

InterLab<sup>®</sup>

Final Report on

## Jabra HFS100 Bluetooth in-car Speakerphone

**Report Reference:** MDE\_GNNET\_1003\_FCCe

**Date:** February 23, 2011

### Test Laboratory:

7 layers AG  
Borsigstr. 11  
40880 Ratingen  
Germany



DGA-PL-192/99-02

#### 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:* Patrick Lomax  
*Date Of Test Report:* 2011/02/23  
*Date of first test:* 2010/10/19  
*Date of last test:* 2010/11/02

**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**

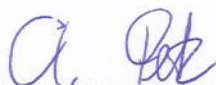
The following list shows all places and laboratories involved for test result generation:

**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  
*Fax :* +49 2102 749 444  
*E Mail :* michael.albert@7Layers.de

**Laboratory Details**

Lab ID	Identification	Responsible	Accreditation Info
Lab 1	Conducted Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAR-Registration no. DGA-PL-192/99-02
Lab 2	Radiated Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAR-Registration no. DGA-PL-192/99-02


**1.4 Signature of the Testing Responsible**

Dipl.-Ing. Andreas Petz  
responsible for tests performed in: Lab 1, Lab 2



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## 1.5 Signature of the Accreditation Responsible

  
 Accreditation scope responsible person  
 responsible for Lab 1, Lab 2



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MACHULEC

## 2 Test Object Data

### 2.1 General OUT Description

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

#### OUT: Bluetooth transceiver + FM LPD transmitter

Type / Model / Family: Jabra HFS100 Bluetooth in-car Speakerphone  
 Product Category: Mobile Phone Accessory

##### Parameter List:

Parameter name	Value
Parameter for Scope FCC_v2:	
DC Power Supply	5 (V)

#### Ancillary Equipment: DC/DC Car Charger

##### Parameter List:

Parameter name	Value
DC Power Supply	12 DC primary / 5 DC secondary (V)
	The EUT is an equipment normally used in a vehicle

#### Ancillary Equipment: USB Adaptor

## 2.2 Detailed Description of OUT Samples

### **Sample : C01**

<i>OUT Identifier</i>	Bluetooth transceiver + FM LPD transmitter		
<i>Sample Description</i>	BT TRX + FM TX, both integr.ant.		
<i>Serial No.</i>	22		
<i>HW Status</i>	28-03161		
<i>SW Status</i>	23h		
<i>Date of Receipt</i>	2010/10/18		
<i>Low Voltage</i>	3.3 V	<i>Low Temp.</i>	-10 °C
<i>High Voltage</i>	4.2 V	<i>High Temp.</i>	60 °C
<i>Nominal Voltage</i>	3.8 V	<i>Normal Temp.</i>	20 °C

#### **Parameter List:**

Parameter Description	Value	
<b>Parameter for Scope FCC_v2</b>		
Antenna Gain (Bluetooth Antenna)	1	(dBi)
FM LPD transmitter frequency range	88.1-107.9	(MHz)
Input Voltage	5	(V)

### **Sample : DCDC01**

<i>OUT Identifier</i>	DC/DC Car Charger
<i>Sample Description</i>	RIM ESC-003 Car Charger
<i>Date of Receipt</i>	2010/10/18

#### **Parameter List:**

<i>Parameter Description</i>	<i>Value</i>	
<b>Parameter for Scope FCC_v2</b>		
Input Voltage	12	(V)
Output Voltage	5	(V)

### **Sample : USB01**

<i>OUT Identifier</i>	USB Adaptor
<i>Sample Description</i>	USB Cable
<i>Date of Receipt</i>	2010/10/18

## 2.3 OUT Features

### Features for OUT: Bluetooth transceiver + FM LPD transmitter

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		
DC	The OUT is powered by or connected to DC Mains		
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		

### Features for OUT: DC/DC Car Charger

Designation	Description	Allowed Values	Supported Value(s)
<b>Features for scope: FCC_v2</b>			
DC	The OUT is powered by or connected to DC Mains		

## 2.4 Auxiliary Equipment

AE No.	Type Designation	Serial No.	HW Status	SW Status	Description
AE 05	Cherry RS 6000	G 0000273 2P28			Keyboard 1
AE 06	Jabra adapter SSA-4P 5050F	-	-	-	AC/DC converter
AE 01	LG Flatron L1740BQ	509WANF1W607			TFT 1
AE 04	Logitech M-BB48	LZC90505478			Computer Mouse
AE 02	Toshiba TECRA M9	87060248H		WinXP Prof. Ger.	Laptop 1
AE 03	Toshiba PA3378E-3AC3	G71C0006R310			AC Adapter 1

## 2.5 Operating Mode(s)

Ref.-No.	Description
op-1	The EUT is transmitting at 2441 MHz in Bluetooth test mode.

## 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
<b>C01_ACDC</b>	<b>(setup with AC/DC converter)</b>			
	Sample: USB01	USB Cable	AE 06	AC/DC converter
	Sample: C01	BT TRX + FM TX, both integr.ant.		
<b>C01_COMP</b>	<b>(computer peripheral setup)</b>			
	Sample: USB01	USB Cable	AE 05	Keyboard 1
	Sample: C01	BT TRX + FM TX, both integr.ant.	AE 01	TFT 1
			AE 04	Computer Mouse
			AE 02	Laptop 1
			AE 03	AC Adapter 1
<b>C01_DCDC</b>	<b>(setup with DC/DC converter)</b>			
	Sample: DCDC01	RIM ESC-003 Car Charger		
	Sample: USB01	USB Cable		
	Sample: C01	BT TRX + FM TX, both integr.ant.		

## 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:

This Test Report replaces the Test Report MDE\_GNNET\_1003\_FCCb.

### 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:* **FCC part 2 and 15**

*Version* 10-1-09 Edition

*Title:* PART 2 - GENERAL RULES AND REGULATIONS  
PART 15 - RADIO FREQUENCY DEVICES

<i>Applicable Errata</i>	<i>Activate Date</i>	<i>Comment</i>
ANSI C63.4-2003	04/1/30	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and electronic Equipment in the Range of 9 kHz to 40 GHz
DA 00-705 considerd	00/3/1	Public Notice: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

### 3.4 Summary

<i>Test Case Identifier / Name</i>		<i>Lab</i>		
<i>Test (condition)</i>	<i>Result</i>	<i>Date of Test</i>	<i>Ref.</i>	<i>Setup</i>
<b>15b.1 Conducted Emissions (AC Power Line) §15.107</b>				
15b.1; Mode = transmit	Passed	2010/11/02	Lab 1	C01_COMP
	operating mode: op-1			
	Passed	2010/11/02	Lab 1	C01_ACDC
	operating mode: op-1			
<b>15b.2 Spurious Radiated Emissions §15.109</b>				
15b.2; Mode = transmit	Passed	2010/11/02	Lab 2	C01_COMP
	operating mode: op-1			
	Passed	2010/11/02	Lab 2	C01_ACDC
	operating mode: op-1			
	Passed	2010/10/19	Lab 2	C01_DCDC
	operating mode: op-1			



### 3.5 Detailed Results

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

##### Test1: 15b.1; Mode = transmit

Result:	Passed
Setup No.:	C01_COMP
Date of Test:	2010/11/02 16:58
Body:	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification:	FCC part 2 and 15
Test Equipment Environmental Conditions	
Temperature:	23°C
Air Pressure:	1008hPa
Rel. Humidity:	38%

##### Used Test Parameter:

Name	Value
Mode	EUT in transmission mode

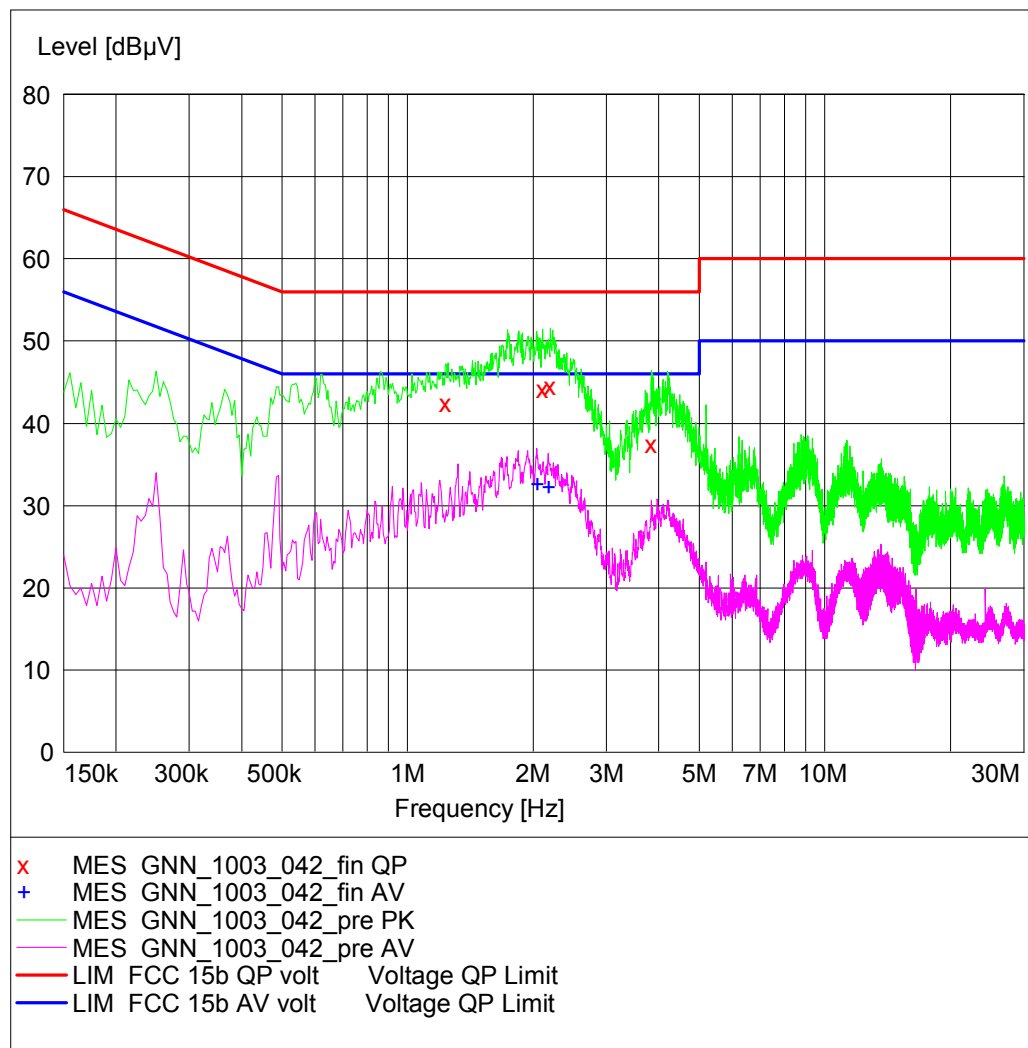
## Detailed Results:

### AC MAINS CONDUCTED

EUT: Jabra HFS100 (CJ110c01) / 02.11.2010  
 Manufacturer: GN Netcom  
 Operating Condition: Tx on 2441 MHz; loopback mode; Packettype: 1-DH1  
 Test Site: 7 layers Ratingen  
 Operator: Doe  
 Test Specification: ANSI C63.4; FCC 15.107 / 15.207  
 Comment: computer peripheral setup  
 Start of Test: 02.11.2010 / 14:47:04

### SCAN TABLE: "FCC Voltage"

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



**MEASUREMENT RESULT: "GNN\_1003\_042\_fin QP"**

02.11.2010 14:52

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
1.235000	42.50	10.0	56	13.5	L1	GND
2.105000	44.10	10.1	56	11.9	N	GND
2.200000	44.50	10.1	56	11.5	L1	GND
3.845000	37.50	10.2	56	18.5	L1	GND

**MEASUREMENT RESULT: "GNN\_1003\_042\_fin AV"**

02.11.2010 14:52

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
2.040000	32.60	10.1	46	13.4	N	GND
2.175000	32.30	10.1	46	13.7	N	GND

**Test2: 15b.1; Mode = transmit**

Result: Passed

Setup No.: C01\_ACDC

Date of Test: 2010/11/02 15:56

Body: FCC47CFRChIPART15bRADIO FREQUENCY DEVICES

Test Specification: FCC part 2 and 15

**Test Equipment Environmental Conditions**

Temperature: 23°C  
Air Pressure: 1008hPa  
Rel. Humidity: 38%

**Used Test Parameter:**

Name	Value
Mode	EUT in transmission mode

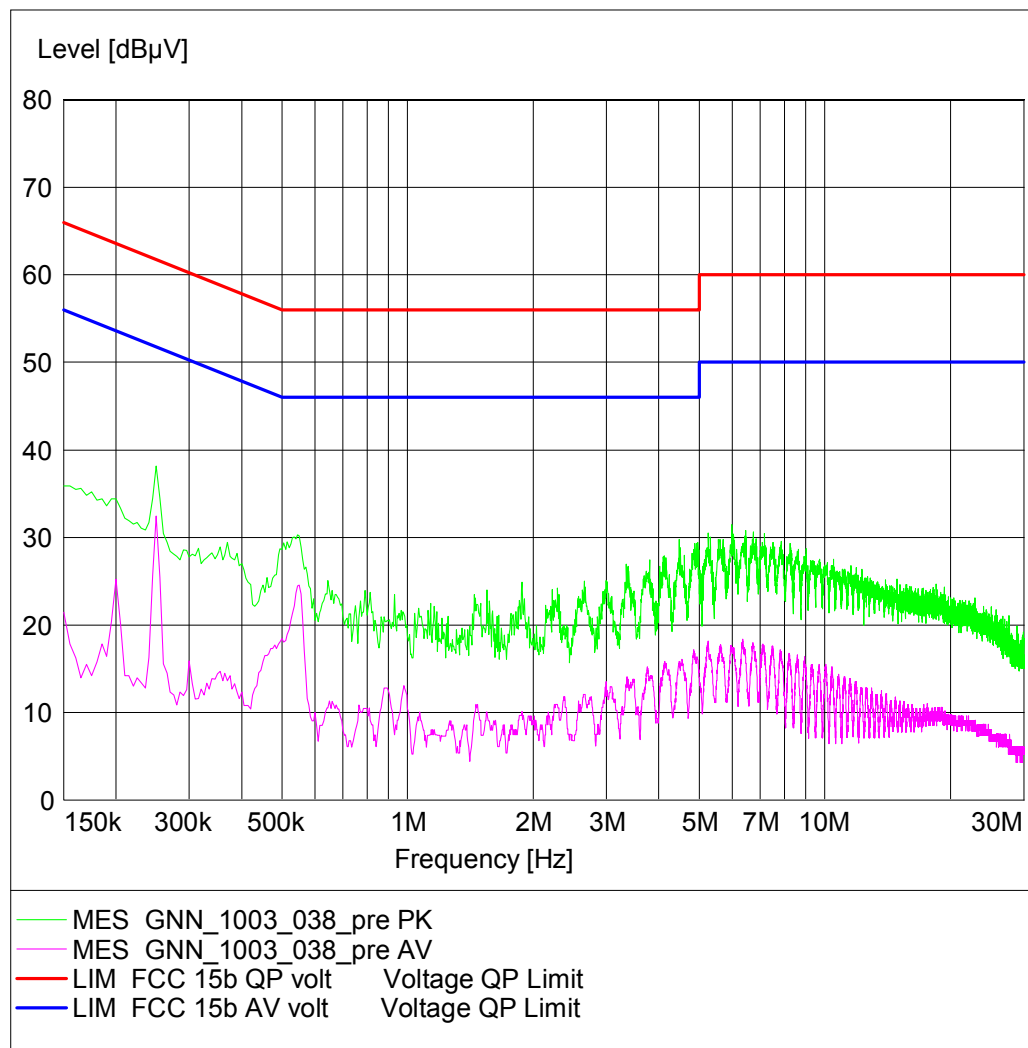
## Detailed Results:

### AC MAINS CONDUCTED

EUT: Jabra HFS100 (CJ110c01) / 02.11.2010  
 Manufacturer: GN Netcom  
 Operating Condition: Tx on 2441 MHz; loopback mode; Packettype: 1-DH1  
 Test Site: 7 layers Ratingen  
 Operator: Doe  
 Test Specification: ANSI C63.4; FCC 15.107 / 15.207  
 Comment: powered by AC/DC-Adapter  
 Start of Test: 02.11.2010 / 13:10:57

### 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					



**3.5.2      15b.2   Spurious Radiated Emissions §15.109****Test1: 15b.2; Mode = transmit**

<i>Result:</i>	Passed
<i>Setup No.:</i>	C01_DCDC
<i>Date of Test:</i>	2010/10/19 13:08
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15
<i>Test Equipment Environmental Conditions</i>	
<i>Temperature:</i>	24°C
<i>Air Pressure:</i>	999hPa
<i>Rel. Humidity:</i>	38%

**Used Test Parameter:**

<i>Name</i>	<i>Value</i>
Mode	EUT in transmission mode

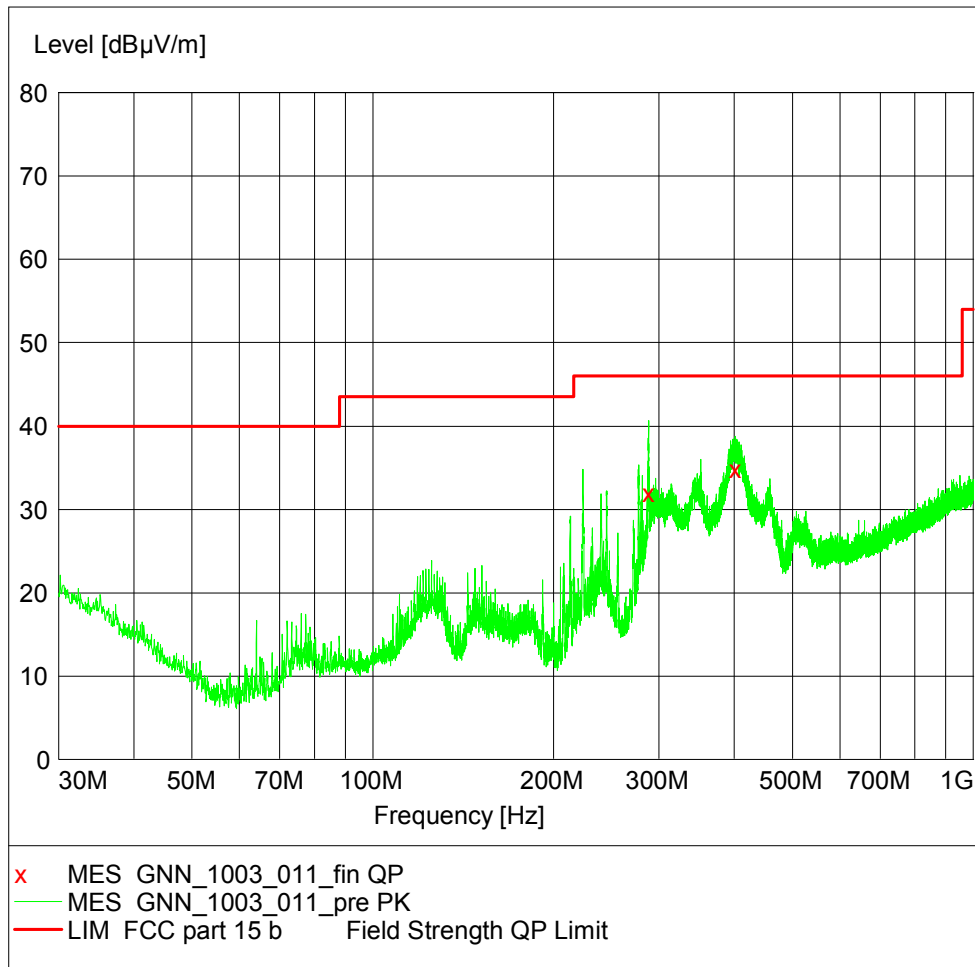
## Detailed Results:

### EMI RADIATED TEST

EUT: Jabra HFS100 (CJ110c01)  
 Manufacturer: GN Netcom  
 Operating Condition: TX on 2441 MHz; loopback mode; Packettype: 1-DH1  
 Test Site: 7 layers, Ratingen  
 Operator: Doe  
 Test Specification: FCC part 15 b  
 Comment: Horizontal EUT position, powered by DC/DC-Adapter  
 Start of Test: 19.10.2010 / 18:31:27

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

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



### MEASUREMENT RESULT: "GNN\_1003\_011\_fin QP"

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
288.000000	32.00	13.5	46.0	14.0	100.0	23.00	HORIZONTAL
401.580000	34.80	17.0	46.0	11.2	114.0	248.00	HORIZONTAL

**Test1: 15b.2; Mode = transmit**

*Result:* Passed

*Setup No.:* C01\_ACDC

*Date of Test:* 2010/11/02 18:24

*Body:* FCC47CFRChIPART15bRADIO FREQUENCY DEVICES

*Test Specification:* FCC part 2 and 15

**Test Equipment Environmental Conditions**

*Temperature:* 23°C

*Air Pressure:* 1008hPa

*Rel. Humidity:* 38%

**Used Test Parameter:**

<i>Name</i>	<i>Value</i>
Mode	EUT in transmission mode

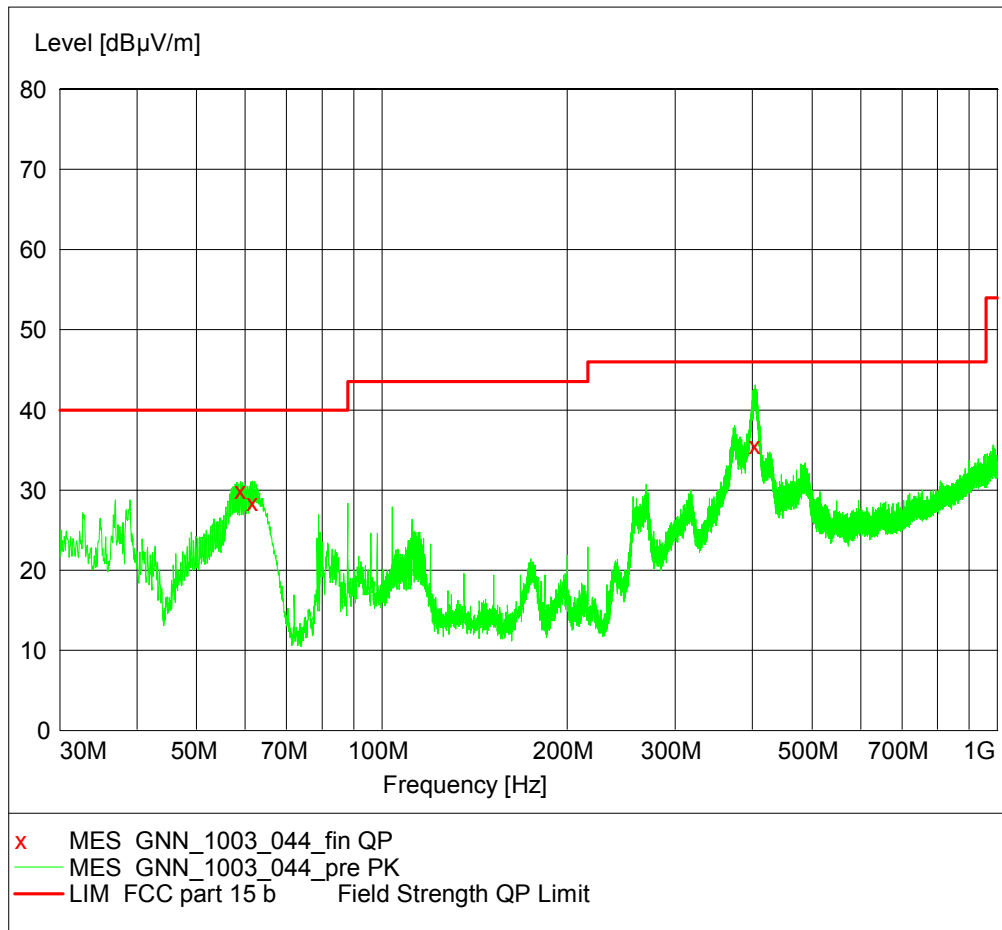
## Detailed Results:

### EMI RADIATED TEST

EUT: Jabra Wave (CJ110c01) / 03.11.2010  
 Manufacturer: GN Netcom  
 Operating Condition: Tx on 2441MHz; loopback mode; Packettype: 1-DH1  
 Test Site: 7 layers, Ratingen  
 Operator: Gal  
 Test Specification: FCC part 15 b  
 Comment: Horizontal EUT position, powered by AC/DC-Adapter  
 Start of Test: 03.11.2010 / 09:18:42

### 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\_1003\_044\_fin QP"

03.11.2010 10:30	Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
	MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
	58.920000	29.90	4.8	40.0	10.1	213.0	67.00	VERTICAL
	61.740000	28.40	5.0	40.0	11.6	199.0	26.00	VERTICAL
	404.700000	35.60	17.1	46.0	10.4	100.0	158.00	HORIZONTAL



**Test1: 15b.2; Mode = transmit**

*Result:* Passed

*Setup No.:* C01\_COMP

*Date of Test:* 2010/11/02 20:05

*Body:* FCC47CFRChIPART15bRADIO FREQUENCY DEVICES

*Test Specification:* FCC part 2 and 15

**Test Equipment Environmental Conditions**

*Temperature:* 23°C

*Air Pressure:* 1008hPa

*Rel. Humidity:* 38%

**Used Test Parameter:**

<i>Name</i>	<i>Value</i>
Mode	EUT in transmission mode

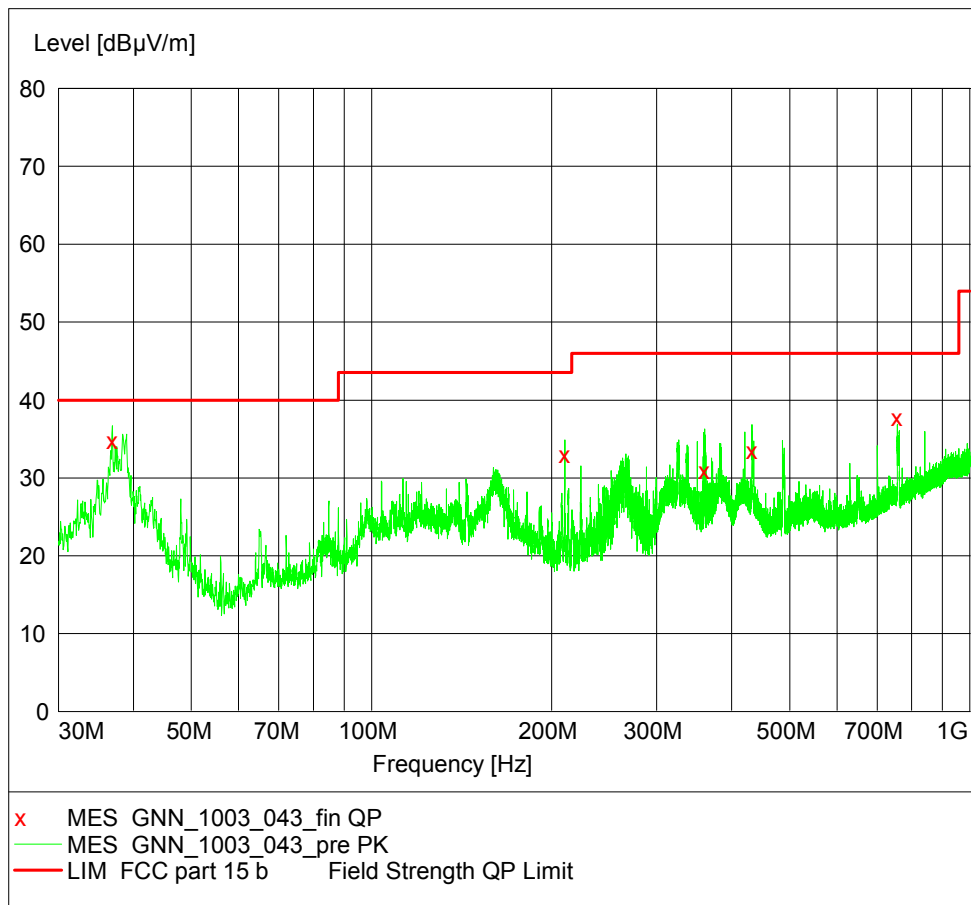
## Detailed Results:

### EMI RADIATED TEST

EUT: Jabra Wave (CJ110c01) / 02.11.2010  
 Manufacturer: GN Netcom  
 Operating Condition: Tx on 2441MHz; loopback mode; Packettype: 1-DH1  
 Test Site: 7 layers, Ratingen  
 Operator: Gal  
 Test Specification: FCC part 15 b  
 Comment: Horizontal EUT position, computer peripheral setup  
 Start of Test: 02.11.2010 / 16:21:43

### 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\_1003\_043\_fin QP"

02.11.2010 17:38							
Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
36.900000	34.80	16.8	40.0	5.2	100.0	247.00	VERTICAL
210.360000	33.00	10.0	43.5	10.5	170.0	67.00	HORIZONTAL
360.300000	30.90	15.8	46.0	15.1	112.0	67.00	HORIZONTAL
432.540000	33.50	17.8	46.0	12.5	142.0	338.00	VERTICAL
756.840000	37.70	24.6	46.0	8.3	189.0	202.00	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 m <sup>3</sup>		
	<i>Calibration Details</i>	<i>Last Execution</i>	<i>Next Exec.</i>
	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 6.00 m <sup>3</sup>	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 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

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>	
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	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	DKD calibration		2008/10/13	2010/10/12

## Test Equipment Auxiliary Equipment for Radiated emissions

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

## Single Devices for Auxiliary Equipment for Radiated emissions

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>		
Antenna mast	AS 620 P		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	
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Path Calibration		2010/05/10	2010/11/09	
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Path Calibration		2010/05/10	2010/11/09	
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Path Calibration		2010/05/10	2010/11/09	
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		2010/05/10	2010/11/09	
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		2010/05/10	2010/11/09	
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		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</i>	<i>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</i>	<i>Next Exec.</i>	
	Path Calibration		2010/05/10	2010/11/09	
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Path Calibration		2010/05/10	2010/11/09	
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Path Calibration		2010/05/10	2010/11/09	
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Path Calibration		2010/05/11	2010/11/09	

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

Single Device Name	Type	Serial Number	Manufacturer	
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</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</i>	<i>Next Exec.</i>
	DKD calibration		2008/10/07	2011/10/06
Network Analyzer	E5071B	MY42200813	Agilent	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Clibration		2008/11/06	2010/11/06
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

<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	
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.	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration		2009/10/07	2011/10/06
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	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2008/08/14	2011/08/13
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: 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 ---		2007/07/16	

### Test Equipment Emission measurement devices

<b>Lab ID:</b>	<b>Lab 1, Lab 2</b>
<i>Description:</i>	Equipment for emission measurements
<i>Serial Number:</i>	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	30304832059	Dell	
Power Sensor	NRV-Z1	836219/005	Rohde & Schwarz GmbH & Co. KG	
<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
Standard Calibration			2009/10/20	2011/10/19
Powermeter	NRVS	836333/064	Rohde & Schwarz GmbH & Co. KG	
<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
Standard calibration			2009/10/15	2011/10/14
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG	

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			2009/12/03	2011/12/02

### Test Equipment Shielded Room 02

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

## **5 Annex**

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



#### Test Description

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#### Conducted emissions (AC power line)

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Standard      FCC Part 15  
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 $\mu$ 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 $\mu$ 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).

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, 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  $\pm 25$  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:  $-22.5^\circ$  to  $+22.5^\circ$  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 (dB $\mu$ V/m)

Frequency Range (MHz)	Class B Limit (dB $\mu$ 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 $\mu$ V/m) / @ 3m !
30 - 88	49.5
88 - 216	54.0
216 - 960	56.9
above 960	60.0

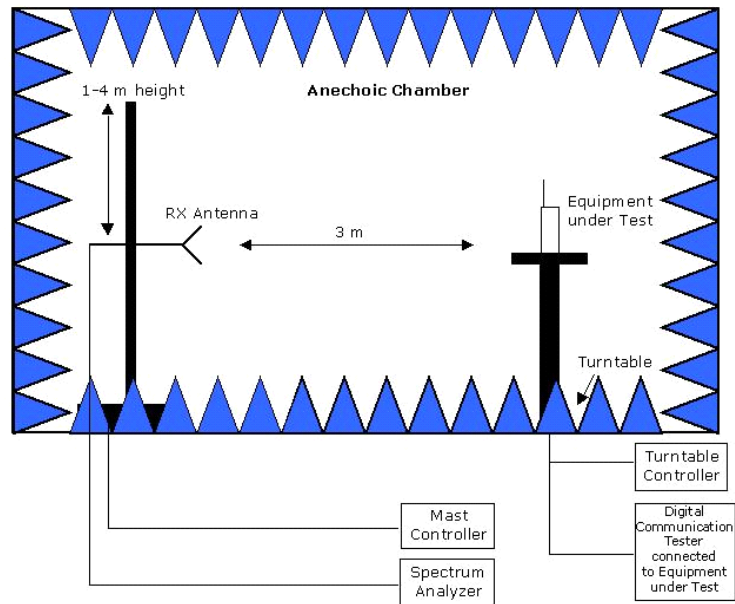
#### §15.35(b)

..., 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 $\mu$ V/m) = 20 log (Limit ( $\mu$ V/m)/1 $\mu$ 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



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.

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