

**TEST REPORT # EMCC-980398NB, 2019-10-11***This report replaces Test Report # EMCC-980398N, 2019-04-12***EQUIPMENT UNDER TEST:**

Trade Name: iID® DESKTOP smart USB 7.0  
Type/Model: 35.29.701.00  
Serial Number(s): 122322, 122316  
Application: RFID Reader  
Manufacturer: Micro-Sensys GmbH  
Address: In der Hochstedter Ecke 2  
99098 Erfurt  
GERMANY  
Phone: +49 361 59874-16  
E-Mail: ppeitsch@microsensys.de

**RELEVANT STANDARD(S):** 47 CFR 15.225, RSS-210 Issue 9, 47 CFR 15 B, ICES-003 Issue 6

**MEASUREMENT PROCEDURE:** ANSI C63.10-2013, RSS-Gen Issue 5, ANSI C63.4-2014

**TEST REPORT PREPARED BY:**

Dominik Krüger  
EMCCons DR. RAŠEK GmbH & Co. KG  
Boelwiese 8  
91320 Ebermannstadt  
Germany  
Phone: +49 9194 7262-0  
Fax: +49 9194 7262-199  
E-Mail: d.krueger@emcc.de

Tested:



Dominik Krüger



Adem Aldogan

Checked:

Reinhard Sauerschell  
- Head of Laboratory -

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Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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## 0 REVISION HISTORY

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| Project number | Issue date | Chapter         | Description                                                    |
|----------------|------------|-----------------|----------------------------------------------------------------|
| 980398N        | 2019-04-12 | n.a.            | Initial issue                                                  |
| 980398NB       | 2019-10-11 | 1.6             | Test date updated                                              |
|                |            | 1.8             | Climatic conditions updated                                    |
|                |            | 2.4             | Operation Mode Scan added                                      |
|                |            | 4.3.4,<br>4.4.4 | Measurements were in Mode “Scan”, Measurement Plots updated    |
|                |            | 4.4.5           | Test results corrected                                         |
|                |            | Annex 2         | EUT photos replaced by photos with dimensions, Side view added |

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## 1 GENERAL INFORMATION

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### 1.1 Purpose

The purpose of this report is to show compliance with the 47 CFR §15.225 and ISSED RSS-210 requirements for the certification of licence-exempt intentional radiator and with the 47 CFR §15.107 / § 15.109 and ICES-003 requirements applicable to unintentional radiators.

### 1.2 Limits and Reservations

The test results in this report apply only to the particular equipment under test (EUT) as declared in this report. This test report shall not be reproduced except in full without the written permission of EMCCCons DR. RAŠEK GmbH & Co. KG.

### 1.3 Test Laboratory

|                                                |                                                                                             |
|------------------------------------------------|---------------------------------------------------------------------------------------------|
| Test laboratory:                               | EMCCCons DR. RAŠEK GmbH & Co. KG                                                            |
| Accreditation No.:                             | D-PL-12067-01-03                                                                            |
|                                                | D-PL-12067-01-04                                                                            |
| FCC Test Firm Registration Number:             | 368753                                                                                      |
| ISED Test Site Registration Number:            | 3464C                                                                                       |
| Address of Labs I, II, III<br>and Head Office: | EMCCCons DR. RAŠEK GmbH & Co. KG<br>Boelwiese 8<br>91320 Ebermannstadt<br>GERMANY           |
| Address of Labs IV and V:                      | EMCCCons DR. RAŠEK GmbH & Co. KG<br>Stoernhofer Berg 15<br>91364 Unterleinleiter<br>GERMANY |
| Phone:                                         | +49 9194 7262-0                                                                             |
| Fax:                                           | +49 9194 7262-199                                                                           |
| E-Mail:                                        | info@emcc.de                                                                                |
| Web:                                           | www.emcc.de                                                                                 |

### 1.4 Customer

|               |                           |
|---------------|---------------------------|
| Company name: | Micro-Sensys GmbH         |
| Street:       | In der Hochstedter Ecke 2 |
| City:         | 99098 Erfurt              |
| Country:      | GERMANY                   |
| Name:         | Peter Peitsch             |
| Phone:        | +49 361 59874-16          |
| Fax:          | +49 361 59874-17          |
| E-Mail:       | ppeitsch@microsensys.de   |

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## 1.5 Manufacturer

Company name: Micro-Sensys GmbH  
Street: In der Hochstedter Ecke 2  
City: 99098 Erfurt  
Country: GERMANY

Phone: +49 361 59874-16  
E-Mail: ppeitsch@microsensys.de

## 1.6 Dates and Test Location

Date of receipt of EUT: 2018-09-17  
Test date: 2018-11-06, 2019-01-28 – 2019-01-31, 2019-02-15, 2019-03-20,  
2019-08-14  
Test location: Lab IV

## 1.7 Ordering Information

Purchase order: D-424-18  
Date: 2018-08-29  
Vendor number: n/a

## 1.8 Climatic Conditions

| Date       | Temperature<br>[°C] | Relative<br>Humidity<br>[%] | Air Pressure<br>[hPa] | Lab | Customer attended<br>tests |
|------------|---------------------|-----------------------------|-----------------------|-----|----------------------------|
| 2018-11-06 | 24                  | 45                          | 968                   | IV  | No                         |
| 2019-01-28 | 23                  | 33                          | 952                   | IV  | No                         |
| 2019-01-29 | 24                  | 35                          | 965                   | IV  | No                         |
| 2019-01-30 | 23                  | 34                          | 954                   | IV  | No                         |
| 2019-01-31 | 23                  | 31                          | 957                   | IV  | No                         |
| 2019-02-15 | 23                  | 36                          | 976                   | IV  | No                         |
| 2019-03-20 | 24                  | 34                          | 992                   | IV  | No                         |
| 2019-08-14 | 25                  | 45                          | 978                   | IV  | No                         |

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## 2 PRODUCT DESCRIPTION

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### 2.1 Equipment Under Test (EUT)

The following data is based on customer's information.

|                             |                                                                            |
|-----------------------------|----------------------------------------------------------------------------|
| Manufacturer:               | Micro-Sensys GmbH                                                          |
| Type:                       | 35.29.701.00                                                               |
| No of variants:             | 1                                                                          |
| Serial No(s):               | EUT #1: 122322<br>EUT #2: 122316 (modified sample with dummy antenna load) |
| FCC:                        | FCC ID: ZLCDESKTOPSHFX                                                     |
| ISED:                       | IC: 21228-DESKTOPSHFX                                                      |
| Application:                | RFID Reader                                                                |
| Transmit frequency:         | 13.56 MHz                                                                  |
| Modulation:                 | Load modulation                                                            |
| Emission designator:        | 2K48A1D                                                                    |
| Antenna:                    | Integrated loop antenna                                                    |
| Antenna diameter:           | 13 mm                                                                      |
| Environment:                | HF transponders, TELID® system.                                            |
| Downloaded OP System:       | iID® 3000PRO                                                               |
| Software Interface:         | iID® driver engine                                                         |
| Firmware version:           | 98 05                                                                      |
| Hardware version:           | EUT #1: B6 11<br>EUT #2: B6 11                                             |
| Highest internal frequency: | 27.12 MHz                                                                  |
| Power source:               | Via USB Port                                                               |
| Voltage for testing:        | 5 VDC                                                                      |
| Ports:                      | USB 2.0 HOST Interface                                                     |
| Remarks:                    | None                                                                       |

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## 2.2 Intended Use

The following information was delivered by the customer:

The HF-RFID read/write module iID<sup>®</sup> DESKTOP smart USB 7.0 is a RFID transceiver device with best opportunities for office applications. It is designed to read and write RFID transponders und RFID sensor transponders in a wide range of 13.56 MHz technology based RFID systems. Typical applications of this device are access control with transponder chipcards and programming/reading of TELID<sup>®</sup> sensor datalogger.

## 2.3 EUT Peripherals/Simulators

The EUT was tested with

- Notebook Panasonic Toughbook CF-19 to power the EUT and flash the firmware
- Notebook Power Supply Panasonic CF-AA6373A M1
- USB micro cable to connect the EUT to the Notebook

The above listed equipment was provided by the customer.

For detailed pictures see “Annex 4: Photographs of ancillary equipment”.



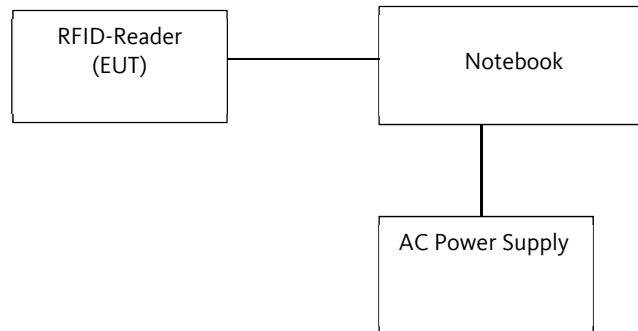
## 2.4 Mode of operation during testing and test setup

The equipment under test (EUT) was connected to the Notebook via a USB micro cable.

The Notebook was powered by an AC power supply.

Software was installed on the notebook which allowed to flash the EUTs firmware for turn on/off the RF of the reader.

The test setup for all tests is outlined below:



Block diagram of test setup

The EUT was operated during the tests under the following conditions:

**FieldOn:** The EUT was continuously transmitting (CW) with normal power (test mode). The EUT was powered by the notebook's USB port, which in turn was powered by the AC power supply.

**Scan:** The EUT was scanning (modulated) according to ISO 15693 (normal operation). The EUT was powered by the notebook's USB port, which in turn was powered by the AC power supply.

**RF-Off:** No Firmware was loaded to simulate the RF off phase. The EUT was powered by the notebook's USB port, which in turn was powered by the AC power supply.

## 2.5 Modifications required for compliance

The USB micro cable has been replaced by one with ferrites (manufacturer's designation: 102-1492-BLF0050).

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Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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### 3 TEST RESULTS SUMMARY

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Summary of test results for the following EUT:

Manufacturer: Micro-Sensys GmbH  
Type: 35.29.701.00  
Serial No.: 122322  
122316

| Requirement                                           | RSS/ICES,<br>Section                          | 47 CFR<br>Section               | Report<br>Section | Tested EUT | Result |
|-------------------------------------------------------|-----------------------------------------------|---------------------------------|-------------------|------------|--------|
| Antenna Requirement                                   | RSS-Gen, 6.8                                  | 15.203                          | 4.1               | 122322     | Passed |
| AC Power Line Conducted Emissions<br>150 kHz - 30 MHz | RSS-Gen, 8.8<br>ICES-003, 6.1                 | 15.207<br>15.107                | 4.2               | 122316     | Passed |
| Spectrum Mask                                         | RSS-210, B.6                                  | 15.225 (a)-(d)                  | 4.3               | 122322     | Passed |
| Occupied Bandwidth                                    | RSS-Gen, 6.7                                  | 15.215                          | 4.4               | 122322     | Passed |
| Radiated Emissions<br>9 kHz – 30 MHz                  | RSS-210, B.6<br>RSS-Gen, 8.9                  | 15.205,<br>15.209,<br>15.225(d) | 4.5               | 122322     | Passed |
| Radiated Emissions<br>30 MHz – 1000 MHz               | RSS-210, B.6<br>RSS-Gen, 8.9<br>ICES-003, 6.2 | 15.209,<br>15.225(d)<br>15.109  | 4.6               | 122322     | Passed |
| Carrier Frequency Stability                           | RSS-210, B.6<br>RSS-Gen, 8.11                 | 15.225(e)                       | 4.7               | 122322     | Passed |

N.A. – not applicable; N.T. – Not tested acc. to applicant's order.

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the procedures described in ANSI C63.10-2013, ANSI C63.4-2014, RSS-Gen Issue 5 and ICES-003 Issue 6. All requirements were found to be within the limits outlined in this report.

The test results in this report apply only to the particular equipment under test (EUT) as declared in this report.

Test personnel: Dominik Krüger, Adem Aldogan  
Issuance date: 2019-10-11

## 4 DETAILED TEST RESULTS

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### 4.1 Antenna Requirement

Test Requirement: 47 CFR §15.203, ISSED RSS-Gen 6.8

#### 4.1.1 Regulation

##### 47 CFR § 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

##### RSS-Gen 6.8 Transmit antenna:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

*This radio transmitter [enter the device's ISSED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.*

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

No applicable antenna requirement specified in RSS-210.

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#### 4.1.2 Test Result

|                 |                   |
|-----------------|-------------------|
| Manufacturer:   | Micro-Sensys GmbH |
| Type:           | 35.29.701.00      |
| Serial No.:     | 122322            |
| Test date:      | 2018-11-06        |
| Test personnel: | Dominik Krüger    |

The EUT's antenna is directly soldered to the PCB.

**The EUT meets the requirements of this section.**

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## 4.2 AC Power Line Conducted Emissions

Test Requirement: FCC 47 CFR §15.107, §15.207

ISED RSS-Gen 8.8, ICES-003 6.1

Test Procedure: ANSI C63.10-2013, KDB 174176, ISED RSS-Gen 8.8; ANSI C63.4-2014

### 4.2.1 Regulation

#### 47 CFR § 15.107 Conducted limits

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

| Frequency of emission [MHz] | Conducted limit [dB $\mu$ V] |           |
|-----------------------------|------------------------------|-----------|
|                             | Quasi-peak                   | Average   |
| 0.15-0.5                    | 66 to 56*                    | 56 to 46* |
| 0.5-5                       | 56                           | 46        |
| 5-30                        | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

#### 47 CFR § 15.207 Conducted limits

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency of emission [MHz] | Conducted limit [dB $\mu$ V] |           |
|-----------------------------|------------------------------|-----------|
|                             | Quasi-peak                   | Average   |
| 0.15-0.5                    | 66 to 56*                    | 56 to 46* |
| 0.5-5                       | 56                           | 46        |
| 5-30                        | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

#### FCC KDB 174176 D01 Line Conducted FAQ v01r01

Q5. How should the RF power output port of a Part 15 intentional radiator be configured when making AC power-line conducted emissions measurements?

The method used for AC power-line conducted measurements with suitable dummy loads will differ for detachable and non-detachable antennas, depending on whether the operating frequency is above or below 30 MHz.

A suitable dummy load is a radio frequency termination used in place of the antenna, which has the same electrical properties as the intended antenna without radiated emissions. A device with a suitable dummy load must supply identical signals to the dummy load, as it would if an antenna were connected. In the test report, results obtained using a suitable dummy antenna shall be so noted.

Devices Operating Above 30 MHz

For a device with a permanent or detachable antenna operating above 30 MHz, measurements must be performed with the antenna connected as specified in clause 6.2 of ANSI C63.10-2013.

Devices Operating Below 30 MHz

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For a device with a permanent or detachable antenna operating at or below 30 MHz, the FCC will accept measurements performed with a suitable dummy load in lieu of the antenna under the following conditions: (1) perform the AC power-line conducted tests with the antenna connected to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network which simulates the antenna in the fundamental frequency band.

All measurements must be performed as specified in clause 6.2 of ANSI C63.10-2013

### RSS-Gen 8.8 AC power-line conducted emissions limits

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50  $\mu$ H / 50  $\Omega$  line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

**Table 4 – AC power-line conducted emissions limits**

| Frequency [MHz] | Conducted limit [dB $\mu$ V] |                       |
|-----------------|------------------------------|-----------------------|
|                 | Quasi-peak                   | Average               |
| 0.15-0.5        | 66 to 56 <sup>1</sup>        | 56 to 46 <sup>1</sup> |
| 0.5-5           | 56                           | 46                    |
| 5-30            | 60                           | 50                    |

Note: The level decreases linearly with the logarithm of the frequency.

For an EUT with a permanent or detachable antenna operating between 150 kHz and 30 MHz, the AC power-line conducted emissions must be measured using the following configurations:

- Perform the AC power-line conducted emissions test with the antenna connected to determine compliance with the limits of table 4 outside the transmitter's fundamental emission band.
- Retest with a dummy load instead of the antenna to determine compliance with the limits of table 4 within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network that simulates the antenna in the fundamental frequency band.

### ICES-003 6.1 conducted emissions limits

Class B: ITE that does not meet the conditions for Class A operation shall comply with the Class B conducted limits set out in Table 2.

**Table 2 – Class B Conducted Limits**

| Frequency [MHz] | Conducted limit [dB $\mu$ V] |                       |
|-----------------|------------------------------|-----------------------|
|                 | Quasi-peak                   | Average               |
| 0.15-0.5        | 66 to 56 <sup>1</sup>        | 56 to 46 <sup>1</sup> |
| 0.5-5           | 56                           | 46                    |
| 5-30            | 60                           | 50                    |

Note: The level decreases linearly with the logarithm of the frequency.

→ ISED limits are equal to FCC limits.

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Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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#### **4.2.2 Test Procedures**

Testing is performed acc. to ANSI C63.10-2013 clause 6.2 and ANSI C63.4-2014 clause 7.3.

The EUT and the notebook were placed on a nonconducting table with nominal dimension of 1.0 m by 1.5 m, height 0.8 m above the ground plane. The EUT was centered laterally (left to right facing the tabletop) on the tabletop and its rear was flush with the rear of the table. The notebook and its AC/DC adaptor that are part of the system were placed in a test arrangement on one or both sides of the host with a 10 cm separation between the nearest points of the cabinets.

The USB cable and AC power line that hang closer than 40 cm to the ground plane were folded back and forth in the center forming a bundle 30 cm to 40 cm long.

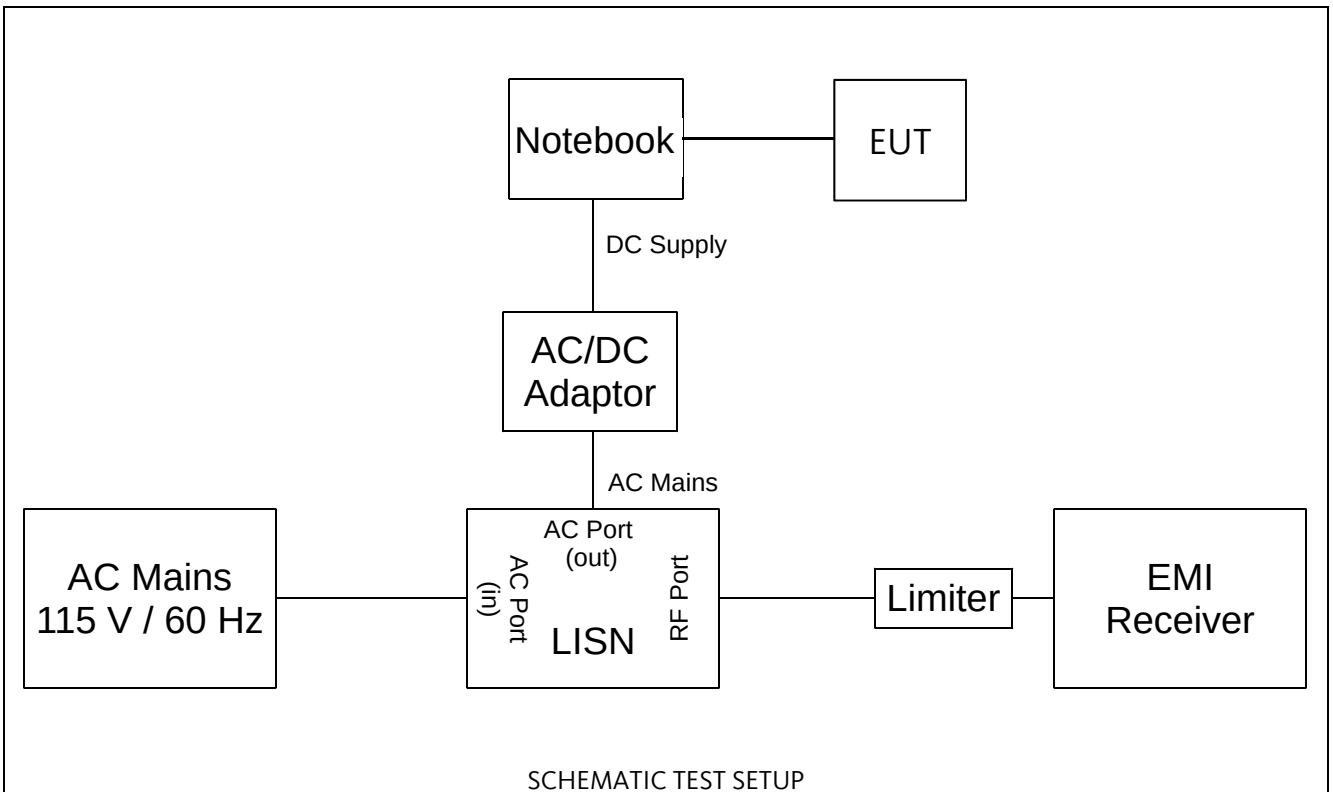
The notebooks AC/DC adaptor was connected to a LISN.

The measurement receiver was connected via limiter to the 50  $\Omega$  RF port of the LISN.

According to FCC KDB 174176 Q5 and RSS-Gen clause 8.8, respectively, the measurement was performed twice, a) with the antenna connected and b) with an inductive dummy load (coil LQH3NPN3R3NJ0L) in lieu of the antenna.

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

### 4.2.3 Test setup with antenna connected



SCHEMATIC TEST SETUP

Requirement: 47 CFR § 15.207, RSS-Gen 8.8  
 Procedure: ANSI C63.10-2013, RSS-Gen 8.8

Power Source: #1  
 Receiver: #516  
 LISN: #1901

TEST EQUIPMENT USED:  
 Refer to chapter 5 of this document.  
 1, 516, 1890, 1901, 3184, 5392, 5404, 5551

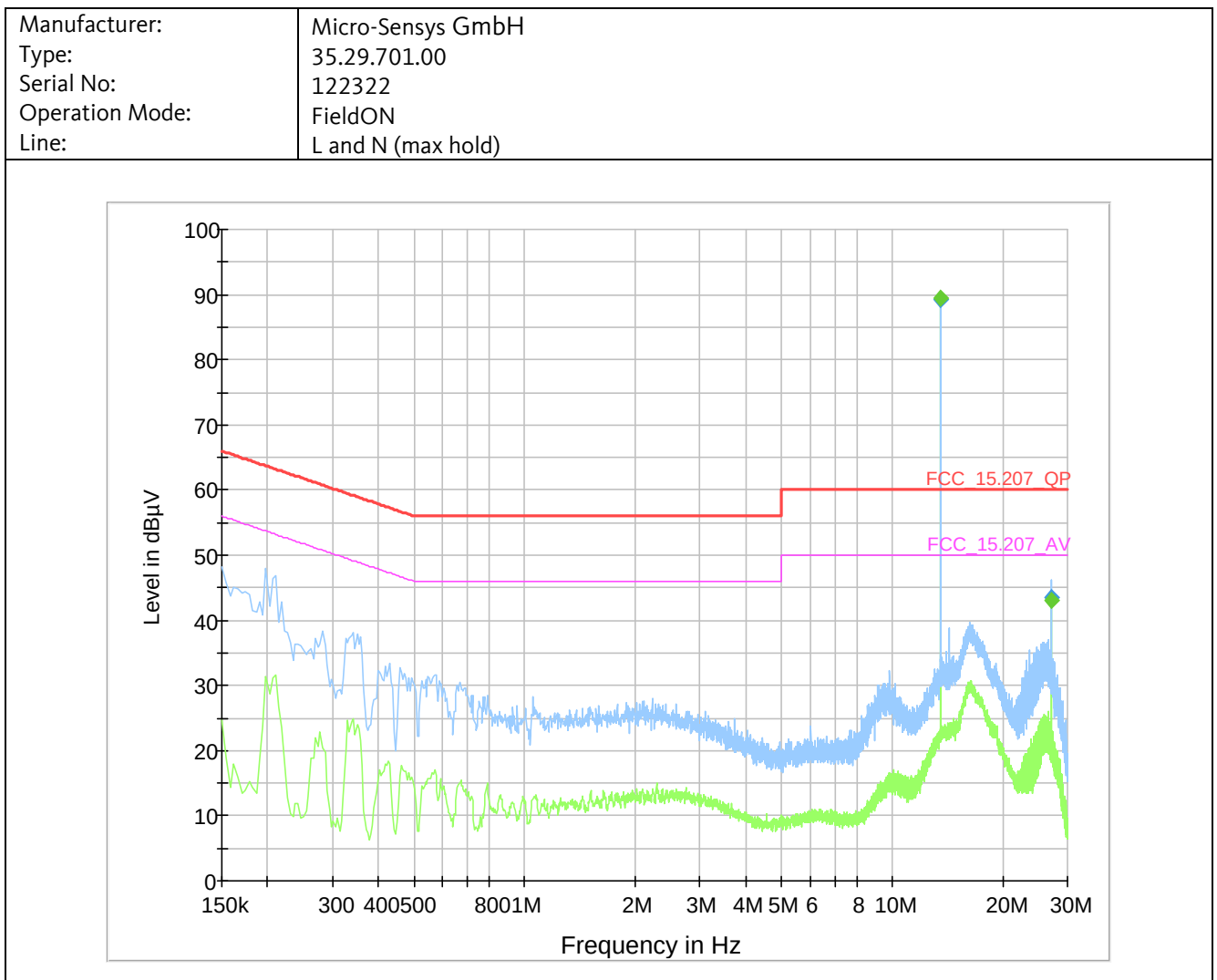


Photo of Setup



Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.2.3.1 Detailed Test Data



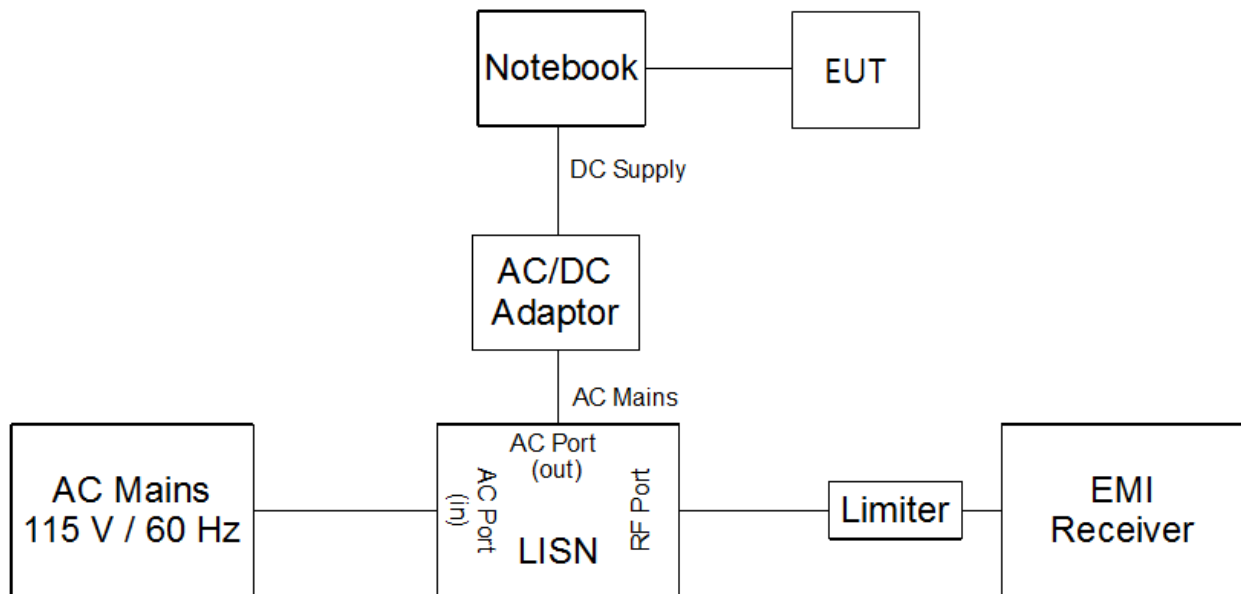
| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE  | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|-----|------------|
| 13.561500       | 89.20            | ---             | 60.00        | -29.20      | 1000.0          | 9.000           | N    | GND | 10.0       |
| 13.561500       | ---              | 89.35           | 50.00        | -39.35      | 1000.0          | 9.000           | N    | GND | 10.0       |
| 27.121500       | 43.57            | ---             | 60.00        | 16.43       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 27.121500       | ---              | 42.99           | 50.00        | 7.01        | 1000.0          | 9.000           | N    | GND | 10.0       |

Worst case results listed, only.

The EUT with the antenna connected is compliant with the applicable limits outside the transmitter's fundamental emissions band.

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.2.4 Test setup with dummy load in lieu of antenna



SCHEMATIC TEST SETUP

Requirement: 47 CFR § 15.207, RSS-Gen 8.8  
Procedure: ANSI C63.10-2013, RSS-Gen 8.8

Power Source: #1  
Receiver: #3846  
LISN: #1901

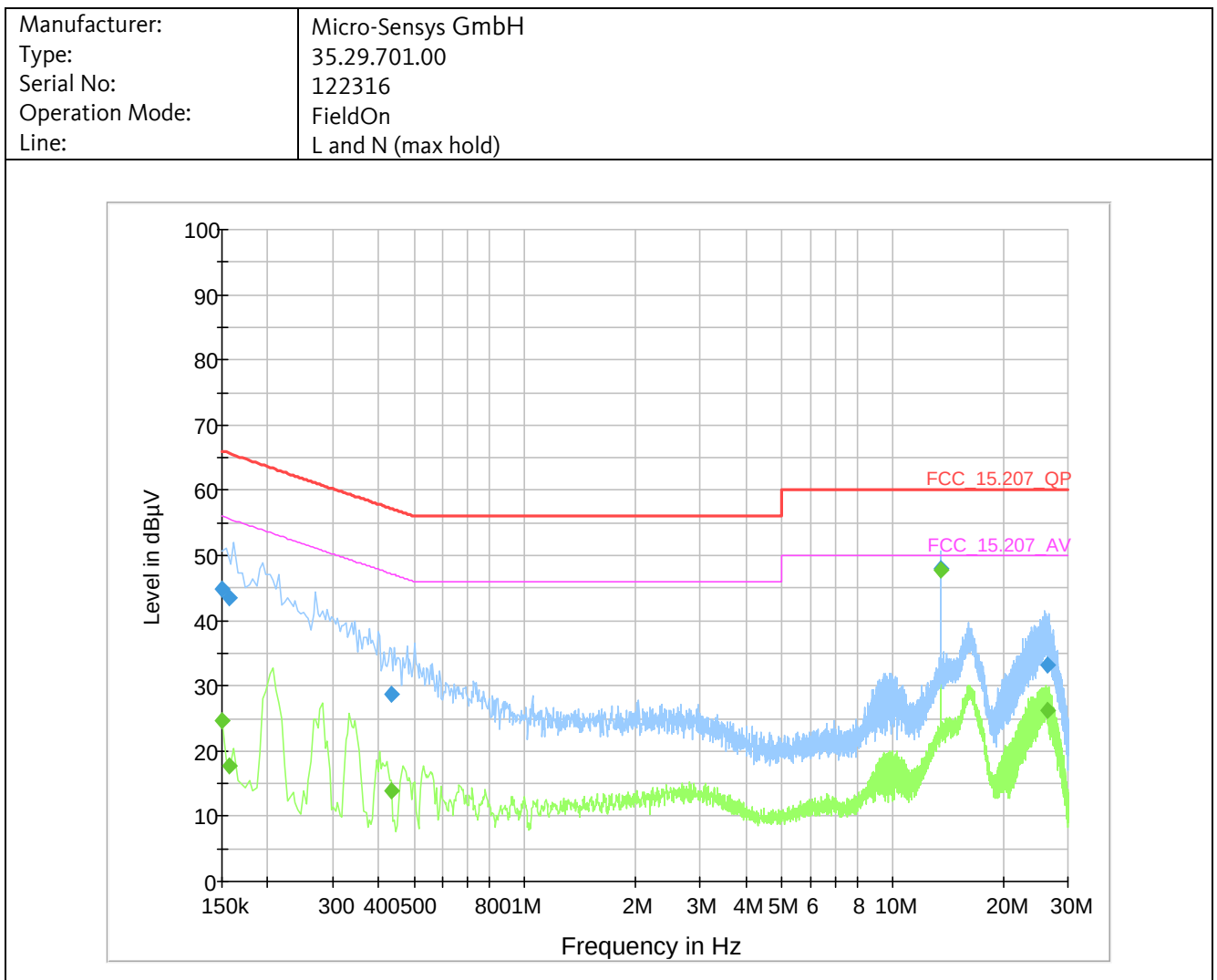
TEST EQUIPMENT USED:  
Refer to chapter 5 of this document.  
1, 1890, 1901, 3184, 3846, 5392, 5404, 5551



Photo of Setup

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.2.4.1 Detailed Test Data



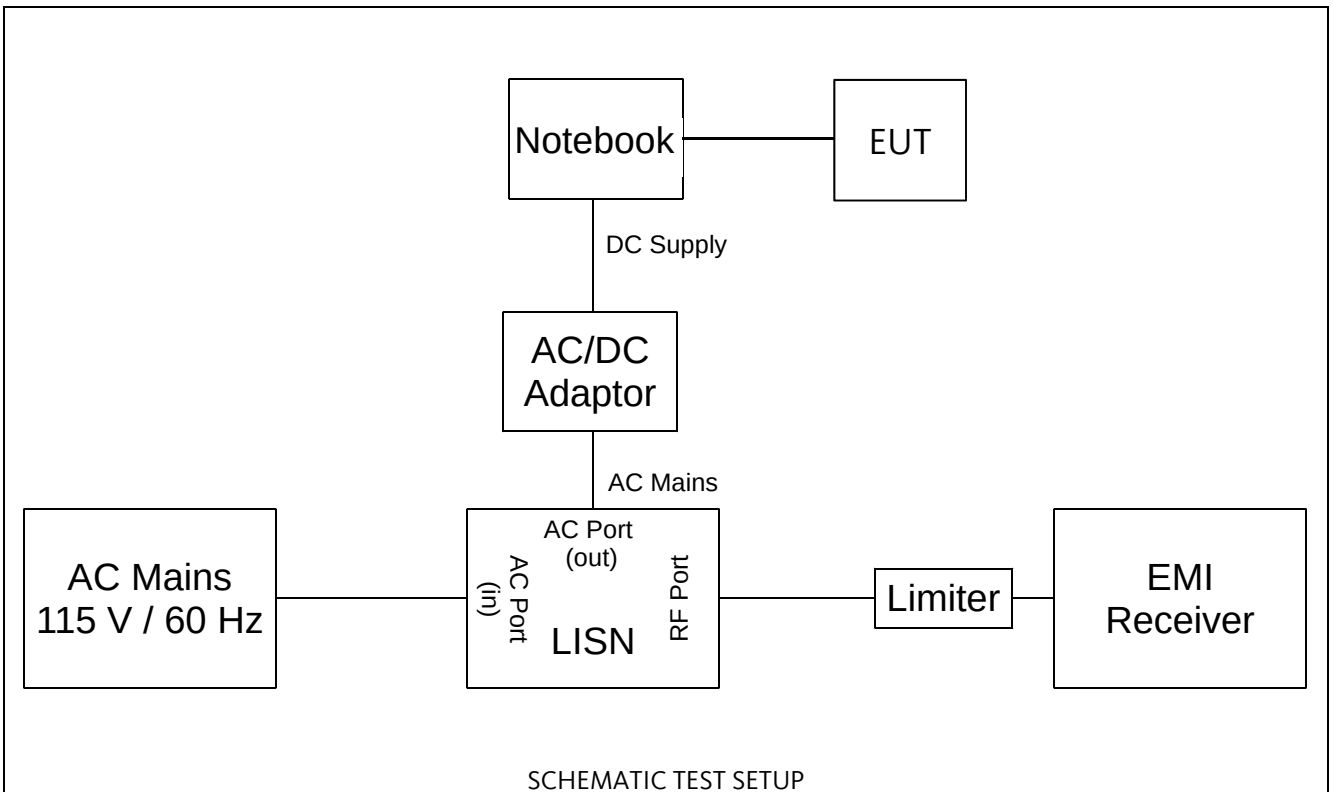
| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE  | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|-----|------------|
| 0.150000        | ---              | 24.65           | 56.00        | 31.35       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 0.150000        | 44.88            | ---             | 66.00        | 21.12       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 0.157500        | ---              | 17.71           | 55.60        | 37.88       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 0.157500        | 43.50            | ---             | 65.60        | 22.09       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 0.433500        | ---              | 13.85           | 47.19        | 33.34       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 0.433500        | 28.70            | ---             | 57.19        | 28.49       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 13.560000       | 47.95            | ---             | 60.00        | 12.05       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 13.560000       | ---              | 47.68           | 50.00        | 2.32        | 1000.0          | 9.000           | N    | GND | 10.0       |
| 26.509500       | ---              | 26.16           | 50.00        | 23.84       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 26.509500       | 33.27            | ---             | 60.00        | 26.73       | 1000.0          | 9.000           | N    | GND | 10.0       |

Worst case results listed, only.

The EUT with the dummy load in lieu of the antenna is compliant with the applicable limits.

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.2.5 Test setup RF-off



Requirement: 47 CFR § 15.107, ICES-003  
 Procedure: ANSI C63.4-2014

Power Source: #1  
 Receiver: #516  
 LISN: #1901

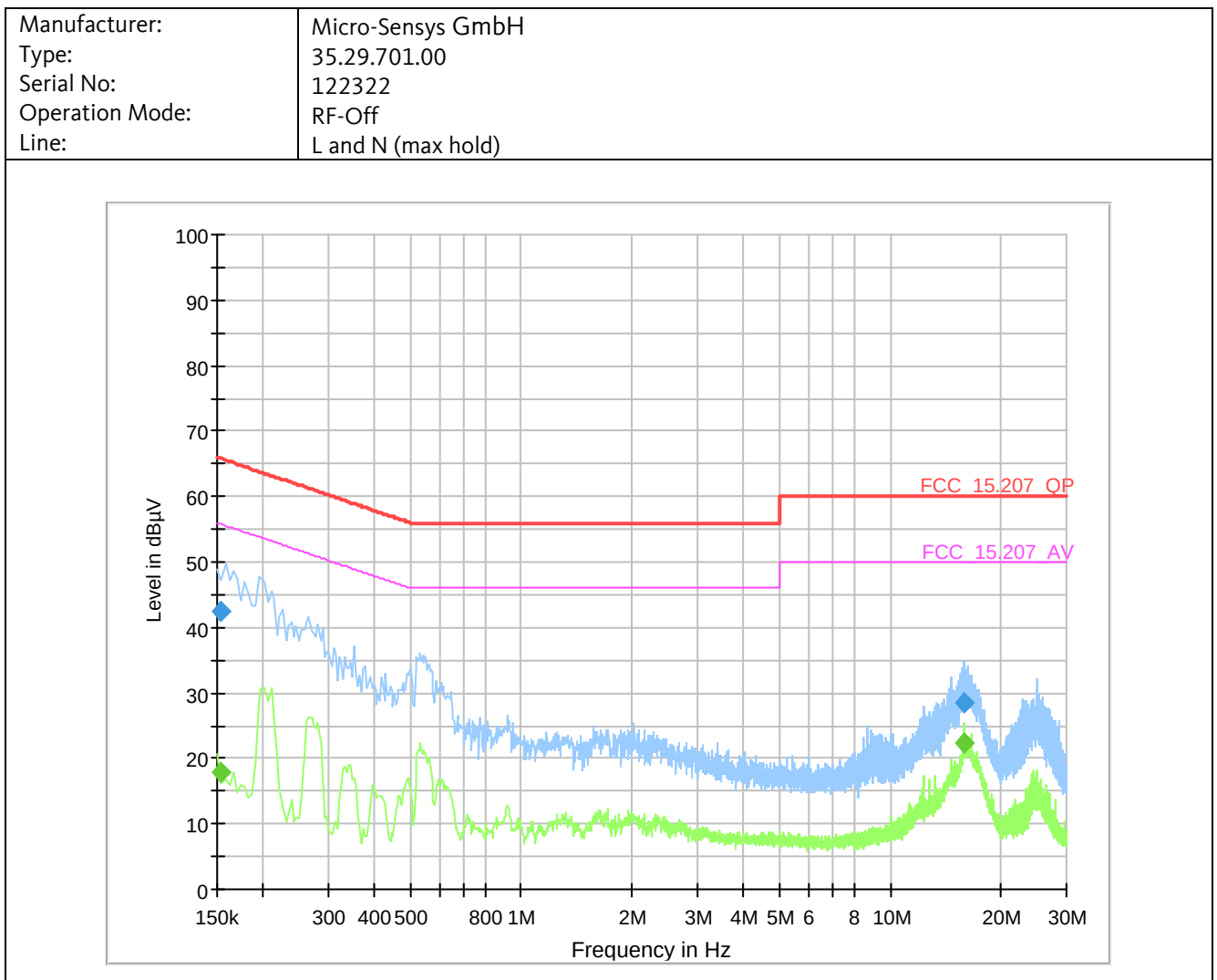
TEST EQUIPMENT USED:  
 Refer to chapter 5 of this document.  
 1, 516, 1890, 1901, 3184, 5392, 5404, 5551



Photo of Setup

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.2.5.1 Detailed Test Data



| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE  | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|-----|------------|
| 0.154000        | ---              | 17.88           | 55.78        | 37.90       | 1000.0          | 9.000           | L1   | GND | 10.0       |
| 0.154000        | 42.47            | ---             | 65.78        | 23.31       | 1000.0          | 9.000           | L1   | GND | 10.0       |
| 15.885500       | ---              | 22.28           | 50.00        | 27.72       | 1000.0          | 9.000           | N    | GND | 10.0       |
| 15.885500       | 28.62            | ---             | 60.00        | 31.38       | 1000.0          | 9.000           | N    | GND | 10.0       |

Worst case results listed, only.

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Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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#### **4.2.6 Test Result**

|                 |                        |
|-----------------|------------------------|
| Manufacturer:   | Micro-Sensys GmbH      |
| Type:           | 35.29.701.00           |
| Serial No.:     | 122316                 |
| Test date:      | 2019-02-15, 2019-03-20 |
| Test personnel: | Dominik Krüger         |

**The EUT meets the requirements of this section.**

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Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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### 4.3 Spectrum Mask

Test Requirement: FCC 47 CFR §15.225, ISED RSS-210 B.6

Test Procedure: ANSI C63.10-2013

#### 4.3.1 Regulation

##### 47 CFR § 15.225

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

##### ISED RSS-210 B.6

The field strength of any emission shall not exceed the following limits:

- (a) 15,848 mV/m (84 dBμV/m) at 30 m, within the band 13.553-13.567 MHz;
- (b) 334 μV/m (50.5 dBμV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;
- (c) 106 μV/m (40.5 dBμV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz; and
- (d) RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz.

#### 4.3.2 Test Procedures

The measurement was performed in a semi-anechoic room at a test distance of 3 m. A calibrated loop antenna as specified in ANSI C63.10 clause 4.3 was positioned with its plane vertical at the test distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna may also need to be positioned horizontally at the specified distance from the EUT. Instead of changing the loop antenna polarization to horizontal the EUT antenna was rotated by 90 degrees. I.e. tests performed for 2 EUT antenna polarizations (EUT in 3 orientations). The center of the loop antenna was 1 m above the ground.

The EUT was tested on a 0.8 meter high tabletop.

The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter.

In certain applications, a remotely located device may be connected to the EUT. In these cases, it is permissible for cabling from the remotely located device to the EUT or accessories to be placed directly on the reference groundplane or, if normally installed beneath the reference groundplane, beneath it. The remotely located device shall be located at a distance sufficient to ensure that it does not contribute to the measured level. This procedure evaluates the interference potential of the EUT, its accessories, and interconnecting cables or wires standing apart from the remotely located device, which in turn shall be evaluated separately, if required.

Measurement initially performed as a pre-scan in the full frequency range in order to find worst case emissions. Final measurement performed at worst-case emission frequencies in a FCC listed semi-anechoic room at the specified 3 m test distance.

Worst case emissions are listed under chapter: test results.

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Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

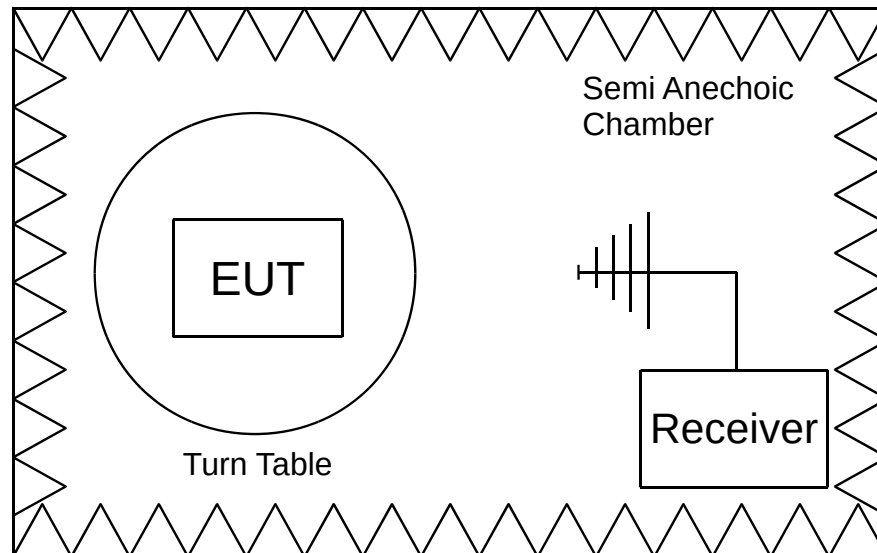
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| Radiated Emissions Test Characteristics   |                           |
|-------------------------------------------|---------------------------|
| Frequency range                           | 13.11 MHz – 14.01 MHz     |
| Test distance                             | 3 m*                      |
| Test instrumentation resolution bandwidth | 10 kHz (150 kHz - 30 MHz) |
| Receive antenna height                    | 1 m                       |
| Receive antenna polarization              | Vertical                  |

\* According to section 15.31 (f)(2): At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The 40 dB/decade factor was used.



### 4.3.3 Test Setup



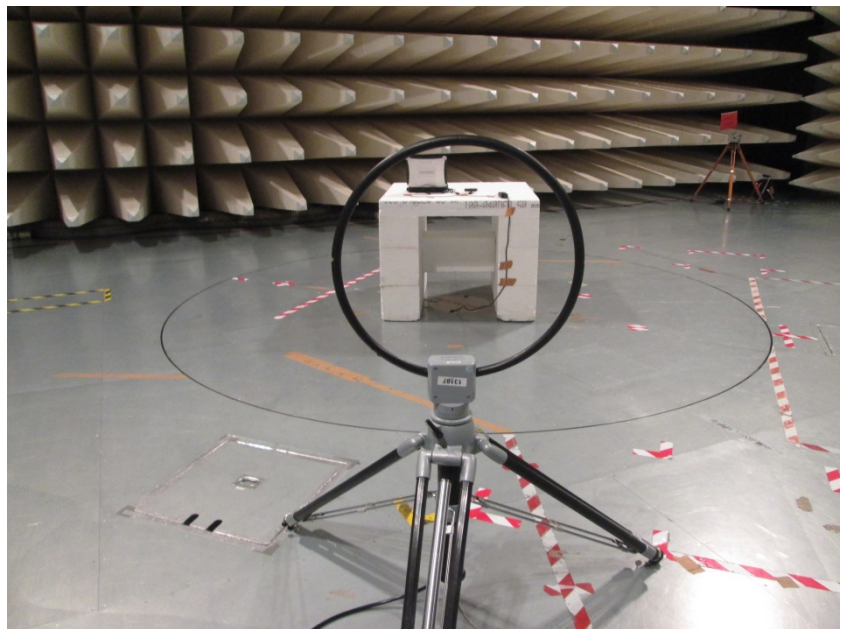
SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.225  
Procedure: ANSI C63.10-2013

Receiver: #516  
Antenna: #374

Test distance: 3 m

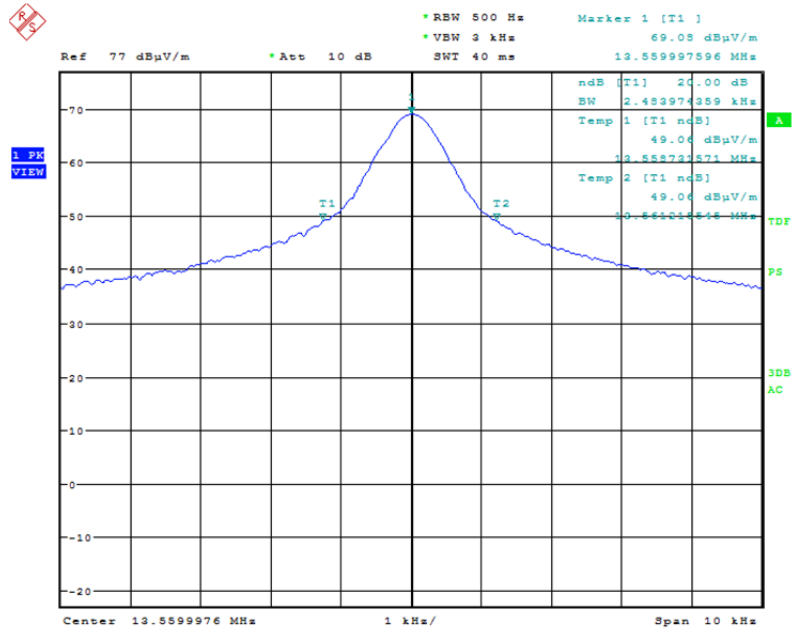
TEST EQUIPMENT USED:  
Refer to chapter 5 of this document.  
374, 516, 1291, 1889, 4075, 4717,  
5392



Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

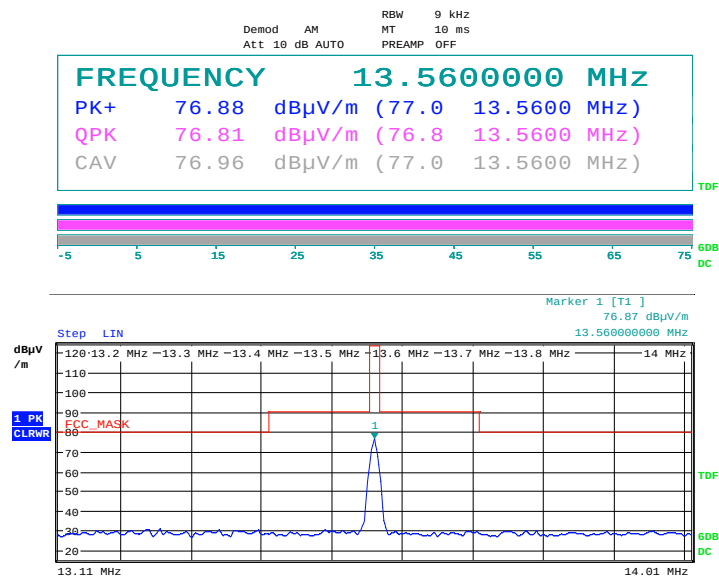
#### 4.3.4 Measurement Plot(s)

Operation Mode: Scan



Date: 14.AUG.2019 10:33:39

Operation Mode: Scan



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Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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#### 4.3.5 Test Result

| Frequency<br>[MHz] | Detector | 3m_Result<br>[dBμV/m] | Distance<br>Correction<br>[dB] | 30m_Result<br>[dBμV/m] | 30m_Limit<br>[dBμV/m] | Margin<br>[dB] |
|--------------------|----------|-----------------------|--------------------------------|------------------------|-----------------------|----------------|
| 13.56              | QP       | 76.8                  | 40                             | 36.8                   | 84                    | 47.2           |

Manufacturer: Micro-Sensys GmbH  
Type: 35.29.701.00  
Serial No.: 122322  
Test date: 2019-01-30, 2019-08-14  
Test personnel: Dominik Krüger

**The EUT meets the requirements of this section.**

#### 4.4 Occupied Bandwidth

Test Requirement: FCC 47 CFR §15.225, ISED RSS-Gen 6.7

Test Procedure: ANSI C63.10-2013

##### 4.4.1 Regulation

###### **47 CFR § 15.215 Additional provisions to the general radiated emission limitations.**

(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

###### **ISED RSS-Gen 6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth**

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

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Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

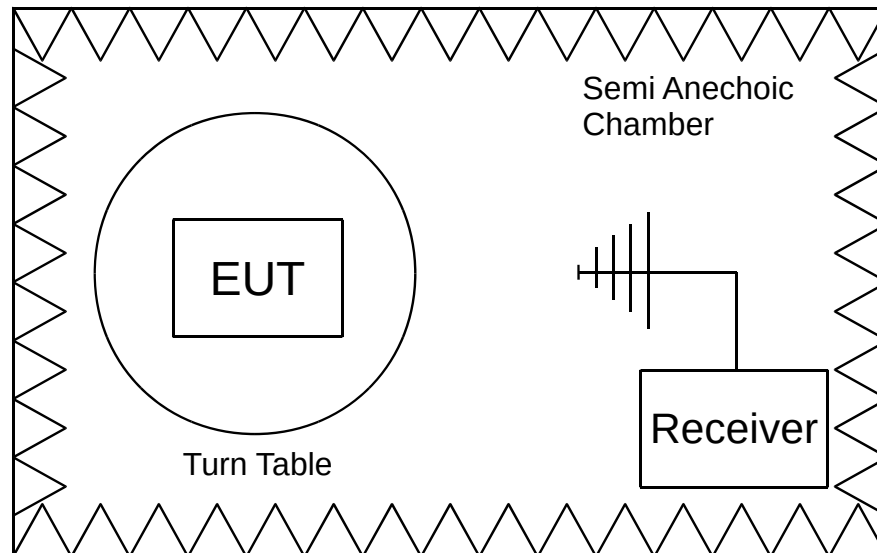
#### 4.4.2 Test Procedures

Measurement was performed in a semi-anechoic room. The EUT was tested on a 0.8 meter high tabletop and was connected to its associated peripherals. A calibrated loop antenna was positioned with its plane vertical at about 1.5m distance from the EUT. For certain applications, the loop antenna may also need to be positioned horizontally at the specified distance from the EUT. The analyzer was setup at the nominal centre frequency of the EUT. The span was 500 Hz, the resolution bandwidth 10 Hz and the video bandwidth 100 Hz. A max peak hold was used to measure the occupied bandwidth.

Worst case emissions are listed under chapter: test results.

Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.4.3 Test Setup



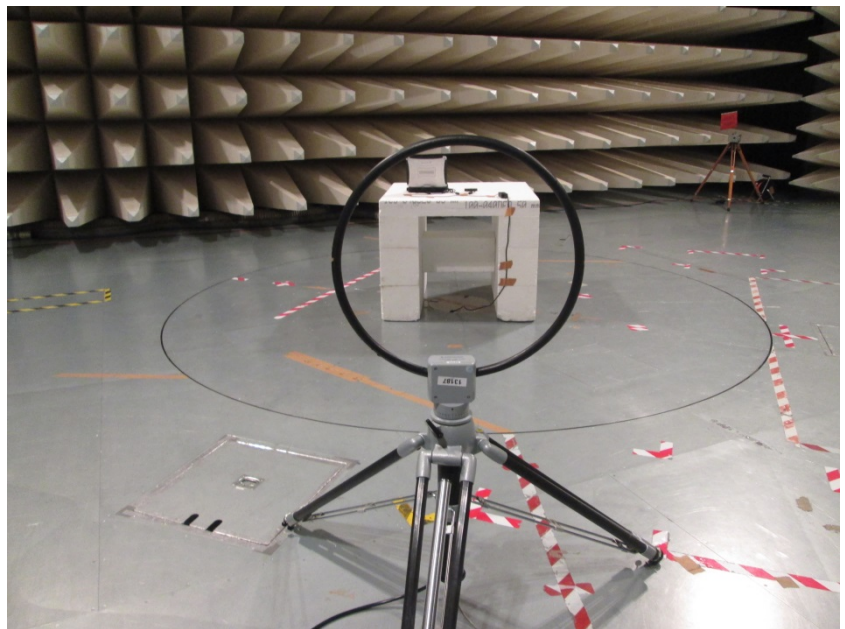
SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.215  
Procedure: ANSI C63.10-2013

Receiver: #516  
Antenna: #374

Test distance: 3 m

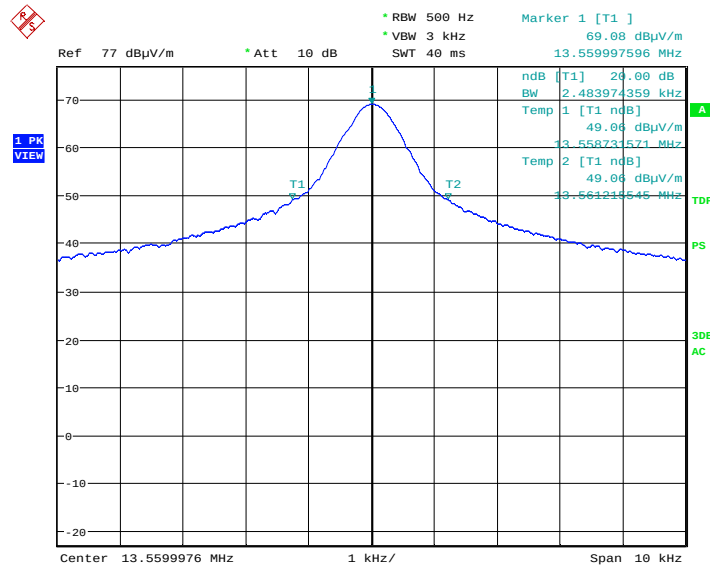
TEST EQUIPMENT USED:  
Refer to chapter 5 of this document.  
374, 516, 1291, 1889, 4075, 4717,  
5392



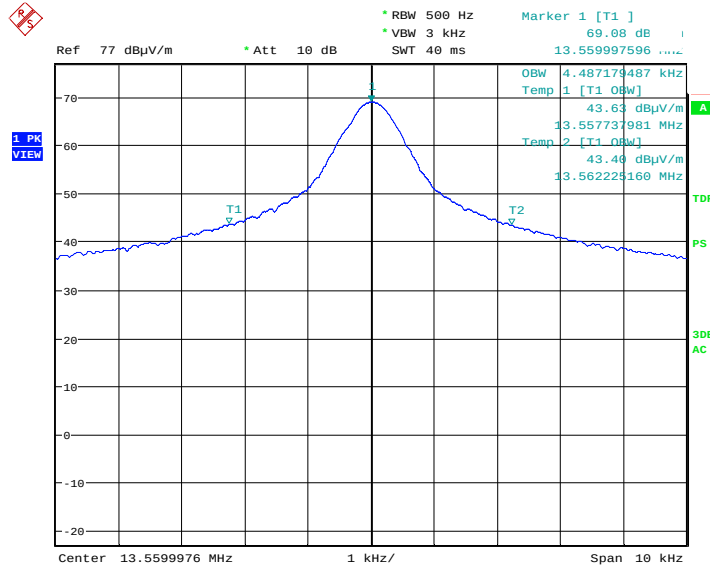
Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.4.4 Measurement Plots

Operation Mode: Scan



Occupied Bandwidth (20 dB)



Occupied Bandwidth (99%)

#### 4.4.5 Test Result

Occupied Bandwidth (20 dB) [kHz]

2.48

Occupied Bandwidth (99%) [kHz]

4.49

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Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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|                 |                   |
|-----------------|-------------------|
| Manufacturer:   | Micro-Sensys GmbH |
| Type:           | 35.29.701.00      |
| Serial No.:     | 122322            |
| Test date:      | 2019-08-14        |
| Test personnel: | Dominik Krüger    |

**The EUT meets the requirements of this section.**

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Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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## 4.5 Radiated Emissions 9 kHz – 30 MHz

Test Requirement: FCC 47 CFR §§15.205, 15.209, 15.225(d), ISED RSS-210 B.6, RSS-Gen 6.7

Test Procedure: ANSI C63.10-2013, RSS-Gen

### 4.5.1 Regulation

#### 47CFR § 15.33 Frequency range of radiated measurements

(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

#### 47CFR § 15.205 Restricted bands of operation

(d)(7) Devices operated pursuant to § 15.225 are exempt from complying with this section for the 13.36–13.41 MHz band only.

#### 47CFR § 15.225 Operation within the band 13.110–14.010 MHz.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

#### 47CFR § 15.209 Radiated emission limits.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency   | Field Strength |                     | Measurement distance |
|-------------|----------------|---------------------|----------------------|
| [MHz]       | [μV/m]         | [dBμV/m]            | [m]                  |
| 0.009–0.490 | 2400/F[kHz]    | 67.6 – 20 logF[kHz] | 300                  |
| 0.490–1.705 | 24000/F[kHz]   | 87.6 – 20 logF[kHz] | 30                   |
| 1.705–30.0  | 30             | 29.5                | 30                   |

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency.

However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

#### ISED RSS-210 B.6

The field strength of any emission shall not exceed the following limits:

(a) RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz.

#### ISED RSS-Gen 8.9 Transmitter emission limits

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.



Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

**Table 6 – General field strength limits at frequencies below 30 MHz**

| Frequency                | Field Strength | Equivalent Field Strength <sup>2</sup> | Measurement distance |
|--------------------------|----------------|----------------------------------------|----------------------|
|                          | [μA/m]         | [μV/m]                                 | [m]                  |
| 9 – 490 kHz <sup>1</sup> | 6.37/F[kHz]    | 2401/F[kHz]                            | 300                  |
| 490 – 1705 kHz           | 63.7/F[kHz]    | 24015/F[kHz]                           | 30                   |
| 1.705–30 MHz             | 0.08           | 30.16                                  | 30                   |

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Note 2: Equivalent electrical field strength according to ANSI C63.10-2013 chapter 4.3.2:

“For the United States, the regulatory limits below 30 MHz are in terms of μV/m. By convention, magnetic field strength is converted to an electric field strength based on free-space impedance.”

→ The ISED limits are in practice identical with the FCC limits (deviations below 1 %). Measurements in this report are related to the insignificant stronger FCC limits.

#### 47 CFR § 15.35 Measurement detector functions and bandwidths.

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrumentation using the CISPR quasi-peak detector can be found in ANSI C63.4-2014, clause 4 (incorporated by reference, see §15.38). As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function as long as the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

#### ISED RSS-Gen 6.13.1 Detector

When the unwanted emissions limits are defined in relative terms, the same parameter, peak power or average power, shall be used as the reference for both the transmitter's output power and the unwanted emissions measurements. When the unwanted emissions limits are expressed in absolute terms, unless otherwise stated in the applicable RSS, the following conditions shall apply:

- (a) Below 1 GHz, compliance with the limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth (see section 6.10).
- (b) Above 1 GHz, compliance with the limits shall be demonstrated using a linear average detector (see section 6.10) with a minimum resolution bandwidth of 1 MHz.

#### 4.5.2 Test Site Correlation for H Field Measurement in Semi-Anechoic Chamber (SAC)

Test procedure following KDB 414788.

The carrier at 13.56 MHz was measured in the semi-anechoic room (SAC) at a test distance of 3 m and at an open field site at a test distance of 3 m with the same calibrated loop antenna. The measurement was performed in a set-up with transmit antennas with a diameter of 0.122 m and 0.249 m, respectively.

These measurements were used to evaluate a correction of the open field measurement to the semi-anechoic room measurement.

| Ant. Diameter | Freq  | Detector | Distance | FSAC     | Fopen    | fc   |
|---------------|-------|----------|----------|----------|----------|------|
|               | [MHz] |          | [m]      | [dBμV/m] | [dBμV/m] | [dB] |
| 0.122 m       | 13.56 | QP       | 3        | 72.2     | 70.8     | -1.4 |
| 0.249 m       | 13.56 | QP       | 3        | 71.8     | 68.5     | -3.3 |

Test date: 2016-09-14

As the correction factor  $f_c$  is negligible compared to the margin found below the correction has not been taken into account.

#### 4.5.3 Calculation of Field Strength Limits

E.g. radiated emissions field strength limits for the frequency band 1.705–30.0 MHz:

30  $\mu\text{V/m}$  at 30 meters

Using the equation:

$$E_{\text{dB}\mu\text{V/m}} = 20 \log(E_{\mu\text{V/m}})$$

where

$E_{\text{dB}\mu\text{V/m}}$  = Field Strength in logarithmic units (in  $\text{dB}\mu\text{V/m}$ )

$E_{\mu\text{V/m}}$  = Field Strength in linear units (in  $\mu\text{V/m}$ )

A field strength limit of 30  $\mu\text{V/m}$  corresponds with 29.5  $\text{dB}\mu\text{V/m}$ .

##### Distance correction (limit)

*Remark: The preferred method is the correction of the measured field strength instead of limit correction. Only one correction method shall be applied to a particular measurement.*

In case of testing being performed in a distance other than specified, the limit may be adjusted by a Distance Extrapolation Factor DF of 40 dB per decade, which is calculated by the following equation:

$$\text{DF} = 40 \log(D_{\text{test}}/D_{\text{specification}})$$

where

DF = Distance Extrapolation Factor (in dB)

$D_{\text{test}}$  = Distance, where measurement was performed (in m)

$D_{\text{specification}}$  = Distance acc. to specification (in m)

Example: Assume a limit specified in 30 m and a measurement performed at 3 m: The distance correction factor is  $40 \log(30 / 3) = 40$ . This factor is mathematically added to the limit by the following equation:

$$E_{\text{dB}\mu\text{V/m\_new}} = E_{\text{dB}\mu\text{V/m}} + \text{DF}$$

where

$E_{\text{dB}\mu\text{V/m}}$  = Field Strength limit in logarithmic units (in  $\text{dB}\mu\text{V/m}$ )

$E_{\text{dB}\mu\text{V/m\_new}}$  = Corrected Field Strength limit in logarithmic units (in  $\text{dB}\mu\text{V/m}$ )

DF = Distance Extrapolation Factor (in dB)

Example: Assume a limit of 29.5  $\text{dB}\mu\text{V/m}$  specified in 30 m distance and the measurement performed at 3 m. The limit is adjusted by the distance correction factor of 40 dB to the new limit of 69.5  $\text{dB}\mu\text{V/m}$ .

#### 4.5.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where

FS = Field Strength (in dB $\mu$ V/m)

RA = Receiver Amplitude (in dB $\mu$ V)

AF = Antenna Factor (in dB (1/m))

CF = Cable Attenuation Factor (in dB)

Assume a receiver reading of 40 dB $\mu$ V is obtained. The Antenna Factor of 10 dB(1/m) and a Cable Factor of 0.5 dB are added, giving a field strength of 50.5 dB $\mu$ V/m in the measurement distance. The field strength of 50.5 dB $\mu$ V/m value can be mathematically converted to its corresponding level in  $\mu$ V/m.

$$FS = 40 + 10 + 0.5 = 50.5$$

$$\text{Level (in } \mu\text{V/m)} = \text{Common Antilogarithm } (50.5/20) = 335$$

#### Distance correction (field strength)

*Remark: The preferred method is the correction of the measured field strength instead of limit correction. Only one correction method shall be applied to a particular measurement.*

If a measurement is performed at a different distance other than specified, the field strength at the specified distance can be obtained by the following equation:

$$FS_{\text{Dspecified}} = FS_{\text{Dtest}} + 40 \log (D_{\text{test}}/D_{\text{specified}})$$

where

$FS_{\text{Dspecified}}$  = Field Strength at specified distance  $D_{\text{specified}}$  (in dB $\mu$ V/m)

$FS_{\text{Dtest}}$  = Field Strength at specified distance  $D_{\text{test}}$  (in dB $\mu$ V/m)

$D_{\text{test}}$  = Measurement distance where test was performed (in m)

$D_{\text{specified}}$  = Measurement distance as specified by the rules (in m)

Assuming a recorded field strength of 50.5 dB $\mu$ V/m in a distance of 3 m. If the rules are specifying a limit in a distance of 30 m, the field strength recorded in 3 m is corrected by the distance. Therefore, the field strength  $FS_{\text{Dspecified}}$  is  $50.5 + 40 \log (3 / 30) = 10.5$  (in dB $\mu$ V/m).

*Remark: Using EMC32 software corrections are combined in the Corr. Factor as listed in the results' table.*

*"Result" represents the FS Result, "Corr." is the combined correction factor.*

#### 4.5.5 Test Procedures

Measurement was performed in a semi-anechoic room at a test distance of 3 m. A calibrated loop antenna as specified in ANSI C63.4 clause 4.3.2 was positioned with its plane vertical at the test distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna may also need to be positioned horizontally at the specified distance from the EUT. Instead of changing the loop antenna polarization to horizontal the EUT antenna was rotated by 90 degrees. I.e. tests performed for 2 EUT antenna polarizations (EUT in 3 orientations). The center of the loop antenna was 1 m above the ground.

The EUT was tested on a 0.8 meter high tabletop.

The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter.

In certain applications, a remotely located device may be connected to the EUT. In these cases, it is permissible for cabling from the remotely located device to the EUT or accessories to be placed directly on the reference groundplane or, if normally installed beneath the reference groundplane, beneath it. The remotely located device shall be located at a distance sufficient to ensure that it does not contribute to the measured level. This procedure evaluates the interference potential of the EUT, its accessories, and interconnecting cables or wires standing apart from the remotely located device, which in turn shall be evaluated separately, if required.

Measurement initially performed as a pre-scan in the full frequency range in order to find worst case emissions. Final measurement performed at worst-case emission frequencies in a FCC and IC listed semi-anechoic room at the specified 3 m test distance. Pre-scan and final measurement performed in modulated mode with and without RFID tags.

Worst case emissions are listed under chapter: Final test results.

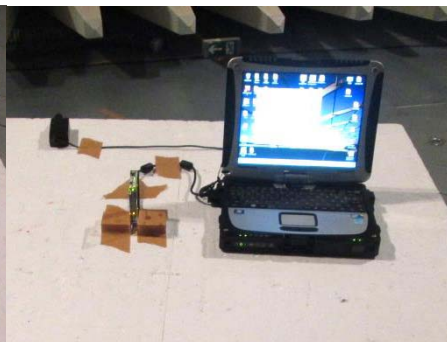
| Radiated Emissions Test Characteristics   |                             |
|-------------------------------------------|-----------------------------|
| Frequency range                           | 9 kHz - 30 MHz              |
| Test distance                             | 3 m*                        |
| Test instrumentation resolution bandwidth | 200 Hz (9 kHz - 150 kHz)    |
|                                           | 10 kHz (150 kHz - 30 MHz)   |
| Receive antenna height                    | 1 m                         |
| Receive antenna polarization              | Vertical                    |
| Measurement location                      | Semi Anechoic Chamber (SAC) |

\* According to Section 15.31 (f)(2): At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The 40 dB/decade factor was used.

#### EUT Orientations



Orientation X

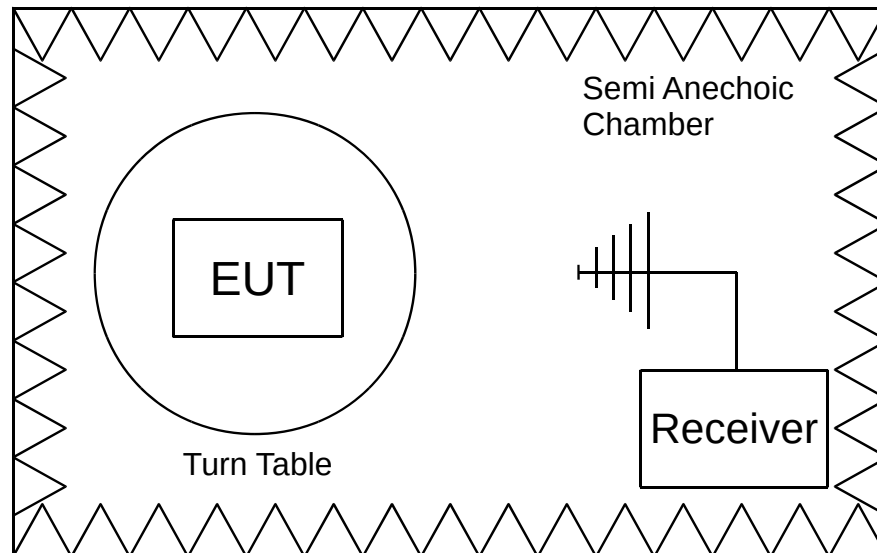


Orientation Y



Orientation Z

#### 4.5.6 Test Setup



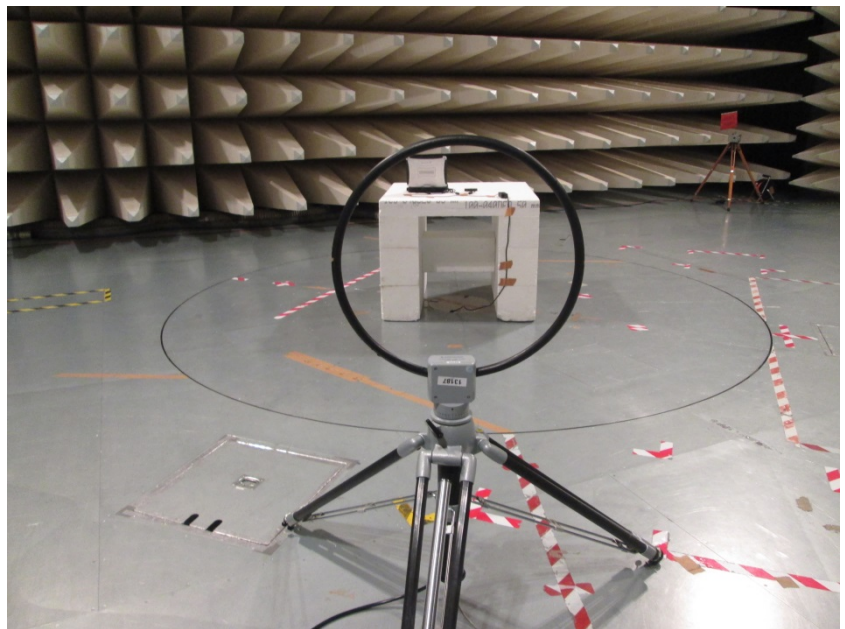
SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.209  
Procedure: ANSI C63.10-2013

Receiver: #516  
Antenna: #374

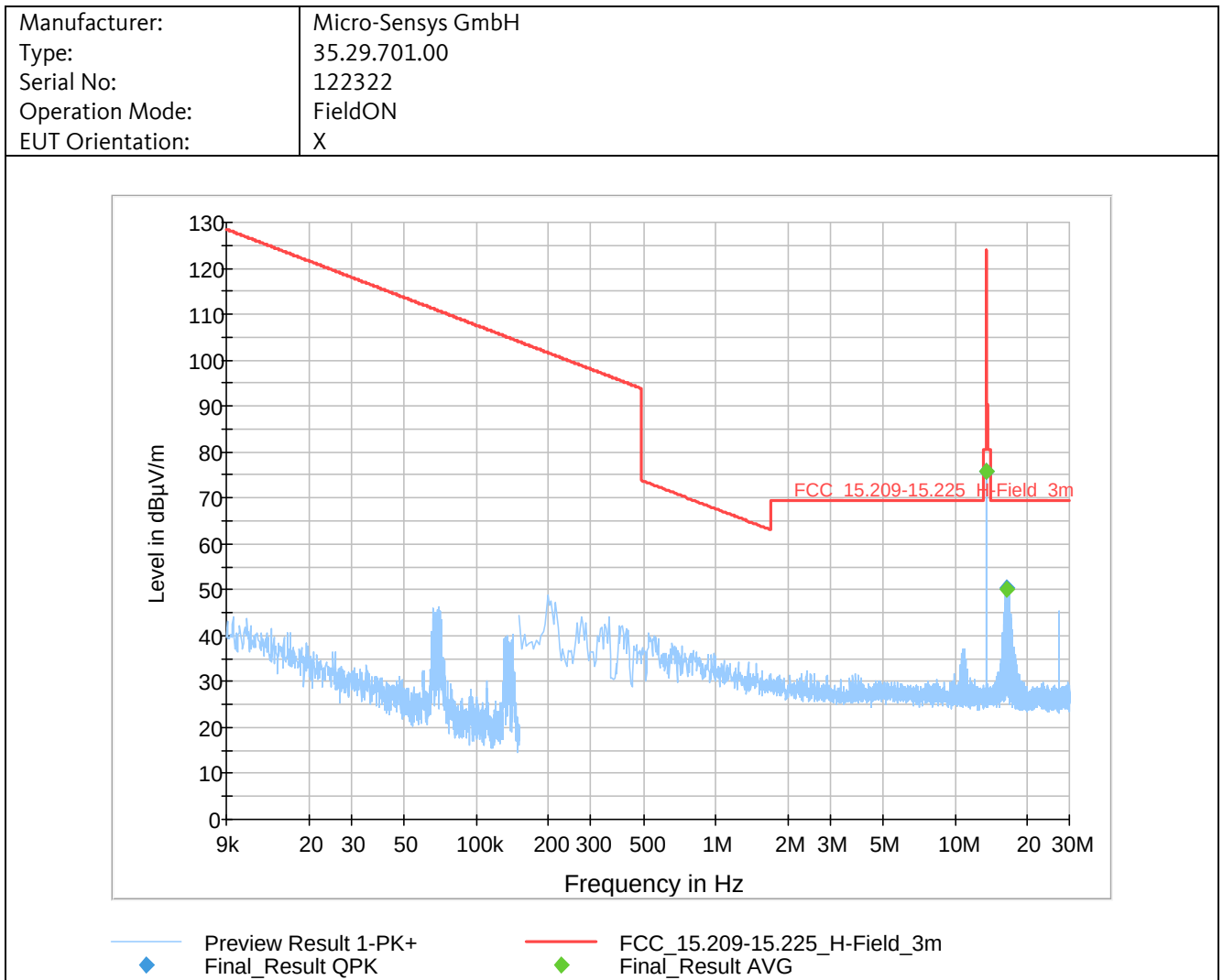
Test distance: 3 m

TEST EQUIPMENT USED:  
Refer to chapter 5 of this document.  
374, 516, 1291, 1889, 4075, 4717,  
5392



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#### 4.5.6.1 Detailed Test Data



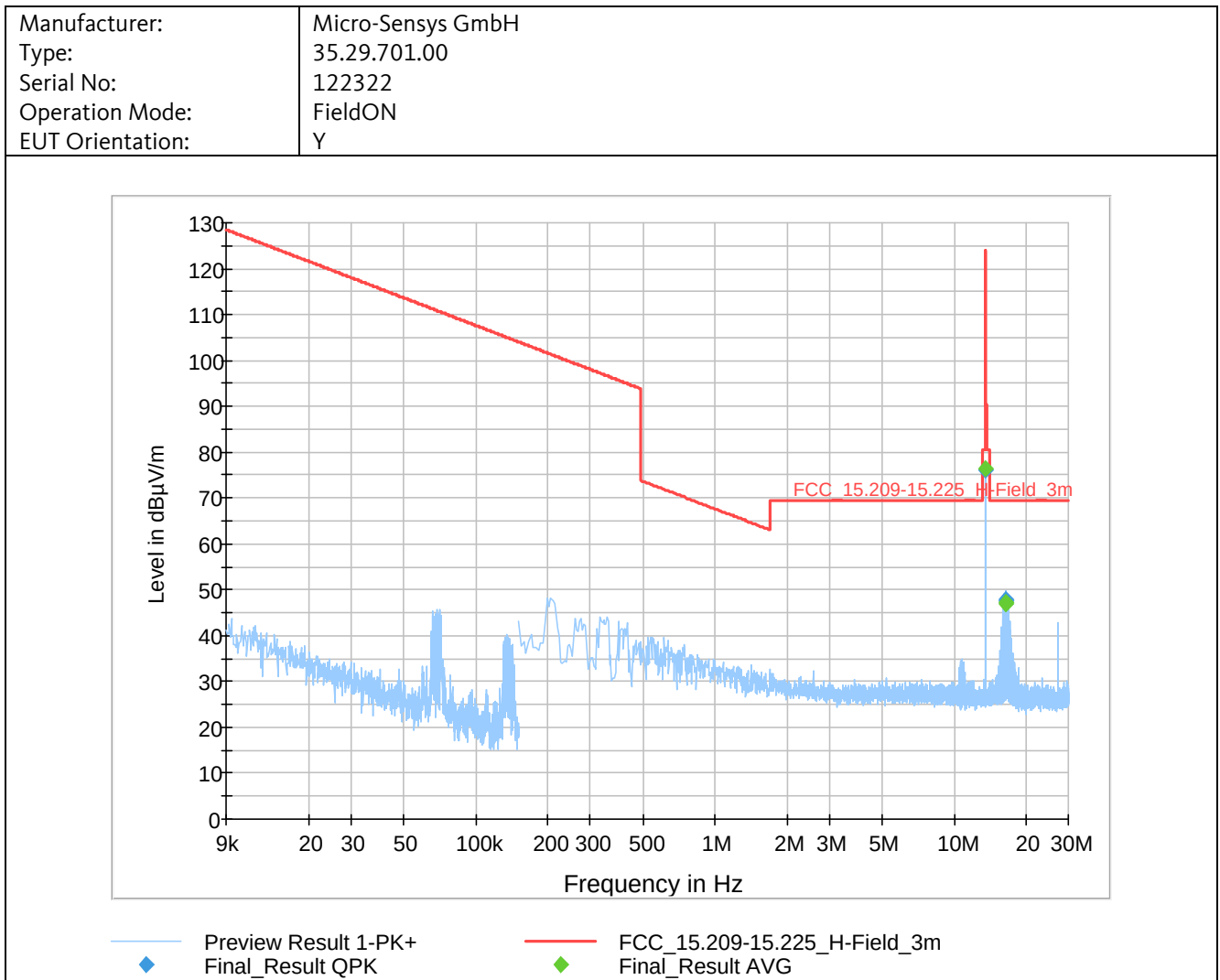
Final Result:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol |
|-----------------|--------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|
| 13.56*          | ---                | 75.8             | ---            | ---         | 1000            | 10.0            | 100.0       | V   |
| 13.56*          | 75.8               | ---              | 124.0          | 48.2        | 1000            | 10.0            | 100.0       | V   |
| 16.54           | ---                | 50.2             | ---            | ---         | 1000            | 10.0            | 100.0       | H   |
| 16.54           | 50.4               | ---              | 69.5           | 19.1        | 1000            | 10.0            | 100.0       | H   |

\* fundamental emission in the band 13.110–14.010 MHz

All tests performed at 3 m distance. The table above contains worst-case emissions, only. Only two final measurements performed because the measured values are far below the limit (> 20 dB). For further details refer to the pre-scan test plot above.

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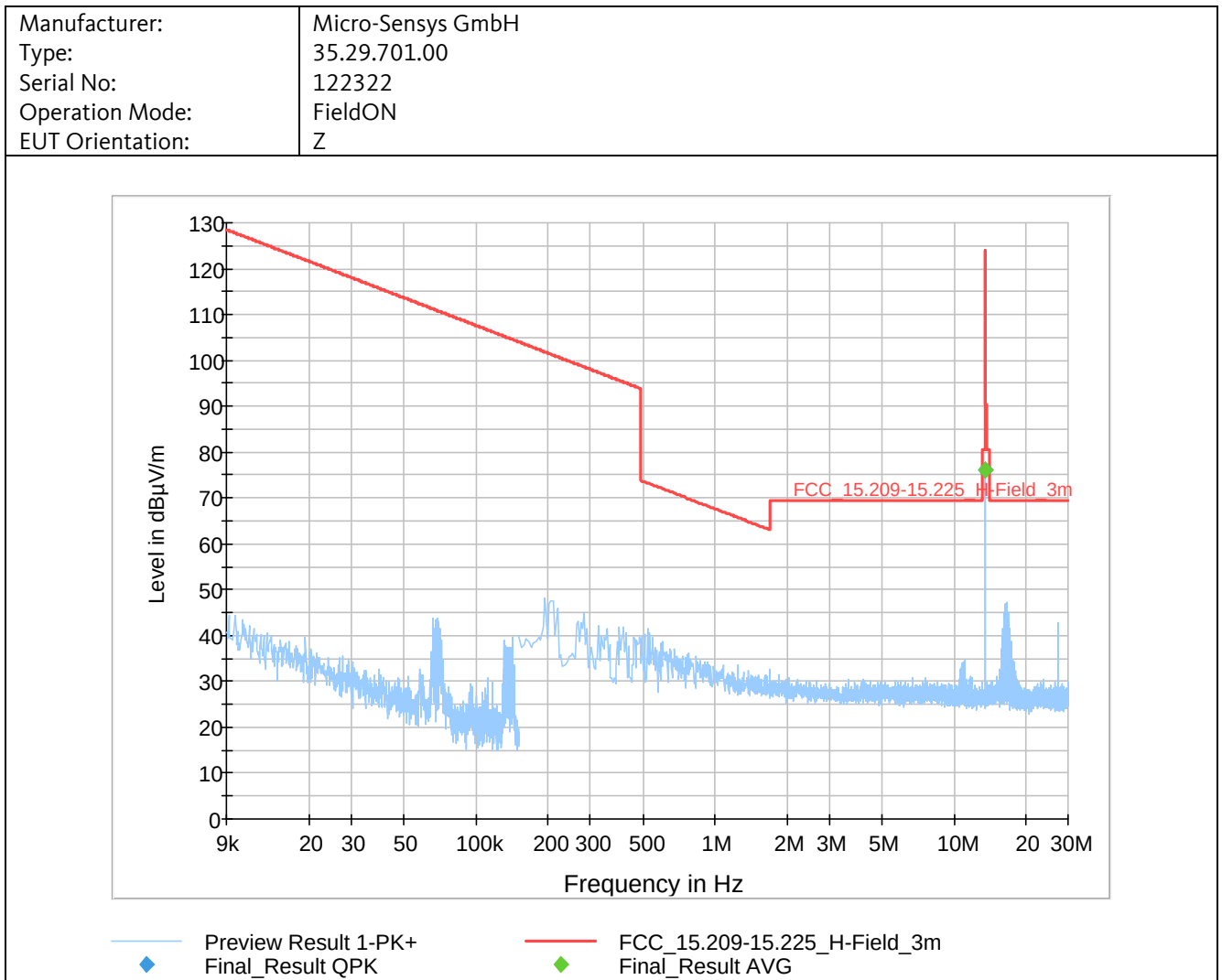
## Final Result:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol |
|-----------------|--------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|
| 13.56*          | 76.2               | ---              | 124.0          | 47.8        | 1000            | 10.0            | 100.0       | V   |
| 13.56*          | ---                | 76.3             | ---            | ---         | 1000            | 10.0            | 100.0       | V   |
| 16.43           | ---                | 47.0             | ---            | ---         | 1000            | 10.0            | 100.0       | H   |
| 16.43           | 47.6               | ---              | 69.5           | 21.9        | 1000            | 10.0            | 100.0       | H   |
| 16.54           | ---                | 47.4             | ---            | ---         | 1000            | 10.0            | 100.0       | H   |
| 16.54           | 47.8               | ---              | 69.5           | 21.7        | 1000            | 10.0            | 100.0       | H   |

\* fundamental emission in the band 13.110–14.010 MHz

All tests performed at 3 m distance. The table above contains worst-case emissions, only. Only three final measurements performed because the measured values are far below the limit (> 20 dB). For further details refer to the pre-scan test plot above.

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Final Result:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol |
|-----------------|--------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|
| 13.56*          | 76.2               | ---              | 69.5           | -6.7        | 1000            | 10.0            | 100.0       | V   |
| 13.56*          | ---                | 76.2             | ---            | ---         | 1000            | 10.0            | 100.0       | V   |

\* fundamental emission in the band 13.110–14.010 MHz

All tests performed at 3 m distance. The table above contains worst-case emissions, only. Only one final measurement performed because the measured values are far below the limit (> 20 dB). For further details refer to the pre-scan test plot above.



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#### 4.5.7 Test Result

|                 |                   |
|-----------------|-------------------|
| Manufacturer:   | Micro-Sensys GmbH |
| Type:           | 35.29.701.00      |
| Serial No.:     | 122322            |
| Test date:      | 2019-01-29        |
| Test personnel: | Dominik Krüger    |

**The EUT meets the requirements of this section.**

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## 4.6 Radiated Emissions 30 MHz – 1000 MHz

Test Requirement: FCC 47 CFR § 15.109, 15.205, 15.209, 15.225(d), ISSED RSS-210 B.6, RSS-Gen 6.7, ICES-003

Test Procedure: ANSI C63.10-2013, RSS-Gen, ANSI C63.4-2014

### 4.6.1 Regulation

#### 47CFR § 15.33 Frequency range of radiated measurements

(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

(b) For unintentional radiators:

(1) Except as otherwise indicated in paragraphs (b)(2) or (b)(3) of this section, for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

| Highest frequency generated or used in the device or on which the device operates or tunes | Upper frequency of measurement range (MHz)                           |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| [MHz]                                                                                      | [MHz]                                                                |
| Below 1.705                                                                                | 30                                                                   |
| 1.705-108                                                                                  | 1000                                                                 |
| 108-500                                                                                    | 2000                                                                 |
| 500-1000                                                                                   | 5000                                                                 |
| Above 1000                                                                                 | 5th harmonic of the highest frequency or 40 GHz, whichever is lower. |

#### 47CFR § 15.205 Restricted bands of operation

(d)(7) Devices operated pursuant to § 15.225 are exempt from complying with this section for the 13.36–13.41 MHz band only.

#### 47CFR § 15.225 Operation within the band 13.110–14.010 MHz.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

#### 47CFR § 15.109 Radiated emission limits.

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency | Field Strength |          | Measurement distance |
|-----------|----------------|----------|----------------------|
|           | [μV/m]         | [dBμV/m] | [m]                  |
| 30–88     | 100            | 40.0     | 3                    |
| 88–216    | 150            | 43.5     | 3                    |
| 216–960   | 200            | 46.0     | 3                    |
| above 960 | 500            | 54.0     | 3                    |

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(c) In the emission tables above, the tighter limit applies at the band edges. Sections 15.33 and 15.35 which specify the frequency range over which radiated emissions are to be measured and the detector functions and other measurement standards apply.

#### 47CFR § 15.209 Radiated emission limits.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency | Field Strength |          | Measurement distance |
|-----------|----------------|----------|----------------------|
|           | [μV/m]         | [dBμV/m] | [m]                  |
| 30–88     | 100            | 40.0     | 3                    |
| 88–216    | 150            | 43.5     | 3                    |
| 216–960   | 200            | 46.0     | 3                    |
| above 960 | 500            | 54.0     | 3                    |

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

#### ISED RSS-210 B.6 Band 13.110-14.010 MHz

The field strength of any emission shall not exceed the following limits:

15.848 mV/m (84 dBμV/m) at 30 m, within the band 13.553-13.567 MHz;

334 μV/m (50.5 dBμV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;

106 μV/m (40.5 dBμV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz; and

RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz.

#### ISED RSS-Gen 8.9 Transmitter emission limits

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

**Table 5 – General field strength limits at frequencies above 30 MHz**

| Frequency | Field Strength |
|-----------|----------------|
| [MHz ]    | [μV/m at 3 m]  |
| 30–88     | 100            |
| 88–216    | 150            |
| 216–960   | 200            |
| above 960 | 500            |

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### ICES-003 6.2.1 Radiated emissions limits below 1 GHz

Class B: ITE that does not meet the conditions for Class A operation shall comply with the Class B radiated limits set out in Table 5 determined at a distance of 3 metres.

**Table 5 — Class B Radiated limits below 1 GHz**

| Frequency | Class B Radiated Limit QP |
|-----------|---------------------------|
| [MHz ]    | [dBμV/m]                  |
| 30–88     | 100                       |
| 88–216    | 150                       |
| 216–960   | 200                       |
| above 960 | 500                       |

→ The ISED limits are identical with the FCC limits.

### 47 CFR § 15.35 Measurement detector functions and bandwidths.

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrumentation using the CISPR quasi-peak detector can be found in ANSI C63.4-2014, clause 4 (incorporated by reference, see §15.38). As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function as long as the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

### ISED RSS-Gen 6.13.1 Detector

When the unwanted emissions limits are defined in relative terms, the same parameter, peak power or average power, shall be used as the reference for both the transmitter's output power and the unwanted emissions measurements. When the unwanted emissions limits are expressed in absolute terms, unless otherwise stated in the applicable RSS, the following conditions shall apply:

- (a) Below 1 GHz, compliance with the limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth (see section 6.10).
- (b) Above 1 GHz, compliance with the limits shall be demonstrated using a linear average detector (see section 6.10) with a minimum resolution bandwidth of 1 MHz.

### 4.6.2 Calculation of Field Strength Limits

E.g. radiated emissions field strength limits for the frequency band 88 - 216 MHz:

150 μV/m at 3 meters

Using the equation:

$$E_{dB\mu V/m} = 20 \log (E_{\mu V/m})$$

where

$E_{dB\mu V/m}$  = Field Strength in logarithmic units (in dBμV/m)

$E_{\mu V/m}$  = Field Strength in linear units (in μV/m)

A field strength limit of 150 μV/m corresponds with 43.5 dBμV/m.

### 4.6.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where

FS = Field Strength (in dBμV/m)

RA = Receiver Amplitude (in dBμV)

AF = Antenna Factor (in dB (1/m))

CF = Cable Attenuation Factor (in dB)

If the measurement unit is dBm instead of dBμV, the conversation constant of 107 dB has to be added to the reading in dBm.

Assume a receiver reading of -30.1 dBm is obtained. The Antenna Factor of 39.2 dB(1/m) and a Cable Factor of 1.2 dB are added, giving a field strength of 117.3 dBμV/m in the measurement distance. The field strength of 117.3 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

$$FS = -30.1 + 39.2 + 1.2 + 107 = 117.3$$

$$\text{Level (in } \mu\text{V/m)} = \text{Common Antilogarithm } (117.3/20) = 732825$$

#### Distance correction (field strength)

If a measurement is performed at a different distance other than specified, the field strength at the specified distance can be obtained by the following equation:

$$FS_{D_{\text{specified}}} = FS_{D_{\text{test}}} + 20 \log (D_{\text{test}}/D_{\text{specified}})$$

where

$FS_{D_{\text{specified}}}$  = Field Strength at specified distance  $D_{\text{specified}}$  (in dBμV/m)

$FS_{D_{\text{test}}}$  = Field Strength at specified distance  $D_{\text{test}}$  (in dBμV/m)

$D_{\text{test}}$  = Measurement distance where test was performed (in m)

$D_{\text{specified}}$  = Measurement distance as specified by the rules (in m)

Assuming a recorded field strength of 117.3 dBμV/m in a distance of 1 m. If the rules are specifying a limit in a distance of 3 m, the field strength recorded in 1 m is corrected by the distance. Therefore, the field strength  $FS_{D_{\text{specified}}}$  is  $117.3 + 20 \log (1 / 3) = 107.8$  (in dBμV/m).

*Remark: Using EMC32 software corrections are combined in the Corr. Factor as listed in the results' table.*

*"Result" represents the FS Result, "Corr." is the combined correction factor.*

#### 4.6.4 Test Procedures

According to customer information the highest fundamental frequency of the intentional radiator is 27.12 MHz.

With this frequency and taking 47CFR § 15.33 (a) (1) into account the spectrum shall be investigated up to 271.2 MHz, and according to 47CFR § 15.33 (b) (1) up to 1000 MHz.

The EUT was tested on a 0.8 meter high tabletop.

In certain applications, a remotely located device may be connected to the EUT. In these cases, it is permissible for cabling from the remotely located device to the EUT or accessories to be placed directly on the reference groundplane or, if normally installed beneath the reference groundplane, beneath it. The remotely located device shall be located at a distance sufficient to ensure that it does not contribute to the measured level. This procedure evaluates the interference potential of the EUT, its accessories, and interconnecting cables or wires standing apart from the remotely located device, which in turn shall be evaluated separately, if required.

With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions [Remark: Not applicable]. All tests performed with the EUT placed in both vertical and horizontal polarizations on the nonconductive table as shown in chapter .

Measurement initially performed as a pre-scan in the full frequency range in order to find worst case emissions. Final measurement performed at worst-case emission frequencies in a FCC and IC listed semi-anechoic room at the specified 3 m test distance. Pre-scan and final measurement performed in modulated mode.

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Worst case emissions are listed under chapter: test results.

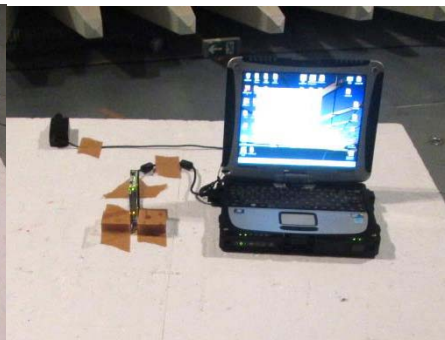
| Radiated Emissions Test Characteristics   |                             |
|-------------------------------------------|-----------------------------|
| Frequency range                           | 30 MHz – 1000 MHz           |
| Test distance                             | 3 m*                        |
| Test instrumentation resolution bandwidth | 120 kHz                     |
| Receive antenna height                    | 1 m - 4 m                   |
| Receive antenna polarization              | Vertical/Horizontal         |
| Measurement location                      | Semi Anechoic Chamber (SAC) |

\* According to Section 15.31 (f)(1): At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. (...) When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

#### EUT Orientations



Orientation X

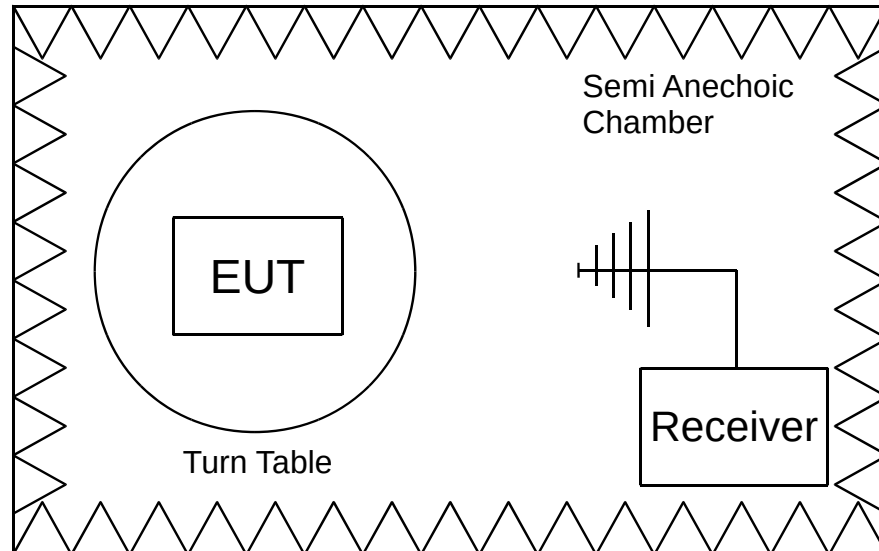


Orientation Y



Orientation Z

#### 4.6.5 Test Setup



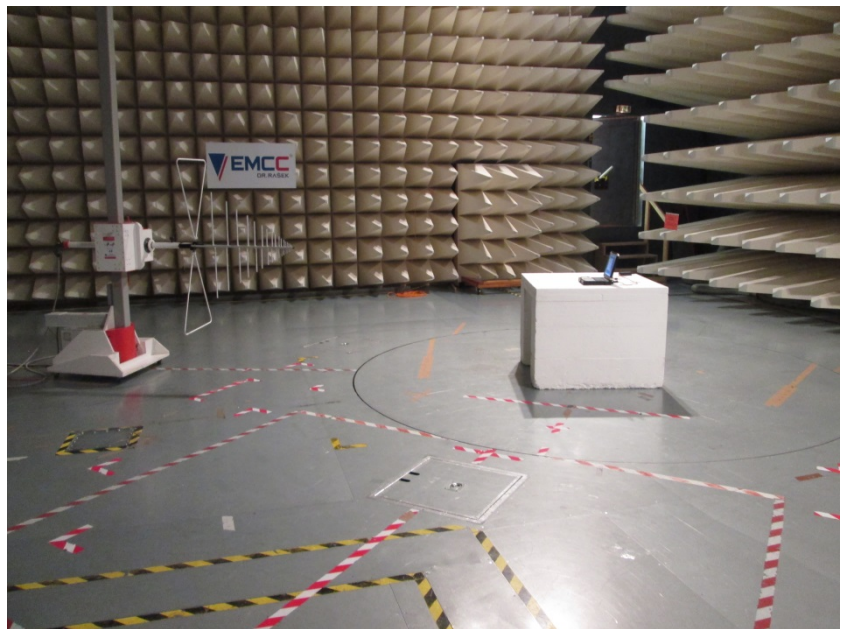
SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.209  
§ 15.109, ICES-003  
Procedure: ANSI C63.10-2013  
ANSI C63.4-2014

Receiver: #516  
Antenna: #6041

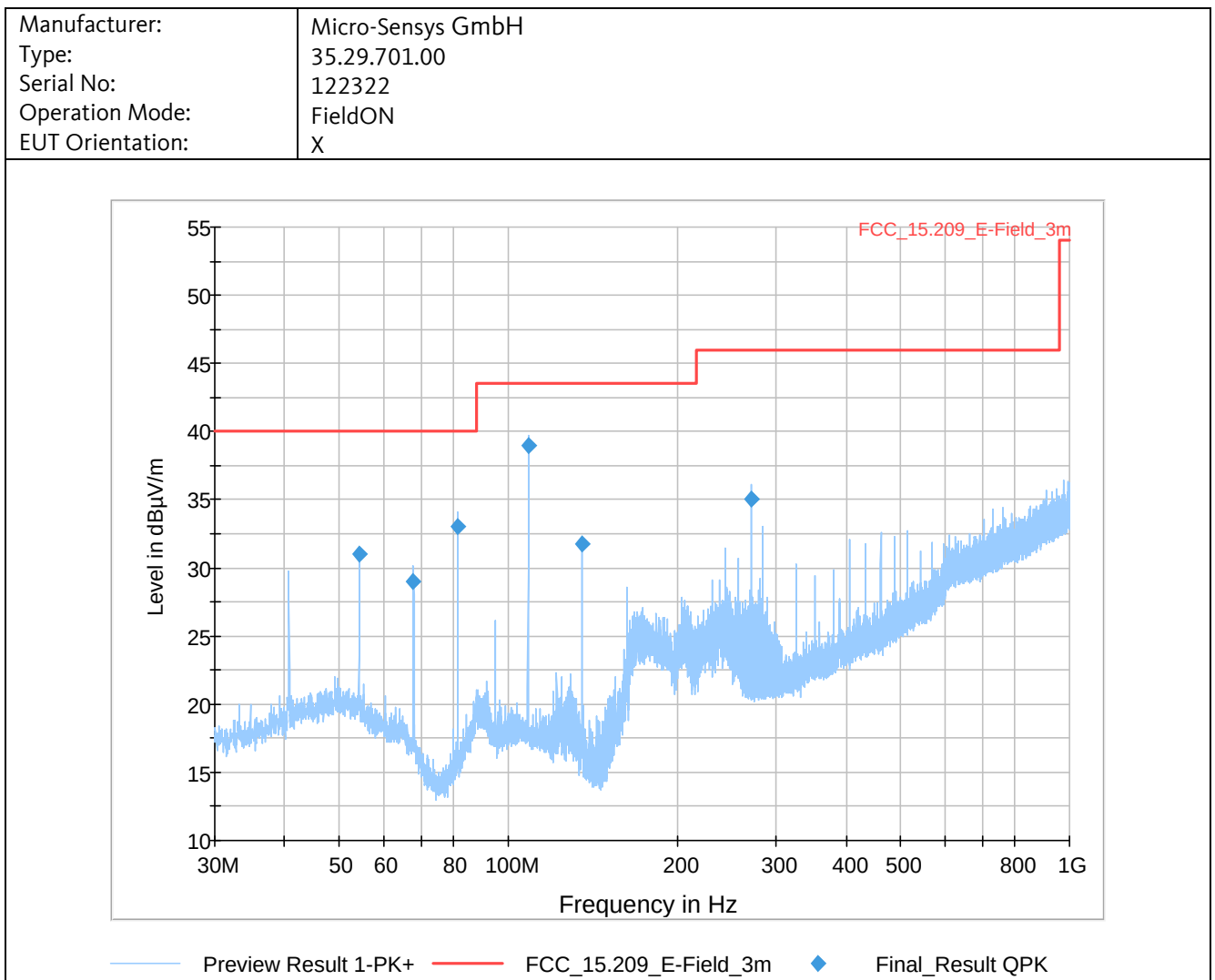
Test distance: 3 m

TEST EQUIPMENT USED:  
Refer to chapter 5 of this document.  
54, 516, 1291, 1292, 1889, 2724,  
3195, 4717, 5392, 6041



Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.6.6 Detailed Test Data



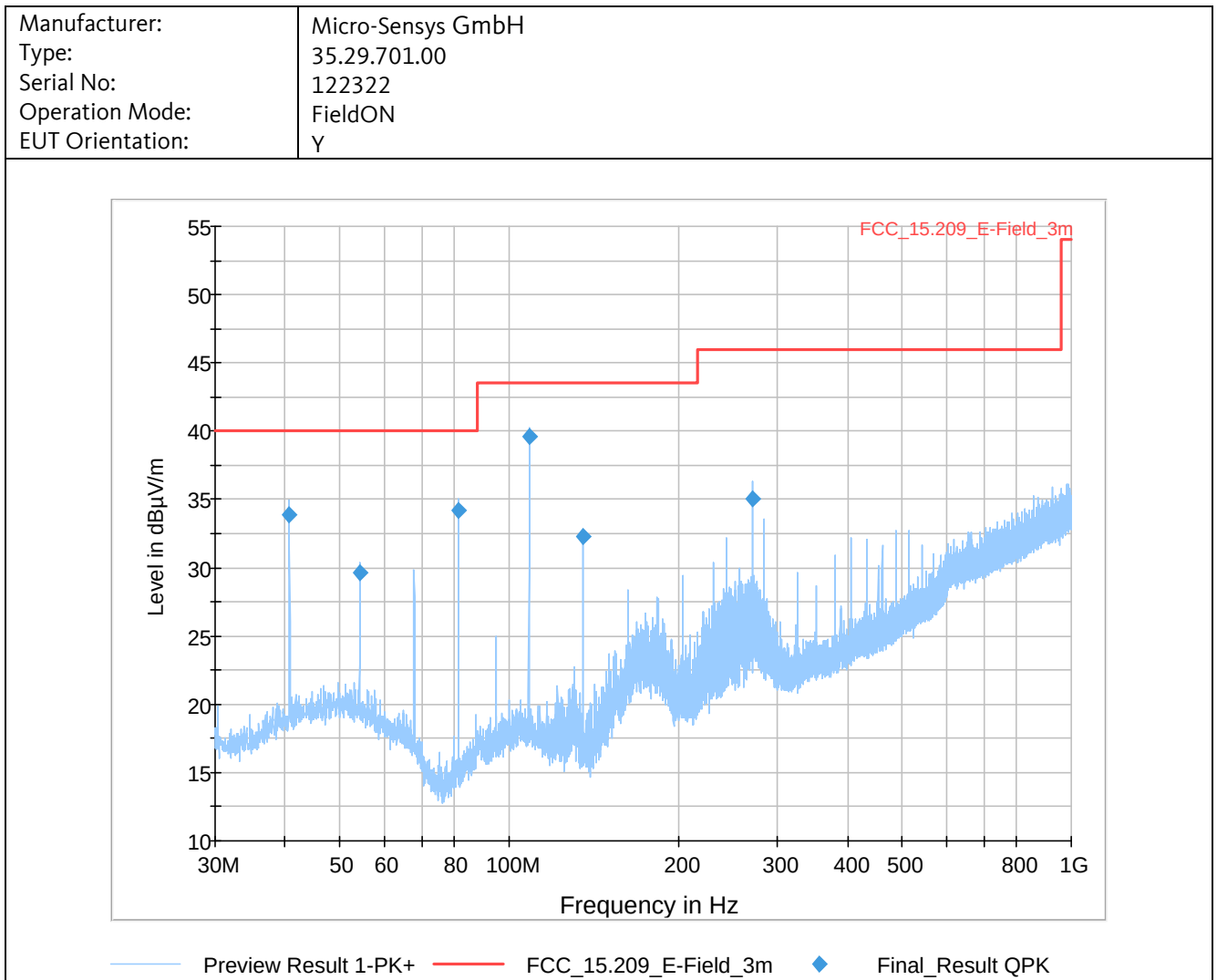
Final Result:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 54.22           | 31.0               | 40.0           | 9.0         | 1000            | 120.0           | 100.0       | V   | 142           | 19.3         |
| 67.82           | 29.0               | 40.0           | 11.0        | 1000            | 120.0           | 318.0       | H   | 2             | 16.2         |
| 81.38           | 33.0               | 40.0           | 7.0         | 1000            | 120.0           | 400.0       | H   | -1            | 13.6         |
| 108.46          | 39.0               | 43.5           | 4.5         | 1000            | 120.0           | 293.0       | H   | 168           | 17.5         |
| 135.58          | 31.8               | 43.5           | 11.7        | 1000            | 120.0           | 243.0       | H   | -42           | 13.8         |
| 271.22          | 35.1               | 46.0           | 10.9        | 1000            | 120.0           | 107.0       | H   | -106          | 19.3         |

All tests performed at 3 m distance. The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.



## Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

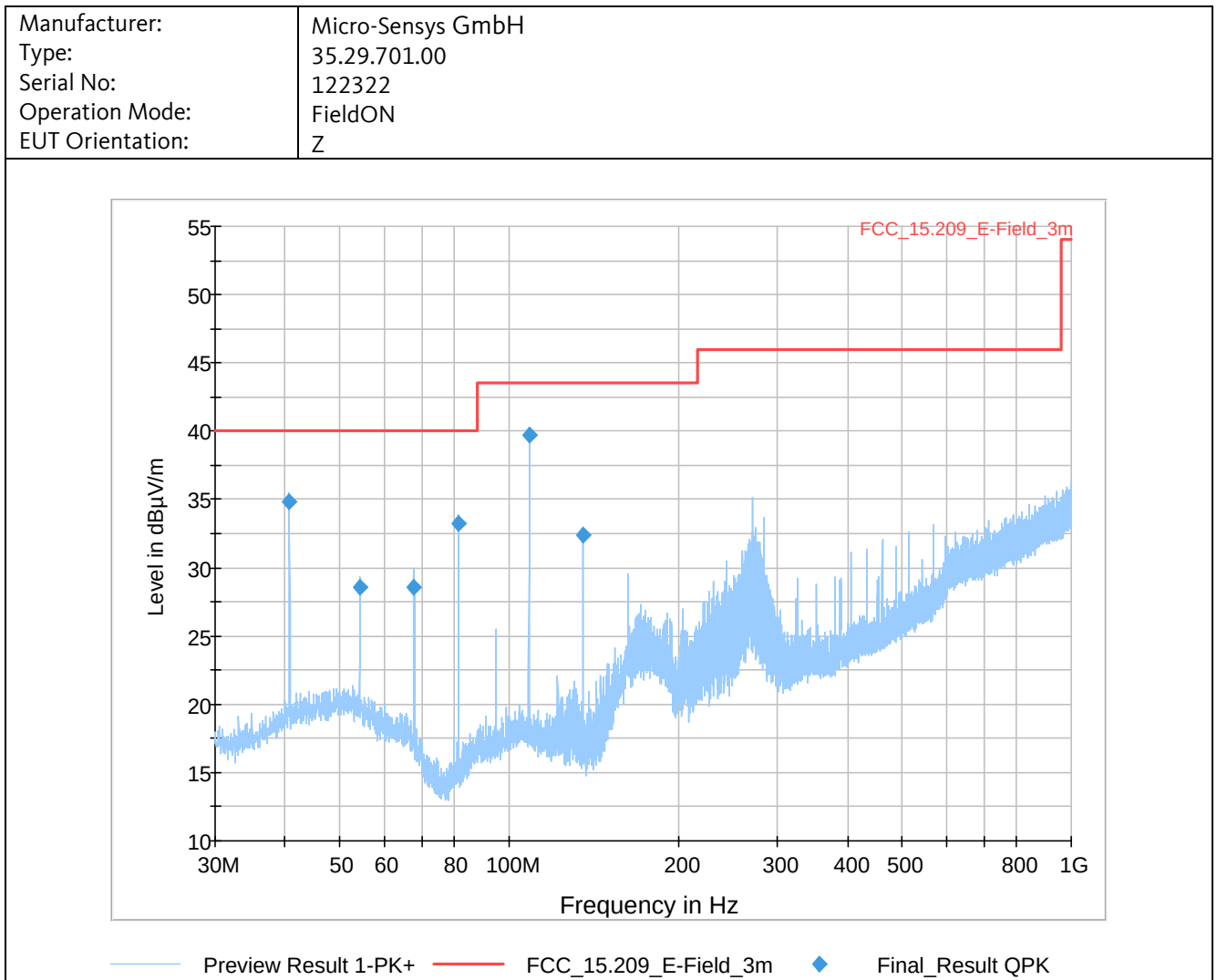


## Final Result:

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 40.70           | 33.9               | 40.0           | 6.1         | 1000            | 120.0           | 100.0       | V   | -14           | 18.8         |
| 54.22           | 29.6               | 40.0           | 10.4        | 1000            | 120.0           | 100.0       | V   | 122           | 19.3         |
| 81.34           | 34.2               | 40.0           | 5.8         | 1000            | 120.0           | 218.0       | H   | 175           | 13.6         |
| 108.46          | 39.6               | 43.5           | 3.9         | 1000            | 120.0           | 278.0       | H   | 168           | 17.5         |
| 135.58          | 32.3               | 43.5           | 11.2        | 1000            | 120.0           | 174.0       | H   | 156           | 13.8         |
| 271.18          | 35.1               | 46.0           | 10.9        | 1000            | 120.0           | 108.0       | H   | -105          | 19.3         |

All tests performed at 3 m distance. The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

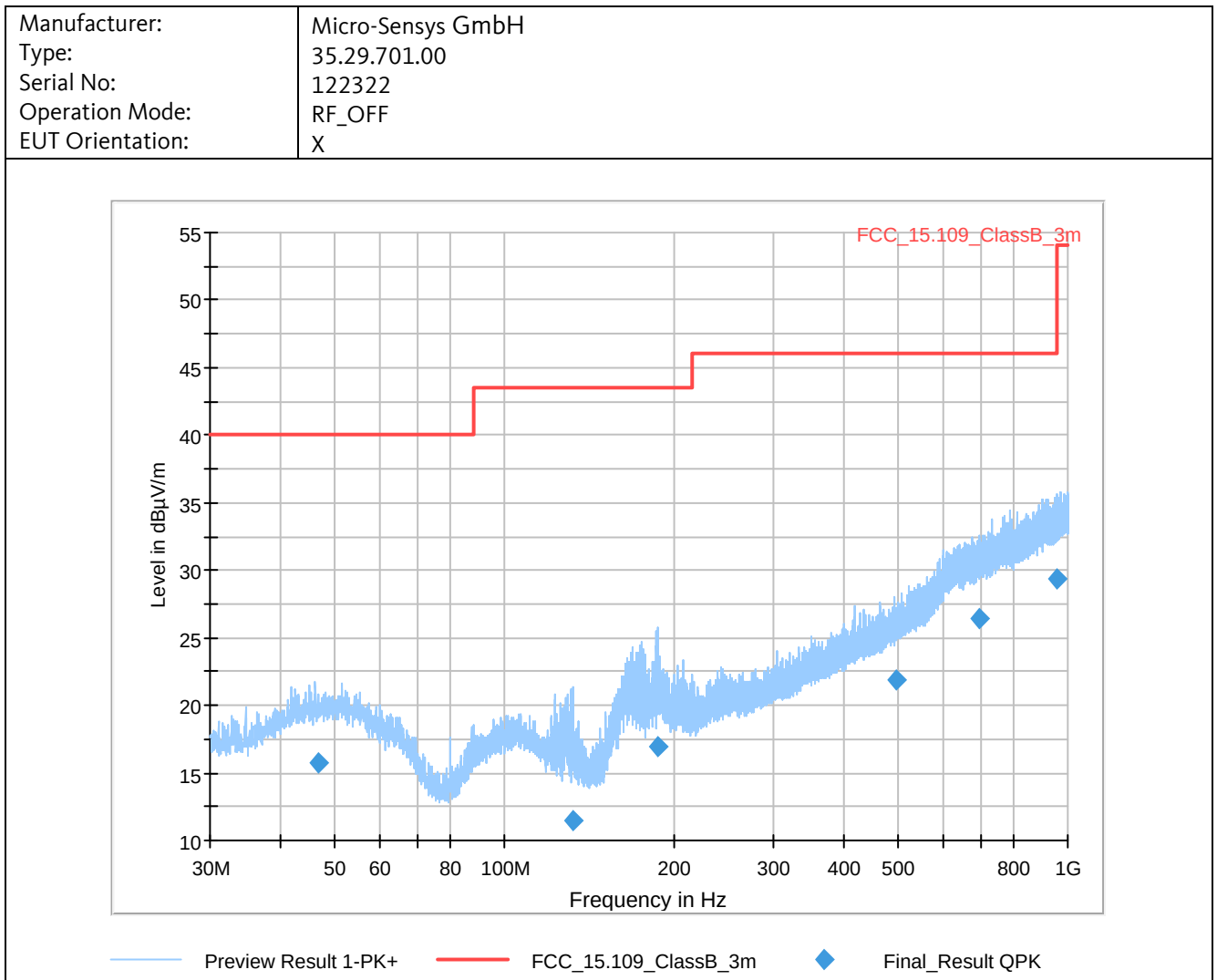


Final Result:

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 40.66           | 34.8               | 40.0           | 5.2         | 1000            | 120.0           | 100.0       | V   | -21           | 18.8         |
| 54.22           | 28.6               | 40.0           | 11.4        | 1000            | 120.0           | 101.0       | V   | 130           | 19.3         |
| 67.78           | 28.6               | 40.0           | 11.4        | 1000            | 120.0           | 323.0       | H   | -8            | 16.2         |
| 81.34           | 33.2               | 40.0           | 6.8         | 1000            | 120.0           | 400.0       | H   | -14           | 13.6         |
| 108.46          | 39.7               | 43.5           | 3.8         | 1000            | 120.0           | 282.0       | H   | 161           | 17.5         |
| 135.58          | 32.4               | 43.5           | 11.1        | 1000            | 120.0           | 223.0       | H   | 157           | 13.8         |

All tests performed at 3 m distance. The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

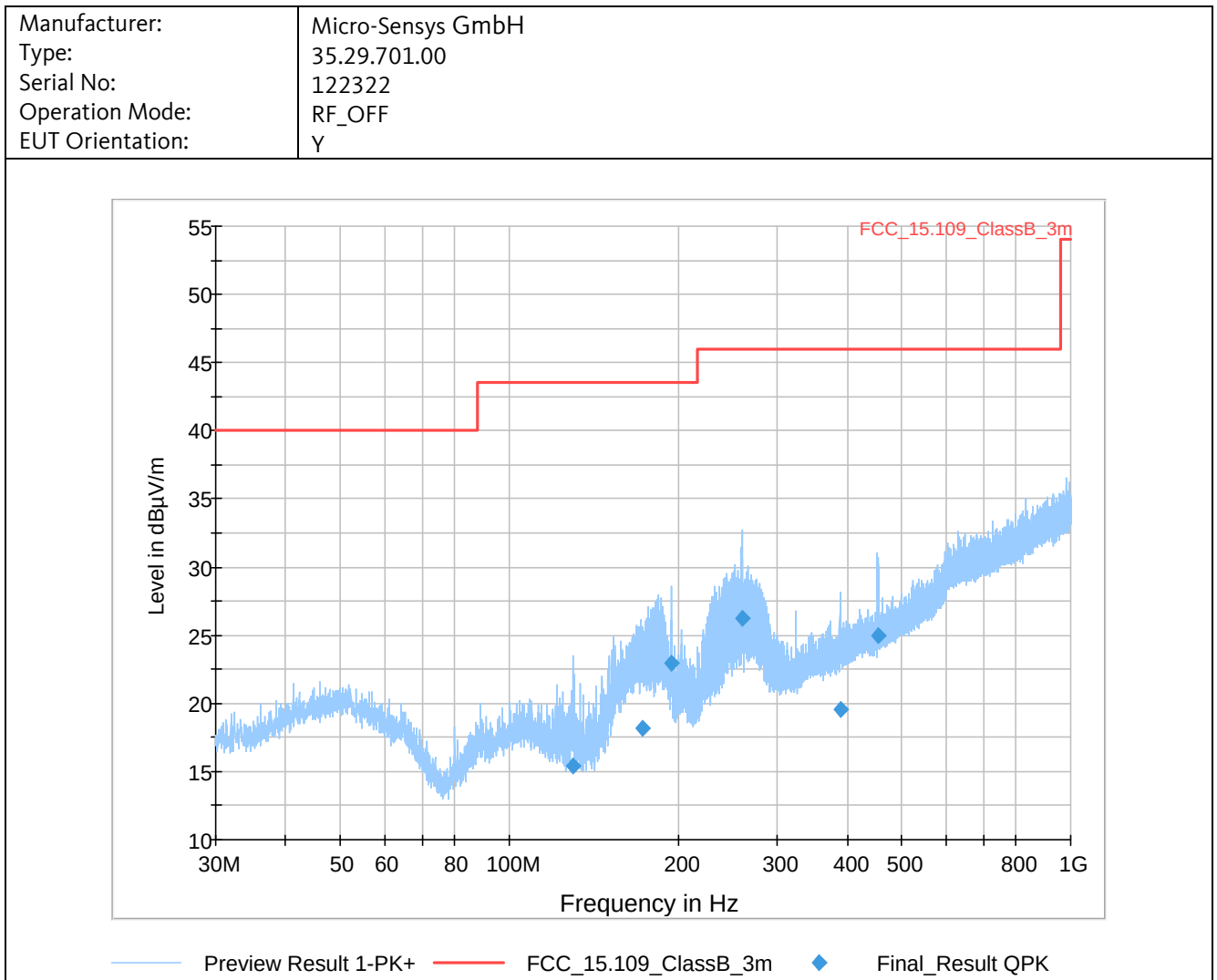


Final Result:

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 46.62           | 15.8               | 40.0           | 24.2        | 1000            | 120.0           | 309.0       | V   | 180           | 19.5         |
| 131.86          | 11.5               | 43.5           | 32.0        | 1000            | 120.0           | 117.0       | V   | 7             | 14.0         |
| 187.06          | 17.0               | 43.5           | 26.5        | 1000            | 120.0           | 103.0       | H   | 158           | 16.2         |
| 494.22          | 22.0               | 46.0           | 24.1        | 1000            | 120.0           | 264.0       | V   | -73           | 24.2         |
| 695.46          | 26.4               | 46.0           | 19.6        | 1000            | 120.0           | 400.0       | H   | 59            | 27.3         |
| 953.50          | 29.4               | 46.0           | 16.6        | 1000            | 120.0           | 100.0       | H   | 11            | 30.1         |

All tests performed at 3 m distance. The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

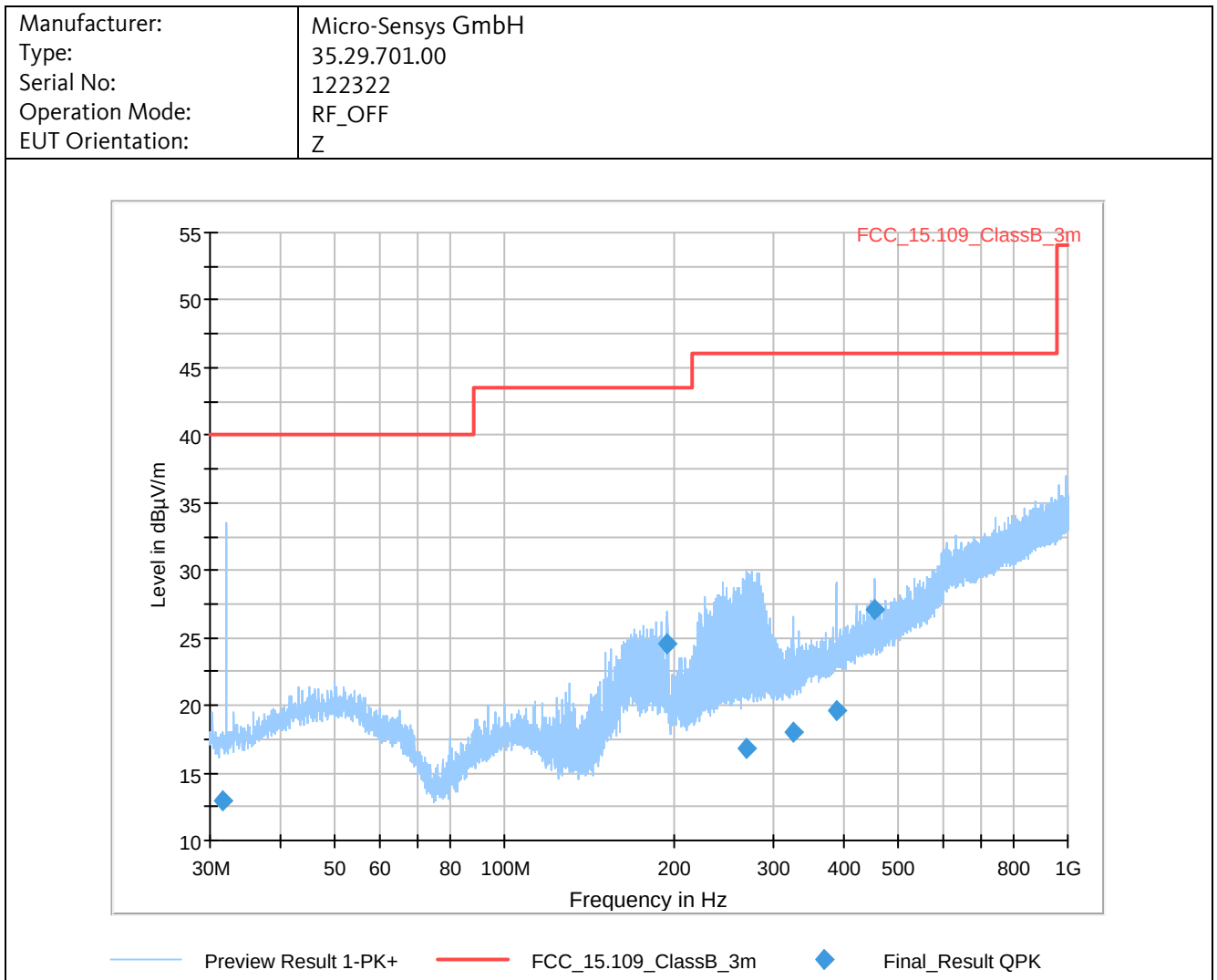


Final Result:

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 129.86          | 15.4               | 43.5           | 28.1        | 1000            | 120.0           | 101.0       | V   | -50           | 14.2         |
| 172.22          | 18.2               | 43.5           | 25.3        | 1000            | 120.0           | 115.0       | H   | -150          | 15.0         |
| 194.86          | 22.9               | 43.5           | 20.6        | 1000            | 120.0           | 247.0       | V   | -27           | 17.1         |
| 259.82          | 26.2               | 46.0           | 19.8        | 1000            | 120.0           | 209.0       | V   | 12            | 19.2         |
| 388.34          | 19.6               | 46.0           | 26.4        | 1000            | 120.0           | 127.0       | V   | -105          | 22.2         |
| 452.98          | 25.0               | 46.0           | 21.0        | 1000            | 120.0           | 109.0       | V   | 164           | 23.3         |

All tests performed at 3 m distance. The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

## Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9



## Final Result:

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 31.58           | 13.0               | 40.0           | 27.0        | 1000            | 120.0           | 372.0       | H   | 135           | 16.4         |
| 194.86          | 24.6               | 43.5           | 18.9        | 1000            | 120.0           | 241.0       | V   | 10            | 17.1         |
| 269.34          | 16.8               | 46.0           | 29.2        | 1000            | 120.0           | 104.0       | H   | 58            | 19.3         |
| 325.10          | 18.0               | 46.0           | 28.0        | 1000            | 120.0           | 100.0       | V   | 180           | 20.7         |
| 387.90          | 19.6               | 46.0           | 26.4        | 1000            | 120.0           | 160.0       | V   | 120           | 22.2         |
| 453.06          | 27.1               | 46.0           | 18.9        | 1000            | 120.0           | 104.0       | V   | 175           | 23.3         |

All tests performed at 3 m distance. The table above contains worst-case emissions, only. For further details refer to the pre-scan test plot above.

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Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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#### **4.6.7 Test Result**

|                 |                   |
|-----------------|-------------------|
| Manufacturer:   | Micro-Sensys GmbH |
| Type:           | 35.29.701.00      |
| Serial No.:     | 122322            |
| Test date:      | 2019-01-28        |
| Test personnel: | Dominik Krüger    |

**The EUT meets the requirements of this section.**

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Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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## 4.7 Carrier Frequency Stability vs Temperature

Test Requirement: FCC 47 CFR §15.225(e), ISSED RSS-210 B.6

Test Procedure: ANSI C63.10-2013, RSS-Gen 6.11

### 4.7.1 Regulation

#### 47 CFR § 15.225 Operation within the band 13.110–14.010 MHz.

(e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

#### RSS-210 B.6 Band 13.110-14.010 MHz

Carrier frequency stability shall be maintained to  $\pm 0.01\%$  ( $\pm 100$  ppm).

### 4.7.2 Test Procedures

#### Frequency stability with respect to ambient temperature:

The EUT was supplied with the nominal DC voltage (5 V) by the USB-port of a notebook. The EUT was placed in the centre of the environmental test chamber. The measurement antenna was placed in the environmental test chamber next to the EUT and connected to a receiver. It was verified that the receiver had an adequate signal level to allow the measurement.

The temperature control of the environmental test chamber was set to the highest temperature for sufficient time to allow the EUT to stabilize at the temperature.

a) While maintaining a constant temperature inside the environmental chamber, the EUT was turned on and the operating frequency was measured at start-up, two, five and ten minutes after the EUT was energized. Four measurements in total were made.

b) The EUT was switched off.

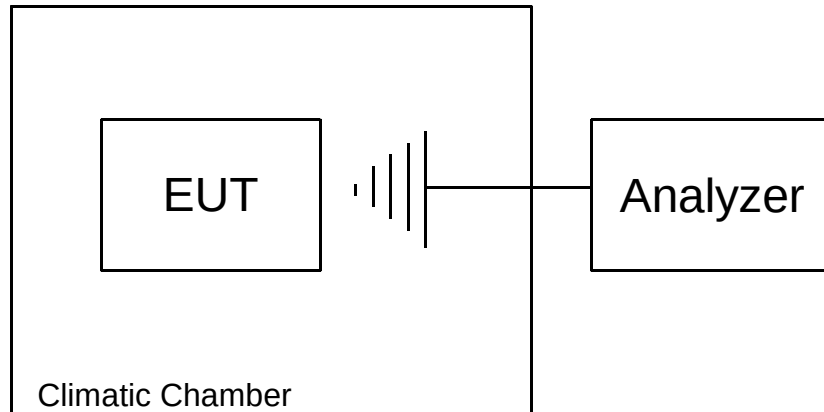
c) The chamber temperature was lowered by 10 °C and sufficient time was waited until the test chamber and the EUT did stabilize at the temperature.

d) The step a) through step c) were repeated down to the lowest specified temperature.

The highest deviation from the nominal carrier frequency was reported in the test result table.

Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.7.3 Test Setup



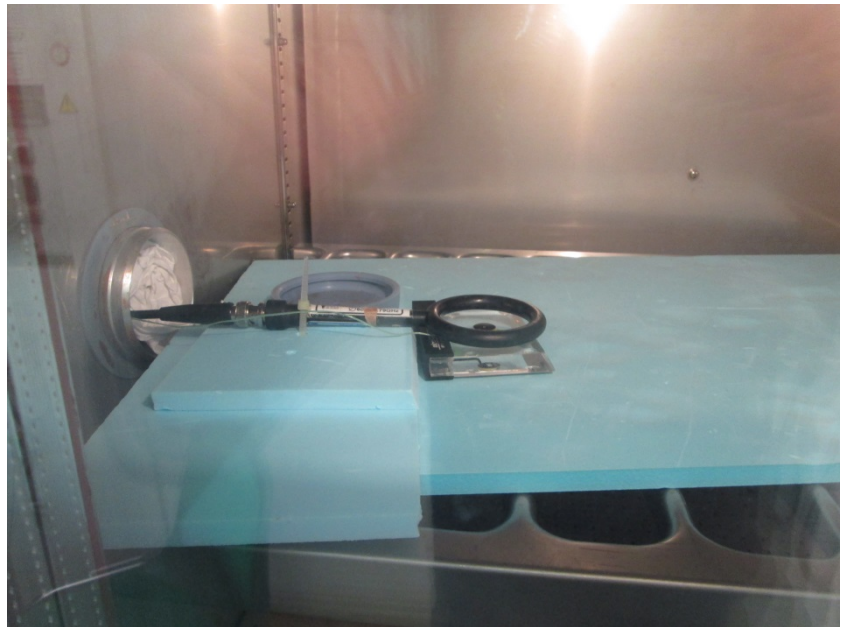
SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.225  
Procedure: ANSI C63.10-2013

Receiver: #3831  
Antenna: #1731

Test distance: 3 m

TEST EQUIPMENT USED:  
Refer to chapter 5 of this document.  
1064, 1731, 3026, 3831, 4493, 6344





Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.7.4 Test Result

Test conditions: Supply voltage = 5 VDC

$f_{ref} = 13.560018 \text{ MHz}$

| Temperature | Time         | Frequency        | Deviation from reference |       | Limit       | Lower limit      | Upper Limit      |
|-------------|--------------|------------------|--------------------------|-------|-------------|------------------|------------------|
| [°C]        | [min]        | [MHz]            | [Hz]                     | [ppm] | [ppm]       | [MHz]            | [MHz]            |
| 50          | 0 (start-up) | 13.560051        | 33                       | 2.434 | ±100        | 13.558662        | 13.561374        |
| 50          | 2            | 13.560051        | 33                       | 2.434 | ±100        | 13.558662        | 13.561374        |
| 50          | 5            | 13.56005         | 32                       | 2.360 | ±100        | 13.558662        | 13.561374        |
| 50          | 10           | 13.560048        | 30                       | 2.212 | ±100        | 13.558662        | 13.561374        |
| 40          | 0 (start-up) | 13.560013        | -5                       | 0.369 | ±100        | 13.558662        | 13.561374        |
| 40          | 2            | 13.560017        | -1                       | 0.074 | ±100        | 13.558662        | 13.561374        |
| 40          | 5            | 13.560019        | 1                        | 0.074 | ±100        | 13.558662        | 13.561374        |
| 40          | 10           | 13.56002         | 2                        | 0.147 | ±100        | 13.558662        | 13.561374        |
| 30          | 0 (start-up) | 13.560017        | -1                       | 0.074 | ±100        | 13.558662        | 13.561374        |
| 30          | 2            | 13.560014        | -4                       | 0.295 | ±100        | 13.558662        | 13.561374        |
| 30          | 5            | 13.560012        | -6                       | 0.442 | ±100        | 13.558662        | 13.561374        |
| 30          | 10           | 13.560012        | -6                       | 0.442 | ±100        | 13.558662        | 13.561374        |
| 20          | 0 (start-up) | 13.560025        | 7                        | 0.516 | ±100        | 13.558662        | 13.561374        |
| 20          | 2            | 13.560021        | 3                        | 0.221 | ±100        | 13.558662        | 13.561374        |
| 20          | 5            | 13.560018        | 0                        | 0.000 | ±100        | 13.558662        | 13.561374        |
| <b>20</b>   | <b>10</b>    | <b>13.560018</b> | <b>0</b>                 | 0.000 | <b>±100</b> | <b>13.558662</b> | <b>13.561374</b> |
| 10          | 0 (start-up) | 13.560048        | 30                       | 2.212 | ±100        | 13.558662        | 13.561374        |
| 10          | 2            | 13.56004         | 22                       | 1.622 | ±100        | 13.558662        | 13.561374        |
| 10          | 5            | 13.560033        | 15                       | 1.106 | ±100        | 13.558662        | 13.561374        |
| 10          | 10           | 13.560031        | 13                       | 0.959 | ±100        | 13.558662        | 13.561374        |
| 0           | 0 (start-up) | 13.560054        | 36                       | 2.655 | ±100        | 13.558662        | 13.561374        |
| 0           | 2            | 13.56005         | 32                       | 2.360 | ±100        | 13.558662        | 13.561374        |
| 0           | 5            | 13.560047        | 29                       | 2.139 | ±100        | 13.558662        | 13.561374        |
| 0           | 10           | 13.560045        | 27                       | 1.991 | ±100        | 13.558662        | 13.561374        |
| -10         | 0 (start-up) | 13.560048        | 30                       | 2.212 | ±100        | 13.558662        | 13.561374        |
| -10         | 2            | 13.560054        | 36                       | 2.655 | ±100        | 13.558662        | 13.561374        |
| -10         | 5            | 13.560055        | 37                       | 2.729 | ±100        | 13.558662        | 13.561374        |
| -10         | 10           | 13.560055        | 37                       | 2.729 | ±100        | 13.558662        | 13.561374        |
| -20         | 0 (start-up) | 13.560053        | 35                       | 2.581 | ±100        | 13.558662        | 13.561374        |
| -20         | 2            | 13.560053        | 35                       | 2.581 | ±100        | 13.558662        | 13.561374        |
| -20         | 5            | 13.560053        | 35                       | 2.581 | ±100        | 13.558662        | 13.561374        |
| -20         | 10           | 13.560053        | 35                       | 2.581 | ±100        | 13.558662        | 13.561374        |

Test performed at nominal supply voltage and within the temperature range of -20 °C up to +50 °C starting at nominal ambient temperature and continuing with the highest specified temperature and proceeding with temperature lowered in 10 degree steps down to the lowest specified.

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Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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|                 |                   |
|-----------------|-------------------|
| Manufacturer:   | Micro-Sensys GmbH |
| Type:           | 35.29.701.00      |
| Serial No.:     | 122322            |
| Test date:      | 2019-01-31        |
| Test personnel: | Adem Aldogan      |

Carrier frequency stability is within the specified limits.

**The EUT meets the requirements of this section.**

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Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

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## **4.8 Carrier Frequency Stability vs Supply Voltage**

Test Requirement: FCC 47 CFR §15.225(e), ISSED RSS-210 B.6

Test Procedure: ANSI C63.10-2013, RSS-Gen

### **4.8.1 Regulation**

#### **47 CFR § 15.225 Operation within the band 13.110–14.010 MHz.**

(e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

#### **RSS-210 B.6 Band 13.110-14.010 MHz**

Carrier frequency stability shall be maintained to  $\pm 0.01\%$  ( $\pm 100$  ppm).

### **4.8.2 Test Procedures**

#### **Frequency stability when varying supply voltage:**

The tests were made at ambient room temperature ( $+15$  °C to  $+25$  °C). The EUT was placed on a wooden table 0.8 meter high tabletop.

The EUT was supplied with the nominal DC voltage (5 V) by the USB-port of a notebook.

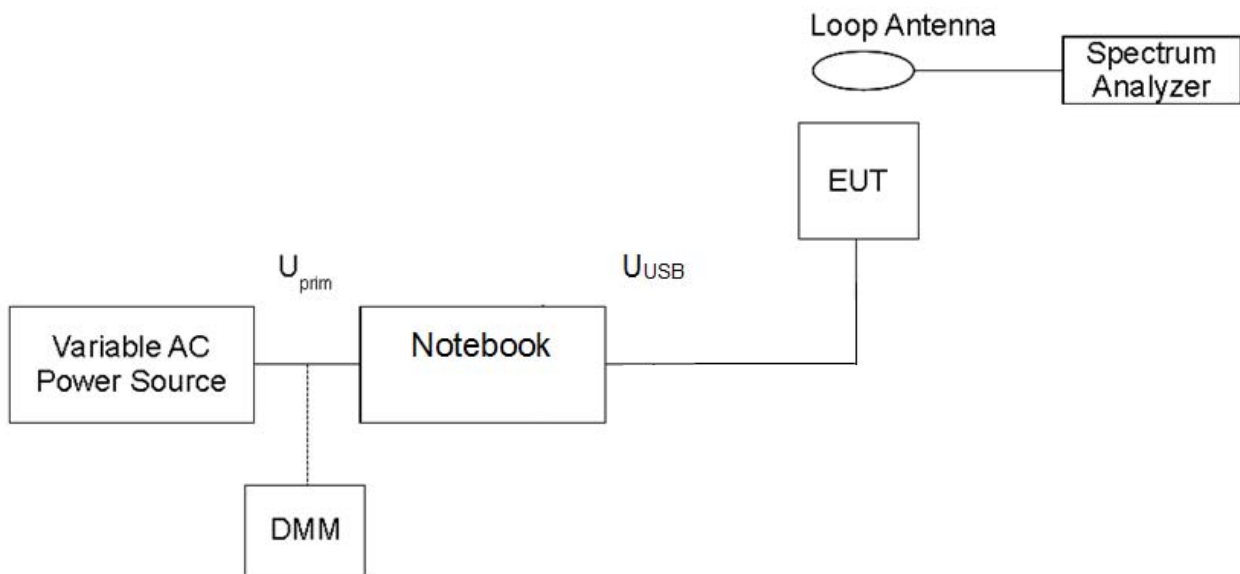
An antenna was placed above the EUT antenna and connected to a receiver. It was verified that the receiver had an adequate signal level to allow the measurement.

The primary input voltage of the notebook was set to 115 V / 60 Hz, 97.8 V / 60 Hz ( $U_{nom} - 15\%$ ) and 132.3 V / 60 Hz ( $U_{nom} + 15\%$ ).

The measurement of the centre frequency was measured at each voltage step.

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

### 4.8.3 Test Setup

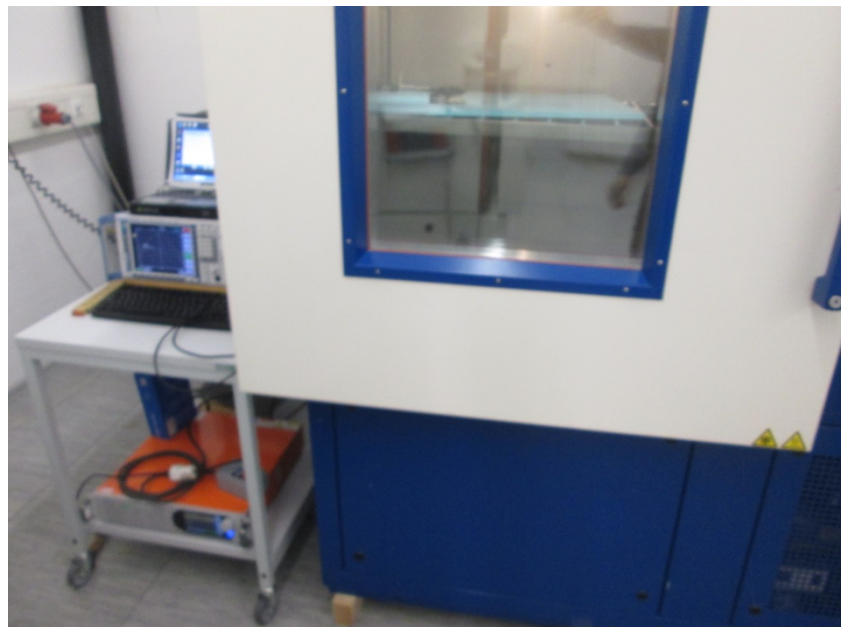


SCHEMATIC TEST SETUP

Requirement: 47 CFR, § 15.225  
Procedure: ANSI C63.10-2013

Receiver: #3831  
Antenna: #1731

TEST EQUIPMENT USED:  
Refer to chapter 5 of this document.  
1731, 2717, 3831, 6344



Test on Micro-Sensys GmbH iID<sup>®</sup> DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

#### 4.8.4 Test Result

Test conditions: Temperature = 20 °C

$f_{\text{ref}} = 13.560021 \text{ MHz}$

| Supply Voltage $U_{\text{prim}}$ | USB Voltage $U_{\text{USB}}$ | Frequency        | Deviation from reference |              | Limit                       | Lower limit      | Upper Limit      |
|----------------------------------|------------------------------|------------------|--------------------------|--------------|-----------------------------|------------------|------------------|
| [V]                              | [V]                          | [MHz]            | [Hz]                     | [ppm]        | [ppm]                       | [MHz]            | [MHz]            |
| 97.8                             | 5.010                        | 13.560027        | 6                        | 0.442        | $\pm 100$                   | 13.558665        | 13.561377        |
| <b>115</b>                       | <b>5.010</b>                 | <b>13.560021</b> | <b>0</b>                 | <b>0.000</b> | <b><math>\pm 100</math></b> | <b>13.558665</b> | <b>13.561377</b> |
| 132.3                            | 5.010                        | 13.560022        | 1                        | 0.074        | $\pm 100$                   | 13.558665        | 13.561377        |

Test performed at normal ambient temperature and within the manufacturer's specified supply voltage range.

Manufacturer: Micro-Sensys GmbH  
Type: 35.29.701.00  
Serial No.: 122316  
Test date: 2019-02-01  
Test personnel: Dominik Krüger

Carrier frequency stability is within the specified limits.

**The EUT meets the requirements of this section.**

Test on Micro-Sensys GmbH iID® DESKTOP smart USB 7.0 Type 35.29.701.00 to 47 CFR 15.225 and RSS-210 Issue 9

## 5 TEST INSTRUMENTS

| EMCC ID # | Instrument                                 | Manufacturer               | Model No.        | Last Calibration | Calibration valid until |
|-----------|--------------------------------------------|----------------------------|------------------|------------------|-------------------------|
| 1         | 60-Hz-Converter                            | AEG                        | DAMK4/DAGK4      | n/a              | n/a                     |
| 54        | N-Cable N/50                               | Rohde & Schwarz            | HFU2-Z5          | 2018-12          | 2019-12                 |
| 374       | Loop Antenna                               | Rohde & Schwarz            | HFH 2-Z2         | 2018-11          | 2021-02                 |
| 516       | EMI Test Receiver                          | Rohde & Schwarz            | ESIB40           | 2018-03          | 2019-03                 |
| 1064      | Thermoconnector                            | Ahlborn                    | ZA9020FS         | 2018-02          | 2020-02                 |
| 1291      | Antenna Mast                               | Frankonia                  | FAM4             | n/a              | n/a                     |
| 1292      | Multi Device Controller                    | Frankonia                  | FC02             | n/a              | n/a                     |
| 1731      | Sniffer Loop Probe                         | EMCO                       | 7405-901         | n/a              | n/a                     |
| 1889      | SR-ULL-01, Semi-Anechoic Chamber (SAC)     | EMCC/FRANK.                | SAC-10           | n/a              | n/a                     |
| 1890      | SR-ULL-05, Absorber-Lined Shielded Chamber | EMCC / SIEM / FRANK        | SC2-ULL          | n/a              | n/a                     |
| 1901      | V-LISN 50 ohms/(50 uH + 5 ohms)            | Rohde & Schwarz            | ESH2-Z5          | 2018-11          | 2019-11                 |
| 2717      | Digital Multimeter                         | Agilent                    | U1241A           | 2018-02          | 2020-02                 |
| 2724      | 5 W Attenuator 6dB                         | Weinschel                  | 2                | 2017-06          | 2019-06                 |
| 3026      | Thermal Chamber                            | Feutron                    | 3416/16          | 2017-09          | 2019-09                 |
| 3184      | Pulse Limiter                              | MTS                        | MTA-IMP-136      | 2017-07          | 2019-07                 |
| 3195      | Notebook                                   | Samsung                    | P560             | n/a              | n/a                     |
| 3831      | Spectrum Analyzer                          | Rohde & Schwarz            | FSU50            | 2018-10          | 2019-10                 |
| 3846      | EMI Test Receiver                          | Rohde & Schwarz            | ESU8             | 2019-02          | 2020-02                 |
| 4075      | Workstation                                | Dell                       | Optiplex 7010    | n/a              | n/a                     |
| 4493      | Data Logger                                | Ahlborn                    | ALMEMO 2890-9    | 2017-10          | 2019-10                 |
| 4717      | Web-Thermo-Hygrobarograph                  | Wiesemann & Theis GmbH WUT | 57613 Web-T/Rh/P | 2018-01          | 2020-01                 |
| 5392      | EMC Measurement Software                   | Rohde & Schwarz            | EMC32            | n/a              | n/a                     |
| 5404      | Notebook                                   | DELL                       | Latitude E5450   | n/a              | n/a                     |
| 5551      | BNC cable                                  | EMCC                       | BNC003m0         | n/a              | n/a                     |
| 6041      | TRILOG Broadband Antenna                   | Schwarzbeck                | VULB 9163        | 2017-09          | 2019-09                 |
| 6344      | Power Supply                               | Preen                      | AFV-P-600A       | n/a              | n/a                     |

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## 6 MEASUREMENT UNCERTAINTY

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| Measurement                                      | Measurement Uncertainty |
|--------------------------------------------------|-------------------------|
| Conducted Emissions, AC mains (150 kHz – 30 MHz) | ±3.5 dB                 |
| Radiated Emissions, H field (9 kHz – 30 MHz)     | ±3.0 dB                 |
| Radiated Emissions 30 – 1000 MHz                 | ±5.6 dB                 |
| Frequency accuracy above 13 MHz                  | ±1.3 • 10 <sup>-7</sup> |

The reported uncertainty values are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of 95%.

The given values have been calculated on the basis of the following documents:

CISPR 16-4-2:2011+A1:2014, Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, statistics and limit modelling - Measurement instrumentation uncertainty.

JCGM 100:2008, Evaluation of measurement data - Guide to the expression of uncertainty in measurement.

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## 7 LIST OF ANNEXES

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The following annexes are separated parts from this test report.

| Description                                           | Pages |
|-------------------------------------------------------|-------|
| Annex 1: Photographs of test setup                    | 5     |
| Annex 2: External photographs of equipment under test | 4     |
| Annex 3: Internal photographs of equipment under test | 7     |
| Annex 4: Photographs of ancillary equipment           | 4     |
| Annex 5: Photographs of EUT modifications             | 2     |