin,<br>dB* |         |         |
| All signals below limit more than 20 dB |                             |                                 |                  |                |                                 |                  |                | L1      | Pass    |
|                                         |                             |                                 |                  |                |                                 |                  |                | L2      | Pass    |

\*- Margin = Measured emission - specification limit.

## Reference numbers of test equipment used

|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0163 | HL 0580 | HL 1425 | HL 1513 | HL 3612 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.



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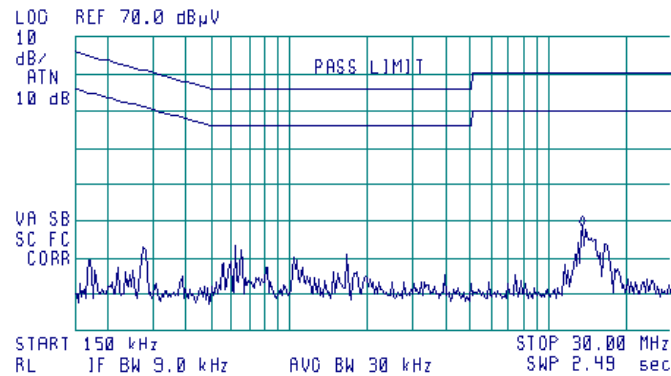
|                     |                        |                                                                |                       |
|---------------------|------------------------|----------------------------------------------------------------|-----------------------|
| Test specification: |                        | Section 15.207(a) / RSS-Gen, section 7.2.4, Conducted emission |                       |
| Test procedure:     |                        | ANSI C63.4, Section 13.1.3                                     |                       |
| Test mode:          |                        | Compliance                                                     | Verdict: PASS         |
| Date(s):            |                        | 6/17/2013                                                      |                       |
| Temperature: 24 °C  | Air Pressure: 1010 hPa | Relative Humidity: 39 %                                        | Power Supply: 120 VAC |
| Remarks:            |                        |                                                                |                       |

Plot 7.3.1 Conducted emission measurements

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



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 13.53 MHz  
18.50 dBμV

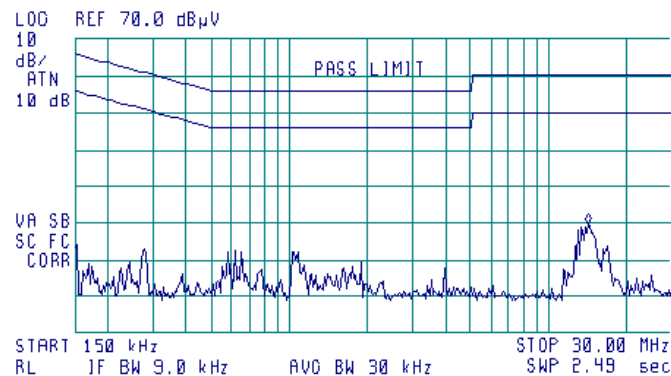


Plot 7.3.2 Conducted emission measurements

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



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 14.07 MHz  
19.61 dBμV



|                            |                               |                                                                     |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.203 / RSS-Gen, Section 7.1.2, Antenna requirement</b> |                              |
| <b>Test procedure:</b>     |                               | Visual inspection / supplier declaration                            |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                     | <b>PASS</b>                  |
| <b>Date(s):</b>            | 6/18/2013                     |                                                                     |                              |
| <b>Temperature:</b> 23 °C  | <b>Air Pressure:</b> 1005 hPa | <b>Relative Humidity:</b> 40 %                                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                     |                              |

## 7.4 Antenna requirements

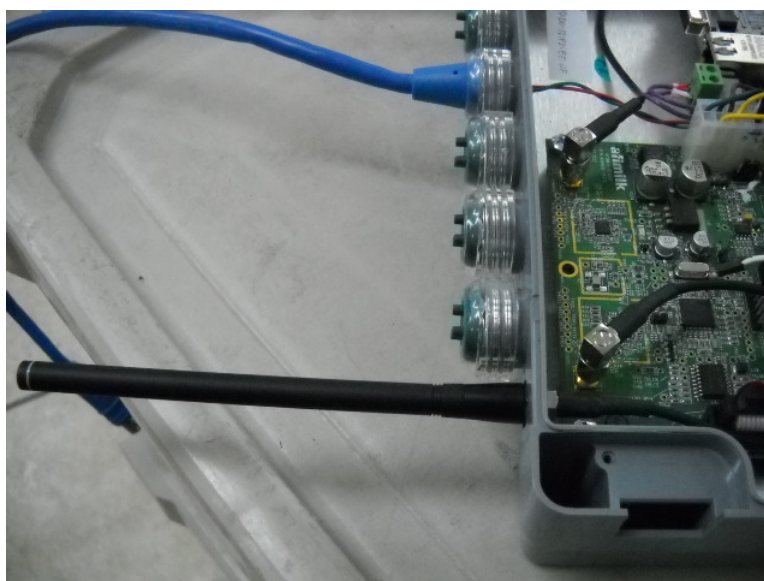
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed 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 7.4.1.

**Table 7.4.1 Antenna requirements**

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

**Photograph 7.4.1 Antenna assembly**





|                            |                               |                                                                     |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.215(c) / RSS-Gen, Section 4.6, 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>            |                               | 5/17/2013 - 5/28/2013                                               |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 52 %                                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                     |                              |

## 7.5 Occupied bandwidth test

### 7.5.1 General

This test was performed to verify that the 20 dB bandwidth of the emissions was contained within the standard specified frequency band according to FCC §15.215 requirements. Specification test limits are given in Table 7.5.1.

**Table 7.5.1 Occupied bandwidth limits**

| Assigned frequency, MHz | Modulation envelope reference points*, dBc |
|-------------------------|--------------------------------------------|
| 902 - 928               | 20.0                                       |
| 2400 – 2483.5           |                                            |
| 5725 – 5875             |                                            |
| 24000 – 24250           |                                            |

\*- Modulation envelope reference points provided in terms of attenuation below modulated carrier.

### 7.5.2 Test procedure

- 7.5.2.1** The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.
- 7.5.2.2** The spectrum analyzer sweep time and bandwidth were set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.
- 7.5.2.3** The peak of emission was measured. The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.5.2 and associated plot.
- 7.5.2.4** Modulation bandwidth was calculated by adding of the negative frequency drift to the lower measured frequency and the positive frequency drift to the higher measured frequency. The obtained modulation bandwidth was verified to be within the allowed frequency range.

**Figure 7.5.1 Occupied bandwidth test setup**





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|                            |                               |                                                                     |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.215(c) / RSS-Gen, Section 4.6, 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>            |                               | 5/17/2013 - 5/28/2013                                               |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 52 %                                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                     |                              |

Table 7.5.2 Occupied bandwidth test results

ASSIGNED FREQUENCY BAND 902-928 MHz  
 DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 10 kHz  
 VIDEO BANDWIDTH: 30 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 20 dBc  
 MODULATION: 2GFSK

| Channel | Frequency, MHz | OBW, kHz |        | Verdict |
|---------|----------------|----------|--------|---------|
|         |                | 20 dBc   | 99%    |         |
| Low     | 906.0          | 168.8    | 148.05 | Pass    |
| Mid     | 916.1          | 170.0    | 147.48 | Pass    |
| High    | 927.5          | 161.6    | 147.44 | Pass    |

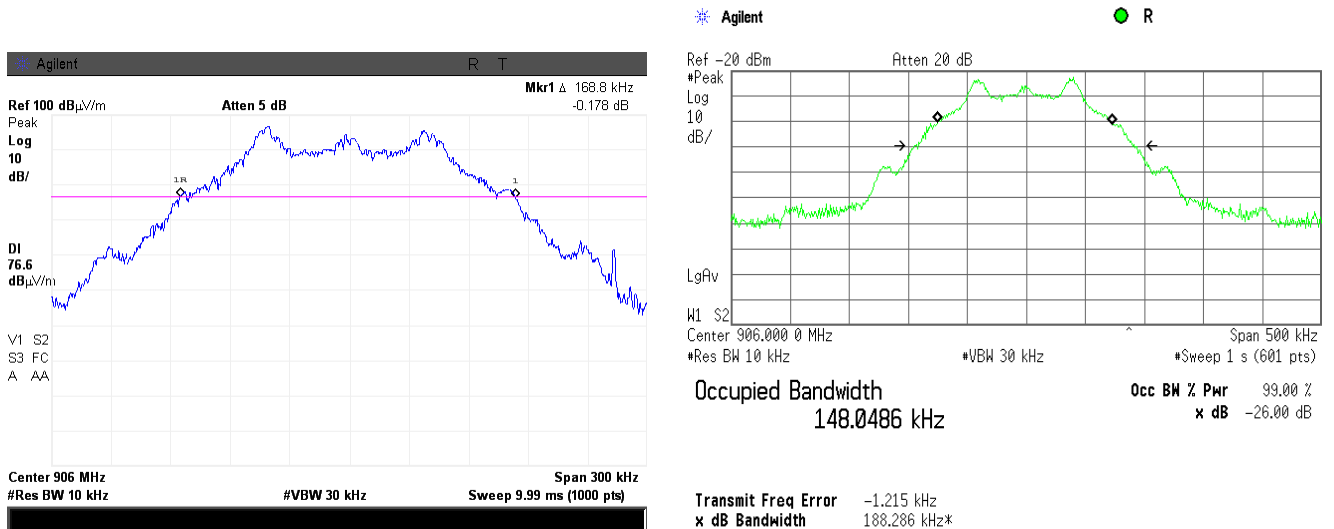
**Reference numbers of test equipment used**

|         |        |         |         |  |  |  |  |  |
|---------|--------|---------|---------|--|--|--|--|--|
| HL 2909 | HL 604 | HL 4353 | HL 2871 |  |  |  |  |  |
|---------|--------|---------|---------|--|--|--|--|--|

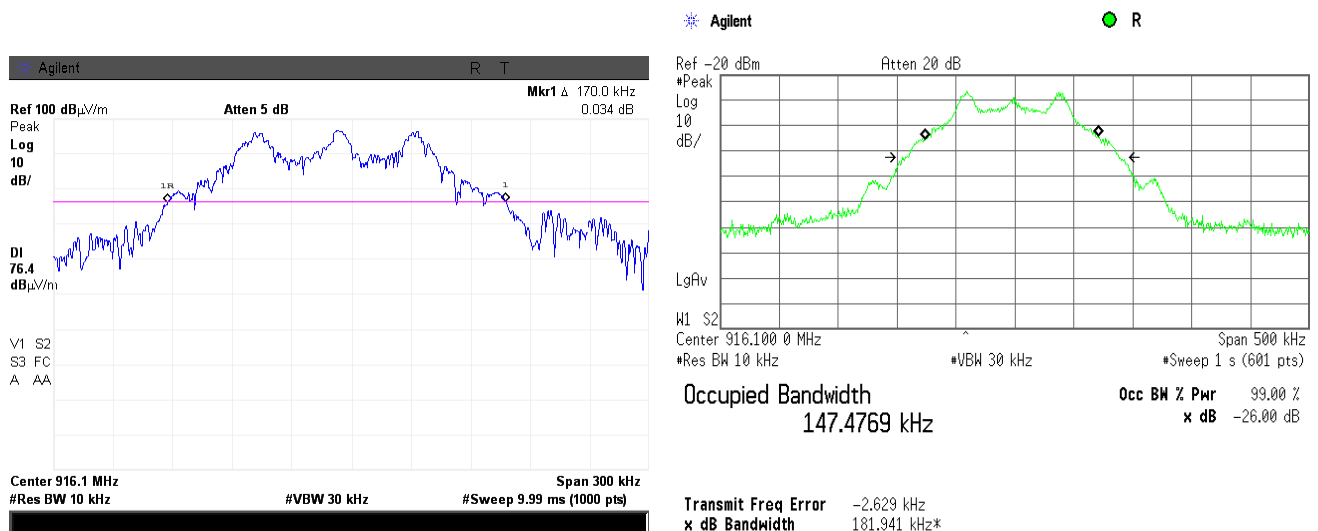
Full description is given in Appendix A.

|                            |                               |                                                                     |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.215(c) / RSS-Gen, Section 4.6, 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>            |                               | 5/17/2013 - 5/28/2013                                               |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 52 %                                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                     |                              |

Plot 7.5.1 Occupied bandwidth test result at low frequency



Plot 7.5.2 Occupied bandwidth test result mid frequency



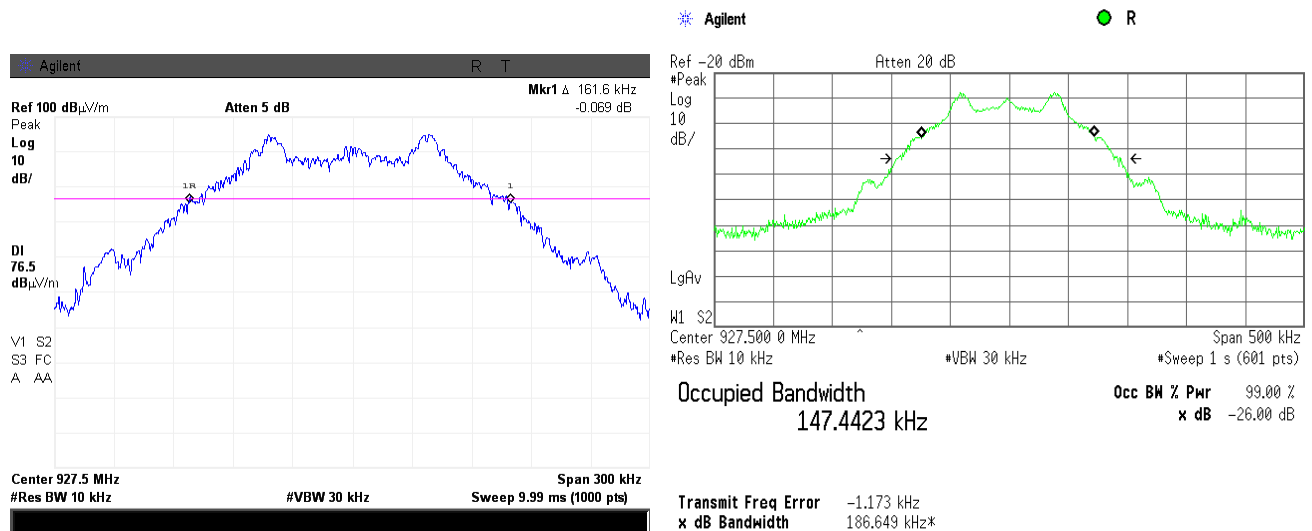


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|                     |                        |                                                              |                       |
|---------------------|------------------------|--------------------------------------------------------------|-----------------------|
| Test specification: |                        | Section 15.215(c) / RSS-Gen, Section 4.6, Occupied bandwidth |                       |
| Test procedure:     |                        | ANSI C63.4, Section 13.1.7                                   |                       |
| Test mode:          |                        | Compliance                                                   | Verdict: PASS         |
| Date(s):            |                        | 5/17/2013 - 5/28/2013                                        |                       |
| Temperature: 24 °C  | Air Pressure: 1013 hPa | Relative Humidity: 52 %                                      | Power Supply: 120 VAC |
| Remarks:            |                        |                                                              |                       |

Plot 7.5.3 Occupied bandwidth test result at high frequency







|                            |                               |                                                                                             |                              |
|----------------------------|-------------------------------|---------------------------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.107/RSS-Gen, section 7.2.4, ICES-003, 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>            |                               | 6/17/2013                                                                                   |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 38 %                                                              | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                                             |                              |

## 8 Unintentional emission tests

### 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   |

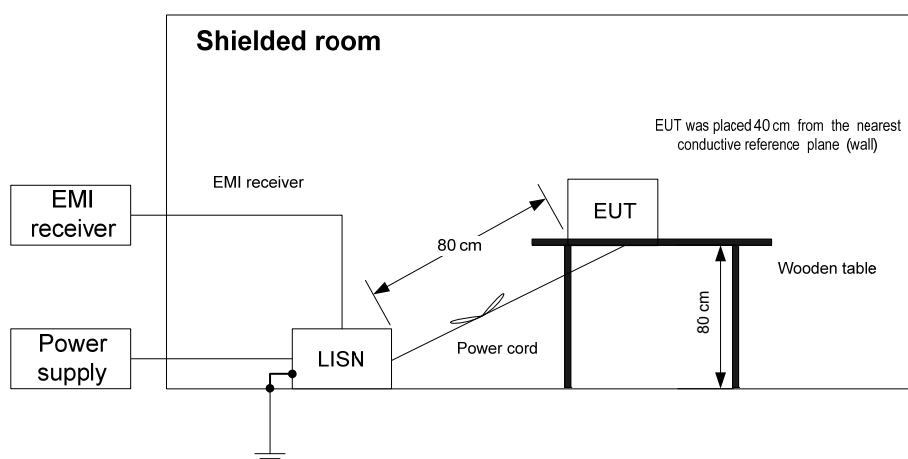
\* The limit decreases linearly with the logarithm of frequency.

#### 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 in the frequency range referred to in Table 8.1.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.
- 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.

|                            |                                                                                             |                                |                              |
|----------------------------|---------------------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.107/RSS-Gen, section 7.2.4, ICES-003, 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>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 6/17/2013                                                                                   |                                |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1010 hPa                                                               | <b>Relative Humidity:</b> 38 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                                             |                                |                              |

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



**Photograph 8.1.1 Setup for conducted emission measurements**





|                            |                                                                                             |                                |                              |
|----------------------------|---------------------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.107/RSS-Gen, section 7.2.4, ICES-003, 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>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 6/17/2013                                                                                   |                                |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1010 hPa                                                               | <b>Relative Humidity:</b> 38 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                                             |                                |                              |

**Table 8.1.2 Conducted emission test results**

LINE: AC mains  
 EUT OPERATING MODE: Receive / Stand-by  
 EUT SET UP: TABLE-TOP  
 TEST SITE: SHIELDED ROOM  
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE  
 FREQUENCY RANGE: 150 kHz - 30 MHz  
 RESOLUTION BANDWIDTH: 9 kHz

| Resolution Bandwidth: 1 Hz              |                       | 5 kHz                     |               |             |                           |               |             | Line ID | Verdict |
|-----------------------------------------|-----------------------|---------------------------|---------------|-------------|---------------------------|---------------|-------------|---------|---------|
| Frequency, MHz                          | Peak emission, dB(μV) | Quasi-peak                |               |             | Average                   |               |             |         |         |
|                                         |                       | Measured emission, dB(μV) | Limit, dB(μV) | Margin, dB* | Measured emission, dB(μV) | Limit, dB(μV) | Margin, dB* |         |         |
| All signals below limit more than 20 dB |                       |                           |               |             |                           |               |             | L1      | Pass    |
|                                         |                       |                           |               |             |                           |               |             | L2      | Pass    |

\*- Margin = Measured emission - specification limit.

**Reference numbers of test equipment used**

|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0163 | HL 0580 | HL 1425 | HL 1513 | HL 3612 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.



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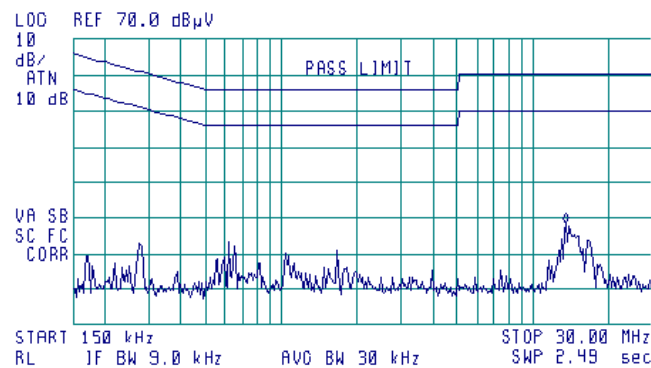
|                     |                                                                                      |                         |                       |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.107/RSS-Gen, section 7.2.4, ICES-003, 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):            | 6/17/2013                                                                            |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 38 % | Power Supply: 120 VAC |
| Remarks:            |                                                                                      |                         |                       |

#### Plot 8.1.1 Conducted emission measurements

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



ACTU DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 13.53 MHz  
10.50 dBμV

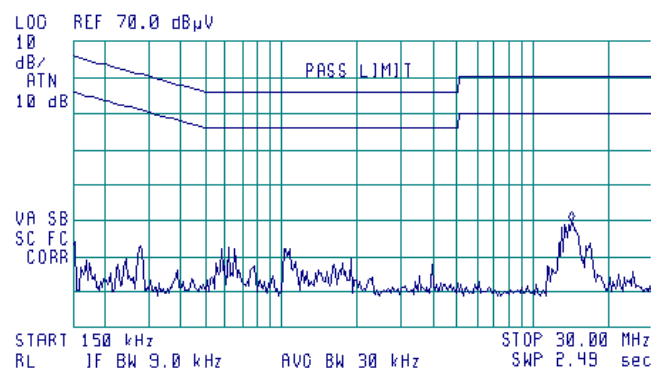


#### Plot 8.1.2 Conducted emission measurements

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



ACTU DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 14.07 MHz  
19.61 dBμV





|                     |                                                                  |                         |                       |
|---------------------|------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.109/RSS-Gen, section 6.1, ICES-003, Radiated emission |                         |                       |
| Test procedure:     | ANSI C63.4, Sections 11.6 and 12.1.4                             |                         |                       |
| Test mode:          | Compliance                                                       | Verdict: PASS           |                       |
| Date(s):            | 6/4/2013                                                         |                         |                       |
| Temperature: 23 °C  | Air Pressure: 1010 hPa                                           | Relative Humidity: 44 % | Power Supply: 120 VAC |
| 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, in Table 8.2.2.

**Table 8.2.1 Radiated emission test 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*        |
| Above 960      | 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:  $\text{Lim}_{S2} = \text{Lim}_{S1} + 20 \log(S1/S2)$ , 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 for measurements in semi-anechoic chamber

**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.

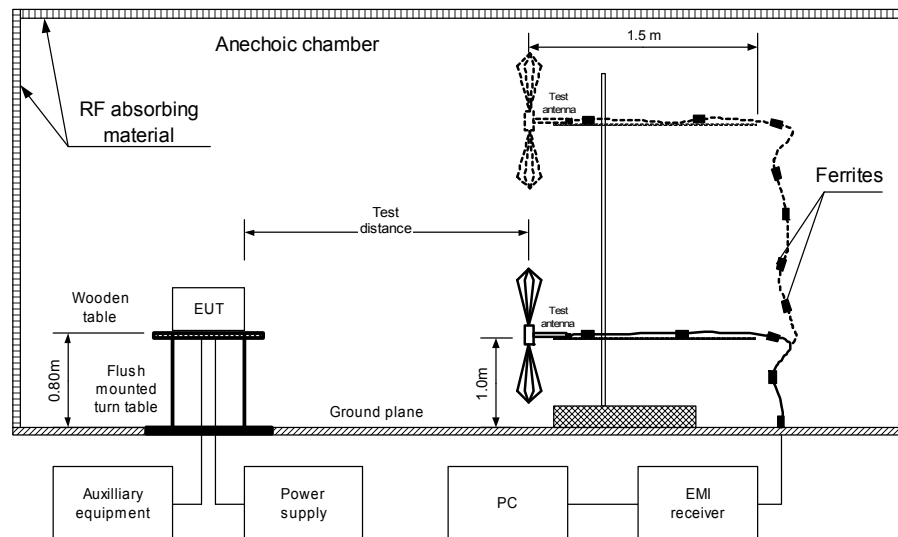
**8.2.2.3** The worst test results (the lowest margins) were recorded in Table 8.2.3 and shown in the associated plots.



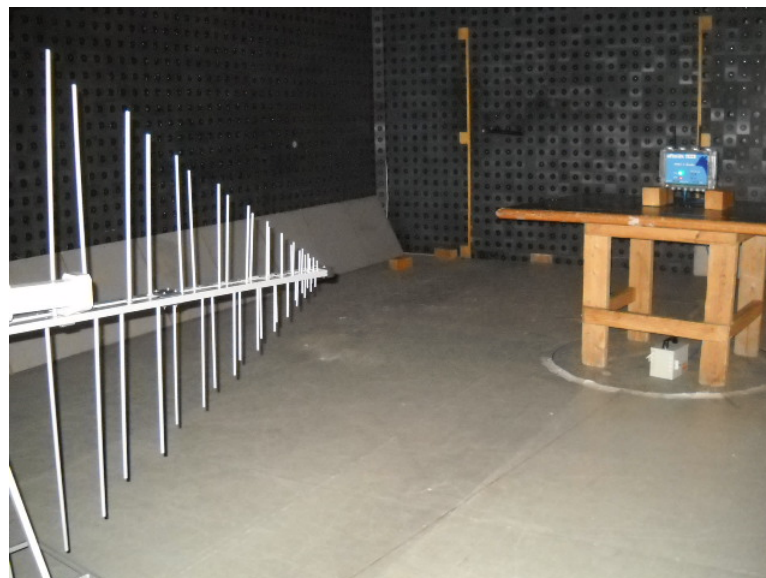
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|                            |                               |                                                                         |                              |
|----------------------------|-------------------------------|-------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.109/RSS-Gen, section 6.1, ICES-003, 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> PASS         |
| <b>Date(s):</b>            |                               | 6/4/2013                                                                |                              |
| <b>Temperature:</b> 23 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 44 %                                          | <b>Power Supply:</b> 120 VAC |
| <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





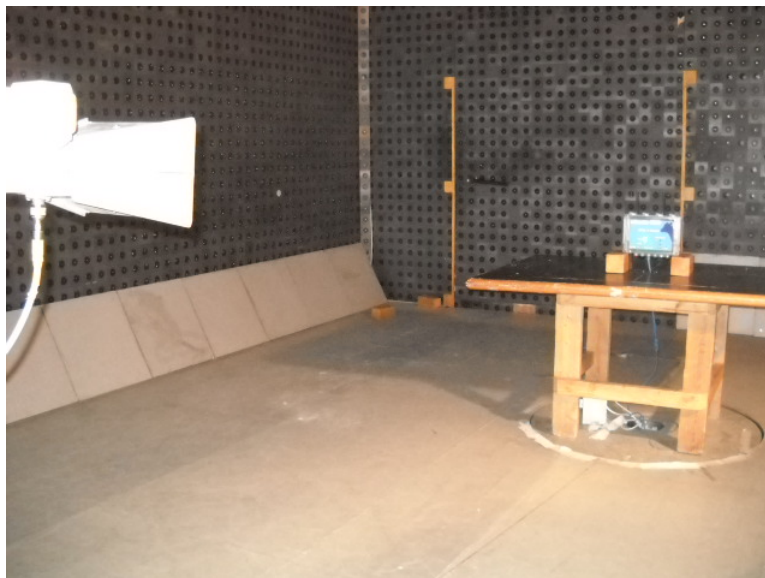
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|                            |                               |                                                                         |                              |
|----------------------------|-------------------------------|-------------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.109/RSS-Gen, section 6.1, ICES-003, 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> PASS         |
| <b>Date(s):</b>            |                               | 6/4/2013                                                                |                              |
| <b>Temperature:</b> 23 °C  | <b>Air Pressure:</b> 1010 hPa | <b>Relative Humidity:</b> 44 %                                          | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                         |                              |

Photograph 8.2.2 Setup for radiated emission measurements





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|                            |                                                                         |                                |                              |
|----------------------------|-------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.109/RSS-Gen, section 6.1, ICES-003, 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> PASS           |                              |
| <b>Date(s):</b>            | 6/4/2013                                                                |                                |                              |
| <b>Temperature:</b> 23 °C  | <b>Air Pressure:</b> 1010 hPa                                           | <b>Relative Humidity:</b> 44 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                         |                                |                              |

**Table 8.2.3 Radiated emission test results**

EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Receive  
TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m

DETECTORS USED: PEAK / QUASI-PEAK  
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* |                      |                   |                                |         |
| 200            | 43.4                    | 41.7                        | 43.5            | -1.8        | H                    | 1.2               | 179                            | Pass    |
| 250            | 40.6                    | 39.2                        | 46.0            | -6.8        | H                    | 1.1               | 190                            |         |
| 300            | 42.7                    | 41.1                        | 46.0            | -4.9        | H                    | 1.2               | 183                            |         |
| 375            | 42.0                    | 40.6                        | 46.0            | -5.4        | H                    | 1.0               | 94                             |         |
| 625            | 44.0                    | 43.1                        | 46.0            | -2.9        | V                    | 1.0               | 282                            |         |
| 800            | 42.0                    | 40.8                        | 46.0            | -5.2        | V                    | 1.0               | 270                            |         |

DETECTORS USED: PEAK / AVERAGE  
FREQUENCY RANGE: 1000 MHz – 8245 MHz  
RESOLUTION BANDWIDTH: 1000 kHz

| Frequency, MHz | Peak                        |                 |             | Average                     |                 |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-----------------------------|-----------------|-------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
|                | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* |                      |                   |                                |         |
| 1333.3         | 48.80                       | 74              | -25.20      | 46.4                        | 54              | -7.60       | V                    | 1.1               | 282                            | Pass    |
| 1340.0         | 47.06                       | 74              | -26.94      | 45.2                        | 54              | -8.80       | V                    | 1.1               | 270                            |         |

\*- Margin = Measured emission - specification limit.

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

**Reference numbers of test equipment used**

|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0604 | HL 1984 | HL 2871 | HL 2909 | HL 4353 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.





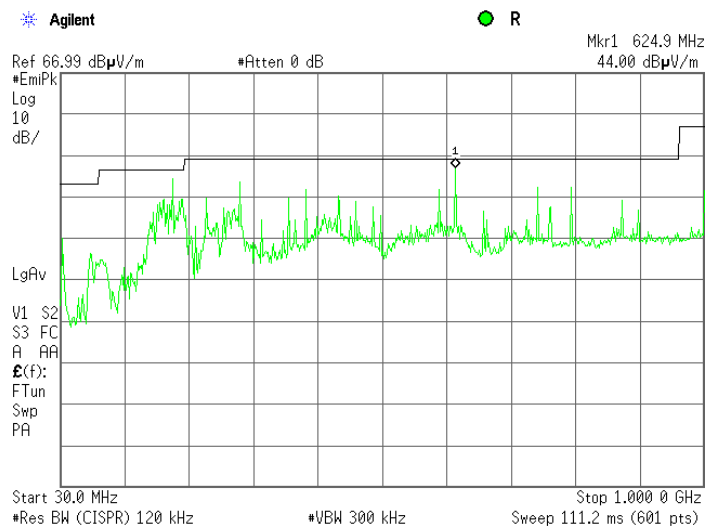
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|                     |                        |                                                                  |                       |
|---------------------|------------------------|------------------------------------------------------------------|-----------------------|
| Test specification: |                        | Section 15.109/RSS-Gen, section 6.1, ICES-003, Radiated emission |                       |
| Test procedure:     |                        | ANSI C63.4, Sections 11.6 and 12.1.4                             |                       |
| Test mode:          |                        | Compliance                                                       | Verdict: PASS         |
| Date(s):            |                        | 6/4/2013                                                         |                       |
| Temperature: 23 °C  | Air Pressure: 1010 hPa | Relative Humidity: 44 %                                          | Power Supply: 120 VAC |
| Remarks:            |                        |                                                                  |                       |

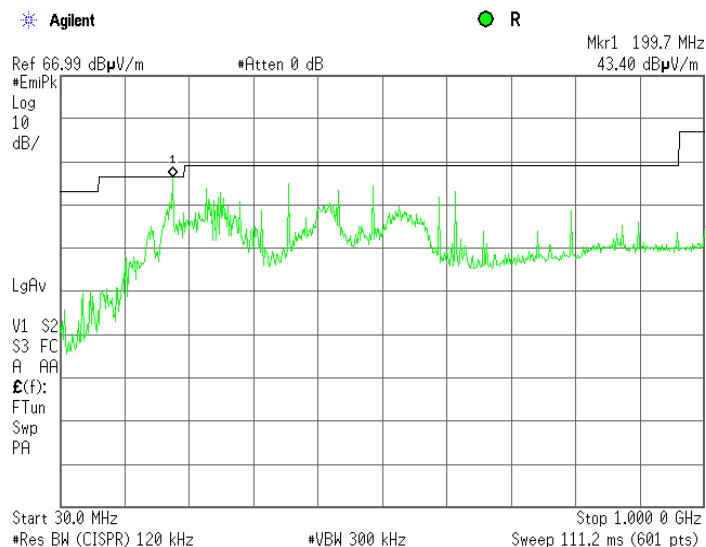
**Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization**

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive



**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  
EUT OPERATING MODE: Receive





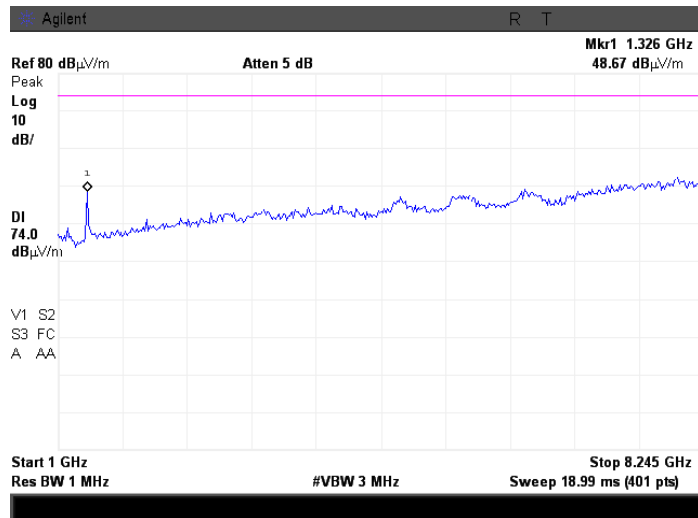
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|                     |                        |                                                                  |                       |
|---------------------|------------------------|------------------------------------------------------------------|-----------------------|
| Test specification: |                        | Section 15.109/RSS-Gen, section 6.1, ICES-003, Radiated emission |                       |
| Test procedure:     |                        | ANSI C63.4, Sections 11.6 and 12.1.4                             |                       |
| Test mode:          |                        | Compliance                                                       | Verdict: PASS         |
| Date(s):            |                        | 6/4/2013                                                         |                       |
| Temperature: 23 °C  | Air Pressure: 1010 hPa | Relative Humidity: 44 %                                          | Power Supply: 120 VAC |
| Remarks:            |                        |                                                                  |                       |

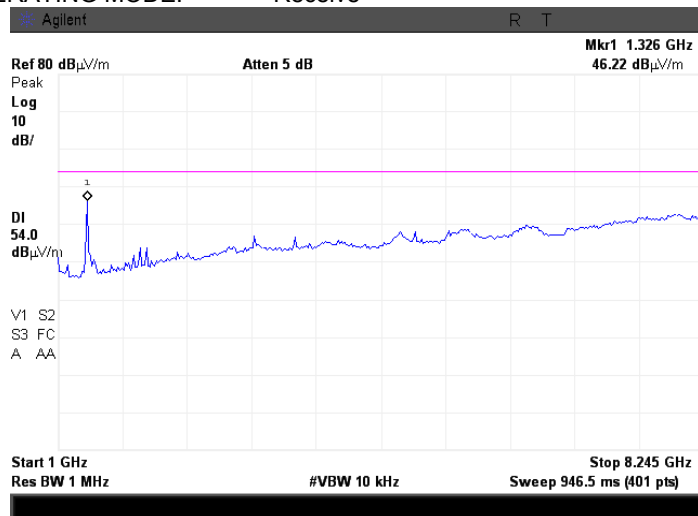
Plot 8.2.3 Radiated emission measurements above 1000 MHz, vertical antenna polarization

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive



Plot 8.2.4 Radiated emission measurements above 1000 MHz, horizontal antenna polarization

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive



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

| HL No | Description                                                        | Manufacturer         | Model            | Ser. No.                 | Last Cal./ Check | Due Cal./ Check |
|-------|--------------------------------------------------------------------|----------------------|------------------|--------------------------|------------------|-----------------|
| 0163  | LISN FCC/VDE/50 Ohm/50 uH + 5 Ohm, MIL-STD-461E, CISPR 16-1        | Electro-Metrics      | ANS 25/2         | 1314                     | 15-Jan-13        | 15-Jan-14       |
| 0446  | Antenna, Loop, Active, 10 kHz - 30 MHz                             | EMCO                 | 6502             | 2857                     | 03-Jul-12        | 03-Jul-14       |
| 0604  | Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz            | EMCO                 | 3141             | 9611-1011                | 04-Jun-13        | 04-Jun-14       |
| 1425  | EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427              | Agilent Technologies | 8542E            | 3710A002 22, 3705A002 04 | 26-Aug-12        | 26-Aug-13       |
| 1513  | Cable RF, 8 m, BNC/BNC                                             | Belden               | M17/167 MIL-C-17 | 1513                     | 02-Sep-12        | 02-Sep-13       |
| 1984  | Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W             | EMC Test Systems     | 3115             | 9911-5964                | 07-Dec-12        | 07-Dec-13       |
| 2780  | EMC analyzer, 100 Hz to 26.5 GHz                                   | Agilent Technologies | E7405A           | MY451024 62              | 10-Jul-13        | 10-Jul-14       |
| 2871  | Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA                 | Huber-Suhner         | 198-8155-00      | 2871                     | 04-Dec-12        | 04-Dec-13       |
| 2909  | Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz                       | Agilent Technologies | E4407B           | MY414447 62              | 20-Dec-12        | 20-Dec-13       |
| 3612  | Cable RF, 17.5 m, N type-N type                                    | Teldor               | RG-214/U         | NA                       | 02-Dec-12        | 02-Dec-13       |
| 4353  | Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M | MegaPhase            | NC29-N1N1-244    | 12025101 003             | 06-Mar-13        | 06-Mar-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 10 m measuring distance<br>Horizontal polarization<br><br>Vertical polarization | Biconilog antenna: $\pm 5.0$ dB<br>Biconical antenna: $\pm 5.0$ dB<br>Log periodic antenna: $\pm 5.1$ dB<br>Double ridged horn antenna: $\pm 5.3$ dB<br>Biconilog antenna: $\pm 5.5$ dB<br>Biconical antenna: $\pm 5.5$ dB<br>Log periodic antenna: $\pm 5.6$ dB<br>Double ridged horn antenna: $\pm 5.8$ 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: 2012 | 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

**Correction factor**  
**Line impedance stabilization network**  
**Model ANS-25/2, Electro-Metrics, HL 0163**

| Frequency, kHz | Correction factor, dB |
|----------------|-----------------------|
| 10             | 4.9                   |
| 15             | 2.86                  |
| 20             | 1.83                  |
| 25             | 1.25                  |
| 30             | 0.91                  |
| 35             | 0.69                  |
| 40             | 0.53                  |
| 50             | 0.35                  |
| 60             | 0.25                  |
| 70             | 0.18                  |
| 80             | 0.14                  |
| 90             | 0.11                  |
| 100            | 0.09                  |
| 125            | 0.06                  |
| 150            | 0.04                  |

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

**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).



**Antenna factor**  
**Double-ridged wave guide horn antenna**  
**Model 3115, S/N 9911-5964, HL1984**

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|
| 1000.0            | 24.7                       |
| 1500.0            | 25.7                       |
| 2000.0            | 27.6                       |
| 2500.0            | 28.9                       |
| 3000.0            | 31.2                       |
| 3500.0            | 32.0                       |
| 4000.0            | 32.5                       |
| 4500.0            | 32.7                       |
| 5000.0            | 33.6                       |
| 5500.0            | 35.1                       |
| 6000.0            | 35.4                       |
| 6500.0            | 34.9                       |
| 7000.0            | 36.1                       |
| 7500.0            | 37.8                       |
| 8000.0            | 38.0                       |
| 8500.0            | 38.1                       |
| 9000.0            | 39.1                       |
| 9500.0            | 38.3                       |
| 10000.0           | 38.6                       |
| 10500.0           | 38.2                       |
| 11000.0           | 38.7                       |
| 11500.0           | 39.5                       |
| 12000.0           | 40.0                       |
| 12500.0           | 40.4                       |
| 13000.0           | 40.5                       |
| 13500.0           | 41.1                       |
| 14000.0           | 41.6                       |
| 14500.0           | 41.7                       |
| 15000.0           | 38.7                       |
| 15500.0           | 38.2                       |
| 16000.0           | 38.8                       |
| 16500.0           | 40.5                       |
| 17000.0           | 42.5                       |
| 17500.0           | 45.9                       |
| 18000.0           | 49.4                       |

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).



**Cable loss**  
**Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00,**  
**HL 2871**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.12              | 5750              | 2.34              | 12000             | 3.55              |
| 30                | 0.14              | 6000              | 2.39              | 12250             | 3.61              |
| 100               | 0.27              | 6250              | 2.46              | 12500             | 3.67              |
| 250               | 0.45              | 6500              | 2.52              | 12750             | 3.74              |
| 500               | 0.63              | 6750              | 2.58              | 13000             | 3.79              |
| 750               | 0.76              | 7000              | 2.64              | 13250             | 3.82              |
| 1000              | 0.89              | 7250              | 2.68              | 13500             | 3.83              |
| 1250              | 1.01              | 7500              | 2.73              | 13750             | 3.83              |
| 1500              | 1.12              | 7750              | 2.78              | 14000             | 3.88              |
| 1750              | 1.23              | 8000              | 2.83              | 14250             | 3.93              |
| 2000              | 1.32              | 8250              | 2.88              | 14500             | 3.96              |
| 2250              | 1.41              | 8500              | 2.94              | 14750             | 4.01              |
| 2500              | 1.49              | 8750              | 2.97              | 15000             | 4.00              |
| 2750              | 1.58              | 9000              | 3.02              | 15250             | 4.01              |
| 3000              | 1.66              | 9250              | 3.07              | 15500             | 4.00              |
| 3250              | 1.73              | 9500              | 3.13              | 15750             | 4.13              |
| 3500              | 1.80              | 9750              | 3.18              | 16000             | 4.22              |
| 3750              | 1.87              | 10000             | 3.21              | 16250             | 4.29              |
| 4000              | 1.93              | 10250             | 3.26              | 16500             | 4.29              |
| 4250              | 2.01              | 10500             | 3.30              | 16750             | 4.32              |
| 4500              | 2.06              | 10750             | 3.36              | 17000             | 4.37              |
| 4750              | 2.12              | 11000             | 3.39              | 17250             | 4.45              |
| 5000              | 2.17              | 11250             | 3.44              | 17500             | 4.49              |
| 5250              | 2.24              | 11500             | 3.48              | 17750             | 4.53              |
| 5500              | 2.29              | 11750             | 3.52              | 18000             | 4.55              |

**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              |                   |                   |

## 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