InterLab®

# FCC Measurement/Technical Report on

## WLAN transceiver
in
## Mobile Handheld Computer
## Datalogic Falcon X3+

## FCC: U4GFX3P

**Report Reference:** MDE_DATA_1405_FCCj

**Test Laboratory:**
7Layers AG
Borsigstrasse 11
40880 Ratingen
Germany

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-12140-01-01

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# 0 Applied Standards and Test Summary

## 0.1 Applied Standards

**Type of Authorization**
Certification for an Intentional Radiator (Digital Device / Spread Spectrum).

**Applicable FCC Rules**

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-13 Edition) and 15 (10-1-13 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

Part 15, Subpart E – Unlicensed National Information Infrastructure Devices

§ 15.403 Definitions

§ 15.407 General technical requirements

Note:
The tests were selected and performed with reference to the FCC Public Notice "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D01 General U-NII Test Procedures v01r03, 2013-4-08"

Instead of applying ANSI C63.4–1992 which is referenced in the FCC Public Note, the newer ANSI C63.4–2009 is applied.

**Summary Test Results:**

**The EUT complied with all performed tests as listed in chapter 0.3 Measurement Summary / Signatures.**

## 0.2 FCC-IC Correlation Table

## Correlation of measurement requirements for UNII / LE-LAN (e.g. WLAN 5 GHz) equipment

**UNII equipment**

| Measurement | FCC reference | IC reference |
|---|---|---|
| Conducted emissions on AC Mains | § 15.207 | RSS-Gen Issue 3: 7.2.4 |
| Occupied bandwidth | § 15.403 (i) (26 dB) /<br>§ 15.407 (e) (6 dB) | RSS-210 Issue 8: A9.2, 9.4 (99%) |
| Maximum conducted output power | § 15.407 (a) (1),(2),(3),(4) | RSS-210 Issue 8: A9.2, 9.4 |
| Maximum power spectral density | § 15.407 (a) (1),(2),(3),(5) | RSS-210 Issue 8: A9.2, 9.4 |
| Transmitter undesirable emissions; General Field Strength Limits, Restricted Bands | 15.407 (b)<br>§ 15.209 (a) | RSS-Gen Issue 3: 6;<br>RSS-210 Issue 8: A9.2, 9.4 |
| Frequency stability | § 15.407 (g) | RSS-Gen Issue 3: 7.2.6, 4.7 |
| Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS) | § 15.407 (h) | RSS-210 Issue 8: A9.2, 9.4 |
| Antenna requirement | § 15.203 / 15.204 | RSS-Gen Issue 3: 7.1.2 |
| Receiver spurious emissions | – | RSS-210 Issue 8: 2.3;<br>RSS Gen Issue 3: 6 *) |

*) Receivers which are part of Transceivers are exempted with respect to Notice 2012-DRS0126.

## 0.3 Measurement Summary / Signatures

| FCC Part 15, Subpart C | § 15.207 | | |
|---|---|---|---|
| Conducted emissions (AC power line) | | | |
| The measurement was performed according to ANSI C63.4 | | | |
| **OP-Mode** | **Setup** | **Port** | **Final Result** |
| - | - | AC Port (power line) | N/A |

| FCC Part 15, Subpart E | § 15.403 (i), 15.407 (e) | | |
|---|---|---|---|
| 26 / 6 dB Emission bandwidth / 99 % occupied bandwidth | | | |
| The measurement was performed according to FCC § 15.31 | | | |
| **OP-Mode** | **Setup** | **Port** | **Final Result** |
| - | - | Temp.ant.connector | Not performed |

| FCC Part 15, Subpart E | § 15.407 (a)(1,2,3,4) | | |
|---|---|---|---|
| Maximum Conducted Output Power | | | |
| The measurement was performed according to FCC § 15.31 / | | | |
| **OP-Mode** | **Setup** | **Port** | **Final Result** |
| - | - | Temp.ant.connector | Not performed |

| FCC Part 15, Subpart E | § 15.407 (a)(1,2,3,5) | | |
|---|---|---|---|
| Maximum Power Spectral Density | | | |
| The measurement was performed according to FCC § 15.31 | | | |
| **OP-Mode** | **Setup** | **Port** | **Final Result** |
| - | - | Temp.ant.connector | Not performed |

| FCC Part 15, Subpart E | § 15.407 (g) | | |
|---|---|---|---|
| Frequency Stability | | | |
| The measurement was performed according to FCC § 15.31 | | | |
| **OP-Mode** | **Setup** | **Port** | **Final Result** |
| - | - | Temp.ant.connector | Not performed |

| **FCC Part 15, Subpart C & E** | **§ 15.205, § 15.209<br>§ 15.407 (b)(1,2,3,4,5,6)** | | |
|---|---|---|---|

Undesirable Emissions, General Field Strength Limits;
Restricted Bands and Radiated Emission Limits
The measurement was performed according to ANSI C63.4

| **OP-Mode** | **Setup** | **Port** | **Final Result** |
|---|---|---|---|
| a-Mode, CH 36, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 44, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 48, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 52, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 56, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 64, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 100, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 120, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 140, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 149, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 157, 20 MHz | Setup_01 | Enclosure | Passed |
| a-Mode, CH 165, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 36, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 44, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 48, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 52, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 56, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 64, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 100, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 120, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 140, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 149, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 157, 20 MHz | Setup_01 | Enclosure | Passed |
| n-Mode, CH 165, 20 MHz | Setup_01 | Enclosure | Passed |

| **FCC Part 15, Subpart E** | **§ 15.407 (h)** | | |
|---|---|---|---|

Dynamic Frequency selection
The measurement was performed according to FCC § 15.31

| **OP-Mode** | **Setup** | **Port** | **Final Result** |
|---|---|---|---|
| – | – | – | Not performed |

N/A Not applicable

Responsible for Accreditation Scope: Digitally signed by Andreas Petz DN: cn=Andreas Petz, sn=Petz, givenName=Andreas, o=7Layers AG, serialNumber=001000000001202918000 1, email=andreas.petz@7layers.de Reason: I am approving this document Date: 2014.08.14 09:29:06 +02'00'

Responsible for Test Report: Digitally signed by Marco Kullik DN: cn=Marco Kullik, sn=Kullik, givenName=Marco, o=7 Layers AG, serialNumber=001000000001202905000 02, email=Marco.Kullik@7Layers.de Reason: I am the author of this document Date: 2014.08.14 08:39:44 +02'00'

# 1 Administrative Data

## 1.1 Testing Laboratory

| | |
|---|---|
| Company Name: | 7Layers AG |
| Address | Borsigstr. 11<br>40880 Ratingen<br>Germany |

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716 .

The test facility is also accredited by the following accreditation organisation:

| | |
|---|---|
| Laboratory accreditation no.: | DAkkS D-PL-12140-01-01 |
| Responsible for Accreditation Scope: | Dipl.-Ing. Bernhard Retka<br>Dipl.-Ing. Robert Machulec<br>Dipl.-Ing. Thomas Hoell<br>Dipl.-Ing Andreas Petz<br>Dipl.-Ing Marco Kullik |
| Report Template Version: | 2014-07-29 |

## 1.2 Project Data

| | |
|---|---|
| Responsible for testing and report: | Dipl.-Ing. Marco Kullik |
| Date of Test(s): | 2014-07-06 to 2014-08-06 |
| Date of Report: | 2014-08-13 |

## 1.3 Applicant Data

| | |
|---|---|
| Company Name: | Datalogic ADC s.r.l. |
| Address: | Via S. Vitalino, 13<br>40012 Lippo di Calderara di Reno, Bologna<br>Italy |
| Contact Person: | Mr. Eucarpio Guarisco |

## 1.4 Manufacturer Data

| | |
|---|---|
| Company Name: | please see at applicant data |
| Address: | |
| Contact Person: | |

# 2 Test object Data

## 2.1 General EUT Description

| | |
|---|---|
| **Equipment under Test:** | IEEE 802.11a/b/g/n WLAN & BT transceiver |
| **Type Designation:** | Datalogic FALCON X3+ |
| **Kind of Device:** | Mobile Handheld Computer |
| **(optional)** | |
| **Voltage Type:** | DC |
| **Voltage Level:** | 5.0 V |
| **Tested Modulation Type:** | OFDM:BPSK; OFDM:64-QAM |

**General product description:**

The EUT is a mobile handheld computer. It runs with Windows Mobile 6 CE.

**Specific product description for the EUT:**

The EUT is a dual band WLAN (802.11 a/b/g/n, 2.4 and 5 GHz) and Bluetooth module with one joint antenna connector for WLAN and Bluetooth. In IEEE 802.11n mode it only supports 20 MHz bandwidth channels (MCS7), providing 72.2 Mbit/s transfer data rates respectively.
The object of this test report is the WLAN (Wireless Local Area Network) transceiver, operating in the 5 GHz band in the range 5.15 – 5.25 GHz, 5.25 – 5.35 GHz, 5.47 – 5.725 GHz and 5.725 – 5.850 GHz ("new rules").

The object of this test report is the WLAN transceiver in the 5 GHZ bands, it was tested at 20 MHz channel bandwidth.

**The EUT provides the following ports:**

**Ports**
Enclosure
System-Port

**The main components of the EUT are listed and described in chapter 2.2**

## 2.2 EUT Main components

### Type, S/N, Short Descriptions etc. used in this Test Report

| Short Description | Equipment under Test | Type Designation | Serial No. | HW Status | SW Status |
|---|---|---|---|---|---|
| EUT A (Code: DE1006002aa01) | WLAN transceiver | FALCON X3+ | 5M | P/N: 945250051 | 1.88 and subsequent |
| Remark: EUT A is equipped with two dual-band integral antennas (2.4 & 5 GHz) frequency band with a maximal antenna gain of 4.2 dBi in the 4.9 – 5.9 GHz frequency range. | | | | | |

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

## 2.3 Ancillary Equipment

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

| Short Description | Equipment under Test | Type Designation | Serial No. | HW Status | SW Status |
|---|---|---|---|---|---|
| - | – | – | – | – | – |

## 2.4 Auxiliary Equipment

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

| Short Description | Equipment under Test | Type Designation | Serial No. | HW Status | SW Status |
|---|---|---|---|---|---|
| - | – | – | – | – | – |

## 2.5 EUT Setups

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

| Setup | Combination of EUTs | Description and Rationale |
|---|---|---|
| Setup_01 | EUT A | setup for radiated radio measurements |

## 2.6 Operating Modes

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

### 2.6.1 Test Channels

| UNII-Subband 1<br>5150 - 5250 MHz | | | UNII-Subband 2A<br>5250 - 5350 MHz | | | UNII-Subband 2C<br>5470 - 5725 MHz | | | UNII-Subband 3<br>5725 - 5825 MHz | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bottom** | **Middle** | **Top** | **Bottom** | **Middle** | **Top** | **Bottom** | **Middle** | **Top** | **Bottom** | **Middle** | **Top** |
| 36 | 44 | 48 | 52 | 56 | 64 | 100 | 120 | 140 | 149 | 157 | 165 |
| 5180 | 5220 | 5240 | 5260 | 5280 | 5320 | 5500 | 5600 | 5700 | 5745 | 5785 | 5825 |

### 2.6.2 Datarates

**SISO:**

| |
|---|
| WLAN a-mode; 6 Mbit/s |
| WLAN n-Mode; 20 MHz; 72.2 Mbit/s |

## 2.7 Special software used for testing

The Windows program "SRU" is used to control the WLAN module.

## 2.8 Product labelling

### 2.8.1 FCC ID label

Please refer to the documentation of the applicant.

### 2.8.2 Location of the label on the EUT

Please refer to the documentation of the applicant.

# 3 Test Results

## 3.1 Undesirable Emissions / General Field Strength Limits; Restricted Band and Radiated Emission Limits, Band Edge

**Standard** FCC Part 15, Subpart C & E

**The test was performed according to:** ANSI C 63.4

### 3.1.1 Test Description

The radiated emissions measurements were made in a typical installation configuration. The measurement procedure is implemented into the EMI test software ES-K1 from R&S.

**1. Measurement up to 30 MHz**
The Equipment Under Test (EUT) was set up on a non-conductive table in the anechoic chamber.
The Loop antenna HFH2-Z2 is used.
**Step 1:** pre measurement
- Anechoic chamber
- Antenna distance: 10 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 - 0.15 and 0.15 – 30 MHz
- Frequency steps: 0.1 kHz and 5 kHz
- IF–Bandwidth: 0.2 kHz and 10 kHz
- Measuring time / Frequency step: 100 ms

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.
**Step 2:** final measurement
For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.
- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF–Bandwidth: 200 Hz - 10 kHz
- Measuring time / Frequency step: 100 ms

**2. Measurement above 30 MHz and up to 1 GHz**
**Step 1:** Preliminary scan
Preliminary test to identify the highest amplitudes relative to the limit.
Settings for step 1:
- Antenna distance: 3 m
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180 to 180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m

- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

**Step 2:** second measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –180 to 180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

**Step 3:** final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by ±22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by ±25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –22.5° to +22.5° around the determined value
- Height variation range: –0.25 m to +0.25 m around the determined value

**Step 4:** final measurement with QP detector

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

**Measurement above 1 GHz**
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
The Equipment Under Test (EUT) was set up on a non-conductive support at 1.4 m height in the fully-anechoic chamber. The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear distance for field strength measurements, inverse linear-distance squared for the power reference level measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 15 GHz) and a horn antenna (15-26 GHz) are used, the steps 2-4 are omitted. Step 1 was performed with one height of the receiving antenna only.
EMI receiver settings:
- Detector: Peak, Average
- IF Bandwidth = 1 MHz

For the data rate in mode n the test is performed as worst-case-check in order to verify that emissions have a comparable level as found at modes b and g. Typically, the measurement is performed in the frequency range 1 to 15 GHz but it depends on the emissions found during the test for the modes b and g. Please refer to the results for the used frequency range.

In the frequency range 26 – 40 GHz the measurement was performed conducted.

### 3.1.2 Test Requirements / Limits

**A) FCC**

FCC Part 15 Subpart E , §15.407 (b)(1)
For transmitters operating in the 5150–5250 MHz band:
Limit: –27 dBm/MHz EIRP outside of the band 5150–5350 MHz.

FCC Part 15 Subpart E , §15.407 (b)(2)
For transmitters operating in the 5250–5350 MHz band:
Limit: –27 dBm/MHz EIRP outside of the band 5150–5350 MHz.

FCC Part 15 Subpart E , §15.407 (b)(3)
For transmitters operating in the 5470–5725 MHz band:
Limit: –27 dBm/MHz EIRP outside of the band 5470–5725 MHz.

FCC Part 15 Subpart E , §15.407 (b)(4)
For transmitters operating in the 5725–5850 MHz band:
Limit: –27 dBm/MHz EIRP outside of the band 5715–5860 MHz and additionally
Limit: –17 dBm/MHz EIRP within the frequency ranges 5715–5725 and 5850–5860 MHz.

**B) IC**
Different frequency bands and limits apply, as compared to the FCC requirements.

RSS-210, A9.2 (1), Emissions outside the band 5150-5250 MHz, indoor operation only:
Limit: –27 dBm/MHz EIRP outside of the band 5150–5250 MHz.

RSS-210, A9.2 (2), Emissions outside the band 5250-5350 MHz:
Limit: –27 dBm/MHz EIRP outside of the band 5250–5350 MHz.

RSS-210, A9.2 (3), Emissions outside the bands 5470-5600 MHz and 5650-5725 MHz:
Limit: –27 dBm/MHz EIRP outside of the band 5470–5725 MHz.
Note: No operation is permitted for the frequency range 5600–5650 MHz.

RSS-210, A9.2 (4), Emissions outside the band 5725-5825 MHz:
Limit: –27 dBm/MHz EIRP outside of the band 5715–5835 MHz and additionally
Limit: –17 dBm/MHz EIRP within the frequency ranges 5715–5725 and 5825–5835 MHz.

**C) FCC & IC**

FCC Part 15 Subpart E , §15.405 and §15.407 (b)(6,7)
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. The provisions of §§ 15.203 and 15.205 are included.

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

| Frequency in MHz | Limit (µV/m) | Measurement distance (m) | Calculated Limits(dBµV/m @10m) | Limits(dBµV/m @10m) |
|---|---|---|---|---|
| 0.009 – 0.49 | 2400/F(kHz) | 300 59.1 dB | (48.5 – 13.8) + 30 dB | 78.5 – 43.8 |
| 0.49 – 1.705 | 24000/F(kHz) | 30 19.1 dB | (48.9 – 23.0) + 10 dB | 58.9 – 33.0 |
| 1.705 – 30 | 30 | 30 19.1 dB | 29.5 + 10 dB | 39.5 |

| Frequency in MHz | Limit (µV/m) | Measurement distance (m) | Limit (dBµV/m) |
|---|---|---|---|
| 30 – 88 | 100 | 3 | 40.0 |
| 88 – 216 | 150 | 3 | 43.5 |
| 216 – 960 | 200 | 3 | 46.0 |
| above 960 | 500 | 3 | 54.0 |

§15.35(b)
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)
Limit (dBµV/m) = EIRP [dBm] – 20 log (d [m]) + 104.8
where d is the measurement distance

### 3.1.3 Test Protocol

**Limit types:**
RB – Emissions falls into a "Restricted Band" according FCC §§15.205 and 15.209
UE – "Undesirable Emission Limit" according FCC §15.407
BE-RB – Band Edge Limit basing on "Restricted Band Limits"
BE-RB – Band Edge Limit basing on "Undesirable Emission Limit"

Temperature: 23–27 °C
Air Pressure: 997–1011 hPa
Humidity: 33–50 %

#### 3.1.3.1 Radiated spurious and undesired emissions

| **WLAN a-mode; 6 Mbit/s** | | | | **Applied duty cycle correction (AV) [dB]:** | | | | **0.0** |
|---|---|---|---|---|---|---|---|---|
| **Ch. No.** | **Ch. Center Freq. [MHz]** | **Spurious Freq. [MHz]** | **Spurious Level [dBµV/m]** | **Detec-tor** | **RBW [kHz]** | **Limit [dBµV/m]** | **Margin to Limit [dB]** | **Limit Type** |
| 44 | 5220 | 118.4 | 33.0 | QP | 120 | 43.5 | 10.5 | RB |
| 100 | 5500 | 11001.0 | 38.6 | AV | 1000 | 54.0 | 15.4 | RB |
| 120 | 5600 | 11201.0 | 38.3 | AV | 1000 | 54.0 | 15.7 | RB |
| 140 | 5700 | 11399.0 | 36.7 | AV | 1000 | 54.0 | 17.3 | RB |
| 140 | 5700 | 5184.0 | 54.4 | PEAK | 1000 | 68.0 | 13.6 | UE |
| 149 | 5745 | 11491.0 | 38.9 | AV | 1000 | 54.0 | 15.1 | RB |
| 157 | 5785 | 11569.0 | 56.8 | PEAK | 1000 | 74.0 | 17.2 | RB |
| 157 | 5785 | 11568.5 | 42.2 | AV | 1000 | 54.0 | 11.8 | RB |
| 157 | 5785 | 3856.5 | 40.7 | AV | 1000 | 54.0 | 13.3 | RB |
| 165 | 5825 | 3883.5 | 43.1 | AV | 1000 | 54.0 | 10.9 | RB |
| 165 | 5825 | 11650.0 | 39.8 | AV | 1000 | 54.0 | 14.2 | RB |

Note: No (further) spurious emissions in the range 20 dB below the limit found.

| WLAN n-Mode; 20 MHz; 72.2 Mbit/s | | | | Applied duty cycle correction (AV) [dB]: 0.0 | | | | |
|---|---|---|---|---|---|---|---|---|
| Ch. No. | Ch. Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBµV/m] | Detec-tor | RBW [kHz] | Limit [dBµV/m] | Margin to Limit [dB] | Limit Type |
| 149 | 5745 | 11491.0 | 56.4 | PEAK | 1000 | 74.0 | 17.6 | RB |
| 149 | 5745 | 11491.0 | 42.1 | AV | 1000 | 54.0 | 11.9 | RB |
| 157 | 5785 | 3856.5 | 40.7 | AV | 1000 | 54.0 | 13.3 | RB |
| 157 | 5785 | 11570.5 | 40.4 | AV | 1000 | 54.0 | 13.6 | RB |
| 165 | 5825 | 3883.5 | 43.0 | AV | 1000 | 54.0 | 11.0 | RB |
| 165 | 5825 | 11647.0 | 38.7 | AV | 1000 | 54.0 | 15.3 | RB |
| 140 | 5700 | 3800.0 | 34.8 | AV | 1000 | 54.0 | 19.2 | RB |
| 140 | 5700 | 11399.5 | 37.5 | AV | 1000 | 54.0 | 16.5 | RB |
| 120 | 5600 | 11203.0 | 56.8 | PEAK | 1000 | 74.0 | 17.2 | RB |
| 120 | 5600 | 11203.0 | 40.3 | AV | 1000 | 54.0 | 13.7 | RB |
| 100 | 5500 | 11001.0 | 54.0 | PEAK | 1000 | 74.0 | 20.0 | RB |
| 100 | 5500 | 11004.0 | 40.2 | AV | 1000 | 54.0 | 13.8 | RB |
| 52 | 5260 | 10520.5 | 35.6 | AV | 1000 | 54.0 | 18.4 | RB |
| 56 | 5280 | 10556.0 | 49.0 | PEAK | 1000 | 68.0 | 19.0 | UE |
| 62 | 5310 | 10643.5 | 36.5 | AV | 1000 | 54.0 | 17.5 | RB |

Note: No (further) spurious emissions in the range 20 dB below the limit found.
The results of the pre-test with peak detector have been similar for all four transmit frequencies in the frequency range 30–1000 MHz and independent from the transmit frequency. Therefore the final test applying the QP-(quasi-peak-) detector was performed only for one transmit frequency.
No (further) spurious emissions in the range 20 dB below the limit found.

### 3.1.3.2 Band Edge

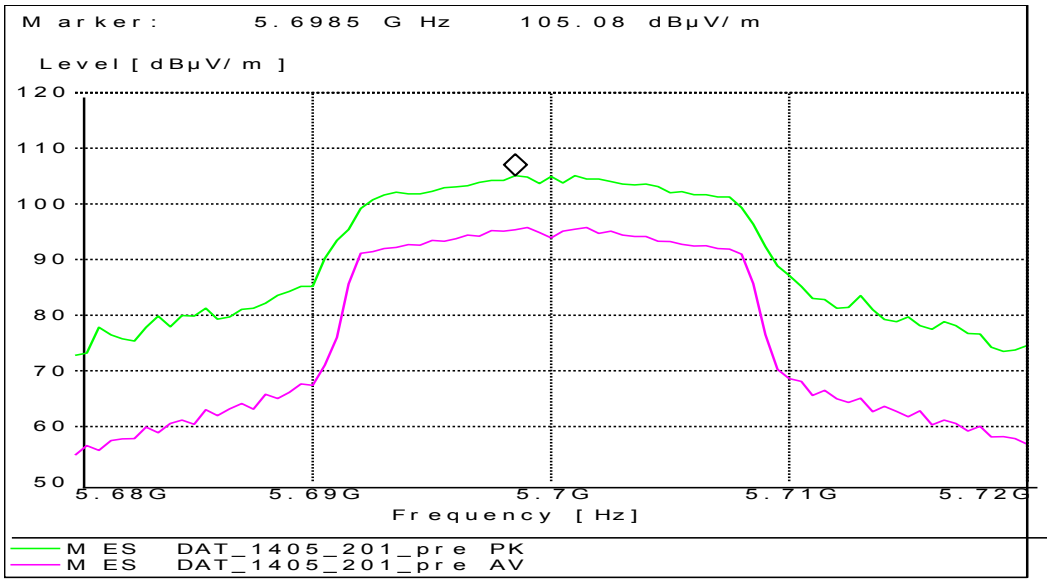
| WLAN a-mode; 6 Mbit/s | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Channel No** | **Channel Center Frequency [MHz]** | **Frequency [MHz]** | **Spurious Level [dBm]** | **Detector** | **RBW [kHz]** | **Limit [dBµV/m]** | **Margin to Limit [dB]** | **Limit Type** |
| 36 | 5180 | 5150.0 | 63.1 | PEAK | 1000 | 74.0 | 10.9 | BE-RB |
| 36 | 5180 | 5150.0 | 47.5 | AV | 1000 | 54.0 | 6.5 | BE-RB |
| 64 | 5320 | 5350.0 | 64.10 | PEAK | 1000 | 74.0 | 9.9 | BE-RB |
| 64 | 5320 | 5350.0 | 48.1 | AV | 1000 | 54.0 | 5.9 | BE-RB |
| 100 | 5500 | 5470.0 | 66.7 | PEAK | 1000 | 68.0 | 1.3 | BE-UE |
| 140 | 5700 | 5725.0 | 65.5 *) | PEAK | 1000 | 68.0 | 2.5 | BE-UE |
| 149 | 5745 | 5725.0 | 71.8 *) | PEAK | 1000 | 78.0 | 6.2 | BE-UE |
| 165 | 5825 | 5850.0 | 70.3 | PEAK | 1000 | 78.0 | 7.7 | BE-UE |

| WLAN n-Mode; 20 MHz; 72.2 Mbit/s | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Channel No** | **Channel Center Frequency [MHz]** | **Frequency [MHz]** | **Spurious Level [dBm]** | **Detector** | **RBW [kHz]** | **Limit [dBm]** | **Margin to Limit [dB]** | **Limit Type** |
| 36 | 5180 | 5150.0 | 61.7 | PEAK | 1000 | 74.0 | 12.3 | BE-RB |
| 36 | 5180 | 5150.0 | 44.9 | AV | 1000 | 54.0 | 9.1 | BE-RB |
| 64 | 5320 | 5350.0 | 63.0 | PEAK | 1000 | 74.0 | 11.0 | BE-RB |
| 64 | 5320 | 5350.0 | 46.1 | AV | 1000 | 54.0 | 7.9 | BE-RB |
| 100 | 5500 | 5470.0 | 66.3 | PEAK | 1000 | 68.0 | 1.7 | BE-UE |
| 140 | 5700 | 5725.0 | 66.0 | PEAK | 1000 | 68.0 | 2.0 | BE-UE |
| 149 | 5745 | 5725.0 | 77.5 | PEAK | 1000 | 78.0 | 0.5 | BE-UE |
| 165 | 5825 | 5850.0 | 70.3 | PEAK | 1000 | 78.0 | 7.7 | BE-UE |

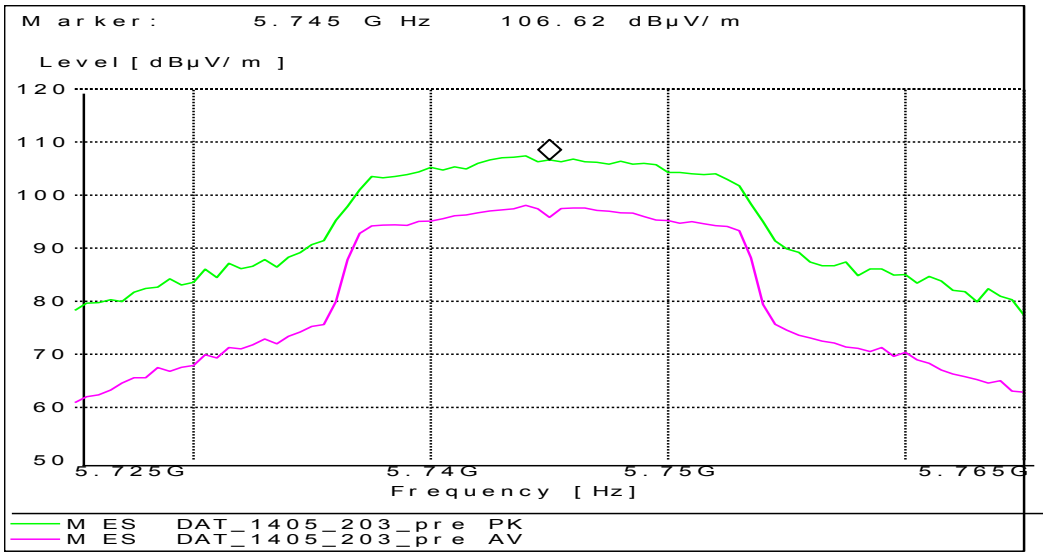
Note: *) values gained with the "marker – delta" method.

### 3.1.4 "Marker – Delta method plots

**Step 1:** Measurement of the output power (radiated) with normal measurement bandwith (1 MHz)

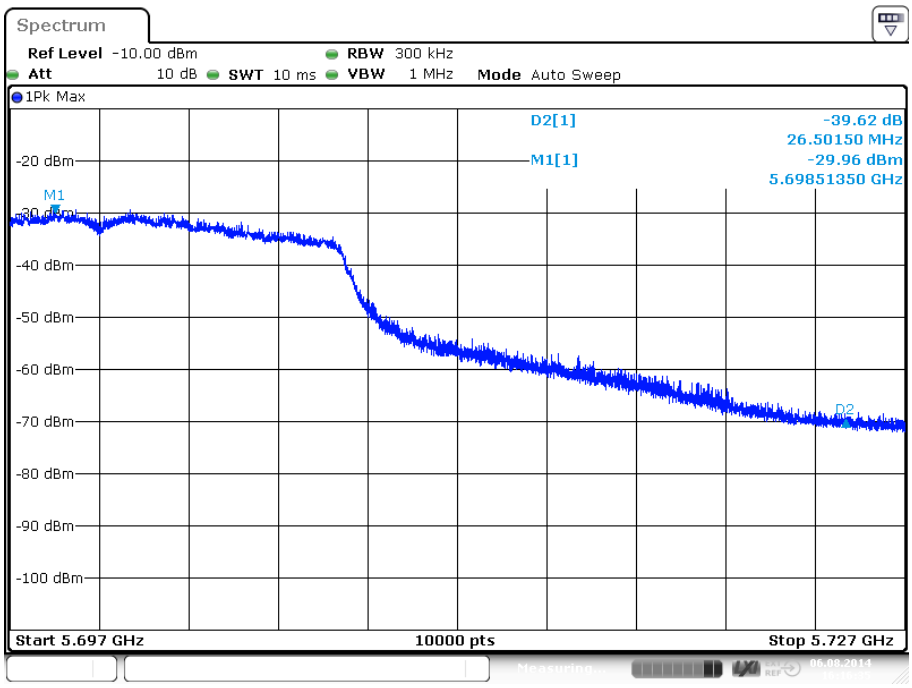



Channel 140:



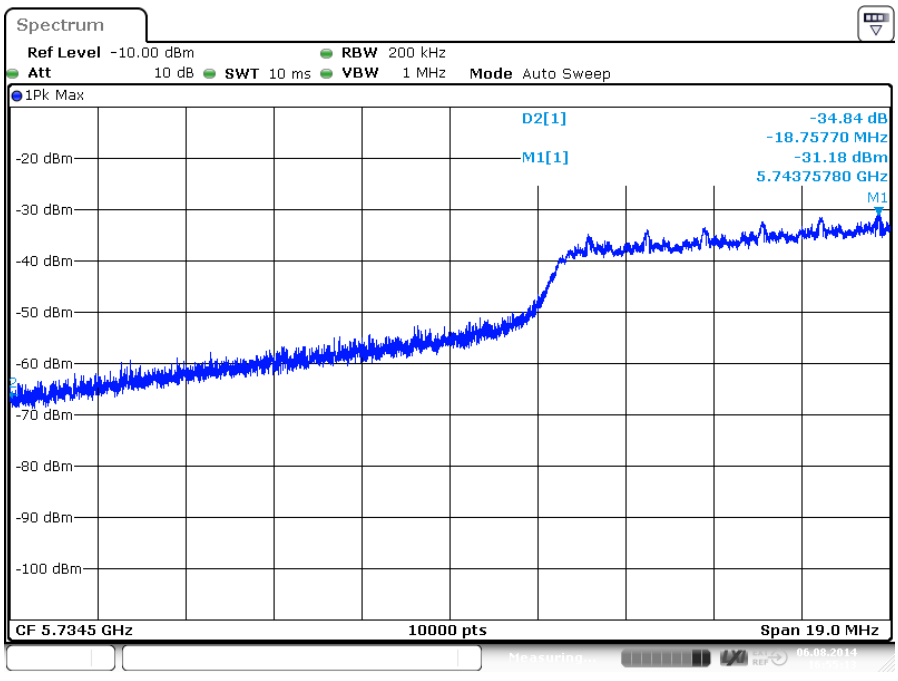

Channel 149:

**Step 2:** Measurement of the "delta-Value" with reduced bandwith (1 % of used span)




Date: 6.AUG.2014 16:16:35

Channel 140:



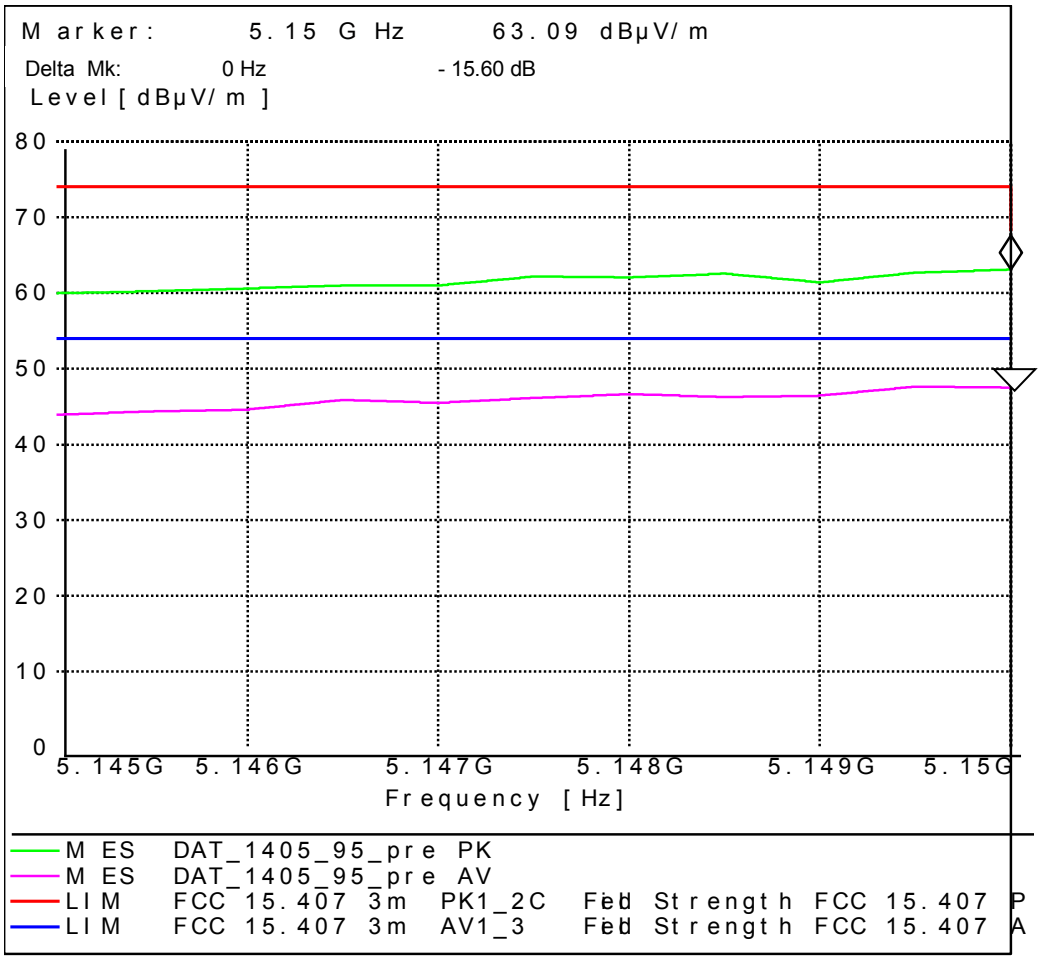

Date: 6.AUG.2014 16:55:13

Channel 149:

**Calculation:**

| Measurement | Channel | |
|---|---|---|
| | 140<br>5700 MHz | 149<br>5745 MHz |
| Max. Output Power [dBµV/m] @ 1 MHz RBW | 105.1 | 106.6 |
| Δ – Value [dB]; Carrier to band edge @ 300 kHz RBW | -39.6 | |
| Δ – Value [dB]; Carrier to band edge @ 200 kHz RBW | | -34.8 |
| Result [dBµV/m] | 65.5 | 71.8 |

### 3.1.5 Measurement Plot Band Edge (showing the highest value, "worst case")



# 4 Test Equipment

## List of Used Test Equipment

The calibration, hardware and software states are shown for the testing period.

### Test Equipment Anechoic Chamber

| | |
|---|---|
| ***Lab ID:*** | **Lab 2** |
| *Manufacturer:* | Frankonia |
| *Description:* | Anechoic Chamber for radiated testing |
| *Type:* | 10.58x6.38x6.00 m³ |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| NSA (FCC) | 2014/01/09 | 2017/01/09 |

### Single Devices for Anechoic Chamber

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| Air compressor | none | - | Atlas Copco |
| Anechoic Chamber | 10.58 x 6.38 x 6.00 m³ | none | Frankonia |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| FCC listing 96716 3m Part15/18 | 2014/01/09 | 2017/01/08 |

| | | | |
|---|---|---|---|
| Controller Maturo | MCU | 961208 | Maturo GmbH |
| EMC camera | CE-CAM/1 | - | CE-SYS |
| EMC camera Nr.2 | CCD-400E | 0005033 | Mitsubishi |
| Filter ISDN | B84312-C110-E1 | | Siemens&Matsushita |
| Filter Universal 1A | BB4312-C30-H3 | - | Siemens&Matsushita |

### Test Equipment Auxiliary Equipment for Conducted emissions

| | |
|---|---|
| ***Lab ID:*** | **Lab 1** |
| *Manufacturer:* | Rohde & Schwarz GmbH & Co.KG |
| *Description:* | EMI Conducted Auxiliary Equipment |

### Single Devices for Auxiliary Equipment for Conducted emissions

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| AC Power Source | Chroma 6404 | 64040001304 | Chroma ATE INC. |
| Cable "LISN to ESI" | RG214 | W18.03+W48.03 | Huber&Suhner |
| Impedance Stabilization Network | ISN T800 | 36159 | Teseq GmbH |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Standard Calibration | 2014/02/06 | 2016/02/28 |

| | | | |
|---|---|---|---|
| Impedance Stabilization Network, Coupling Decoupling Network | ISN/CDN ENY41 | 100002 | Rohde & Schwarz GmbH & Co. KG |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Standard calibration | 2013/03/01 | 2015/03/31 |

| | | | |
|---|---|---|---|
| Impedance Stabilization Network, Coupling Decoupling Network | ISN/CDN ST08 | 36292 | Teseq GmbH |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Standard calibration | 2014/01/10 | 2016/01/31 |

**Single Devices for Auxiliary Equipment for Conducted emissions (continued)**

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* | |
|---|---|---|---|---|
| Impedance Stabilization Network, Coupling Decoupling Network | ISN/CDN T8-Cat6 | 32187 | Teseq GmbH | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2014/01/08 | 2016/01/31 |
| One-Line V-Network | ESH 3-Z6 | 100489 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | standard calibration | | 2014/06/18 | 2017/11/30 |
| One-Line V-Network | ESH 3-Z6 | 100570 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2013/11/25 | 2016/11/24 |
| Two-Line V-Network | ESH 3-Z5 | 828304/029 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standart Calibration | | 2013/03/01 | 2015/02/28 |
| Two-Line V-Network | ESH 3-Z5 | 829996/002 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2013/03/01 | 2015/02/28 |

## Test Equipment Auxiliary Equipment for Radiated emissions

| | |
|---|---|
| ***Lab ID:*** | **Lab 2** |
| *Description:* | Equipment for emission measurements |
| *Serial Number:* | see single devices |

### Single Devices for Auxiliary Equipment for Radiated emissions

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* | |
|---|---|---|---|---|
| Antenna mast | AM 4.0 | AM4.0/180/11920513 | Maturo GmbH | |
| Biconical Broadband Antenna | SBA 9119 | 9119-005 | Schwarzbeck | |
| Biconical dipole | VUBA 9117 | 9117-108 | Schwarzbeck | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2012/01/18 | 2015/01/17 |
| Broadband Amplifier 18MHz-26GHz | JS4-18002600-32-5P | 849785 | Miteq | |
| Broadband Amplifier 1GHz-4GHz | AFS4-01000400-1Q-10P-4 | - | Miteq | |
| Broadband Amplifier 30MHz-18GHz | JS4-00101800-35-5P | 896037 | Miteq | |
| Cable "ESI to EMI Antenna" | EcoFlex10 | W18.01-2+W38.01-2 | Kabel Kusch | |
| Cable "ESI to Horn Antenna" | UFB311A+UFB293C | W18.02-2+W38.02-2 | Rosenberger Micro-Coax | |
| Double-ridged horn | HF 906 | 357357/001 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2012/05/18 | 2015/05/17 |
| Double-ridged horn | HF 906 | 357357/002 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2012/06/26 | 2015/06/25 |
| High Pass Filter | 4HC1600/12750-1.5-KK | 9942011 | Trilithic | |
| High Pass Filter | 5HC2700/12750-1.5-KK | 9942012 | Trilithic | |
| High Pass Filter | 5HC3500/12750-1.2-KK | 200035008 | Trilithic | |
| High Pass Filter | WHKX 7.0/18G-8SS | 09 | Wainwright | |
| Horn Antenna Schwarzbeck 15-26 GHz BBHA 9170 | BBHA 9170 | | | |
| Log.-per. Antenna | HL 562 Ultralog | 100609 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2012/12/18 | 2015/12/17 |
| Log.-per. Antenna | HL 562 Ultralog | 830547/003 | Rohde & Schwarz GmbH & Co. KG | |
| Loop Antenna | HFH2-Z2 | 829324/006 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2011/10/27 | 2014/10/26 |
| Pyramidal Horn Antenna 26,5 GHz | 3160-09 | 00083069 | EMCO Elektronik GmbH | |
| Pyramidal Horn Antenna 40 GHz | 3160-10 | 00086675 | EMCO Elektronik GmbH | |

### Single Devices for Auxiliary Equipment for Radiated emissions (continued)

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| Tilt device Maturo (Rohacell) | Antrieb TD1.5-10kg | TD1.5-10kg/024/3790709 | Maturo GmbH |

## Test Equipment Auxiliary Test Equipment

| | |
|---|---|
| ***Lab ID:*** | **Lab 2, Lab 3** |
| *Manufacturer:* | see single devices |
| *Description:* | Single Devices for various Test Equipment |
| *Type:* | various |
| *Serial Number:* | none |

### Single Devices for Auxiliary Test Equipment

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| AC Power Source | Chroma 6404 | 64040001304 | Chroma ATE INC. |
| Broadband Power Divider N (Aux) | 1506A / 93459 | LM390 | Weinschel Associates |
| Broadband Power Divider SMA | WA1515 | A855 | Weinschel Associates |
| Digital Multimeter 03 (Multimeter) | Fluke 177 | 86670383 | Fluke Europe B.V. |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Customized calibration | | 2013/12/04 2015/12/03 |
| Fibre optic link Satellite (Aux) | FO RS232 Link | 181-018 | Pontis |
| Fibre optic link Transceiver (Aux) | FO RS232 Link | 182-018 | Pontis |
| Isolating Transformer | LTS 604 | 1888 | Thalheimer Transformatorenwerke GmbH |
| Notch Filter Ultra Stable (Aux) | WRCA800/960-6EEK | 24 | Wainwright |
| Signal Analyzer | FSV30 | 103005 | Rohde & Schwarz GmbH & Co. KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard | | 2014/02/10 2016/02/09 |
| Spectrum Analyser | FSP3 | 836722/011 | Rohde & Schwarz GmbH & Co. KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard | | 2012/06/13 2015/06/12 |
| Spectrum Analyser | FSU26 | 200418 | Rohde & Schwarz GmbH & Co.KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2013/07/29 2014/07/28 |
| Vector Signal Generator | SMIQ 03B | 832492/061 | Rohde & Schwarz GmbH & Co.KG |

## Test Equipment Digital Signalling Devices

***Lab ID:*** **Lab 1, Lab 2, Lab 3**
*Description:* Signalling equipment for various wireless technologies.

### Single Devices for Digital Signalling Devices

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| Bluetooth Signalling Unit CBT | CBT | 100589 | Rohde & Schwarz GmbH & Co. KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2011/11/24 2014/11/23 |
| CMW500 | CMW500 | 107500 | Rohde & Schwarz GmbH & Co.KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2014/01/27 2016/01/26 |
| Digital Radio Communication Tester | CMD 55 | 831050/020 | Rohde & Schwarz GmbH & Co. KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2011/11/28 2014/11/27 |
| Universal Radio Communication Tester | CMU 200 | 102366 | Rohde & Schwarz GmbH & Co. KG |
| | *HW/SW Status* | | *Date of Start* *Date of End* |
| | Hardware:<br>B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04<br>Software:<br>K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22<br>Firmware:<br>µP1 8v50 02.05.06<br>--- | | 2007/07/16 |
| Universal Radio Communication Tester | CMU 200 | 837983/052 | Rohde & Schwarz GmbH & Co. KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2011/12/07 2014/12/06 |
| | *HW/SW Status* | | *Date of Start* *Date of End* |
| | HW options:<br>B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02<br>SW options:<br>K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10,<br>Firmware:<br>µP1 8v40 01.12.05<br>--- | | 2007/01/02 |
| | SW:<br>K62, K69 | | 2008/11/03 |
| Vector Signal Generator | SMU200A | 100912 | Rohde & Schwarz GmbH & Co. KG |

### Test Equipment Emission measurement devices

| | |
|---|---|
| ***Lab ID:*** | **Lab 1, Lab 2** |
| *Description:* | Equipment for emission measurements |
| *Serial Number:* | see single devices |

### Single Devices for Emission measurement devices

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* | |
|---|---|---|---|---|
| Personal Computer | Dell | 30304832059 | Dell | |
| Power Meter | NRVD | 828110/016 | Rohde & Schwarz GmbH & Co.KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2014/05/13 | 2015/05/12 |
| Sensor Head A | NRV-Z1 | 827753/005 | Rohde & Schwarz GmbH & Co.KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2014/05/13 | 2015/05/12 |
| Signal Generator | SMR 20 | 846834/008 | Rohde & Schwarz GmbH & Co. KG | |
| Spectrum Analyzer | ESIB 26 | 830482/004 | Rohde & Schwarz GmbH & Co. KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2014/01/07 | 2016/01/31 |
| | *HW/SW Status* | | *Date of Start* | *Date of End* |
| | Firmware-Update 4.34.4 from 3.45 during calibration | | 2009/12/03 | |

### Test Equipment Multimeter 12

| | |
|---|---|
| ***Lab ID:*** | **Lab 4, Lab 5** |
| *Description:* | Ex-Tech 520 |
| *Serial Number:* | 05157876 |

### Single Devices for Multimeter 12

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* | |
|---|---|---|---|---|
| Digital Multimeter 12 (Multimeter) | EX520 | 05157876 | Extech Instruments Corp. | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Customized calibration | | 2013/12/04 | 2015/12/03 |

## Test Equipment Radio Lab Test Equipment

***Lab ID:*** **Lab 3**
*Description:* Radio Lab Test Equipment

### Single Devices for Radio Lab Test Equipment

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| Broadband Power Divider SMA | WA1515 | A856 | Weinschel Associates |
| Coax Attenuator 10dB SMA 2W | 4T-10 | F9401 | Weinschel Associates |
| Coax Attenuator 10dB SMA 2W | 56-10 | W3702 | Weinschel Associates |
| Coax Attenuator 10dB SMA 2W | 56-10 | W3711 | Weinschel Associates |
| Coax Cable Huber&Suhner | Sucotest 2,0m | | Huber&Suhner |
| Coax Cable Rosenberger Micro Coax FA210A0010003030 SMA/SMA 1,0m | FA210A0010003030 | 54491-2 | Rosenberger Micro-Coax |
| Power Meter | NRVD | 828110/016 | Rohde & Schwarz GmbH & Co.KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2014/05/13 2015/05/12 |
| RF Step Attenuator RSP | RSP | 833695/001 | Rohde & Schwarz GmbH & Co.KG |
| Rubidium Frequency Standard | Datum, Model: MFS | 5489/001 | Datum-Beverly |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2013/06/24 2014/07/02 |
| | Standard calibration | | 2014/07/03 2015/07/02 |
| Sensor Head A | NRV-Z1 | 827753/005 | Rohde & Schwarz GmbH & Co.KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2014/05/13 2015/05/12 |
| Signal Generator SME | SME03 | 827460/016 | Rohde & Schwarz GmbH & Co.KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2011/11/25 2014/11/24 |
| Signal Generator SMP | SMP02 | 836402/008 | Rohde & Schwarz GmbH & Co. KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard calibration | | 2013/05/06 2016/05/05 |
| Spectrum Analyser | FSIQ26 | 840061/005 | Rohde & Schwarz GmbH & Co. KG |
| | *Calibration Details* | | *Last Execution* *Next Exec.* |
| | Standard Calibration | | 2013/02/12 2015/02/11 |

### Test Equipment Regulatory Bluetooth RF Test Solution

| | |
|---|---|
| ***Lab ID:*** | **Lab 4** |
| *Description:* | Regulatory Bluetooth RF Tests |
| *Type:* | Bluetooth RF |
| *Serial Number:* | 001 |

### Single Devices for Regulatory Bluetooth RF Test Solution

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* | |
|---|---|---|---|---|
| ADU 200 Relay Box 7 | Relay Box | A04380 | Ontrak Control Systems Inc. | |
| Bluetooth Signalling Unit CBT | CBT | 100302 | Rohde & Schwarz GmbH & Co.KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/08/28 | 2014/08/27 |
| Power Meter NRVD | NRVD | 832025/059 | | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/08/26 | 2014/08/25 |
| Power Sensor NRV Z1 A | PROBE | 832279/013 | | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/08/28 | 2014/08/27 |
| Power Supply | NGSM 32/10 | 2725 | | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/06/20 | 2015/06/19 |
| Rubidium Frequency Normal MFS | Datum MFS | 002 | Datum GmbH | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/08/27 | 2014/08/26 |
| Signal Analyser FSIQ26 | 1119.6001.26 | 832695/007 | Rohde & Schwarz GmbH & Co.KG | |
| Vector Signal Generator SMIQ03B | SMIQ03B | 832870/017 | | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/06/21 | 2016/06/20 |

### Test Equipment Shielded Room 02

| | |
|---|---|
| ***Lab ID:*** | **Lab 1** |
| *Manufacturer:* | Frankonia |
| *Description:* | Shielded Room for conducted testing |
| *Type:* | 12 qm |
| *Serial Number:* | none |

### Test Equipment Shielded Room 07

| | |
|---|---|
| ***Lab ID:*** | **Lab 4, Lab 5** |
| *Description:* | Shielded Room 4m x 6m |

### Test Equipment T/A Logger 13

| | |
|---|---|
| ***Lab ID:*** | **Lab 1, Lab 2, Lab 3** |
| *Description:* | Lufft Opus10 TPR |
| *Type:* | Opus10 TPR |
| *Serial Number:* | 13936 |

#### Single Devices for T/A Logger 13

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| ThermoAirpressure Datalogger 13 (Environ) | Opus10 TPR (8253.00) | 13936 | Lufft Mess- und Regeltechnik GmbH |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Customized calibration | 2013/02/07 | 2015/02/06 |

### Test Equipment T/H Logger 02

| | |
|---|---|
| ***Lab ID:*** | **Lab 1** |
| *Description:* | Lufft Opus10 |
| *Serial Number:* | 7489 |

#### Single Devices for T/H Logger 02

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| ThermoHygro Datalogger 02 (Environ) | Opus10 THI (8152.00) | 7489 | Lufft Mess- und Regeltechnik GmbH |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Customized calibration | 2013/02/07 | 2015/02/06 |

### Test Equipment T/H Logger 03

| | |
|---|---|
| ***Lab ID:*** | **Lab 3** |
| *Description:* | Lufft Opus10 |
| *Serial Number:* | 7482 |

#### Single Devices for T/H Logger 03

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| ThermoHygro Datalogger 03 (Environ) | Opus10 THI (8152.00) | 7482 | Lufft Mess- und Regeltechnik GmbH |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Customized calibration | 2013/02/07 | 2015/02/06 |

### Test Equipment T/H Logger 12

| | |
|---|---|
| ***Lab ID:*** | **Lab 2** |
| *Description:* | Lufft Opus10 |
| *Serial Number:* | 12482 |

#### Single Devices for T/H Logger 12

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| ThermoHygro Datalogger 12 (Environ) | Opus10 THI (8152.00) | 12482 | Lufft Mess- und Regeltechnik GmbH |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Customized calibration | 2013/01/07 | 2015/01/06 |

### Test Equipment T/H Logger 15

| | |
|---|---|
| ***Lab ID:*** | **Lab 4, Lab 5** |
| *Description:* | Lufft Opus10 |
| *Serial Number:* | 13985 |

### Single Devices for T/H Logger 15

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| ThermoHygro Datalogger 15 (Environ) | Opus10 THI (8152.00) | 13985 | Lufft Mess- und Regeltechnik GmbH |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Customized calibration | 2013/01/07 | 2015/01/06 |

### Test Equipment Temperature Chamber 01

| | |
|---|---|
| ***Lab ID:*** | **Lab 4, Lab 5** |
| *Manufacturer:* | see single devices |
| *Description:* | Temperature Chamber KWP 120/70 |
| *Type:* | Weiss |
| *Serial Number:* | see single devices |

### Single Devices for Temperature Chamber 01

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| Temperature Chamber Weiss 01 | KWP 120/70 | 59226012190010 | Weiss Umwelttechnik GmbH |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Customized calibration | 2014/03/12 | 2016/03/11 |

### Test Equipment Temperature Chamber 05

| | |
|---|---|
| ***Lab ID:*** | **Lab 3** |
| *Manufacturer:* | see single devices |
| *Description:* | Temperature Chamber VT4002 |
| *Type:* | Vötsch |
| *Serial Number:* | see single devices |

### Single Devices for Temperature Chamber 05

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* |
|---|---|---|---|
| Temperature Chamber Vötsch 05 | VT 4002 | 58566080550010 | Vötsch |

| *Calibration Details* | *Last Execution* | *Next Exec.* |
|---|---|---|
| Customized calibration | 2014/03/11 | 2016/03/10 |

### Test Equipment WLAN RF Test Solution

| | |
|---|---|
| ***Lab ID:*** | **Lab 5** |
| *Manufacturer:* | 7 layers AG |
| *Description:* | Regulatory WLAN RF Tests |
| *Type:* | WLAN RF |
| *Serial Number:* | 001 |

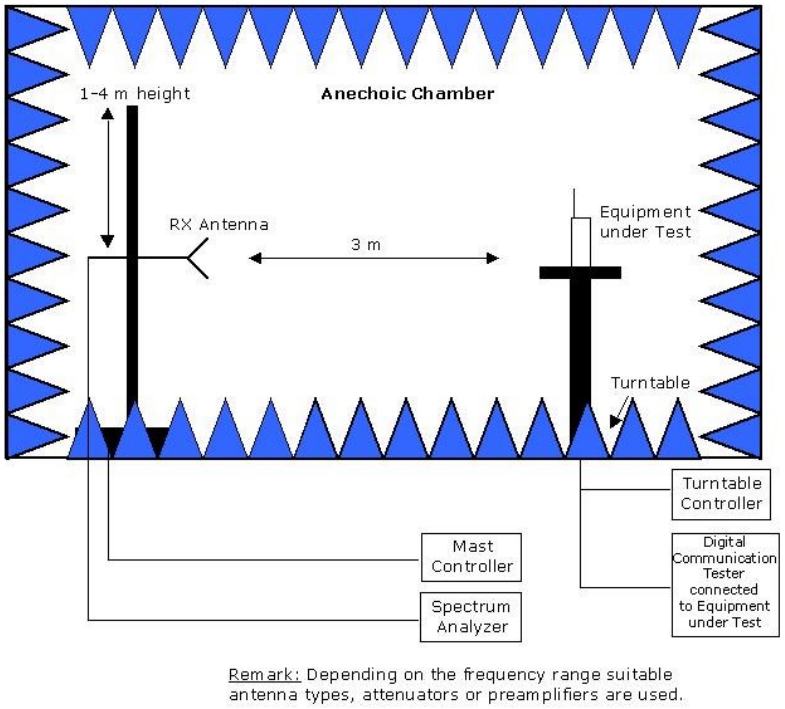
### Single Devices for WLAN RF Test Solution

| *Single Device Name* | *Type* | *Serial Number* | *Manufacturer* | |
|---|---|---|---|---|
| Arbitrary Waveform Generator | TGA12101 | 284482 | | |
| Power Meter NRVD | NRVD | 832025/059 | | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/08/26 | 2014/08/25 |
| Power Sensor NRV Z1 A | PROBE | 832279/013 | | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/08/28 | 2014/08/27 |
| Power Supply | NGSM 32/10 | 2725 | | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/06/20 | 2015/06/19 |
| Rubidium Frequency Normal MFS | Datum MFS | 002 | Datum GmbH | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/08/27 | 2014/08/26 |
| Signal Analyser FSIQ26 | 1119.6001.26 | 832695/007 | Rohde & Schwarz GmbH & Co.KG | |
| Spectrum Analyser | FSU26 | 100136 | Rohde & Schwarz GmbH & Co.KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard Calibration | | 2014/01/06 | 2015/01/05 |
| | *HW/SW Status* | | *Date of Start* | *Date of End* |
| | FSU FW Update to v4.61 SP3, K5 v4.60 and K73 v4.61 | | 2011/12/05 | |
| Spectrum Analyser | FSU3 | 200046 | Rohde & Schwarz GmbH & Co.KG | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/06/20 | 2014/06/19 |
| | *HW/SW Status* | | *Date of Start* | *Date of End* |
| | Firmware Version 4.51 SP1<br>Option FS-K72 4.50 SP1<br>Option FS-K73 4.50 SP1 | | 2011/12/07 | |
| TOCT Switching Unit | Switching Unit | 040107 | 7 layers, Inc. | |
| Vector Signal Generator SMIQ03B | SMIQ03B | 832870/017 | | |
| | *Calibration Details* | | *Last Execution* | *Next Exec.* |
| | Standard calibration | | 2013/06/21 | 2016/06/20 |

# 5 Photo Report

Please refer to external report.

# 6 Setup Drawings




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