



InterLab®

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

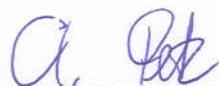
The following list shows all places and laboratories involved for test result generation:

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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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
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Parameter for Scope FCC_v2:

DC Power Supply	5 (V)
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Ancillary Equipment: DC/DC Car Charger

Parameter List:

Parameter name	Value
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DC Power Supply	12 DC primary / 5 DC secondary (V) The EUT is an equipment normally used in a vehicle
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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
Parameter for Scope FCC_v2	
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:

Parameter Description	Value
Parameter for Scope FCC_v2	
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)
Features for scope: FCC_v2			
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)
Features for scope: FCC_v2			
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
C01_ACDC (setup with AC/DC converter)				
Sample:	USB01	USB Cable	AE 06	AC/DC converter
Sample:	C01	BT TRX + FM TX, both integr.ant.		
C01_COMP (computer peripheral setup)				
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
C01_DCDC (setup with DC/DC converter)				
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

<i>Test Specification:</i>	FCC part 2 and 15	
<i>Version</i>	10-1-09 Edition	
<i>Title:</i>	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 considered	00/3/1	Public Notice: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems



3.4 Summary

Test Case Identifier / Name

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



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:

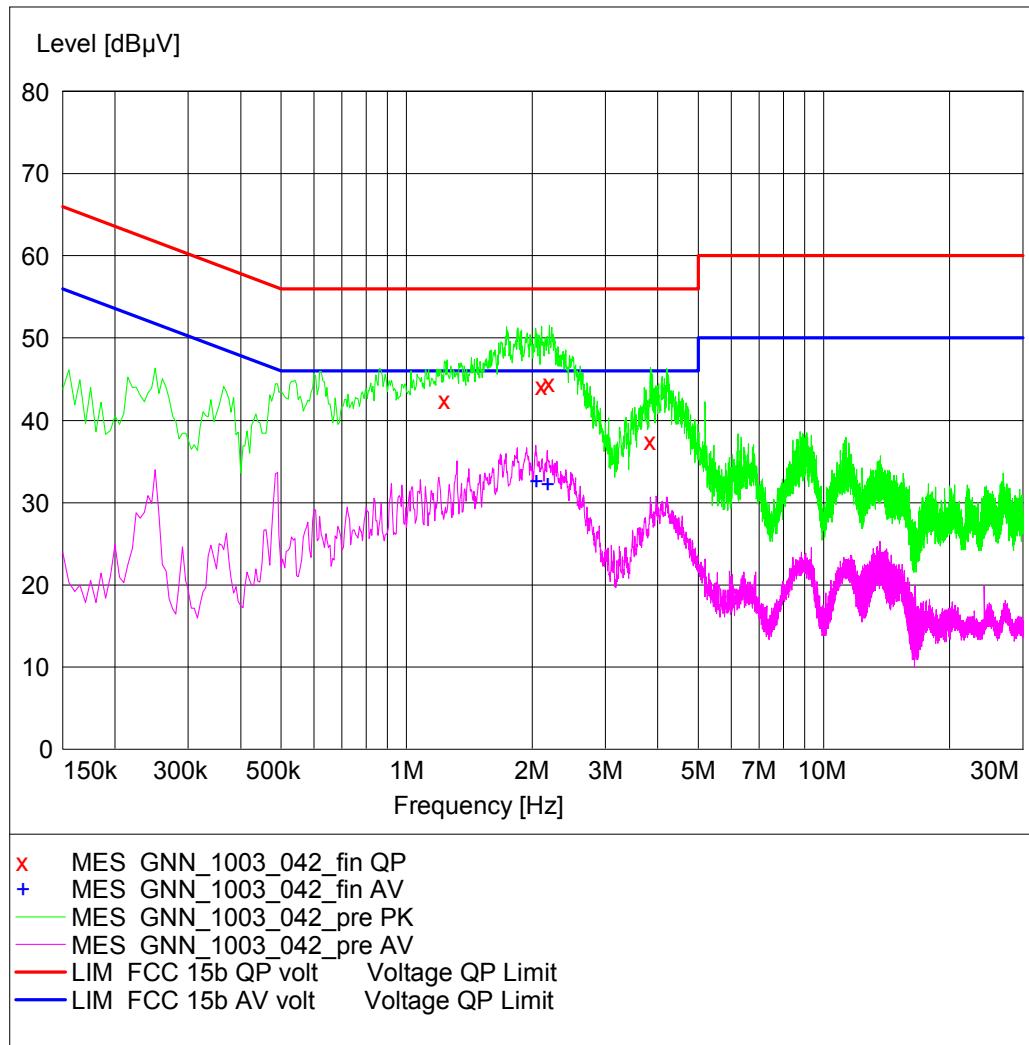
Name	Value
Mode	EUT in transmission mode

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





Reference: MDE_GNNET_1003_FCCe

MEASUREMENT RESULT: "GNN_1003_042_fin_QB"

02.11.2010 14:52

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	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 dB μ V	Transd dB	Limit dB μ V	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

<i>Temperature:</i>	23°C
<i>Air Pressure:</i>	1008hPa
<i>Rel. Humidity:</i>	38%

Used Test Parameter:

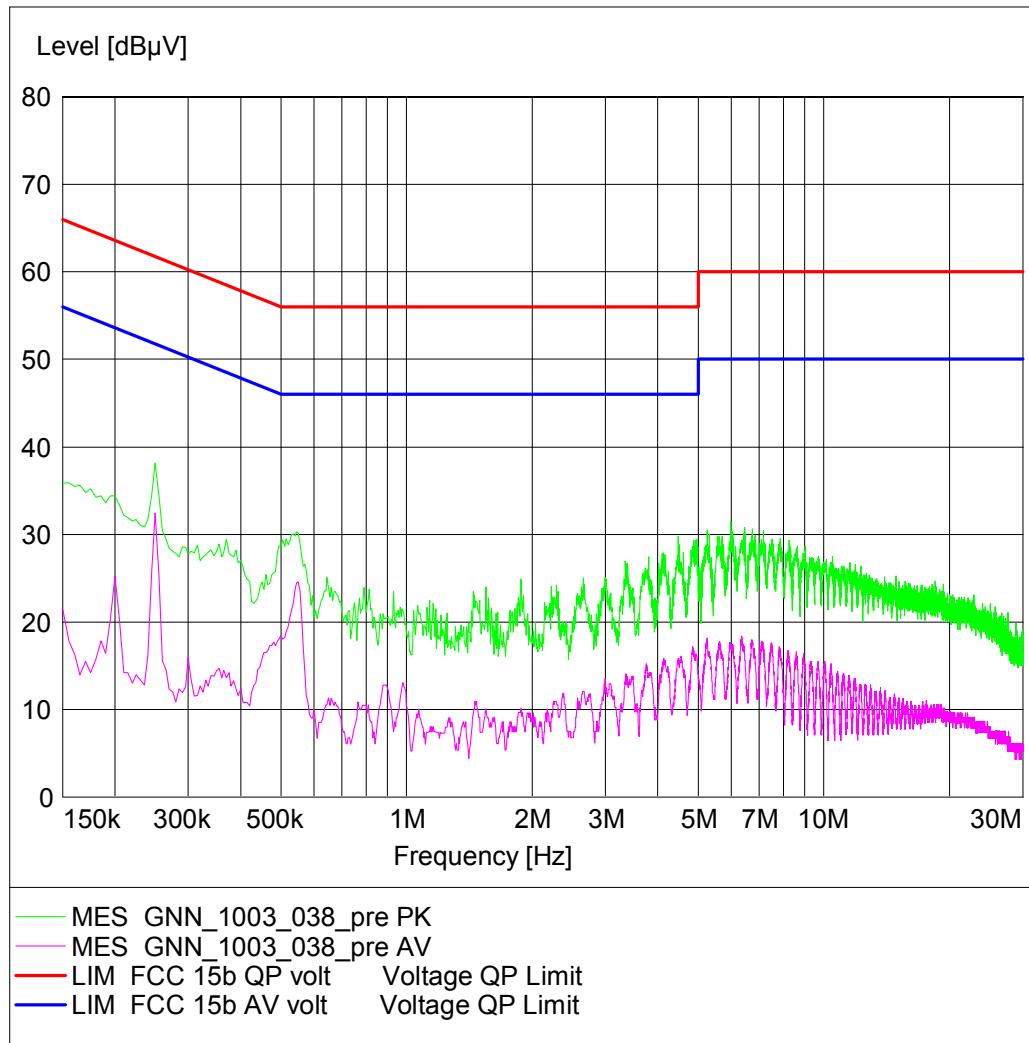
Name	Value
Mode	EUT in transmission mode

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





Reference: MDE_GNNET_1003_FCCe

3.5.2 15b.2 Spurious Radiated Emissions §15.109

Test1: 15b.2; Mode = transmit

Result: Passed

Setup No.: C01_DCDC

Date of Test: 2010/10/19 13:08

Body: FCC47CFRChIPART15bRADIO FREQUENCY DEVICES

Test Specification: FCC part 2 and 15

Test Equipment Environmental Conditions

Temperature: 24°C

Air Pressure: 999hPa

Rel. Humidity: 38%

Used Test Parameter:

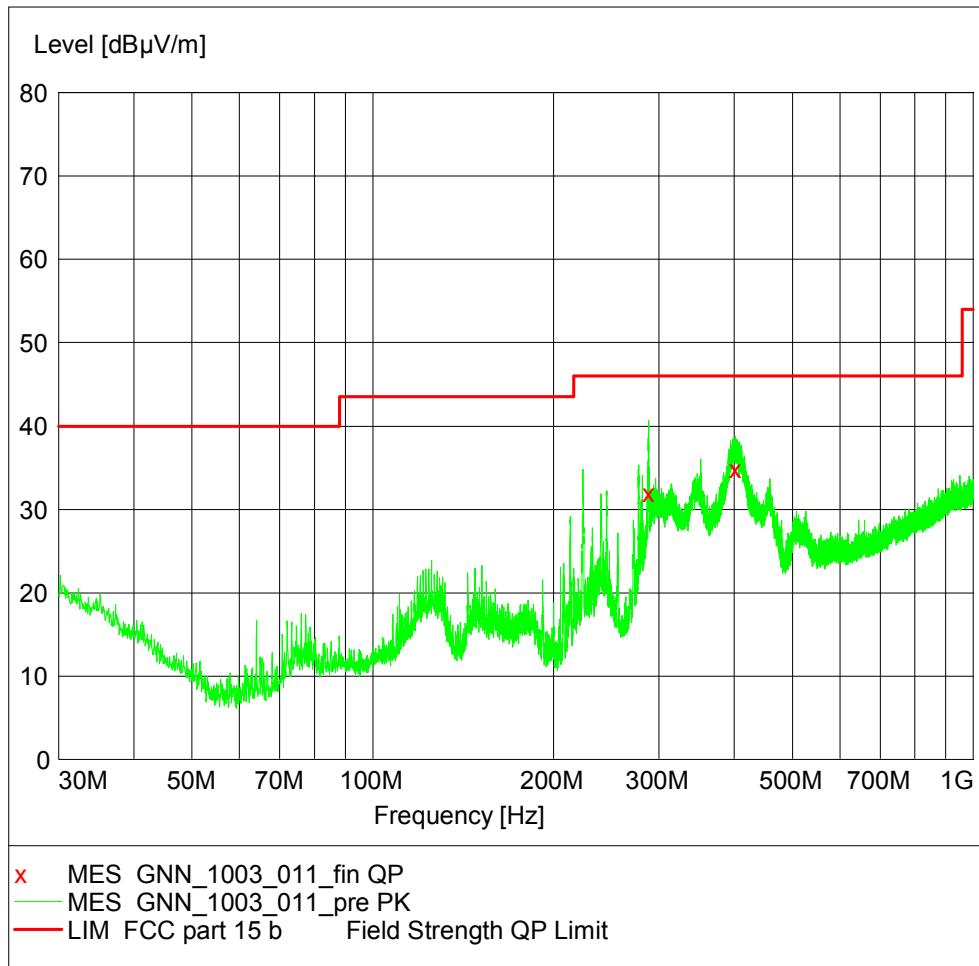
<i>Name</i>	<i>Value</i>
Mode	EUT in transmission mode

Detailed Results:
EMI RADIATED TEST

EUT: Jabra HFS100 (CJ110c01)
 Manufacturer: GN Netcom
 Operating Condition: TX on 2441 MHz; loopback mode; Packetttype: 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"

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


MEASUREMENT RESULT: "GNN_1003_011_fin_QP"

19.10.2010 19:15	Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/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



Reference: MDE_GNNET_1003_FCCe

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:

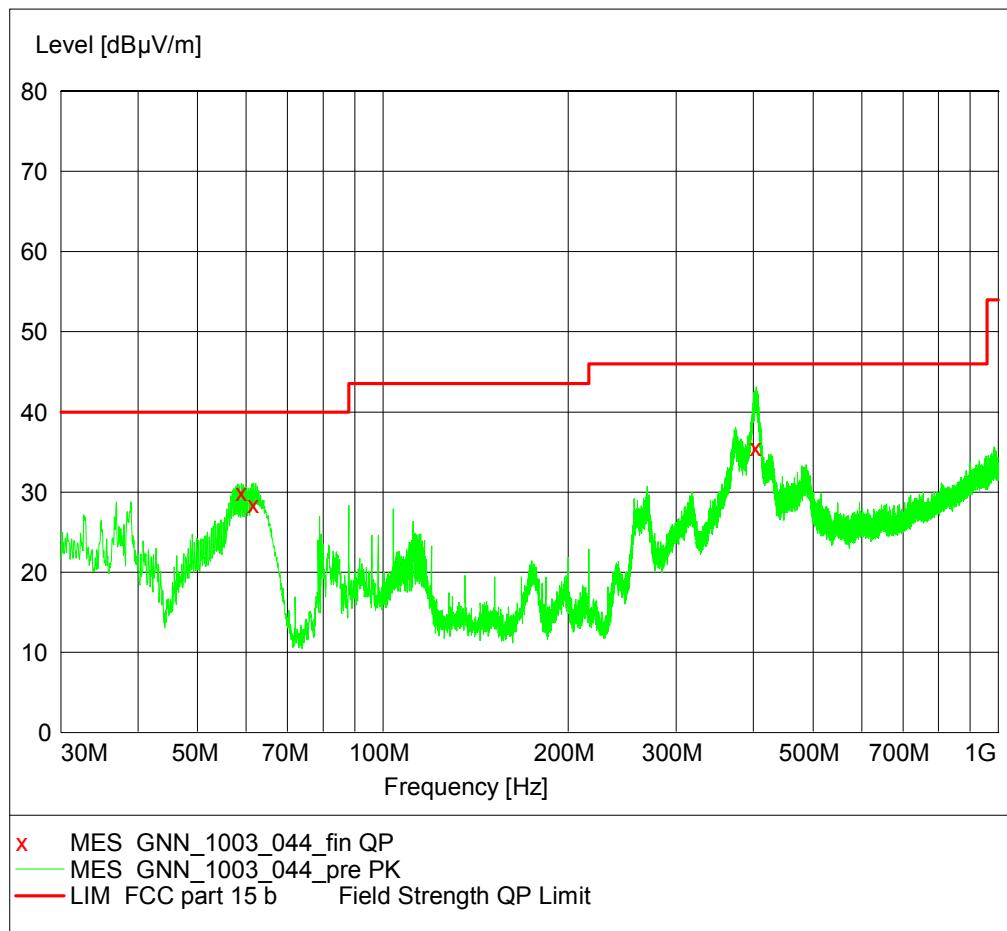
<i>Name</i>	<i>Value</i>
Mode	EUT in transmission mode

Detailed Results:
EMI RADIATED TEST

EUT: Jabra Wave (CJ110c01) / 03.11.2010
 Manufacturer: GN Netcom
 Operating Condition: Tx on 2441MHz; loopback mode; Packetttype: 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	dB μ V/m	dB	dB μ V/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	



Reference: MDE_GNNET_1003_FCCe

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:

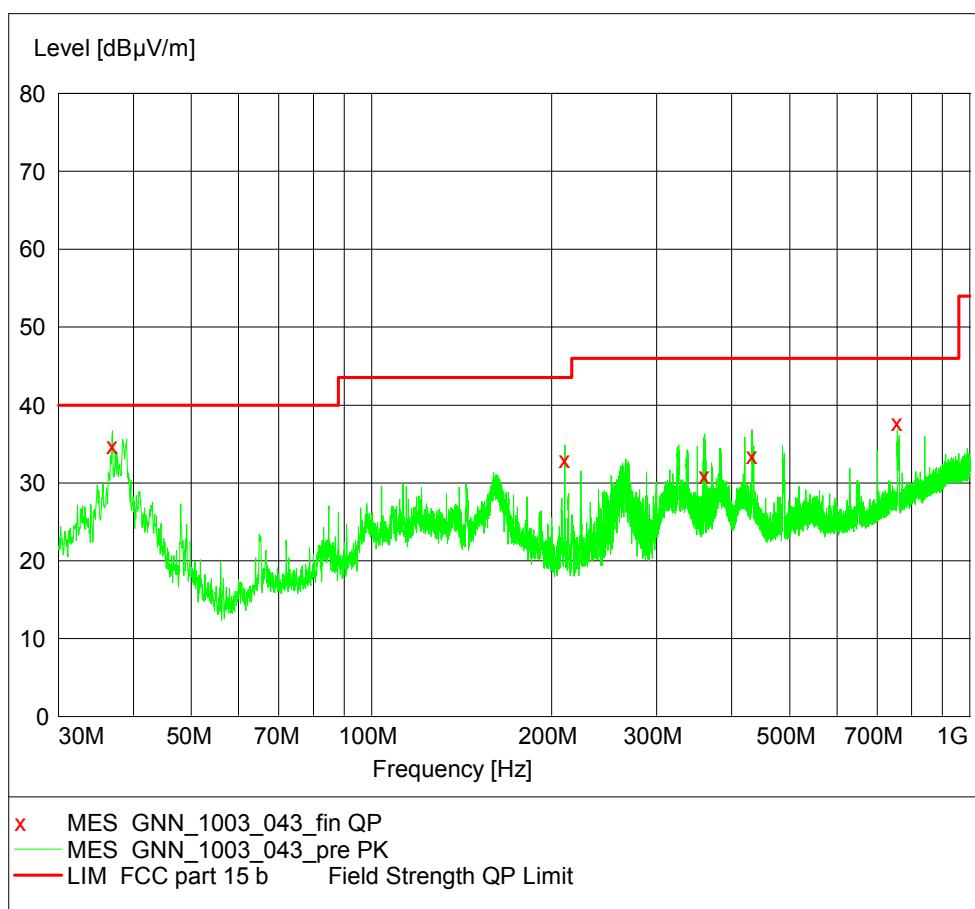
<i>Name</i>	<i>Value</i>
Mode	EUT in transmission mode

Detailed Results:
EMI RADIATED TEST

EUT: Jabra Wave (CJ110c01) / 02.11.2010
 Manufacturer: GN Netcom
 Operating Condition: Tx on 2441MHz; loopback mode; Packetttype: 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 Frequency	Stop Frequency	Step Width	Detector	Meas.	IF	Transducer
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	dB μ V/m	dB	dB μ V/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

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

Single Device Name	Type	Serial Number	Manufacturer
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m ³	none	Frankonia
	<i>Calibration Details</i>		<i>Last Execution</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

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
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		2008/10/13	2010/10/12

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	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
	Standard Calibration		2009/11/11 2010/11/11
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 2
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.
	<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			2007/07/16
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			

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 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

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



Reference: MDE_GNNET_1003_FCCe

5 Annex

5.1 Additional Information for Report

**Test Description**

Conducted emissions (AC power line)

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 50µH || 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 (dB μ V)	AV Limit (dB μ V)
0.15 - 0.5	79	66
0.5 - 30	73	60

Used conversion factor: Limit (dB μ V) = 20 log (Limit (μ V)/1 μ V).

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 μ s
- 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 (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

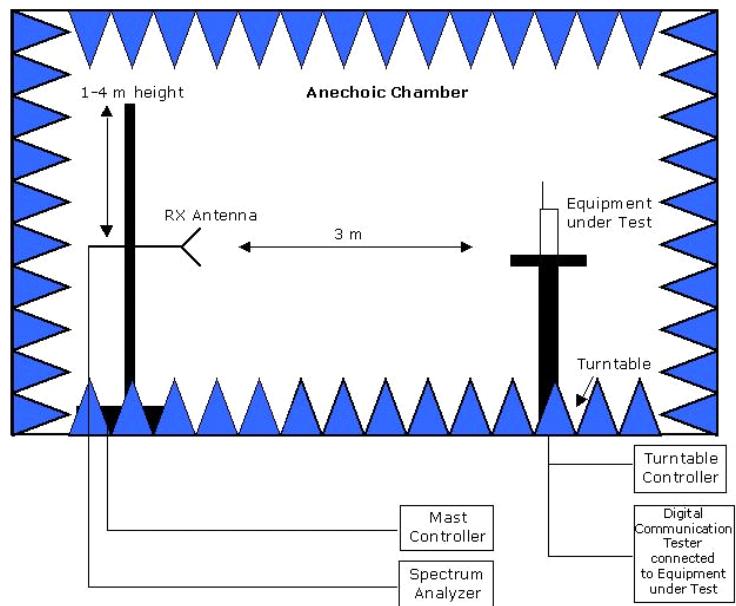
§15.35(b)

..., 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 (Limit (μ V/m)/1 μ 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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