

# TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.231

FOR:

**3M Electronic Monitoring Ltd.**  
**One-Piece Home Curfew RF**  
**Monitoring Unit**  
**Model: 1000B**  
**FCC ID: DGF-TSSDB-830-5**

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## 1 Applicant information

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## 2 Equipment under test attributes

**Product name:** One-Piece Home Curfew RF Monitoring Unit  
**Product type:** Transceiver  
**Model:** 1000B  
**Serial number:** 52434671  
**Hardware version:** B08  
**Software release:** 13.1  
**Receipt date:** 09-Mar-16

## 3 Manufacturer information

**Manufacturer name:** 3M Electronic Monitoring Ltd.  
**Address:** 2 Habarzel St., P.O. Box13236, Tel-Aviv 6971002, Israel  
**Telephone:** +972 3-7671700 ext. 6551  
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**E-mail:** hsharet@mmm.com  
**Contact name:** Mr. Hanan Sharet

## 4 Test details

**Project ID:** 28093  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 09-Mar-16  
**Test completed:** 20-Apr-16  
**Test specification:** FCC 47CFR part 15, subpart C, §15.231

## 5 Tests summary

| Test                                               | Status |
|----------------------------------------------------|--------|
| <b>Transmitter characteristics</b>                 |        |
| Section 15.231(a), Periodic operation requirements | Pass   |
| Section 15.231(b), Field strength of emissions     | Pass   |
| Section 15.231(c), Occupied bandwidth              | Pass   |
| Section 15.203, Antenna requirement                | Pass   |
| Section 15.207(a), Conducted emission              | Pass   |

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

The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

This test report supersedes the previously issued test report identified by Doc ID:3MERAD\_FCC.28093F\_rev1.

|                     | Name and Title                               | Date           | Signature                                                                            |
|---------------------|----------------------------------------------|----------------|--------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mrs. E. Pitt, test engineer                  | April 20, 2016 |   |
| <b>Reviewed by:</b> | Ms. N. Averin, certification engineer        | May 4, 2016    |   |
| <b>Approved by:</b> | Mr. M. Nikishin, EMC and Radio group manager | June 6, 2016   |  |

## 6 EUT description

### 6.1 General information

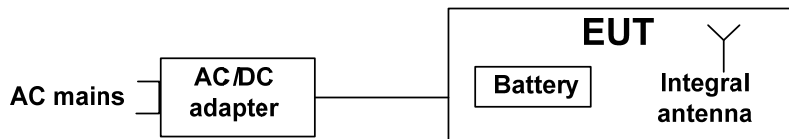
The EUT, One-Piece Home Curfew RF Monitoring Unit, is placed at the Offender's home to provide an enhanced level of home curfew control for offender under supervision of 1Piece GPS tracking program. The EUT provides an alternative RF communication, allowing for continued monitoring of the offender while indoors. This functionality allows the 1 Piece device to discontinue searching for GPS/LBS location when indoors, thus saving on the battery life of the 1 Piece unit. The EUT comprises the 433 MHz transceiver.

The EUT is powered from AC mains via AC/DC adapter. The AC/DC adapters part number KSAS0121200100HU and part number DCA-12PFT-12FUS 120100 were used during the testing. The EUT is equipped with internal backup battery.

### 6.2 Ports and lines

| Port type | Port description | Connected from | Connected to  | Qty. | Cable type | Cable length | Indoor / outdoor |
|-----------|------------------|----------------|---------------|------|------------|--------------|------------------|
| Power     | DC power         | EUT            | AC/DC adapter | 1    | Unshielded | 1.5 m        | Indoor           |
| Power     | AC power         | AC/DC adapter  | AC mains      | 1    | NA         | NA           | Indoor           |

### 6.3 Test configuration



### 6.4 Transmitter characteristics

| Type of equipment                                |                                                                                                          |                                         |         |                  |                                                               |  |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------|---------|------------------|---------------------------------------------------------------|--|
| X                                                | 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)                                          |                                         |         |                  |                                                               |  |
| Operating frequency                              |                                                                                                          | 433.92 MHz                              |         |                  |                                                               |  |
| Maximum rated output power                       |                                                                                                          | At transmitter 50 Ω RF output connector |         |                  | dBm                                                           |  |
|                                                  |                                                                                                          | Field strength at 3 m distance          |         |                  | 99.67 dB(μV/m) -peak<br>69.67 dB(μV/m)-average                |  |
| Is transmitter output power variable?            |                                                                                                          | X                                       | No      |                  |                                                               |  |
|                                                  |                                                                                                          |                                         | Yes     |                  | continuous variable                                           |  |
|                                                  |                                                                                                          |                                         |         |                  | stepped variable with stepsize                                |  |
|                                                  |                                                                                                          |                                         |         |                  | dB                                                            |  |
|                                                  |                                                                                                          |                                         |         | minimum RF power | dBm                                                           |  |
|                                                  |                                                                                                          | maximum RF power                        | dBm     |                  |                                                               |  |
| Antenna connection                               |                                                                                                          |                                         |         |                  |                                                               |  |
| unique coupling                                  |                                                                                                          | standard connector                      |         | X                | integral                                                      |  |
|                                                  |                                                                                                          |                                         |         | X                | with temporary RF connector<br>without temporary RF connector |  |
| Type of modulation                               |                                                                                                          | GFSK                                    |         |                  |                                                               |  |
| Transmitter aggregate data rate/s                |                                                                                                          | 76.8 kbps                               |         |                  |                                                               |  |
| Transmitter power source                         |                                                                                                          |                                         |         |                  |                                                               |  |
| X                                                | Battery                                                                                                  | Nominal rated voltage                   | 3.6 VDC | Battery type     | Lithium-Ion                                                   |  |
|                                                  | DC                                                                                                       | Nominal rated voltage                   | VDC     |                  |                                                               |  |
| X                                                | AC mains                                                                                                 | Nominal rated voltage                   | 120 VAC | Frequency        | 60 Hz                                                         |  |
| Common power source for transmitter and receiver |                                                                                                          |                                         |         | X                | yes                                                           |  |
|                                                  |                                                                                                          |                                         |         |                  | no                                                            |  |

|                     |                                                    |                         |                       |
|---------------------|----------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(a), Periodic operation requirements |                         |                       |
| Test procedure:     | Supplier declaration                               |                         |                       |
| Test mode:          | Compliance                                         | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16                                          |                         |                       |
| Temperature: 23 °C  | Air Pressure: 1010 hPa                             | Relative Humidity: 55 % | Power Supply: 120 VAC |
| Remarks:            |                                                    |                         |                       |

## 7 Transmitter tests according to 47CFR part 15 subpart C requirements

### 7.1 Periodic operation requirements

#### 7.1.1 General

The EUT was verified for compliance with periodic operation requirements listed below:

- Continuous transmissions such as voice, video and the radio control of toys are not permitted;
- A manually operated transmitter shall employ switch that will automatically deactivate the transmitter within not more than 5 seconds of being released;
- A transmitter activated automatically shall cease transmission within 5 seconds after activation;
- Periodic transmissions, excluding polling or supervision transmissions, at regular predetermined intervals are not permitted;
- Total duration of polling or supervision transmissions, including data, to determine system integrity in security or safety applications shall not exceed 2 seconds per hour;
- Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

The rationale for compliance with the above requirements was either test results or supplier declaration. The summary of results is provided in Table 7.1.1.

#### 7.1.2 Test procedure for transmitter shut down test

7.1.2.1 The EUT was set up as shown in Figure 7.1.1.

7.1.2.2 The spectrum analyzer center frequency was adjusted to the EUT carrier, span set to zero and video triggered for transmission.

7.1.2.3 The transmitter was activated automatically.

7.1.2.4 The transmission time was captured and shown in Plot 7.1.1.

#### 7.1.3 Test procedure for measurements of polling / supervision transmission duration

7.1.3.1 The EUT was set up as shown in Figure 7.1.1.

7.1.3.2 The spectrum analyzer center frequency was adjusted to the EUT carrier, span set to zero and video triggered for transmission.

7.1.3.3 The transmission time was captured and shown in Plot 7.1.2.

Figure 7.1.1 Setup for transmitter shut down test



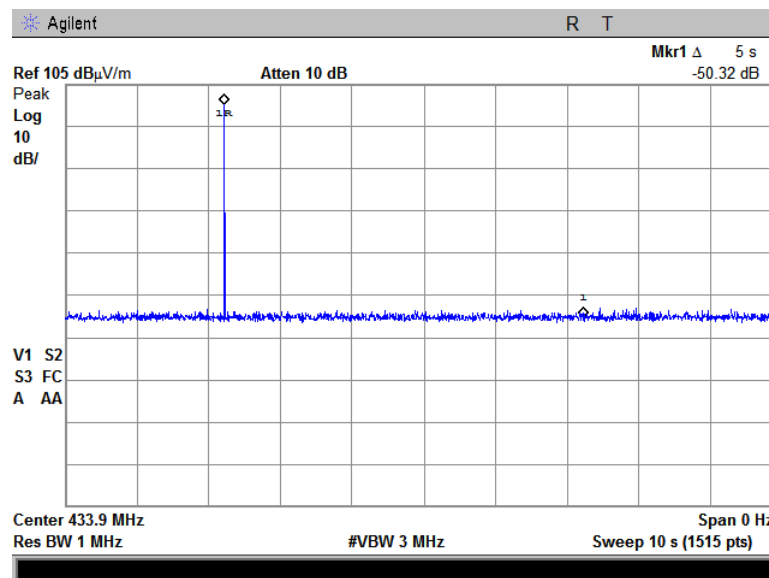


|                            |                                                           |                                |                              |
|----------------------------|-----------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.231(a), Periodic operation requirements</b> |                                |                              |
| <b>Test procedure:</b>     | Supplier declaration                                      |                                |                              |
| <b>Test mode:</b>          | Compliance                                                | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 09-Mar-16                                                 |                                |                              |
| <b>Temperature:</b> 23 °C  | <b>Air Pressure:</b> 1010 hPa                             | <b>Relative Humidity:</b> 55 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                           |                                |                              |

Table 7.1.1 Periodic operation requirements

| Requirement                                                                                                                                                                                                                                                                                                                                                       | Rationale              | Verdict |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------|
| Continuous transmissions are not permitted                                                                                                                                                                                                                                                                                                                        | Supplier declaration   | Comply  |
| A manually operated transmitter shall be deactivated within not more than 5 seconds of switch being released                                                                                                                                                                                                                                                      | NA                     | NA      |
| Transmitter activated automatically shall cease transmission within 5 seconds                                                                                                                                                                                                                                                                                     | Plot 7.1.1             | Comply  |
| Periodic transmissions at regular predetermined intervals are not permitted                                                                                                                                                                                                                                                                                       | Supplier declaration   | Comply  |
| Total duration of polling or supervision transmissions shall not exceed 2 seconds per hour                                                                                                                                                                                                                                                                        | Plot 7.1.2, Plot 7.1.3 | Comply  |
| Transmission of set-up information for security systems may exceed the transmission duration limits of 5 seconds, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data. | NA                     | NA      |

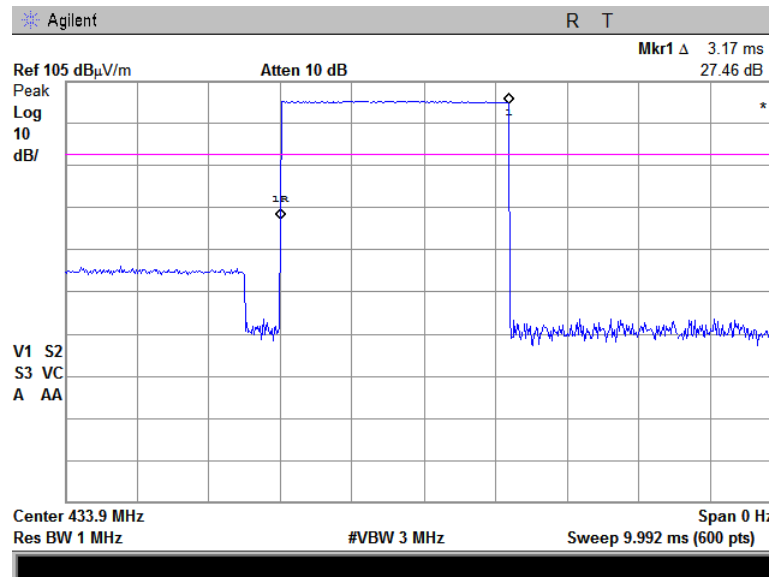
Plot 7.1.1 Transmitter shut down test result





|                     |                                                    |                         |                       |
|---------------------|----------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(a), Periodic operation requirements |                         |                       |
| Test procedure:     | Supplier declaration                               |                         |                       |
| Test mode:          | Compliance                                         | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16                                          |                         |                       |
| Temperature: 23 °C  | Air Pressure: 1010 hPa                             | Relative Humidity: 55 % | Power Supply: 120 VAC |
| Remarks:            |                                                    |                         |                       |

Plot 7.1.2 Polling / supervision transmission duration



Plot 7.1.3 Polling / supervision transmission period

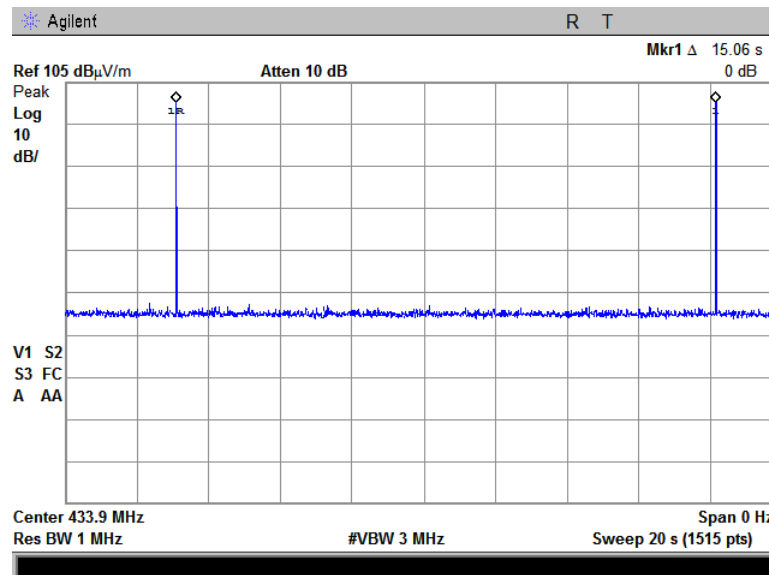


Table 7.1.2 Total duration of polling / supervision transmissions

| Duration, ms | Repetition period, s | Maximum number of transmissions within 1 hour | Total duration within 1 hour, ms |
|--------------|----------------------|-----------------------------------------------|----------------------------------|
| 3.17         | 15                   | 240                                           | 760.8                            |

## Reference numbers of test equipment used

|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 0604 | HL 2780 | HL 4278 | HL 4353 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.





|                            |                                                       |                                |                              |
|----------------------------|-------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.231(b), Field strength of emissions</b> |                                |                              |
| <b>Test procedure:</b>     | ANSI C63.10 sections 6.5, 6.6                         |                                |                              |
| <b>Test mode:</b>          | Compliance                                            | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 09-Mar-16 - 20-Apr-16                                 |                                |                              |
| <b>Temperature: 22 °C</b>  | <b>Air Pressure: 1010 hPa</b>                         | <b>Relative Humidity: 48 %</b> | <b>Power Supply: 120 VAC</b> |
| <b>Remarks:</b>            |                                                       |                                |                              |

## 7.2 Field strength of emissions

### 7.2.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.2.1 and Table 7.2.2.

**Table 7.2.1 Radiated fundamental emission limits**

| Fundamental frequency, MHz | Field strength at 3 m, dB(μV/m) |         |
|----------------------------|---------------------------------|---------|
|                            | Peak                            | Average |
| 433.92                     | 100.8                           | 80.8    |

**Table 7.2.2 Radiated spurious emissions limits**

| Frequency, MHz | Field strength at 3 m, dB(μV/m) |                 |                 |                          |         |
|----------------|---------------------------------|-----------------|-----------------|--------------------------|---------|
|                | Within restricted bands         |                 |                 | Outside restricted bands |         |
|                | Peak                            | Quasi Peak      | Average         | Peak                     | Average |
| 0.009 – 0.090  | 148.5 – 128.5                   | NA              | 128.5 – 108.5** | 80.8                     | 60.8    |
| 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:

$$\text{Lim}_{S2} = \text{Lim}_{S1} + 40 \log(S_1/S_2),$$

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

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

Note 1: The fundamental emission limit in dB(μV/m) was calculated as follows:

$$\text{Lim}_{AVR} = 20 \times \log(56.81818 \times F - 6136.3636) \text{ - within } 130 - 174 \text{ MHz band;}$$

$$\text{Lim}_{AVR} = 20 \times \log(41.6667 \times F - 7083.3333) \text{ - within } 260 - 470 \text{ MHz band,}$$

where  $F$  is the carrier frequency in MHz.

The limit for spurious emissions was 20 dB lower than fundamental emission limit.

The above limits provided in terms of average values, peak limit was 20 dB above the average limit.

Note 2: 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.

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

**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 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.

**7.2.2.3** The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

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

**7.2.3.1** The EUT was set up as shown in Figure 7.2.2, energized and the performance check was conducted.

**7.2.3.2** 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.

**7.2.3.3** The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

|                     |                                                |                         |                       |
|---------------------|------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(b), Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.10 sections 6.5, 6.6                  |                         |                       |
| Test mode:          | Compliance                                     | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16 - 20-Apr-16                          |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa                         | Relative Humidity: 48 % | Power Supply: 120 VAC |
| Remarks:            |                                                |                         |                       |

Figure 7.2.1 Setup for spurious emission field strength measurements below 30 MHz

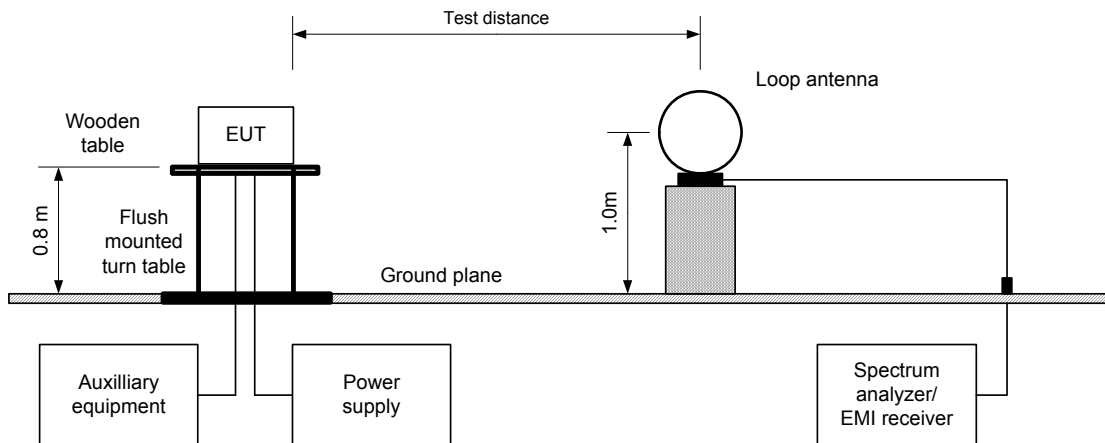
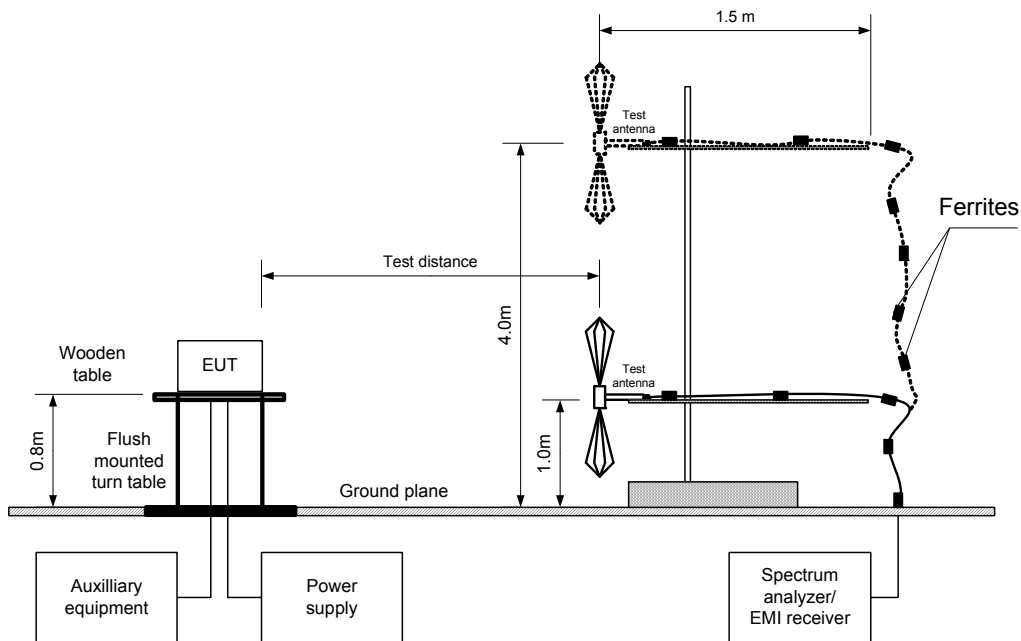


Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz





|                            |                                                       |                                |                              |
|----------------------------|-------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.231(b), Field strength of emissions</b> |                                |                              |
| <b>Test procedure:</b>     | ANSI C63.10 sections 6.5, 6.6                         |                                |                              |
| <b>Test mode:</b>          | Compliance                                            | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 09-Mar-16 - 20-Apr-16                                 |                                |                              |
| <b>Temperature:</b> 22 °C  | <b>Air Pressure:</b> 1010 hPa                         | <b>Relative Humidity:</b> 48 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                       |                                |                              |

**Table 7.2.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz**

TEST DISTANCE: 3 m  
 EUT POSITION: Typical (Vertical)  
 MODULATION: GFSK  
 BIT RATE: 76.8 kbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 INVESTIGATED FREQUENCY RANGE: 0.009 - 4500 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)  
 9.0 kHz (150 kHz – 30 MHz)  
 120 kHz (30 MHz – 1000 MHz)  
 1.0 MHz (above 1000 MHz)  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Log periodic (200 MHz – 1000 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)

| F, MHz                  | Antenna |           | Azimuth, degrees* | Peak field strength |                 |              | Average field strength |                      |                 |              | Verdict |
|-------------------------|---------|-----------|-------------------|---------------------|-----------------|--------------|------------------------|----------------------|-----------------|--------------|---------|
|                         | Pol.    | Height, m |                   | Measured, dB(μV/m)  | Limit, dB(μV/m) | Margin, dB** | Measured, dB(μV/m)     | Calculated, dB(μV/m) | Limit, dB(μV/m) | Margin, dB** |         |
| Fundamental emission*** |         |           |                   |                     |                 |              |                        |                      |                 |              |         |
| 433.92                  | V       | 1.2       | 142               | 99.67               | 100.8           | -1.13        | 99.67                  | 69.67                | 80.8            | -11.33       | Pass    |
| Spurious emissions      |         |           |                   |                     |                 |              |                        |                      |                 |              |         |
| 867.763                 | V       | 1.1       | 60                | 39.69               | 80.8            | -41.11       | 39.69                  | 9.69                 | 60.8            | -51.11       | Pass    |
| 1301.748                | V       | 1.3       | 30                | 47.76               | 74.0            | -26.24       | 47.76                  | 17.76                | 54.0            | -36.24       |         |
| 1735.488                | V       | 1.5       | 80                | 40.78               | 80.8            | -40.02       | 40.78                  | 10.78                | 60.8            | -50.02       |         |

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

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

\*\*\* Max value was obtained at Unom (115%Unom, 85%Unom) input power voltage.

**Table 7.2.4 Average factor calculation**

| Transmission pulse |                               | Transmission burst |            | Transmission train duration, ms | Average factor, dB |
|--------------------|-------------------------------|--------------------|------------|---------------------------------|--------------------|
| Duration, ms       | Number pulse within 100 msec, | Duration, ms       | Period, ms |                                 |                    |
| 3.17               | 1                             | NA                 | NA         | NA                              | -30                |

\*- 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 0034 | HL 0446 | HL 0521 | HL 0604 | HL 3340 | HL 4278 | HL 4353 | HL 4339 |
| HL 4933 |         |         |         |         |         |         |         |

Full description is given in Appendix A.



|                            |                                                       |                                |                              |
|----------------------------|-------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.231(b), Field strength of emissions</b> |                                |                              |
| <b>Test procedure:</b>     | ANSI C63.10 sections 6.5, 6.6                         |                                |                              |
| <b>Test mode:</b>          | Compliance                                            | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 09-Mar-16 - 20-Apr-16                                 |                                |                              |
| <b>Temperature:</b> 22 °C  | <b>Air Pressure:</b> 1010 hPa                         | <b>Relative Humidity:</b> 48 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                       |                                |                              |

**Table 7.2.5 Field strength of emissions below 1 GHz within restricted bands**

TEST DISTANCE: 3 m  
 EUT POSITION: Typical (Vertical)  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)  
                                           9.0 kHz (150 kHz – 30 MHz)  
                                           120 kHz (30 MHz – 1000 MHz)  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
                                           Log periodic (200 MHz – 1000 MHz)  
                                           Biconilog (30 MHz – 1000 MHz)

| Frequency,<br>MHz        | Peak<br>emission,<br>dB(μV/m) | Quasi-peak                        |                    |                | Antenna<br>polarization | Antenna<br>height,<br>m | Turn-table<br>position**,<br>degrees | Verdict |
|--------------------------|-------------------------------|-----------------------------------|--------------------|----------------|-------------------------|-------------------------|--------------------------------------|---------|
|                          |                               | Measured<br>emission,<br>dB(μV/m) | Limit,<br>dB(μV/m) | Margin,<br>dB* |                         |                         |                                      |         |
| No emissions were found. |                               |                                   |                    |                |                         |                         |                                      | Pass    |

\*- Margin = Measured emission - specification limit.

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

**Table 7.2.6 Restricted bands**

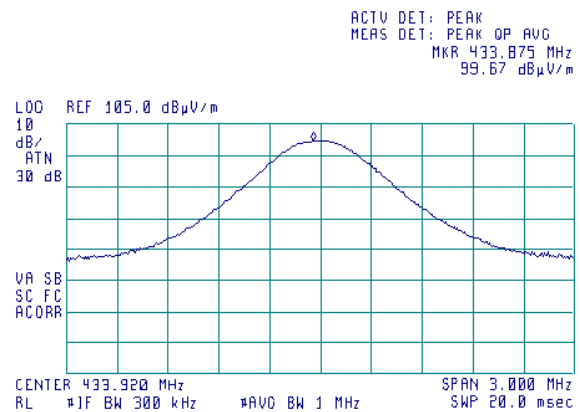
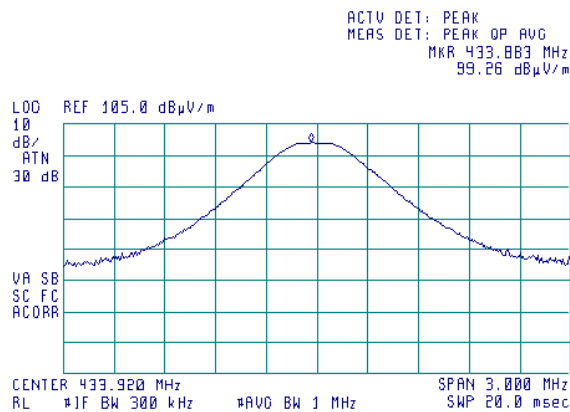
| MHz               | MHz                 | MHz                   | MHz             | MHz           | GHz           |
|-------------------|---------------------|-----------------------|-----------------|---------------|---------------|
| 0.09 - 0.11       | 8.37625 - 8.38675   | 73 - 74.6             | 399.9 - 410     | 2690 - 2900   | 10.6 - 12.7   |
| 0.495 - 0.505     | 8.41425 - 8.41475   | 74.8 - 75.2           | 608 - 614       | 3260 - 3267   | 13.25 - 13.4  |
| 2.1735 - 2.1905   | 12.29 - 12.293      | 108 - 121.94          | 960 - 1240      | 3332 - 3339   | 14.47 - 14.5  |
| 4.125 - 4.128     | 12.51975 - 12.52025 | 123 - 138             | 1300 - 1427     | 3345.8 - 3358 | 15.35 - 16.2  |
| 4.17725 - 4.17775 | 12.57675 - 12.57725 | 149.9 - 150.05        | 1435 - 1626.5   | 3600 - 4400   | 17.7 - 21.4   |
| 4.20725 - 4.20775 | 13.36 - 13.41       | 156.52475 - 156.52525 | 1645.5 - 1646.5 | 4500 - 5150   | 22.01 - 23.12 |
| 6.215 - 6.218     | 16.42 - 16.423      | 156.7 - 156.9         | 1660 - 1710     | 5350 - 5460   | 23.6 - 24     |
| 6.26775 - 6.26825 | 16.69475 - 16.69525 | 162.0125 - 167.17     | 1718.8 - 1722.2 | 7250 - 7750   | 31.2 - 31.8   |
| 6.31175 - 6.31225 | 16.80425 - 16.80475 | 167.72 - 173.2        | 2200 - 2300     | 8025 - 8500   | 36.43 - 36.5  |
| 8.291 - 8.294     | 25.5 - 25.67        | 240 - 285             | 2310 - 2390     | 9000 - 9200   | Above 38.6    |
| 8.362 - 8.366     | 37.5 - 38.25        | 322 - 335.4           | 2483.5 - 2500   | 9300 - 9500   |               |



|                     |                                                |                         |                       |
|---------------------|------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(b), Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.10 sections 6.5, 6.6                  |                         |                       |
| Test mode:          | Compliance                                     | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16 - 20-Apr-16                          |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa                         | Relative Humidity: 48 % | Power Supply: 120 VAC |
| Remarks:            |                                                |                         |                       |

Plot 7.2.1 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical  
 EUT POSITION: Typical (Vertical)  
 INPUT VOLTAGE: Unom

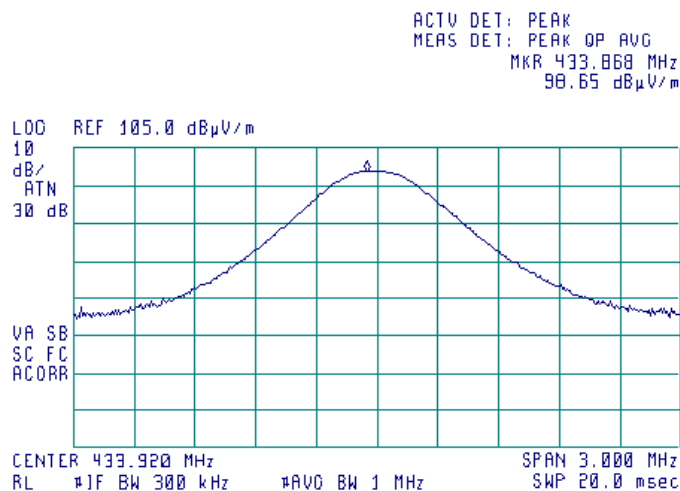


With AC/DC adapter part number KSAS01212200100HU

with AC/DC adapter part number PS DSA-12PFT-12FUS 120100-U22

Plot 7.2.2 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Horizontal  
 EUT POSITION: Typical (Vertical)  
 INPUT VOLTAGE: Unom



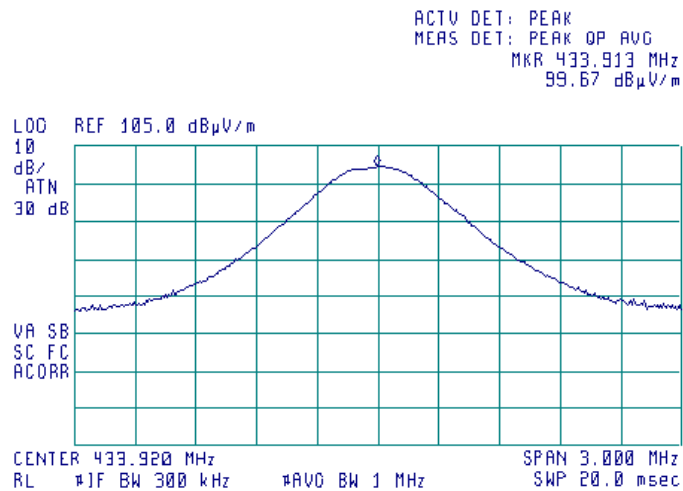
With AC/DC adapter part number KSAS01212200100HU and  
 with AC/DC adapter part number PS DSA-12PFT-12FUS 120100-U22



|                     |                                                |                         |                       |
|---------------------|------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(b), Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.10 sections 6.5, 6.6                  |                         |                       |
| Test mode:          | Compliance                                     | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16 - 20-Apr-16                          |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa                         | Relative Humidity: 48 % | Power Supply: 120 VAC |
| Remarks:            |                                                |                         |                       |

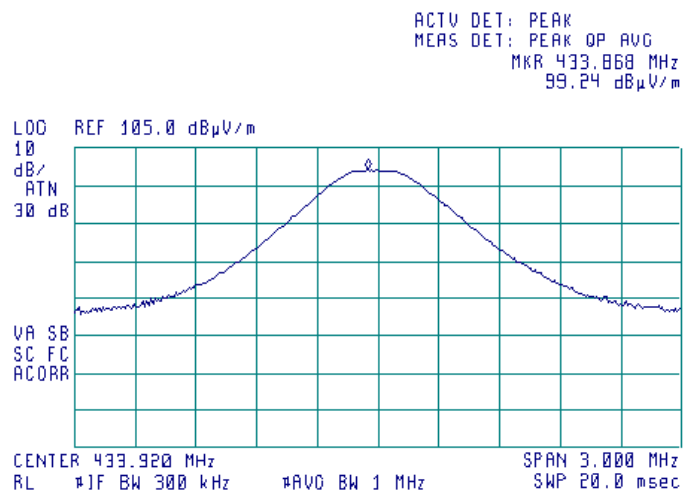
Plot 7.2.3 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical & Horizontal  
 EUT POSITION: Typical (Vertical)  
 INPUT VOLTAGE: 115%Unom



Plot 7.2.4 Radiated emission measurements at the fundamental frequency

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical & Horizontal  
 EUT POSITION: Typical (Vertical)  
 INPUT VOLTAGE: 85%Unom

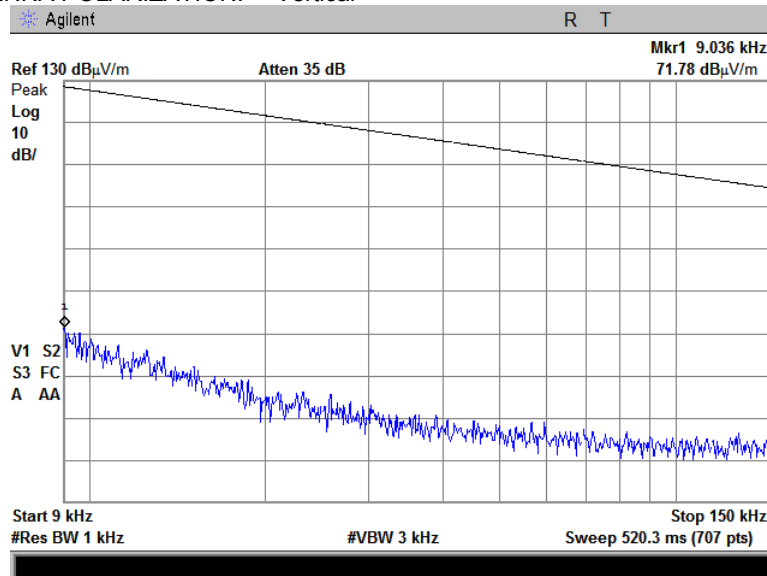




|                     |                                                |                         |                       |
|---------------------|------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(b), Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.10 sections 6.5, 6.6                  |                         |                       |
| Test mode:          | Compliance                                     | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16 - 20-Apr-16                          |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa                         | Relative Humidity: 48 % | Power Supply: 120 VAC |
| Remarks:            |                                                |                         |                       |

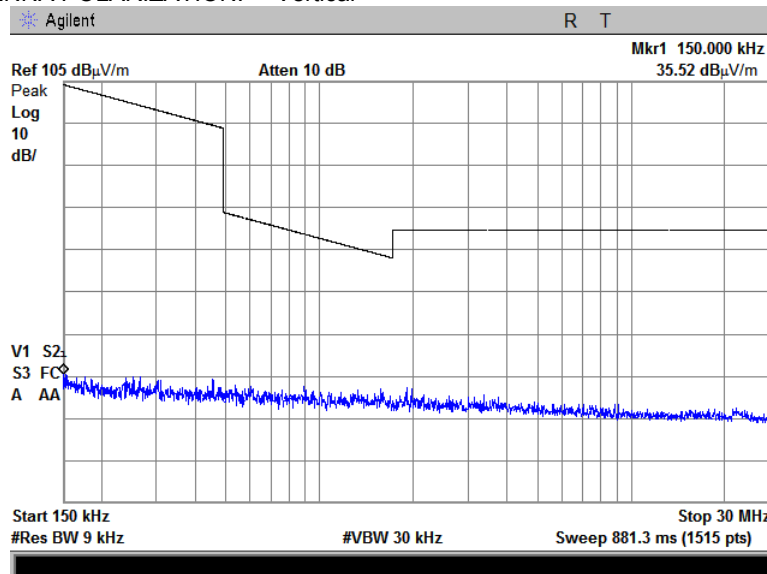
Plot 7.2.5 Radiated emission measurements from 9 to 150 kHz

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



Plot 7.2.6 Radiated emission measurements from 0.15 to 30 MHz

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

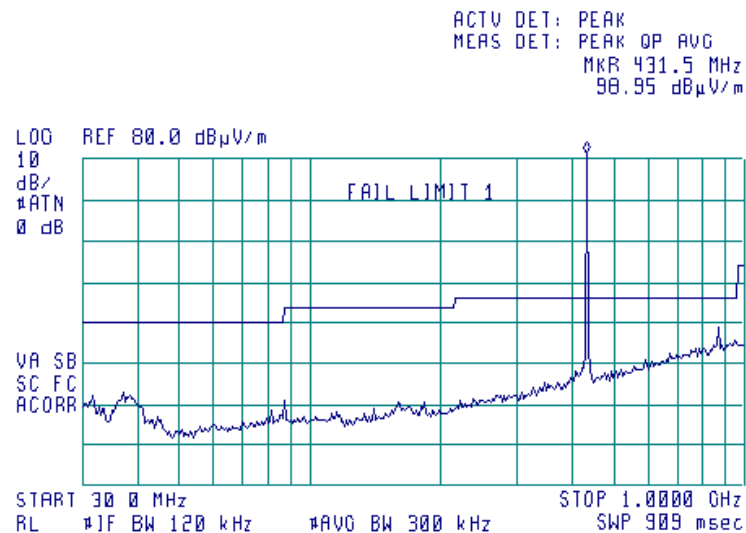




|                     |                                                |                         |                       |
|---------------------|------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(b), Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.10 sections 6.5, 6.6                  |                         |                       |
| Test mode:          | Compliance                                     | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16 - 20-Apr-16                          |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa                         | Relative Humidity: 48 % | Power Supply: 120 VAC |
| Remarks:            |                                                |                         |                       |

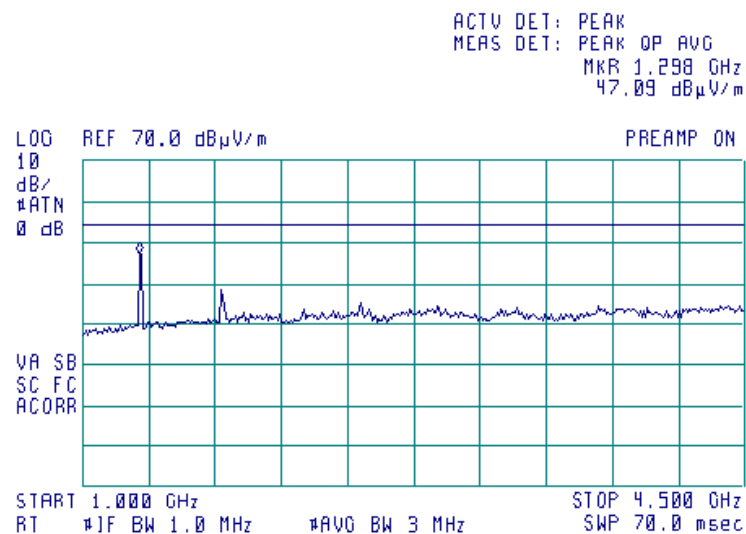
## Plot 7.2.7 Radiated emission measurements from 30 to 1000 MHz

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



## Plot 7.2.8 Radiated emission measurements from 1000 to 4500 MHz

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



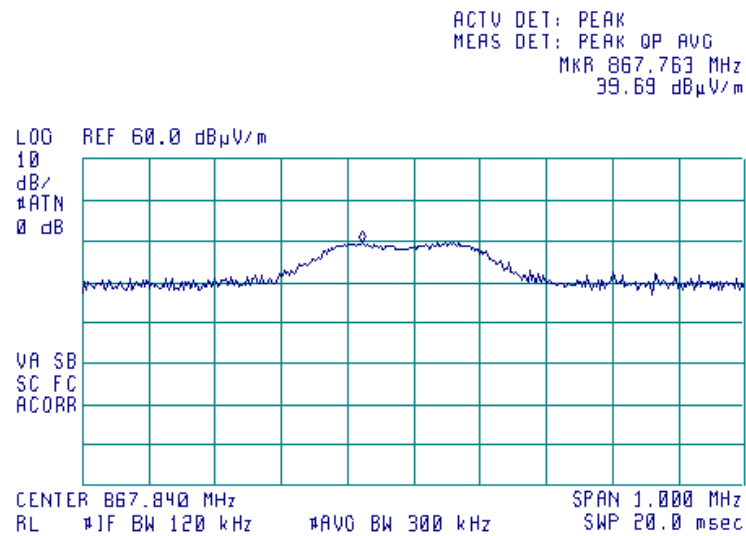




|                     |                                                |                         |                       |
|---------------------|------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(b), Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.10 sections 6.5, 6.6                  |                         |                       |
| Test mode:          | Compliance                                     | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16 - 20-Apr-16                          |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa                         | Relative Humidity: 48 % | Power Supply: 120 VAC |
| Remarks:            |                                                |                         |                       |

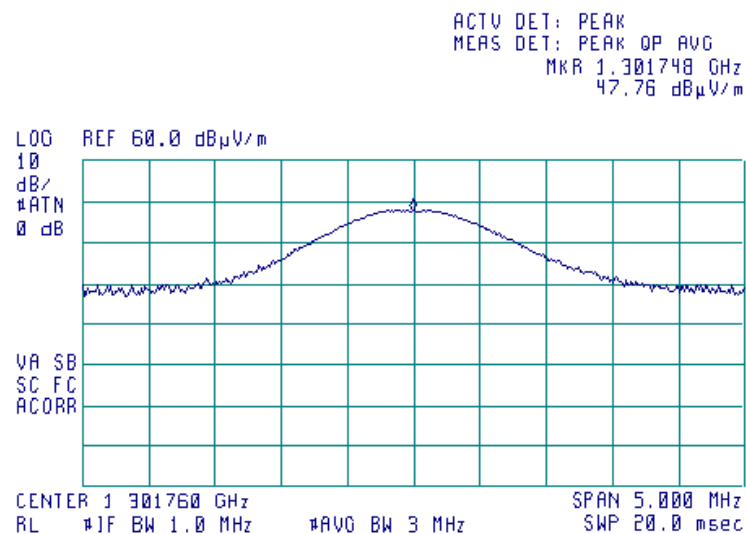
### Plot 7.2.9 Radiated emission measurements at the second harmonic frequency

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



### Plot 7.2.10 Radiated emission measurements at the third harmonic frequency

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

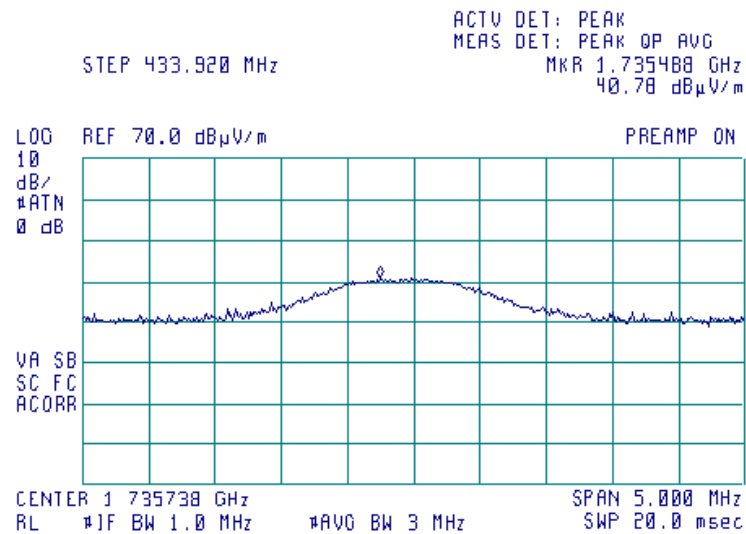




|                     |                                                |                         |                       |
|---------------------|------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(b), Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.10 sections 6.5, 6.6                  |                         |                       |
| Test mode:          | Compliance                                     | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16 - 20-Apr-16                          |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa                         | Relative Humidity: 48 % | Power Supply: 120 VAC |
| Remarks:            |                                                |                         |                       |

## Plot 7.2.11 Radiated emission measurements at the 4th harmonic frequency

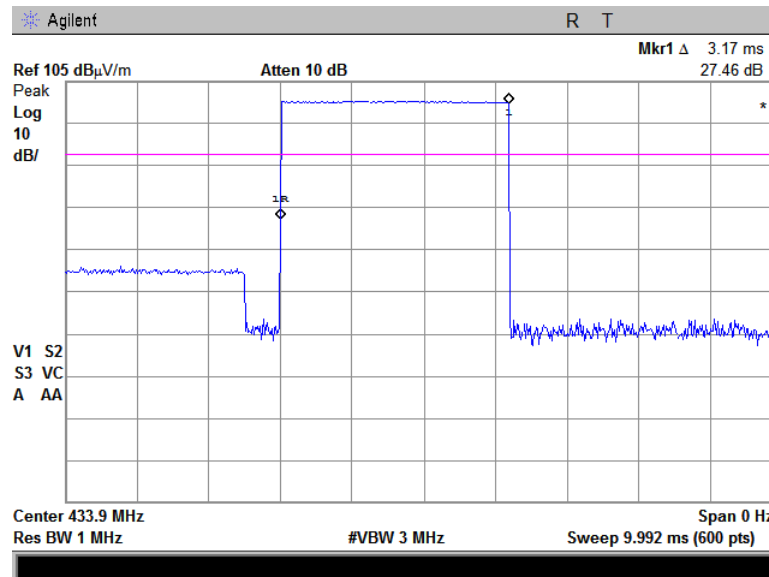
TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical & Horizontal



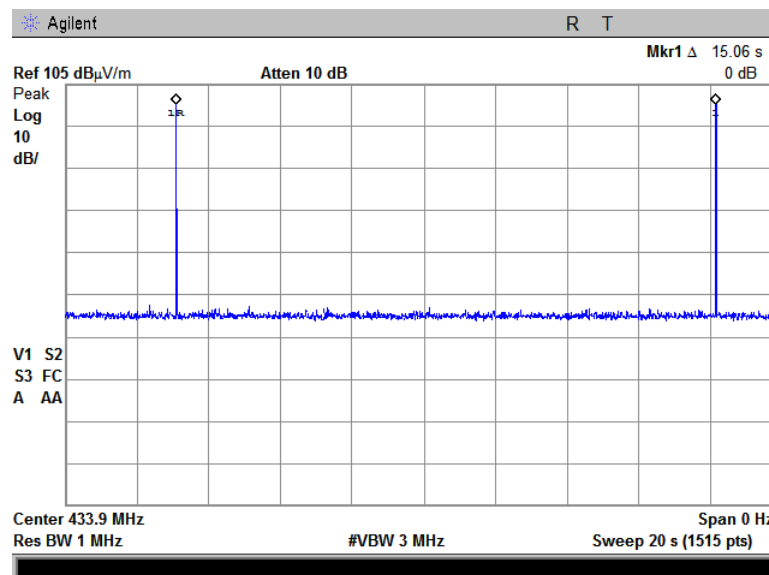


|                     |                                                |                         |                       |
|---------------------|------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.231(b), Field strength of emissions |                         |                       |
| Test procedure:     | ANSI C63.10 sections 6.5, 6.6                  |                         |                       |
| Test mode:          | Compliance                                     | Verdict:                | PASS                  |
| Date(s):            | 09-Mar-16 - 20-Apr-16                          |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa                         | Relative Humidity: 48 % | Power Supply: 120 VAC |
| Remarks:            |                                                |                         |                       |

Plot 7.2.12 Transmission pulse duration



Plot 7.2.13 Transmission pulse period





|                            |                                              |                                |                              |
|----------------------------|----------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.231(c), Occupied bandwidth</b> |                                |                              |
| <b>Test procedure:</b>     | ANSI C63.10 section 6.9.2                    |                                |                              |
| <b>Test mode:</b>          | Compliance                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 11-Mar-16                                    |                                |                              |
| <b>Temperature:</b> 22 °C  | <b>Air Pressure:</b> 1010 hPa                | <b>Relative Humidity:</b> 54 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                              |                                |                              |

## 7.3 Occupied bandwidth test

### 7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1. The test results are provided in Table 7.3.2 and associated plots.

**Table 7.3.1 Occupied bandwidth limits**

| Assigned frequency, MHz | Modulation envelope reference points*, dBc | Maximum allowed bandwidth, % of the carrier frequency |
|-------------------------|--------------------------------------------|-------------------------------------------------------|
| 70 - 900                | 20.0                                       | 0.25                                                  |
| Above 900               |                                            | 0.50                                                  |

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

### 7.3.2 Test procedure

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

**7.3.2.2** The EUT was set to transmit modulated carrier.

**7.3.2.3** The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.3.2 and associated plot.

**Figure 7.3.1 Occupied bandwidth test setup**





|                            |                                              |                                |                              |
|----------------------------|----------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.231(c), Occupied bandwidth</b> |                                |                              |
| <b>Test procedure:</b>     | ANSI C63.10 section 6.9.2                    |                                |                              |
| <b>Test mode:</b>          | Compliance                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 11-Mar-16                                    |                                |                              |
| <b>Temperature: 22 °C</b>  | <b>Air Pressure: 1010 hPa</b>                | <b>Relative Humidity: 54 %</b> | <b>Power Supply: 120 VAC</b> |
| <b>Remarks:</b>            |                                              |                                |                              |

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 10 kHz  
 VIDEO BANDWIDTH: 30 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 20 dBc  
 MODULATION: GFSK  
 BIT RATE: 76.8 kbps

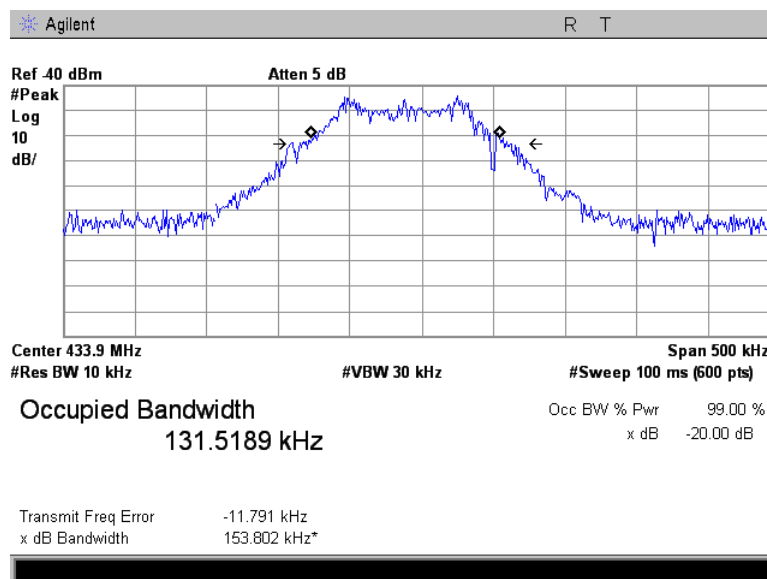
| Carrier frequency,<br>MHz | Occupied bandwidth,<br>kHz | Limit                      |      | Margin,<br>kHz | Verdict |
|---------------------------|----------------------------|----------------------------|------|----------------|---------|
|                           |                            | % of the carrier frequency | kHz  |                |         |
| 433.92                    | 153.802                    | 0.25                       | 1085 | -931.198       | Pass    |

## Reference numbers of test equipment used

|         |  |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|--|
| HL 2909 |  |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|--|

Full description is given in Appendix A.

Plot 7.3.1 Occupied bandwidth test result



|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.203, Antenna requirement |                         |                       |
| Test procedure:     | Visual inspection                   |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date(s):            | 10-Mar-16                           |                         |                       |
| Temperature: 22 °C  | Air Pressure: 1010 hPa              | Relative Humidity: 54 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

## 7.4 Antenna requirements

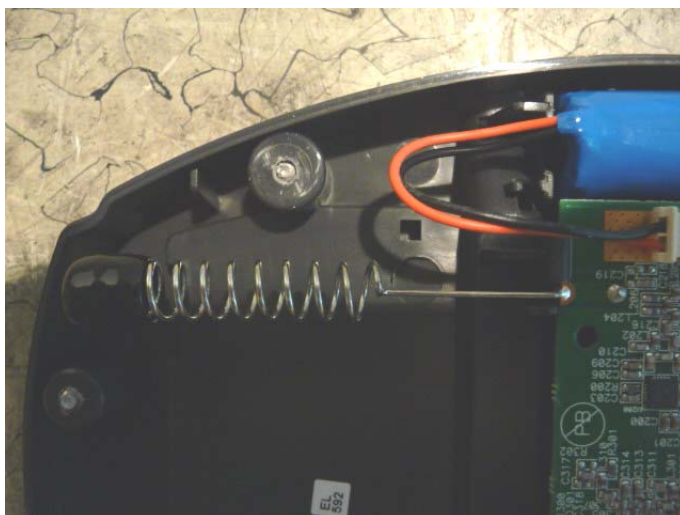
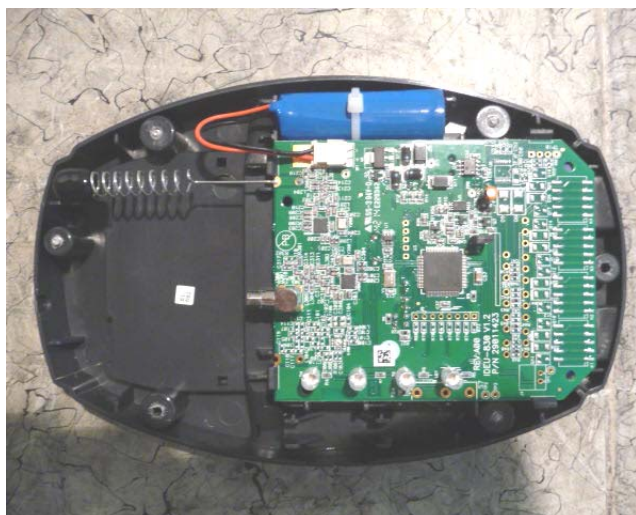
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed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

Photograph 7.4.1 Antenna assembly



|                            |                                              |                                |                              |
|----------------------------|----------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.207(a), Conducted emission</b> |                                |                              |
| <b>Test procedure:</b>     | ANSI C63.10 section 6.2                      |                                |                              |
| <b>Test mode:</b>          | Compliance                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 10-Mar-16                                    |                                |                              |
| <b>Temperature: 23 °C</b>  | <b>Air Pressure: 1010 hPa</b>                | <b>Relative Humidity: 50 %</b> | <b>Power Supply: 120 VAC</b> |
| <b>Remarks:</b>            |                                              |                                |                              |

## 7.5 Conducted emissions

### 7.5.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.5.1. The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

Table 7.5.1 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.

### 7.5.2 Test procedure

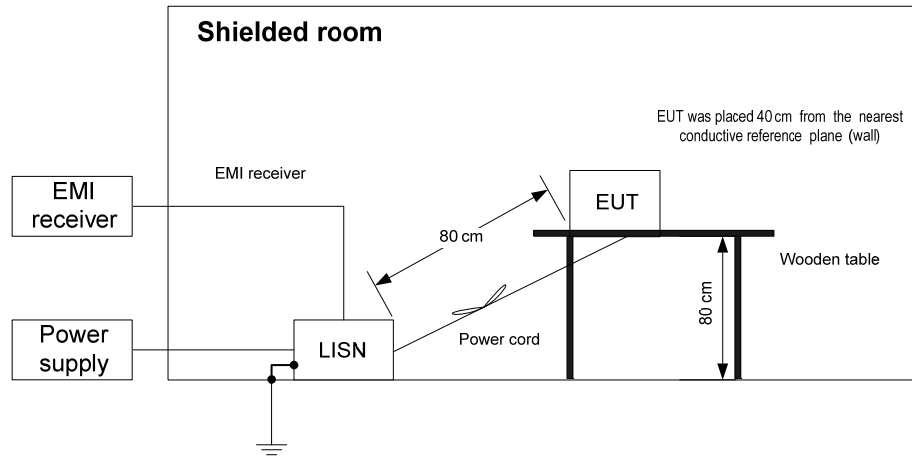
**7.5.2.1** The EUT was set up as shown in Figure 7.5.1 and associated photographs, energized and the performance check was conducted.

**7.5.2.2** The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.5.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

|                            |                                              |                                |                              |
|----------------------------|----------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.207(a), Conducted emission</b> |                                |                              |
| <b>Test procedure:</b>     | ANSI C63.10 section 6.2                      |                                |                              |
| <b>Test mode:</b>          | Compliance                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date(s):</b>            | 10-Mar-16                                    |                                |                              |
| <b>Temperature:</b> 23 °C  | <b>Air Pressure:</b> 1010 hPa                | <b>Relative Humidity:</b> 50 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                              |                                |                              |

**Figure 7.5.1 Setup for conducted emission measurements, table-top equipment**



**Photograph 7.5.1 Setup for conducted emission measurements**





|                     |                                       |                         |                       |
|---------------------|---------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.207(a), Conducted emission |                         |                       |
| Test procedure:     | ANSI C63.10 section 6.2               |                         |                       |
| Test mode:          | Compliance                            | Verdict:                | PASS                  |
| Date(s):            | 10-Mar-16                             |                         |                       |
| Temperature: 23 °C  | Air Pressure: 1010 hPa                | Relative Humidity: 50 % | Power Supply: 120 VAC |
| Remarks:            |                                       |                         |                       |

Table 7.5.2 Conducted emission test results

LINE: AC mains input of AC/DC adapter  
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* |         |         |
| Part number KSAS0121200100HU       |                             |                                 |                  |                |                                 |                  |                |         |         |
| 0.151                              | 57.82                       | 55.03                           | 65.96            | -10.93         | 43.15                           | 55.96            | -12.81         | L1      | Pass    |
| 0.200                              | 50.56                       | 47.29                           | 63.65            | -16.36         | 31.42                           | 53.65            | -22.23         |         |         |
| 0.251                              | 44.93                       | 41.71                           | 61.77            | -20.06         | 26.36                           | 51.77            | -25.41         |         |         |
| 0.304                              | 42.45                       | 38.78                           | 60.15            | -21.37         | 29.01                           | 50.15            | -21.14         |         |         |
| 0.354                              | 43.08                       | 38.17                           | 58.92            | -20.75         | 27.46                           | 48.92            | -21.46         |         |         |
| 0.154                              | 58.18                       | 56.70                           | 65.78            | -9.08          | 44.03                           | 55.78            | -11.75         | L2      | Pass    |
| 0.201                              | 50.98                       | 48.03                           | 63.62            | -15.59         | 32.05                           | 53.62            | -21.57         |         |         |
| 0.257                              | 45.00                       | 42.82                           | 61.58            | -18.76         | 30.23                           | 51.58            | -21.35         |         |         |
| 0.335                              | 42.07                       | 39.91                           | 59.39            | -19.48         | 35.03                           | 49.39            | -14.36         |         |         |
| 0.404                              | 38.82                       | 33.57                           | 57.79            | -24.22         | 20.17                           | 47.79            | -27.62         |         |         |
| Part number DCA-12PFT-12FUS 120100 |                             |                                 |                  |                |                                 |                  |                |         |         |
| 0.152720                           | 52.64                       | 50.52                           | 65.87            | -15.35         | 38.00                           | 55.87            | -17.87         | L1      | Pass    |
| 0.202940                           | 46.89                       | 44.45                           | 63.54            | -19.09         | 30.70                           | 53.54            | -22.84         |         |         |
| 0.250905                           | 43.10                       | 38.45                           | 61.76            | -23.31         | 23.36                           | 51.76            | -28.40         |         |         |
| 0.336215                           | 40.89                       | 38.76                           | 59.35            | -20.59         | 34.35                           | 49.35            | -15.00         |         |         |
| 8.005535                           | 34.79                       | 29.93                           | 60.00            | -30.07         | 20.98                           | 50.00            | -29.02         |         |         |
| 0.151900                           | 53.71                       | 51.55                           | 65.91            | -14.36         | 38.37                           | 55.91            | -17.54         | L2      | Pass    |
| 0.200185                           | 48.45                       | 44.74                           | 63.65            | -18.91         | 29.04                           | 53.65            | -24.61         |         |         |
| 0.259785                           | 42.30                       | 39.73                           | 61.49            | -21.76         | 27.74                           | 51.49            | -23.75         |         |         |
| 0.318080                           | 39.03                       | 34.95                           | 59.78            | -24.83         | 23.38                           | 49.78            | -26.40         |         |         |
| 9.501135                           | 39.29                       | 32.43                           | 60.00            | -27.57         | 23.17                           | 50.00            | -26.83         |         |         |

\*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

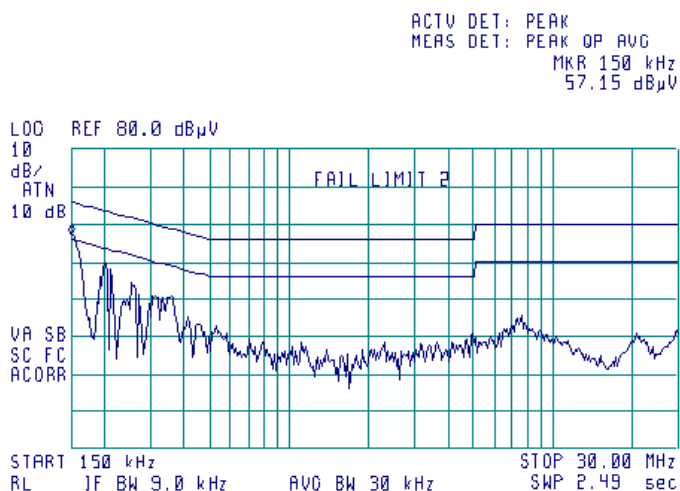
|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0447 | HL 0787 | HL 1513 | HL 3612 | HL 4778 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.

|                     |                                       |                         |                       |
|---------------------|---------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.207(a), Conducted emission |                         |                       |
| Test procedure:     | ANSI C63.10 section 6.2               |                         |                       |
| Test mode:          | Compliance                            | Verdict:                | PASS                  |
| Date(s):            | 10-Mar-16                             |                         |                       |
| Temperature: 23 °C  | Air Pressure: 1010 hPa                | Relative Humidity: 50 % | Power Supply: 120 VAC |
| Remarks:            |                                       |                         |                       |

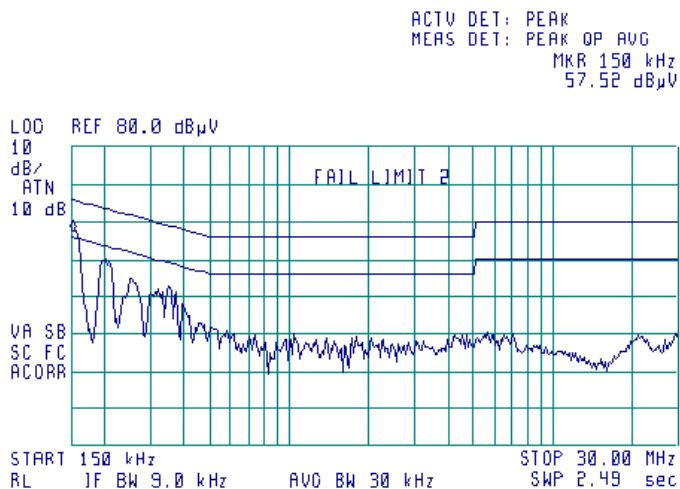
Plot 7.5.1 Conducted emission measurements, AC mains input of AC/DC adapter, Part number KSAS0121200100HU

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



Plot 7.5.2 Conducted emission measurements, AC mains input of AC/DC adapter, Part number KSAS0121200100HU

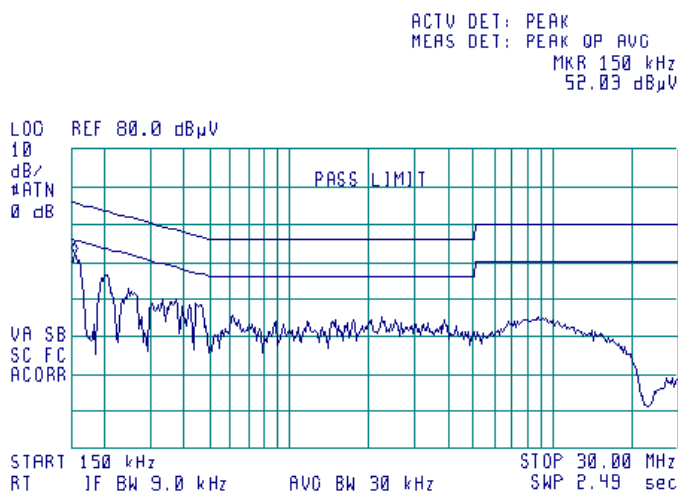
LINE: L2  
EUT OPERATING MODE: Transmit  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



|                     |                                       |                         |                       |
|---------------------|---------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.207(a), Conducted emission |                         |                       |
| Test procedure:     | ANSI C63.10 section 6.2               |                         |                       |
| Test mode:          | Compliance                            | Verdict:                | PASS                  |
| Date(s):            | 10-Mar-16                             |                         |                       |
| Temperature: 23 °C  | Air Pressure: 1010 hPa                | Relative Humidity: 50 % | Power Supply: 120 VAC |
| Remarks:            |                                       |                         |                       |

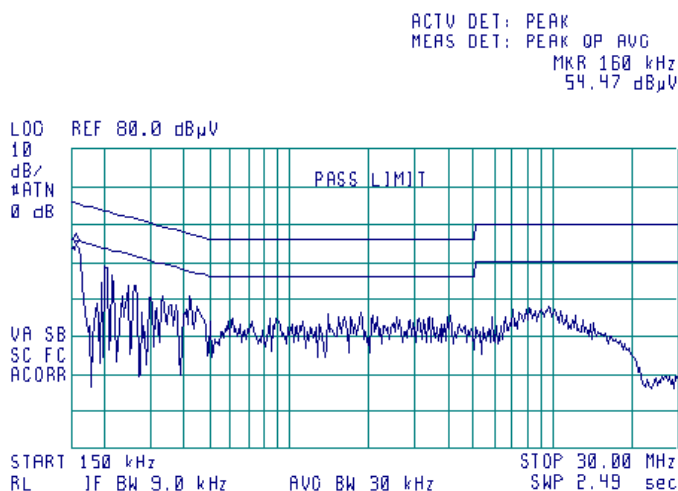
Plot 7.5.3 Conducted emission measurements, AC mains input of AC/DC adapter,  
Part number DCA-12PFT-12FUS 120100

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



Plot 7.5.4 Conducted emission measurements, AC mains input of AC/DC adapter,  
Part number DCA-12PFT-12FUS 120100

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



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

| HL No | Description                                                           | Manufacturer          | Model            | Ser. No.                | Last Cal./Check | Due Cal./Check |
|-------|-----------------------------------------------------------------------|-----------------------|------------------|-------------------------|-----------------|----------------|
| 0034  | Antenna, Log Periodic, 200 - 1000 MHz                                 | Electro-Metrics       | LPA 25/30        | 1988                    | 17-Mar-16       | 17-Sep-17      |
| 0446  | Antenna, Loop, Active, 10 kHz - 30 MHz                                | EMCO                  | 6502             | 2857                    | 18-Jan-16       | 18-Jan-17      |
| 0447  | LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1            | Hermon Laboratories   | LISN 16 - 1      | 066                     | 13-Oct-15       | 13-Oct-16      |
| 0521  | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz | Hewlett Packard       | 8546A            | 3617A00319, 3448A00253  | 27-Oct-15       | 27-Oct-16      |
| 0604  | Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz               | EMCO                  | 3141             | 9611-1011               | 15-May-16       | 15-May-17      |
| 0787  | Transient Limiter 9 kHz-200 MHz                                       | Hewlett Packard       | 11947A           | 3107A01877              | 12-Oct-15       | 12-Oct-16      |
| 1513  | Cable RF, 8 m, BNC/BNC                                                | Belden                | M17/167 MIL-C-17 | 1513                    | 08-Sep-15       | 08-Sep-16      |
| 2780  | EMC analyzer, 100 Hz to 26.5 GHz                                      | Agilent Technologies  | E7405A           | MY45102462              | 08-Sep-15       | 08-Sep-16      |
| 2909  | Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz                          | Agilent Technologies  | E4407B           | MY41444762              | 21-Feb-16       | 21-Feb-17      |
| 3340  | High Pass Filter, 50 Ohm, 1000 to 3000 MHz.                           | Mini-Circuits         | SHP-1000+        | NA                      | 01-Oct-15       | 01-Oct-17      |
| 3612  | Cable RF, 17.5 m, N type-N type                                       | Teldor                | RG-214/U         | NA                      | 07-Dec-15       | 07-Dec-16      |
| 4278  | Test Cable , DC-18 GHz, 4.6 m, N/M - N/M                              | Mini-Circuits         | APC-15FT-NMNM+   | 0755A                   | 22-Nov-15       | 22-Nov-16      |
| 4339  | High pass Filter, 50 Ohm, 1000 to 18000 MHz, SMA-FM / SMA-M           | Micro-Tronics         | HPM50115-02      | 001                     | 06-May-16       | 06-May-17      |
| 4353  | Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M    | MegaPhase             | NC29-N1N1-244    | 12025101 003            | 15-Mar-16       | 15-Mar-17      |
| 4778  | EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777                 | Hewlett Packard       | 8542E            | 30807A00262, 3427A00123 | 05-Nov-15       | 05-Nov-16      |
| 4933  | Active Horn Antenna, 1 GHz to 18 GHz                                  | COM-POWER CORPORATION | AHA-118          | 701046                  | 04-Sep-15       | 04-Sep-16      |

## 9 APPENDIX B 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 number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, 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 IL1001.

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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

## 10 APPENDIX C Abbreviations and acronyms

|                |                                             |
|----------------|---------------------------------------------|
| A              | ampere                                      |
| AC             | alternating current                         |
| A/m            | ampere per meter                            |
| AM             | amplitude modulation                        |
| 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                              |
| NB             | narrow band                                 |
| OATS           | open area test site                         |
| $\Omega$       | Ohm                                         |
| PM             | pulse modulation                            |
| 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                                        |
| WB             | wideband                                    |

## 11 APPENDIX D Test equipment correction factors

Correction factor  
Line impedance stabilization network  
Model LISN 16 - 1  
Hermon Laboratories

Voltage division factor (insertion loss)

| Frequency, kHz | L1, dB | L2, dB | Uncertainty, dB |
|----------------|--------|--------|-----------------|
| 150            | 0.00   | 0.10   | ±0.09           |
| 170            | 0.00   | 0.09   | ±0.09           |
| 200            | 0.00   | 0.08   | ±0.09           |
| 250            | 0.01   | 0.07   | ±0.09           |
| 300            | 0.02   | 0.07   | ±0.09           |
| 350            | 0.03   | 0.06   | ±0.09           |
| 400            | 0.03   | 0.05   | ±0.09           |
| 500            | 0.04   | 0.05   | ±0.09           |
| 600            | 0.05   | 0.06   | ±0.09           |
| 700            | 0.05   | 0.06   | ±0.09           |
| 800            | 0.05   | 0.06   | ±0.09           |
| 900            | 0.06   | 0.06   | ±0.09           |
| 1000           | 0.06   | 0.06   | ±0.09           |
| 1200           | 0.06   | 0.06   | ±0.16           |
| 1500           | 0.07   | 0.07   | ±0.16           |
| 2000           | 0.07   | 0.06   | ±0.16           |
| 2500           | 0.08   | 0.07   | ±0.16           |
| 3000           | 0.08   | 0.07   | ±0.16           |
| 4000           | 0.08   | 0.08   | ±0.16           |
| 5000           | 0.09   | 0.09   | ±0.16           |
| 7000           | 0.11   | 0.10   | ±0.16           |
| 10000          | 0.13   | 0.14   | ±0.16           |
| 15000          | 0.18   | 0.19   | ±0.16           |
| 20000          | 0.26   | 0.27   | ±0.16           |
| 30000          | 0.45   | 0.50   | ±0.32           |

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**

| 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 strength in dB( $\mu$ V/m).

**Antenna Factor  
Log Periodic Antenna Electro-Metrics Model LPA-25/30  
Ser.No.1988**

| Frequency, MHz | Antenna factor, dB/m |                          |           |
|----------------|----------------------|--------------------------|-----------|
|                | Measured             | Historical in-house data | Deviation |
| 200            | 11.9                 | 12.3                     | -0.3      |
| 250            | 12.4                 | 12.7                     | -0.3      |
| 300            | 14.4                 | 14.8                     | -0.4      |
| 350            | 15.5                 | 15.4                     | 0.1       |
| 400            | 16.0                 | 16.2                     | -0.2      |
| 450            | 16.8                 | 17.0                     | -0.2      |
| 500            | 17.9                 | 18.2                     | -0.3      |
| 550            | 18.3                 | 18.6                     | -0.3      |
| 600            | 18.8                 | 19.2                     | -0.5      |
| 650            | 19.5                 | 20.0                     | -0.5      |
| 700            | 21.7                 | 21.5                     | 0.2       |
| 750            | 21.4                 | 21.5                     | 0.0       |
| 800            | 21.7                 | 21.8                     | 0.0       |
| 850            | 22.7                 | 22.7                     | 0.0       |
| 900            | 22.7                 | 23.2                     | -0.5      |
| 950            | 23.2                 | 23.6                     | -0.3      |
| 1000           | 24.4                 | 24.6                     | -0.2      |

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



**Antenna factor**  
**Biconilog antenna EMCO, model 3141, serial number 1011**

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

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).

Horn antenna factor  
COM-POWER CORPORATION, Model ANA-118  
Serial number 701046

| Frequency,<br>MHz | Measured antenna factor (with preamplifier),<br>dB/m |
|-------------------|------------------------------------------------------|
| 1000              | -16.0                                                |
| 1500              | -13.9                                                |
| 2000              | -12.1                                                |
| 2500              | -12.0                                                |
| 3000              | -11.4                                                |
| 3500              | -10.9                                                |
| 4000              | -10.1                                                |
| 4500              | -8.8                                                 |
| 5000              | -6.3                                                 |
| 5500              | -5.4                                                 |
| 6000              | -4.8                                                 |
| 6500              | -3.1                                                 |
| 7000              | -2.7                                                 |
| 7500              | -1.8                                                 |
| 8000              | -1.0                                                 |
| 8500              | -0.5                                                 |
| 9000              | -0.8                                                 |
| 9500              | -1.3                                                 |
| 10000             | -0.6                                                 |
| 10500             | 0.5                                                  |
| 11000             | 0.5                                                  |
| 11500             | 1.6                                                  |
| 12000             | 0.5                                                  |
| 12500             | 0.7                                                  |
| 13000             | 0.0                                                  |
| 13500             | 0.6                                                  |
| 14000             | 1.1                                                  |
| 14500             | 2.3                                                  |
| 15000             | 0.9                                                  |
| 15500             | -0.6                                                 |
| 16000             | 0.1                                                  |
| 16500             | 0.0                                                  |
| 17000             | 0.3                                                  |
| 17500             | 2.7                                                  |
| 18000             | 4.1                                                  |

Antenna factor 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, RG-214/U, N type-N type, 17 m**  
**Teldor, HL 3612**

| No. | Parameter      | SET, MHz | Measured, dB | Deviation, dB | Tolerance, dB | Meas. Uncert., dB |
|-----|----------------|----------|--------------|---------------|---------------|-------------------|
| 1   | Insertion loss | 0.10     | 0.04         | NA            | NA            | +0.11 / -0.11     |
| 2   |                | 10.0     | 0.37         | NA            | NA            | +0.11 / -0.11     |
| 3   |                | 20.0     | 0.54         | NA            | NA            | +0.11 / -0.11     |
| 4   |                | 30.0     | 0.69         | NA            | NA            | +0.11 / -0.11     |
| 5   |                | 40.0     | 0.80         | NA            | NA            | +0.11 / -0.11     |
| 6   |                | 50       | 0.91         | NA            | NA            | +0.11 / -0.11     |
| 7   |                | 60       | 1.00         | NA            | NA            | +0.11 / -0.11     |
| 8   |                | 70       | 1.08         | NA            | NA            | +0.12 / -0.12     |
| 9   |                | 80       | 1.16         | NA            | NA            | +0.12 / -0.12     |
| 10  |                | 90       | 1.24         | NA            | NA            | +0.12 / -0.12     |
| 11  |                | 100      | 1.31         | NA            | NA            | +0.12 / -0.12     |
| 12  |                | 110      | 1.38         | NA            | NA            | +0.12 / -0.12     |
| 13  |                | 120      | 1.44         | NA            | NA            | +0.12 / -0.12     |
| 14  |                | 130      | 1.50         | NA            | NA            | +0.12 / -0.12     |
| 15  |                | 140      | 1.57         | NA            | NA            | +0.12 / -0.12     |
| 16  |                | 150      | 1.63         | NA            | NA            | +0.12 / -0.12     |
| 17  |                | 160      | 1.68         | NA            | NA            | +0.12 / -0.12     |
| 18  |                | 170      | 1.74         | NA            | NA            | +0.12 / -0.12     |
| 19  |                | 180      | 1.79         | NA            | NA            | +0.12 / -0.12     |
| 20  |                | 190      | 1.85         | NA            | NA            | +0.12 / -0.12     |
| 21  |                | 200      | 1.90         | NA            | NA            | +0.12 / -0.12     |
| 22  |                | 210      | 1.95         | NA            | NA            | +0.12 / -0.12     |
| 23  |                | 220      | 2.00         | NA            | NA            | +0.12 / -0.12     |
| 24  |                | 230      | 2.05         | NA            | NA            | +0.12 / -0.12     |
| 25  |                | 240      | 2.10         | NA            | NA            | +0.12 / -0.12     |
| 26  |                | 250      | 2.15         | NA            | NA            | +0.12 / -0.12     |
| 27  |                | 260      | 2.20         | NA            | NA            | +0.12 / -0.12     |
| 28  |                | 270      | 2.24         | NA            | NA            | +0.13 / -0.13     |
| 29  |                | 280      | 2.29         | NA            | NA            | +0.12 / -0.12     |
| 30  |                | 290      | 2.34         | NA            | NA            | +0.13 / -0.13     |

| No. | Parameter      | SET, MHz | Measured, dB | Deviation, dB | Tolerance, dB | Meas. Uncert., dB |
|-----|----------------|----------|--------------|---------------|---------------|-------------------|
| 31  | Insertion loss | 300      | 2.38         | NA            | NA            | +0.12 / -0.12     |
| 32  |                | 310      | 2.43         | NA            | NA            | +0.12 / -0.12     |
| 33  |                | 320      | 2.47         | NA            | NA            | +0.12 / -0.12     |
| 34  |                | 330      | 2.51         | NA            | NA            | +0.12 / -0.12     |
| 35  |                | 340      | 2.56         | NA            | NA            | +0.12 / -0.12     |
| 36  |                | 350      | 2.60         | NA            | NA            | +0.12 / -0.12     |
| 37  |                | 360      | 2.64         | NA            | NA            | +0.12 / -0.12     |
| 38  |                | 370      | 2.68         | NA            | NA            | +0.12 / -0.12     |
| 39  |                | 380      | 2.72         | NA            | NA            | +0.12 / -0.12     |
| 40  |                | 390      | 2.76         | NA            | NA            | +0.12 / -0.12     |
| 41  |                | 400      | 2.80         | NA            | NA            | +0.12 / -0.12     |
| 42  |                | 410      | 2.84         | NA            | NA            | +0.12 / -0.12     |
| 43  |                | 420      | 2.88         | NA            | NA            | +0.12 / -0.12     |
| 44  |                | 430      | 2.92         | NA            | NA            | +0.12 / -0.12     |
| 45  |                | 440      | 2.96         | NA            | NA            | +0.12 / -0.12     |
| 46  |                | 450      | 3.00         | NA            | NA            | +0.12 / -0.12     |
| 47  |                | 460      | 3.03         | NA            | NA            | +0.12 / -0.12     |
| 48  |                | 470      | 3.07         | NA            | NA            | +0.12 / -0.12     |
| 49  |                | 480      | 3.11         | NA            | NA            | +0.12 / -0.12     |
| 50  |                | 490      | 3.14         | NA            | NA            | +0.12 / -0.12     |
| 51  |                | 500      | 3.18         | NA            | NA            | +0.12 / -0.12     |
| 52  |                | 510      | 3.22         | NA            | NA            | +0.14 / -0.14     |
| 53  |                | 520      | 3.25         | NA            | NA            | +0.14 / -0.14     |
| 54  |                | 530      | 3.29         | NA            | NA            | +0.14 / -0.14     |
| 55  |                | 540      | 3.33         | NA            | NA            | +0.14 / -0.14     |
| 56  |                | 550      | 3.36         | NA            | NA            | +0.14 / -0.14     |
| 57  |                | 560      | 3.40         | NA            | NA            | +0.14 / -0.14     |
| 58  |                | 570      | 3.44         | NA            | NA            | +0.14 / -0.15     |
| 59  |                | 580      | 3.47         | NA            | NA            | +0.14 / -0.14     |
| 60  |                | 590      | 3.51         | NA            | NA            | +0.14 / -0.15     |

| No. | Parameter      | SET, MHz | Measured, dB | Deviation, dB | Tolerance, dB | Meas. Uncert., dB |
|-----|----------------|----------|--------------|---------------|---------------|-------------------|
| 61  | Insertion loss | 600      | 3.54         | NA            | NA            | +0.14 / -0.14     |
| 62  |                | 610      | 3.58         | NA            | NA            | +0.14 / -0.14     |
| 63  |                | 620      | 3.61         | NA            | NA            | +0.14 / -0.14     |
| 64  |                | 630      | 3.64         | NA            | NA            | +0.14 / -0.14     |
| 65  |                | 640      | 3.67         | NA            | NA            | +0.14 / -0.14     |
| 66  |                | 650      | 3.71         | NA            | NA            | +0.14 / -0.14     |
| 67  |                | 660      | 3.77         | NA            | NA            | +0.14 / -0.14     |
| 68  |                | 670      | 3.79         | NA            | NA            | +0.14 / -0.14     |
| 69  |                | 680      | 3.81         | NA            | NA            | +0.14 / -0.14     |
| 70  |                | 690      | 3.84         | NA            | NA            | +0.14 / -0.14     |
| 71  |                | 700      | 3.87         | NA            | NA            | +0.14 / -0.14     |
| 72  |                | 710      | 3.91         | NA            | NA            | +0.14 / -0.14     |
| 73  |                | 720      | 3.94         | NA            | NA            | +0.14 / -0.14     |
| 74  |                | 730      | 3.97         | NA            | NA            | +0.14 / -0.14     |
| 75  |                | 740      | 4.01         | NA            | NA            | +0.14 / -0.14     |
| 76  |                | 750      | 4.04         | NA            | NA            | +0.14 / -0.14     |
| 77  |                | 760      | 4.07         | NA            | NA            | +0.14 / -0.14     |
| 78  |                | 770      | 4.11         | NA            | NA            | +0.14 / -0.14     |
| 79  |                | 780      | 4.14         | NA            | NA            | +0.14 / -0.14     |
| 80  |                | 790      | 4.17         | NA            | NA            | +0.14 / -0.14     |
| 81  |                | 800      | 4.20         | NA            | NA            | +0.14 / -0.14     |
| 82  |                | 810      | 4.23         | NA            | NA            | +0.14 / -0.14     |
| 83  |                | 820      | 4.26         | NA            | NA            | +0.14 / -0.14     |
| 84  |                | 830      | 4.29         | NA            | NA            | +0.14 / -0.14     |
| 85  |                | 840      | 4.32         | NA            | NA            | +0.14 / -0.14     |
| 86  |                | 850      | 4.35         | NA            | NA            | +0.14 / -0.14     |
| 87  |                | 860      | 4.38         | NA            | NA            | +0.14 / -0.14     |
| 88  |                | 870      | 4.42         | NA            | NA            | +0.14 / -0.15     |
| 89  |                | 880      | 4.45         | NA            | NA            | +0.14 / -0.14     |
| 90  |                | 890      | 4.48         | NA            | NA            | +0.14 / -0.15     |
| 91  |                | 900      | 4.51         | NA            | NA            | +0.14 / -0.14     |
| 92  |                | 910      | 4.54         | NA            | NA            | +0.14 / -0.14     |
| 93  |                | 920      | 4.57         | NA            | NA            | +0.14 / -0.14     |
| 94  |                | 930      | 4.60         | NA            | NA            | +0.14 / -0.14     |
| 95  |                | 940      | 4.63         | NA            | NA            | +0.14 / -0.14     |
| 96  |                | 950      | 4.66         | NA            | NA            | +0.14 / -0.14     |
| 97  |                | 960      | 4.69         | NA            | NA            | +0.14 / -0.14     |
| 98  |                | 970      | 4.72         | NA            | NA            | +0.14 / -0.14     |
| 99  |                | 980      | 4.75         | NA            | NA            | +0.14 / -0.14     |
| 100 |                | 990      | 4.78         | NA            | NA            | +0.14 / -0.14     |
| 101 |                | 1000     | 4.81         | NA            | NA            | +0.14 / -0.14     |

**Cable loss**  
**Cable RF, M17/167 MIL-C-17, 8 m**  
**Belden, HL 1513**

| No. | Parameter          | Measured attenuation | Meas. Uncert. |
|-----|--------------------|----------------------|---------------|
| 1   | Frequency 10 kHz   | 0.01 dB              | ±0.05 dB      |
| 2   | Frequency 100 kHz  | 0.05 dB              | ±0.05 dB      |
| 3   | Frequency 1 MHz    | 0.11 dB              | ±0.05 dB      |
| 4   | Frequency 10 MHz   | 0.35 dB              | ±0.05 dB      |
| 5   | Frequency 20 MHz   | 0.48 dB              | ±0.05 dB      |
| 6   | Frequency 30 MHz   | 0.58 dB              | ±0.05 dB      |
| 7   | Frequency 40 MHz   | 0.65 dB              | ±0.05 dB      |
| 8   | Frequency 50 MHz   | 0.71 dB              | ±0.05 dB      |
| 9   | Frequency 60 MHz   | 0.79 dB              | ±0.05 dB      |
| 10  | Frequency 70 MHz   | 0.84 dB              | ±0.05 dB      |
| 11  | Frequency 80 MHz   | 0.92 dB              | ±0.05 dB      |
| 12  | Frequency 90 MHz   | 0.96 dB              | ±0.05 dB      |
| 13  | Frequency 100 MHz  | 1.03 dB              | ±0.05 dB      |
| 14  | Frequency 200 MHz  | 1.58 dB              | ±0.05 dB      |
| 15  | Frequency 300 MHz  | 2.04 dB              | ±0.05 dB      |
| 16  | Frequency 400 MHz  | 2.43 dB              | ±0.05 dB      |
| 17  | Frequency 500 MHz  | 2.46 dB              | ±0.05 dB      |
| 18  | Frequency 600 MHz  | 3.11 dB              | ±0.05 dB      |
| 19  | Frequency 700 MHz  | 3.38 dB              | ±0.05 dB      |
| 20  | Frequency 800 MHz  | 3.71 dB              | ±0.05 dB      |
| 21  | Frequency 900 MHz  | 3.94 dB              | ±0.05 dB      |
| 22  | Frequency 1000 MHz | 4.25 dB              | ±0.05 dB      |
| 23  | Frequency 1200 MHz | 4.58 dB              | ±0.05 dB      |
| 24  | Frequency 1400 MHz | 5.04 dB              | ±0.05 dB      |
| 25  | Frequency 1600 MHz | 5.55 dB              | ±0.05 dB      |
| 26  | Frequency 1800 MHz | 6.04 dB              | ±0.05 dB      |
| 27  | Frequency 2000 MHz | 6.62 dB              | ±0.05 dB      |
| 28  | Frequency 2500 MHz | 7.67 dB              | ±0.05 dB      |
| 29  | Frequency 2900 MHz | 8.12 dB              | ±0.05 dB      |

**Cable loss**  
**Cable DC-18 GHz, 4.6 m, N/M - N/M, Mini-Circuits, model APC-15FT-NMNM+, S/N 0755A**  
**HL 4278**

| No. | Parameter      | Set / Applied | Measured | Deviation | Tolerance | Uncertainty      |
|-----|----------------|---------------|----------|-----------|-----------|------------------|
| 1   | Insertion loss | 0.1 MHz       | 0.04 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 2   |                | 50 MHz        | 0.39 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 3   |                | 100 MHz       | 0.57 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 4   |                | 200 MHz       | 0.82 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 5   |                | 300 MHz       | 1.02 dB  | NA        | NA        | +0.08 / -0.09 dB |
| 6   |                | 400 MHz       | 1.19 dB  | NA        | NA        | +0.08 / -0.09 dB |
| 7   |                | 500 MHz       | 1.33 dB  | NA        | NA        | +0.08 / -0.09 dB |
| 8   |                | 600 MHz       | 1.47 dB  | NA        | NA        | +0.08 / -0.09 dB |
| 9   |                | 700 MHz       | 1.60 dB  | NA        | NA        | +0.08 / -0.09 dB |
| 10  |                | 800 MHz       | 1.70 dB  | NA        | NA        | +0.08 / -0.09 dB |
| 11  |                | 900 MHz       | 1.83 dB  | NA        | NA        | +0.08 / -0.09 dB |
| 12  |                | 1000 MHz      | 1.92 dB  | NA        | NA        | +0.08 / -0.09 dB |
| 13  |                | 1100 MHz      | 2.02 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 14  |                | 1200 MHz      | 2.12 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 15  |                | 1300 MHz      | 2.20 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 16  |                | 1400 MHz      | 2.30 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 17  |                | 1500 MHz      | 2.39 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 18  |                | 1600 MHz      | 2.47 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 19  |                | 1700 MHz      | 2.55 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 20  |                | 1800 MHz      | 2.64 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 21  |                | 1900 MHz      | 2.71 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 22  |                | 2000 MHz      | 2.78 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 23  |                | 2100 MHz      | 2.87 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 24  |                | 2200 MHz      | 2.94 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 25  |                | 2300 MHz      | 3.01 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 26  |                | 2400 MHz      | 3.09 dB  | NA        | NA        | +0.12 / -0.13 dB |
| 27  |                | 2500 MHz      | 3.16 dB  | NA        | NA        | +0.17 / -0.18 dB |
| 28  |                | 2600 MHz      | 3.23 dB  | NA        | NA        | +0.17 / -0.18 dB |
| 29  |                | 2700 MHz      | 3.30 dB  | NA        | NA        | +0.17 / -0.18 dB |
| 30  |                | 2800 MHz      | 3.38 dB  | NA        | NA        | +0.17 / -0.18 dB |
| 31  |                | 2900 MHz      | 3.44 dB  | NA        | NA        | +0.17 / -0.18 dB |
| 32  |                | 3000 MHz      | 3.52 dB  | NA        | NA        | +0.17 / -0.18 dB |
| 33  |                | 3100 MHz      | 3.58 dB  | NA        | NA        | +0.19 / -0.2 dB  |
| 34  |                | 3200 MHz      | 3.64 dB  | NA        | NA        | +0.19 / -0.2 dB  |
| 35  |                | 3300 MHz      | 3.72 dB  | NA        | NA        | +0.19 / -0.2 dB  |
| 36  |                | 3400 MHz      | 3.77 dB  | NA        | NA        | +0.19 / -0.2 dB  |
| 37  |                | 3500 MHz      | 3.84 dB  | NA        | NA        | +0.19 / -0.2 dB  |
| 38  |                | 3600 MHz      | 3.90 dB  | NA        | NA        | +0.19 / -0.2 dB  |
| 39  |                | 3700 MHz      | 3.97 dB  | NA        | NA        | +0.19 / -0.2 dB  |
| 40  |                | 3800 MHz      | 4.03 dB  | NA        | NA        | +0.19 / -0.2 dB  |

| No. | Parameter      | Set / Applied | Measured | Deviation | Tolerance | Uncertainty     |
|-----|----------------|---------------|----------|-----------|-----------|-----------------|
| 41  | Insertion loss | 3900 MHz      | 4.09 dB  | NA        | NA        | +0.19 / -0.2 dB |
| 42  |                | 4000 MHz      | 4.14 dB  | NA        | NA        | +0.19 / -0.2 dB |
| 43  |                | 4100 MHz      | 4.20 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 44  |                | 4200 MHz      | 4.26 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 45  |                | 4300 MHz      | 4.32 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 46  |                | 4400 MHz      | 4.37 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 47  |                | 4500 MHz      | 4.43 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 48  |                | 4600 MHz      | 4.50 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 49  |                | 4700 MHz      | 4.54 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 50  |                | 4800 MHz      | 4.60 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 51  |                | 4900 MHz      | 4.67 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 52  |                | 5000 MHz      | 4.72 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 53  |                | 5100 MHz      | 4.77 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 54  |                | 5200 MHz      | 4.82 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 55  |                | 5300 MHz      | 4.89 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 56  |                | 5400 MHz      | 4.94 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 57  |                | 5500 MHz      | 4.99 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 58  |                | 5600 MHz      | 5.05 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 59  |                | 5700 MHz      | 5.11 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 60  |                | 5800 MHz      | 5.15 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 61  |                | 5900 MHz      | 5.21 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 62  |                | 6000 MHz      | 5.26 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 63  |                | 6100 MHz      | 5.31 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 64  |                | 6200 MHz      | 5.38 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 65  |                | 6300 MHz      | 5.43 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 66  |                | 6400 MHz      | 5.49 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 67  |                | 6500 MHz      | 5.54 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 68  |                | 6600 MHz      | 5.60 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 69  |                | 6700 MHz      | 5.65 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 70  |                | 6800 MHz      | 5.71 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 71  |                | 6900 MHz      | 5.76 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 72  |                | 7000 MHz      | 5.81 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 73  |                | 7100 MHz      | 5.86 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 74  |                | 7200 MHz      | 5.91 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 75  |                | 7300 MHz      | 5.96 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 76  |                | 7400 MHz      | 6.00 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 77  |                | 7500 MHz      | 6.07 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 78  |                | 7600 MHz      | 6.12 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 79  |                | 7700 MHz      | 6.16 dB  | NA        | NA        | +0.3 / -0.33 dB |
| 80  |                | 7800 MHz      | 6.22 dB  | NA        | NA        | +0.3 / -0.33 dB |



| No. | Parameter      | Set / Applied | Measured | Deviation | Tolerance | Uncertainty      |
|-----|----------------|---------------|----------|-----------|-----------|------------------|
| 81  | Insertion loss | 7900 MHz      | 6.27 dB  | NA        | NA        | +0.3 / -0.33 dB  |
| 82  |                | 8000 MHz      | 6.31 dB  | NA        | NA        | +0.3 / -0.33 dB  |
| 83  |                | 8100 MHz      | 6.38 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 84  |                | 8200 MHz      | 6.42 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 85  |                | 8300 MHz      | 6.46 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 86  |                | 8400 MHz      | 6.51 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 87  |                | 8500 MHz      | 6.57 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 88  |                | 8600 MHz      | 6.62 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 89  |                | 8700 MHz      | 6.67 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 90  |                | 8800 MHz      | 6.72 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 91  |                | 8900 MHz      | 6.76 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 92  |                | 9000 MHz      | 6.80 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 93  |                | 9100 MHz      | 6.86 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 94  |                | 9200 MHz      | 6.90 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 95  |                | 9300 MHz      | 6.95 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 96  |                | 9400 MHz      | 7.01 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 97  |                | 9500 MHz      | 7.05 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 98  |                | 9600 MHz      | 7.09 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 99  |                | 9700 MHz      | 7.14 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 100 |                | 9800 MHz      | 7.16 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 101 |                | 9900 MHz      | 7.22 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 102 |                | 10000 MHz     | 7.25 dB  | NA        | NA        | +0.34 / -0.36 dB |
| 103 |                | 10100 MHz     | 7.26 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 104 |                | 10200 MHz     | 7.30 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 105 |                | 10300 MHz     | 7.33 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 106 |                | 10400 MHz     | 7.35 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 107 |                | 10500 MHz     | 7.40 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 108 |                | 10600 MHz     | 7.40 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 109 |                | 10700 MHz     | 7.43 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 110 |                | 10800 MHz     | 7.47 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 111 |                | 10900 MHz     | 7.50 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 112 |                | 11000 MHz     | 7.53 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 113 |                | 11100 MHz     | 7.56 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 114 |                | 11200 MHz     | 7.58 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 115 |                | 11300 MHz     | 7.63 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 116 |                | 11400 MHz     | 7.67 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 117 |                | 11500 MHz     | 7.72 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 118 |                | 11600 MHz     | 7.77 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 119 |                | 11700 MHz     | 7.81 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 120 |                | 11800 MHz     | 7.85 dB  | NA        | NA        | +0.4 / -0.44 dB  |

| No. | Parameter      | Set / Applied | Measured | Deviation | Tolerance | Uncertainty      |
|-----|----------------|---------------|----------|-----------|-----------|------------------|
| 121 | Insertion loss | 11900 MHz     | 7.88 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 122 |                | 12000 MHz     | 7.94 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 123 |                | 12100 MHz     | 7.99 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 124 |                | 12200 MHz     | 8.03 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 125 |                | 12300 MHz     | 8.06 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 126 |                | 12400 MHz     | 8.09 dB  | NA        | NA        | +0.4 / -0.44 dB  |
| 127 |                | 12500 MHz     | 8.14 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 128 |                | 12600 MHz     | 8.16 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 129 |                | 12700 MHz     | 8.21 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 130 |                | 12800 MHz     | 8.29 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 131 |                | 12900 MHz     | 8.32 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 132 |                | 13000 MHz     | 8.34 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 133 |                | 13100 MHz     | 8.39 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 134 |                | 13200 MHz     | 8.46 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 135 |                | 13300 MHz     | 8.47 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 136 |                | 13400 MHz     | 8.53 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 137 |                | 13500 MHz     | 8.55 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 138 |                | 13600 MHz     | 8.58 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 139 |                | 13700 MHz     | 8.64 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 140 |                | 13800 MHz     | 8.67 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 141 |                | 13900 MHz     | 8.72 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 142 |                | 14000 MHz     | 8.76 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 143 |                | 14100 MHz     | 8.81 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 144 |                | 14200 MHz     | 8.86 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 145 |                | 14300 MHz     | 8.91 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 146 |                | 14400 MHz     | 8.94 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 147 |                | 14500 MHz     | 9.00 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 148 |                | 14600 MHz     | 9.05 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 149 |                | 14700 MHz     | 9.13 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 150 |                | 14800 MHz     | 9.18 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 151 |                | 14900 MHz     | 9.20 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 152 |                | 15000 MHz     | 9.25 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 153 |                | 15100 MHz     | 9.26 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 154 |                | 15200 MHz     | 9.32 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 155 |                | 15300 MHz     | 9.36 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 156 |                | 15400 MHz     | 9.38 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 157 |                | 15500 MHz     | 9.40 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 158 |                | 15600 MHz     | 9.40 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 159 |                | 15700 MHz     | 9.46 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 160 |                | 15800 MHz     | 9.48 dB  | NA        | NA        | +0.47 / -0.52 dB |

| No. | Parameter      | Set / Applied | Measured | Deviation | Tolerance | Uncertainty      |
|-----|----------------|---------------|----------|-----------|-----------|------------------|
| 161 | Insertion loss | 15900 MHz     | 9.51 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 162 |                | 16000 MHz     | 9.56 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 163 |                | 16100 MHz     | 9.58 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 164 |                | 16200 MHz     | 9.62 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 165 |                | 16300 MHz     | 9.66 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 166 |                | 16400 MHz     | 9.70 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 167 |                | 16500 MHz     | 9.71 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 168 |                | 16600 MHz     | 9.75 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 169 |                | 16700 MHz     | 9.80 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 170 |                | 16800 MHz     | 9.88 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 171 |                | 16900 MHz     | 9.94 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 172 |                | 17000 MHz     | 9.99 dB  | NA        | NA        | +0.47 / -0.52 dB |
| 173 |                | 17100 MHz     | 10.04 dB | NA        | NA        | +0.47 / -0.52 dB |
| 174 |                | 17200 MHz     | 10.07 dB | NA        | NA        | +0.47 / -0.52 dB |
| 175 |                | 17300 MHz     | 10.14 dB | NA        | NA        | +0.47 / -0.52 dB |
| 176 |                | 17400 MHz     | 10.17 dB | NA        | NA        | +0.47 / -0.52 dB |
| 177 |                | 17500 MHz     | 10.18 dB | NA        | NA        | +0.47 / -0.52 dB |
| 178 |                | 17600 MHz     | 10.24 dB | NA        | NA        | +0.47 / -0.52 dB |
| 179 |                | 17700 MHz     | 10.26 dB | NA        | NA        | +0.47 / -0.52 dB |
| 180 |                | 17800 MHz     | 10.31 dB | NA        | NA        | +0.47 / -0.52 dB |
| 181 |                | 17900 MHz     | 10.31 dB | NA        | NA        | +0.47 / -0.52 dB |
| 182 |                | 18000 MHz     | 10.37 dB | NA        | NA        | +0.47 / -0.52 dB |

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

| No. | Parameter      | Set / Applied | Measured | Deviation | Tolerance | Uncertainty      |
|-----|----------------|---------------|----------|-----------|-----------|------------------|
| 1   | Insertion loss | 50 MHz        | 0.23 dB  | NA        | NA        | +0.06 / -0.06 dB |
| 2   |                | 100 MHz       | 0.31 dB  | NA        | NA        | +0.06 / -0.06 dB |
| 3   |                | 300 MHz       | 0.52 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 4   |                | 500 MHz       | 0.66 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 5   |                | 1000 MHz      | 0.93 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 6   |                | 1500 MHz      | 1.14 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 7   |                | 2000 MHz      | 1.32 dB  | NA        | NA        | +0.07 / -0.07 dB |
| 8   |                | 2500 MHz      | 1.48 dB  | NA        | NA        | +0.09 / -0.1 dB  |
| 9   |                | 3000 MHz      | 1.62 dB  | NA        | NA        | +0.09 / -0.1 dB  |
| 10  |                | 3500 MHz      | 1.76 dB  | NA        | NA        | +0.12 / -0.12 dB |
| 11  |                | 4000 MHz      | 1.89 dB  | NA        | NA        | +0.16 / -0.17 dB |
| 12  |                | 4500 MHz      | 2.02 dB  | NA        | NA        | +0.21 / -0.22 dB |
| 13  |                | 5000 MHz      | 2.12 dB  | NA        | NA        | +0.21 / -0.22 dB |
| 14  |                | 5500 MHz      | 2.25 dB  | NA        | NA        | +0.21 / -0.22 dB |
| 15  |                | 6000 MHz      | 2.38 dB  | NA        | NA        | +0.21 / -0.22 dB |
| 16  |                | 6500 MHz      | 2.47 dB  | NA        | NA        | +0.21 / -0.22 dB |
| 17  |                | 7000 MHz      | 2.57 dB  | NA        | NA        | +0.21 / -0.22 dB |
| 18  |                | 7500 MHz      | 2.67 dB  | NA        | NA        | +0.21 / -0.22 dB |
| 19  |                | 8000 MHz      | 2.76 dB  | NA        | NA        | +0.24 / -0.26 dB |
| 20  |                | 8500 MHz      | 2.83 dB  | NA        | NA        | +0.27 / -0.29 dB |
| 21  |                | 9000 MHz      | 2.94 dB  | NA        | NA        | +0.27 / -0.29 dB |
| 22  |                | 9500 MHz      | 3.04 dB  | NA        | NA        | +0.27 / -0.29 dB |
| 23  |                | 10000 MHz     | 3.13 dB  | NA        | NA        | +0.27 / -0.29 dB |
| 24  |                | 10500 MHz     | 3.21 dB  | NA        | NA        | +0.27 / -0.29 dB |
| 25  |                | 11000 MHz     | 3.29 dB  | NA        | NA        | +0.27 / -0.29 dB |
| 26  |                | 11500 MHz     | 3.37 dB  | NA        | NA        | +0.27 / -0.29 dB |
| 27  |                | 12000 MHz     | 3.42 dB  | NA        | NA        | +0.27 / -0.29 dB |
| 28  |                | 12500 MHz     | 3.50 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 29  |                | 13000 MHz     | 3.60 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 30  |                | 13500 MHz     | 3.72 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 31  |                | 14000 MHz     | 3.75 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 32  |                | 14500 MHz     | 3.81 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 33  |                | 15000 MHz     | 3.91 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 34  |                | 15500 MHz     | 3.92 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 35  |                | 16000 MHz     | 4.01 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 36  |                | 16500 MHz     | 4.13 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 37  |                | 17000 MHz     | 4.16 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 38  |                | 17500 MHz     | 4.26 dB  | NA        | NA        | +0.36 / -0.4 dB  |
| 39  |                | 18000 MHz     | 4.33 dB  | NA        | NA        | +0.36 / -0.4 dB  |

## 12 APPENDIX E 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.

## 13 APPENDIX F Specification references

FCC 47CFR part 15: 2015

ANSI C63.10: 2013

ANSI C63.2: 1996

Radio Frequency Devices

American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications

END OF DOCUMENT