

# FCC Measurement/Technical Report on

## Infotainment device

## LICU

FCC ID: 2AUGZLICU  
IC: 25426-LICU

**Test Report Reference:** MDE\_FAKT\_1901\_FCC02

**Test Laboratory:**

7layers GmbH  
Borsigstrasse 11  
40880 Ratingen  
Germany



Deutsche  
Akkreditierungsstelle  
D-PL-12140-01-00

**Note:**

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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## 1 APPLIED STANDARDS AND TEST SUMMARY

### 1.1 APPLIED STANDARDS

#### **Type of Authorization**

Certification for an Intentional Radiator.

#### **Applicable FCC Rules**

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 15 (10-1-18 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz

#### **Note:**

The tests were selected and performed with reference to the FCC Public Notice "Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of the FCC Rules, 558074 D01 15.247 Meas Guidance v05r02, 2019-04-02". ANSI C63.10-2013 is applied.

## Summary Test Results:

The EUT complied with all performed tests as listed in chapter 1.3 Measurement Summary / Signatures.

### 1.2 FCC-IC CORRELATION TABLE

#### Correlation of measurement requirements for FHSS (e.g. Bluetooth®) equipment from FCC and IC

##### FHSS equipment

| Measurement                                 | FCC reference                 | IC reference                                              |
|---------------------------------------------|-------------------------------|-----------------------------------------------------------|
| Conducted emissions on AC Mains             | § 15.207                      | RSS-Gen Issue 5: 8.8                                      |
| Occupied bandwidth                          | § 15.247 (a) (1)              | RSS-247 Issue 2: 5.1 (b)                                  |
| Peak conducted output power                 | § 15.247 (b) (1), (4)         | RSS-247 Issue 2: 5.4 (b)                                  |
| Transmitter spurious RF conducted emissions | § 15.247 (d)                  | RSS-Gen Issue 5: 6.13/8.9/8.10;<br>RSS-247 Issue 2: 5.5   |
| Transmitter spurious radiated emissions     | § 15.247 (d);<br>§ 15.209 (a) | RSS-Gen Issue 5: 6.13 / 8.9/8.10;<br>RSS-247 Issue 2: 5.5 |
| Band edge compliance                        | § 15.247 (d)                  | RSS-247 Issue 2: 5.5                                      |
| Dwell time                                  | § 15.247 (a) (1) (iii)        | RSS-247 Issue 2: 5.1 (d)                                  |
| Channel separation                          | § 15.247 (a) (1)              | RSS-247 Issue 2: 5.1 (b)                                  |
| No. of hopping frequencies                  | § 15.247 (a) (1) (iii)        | RSS-247 Issue 2: 5.1 (d)                                  |
| Hybrid systems (only)                       | § 15.247 (f);<br>§ 15.247 (e) | RSS-247 Issue 2: 5.3                                      |
| Antenna requirement                         | § 15.203 / 15.204             | RSS-Gen Issue 5: 8.3                                      |
| Receiver spurious emissions                 | -                             | -                                                         |

### 1.3 MEASUREMENT SUMMARY / SIGNATURES

#### 47 CFR CHAPTER I FCC PART 15 Subpart C §15.247

#### § 15.247 (b) (1) (2)

Peak Power Output

The measurement was performed according to ANSI C63.10

#### Final Result

| OP-Mode                                                   | Setup      | Date       | FCC    | IC     |
|-----------------------------------------------------------|------------|------------|--------|--------|
| Radio Technology, Operating Frequency, Measurement method |            |            |        |        |
| Bluetooth BDR, high, conducted                            | Setup_AB01 | 2019-09-03 | Passed | Passed |
| Bluetooth BDR, low, conducted                             | Setup_AB01 | 2019-09-03 | Passed | Passed |
| Bluetooth BDR, mid, conducted                             | Setup_AB01 | 2019-09-03 | Passed | Passed |
| Bluetooth EDR 2, high, conducted                          | Setup_AB01 | 2019-09-03 | Passed | Passed |
| Bluetooth EDR 2, low, conducted                           | Setup_AB01 | 2019-09-03 | Passed | Passed |
| Bluetooth EDR 2, mid, conducted                           | Setup_AB01 | 2019-09-03 | Passed | Passed |
| Bluetooth EDR 3, high, conducted                          | Setup_AB01 | 2019-09-03 | Passed | Passed |
| Bluetooth EDR 3, low, conducted                           | Setup_AB01 | 2019-09-03 | Passed | Passed |
| Bluetooth EDR 3, mid, conducted                           | Setup_AB01 | 2019-09-03 | Passed | Passed |

N/A: Not applicable

N/P: Not performed

## 2 REVISION HISTORY

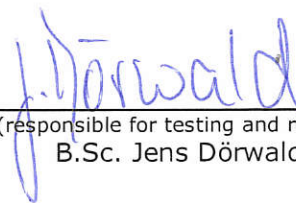
| Report version control |              |                    |                  |
|------------------------|--------------|--------------------|------------------|
| Version                | Release date | Change Description | Version validity |
| initial                | 2019-10-16   | --                 | valid            |
| --                     | --           | --                 | --               |

### COMMENT:

Not all applicable tests were performed, according to "KDB996369 D04 Module Integration Guide v01" only spot checks for conducted output power were performed.



(responsible for accreditation scope)  
Dipl.-Ing. Marco Kullik



(responsible for testing and report)  
B.Sc. Jens Dörwald

### 3 ADMINISTRATIVE DATA

#### 3.1 TESTING LABORATORY

Company Name: 7layers GmbH  
Address: Borsigstr. 11  
40880 Ratingen  
Germany

The test facility is accredited by the following accreditation organisation:

Laboratory accreditation no: DAKkS  
D-PL-12140-01-01  
D-PL-12140-01-02  
D-PL-12140-01-03  
  
FCC Designation Number: DE0015  
  
FCC Test Firm Registration: 929146  
  
ISED CAB Identifier DE0007; ISED#: 3699A  
  
Responsible for accreditation scope: Dipl.-Ing. Marco Kullik  
  
Report Template Version: 2019-06-18

#### 3.2 PROJECT DATA

Responsible for testing and report: B.Sc. Jens Dörwald  
Employees who performed the tests: documented internally at 7Layers  
  
Date of Report: 2019-10-16  
  
Testing Period: 2019-09-03 to 2019-09-03

#### 3.3 APPLICANT DATA

Company Name: FAKT S.r.l.  
Address: Via Lithos, 53  
25086 Rezzato (BS)  
Italy  
Contact Person: Sig. Nicola Scartapacchio

#### 3.4 MANUFACTURER DATA

Company Name: ART S.p.A.  
Address: Voc. Pischello, 20  
Passignano sul Trasimeno (PG)  
Italy  
Contact Person: Mr. Riccardo Diamanti

## 4 TEST OBJECT DATA

### 4.1 GENERAL EUT DESCRIPTION

|                                          |                                                                                                          |
|------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Kind of Device product description       | Infotainment device                                                                                      |
| Product name                             | LICU                                                                                                     |
| Type                                     | LICU                                                                                                     |
| <b>Declared EUT data by the supplier</b> |                                                                                                          |
| Voltage Type                             | DC                                                                                                       |
| Voltage Level                            | 12 V                                                                                                     |
| Tested Modulation Type                   | GFSK Modulation, 1-DHx packets<br>π/4 DQPS Modulation, 2-DHx packets<br>8-DQPS Modulation, 3-DHx packets |
| General product description              | The EUT is vehicular infotainment device including cellular, Bluetooth and WLAN RF technologies.         |
| The EUT provides the following ports:    | DC<br>Cellular Antenna<br>Bluetooth Antenna<br>GPS Antenna<br>AM/FM Antenna<br>DAB Antenna               |
| Tested datarates                         | 1 Mbps                                                                                                   |

**The main components of the EUT are listed and described in chapter 3.2 EUT Main components.**

### 4.2 EUT MAIN COMPONENTS

| Sample Name      | Sample Code   | Description      |
|------------------|---------------|------------------|
| EUT A            | DE1052014ab01 | conducted sample |
| Sample Parameter | Value         |                  |
| Serial No.       | AFLIC000X76   |                  |
| HW Version       | 06            |                  |
| SW Version       | 0131          |                  |
| Comment          | -             |                  |

NOTE: The short description is used to simplify the identification of the EUT in this test report.



### 4.3 ANCILLARY EQUIPMENT

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

| Device | Details<br>(Manufacturer, Type Model, OUT Code) | Description |
|--------|-------------------------------------------------|-------------|
| -      | -                                               | -           |

### 4.4 AUXILIARY EQUIPMENT

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

| Device | Details<br>(Manufacturer, Type Model, HW, SW, S/N) | Description |
|--------|----------------------------------------------------|-------------|
| -      | -                                                  | -           |

### 4.5 EUT SETUPS

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

| Setup      | Combination of<br>EUTs | Description and Rationale |
|------------|------------------------|---------------------------|
| Setup_AB01 | EUT A                  | Conducted setup           |

## 4.6 OPERATING MODES

This chapter describes the operating modes of the EUTs used for testing.

### 4.6.1 TEST CHANNELS

**BT Test Channels:**  
**Channel:**  
**Frequency [MHz]**

| <b>2.4 GHz ISM<br/>2400 - 2483.5 MHz</b> |            |             |
|------------------------------------------|------------|-------------|
| <b>low</b>                               | <b>mid</b> | <b>high</b> |
| <b>0</b>                                 | <b>39</b>  | <b>78</b>   |
| 2402                                     | 2441       | 2480        |

## 4.7 PRODUCT LABELLING

### 4.7.1 FCC ID LABEL

Please refer to the documentation of the applicant.

### 4.7.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

## 5 TEST RESULTS

### 5.1 PEAK POWER OUTPUT

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**  
ANSI C63.10

#### 5.1.1 TEST DESCRIPTION

##### FHSS EQUIPMENT:

The Equipment Under Test (EUT) was set up to perform the output power measurements. The results recorded were measured with the modulation which produces the worst-case (highest) output power. The reference level of the spectrum analyzer was set higher than the output power of the EUT.

The EUT was connected to the spectrum analyzer via a short coax cable with a known loss.

##### Analyzer settings:

- Resolution Bandwidth (RBW): 3 MHz
- Video Bandwidth (VBW): 3 MHz
- Trace: Maxhold
- Sweeps: 2000
- Sweeptime: 5 ms
- Detector: Peak

##### DTS EQUIPMENT:

The Equipment Under Test (EUT) was set up to perform the output power measurements. The results recorded were measured with the modulation which produces the worst-case (highest) output power. The reference level of the spectrum analyzer was set higher than the output power of the EUT.

The EUT was connected to the spectrum analyzer via a short coax cable with a known loss.

##### Analyzer settings:

- Resolution Bandwidth (RBW): 1 MHz
- Video Bandwidth (VBW): 3 MHz
- Trace: Maxhold
- Sweeps: 2000
- Sweeptime: 5 ms
- Detector: Peak

The channel power function of the spectrum analyser was used (Used channel bandwidth = DTS bandwidth)

## 5.1.2 TEST REQUIREMENTS / LIMITS

### DTS devices:

FCC Part 15, Subpart C, §15.247 (b) (3)

For systems using digital modulation techniques in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands: 1 watt.

==> Maximum conducted peak output power: 30 dBm (excluding antenna gain, if antennas with directional gains that do not exceed 6 dBi are used).

### Frequency Hopping Systems:

FCC Part 15, Subpart C, §15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

FCC Part 15, Subpart C, §15.247 (b) (2)

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Used conversion factor: Limit (dBm) = 10 log (Limit (W)/1mW)

## 5.1.3 TEST PROTOCOL

Ambient temperature: 24 °C  
Humidity: 43 %  
BT GFSK (1-DH1)

| Band        | Channel No. | Frequency [MHz] | Peak Power [dBm] |
|-------------|-------------|-----------------|------------------|
| 2.4 GHz ISM | 0           | 2402            | 9.5              |
|             | 39          | 2441            | 10.0             |
|             | 78          | 2480            | 7.2              |

BT π/4 DQPSK (2-DH1)

| Band        | Channel No. | Frequency [MHz] | Peak Power [dBm] |
|-------------|-------------|-----------------|------------------|
| 2.4 GHz ISM | 0           | 2402            | 8.5              |
|             | 39          | 2441            | 8.7              |
|             | 78          | 2480            | 5.6              |

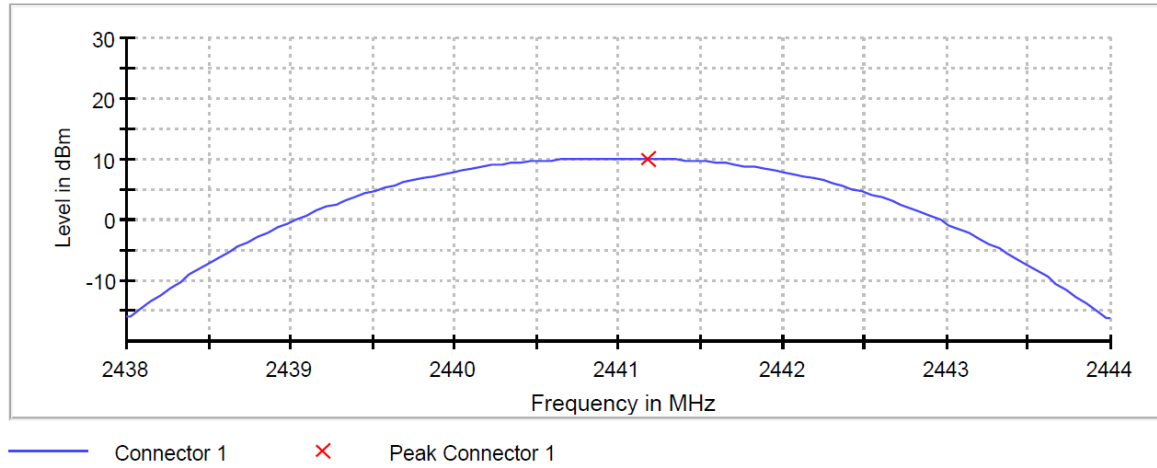
BT 8-DPSK (3-DH1)

| Band        | Channel No. | Frequency [MHz] | Peak Power [dBm] |
|-------------|-------------|-----------------|------------------|
| 2.4 GHz ISM | 0           | 2402            | 8.1              |
|             | 39          | 2441            | 8.4              |
|             | 78          | 2480            | 6.2              |

Remark: Please see next sub-clause for the measurement plot.

#### 5.1.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE") BT GFSK CH39

Peak Power



#### 5.1.5 TEST EQUIPMENT USED

- R&S TS8997

## 6 TEST EQUIPMENT

1 R&S TS8997  
EN300328/301893 Test Lab

| Ref.No. | Device Name                 | Description                                | Manufacturer                      | Serial Number  | Last Calibration | Calibration Due |
|---------|-----------------------------|--------------------------------------------|-----------------------------------|----------------|------------------|-----------------|
| 1.1     | SMB100A                     | Signal Generator 9 kHz - 6 GHz             | Rohde & Schwarz                   | 107695         | 2017-07          | 2020-07         |
| 1.2     | FSV30                       | Signal Analyzer 10 Hz - 30 GHz             | Rohde & Schwarz                   | 103005         | 2018-04          | 2020-04         |
| 1.3     | Fluke 177                   | Digital Multimeter 03 (Multimeter)         | Fluke Europe B.V.                 | 86670383       | 2018-04          | 2020-04         |
| 1.4     | Temperature Chamber VT 4002 | Temperature Chamber Vötsch 03              | Vötsch                            | 58566002150010 | 2018-04          | 2020-04         |
| 1.5     | A8455-4                     | 4 Way Power Divider (SMA)                  |                                   | -              |                  |                 |
| 1.6     | Opus10 THI (8152.00)        | ThermoHygro Datalogger 03                  | Lufth Mess- und Regeltechnik GmbH | ID 7482        | 2019-06          | 2021-06         |
| 1.7     | SMBV100A                    | Vector Signal Generator 9 kHz - 6 GHz      | Rohde & Schwarz                   | 259291         | 2016-10          | 2019-10         |
| 1.8     | OSP120                      | Switching Unit with integrated power meter | Rohde & Schwarz                   | 101158         | 2018-05          | 2021-05         |

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

## 7 ANTENNA FACTORS, CABLE LOSS AND SAMPLE CALCULATIONS

This chapter contains the antenna factors with their corresponding path loss of the used measurement path for all antennas as well as the insertion loss of the LISN.

### 7.1 LISN R&S ESH3-Z5 (150 KHZ – 30 MHZ)

| Frequency |  | Corr. | LISN<br>insertion<br>loss<br>ESH3-<br>Z5 | cable<br>loss<br>(incl. 10<br>dB<br>atten-<br>uator) |
|-----------|--|-------|------------------------------------------|------------------------------------------------------|
| MHz       |  | dB    | dB                                       | dB                                                   |
| 0.15      |  | 10.1  | 0.1                                      | 10.0                                                 |
| 5         |  | 10.3  | 0.1                                      | 10.2                                                 |
| 7         |  | 10.5  | 0.2                                      | 10.3                                                 |
| 10        |  | 10.5  | 0.2                                      | 10.3                                                 |
| 12        |  | 10.7  | 0.3                                      | 10.4                                                 |
| 14        |  | 10.7  | 0.3                                      | 10.4                                                 |
| 16        |  | 10.8  | 0.4                                      | 10.4                                                 |
| 18        |  | 10.9  | 0.4                                      | 10.5                                                 |
| 20        |  | 10.9  | 0.4                                      | 10.5                                                 |
| 22        |  | 11.1  | 0.5                                      | 10.6                                                 |
| 24        |  | 11.1  | 0.5                                      | 10.6                                                 |
| 26        |  | 11.2  | 0.5                                      | 10.7                                                 |
| 28        |  | 11.2  | 0.5                                      | 10.7                                                 |
| 30        |  | 11.3  | 0.5                                      | 10.8                                                 |

#### Sample calculation

$$U_{\text{LISN}} (\text{dB } \mu\text{V}) = U (\text{dB } \mu\text{V}) + \text{Corr. (dB)}$$

U = Receiver reading

LISN Insertion loss = Voltage Division Factor of LISN

Corr. = sum of single correction factors of used LISN, cables, switch units (if used)

Linear interpolation will be used for frequencies in between the values in the table.

## 7.2 ANTENNA R&S HFH2-Z2 (9 KHZ – 30 MHZ)

| Frequency<br>MHz | AF<br>HFH-Z2)<br>dB (1/m) | Corr.<br>dB | cable<br>loss 1<br>(inside<br>chamber)<br>dB | cable<br>loss 2<br>(outside<br>chamber)<br>dB | cable<br>loss 3<br>(switch<br>unit)<br>dB | cable<br>loss 4<br>(to<br>receiver)<br>dB | distance<br>corr.<br>(-40 dB/<br>decade)<br>dB | d <sub>Limit</sub><br>(meas.<br>distance<br>(limit)<br>m | d <sub>used</sub><br>(meas.<br>distance<br>(used)<br>m |
|------------------|---------------------------|-------------|----------------------------------------------|-----------------------------------------------|-------------------------------------------|-------------------------------------------|------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------|
| 0.009            | 20.50                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.01             | 20.45                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.015            | 20.37                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.02             | 20.36                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.025            | 20.38                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.03             | 20.32                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.05             | 20.35                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.08             | 20.30                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.1              | 20.20                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.2              | 20.17                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.3              | 20.14                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.49             | 20.12                     | -79.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -80                                            | 300                                                      | 3                                                      |
| 0.490001         | 20.12                     | -39.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 0.5              | 20.11                     | -39.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 0.8              | 20.10                     | -39.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 1                | 20.09                     | -39.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 2                | 20.08                     | -39.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 3                | 20.06                     | -39.6       | 0.1                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 4                | 20.05                     | -39.5       | 0.2                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 5                | 20.05                     | -39.5       | 0.2                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 6                | 20.02                     | -39.5       | 0.2                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 8                | 19.95                     | -39.5       | 0.2                                          | 0.1                                           | 0.1                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 10               | 19.83                     | -39.4       | 0.2                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 12               | 19.71                     | -39.4       | 0.2                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 14               | 19.54                     | -39.4       | 0.2                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 16               | 19.53                     | -39.3       | 0.3                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 18               | 19.50                     | -39.3       | 0.3                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 20               | 19.57                     | -39.3       | 0.3                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 22               | 19.61                     | -39.3       | 0.3                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 24               | 19.61                     | -39.3       | 0.3                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 26               | 19.54                     | -39.3       | 0.3                                          | 0.1                                           | 0.2                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 28               | 19.46                     | -39.2       | 0.3                                          | 0.1                                           | 0.3                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |
| 30               | 19.73                     | -39.1       | 0.4                                          | 0.1                                           | 0.3                                       | 0.1                                       | -40                                            | 30                                                       | 3                                                      |

### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction =  $-40 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values



### 7.3 ANTENNA R&S HL562 (30 MHz – 1 GHz)

( $d_{\text{Limit}} = 3 \text{ m}$ )

| Frequency | AF<br>R&S<br>HL562 | Corr. |
|-----------|--------------------|-------|
| MHz       | dB (1/m)           | dB    |
| 30        | 18.6               | 0.6   |
| 50        | 6.0                | 0.9   |
| 100       | 9.7                | 1.2   |
| 150       | 7.9                | 1.6   |
| 200       | 7.6                | 1.9   |
| 250       | 9.5                | 2.1   |
| 300       | 11.0               | 2.3   |
| 350       | 12.4               | 2.6   |
| 400       | 13.6               | 2.9   |
| 450       | 14.7               | 3.1   |
| 500       | 15.6               | 3.2   |
| 550       | 16.3               | 3.5   |
| 600       | 17.2               | 3.5   |
| 650       | 18.1               | 3.6   |
| 700       | 18.5               | 3.6   |
| 750       | 19.1               | 4.1   |
| 800       | 19.6               | 4.1   |
| 850       | 20.1               | 4.4   |
| 900       | 20.8               | 4.7   |
| 950       | 21.1               | 4.8   |
| 1000      | 21.6               | 4.9   |

| cable<br>loss 1<br>(inside<br>chamber) | cable<br>loss 2<br>(outside<br>chamber) | cable<br>loss 3<br>(switch<br>unit) | cable<br>loss 4<br>(to<br>receiver) | distance<br>corr.<br>(-20 dB/<br>decade) | $d_{\text{Limit}}$<br>(meas.<br>distance<br>(limit)) | $d_{\text{used}}$<br>(meas.<br>distance<br>(used)) |
|----------------------------------------|-----------------------------------------|-------------------------------------|-------------------------------------|------------------------------------------|------------------------------------------------------|----------------------------------------------------|
| dB                                     | dB                                      | dB                                  | dB                                  | dB                                       | m                                                    | m                                                  |
| 0.29                                   | 0.04                                    | 0.23                                | 0.02                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.39                                   | 0.09                                    | 0.32                                | 0.08                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.56                                   | 0.14                                    | 0.47                                | 0.08                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.73                                   | 0.20                                    | 0.59                                | 0.12                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.84                                   | 0.21                                    | 0.70                                | 0.11                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.98                                   | 0.24                                    | 0.80                                | 0.13                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.04                                   | 0.26                                    | 0.89                                | 0.15                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.18                                   | 0.31                                    | 0.96                                | 0.13                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.28                                   | 0.35                                    | 1.03                                | 0.19                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.39                                   | 0.38                                    | 1.11                                | 0.22                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.44                                   | 0.39                                    | 1.20                                | 0.19                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.55                                   | 0.46                                    | 1.24                                | 0.23                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.59                                   | 0.43                                    | 1.29                                | 0.23                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.67                                   | 0.34                                    | 1.35                                | 0.22                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.67                                   | 0.42                                    | 1.41                                | 0.15                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.87                                   | 0.54                                    | 1.46                                | 0.25                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.90                                   | 0.46                                    | 1.51                                | 0.25                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.99                                   | 0.60                                    | 1.56                                | 0.27                                | 0.0                                      | 3                                                    | 3                                                  |
| 2.14                                   | 0.60                                    | 1.63                                | 0.29                                | 0.0                                      | 3                                                    | 3                                                  |
| 2.22                                   | 0.60                                    | 1.66                                | 0.33                                | 0.0                                      | 3                                                    | 3                                                  |
| 2.23                                   | 0.61                                    | 1.71                                | 0.30                                | 0.0                                      | 3                                                    | 3                                                  |

( $d_{\text{Limit}} = 10 \text{ m}$ )

|      |      |      |
|------|------|------|
| 30   | 18.6 | -9.9 |
| 50   | 6.0  | -9.6 |
| 100  | 9.7  | -9.2 |
| 150  | 7.9  | -8.8 |
| 200  | 7.6  | -8.6 |
| 250  | 9.5  | -8.3 |
| 300  | 11.0 | -8.1 |
| 350  | 12.4 | -7.9 |
| 400  | 13.6 | -7.6 |
| 450  | 14.7 | -7.4 |
| 500  | 15.6 | -7.2 |
| 550  | 16.3 | -7.0 |
| 600  | 17.2 | -6.9 |
| 650  | 18.1 | -6.9 |
| 700  | 18.5 | -6.8 |
| 750  | 19.1 | -6.3 |
| 800  | 19.6 | -6.3 |
| 850  | 20.1 | -6.0 |
| 900  | 20.8 | -5.8 |
| 950  | 21.1 | -5.6 |
| 1000 | 21.6 | -5.6 |

|      |      |      |      |       |    |   |
|------|------|------|------|-------|----|---|
| 0.29 | 0.04 | 0.23 | 0.02 | -10.5 | 10 | 3 |
| 0.39 | 0.09 | 0.32 | 0.08 | -10.5 | 10 | 3 |
| 0.56 | 0.14 | 0.47 | 0.08 | -10.5 | 10 | 3 |
| 0.73 | 0.20 | 0.59 | 0.12 | -10.5 | 10 | 3 |
| 0.84 | 0.21 | 0.70 | 0.11 | -10.5 | 10 | 3 |
| 0.98 | 0.24 | 0.80 | 0.13 | -10.5 | 10 | 3 |
| 1.04 | 0.26 | 0.89 | 0.15 | -10.5 | 10 | 3 |
| 1.18 | 0.31 | 0.96 | 0.13 | -10.5 | 10 | 3 |
| 1.28 | 0.35 | 1.03 | 0.19 | -10.5 | 10 | 3 |
| 1.39 | 0.38 | 1.11 | 0.22 | -10.5 | 10 | 3 |
| 1.44 | 0.39 | 1.20 | 0.19 | -10.5 | 10 | 3 |
| 1.55 | 0.46 | 1.24 | 0.23 | -10.5 | 10 | 3 |
| 1.59 | 0.43 | 1.29 | 0.23 | -10.5 | 10 | 3 |
| 1.67 | 0.34 | 1.35 | 0.22 | -10.5 | 10 | 3 |
| 1.67 | 0.42 | 1.41 | 0.15 | -10.5 | 10 | 3 |
| 1.87 | 0.54 | 1.46 | 0.25 | -10.5 | 10 | 3 |
| 1.90 | 0.46 | 1.51 | 0.25 | -10.5 | 10 | 3 |
| 1.99 | 0.60 | 1.56 | 0.27 | -10.5 | 10 | 3 |
| 2.14 | 0.60 | 1.63 | 0.29 | -10.5 | 10 | 3 |
| 2.22 | 0.60 | 1.66 | 0.33 | -10.5 | 10 | 3 |
| 2.23 | 0.61 | 1.71 | 0.30 | -10.5 | 10 | 3 |

#### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + \text{AF (dB 1/m)} + \text{Corr. (dB)}$   
 $U$  = Receiver reading  
 $\text{AF}$  = Antenna factor  
 $\text{Corr.}$  = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)  
 $\text{distance correction} = -20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$   
 Linear interpolation will be used for frequencies in between the values in the table.  
 Tables show an extract of values.

## 7.4 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

| Frequency | AF<br>R&S<br>HF907 | Corr. |
|-----------|--------------------|-------|
| MHz       | dB (1/m)           | dB    |
| 1000      | 24.4               | -19.4 |
| 2000      | 28.5               | -17.4 |
| 3000      | 31.0               | -16.1 |
| 4000      | 33.1               | -14.7 |
| 5000      | 34.4               | -13.7 |
| 6000      | 34.7               | -12.7 |
| 7000      | 35.6               | -11.0 |

| cable<br>loss 1<br>(relay +<br>cable<br>inside<br>chamber) | cable<br>loss 2<br>(outside<br>chamber) | cable<br>loss 3<br>(switch<br>unit,<br>atten-<br>uator &<br>pre-amp) | cable<br>loss 4 (to<br>receiver) |  |  |
|------------------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------|----------------------------------|--|--|
| dB                                                         | dB                                      | dB                                                                   | dB                               |  |  |
| 0.99                                                       | 0.31                                    | -21.51                                                               | 0.79                             |  |  |
| 1.44                                                       | 0.44                                    | -20.63                                                               | 1.38                             |  |  |
| 1.87                                                       | 0.53                                    | -19.85                                                               | 1.33                             |  |  |
| 2.41                                                       | 0.67                                    | -19.13                                                               | 1.31                             |  |  |
| 2.78                                                       | 0.86                                    | -18.71                                                               | 1.40                             |  |  |
| 2.74                                                       | 0.90                                    | -17.83                                                               | 1.47                             |  |  |
| 2.82                                                       | 0.86                                    | -16.19                                                               | 1.46                             |  |  |

| Frequency | AF<br>R&S<br>HF907 | Corr. |
|-----------|--------------------|-------|
| MHz       | dB (1/m)           | dB    |
| 3000      | 31.0               | -23.4 |
| 4000      | 33.1               | -23.3 |
| 5000      | 34.4               | -21.7 |
| 6000      | 34.7               | -21.2 |
| 7000      | 35.6               | -19.8 |

| cable<br>loss 1<br>(relay<br>inside<br>chamber) | cable<br>loss 2<br>(inside<br>chamber) | cable<br>loss 3<br>(outside<br>chamber) | cable<br>loss 4<br>(switch<br>unit,<br>atten-<br>uator &<br>pre-amp) | cable<br>loss 5 (to<br>receiver) | used<br>for<br>FCC<br>15.247 |
|-------------------------------------------------|----------------------------------------|-----------------------------------------|----------------------------------------------------------------------|----------------------------------|------------------------------|
| dB                                              | dB                                     | dB                                      | dB                                                                   | dB                               |                              |
| 0.47                                            | 1.87                                   | 0.53                                    | -27.58                                                               | 1.33                             |                              |
| 0.56                                            | 2.41                                   | 0.67                                    | -28.23                                                               | 1.31                             |                              |
| 0.61                                            | 2.78                                   | 0.86                                    | -27.35                                                               | 1.40                             |                              |
| 0.58                                            | 2.74                                   | 0.90                                    | -26.89                                                               | 1.47                             |                              |
| 0.66                                            | 2.82                                   | 0.86                                    | -25.58                                                               | 1.46                             |                              |

| Frequency | AF<br>R&S<br>HF907 | Corr. |
|-----------|--------------------|-------|
| MHz       | dB (1/m)           | dB    |
| 7000      | 35.6               | -57.3 |
| 8000      | 36.3               | -56.3 |
| 9000      | 37.1               | -55.3 |
| 10000     | 37.5               | -56.2 |
| 11000     | 37.5               | -55.3 |
| 12000     | 37.6               | -53.7 |
| 13000     | 38.2               | -53.5 |
| 14000     | 39.9               | -56.3 |
| 15000     | 40.9               | -54.1 |
| 16000     | 41.3               | -54.1 |
| 17000     | 42.8               | -54.4 |
| 18000     | 44.2               | -54.7 |

| cable<br>loss 1<br>(relay<br>inside<br>chamber) | cable<br>loss 2<br>(High<br>Pass) | cable<br>loss 3<br>(pre-<br>amp) | cable<br>loss 4<br>(inside<br>chamber) | cable<br>loss 5<br>(outside<br>chamber) | cable<br>loss 6<br>(to<br>receiver) |
|-------------------------------------------------|-----------------------------------|----------------------------------|----------------------------------------|-----------------------------------------|-------------------------------------|
| dB                                              | dB                                | dB                               | dB                                     | dB                                      | dB                                  |
| 0.56                                            | 1.28                              | -62.72                           | 2.66                                   | 0.94                                    | 1.46                                |
| 0.69                                            | 0.71                              | -61.49                           | 2.84                                   | 1.00                                    | 1.53                                |
| 0.68                                            | 0.65                              | -60.80                           | 3.06                                   | 1.09                                    | 1.60                                |
| 0.70                                            | 0.54                              | -61.91                           | 3.28                                   | 1.20                                    | 1.67                                |
| 0.80                                            | 0.61                              | -61.40                           | 3.43                                   | 1.27                                    | 1.70                                |
| 0.84                                            | 0.42                              | -59.70                           | 3.53                                   | 1.26                                    | 1.73                                |
| 0.83                                            | 0.44                              | -59.81                           | 3.75                                   | 1.32                                    | 1.83                                |
| 0.91                                            | 0.53                              | -63.03                           | 3.91                                   | 1.40                                    | 1.77                                |
| 0.98                                            | 0.54                              | -61.05                           | 4.02                                   | 1.44                                    | 1.83                                |
| 1.23                                            | 0.49                              | -61.51                           | 4.17                                   | 1.51                                    | 1.85                                |
| 1.36                                            | 0.76                              | -62.36                           | 4.34                                   | 1.53                                    | 2.00                                |
| 1.70                                            | 0.53                              | -62.88                           | 4.41                                   | 1.55                                    | 1.91                                |

### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Tables show an extract of values.

## 7.5 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

| Frequency | AF<br>EMCO<br>3160-09 | Corr. | cable<br>loss 1<br>(inside<br>chamber) | cable<br>loss 2<br>(pre-<br>amp) | cable<br>loss 3<br>(inside<br>chamber) | cable<br>loss 4<br>(switch<br>unit) | cable<br>loss 5<br>(to<br>receiver) |
|-----------|-----------------------|-------|----------------------------------------|----------------------------------|----------------------------------------|-------------------------------------|-------------------------------------|
| MHz       | dB (1/m)              | dB    | dB                                     | dB                               | dB                                     | dB                                  | dB                                  |
| 18000     | 40.2                  | -23.5 | 0.72                                   | -35.85                           | 6.20                                   | 2.81                                | 2.65                                |
| 18500     | 40.2                  | -23.2 | 0.69                                   | -35.71                           | 6.46                                   | 2.76                                | 2.59                                |
| 19000     | 40.2                  | -22.0 | 0.76                                   | -35.44                           | 6.69                                   | 3.15                                | 2.79                                |
| 19500     | 40.3                  | -21.3 | 0.74                                   | -35.07                           | 7.04                                   | 3.11                                | 2.91                                |
| 20000     | 40.3                  | -20.3 | 0.72                                   | -34.49                           | 7.30                                   | 3.07                                | 3.05                                |
| 20500     | 40.3                  | -19.9 | 0.78                                   | -34.46                           | 7.48                                   | 3.12                                | 3.15                                |
| 21000     | 40.3                  | -19.1 | 0.87                                   | -34.07                           | 7.61                                   | 3.20                                | 3.33                                |
| 21500     | 40.3                  | -19.1 | 0.90                                   | -33.96                           | 7.47                                   | 3.28                                | 3.19                                |
| 22000     | 40.3                  | -18.7 | 0.89                                   | -33.57                           | 7.34                                   | 3.35                                | 3.28                                |
| 22500     | 40.4                  | -19.0 | 0.87                                   | -33.66                           | 7.06                                   | 3.75                                | 2.94                                |
| 23000     | 40.4                  | -19.5 | 0.88                                   | -33.75                           | 6.92                                   | 3.77                                | 2.70                                |
| 23500     | 40.4                  | -19.3 | 0.90                                   | -33.35                           | 6.99                                   | 3.52                                | 2.66                                |
| 24000     | 40.4                  | -19.8 | 0.88                                   | -33.99                           | 6.88                                   | 3.88                                | 2.58                                |
| 24500     | 40.4                  | -19.5 | 0.91                                   | -33.89                           | 7.01                                   | 3.93                                | 2.51                                |
| 25000     | 40.4                  | -19.3 | 0.88                                   | -33.00                           | 6.72                                   | 3.96                                | 2.14                                |
| 25500     | 40.5                  | -20.4 | 0.89                                   | -34.07                           | 6.90                                   | 3.66                                | 2.22                                |
| 26000     | 40.5                  | -21.3 | 0.86                                   | -35.11                           | 7.02                                   | 3.69                                | 2.28                                |
| 26500     | 40.5                  | -21.1 | 0.90                                   | -35.20                           | 7.15                                   | 3.91                                | 2.36                                |

### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

## 7.6 ANTENNA EMCO 3160-10 (26.5 GHZ – 40 GHZ)

| Frequency<br>GHz | AF<br>EMCO<br>3160-10<br>dB (1/m) | Corr.<br>dB | cable<br>loss 1<br>(inside<br>chamber)<br>dB | cable<br>loss 2<br>(outside<br>chamber)<br>dB | cable<br>loss 3<br>(switch<br>unit)<br>dB | cable<br>loss 4<br>(to<br>receiver)<br>dB | distance<br>corr.<br>(-20 dB/<br>decade)<br>dB | d <sub>Limit</sub><br>(meas.<br>distance<br>(limit)<br>m | d <sub>used</sub><br>(meas.<br>distance<br>(used)<br>m |
|------------------|-----------------------------------|-------------|----------------------------------------------|-----------------------------------------------|-------------------------------------------|-------------------------------------------|------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------|
| 26.5             | 43.4                              | -11.2       | 4.4                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 27.0             | 43.4                              | -11.2       | 4.4                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 28.0             | 43.4                              | -11.1       | 4.5                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 29.0             | 43.5                              | -11.0       | 4.6                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 30.0             | 43.5                              | -10.9       | 4.7                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 31.0             | 43.5                              | -10.8       | 4.7                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 32.0             | 43.5                              | -10.7       | 4.8                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 33.0             | 43.6                              | -10.7       | 4.9                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 34.0             | 43.6                              | -10.6       | 5.0                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 35.0             | 43.6                              | -10.5       | 5.1                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 36.0             | 43.6                              | -10.4       | 5.1                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 37.0             | 43.7                              | -10.3       | 5.2                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 38.0             | 43.7                              | -10.2       | 5.3                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 39.0             | 43.7                              | -10.2       | 5.4                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 40.0             | 43.8                              | -10.1       | 5.5                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |

### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

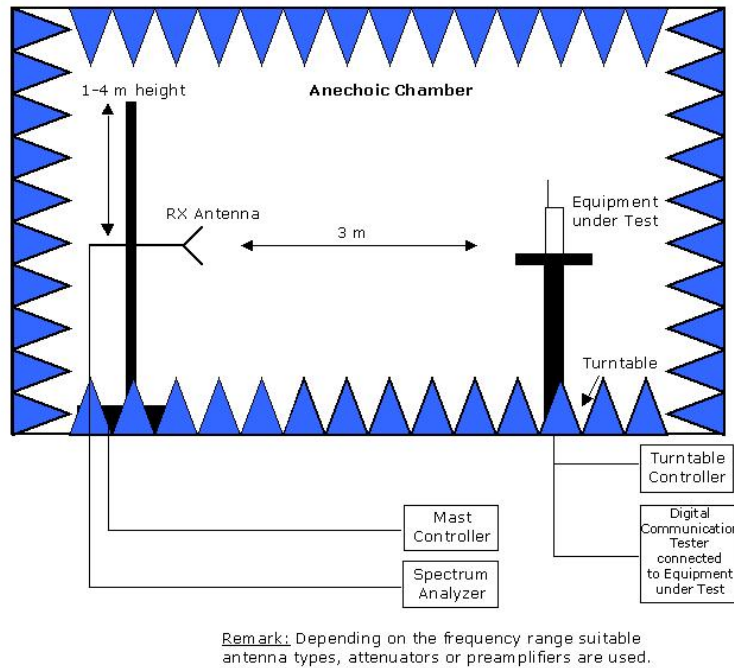
Linear interpolation will be used for frequencies in between the values in the table.

distance correction =  $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

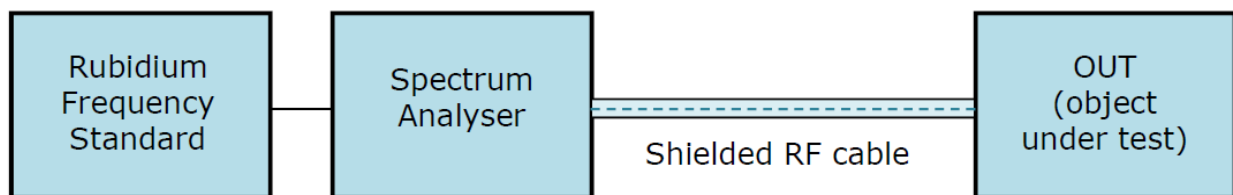
Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

## 8 SETUP DRAWINGS



**Drawing 1:** Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting groundplane.

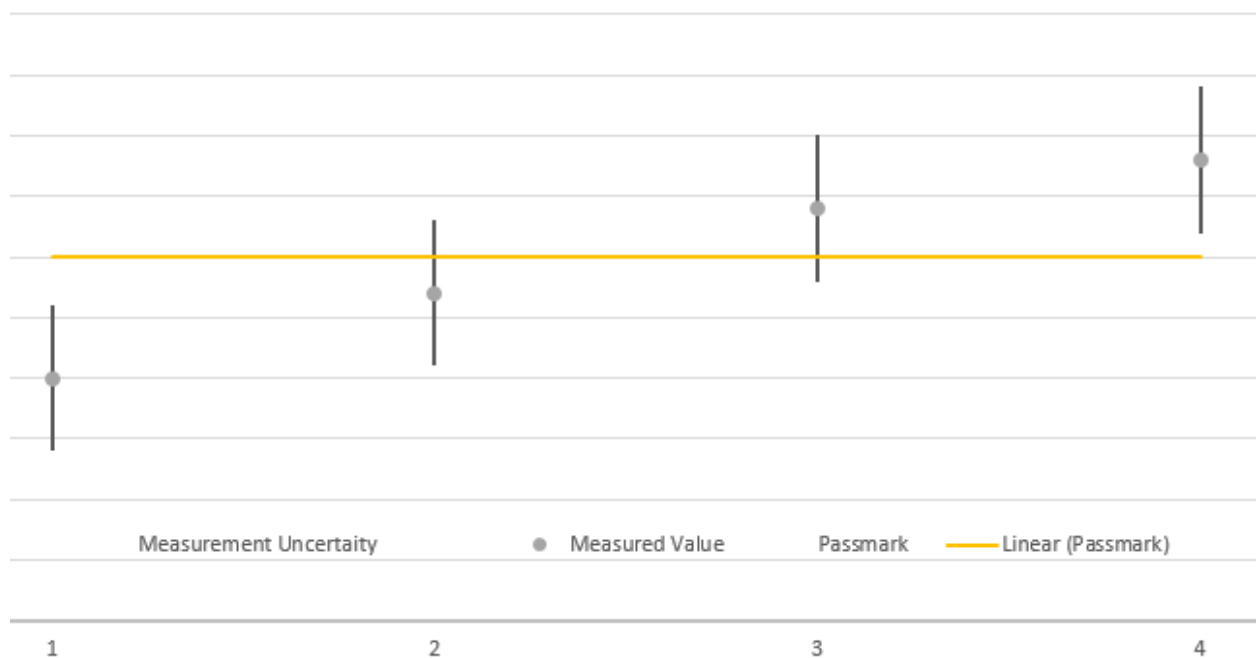


**Drawing 2:** Setup for conducted radio tests.

## 9 MEASUREMENT UNCERTAINTIES

| Test Case                            | Parameter          | Uncertainty                    |
|--------------------------------------|--------------------|--------------------------------|
| AC Power Line                        | Power              | $\pm 3.4$ dB                   |
| Field Strength of spurious radiation | Power              | $\pm 5.5$ dB                   |
| 6 dB / 26 dB / 99% Bandwidth         | Power<br>Frequency | $\pm 2.9$ dB<br>$\pm 11.2$ kHz |
| Conducted Output Power               | Power              | $\pm 2.2$ dB                   |
| Band Edge Compliance                 | Power<br>Frequency | $\pm 2.2$ dB<br>$\pm 11.2$ kHz |
| Frequency Stability                  | Frequency          | $\pm 25$ Hz                    |
| Power Spectral Density               | Power              | $\pm 2.2$ dB                   |

The measurement uncertainties for all parameters are calculated with an expansion factor (coverage factor)  $k = 1.96$ . This means, that the true value is in the corresponding interval with a probability of 95 %.



The verdicts in this test report are given according the above diagram:

| Case | Measured Value  | Uncertainty Range | Verdict |
|------|-----------------|-------------------|---------|
| 1    | below pass mark | below pass mark   | Passed  |
| 2    | below pass mark | within pass mark  | Passed  |
| 3    | above pass mark | within pass mark  | Failed  |
| 4    | above pass mark | above pass mark   | Failed  |

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so called shared risk principle.

## 10 PHOTO REPORT

Please see separate photo report.