



# InterLab<sup>®</sup>

## Final Report on

### Jabra OTE13

**Report Reference:** MDE\_GNNET\_1212\_FCCa  
According to:  
FCC 47 CFR Ch.1 Part 15 Subpart B

**Date:** December 14, 2012

**Test Laboratory:**

7Layers AG  
Borsigstr. 11  
40880 Ratingen  
Germany



**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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DE 203159652  
TAX No. 147/5869/0385

## 1 Administrative Data

### 1.1 Project Data

*Project Responsible:* Patrick Lomax  
*Date Of Test Report:* 2012/12/14  
*Date of first test:* 2012/11/18  
*Date of last test:* 2012/11/18

### 1.2 Applicant Data

*Company Name:* GN Netcom A/S  
*Street:* Lautrupbjerg 7  
*City:* DK-2750 Ballerup  
*Country:* Denmark  
*Contact Person:* Mr. Tom Ringtved  
*Phone:* +45 45 75 91 86  
*E-Mail:* tringtved@gn.com

### 1.3 Test Laboratory Data

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

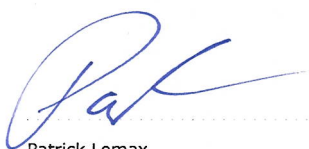
#### 7 layers DE

*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	Conducted Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAkkS-Registration no. D-PL-12140-01-01
Lab 2	Radiated Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAkkS-Registration no. D-PL-12140-01-01

### 1.4 Signature of the Testing Responsible



Patrick Lomax  
responsible for tests performed in: Lab 1, Lab 2

## 1.5 Signature of the Accreditation Responsible



Accreditation scope responsible person  
responsible for Lab 1, Lab 2

## 2 Test Object Data

### 2.1 General OUT Description

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

#### OUT: Jabra OTE13

##### Parameter List:

Parameter name	Value
<b>Parameter for Scope FCC_v2:</b>	
AC Power Supply	110 (V)
Antenna Gain	2.5 dBi
highest channel (BT)	2480 (MHz)
lowest channel (BT)	2402 (MHz)
mid channel (BT)	2441 (MHz)

**Ancillary Equipment: USB Cable**

### 2.2 Detailed Description of OUT Samples

#### Sample : B01

OUT Identifier	Jabra OTE13
Sample Description	Radiated Sample
Serial No.	#02
HW Status	2.6.0
SW Status	28-03611

#### Sample : USB1

OUT Identifier	USB Cable
Sample Description	USB Data cable

## 2.3 OUT Features

### Features for OUT: Jabra OTE13

Designation	Description	Allowed Values	Supported Value(s)
<b>Features for scope: FCC_v2</b>			
AC	The OUT is powered by or connected to AC Mains		
BT	EUT supports Bluetooth data rate of 1 Mbps with GFSK modulation in the band 2400 MHz - 2483.5 MHz		
EDR2	EUT supports Bluetooth using data rate of 2 Mbps with PI/4 DQPSK modulation in the band 2400 MHz - 2483.5 MHz		
EDR3	EUT supports Bluetooth using data rate of 3 Mbps with 8DPSK modulation in the band 2400 MHz - 2483.5 MHz		
Iant	Integral Antenna: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment		
TantC	temporary antenna connector, which may be only built-in for testing, designed as an example part of the equipment		

## 2.4 Auxiliary Equipment

AE No.	Type Designation	Serial No.	HW Status	SW Status	Description
AE 05	0335C2065 (110v/60Hz)	A30638114250			AC Adapter 2
AE 07	CHERRY RS 6000 USB ON	G 0000273 2P28			Keyboard 1
AE 04	Fujitsu Siemens/ AMILO Pro V3205	YK2H014267		Windows 7 Professional Engl.	Laptop 2
AE 03	LG Flatron L1740BQ	509WANF1W607			TFT 1
AE 06	Logitech M-BB48	LZC90505478			Mouse

## 2.5 Operating Mode(s)

Ref.-No.	Description
01	EUT connected to laptop computer via USB cable. Audio playback via USB cable is enabled. Computer is connected to 110v / 60Hz power supply.

## 2.6 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.

Setup No.	List of OUT samples		List of auxiliary equipment	
Sample No.	Sample Description		AE No.	AE Description
S_PC1B01	(Computer setup USB connection)			
	Sample: USB1	USB Data cable	AE 05	AC Adapter 2
	Sample: B01	Radiated Sample	AE 07	Keyboard 1
			AE 04	Laptop 2
			AE 03	TFT 1
			AE 06	Mouse

## 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.

**Note:**

The laboratory environmental conditions are recorded and available in the Interlab system for each performed test.

### 3.2 List of the Applicable Body

(Body for Scope: FCC\_v2)

Designation	Description
FCC47CFRChIPART15bRADIO FREQUENCY DEVICES	Part 15, Subpart B - Unintentional Radiators

### 3.3 List of Test Specification

Test Specification:	<b>FCC part 2 and 15</b>
Version	10-1-11 Edition
Title:	PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES



Reference: MDE\_GNNET\_1212\_FCCa  
According to:  
FCC 47 CFR Ch.1 Part 15 Subpart B

### 3.4 Summary

<i>Test Case Identifier / Name</i>	<i>Result</i>	<i>Date of Test</i>	<i>Lab Ref.</i>	<i>Setup</i>
<b>15b.1 Conducted Emissions (AC Power Line) §15.107</b>				
15b.1; Mode = transmit	Passed	2012/11/18	Lab 1	S_PC1B01
	operating mode: 01			
<b>15b.2 Spurious Radiated Emissions §15.109</b>				
15b.2; Mode = transmit	Passed	2012/11/18	Lab 2	S_PC1B01
	operating mode: 01			



Reference: MDE\_GNNET\_1212\_FCCa  
According to:  
FCC 47 CFR Ch.1 Part 15 Subpart B

### 3.5 Detailed Results

#### 3.5.1 15b.1 Conducted Emissions (AC Power Line) §15.107

**Test: 15b.1; Mode = transmit**

<i>Result:</i>	Passed
<i>Setup No.:</i>	S_PC1B01
<i>Date of Test:</i>	2012/11/18 19:54
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

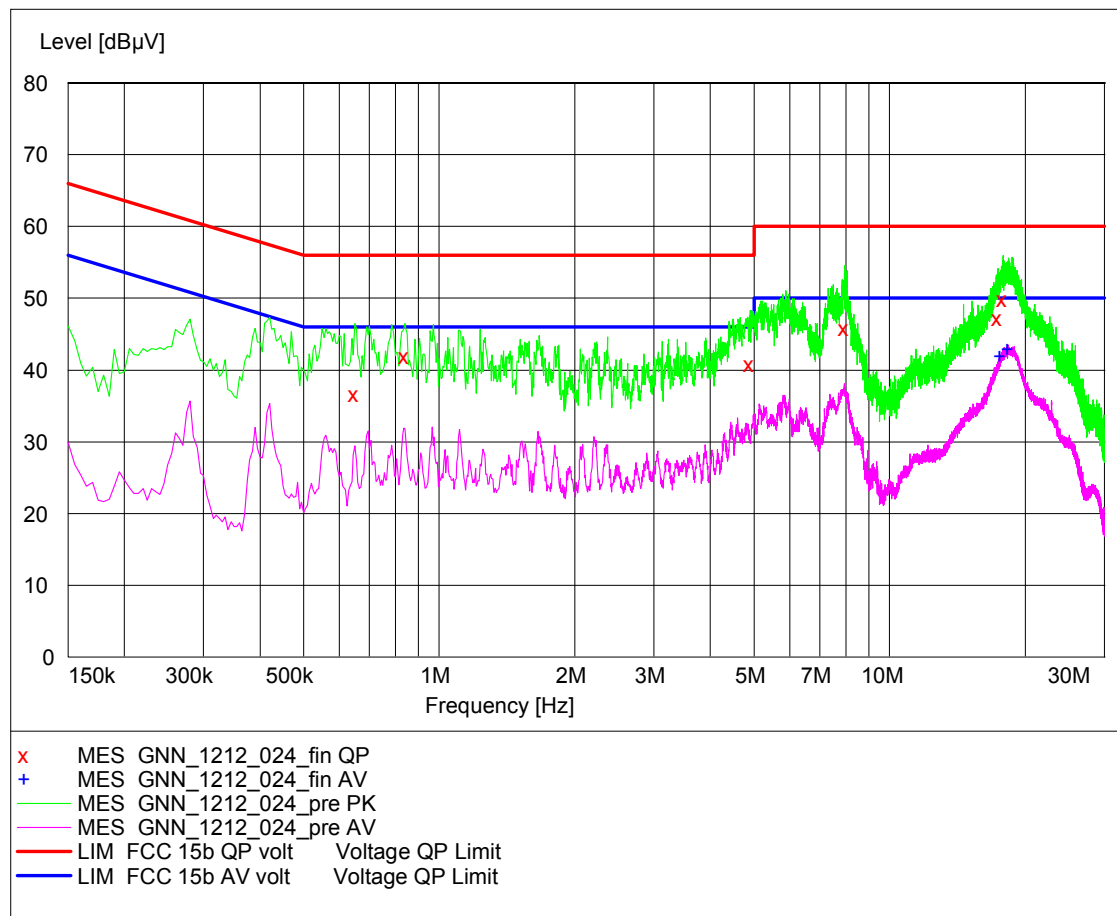
## Detailed Results:

### AC MAINS CONDUCTED

EUT: (CJ180b01)  
Manufacturer: GNNET  
Operating Condition: music playback via USB connetcion to computer  
Test Site: 7 layers Ratingen  
Operator: URO  
Test Specification: ANSI C63.4; FCC 15.107 / 15.207 Class B  
Comment:  
Start of Test: 26.11.2012 / 19:29:01

### SCAN TABLE: "FCC Voltage"

Short Description:	FCC Voltage					
Start Stop Step	Detector	Meas. Time	IF Bandw.	Transducer		
Frequency Frequency Width						
150.0 kHz 30.0 MHz 5.0 kHz	MaxPeak	20.0 ms	9 kHz	ESH3-Z5		
	Average					







Reference: MDE\_GNNET\_1212\_FCCa  
According to:  
FCC 47 CFR Ch.1 Part 15 Subpart B

**MEASUREMENT RESULT: "GNN\_1212\_024\_fin QP"**

26.11.2012 19:34

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.650000	36.70	10.1	56	19.3	N	FLO
0.840000	42.00	10.1	56	14.0	L1	GND
4.910000	40.80	10.4	56	15.2	L1	FLO
7.970000	45.90	10.5	60	14.1	N	FLO
17.430000	47.30	10.9	60	12.7	L1	GND
17.860000	49.80	10.9	60	10.2	N	FLO

**MEASUREMENT RESULT: "GNN\_1212\_024\_fin AV"**

26.11.2012 19:34

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
17.620000	41.90	10.9	50	8.1	N	FLO
18.350000	42.90	10.9	50	7.1	L1	FLO



Reference: MDE\_GNNET\_1212\_FCCa  
According to:  
FCC 47 CFR Ch.1 Part 15 Subpart B

### **3.5.2      15b.2   Spurious Radiated Emissions §15.109**

**Test: 15b.2; Mode = transmit**

<i>Result:</i>	Passed
<i>Setup No.:</i>	S_PC1B01
<i>Date of Test:</i>	2012/11/18 19:51
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

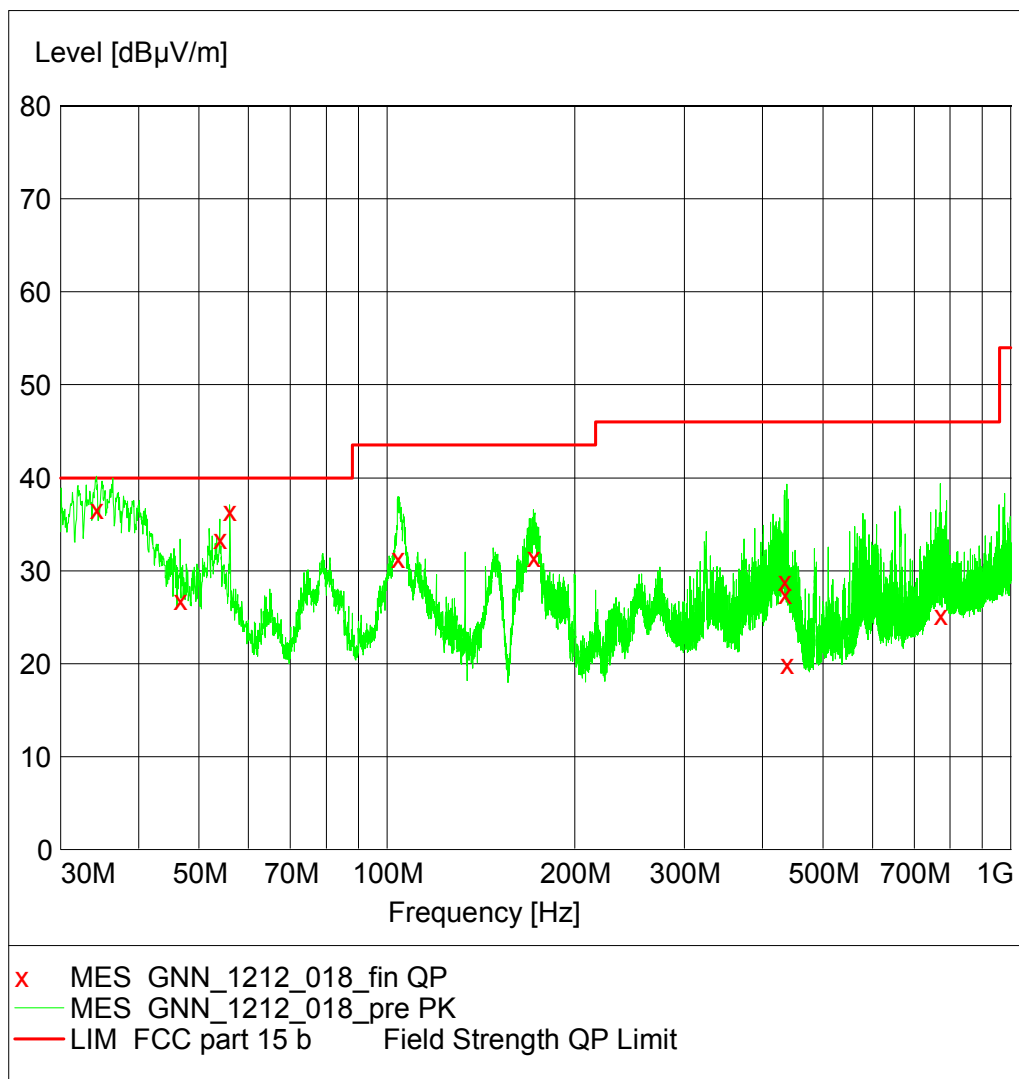
## Detailed Results:

### EMI RADIATED TEST

EUT: (CJ180b01)  
Manufacturer: GNNET  
Operating Condition: music playback via USB connetcion to computer  
Test Site: 7 layers, Ratingen  
Operator: Doe  
Test Specification: FCC part 15 B Class B  
Comment: Horizontal EUT position  
Start of Test: 23.11.2012 / 14:22:54

### SCAN TABLE: "FCC part 15 b"

Short Description:		FCC part 15 b				
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	1.0 ms	120 kHz	HL562



**MEASUREMENT RESULT: "GNN\_1212\_018\_fin QP"**

23.11.2012 15:26

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
34.200000	36.70	18.3	40.0	3.3	100.0	67.00	VERTICAL
46.620000	26.90	11.0	40.0	13.1	100.0	157.00	VERTICAL
53.940000	33.40	6.3	40.0	6.6	100.0	292.00	VERTICAL
55.980000	36.50	5.1	40.0	3.5	125.0	293.00	VERTICAL
104.040000	31.40	10.7	43.5	12.1	119.0	247.00	VERTICAL
171.720000	31.50	8.6	43.5	12.0	100.0	350.00	VERTICAL
433.560000	29.00	16.4	46.0	17.0	118.0	292.00	HORIZONTAL
434.400000	27.50	16.4	46.0	18.5	100.0	338.00	HORIZONTAL
437.400000	20.00	16.5	46.0	26.0	100.0	22.00	HORIZONTAL
770.640000	25.20	22.2	46.0	20.8	100.0	293.00	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

<b>Lab ID:</b>	<b>Lab 2</b>
<b>Manufacturer:</b>	Frankonia
<b>Description:</b>	Anechoic Chamber for radiated testing
<b>Type:</b>	10.58x6.38x6.00 m <sup>3</sup>

#### 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 m <sup>3</sup>	none	Frankonia	
	Calibration Details		Last Execution	Next Exec.
	FCC listing 96716 3m Part15/18		2011/01/11	2014/01/10
	IC listing 3699A-1 3m		2011/02/07	2014/02/06
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

<b>Lab ID:</b>	<b>Lab 1</b>
<b>Manufacturer:</b>	Rohde & Schwarz GmbH & Co.KG
<b>Description:</b>	EMI Conducted Auxiliary Equipment

#### Single Devices for Auxiliary Equipment for Conducted emissions

Single Device Name	Type	Serial Number	Manufacturer	
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber&Suhner	
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz GmbH & Co. KG	
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		Last Execution	Next Exec.
	DKD calibration		2011/01/20	2013/01/19

### Test Equipment Auxiliary Equipment for Radiated emissions

<b>Lab ID:</b>	<b>Lab 2</b>
<b>Description:</b>	Equipment for emission measurements
<b>Serial Number:</b>	see single devices

### Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	Type	Serial Number	Manufacturer	
Antenna mast	AS 620 P	620/37	HD GmbH	
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2008/10/27	2013/10/26
	Standard Calibration		2012/01/18	2015/01/17
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Path Calibration		2012/05/24	2012/11/23
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Path Calibration		2012/05/24	2012/11/23
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Path Calibration		2012/05/24	2012/11/23
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01- 2+W38.01-2	Kabel Kusch	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Path Calibration		2012/05/24	2012/11/23
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02- 2+W38.02-2	Rosenberger Micro-Coax	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Path Calibration		2012/05/24	2012/11/23
	Path Calibration		2012/05/24	2012/11/23
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2012/05/18	2015/05/17
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2012/06/26	2015/06/25
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Path Calibration		2012/05/24	2012/11/23
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Path Calibration		2012/05/24	2012/11/23
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Path Calibration		2012/05/24	2012/11/23
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>

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

Single Device Name	Type	Serial Number	Manufacturer
	Path Calibration		2012/05/24 2012/11/23
Horn Antenna Schwarzbeck 15-26 GHz BBHA 9170	BBHA 9170		
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
	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
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5- 10kg/024/379070 9	Maturo GmbH

### Test Equipment Auxiliary Test Equipment

<b>Lab ID:</b>	<b>Lab 2</b>
<b>Manufacturer:</b>	see single devices
<b>Description:</b>	Single Devices for various Test Equipment
<b>Type:</b>	various
<b>Serial Number:</b>	none

### Single Devices for Auxiliary Test Equipment

Single Device Name	Type	Serial Number	Manufacturer
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.
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
	Customized calibration		2011/10/19 2013/10/18
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
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG

## Test Equipment Digital Signalling Devices

### Lab ID:

### Lab 1, Lab 2

### 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.
	Initial factory calibration		2012/01/26	2014/01/25
	HW/SW Status		Date of Start	Date of End
	Firmware: V.2.01.25		2012/10/29	
	3G : KC42x 12.23.00			
	LTE: KC501 1.7.0 up to 2.0.0			
	KC503 1.7.2 up to 2.0.0			
	KC506 1.9.8 up to 2.0.0			
	KC507 1.7.0			
	KC508 1.8.5 up to 2.0.0			
	KC551 1.4.9 up to 2.0.0			
	KC553 1.7.0 up to 2.0.0			
	KC556 2.0.0			
	KC571 1.8.5 up to 2.0.0			
	KC572 1.8.5 up to 2.0.0			
	Firmware: V.3.00.11			
	LTE: KC501 2.2.0			
	KC503 2.2.0			
	KC506 2.2.0			
	KC508 2.2.0			
	KC551 2.2.0			
	KC553 2.2.0			
	KC556 2.2.0			
	KC571 2.2.0			
	KC572 2.2.0			
	---			
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		Last Execution	Next Exec.
	Standard calibration		2011/05/26	2013/05/25
	HW/SW Status		Date of Start	Date of End
	Hardware:		2007/07/16	
	B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04			
	Software:			
	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			
	---			
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



### Single Devices for Digital Signalling Devices (continued)

Single Device Name	Type	Serial Number	Manufacturer
	HW options: 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 --- SW: K62, K69		2007/01/02          2008/11/03

### Test Equipment Emission measurement devices

<b>Lab ID:</b>	<b>Lab 1, Lab 2</b>
<b>Description:</b>	Equipment for emission measurements
<b>Serial Number:</b>	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
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2012/05/22    2013/05/21
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2012/05/21    2013/05/20
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		2011/05/12    2014/05/11
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		2011/12/05    2013/12/04
	<i>HW/SW Status</i>		<i>Date of Start</i> <i>Date of End</i>
	Firmware-Update 4.34.4 from 3.45 during calibration		2009/12/03

### Test Equipment Shielded Room 02

<b>Lab ID:</b>	<b>Lab 1</b>
<b>Manufacturer:</b>	Frankonia
<b>Description:</b>	Shielded Room for conducted testing
<b>Type:</b>	12 qm
<b>Serial Number:</b>	none



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Reference: MDE\_GNNET\_1212\_FCCa  
According to:  
FCC 47 CFR Ch.1 Part 15 Subpart B

## **5 Annex**

### **5.1 Additional Information for Report**

#### Test Description

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\_\_\_\_\_

#### Conducted emissions (AC power line)

Standard      FCC Part 15 Subpart B

The test was performed according to: ANSI C 63.4, 2009

#### Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.

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 $\mu$ H || 50 Ohm Line Impedance Stabilization Network (LISN) which meets the requirements of ANSI C63.4-2009, Annex B, in the frequency range of the measurements. 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 $\mu$ V)	AV Limit (dB $\mu$ 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).

NOTES:

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.  
The chosen operating mode is selected as representative mode to generate "worst-case" conditions, i.e. high power consumption.

Spurious radiated emissions

Standard      FCC Part 15, Subpart B

The test was performed according to: ANSI C 63.4, 2009

Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.

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 influence of the EUT support table that is used between 30–1000 MHz was evaluated.

The test was performed at the distance of 3 m between the EUT and the receiving antenna. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The radiated emissions measurements were made in a typical installation configuration. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition.

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 +/- 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: 100ms
- 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(< 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 (dBµV/m)

Frequency Range (MHz)	Class B Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

Frequency Range (MHz)	Class A Limit (dBµV/m) / @ 3m !
30 – 88	49.5
88 – 216	54.0
216 – 960	56.9
above 960	60.0

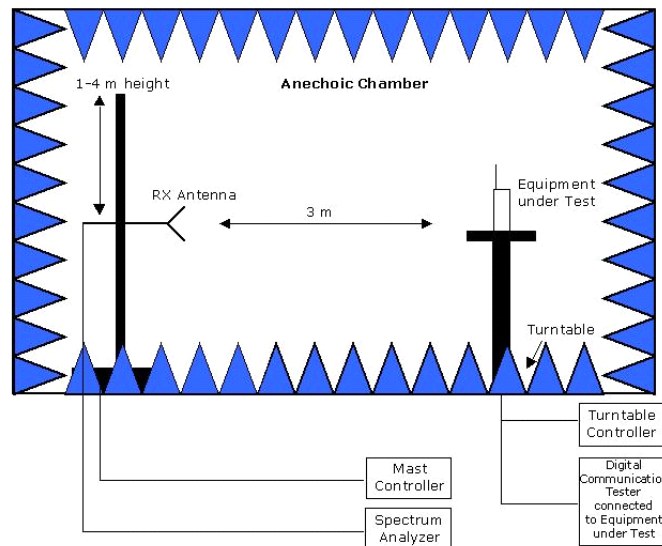
#### §15.35(b)

..., 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 (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

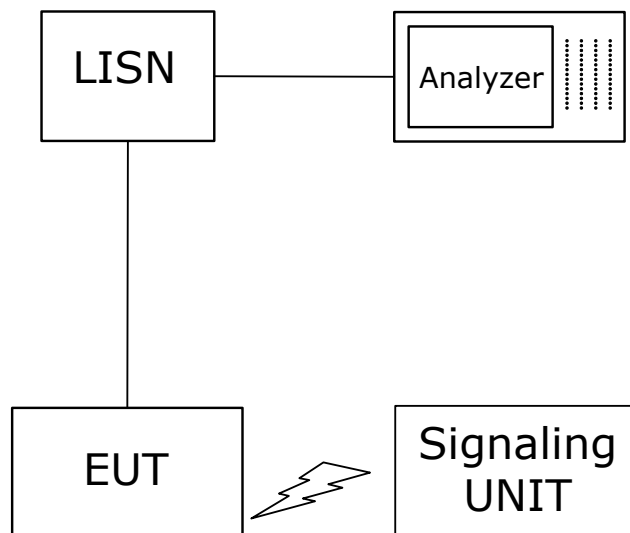
NOTE: A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

## Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

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



Setup in the shielded room for conducted measurements at AC mains port



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