
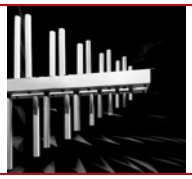
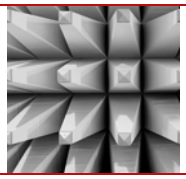

CETECOM™
CETECOM ICT Services
consulting - testing - certification

# TEST REPORT

**Test report no.: 1-3570/11-01-03-B**

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

## Testing laboratory


**CETECOM ICT Services GmbH**
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.cetecom.com
e-mail: 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-12076-01-01
Area of Testing: Radio/Satellite Communications

## Applicant


**DELPHI DEUTSCHLAND GmbH**
Delphiplatz 1
42119 Wuppertal / GERMANY
Fax: +49 2261 97-2351
Contact: Achim Göckener
e-mail: achim.goeckener@delphi.com
Phone: +49 2261 97-1351


## Manufacturer


**Delphi Delco Elecronics de Mexico S. de R.L. de C.V.**
Avenida Fomento Industrial SN.
Parque Industrial del Norte
PLZ Reybosa Tamaulipas 88736 / MEXICO


## Test standard/s

| | |
|---|---|
| 47 CFR Part 15 | Title 47 of the Code of Federal Regulations; Chapter I<br>Part 15 - Radio frequency devices |
| RSS - 210 Issue 8 | Spectrum Management and Telecommunications - Radio Standards Specification<br>Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands):<br>Category I Equipment |

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

## Test Item

| | |
|---|---|
| **Kind of test item:** | **TPMS Receiver & RKE Transceiver** |
| **Model name:** | **FO4** |
| **FCC ID:** | **LTQFO4AM902TRX** |
| **IC:** | 3659A-FO4AM902TRX |
| Frequency range: | 902.335 – 903.465 MHz |
| Technology tested: | Modulated carrier |
| Antenna: | Internal antenna |
| Power Supply: | 12.50 V DC by power supply |
| Temperature Range: | -40°C to +105 °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:

cn=Marco Bertolino, o=CETECOM ICT Services GmbH, ou=BTL-100826, email=marco.bertolino@cetecom.com, c=DE
2012.05.30 11:19:46 +02'00'

Marco Bertolino
Testing Manager

## Test performed:

cn=Tobias Wittenmeier, o=CETECOM ICT Services GmbH, ou=WIT-111222, email=tobias.wittenmeier@cetecom.com, c=DE
2012.05.30 11:06:15 +02'00'

Tobias Wittenmeier

# 1 Table of contents

# 2 General information

## 2.1 Notes and disclaimer

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In no case this test report can be considered as a Letter of Approval.

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

## 2.2 Application details

| | |
|---|---|
| Date of receipt of order: | 2011-07-15 |
| Date of receipt of test item: | 2012-03-12 |
| Start of test: | 2012-03-12 |
| End of test: | 2012-04-19 |
| Person(s) present during the test: | -/- |

# 3 Test standard/s

| Test standard | Date | Test standard description |
|---|---|---|
| 47 CFR Part 15 | 2010-10 | Title 47 of the Code of Federal Regulations; Chapter I<br>Part 15 - Radio frequency devices |
| RSS - 210 Issue 8 | 2010-12 | Spectrum Management and Telecommunications - Radio Standards Specification<br>Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment |

## 4 Test environment

| | | | |
|---|---|---|---|
| Temperature: | $T_{nom}$ | +22 °C | during room temperature tests |
| | $T_{max}$ | +105 °C | during high temperature tests |
| | $T_{min}$ | -40 °C | during low temperature tests |
| Relative humidity content: | | 55 % | |
| Barometric pressure: | | not relevant for this kind of testing | |
| Power supply: | $V_{nom}$ | 12.50 V | DC by power supply |
| | $V_{max}$ | 16.00 V | |
| | $V_{min}$ | 8.00 V | |

## 5 Test item

| | | |
|---|---|---|
| **Kind of test item** | : | **TPMS Receiver & RKE Transceiver** |
| **Type identification** | : | **FO4** |
| | | |
| **S/N serial number** | : | **unknown** |
| **HW hardware status** | : | **HW08 / 28366713** |
| **SW software status** | : | **07.02 / 28354561** |
| **Firmware status** | : | **07.02 / 28354563** |
| **Frequency band [MHz]** | : | **902.335 – 903.465 MHz** |
| **Type of modulation** | : | **Receive: FSK / Transmit: OOK** |
| **Number of channels** | : | **2** |
| **Antenna** | : | **Internal antenna** |
| **Power supply** | : | **12.50 V DC by power supply** |
| **Temperature range** | : | **-40°C to +105 °C** |

## 6 Test laboratories sub-contracted

None

## 7 Summary of measurement results

☒ **No deviations from the technical specifications were ascertained**

☐ There were deviations from the technical specifications ascertained

| TC Identifier | Description | Verdict | Date | Remark |
|---|---|---|---|---|
| RF-Testing | CFR Part 15<br>RSS 210, Issue 8 | Passed | 2012-05-30 | -/- |

| Test Specification Clause | Test Case | Temperature Conditions | Power Source Voltages | Pass | Fail | NA | NP | Results (max.) |
|---|---|---|---|---|---|---|---|---|
| § 15.35 (c)/ RSS-GEN Issue 2 | Timing of the transmitter (Duty cycle correction factor ) | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | complies |
| § 15.231 (a) (1)/ RSS-210 Issue 8 | Switch off time | Nominal | Nominal | ☐ | ☐ | ☒ | ☐ | Declared by the customer! |
| § 15.231 (3) (c)/ RSS-210 Issue 8 | Emission Bandwidth | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | complies |
| § 15.231 (b)/ RSS-210 Issue 8 | Fieldstrength of Fundamental | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | complies |
| § 15.209/ RSS-210 Issue 8 | Fieldstrength of harmonics and spurious | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | complies |
| § 15.209/ RSS-GEN | Receiver spurious emissions (radiated) | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | complies |

**Note:** NA = Not Applicable; NP = Not Performed

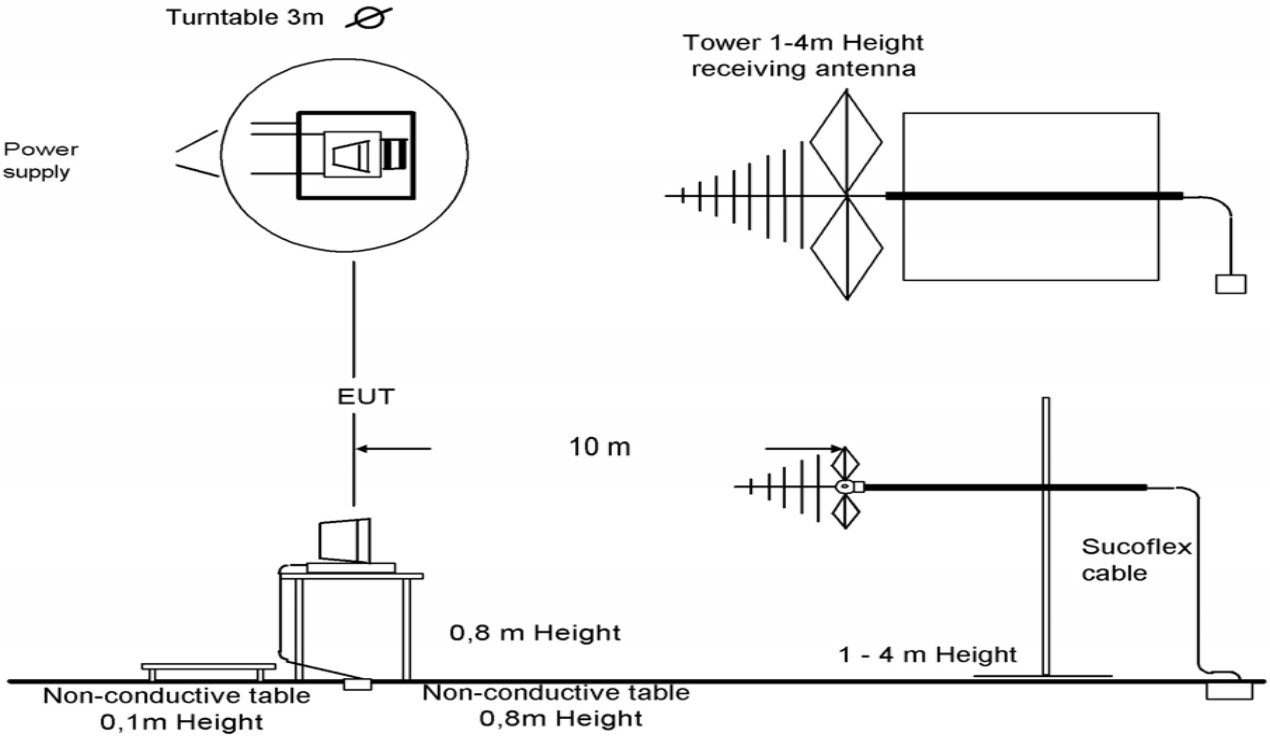
# 8 RF measurement testing

## 8.1 Description of test setup

### 8.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 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 C63.2-1996 clause 15 and ANSI C63.4-2003 clause 4.1.5. 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 analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-2003 clause 4.2.
Antennas are confirmed with ANSI C63.2-1996 item 15.

Semi anechoic chamber



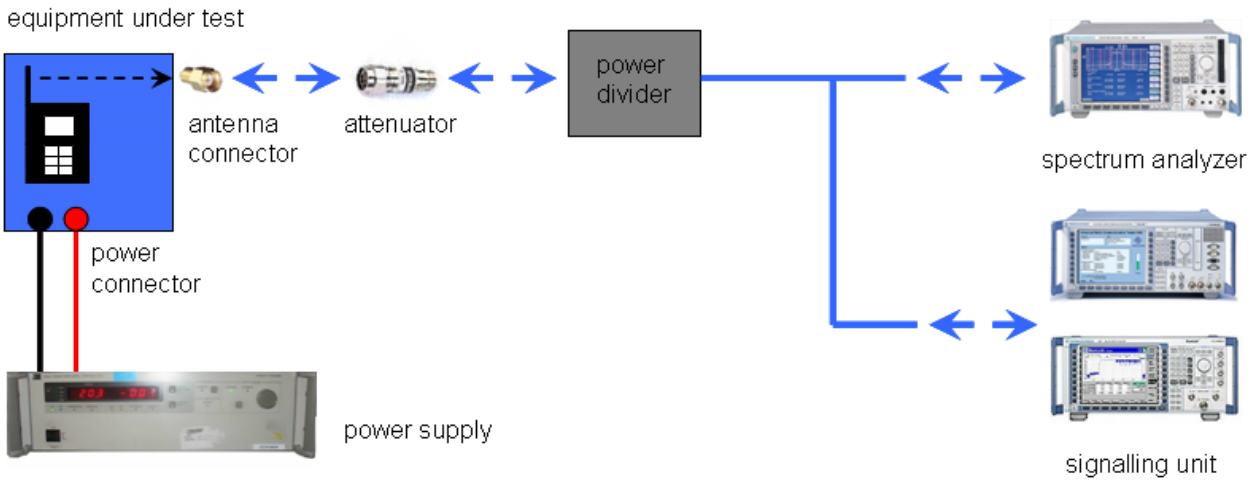

**Picture 1: Diagram radiated measurements**

| | |
|---|---|
| 9 kHz - 30 MHz: | active loop antenna |
| 30 MHz – 1 GHz: | tri-log antenna |
| > 1 GHz: | horn antenna |

The EUT is powered by an external power supply with nominal voltage. The signalling is performed from outside the chamber with a signalling unit (CMU200 or other) by air link using signalling antenna.

### 8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal paths is connected to the communication base Station (CMU200 or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm.




**Picture 2: Diagram conducted measurements**

## 8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: Five different prepared devices provided from the manufacturer.
Four transmitting at 903 MHz
- Ant2/Ch1
- Ant2/Ch2
- Ant3/Ch1
- Ant3/Ch2

One is prepared for receiving on both antennas

Test mode:

☐ Normal operation, no special test mode available.

☐ Special software is used.

☒ Prepared devices provided

## 8.3 RSP100 test report cover sheet / performance test data

| | | |
|---|---|---|
| **Test Report Number** | **:** | **1-3570/11-01-03-B** |
| **Equipment Model Number** | **:** | **FO4** |
| **Certification Number** | **:** | **3659A-FO4AM902TRX** |
| **Manufacturer (complete Address)** | **:** | **Delphi Delco Elecronics de Mexico S. de R.L. de C.V. Avenida Fomento Industrial SN. Parque Industrial del Norte** P **PLZ Reybosa Tamaulipas 88736 / MEXICO** |
| **Tested to radio standards specification no.** | **:** | **RSS 210, Issue 8** |
| **Open Area Test Site IC No.** | **:** | **IC 3462C-1** |
| **Frequency Range or fixed frequency** | **:** | **314.935MHz … 315.065MHz (Receiver) 902.335MHz … 903.465MHz (Transmitter & Receiver)** |
| **Field Strength [dBµV/m] (@ 3m)** | **:** | **70.95 dBµV/m** |
| **Occupied bandwidth (99%-BW) [kHz]** | **:** | **20.3 KHz** |
| **Type of modulation** | **:** | **Receive: FSK / Transmit: OOK** |
| **Emission Designator (TRC-43)** | **:** | **20K3A1D** |
| **Antenna Information** | **:** | **Integrated antenna** |
| **Transmitter Spurious (worst case) [µV/m @ 3m]:** | | **54.04 dBµV/m @ 1805 MHz** |
| **Receiver Spurious (worst case) [µV/m @ 3m]:** | | **52.7 dB µV/m (noise floor)** |

**ATTESTATION:**
**DECLARATION OF COMPLIANCE:**

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

**Laboratory Manager:**

| **2012-05-30** | **Tobias Wittenmeier** | |
|---|---|---|
| Date | Name | Signature |

# 9 Measurement results

## 9.1 Timing of the transmitter

**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | See Plots |
| Resolution bandwidth: | 3kHz |
| Video bandwidth: | 3kHz |
| Span: | Zero |
| Trace-Mode: | Trigger video |

**Limits:**

| FCC | IC |
|---|---|
| CFR Part SUBCLAUSE § 15.35 (c) | RSS-GEN Issue 2 Section 4.5 |
| Timing of the transmitter | |
| (c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification. | |

**Result:**

Plot 1: Signal


The EUT is sending this signal continuously in the test mode.

Plot 2: 1 pulse / 205 ms

Plot 3: Pulse length of a single pulse:


Transmit time (Tx on) = 19.25 ms (Plot 3)
Tx on + Tx off = 100 ms (Plot 2)
Duty Cycle = 19.25 %
The peak-to-average correction factor is calculated with 20Log [Tx on/(Tx on + Tx off)].
Hereby the peak-to-average correction factor is 14.31dB.

**Result:** **The result of the measurement is passed.**

## 9.2 Switch off time

The transmitter only sends one data block in normal use. The transmission stops after 224 ms (customer declaration).

## 9.3 Emission bandwidth

**Measurement:**

Measurement of the 20 dB bandwidth of the modulated signal

| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | See plots |
| Resolution bandwidth: | 300 Hz |
| Video bandwidth: | 300 Hz |
| Span: | See plots |
| Trace-Mode: | Max. hold |

**Limits:**

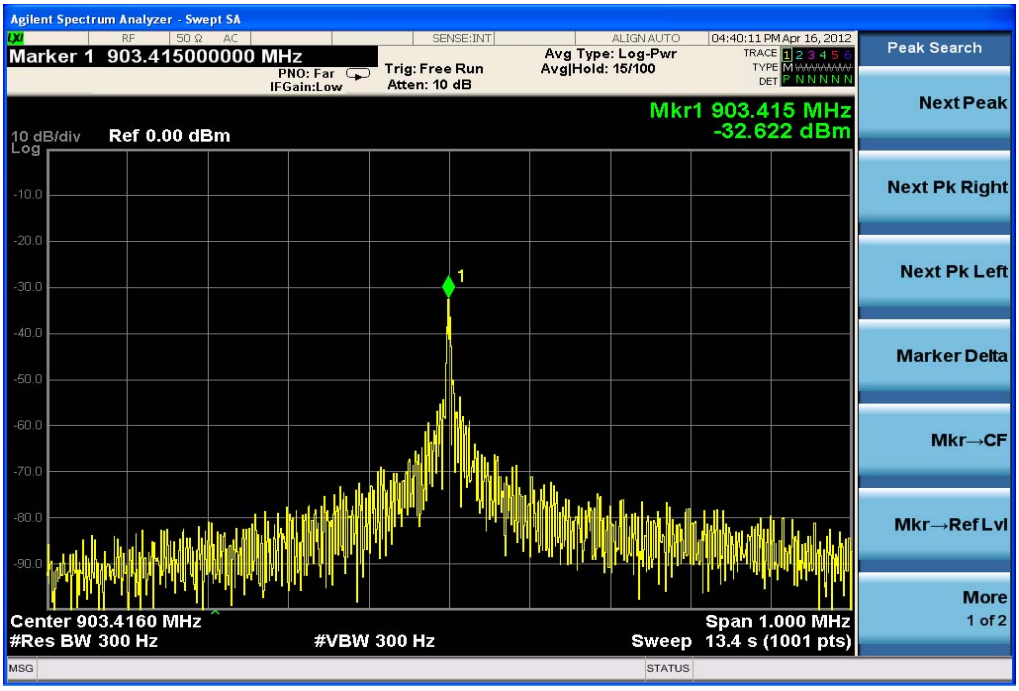
| FCC | IC |
|---|---|
| CFR Part SUBCLAUSE § 15.231 (c) | RSS-210 Issue 8 Section A1.1.3 |
| Emission bandwidth | |
| The OBW shall not be wider than 0.25% of the centre frequency. | |

The emission bandwidth at 20 dB is 20.3 kHz

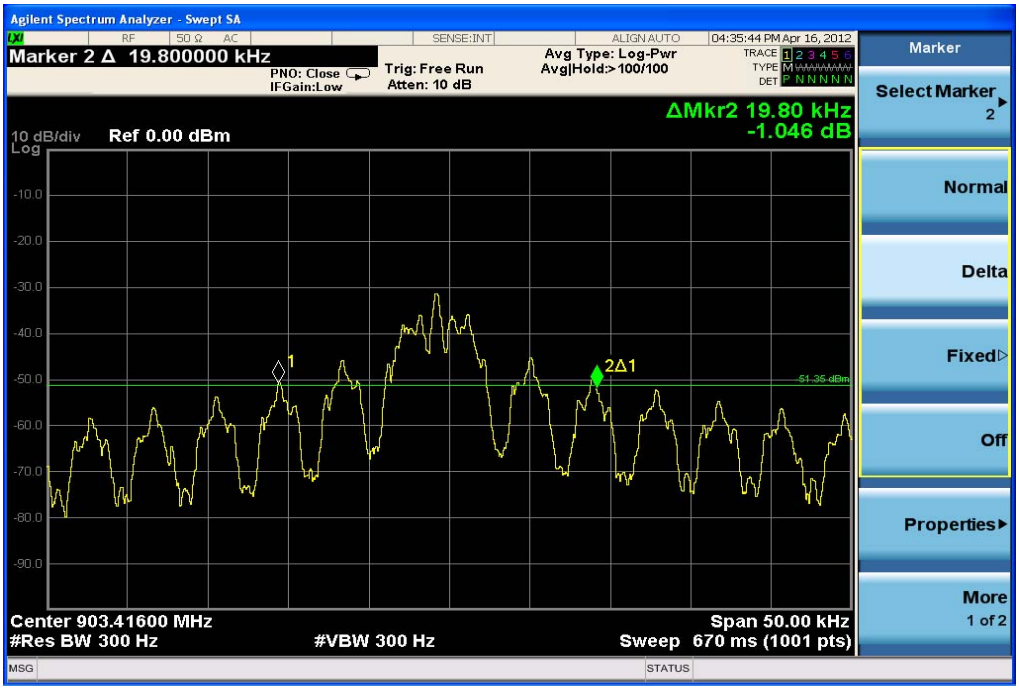
**Result:** **The result of the measurement is passed.**

**Result:**

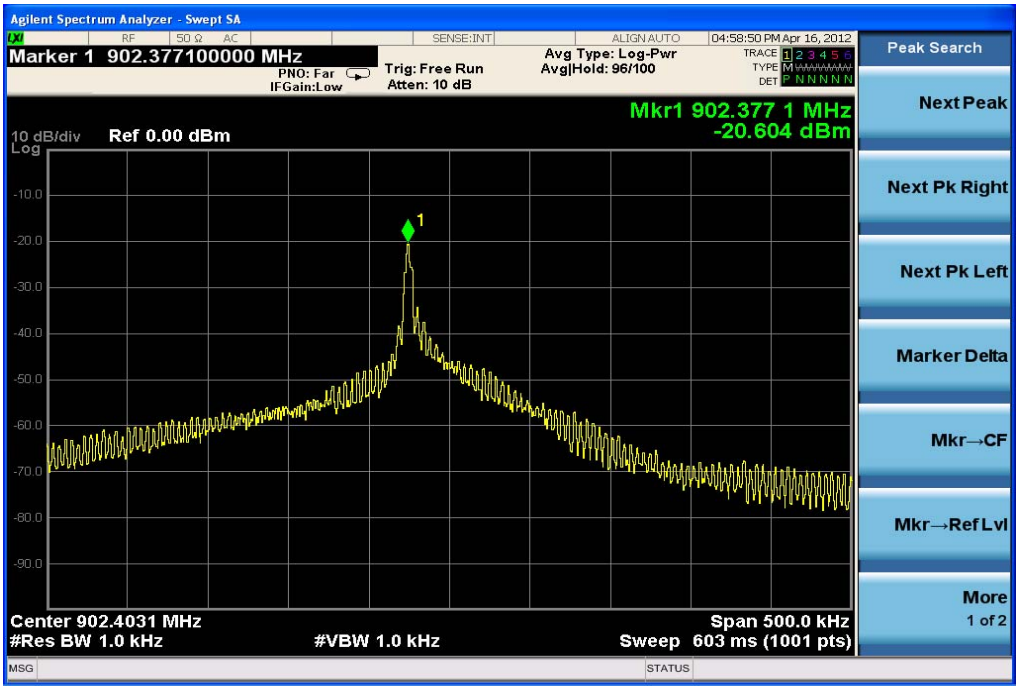
Plot 1: (Ant 2 / Ch 1; complete signal, only for information)



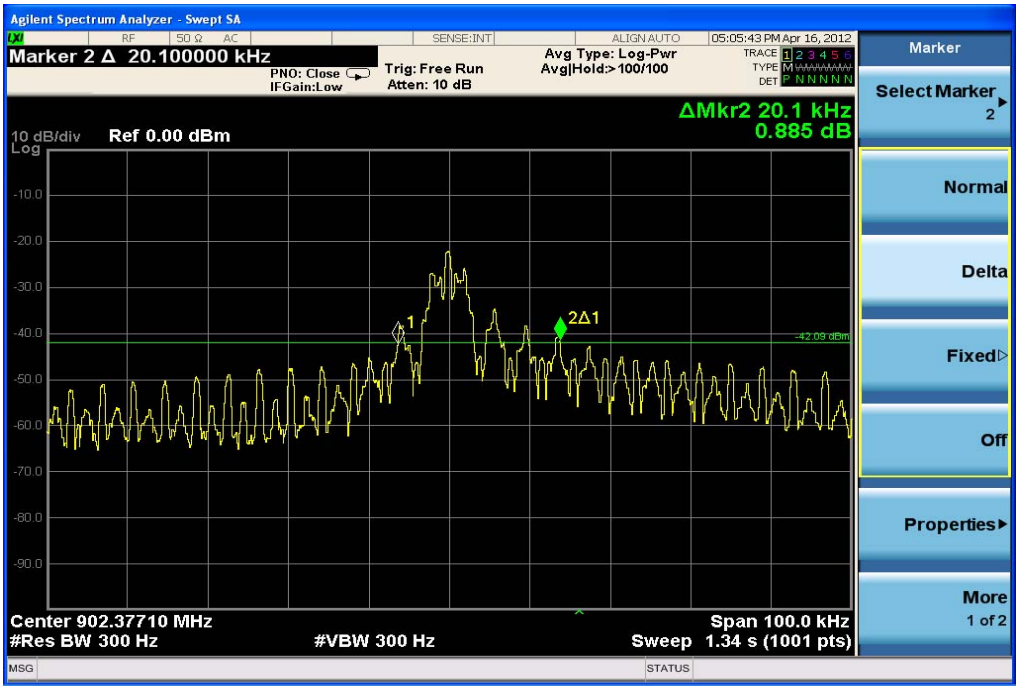

Plot 2: (Ant 2 / Ch 1; 20 dB-bandwidth)



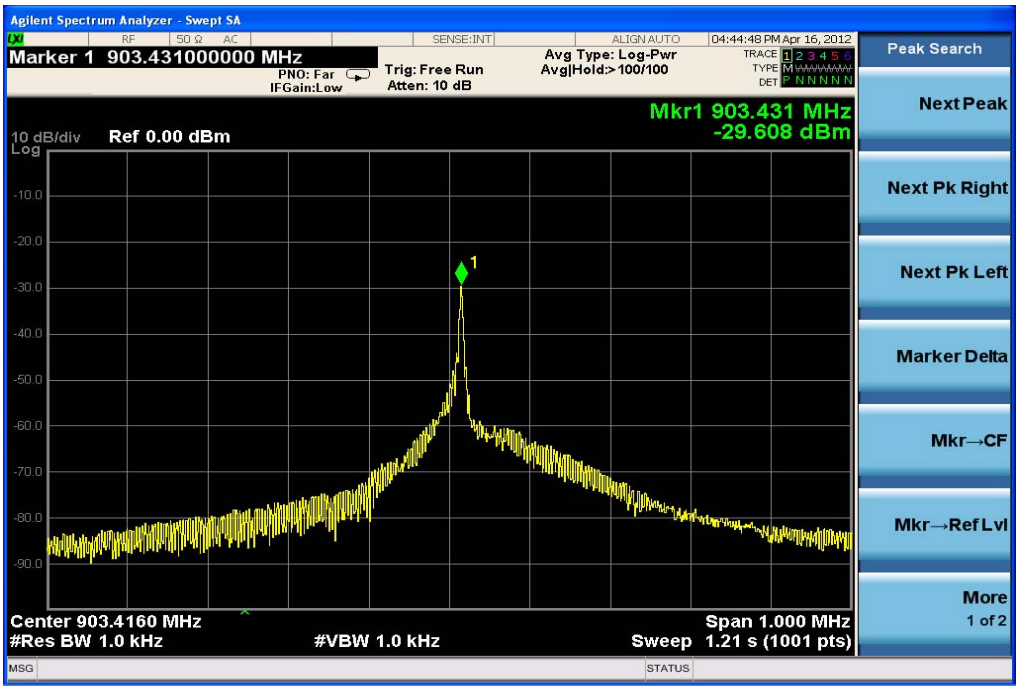
Plot 3(Ant 2 / Ch 2; complete signal, only for information)



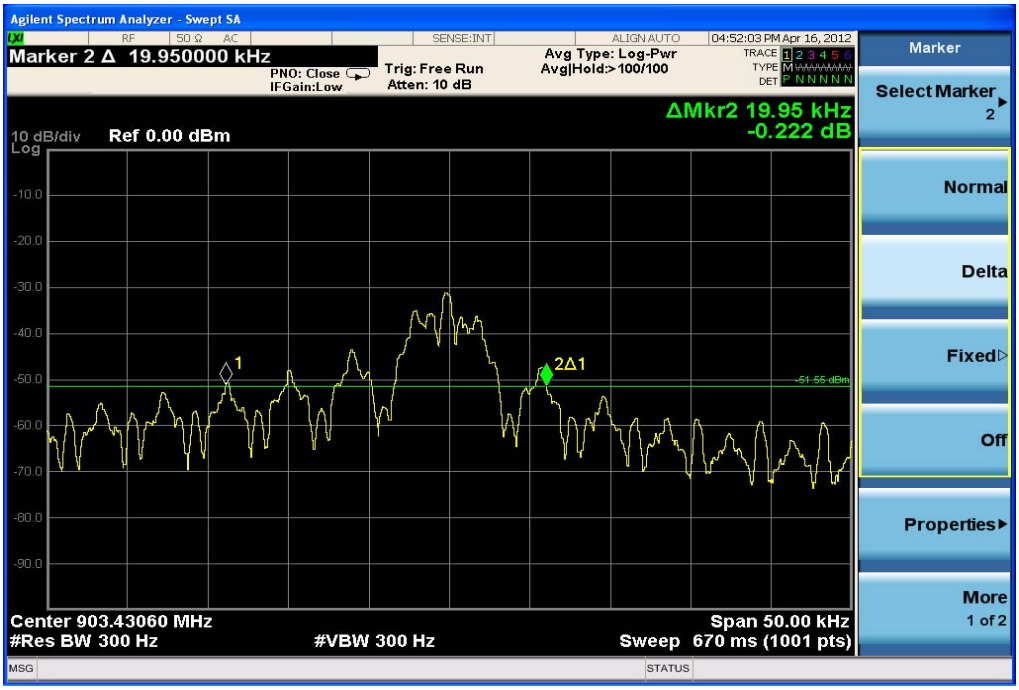

Plot 4: (Ant 2 / Ch 2; 20 dB-bandwidth)



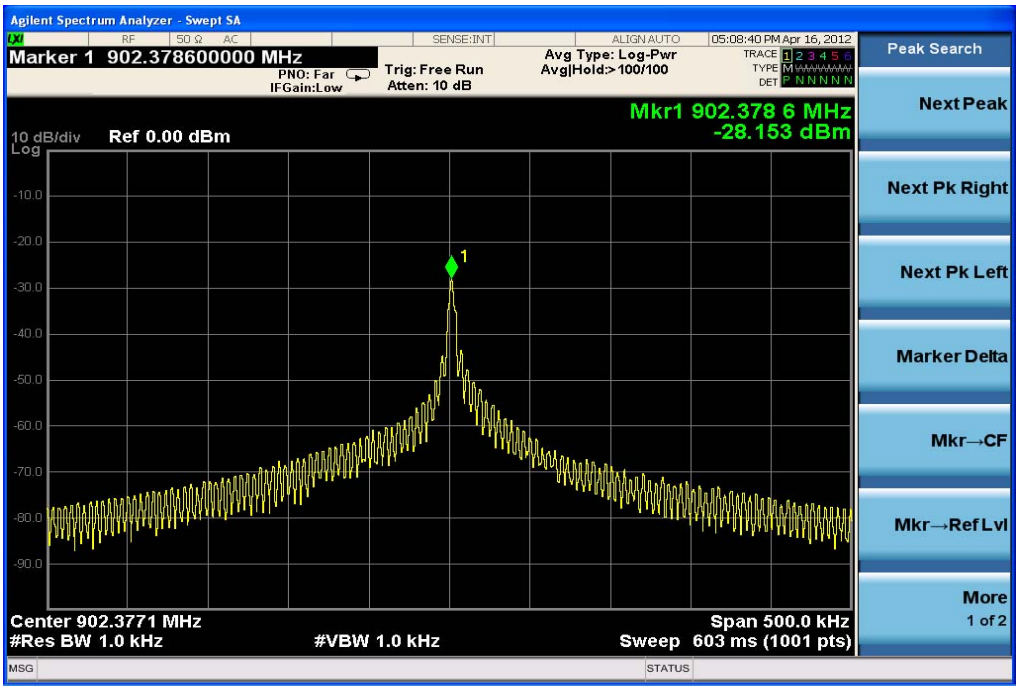
Plot 5: (Ant 3 / Ch 1; complete signal, only for information)



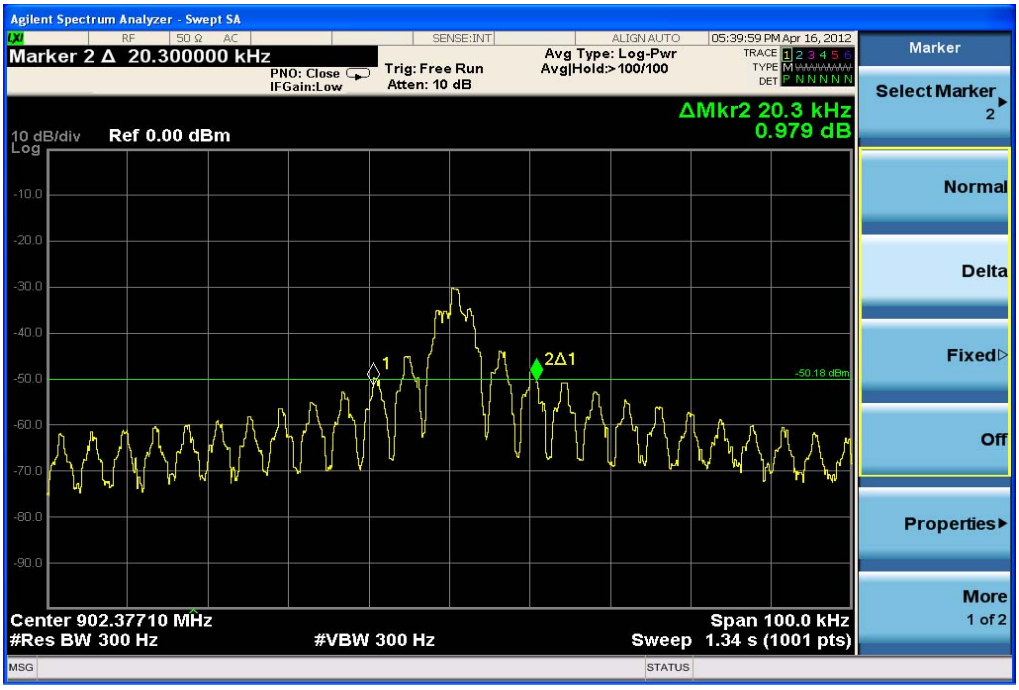

Plot 6: (Ant 3 / Ch 1; 20 dB-bandwidth)



Plot 7: (Ant3 / Ch2; complete signal, only for information)




Plot 8: (Ant 3 / Ch 2; 20 dB-bandwidth)



## 9.4 Field strength of the fundamental

**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | Auto |
| Video bandwidth: | 3*RBW |
| Resolution bandwidth: | 120 kHz |
| Trace-Mode: | Max. hold |

**Limits:**

| FCC | IC | |
|---|---|---|
| CFR Part SUBCLAUSE § 15.231 (b) | RSS-210 Issue 8 Section A1.1.2 / 2.7 Table 4 | |
| Field strength of the fundamental.<br>In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following: | | |
| **Fundamental Frequency (MHz)** | **Field strength of Fundamental (µV/m)** | **Measurement distance (m)** |
| 40.66 – 40.70 | 2,250 | 3 |
| 70-130 | 1,250 | 3 |
| 130-174 | 1,250 to 3,750 | 3 |
| 174-260 | 3,750 | 3 |
| 260-470 | 3,750 to 12,500 | 3 |
| Above 470 | 12,500 | 3 |

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

- for the band 130-174 MHz, µV/m at 3 meters = 56.81818(F) - 6136.3636;
- for the band 260-470 MHz, µV/m at 3 meters = 41.6667(F) - 7083.3333.

**Result: Ant2/Ch1**

| TEST CONDITIONS | | Maximum field strength (dBµV/m at 3 m distance) | |
|---|---|---|---|
| Distance | | Field strength [dBµV/m] | Field strength [dBµV/m] |
| Mode | | Peak | Average |
| $T_{nom}$ | $V_{nom}$ | 90.99 | 76.68* |
| Measurement uncertainty | | ±3dB | |

*Value recalculated from Peak-to-Average correction factor described in 9.1

**Result: Ant2/Ch2**

| TEST CONDITIONS | | Maximum field strength (dBµV/m at 3 m distance) | |
|---|---|---|---|
| Distance | | Field strength [dBµV/m] | Field strength [dBµV/m] |
| Mode | | Peak | Average |
| $T_{nom}$ | $V_{nom}$ | 91.50 | 77.19* |
| Measurement uncertainty | | ±3dB | |

*Value recalculated from Peak-to-Average correction factor described in 9.1

**Result: Ant3/Ch1**

| TEST CONDITIONS | | Maximum field strength (dBµV/m at 3 m distance) | |
|---|---|---|---|
| Distance | | Field strength [dBµV/m] | Field strength [dBµV/m] |
| Mode | | Peak | Average |
| $T_{nom}$ | $V_{nom}$ | 90.07 | 75.76* |
| Measurement uncertainty | | ±3dB | |

*Value recalculated from Peak-to-Average correction factor described in 9.1

**Result: Ant3/Ch2**

| TEST CONDITIONS | | Maximum field strength (dBµV/m at 3 m distance) | |
|---|---|---|---|
| Distance | | Field strength [dBµV/m] | Field strength [dBµV/m] |
| Mode | | Peak | Average |
| $T_{nom}$ | $V_{nom}$ | 91.50 | 77.19* |
| Measurement uncertainty | | ±3dB | |

*Value recalculated from Peak-to-Average correction factor described in 9.1

**Result:** **The result of the measurement is passed.**

## 9.5 Field strength of the harmonics and spurious

**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | Auto |
| Resolution bandwidth: | 120 KHz |
| Video bandwidth: | 3*RBW |
| Trace-Mode: | Max. hold |

**Limits:**

| FCC | | IC |
|---|---|---|
| CFR Part SUBCLAUSE § 15.231 (b) | | RSS-210 Issue 8 Section A1.1.2 / 2.7 Table 4 |
| Field strength of the fundamental.<br>In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following: | | |
| **Fundamental Frequency (MHz)** | **Field strength of spurious (µV/m)** | **Measurement distance (m)** |
| 40.66 – 40.70 | 225 | 3 |
| 70-130 | 125 | 3 |
| 130-174 | 125 to 375 | 3 |
| 174-260 | 375 | 3 |
| 260-470 | 375 to 1,250 | 3 |
| Above 470 | 1,250 | 3 |

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

| FCC | | IC |
|---|---|---|
| **SUBCLAUSE § 15.209** | | |
| Field strength of the harmonics and spurious. | | |
| **Frequency (MHz)** | **Field strength (µV/m)** | **Measurement distance (m)** |
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30 | 30 | 30 |
| 30 – 88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 – 960 | 200 | 3 |
| above 960 | 500 | 3 |

## Results:

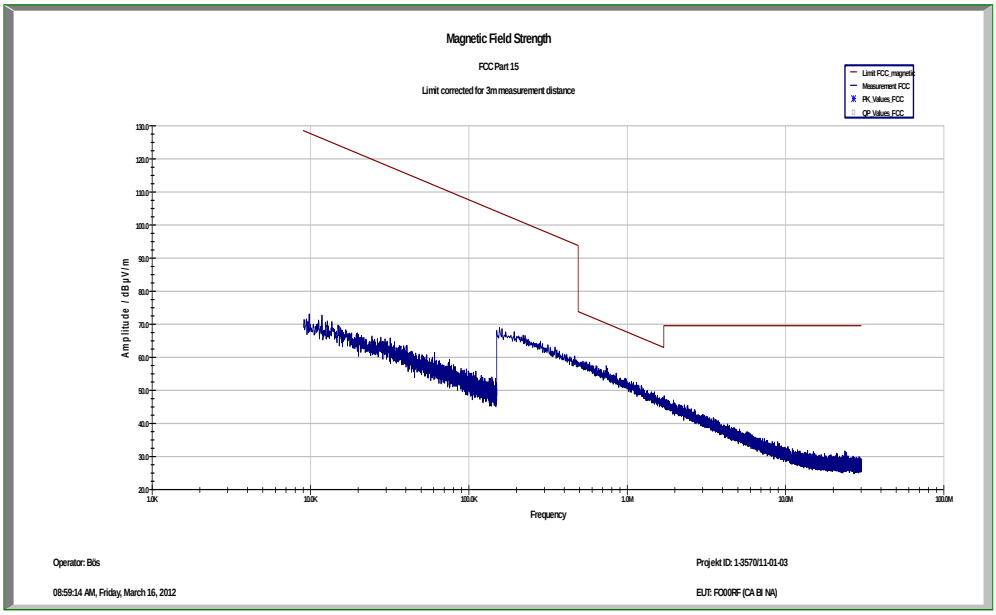
| EMISSION LIMITATIONS | | | | |
|---|---|---|---|---|
| f [MHz] | Detector | Limit max. allowed [dBµV/m] | Amplitude of emission [dBµV/m] | Results |
| 1804.7 | Peak / Pulse average | peak 74 / average 54 | 52.8 / 38.49 | passed |
| 1804.8 | Peak / Pulse average | peak 74 / average 54 | 52.7 / 38.39 | passed |
| 1806.9 | Peak / Pulse average | peak 74 / average 54 | 53.9 / 39.59 | passed |
| | | | | |

**Result:** **The result of the measurement is passed.**

**Plots of the measurements**

**Device: Ant2/Ch1**

Plot 1: 9 kHz to 30 MHz



Plot 2: 30 MHz to 1 GHz, horizontal / vertical polarization – max hold

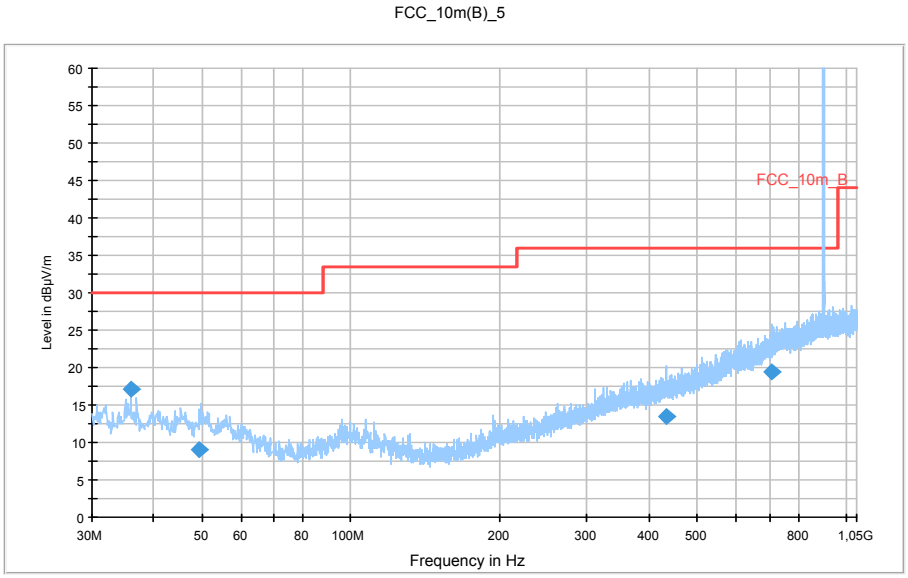
## Common Information

| | |
|---|---|
| EUT: | FO00RF |
| Serial Number: | 5100120003642441 |
| Test Description: | FCC part 15C class B |
| Operating Conditions: | cont TX Channel 1 Ant 2 |
| Operator Name: | Kraus |
| Comment: | DC 12V |

## Scan Setup: STAN_Fin [EMI radiated]

| | |
|---|---|
| Hardware Setup: | Electric Field (NOS) |
| Receiver: | [ESCI 3] |
| Level Unit: | dBµV/m |

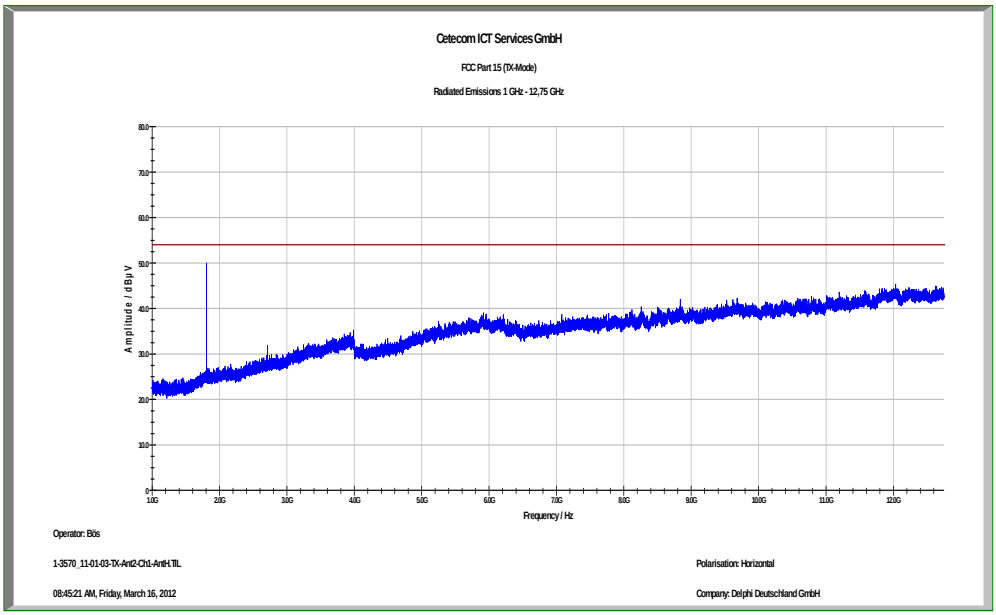
| Subrange | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|---|---|---|---|---|---|
| 30 MHz - 2 GHz | 60 kHz | QPK | 120 kHz | 1 s | 20 dB |



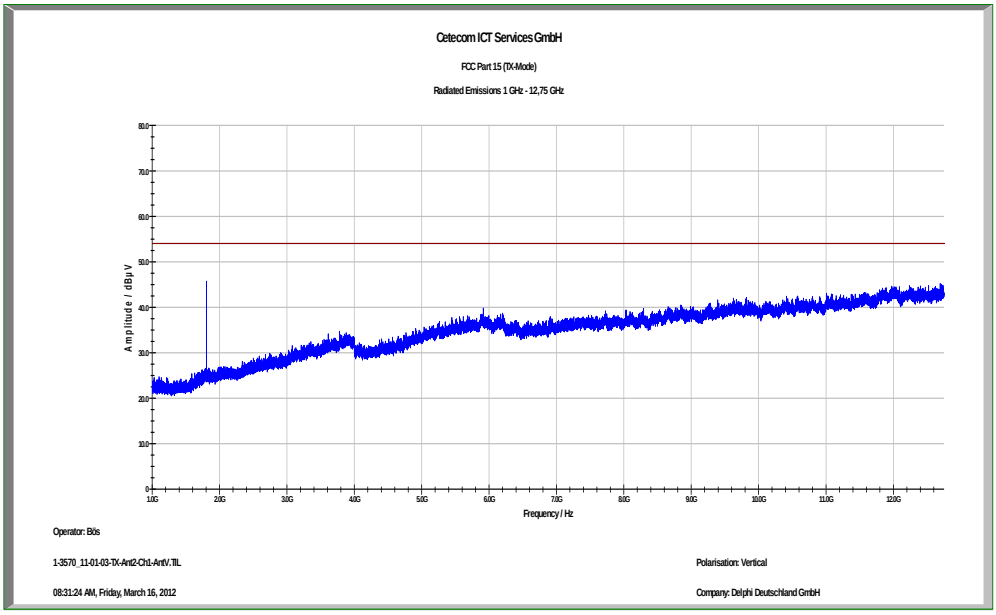

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 36.000000 | 17.0 | 1000.0 | 120.000 | 98.0 | V | 206.0 | 13.1 | 13.0 | 30.0 | |
| 49.320000 | 9.0 | 1000.0 | 120.000 | 270.0 | H | 109.0 | 13.4 | 21.0 | 30.0 | |
| 433.680000 | 13.5 | 1000.0 | 120.000 | 257.0 | V | 357.0 | 17.4 | 22.5 | 36.0 | |
| 709.560000 | 19.5 | 1000.0 | 120.000 | 229.0 | V | 64.0 | 22.7 | 16.5 | 36.0 | |

Plot 3: 1 GHz to 12.75 GHz, horizontal polarization

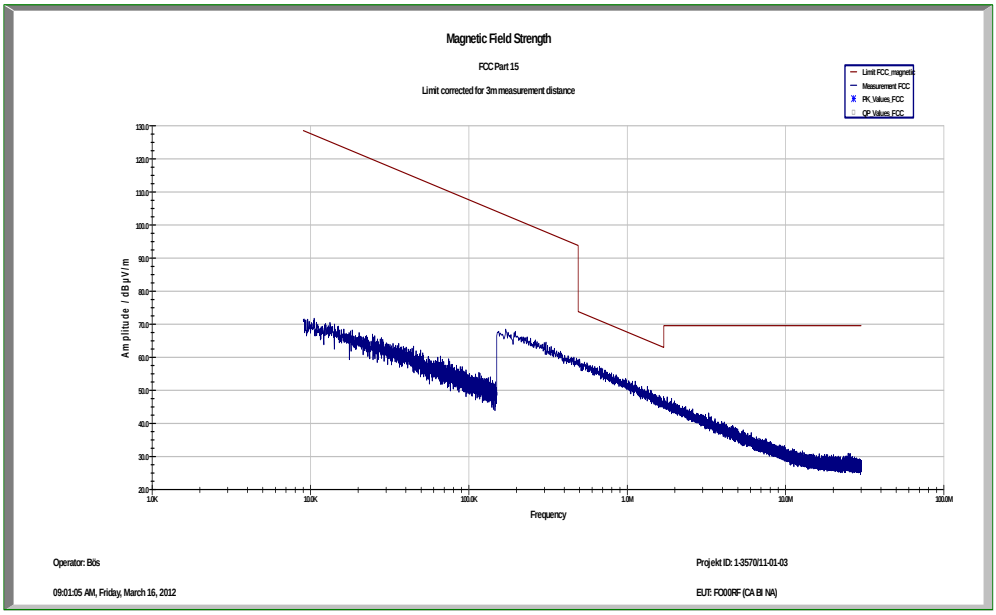



Plot 4: 1 GHz to 12.75 GHz, vertical polarization



**Device: Ant2/Ch2**

Plot 5: 9 kHz to 30 MHz



Plot 6: 30 MHz to 1 GHz, horizontal / vertical polarization – max hold

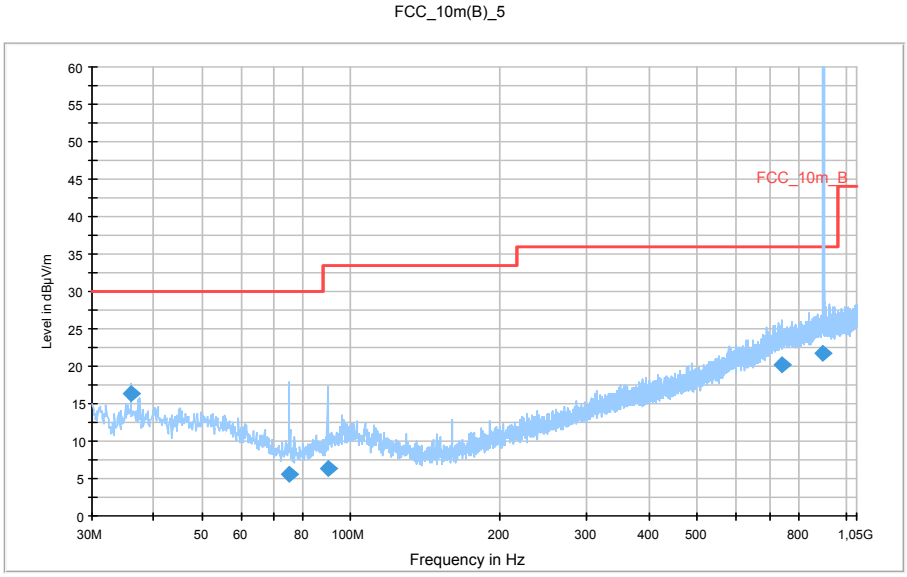
## Common Information

| | |
|---|---|
| EUT: | FO00RF |
| Serial Number: | 5100120003642455 |
| Test Description: | FCC part 15C class B |
| Operating Conditions: | cont TX Channel 2 Ant 2 |
| Operator Name: | Kraus |
| Comment: | DC 12V |

## Scan Setup: STAN_Fin [EMI radiated]

| | |
|---|---|
| Hardware Setup: | Electric Field (NOS) |
| Receiver: | [ESCI 3] |
| Level Unit: | dBµV/m |

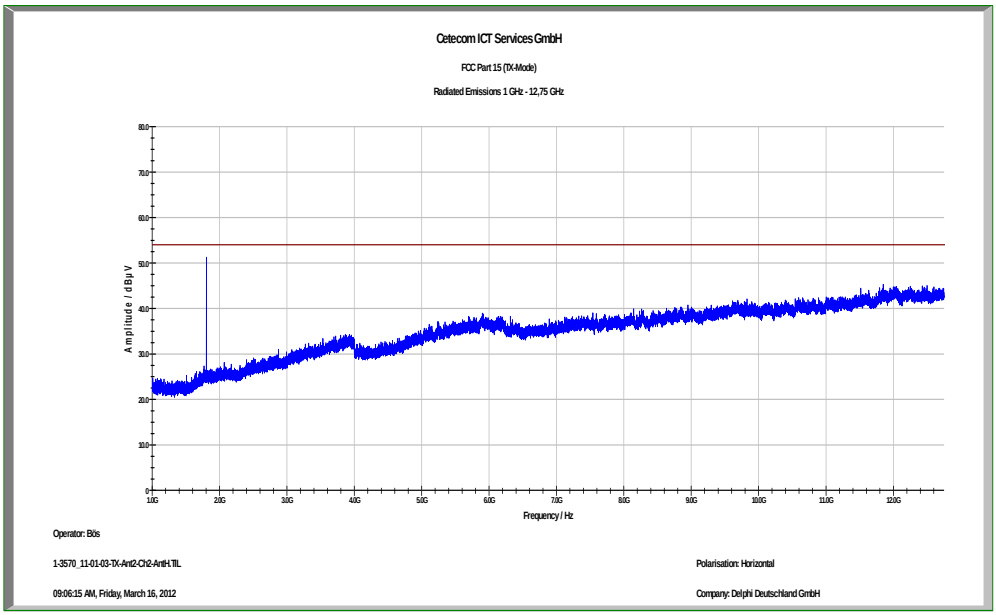
| Subrange | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|---|---|---|---|---|---|
| 30 MHz - 2 GHz | 60 kHz | QPK | 120 kHz | 1 s | 20 dB |



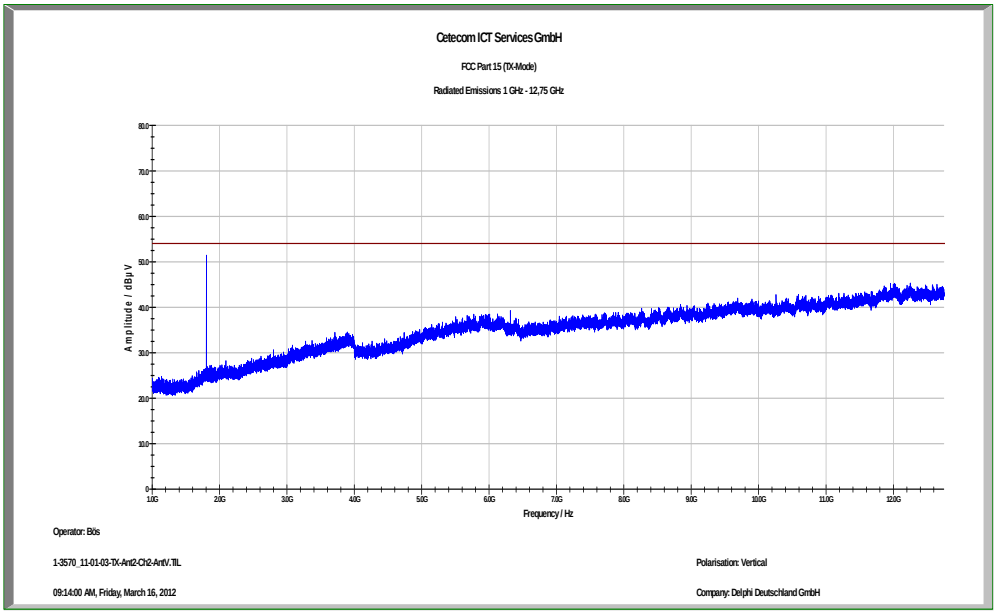

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 36.000000 | 16.4 | 1000.0 | 120.000 | 105.0 | V | 31.0 | 13.1 | 13.6 | 30.0 | |
| 75.120000 | 5.5 | 1000.0 | 120.000 | 216.0 | V | 311.0 | 9.2 | 24.5 | 30.0 | |
| 89.640000 | 6.3 | 1000.0 | 120.000 | 124.0 | V | 328.0 | 10.5 | 27.2 | 33.5 | |
| 740.880000 | 20.2 | 1000.0 | 120.000 | 223.0 | V | -2.0 | 23.4 | 15.8 | 36.0 | |
| 898.680000 | 21.8 | 1000.0 | 120.000 | 134.0 | H | 137.0 | 25.2 | 14.2 | 36.0 | |

Plot 7: 1 GHz to 12.75 GHz, horizontal polarization

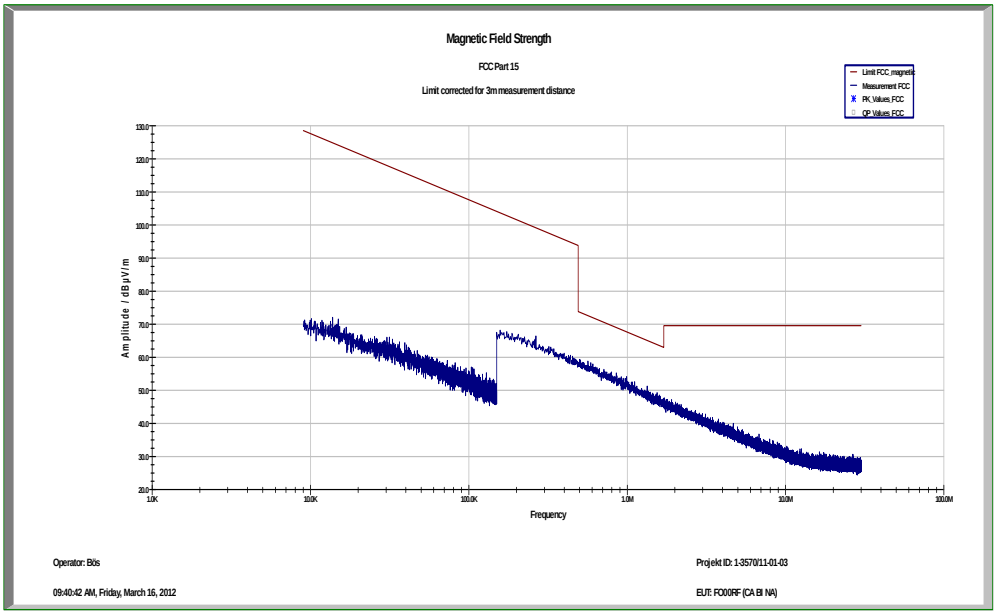



Plot 8: 1 GHz to 12.75 GHz, vertical polarization



**Device: Ant3/Ch1**

Plot 9: 9 kHz to 30 MHz



Plot 10: 30 MHz to 1 GHz, horizontal / vertical polarization – max hold

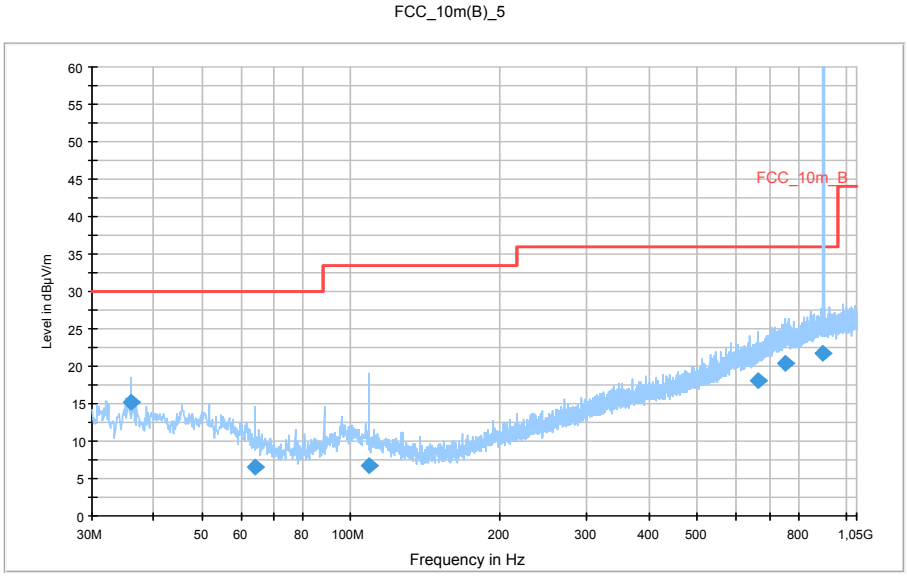
## Common Information

| | |
|---|---|
| EUT: | FO00RF |
| Serial Number: | 5100120003642448 |
| Test Description: | FCC part 15C class B |
| Operating Conditions: | cont TX Channel 1 Ant 3 |
| Operator Name: | Kraus |
| Comment: | DC 12V |

## Scan Setup: STAN_Fin [EMI radiated]

| | |
|---|---|
| Hardware Setup: | Electric Field (NOS) |
| Receiver: | [ESCI 3] |
| Level Unit: | dBµV/m |

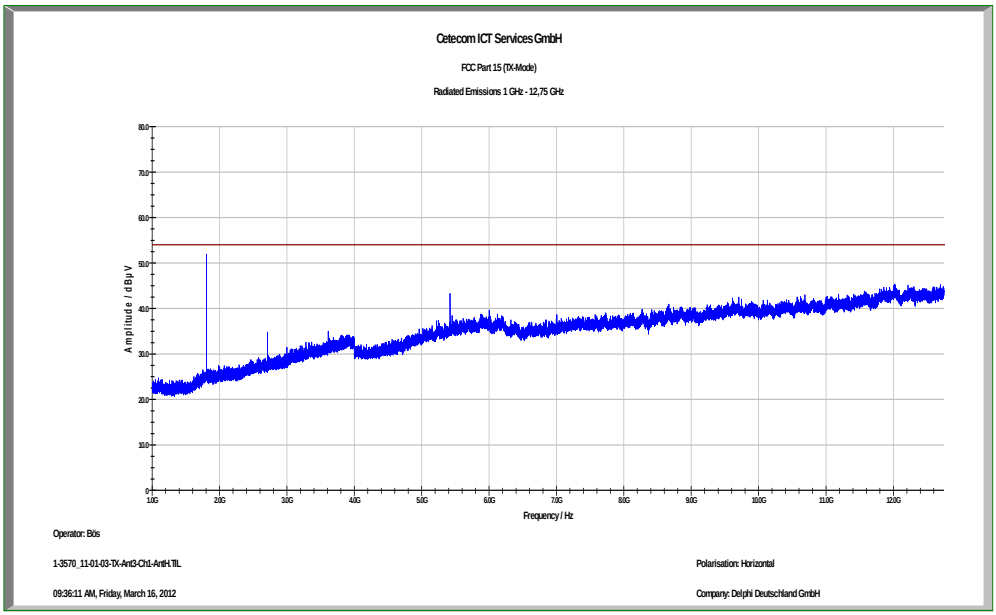
| Subrange | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|---|---|---|---|---|---|
| 30 MHz - 2 GHz | 60 kHz | QPK | 120 kHz | 1 s | 20 dB |



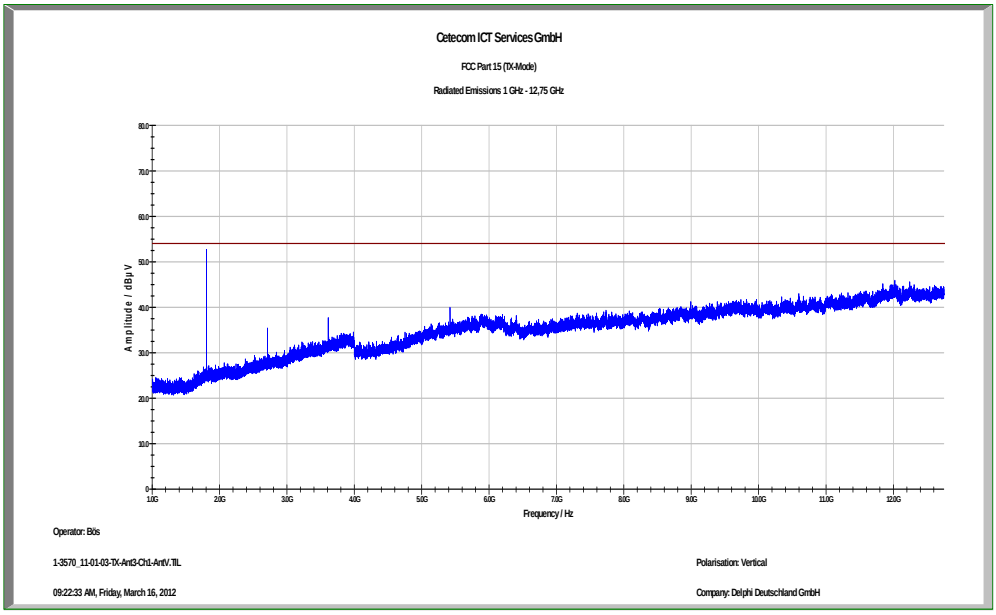

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 36.000000 | 15.2 | 1000.0 | 120.000 | 146.0 | V | 246.0 | 13.1 | 14.8 | 30.0 | |
| 63.960000 | 6.5 | 1000.0 | 120.000 | 270.0 | V | 321.0 | 10.7 | 23.5 | 30.0 | |
| 108.480000 | 6.7 | 1000.0 | 120.000 | 123.0 | V | 271.0 | 11.2 | 26.8 | 33.5 | |
| 664.800000 | 18.1 | 1000.0 | 120.000 | 270.0 | V | 171.0 | 21.5 | 17.9 | 36.0 | |
| 755.640000 | 20.3 | 1000.0 | 120.000 | 270.0 | V | 179.0 | 23.7 | 15.7 | 36.0 | |
| 898.680000 | 21.8 | 1000.0 | 120.000 | 205.0 | H | 353.0 | 25.2 | 14.2 | 36.0 | |
| 903.360000 | 77.3 | 1000.0 | 120.000 | 270.0 | H | 148.0 | 25.2 | -41.3 | 36.0 | |

Plot 11: 1 GHz to 12.75 GHz, horizontal polarization

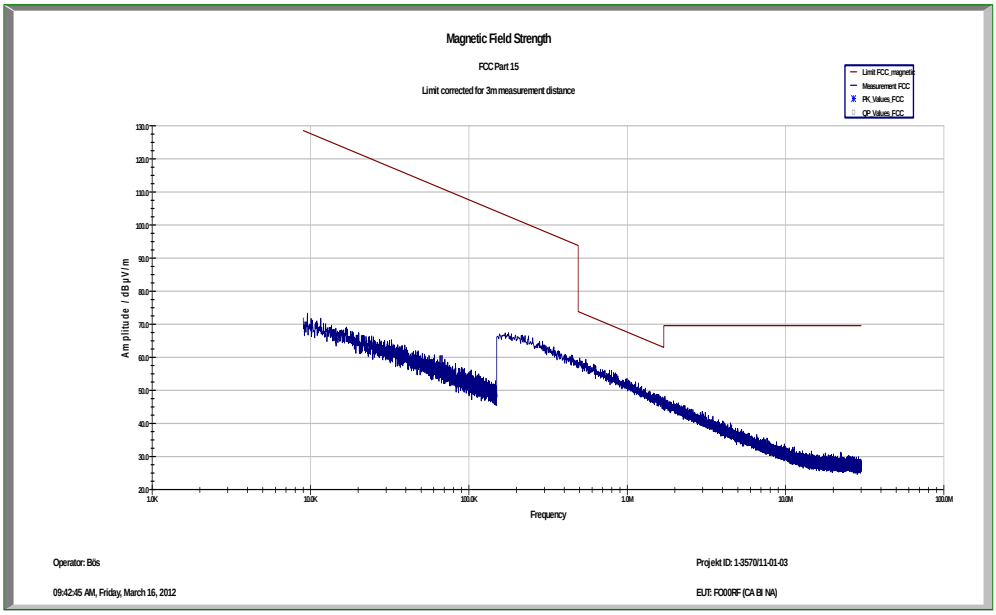



Plot 12: 1 GHz to 12.75 GHz, vertical polarization



**Device: Ant3/Ch2**

Plot 13: 9 kHz to 30 MHz



Plot 14: 30 MHz to 1 GHz, horizontal / vertical polarization – max hold

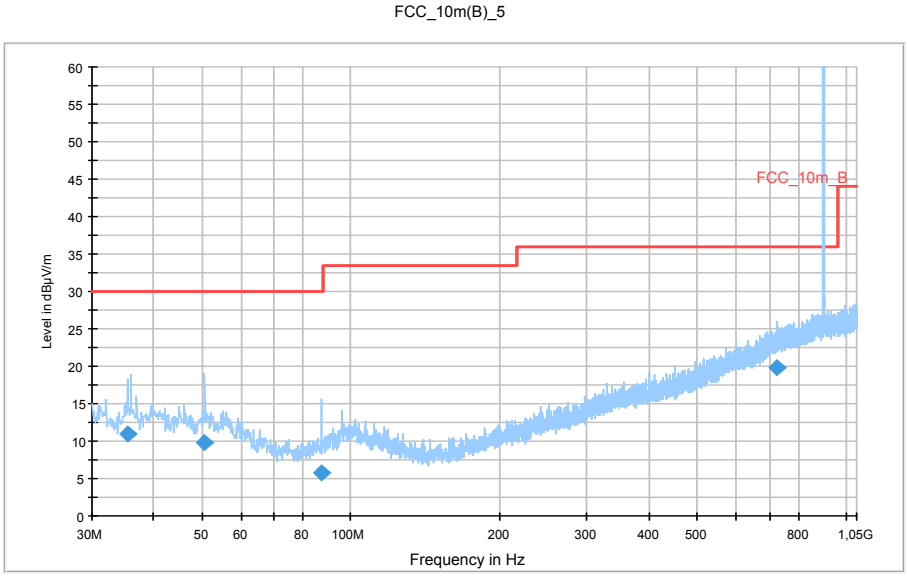
## Common Information

| | |
|---|---|
| EUT: | FO00RF |
| Serial Number: | 5100120003642458 |
| Test Description: | FCC part 15C class B |
| Operating Conditions: | cont TX Channel 2 Ant 3 |
| Operator Name: | Kraus |
| Comment: | DC 12V |

## Scan Setup: STAN_Fin [EMI radiated]

| | |
|---|---|
| Hardware Setup: | Electric Field (NOS) |
| Receiver: | [ESCI 3] |
| Level Unit: | dBµV/m |

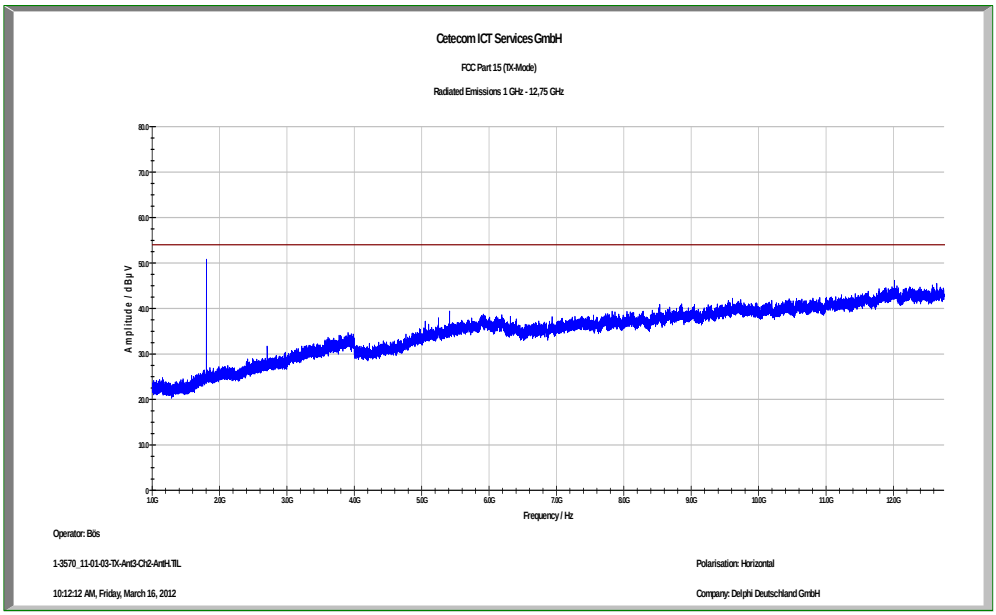
| Subrange | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|---|---|---|---|---|---|
| 30 MHz - 2 GHz | 60 kHz | QPK | 120 kHz | 1 s | 20 dB |



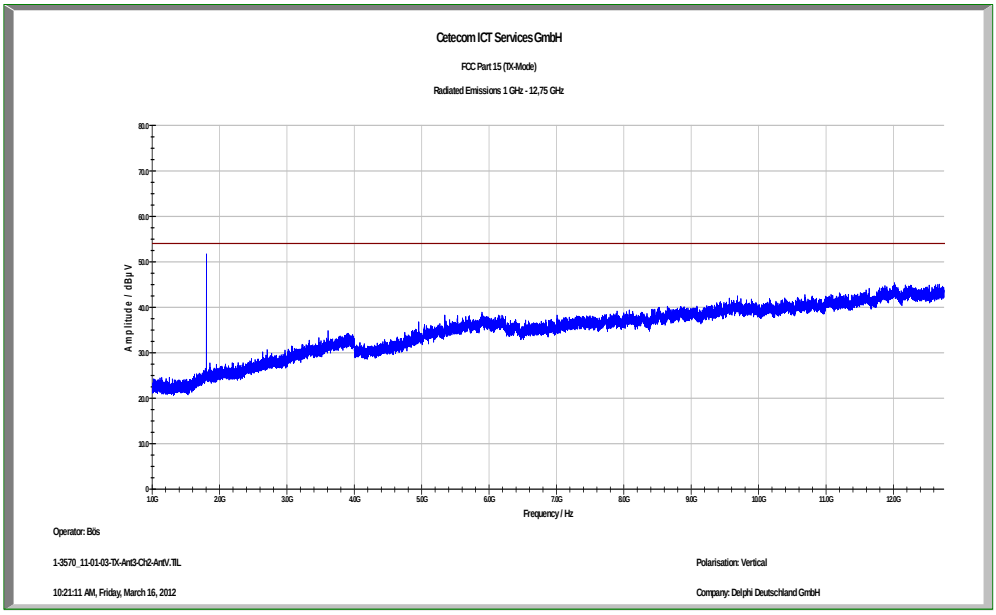

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 35.400000 | 11.0 | 1000.0 | 120.000 | 164.0 | V | 98.0 | 13.1 | 19.0 | 30.0 | |
| 50.640000 | 9.8 | 1000.0 | 120.000 | 112.0 | V | 131.0 | 13.3 | 20.2 | 30.0 | |
| 87.360000 | 5.7 | 1000.0 | 120.000 | 128.0 | V | 328.0 | 10.2 | 24.3 | 30.0 | |
| 726.600000 | 19.8 | 1000.0 | 120.000 | 98.0 | V | 14.0 | 23.1 | 16.2 | 36.0 | |

Plot 15: 1 GHz to 12.75 GHz, horizontal polarization




Plot 16: 1 GHz to 12.75 GHz, vertical polarization



## 9.6 Receiver spurious emission (radiated)

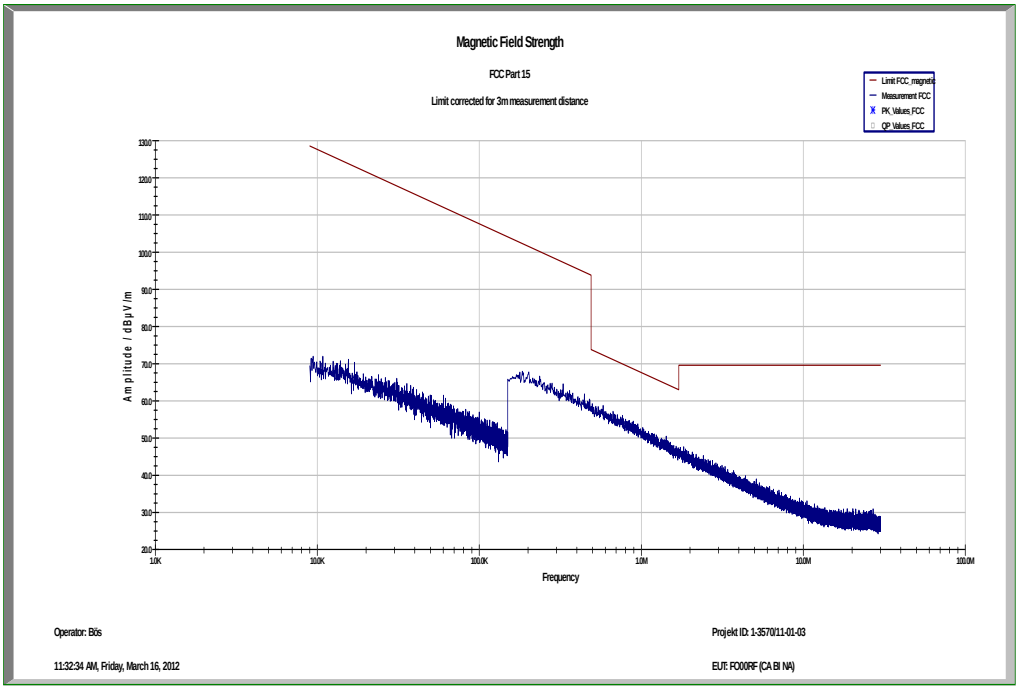
**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | Auto |
| Video bandwidth: | 3*RBW |
| Resolution bandwidth: | 120 KHz |
| Trace-Mode: | Max. hold |

**Limits:**

| FCC | | IC |
|---|---|---|
| **SUBCLAUSE § 15.109** | | RSS-GEN Issue Section 6 |
| Receiver Spurious Emission (radiated) | | |
| **Frequency (MHz)** | **Field strength (µV/m)** | **Measurement distance (m)** |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| above 960 | 500 | 3 |

Plot 1: 9 kHz – 30 MHz;



Plot 2: 30 MHz to 1 GHz, horizontal / vertical polarization – max hold

## Common Information

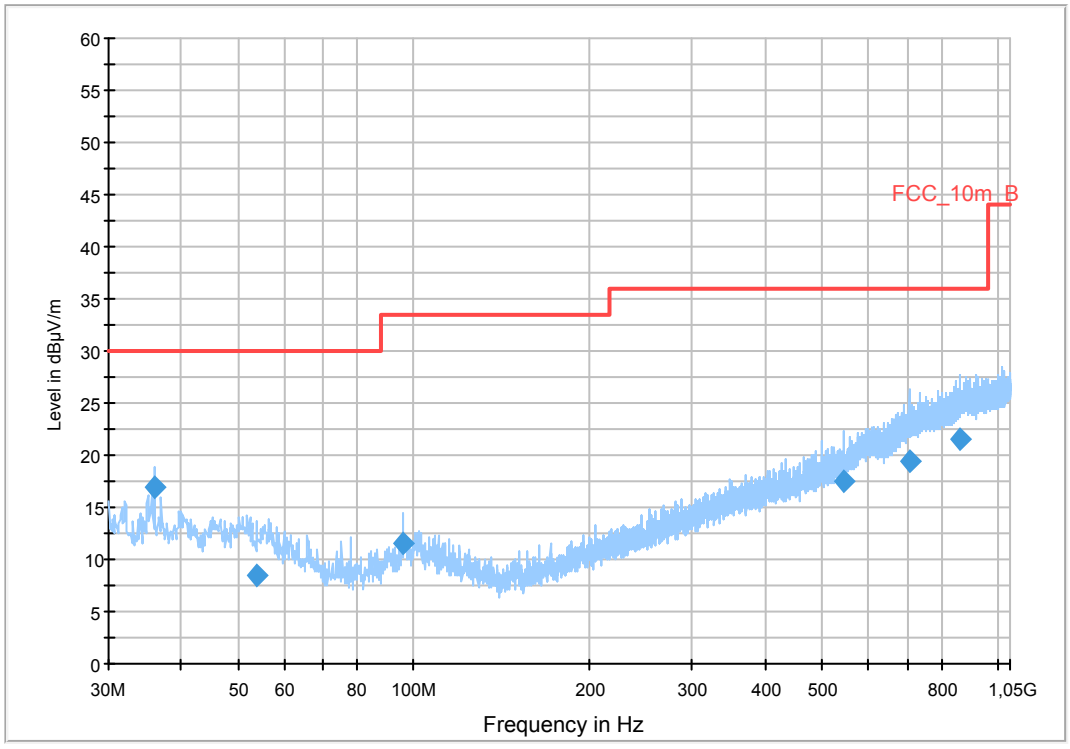
| | |
|---|---|
| EUT: | FO00RF |
| Serial Number: | 5100120003642471 |
| Test Description: | FCC part 15C class B |
| Operating Conditions: | cont RX |
| Operator Name: | Kraus |
| Comment: | DC 12V |

## Scan Setup: STAN_Fin [EMI radiated]

| | |
|---|---|
| Hardware Setup: | Electric Field (NOS) |
| Receiver: | [ESCI 3] |
| Level Unit: | dBµV/m |

| Subrange | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|---|---|---|---|---|---|
| 30 MHz - 2 GHz | 60 kHz | QPK | 120 kHz | 1 s | 20 dB |

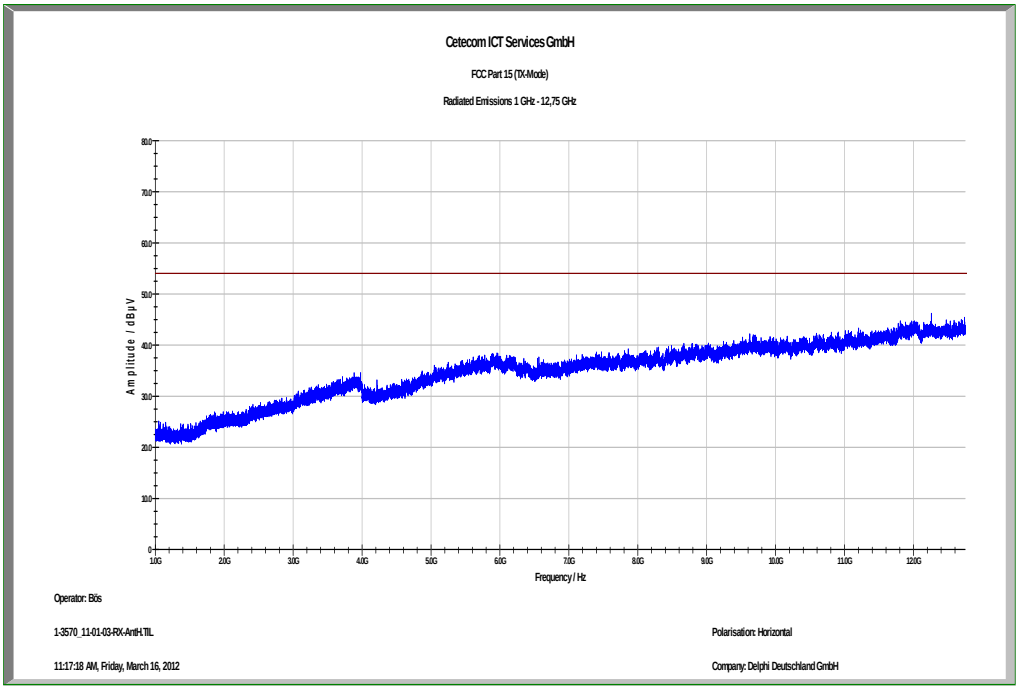
FCC_10m(B)_5



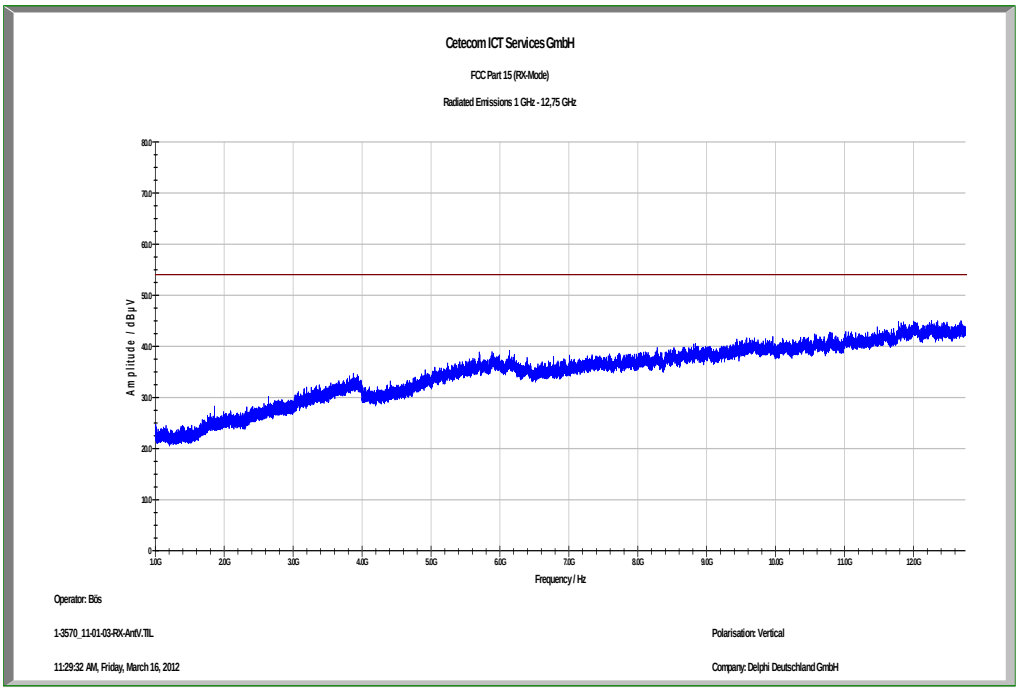

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 36.000000 | 16.9 | 1000.0 | 120.000 | 270.0 | V | 285.0 | 13.1 | 13.1 | 30.0 | |
| 53.880000 | 8.4 | 1000.0 | 120.000 | 165.0 | H | 146.0 | 13.0 | 21.6 | 30.0 | |
| 96.000000 | 11.5 | 1000.0 | 120.000 | 172.0 | V | -2.0 | 11.4 | 22.0 | 33.5 | |
| 544.080000 | 17.4 | 1000.0 | 120.000 | 270.0 | H | 201.0 | 19.3 | 18.6 | 36.0 | |
| 704.640000 | 19.3 | 1000.0 | 120.000 | 264.0 | H | 355.0 | 22.6 | 16.7 | 36.0 | |
| 864.240000 | 21.5 | 1000.0 | 120.000 | 270.0 | V | 201.0 | 24.7 | 14.5 | 36.0 | |

Plot 3: 1 GHz to 12.75 GHz, horizontal polarization




Plot 4: 1 GHz to 12.75 GHz, vertical polarization



## 10 Test equipment and ancillaries used for tests

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 signalling 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 (Labor/Item).

| No. | Lab / Item | Equipment | Type | Manufact. | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | n. a. | MXA Signal Analyzer 20 Hz - 26.5 GHz | N9020A MXA Signal Analyzer | Agilent Vertr. Bad Hom | US46220229 | 300003805 | k | 08.09.2010 | 08.09.2012 |
| 2 | n. a. | DC power supply, 60Vdc, 50A, 1200 W | 6032A | HP Meßtechnik | 2818A03450 | 300001040 | Ve | 12.01.2012 | 12.01.2015 |
| 3 | n. a. | Coaxial Attenuator 30dB/500W | 8325 | Bird | 1530 | 300001595 | ev | | |
| 4 | n. a. | Active Loop Antenna | 6502 | EMCO | 2210 | 300001015 | ne | | |
| 5 | n. a. | Anechoic chamber | FAC 3/5m | MWB / TDK | 87400/02 | 300000996 | | 23.03.2009 | |
| 6 | Spec.A. 2_2e | System rack for EMI measurement solution | 85900 | HP I.V. | * | 300000222 | ne | | |
| 7 | 9 | Artificial Mains 9 kHz to 30 MHz | ESH3-Z5 | R&S | 828576/020 | 300001210 | Ve | 06.01.2012 | 06.01.2014 |
| 8 | n. a. | Relais Matrix | 3488A | HP Meßtechnik | 2719A15013 | 300001156 | ne | | |
| 9 | n. a. | Relais Matrix | PSU | R&S | 890167/024 | 300001168 | ne | | |
| 10 | n. a. | Three-Way Power Splitter, 50 Ohm | 11850C | HP Meßtechnik | | 300000997 | ne | | |
| 11 | n. a. | Switch / Control Unit | 3488A | HP | 2605e08770 | 300001443 | ne | | |
| 12 | n. a. | Amplifier | js42-00502650-28-5a | Parzich GMBH | 928979 | 300003143 | ne | | |
| 13 | n. a. | Band Reject filter | WRCG185 5/1910-1835/1925-40/8SS | Wainwright | 7 | 300003350 | ev | | |
| 14 | n. a. | Band Reject filter | WRCG240 0/2483-2375/2505-50/10SS | Wainwright | 11 | 300003351 | ev | | |
| 15 | n. a. | TILE-Software Emission | Quantum Change, Modell TILE-ICS/FULL | EMCO | none | 300003451 | ne | | |
| 16 | n. a. | Highpass Filter | WHKX2.9/1 8G-12SS | Wainwright | 1 | 300003492 | ev | | |
| 17 | n. a. | Highpass Filter | WHK1.1/15 G-10SS | Wainwright | 3 | 300003255 | ev | | |
| 18 | n. a. | Highpass Filter | WHKX7.0/1 8G-8SS | Wainwright | 18 | 300003789 | ne | | |
| 19 | n. a. | PSA Spectrum Analyzer 3 Hz - 26.5 GHz | E4440A | Agilent Technologies | MY48250080 | 300003812 | k | 08.09.2010 | 08.09.2012 |
| 20 | n. a. | RF Filter Section 9kHz - 1GHz | N9039A | Agilent Technologies | MY48260003 | 300003825 | vlKl! | 08.09.2010 | 08.09.2012 |
| 21 | n. a. | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163 | Schwarzbeck | 371 | 300003854 | vlKl! | 14.10.2011 | 14.10.2014 |
| 22 | n. a. | MXE EMI Receiver 20 Hz bis 26,5 GHz | N9038A | Agilent Technologies | MY51210197 | 3000042xx | k | 19.12.2011 | 19.12.2012 |

**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 |
| vlkl! | Attention: extended calibration interval | | |
| NK! | Attention: not calibrated | *) | next calibration ordered / currently in progress |

## 11 Observations

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

## Annex A Photographs of the test setup

Photo documentation:

Photo 1:

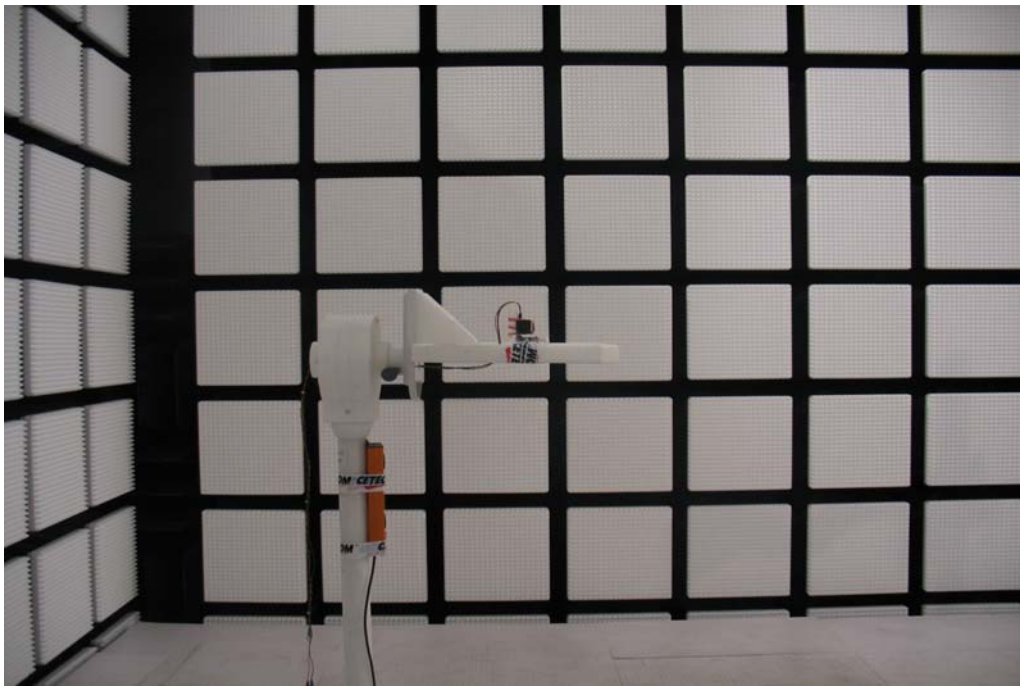


Photo 2:

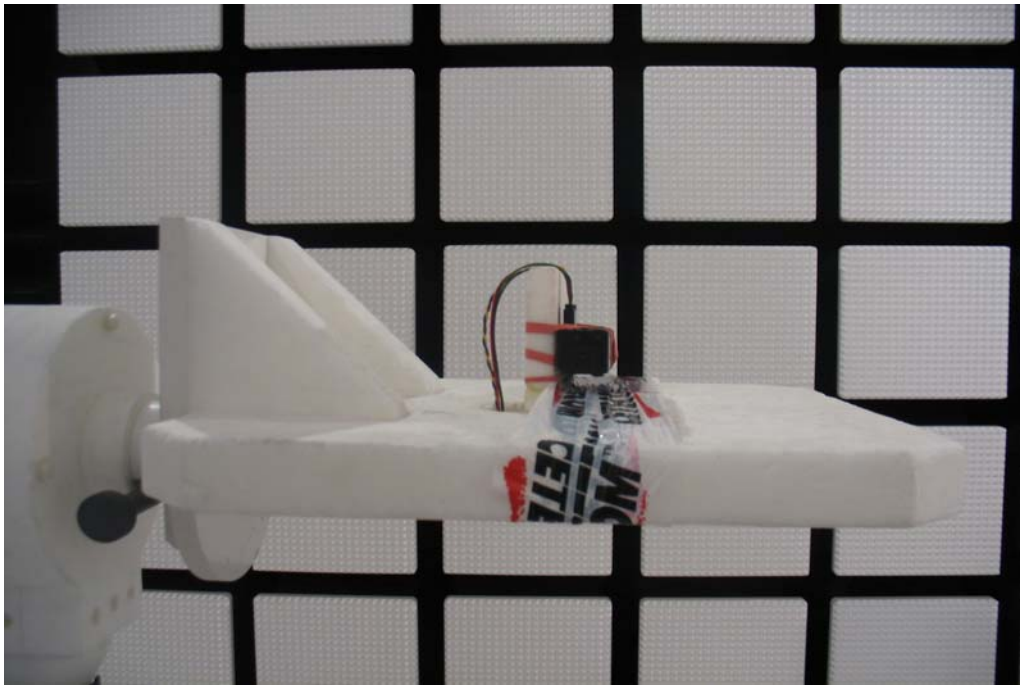


Photo 3:

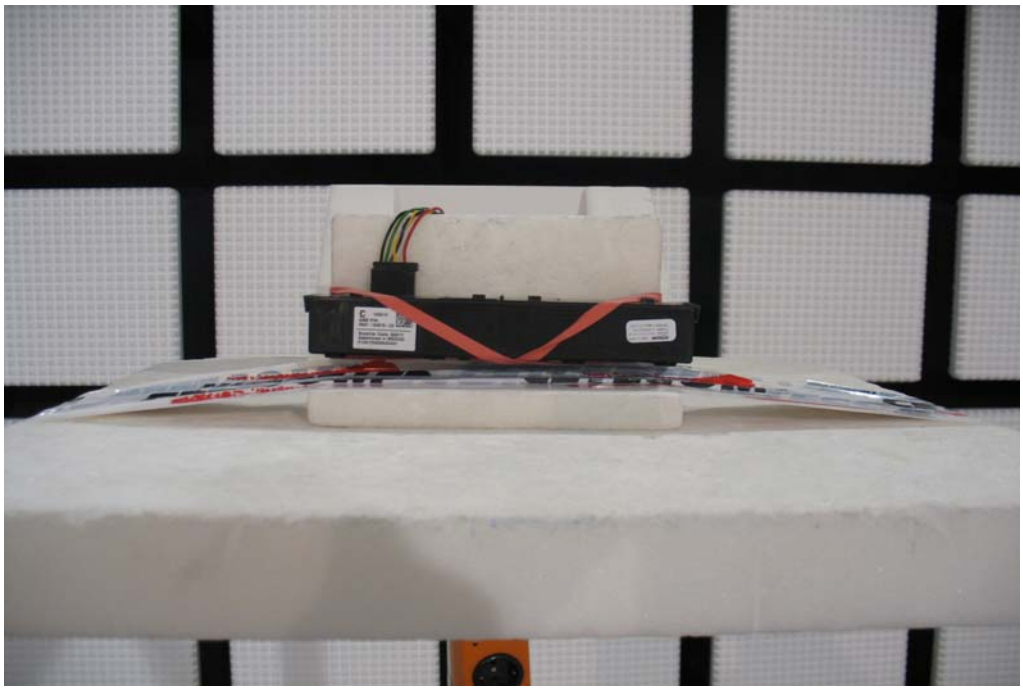


Photo 4:

Photo 5:

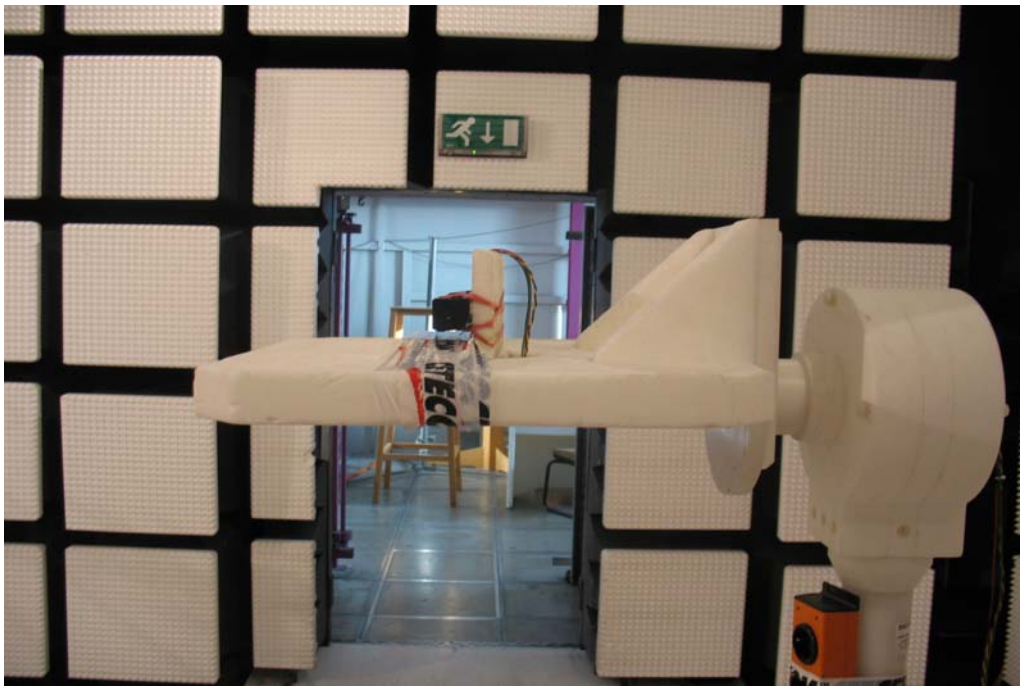


Photo 6:

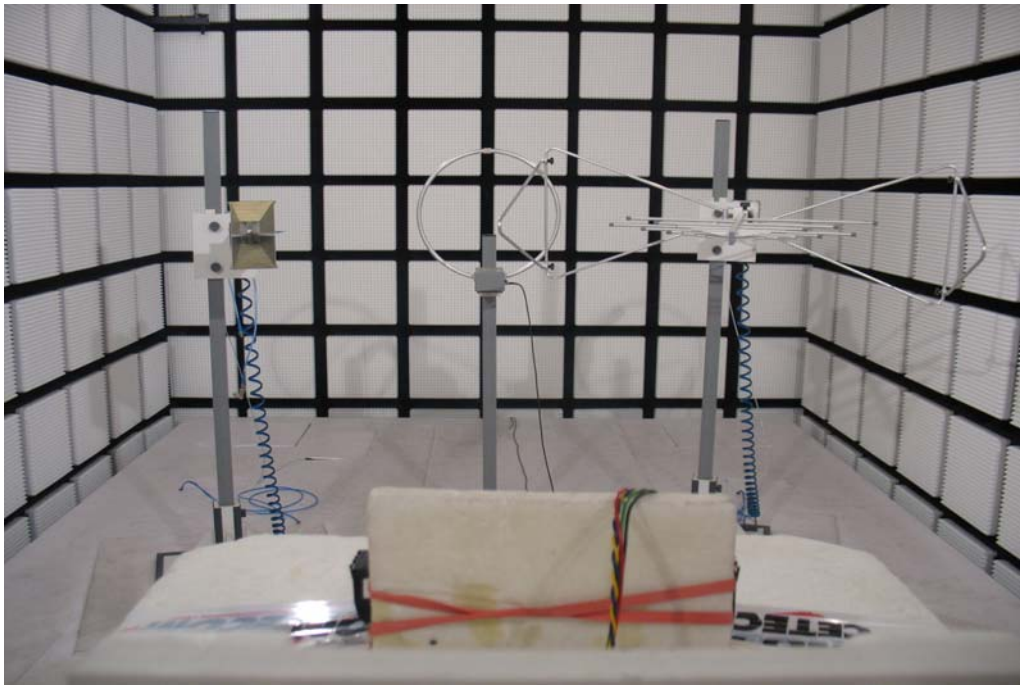


Photo 7:

Photo 8:

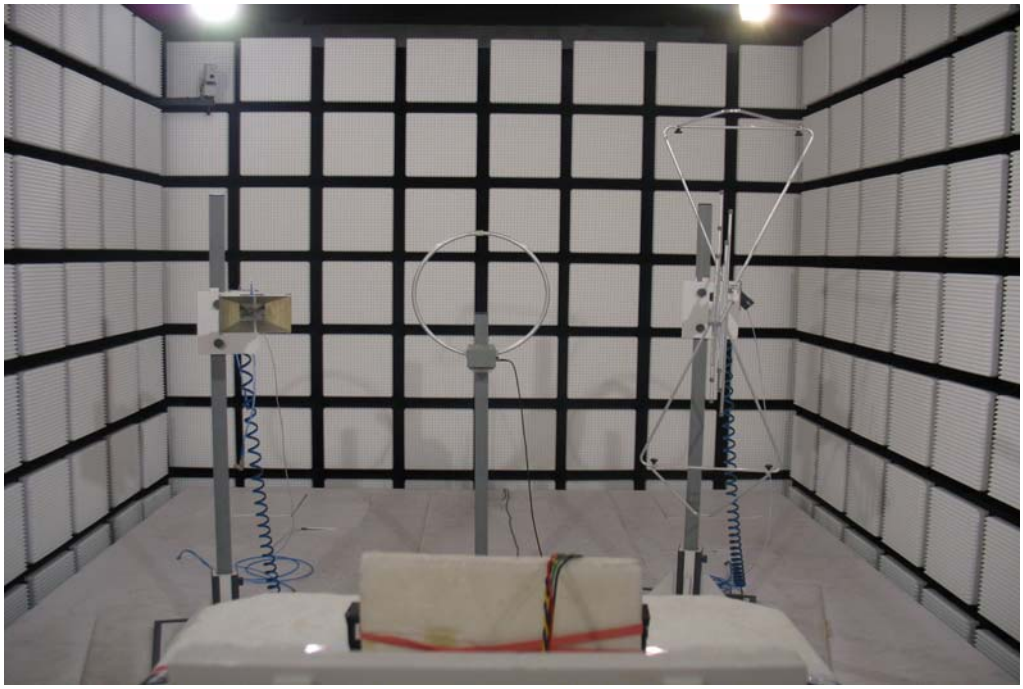
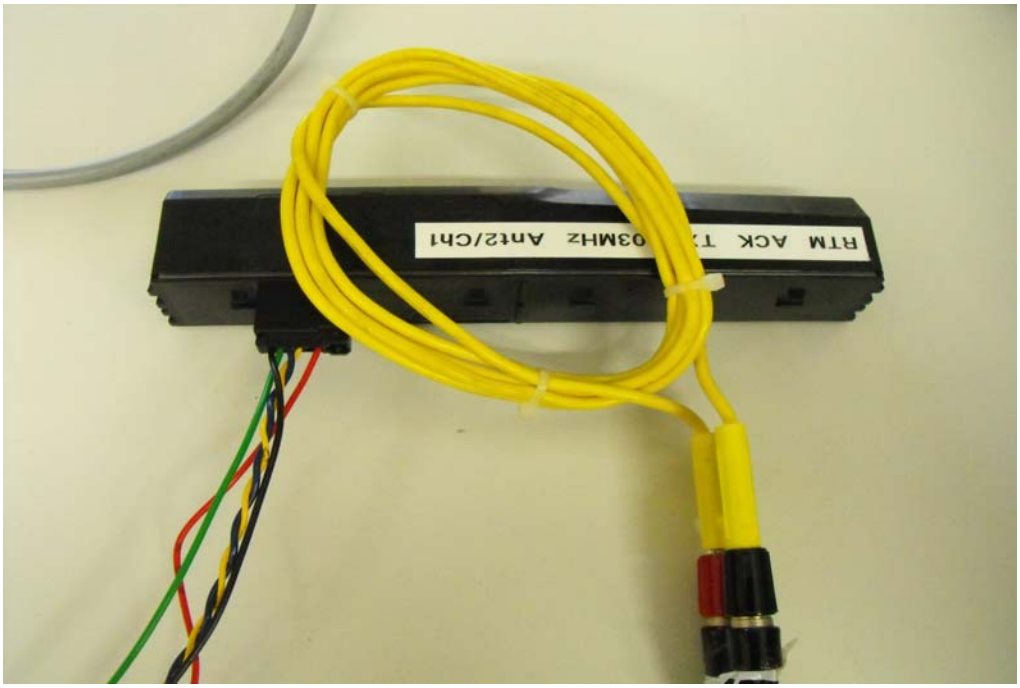


Photo 9:



## Annex B External photographs of the EUT

Photo documentation:

Photo 1:

Photo 2:

Photo 3:

Photo 4:

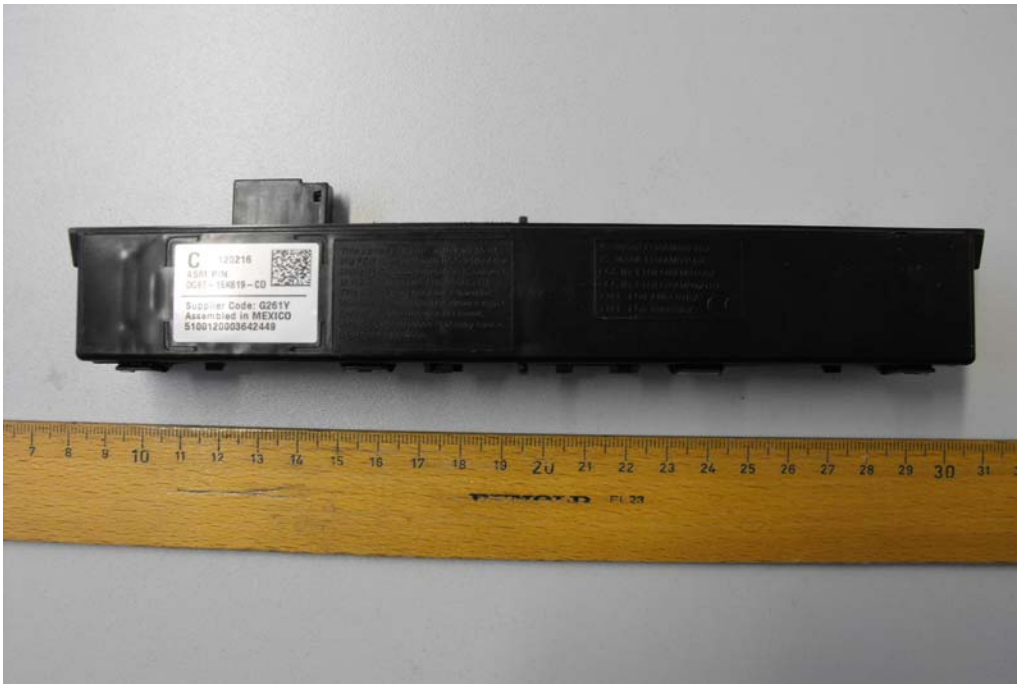


Photo 5:


Photo 6:

Photo 7:

Photo 8:

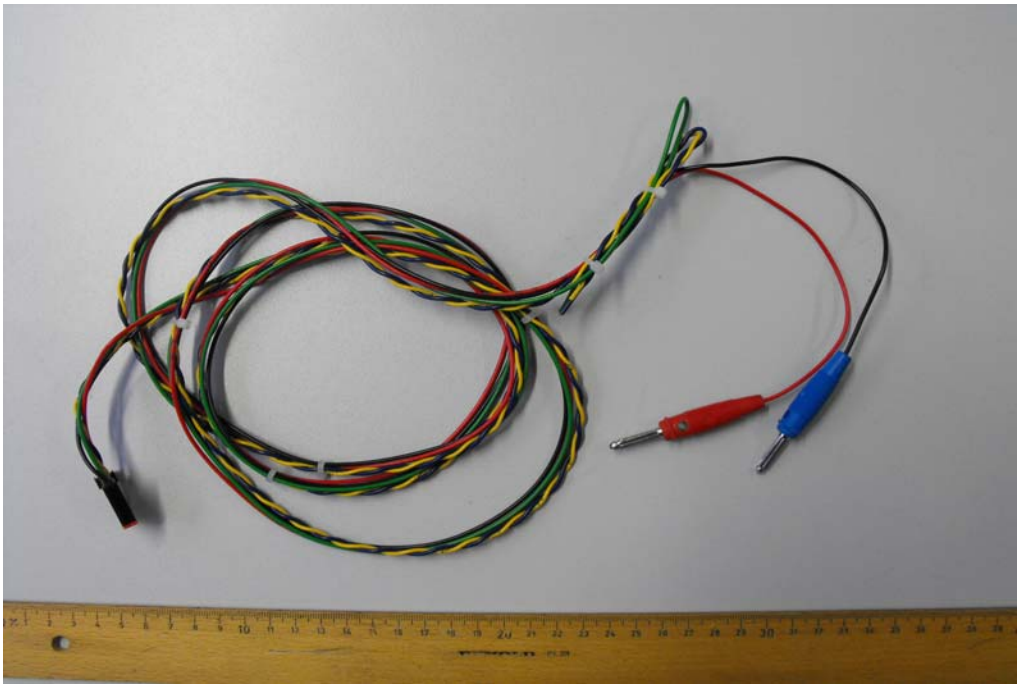
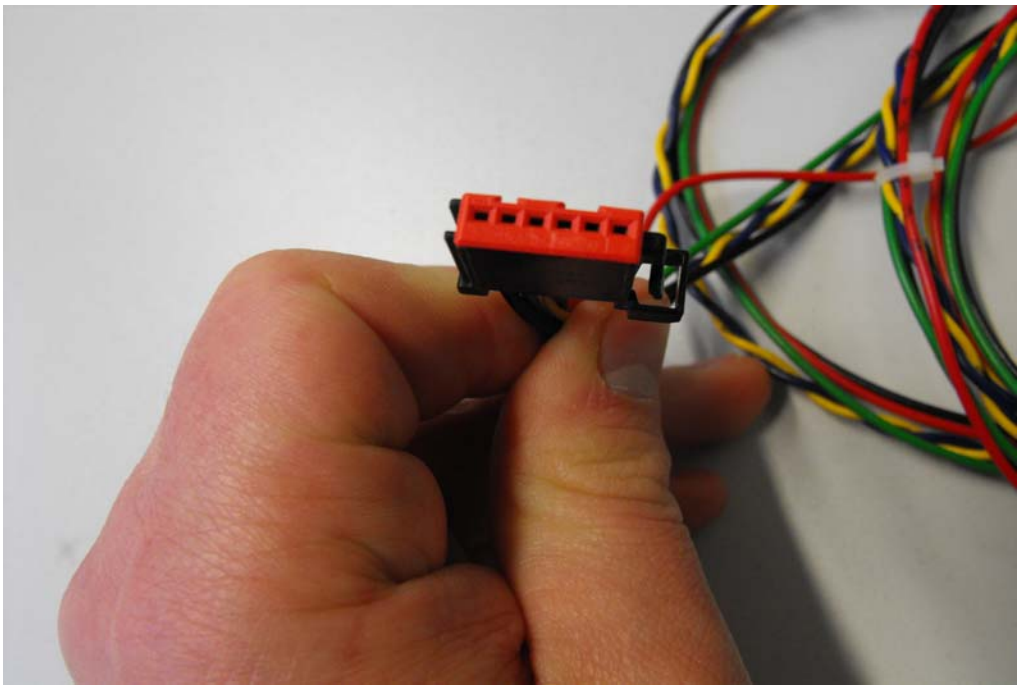


Photo 9:



## Annex C Internal photographs of the EUT

Photo documentation:

Photo 1:

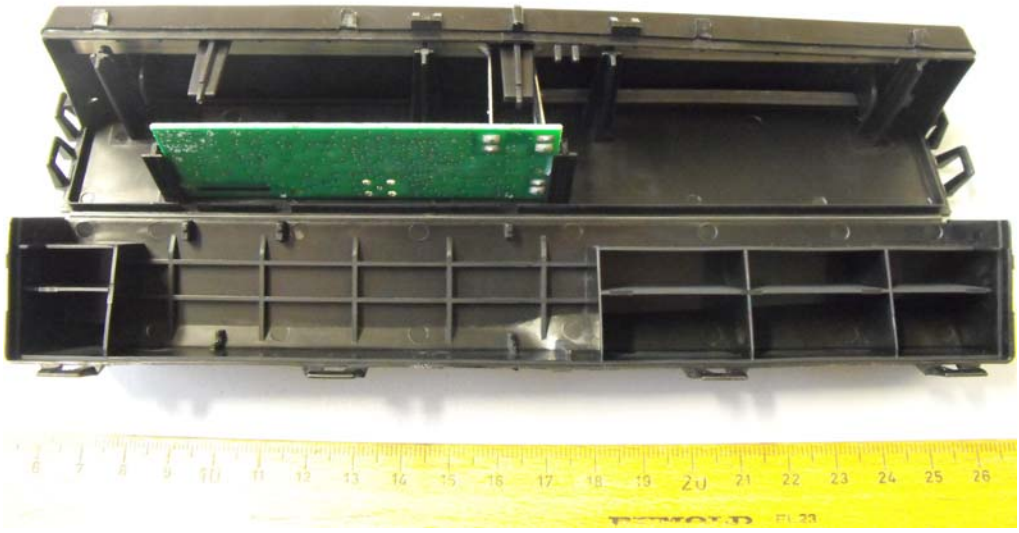


Photo 2:

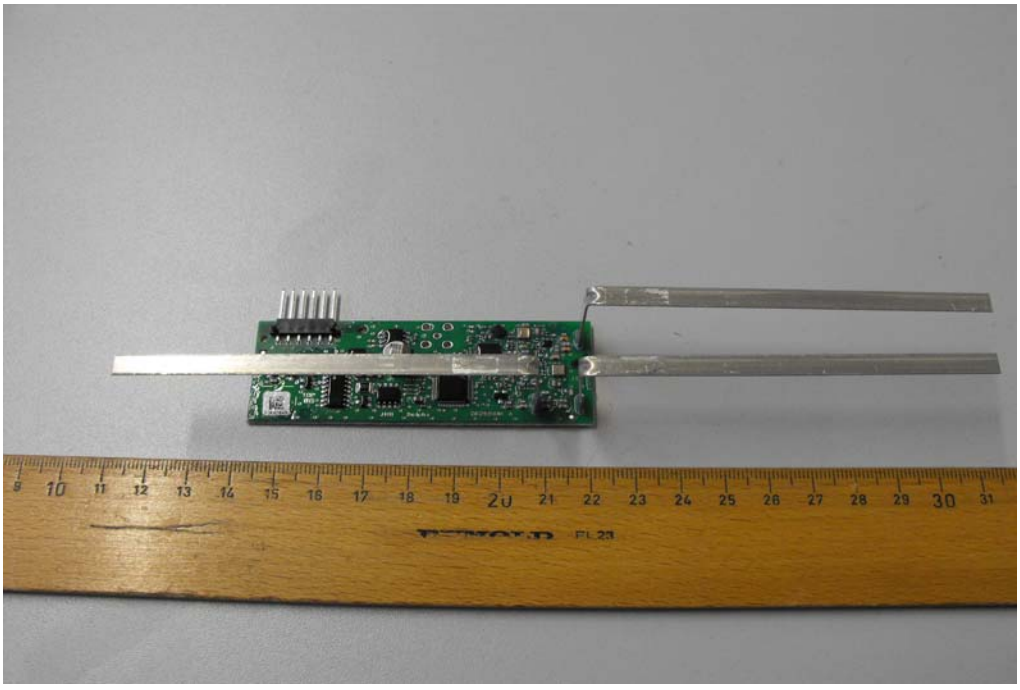


Photo 3:

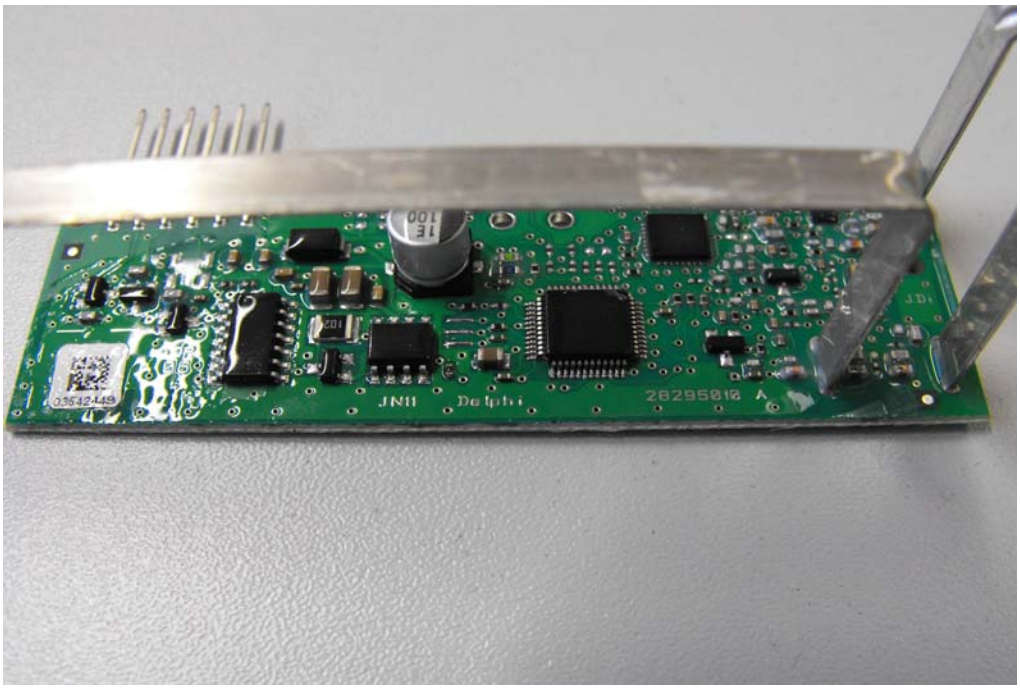



Photo 4:

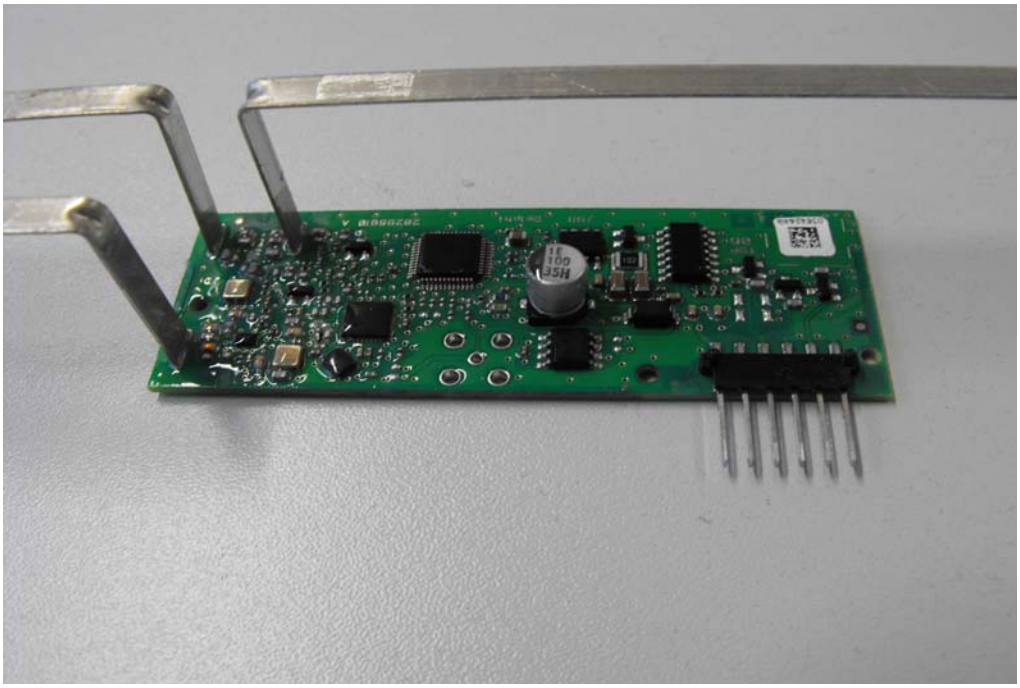
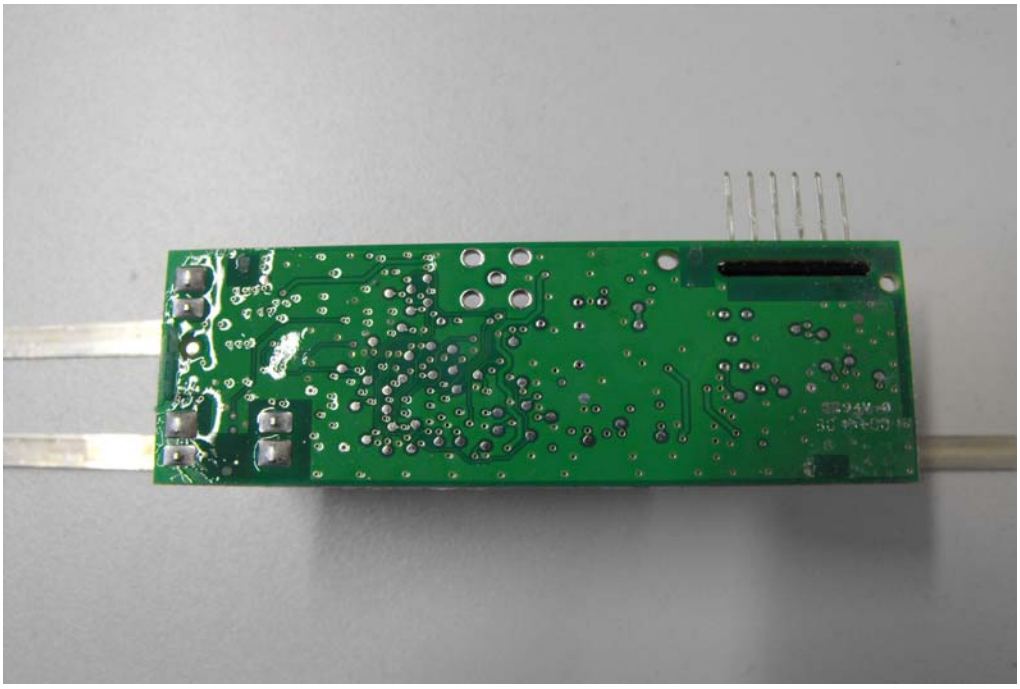


Photo 5:



## Annex D Document history

| Version | Applied changes | Date of release |
|---|---|---|
| 1.0 | Initial release | 2012-04-19 |
| -A | Correction of model name; IC-no. ; frequency range | 2012-05-16 |
| -B | Correction of model name | 2012-05-30 |

## Annex E 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

## Annex F Accreditation Certificate

DAkkS Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

**Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV**
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

**Accreditation**

The Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) attests that the testing laboratory

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

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

**Wired communications and DECT**
**Acoustic**
**Radio**
**Shirt Range Devices (SRD)**
**RFID**
**WiMax and Richtfunk**
**Mobile radio (GSM / DCS), Over the Air (OTA) Performance**
**Electromagnetic Compatibility (EMC) incl. Automotive**
**Product safety**
**SAR and Hearing Aid Compatibility (HAC)**
**Environmental simulation**
**Smart Card Terminals**
**Bluetooth**
**Wi-Fi-Services**

The accreditation certificate shall only apply in connection with the notice of accreditation of 13.04.2011 with the accreditation number D-PL-12076-01 and is valid until 03.09.2014. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 82 pages.

Registration number of the certificate: **D-PL-12076-01-01**

Frankfurt am Main, 13.04.2011

Dipl.-Ing. (FH) Rolf Egner
Head of Division 2

This document is a translation. The definitive version is the original German accreditation certificate.

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkkS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkkS.

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

Front side of certificate

Back side of certificate

**Note:**
**The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.**

http://www.cetecom.com/fileadmin/de/CETECOM_D_Saarbruecken/accreditations_Jan_2010/DAKKS_Akkredi_Urk_EN17025-En_incl_Annex.pdf