

# TEST REPORT

**Test Report Reference: F060942E01**

**Equipment under Test: SePem01 Master**

**FCC ID: WSPSF01M7021**

**IC: 7994A-SF01M7021**

**Applicant: Hermann Sewerin GmbH**

**Manufacturer: Hermann Sewerin GmbH**

**Test Laboratory  
(CAB)**

**accredited by DATech in der TGA GmbH  
in compliance with DIN EN ISO/IEC 17025  
under the Reg. No. DAT-P-105/99-21,**

**recognized by Bundesnetzagentur  
under the Reg.-No. BNetzA-CAB-02/21-104/1,**

**CAB Designation Number DE0004,**

**listed by  
FCC 31040/SIT1300F2  
FCC Test site registration number 90877  
Industry Canada Test site registration IC3469A-1**

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## 1 IDENTIFICATION

### 1.1 APPLICANT

|                            |                                    |
|----------------------------|------------------------------------|
| Name:                      | Hermann Sewerin GmbH               |
| Address:                   | Robert-Bosch-Strasse 3             |
|                            | 33334 Gütersloh                    |
| Country:                   | Germany                            |
| Name for contact purposes: | Mr. Christian KREIENBRINK          |
| Tel:                       | + 49 52 41 934-319                 |
| Fax:                       | +49 52 41 934-444                  |
| e-mail address:            | christian.kreienbrinck@sewerin.com |

### 1.2 MANUFACTURER

|                            |                                    |
|----------------------------|------------------------------------|
| Name:                      | Hermann Sewerin GmbH               |
| Address:                   | Robert-Bosch-Strasse 3             |
|                            | 33334 Gütersloh                    |
| Country:                   | Germany                            |
| Name for contact purposes: | Mr. Christian KREIENBRINK          |
| Tel:                       | + 49 52 41 934-319                 |
| Fax:                       | +49 52 41 934-444                  |
| e-mail address:            | christian.kreienbrinck@sewerin.com |

### 1.3 DATES

|                                 |                  |
|---------------------------------|------------------|
| Date of receipt of test sample: | 30 October 2008  |
| Start of test:                  | 30 October 2008  |
| End of test:                    | 07 November 2008 |

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## 1.4 TEST LABORATORY

The tests were carried out at: **PHOENIX TESTLAB GmbH**  
**Königswinkel 10**  
**D-32825 Blomberg** Phone: **+49 (0) 52 35 / 95 00-0**  
**Germany** Fax: **+49 (0) 52 35 / 95 00-10**

Test engineer: Thomas KÜHN  
Name

*T. Li*  
Signature

18 November 2008  
Date

Test report checked: Bernd STEINER  
Name

*B. Steiner*  
Signature

18 November 2008  
Date

**PHOENIX TESTLAB GmbH**  
**Königswinkel 10**  
**32825 Blomberg**  
Tel. 0 52 35 / 95 00-0  
Fax 0 52 35 / 95 00-10

Stamp

## 1.5 RESERVATION

This test report is only valid in its original form.

Any reproduction of its contents without written permission of the accredited test laboratory PHOENIX TESTLAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT REFERENCE.

## 1.6 NORMATIVE REFERENCES

- [1] **ANSI C63.4:2003** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- [2] **FCC 47 CFR Part 2** Frequency allocations and radio treaty matters, General Rules and Regulations
- [3] **FCC 47 CFR Part 90** Privat land mobile radio services
- [4] **RSS-119 Issue 9 June 2007** Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz
- [5] **RSS-Gen Issue 2 June 2007** General Requirements and Information for the Certification of Radiocommunication Equipment

## 1.7 TEST RESULTS

The requirements of this test document are fulfilled by the equipment under test. The complete test results are presented in the following.

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## 2 TECHNICAL DATA OF EQUIPMENT

### 2.1 DEVICE UNDER TEST

|                                       |   |
|---------------------------------------|---|
| Type of equipment: *                  | Noise Logger  |
| Type designation: *                   | SePem 01 Master   |
| FCC ID: *                             | WSPSF01M7021  |
| IC: *                                 | 7994A-SF01M7021   |
| Antenna type: *                       | External antenna K71 17 23 or FSP70/CEL1  |
| Antenna gain: *                       | 4 dB (K71 17 23) or 5 dB (FSP70/CEL1) referred to $\lambda/4$ radiator            |
| Antenna connector: *                  | BNC   |
| Power supply: *                       | 6.0 V DC by internal battery or 12 V by external power supply                     |
| Type of modulation: *                 | GFSK  |
| Operating frequency range: *          | 466.0375 MHz to 469.5625 MHz (transmit)<br>461.0375 MHz to 464.5625 MHz (receive) |
| Channel spacing: *                    | 12.5 kHz  |
| Number of channels: *                 | 282   |
| Temperature range: *                  | -20 °C to 70 °C   |
| Lowest internal Frequency: *          | 32 kHz  |
| Ancillary equipment used for testing: | AC/DC adaptor type FW 75550/12  |

\*: declared by the applicant

The following external I/O cables were used:

| Cable   | Length           | Shielding | Connector |
|---------|------------------|-----------|-----------|
| DC in   | 2 m <sup>1</sup> | No        |           |
| Antenna | 4 m <sup>1</sup> | Yes       | BNC       |

<sup>1</sup>: Length during the test if no other specified and if the cable was used during the test.

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## 2.2 PERIPHERY DEVICES

The following equipment was used as control unit and ancillary equipment:

- If stated, an AC/DC adaptor type FW75550/12, which was connected to an AC mains network with 120 V DC / 60 Hz was used.

## 3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

The test was carried out with an unmodified test sample operating with a test-software. The operational state of the SePem 01 Master could be chosen with the help of a menu, which will be not visible in final application.

During the spurious emission and radiation measurement the test sample was powered by the internal 6.0 V battery.

For measurements under extreme conditions, an external power supply was connected to the 12 V connector of the EUT.

As declared by the applicant, the EUT is intended to be used in the frequency range  $-20\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$ . Due to this fact the measurements under extreme conditions were carried out, using this temperature range.

The EUT is equipped with a permanent external antenna connector, but is intended to be used with the antennas listed in the table on the page before.

Because the EUT is a handheld equipment, the radiated measurements were carried out in three orthogonal directions, which were defined as follows:

| Position | Definition                                  |
|----------|---|
| 1        | EUT lying horizontally on the table         |
| 2        | EUT standing vertically on the table        |
| 3        | EUT lying on ist lefthand side on the table |

During the tests, the EUT was not labelled.

The following operation modes were used during the tests:

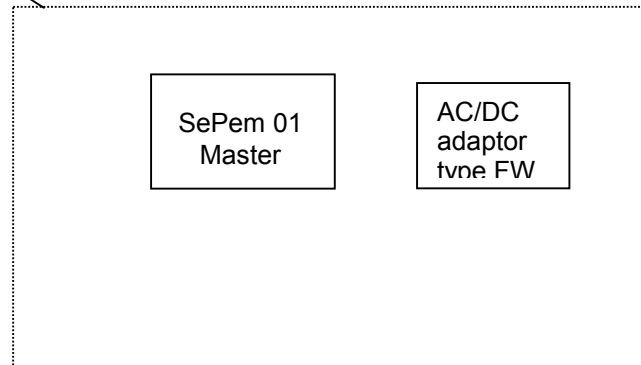
| Operation mode | Description of the operation mode                                     |
|----------------|---|
| 1              | Continuous transmitting on 466.0375 MHz with and without modulation * |
| 2              | Continuous transmitting on 467.8625 MHz with and without modulation * |
| 3              | Continuous transmitting on 469.5625 MHz with and without modulation * |
| 4              | Continuous receiving on 461.0375 MHz                                  |
| 5              | Continuous receiving on 462.8625 MHz                                  |
| 6              | Continuous receiving on 464.5625 MHz                                  |

\*: The following options were selectable:

- Unmodulated carrier
- Modulated signal with continuous 01 bit sequence
- Modulated signal with data telegrams (burst operation)

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Physical boundary of the EUT



## 4 APPLICATION OVERVIEW

| Application                        | Frequency range [MHz] | FCC 47 CFR section | RSS 119, Issue 9 [4]<br>or<br>RSS-Gen, Issue 2 [5] | Status | Refer page                            |
|------------------------------------|-----------------------|--------------------|--|--------|---------------------------------------|
| RF Output Power                    | General               | 2.1046 (a)         | 5.4 [4]  | Passed | 8 et seq.                             |
| Spectrum Mask                      | General               | 90.217 (b)         | 5.10 [4]   | Passed | 10 et seq.                            |
| Radiated emissions (transmitter)   | 0.009 - 5,000         | 2.1053             | 5.8.3 [4]  | Passed | 16 et seq.                            |
| Frequency Stability                | General               | 90.213             | 5.3 [5]  | Passed | 34 et seq.                            |
| Conducted emissions on supply line | 0.15 – 30             | 15.207 (a)         | 7.2.2 [5]  | Passed | 45 et seq.                            |
| Radiated emissions (receiver)      | 0.009 - 2,500         | 15.109 (a)         | 5.11 [4],<br>6 [4]                                 | Passed | 1 et seq.<br>of<br>F060942E01 Annex D |
| 99 % Bandwidth                     | General               | -                  | 4.6.1 [5]  | -      | 5 et seq.<br>of<br>F082373E01 Annex D |

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## 5 TEST RESULTS

### 5.1 OUTPUT POWER

#### 5.1.1 METHOD OF MEASUREMENT (OUTPUT POWER)

The calibration of the power meter has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the power meter via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on.

The following power meter settings shall be used:

- Filter No. auto.
- Measuring time 0.136 s to 26 s.
- Used peak sensor NRV –Z51.

The measurement will be performed at the upper and lower end and the middle of the assigned frequency band.

Test set-up:





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### 5.1.2 TEST RESULTS (OUTPUT POWER)

|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 43 % |
|---------------------|-------|-------------------|------|

| TEST CONDITION              | MEASURED OUTPUT POWER (dBm) |              |              |
|-----------------------------|-----------------------------|--------------|--------------|
| T <sub>nom</sub> (20 °C)    | 466.0375 MHz                | 467.8625 MHz | 469.5625 MHz |
| U <sub>nom</sub> (6.0 V DC) | 13.4                        | 13.4         | 13.4         |
| U <sub>min</sub> (4.6 V DC) | 13.4                        | 13.4         | 13.4         |
| U <sub>max</sub> (7.0 V DC) | 13.4                        | 13.4         | 13.4         |
| Measurement uncertainty     | ±0.2 dB                     |              |              |

Test: Passed

|                                   |
|-----------------------------------|
| TEST EQUIPMENT USED FOR THE TEST: |
| 54, 65, 66                        |

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## 5.2 SPECTRUM MASK

### 5.2.1 METHOD OF MEASUREMENT (SPECTRUM MASK)

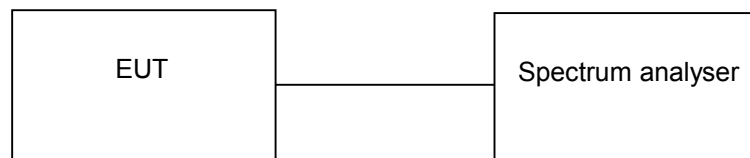
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed.

The following spectrum analyser settings shall be used:

- Span: 100 kHz, centred on the actual channel.
- Resolution bandwidth: 100 Hz.
- Video bandwidth: 100 kHz.
- Sweep: 50 s.
- Detector function: peak.
- Trace mode: Max hold.

After trace stabilisation the marker shall be set to the peak of the unmodulated carrier. This value has to set to the Reference Level. The measurement has to be repeated with all kinds of modulation to find the worst case.

Test set-up:



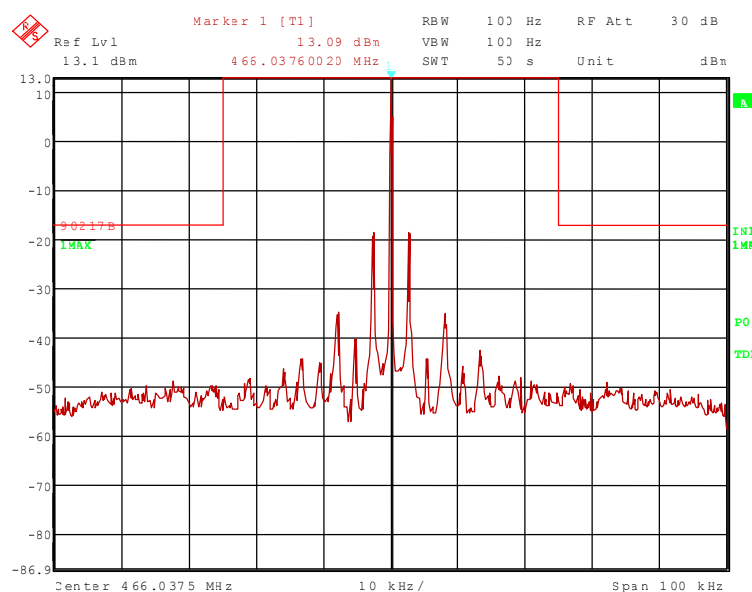
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## 5.2.2 TEST RESULTS (SPECTRUM MASK)

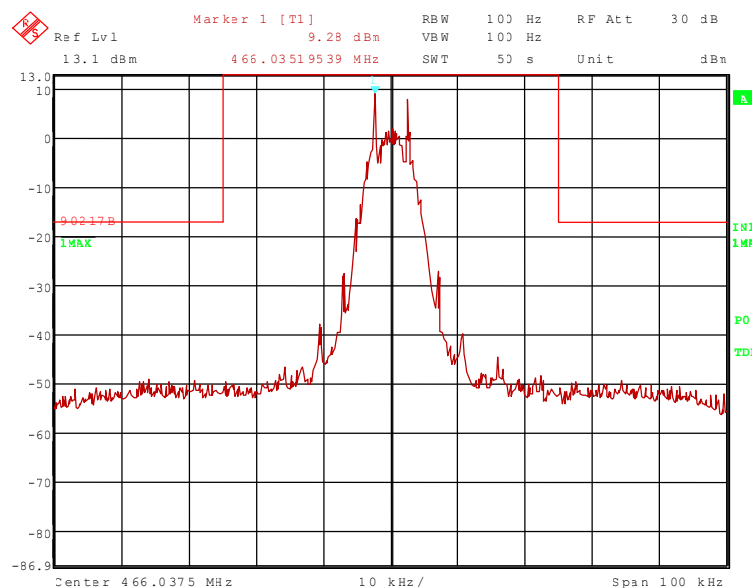
|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 43 % |
|---------------------|-------|-------------------|------|

Transmitter operates on 466.0375 MHz:

60942\_10.wmf: Spectrum mask, transmitter operates without modulation on 466.0375 MHz:

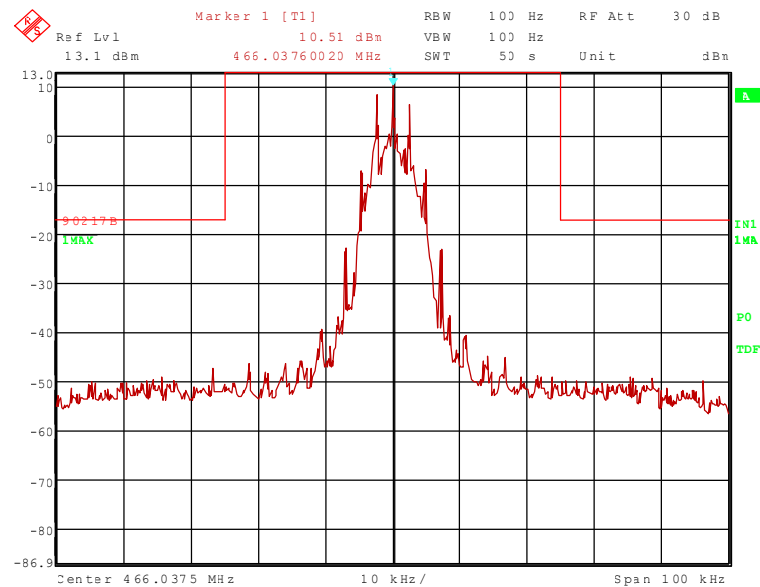


60942\_11.wmf: Spectrum mask, transmitter operates continuous modulation on 466.0375 MHz:



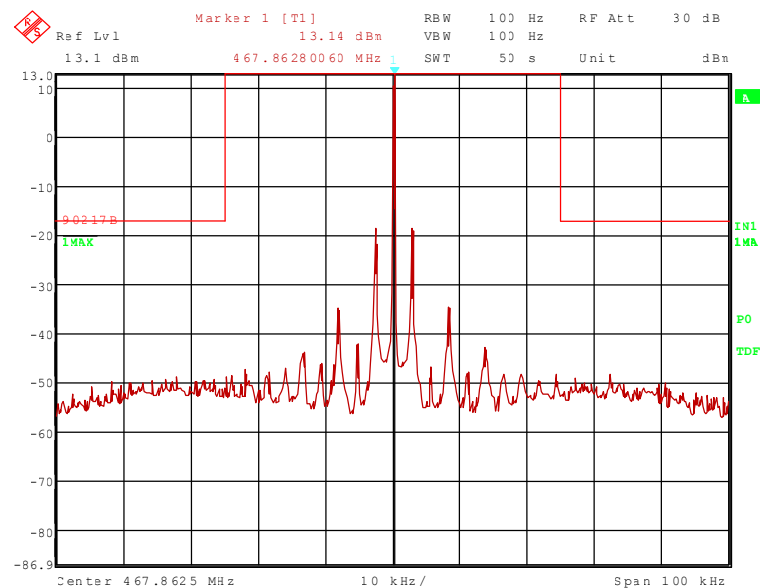
TEST REPORT REFERENCE: F060942E01

60942\_12.wmf: Spectrum mask, transmitter operates with burst modulation on 466.0375 MHz:



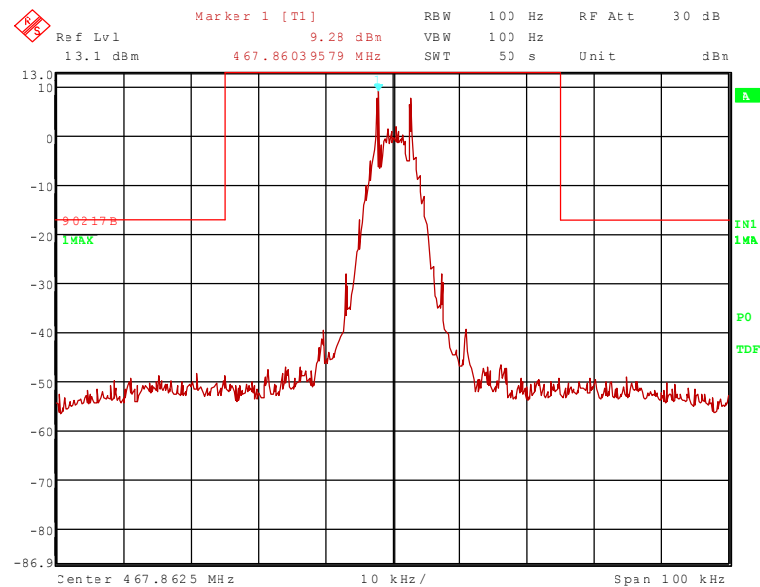
Transmitter operates on 467.8625 MHz:

60942\_13.wmf: Spectrum mask, transmitter operates without modulation on 467.8625 MHz:

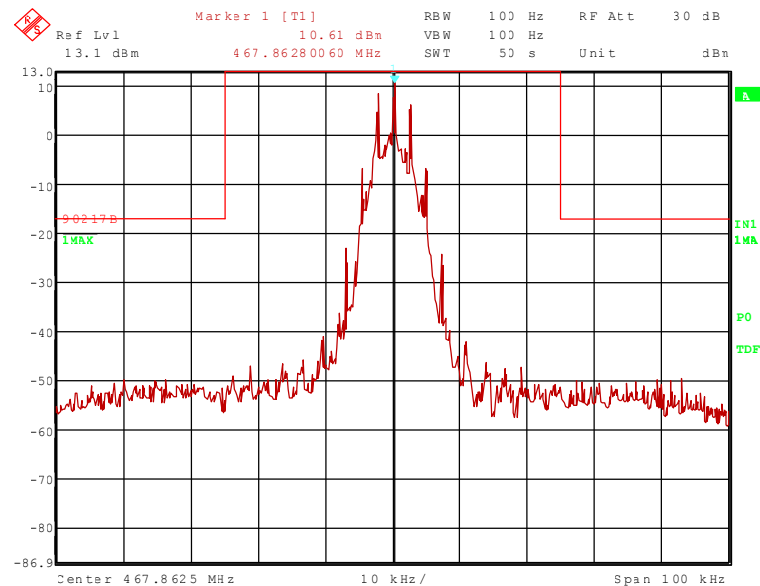


TEST REPORT REFERENCE: F060942E01

60942\_14.wmf: Spectrum mask, transmitter operates continuous modulation on 467.8625 MHz:



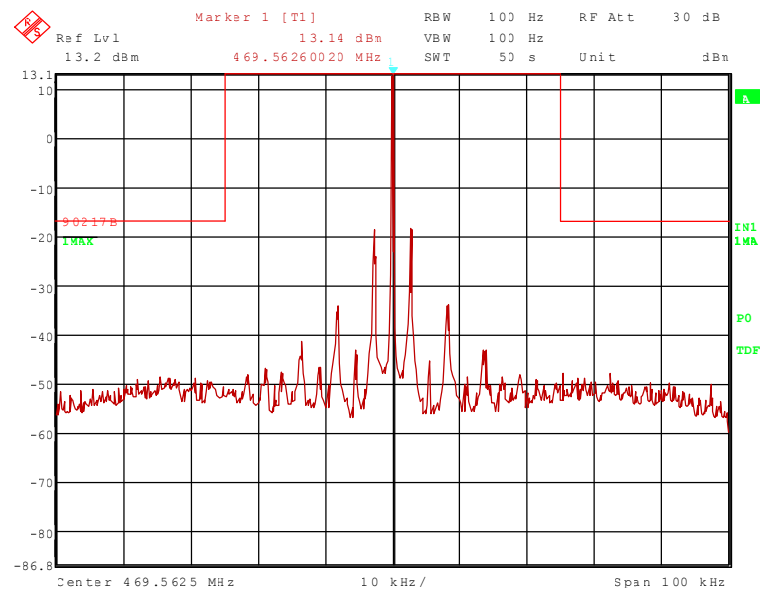
60942\_15.wmf: Spectrum mask, transmitter operates with burst modulation on 467.8625 MHz:



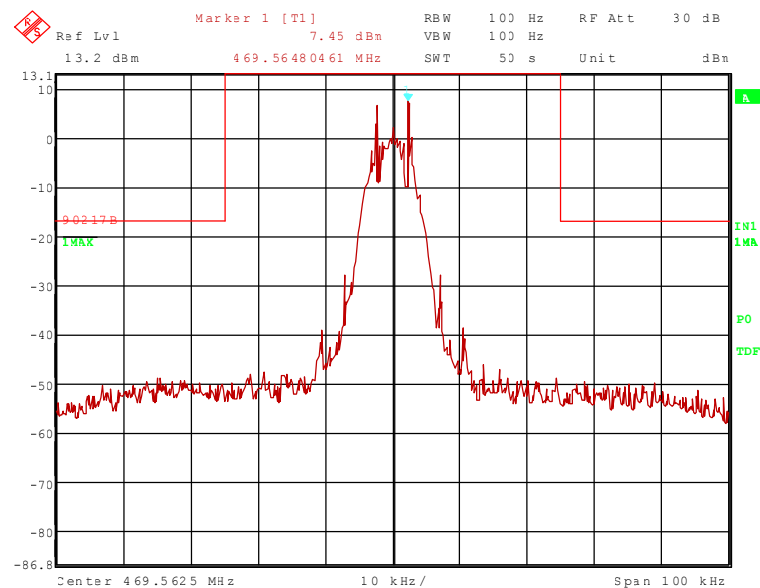
TEST REPORT REFERENCE: F060942E01

Transmitter operates on 469.5625 MHz:

60942\_16.wmf: Spectrum mask, transmitter operates without modulation on 469.5625 MHz:

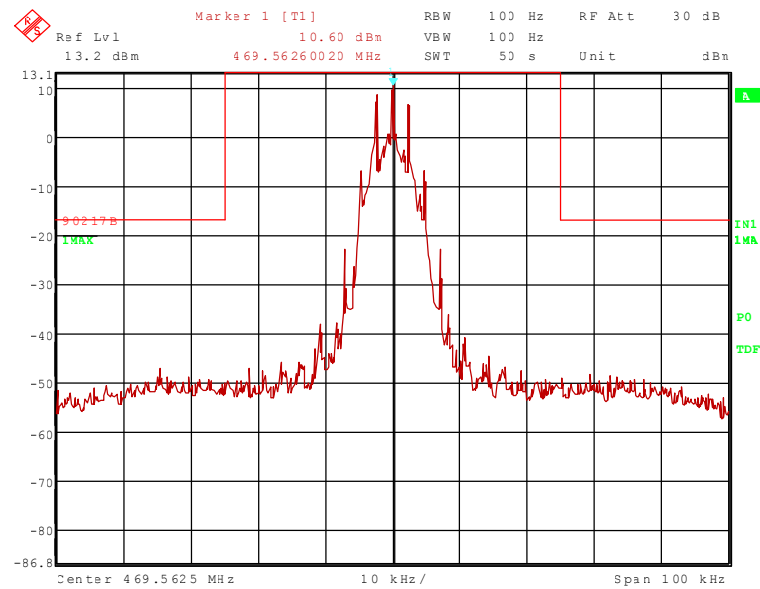


60942\_17.wmf: Spectrum mask, transmitter operates continuous modulation on 469.5625 MHz:



TEST REPORT REFERENCE: F060942E01

60942\_18.wmf: Spectrum mask, transmitter operates with burst modulation on 469.5625 MHz:



Test:        Passed

TEST EQUIPMENT USED FOR THE TEST:

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## 5.3 RADIATED EMISSIONS

### 5.3.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS)

The radiated emission measurement is subdivided into five stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 9 kHz to 1 GHz.
- A final measurement carried out on an outdoor test side without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A final measurement carried out on an open area test side with reflecting ground plane and various antenna height in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and height in the frequency range 1 GHz to 25 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 25 GHz.

All measurements will be carried out with the EUT working on the middle and upper and lower edge of the assigned frequency band. For this reason the hopping function of the EUT has to be disabled.

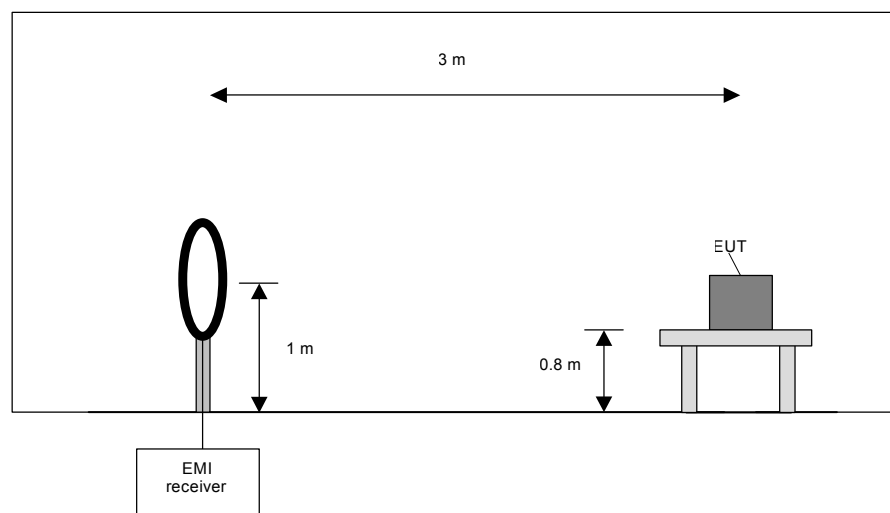
#### **Preliminary measurement (9 kHz to 30 MHz):**

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyser while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to found the maximum emissions.

The resolution bandwidth of the spectrum analyser will be set to the following values:

| Frequency range   | Resolution bandwidth |
|-------------------|----------------------|
| 9 kHz to 150 kHz  | 200 Hz               |
| 150 kHz to 30 MHz | 10 kHz               |





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Preliminary measurement procedure:

Prescans were performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

The following procedure will be used:

- 1) Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
- 2) Manipulate the system cables within the range to produce the maximum level of emission.
- 3) Rotate the EUT by 360 ° to maximize the detected signals.
- 4) Make a hardcopy of the spectrum.
- 5) Measure the frequencies of highest detected emission with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
- 6) Repeat steps 1) to 5) with the other orthogonal axes of the EUT (if handheld equipment).
- 7) Rotate the measuring antenna and repeat steps 1) to 5).

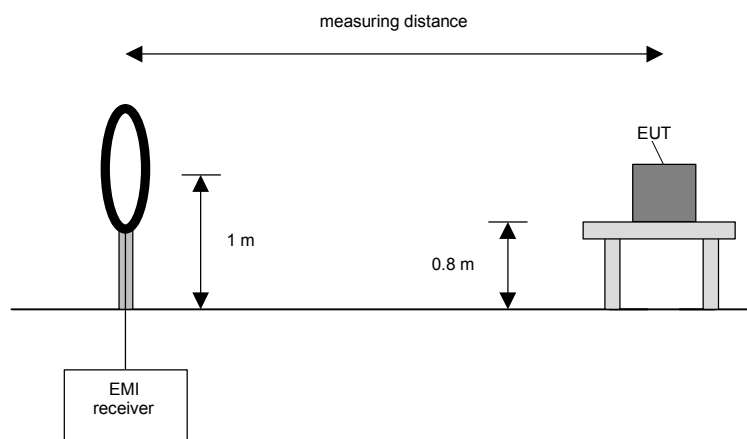
**Final measurement (9 kHz to 30 MHz):**

In the second stage a final measurement will be performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m and 30 m. In the case where larger measuring distances are required the results will be extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with a EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an average detector will be used according Section 15.209 (d) [2].

On the during the preliminary measurement detected frequencies the final measurement will be performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum value is found.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range   | Resolution bandwidth |
|-------------------|----------------------|
| 9 kHz to 150 kHz  | 200 Hz               |
| 150 kHz to 30 MHz | 9 kHz                |



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Final measurement procedure:

The following procedure will be used:

- 1) Monitor the frequency range with the measuring antenna at vertical orientation parallel to the EUT at an azimuth of 0 °.
- 2) Rotate the EUT by 360 ° to maximize the detected signals and note the azimuth and orientation.
- 3) Rotate the measuring antenna to find the maximum and note the value.
- 4) Rotate the measuring antenna and repeat steps 1) to 3) until the maximum value is found.
- 5) Repeat steps 1) to 4) with the other orthogonal axes of the EUT (if handheld equipment application).

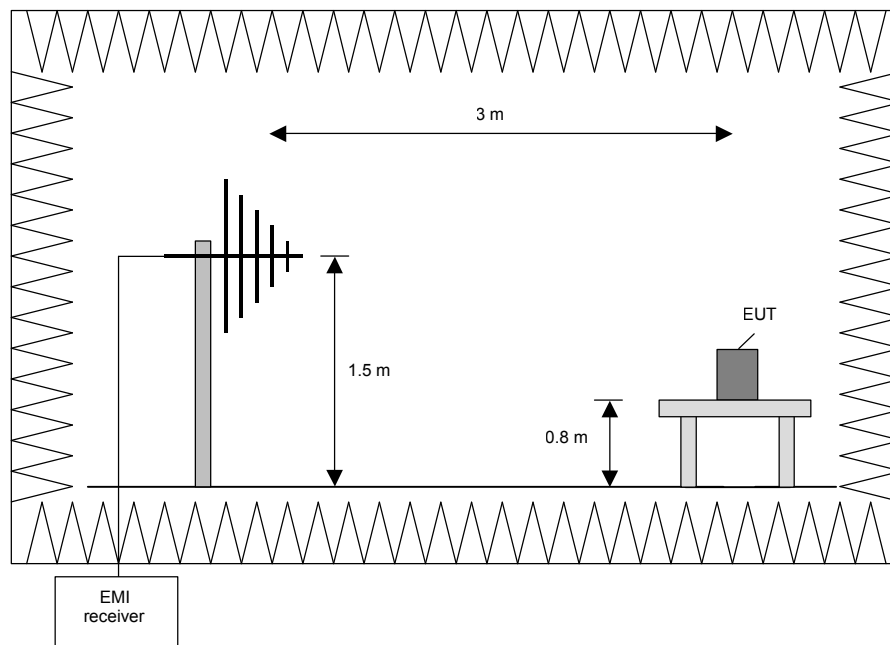
**Preliminary measurement (30 MHz to 1 GHz)**

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range   | Resolution bandwidth |
|-------------------|----------------------|
| 30 MHz to 230 MHz | 100 kHz              |
| 230 MHz to 1 GHz  | 100 kHz              |



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#### Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.  
The following procedure will be used:

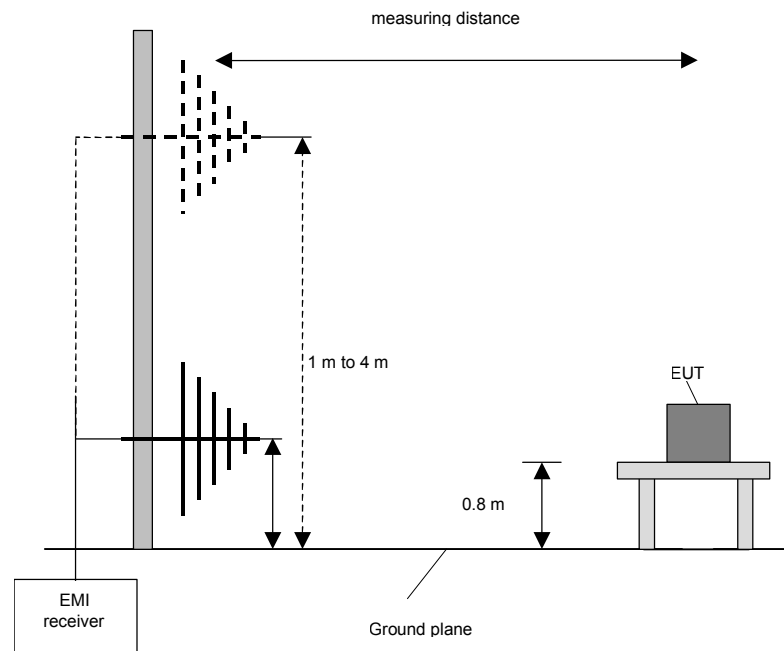
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6. Repeat 1) to 4) with the other orthogonal axes of the EUT (if handheld equipment).
7. Repeat 1) to 5) with the vertical polarisation of the measuring antenna.

#### Final measurement (30 MHz to 1 GHz)

A final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of 0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range | Resolution bandwidth |
|-----------------|----------------------|
| 30 MHz to 1 GHz | 120 kHz              |



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Procedure final measurement:

The following procedure will be used:

- 1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
- 2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
- 3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
- 4) Repeat 1) to 3) for the other orthogonal antenna polarization.
- 5) Move the antenna and the turntable to the position where the maximum value is detected.
- 6) Measure while moving the antenna slowly +/- 1 m.
- 7) Set the antenna to the position where the maximum value is found.
- 8) Measure while moving the turntable +/- 45 °.
- 9) Set the turntable to the azimuth where the maximum value is found.
- 10) Measure with Final detector and note the value.
- 11) Repeat 5) to 10) for each frequency.
- 12) Repeat 1) to 11) for each orthogonal axes of the EUT (if handheld equipment).
- 13) Replace the EUT by a suitable substitution antenna and connect this antenna to a signal generator.
- 14) Set the turntable to the azimuth and the antenna to the position where the maximum value is found
- 15) Vary the output power for each frequency, until the level of the EUTs emission is found.
- 16) Note the output power of the signal generator.

**Preliminary and final measurement (1 GHz to 25 GHz)**

This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

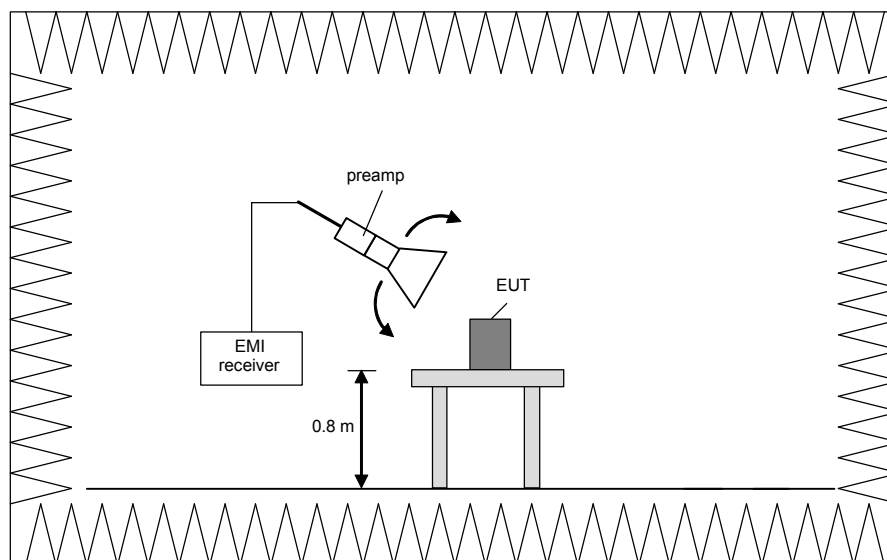
**Preliminary measurement (1 GHz to 25 GHz)**

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna, the antenna close to the EUT and while moving the antenna over all sides of the EUT. With the spectrum analyser in CLEAR / WRITE mode the cone of the emission should be found and than the measuring distance will be set to 3 m with the receiving antenna moving in this cone of emission. At this position the final measurement will be carried out.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range  | Resolution bandwidth |
|------------------|----------------------|
| 1 GHz to 4 GHz   | 100 kHz              |
| 4 GHz to 12 GHz  | 100 kHz              |
| 12 GHz to 18 GHz | 100 kHz              |
| 18 GHz to 25 GHz | 100 kHz              |

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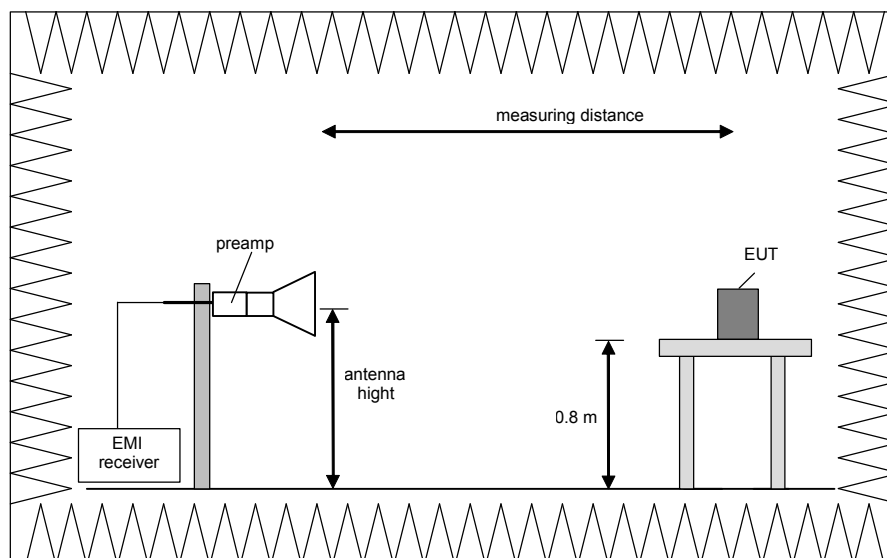


### **Final measurement (1 GHz to 25 GHz)**

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 ° in order to have the antenna inside the cone of radiation.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range  | Resolution bandwidth |
|------------------|----------------------|
| 1 GHz to 4 GHz   | 1 MHz                |
| 4 GHz to 12 GHz  | 1 MHz                |
| 12 GHz to 18 GHz | 1 MHz                |
| 18 GHz to 25 GHz | 1 MHz                |



TEST REPORT REFERENCE: F060942E01

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Procedure of measurement:

The measurements were performed in the frequency range 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz and 18 GHz to 25 GHz.

The following procedure will be used:

- 1) Monitor the frequency range at horizontal polarisation and move the antenna over all sides of the EUT (if necessary move the EUT to another orthogonal axis).
- 2) Change the antenna polarisation and repeat 1) with vertical polarisation.
- 3) Make a hardcopy of the spectrum.
- 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
- 5) Change the analyser mode to Clear / Write and found the cone of emission.
- 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3 m and the antenna will be still inside the cone of emission.
- 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarisation and azimuth and the peak and average detector, which causes the maximum emission.
- 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
- 9) Replace the EUT by a suitable substitution antenna and connect this antenna to a signal generator.
- 10) Set the turntable to the azimuth to the position where the maximum value is found
- 11) Vary the output power for each frequency, until the level of the EUTs emission is found.
- 12) Note the output power of the signal generator.

Step 1) to 6) are defined as preliminary measurement.

TEST REPORT REFERENCE: F060942E01

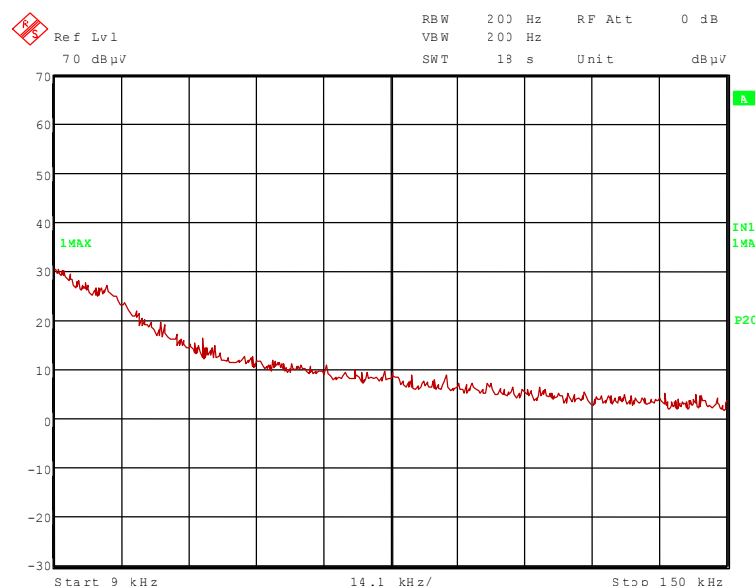
## 5.3.2 TEST RESULTS (RADIATED EMISSIONS)

### 5.3.2.1 PRELIMINARY MEASUREMENT (9 kHz to 5 GHz)

|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 21 °C | Relative humidity | 37 % |
|---------------------|-------|-------------------|------|

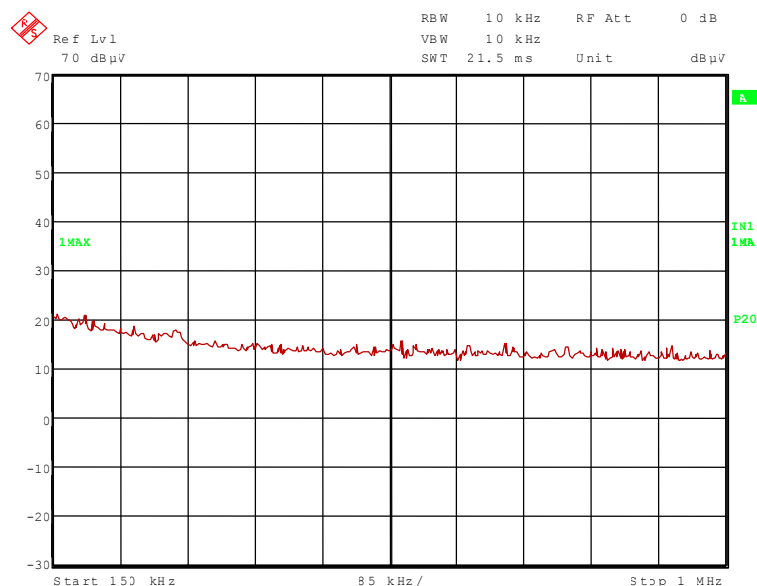
- Position of EUT:** The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m. For further information of the set up refer to the pictures in annex A of this test report.
- Cable guide:** The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.
- Test record:** Where not otherwise stated the test was carried out in test mode 2 of the EUT, because there was no difference to the other test modes. Because of handheld equipment, the EUT was measured under three orthogonal directions. All results are shown in the following are showing the maximum of all three directions.
- Supply voltage:** During all measurements the EUT was supplied with 6.0 V DC via the internal battery.
- Remark:** As pre-tests have shown, the emissions in the frequency range 9 kHz to 30 MHz are not depending on selected channel. All test were carried out with the K71 17 23, because additional pretests have shown, that this antenna causes higher emissions than the FSP70/CEL1.

60942\_19.wmf: Spurious emissions from 9 kHz to 150 kHz (operation mode 2):

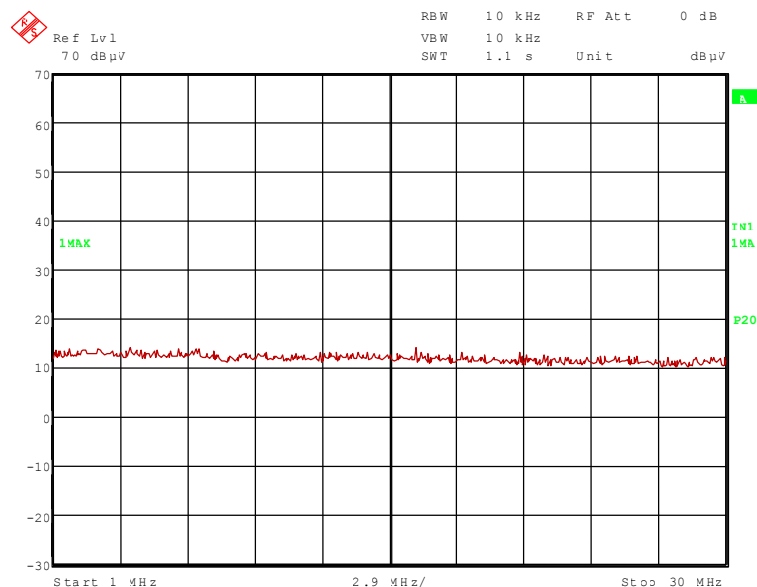


TEST REPORT REFERENCE: F060942E01

60942\_20.wmf: Spurious emissions from 150 kHz to 1 MHz (operation mode 2):



60942\_21.wmf: Spurious emissions from 1 MHz to 30 MHz (operation mode 2):



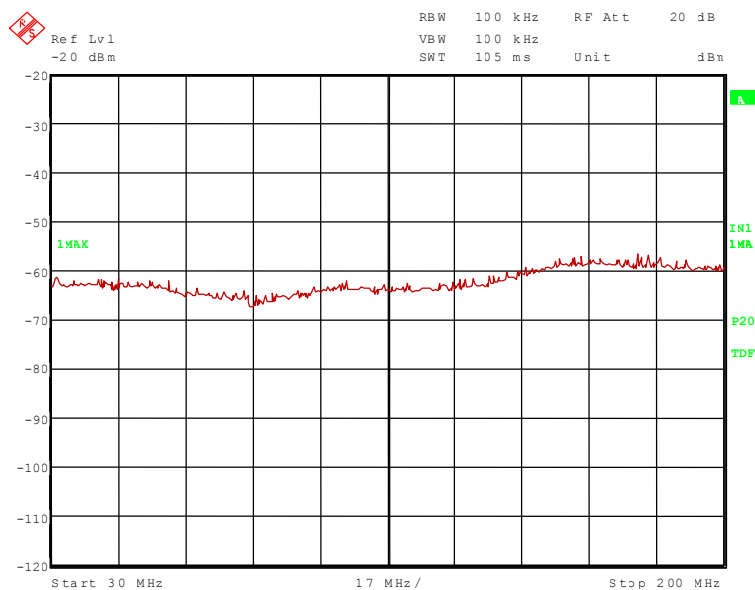
No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.



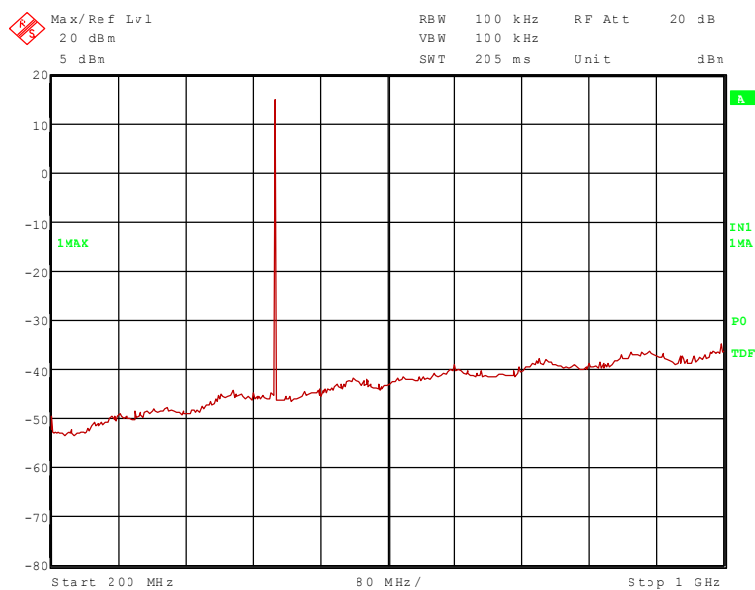
TEST REPORT REFERENCE: F060942E01

**Transmitter operates at the lower end of the assigned frequency band (operation mode 1)**

**60942\_6.wmf: Spurious emissions from 30 MHz to 200 MHz (operation mode 1):**



**60942\_1.wmf: Spurious emissions from 200 MHz to 1 GHz (operation mode 1):**



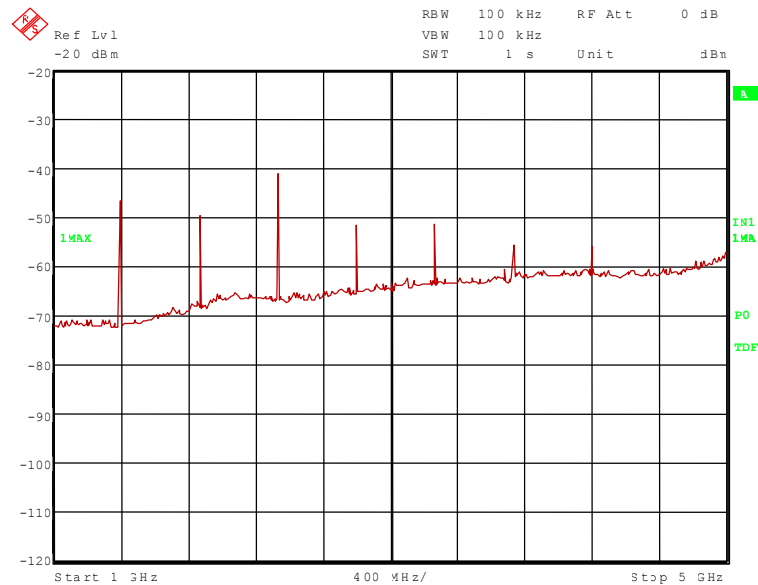
The following frequency was found during the preliminary radiated emission test:

- 466.0375 MHz.

This frequency has to be measured on the open area test site. The results were presented in the following

TEST REPORT REFERENCE: F060942E01

60942\_7.wmf: Spurious emissions from 1 GHz to 5 GHz (operation mode 1):



The following frequencies were found during the preliminary radiated emission test:

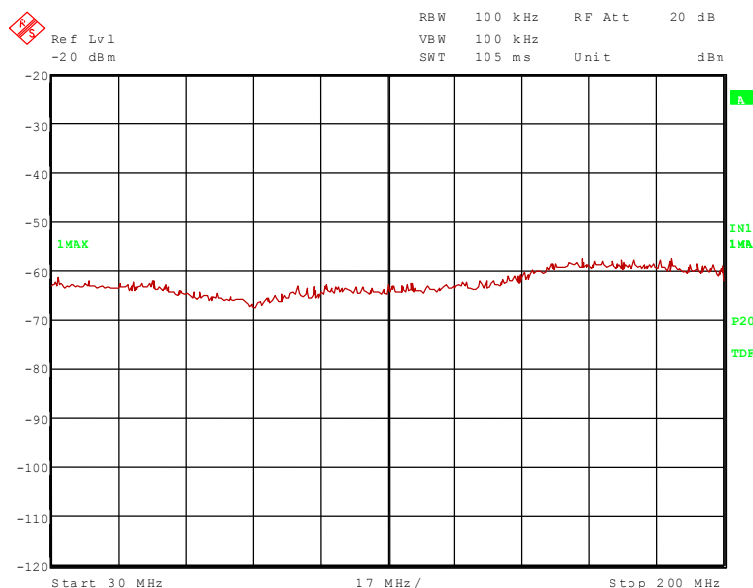
- 1398.1125 MHz, 1864.150 MHz, 2330.1875 MHz, 2796.225 MHz, 3262.2625 MHz, 3728.300 MHz and 4194.3375 MHz.

These frequencies have to be measured on in a final measurement.

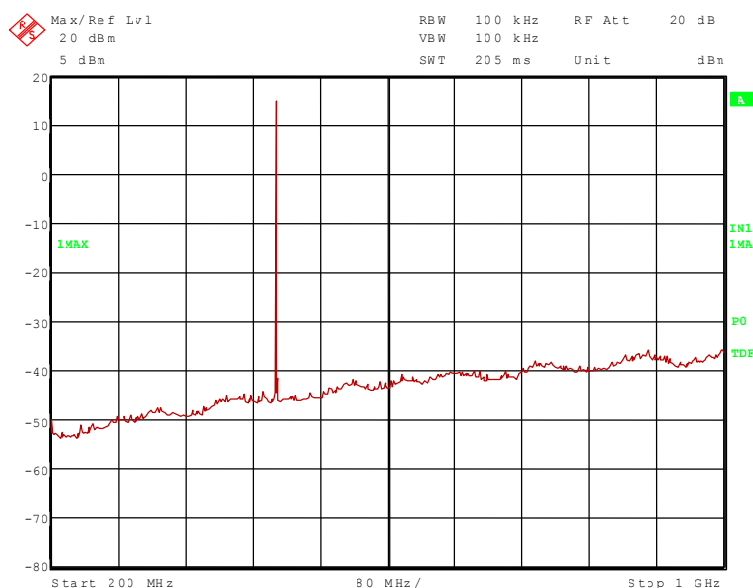
TEST REPORT REFERENCE: F060942E01

**Transmitter operates at the middle of the assigned frequency band (operation mode 2)**

**60942\_5.wmf: Spurious emissions from 30 MHz to 200 MHz (operation mode 2):**



**60942\_2.wmf: Spurious emissions from 200 MHz to 1 GHz (operation mode 2):**



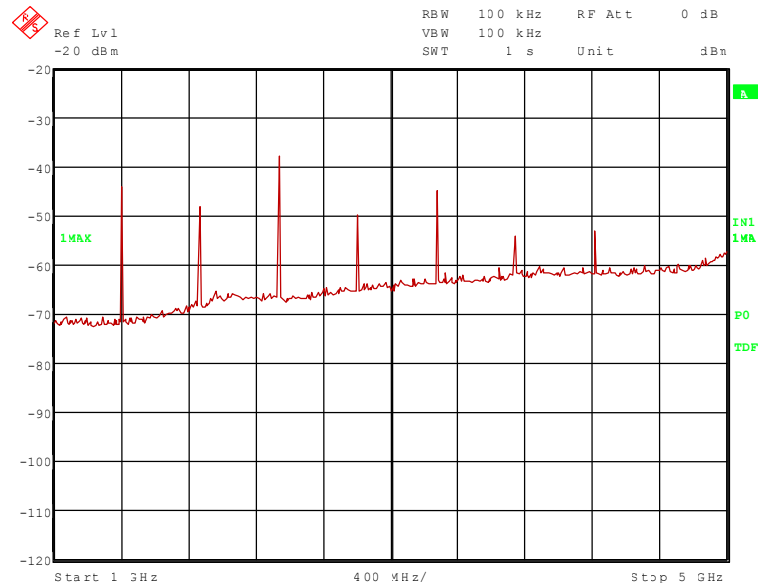
The following frequency was found during the preliminary radiated emission test:

- 467.8625 MHz.

This frequency has to be measured on the open area test site. The results were presented in the following

TEST REPORT REFERENCE: F060942E01

60942\_8.wmf: Spurious emissions from 1 GHz to 5 GHz (operation mode 2):



The following frequencies were found during the preliminary radiated emission test:

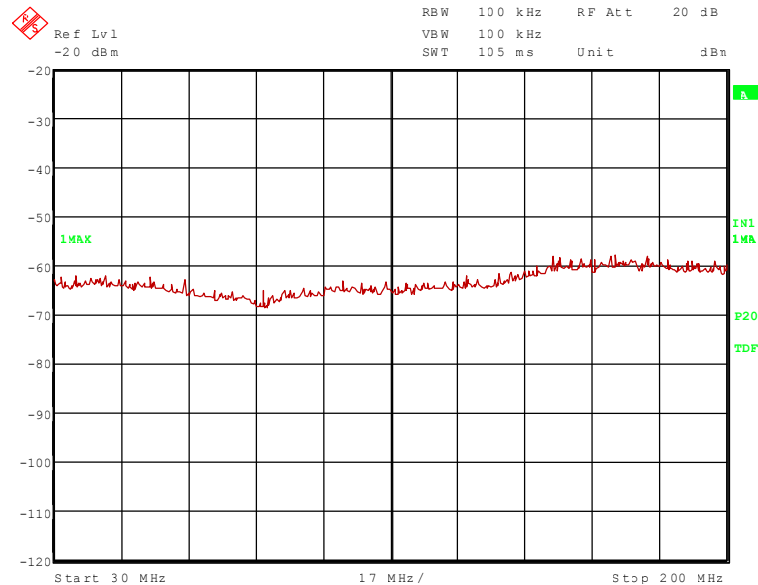
- 1403.5875 MHz, 1871.450 MHz, 2339.3125 MHz, 2807.175 MHz, 3275.0375 MHz, 3742.900 MHz and 4210.7625 MHz.

These frequencies have to be measured on in a final measurement.

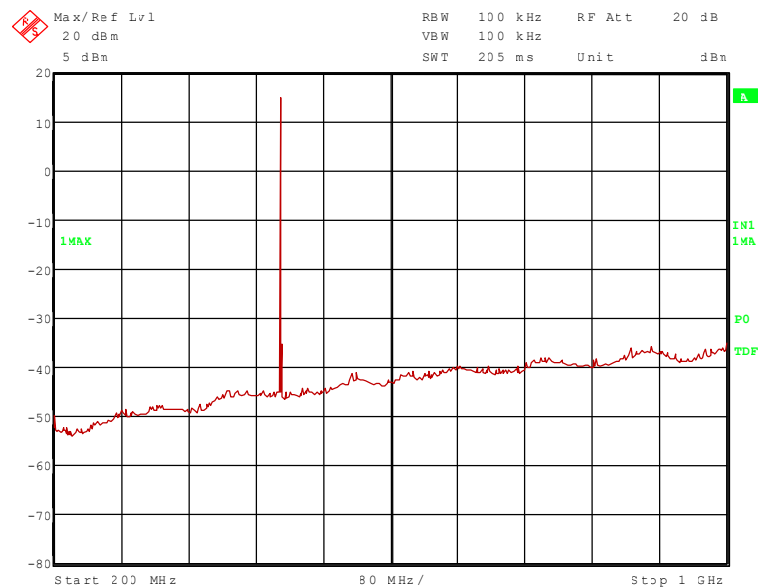
TEST REPORT REFERENCE: F060942E01

**Transmitter operates at the upper end of the assigned frequency band (operation mode 3)**

**60942\_4.wmf: Spurious emissions from 30 MHz to 200 MHz (operation mode 3):**



**60942\_3.wmf: Spurious emissions from 200 MHz to 1 GHz (operation mode 3):**



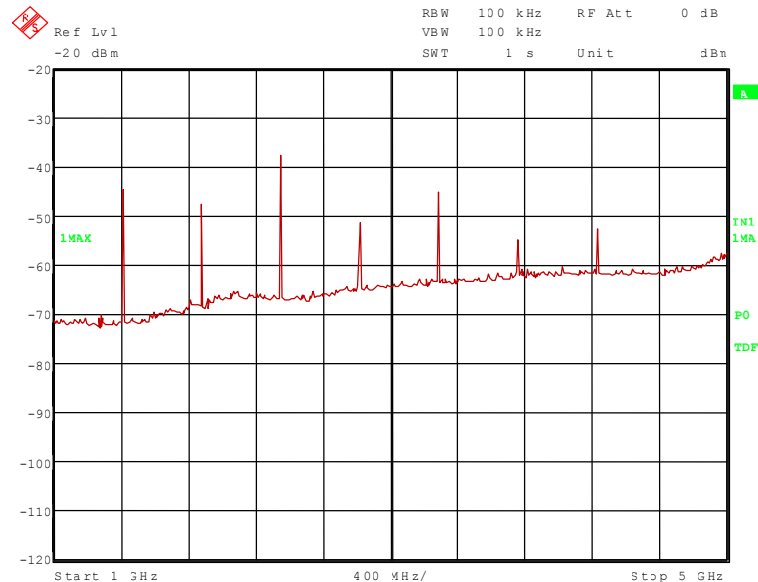
The following frequencies were found during the preliminary radiated emission test:

- 469.5625 MHz.

These frequencies have to be measured on the open area test site. The results were presented in the following.

TEST REPORT REFERENCE: F060942E01

60942\_9.wmf: Spurious emissions from 1 GHz to 5 GHz (operation mode 3):



The following frequencies were found during the preliminary radiated emission test:

- 1408.6875 MHz, 1878.250 MHz, 2347.8125 MHz, 2817.375 MHz, 3286.9375 MHz, 3756.500 MHz and 4226.0625 MHz.

These frequencies have to be measured on in a final measurement

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 36, 43, 44, 49, 58, 67

TEST REPORT REFERENCE: F060942E01

### 5.3.2.2 FINAL MEASUREMENT (30 MHz to 1 GHz)

|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 19 °C | Relative humidity | 46 % |
|---------------------|-------|-------------------|------|

- Position of EUT:** The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m. For further information of the set up refer to the pictures in annex A of this test report.
- Cable guide:** The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.
- Supply voltage:** During all measurements the EUT was supplied with 6.0 V DC via the internal battery.
- Resolution bandwidth:** For all measurements a resolution bandwidth of 120 kHz was used.

The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

### Result measured with the quasipeak detector:

(These values are marked in the above diagram by x)

| Spurious emissions         |                  |              |                   |              |              |                |              |          |
|----------------------------|------------------|--------------|-------------------|--------------|--------------|----------------|--------------|----------|
| Transmitter operation mode | Frequency<br>MHz | Result<br>mW | Limit<br>mW       | Margin<br>dB | Height<br>cm | Azimuth<br>deg | Polarisation | Position |
| Operation mode 1           | 466.0375         | 83.2         | 120               | 1.5          | 100          | 337.0          | Vertical     | 1        |
| Operation mode 2           | 467.8625         | 89.1         | 120               | 1.2          | 100          | 247.0          | Vertical     | 1        |
| Operation mode 3           | 469.5625         | 83.2         | 120               | 1.5          | 100          | 337.0          | Vertical     | 1        |
| Measurement uncertainty    |                  |              | +2.2 dB / -3.6 dB |              |              |                |              |          |

Test: Passed

|                                   |
|-----------------------------------|
| TEST EQUIPMENT USED FOR THE TEST: |
| 14 – 20, 60, 61, 63               |

TEST REPORT REFERENCE: F060942E01

### 5.3.2.3 FINAL MEASUREMENT (1 GHz to 5 GHz)

|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 21 °C | Relative humidity | 37 % |
|---------------------|-------|-------------------|------|

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m. For further information of the set up refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 6.0 V DC via the internal battery.

Resolution bandwidth: For all measurements a resolution bandwidth of 1 MHz was used.

#### Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

Result measured with the average detector:

| Frequency<br>MHz        | Corr. value<br>dBm | Limit<br>dBm | Margin<br>dB | Preamp            | Height<br>cm | Polarisation | Position |
|-------------------------|--------------------|--------------|--------------|-------------------|--------------|--------------|----------|
| 1383.1125               | -46.6              | -10.8        | 35.8         | Yes               | 150          | Vertical     | 1        |
| 1864.150                | -48.5              | -10.8        | 37.7         | Yes               | 150          | Vertical     | 2        |
| 2330.1875               | -37.2              | -10.8        | 26.4         | Yes               | 150          | Vertical     | 2        |
| 2796.225                | -49.5              | -10.8        | 38.7         | Yes               | 150          | Horizontal   | 2        |
| 3262.2625               | -46.9              | -10.8        | 36.1         | Yes               | 150          | Vertical     | 2        |
| 3728.300                | -55.1              | -10.8        | 44.3         | Yes               | 150          | Horizontal   | 2        |
| 4194.3375               | -53.2              | -10.8        | 42.4         | Yes               | 150          | Vertical     | 2        |
| Measurement uncertainty |                    |              |              | +2.2 dB / -3.6 dB |              |              |          |

#### Transmitter operates at the middle of the assigned frequency band (operation mode 2)

Result measured with the average detector:

| Frequency<br>MHz        | Corr. value<br>dBm | Limit<br>dBm | Margin<br>dB | Preamp            | Height<br>cm | Polarisation | Position |
|-------------------------|--------------------|--------------|--------------|-------------------|--------------|--------------|----------|
| 1403.5875               | -45.9              | 10.5         | 35.4         | Yes               | 150          | Vertical     | 1        |
| 1871.450                | -48.7              | 10.5         | 38.2         | Yes               | 150          | Vertical     | 2        |
| 2339.3125               | -38.2              | 10.5         | 27.7         | Yes               | 150          | Vertical     | 2        |
| 2807.175                | -49.7              | 10.5         | 39.2         | Yes               | 150          | Horizontal   | 2        |
| 3275.0375               | -46.3              | 10.5         | 35.8         | Yes               | 150          | Vertical     | 2        |
| 3742.900                | -54.7              | 10.5         | 44.2         | Yes               | 150          | Horizontal   | 2        |
| 4210.7625               | -53.3              | 10.5         | 42.8         | Yes               | 150          | Vertical     | 2        |
| Measurement uncertainty |                    |              |              | +2.2 dB / -3.6 dB |              |              |          |



TEST REPORT REFERENCE: F060942E01

**Transmitter operates at the upper end of the assigned frequency band (operation mode 3)**

**Result measured with the average detector:**

| Frequency<br>MHz        | Corr. value<br>dBm | Limit<br>dBm | Margin<br>dB | Preamp            | Height<br>cm | Polarisation | Position |
|-------------------------|--------------------|--------------|--------------|-------------------|--------------|--------------|----------|
| 1408.6875               | -48.7              | -10.8        | 37.9         | Yes               | 150          | Vertical     | 1        |
| 1878.250                | -47.4              | -10.8        | 36.6         | Yes               | 150          | Vertical     | 2        |
| 2347.8125               | -37.5              | -10.8        | 26.7         | Yes               | 150          | Vertical     | 2        |
| 2817.375                | -51.4              | -10.8        | 40.6         | Yes               | 150          | Horizontal   | 2        |
| 3286.9375               | -47.3              | -10.8        | 36.5         | Yes               | 150          | Vertical     | 2        |
| 3756.500                | -54.4              | -10.8        | 43.6         | Yes               | 150          | Horizontal   | 2        |
| 4226.0625               | -52.8              | -10.8        | 42.0         | Yes               | 150          | Vertical     | 2        |
| Measurement uncertainty |                    |              |              | +2.2 dB / -3.6 dB |              |              |          |

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 34, 36, 44, 49, 60, 62, 63, 67

TEST REPORT REFERENCE: F060942E01

## 5.4 CONDUCTED EMISSIONS

### 5.4.1 METHOD OF MEASUREMENT (CONDUCTED EMISSIONS)

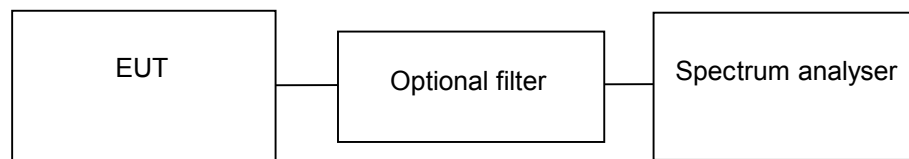
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on and the hopping function has to be disenabled (if applicable).

| Analyser Parameter   | Frequency range  |                   |                 |                 |
|----------------------|------------------|-------------------|-----------------|-----------------|
|                      | 9 kHz to 150 kHz | 150 kHz to 30 MHz | 30 MHz to 1 GHz | 1 GHz to 25 GHz |
| Start frequency      | 9 kHz            | 150 kHz           | 30 MHz          | 1 GHz           |
| Stop frequency       | 150 kHz          | 30 MHz            | 1 GHz           | 25 GHz          |
| Resolution bandwidth | 200 Hz           | 10 kHz            | 100 kHz         | 1 MHz           |
| Video bandwidth      | 200 Hz           | 10 kHz            | 100 kHz         | 1 MHz           |
| Sweep                | Auto             | Auto              | Auto            | Auto            |
| Detector function    | Peak             | Peak              | Peak            | Peak            |
| Trace mode           | Max hold         | Max hold          | Max hold        | Max hold        |

The resolution bandwidth settings below 30 MHz were chosen in accordance to the ANSI C63.4 [1] in regarding of a good engineering practice.

The measurement will be performed with the EUT operates at the middle, the upper and lower end of the assigned frequency band.

Test set-up:



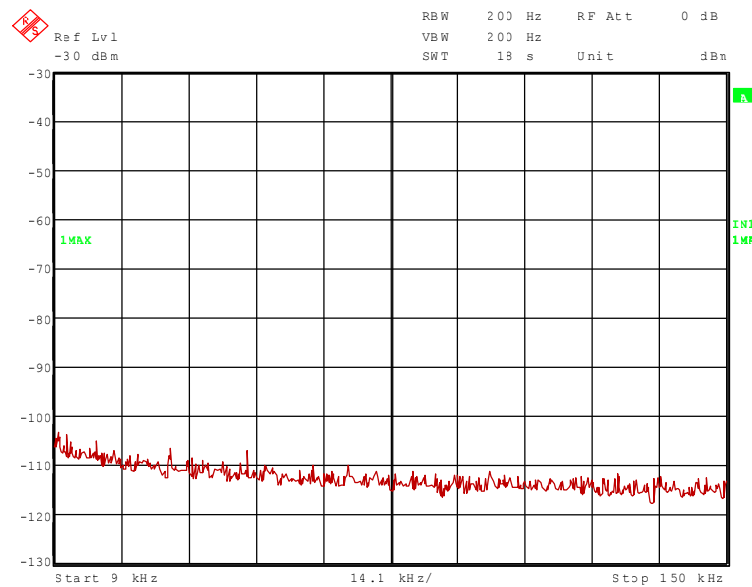
TEST REPORT REFERENCE: F060942E01

## 5.4.2 TEST RESULTS (CONDUCTED EMISSIONS)

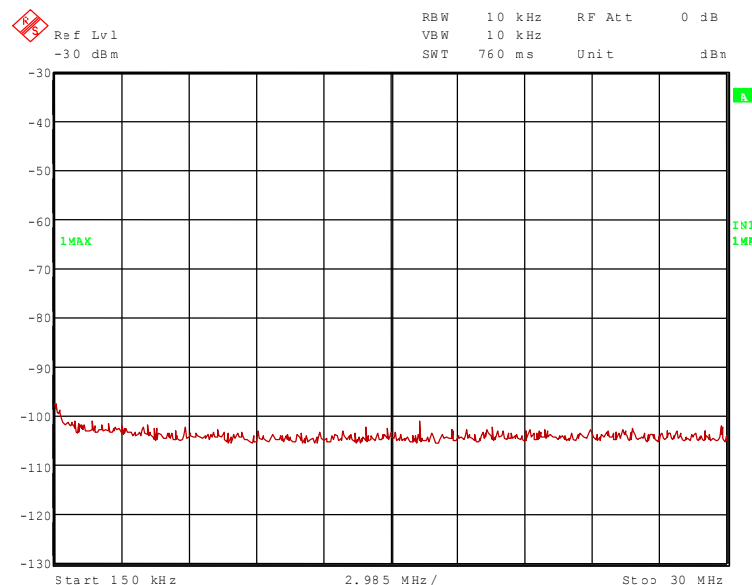
|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

**Transmitter operates at the lower end of the assigned frequency band (operation mode 1)**

60942\_28.wmf: Conducted spurious emissions from 9 kHz to 150 kHz (operation mode 1):

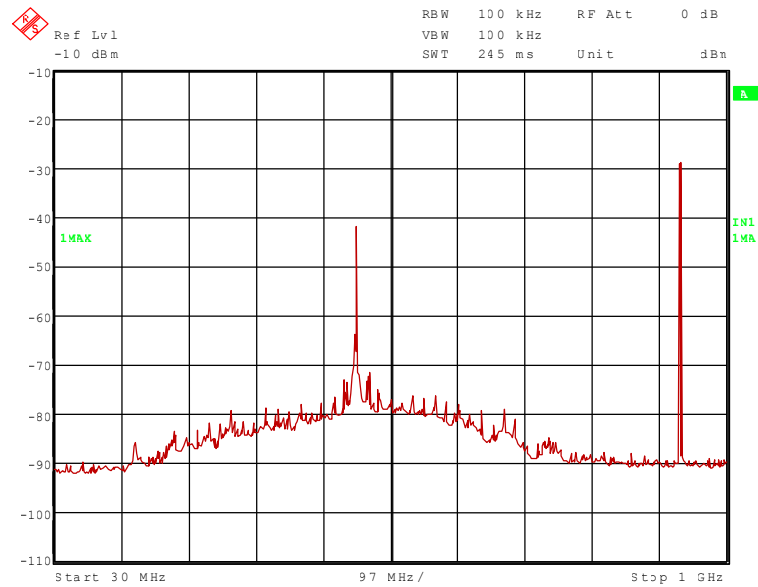


60942\_29.wmf: Conducted spurious emissions from 150 kHz to 30 MHz (operation mode 1):

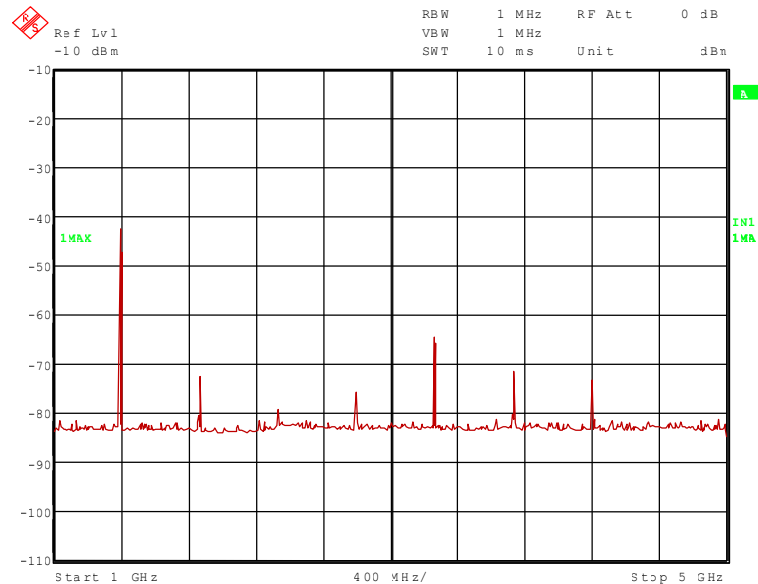


TEST REPORT REFERENCE: F060942E01

60942\_30.wmf: Conducted spurious emissions from 30 MHz to 1 GHz (operation mode 1):



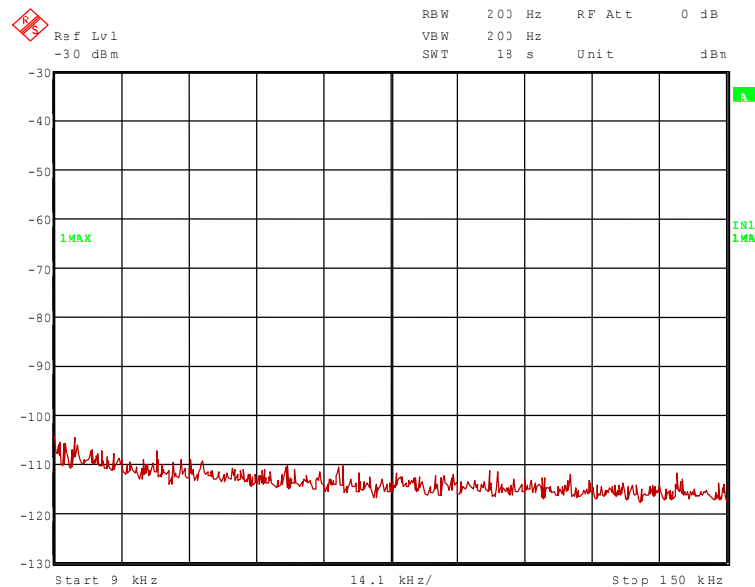
60942\_31.wmf: Conducted spurious emissions from 1 GHz to 5 GHz (operation mode 1):



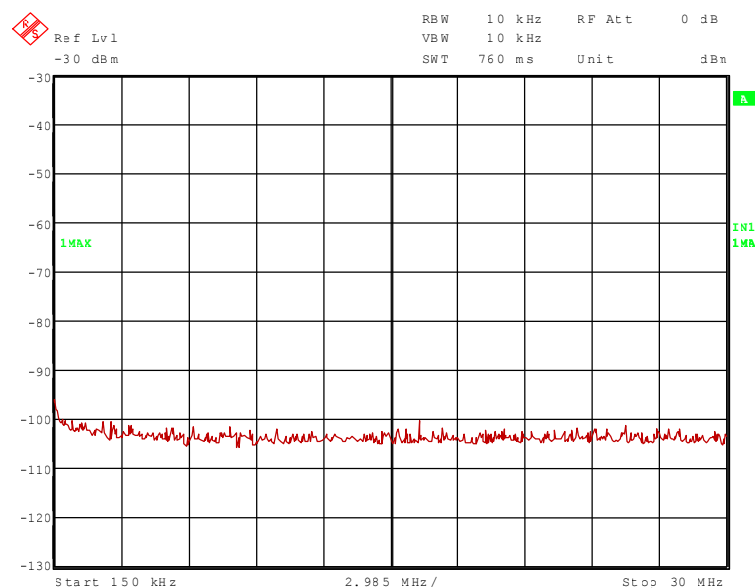
TEST REPORT REFERENCE: F060942E01

**Transmitter operates at the middle of the assigned frequency band (operation mode 2)**

**60942\_35.wmf: Conducted spurious emissions from 9 kHz to 150 kHz (operation mode 2):**

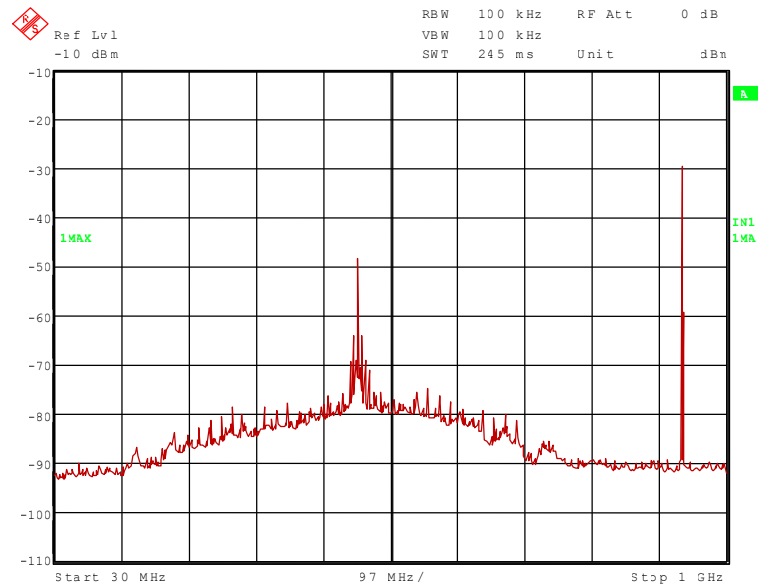


**60942\_34.wmf: Conducted spurious emissions from 150 kHz to 30 MHz (operation mode 2):**

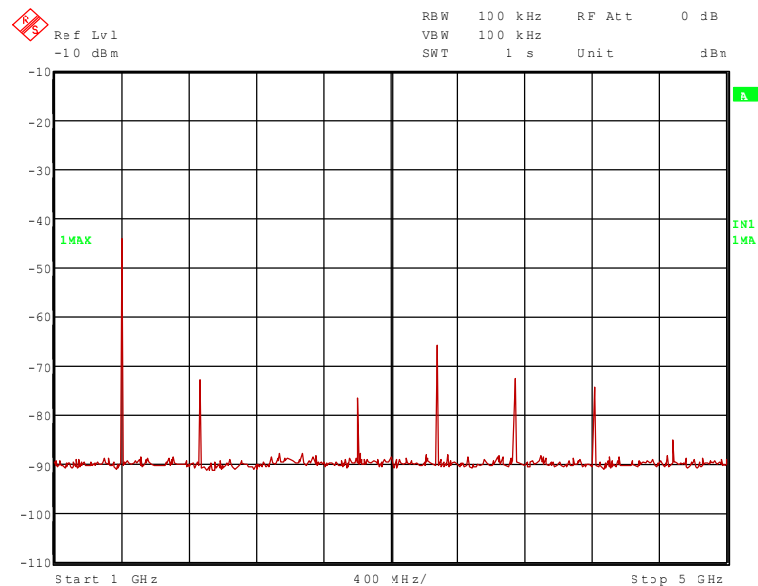


TEST REPORT REFERENCE: F060942E01

60942\_33.wmf: Conducted spurious emissions from 30 MHz to 1 GHz (operation mode 2):



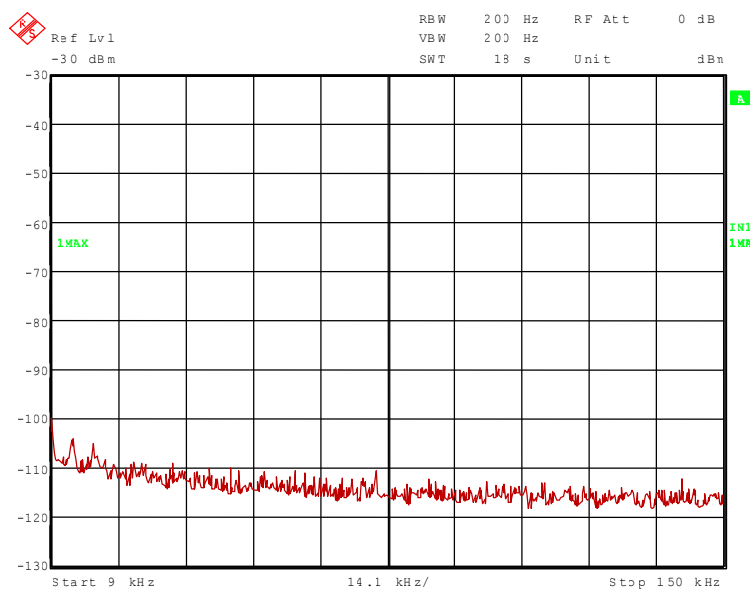
60942\_32.wmf: Conducted spurious emissions from 1 GHz to 5 GHz (operation mode 2):



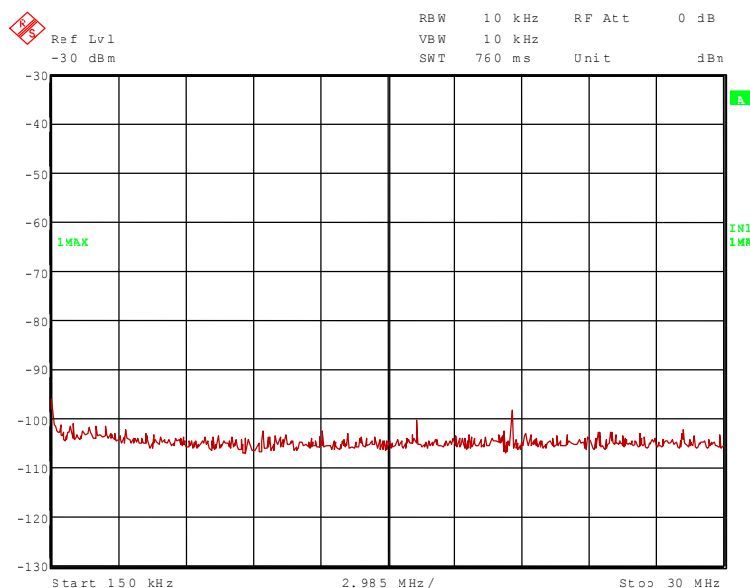
TEST REPORT REFERENCE: F060942E01

**Transmitter operates at the upper end of the assigned frequency band (operation mode 3)**

**60942\_36.wmf: Conducted spurious emissions from 9 kHz to 150 kHz (operation mode 3):**

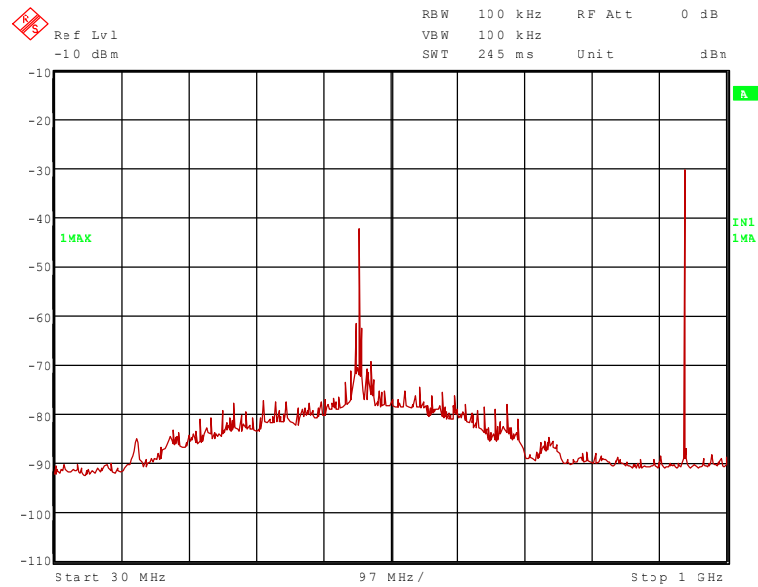


**60942\_37.wmf: Conducted spurious emissions from 150 kHz to 30 MHz (operation mode 3):**

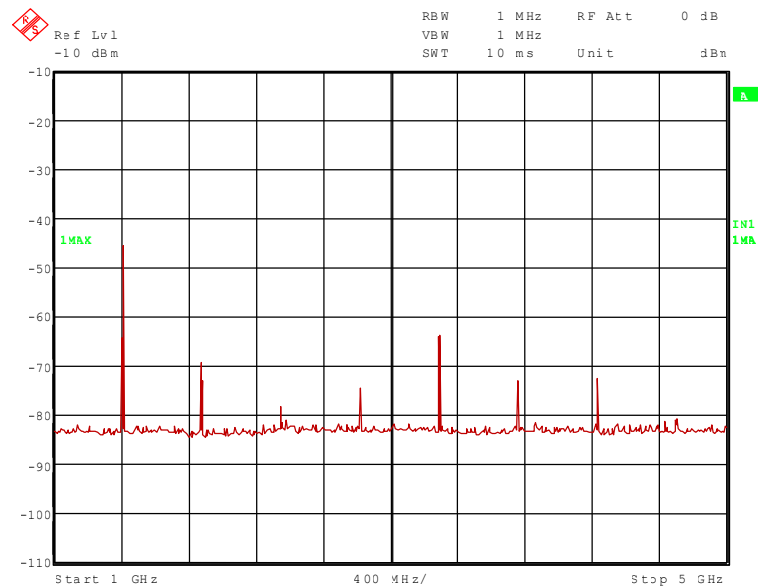


TEST REPORT REFERENCE: F060942E01

60942\_38.wmf: Conducted spurious emissions from 30 MHz to 1 GHz (operation mode 3):



60942\_39.wmf: Conducted spurious emissions from 1 GHz to 5 GHz (operation mode 3):





TEST REPORT REFERENCE: F060942E01

| Conducted emissions with transmitter operates at the lower end of the assigned frequency band |            |           |           |             |                     |                       |
|---|------------|-----------|-----------|-------------|---------------------|-----------------------|
| Frequency MHz   | Result dBm | Limit dBm | Margin dB | Reading dBm | Cable loss dB       | Reference level [dBm] |
| 932.0750  | -29.0      | -16.6     | 12.4      | -29.3       | 0.3                 | 13.4                  |
| 1398.1124   | -42.6      | -16.6     | 26.0      | -43.0       | 0.4                 | 13.4                  |
| 1864.1500   | -72.5      | -16.6     | 55.9      | -73.0       | 0.5                 | 13.4                  |
| 2796.2250   | -75.8      | -16.6     | 59.2      | -76.5       | 0.7                 | 13.4                  |
| 3262.2625   | -64.6      | -16.6     | 48.0      | -65.4       | 0.8                 | 13.4                  |
| 3728.3000   | -71.6      | -16.6     | 55.0      | -72.5       | 0.9                 | 13.4                  |
| 4194.3375   | -73.0      | -16.6     | 56.4      | -74.0       | 1.0                 | 13.4                  |
| Conducted emissions with transmitter operates at the middle of the assigned frequency band    |            |           |           |             |                     |                       |
| Frequency MHz   | Result dBm | Limit dBm | Margin dB | Reading dBm | Cable loss dB       | Reference level [dBm] |
| 935.7250  | -29.4      | -16.6     | 12.8      | -29.7       | 0.3                 | 13.4                  |
| 1403.5875   | -44.1      | -16.6     | 27.5      | -44.5       | 0.4                 | 13.4                  |
| 1871.4500   | -71.2      | -16.6     | 54.6      | -71.7       | 0.5                 | 13.4                  |
| 2807.1750   | -74.1      | -16.6     | 57.5      | -74.8       | 0.7                 | 13.4                  |
| 3275.0375   | -65.2      | -16.6     | 48.6      | -66.0       | 0.8                 | 13.4                  |
| 3742.9000   | -70.5      | -16.6     | 53.9      | -71.4       | 0.9                 | 13.4                  |
| 4210.7625   | -73.1      | -16.6     | 56.5      | -74.1       | 1.0                 | 13.4                  |
| Conducted emissions with transmitter operates at the upper end of the assigned frequency band |            |           |           |             |                     |                       |
| Frequency MHz   | Result dBm | Limit dBm | Margin dB | Reading dBm | Cable loss dB       | Reference level [dBm] |
| 939.1250  | -30.3      | -16.6     | 13.7      | -30.6       | 0.3                 | 13.4                  |
| 1408.6875   | -45.7      | -16.6     | 29.1      | -46.1       | 0.4                 | 13.4                  |
| 1878.2500   | -69.2      | -16.6     | 52.6      | -69.7       | 0.5                 | 13.4                  |
| 2817.3750   | -74.1      | -16.6     | 57.5      | -74.8       | 0.7                 | 13.4                  |
| 3286.9375   | -63.4      | -16.6     | 46.8      | -64.2       | 0.8                 | 13.4                  |
| 3756.5000   | -72.7      | -16.6     | 56.1      | -73.6       | 0.9                 | 13.4                  |
| 4226.0625   | -72.3      | -16.6     | 55.7      | -73.3       | 1.0                 | 13.4                  |
| Measurement uncertainty   |            |           |           |             | +0.66 dB / -0.72 dB |                       |

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

31, 54, 67, 68

TEST REPORT REFERENCE: F060942E01

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## 5.5 FREQUENCY STABILITY

### 5.5.1 METHOD OF MEASUREMENT (FREQUENCY STABILITY)

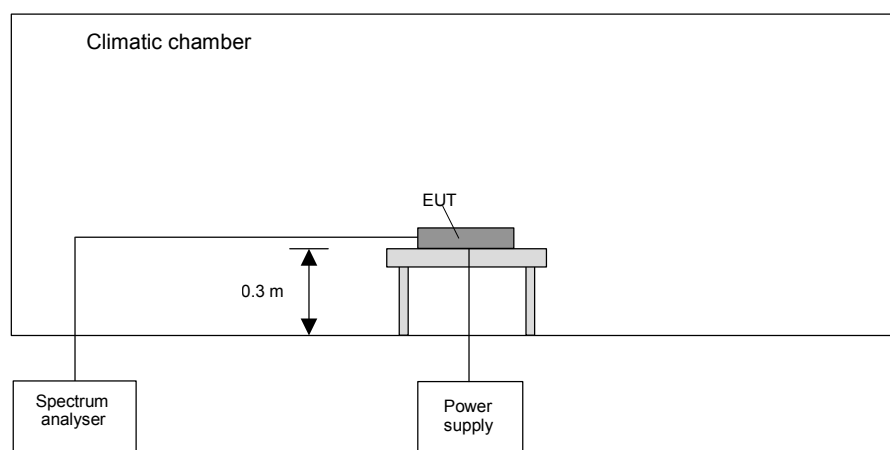
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a test fixture shall be used.

The following procedure will be used:

- 1) Place the EUT in the climatic chamber.
- 2) Switch on the EUT and check the correct function and the settings of the spectrum analyser.
- 3) Switch off the EUT and tune the climatic chamber to a temperature of 50 °C. Wait until the thermal balance is obtained.
- 4) Switch the EUT on and record the frequencies at start-up and 2, 5 and 10 minutes after powering on.
- 5) Repeat 4) with the minimum and the maximum of the supply voltage.
- 6) Switch off the EUT and tune the climatic chamber to a temperature range of 50 °C to –20 °C to in ten-degree steps. Wait until the thermal balance is obtained for every step.
- 7) Switch the EUT on and record the frequencies at start-up and 2, 5 and 10 minutes after powering on.
- 8) Repeat 7) with the minimum and the maximum of the supply voltage at 20 °C.
- 9) Repeat 6) with the next temperature step until –20 °C were reached.

The measurement will be performed at the upper and lower end and the middle of the assigned frequency band.

Test set-up:



TEST REPORT REFERENCE: F060942E01

## 5.5.2 TEST RESULTS (FREQUENCY STABILITY)

|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 43 % |
|---------------------|-------|-------------------|------|

Test set-up: For this test the EUT was fixed on a wooden table inside the climatic chamber.

Cable guide: For further information of the cable guide refer to the pictures in annex A of this test report.

Remark: The table below shows the worst case frequency error with regard to the power-on time.

### Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

| Temperature             | Supply voltage               | Minutes after switch on | Frequency [MHz] | Allowed tolerance      | Measured tolerance | Result |
|-------------------------|------------------------------|-------------------------|-----------------|------------------------|--------------------|--------|
| 70 °C                   | 6.0 V DC                     | 10                      | 466.0381539     | ±1.153 kHz             | 0.7374 kHz         | Passed |
| 60 °C                   | 6.0 V DC                     | 10                      | 466.0380417     | ±1.153 kHz             | 0.6252 kHz         | Passed |
| 50 °C                   | 6.0 V DC                     | 10                      | 466.0374202     | ±1.153 kHz             | 0.0037 kHz         | Passed |
| 40 °C                   | 6.0 V DC                     | 10                      | 466.0374491     | ±1.153 kHz             | 0.0326 kHz         | Passed |
| 30 °C                   | 6.0 V DC                     | 10                      | 466.0374128     | ±1.153 kHz             | -0.0037 kHz        | Passed |
| 20 °C                   | 4.6 V DC (U <sub>min</sub> ) | 10                      | 466.0374117     | ±1.153 kHz             | -0.0048 kHz        | Passed |
|                         | 6.0 V DC (U <sub>nom</sub> ) |                         | 466.0374165     | ±1.153 kHz             | 0.0000 Hz          | Passed |
|                         | 7.0 V DC (U <sub>max</sub> ) |                         | 466.0374165     | ±1.153 kHz             | 0.0000 Hz          | Passed |
| 10 °C                   | 6.0 V DC                     | 10                      | 466.0374165     | ±1.153 kHz             | 0.1476 kHz         | Passed |
| 0 °C                    | 6.0 V DC                     | 10                      | 466.0374165     | ±1.153 kHz             | 0.3191 kHz         | Passed |
| -10 °C                  | 6.0 V DC                     | 10                      | 466.0374165     | ±1.153 kHz             | 0.2389 kHz         | Passed |
| -20 °C                  | 6.0 V DC                     | 10                      | 466.0374165     | ±1.153 kHz             | 0.0290 kHz         | Passed |
| Measurement uncertainty |                              |                         |                 | < ± 1*10 <sup>-7</sup> |                    |        |

### Transmitter operates at the middle of the assigned frequency band (operation mode 2)

| Temperature             | Supply voltage               | Minutes after switch on | Frequency [MHz] | Allowed tolerance      | Measured tolerance | Result |
|-------------------------|------------------------------|-------------------------|-----------------|------------------------|--------------------|--------|
| 70 °C                   | 6.0 V DC                     | 10                      | 467.8632115     | ±1.157 kHz             | 0.6762 kHz         | Passed |
| 60 °C                   | 6.0 V DC                     | 10                      | 467.8632051     | ±1.157 kHz             | 0.6698 kHz         | Passed |
| 50 °C                   | 6.0 V DC                     | 10                      | 467.8632276     | ±1.157 kHz             | 0.6923 kHz         | Passed |
| 40 °C                   | 6.0 V DC                     | 10                      | 467.8632067     | ±1.157 kHz             | 0.6714 kHz         | Passed |
| 30 °C                   | 6.0 V DC                     | 10                      | 467.8627821     | ±1.157 kHz             | 0.2468 kHz         | Passed |
| 20 °C                   | 4.6 V DC (U <sub>min</sub> ) | 10                      | 467.8625353     | ±1.157 kHz             | 0.0000 Hz          | Passed |
|                         | 6.0 V DC (U <sub>nom</sub> ) |                         | 467.8625353     | ±1.157 kHz             | 0.0000 Hz          | Passed |
|                         | 7.0 V DC (U <sub>max</sub> ) |                         | 467.8625385     | ±1.157 kHz             | 0.0032 kHz         | Passed |
| 10 °C                   | 6.0 V DC                     | 10                      | 467.8626811     | ±1.157 kHz             | 0.1458 kHz         | Passed |
| 0 °C                    | 6.0 V DC                     | 10                      | 467.8628654     | ±1.157 kHz             | 0.3301 kHz         | Passed |
| -10 °C                  | 6.0 V DC                     | 10                      | 467.8628058     | ±1.157 kHz             | 0.2705 kHz         | Passed |
| -20 °C                  | 6.0 V DC                     | 10                      | 467.8625995     | ±1.157 kHz             | 0.0642 kHz         | Passed |
| Measurement uncertainty |                              |                         |                 | < ± 1*10 <sup>-7</sup> |                    |        |

TEST REPORT REFERENCE: F060942E01

**Transmitter operates at the upper end of the assigned frequency band (operation mode 3)**

| Temperature             | Supply voltage               | Minutes after switch on | Frequency [MHz] | Allowed tolerance      | Measured tolerance | Result |
|-------------------------|------------------------------|-------------------------|-----------------|------------------------|--------------------|--------|
| 70 °C                   | 6.0 V DC                     | 10                      | 469.5630747     | ±1.161 kHz             | 0.7398 kHz         | Passed |
| 60 °C                   | 6.0 V DC                     | 10                      | 469.5629631     | ±1.161 kHz             | 0.6282 kHz         | Passed |
| 50 °C                   | 6.0 V DC                     | 10                      | 469.5623061     | ±1.161 kHz             | -0.0288 kHz        | Passed |
| 40 °C                   | 6.0 V DC                     | 10                      | 469.5623601     | ±1.161 kHz             | 0.0252 kHz         | Passed |
| 30 °C                   | 6.0 V DC                     | 10                      | 469.5623222     | ±1.161 kHz             | -0.0127 kHz        | Passed |
| 20 °C                   | 4.6 V DC (U <sub>min</sub> ) | 10                      | 469.5623270     | ±1.161 kHz             | -0.0079 kHz        | Passed |
|                         | 6.0 V DC (U <sub>nom</sub> ) |                         | 469.5623349     | ±1.161 kHz             | 0.0000 Hz          | Passed |
|                         | 7.0 V DC (U <sub>max</sub> ) |                         | 469.5623397     | ±1.161 kHz             | 0.0048 kHz         | Passed |
| 10 °C                   | 6.0 V DC                     | 10                      | 469.5624891     | ±1.161 kHz             | 0.1542 kHz         | Passed |
| 0 °C                    | 6.0 V DC                     | 10                      | 469.5626446     | ±1.161 kHz             | 0.3097 kHz         | Passed |
| -10 °C                  | 6.0 V DC                     | 10                      | 469.5625545     | ±1.161 kHz             | 0.2196 kHz         | Passed |
| -20 °C                  | 6.0 V DC                     | 10                      | 469.5623397     | ±1.161 kHz             | 0.0048 kHz         | Passed |
| Measurement uncertainty |                              |                         |                 | < ± 1*10 <sup>-7</sup> |                    |        |

Test result: Passed

TEST EQUIPMENT USED FOR THE TEST:

31, 54, 64

TEST REPORT REFERENCE: F060942E01

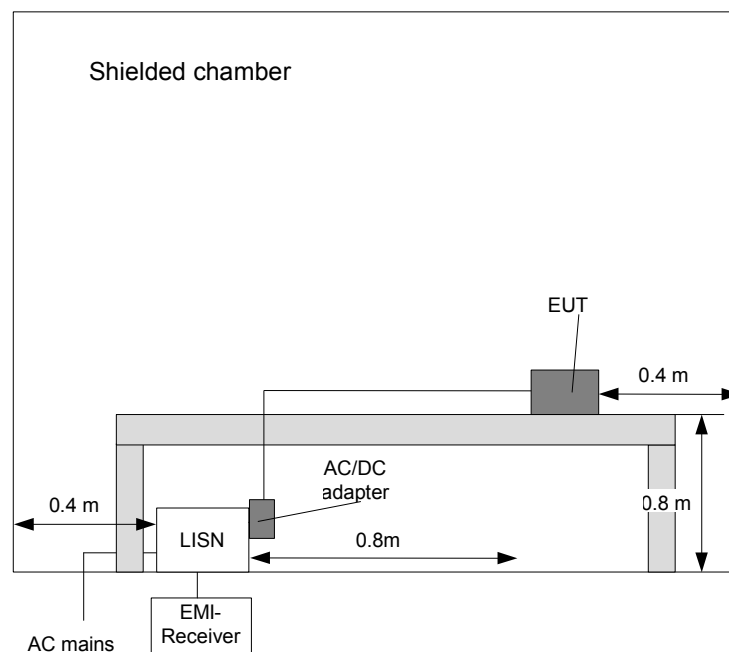
## 5.6 CONDUCTED EMISSIONS ON POWER SUPPLY LINES (150 kHz to 30 MHz)

### 5.6.1 METHOD OF MEASUREMENT

This test will be carried out in a shielded chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the appropriate limit, this emission will be measured with the average and quasi-peak detector on all lines.

| Frequency range   | Resolution bandwidth |
|-------------------|----------------------|
| 150 kHz to 30 MHz | 9 kHz                |



TEST REPORT REFERENCE: F060942E01

## 5.6.2 TEST RESULTS (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 19 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 12 V CD via an AC/DC adaptor type FW75550/12 at an AC mains network with 120 V AC / 60 Hz.

Title: Mains terminal disturbance voltage measurement  
with protective ground conductor simulation

EUT: SePem01 Master

Manufacturer: Hermann Sewerin GmbH

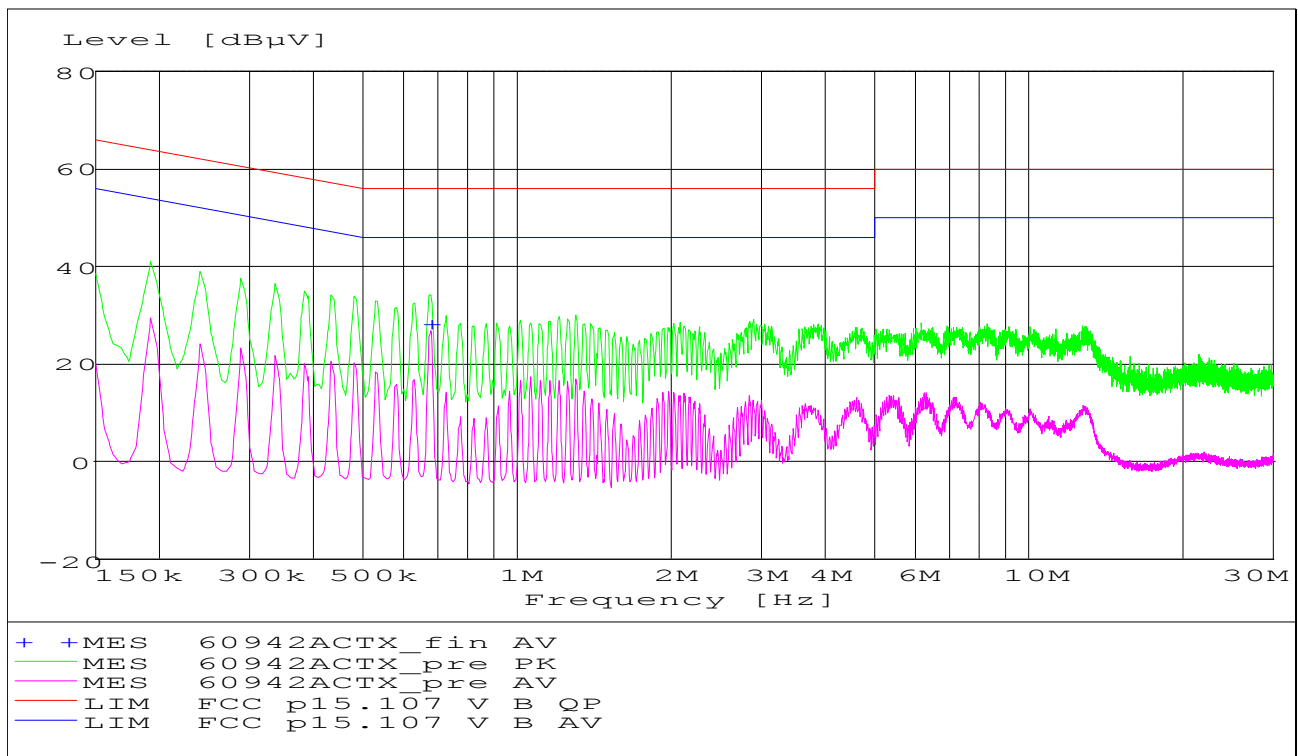
Operating Condition: Transmit on mid channel

Test site: PHOENIX TESTLAB Blomberg M4

Operator: Th. KÜHN

Test Specification:

Comment:



Data record name: 60942ACTX

TEST REPORT REFERENCE: F060942E01

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**Result measured with the average detector:**

(These values are marked in the above diagram by +)

| Frequency<br>MHz | Level<br>dB $\mu$ V | Transducer<br>dB | Limit<br>dB $\mu$ V | Margin<br>dB | Line | PE  |
|------------------|---------------------|------------------|---------------------|--------------|------|-----|
| 0.675240         | 28.60               | 0.8              | 46.0                | 17.4         | L1   | FLO |

Data record name: 60942ACTX\_fin AV

Test:        Passed

TEST EQUIPMENT USED FOR THE TEST:

|             |
|-------------|
| 1 – 3, 5, 6 |
|-------------|

TEST REPORT REFERENCE: F060942E01

## 6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

| No. | Test equipment             | Type               | Manufacturer                | Serial No.               | PM. No.          | Cal. Date                            | Cal. due |
|-----|----------------------------|--------------------|-----------------------------|--------------------------|------------------|--------------------------------------|----------|
| 1   | Shielded chamber M4        | -                  | Siemens                     | B83117S1-X158            | 480088           | Weekly verification (system cal.)    |          |
| 2   | Measuring receiver         | ESAI               | Rohde & Schwarz             | 831953/001<br>833181/018 | 480025<br>480026 | 02/27/2008                           | 02/2010  |
| 3   | LISN                       | NSLK8128           | Schwarzbeck                 | 8128155                  | 480058           | 01/09/2008                           | 01/2009  |
| 5   | AC-filter                  | B84299-D87-E3      | Siemens                     | 930262292                | 480097           | Weekly verification (system cal.)    |          |
| 6   | EMI-Software               | ES-K1              | Rohde & Schwarz             | -                        | 480111           | -                                    | -        |
| 14  | Open area test site        | -                  | Phoenix Test-Lab            | -                        | 480085           | Weekly verification (system cal.)    |          |
| 15  | Measuring receiver         | ESCS30             | Rohde & Schwarz             | 828985/014               | 480270           | 02/27/2008                           | 02/2010  |
| 16  | Controller                 | HD100              | Deisel                      | 100/670                  | 480139           | -                                    | -        |
| 17  | Turntable                  | DS420HE            | Deisel                      | 420/620/80               | 480087           | -                                    | -        |
| 18  | Antenna support            | AS615P             | Deisel                      | 615/310                  | 480086           | -                                    | -        |
| 19  | Antenna                    | CBL6111 A          | Chase                       | 1643                     | 480147           | 08/01/2007                           | 08/2012  |
| 18  | Antenna support            | AS615P             | Deisel                      | 615/310                  | 480086           | -                                    | -        |
| 19  | Antenna                    | CBL6111 A          | Chase                       | 1643                     | 480147           | 08/01/2007                           | 08/2012  |
| 20  | EMI Software               | ES-K1              | Rohde & Schwarz             | -                        | 480111           | -                                    | -        |
| 29  | Fully anechoic chamber M20 | -                  | Albatross Projects          | B83107-E2439-T232        | 480303           | Weekly verification (system cal.)    |          |
| 31  | Measuring receiver         | ESI 40             | Rohde & Schwarz             | 100064                   | 480355           | 02/25/2008                           | 02/2010  |
| 32  | Controller                 | MCU                | Maturo GmbH                 | MCU/043/971107           | 480832           | -                                    | -        |
| 33  | Turntable                  | DS420HE            | Deisel                      | 420/620/80               | 480315           | -                                    | -        |
| 34  | Antenna support            | AS615P             | Deisel                      | 615/310                  | 480187           | -                                    | -        |
| 35  | Antenna                    | CBL6112 B          | Chase                       | 2688                     | 480328           | 10/11/2005                           | 10/2010  |
| 36  | Antenna                    | 3115 B             | EMCO                        | 9609-4918                | 480184           | 09/11/2008                           | 09/2013  |
| 43  | RF-cable No. 30            | RTK 081            | Rosenberger                 | -                        | 410141           | Weekly verification (system cal.)    |          |
| 44  | RF-cable No. 31            | RTK 081            | Rosenberger                 | -                        | 410142           | Weekly verification (system cal.)    |          |
| 49  | Preamplifier               | JS3-00101200-23-5A | Miteq                       | 681851                   | 480337           | Six month verification (system cal.) |          |
| 54  | Power supply               | TOE 8752-32        | Toellner                    | 31566                    | 480010           | 06/19/2007                           | 06/2009  |
| 58  | Loop antenna               | HFH2-Z2            | Rohde & Schwarz             | 832609/014               | 480059           | 02/19/2008                           | 02/2013  |
| 60  | Signal generator           | 83650L             | Agilent                     | 3844A00554               | 480333           | 02/26/2008                           | 02/2010  |
| 61  | Precision Dipole           | HZ 13              | Rohde & Schwarz             | 831782/02                | 480062           | Six month verification (system cal.) |          |
| 62  | Horn Antenna               | 3115 A             | EMCO                        | 9609-4922                | 480183           | Six month verification (system cal.) |          |
| 63  | RF-cable No. 1             | RTK 081            | Rosenberger                 | -                        | 410093           | Weekly verification (system cal.)    |          |
| 64  | Climatic chamber           | MK 240             | BINDER                      | 05-79022                 | 480462           | 01/22/2008                           | 07/2009  |
| 65  | Power Meter                | NRVD               | Rohde & Schwarz             | 828110/026               | 480267           | 02/26/2008                           | 02/2010  |
| 66  | Thermal Power Sensor       | NRV-Z51            | Rohde & Schwarz             | 825489/004               | 480247           | 02/22/2008                           | 02/2010  |
| 67  | High Pass Filter           | WHJS1000C11 /60EF  | Wainwright Instruments GmbH | 1                        | 480413           | -                                    | -        |
| 68  | Tuneable Notch Filter      | TTR 375-3EE        | TELONIC Berkeley            | -                        | 480330           | -                                    | -        |



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## 7 LIST OF ANNEXES

|                |  |                |
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|                | SePem 01 Master, test setup fully anechoic chamber (pos. 2)      | 60942_10.jpg   |
|                | SePem 01 Master, test setup fully anechoic chamber (pos. 1)      | 60942_7.jpg    |
|                | SePem 01 Master, test setup fully anechoic chamber (pos. 1)      | 60942_5.jpg    |
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|                | SePem 01 Master, main PCB, top view                              | 60942_n.jpg    |
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| <b>ANNEX D</b> | <b>ADDITIONAL RESULTS FOR INDUSTRY CANADA:</b>                   | <b>9 pages</b> |