**CETECOM™****CETECOM ICT Services**  
consulting - testing - certification >>>

## TEST REPORT

Test report no.: 1-0210/15-01-05-C

Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-00

### Testing laboratory

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Internet: <http://www.cetecom.com>e-mail: [ict@cetecom.com](mailto:ict@cetecom.com)**Accredited Testing Laboratory:**

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

### Applicant

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Kaiserstraße

67722 Langmeil / GERMANY

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### Manufacturer

**Mobotix AG**

Kaiserstraße

67722 Langmeil / GERMANY

### Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

RSS - Gen Issue 4

Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

RSS - 210 Issue 8

Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

For further applied test standards please refer to section 3 of this test report.

### Test Item

**Kind of test item:** Display**Model name:** MX- Display+**FCC ID:** YYRDISPB**IC:** 9357A-DISPB

Frequency: 13.56 MHz

Technology tested: RFID

Antenna: Integrated loop antenna

Power supply: 48.0 V DC by POE

Temperature range: 0°C to +40°C



This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### Test report authorised:

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## 2 General information

### 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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**This test report replaces the test report with the number 1-0210/15-01-05-B and dated 2015-11-27**

### 2.2 Application details

|                                    |            |
|------------------------------------|------------|
| Date of receipt of order:          | 2015-07-31 |
| Date of receipt of test item:      | 2015-08-24 |
| Start of test:                     | 2015-08-24 |
| End of test:                       | 2015-09-21 |
| Person(s) present during the test: | -/-        |

## 3 Test standard/s

| Test standard                 | Date          | Test standard description                                                                                                                                 |
|-------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47 CFR Part 15                | 01.10.2013    | Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices                                                                 |
| RSS - Gen Issue 4             | November 2014 | Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus |
| RSS - 210 Issue 8             | December 2010 | Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment     |
| RSS - 210 Issue 8 Amendment 1 | February 2015 | RSS-210, Amendment 1 — Licence-Exempt, Low-Power Radio Apparatus Operating in the Television Bands (February 2015)                                        |

### 3.1 Measurement guidance

| Guidance         | Version | Description                                                                                                                                                         |
|------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI C63.4-2014  | -/-     | American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz |
| ANSI C63.10-2013 | -/-     | American national standard of procedures for compliance testing of unlicensed wireless devices                                                                      |

## 4 Test environment

|                            |           |                                       |
|----------------------------|-----------|---------------------------------------|
| Temperature:               | $T_{nom}$ | +22 °C during room temperature tests  |
|                            | $T_{max}$ | +40 °C during high temperature tests  |
|                            | $T_{min}$ | 0 °C during low temperature tests     |
| Relative humidity content: |           | 51 %                                  |
| Barometric pressure:       |           | not relevant for this kind of testing |
| Power supply:              | $V_{nom}$ | 48.0 V DC by POE                      |
|                            | $V_{max}$ | 48.0 V                                |
|                            | $V_{min}$ | 12.0 V                                |

## 5 Test item

|                            |   |                                        |
|----------------------------|---|----------------------------------------|
| Kind of test item          | : | Display                                |
| Type identification        | : | MX- Display+                           |
| PMN                        | : | MXDisplay+                             |
| HVIN                       | : | MXDisplay+                             |
| FVIN                       | : | 0.0.1.2                                |
| HMN                        | : | -/-                                    |
| S/N serial number          | : | 10.7.1.133 and 10.7.32.84              |
| HW hardware status         | : | Mainboard: 2V3<br>Peripheralboard: 2V2 |
| SW software status         | : | 0.0.1.2                                |
| Frequency band             | : | 13.56 MHz                              |
| Type of radio transmission | : | Modulated carrier                      |
| Use of frequency spectrum  | : |                                        |
| Type of modulation         | : | AM                                     |
| Antenna                    | : | Integrated loop antenna                |
| Power supply               | : | 48.0 V DC by POE                       |
| Temperature range          | : | 0°C to +40°C                           |

### 5.1 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report:      1-0210/15-01-01\_AnnexA  
                                                                                                  1-0210/15-01-01\_AnnexB  
                                                                                                  1-0210/15-01-01\_AnnexD

## 6 Test laboratories sub-contracted

None

## 7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

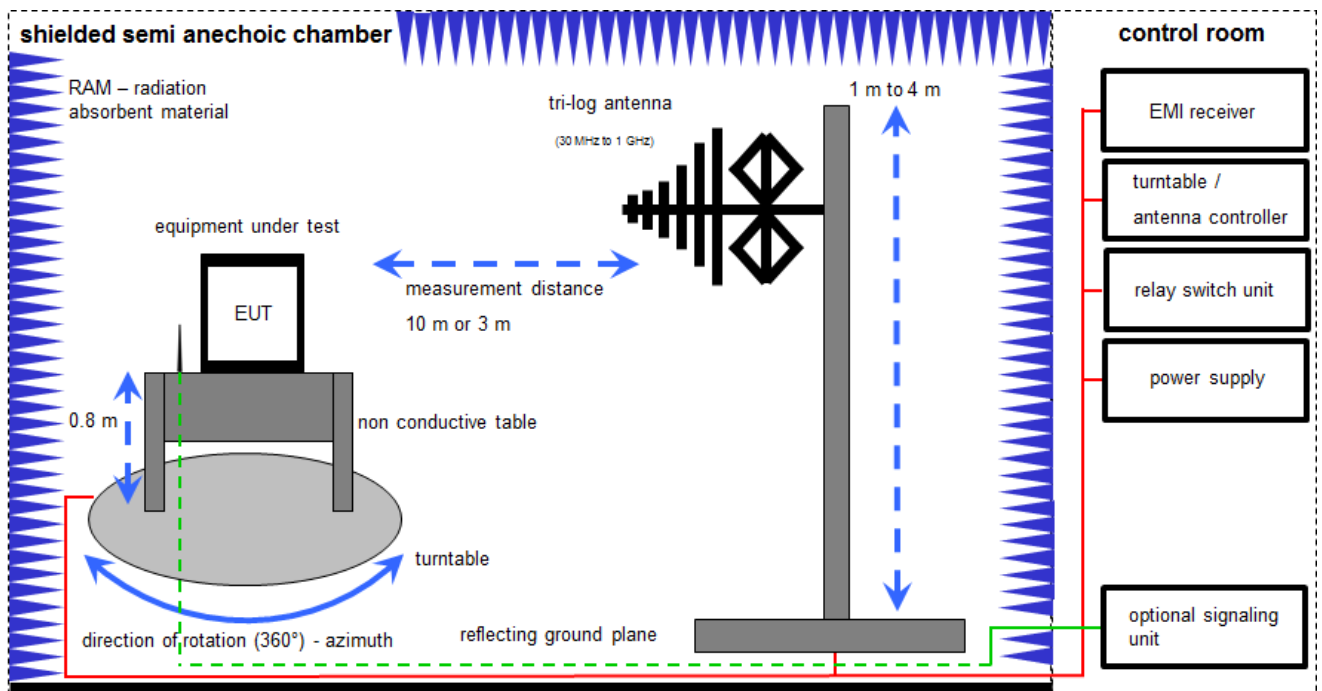
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

### **Agenda:** Kind of Calibration

|      |                                            |     |                                                      |
|------|--------------------------------------------|-----|------------------------------------------------------|
| k    | calibration / calibrated                   | EK  | limited calibration                                  |
| ne   | not required (k, ev, izw, zw not required) | zw  | cyclical maintenance (external cyclical maintenance) |
| ev   | periodic self verification                 | izw | internal cyclical maintenance                        |
| Ve   | long-term stability recognized             | g   | blocked for accredited testing                       |
| vkl! | Attention: extended calibration interval   |     |                                                      |
| NK!  | Attention: not calibrated                  | *)  | next calibration ordered / currently in progress     |

## 7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



$$SS = U_R + CL + AF$$

(SS-signal strength;  $U_R$ -voltage at the receiver; CL-loss of the cable; AF-antenna factor)

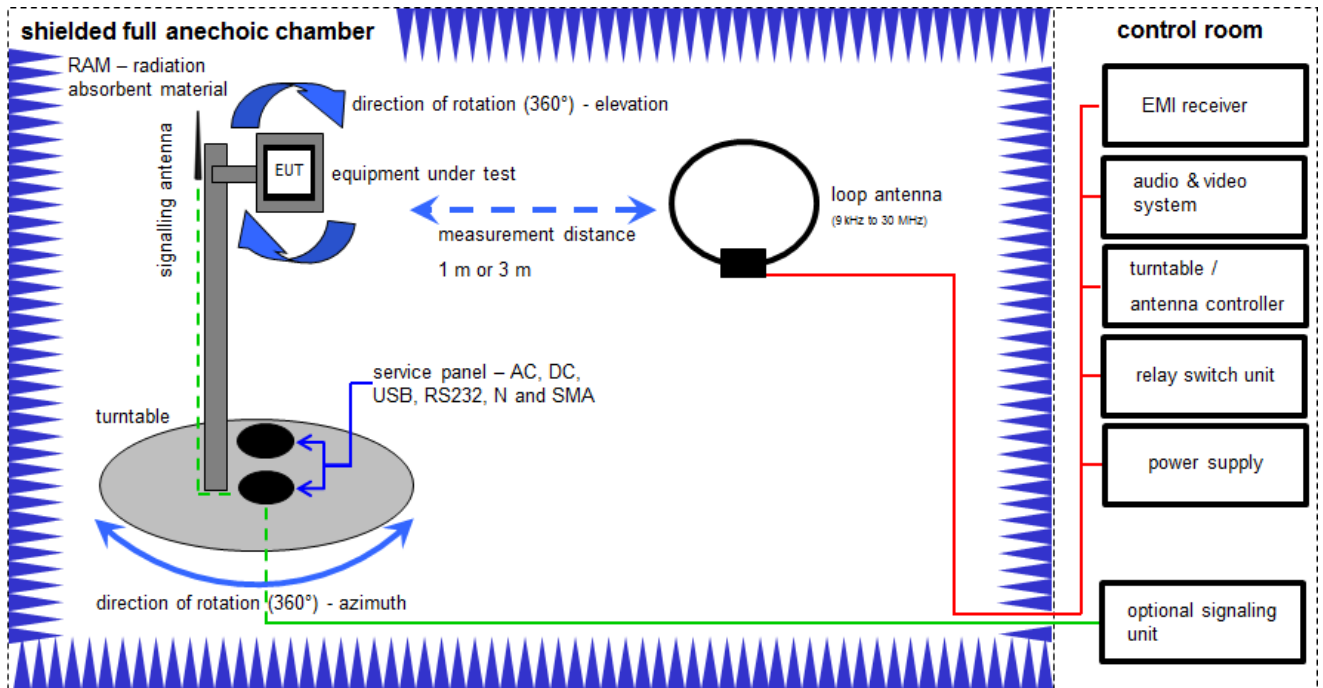
### Example calculation:

$$SS \text{ [dB}\mu\text{V/m]} = 12.35 \text{ [dB}\mu\text{V/m]} + 1.90 \text{ [dB]} + 16.80 \text{ [dB}\mu\text{V/m]} = 31.05 \text{ [dB}\mu\text{V/m]} \text{ (35.69 } \mu\text{V/m)}$$

### Equipment table:

| No. | Lab / Item | Equipment                                    | Type         | Manufact.    | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|----------------------------------------------|--------------|--------------|------------|-----------------|---------------------|------------------|------------------|
| 1   | A          | EMI Test Receiver                            | ESCI 3       | R&S          | 100083     | 300003312       | k                   | 26.01.2015       | 26.01.2016       |
| 2   | A          | Antenna Tower                                | Model 2175   | ETS-Lindgren | 64762      | 300003745       | izw                 | -/-              | -/-              |
| 3   | A          | Turntable Interface-Box                      | Model 105637 | ETS-Lindgren | 44583      | 300003747       | izw                 | -/-              | -/-              |
| 4   | A          | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163     | Schwarzbeck  | 295        | 300003787       | k                   | 22.04.2014       | 22.04.2016       |

## 7.2 Shielded fully anechoic chamber



$$SS = U_R + CA + AF$$

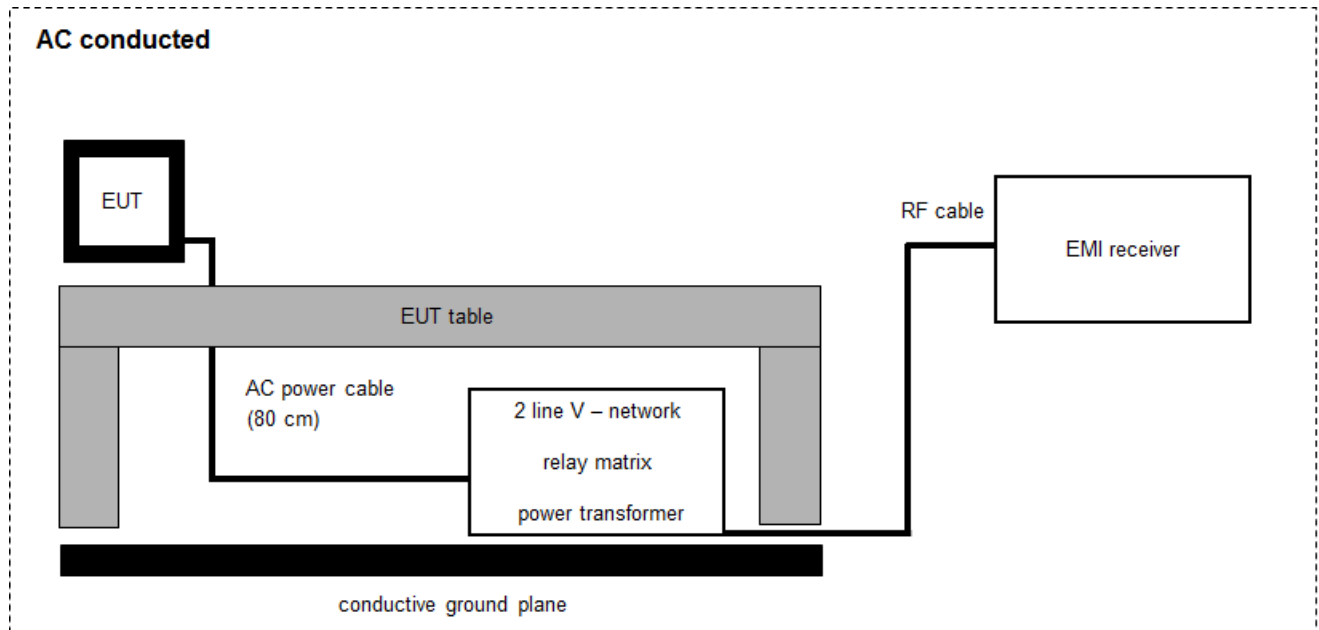
(SS-signal strength;  $U_R$ -voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

### Example calculation:

$$SS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V/m]} + (-35.8) \text{ [dB]} + 32.9 \text{ [dB}\mu\text{V/m]} = 37.1 \text{ [dB}\mu\text{V/m]} \text{ (71.61 } \mu\text{V/m)}$$

### Equipment table:

| No. | Lab / Item | Equipment                            | Type     | Manufact.            | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|--------------------------------------|----------|----------------------|------------|-----------------|---------------------|------------------|------------------|
| 1   | B          | DC power supply, 60Vdc, 50A, 1200 W  | 6032A    | HP                   | 2818A03450 | 300001040       | Ve                  | 20.01.2015       | 20.01.2018       |
| 2   | B          | Anechoic chamber                     | FAC 3/5m | MWB / TDK            | 87400/02   | 300000996       | ev                  | -/-              | -/-              |
| 3   | B          | Switch / Control Unit                | 3488A    | HP                   | *          | 300000199       | ne                  | -/-              | -/-              |
| 4   | B          | Active Loop Antenna 10 kHz to 30 MHz | 6502     | Kontron Psychotech   | 8905-2342  | 300000256       | k                   | 24.06.2015       | 24.06.2017       |
| 5   | B          | MXE EMI Receiver 20 Hz to 26,5 GHz   | N9038A   | Agilent Technologies | MY51210197 | 300004405       | k                   | 06.03.2015       | 06.03.2016       |
| 6   | B          | 4U RF Switch Platform                | L4491A   | Agilent Technologies | MY50000037 | 300004509       | ne                  | -/-              | -/-              |

**7.3 AC conducted****AC conducted**

$$SS = UR + CF + VC$$

(SS-signal strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:

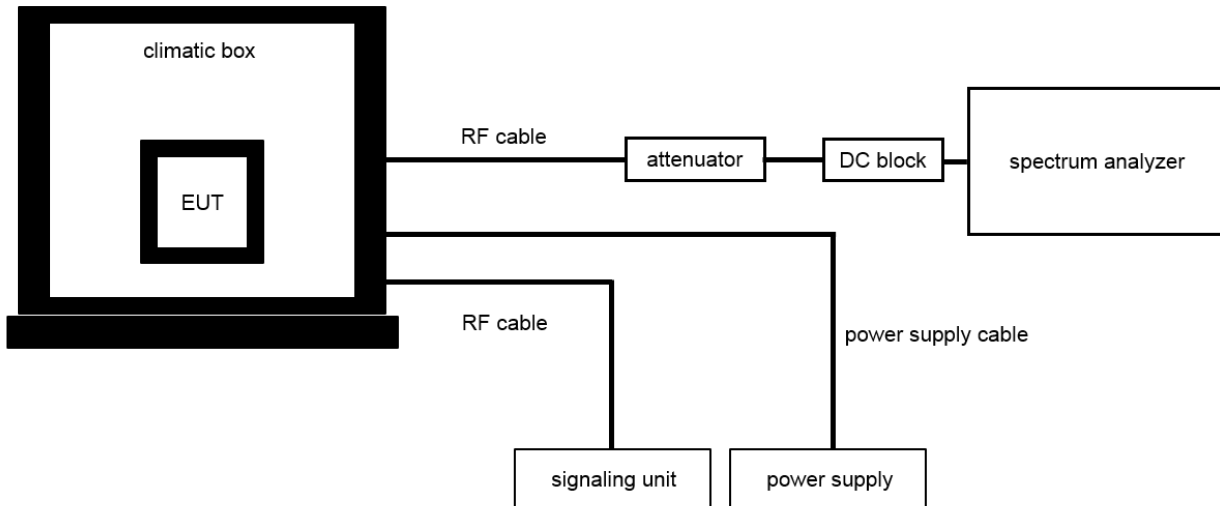
$$SS \text{ [dB}\mu\text{V/m]} = 37.62 \text{ [dB}\mu\text{V/m]} + 9.90 \text{ [dB]} + 0.23 \text{ [dB]} = 47.75 \text{ [dB}\mu\text{V/m]} \text{ (244.06 } \mu\text{V/m)}$$

**Equipment table:**

| No. | Lab / Item | Equipment                                         | Type     | Manufact. | Serial No.      | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|---------------------------------------------------|----------|-----------|-----------------|-----------------|---------------------|------------------|------------------|
| 1   | C          | EMI-Receiver                                      | 8542E    | HP        | 3617A00170      | 300000568       | k                   | 28.01.2015       | 28.01.2016       |
| 2   | C          | Analyzer-Reference-System (Harmonics and Flicker) | ARS 16/1 | SPS       | A3509 07/0 0205 | 300003314       | Ve                  | 11.02.2014       | 11.02.2016       |
| 3   | C          | Netznachbildung                                   | ESH3-Z5  | R&S       | 892475/017      | 300002209       | k                   | 17.06.2014       | 17.06.2016       |

## 7.4 Conducted measurements normal and extreme conditions

### Conducted measurements normal & extreme conditions



$$OP = AV + CA$$

(OP-output power; AV-analyzer value; CA-loss signal path)

#### Example calculation:

$$OP \text{ [dBm]} = 6.0 \text{ [dBm]} + (11.7) \text{ [dB]} = 17.7 \text{ [dBm]} (58.88 \text{ mW})$$

#### Equipment table:

| No. | Lab / Item | Equipment                                         | Type    | Manufact.       | Serial No.  | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|---------------------------------------------------|---------|-----------------|-------------|-----------------|---------------------|------------------|------------------|
| 1   | D          | DC power supply, 60Vdc, 50A, 1200 W               | 6032A   | HP              | 2818A03450  | 300001040       | Ve                  | 20.01.2015       | 20.01.2018       |
| 2   | D          | Temperature Test Chamber                          | VT 4002 | Heraeus Voetsch | 521/83761   | 300002326       | Ve                  | 26.09.2013       | 26.09.2015       |
| 3   | D          | EMI Test Receiver 9 kHz - 3 GHz incl. Preselector | ESPI3   | R&S             | 101713      | 300004059       | k                   | 23.01.2015       | 23.01.2016       |
| 4   | D          | Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM      | FSIQ26  | R&S             | 835111/0004 | 300002678       | Ve                  | 22.01.2015       | 22.01.2017       |

**8 Measurement uncertainty**

| Measurement uncertainty                                  |                                          |
|----------------------------------------------------------|------------------------------------------|
| Test case                                                | Uncertainty                              |
| Antenna gain                                             | ± 3 dB                                   |
| Spectrum bandwidth                                       | ± 21.5 kHz absolute; ± 15.0 kHz relative |
| Maximum output power                                     | ± 1 dB                                   |
| Detailed conducted spurious emissions @ the band edge    | ± 1 dB                                   |
| Band edge compliance radiated                            | ± 3 dB                                   |
| Spurious emissions conducted                             | ± 3 dB                                   |
| Spurious emissions radiated below 30 MHz                 | ± 3 dB                                   |
| Spurious emissions radiated 30 MHz to 1 GHz              | ± 3 dB                                   |
| Spurious emissions radiated 1 GHz to 12.75 GHz           | ± 3.7 dB                                 |
| Spurious emissions radiated above 12.75 GHz              | ± 4.5 dB                                 |
| Spurious emissions conducted below 30 MHz (AC conducted) | ± 2.6 dB                                 |

## **9 Sequence of testing**

### **9.1 Sequence of testing 9 kHz to 30 MHz**

#### **Setup**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

#### **Premeasurement**

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

#### **Final measurement**

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK (QPK / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

## 9.2 Sequence of testing 30 MHz to 1 GHz

### Setup

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 10 or 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.
- 

### Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions
- 

### Final measurement

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP (Quasi-Peak / see ANSI C 63.4) detector with an EMI receiver

The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final

## 10 Summary of measurement results

|                                     |                                                                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | No deviations from the technical specifications were ascertained                                                      |
| <input type="checkbox"/>            | There were deviations from the technical specifications ascertained                                                   |
| <input type="checkbox"/>            | This test report is only a partial test report. The content and verdict of the performed test cases are listed below. |

| TC Identifier | Description                                       | Verdict    | Date       | Remark |
|---------------|---------------------------------------------------|------------|------------|--------|
| RF-Testing    | CFR Part 15<br>RSS 210 Issue 8<br>RSS Gen Issue 4 | See table! | 2016-02-26 | -/-    |

| Test specification clause | Test case                                          | Temperature conditions      | Power source conditions     | C                                   | NC                       | NA                                  | NP                       | Remark |
|---------------------------|----------------------------------------------------|-----------------------------|-----------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|--------|
| RSS Gen Issue 4           | Occupied bandwidth                                 | Nominal                     | Nominal                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-    |
| § 15.225 (a)              | Field strength of the fundamental                  | Nominal                     | Nominal                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-    |
| § 15.209 & § 15.225 (b-d) | Field strength of the harmonics and spurious       | Nominal                     | Nominal                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-    |
| § 15.109                  | Receiver spurious emissions and cabinet radiations | Nominal                     | Nominal                     | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | -/-    |
| §15.107<br>§15.207        | Conducted limits                                   | Nominal                     | Nominal                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-    |
| § 15.225 (a)              | Frequency tolerance                                | Normal & extreme conditions | Normal & extreme conditions | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-    |

**Note:** C = Complies; NC = Not complies; NA = Not applicable; NP = Not performed

## 11 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

## 12 Measurement results

### 12.1 Occupied bandwidth

#### Measurement:

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

| Measurement parameters   |                                     |
|--------------------------|-------------------------------------|
| Detector:                | Peak                                |
| Resolution bandwidth:    | 1 % – 5 % of the occupied bandwidth |
| Video bandwidth:         | ≥ 3x RBW                            |
| Trace mode:              | Max hold                            |
| Analyser function:       | 99 % power function                 |
| Used equipment:          | See chapter 7.4                     |
| Measurement uncertainty: | See chapter 8                       |

#### Limit:

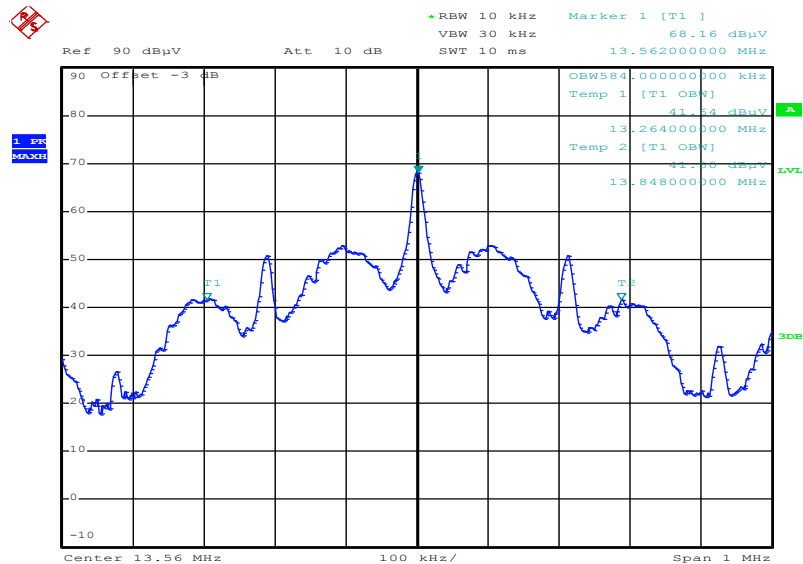
| IC                                      |
|-----------------------------------------|
| for RSP-100 test report coversheet only |

#### Result EUT A:

| 99% emission bandwidth |
|------------------------|
| 584 kHz                |

Plot:

Plot 1: 99 % emission bandwidth



Date: 26.AUG.2015 11:02:11

## 12.2 Field strength of the fundamental

### Measurement:

The maximum detected field strength for the carrier signal.

| Measurement parameters   |                                |
|--------------------------|--------------------------------|
| Detector:                | Quasi peak / peak (worst case) |
| Resolution bandwidth:    | 120 kHz                        |
| Video bandwidth:         | ≥ 3x RBW                       |
| Trace mode:              | Max hold                       |
| Used equipment:          | See chapter 7.2                |
| Measurement uncertainty: | See chapter 8                  |

### Limit:

| FCC & IC           |                          |                             |
|--------------------|--------------------------|-----------------------------|
| Frequency<br>(MHz) | Field strength<br>(μV/m) | Measurement distance<br>(m) |
| 13.553 to 13.567   | 15,848 (84 dBμV/m)       | 30                          |

### Recalculation:

| According to ANSI C63.10 |                                                                                                                                                                                 |                  |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Frequency                | Formula                                                                                                                                                                         | Correction value |
| 13.56 MHz                | $FS_{\text{limit}} = FS_{\text{max}} - 40 \log\left(\frac{d_{\text{nearfield}}}{d_{\text{measure}}}\right) - 20 \log\left(\frac{d_{\text{limit}}}{d_{\text{nearfield}}}\right)$ | -21.39           |

| According to ANSI C63.10 |
|--------------------------|
|--------------------------|

### Result:

| Field strength of the fundamental |             |             |
|-----------------------------------|-------------|-------------|
| Frequency                         | 13.56 MHz   |             |
| Distance                          | @ 3 m       | @ 30 m      |
| Measured / calculated value       | 77.3 dBμV/m | 55.9 dBμV/m |

### 12.3 Field strength of the harmonics and spurious

#### Measurement:

The maximum detected field strength for the harmonics and spurious.

| Measurement parameters   |                                                                                    |
|--------------------------|------------------------------------------------------------------------------------|
| Detector:                | Quasi peak / average or peak (worst case – pre-scan)                               |
| Resolution bandwidth:    | F < 150 kHz: 200 Hz<br>150 kHz < F < 30 MHz: 9 kHz<br>30 MHz < F < 1 GHz: 120 kHz  |
| Video bandwidth:         | F < 150 kHz: 1 kHz<br>150 kHz < F < 30 MHz: 100 kHz<br>30 MHz < F < 1 GHz: 300 kHz |
| Trace mode:              | Max hold                                                                           |
| Used equipment:          | See chapter 7.1 and 7.2                                                            |
| Measurement uncertainty: | See chapter 8                                                                      |

#### Limit:

| FCC & IC        |                               |                          |
|-----------------|-------------------------------|--------------------------|
| Frequency (MHz) | Field strength (dB $\mu$ V/m) | Measurement distance (m) |
| 0.009 – 0.490   | 2400/F(kHz)                   | 300                      |
| 0.490 – 1.705   | 24000/F(kHz)                  | 30                       |
| 1.705 – 30      | 30 (29.5 dB $\mu$ V/m)        | 30                       |
| 30 – 88         | 100 (40 dB $\mu$ V/m)         | 3                        |
| 88 – 216        | 150 (43.5 dB $\mu$ V/m)       | 3                        |
| 216 – 960       | 200 (46 dB $\mu$ V/m)         | 3                        |

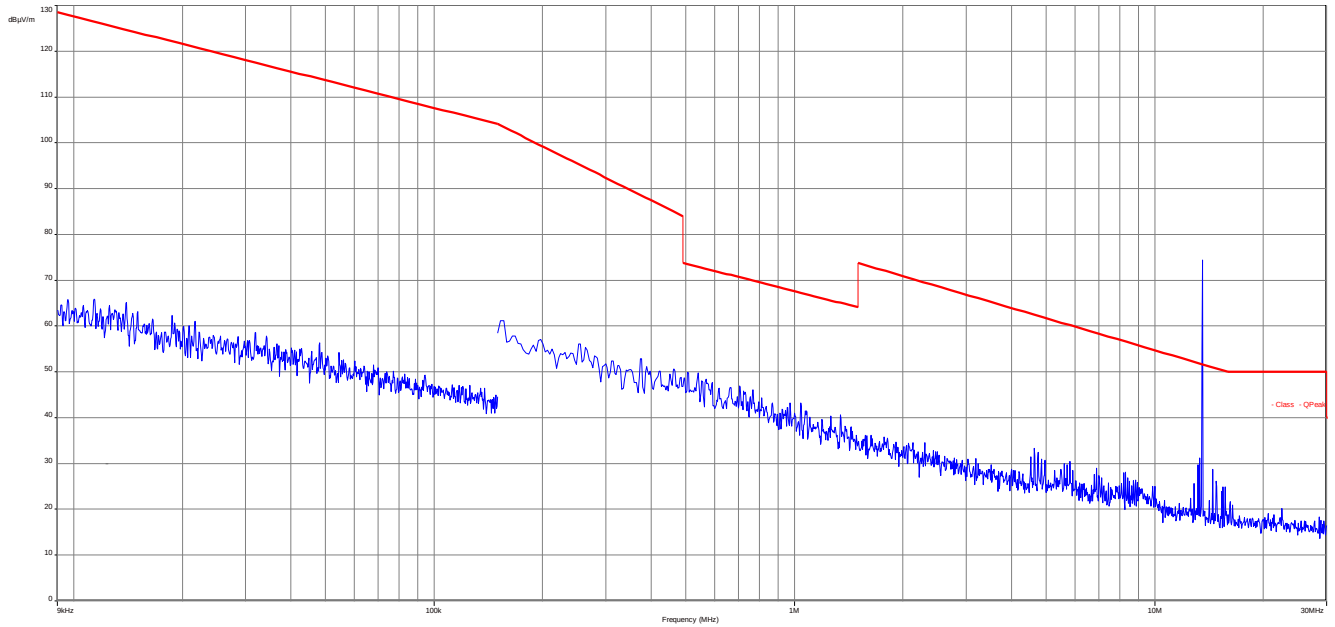
**Note:** For a reduced measurement distance, please take a look at the limit line and the ANSI C63.10-2013 sub clause 6.4 radiated emissions from unlicensed wireless devices below 30 MHz.

#### Result:

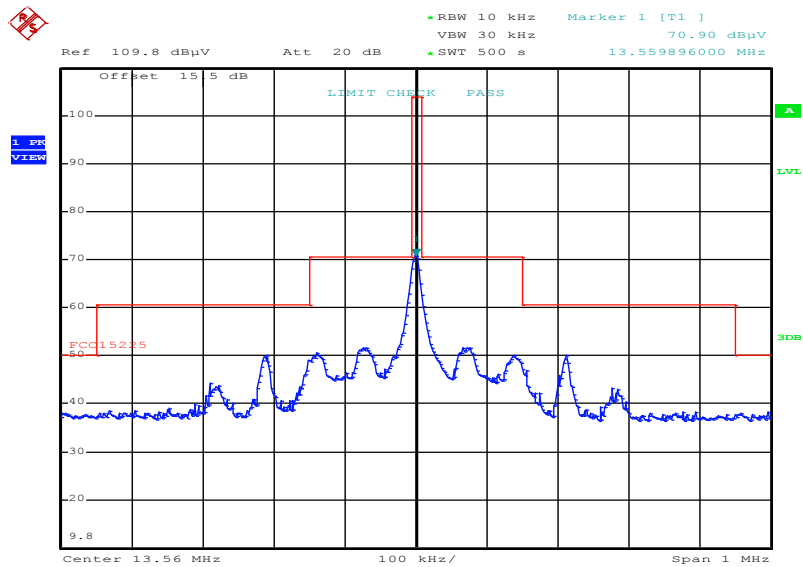
| Detected emissions                                                        |          |                            |                |
|---------------------------------------------------------------------------|----------|----------------------------|----------------|
| Frequency (MHz)                                                           | Detector | Resolution bandwidth (kHz) | Detected value |
| All peaks detected in range from 9 kHz to 30 MHz are > 20 dB below limit. |          |                            |                |
| For frequencies > 30 MHz see result table below the plots                 |          |                            |                |

**Plots:**

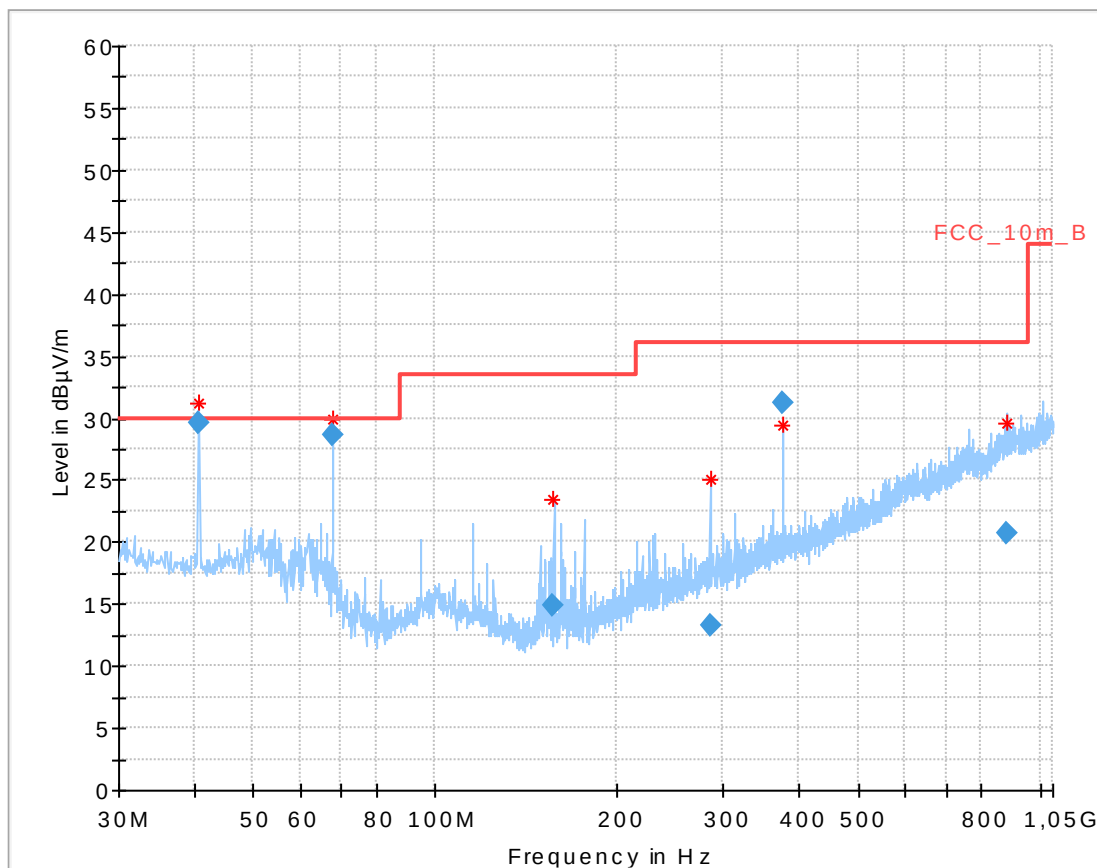
**Plot 1: 9 kHz – 30 MHz, magnetic emissions**



**Plot 2: Spectrum mask (the limits are recalculated according to the ANSI C63.10-2013 sub clause 6.4)**



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**Plot 3:** 30 MHz – 1 GHz, vertical and horizontal polarisation

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 40.684800       | 29.56              | 30.00          | 0.44        | 1000.0          | 120.000         | 100.0       | V   | 276           | 14.0       |
| 67.795200       | 28.69              | 30.00          | 1.31        | 1000.0          | 120.000         | 352.0       | V   | 117           | 8.9        |
| 156.992400      | 14.93              | 33.50          | 18.57       | 1000.0          | 120.000         | 100.0       | V   | 266           | 9.0        |
| 284.740350      | 13.31              | 36.00          | 22.69       | 1000.0          | 120.000         | 400.0       | H   | 220           | 14.1       |
| 374.978550      | 31.26              | 36.00          | 4.74        | 1000.0          | 120.000         | 272.0       | H   | 97            | 16.5       |
| 881.049000      | 20.74              | 36.00          | 15.26       | 1000.0          | 120.000         | 200.0       | H   | 27            | 23.9       |

## 12.4 Conducted limits

### Measurement:

Measurement of the conducted spurious emissions for an intentional radiator that is designed to be connected to the public utility (AC) power line.

| Measurement parameters   |                                                      |
|--------------------------|------------------------------------------------------|
| Detector:                | Quasi peak / average or peak (worst case – pre-scan) |
| Resolution bandwidth:    | F < 150 kHz: 200 Hz<br>F > 150 kHz: 9 kHz            |
| Video bandwidth:         | F < 150 kHz: 1 kHz<br>F > 150 kHz: 100 kHz           |
| Trace mode:              | Max hold                                             |
| Used equipment:          | See chapter 7.3                                      |
| Measurement uncertainty: | See chapter 8                                        |

### Limit:

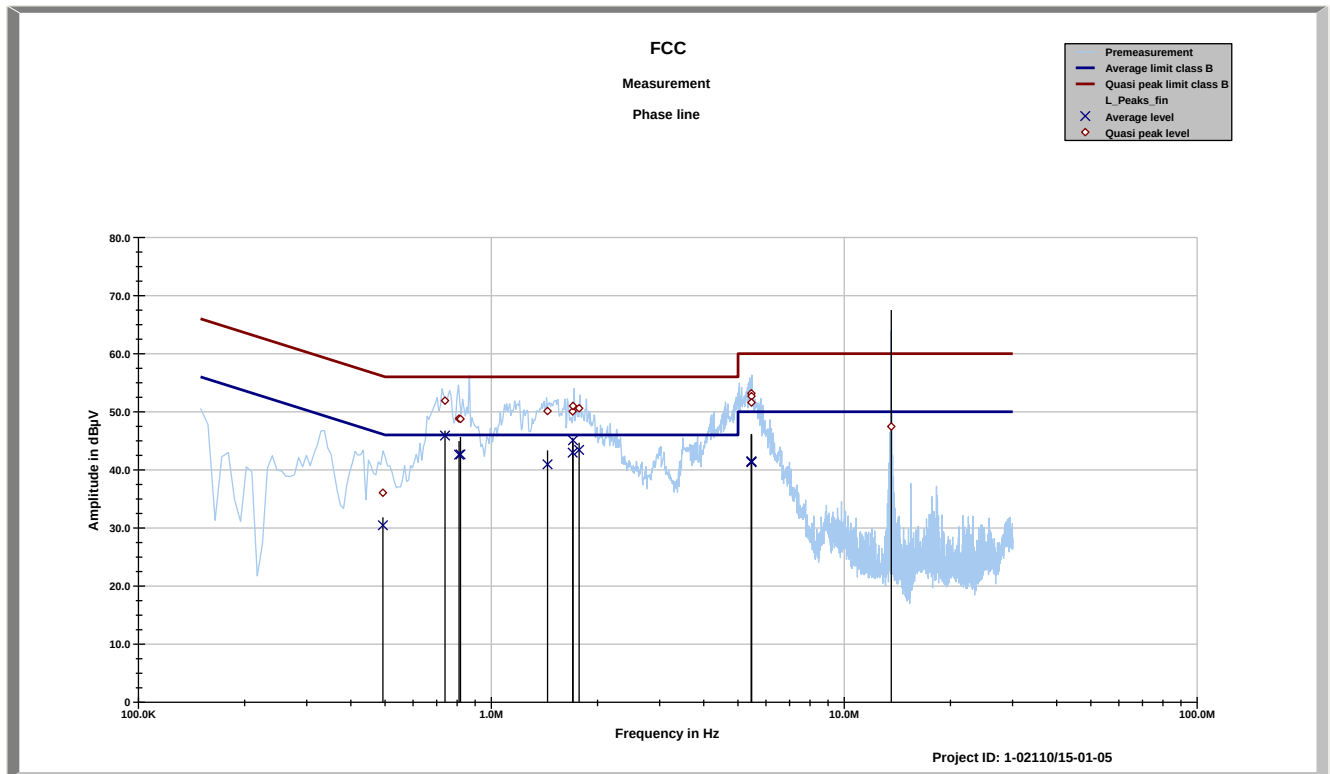
| FCC & IC        |                           |                        |
|-----------------|---------------------------|------------------------|
| Frequency (MHz) | Quasi-peak (dB $\mu$ V/m) | Average (dB $\mu$ V/m) |
| 0.15 – 0.5      | 66 to 56*                 | 56 to 46*              |
| 0.5 – 5         | 56                        | 46                     |
| 5 – 30.0        | 60                        | 50                     |

### Result:

| Detected emissions     |          |                            |                |
|------------------------|----------|----------------------------|----------------|
| Frequency (MHz)        | Detector | Resolution bandwidth (kHz) | Detected value |
| See table below plots! |          |                            |                |
|                        |          |                            |                |
|                        |          |                            |                |

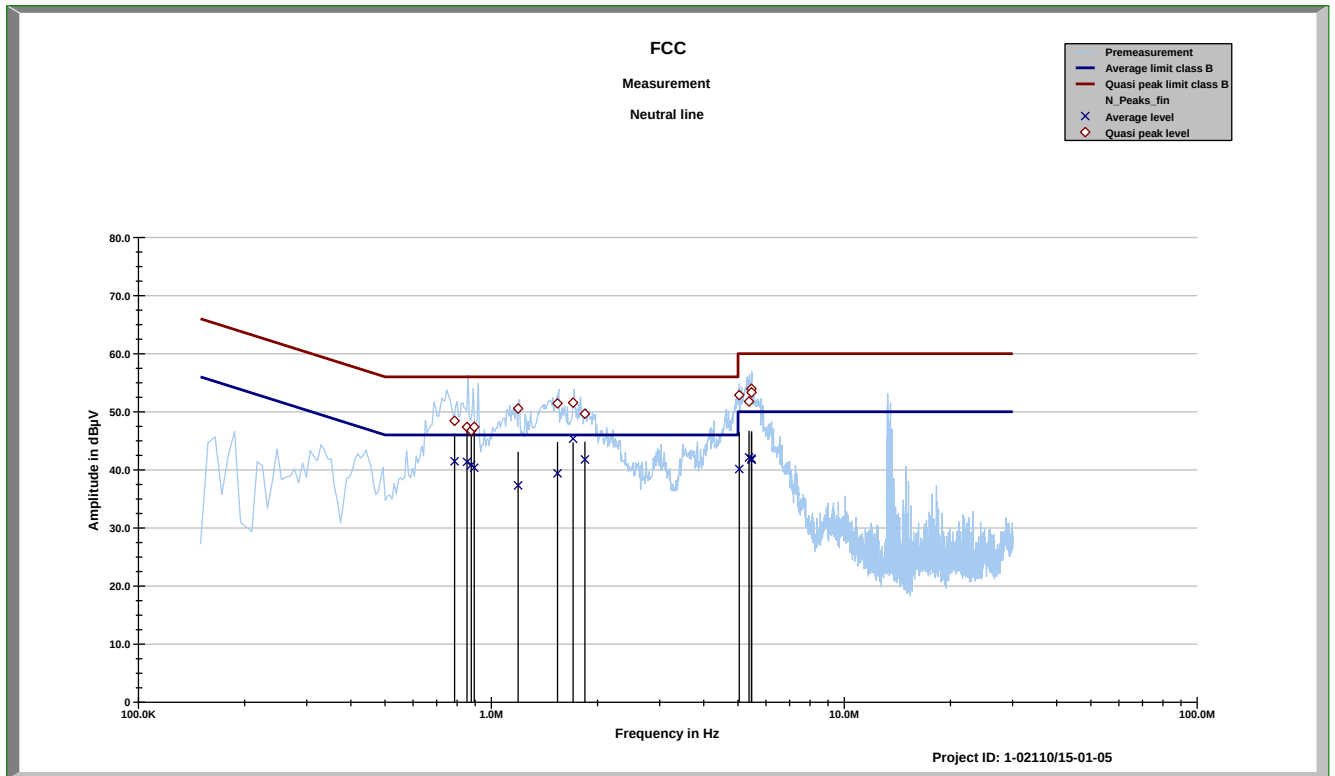
### Plots:

**Plot 1:** 150 kHz to 30 MHz, phase line



| Frequency | Quasi peak level | Margin quasi peak | Average level | Margin average |
|-----------|------------------|-------------------|---------------|----------------|
| MHz       | dBμV             | dBμV              | dBμV          | dBμV           |
| 0.49302   | 36.06            | 20.06             | 30.46         | 15.74          |
| 0.73902   | 51.91            | 4.09              | 45.91         | 0.09           |
| 0.80983   | 48.82            | 7.18              | 42.61         | 3.39           |
| 0.81773   | 48.76            | 7.24              | 42.67         | 3.33           |
| 1.4426    | 50.11            | 5.89              | 40.94         | 5.06           |
| 1.6994    | 50.07            | 5.93              | 42.95         | 3.05           |
| 1.7033    | 51.00            | 5.00              | 45.09         | 0.91           |
| 1.7725    | 50.60            | 5.40              | 43.44         | 2.56           |
| 5.4554    | 53.17            | 6.83              | 41.45         | 8.55           |
| 5.4566    | 52.67            | 7.33              | 41.43         | 8.57           |
| 5.4569    | 51.58            | 8.42              | 41.32         | 8.68           |
| 13.583    | 47.46            | 12.54             | 47.41         | 2.59           |

Plot 2: 150 kHz to 30 MHz, neutral line



| Frequency | Quasi peak level | Margin quasi peak | Average level | Margin average |
|-----------|------------------|-------------------|---------------|----------------|
| MHz       | dBμV             | dBμV              | dBμV          | dBμV           |
| 0.78695   | 48.44            | 7.56              | 41.47         | 4.53           |
| 0.85333   | 47.37            | 8.63              | 41.36         | 4.64           |
| 0.87698   | 46.76            | 9.24              | 40.83         | 5.17           |
| 0.89434   | 47.39            | 8.61              | 40.38         | 5.62           |
| 1.191     | 50.55            | 5.45              | 37.32         | 8.68           |
| 1.5402    | 51.43            | 4.57              | 39.40         | 6.60           |
| 1.7044    | 51.56            | 4.44              | 45.36         | 0.64           |
| 1.8414    | 49.64            | 6.36              | 41.78         | 4.22           |
| 5.0407    | 52.87            | 7.13              | 40.14         | 9.86           |
| 5.3725    | 51.77            | 8.23              | 42.14         | 7.86           |
| 5.4588    | 53.96            | 6.04              | 41.94         | 8.06           |
| 5.4598    | 53.33            | 6.67              | 41.76         | 8.24           |

## 12.5 Frequency error

### Measurement:

The maximum detected field strength for the spurious.

| Measurement parameters   |                 |
|--------------------------|-----------------|
| Detector:                | Peak detector   |
| Resolution bandwidth:    | 10 Hz / 100 Hz  |
| Video bandwidth:         | > RBW           |
| Trace mode:              | Max hold        |
| Used equipment:          | See chapter 7.4 |
| Measurement uncertainty: | See chapter 8   |

### Limit:

| FCC                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The frequency tolerance of the carrier signal shall be maintained within +/- 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. ( $\pm 1.356$ kHz) |

### Results: Temperature variation

| Frequency tolerance      |                       |          |
|--------------------------|-----------------------|----------|
| Measured frequency (MHz) | Conditions            | Result   |
| 13.559896                | -20 °C & 100% voltage | complies |
| 13.559908                | -10 °C & 100% voltage | complies |
| 13.559888                | 0 °C & 100% voltage   | complies |
| 13.559876                | +10 °C & 100% voltage | complies |
| 13.559872                | +20 °C & 100% voltage | complies |
| 13.559776                | +30 °C & 100% voltage | complies |
| 13.559776                | +40 °C & 100% voltage | complies |
| 13.559768                | +50 °C & 100% voltage | complies |

### Results: Voltage variation

| Frequency tolerance      |                       |           |
|--------------------------|-----------------------|-----------|
| Measured frequency (MHz) | Temperature           | Result    |
| 13.559872                | +20 °C & 85% voltage  | complies  |
| 13.559872                | +20 °C & 100% voltage | complies  |
| 13.559872                | +20 °C & 115% voltage | complies  |
| Measurement uncertainty  |                       | $\pm$ RBW |

### 13 Observations

No observations except those reported with the single test cases have been made.

### Annex A Document history

| Version | Applied changes                          | Date of release |
|---------|------------------------------------------|-----------------|
|         | Initial release                          | 2015-09-29      |
| -A      | Editorial changes (FCC/IC ID, HVIN,FVIN) | 2015-11-24      |
| -B      | Editorial changes (HVIN,HMN)             | 2015-11-27      |
| -C      | Editorial changes (Section 5)            | 2016-02-26      |

### Annex B Further information

#### Glossary

|          |   |                                                |
|----------|---|------------------------------------------------|
| AVG      | - | Average                                        |
| DUT      | - | Device under test                              |
| EMC      | - | Electromagnetic Compatibility                  |
| EN       | - | European Standard                              |
| EUT      | - | Equipment under test                           |
| ETSI     | - | European Telecommunications Standard Institute |
| FCC      | - | Federal Communication Commission               |
| FCC ID   | - | Company Identifier at FCC                      |
| HW       | - | Hardware                                       |
| IC       | - | Industry Canada                                |
| Inv. No. | - | Inventory number                               |
| N/A      | - | Not applicable                                 |
| PP       | - | Positive peak                                  |
| QP       | - | Quasi peak                                     |
| S/N      | - | Serial number                                  |
| SW       | - | Software                                       |
| PMN      |   | Product marketing name                         |
| HMN      |   | Host marketing name                            |
| HVIN     |   | Hardware version identification number         |
| FVIN     |   | Firmware version identification number         |

## Annex C Accreditation Certificate

Front side of certificate

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Befehlens gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV  
 Unterzeichnerin der Multilateralen Abkommen  
 von EA, ILAC und IAF zur gegenseitigen Anerkennung

### Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

**CETECOM ICT Services GmbH**  
 Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL  
 VoIP und DECT  
 Akustik  
 Funk einschließlich WLAN  
 Short Range Devices (SRD)  
 RFID  
 WiMax und Richtfunk  
 Mobilfunk (GSM / GPRS, Over the Air (OTA) Performance)  
 Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive  
 Produktsicherheit  
 SAR und Hearing Aid Compatibility (HAC)  
 Umweltsimulation  
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 10117 Berlin

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 38115 Braunschweig

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 und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung  
 im Zusammenhang mit der Vermarktung von Produkten (ABl. L 218 vom 9. Juli 2008, S. 30).  
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