



Inter**Lab**[®]

cRIO GXXX 3G MOBILE HSPA Module

Report Reference: MDE_SEA_0902_FCCa
FCC part 15b

Date: October 15, 2009

Test Laboratory:

7 layers AG
Borsigstr. 11
40880 Ratingen
Germany



DAT-P-192/99-01

Note:

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

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1 Administrative Data**1.1 Project Data**

Project Responsible: Yao Jing
Date Of Test Report: 2009/10/15
Date of first test: 2009/09/10
Date of last test: 2009/09/10

1.2 Applicant Data

Company Name: S.E.A. Datentechnik GmbH
Street: Linder Höhe
51147 Köln
Country: Germany
Contact Person: Hr. Wolfram Koerver
Function: Director
Phone: +49 2203 98007-23
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1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

7 layers DE

Company Name : 7 layers AG
Street : Borsigstrasse 11
City : 40880 Ratingen
Country : Germany
Contact Person : Mr. Michael Albert
Phone : +49 2102 749 201
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E Mail : michael.albert@7Layers.de

Laboratory Details

| Lab ID | Identification | Responsible | Accreditation Info |
|--------|--------------------|---|--------------------------------------|
| Lab 1 | Radiated Emissions | Mr. Robert Machulec Mr. Andreas Petz | DAR-Registration no. DAT-P-192/99-01 |

1.4 Signature of the Testing Responsible

Dr. Michael Küppers
responsible for tests performed in: Lab 1

1.5 Signature of the Accreditation Responsible



Accreditation scope responsible person
responsible for Lab 1

2 Test Object Data

2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: cRIO GXXX 3G MOBILE HSPA Module

| | |
|--------------------------|--------------------------------------|
| <i>Product Category:</i> | Others |
| Manufacturer: | |
| <i>Company Name:</i> | S.E.A. Datentechnik GmbH |
| <i>Street:</i> | Linder Höhe 51147 Köln Germany |
| <i>Country:</i> | |
| <i>Contact Person:</i> | Mr. Wolfram Koerver |
| <i>Function:</i> | Director |
| <i>Phone:</i> | +49 2203 98007-23 |
| <i>E-Mail:</i> | wolfram.koerver@sea-gmbh.com |

2.2 Detailed Description of OUT Samples

Sample : a01

| | |
|---------------------------|---------------------------------|
| <i>OUT Identifier</i> | cRIO GXXX 3G MOBILE HSPA Module |
| <i>Sample Description</i> | |
| <i>Serial No.</i> | D663578019210 |
| <i>HW Status</i> | 60000037 |
| <i>SW Status</i> | K1_0_3_0 |
| <i>Nominal Voltage</i> | 12 V |

2.3 OUT Features

Features for OUT: cRIO GXXX 3G MOBILE HSPA Module

| <i>Designation</i> | <i>Description</i> | <i>Allowed Values</i> | <i>Supported Value(s)</i> |
|-----------------------------------|--|-----------------------|---------------------------|
| Features for scope: FCC_v2 | | | |
| DC | The OUT is powered by or connected to DC Mains | | |
| EDGE850 | EUT supports EDGE in the band 824 MHz - 849 MHz | | |
| EDGE1900 | EUT supports EDGE in the band 1850 MHz - 1910 MHz | | |
| FDD2 | EUT supports UMTS FDD2 in the band 1850 MHz - 1910 MHz | | |
| FDD5 | EUT supports UMTS FDD5 in the band 824 MHz - 849 MHz | | |
| GSM850 | EUT supports GSM850 band 824MHz - 849MHz | | |
| HSDPA-FDD2 | EUT supports UMTS FDD2 HSDPA in the band 1850 MHz - 1910 MHz | | |
| HSDPA-FDD5 | EUT supports UMTS FDD5 HSDPA in the band 824 MHz - 849 MHz | | |
| PantC | permanent fixed antenna connector, which may be built-in, designed as an indispensable part of the equipment | | |
| PCS1900 | EUT supports PCS1900 band 1850MHz - 1910MHz | | |

2.4 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

| <i>Setup No.</i> | <i>List of OUT samples</i> | <i>List of auxiliary equipment</i> |
|-------------------|----------------------------|------------------------------------|
| <i>Sample No.</i> | <i>Sample Description</i> | <i>AE No. AE Description</i> |

A01

Sample: a01

3 Results

3.1 General

Documentation of tested devices:

Available at the test laboratory.

Interpretation of the test results:

The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation. EUT complies with the Class B limits of §15.107

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

| <i>Designation</i> | <i>Description</i> |
|--|--|
| FCC47CFRChIPART15bRADIO FREQUENCY DEVICES | Part 15, Subpart B - Unintentional Radiators |

3.3 List of Test Specification

| | |
|----------------------------|---|
| <i>Test Specification:</i> | FCC part 2 and 15 |
| <i>Date / Version</i> | 2009/03/26 Version: 10-1-08 Edition |
| <i>Title:</i> | PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES |



Reference: MDE_SEA_0902_FCCa
FCC part 15b

3.4 Summary

| <i>Test Case Identifier / Name</i> <i>Test (condition)</i> | <i>Result</i> | <i>Date of Test</i> | <i>Lab</i> <i>Ref.</i> | <i>Setup</i> |
|--|---------------|---------------------|---------------------------|--------------|
| 15b.2 Spurious Radiated Emissions §15.109 15b.2; Mode = transmit | Passed | 2009/09/10 | Lab 1 | A01 |



3.5 Detailed Results

3.5.1 15b.2 Spurious Radiated Emissions §15.109

Test: 15b.2; Mode = transmit

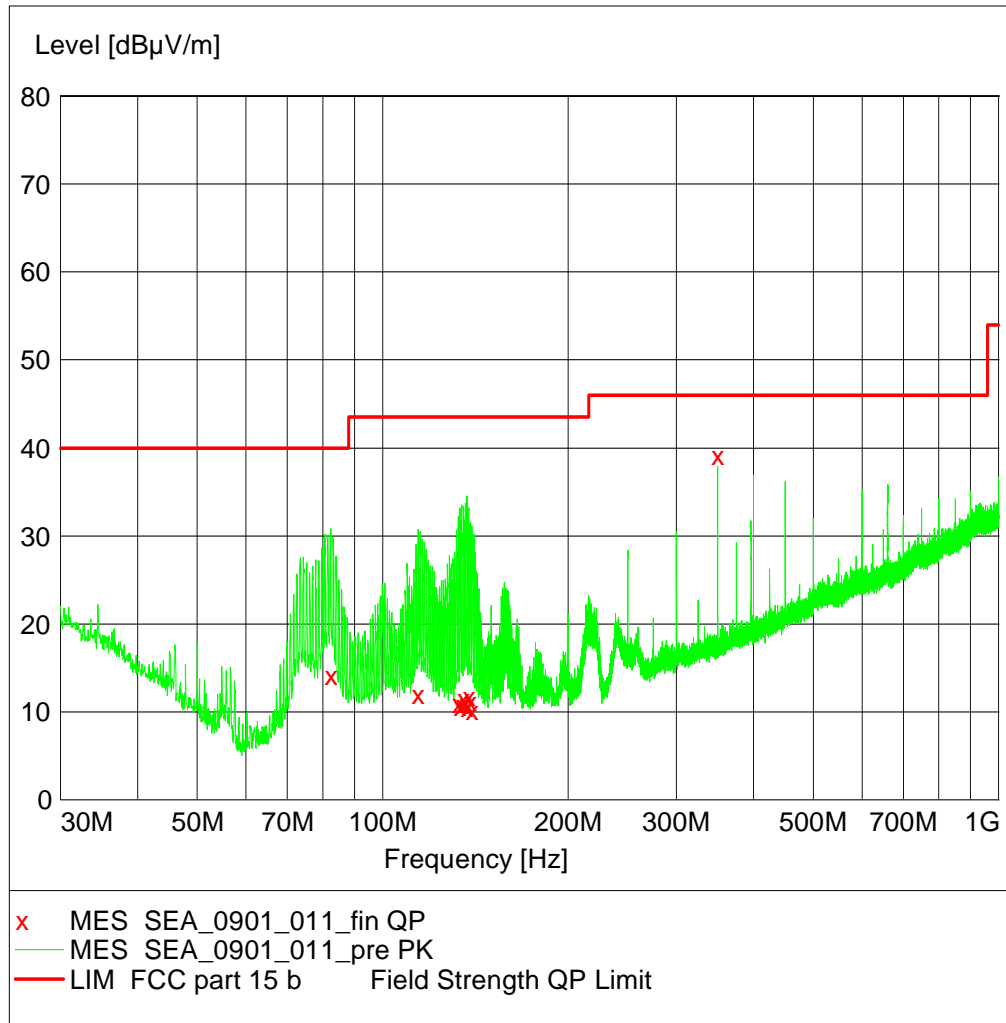
| | |
|----------------------------|---|
| <i>Result:</i> | Passed |
| <i>Setup No.:</i> | A01 |
| <i>Date of Test:</i> | 2009/09/10 7:38 |
| <i>Body:</i> | FCC47CFRChIPART15bRADIO FREQUENCY DEVICES |
| <i>Test Specification:</i> | FCC part 2 and 15 |

Detailed Results:

EMI RADIATED TEST

Diagram No.: 2.01

EUT: cRIO--Gxxx-3G (38150a01)
Manufacturer: SEA Datentechnik GmbH
Operating Condition: GPRS traffic
Test Site: 7 layers, Ratingen
Operator: MAC
Test Specification: FCC 15 B
Comment: Horizontal + vertical antenna polarisation
Start of Test: 10.09.2009 / 13:05:31



MEASUREMENT RESULT: "SEA_0901_011_fin QP"

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Height cm | Azimuth deg | Polarisation |
|------------------|-----------------|--------------|-----------------|--------------|--------------|----------------|--------------|
| 82.380000 | 14.10 | 9.9 | 40.0 | 28.9 | 131.0 | 67.00 | VERTICAL |
| 114.180000 | 12.00 | 11.9 | 43.0 | 31.0 | 113.0 | 247.00 | VERTICAL |
| 132.600000 | 10.90 | 10.4 | 43.0 | 32.1 | 125.0 | 111.00 | VERTICAL |
| 133.500000 | 10.60 | 10.3 | 43.0 | 32.4 | 133.0 | 107.00 | VERTICAL |
| 134.400000 | 10.80 | 10.2 | 43.0 | 32.2 | 101.0 | 167.00 | VERTICAL |
| 135.300000 | 11.50 | 10.2 | 43.0 | 31.5 | 100.0 | 67.00 | VERTICAL |
| 136.140000 | 10.90 | 10.2 | 43.0 | 32.1 | 136.0 | 159.00 | VERTICAL |
| 137.040000 | 10.50 | 10.1 | 43.0 | 32.5 | 109.0 | 157.00 | VERTICAL |
| 137.940000 | 11.80 | 10.0 | 43.0 | 31.2 | 106.0 | 67.00 | VERTICAL |
| 138.780000 | 11.10 | 10.0 | 43.0 | 31.9 | 125.0 | 158.00 | VERTICAL |
| 139.680000 | 10.20 | 9.9 | 43.0 | 32.8 | 106.0 | 157.00 | VERTICAL |
| 349.980000 | 39.10 | 15.5 | 47.0 | 7.9 | 100.0 | 247.00 | VERTICAL |

4 Test Equipment Details

4.1 List of Used Test Equipment

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

Test Equipment Anechoic Chamber

| | | | |
|----------------------|---------------------------------------|-----------------------|-------------------|
| Lab ID: | Lab 1 | | |
| Manufacturer: | Frankonia | | |
| Description: | Anechoic Chamber for radiated testing | | |
| Type: | 10.58x6.38x6 | | |
| | <i>Calibration Details</i> | <i>Last Execution</i> | <i>Next Exec.</i> |
| | FCC renewal | 2006/12/19 | 2009/12/19 |
| | IC renewal | 2009/01/21 | 2011/01/20 |
| | FCC renewal | 2009/01/07 | 2011/01/06 |

Single Devices for Anechoic Chamber

| <i>Single Device Name</i> | <i>Type</i> | <i>Serial Number</i> | <i>Manufacturer</i> |
|---------------------------|--------------------------------|---------------------------|---|
| Air compressor | none | - | Atlas Copco |
| Anechoic Chamber | 10.58 x 6.38 x 6 | none | Frankonia |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | FCC listing 96716 3m Part15/18 | | 2009/01/07 2011/01/06 |
| | ANSI C64.3 NSA | | 2009/01/21 2011/01/20 |
| Controller Innco 2000 | CO 2000 | CO2000/328/1247 0406/L | Innco innovative constructions 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 Radiated emissions

Lab ID: Lab 1
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 | AS 620 P | | HD GmbH |
| Biconical dipole | VUBA 9117 | 9117108 | Schwarzbeck |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Standard Calibration | | 2008/10/27 2013/10/26 |
| Broadband Amplifier 18MHz-26GHz | JS4-18002600-32-5P | 849785 | Miteq |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Path Calibration | | 2009/05/18 2009/11/17 |
| Broadband Amplifier 1GHz-4GHz | AFS4-01000400-1Q-10P-4 | - | Miteq |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Path Calibration | | 2009/05/18 2009/11/17 |
| Broadband Amplifier 30MHz-18GHz | JS4-00101800-35-5P | 896037 | Miteq |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Path Calibration | | 2009/05/18 2009/11/17 |
| Cable "ESI to EMI Antenna" | EcoFlex10 | W18.01- 2+W38.01-2 | Kabel Kusch |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Path Calibration | | 2009/05/18 2009/11/17 |
| Cable "ESI to Horn Antenna" | UFB311A+UFB293C | W18.02- 2+W38.02-2 | Rosenberger Micro-Coax |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Path Calibration | | 2009/05/18 2009/11/17 |
| Double-ridged horn | HF 906 | 357357/001 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Standard Calibration | | 2009/04/16 2012/04/15 |
| Double-ridged horn | HF 906 | 357357/002 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Standard Calibration | | 2009/04/28 2012/04/27 |
| Dreheinheit | DE 325 | | HD GmbH |
| High Pass Filter | 4HC1600/12750-1.5-KK | 9942011 | Trilithic |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Path Calibration | | 2009/05/18 2009/11/17 |
| High Pass Filter | 5HC2700/12750-1.5-KK | 9942012 | Trilithic |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Path Calibration | | 2009/05/18 2009/11/17 |
| High Pass Filter | 5HC3500/12750-1.2-KK | 200035008 | Trilithic |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | Path Calibration | | 2009/05/18 2009/11/17 |
| Log.-per. Antenna | HL 562 Ultralog | 830547/003 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

| <i>Single Device Name</i> | <i>Type</i> | <i>Serial Number</i> | <i>Manufacturer</i> |
|---------------------------------|----------------------------|----------------------|----------------------------------|
| | Standard Calibration | | 2009/05/27 2012/05/26 |
| Loop Antenna | HFH2-Z2 | 829324/006 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | DKD calibration | | 2008/10/07 2011/10/06 |
| Pyramidal Horn Antenna 26,5 GHz | 3160-09 | 00083069 | EMCO Elektronik GmbH |
| Pyramidal Horn Antenna 40 GHz | 3160-10 | 00086675 | EMCO Elektronik GmbH |

Test Equipment Auxiliary Test Equipment

| | |
|-----------------------|---|
| Lab ID: | Lab 1 |
| Manufacturer: | see single devices |
| Description: | Single Devices for various Test Equipment |
| Type: | various |
| Serial Number: | none |

Single Devices for Auxiliary Test Equipment

| <i>Single Device Name</i> | <i>Type</i> | <i>Serial Number</i> | <i>Manufacturer</i> |
|------------------------------------|----------------------------|----------------------|--------------------------------------|
| 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 01 (Multimeter) | Voltcraft M-3860M | IJ096055 | Conrad Electronics |
| Digital Multimeter 03 (Multimeter) | Fluke 177 | 86670383 | Fluke Europe B.V. |
| Digital Oscilloscope [SA2] (Aux) | TDS 784C | B021311 | Tektronix GmbH |
| 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 |
| Spectrum Analyser | FSP3 | 836722/011 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Exec.</i> |
| | DKD calibration | | 2008/10/06 2011/10/05 |

Test Equipment Digital Signalling Devices

Lab ID: Lab 1
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 |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | Standard Calibration | | 2008/08/14 2011/08/13 |
| Digital Radio Communication Tester | CMD 55 | 831050/020 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | Standard calibration | | 2008/10/07 2010/10/06 |
| Digital Radio Test Set | 6103E | 2359 | Racal Instruments, Ltd. |
| Universal Radio Communication Tester | CMU 200 | 102366 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | Standard calibration | | 2009/02/16 2011/02/15 |
| | <i>HW/SW Status</i> | | <i>Date of Start</i> <i>Date of End</i> |
| | Hardware: | | 2007/07/16 |
| | B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04 | | |
| | Software: | | |
| Universal Radio Communication Tester | 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 | | |
| | Firmware: | | |
| | µP1 8v50 02.05.06 | | |
| | --- | | |
| | CMU 200 | | 837983/052 |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | Standard calibration | | 2008/12/01 2011/11/30 |
| Universal Radio Communication Tester | <i>HW/SW Status</i> | | <i>Date of Start</i> <i>Date of End</i> |
| | HW options: | | 2007/01/02 |
| | B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 | | |
| | SW options: | | |
| | K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, | | |
| | Firmware: | | |
| | µP1 8v40 01.12.05 | | |
| Universal Radio Communication Tester | --- | | |
| | SW: | | 2008/11/03 |
| | K62, K69 | | |
| Vector Signal Generator | SMU200A | 100912 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | standard calibration | | 2008/10/28 2011/10/27 |

Test Equipment Emission measurement devices

Lab ID: Lab 1
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Emission measurement devices

| <i>Single Device Name</i> | <i>Type</i> | <i>Serial Number</i> | <i>Manufacturer</i> |
|----------------------------|-------------|----------------------|---|
| Personal Computer | Dell | | Dell |
| Signal Generator | SMR 20 | 846834/008 | Rohde & Schwarz GmbH & Co. KG |
| <i>Calibration Details</i> | | | <i>Last Execution</i> <i>Next Exec.</i> |
| Standard Calibration | | | 2007/12/05 2010/12/04 |
| Spectrum Analyzer | ESIB 26 | 830482/004 | Rohde & Schwarz GmbH & Co. KG |
| <i>Calibration Details</i> | | | <i>Last Execution</i> <i>Next Exec.</i> |
| Standard Calibration | | | 2007/12/06 2009/12/05 |

4.2 Laboratory Environmental Conditions

| <i>Laboratory</i> | <i>Date</i> | <i>Temperature</i> | <i>Humidity</i> | <i>Air Pressure</i> |
|-------------------|-------------|--------------------|-----------------|---------------------|
| Lab 1 | 2009/09/10 | 25 °C | 38 % | 1025 hPa |

5 Annex

5.1 Additional Information for OUT Description



back view



front view

5.2 Additional Information for Test Plan



setup for the test radiated emissions



5.3 Additional Information for Report

Test Description

Conducted emissions (AC power line)

Standard FCC Part 15, 10-1-08
Subpart B

The test was performed according to: ANSI C 63.4, 2003

Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003.
The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50 μ H || 50 Ohm Line Impedance Stabilization Network (LISN). The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan

Intention of this step is, to determine the conducted EMI-profile of the EUT.

EMI receiver settings:

- Detector: Peak - Maxhold
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement

Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.

EMI receiver settings:

- Detector: Quasi-Peak
- IF - Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:

- 1) Neutral lead - reference ground (PE grounded)
- 2) Phase lead - reference ground (PE grounded)
- 3) Neutral lead - reference ground (PE floating)
- 4) Phase lead - reference ground (PE floating)

The highest value is reported.

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.107, Class B Limit

| Frequency Range (MHz) | QP Limit (dB μ V) | AV Limit (dB μ V) |
|-----------------------|-----------------------|-----------------------|
| 0.15 – 0.5 | 66 to 56 | 56 to 46 |
| 0.5 – 5 | 56 | 46 |
| 5 – 30 | 60 | 50 |

FCC Part 15, Subpart B, §15.107, Class A Limit

| Frequency Range (MHz) | QP Limit (dBµV) | AV Limit (dBµV) |
|-----------------------|-----------------|-----------------|
| 0.15 - 0.5 | 79 | 66 |
| 0.5 - 30 | 73 | 60 |

Used conversion factor: Limit (dBµV) = 20 log (Limit (µV)/1µV).

NOTE: a missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Spurious radiated emissions

Standard FCC Part 15, 10-1-08, Subpart B

The test was performed according to: ANSI C 63.4, 2003

Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003.

The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.

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.

Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)

Intention of this step is, to determine the radiated EMI-profile of the EUT.

Settings for step 1:

- 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

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2:

A further measurement will be performed on the frequencies determined in step 1. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

Settings for step 2:

- 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 $\pm 22.5^\circ$ 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: 100ms
- Turntable angle range: -22.5° to $+ 22.5^\circ$ around the determined value
- Height variation range: -0.25m 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(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

Measurement above 1 GHz:

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

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 density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.

Detector: Peak, Average (simultaneously)

RBW = VBW = 1 MHz; above 7 GHz 100 kHz

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits

Frequency Range (MHz): Class B Limit (dB μ V/m)

| Frequency Range (MHz) | Class B Limit (dB μ V/m) |
|-----------------------|------------------------------|
| 30 – 88 | 40.0 |
| 88 – 216 | 43.5 |
| 216 – 960 | 46.0 |
| above 960 | 54.0 |

| Frequency Range (MHz) | Class A Limit (dB μ V/m) / @ 3m ! |
|-----------------------|---------------------------------------|
| 30 - 88 | 49.5 |
| 88 - 216 | 54.0 |
| 216 - 960 | 56.9 |
| above 960 | 60.0 |

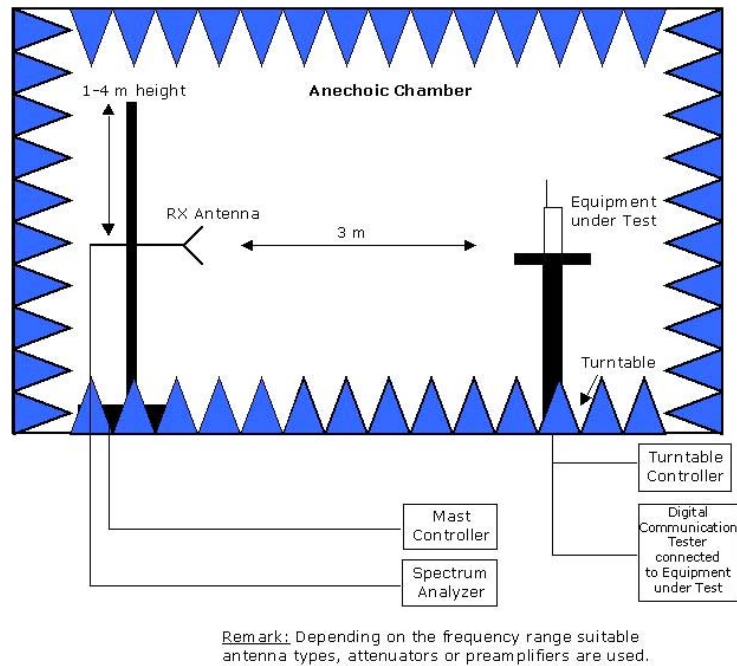
§15.35(b)

..., 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 (dB μ V/m) = $20 \log (\text{Limit } (\mu\text{V/m})/1\mu\text{V/m})$

NOTE: a missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Setup Drawings



Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

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