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DELTA Test Report



DANAK
TEST Reg. no. 19

Radio parameter test of BO312 according to FCC and IC requirements

Performed for GN Hearing A/S

DANAK-1911210

Project no.: A506865-9

Page 1 of 60

24 January 2011

DELTA
Venlighedsvej 4
2970 Hørsholm
Denmark

Tel. +45 72 19 40 00
Fax +45 72 19 40 01
www.delta.dk
VAT No. 12275110

Title Radio parameter test of BO312 according to FCC and IC requirements

Test object BO312

Report no. DANAK-1911210

Project no. A506865-9

Test period 19 April 2010

Client GN Hearing A/S
Lautrupbjerg 7
2750 Ballerup
Denmark
Tel.: +45 45 75 11 11

Contact person Vinnie Nørager
E-mail: vnoerager@gnresound.dk

Manufacturer GN Hearing A/S

Specifications FCC CFR 47 Part 15, Subpart C
IC standard RSS-210, Issue 7:2007
IC standard RSS-Gen, Issue 2:2007

Results The test object was found to be in compliance with the specifications, as listed in Section 1

Test personnel Roa A. Salman
Jan Askov
Henrik Egebjerg Nielsen
Claus Momme Thomsen

Date 24 January 2011

Project Manager



Jan Askov
Senior Specialist, Wireless
DELTA

Responsible



Jørgen Duvald Christensen
Senior Specialist, EMC
DELTA

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1. Summary of tests

Tests SRD	Test methods	Rule Section	Results
Peak to average correction factor (PACF)	FCC CFR 47 Part 15 IC RSS-Gen:2007	15.35(c) Gen, 4.5	N.A.
Antenna requirement	Visual inspection IC RSS-Gen:2007	15.203 Gen, 7.1.4	Passed
Measurement of radiated emission	ANSI C 63.4:2003 IC RSS-Gen:2007	15.209 210, 2.6 & A2.9	Passed
Measurement of 20 dB bandwidth	FCC CFR 47 Part 15	15.215(c)	Passed
Measurement of band edge compliance	FCC CFR 47 Part 15 ANSI C 63.4:2003 IC RSS-Gen:2007	15.209(a)&15.249(d)(e) 210, 2.6 & A2.9	Passed
Measurement of field strength of fundamental	ANSI C 63.4:2003 IC RSS-Gen:2007	15.249(a) 210, A2.9	Passed
Measurement of occupied bandwidth	IC RSS-Gen:2007	Gen, 4.6.1	Passed
Measurement of radiated emission, receiver	EN 300 440-1 V1.5.1:2009	Gen, 7.2.3.2 210, 2.6	Passed

The given result is based on a shared risk principle with respect to the measurement uncertainty.

Conclusion

The test objects mentioned in this report meet the requirements of the standard stated below.

- FCC CFR 47 Part 15, Subpart C
Specific rule part 15.249
- IC Standards: RSS-210 Issue 7:2007
- IC Standards: RSS-Gen, Issue 2:2007

The test results relate only to the objects tested.

2. Test objects and auxiliary equipment

2.1 Test objects

Test object 2.1.1

Name of test object	BO312
Model / type	BO312
Part no.	BO312
Serial no.	BO312-70
FCC ID	X26BO312
IC ID	6941C-BO312
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Deltatest:30.06.10
Cycle time	0.5 ms / 1.0 ms
Comments	Supplied by external power supply or battery

Test object 2.1.2

Name of test object	BO312
Model / type	BO312
Part no.	BO312
Serial no.	BO312-72
FCC ID	X26BO312
IC ID	6941C-BO312
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Deltatest:30.06.10
Cycle time	0.5 ms / 1.0 ms
Comments	Supplied by external power supply or battery



Test object 2.1.3

Name of test object	BO312
Model / type	BO312
Part no.	BO312
Serial no.	BO312-369
FCC ID	X26BO312
IC ID	6941C-BO312
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Deltatest:30.06.10
Cycle time	0.5 ms / 1.0 ms
Comments	Supplied by external power supply or battery

Test object 2.1.4

Name of test object	BO312
Model / type	BO312
Part no.	BO312
Serial no.	BO312-64
FCC ID	X26BO312
IC ID	6941C-BO312
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Deltatest:30.06.10
Cycle time	0.5 ms / 1.0 ms
Highest frequency generated or used	Antenna replaced by SMA connector and supplied by external power supply

3. General test conditions

3.1 Test setup during test

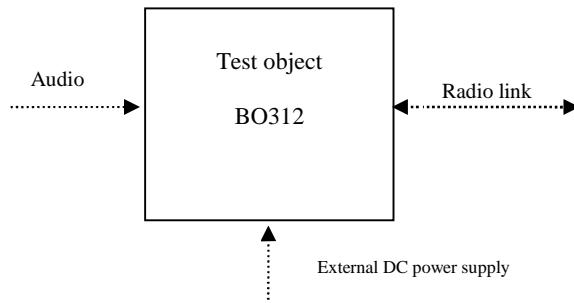


Figure 3.1.1 Block diagram of test object with external cables.

All test objects were running special test software.

During test, the test objects were in continuous Tx mode or continuous Rx mode. (Normal modulation, normal data packets with optimized repetition rate)

Tests were performed at three frequencies

- Low frequency: 2404 MHz
- Middle frequency: 2440 MHz
- High frequency: 2478 MHz.

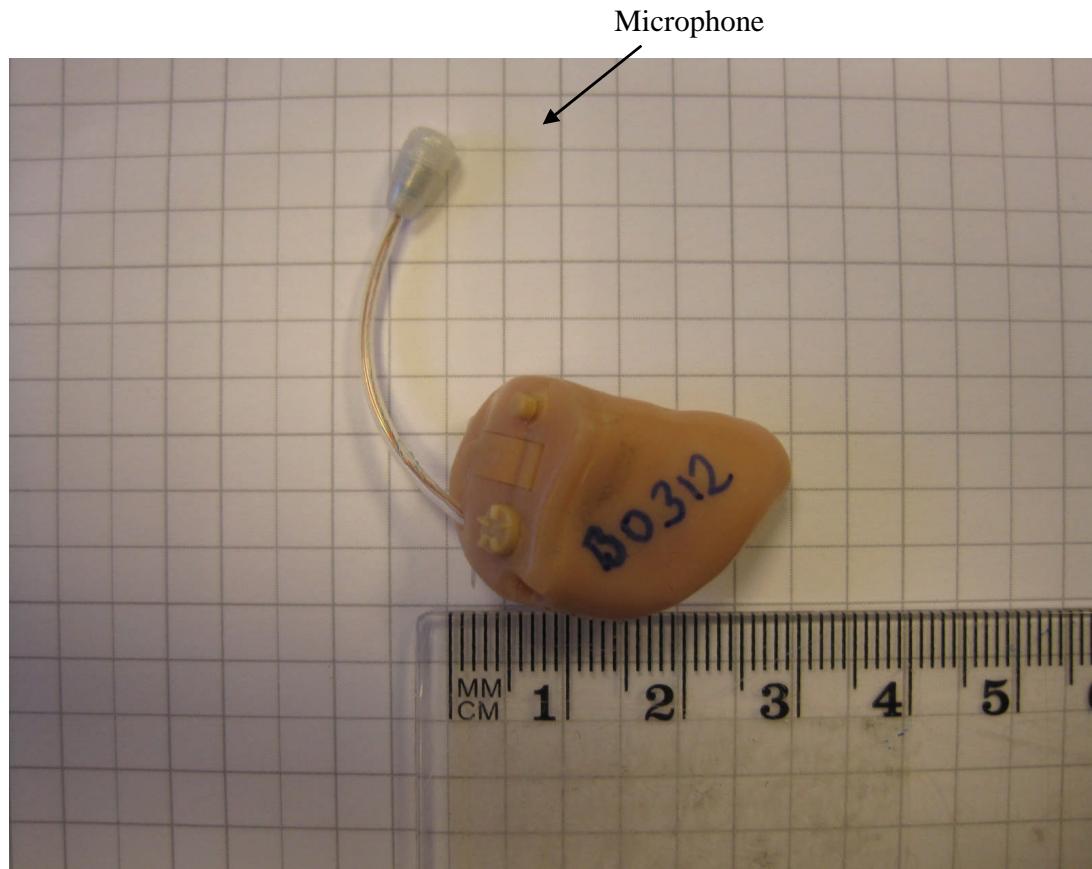
During relevant tests, the battery was replaced by an external DC power supply.
External power supply is not used under intended use.

Intended use

BO312 is a hearing aid used for alleviation of hearing loss. It can receive audio signals and be configured via the radio link.

Size of the test object:

The test object measures 28 x 15 x 20 mm without microphone



3.2 Test sequence

The tests described in this test report were performed in the following sequence:

1. Measurement of field strength of fundamental
2. Measurement of band edge compliance
3. Measurement of occupied bandwidth
4. Measurement of 20 dB bandwidth of the emission, IC
5. Measurement of radiated emission, Rx, IC
6. Measurement of radiated emission
7. Visual inspection of antenna

4. Test results

4.1 Radio specifications, receiver and transmitter

Test object	BO312	Sheet	Radio-1
Type	BO312	Project no.	A506865-9
Serial no.	All		
Client	GN Hearing A/S		
Specification	FCC CFR 47 Part 15, Subpart C IC standard RSS-210, Issue 7:2007 IC standard RSS-Gen, Issue 2:2007		

The radio of the test object has the following specified RF parameters, the below information regarding the receiver and the transmitter is declared by the manufacturer:

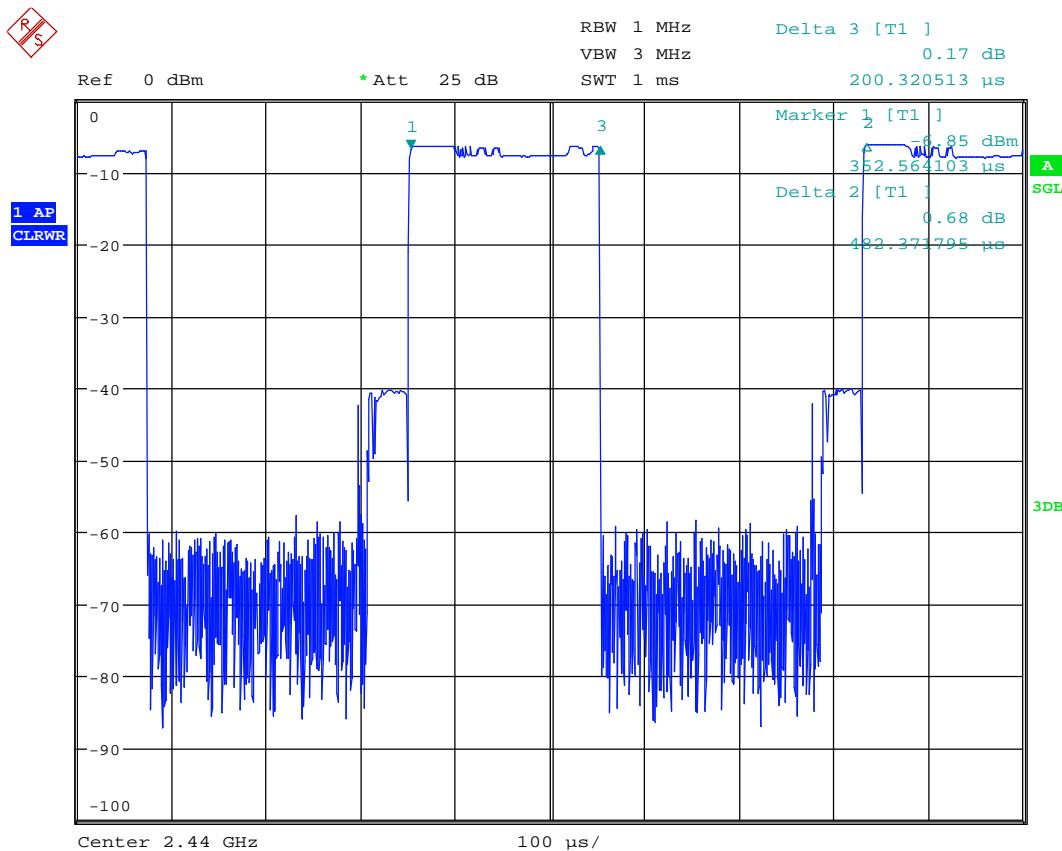
Type of equipment	:	Low power device (2400-2483.5 MHz)
Operating frequency range	:	2404 to 2478 MHz
Antenna	:	Permanently attached wire antenna,
Maximum gain	:	-0.7 dB
Transmit power, max	:	-2.1 dBm EIRP
Field Strength, max, peak	:	93.1 dB μ V/m (45 mV) @ 3 meter
Power level	:	No
No of channels	:	20
Bandwidth	:	
Occupied bandwidth (99%)	:	4.7 MHz (Measured)
Necessary bandwidth	:	4.7 MHz
Channel separation	:	2 MHz
Modulation	:	GFSK
Data rate	:	2 Mbits
Duty cycle	:	10 % during normal mode
Transmit mode	:	Yes
Receive mode	:	Yes
Standby mode	:	Yes
Power supply	:	1.3 V Zinc Air battery
Specified min voltage	:	1.19 V
Specified max voltage	:	1.4 V
Temperature category	:	-20 to +55 °C.
Emission Designator	:	3M43F7E
Max. TX spurious emission, average	:	403 (μ V/m) @ 3 meter (Field Strength)
Max. RX spurious emission, peak	:	302 (μ V/m) @ 3 meter (Field Strength)

4.2 Peak to average correction factor (PACF)

Test object	BO312	Sheet	PACF-1-
Type	BO312	Project no.	A506865-9
Serial no.	BO312-64	Date	01 Dec. 2010
Client	GN Hearing A/S	Initials	JAS
Specification	FCC CFR 47 Part 15, Subpart C IC standard RSS-Gen, issue 2:2007		

Test method	FCC CFR 47 Part 15, Subpart C, Section 15.35(c) IC standard RSS-Gen, issue 2:2007, section 4.5			
Characteristics	Temperature: 22°C, Humidity: 45% , Test voltage: External power supply at 1.3 V DC			
Test equipm.	29962 49321 49183			Uncertainty: 10 µS
SA Settings	RBW:1 MHz VBW:3 MHz SPAN:Zero-1ms DET:Peak CF: 2440 Trace:CLRWR			
Operating frequency	Max Tx on time	Periode time	Duty Cycle	PACF
2440 MHz	200.32 µS	482.37 µS	41.5 %	7.6 dB

Note: PACF=-20 log (Duty Cycle[%]/100)



Date: 1.DEC.2010 13:56:21

Test Port	Conducted - SMA connector
Test mode	Continuous Tx - normal modulation - hopping off
Comments	This is according to FCC CFR 47 Part 15, Subpart C, Section 15.35(c) and IC standard RSS-Gen, Section 4.5 for one complete pulse train, including blanking intervals and the pulse train do not exceed 0.1 seconds. This PACF can be subtracted from the peak measurements to obtain the average values.

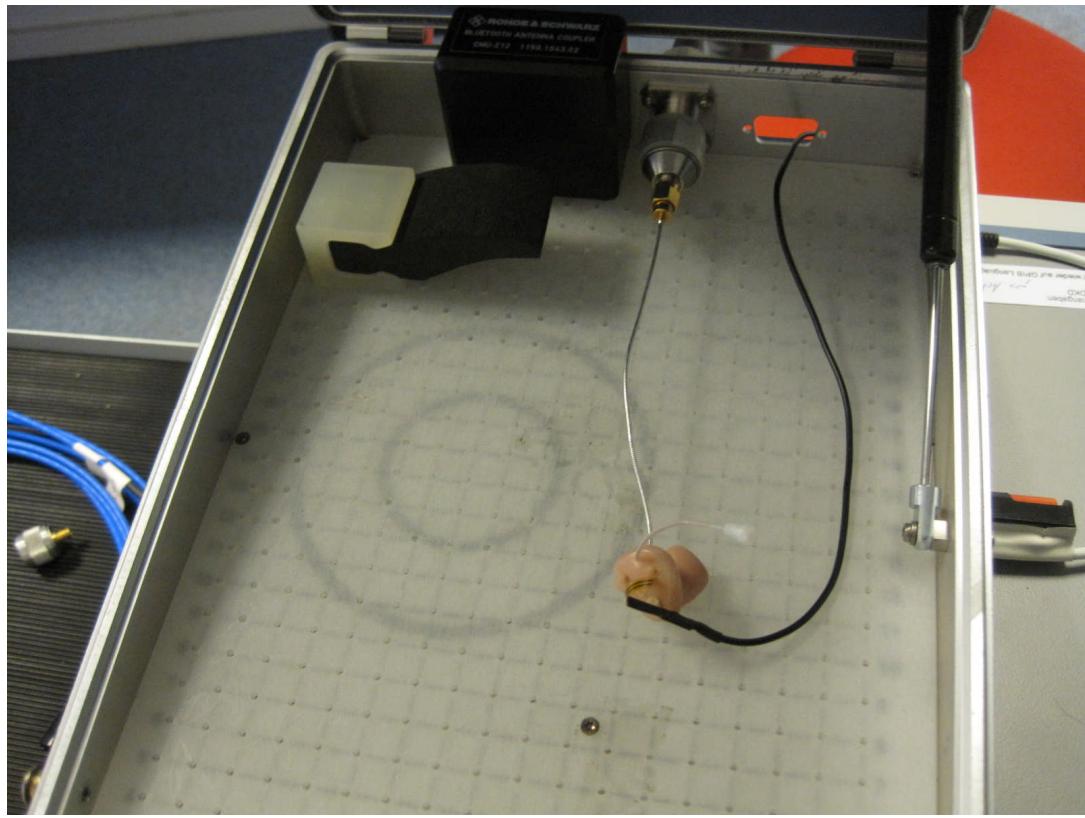


Photo 4.2.1 Test setup regarding measurement of peak to average correction factor (PACF).

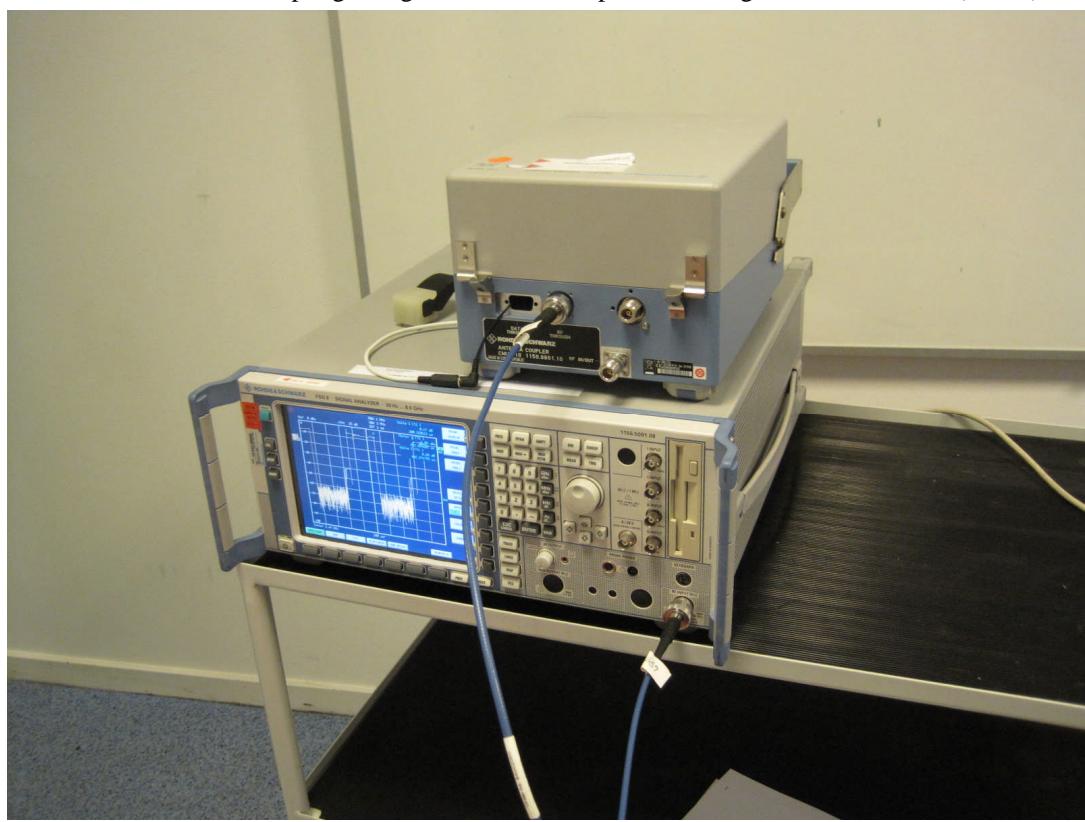


Photo 4.2.2 Test setup regarding measurement of peak to average correction factor (PACF).



4.3 Antenna requirement

Test object	BO312	Sheet	ANT-1
Type	BO312	Project no.	A506865-9
Serial no.	BO312-369	Date	01 Dec. 2010
Client	GN Hearing A/S	Initials	JAS
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.203 RSS-Gen, Section 7.1.4		

Test method	Visual inspection
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Evaluation criteria

Section 15.203 of the FCC rules and 7.1.4 of RSS-Gen state that the subject device must meet at least one of the following criteria:

- (a) Antenna must be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the unit.
- (c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Evaluation result

The BO312 has one permanently attached wire antenna.



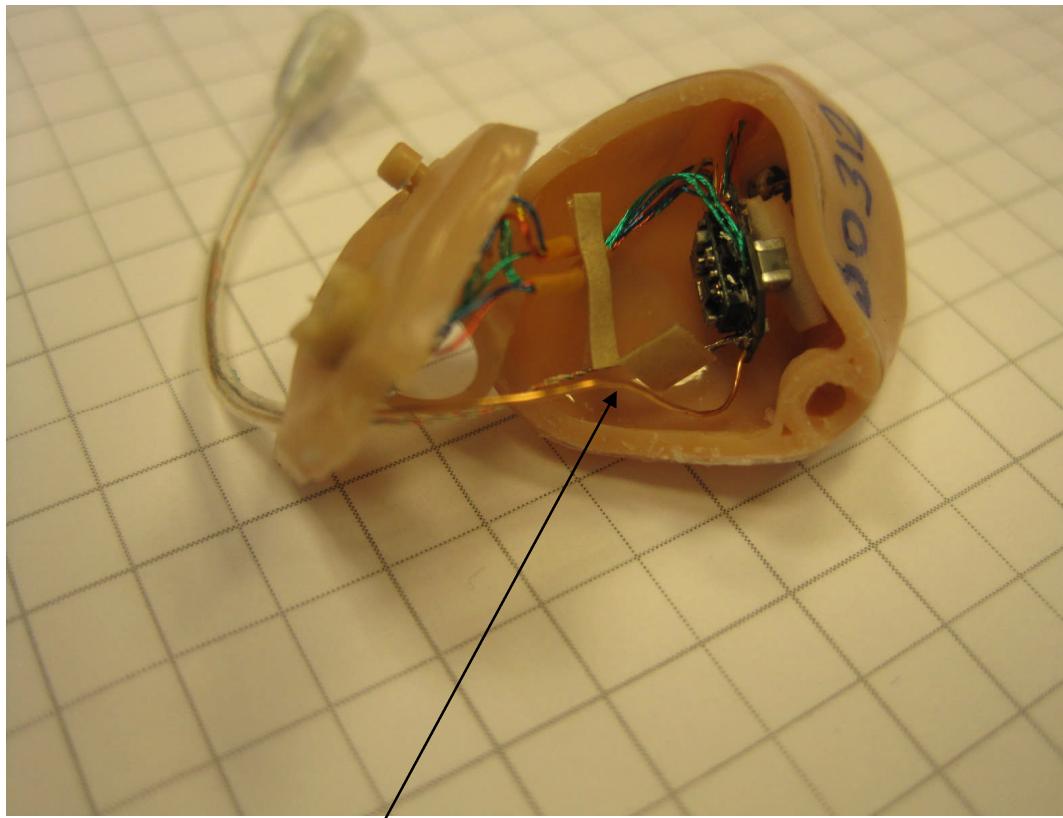
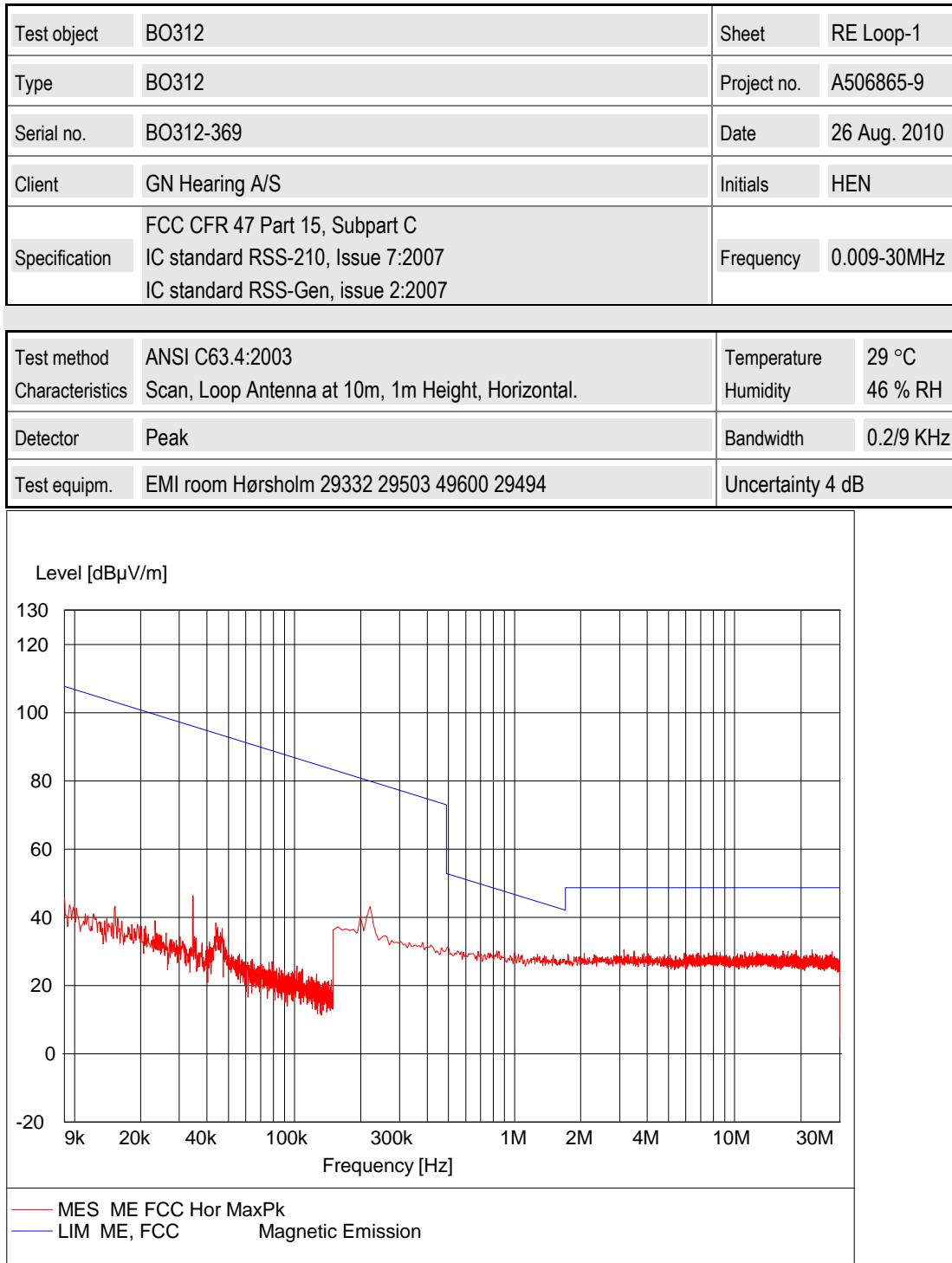


Photo 4.3.1 Test setup regarding Antenna requirement.

Antenna

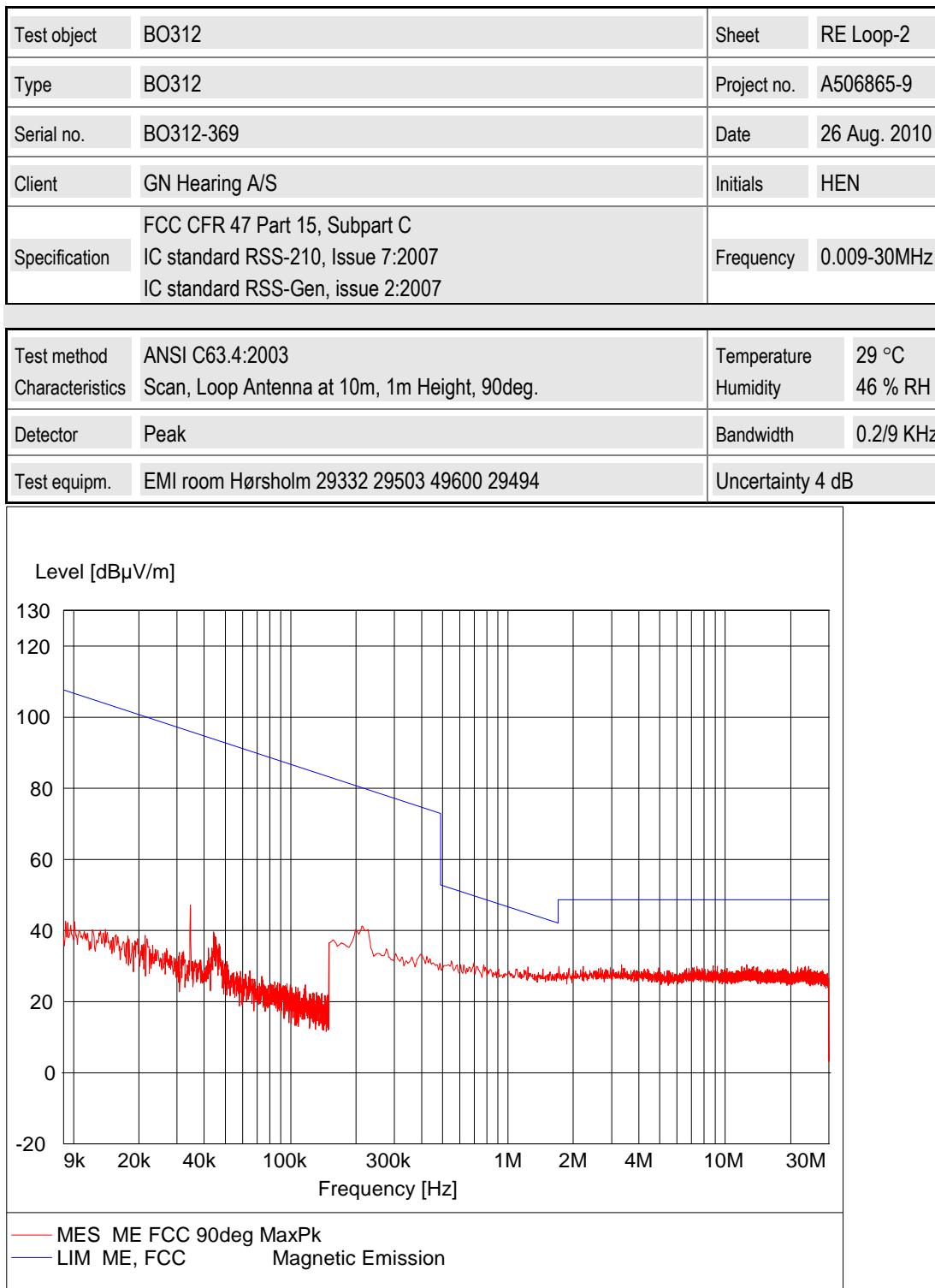
4.4 Measurement of radiated emission



Comments

The limit has been extrapolated to 10 m using an extrapolation factor of 40 dB/decade as specified in § 15.31(f)(2). $L_2 = L_1 + 40 \log_{10} (D_1/D_2)$.





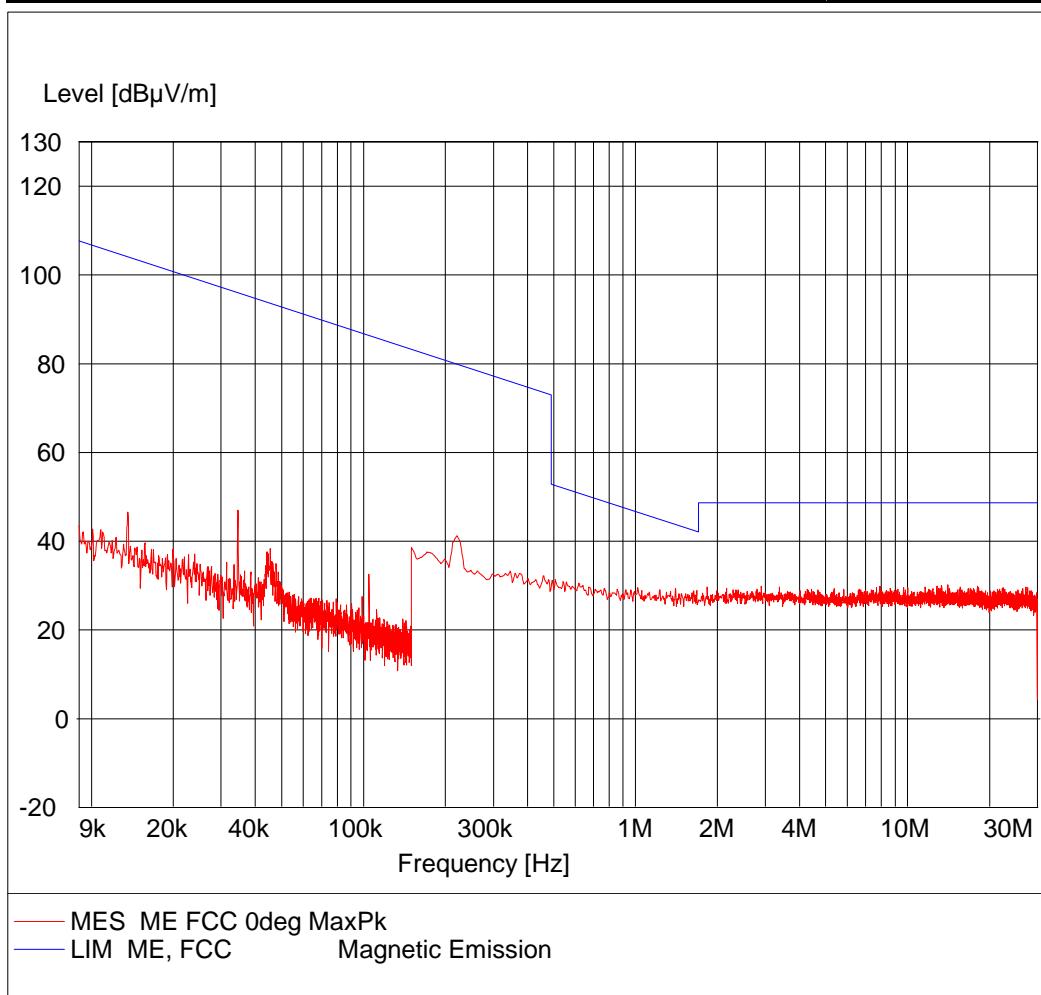
Comments

The limit has been extrapolated to 10 m using an extrapolation factor of 40 dB/decade as specified in § 15.31(f)(2). $L_2 = L_1 + 40 \log_{10} (D_1/D_2)$.



Test object	BO312	Sheet	RE Loop-3
Type	BO312	Project no.	A506865-9
Serial no.	BO312-369	Date	26 Aug. 2010
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC standard RSS-210, Issue 7:2007 IC standard RSS-Gen, issue 2:2007	Frequency	0.009-30MHz

Test method	ANSI C63.4:2003	Temperature	29 °C
Characteristics	Scan, Loop Antenna at 10m, 1m Height, 0deg.	Humidity	46 % RH
Detector	Peak	Bandwidth	0.2/9 KHz
Test equipm.	EMI room Hørsholm 29332 29503 49600 29494	Uncertainty	4 dB



Comments

The limit has been extrapolated to 10 m using an extrapolation factor of 40 dB/decade as specified in § 15.31(f)(2). $L_2 = L_1 + 40 \log_{10} (D_1/D_2)$.



Test frequency	2440 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Test result	The measured field strengths are more than 15 dB below the limit.
Compliant	Yes
Comments	Measurement performed in a shielded room.

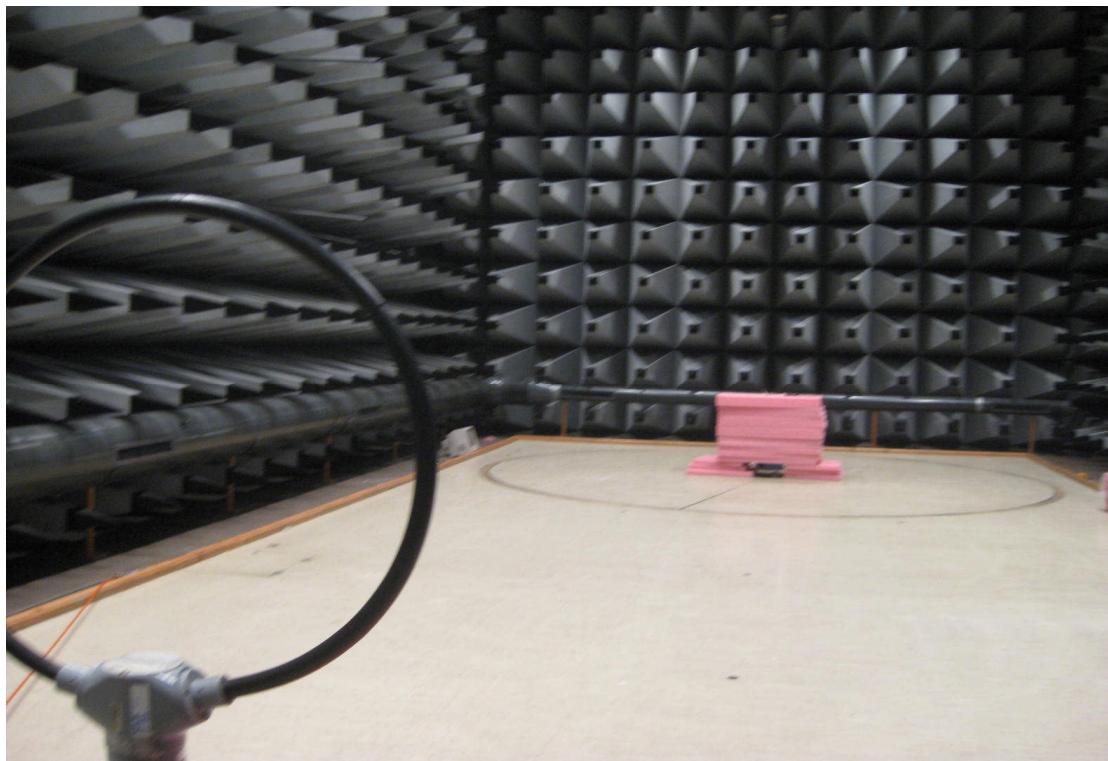


Photo 4.4.1 Test setup regarding measurement of radiated emission, 0.009 MHz - 30 MHz.

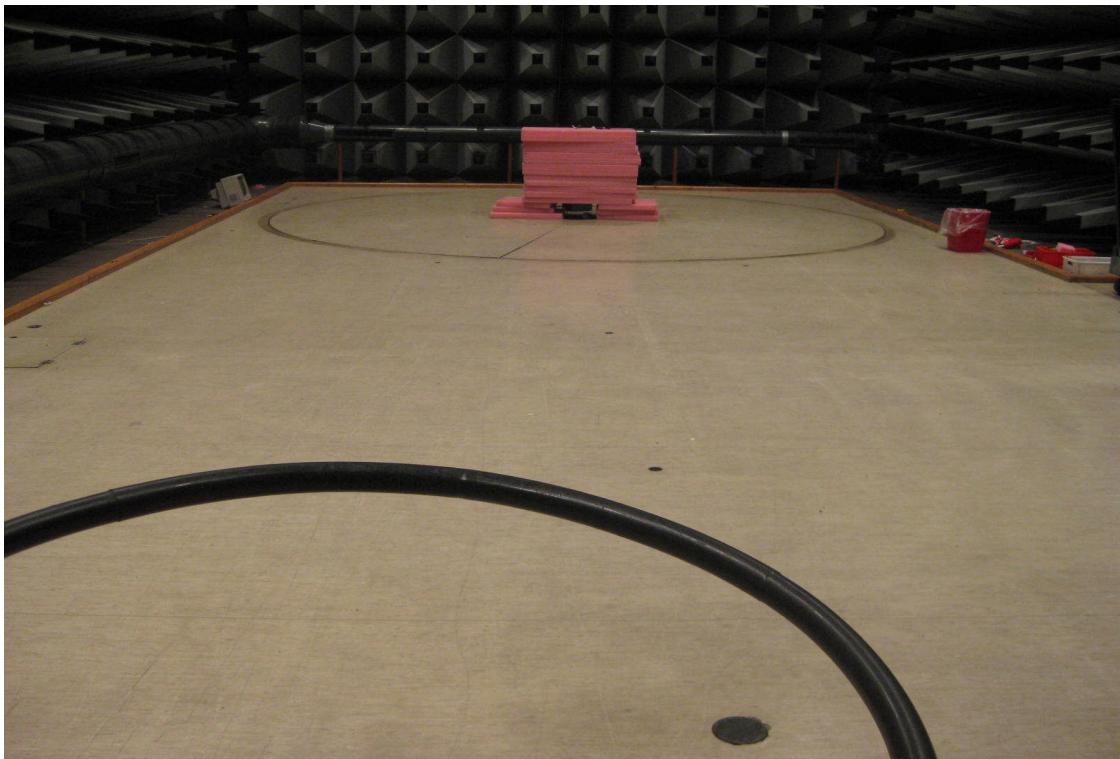


Photo 4.4.2 Test setup regarding measurement of radiated emission, 0.009 MHz - 30 MHz.

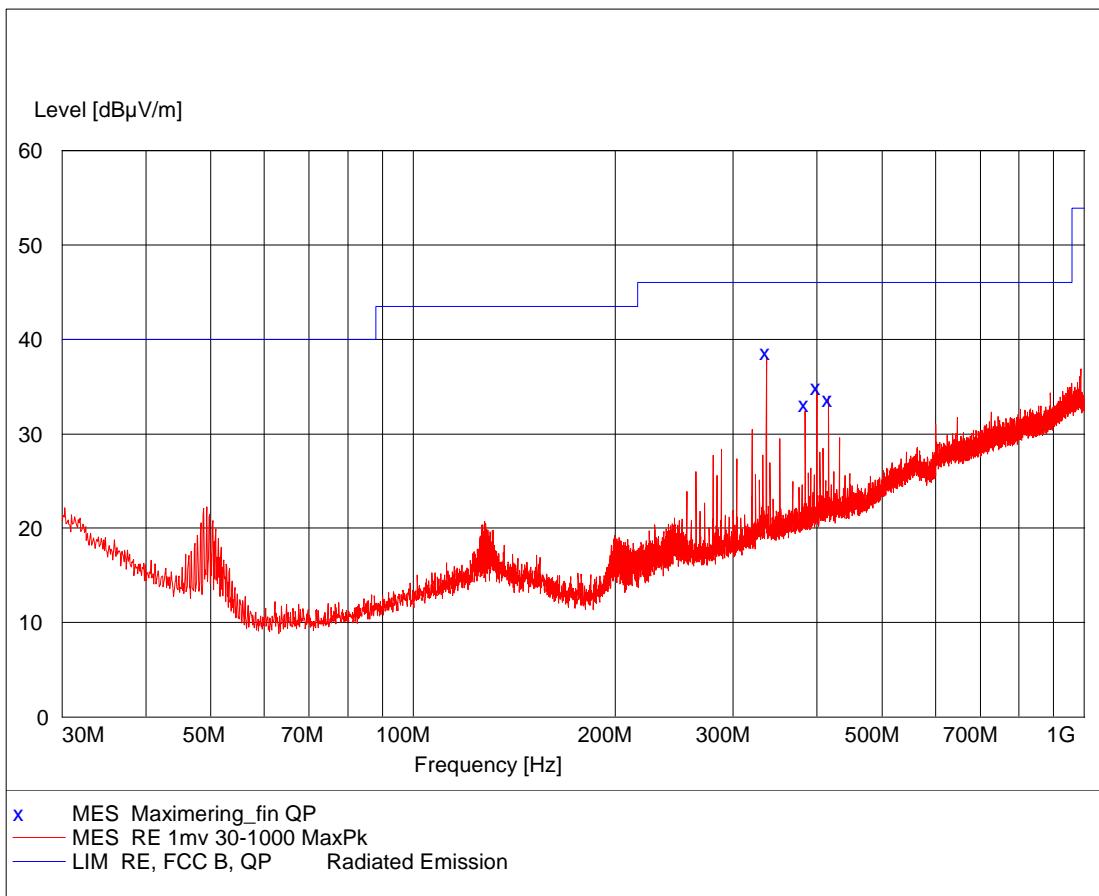


Photo 4.4.3 Test setup regarding measurement of radiated emission, 0.009 MHz - 30 MHz



Test object	BO312	Sheet	RE_Spur-1
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	09 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	ANSI C 63.4:2003	Temperature	23 °C
Characteristics	Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Humidity	55 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

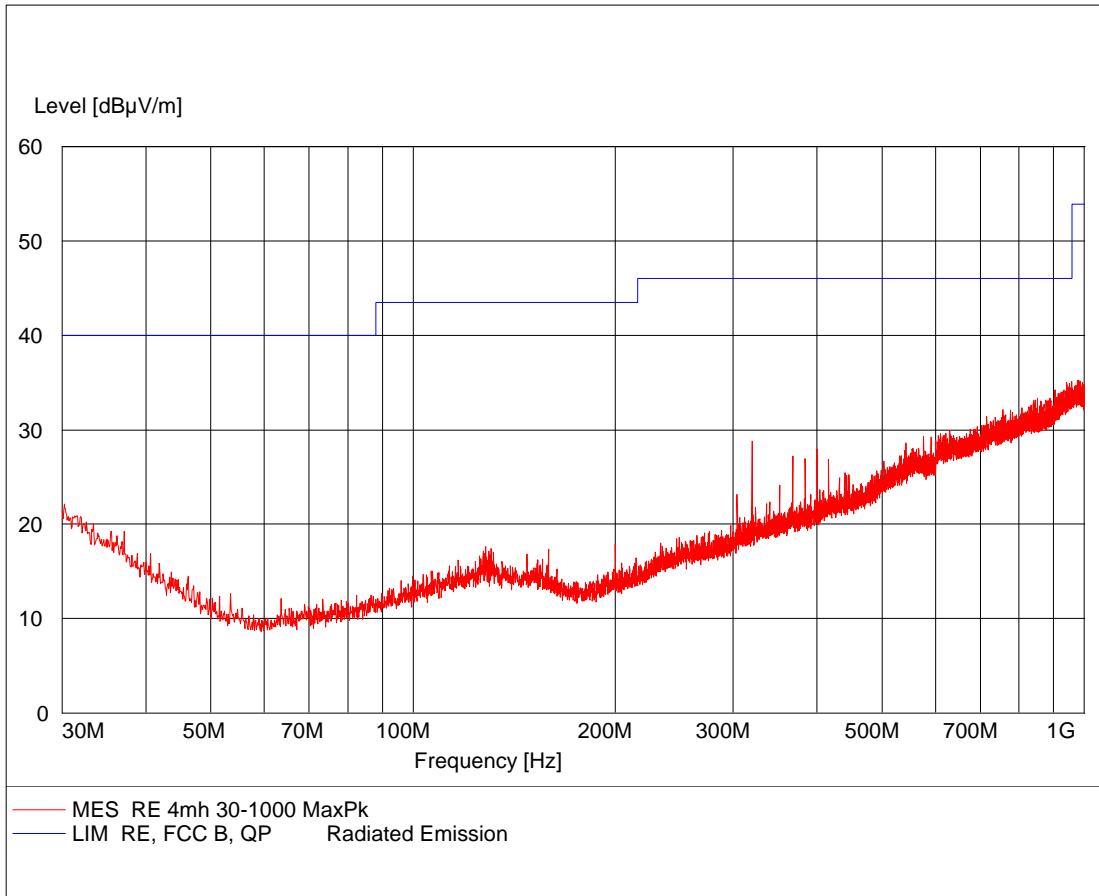


Comments

Continuous Tx - normal modulation - hopping off

Test object	BO312	Sheet	RE_Spur-2
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	09 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	ANSI C 63.4:2003	Temperature	23 °C
Characteristics	Pre-scan, Antenna at 3 m, 4 m height, hor. pol.	Humidity	55 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



Comments

Continuous Tx - normal modulation - hopping off

Test object	BO312	Sheet	RE_Spur-3
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	09 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	ANSI C 63.4:2003	Temperature	23 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	55 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

MEASUREMENT RESULT: "Maximering_fin QP"

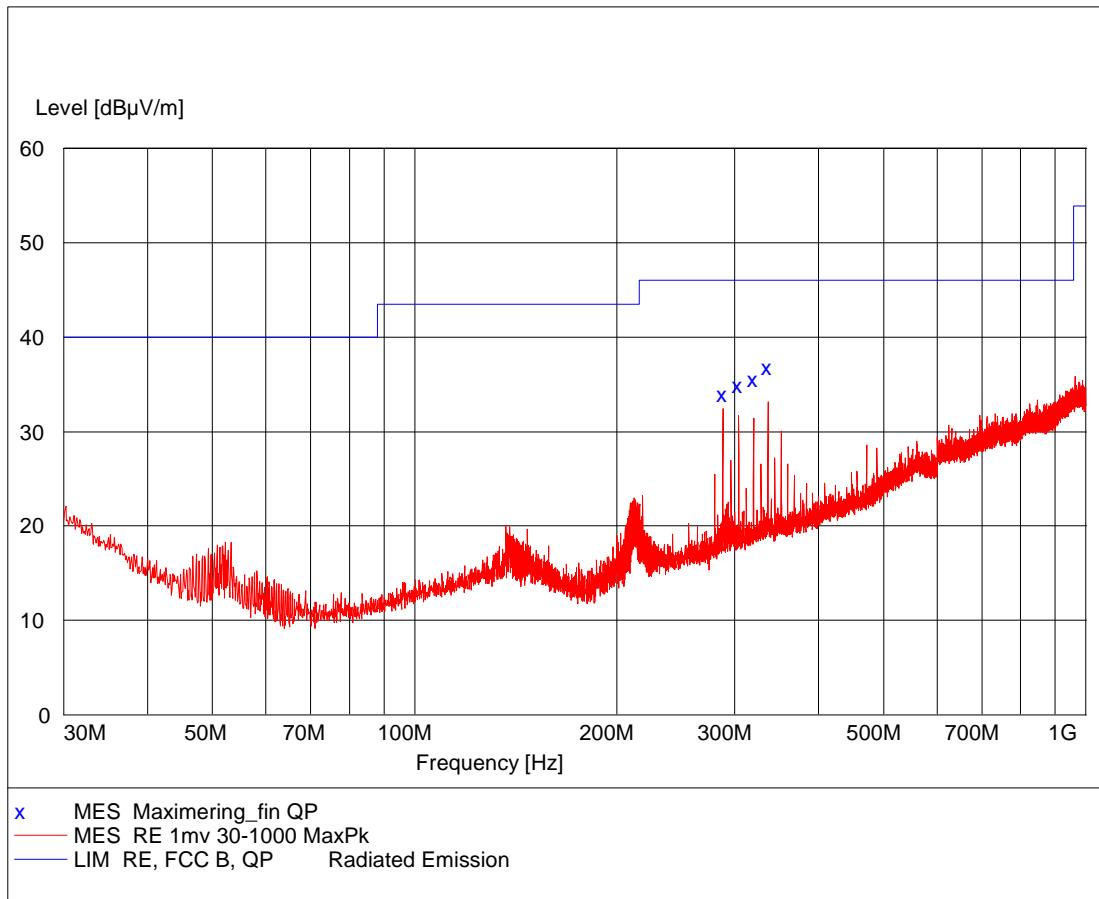
09-07-2010 15:45

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Height cm	Azimuth deg	Polarisation
336.000000	38.70	17.2	46.0	7.3	145.0	13.00	VERTICAL
384.000000	33.10	18.6	46.0	12.9	104.0	128.00	VERTICAL
400.000000	34.90	19.0	46.0	11.1	118.0	298.00	VERTICAL
416.000000	33.70	19.7	46.0	12.3	105.0	133.00	VERTICAL

Test result	The measured field strengths are below the limit.
Test Port	Enclosure
Test frequency	2404 MHz Low
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 1.3 V DC.

Test object	BO312	Sheet	RE_Spur-4
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	13 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	ANSI C 63.4:2003	Temperature	21 °C
Characteristics	Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Humidity	45 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

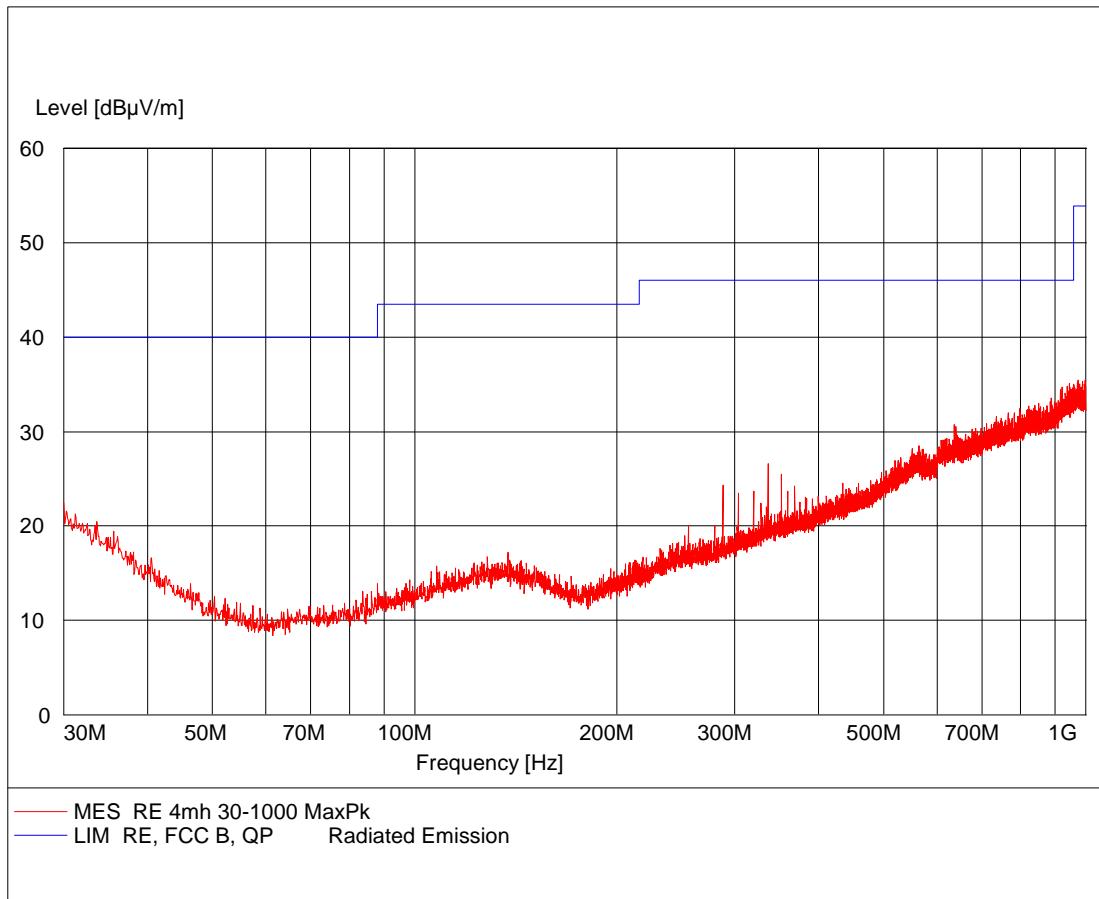


Comments

Continuous Tx - normal modulation - hopping off

Test object	BO312	Sheet	RE_Spur-5
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	13 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	ANSI C 63.4:2003	Temperature	21 °C
Characteristics	Pre-scan, Antenna at 3 m, 4 m height, hor. pol.	Humidity	45 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



Comments

Continuous Tx - normal modulation - hopping off

Test object	BO312	Sheet	RE_Spur-6
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	13 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	ANSI C 63.4:2003	Temperature	21 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	45 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

MEASUREMENT RESULT: "Maximering_fin QP"

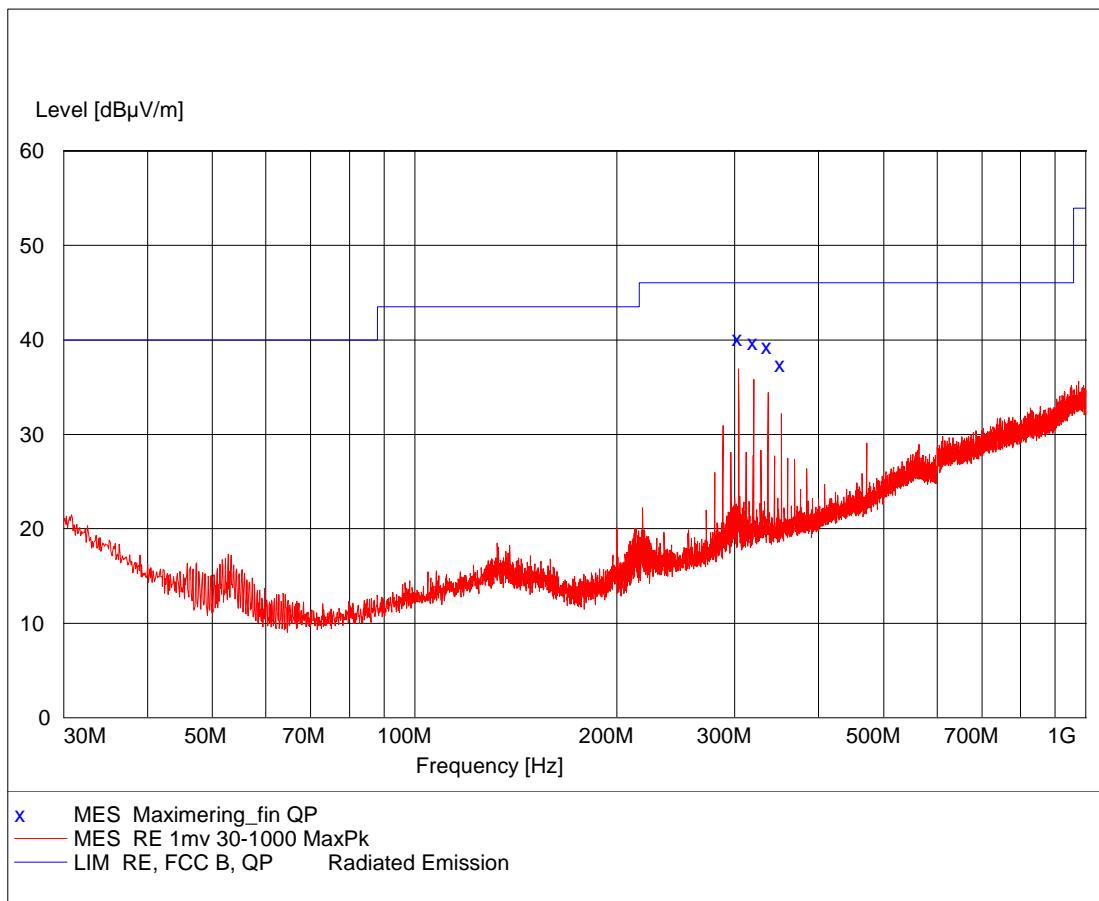
13-07-2010 15:08

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Height cm	Azimuth deg	Polarisation
288.000000	33.90	15.9	46.0	12.1	133.0	88.00	VERTICAL
304.000000	34.90	16.2	46.0	11.1	145.0	85.00	VERTICAL
320.000000	35.50	16.6	46.0	10.5	132.0	73.00	VERTICAL
336.000000	36.80	17.2	46.0	9.2	144.0	74.00	VERTICAL

Test result	The measured field strengths are below the limit.
Test Port	Enclosure
Test frequency	2440 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 1.3 V DC.

Test object	BO312	Sheet	RE_Spur-7
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	13 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	ANSI C 63.4:2003	Temperature	21 °C
Characteristics	Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Humidity	45 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

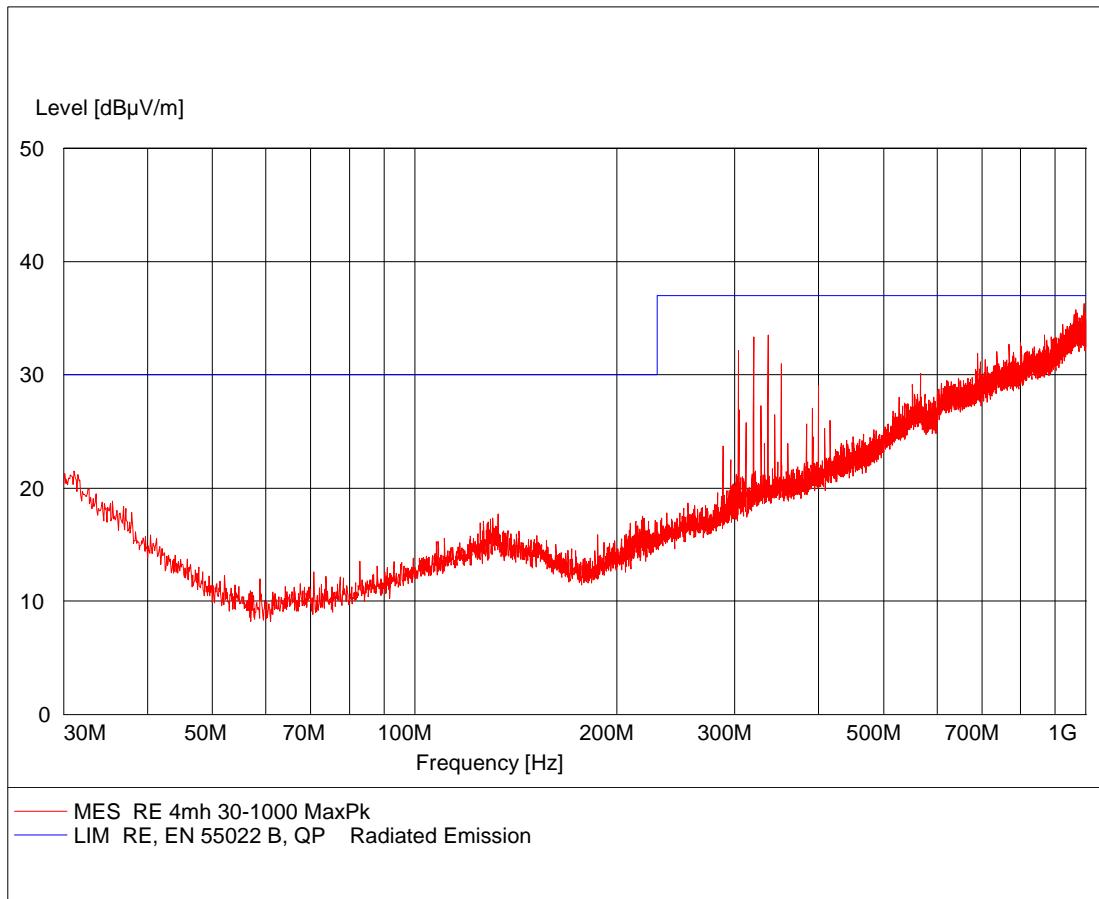


Comments

Continuous Tx - normal modulation - hopping off

Test object	BO312	Sheet	RE_Spur-8
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	13 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	ANSI C 63.4:2003	Temperature	21 °C
Characteristics	Pre-scan, Antenna at 3 m, 4 m height, hor. pol.	Humidity	45 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



Comments

Continuous Tx - normal modulation - hopping off

Test object	BO312	Sheet	RE_Spur-9
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	13 Jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	30-1000 MHz

Test method	EN 300 440-1 V1.5.1:2009	Temperature	21 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	45 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

MEASUREMENT RESULT: "Maximering_fin_QP"

13-07-2010 16:02

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Height cm	Azimuth deg	Polarisation
304.000000	40.10	16.2	46.0	5.9	131.0	93.00	VERTICAL
320.000000	39.70	16.6	46.0	6.3	130.0	85.00	VERTICAL
336.000000	39.30	17.2	46.0	6.7	132.0	86.00	VERTICAL
352.000000	37.40	17.7	46.0	8.6	131.0	85.00	VERTICAL

Test result	The measured field strengths are below the limit.
Test Port	Enclosure
Test frequency	2478 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 1.3 V DC.

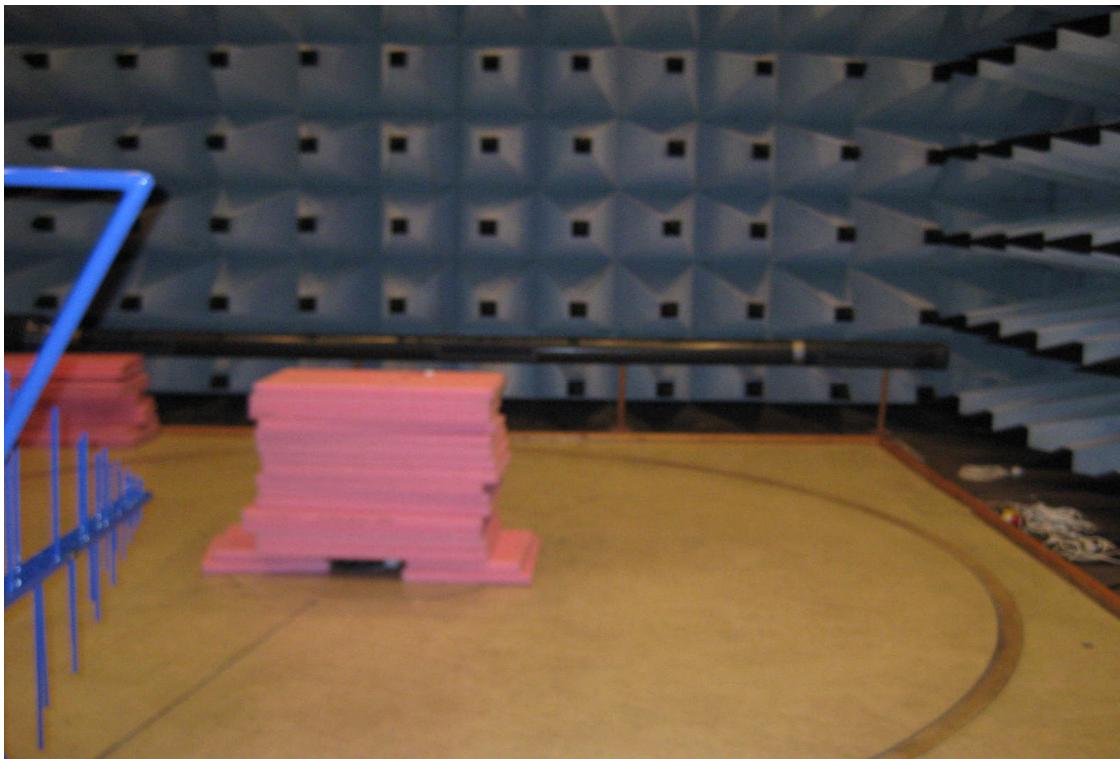


Photo 4.4.4 Test setup regarding measurement of radiated emission, 30 MHz to 1000 MHz.

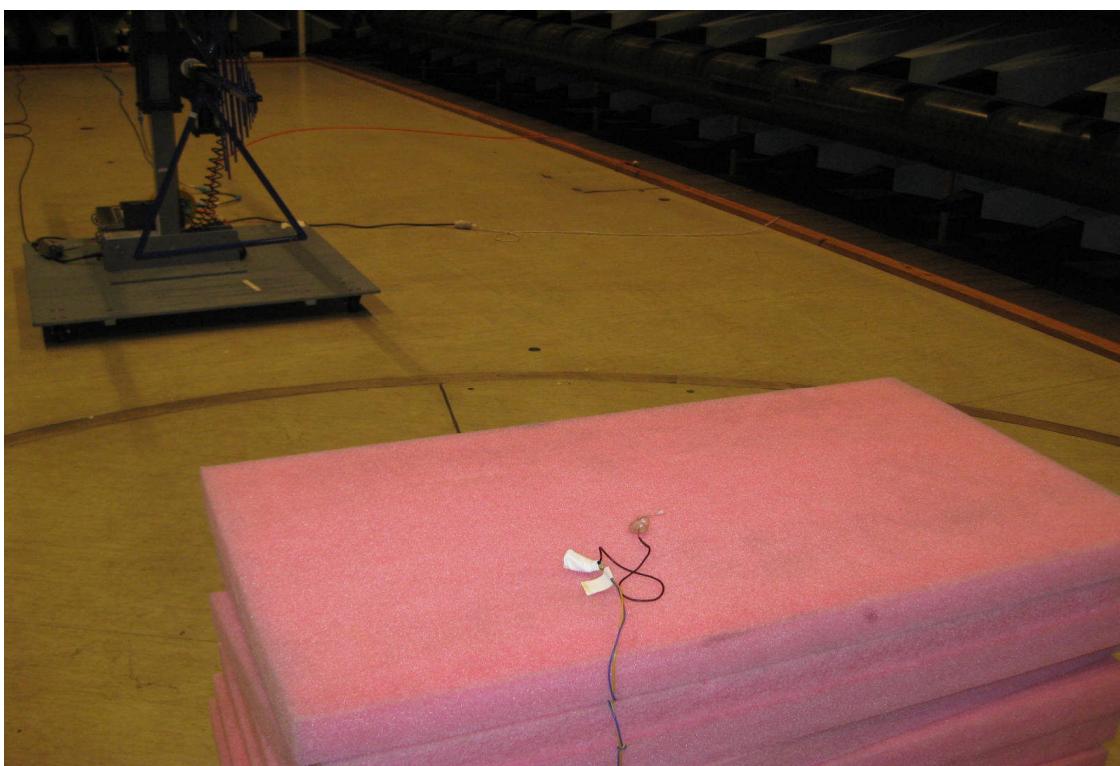
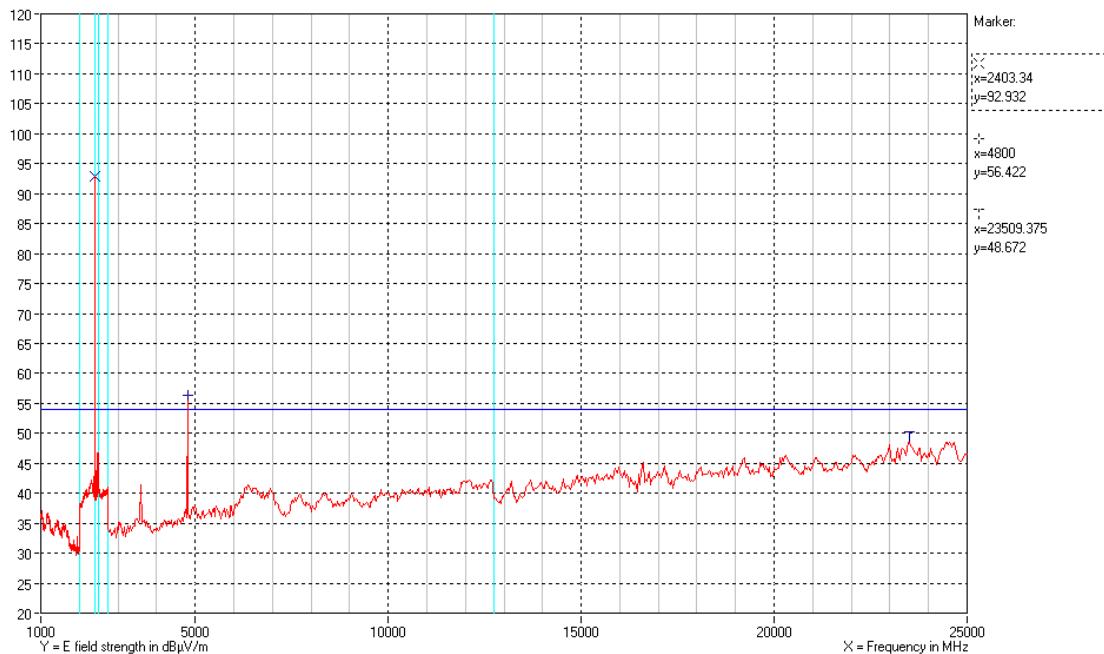


Photo 4.4.5 Test setup regarding measurement of radiated emission, 30 MHz to 1000 MHz.



Test object	BO312	Sheet	RE_Spur-10
Type	BO312	Project no.	A506865-9
Serial no.	BO312-3	Date	01 jul. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	1 GHz–25GHz

Test method	ANSI C 63.4:2003	Temperature	21 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	58 % RH
Detector	Peak for 1GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty	4.9 dB

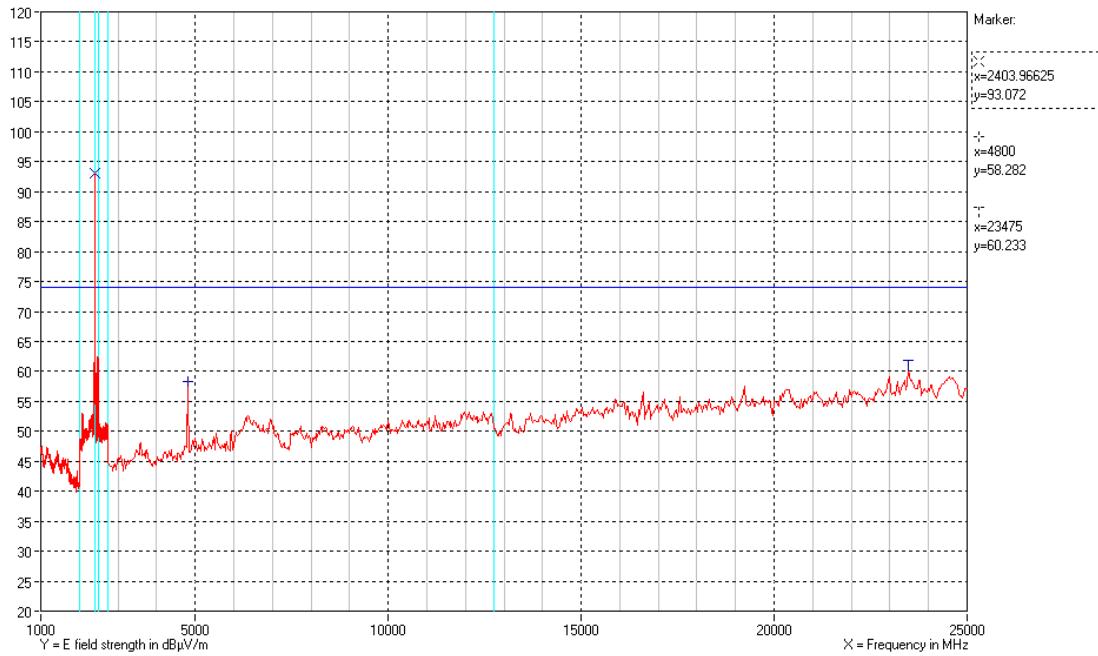


Polarization

Vertical and horizontal average measurements

Comments

Continuous Tx - normal modulation - hopping off



Polarization

Vertical and horizontal peak measurements

Comments

Continuous Tx - normal modulation - hopping off

Frequency	Peak Measurement	PACF	Corrected average	Limit	Comment
4800	56.4	7.6	48.8	54	Passed
MHz	dBμV/m	dB	dBμV/m	dBμV/m	

Test result

The measured peak field strengths are below the peak limit (Peak limit = Average limit + 20 dB). The corrected average field strengths are below the average limit.
 Corrected Average value = Peak value - PACF.

Test Port

Enclosure

Test frequency

2404 MHz

Test mode

Continuous Tx - normal modulation - hopping off

Condition

Normal

Compliant

Yes

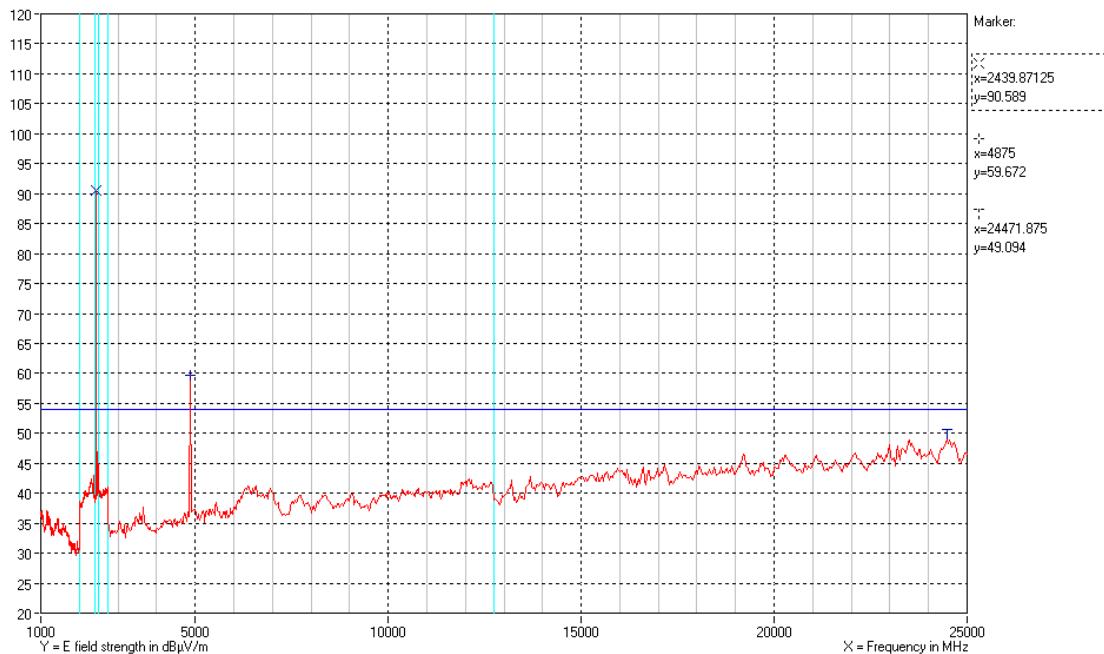
Comments

Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.
 Test voltage: External power supply at 1.3 V DC.



Test object	BO312	Sheet	RE_Spur-11
Type	BO312	Project no.	A506865-9
Serial no.	BO312-3	Date	03 Aug. 2010
Client	GN Hearing A/S	Initials	A-RAS
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	1 GHz–25GHz

Test method	ANSI C 63.4:2003	Temperature	20 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	60 % RH
Detector	Peak for 1GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty	4.9 dB

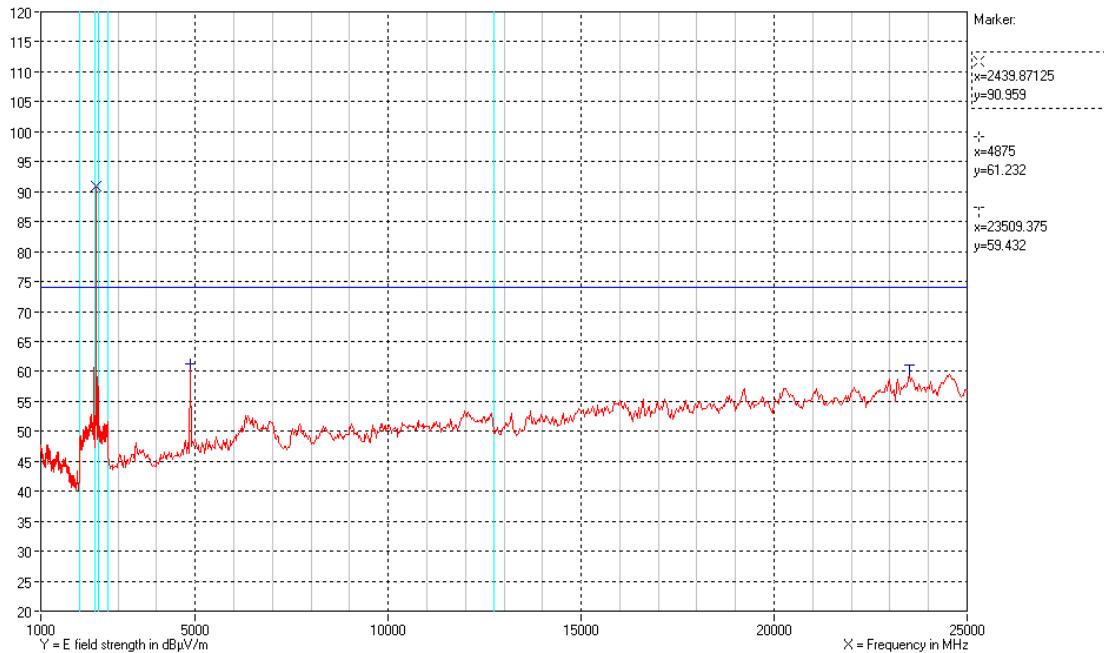


Polarization

Vertical and horizontal average measurements

Comments

Continuous Tx - normal modulation - hopping off



Polarization

Vertical and horizontal peak measurements

Comments

Continuous Tx - normal modulation - hopping off

Frequency	Peak Measurement	PACF	Corrected average	Limit	Comment
4875	59.7	7.6	52.1	54	Passed
MHz	dB μ V/m	dB	dB μ V/m	dB μ V/m	

Test result

The measured peak field strengths are below the peak limit (Peak limit = Average limit + 20 dB). The corrected average field strengths are below the average limit.
 Corrected Average value = Peak value - PACF.

Test Port

Enclosure

Test frequency

2440 MHz

Test mode

Continuous Tx - normal modulation - hopping off

Condition

Normal

Compliant

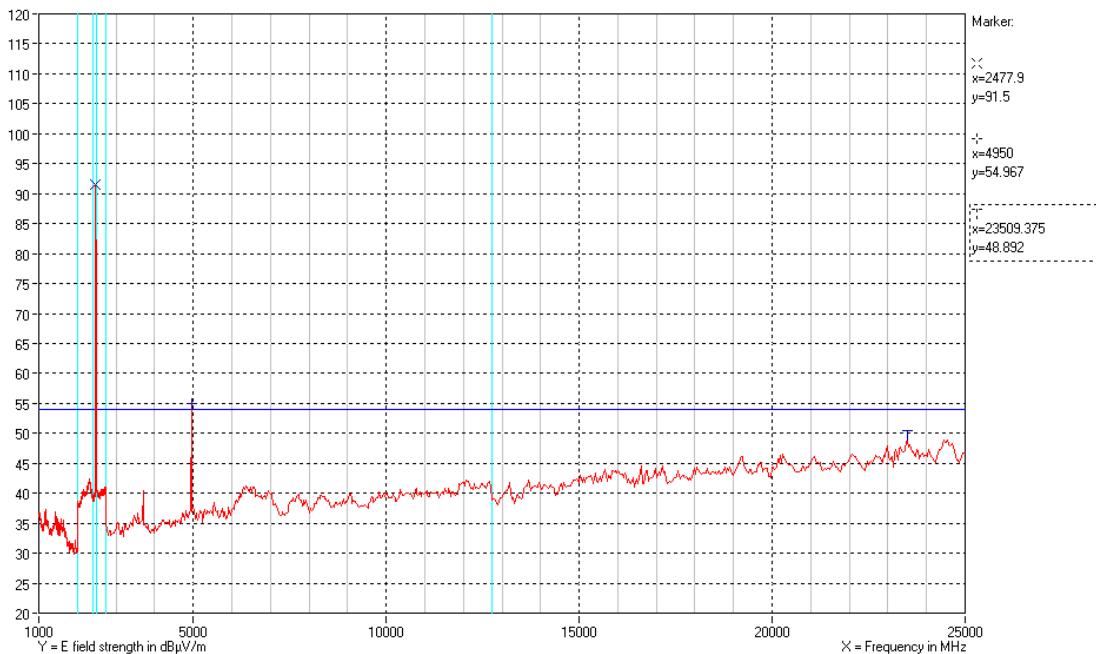
Yes

Comments

Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.
 Test voltage: External power supply at 1.3 V DC.

Test object	BO312	Sheet	RE_Spur-12
Type	BO312	Project no.	A506865-9
Serial no.	BO312-3	Date	03 Aug. 2010
Client	GN Hearing A/S	Initials	A-RAS
Specification	FCC CFR 47 Part 15, Subpart C, IC standard RSS-210, Issue 7:2007 and IC standard RSS-Gen, issue 2:2007	Frequency	1 GHz–25GHz

Test method	ANSI C 63.4:2003	Temperature	20 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	60 % RH
Detector	Peak for 1GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty	4.9 dB

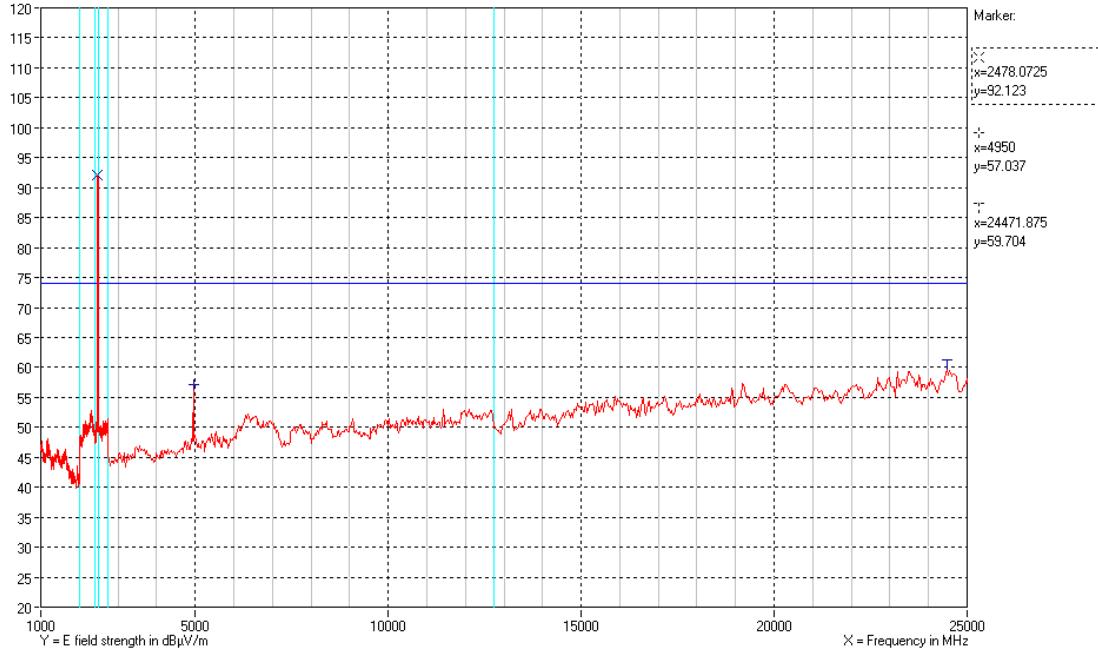


Polarization

Vertical and horizontal average measurements

Comments

Continuous Tx - normal modulation - hopping off



Polarization

Vertical and horizontal peak measurements

Comments

Continuous Tx - normal modulation - hopping off

Frequency	Peak Measurement	PACF	Corrected average	Limit	Comment
4950 MHz	55.0 dB μ V/m	7.6 dB	47.4 dB μ V/m	54 dB μ V/m	Passed

Test result

The measured peak field strengths are below the peak limit (Peak limit = Average limit + 20 dB). The corrected average field strengths are below the average limit.
 Corrected Average value = Peak value - PACF.

Test Port

Enclosure

Test frequency

2478 MHz

Test mode

Continuous Tx - normal modulation - hopping off

Condition

Normal

Compliant

Yes

Comments

Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.
 Test voltage: External power supply at 1.3 V DC.



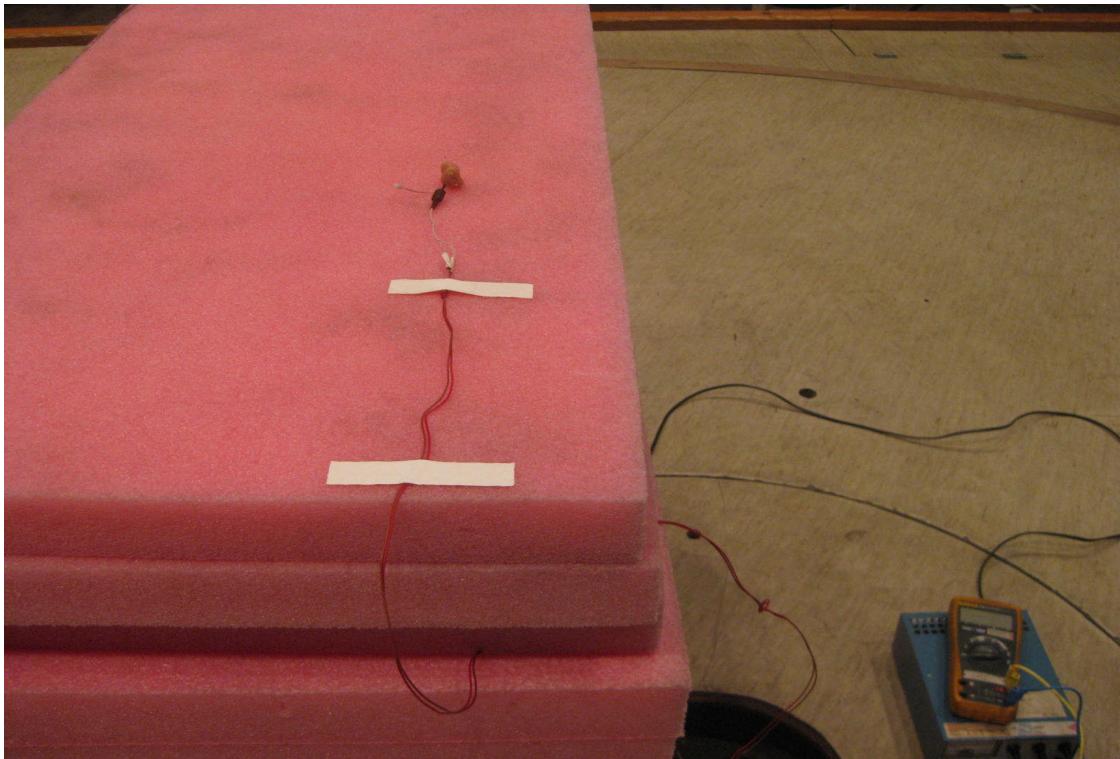


Photo 4.4.6 Test setup regarding measurement of radiated emission, 1 GHz to 25 GHz.

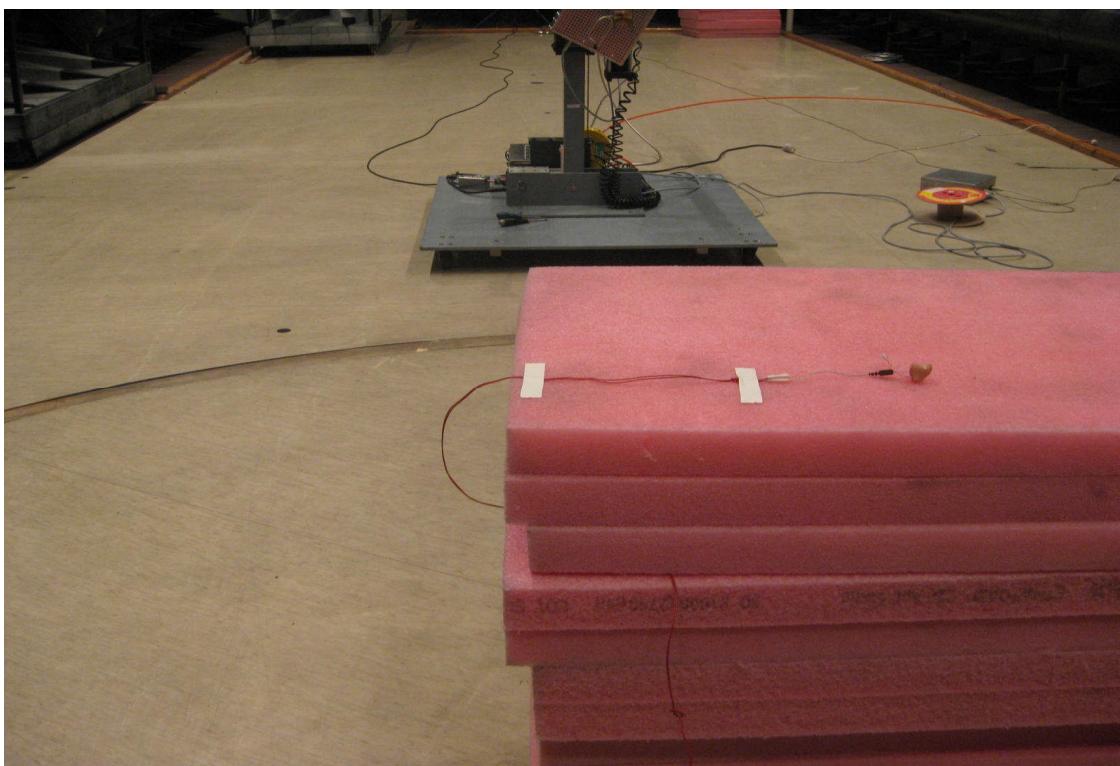


Photo 1.1.7 Test setup regarding measurement of radiated emission, 1 GHz to 25 GHz.

4.5 Measurement of field strength of fundamental

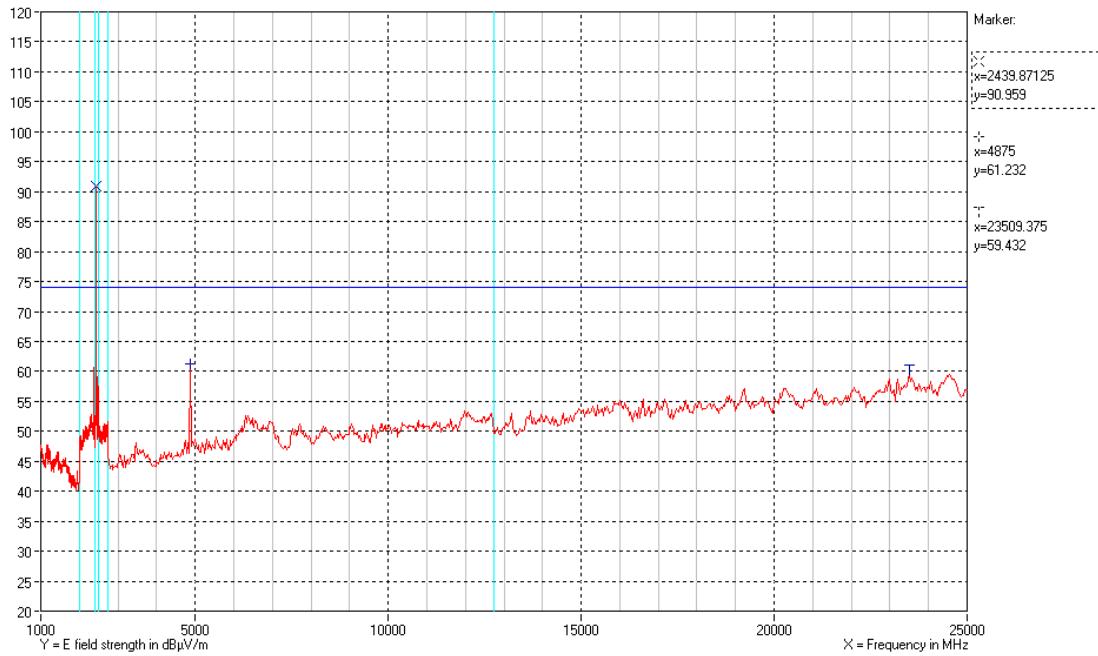
Test object	BO312	Sheet	RE_Spur-13
Type	BO312	Project no.	A506865-9
Serial no.	BO312-70	Date	03 Aug. 2010
Client	GN Hearing A/S	Initials	A-RAS
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.249(a) IC standard RSS-210, Issue 7:2007, Section A2.9		1 GHz–25GHz

Test method	ANSI C 63.4:2003	Temperature	21 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	58 % RH
Detector	Peak for 1GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty	4.9 dB

Operating frequency	Peak Measurement	PACF	Corrected average	Limit	Comment
2404	93.1	-	-	94	Passed
2440	91.0	-	-	94	Passed
2478	92.1	-	-	94	Passed
MHz	dB μ V/m	dB	dB μ V/m	dB μ V/m	

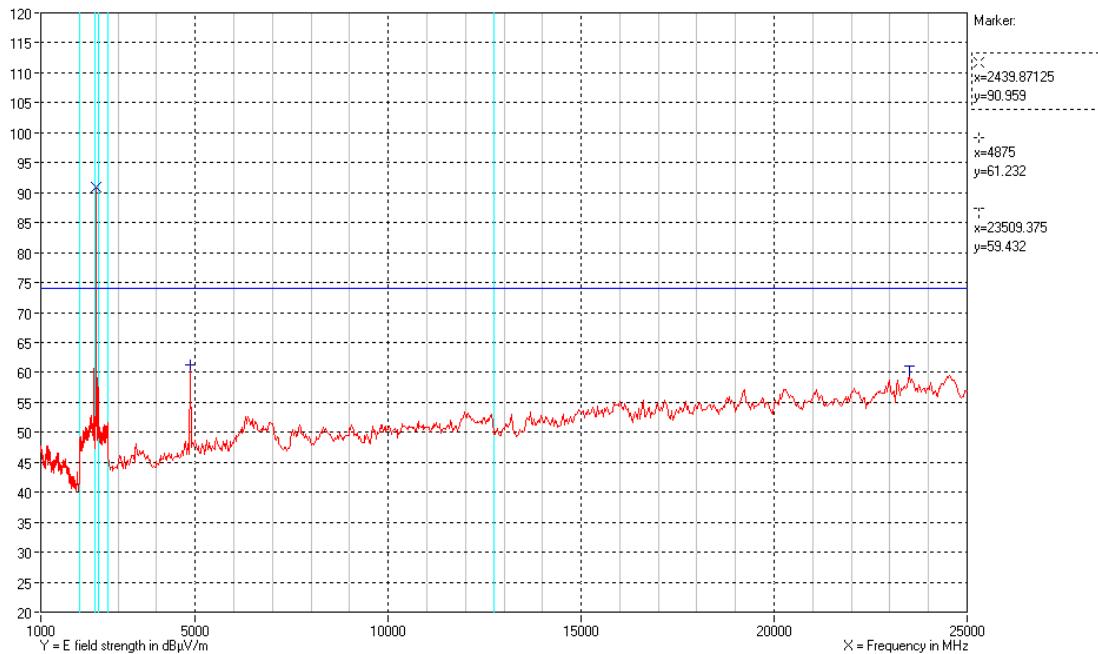
Note:

Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 1.3 V DC.



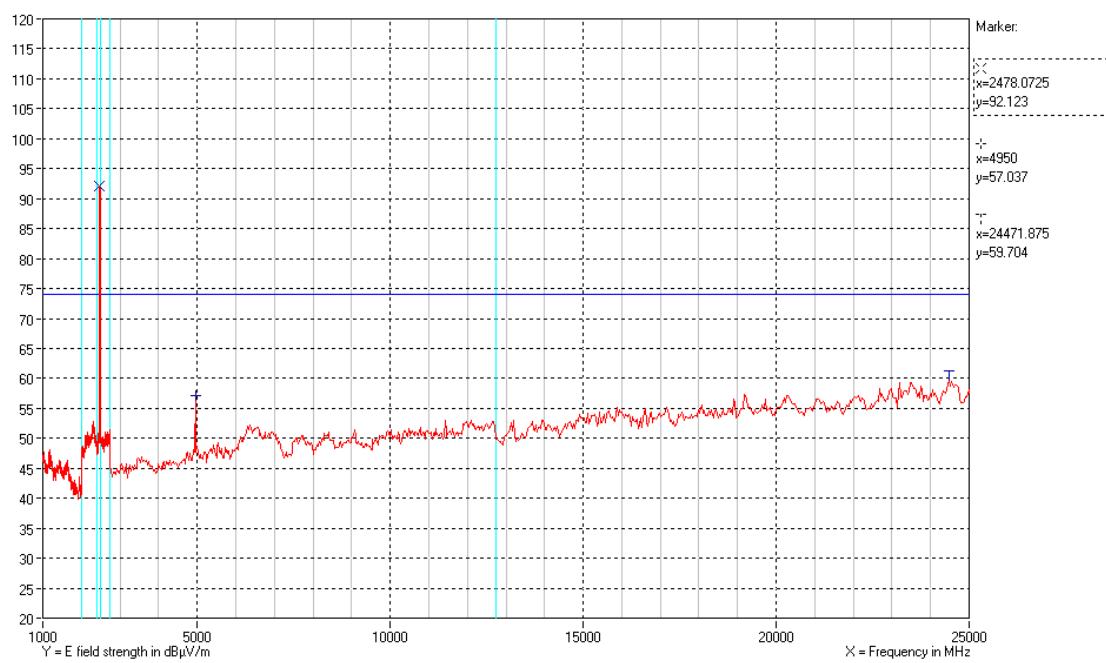
Comments

2404 MHz



Comments

2440 MHz



Comments

2478 MHz



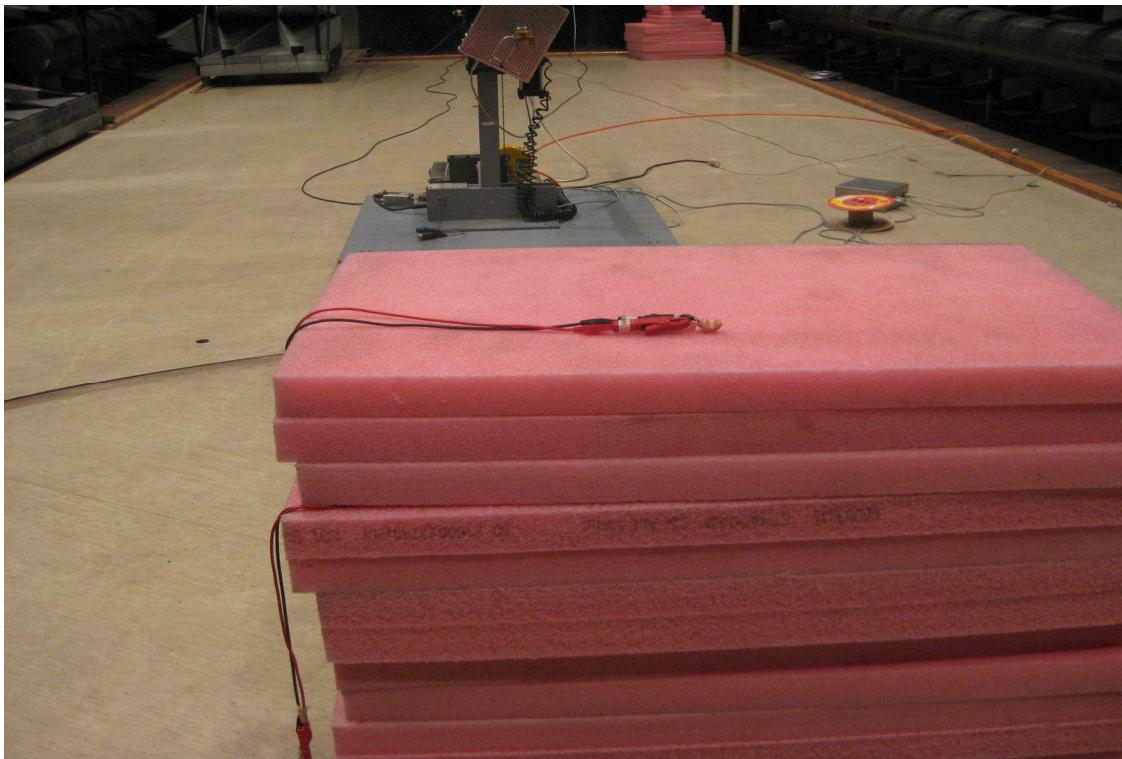


Photo 4.5.1 Test setup regarding measurement of field strength of fundamental.



Photo 4.5.2 Test setup regarding measurement of field strength of fundamental.



4.6 Measurement of 20 dB bandwidth

Test object	BO312	Sheet	PROF-1
Type	BO312	Project no.	A506865-9
Serial no.	BO312-64	Date	13 Aug. 2010
Client	GN Hearing A/S	Initials	JAS
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.215(c)		

Test method	ANSI C 63.4:2003		
Characteristics	Temperature: 22°C. Test voltage: External power supply at 1.3 V DC		
Test equipm.	29962 49321 49183		
SA Settings	RBW:100kHz VBW:300kHz SPAN:4/5/10MHz DET:Peak CF:Operating freq. Trace:Max hold		
Operating frequency	Low frequency	High frequency	Comment
2404	2402.893	2405.507	-
2440	2438.440	2442.178	-
2478	2476.133	2480.653	-
MHz	MHz	MHz	
	Measured	Limit	Comment
Lowest frequency	2402.893	2400.00	Passed
Highest frequency	2480.653	2483.50	Passed
	MHz	MHz	

Band edge criteria

20 dB bandwidth

Test result

The measured 20 dB bandwidth was within limit designated in 15.215(c).

Compliant

Yes

Test Port

Conducted - SMA connector

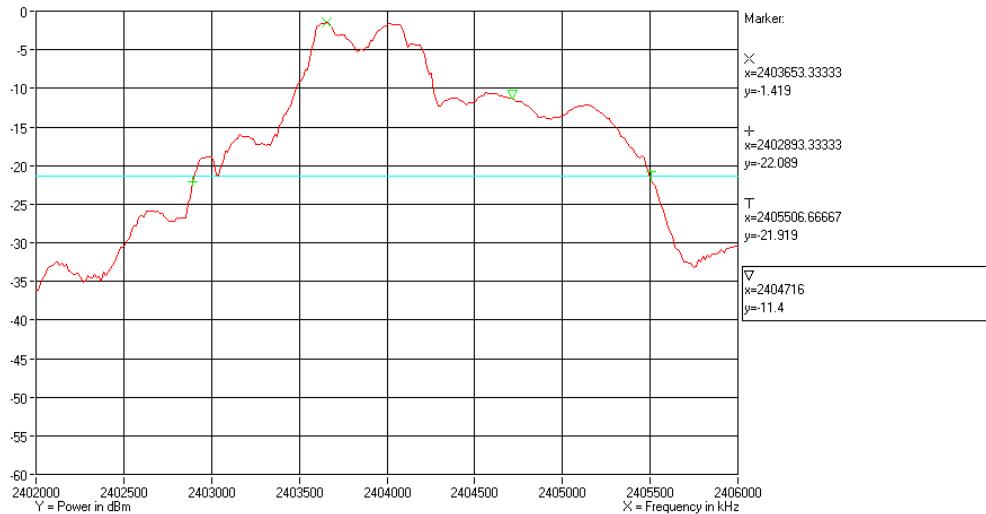
Test mode

Continuous Tx - normal modulation - hopping on

Comments

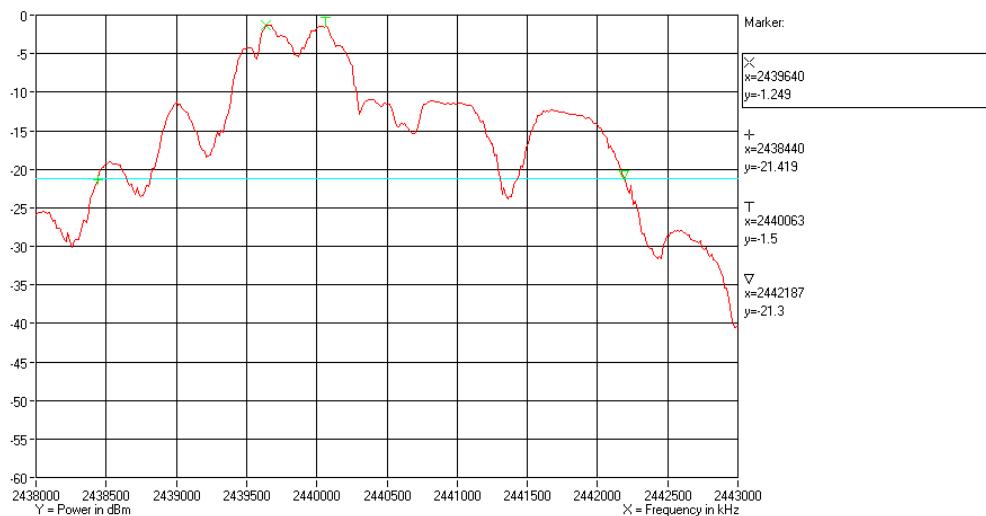
None





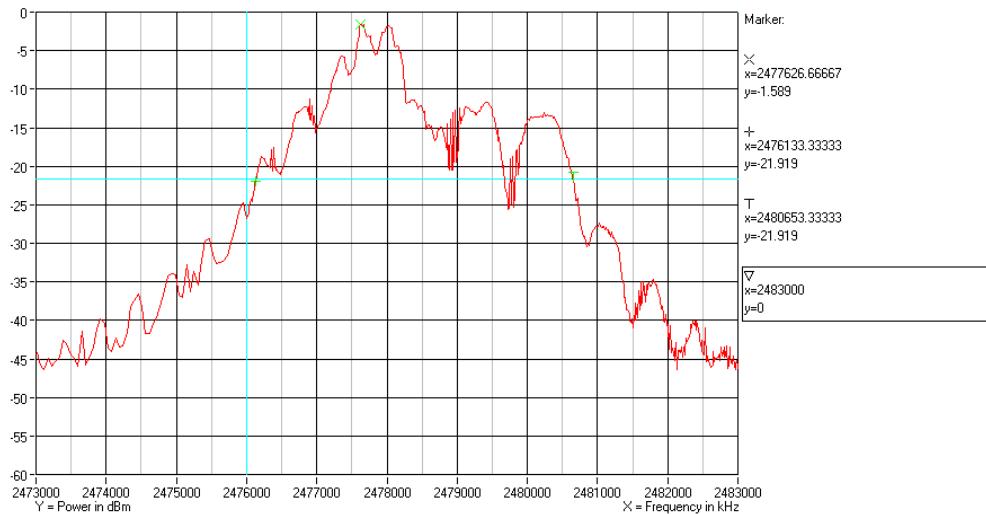
Comments

2404 MHz



Comments

2440 MHz



Comments

2478 MHz

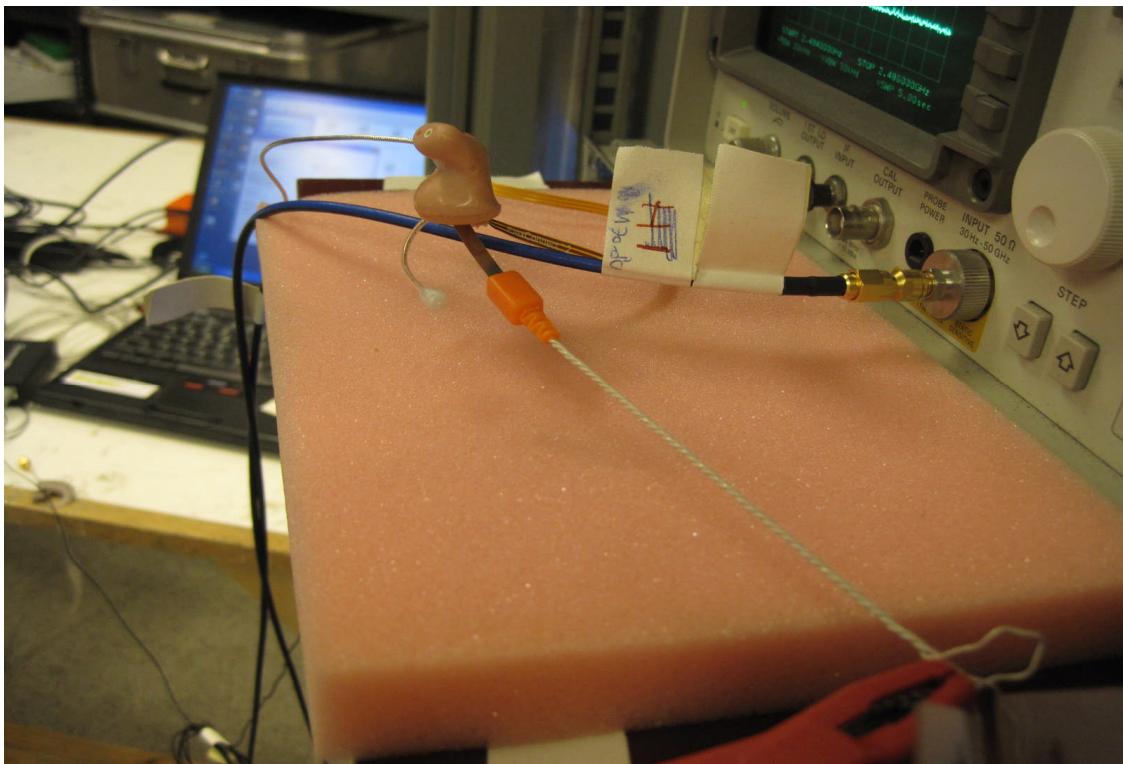


Photo 4.6.1 Test setup regarding measurement of 20 dB bandwidth.

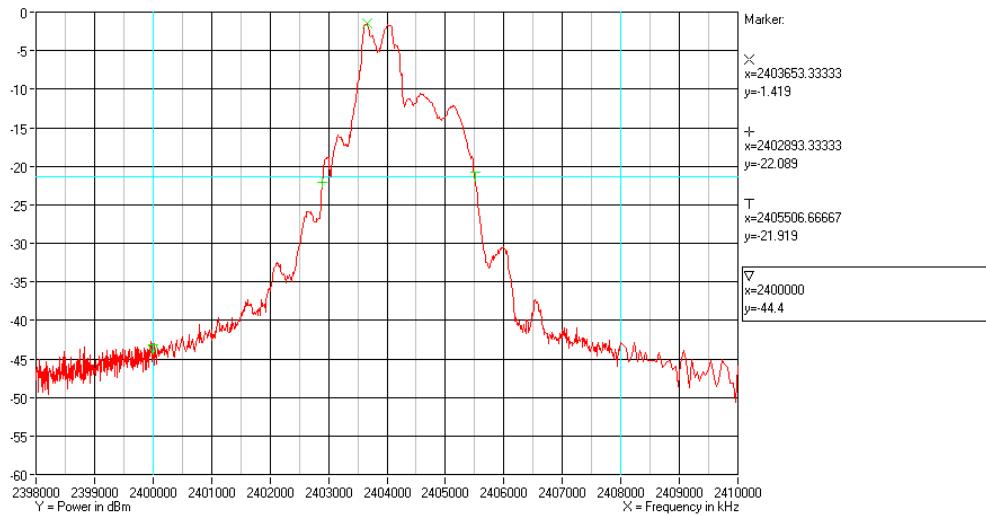
4.7 Measurement of band edge compliance

Test object	BO312	Sheet	PROF-2
Type	BO312	Project no.	A506865-9
Serial no.	BO312-64	Date	13 Aug. 2010
Client	GN Hearing A/S	Initials	JAS
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.249(d)(e) IC standard RSS-210, Issue 7:2007, Section A2.9		

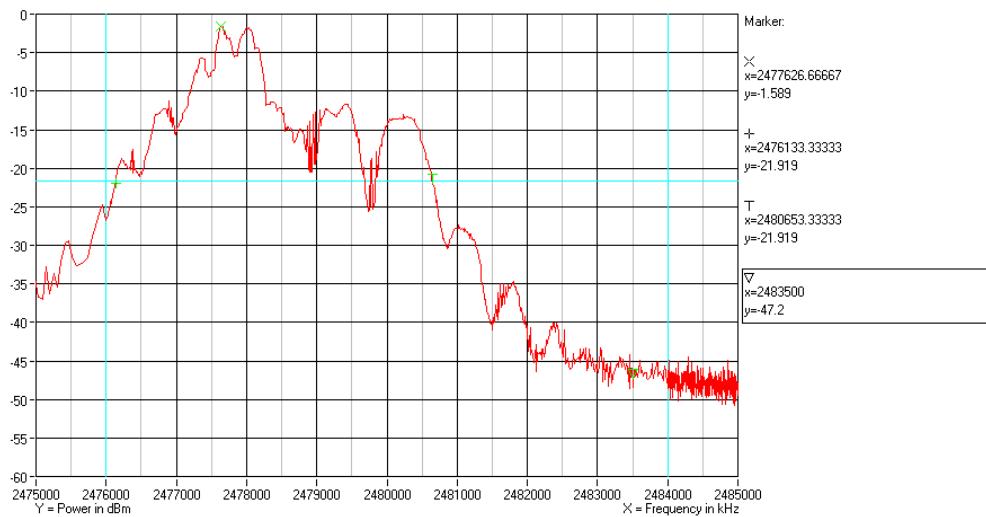
Test method	ANSI C 63.4:2003							
Characteristics	Temperature: 22°C. Test voltage: External power supply at 1.3 V DC							
Test equipm.	29962 49321 49183							
SA Settings	RBW:100KHz VBW:300KHz SPAN:12/10MHz DET:Peak CF:2404/2480MHz Trace:Max hold							
Operating frequency	Average / Peak	Measured Fundamental (peak)	Band Edge Correction Factor	Measured Band Edge (peak)	PACF	Corrected average	Limit	Comment
2404	Average	93.1	43.0	50.1	-	-	54	Passed
2404	Peak	93.1	43.0	50.1	-	-	74	Passed
2478	Average	92.1	45.6	46.5	-	-	54	Passed
2478	Peak	92.1	45.6	46.5	-	-	74	Passed
MHz	-	dB μ V/m	dB	dB μ V/m	dB	dB μ V/m	dB μ V/m	-
Measured Band Edge (peak) = Measured fundamental (peak)- Band Edge Correction Factor								
Band Edge Correction Factor = BECF (relative measurement)								
BECF = Measured conducted power of fundamental–measured conducted power of band edge [dB]								

Test result	The corrected field strengths are below the limit The measurements are corrected from a relative conducted power to radiated emission field strengths at the band edge.
Compliant	Yes
Test Port	Conducted - SMA connector
Test mode	Continuous Tx - normal modulation - hopping on
Condition	Normal
Comments	None





Comments 2404 MHz, Conducted peak measurements



Comments 2478MHz, Conducted peak measurements

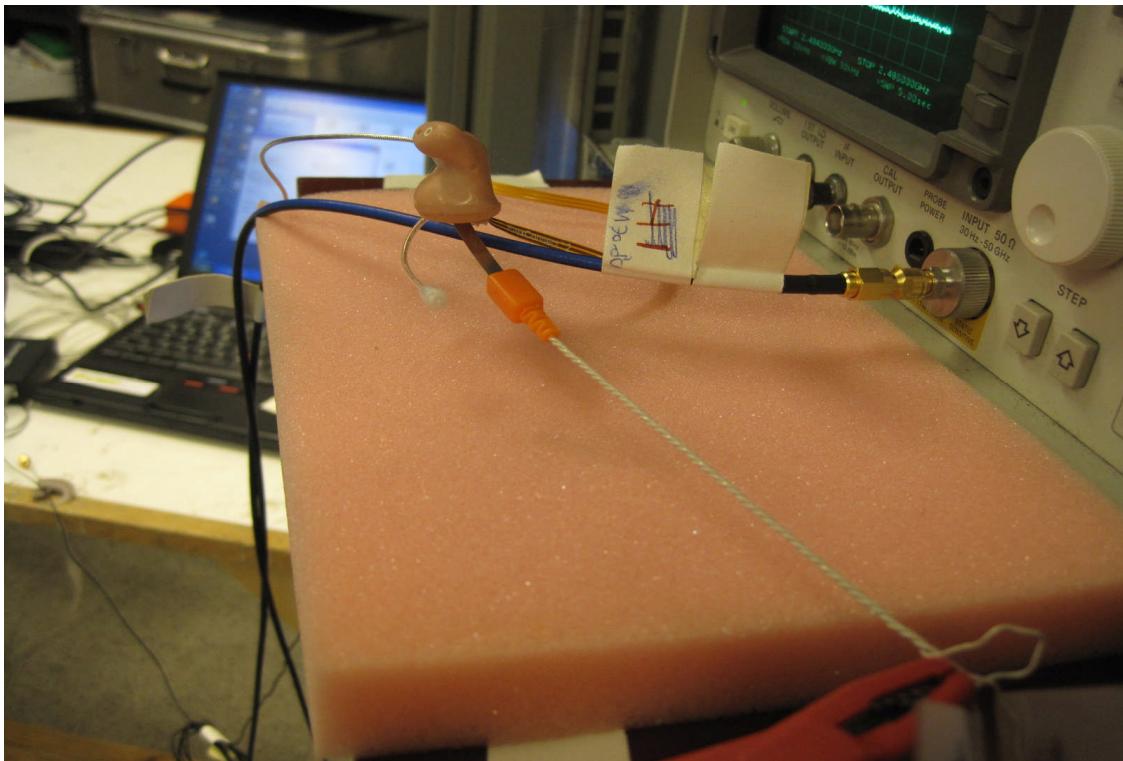


Photo 4.7.1 Test setup regarding measurement of band edge compliance.

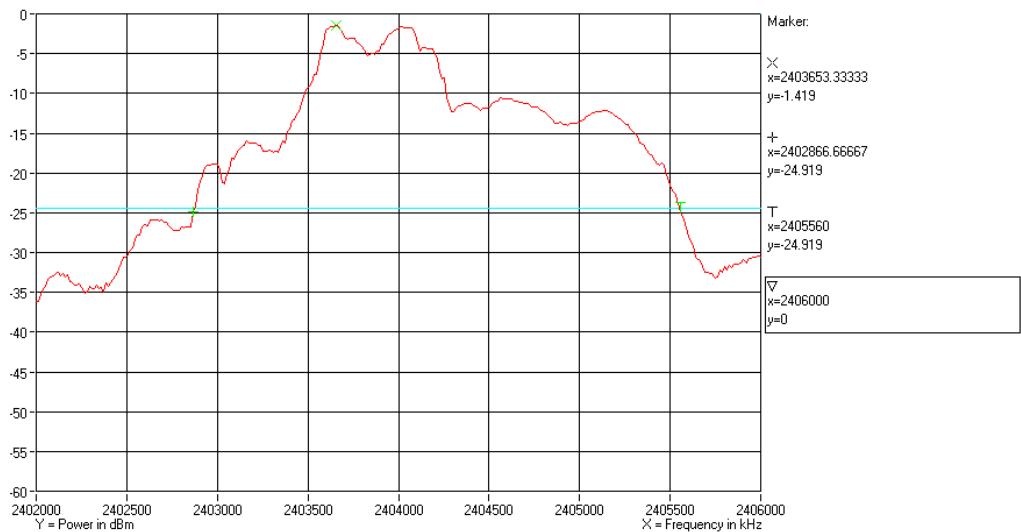


4.8 Measurement of occupied bandwidth, IC

Test object	BO312	Sheet	PROF-3
Type	BO312	Project no.	A506865-9
Serial no.	BO312-64	Date	13 Aug. 2010
Client	GN Hearing A/S	Initials	JAS
Specification	IC standard RSS-Gen, issue 2:2007 - Section 4.6.1		

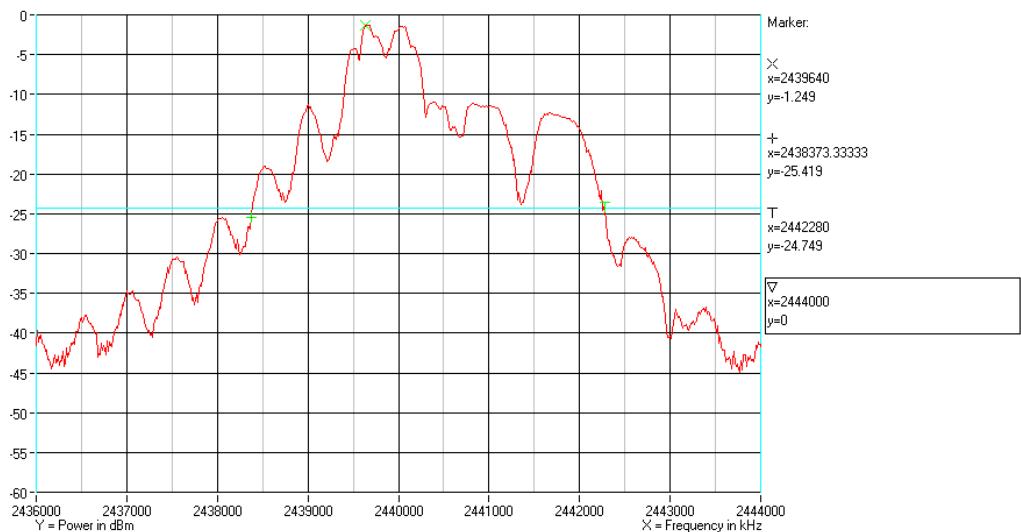
Test method	IC RSS-Gen:2007		
Characteristics	Temperature: 22°C. Test voltage: External power supply at 1.3 V DC		
Test equipm.	29962 49321 49183		
SA Settings	RBW:30kHz VBW:100kHz SPAN:4/8/10MHz DET:Peak CF:Operating freq. Trace:Max hold		
Operating frequency	Low frequency	High frequency	Measured 99% emission bandwidth
2404	2402.867	2405.560	2.693
2440	2438.373	2442.280	3.907
2478	2476.053	2480.733	4.680
MHz	MHz	MHz	MHz
Note:			

Band edge criteria	Measured 99% emission bandwidth
Test Port	Conducted - SMA connector
Test mode	Continuous Tx - normal modulation - hopping on
Comments	None



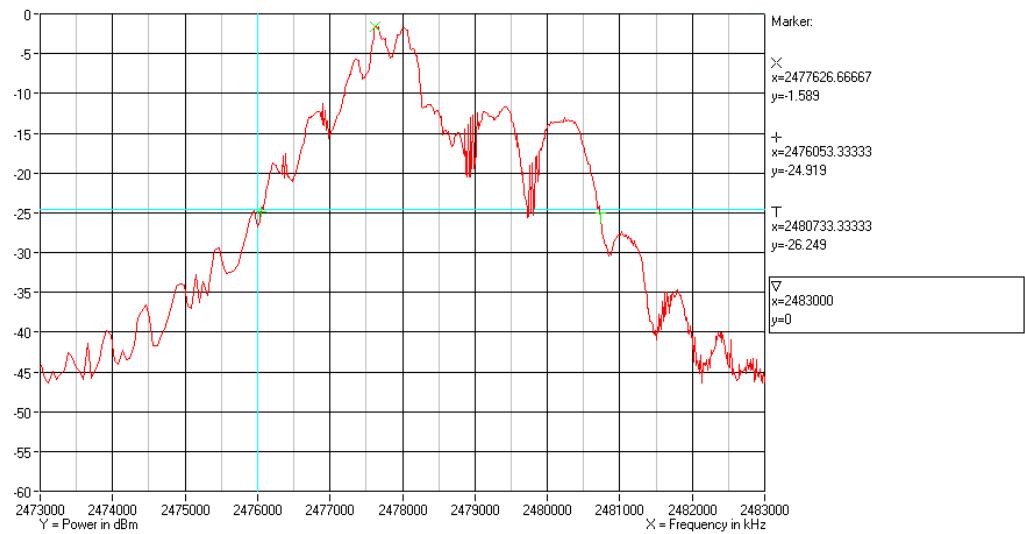
Comments

2404 MHz



Comments

2440 MHz



Comments 2478 MHz

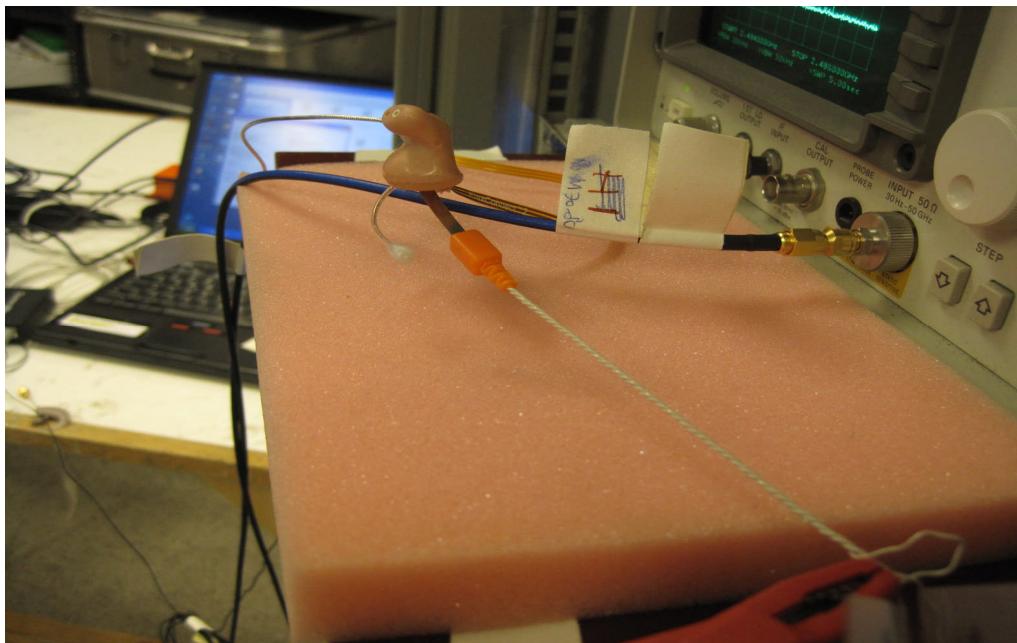
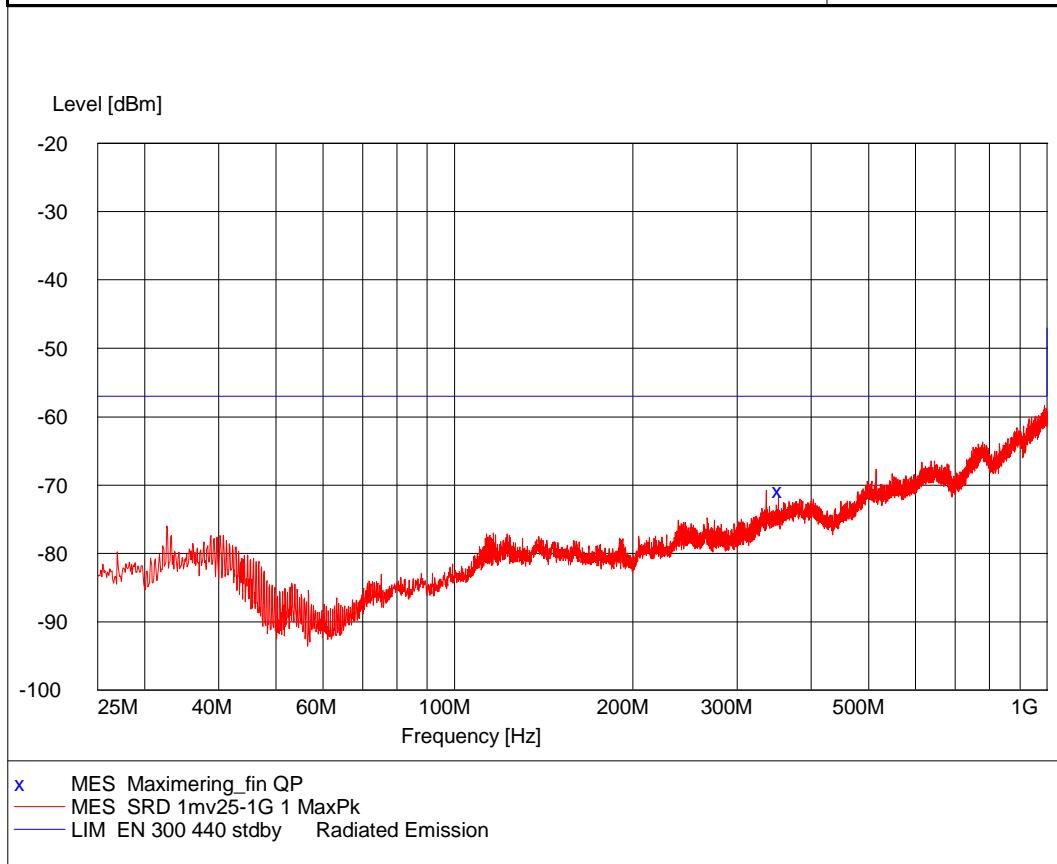


Photo 4.8.1 Test setup regarding measurement of occupied bandwidth, IC.

4.9 Measurement of radiated emission, Rx, IC

Test object	Combination of 2.1.2: BO312 2.1.3: BO312	Sheet	RE_Spur-14
Type	See section 2	Project no.	A506865-9
Serial no.	See section 2	Date	09 July. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	IC standard RSS-210, Issue 7:2007, 2,6 IC standard RSS-Gen, issue 2:2007, Gen, 7.2.3.2	Frequency	25MHz–1GHz

Test method	EN 300 440-1 V1.5.1:2009	Temperature	24 °C
Characteristics	Pre-scan, Antenna at 10 m, 1 m height, vert. pol.	Humidity	61 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

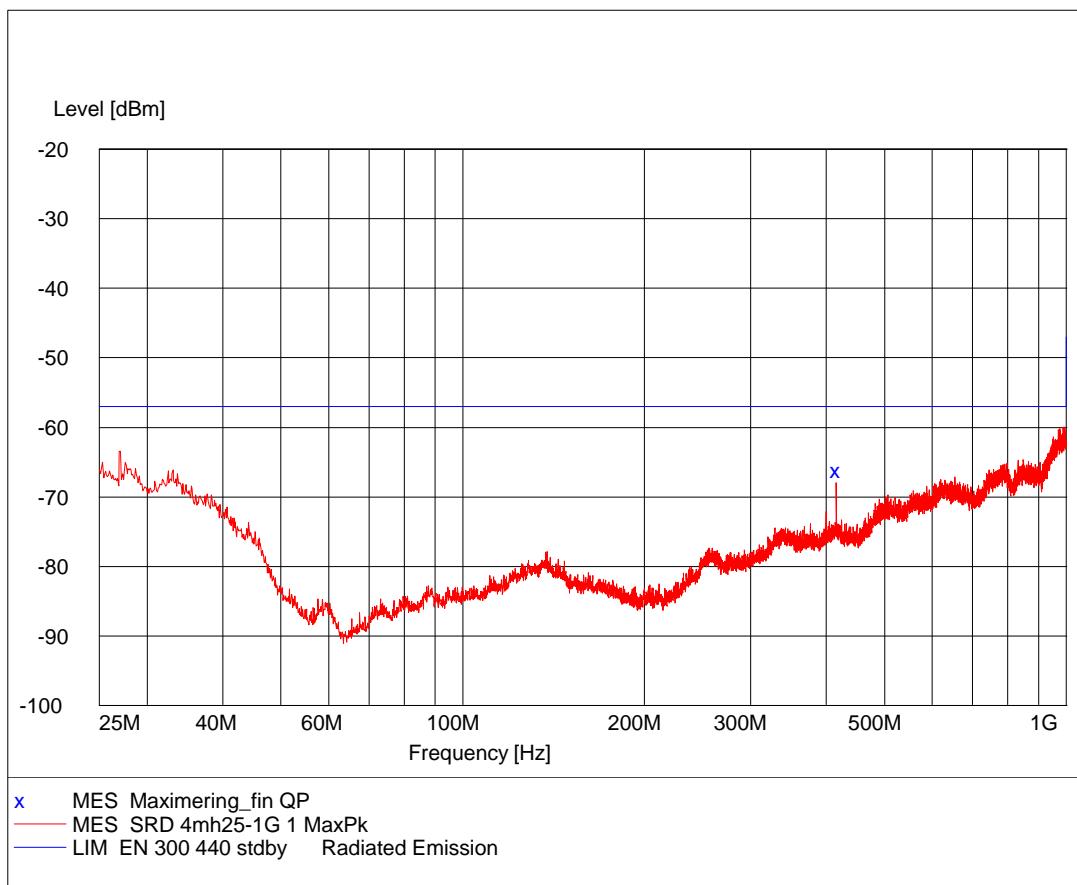


Comments

Continuous Rx & Tx standby - normal modulation - hopping between lowest and highest operating freq.

Test object	Combination of 2.1.2: BO312 2.1.3: BO312	Sheet	RE_Spur-15
Type	See section 2	Project no.	A506865-9
Serial no.	See section 2	Date	09 July. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	IC standard RSS-210, Issue 7:2007, 2,6 IC standard RSS-Gen, issue 2:2007, Gen, 7.2.3.2	Frequency	25MHz–1GHz

Test method	EN 300 440-1 V1.5.1:2009	Temperature	24 °C
Characteristics	Pre-scan, Antenna at 10 m, 4 m height, hor. pol.	Humidity	61 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



Comments

Continuous Rx & Tx standby - normal modulation - hopping between lowest and highest operating freq.

Test object	Combination of 2.1.2: BO312 2.1.3: BO312	Sheet	RE_Spur-16
Type	See section 2	Project no.	A506865-9
Serial no.	See section 2	Date	09 July. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	IC standard RSS-210, Issue 7:2007, 2,6 IC standard RSS-Gen, issue 2:2007, Gen, 7.2.3.2	Frequency	25MHz–1GHz

Test method	EN 300 440-1 V1.5.1:2009	Temperature	24 °C
Characteristics	Peak search ant. at 10 m, height: 1-4 m, v/h pol.	Humidity	61 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

MEASUREMENT RESULT: "Maximering_fin QP"

09-07-2010 13:54

Frequency MHz	Level dBm	Transd dB	Limit dBm	Margin dB	Height cm	Azimuth deg	Polarisation
352.000000	-70.80	-89.9	-57.0	13.8	240.0	232.00	Vertical
416.000000	-66.20	-90.2	-57.0	9.2	354.0	261.00	Horizontal

Test result	The measured field strengths are below the limit.
Polarization	Horizontal and vertical
Test Port	Enclosure
Test frequency	2404/2478 MHz & 2440 MHz
Test mode	Continuous Rx & Tx standby - normal modulation - hopping between lowest and highest operating freq.
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. The radiated substitution test method of EN 300 440 was used to demonstrate compliance with the limits for RSS-Gen, Section 7.2.3.



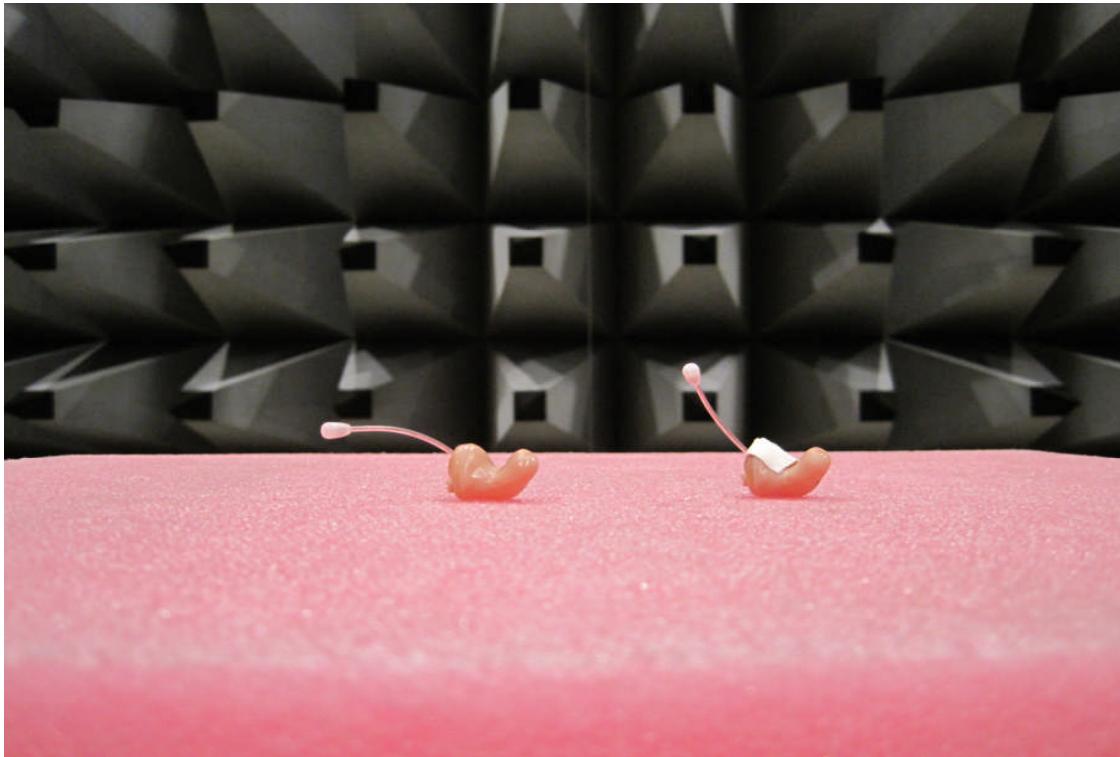


Photo 4.9.1 Test setup regarding measurement of radiated emission, Rx, IC, 30 MHz to 1000 MHz.

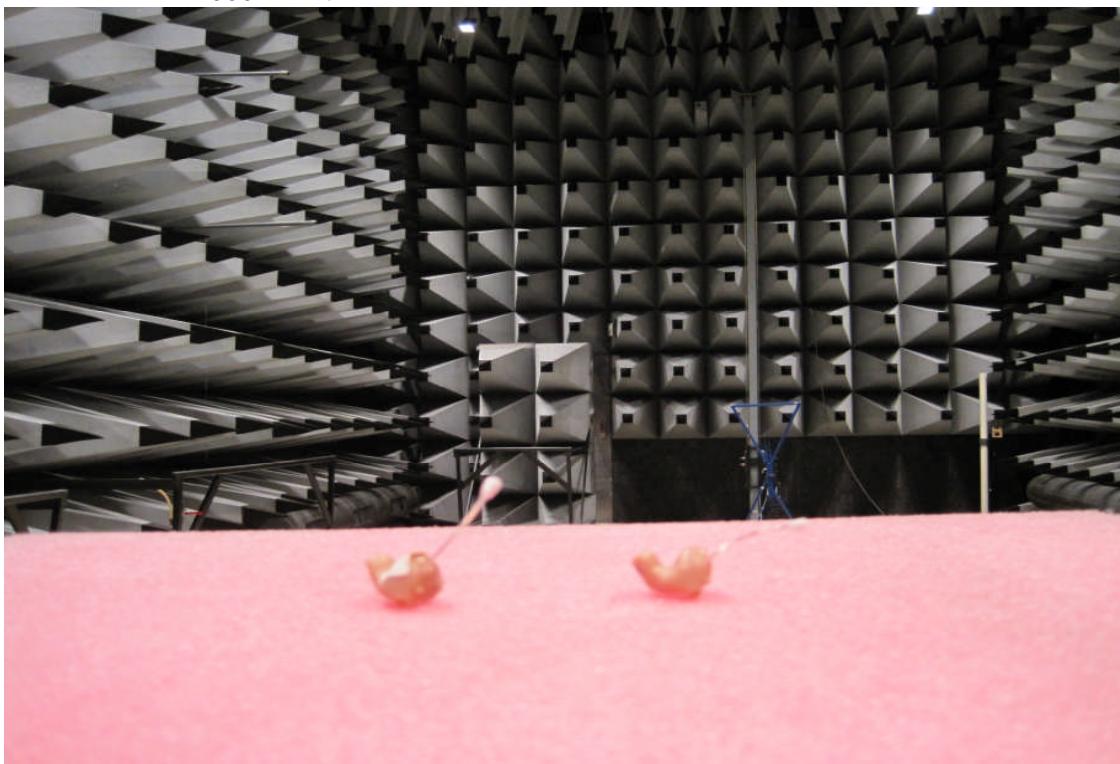
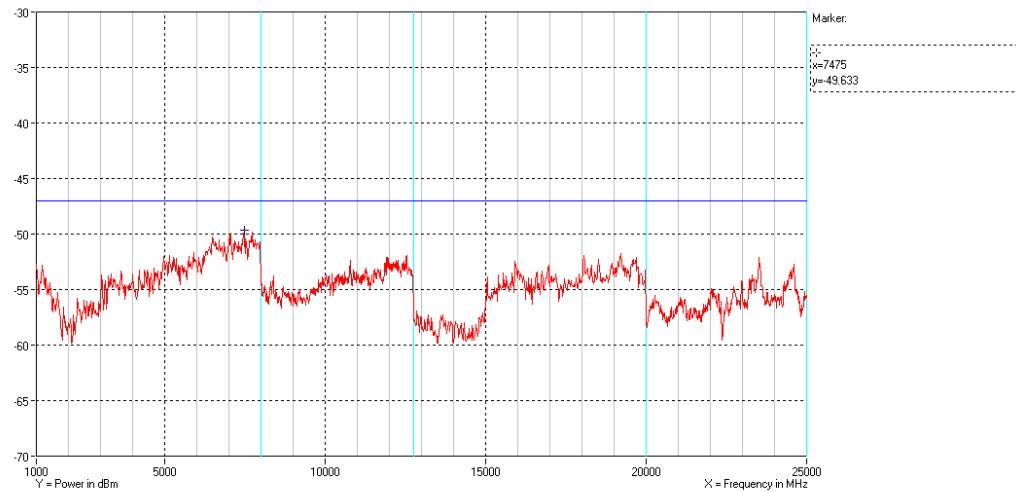


Photo 4.9.2 Test setup regarding measurement of radiated emission, Rx, IC, 30 MHz to 1000 MHz.

Test object	Combination of 2.1.2: BO312 2.1.3: BO312	Sheet	RE_Spur-17
Type	See section 2	Project no.	A506865-9
Serial no.	See section 2	Date	23 Aug. 2010
Client	GN Hearing A/S	Initials	JAS
Specification	IC standard RSS-210, Issue 7:2007, 2,6 IC standard RSS-Gen, issue 2:2007, Gen, 7.2.3.2	Frequency	1GHz–25GHz

Test method	EN 300 440-1 V1.5.1:2009	Temperature	33 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	59 % RH
Detector	Peak for 1GHz to 8 GHz	Bandwidth	1 MHz
Detector	Peak for 8 GHz to 12.75GHz	Bandwidth	300 kHz
Detector	Peak for 12.75GHz to 20 GHz	Bandwidth	100 kHz
Detector	Peak for 20 GHz to 25 GHz	Bandwidth	30 KHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty	4.9 dB



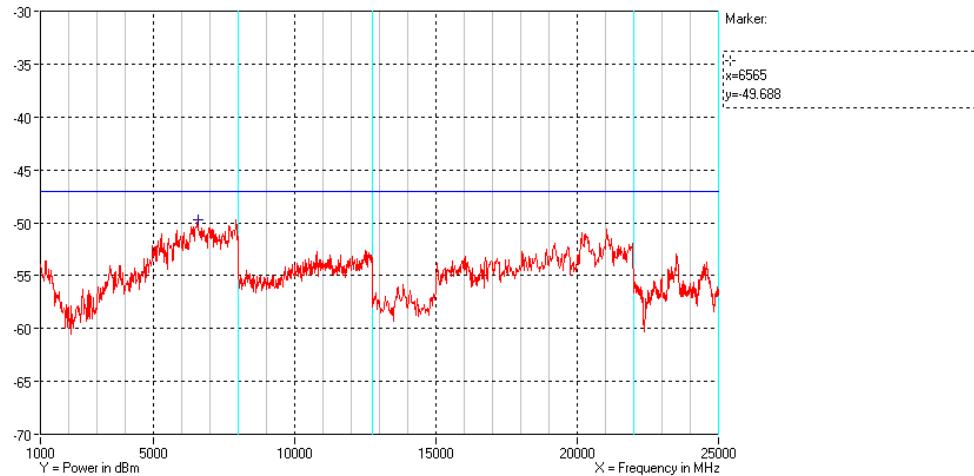
Polarization

Horizontal peak measurements

Comments

Continuous Rx & Tx standby - normal modulation - hopping between lowest and highest operating freq.





Polarization	Vertical peak measurements
Comments	Continuous Rx & Tx standby - normal modulation - hopping between lowest and highest operating freq.
Test result	The measured field strengths are below the limit.
Test Port	Enclosure
Test frequency	2440 MHz
Test mode	Continuous Rx and Tx standby - normal modulation - hopping between lowest and highest operating freq.
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization. The radiated substitution test method of EN 300 440 was used to demonstrate compliance with the limits for RSS-Gen, Section 7.2.3.



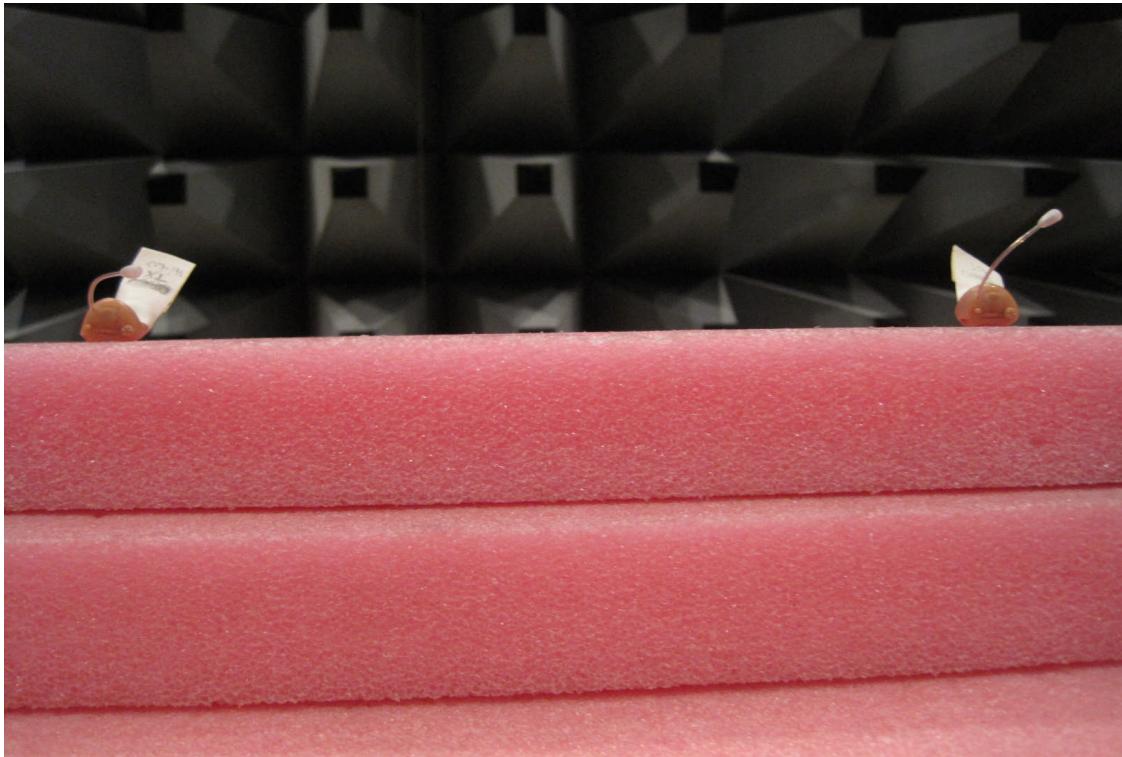


Photo 4.9.3 Test setup regarding measurement of radiated emission, Rx, IC, 1 GHz to 25 GHz.

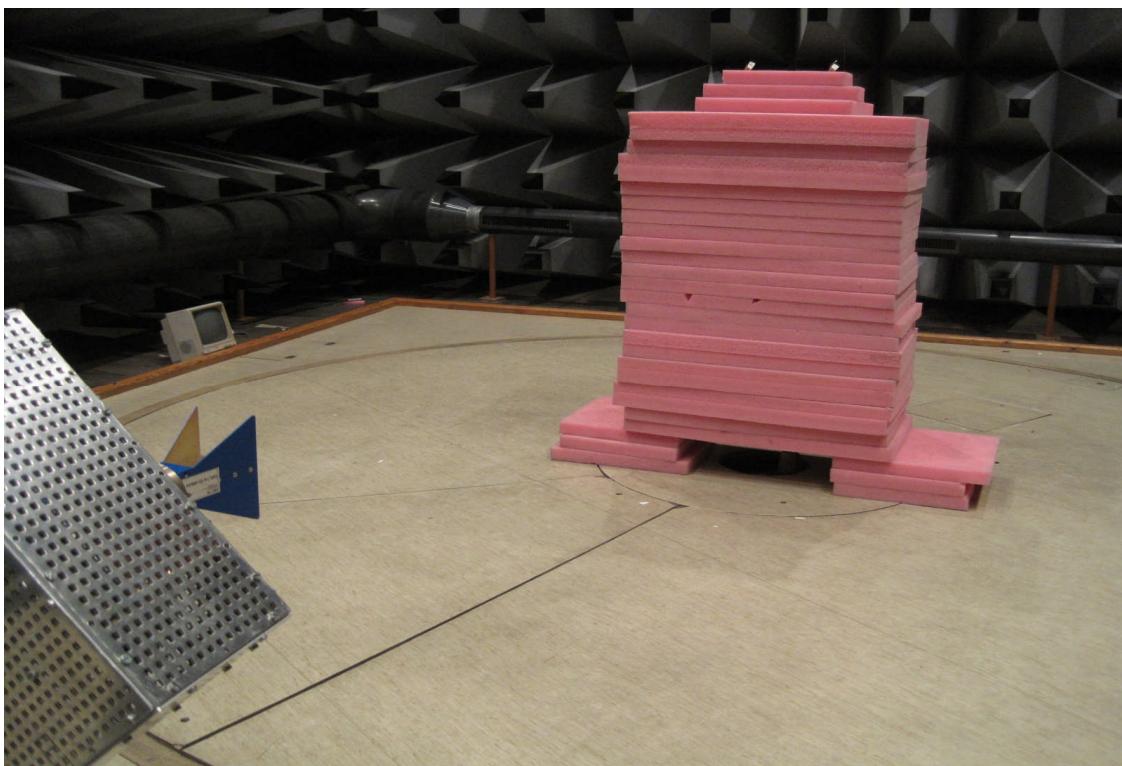


Photo 4.9.4 Test setup regarding measurement of radiated emission, Rx, IC, 1 GHz to 25 GHz.

5. National registrations and accreditations

5.1 DANAK Accreditation

Organization: Danish Accreditation and Metrology Fund - DANAK, see www.danak.dk and www.ilac.org

Registration Number: 19

Area Number: C

DANAK is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement). The MRA includes the Australian NATA and Canadian SCC.

CISPR 22 is equivalent to AS/NZS CISPR 22, and therefore this report can be used for applying the **Australian C-Tick mark** for IT equipment, when this test has been passed.

CISPR 22:2002 is equivalent to ICES-003:2004, and therefore this report can be used for approval in Canada for IT equipment, when this test has been passed.

5.2 FCC Registrations

Organization: Federal Communications Commission, USA

Registration Number: 90529

Facilities:
OATS Hørsholm (EMC-0)
EMC room 2 Hørsholm (EMC-2)
EMC room 3 Hørsholm (EMC-3)
EMC room 4 Hørsholm (EMC-4)
EMI room Hørsholm (EMC-5)

5.3 VCCI Registrations

Organization: Voluntary Control Council for Interference by Information Technology, Japan

Member Number: 910

Facilities:
OATS Hørsholm (EMC-0): R-691
EMC room 2 Hørsholm (EMC-2): C-707, T-246 and T-1547
EMC room 3 Hørsholm (EMC-3): C-2532, T-247 and T-1548
EMC room 4 Hørsholm (EMC-4): C-2533, T-248 and T1549
EMI room Hørsholm (EMC-5): R-1180, C-706, T-249 and T-1550



5.4 IC Registrations

Organization: Industry Canada, Certification and Engineering Bureau

Registration Number: IC4187A-5

Facilities: EMI room Hørsholm (EMC-5)



6. List of instruments

No.	Description	Manufacturer	Type No.
29332	ACTIVE LOOP ANTENNA	ROHDE & SCHWARZ	HFH-Z2
29494	MICROWAVE CABLE, FIXED ROOM 1 CABLE	SUHNER	SUCOFLEX 104
29503	LOOP ANTENNA CHECK GENERATOR	EC	PTJ
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A
29861	EMI-SOFTWARE Ver. 1.60	ROHDE & SCHWARZ	ES-K1, PART: 1026.6790.02
29962	DIGITAL MULTIMETER, ROOM xx	FLUKE	77 SERIES III
49183	POWER SUPPLY	TTI	PL 320
49299	DIGITAL MULTIMETER	Fluke	87-4
49321	SPECTRUM ANALYZER, 50GHz with option 006	HEWLETT-PACKARD	8565E
49431	MICROWAVE CABLE, 2 m fixed at EMI-room	SUHNER	SUCOFLEX 104
49436	MICROWAVE CABLE, 1 m SMA-SMA	SUHNER	SUCOFLEX 104
49532	MICROWAVE CABLE, 1 m	SUHNER	SUCOFLEX 104
49600	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESU40
49622	CABLE 3.25 M PC3.5 MALE-FEMALE SUCOFLEX 104	HUBER+SUHNER	
49623	CABLE 16 M PC3.5 MALE-MALE SUCOFLEX 104PB	HUBER+SUHNER	
49624	DUAL RIDGE HORN ANTENNA – 1GHZ-26GHZ (2GHZ-32GHZ)	SATIMO	SH2000
49625	SRD COAX SWITCH MATRIX USED IN 1GHZ TO 26GHZ SRD ANTENNASYSTEM	DELTA	COAX SWITCH MATRIX