

# TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247 (DTS)

FOR:

**LiveMetric (Medical) S.A.**  
**Wristband blood pressure monitor**  
**Model:LM1P**  
**FCC ID: 2AQVELM1PX**

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## 1 Applicant information

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**Telephone:** +1 (330) 285-7222  
**E-mail:** benita.lanzer@livemetric.com  
**Contact name:** Mr. Benita Lanzer

## 2 Equipment under test attributes

**Product name:** Wristband blood pressure monitor  
**Product type:** BLE  
**Model(s):** LM1P  
**Serial number:** 102-032-07  
**Hardware version:** A1  
**Software release:** Rev 1.0  
**Receipt date** 27-Aug-18

## 3 Manufacturer information

**Manufacturer name:** LiveMetric (Medical) S.A.  
**Address:** 40, rue Glesener, Luxembourg L-1630  
**Telephone:** +1 (330) 285-7222  
**E-Mail:** benita.lanzer@livemetric.com  
**Contact name:** Mr. Benita Lanzer

## 4 Test details

**Project ID:** 31317  
**Location:** Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel  
**Test started:** 27-Aug-18  
**Test completed:** 29-Nov-18  
**Test specification(s):** FCC 47CFR part 15 subpart C § 15.247 (DTS)

## 5 Tests summary

| Test                                           | Status                                                            |
|------------------------------------------------|-------------------------------------------------------------------|
| <b>Transmitter characteristics</b>             |                                                                   |
| Section 15.247(a)2, 6 dB bandwidth             | Pass                                                              |
| Section 15.247(b)3, Peak output power          | Pass                                                              |
| Section 15.247(d), Radiated spurious emissions | Pass                                                              |
| Section 15.247(d), Band edge emissions         | Pass                                                              |
| Section 15.247(e), Peak power density          | Pass                                                              |
| Section 15.247(b)5, RF exposure                | Pass, the exhibit to the application of certification is provided |
| Section 15.207(a), Conducted emission          | Not required                                                      |
| Section 15.203, Antenna requirement            | Pass                                                              |

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

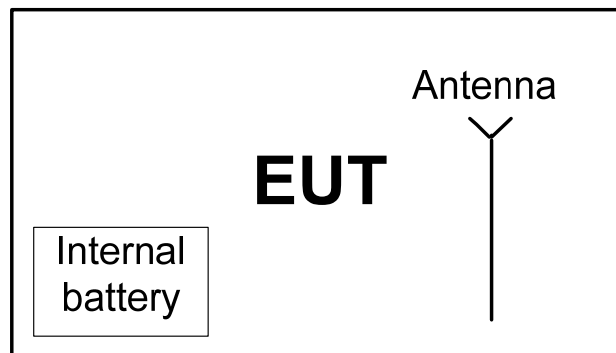
|                     | Name and Title                                            | Date              | Signature                                                                             |
|---------------------|-----------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mrs. E. Pitt, test engineer                               | November 29, 2018 |  |
| <b>Reviewed by:</b> | Mrs. M. Cherniavsky, certification engineer               | December 5, 2018  |  |
| <b>Approved by:</b> | Mr. K. Zushchuk, Projects & Customer Manager, EMC & Radio | December 24, 2018 |  |

## 6 EUT description

### 6.1 General information

The EUT, model name LM1P, wristband blood pressure monitor, is intended to measure systolic and diastolic blood pressure (BP) and heart rate (HR) in a non-invasive manner.

### 6.2 Test configuration



### 6.3 Changes made in EUT

No changes were implemented in the EUT during testing.

## 6.4 EUT test positions

Photograph 6.4.1 EUT in X-axis orthogonal position



Photograph 6.4.2 EUT in Y-axis orthogonal position



Photograph 6.4.3 EUT in Z-axis orthogonal position



## 6.5 Transmitter characteristics

|                                              |                                                                                                          |                                                           |         |                                   |                                                               |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------|-----------------------------------|---------------------------------------------------------------|
| <b>Type of equipment</b>                     |                                                                                                          |                                                           |         |                                   |                                                               |
| 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)                                          |                                                           |         |                                   |                                                               |
| <b>Intended use</b>                          |                                                                                                          | <b>Condition of use</b>                                   |         |                                   |                                                               |
|                                              | fixed                                                                                                    | Always at a distance more than 2 m from all people        |         |                                   |                                                               |
|                                              | mobile                                                                                                   | Always at a distance more than 20 cm from all people      |         |                                   |                                                               |
| X                                            | portable                                                                                                 | May operate at a distance closer than 20 cm to human body |         |                                   |                                                               |
| <b>Assigned frequency range</b>              |                                                                                                          | 2400-2483.5 MHz                                           |         |                                   |                                                               |
| <b>Operating frequency range</b>             |                                                                                                          | 2402 – 2480 MHz                                           |         |                                   |                                                               |
| <b>Maximum rated output power</b>            |                                                                                                          | At transmitter 50 $\Omega$ RF output connector            |         | NA                                |                                                               |
|                                              |                                                                                                          | Peak output power                                         |         | -9.72 dBm                         |                                                               |
| <b>Is transmitter output power variable?</b> |                                                                                                          | X                                                         | No      |                                   |                                                               |
|                                              |                                                                                                          |                                                           | Yes     | continuous variable               |                                                               |
|                                              |                                                                                                          |                                                           |         | stepped variable with stepsize dB |                                                               |
|                                              |                                                                                                          |                                                           |         | minimum RF power dBm              |                                                               |
|                                              |                                                                                                          |                                                           |         | maximum RF power dBm              |                                                               |
| <b>Antenna connection</b>                    |                                                                                                          |                                                           |         |                                   |                                                               |
| unique coupling                              |                                                                                                          | standard connector                                        |         | X                                 | integral                                                      |
|                                              |                                                                                                          |                                                           |         | X                                 | with temporary RF connector<br>without temporary RF connector |
| <b>Antenna/s technical characteristics</b>   |                                                                                                          |                                                           |         |                                   |                                                               |
| <b>Type</b>                                  |                                                                                                          | <b>Manufacturer</b>                                       |         | <b>Model number</b>               |                                                               |
| Internal                                     |                                                                                                          | Würth elektronik                                          |         | SMT                               |                                                               |
|                                              |                                                                                                          |                                                           |         | Gain                              |                                                               |
|                                              |                                                                                                          |                                                           |         | -0.5 dBi                          |                                                               |
| <b>Transmitter aggregate data rate/s</b>     |                                                                                                          | 1 Mbps                                                    |         |                                   |                                                               |
| <b>Type of modulation</b>                    |                                                                                                          | BLE(GFSK)                                                 |         |                                   |                                                               |
| <b>Modulating test signal (baseband)</b>     |                                                                                                          | PRBS                                                      |         |                                   |                                                               |
| <b>Transmitter power source</b>              |                                                                                                          |                                                           |         |                                   |                                                               |
| X                                            | Battery                                                                                                  | <b>Nominal rated voltage</b>                              | 3.7 VDC | <b>Battery type</b>               | Li-Ion polymer battery                                        |
|                                              | DC                                                                                                       | <b>Nominal rated voltage</b>                              |         |                                   |                                                               |
|                                              | AC mains                                                                                                 | <b>Nominal rated voltage</b>                              |         | <b>Frequency</b>                  |                                                               |

|                                                                        |                                |                             |                       |
|------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(a)(2), 6 dB bandwidth</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, Section 11.8.1                     |                                |                             |                       |
| <b>Test mode:</b> Compliance                                           |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 03-Sep-18                                              |                                |                             |                       |
| <b>Temperature:</b> 23 °C                                              | <b>Relative Humidity:</b> 50 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                        |                                |                             |                       |

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

### 7.1 Minimum 6 dB bandwidth

#### 7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 6 dB bandwidth limits

| Assigned frequency, MHz | Modulation envelope reference points*, dBc | Minimum bandwidth, kHz |
|-------------------------|--------------------------------------------|------------------------|
| 902.0 – 928.0           | 6.0                                        | 500.0                  |
| 2400.0 – 2483.5         |                                            |                        |
| 5725.0 – 5850.0         |                                            |                        |

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

#### 7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was set to transmit modulated carrier.

7.1.2.3 The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and associated plot.

Figure 7.1.1 The 6 dB bandwidth test setup





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|                                                                        |                                |                             |                       |
|------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(a)(2), 6 dB bandwidth</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, Section 11.8.1                     |                                |                             |                       |
| <b>Test mode:</b> Compliance                                           |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 03-Sep-18                                              |                                |                             |                       |
| <b>Temperature:</b> 23 °C                                              | <b>Relative Humidity:</b> 50 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                        |                                |                             |                       |

Table 7.1.2 The 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz  
DETECTOR USED: Peak  
SWEEP TIME: Auto  
RESOLUTION BANDWIDTH: 100 kHz  
VIDEO BANDWIDTH: 300 kHz  
MODULATION ENVELOPE REFERENCE POINTS: 6.0 dBc  
MODULATION: GFSK  
BIT RATE: 1 Mbps

| Carrier frequency, MHz | 6 dB bandwidth, kHz | Limit, kHz | Margin, kHz | Verdict |
|------------------------|---------------------|------------|-------------|---------|
| 2402                   | 510.5               | 500        | 10.5        | Pass    |
| 2442                   | 522.5               | 500        | 22.5        | Pass    |
| 2480                   | 513.5               | 500        | 13.5        | Pass    |

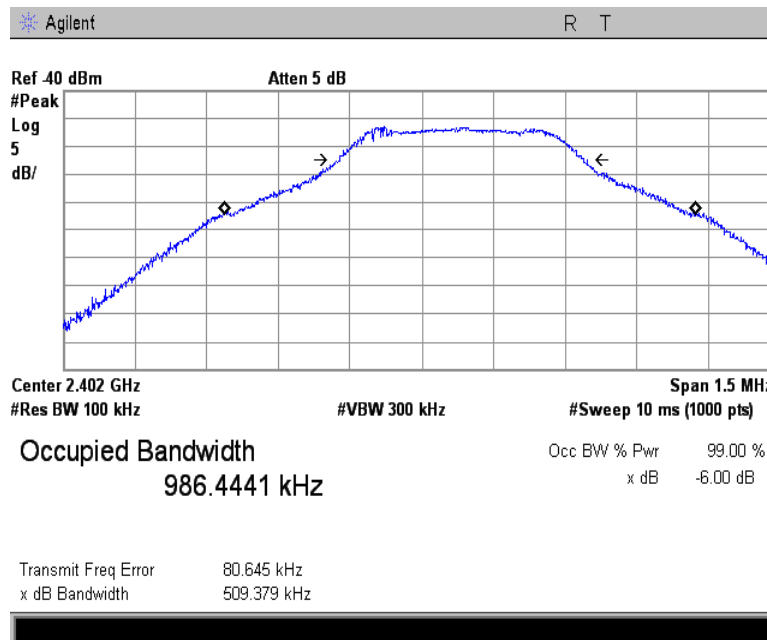
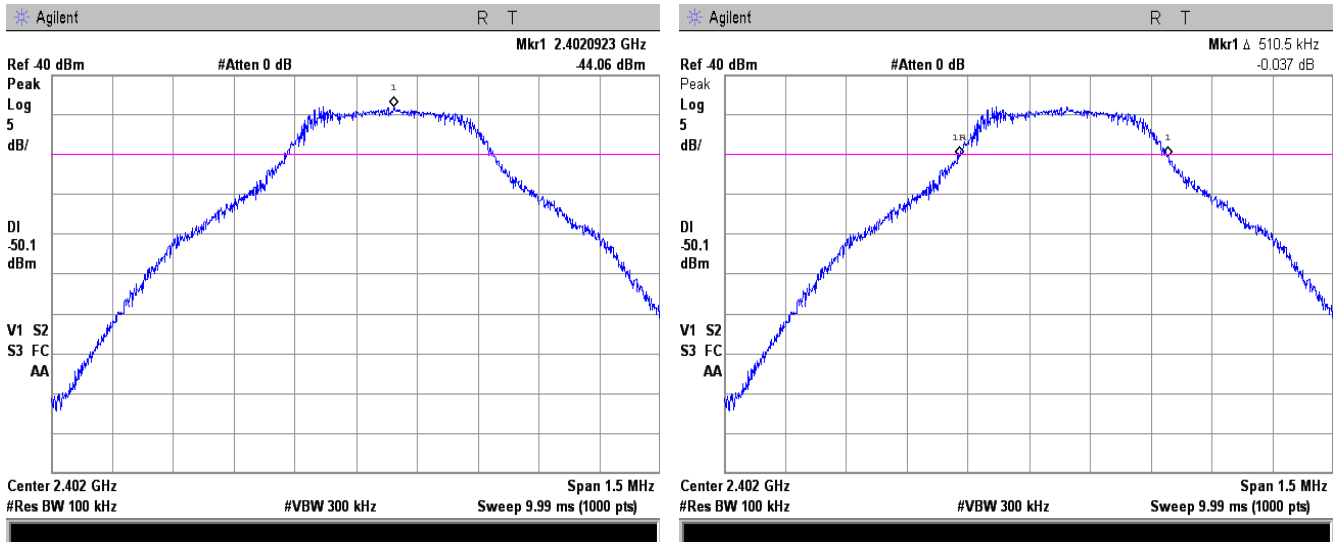
**Reference numbers of test equipment used**

|         |         |  |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|--|
| HL 2909 | HL 4135 |  |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|--|

Full description is given in Appendix A.

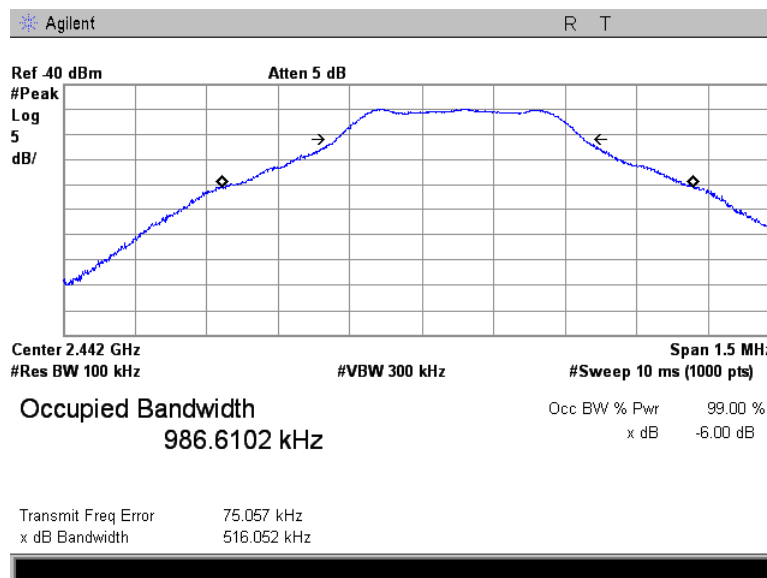
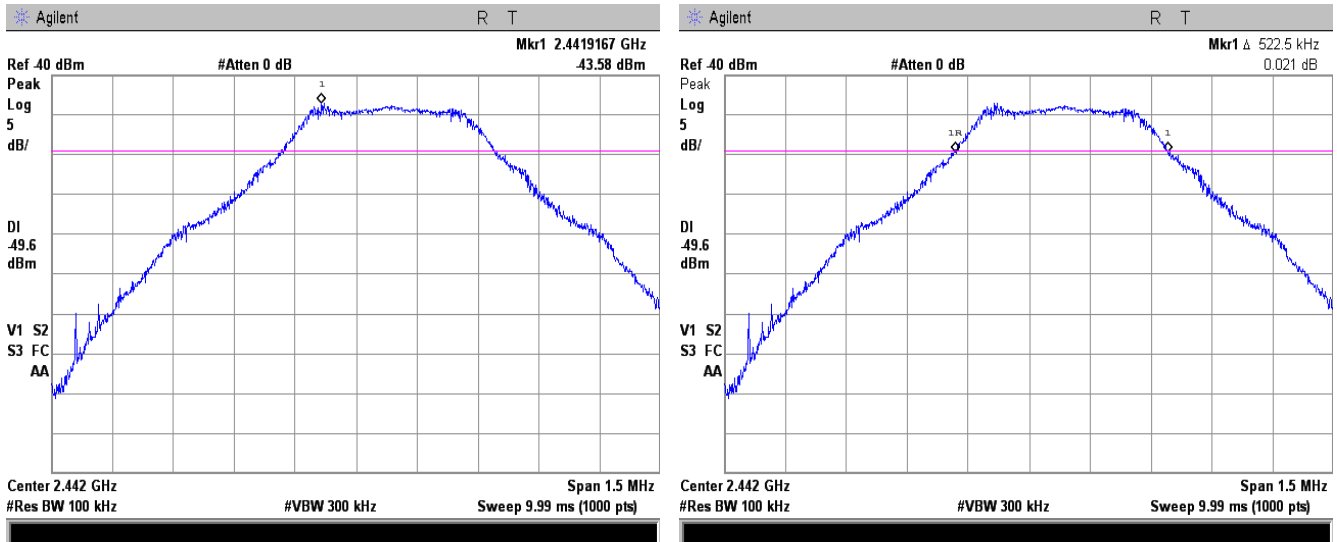
|                     |                         |                                      |                |
|---------------------|-------------------------|--------------------------------------|----------------|
| Test specification: |                         | Section 15.247(a)(2), 6 dB bandwidth |                |
| Test procedure:     |                         | ANSI C63.10, Section 11.8.1          |                |
| Test mode:          |                         | Verdict: PASS                        |                |
| Date(s):            |                         |                                      |                |
| 03-Sep-18           |                         |                                      |                |
| Temperature: 23 °C  | Relative Humidity: 50 % | Air Pressure: hPa                    | Power: Battery |
| Remarks:            |                         |                                      |                |

Plot 7.1.1 The 6 dB bandwidth test result at low frequency



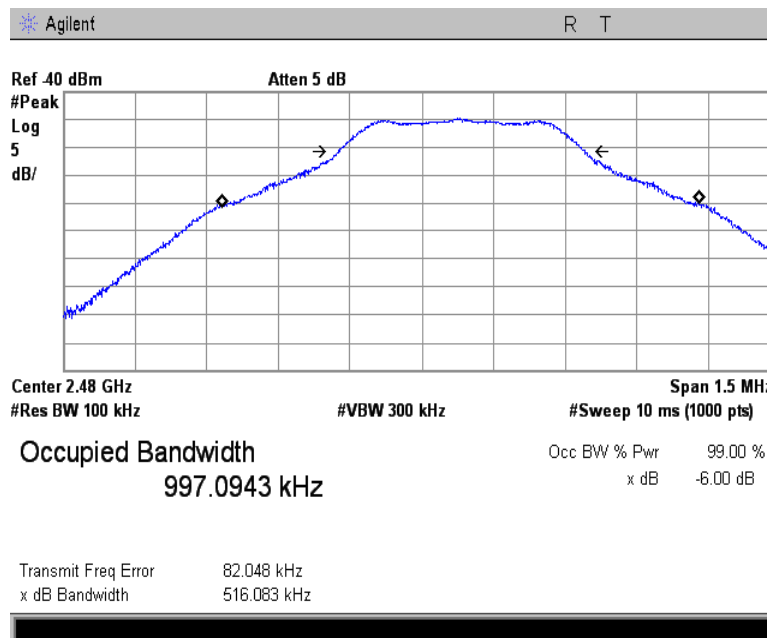
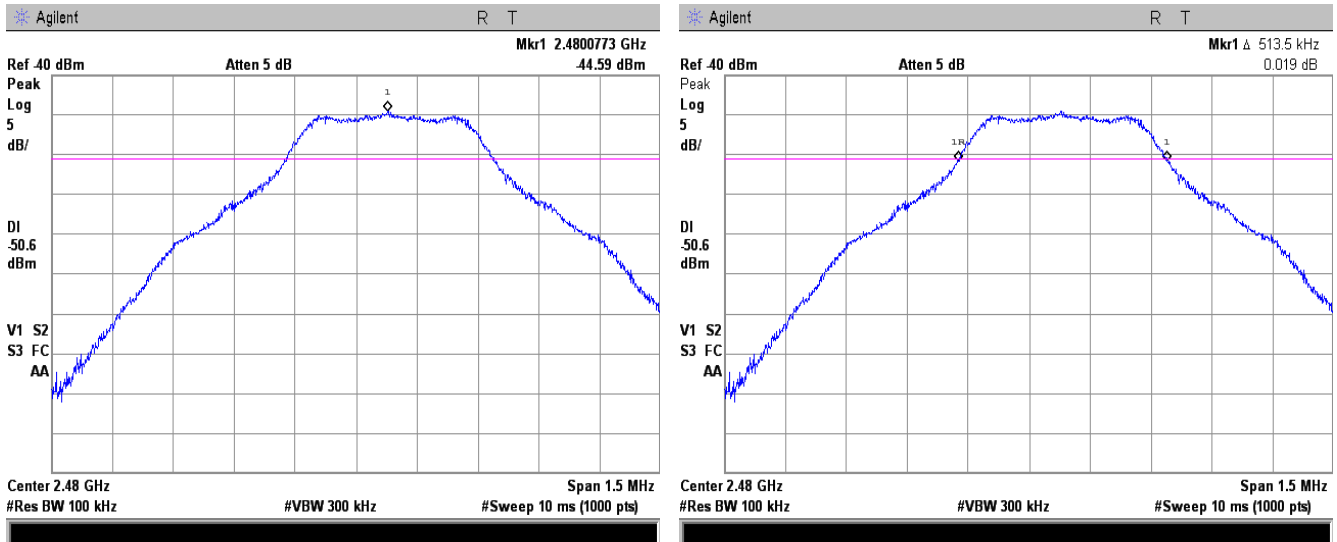
|                     |                         |                                      |                |
|---------------------|-------------------------|--------------------------------------|----------------|
| Test specification: |                         | Section 15.247(a)(2), 6 dB bandwidth |                |
| Test procedure:     |                         | ANSI C63.10, Section 11.8.1          |                |
| Test mode:          |                         | Verdict: PASS                        |                |
| Date(s):            |                         |                                      |                |
| 03-Sep-18           |                         |                                      |                |
| Temperature: 23 °C  | Relative Humidity: 50 % | Air Pressure: hPa                    | Power: Battery |
| Remarks:            |                         |                                      |                |

Plot 7.1.2 The 6 dB bandwidth test result at mid frequency



|                     |                         |                                      |                |
|---------------------|-------------------------|--------------------------------------|----------------|
| Test specification: |                         | Section 15.247(a)(2), 6 dB bandwidth |                |
| Test procedure:     |                         | ANSI C63.10, Section 11.8.1          |                |
| Test mode:          |                         | Verdict: PASS                        |                |
| Date(s):            |                         |                                      |                |
| 03-Sep-18           |                         |                                      |                |
| Temperature: 23 °C  | Relative Humidity: 50 % | Air Pressure: hPa                    | Power: Battery |
| Remarks:            |                         |                                      |                |

Plot 7.1.3 The 6 dB bandwidth test result at high frequency





|                                                                           |                                |                             |                       |
|---------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(b)(3), Peak output power</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, Section 11.9.1.1                      |                                |                             |                       |
| <b>Test mode:</b> Compliance                                              |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 03-Sep-18                                                 |                                |                             |                       |
| <b>Temperature:</b> 23 °C                                                 | <b>Relative Humidity:</b> 50 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                           |                                |                             |                       |

## 7.2 Peak output power

### 7.2.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

| Assigned frequency range, MHz | Maximum antenna gain, dBi | Peak output power* |      | Equivalent field strength limit @ 3m, dB(μV/m)** |
|-------------------------------|---------------------------|--------------------|------|--------------------------------------------------|
|                               |                           | W                  | dBm  |                                                  |
| 902.0 – 928.0                 | 6.0                       | 1.0                | 30.0 | 131.2                                            |
| 2400.0 – 2483.5               |                           |                    |      |                                                  |
| 5725.0 – 5850.0               |                           |                    |      |                                                  |

\*- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

- by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
- without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
- by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

\*\*- Equivalent field strength limit was calculated from the peak output power as follows:  $E = \sqrt{30 \times P \times G} / r$ , where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.

### 7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.2.2.3 The frequency span of spectrum analyzer was set approximately 5 times wider than 20 dB bandwidth of the EUT and the resolution bandwidth was set wider than 20 dB bandwidth of the EUT. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.2.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.2.2 and associated plots.

7.2.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.

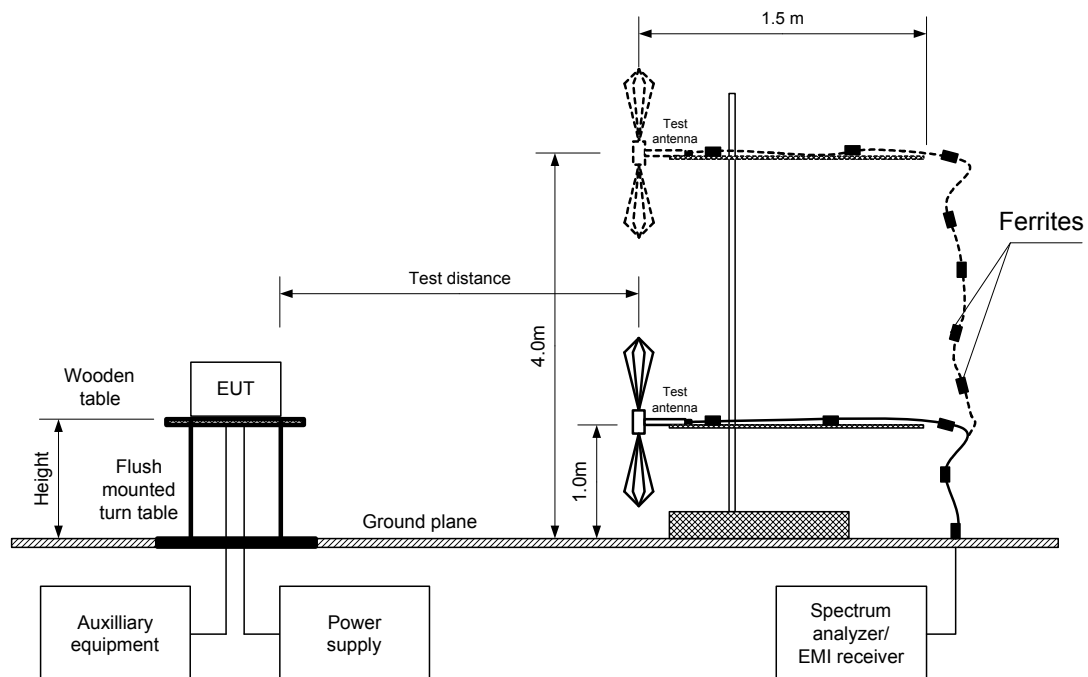
The above equation was converted in logarithmic units for 3 m test distance:

$$\text{Peak output power in dBm} = \text{Field strength in dB}(\mu\text{V/m}) - \text{Transmitter antenna gain in dBi} - 95.2 \text{ dB}$$

7.2.2.6 The worst test results (the lowest margins) were recorded in Table 7.2.2.

|                                                                           |                                |                             |                       |
|---------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(b)(3), Peak output power</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, Section 11.9.1.1                      |                                |                             |                       |
| <b>Test mode:</b> Compliance                                              |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 03-Sep-18                                                 |                                |                             |                       |
| <b>Temperature:</b> 23 °C                                                 | <b>Relative Humidity:</b> 50 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                           |                                |                             |                       |

Figure 7.2.1 Setup for carrier field strength measurements





|                                                                           |                                |                             |                       |
|---------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(b)(3), Peak output power</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, Section 11.9.1.1                      |                                |                             |                       |
| <b>Test mode:</b> Compliance                                              |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 03-Sep-18                                                 |                                |                             |                       |
| <b>Temperature:</b> 23 °C                                                 | <b>Relative Humidity:</b> 50 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                           |                                |                             |                       |

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY: 2400-2483.5 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: Semi anechoic chamber  
 EUT HEIGHT: 0.8 m  
 DETECTOR USED: Peak  
 TEST ANTENNA TYPE: Double ridged guide  
 MODULATION: GFSK  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 1 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 DETECTOR USED: Peak  
 EUT 6 dB BANDWIDTH: 522.5 kHz  
 RESOLUTION BANDWIDTH: 1 MHz  
 VIDEO BANDWIDTH: 3 MHz

| Frequency, MHz | Field strength, dB(μV/m) | Antenna polarization | Antenna height, m | Azimuth, degrees* | EUT antenna gain, dBi | Peak output power, dBm** | Limit, dBm | Margin, dB*** | Verdict |
|----------------|--------------------------|----------------------|-------------------|-------------------|-----------------------|--------------------------|------------|---------------|---------|
| 2402.0000      | 84.77                    | H                    | 1.5               | 5.0               | -0.5                  | -9.93                    | 10         | -20.43        | Pass    |
| 2442.0000      | 84.98                    | H                    | 1.5               | -24.0             | -0.5                  | -9.72                    | 10         | -20.22        | Pass    |
| 2479.9772      | 77.91                    | H                    | 1.5               | -33.0             | -0.5                  | -16.79                   | 10         | -27.29        | Pass    |

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

\*\* - Peak output power was calculated from the field strength of carrier as follows:  $P = (E \times d)^2 / (30 \times G)$ , where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi - 95.2 dB*

\*\*\* - Margin = Peak output power – specification limit.

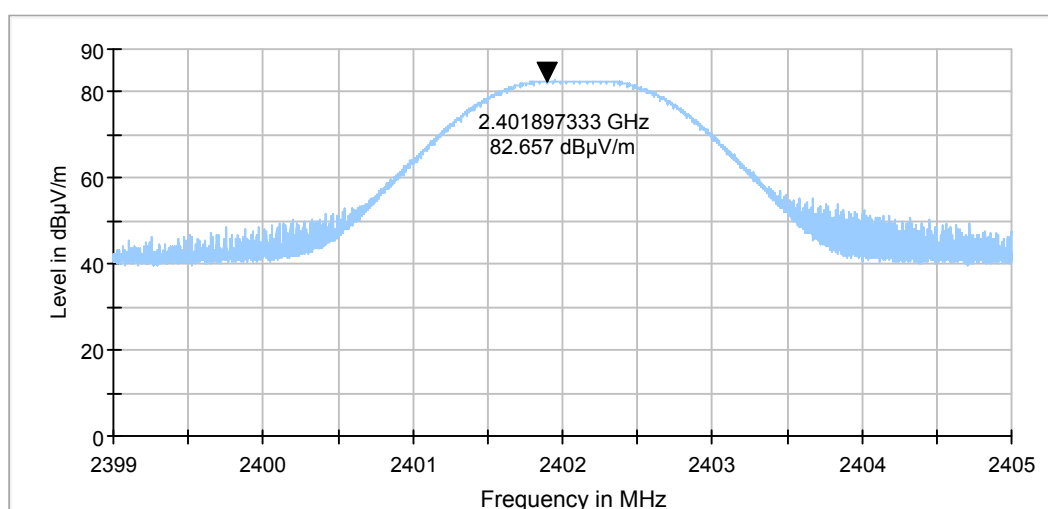
## Reference numbers of test equipment used

|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 3903 | HL 4360 | HL 5288 | HL 5405 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

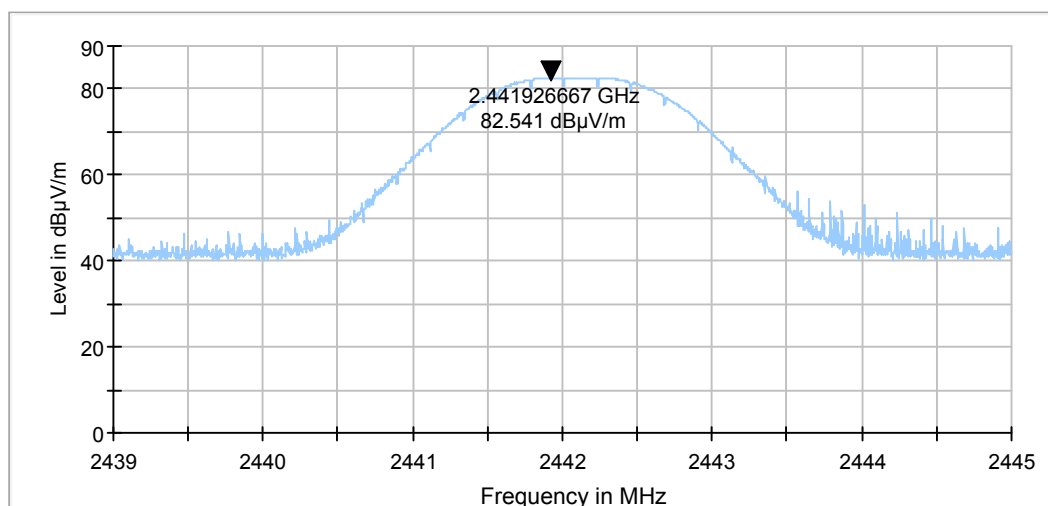
Full description is given in Appendix A.

|                                                                           |                                |                             |                       |
|---------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(b)(3), Peak output power</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, Section 11.9.1.1                      |                                |                             |                       |
| <b>Test mode:</b> Compliance                                              |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 03-Sep-18                                                 |                                |                             |                       |
| <b>Temperature:</b> 23 °C                                                 | <b>Relative Humidity:</b> 50 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                           |                                |                             |                       |

Plot 7.2.1 Field strength of carrier at low frequency

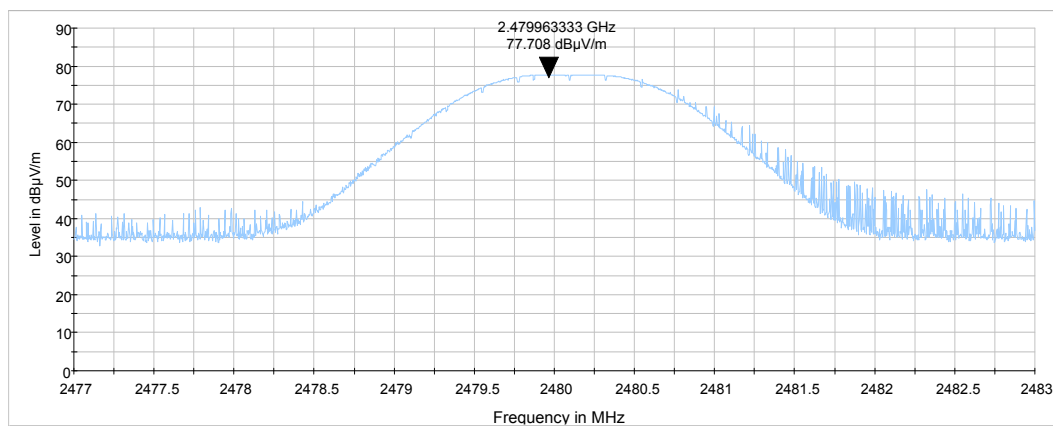


Plot 7.2.2 Field strength of carrier at mid frequency



|                                                                           |                                |                             |                       |
|---------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(b)(3), Peak output power</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, Section 11.9.1.1                      |                                |                             |                       |
| <b>Test mode:</b> Compliance                                              |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 03-Sep-18                                                 |                                |                             |                       |
| <b>Temperature:</b> 23 °C                                                 | <b>Relative Humidity:</b> 50 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                           |                                |                             |                       |

Plot 7.2.3 Field strength of carrier at high frequency





|                                                                                  |                                |                             |                       |
|----------------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Radiated spurious emissions</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1                   |                                |                             |                       |
| <b>Test mode:</b> Compliance                                                     |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 28-Aug-18                                                        |                                |                             |                       |
| <b>Temperature:</b> 24 °C                                                        | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                                  |                                |                             |                       |

## 7.3 Field strength of spurious emissions

### 7.3.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

**Table 7.3.1 Radiated spurious emissions limits**

| Frequency, MHz                   | Field strength at 3 m within restricted bands, dB(μV/m)*** |                 |                 | Attenuation of field strength of spurious versus carrier outside restricted bands, dBc*** |
|----------------------------------|------------------------------------------------------------|-----------------|-----------------|-------------------------------------------------------------------------------------------|
|                                  | Peak                                                       | Quasi Peak      | Average         |                                                                                           |
| 0.009 – 0.090                    | 148.5 – 128.5                                              | NA              | 128.5 – 108.5** | 20.0                                                                                      |
| 0.090 – 0.110                    | NA                                                         | 108.5 – 106.8** | NA              |                                                                                           |
| 0.110 – 0.490                    | 126.8 – 113.8                                              | NA              | 106.8 – 93.8**  |                                                                                           |
| 0.490 – 1.705                    | NA                                                         | 73.8 – 63.0**   | NA              |                                                                                           |
| 1.705 – 30.0*                    |                                                            | 69.5            |                 |                                                                                           |
| 30 – 88                          |                                                            | 40.0            |                 |                                                                                           |
| 88 – 216                         |                                                            | 43.5            |                 |                                                                                           |
| 216 – 960                        |                                                            | 46.0            |                 |                                                                                           |
| 960 - 1000                       |                                                            | 54.0            |                 |                                                                                           |
| 1000 – 10 <sup>th</sup> harmonic | 74.0                                                       | NA              | 54.0            |                                                                                           |

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

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

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

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

\*\*\* - The 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.

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

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

**7.3.2.2** 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.

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

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

**7.3.3.1** The EUT was set up as shown in Figure 7.3.2, Figure 7.3.3, energized and the performance check was conducted.

**7.3.3.2** 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.

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

|                                                                                  |                                |                             |                       |
|----------------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Radiated spurious emissions</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1                   |                                |                             |                       |
| <b>Test mode:</b> Compliance                                                     |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 28-Aug-18                                                        |                                |                             |                       |
| <b>Temperature:</b> 24 °C                                                        | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                                  |                                |                             |                       |

Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz

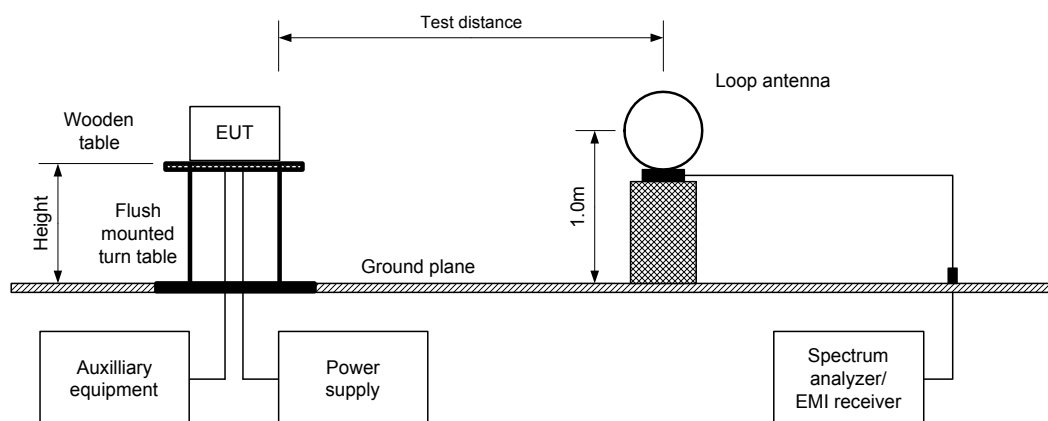
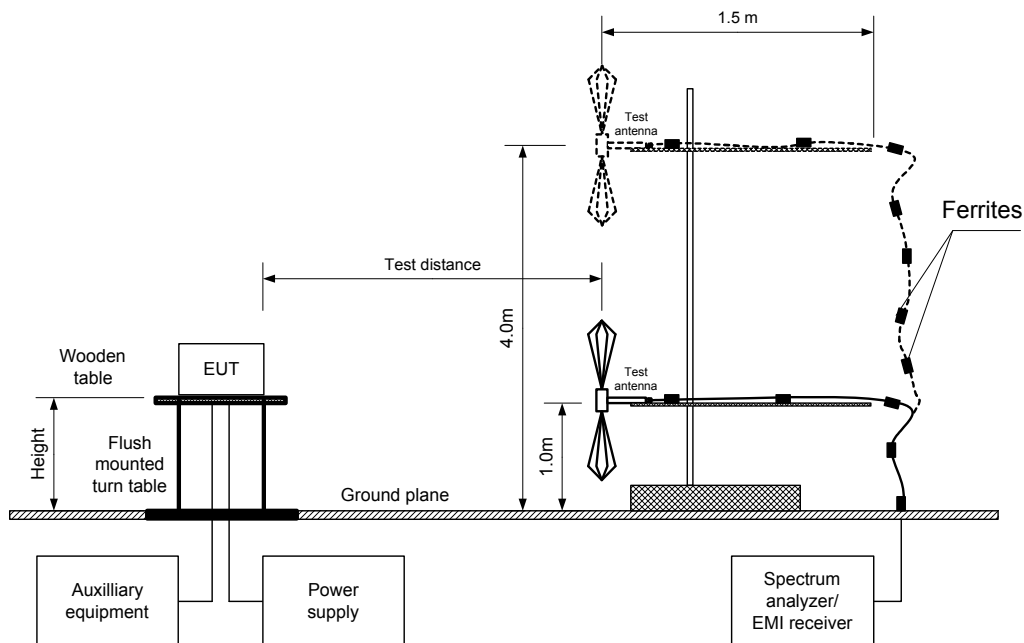
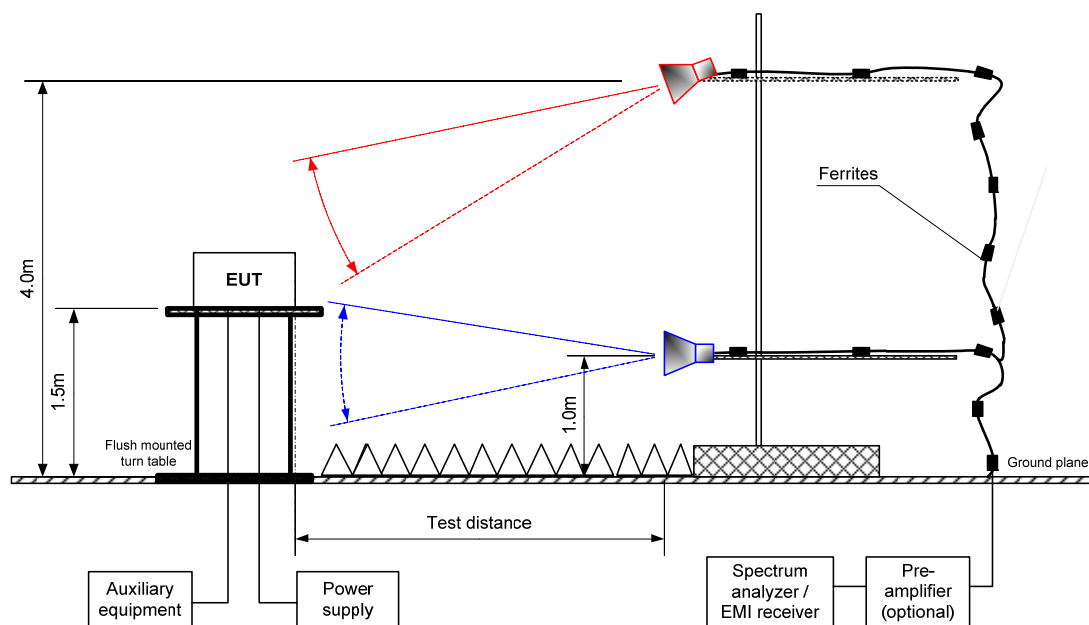


Figure 7.3.2 Setup for spurious emission field strength measurements from 30 to 1000 MHz



|                            |                                |                                                                                                                                         |                       |
|----------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>Test specification:</b> |                                | <b>Section 15.247(d), Radiated spurious emissions</b>                                                                                   |                       |
| <b>Test procedure:</b>     |                                | ANSI C63.10, sections 11.11 and 11.12.1                                                                                                 |                       |
| <b>Test mode:</b>          |                                | <div style="display: flex; justify-content: space-between; align-items: center;"> <span><b>Verdict:</b></span> <span>PASS</span> </div> |                       |
| <b>Date(s):</b>            |                                |                                                                                                                                         |                       |
| 28-Aug-18                  |                                |                                                                                                                                         |                       |
| <b>Temperature:</b> 24 °C  | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa                                                                                                                | <b>Power:</b> Battery |
| <b>Remarks:</b>            |                                |                                                                                                                                         |                       |

**Figure 7.3.3 Setup for spurious emission field strength measurements above 1000 MHz**





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|                                                                           |                                |                          |                       |
|---------------------------------------------------------------------------|--------------------------------|--------------------------|-----------------------|
| <b>Test specification: Section 15.247(d), Radiated spurious emissions</b> |                                |                          |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1            |                                |                          |                       |
| <b>Test mode:</b>                                                         | Compliance                     | <b>Verdict:</b> PASS     |                       |
| <b>Date(s):</b>                                                           | 28-Aug-18                      |                          |                       |
| <b>Temperature:</b> 24 °C                                                 | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                           |                                |                          |                       |

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY: 2400-2483.5 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 25000 MHz  
 TEST DISTANCE: 3 m  
 MODULATION: GFSK  
 BIT RATE: 1 Mbps  
 DUTY CYCLE: 100 %  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 100 kHz  
 VIDEO BANDWIDTH: 300 kHz  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)

| Frequency, MHz         | Field strength of spurious, dB(μV/m) | Antenna polarization | Antenna height, m | Azimuth, degrees* | Field strength of carrier, dB(μV/m) | Attenuation below carrier, dBc | Limit, dBc | Margin, dB** | Verdict |
|------------------------|--------------------------------------|----------------------|-------------------|-------------------|-------------------------------------|--------------------------------|------------|--------------|---------|
| Low carrier frequency  |                                      |                      |                   |                   |                                     |                                |            |              |         |
| 7205.8375              | 52.37                                | V                    | 1.29              | 8.0               | 84.77                               | 32.40                          | 20.0       | 12.40        | Pass    |
| 9270.6000              | 48.73                                | H                    | 2.34              | -6.0              |                                     | 36.04                          |            | 16.04        |         |
| Mid carrier frequency  |                                      |                      |                   |                   |                                     |                                |            |              |         |
| 14435.3500             | 52.29                                | H                    | 1.00              | -15.0             | 84.98                               | 32.69                          | 20.0       | 12.69        | Pass    |
| High carrier frequency |                                      |                      |                   |                   |                                     |                                |            |              |         |
| 14407.9375             | 52.29                                | H                    | 1.00              | 180.0             | 77.91                               | 20.52                          | 20.0       | 0.52         | Pass    |

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

\*\*- Margin = Attenuation below carrier – specification limit.



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|                                                                                  |                                |                             |                       |
|----------------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Radiated spurious emissions</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1                   |                                |                             |                       |
| <b>Test mode:</b> Compliance                                                     |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 28-Aug-18                                                        |                                |                             |                       |
| <b>Temperature:</b> 24 °C                                                        | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                                  |                                |                             |                       |

**Table 7.3.3 Field strength of spurious emissions above 1 GHz within restricted bands**

ASSIGNED FREQUENCY: 2400 – 2483.5 MHz  
 INVESTIGATED FREQUENCY RANGE: 1000 – 25000 MHz  
 TEST DISTANCE: 3 m  
 MODULATION: GFSK  
 BIT RATE: 1 Mbps  
 DUTY CYCLE: 100 %  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1000 kHz  
 TEST ANTENNA TYPE: Double ridged guide

| Frequency,<br>MHz      | Antenna      |              | Azimuth,<br>degrees* | Peak field strength(VBW=3 MHz) |                    |                 | Average field strength(VBW=10 Hz) |                    |              | Verdict |
|------------------------|--------------|--------------|----------------------|--------------------------------|--------------------|-----------------|-----------------------------------|--------------------|--------------|---------|
|                        | Polarization | Height,<br>m |                      | Measured,<br>dB(μV/m)          | Limit,<br>dB(μV/m) | Margin,<br>dB** | Measured,<br>dB(μV/m)             | Limit,<br>dB(μV/m) | Margin, dB** |         |
| Low carrier frequency  |              |              |                      |                                |                    |                 |                                   |                    |              |         |
| 4808.4000              | V            | 1.29         | 8.0                  | 46.94                          | 74.00              | -27.06          | 46.94                             | 54.00              | -7.06        | Pass    |
| 12558.7875             | H            | 2.34         | -6.0                 | 50.58                          | 74.00              | -23.42          | 50.58                             | 54.00              | -3.42        |         |
| Mid carrier frequency  |              |              |                      |                                |                    |                 |                                   |                    |              |         |
| 4883.9125              | H            | 1.00         | 9.0                  | 42.69                          | 74.00              | -31.31          | 42.69                             | 54.00              | -11.31       | Pass    |
| 7388.8375              | H            | 2.08         | 117.0                | 46.96                          | 74.00              | -27.04          | 46.96                             | 54.00              | -7.04        |         |
| 12105.9625             | V            | 1.02         | -163.0               | 53.18                          | 74.00              | -20.82          | 53.18                             | 54.00              | -0.82        |         |
| High carrier frequency |              |              |                      |                                |                    |                 |                                   |                    |              |         |
| 4880.4375              | V            | 3.15         | -14.0                | 43.27                          | 74.00              | -30.73          | 43.27                             | 54.00              | -10.73       | Pass    |
| 7440.5000              | H            | 1.02         | 130.0                | 51.50                          | 74.00              | -22.5           | 51.50                             | 54.00              | -2.50        |         |
| 12139.7625             | V            | 4.00         | 117.0                | 53.34                          | 74.00              | -20.66          | 53.34                             | 54.00              | -0.66        |         |

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

\*\* - Margin = Measured field strength - specification limit.



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|                                                                                  |                                |                             |                       |
|----------------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Radiated spurious emissions</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1                   |                                |                             |                       |
| <b>Test mode:</b> Compliance                                                     |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 28-Aug-18                                                        |                                |                             |                       |
| <b>Temperature:</b> 24 °C                                                        | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                                  |                                |                             |                       |

**Table 7.3.4 Field strength of spurious emissions below 1 GHz within restricted bands**

ASSIGNED FREQUENCY: 2400 – 2483.5 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz  
 TEST DISTANCE: 3 m  
 MODULATION: GFSK  
 BIT RATE: 1 Mbps  
 DUTY CYCLE: 100 %  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 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)  
 Biconilog (30 MHz – 1000 MHz)  
 FREQUENCY HOPPING: Disabled

| Frequency, MHz               |  | Peak emission, dB(μV/m)     |  | Quasi-peak      |  |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|------------------------------|--|-----------------------------|--|-----------------|--|-------------|----------------------|-------------------|--------------------------------|---------|
|                              |  | Measured emission, dB(μV/m) |  | Limit, dB(μV/m) |  | Margin, dB* |                      |                   |                                |         |
| Low carrier frequency        |  |                             |  |                 |  |             |                      |                   |                                |         |
| No emission peaks were found |  |                             |  |                 |  |             |                      |                   |                                | Pass    |
| Mid carrier frequency        |  |                             |  |                 |  |             |                      |                   |                                |         |
| No emission peaks were found |  |                             |  |                 |  |             |                      |                   |                                | Pass    |
| High carrier frequency       |  |                             |  |                 |  |             |                      |                   |                                |         |
| No emission peaks were found |  |                             |  |                 |  |             |                      |                   |                                | Pass    |

\*- Margin = Measured emission - specification limit.

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

**Reference numbers of test equipment used**

|         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 3903 | HL 4360 | HL 4933 | HL 5288 | HL 5405 |
|---------|---------|---------|---------|---------|---------|

Full description is given in Appendix A.



|                     |                         |                                                |                |
|---------------------|-------------------------|------------------------------------------------|----------------|
| Test specification: |                         | Section 15.247(d), Radiated spurious emissions |                |
| Test procedure:     |                         | ANSI C63.10, sections 11.11 and 11.12.1        |                |
| Test mode:          |                         | Verdict: PASS                                  |                |
| Date(s):            |                         |                                                |                |
| 28-Aug-18           |                         |                                                |                |
| Temperature: 24 °C  | Relative Humidity: 51 % | Air Pressure: hPa                              | Power: Battery |
| Remarks:            |                         |                                                |                |

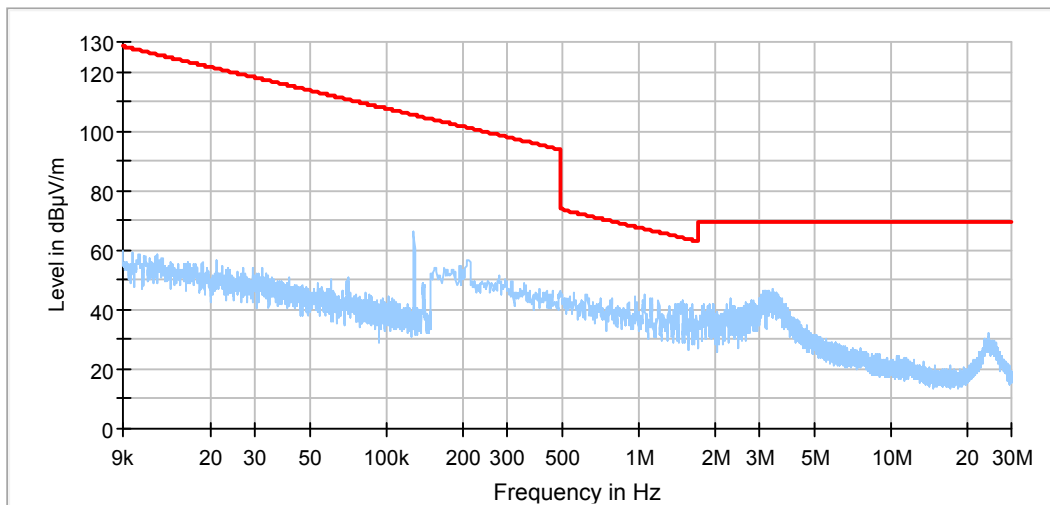
Table 7.3.5 Restricted bands according to FCC section 15.205

| MHz               | MHz                 | MHz                   | MHz             | MHz           | GHz           |
|-------------------|---------------------|-----------------------|-----------------|---------------|---------------|
| 0.09 - 0.11       | 8.37625 - 8.38675   | 73 - 74.6             | 399.9 - 410     | 2690 - 2900   | 10.6 - 12.7   |
| 0.495 - 0.505     | 8.41425 - 8.41475   | 74.8 - 75.2           | 608 - 614       | 3260 - 3267   | 13.25 - 13.4  |
| 2.1735 - 2.1905   | 12.29 - 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   |               |

|                                                                           |                                |                          |                       |
|---------------------------------------------------------------------------|--------------------------------|--------------------------|-----------------------|
| <b>Test specification:</b> Section 15.247(d), Radiated spurious emissions |                                |                          |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1            |                                |                          |                       |
| <b>Test mode:</b> Compliance                                              |                                | <b>Verdict:</b> PASS     |                       |
| <b>Date(s):</b> 28-Aug-18                                                 |                                |                          |                       |
| <b>Temperature:</b> 24 °C                                                 | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                           |                                |                          |                       |

**Plot 7.3.1 Radiated emission measurements from 0.009 to 30 MHz at the low, mid, high carrier frequency**

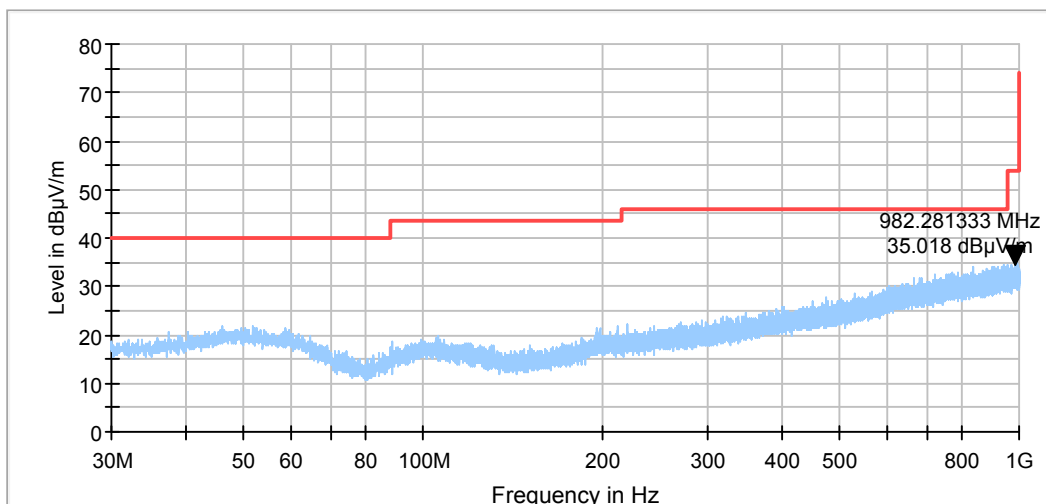
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical



|                                                                    |                         |                   |                |
|--------------------------------------------------------------------|-------------------------|-------------------|----------------|
| Test specification: Section 15.247(d), Radiated spurious emissions |                         |                   |                |
| Test procedure: ANSI C63.10, sections 11.11 and 11.12.1            |                         |                   |                |
| Test mode: Compliance                                              |                         | Verdict: PASS     |                |
| Date(s): 28-Aug-18                                                 |                         |                   |                |
| Temperature: 24 °C                                                 | Relative Humidity: 51 % | Air Pressure: hPa | Power: Battery |
| Remarks:                                                           |                         |                   |                |

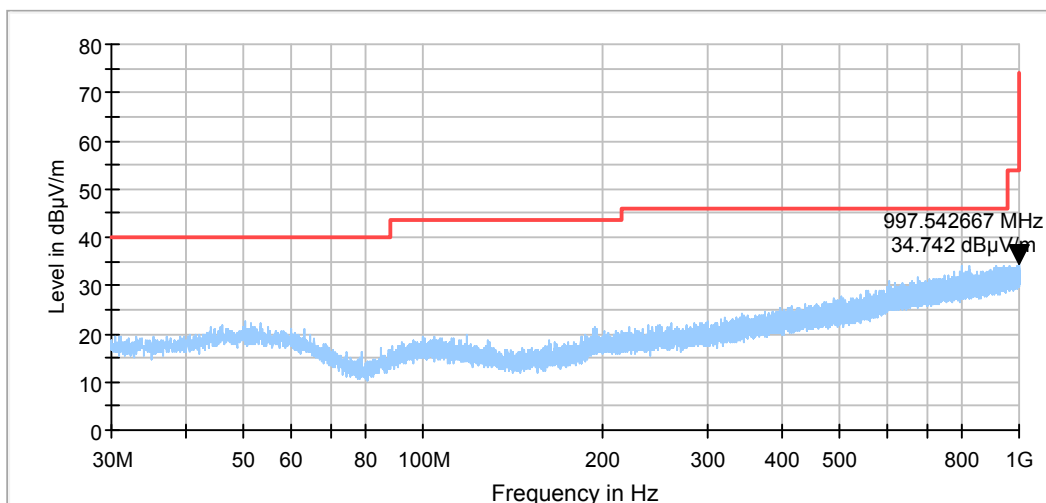
**Plot 7.3.2 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency**

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



**Plot 7.3.3 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency**

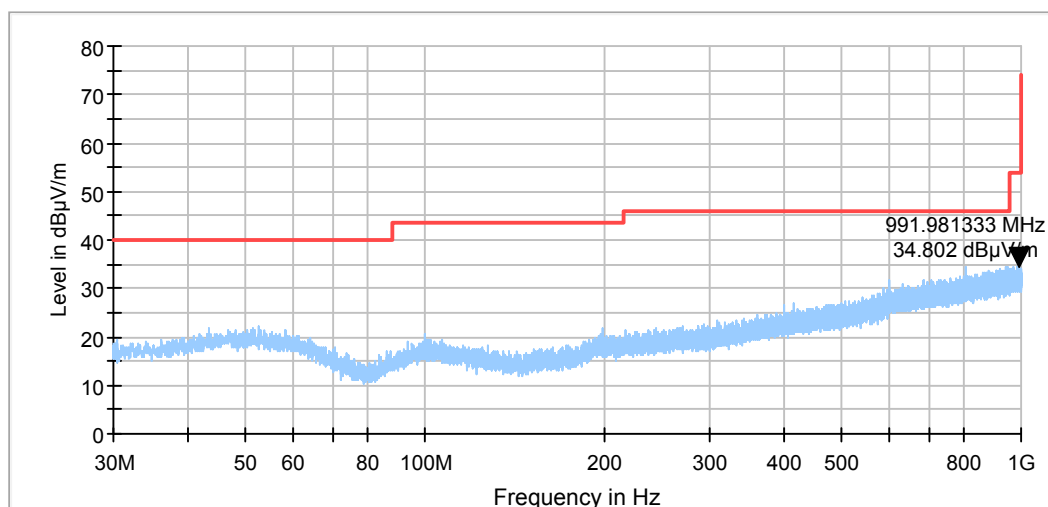
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



|                                                                           |                                |                          |                       |
|---------------------------------------------------------------------------|--------------------------------|--------------------------|-----------------------|
| <b>Test specification:</b> Section 15.247(d), Radiated spurious emissions |                                |                          |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1            |                                |                          |                       |
| <b>Test mode:</b> Compliance                                              |                                | <b>Verdict:</b> PASS     |                       |
| <b>Date(s):</b> 28-Aug-18                                                 |                                |                          |                       |
| <b>Temperature:</b> 24 °C                                                 | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                           |                                |                          |                       |

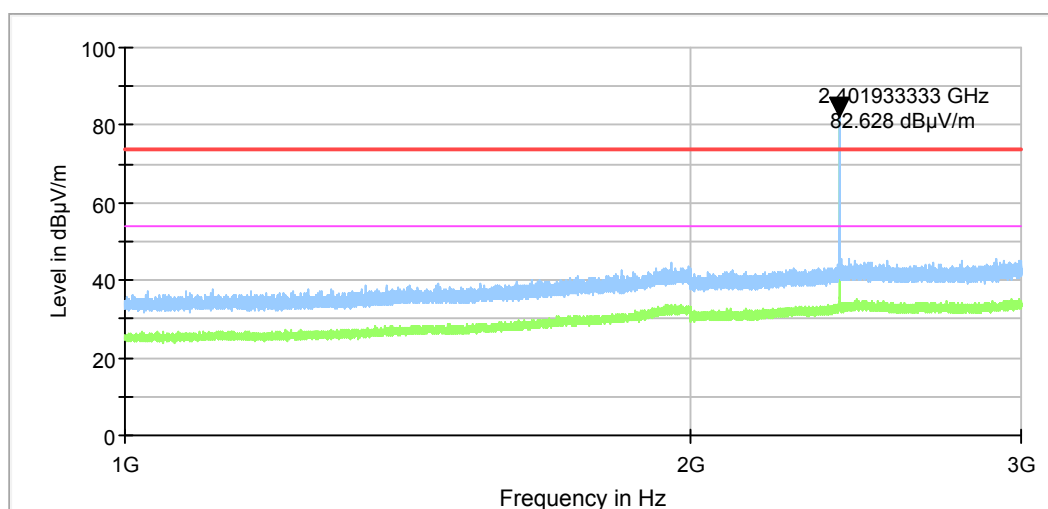
**Plot 7.3.4 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency**

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



**Plot 7.3.5 Radiated emission measurements from 1000 to 3000 MHz at the low carrier frequency**

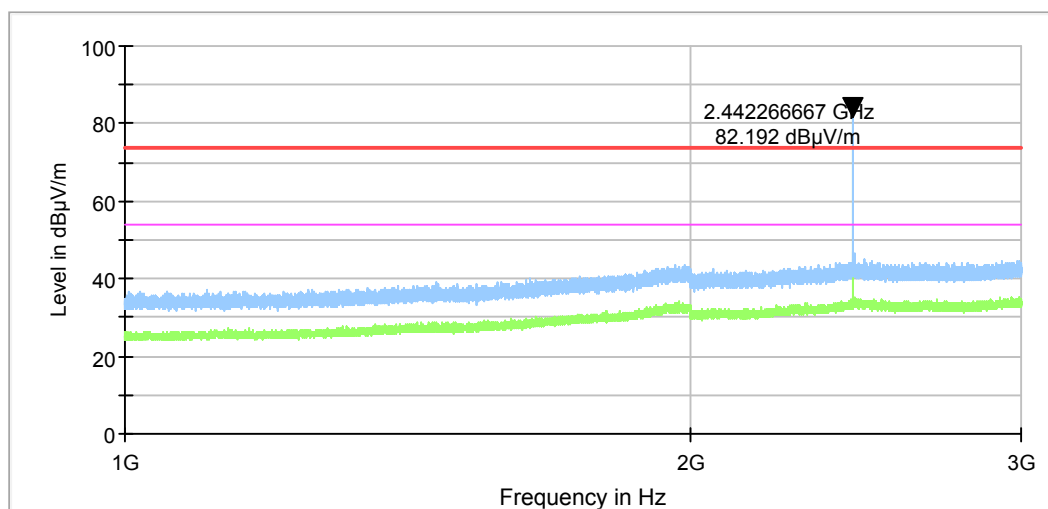
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



|                                                                                  |                                |                             |                       |
|----------------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Radiated spurious emissions</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1                   |                                |                             |                       |
| <b>Test mode:</b> Compliance                                                     |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 28-Aug-18                                                        |                                |                             |                       |
| <b>Temperature:</b> 24 °C                                                        | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                                  |                                |                             |                       |

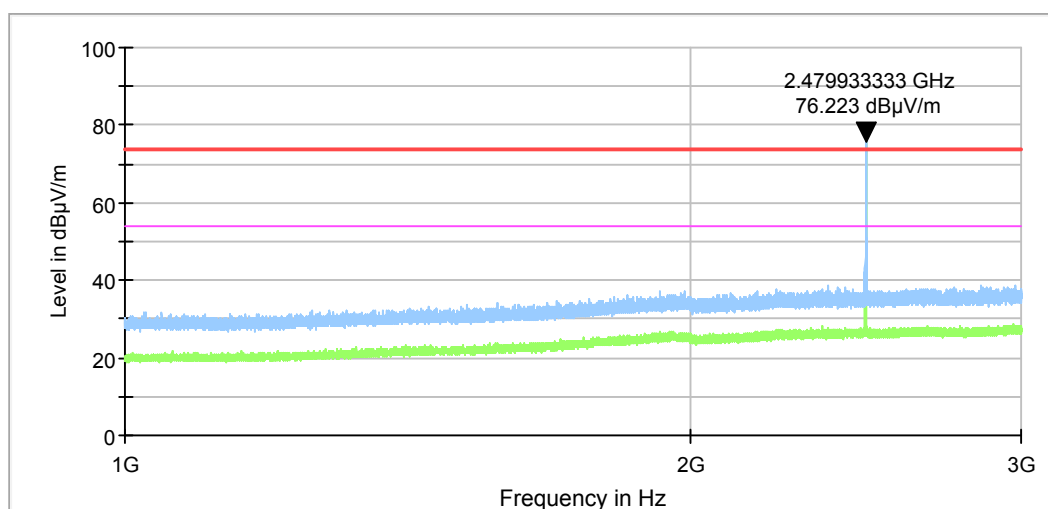
**Plot 7.3.6 Radiated emission measurements from 1000 to 3000 MHz at the mid carrier frequency**

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



**Plot 7.3.7 Radiated emission measurements from 1000 to 3000 MHz at the high carrier frequency**

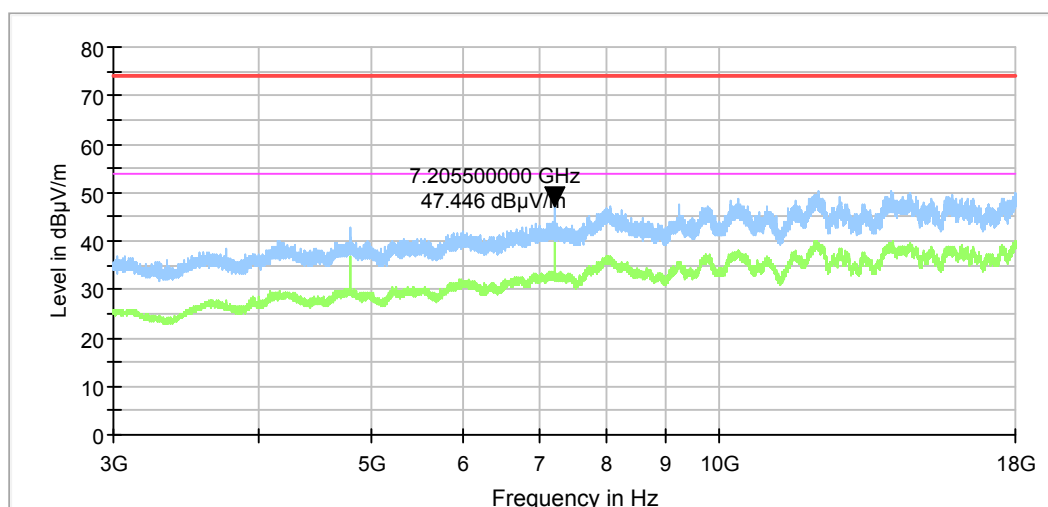
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



|                                                                                  |                                |                             |                       |
|----------------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Radiated spurious emissions</b> |                                |                             |                       |
| <b>Test procedure:</b> ANSI C63.10, sections 11.11 and 11.12.1                   |                                |                             |                       |
| <b>Test mode:</b> Compliance                                                     |                                | <b>Verdict:</b> <b>PASS</b> |                       |
| <b>Date(s):</b> 28-Aug-18                                                        |                                |                             |                       |
| <b>Temperature:</b> 24 °C                                                        | <b>Relative Humidity:</b> 51 % | <b>Air Pressure:</b> hPa    | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                                  |                                |                             |                       |

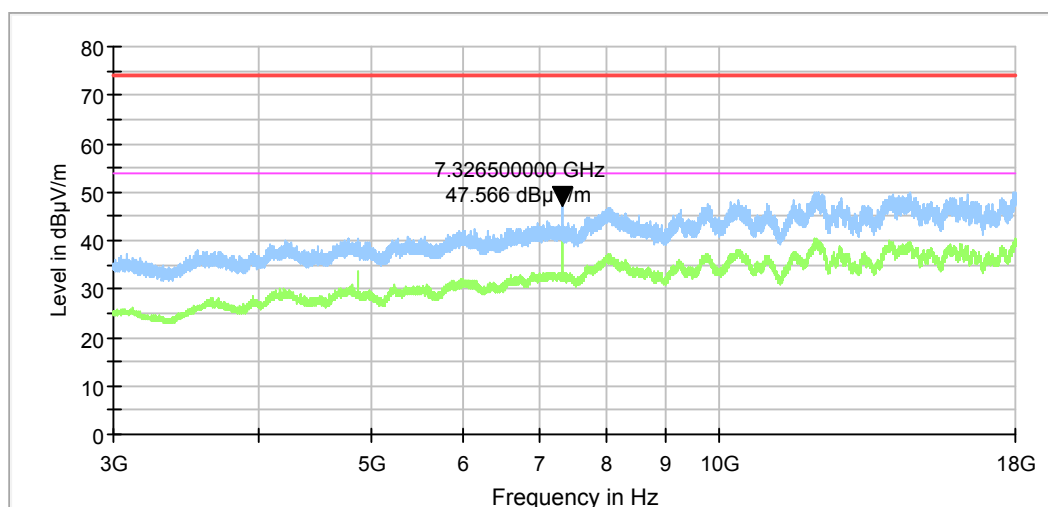
**Plot 7.3.8 Radiated emission measurements from 3000 to 18000 MHz at the low carrier frequency**

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



**Plot 7.3.9 Radiated emission measurements from 3000 to 18000 MHz at the mid carrier frequency**

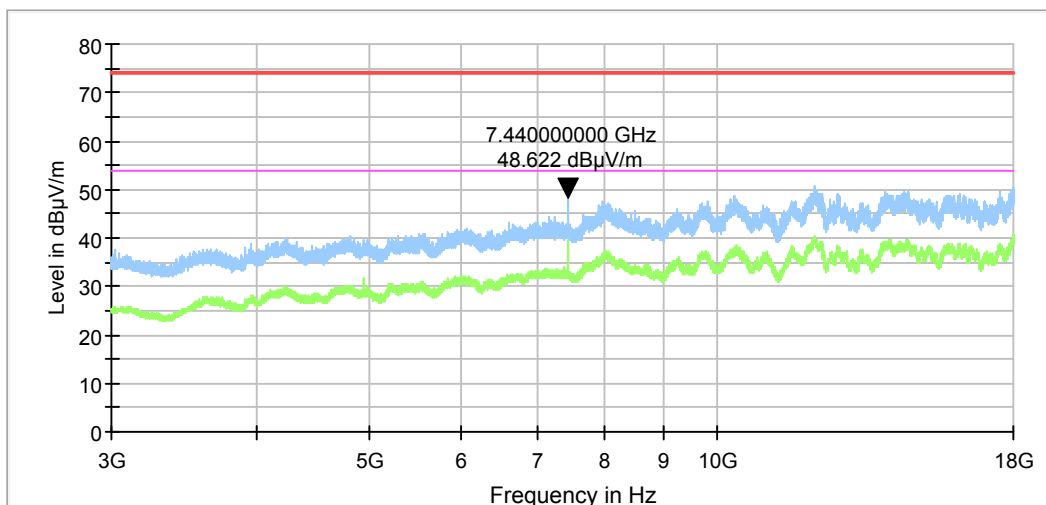
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal



|                                                                    |                         |                   |                |
|--------------------------------------------------------------------|-------------------------|-------------------|----------------|
| Test specification: Section 15.247(d), Radiated spurious emissions |                         |                   |                |
| Test procedure: ANSI C63.10, sections 11.11 and 11.12.1            |                         |                   |                |
| Test mode: Compliance                                              |                         | Verdict: PASS     |                |
| Date(s): 28-Aug-18                                                 |                         |                   |                |
| Temperature: 24 °C                                                 | Relative Humidity: 51 % | Air Pressure: hPa | Power: Battery |
| Remarks:                                                           |                         |                   |                |

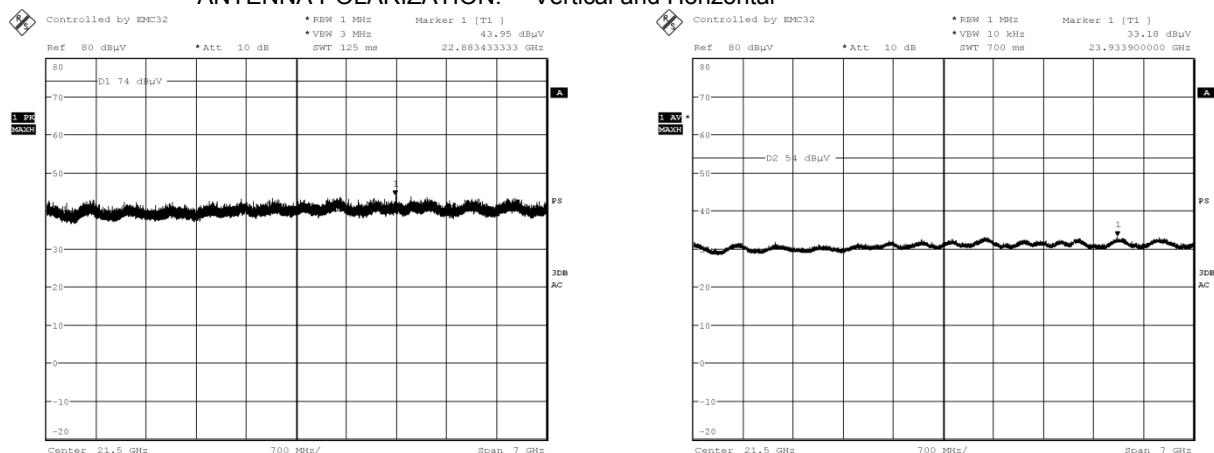
**Plot 7.3.10 Radiated emission measurements from 3000 to 18000 MHz at the high carrier frequency**

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



**Plot 7.3.11 Radiated emission measurements from 18000 to 25000 MHz at the low carrier frequency**

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



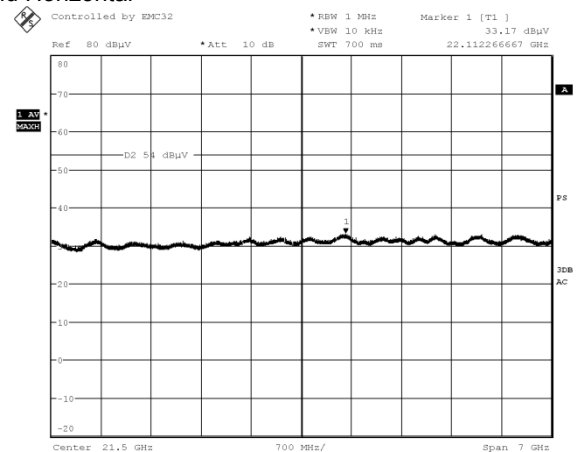
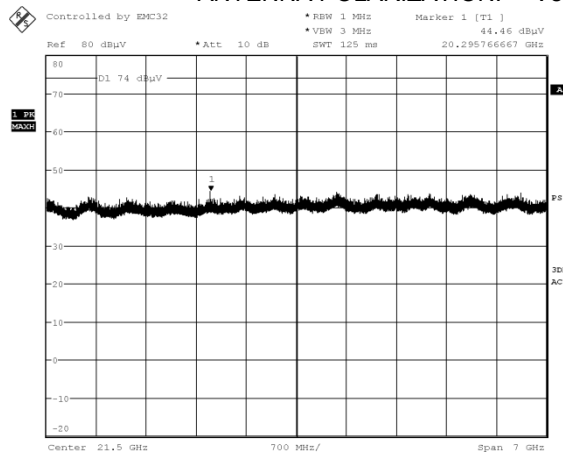
Date: 28.AUG.2018 12:08:46

Date: 28.AUG.2018 12:38:45

|                     |                         |                                                |                |
|---------------------|-------------------------|------------------------------------------------|----------------|
| Test specification: |                         | Section 15.247(d), Radiated spurious emissions |                |
| Test procedure:     |                         | ANSI C63.10, sections 11.11 and 11.12.1        |                |
| Test mode:          |                         | Verdict: PASS                                  |                |
| Date(s):            |                         |                                                |                |
| 28-Aug-18           |                         |                                                |                |
| Temperature: 24 °C  | Relative Humidity: 51 % | Air Pressure: hPa                              | Power: Battery |
| Remarks:            |                         |                                                |                |

**Plot 7.3.12 Radiated emission measurements from 18000 to 25000 MHz at the mid carrier frequency**

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

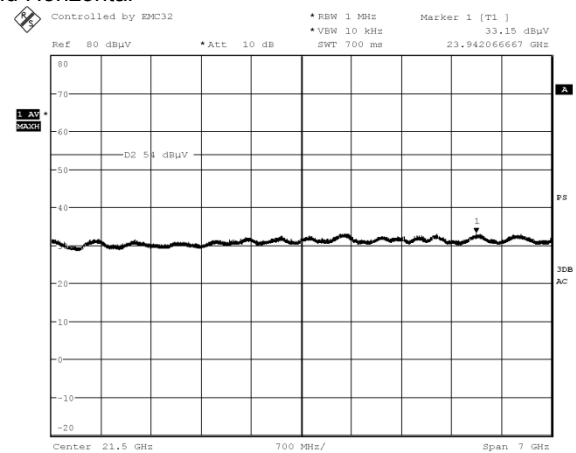
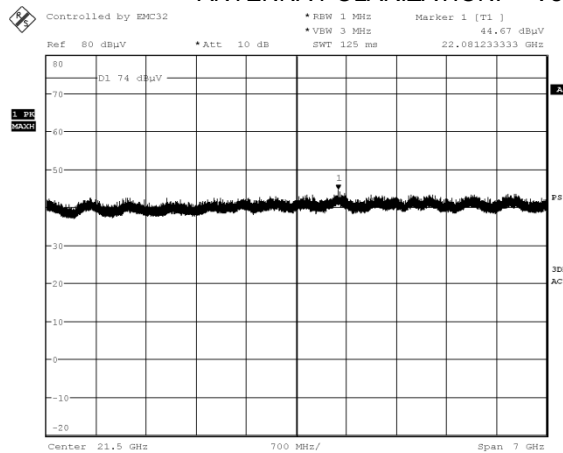


Date: 28.AUG.2018 12:14:40

Date: 28.AUG.2018 12:35:14

**Plot 7.3.13 Radiated emission measurements from 18000 to 25000 MHz at the high carrier frequency**

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



Date: 28.AUG.2018 12:20:05

Date: 28.AUG.2018 12:28:58

|                                                                          |                                |                               |                       |
|--------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Band edge emissions</b> |                                |                               |                       |
| <b>Test procedure:</b> ANSI C63.10, section 11.13                        |                                |                               |                       |
| <b>Test mode:</b> Compliance                                             |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 22-Nov-18                                                |                                |                               |                       |
| <b>Temperature:</b> 23 °C                                                | <b>Relative Humidity:</b> 55 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                          |                                |                               |                       |

## 7.4 Band edge radiated emissions

### 7.4.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Band edge emission limits

| Output power                  | Assigned frequency, MHz | Attenuation below carrier*, dBc | Field strength at 3 m within restricted bands, dB(μV/m) |         |
|-------------------------------|-------------------------|---------------------------------|---------------------------------------------------------|---------|
|                               |                         |                                 | Peak                                                    | Average |
| Peak                          | 902.0 – 928.0           | 20.0                            | 74.0                                                    | 54.0    |
|                               | 2400.0 – 2483.5         |                                 |                                                         |         |
|                               | 5725.0 – 5850.0         |                                 |                                                         |         |
| Averaged over a time interval | 902.0 – 928.0           | 30.0                            | 74.0                                                    | 54.0    |
|                               | 2400.0 – 2483.5         |                                 |                                                         |         |
|                               | 5725.0 – 5850.0         |                                 |                                                         |         |

\* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

### 7.4.2 Test procedure

- 7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized normally modulated at the maximum data rate and its proper operation was checked.
- 7.4.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.
- 7.4.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.
- 7.4.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.
- 7.4.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.4.2 and associated plots and referenced to the highest emission level measured within the authorized band.
- 7.4.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

Figure 7.4.1 Band edge emission test setup





|                                                                          |                                |                               |                       |
|--------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Band edge emissions</b> |                                |                               |                       |
| <b>Test procedure:</b> ANSI C63.10, section 11.13                        |                                |                               |                       |
| <b>Test mode:</b> Compliance                                             |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 22-Nov-18                                                |                                |                               |                       |
| <b>Temperature:</b> 23 °C                                                | <b>Relative Humidity:</b> 55 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                          |                                |                               |                       |

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 2400-2483.5 MHz  
 DETECTOR USED: Peak  
 MODULATION: GFSK  
 BIT RATE: 1 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 VIDEO BANDWIDTH:  $\geq$  RBW

| Frequency, MHz | Band edge emission, Peak, dB( $\mu$ V/m) | Limit Average, dB( $\mu$ V/m) | Margin, dB | Verdict |
|----------------|------------------------------------------|-------------------------------|------------|---------|
| 2400           | 42.879                                   | 54                            | -11.121    | Pass    |
| 2483.5         | 38.027                                   |                               | -16.973    |         |

\*- Margin = Attenuation below carrier – specification limit.

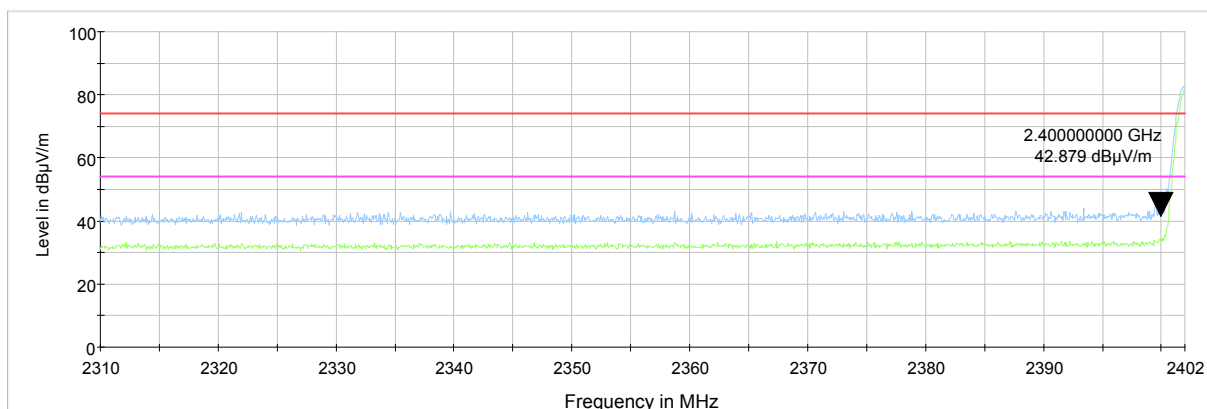
## Reference numbers of test equipment used

|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 3903 | HL 4360 | HL 5288 | HL 5405 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

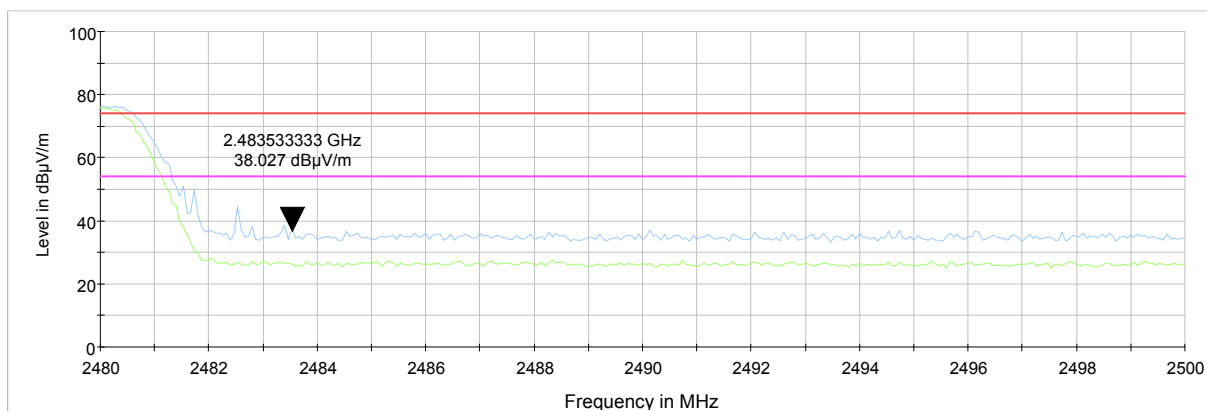
Full description is given in Appendix A.

|                                                                          |                                |                               |                       |
|--------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Band edge emissions</b> |                                |                               |                       |
| <b>Test procedure:</b> ANSI C63.10, section 11.13                        |                                |                               |                       |
| <b>Test mode:</b> Compliance                                             |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 22-Nov-18                                                |                                |                               |                       |
| <b>Temperature:</b> 23 °C                                                | <b>Relative Humidity:</b> 55 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                          |                                |                               |                       |

Plot 7.4.1 The highest band edge emission at low carrier frequency



Plot 7.4.2 The highest band edge emission at high carrier frequency





|                                                                         |                                |                               |                       |
|-------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Peak power density</b> |                                |                               |                       |
| <b>Test procedure:</b> ANSI C63.10 section 11.10                        |                                |                               |                       |
| <b>Test mode:</b> Compliance                                            |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 22-Nov-18                                               |                                |                               |                       |
| <b>Temperature:</b> 23 °C                                               | <b>Relative Humidity:</b> 55 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                         |                                |                               |                       |

## 7.5 Maximum power spectral density (PSD)

### 7.5.1 General

This test was performed to measure the peak spectral power density radiated by the transmitter RF antenna. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Peak spectral power density limits

| Assigned frequency range, MHz | Measurement bandwidth, kHz | Peak spectral power density, dBm | Equivalent field strength limit @ 3m, dB(μV/m)* |
|-------------------------------|----------------------------|----------------------------------|-------------------------------------------------|
| 902.0 – 928.0                 | 3.0                        | 8.0                              | 103.2                                           |
| 2400.0 – 2483.5               |                            |                                  |                                                 |
| 5725.0 – 5850.0               |                            |                                  |                                                 |

\* - Equivalent field strength limit was calculated from the peak spectral power density as follows:  $E = \sqrt{30 \times P} / r$ , where P is peak spectral power density and r is antenna to EUT distance in meters.

### 7.5.2 Test procedure for field strength measurements

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

7.5.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.5.2.3 The field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.5.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.2.2 and associated plots.

7.5.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.

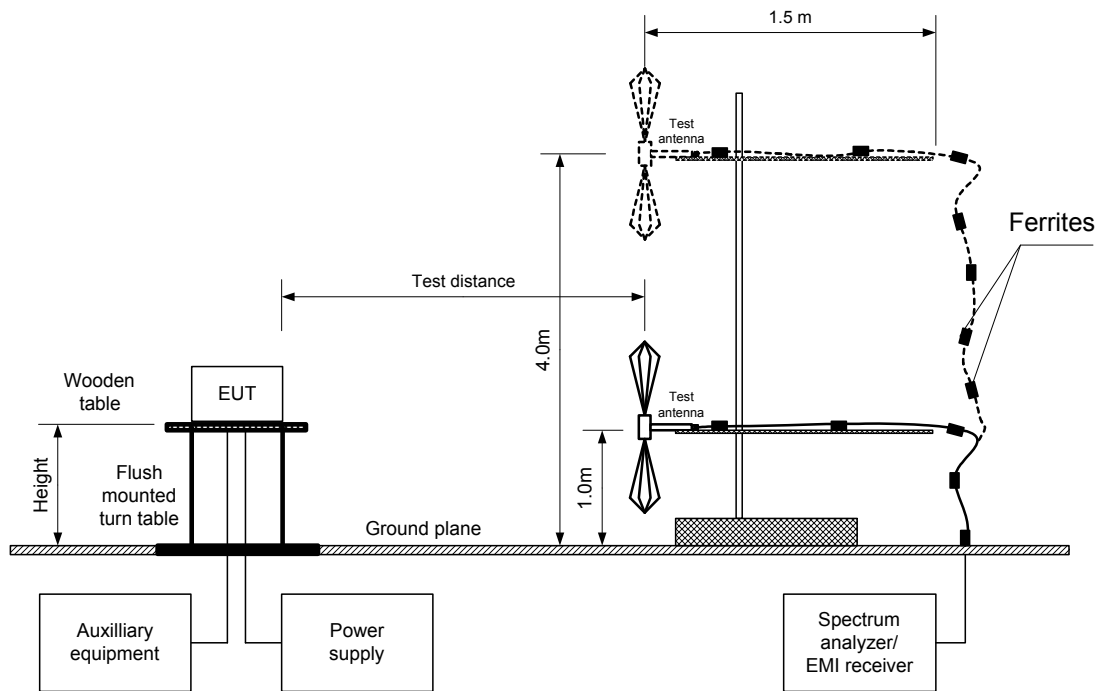
The above equation was converted in logarithmic units for 3 m test distance:

$$\text{Peak output power in dBm} = \text{Field strength in dB}(\mu\text{V/m}) - \text{Transmitter antenna gain in dBi} - 95.2 \text{ dB}$$

7.5.2.6 The calculated maximum peak output power was found below the peak spectral power density limit as provided in Table 7.5.2 and associated plots.

|                     |                         |                                       |                |
|---------------------|-------------------------|---------------------------------------|----------------|
| Test specification: |                         | Section 15.247(d), Peak power density |                |
| Test procedure:     |                         | ANSI C63.10 section 11.10             |                |
| Test mode:          |                         | Verdict: PASS                         |                |
| Date(s):            |                         |                                       |                |
| 22-Nov-18           |                         |                                       |                |
| Temperature: 23 °C  | Relative Humidity: 55 % | Air Pressure: 1008 hPa                | Power: Battery |
| Remarks:            |                         |                                       |                |

Figure 7.5.1 Setup for carrier field strength measurements





|                                                                         |                                |                               |                       |
|-------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.247(d), Peak power density</b> |                                |                               |                       |
| <b>Test procedure:</b>                                                  |                                | ANSI C63.10 section 11.10     |                       |
| <b>Test mode:</b>                                                       |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b>                                                         |                                |                               |                       |
| 22-Nov-18                                                               |                                |                               |                       |
| <b>Temperature:</b> 23 °C                                               | <b>Relative Humidity:</b> 55 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                         |                                |                               |                       |

Table 7.5.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY: 2400-2483.5 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: Semi anechoic chamber  
 EUT HEIGHT: 0.8 m  
 DETECTOR USED: Peak  
 TEST ANTENNA TYPE: Double ridged guide  
 MODULATION: GFSK  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 1 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 DETECTOR USED: Peak  
 EUT 6 dB BANDWIDTH: 522.5 kHz  
 RESOLUTION BANDWIDTH: 1 MHz  
 VIDEO BANDWIDTH: 3 MHz

| Frequency, MHz | Field strength, dB(μV/m) | Antenna polarization | Antenna height, m | Azimuth, degrees* | EUT antenna gain, dBi | Peak output power, dBm** | Limit, dBm | Margin, dB*** | Verdict |
|----------------|--------------------------|----------------------|-------------------|-------------------|-----------------------|--------------------------|------------|---------------|---------|
| 2402.0000      | 84.77                    | H                    | 1.5               | 5.0               | -0.5                  | -9.93                    | 8          | -18.43        | Pass    |
| 2442.0000      | 84.98                    | H                    | 1.5               | -24.0             | -0.5                  | -9.72                    | 8          | -18.22        | Pass    |
| 2479.9772      | 77.91                    | H                    | 1.5               | -33.0             | -0.5                  | -16.79                   | 8          | -27.29        | Pass    |

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

\*\* - Peak output power was calculated from the field strength of carrier as follows:  $P = (E \times d)^2 / (30 \times G)$ , where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi - 95.2 dB*

\*\*\* - Margin = Peak output power – specification limit.

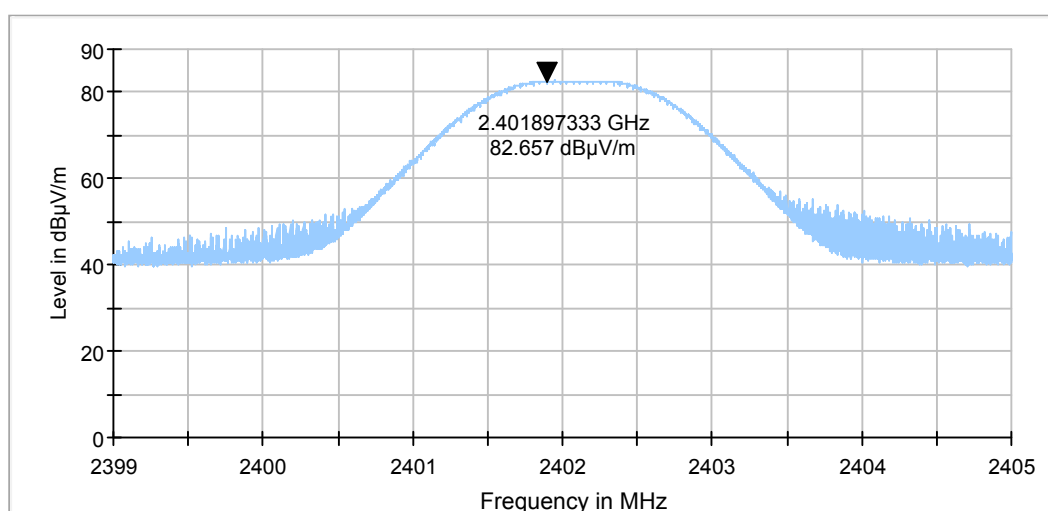
## Reference numbers of test equipment used

|         |         |         |         |  |  |  |
|---------|---------|---------|---------|--|--|--|
| HL 3903 | HL 4360 | HL 5288 | HL 5405 |  |  |  |
|---------|---------|---------|---------|--|--|--|

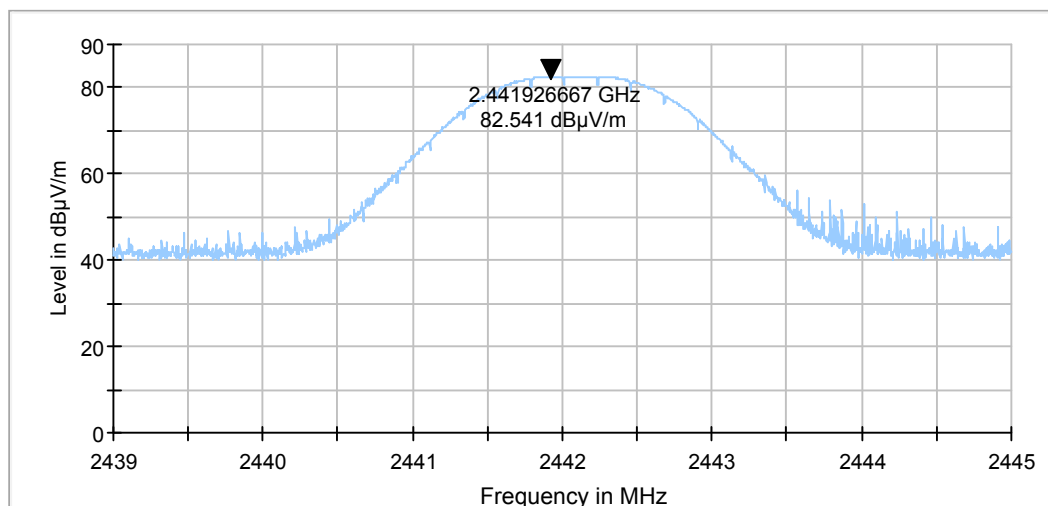
Full description is given in Appendix A.

|                                                                  |                                |                               |                       |
|------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 15.247(d), Peak power density |                                |                               |                       |
| <b>Test procedure:</b> ANSI C63.10 section 11.10                 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                     |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 22-Nov-18                                        |                                |                               |                       |
| <b>Temperature:</b> 23 °C                                        | <b>Relative Humidity:</b> 55 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                  |                                |                               |                       |

Plot 7.5.1 Field strength of carrier at low frequency

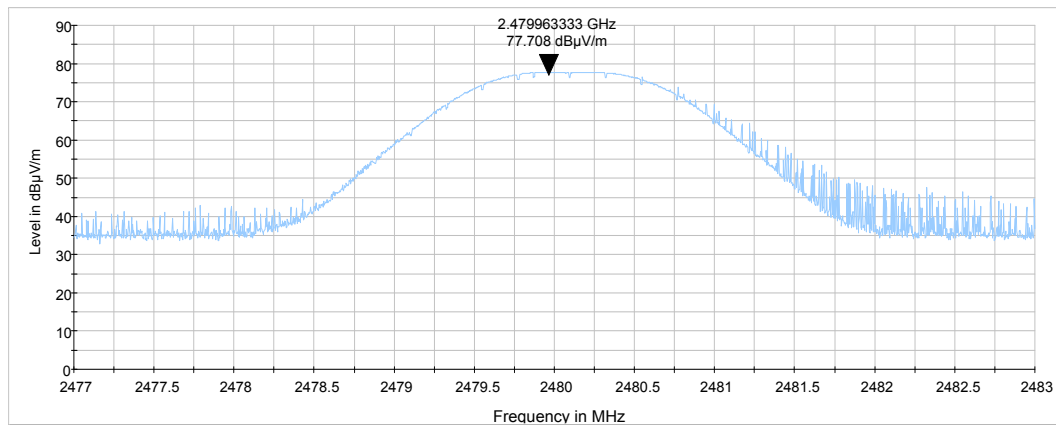


Plot 7.5.2 Field strength of carrier at mid frequency



|                     |                         |                                       |                |
|---------------------|-------------------------|---------------------------------------|----------------|
| Test specification: |                         | Section 15.247(d), Peak power density |                |
| Test procedure:     |                         | ANSI C63.10 section 11.10             |                |
| Test mode:          |                         | Verdict: PASS                         |                |
| Date(s):            |                         |                                       |                |
| 22-Nov-18           |                         |                                       |                |
| Temperature: 23 °C  | Relative Humidity: 55 % | Air Pressure: 1008 hPa                | Power: Battery |
| Remarks:            |                         |                                       |                |

Plot 7.5.3 Field strength of carrier at high frequency



|                                                                        |                                |                               |                       |
|------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 15.203, Antenna requirements</b> |                                |                               |                       |
| <b>Test procedure:</b>                                                 |                                | Visual inspection             |                       |
| <b>Test mode:</b>                                                      |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b>                                                        |                                |                               |                       |
| 29-Nov-18                                                              |                                |                               |                       |
| <b>Temperature:</b> 22 °C                                              | <b>Relative Humidity:</b> 55 % | <b>Air Pressure:</b> 1010 hPa | <b>Power:</b> Battery |
| <b>Remarks:</b>                                                        |                                |                               |                       |

## 7.6 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 7.6.1.

**Table 7.6.1 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                |         |

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

| HL No | Description                                        | Manufacturer          | Model          | Ser. No.     | Last Cal./ Check | Due Cal./ Check |
|-------|----------------------------------------------------|-----------------------|----------------|--------------|------------------|-----------------|
| 0446  | Antenna, Loop, Active, 10 kHz - 30 MHz             | EMCO                  | 6502           | 2857         | 11-Feb-18        | 11-Feb-19       |
| 2909  | Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz       | Agilent Technologies  | E4407B         | MY414447 62  | 27-Mar-18        | 27-Mar-19       |
| 3903  | Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA | Huber-Suhner          | SUCOFLE X 102A | 1226/2A      | 07-Feb-18        | 07-Feb-19       |
| 4135  | Shield Box                                         | TESCOM CO., LTD       | TC-5916A       | 5916A000 136 | 04-Apr-18        | 04-Apr-19       |
| 4360  | EMI Test Receiver, 20 Hz to 40 GHz.                | Rohde & Schwarz       | ESU40          | 100322       | 26-Dec-17        | 26-Dec-18       |
| 4933  | Active Horn Antenna, 1 GHz to 18 GHz               | Com-Power Corporation | AHA-118        | 701046       | 04-Jan-18        | 04-Jan-19       |
| 5288  | Trilog Antenna, 25 MHz - 8 GHz, 100W               | Frankonia             | ALX-8000E      | 00809        | 21-Jan-18        | 21-Jan-19       |
| 5405  | RF cable, 18 GHz, N-N, 6 m                         | Huber-Suhner          | SF118/11 N(x2) | 500023/11 8  | 01-Aug-18        | 01-Aug-19       |

## 9 APPENDIX B Measurement uncertainties

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

| Test description                                                                                     | Expanded uncertainty                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conducted carrier power at RF antenna connector                                                      | Below 12.4 GHz: $\pm 1.7$ dB<br>12.4 GHz to 40 GHz: $\pm 2.3$ 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                                                                                  |
| Occupied bandwidth                                                                                   | $\pm 8.0$ %                                                                                                                                                                                                                                                                                                  |
| Duty cycle, timing (Tx ON / OFF) and average factor measurements                                     | $\pm 1.0$ %                                                                                                                                                                                                                                                                                                  |
| Conducted emissions with LISN                                                                        | 9 kHz to 150 kHz: $\pm 3.9$ dB<br>150 kHz to 30 MHz: $\pm 3.8$ dB                                                                                                                                                                                                                                            |
| Radiated emissions at 3 m measuring distance<br>Horizontal polarization<br><br>Vertical polarization | Biconilog antenna: $\pm 5.3$ dB<br>Biconical antenna: $\pm 5.0$ dB<br>Log periodic antenna: $\pm 5.3$ dB<br>Double ridged horn antenna: $\pm 5.3$ dB<br>Biconilog antenna: $\pm 6.0$ dB<br>Biconical antenna: $\pm 5.7$ dB<br>Log periodic antenna: $\pm 6.0$ dB<br>Double ridged horn antenna: $\pm 6.0$ dB |

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.

## 10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.

Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-10808 for OATS, R-1082 for anechoic chamber, G-10869 for RE measurements above 1 GHz, C-10845 for conducted emissions site and T-11606 for conducted emissions at telecommunication ports).

The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

Address: P.O. Box 23, Binyamina 3055001, Israel.  
Telephone: +972 4628 8001  
Fax: +972 4628 8277  
e-mail: mail@hermonlabs.com  
website: www.hermonlabs.com

Person for contact: Mr. Michael Nikishin, EMC&Radio group manager

## 11 APPENDIX D Specification references

|                         |                                                                                                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC 47CFR part 15: 2017 | Radio Frequency Devices                                                                                                                                             |
| ANSI C63.10: 2013       | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices                                                                      |
| ANSI C63.2: 1996        | American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications                                            |
| ANSI C63.4: 2014        | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |

## 12 APPENDIX E Test equipment correction factors

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

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

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

**Antenna factor**  
**Trilog antenna**  
**Model ALX-8000E, Frankonia, S/N 00809, HL 5288, 30-1000 MHz**

| Frequency, MHz | Antenna factor, dB/m |
|----------------|----------------------|
| 30             | 14.96                |
| 35             | 15.33                |
| 40             | 16.37                |
| 45             | 17.56                |
| 50             | 17.95                |
| 60             | 16.87                |
| 70             | 13.22                |
| 80             | 10.56                |
| 90             | 13.61                |
| 100            | 15.46                |
| 120            | 14.03                |
| 140            | 12.23                |
| 160            | 12.67                |
| 180            | 13.34                |
| 200            | 15.40                |
| 250            | 16.42                |
| 300            | 17.28                |
| 400            | 19.98                |
| 500            | 21.11                |
| 600            | 22.90                |
| 700            | 24.13                |
| 800            | 25.25                |
| 900            | 26.35                |
| 1000           | 27.18                |

The antenna factor shall be added to receiver reading in dB $\mu$ V to obtain field strength in dB $\mu$ V/m.

**Antenna factor**  
**Active Horn Antenna,**  
**Com-Power Corporation, model: AHA-118, s/n 701046, HL 4933**

| Frequency, MHz | Measured antenna factor<br>(with preamplifier), dB/m |
|----------------|------------------------------------------------------|
| 1000           | -16.1                                                |
| 1500           | -15.1                                                |
| 2000           | -10.9                                                |
| 2500           | -11.9                                                |
| 3000           | -11.1                                                |
| 3500           | -10.6                                                |
| 4000           | -8.6                                                 |
| 4500           | -8.3                                                 |
| 5000           | -5.9                                                 |
| 5500           | -5.7                                                 |
| 6000           | -3.3                                                 |
| 6500           | -4.0                                                 |
| 7000           | -2.2                                                 |
| 7500           | -1.7                                                 |
| 8000           | 1.1                                                  |
| 8500           | -0.8                                                 |
| 9000           | -1.5                                                 |
| 9500           | -0.2                                                 |

| Frequency, MHz | Measured antenna factor<br>(with preamplifier), dB/m |
|----------------|------------------------------------------------------|
| 10000          | 1.8                                                  |
| 10500          | 1.0                                                  |
| 11000          | 0.3                                                  |
| 11500          | -0.5                                                 |
| 12000          | 3.1                                                  |
| 12500          | 1.4                                                  |
| 13000          | -0.3                                                 |
| 13500          | -0.4                                                 |
| 14000          | 2.5                                                  |
| 14500          | 2.2                                                  |
| 15000          | 1.9                                                  |
| 15500          | 0.5                                                  |
| 16000          | 2.1                                                  |
| 16500          | 1.2                                                  |
| 17000          | 0.6                                                  |
| 17500          | 3.1                                                  |
| 18000          | 4.2                                                  |

The antenna factor shall be added to receiver reading in dB $\mu$ V to obtain field strength in dB $\mu$ V/m.

**Cable loss**  
**Microwave Cable Assembly, Huber-Suhner, 40 GHz, 1.5 m, SMA-SMA, S/N 1226/2A**  
**HL 3903**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | -0.02             | 9500              | 1.84              | 21000             | 2.98              |
| 100               | 0.15              | 10000             | 1.86              | 22000             | 3.07              |
| 500               | 0.38              | 10500             | 1.93              | 23000             | 3.13              |
| 1000              | 0.56              | 11000             | 1.99              | 24000             | 3.21              |
| 1500              | 0.69              | 11500             | 2.04              | 25000             | 3.26              |
| 2000              | 0.82              | 12000             | 2.10              | 26000             | 3.48              |
| 2500              | 0.90              | 12500             | 2.15              | 27000             | 3.44              |
| 3000              | 0.98              | 13000             | 2.21              | 28000             | 3.53              |
| 3500              | 1.06              | 13500             | 2.25              | 29000             | 3.59              |
| 4000              | 1.11              | 14000             | 2.29              | 30000             | 3.66              |
| 4500              | 1.17              | 14500             | 2.34              | 31000             | 3.70              |
| 5000              | 1.24              | 15000             | 2.36              | 32000             | 3.79              |
| 5500              | 1.32              | 15500             | 2.40              | 33000             | 3.88              |
| 6000              | 1.40              | 16000             | 2.45              | 34000             | 3.94              |
| 6500              | 1.50              | 16500             | 2.48              | 35000             | 3.91              |
| 7000              | 1.56              | 17000             | 2.56              | 36000             | 4.05              |
| 7500              | 1.62              | 17500             | 2.58              | 37000             | 4.22              |
| 8000              | 1.68              | 18000             | 2.60              | 38000             | 4.25              |
| 8500              | 1.74              | 19000             | 2.84              | 39000             | 4.27              |
| 9000              | 1.78              | 20000             | 2.88              | 40000             | 4.33              |



HERMON LABORATORIES

Cable loss  
RF Cable, Huber-Suhner, 18 GHz, 6 m,  
SF118/11N(x2), S/N 500023/118  
HL 5405

5405

## Specific Test Report



| Frequency Range [GHz] | IL min S21 [dB] | IL min S12 [dB] | RL max S11 [dB] | RL max S22 [dB] |
|-----------------------|-----------------|-----------------|-----------------|-----------------|
| 0.040 - 1.836         | -1.431          | -1.431          | -37.037         | -37.704         |
| 1.836 - 3.632         | -2.062          | -2.066          | -33.573         | -32.848         |
| 3.632 - 5.428         | -2.576          | -2.576          | -28.548         | -29.602         |
| 5.428 - 7.224         | -3.013          | -3.014          | -30.738         | -32.523         |
| 7.224 - 9.020         | -3.415          | -3.416          | -33.728         | -32.257         |
| 9.020 - 10.816        | -3.772          | -3.772          | -29.302         | -30.735         |
| 10.816 - 12.612       | -4.138          | -4.138          | -28.768         | -26.255         |
| 12.612 - 14.408       | -4.456          | -4.462          | -27.109         | -26.151         |
| 14.408 - 16.204       | -4.786          | -4.786          | -26.056         | -27.116         |
| 16.204 - 18.000       | -5.113          | -5.111          | -27.762         | -28.508         |

Type: SF118/11N/11N/6000MM  
Sales no.: 10497130  
Serial no.: 500023 /118  
PA no.: 1956306  
Ring no.:  
Cable length: 6 m  
Test length:  
Connector 1: SF\_11\_N-656  
Connector 2: SF\_11\_N-656  
Cable: SUCOFLEX\_118  
Meas. System: N5230C,MY49001834,A.09.42.22

Time: 7:04:21 AM  
Date: 6/6/2018  
Inspected by: AZ /111

Start Freq.: 0.04000 GHz  
Stop Freq.: 18.00000 GHz  
Meas Points: 801  
Source Power: -5 dBm

## 13 APPENDIX F Abbreviations and acronyms

|                |                                             |
|----------------|---------------------------------------------|
| A              | ampere                                      |
| AC             | alternating current                         |
| 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                                    |

END OF DOCUMENT