

DELTA Test Report



Radio parameter test of FD-1

Performed for GN Hearing A/S

DANAK-1910854, Rev. B

Project no.: A506404-2

Page 1 of 50

14 April 2010


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Title	Radio parameter test of FD-1
Test object	FD-1
Report no.	DANAK-1910854, Rev. B
Project no.	A506404-2
Test period	6 November 2009 to 13 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
Results	The test objects were found to be in compliance with the specifications, as listed in Section 1
Test personnel	Claus Momme Thomsen Henrik Egebjerg Nielsen Jan Askov



Date 14 April 2010

Project Manager 
Jan Askov
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Responsible 
Claus Rømer Andersen
Team Manager, Wireless
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This report is a revision of the test report A506404-2 Rev. A dated 14 April 2010.

The revision has been made due to the following:

Units corrected on page 34, 36 and 38 (dB μ V changed to dB μ V/m).

Instrument list revised to include calibration date and calibration interval.

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1. Summary of tests

Tests	Test methods	Rule Section	Results
Peak to Average Correction Factor (PACF)		15.35(c)	N.A.
Antenna requirement	Visual inspection	15.203	Passed
Measurement of radio frequency voltage on mains	ANSI C63.4:2003	15.207	Passed
Measurements of radiated emission	ANSI C63.4:2003	15.209	Passed
Measurement of band edge compliance	ANSI C63.4:2003	15.215(c)	Passed
Measurement of field strength of fundamental	ANSI C63.4:2003	15.249	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.

The test results relate only to the objects tested.



2. Test objects

2.1 Test objects

Test object 2.1.1

Name of test object	FD-1	
Model / type	FD-1	
Part no.	FD-001	
Serial no.	EMC 3-Spurious Emissions	
FCC ID	X26FD-1	
Manufacturer	GN Hearing A/S	
Supply voltage	USB power supply	
Software version	Special firmware for spurious emission test Version:0D	Ver-
Cycle time	0.5 ms / 1.0 ms	
Comments	Supplied by external power supply	

Test object 2.1.2

Name of test object	FD-1	
Model / type	FD-1	
Part no.	FD-002	
Serial no.	EMC 3-Conducted	
FCC ID	X26FD-1	
Manufacturer	GN Hearing A/S	
Supply voltage	USB power supply	
Software version	Special firmware for Spurious emission test Version:0D	
Cycle time	0.5 ms / 1.0 ms	
Comments	Antenna replaced by SMA connector and supplied by external power supply	



Auxiliary equipment 2.1.3

Name of auxiliary equipment	PC Laptop
Model / type	ThinkPad T43
Part no.	2669-CTO
Serial no.	L3-KTDP6
FCC ID	-
Manufacturer	IBM
Supply voltage	220 V via adaptor for Test PC
Comments	Test PC - USB power for FD-1 Auxiliary equipment supplied by the client



3. General test conditions

3.1 Test setup during test

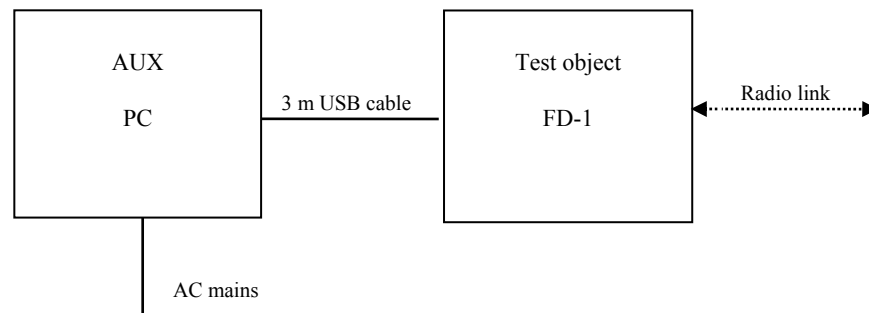


Figure 3.1.1 Block diagram of test object and auxiliary equipment.

All test objects were running special test software.

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

Tests were performed at three frequencies

- Low frequency: 2404 MHz
- Middle frequency: 2441 MHz
- High frequency: 2478 MHz.

During relevant tests, the test PC was replaced by an external DC power supply.

Intended use

FD-1 is used to fit or configure hearing aids to the hearing aid user.

It is intended to be used at hearing clinics only, i.e. it is not intended for connection to a Class B personal computer. FD-1 is a Class A device.

Size of the test object

The test object measures 45 x 20 x 10 mm.



3.2 Description of radio link

The radio of the test object has the following specified RF parameters:

Antenna	:	PCB antenna
Operating frequency range	:	2404 to 2478 MHz
Transmit power	:	0 dBm
Power level	:	No
No of channels	:	20
Bandwidth (Specification)	:	2 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	:	5 V DC - USB power supply Specified min voltage: 4.4 V DC Specified max voltage: 5.5 V DC
Temperature category	:	-20 to +55 °C.



3.3 Test sequence

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

1. Measurement of spurious emission
2. Measurement of field strength of fundamental
3. Measurement of Peak to Average Correction Factor (PACF)
4. Measurement of radio frequency voltage on mains
5. Measurement of band edge compliance
6. Antenna requirement.
7. Measurement of radiated emission, 0.009-30 MHz



4. Test results

4.1 Peak to Average Correction Factor (PACF)

Test object	FD-1	Sheet	PACF-1
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	22 Dec. 2009
Client	GN Hearing A/S	Initials	JAS
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.35(c)		
Characteristics	Temperature: 24 °C. Test voltage: 5.0 V DC		
Test equipm.	49550 49183 49299 Uncertainty: 1•10-7		
SA Settings	RBW: 3 MHz VBW: 10 MHz SPAN: Zero-2ms DET: Peak CF: 2441 MHz Trace: Max Hold		

The measured value for the Duty Cycle (DC):

Max. Tx on time: 205.1 μ s – Delta 3 (T1)
 Period: 1160.3 μ s – Delta 2 (T1).

The calculated duty cycle is:

DC: $(205.1 \mu\text{s} / 1160.3 \mu\text{s}) \cdot 100\% = 17.7 \%$.

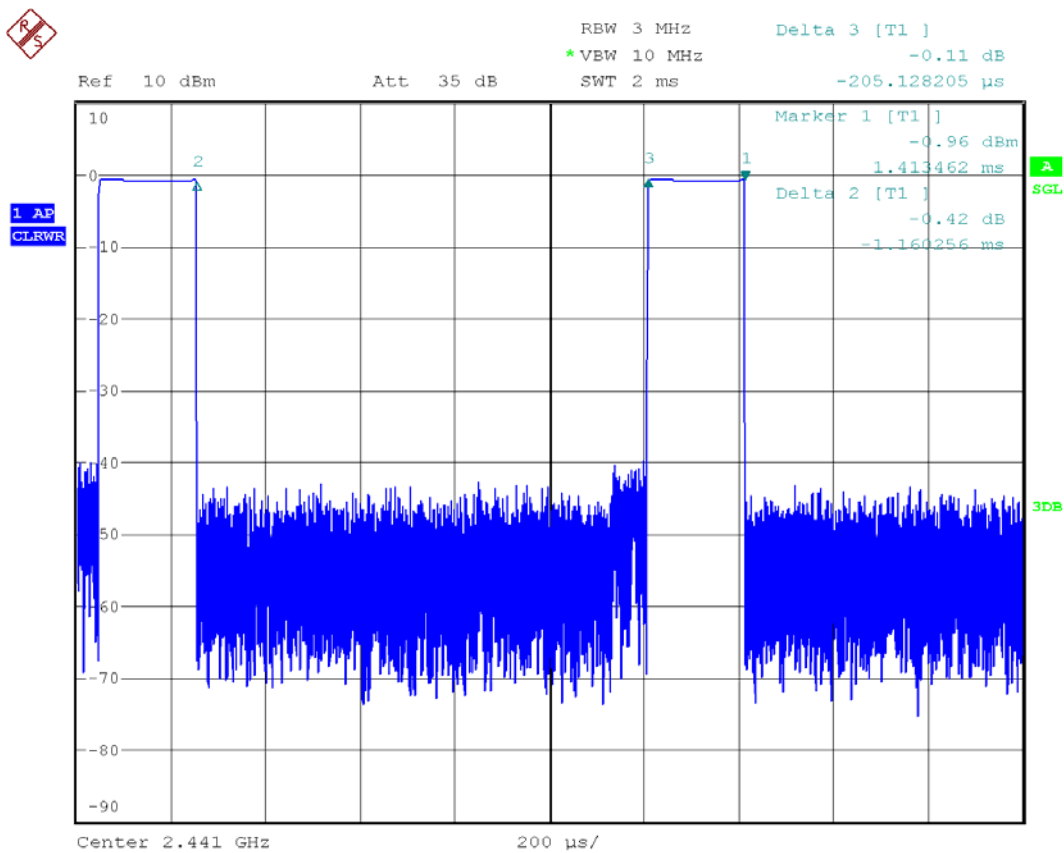
This corresponds to a Peak to Average Correction Factor of:

PACF: $20 \log (0.177) = 15.1 \text{ dB}$.

This is according to FCC CFR 47 Part 15, Subpart C, Section 15.35(c) 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.





Date: 22.DEC.2009 10:43:17

Comments

Operating frequency is 2441 MHz, measured conducted.



4.2 Antenna requirement

Test object	FD-1	Sheet	ANT-1
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	26 Mar. 2010
Client	GN Hearing A/S	Initials	JAS
Specification	FCC CFR 47 Part 15, Subpart C Section 15.203		

Test method	Visual inspection
<p>Evaluation criteria Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:</p> <ul style="list-style-type: none"> (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. <p>Evaluation result The FD-1 has a PCB antenna.</p>	

Evaluation result The test object meets evaluation criterion (a)

Compliant Yes

Comments None



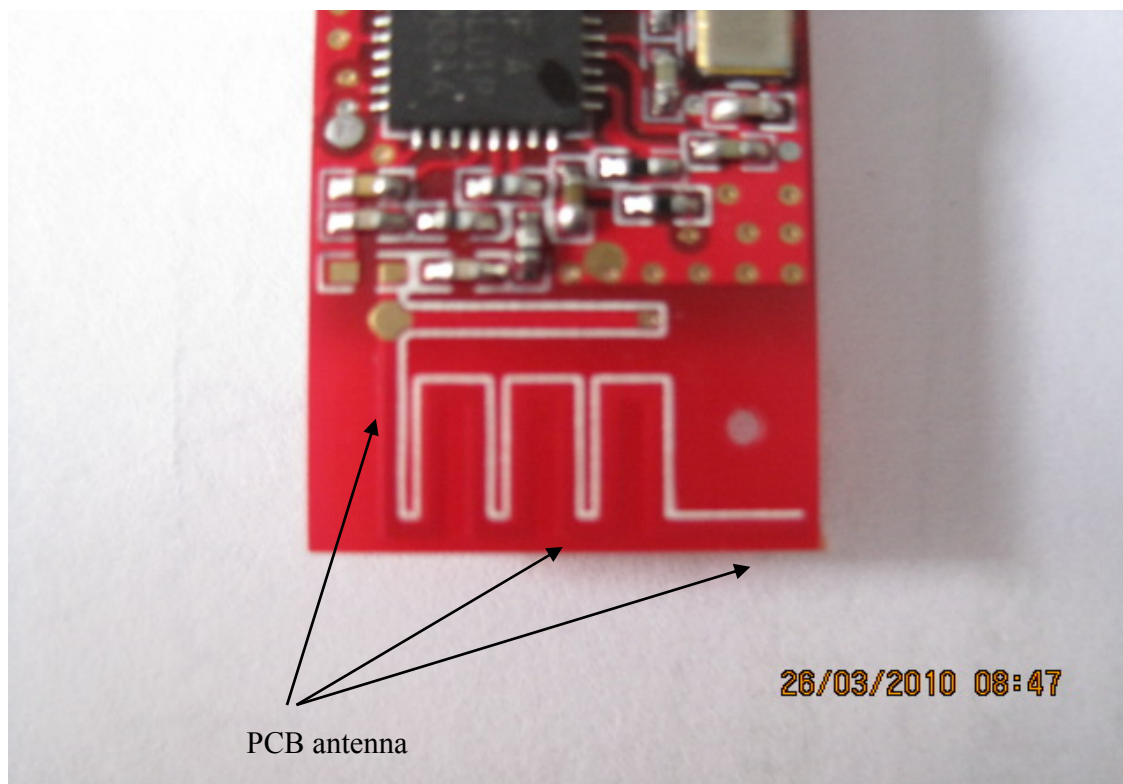


Photo 4.2.1 Test setup regarding measurement of antenna requirement.



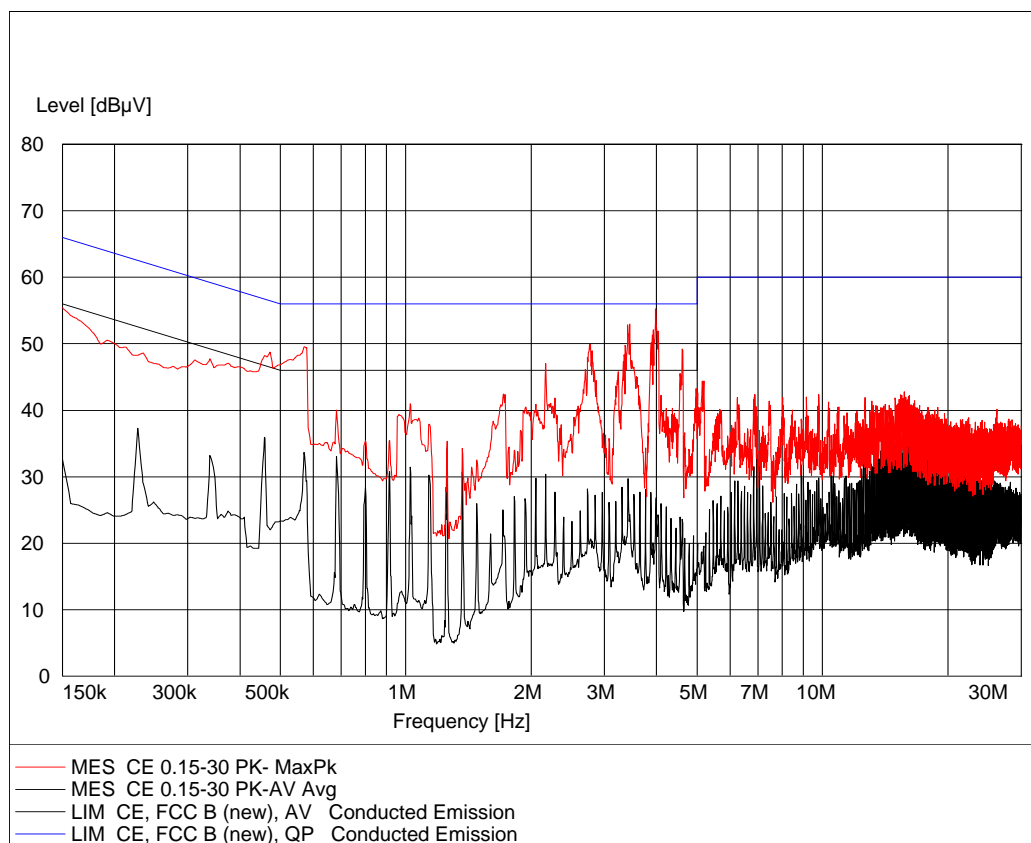
Photo 4.2.2 Test setup regarding measurement of antenna requirement.



4.3 Measurement of radio frequency voltage on mains

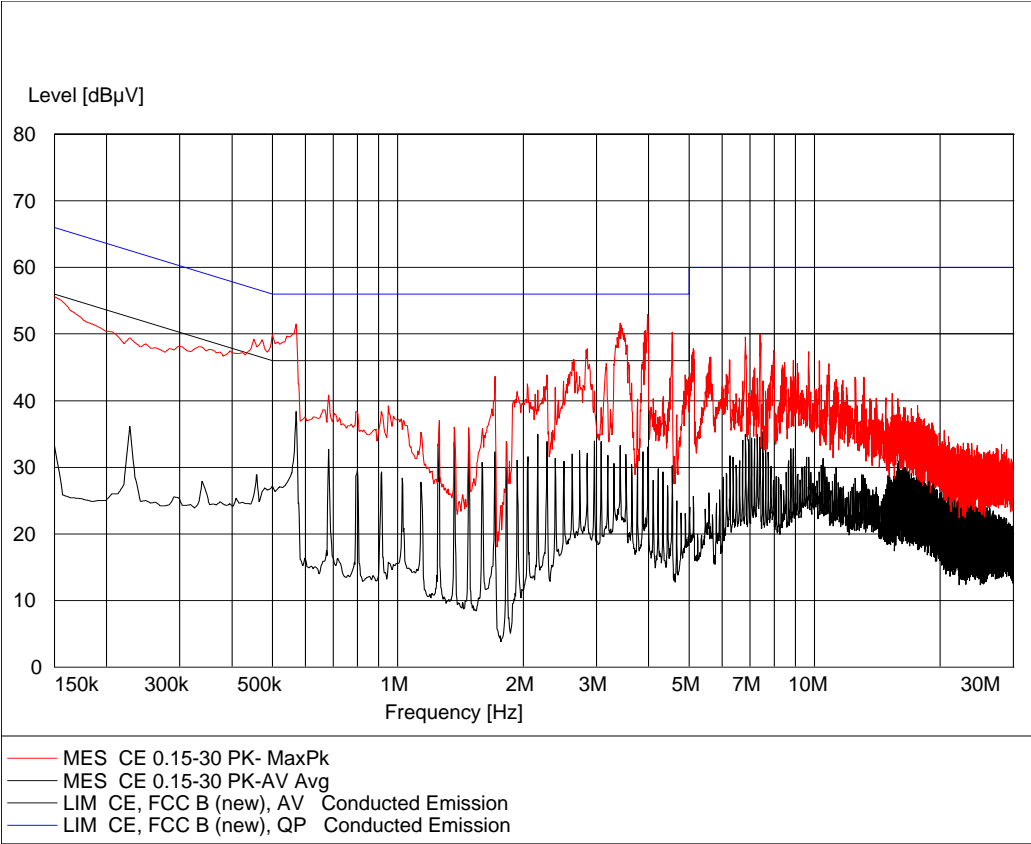
Test object	FD-1	Sheet	CE-1
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	8 Mar. 2010
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.207	Frequency	0.15-30 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Artificial mains network: 50 Ω , 50 μ H	Humidity	27 % RH
Detector	Peak and average	Bandwidth	10 kHz
Test equipm.	EMI room Hørsholm 29301 29680 49600 29861	Uncertainty	4.9 dB



Line under test	Neutral
Test result	The measured voltages were below the limit
Comments	Mains voltage: 120 VAC





Line under test	Line
Test result	The measured voltages were below the limit
Compliant	Yes
Comments	Mains voltage: 120 VAC



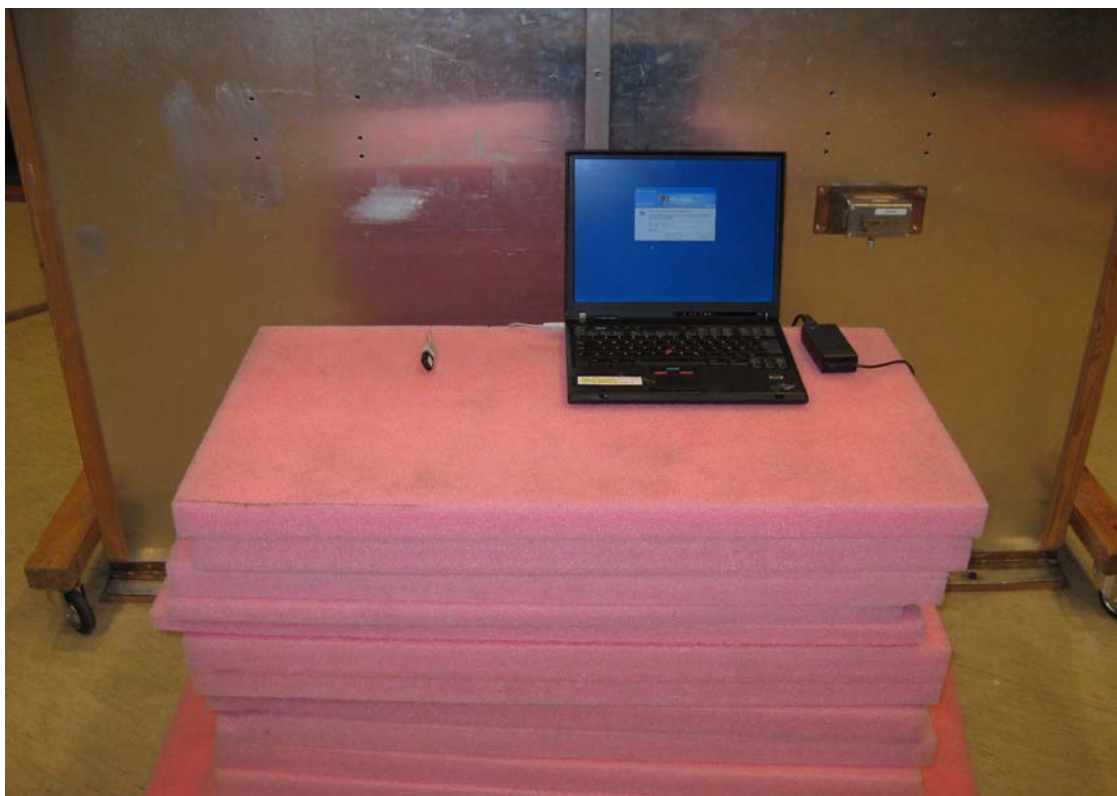


Photo 4.3.1 Test setup regarding measurement of radio frequency voltage on mains.

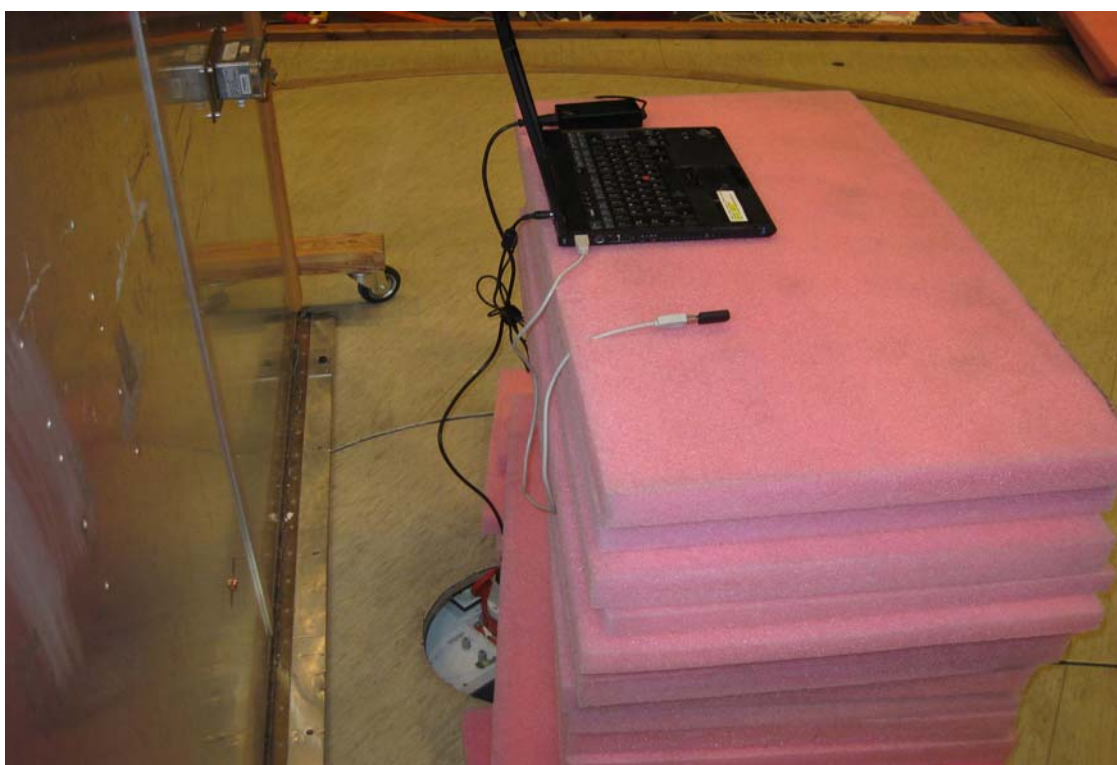


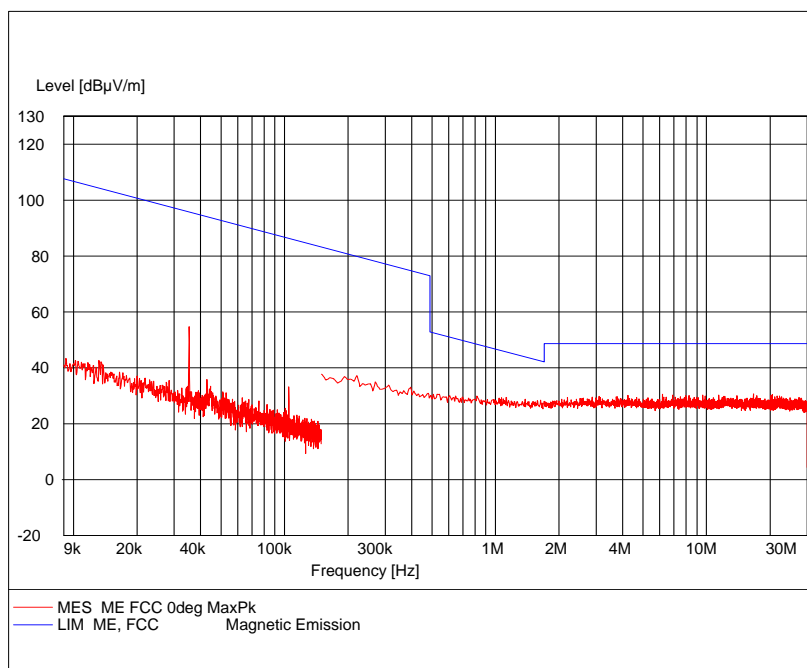
Photo 4.3.2 Test setup regarding measurement of radio frequency voltage on mains.



4.4 Measurement of radiated emission, 0.009-30 MHz

Test object	FD-1	Sheet	ME-1
Type	FD-1	Project no.	A506404-1
Serial no.	FD-001	Date	13 Apr. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	0.009-30 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Loop antenna pos. X. Antenna distance 10 m.	Humidity	29 % RH
Detector	Peak	Bandwidth	200 Hz / 9 kHz
Test equipm.	EMI room Hørsholm 49600 29332	Uncertainty	4 dB



Test result

The measured field strengths are below the limit

Compliant Yes

Comments

Test frequency: 2441 MHz.

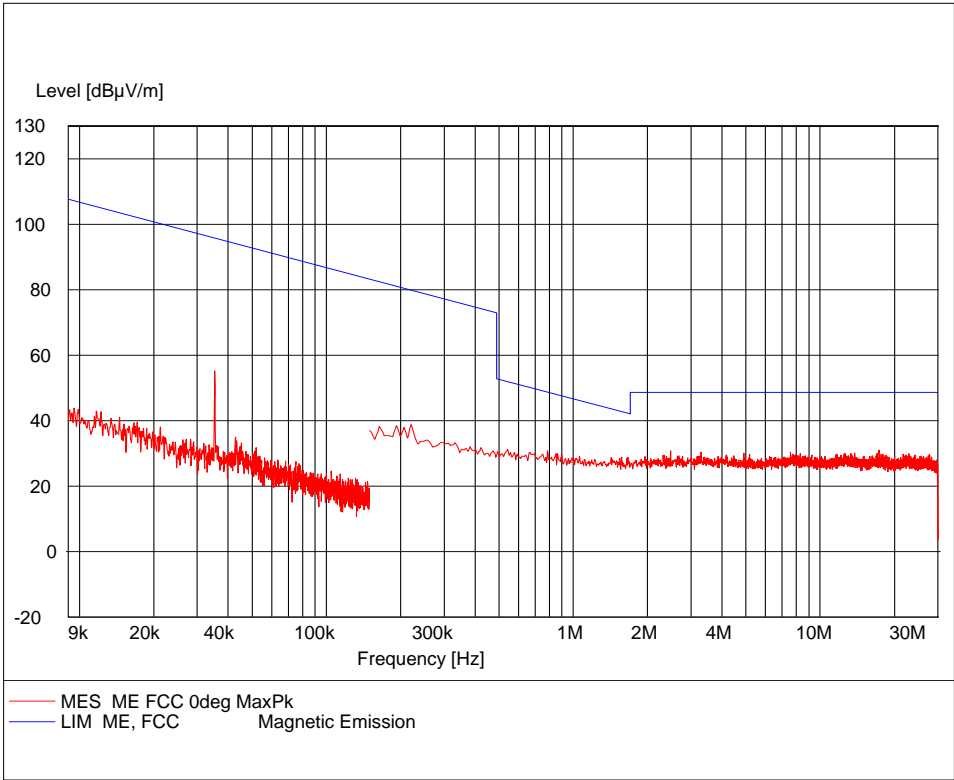
The limit has been extrapolated to 10 m using an extrapolation factor of 40 dB / decade as specified in §15.31(f)(2):

$$L_2 = L_1 + 40 \cdot \log_{10}(D_1/D_2)$$



Test object	FD-1	Sheet	ME-2
Type	FD-1	Project no.	A506404-1
Serial no.	FD-001	Date	13 Apr. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	0.009-30 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Loop antenna pos. Y. Antenna distance 10 m.	Humidity	29 % RH
Detector	Peak	Bandwidth	200 Hz / 9 kHz
Test equipm.	EMI room Hørsholm 49600 29332	Uncertainty	4 dB



Test result

The measured field strengths are below the limit

Compliant Yes

Comments

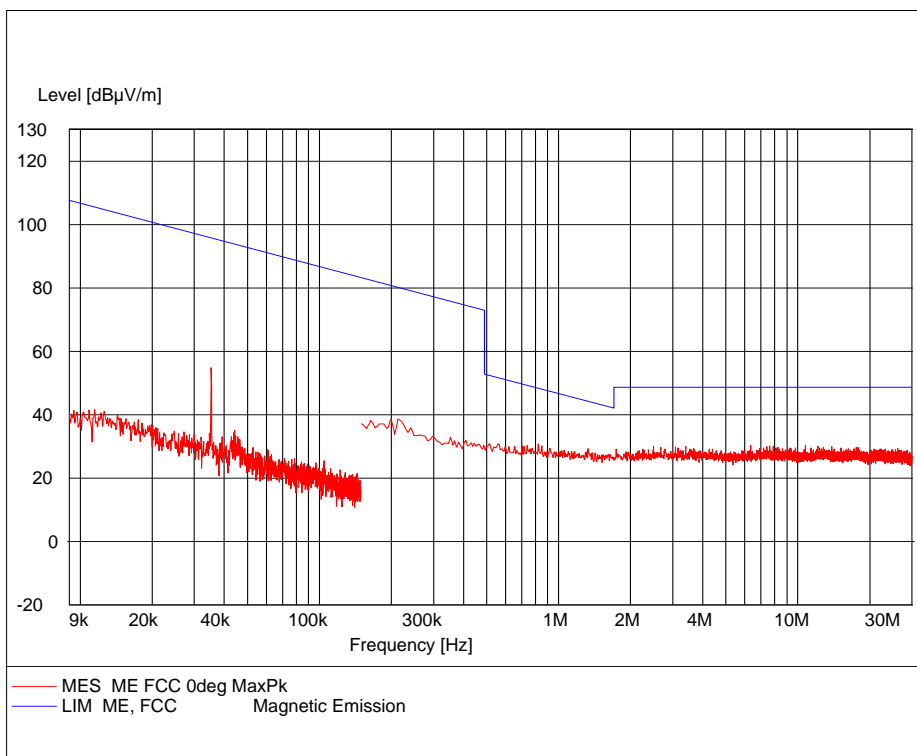
Test frequency: 2441 MHz.
The limit has been extrapolated to 10 m using an extrapolation factor of 40 dB / decade as specified in §15.31(f)(2):

$$L_2 = L_1 + 40 \cdot \log_{10}(D_1/D_2)$$



Test object	FD-1	Sheet	ME-3
Type	FD-1	Project no.	A506404-1
Serial no.	FD-001	Date	13 Apr. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	0.009-30 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Loop antenna pos. Z. Antenna distance 10 m.	Humidity	29 % RH
Detector	Peak	Bandwidth	200 Hz / 9 kHz
Test equipm.	EMI room Hørsholm 49600 29332	Uncertainty	4 dB



Test result

The measured field strengths are below the limit

Compliant Yes

Comments

Test frequency: 2441 MHz.
The limit has been extrapolated to 10 m using an extrapolation factor of 40 dB / decade as specified in §15.31(f)(2):

$$L_2 = L_1 + 40 \cdot \log_{10}(D_1/D_2)$$





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



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





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

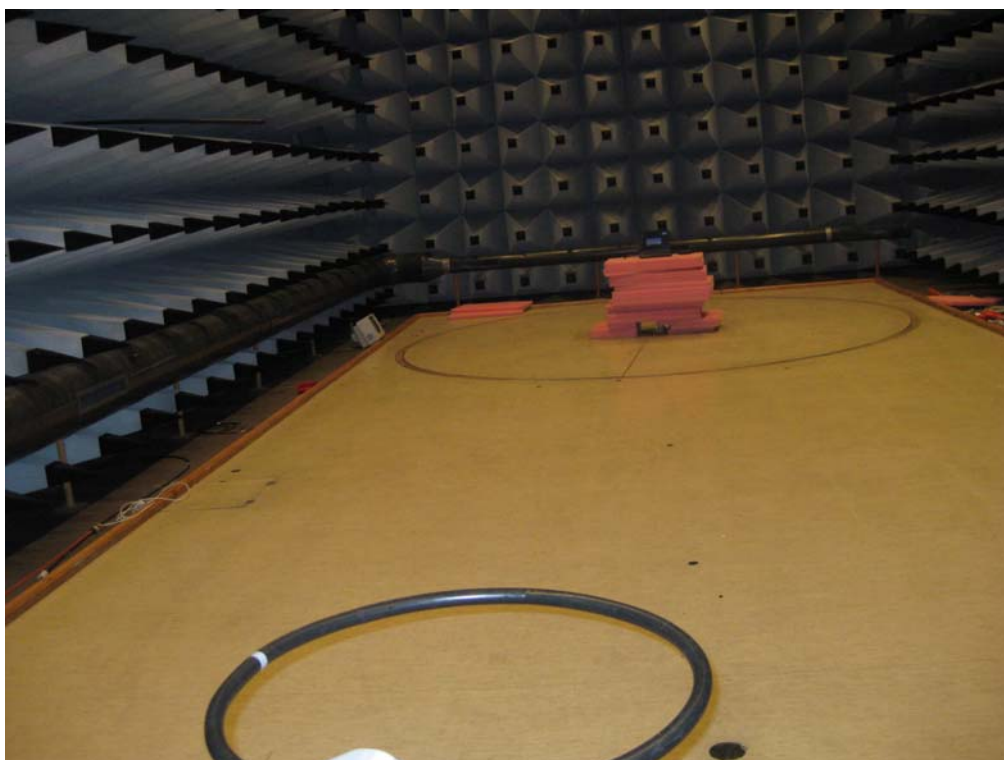


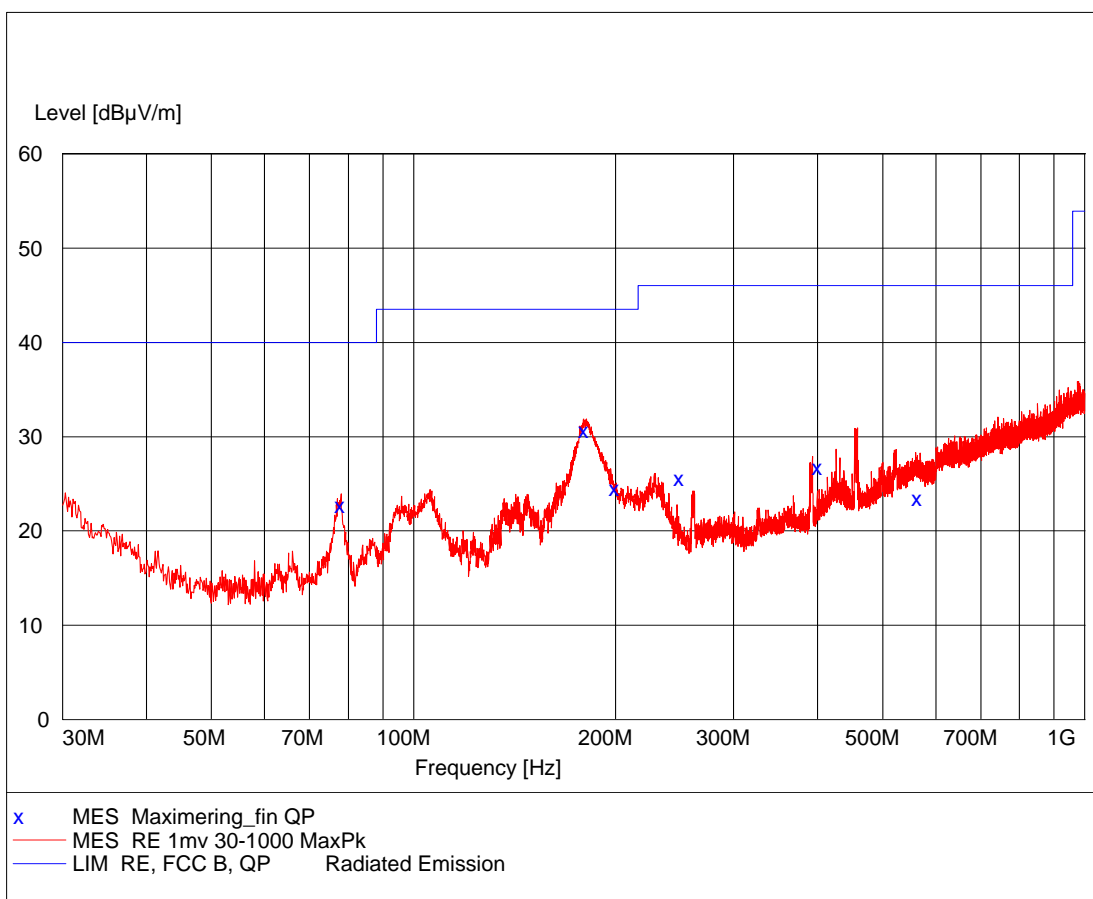
Photo 4.4.4 Test setup regarding measurement of radiated emission, 0.009-30 MHz.



4.5 Measurement of radiated emission, 30 MHz to 1000 MHz

Test object	FD-1	Sheet	RE_Spur-1
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	2 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Pre-scan, Antenna at 3 m, 1 m height, hor. pol.	Humidity	32 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



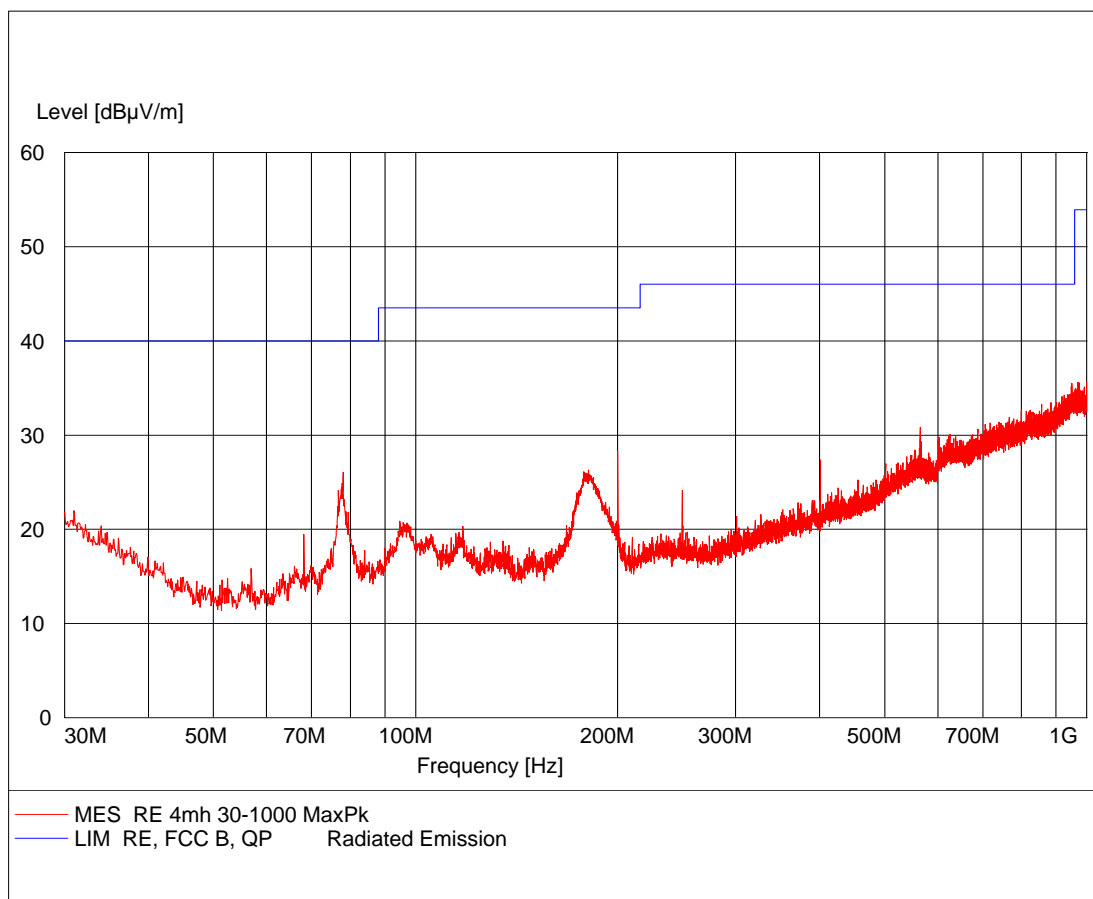
Comments

Operating frequency 2404 MHz



Test object	FD-1	Sheet	RE_Spur-2
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	2 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Pre-scan, Antenna at 3 m, 4 m height, hor. pol.	Humidity	32 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



Comments

Operating frequency 2404 MHz

Test object	FD-1	Sheet	RE_Spur-3
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	2 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	32 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
78.000000	22.70	9.4	40.0	17.3	400.0	159.00	HORIZONTAL
180.000000	30.70	10.4	43.5	12.8	101.0	346.00	VERTICAL
200.000000	24.50	11.6	43.5	19.0	171.0	1.00	VERTICAL
250.000000	25.60	14.9	46.0	20.4	102.0	114.00	HORIZONTAL
401.580000	26.70	19.1	46.0	19.3	243.0	183.00	HORIZONTAL
565.400000	23.50	23.6	46.0	22.5	159.0	20.00	HORIZONTAL

Test result The measured field strengths are below the limit

Test Port Enclosure

Test frequency 2404 MHz

Test mode Continuous Tx - normal modulation - hopping on

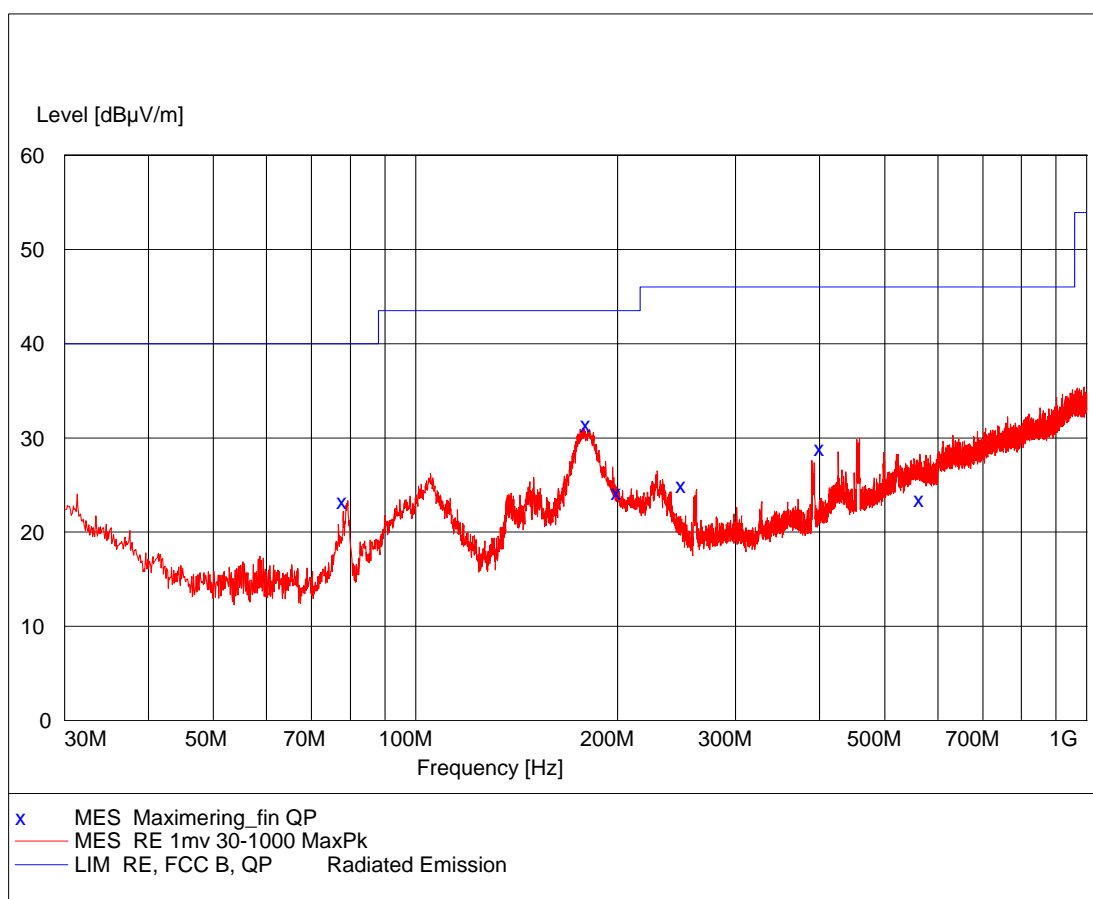
Condition Norm al

Compliant Yes

Comments Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation

Test object	FD-1	Sheet	RE_Spur-4
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	2 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	30-1000 MHz

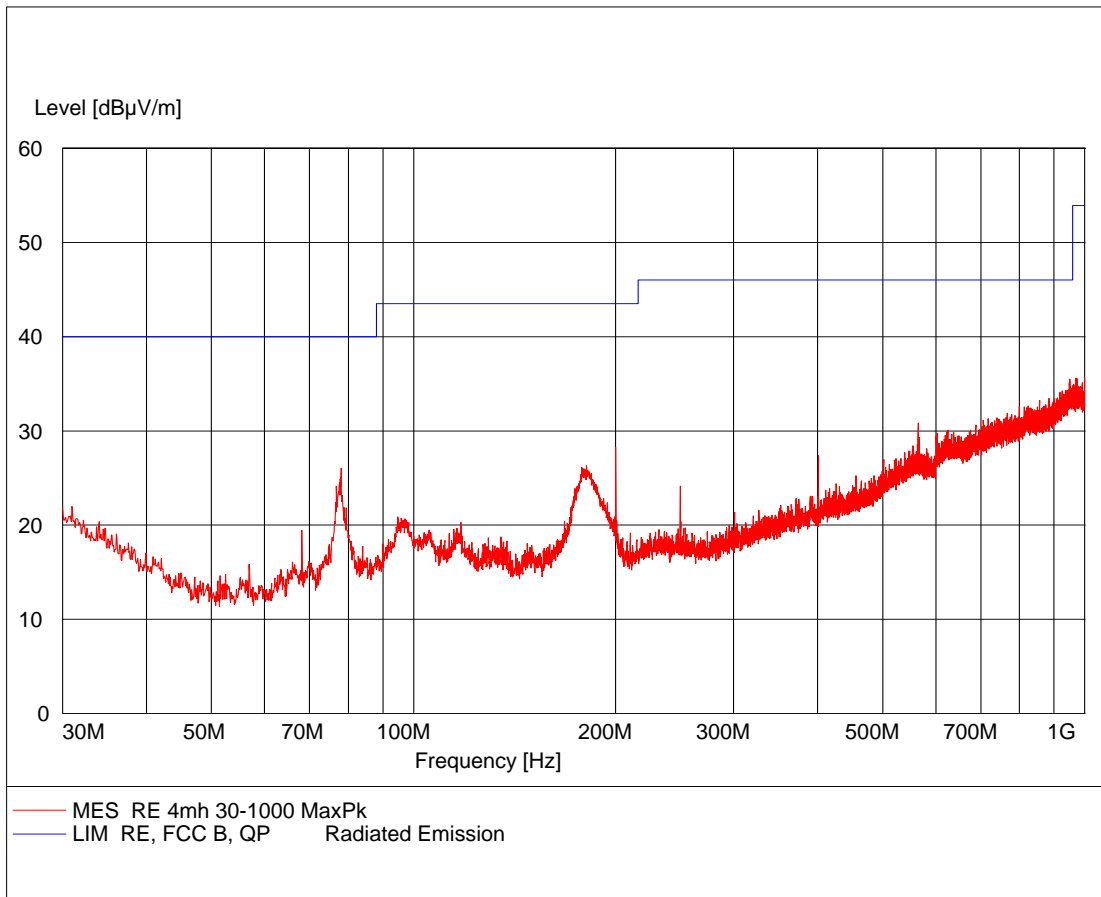
Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Humidity	29 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



Comments	Operating frequency 2441 MHz
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Test object	FD-1	Sheet	RE_Spur-5
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	2 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Pre-scan, Antenna at 3 m, 4 m height, hor. pol.	Humidity	29 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 2979 29861 49183 49299	Uncertainty	4.9 dB



Operating frequency 2441 MHz

Test object	FD-1	Sheet	RE_Spur-6
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	2 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	29 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
78.000000	23.30	9.4	40.0	16.7	400.0	181.00	HORIZONTAL
180.000000	31.40	10.4	43.5	12.1	101.0	323.00	VERTICAL
200.000000	24.20	11.6	43.5	19.3	182.0	357.00	VERTICAL
250.000000	24.90	14.9	46.0	21.1	242.0	300.00	VERTICAL
401.580000	28.80	19.1	46.0	17.2	212.0	269.00	HORIZONTAL
565.400000	23.50	23.6	46.0	22.5	146.0	21.00	HORIZONTAL

Test result The measured field strengths are below the limit

Test Port Enclosure

Test frequency 2441MHz

Test mode Continuous Tx - normal modulation - hopping on

Condition Norm al

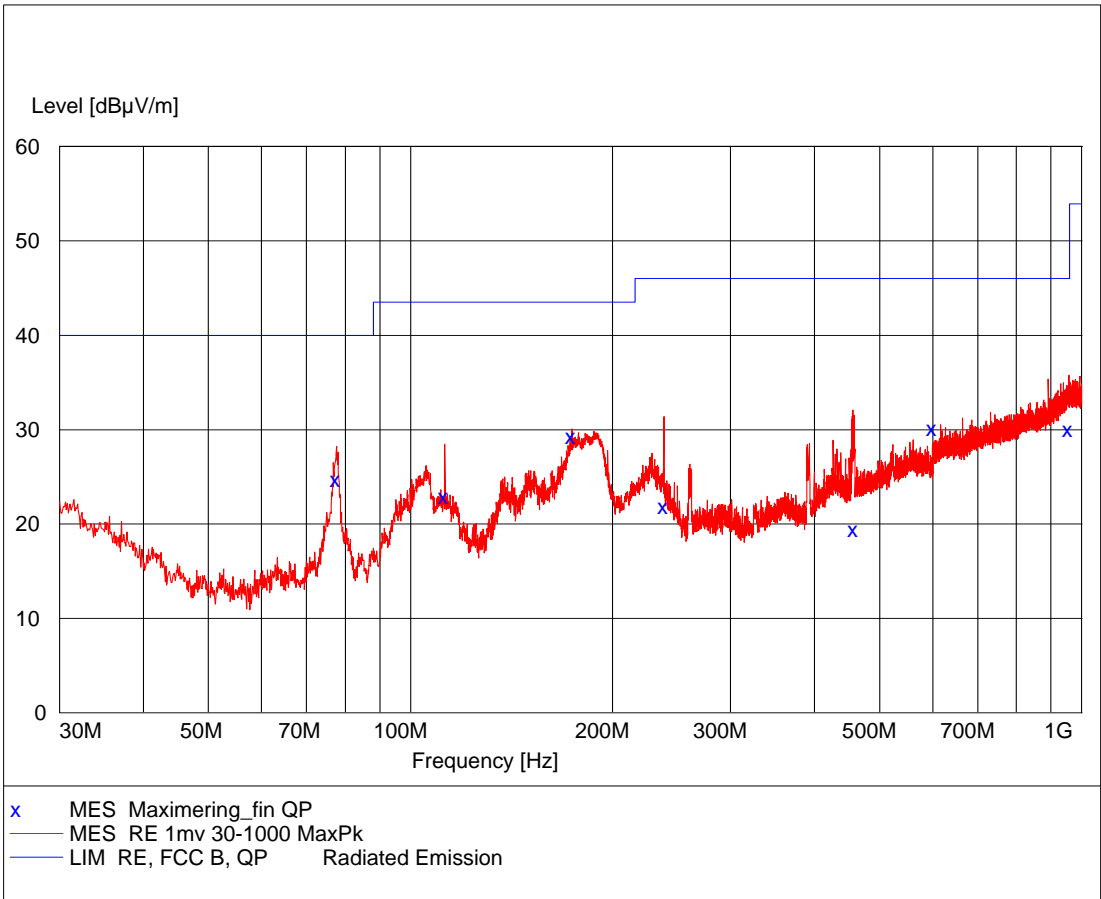
Compliant Yes

Comments Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation



Test object	FD-1	Sheet	RE_Spur-7
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	9 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	23 °C
Characteristics	Pre-scan, Antenna at 3 m, 1 m height, hor. pol.	Humidity	29 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

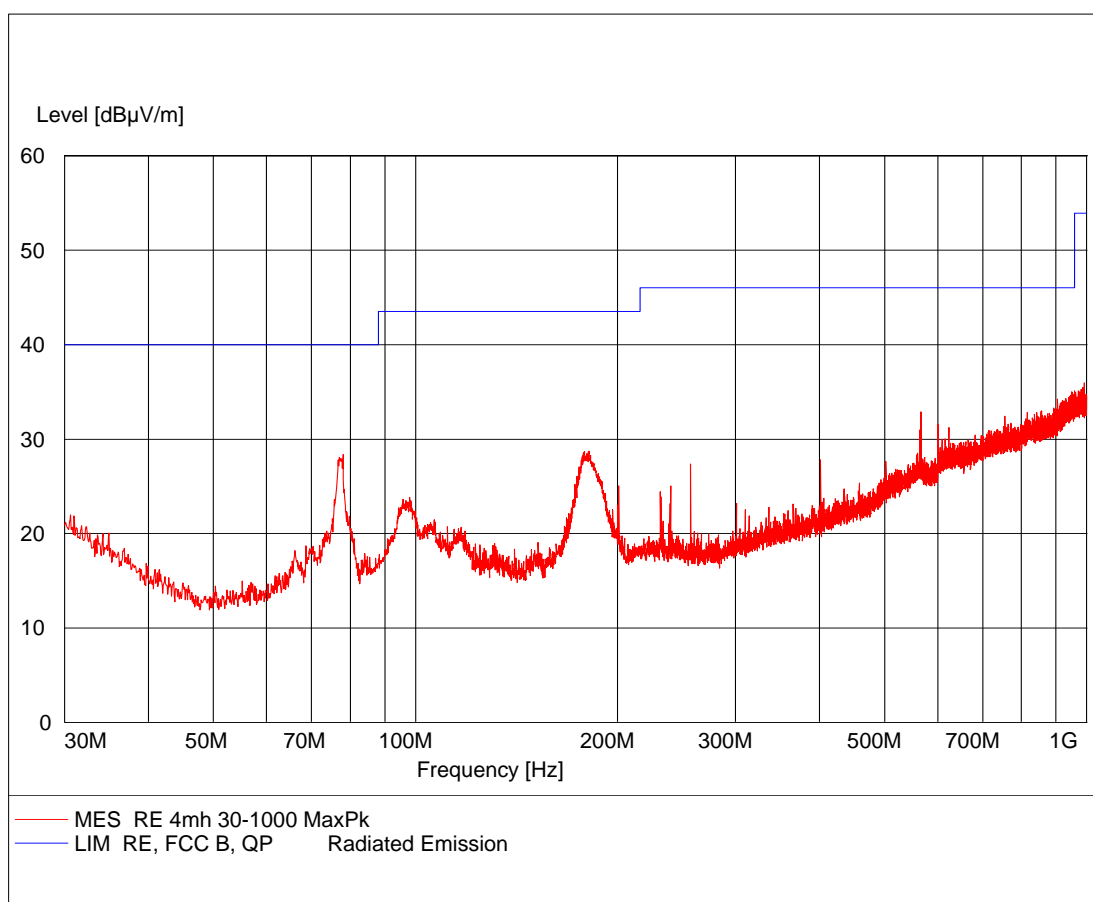


Comments Operating frequency 2478 MHz



Test object	FD-1	Sheet	RE_Spur-8
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	9 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	23 °C
Characteristics	Pre-scan, Antenna at 3 m, 4 m height, hor. pol.	Humidity	29 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



Comments	Operating frequency 2478 MHz
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Test object	FD-1	Sheet	RE_Spur-9
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	9 Dec. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 209	Frequency	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	23 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	29 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
77.600000	24.70	9.4	40.0	15.3	157.0	202.00	VERTICAL
112.500000	22.90	12.6	43.5	20.6	101.0	269.00	VERTICAL
174.000000	29.20	10.7	43.5	14.3	101.0	314.00	VERTICAL
238.600000	21.90	14.3	46.0	24.1	135.0	357.00	VERTICAL
458.630000	19.40	20.3	46.0	26.6	104.0	275.00	VERTICAL
600.000000	30.10	23.2	46.0	15.9	126.0	20.00	HORIZONTAL
957.600000	30.00	29.4	46.0	16.0	102.0	2.00	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 on

Condition Norm al

Compliant Yes

Comments Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation



Photo 4.5.1 Test setup regarding measurement of radiated emission.

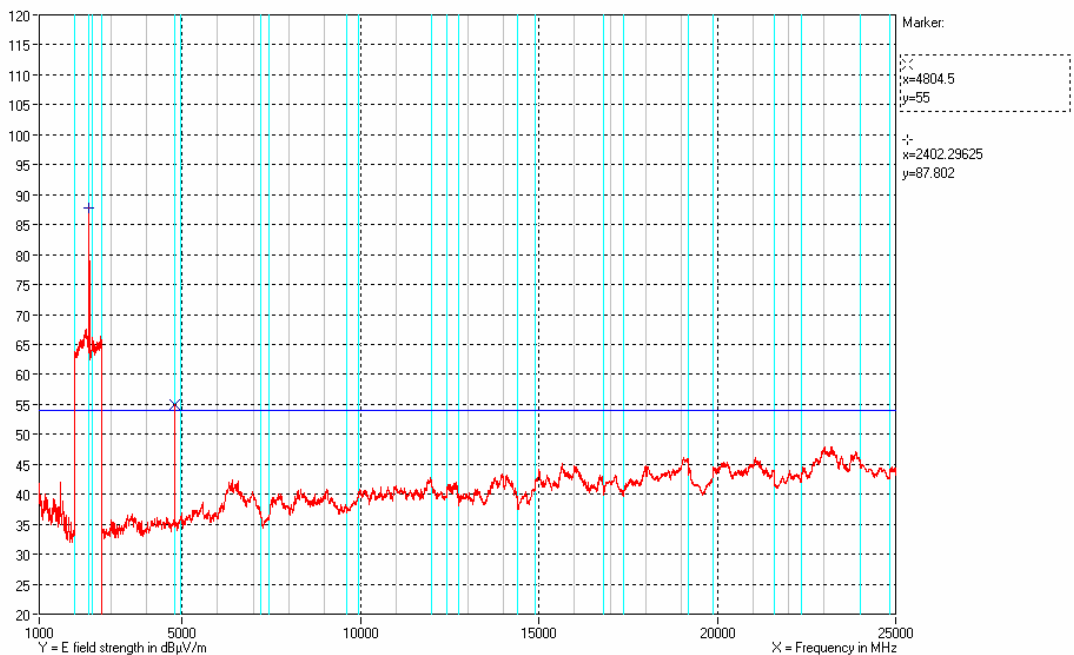


Photo 4.5.2 Test setup regarding measurement of radiated emission.



4.6 Measurement of radiated emission, 1 GHz to 25 GHz

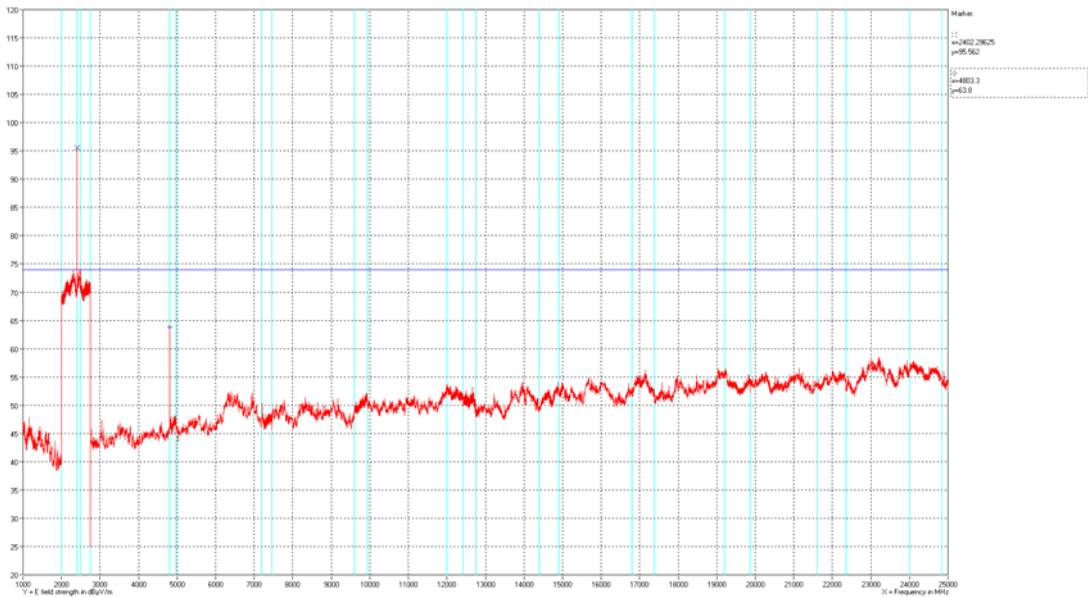
Test object	FD-1	Sheet	RE_Spur-2
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	6 Nov. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 209	Frequency	1-25 GHz
Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	29 % RH
Detector	Peak and average for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty	4.9 dB



Polarization Horizontal and vertical

Comments Average





Polarization Horizontal and vertical

Comments Peak

Frequency Peak		PACF	Corrected Average	Limit
2404 MHz	63.8 dBµV/m	15.1 dB	48.7 dBµV/m	54 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 2404MHz

Test mode Continuous Tx - normal modulation - hopping on

Condition Norm al

Compliant Yes

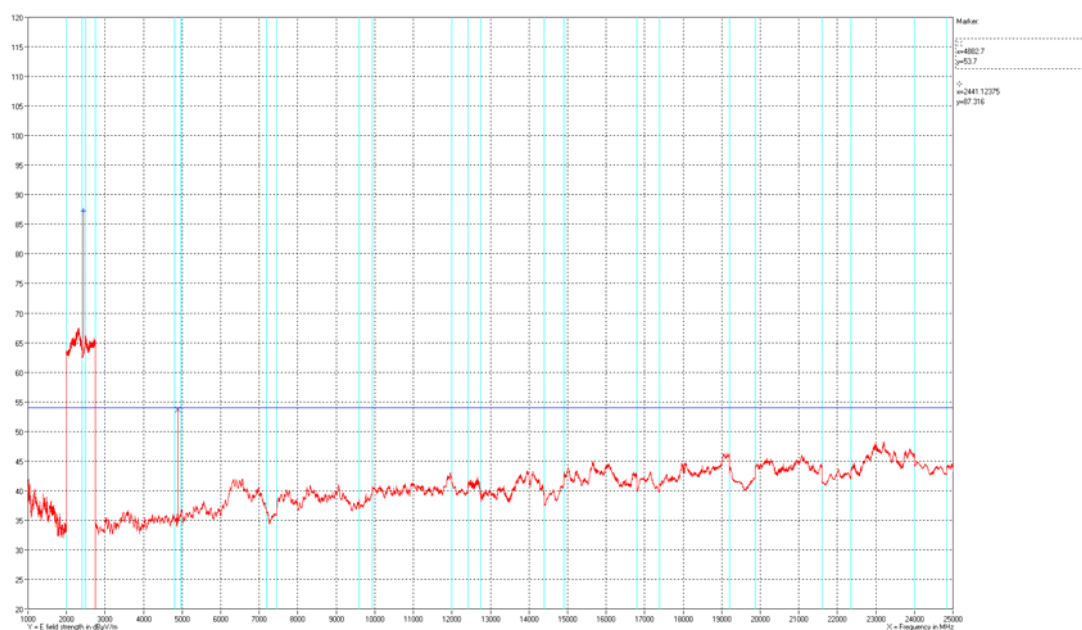
Comments (Avg/Pk) Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization.

Measured level at band edge		
Band edge	2400 MHz	2483.5 MHz
Average	30.6 dBµV/m	32.1 dBµV/m
Peak	42.8 dBµV/m	40.4 dBµV/m



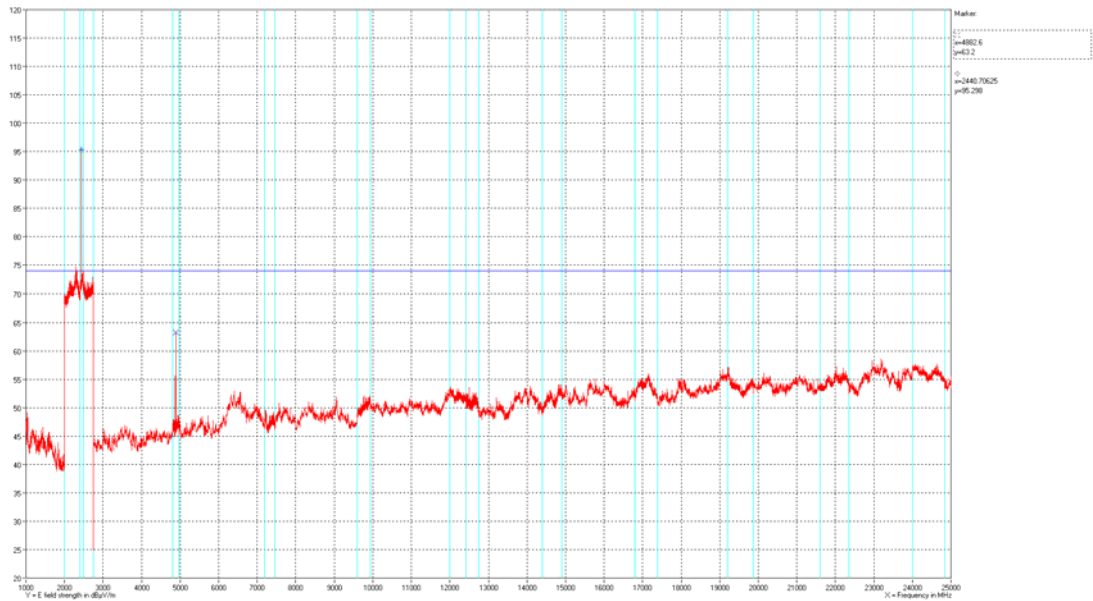
Test object	FD-1	Sheet	RE_Spur-3
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	6 Nov. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	1-25 GHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	29 % RH
Detector	Peak and average for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty	4.9 dB



Polarization	Horizontal and vertical
	
	
	
	
	
	
	
	
	
	
	

Comments Average



Horizontal and vertical

Comments Peak

The measured average field strengths are below the average limit.

The measured peak field strengths are below the peak limit (Peak limit = Average limit + 20 dB). The average field strengths are below the average limit.

Enclosure

2441 MHz

Continuous Tx - normal modulation - hopping on

al

Compliant Yes

Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization.

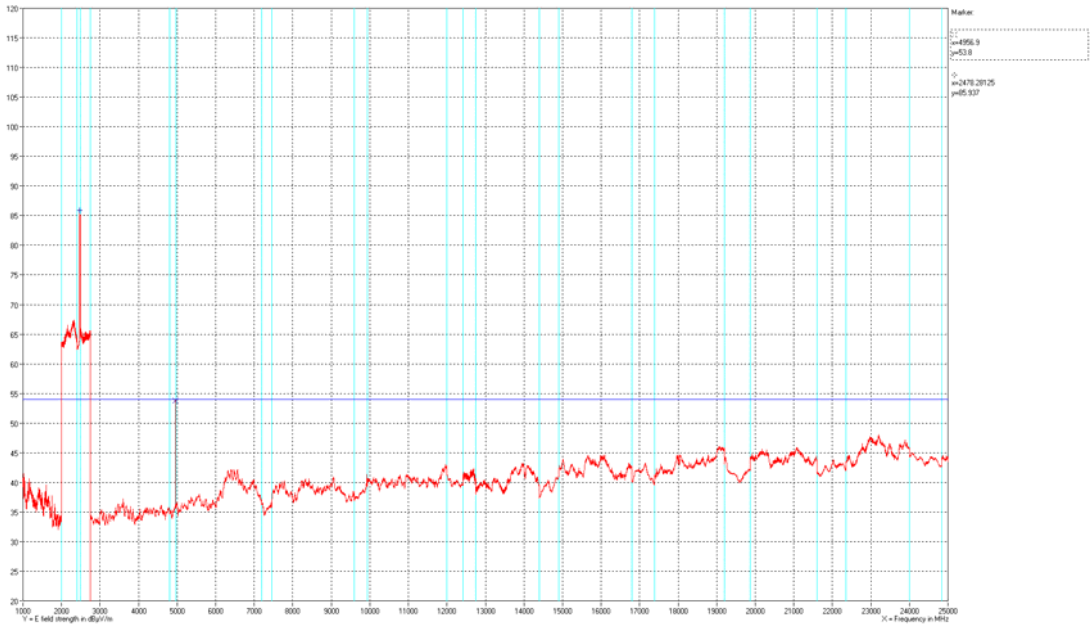
Measured level at band edge

Band edge	2400 MHz	2483.5 MHz
Average	30 dB μ V/m	32.1 dB μ V/m
Peak	38.4 dB μ V/m	40 dB μ V/m



Test object	FD-1	Sheet	RE_Spur-4
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	6 Nov. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.209	Frequency	1-25 GHz

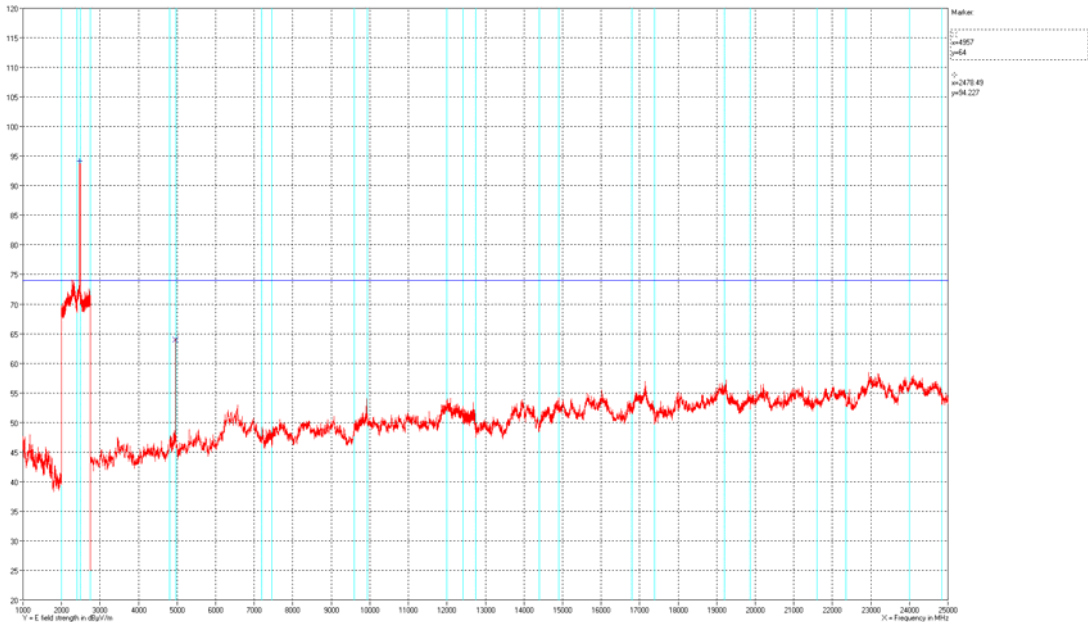
Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	29 % RH
Detector	Peak and average for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49624 49625 49600 49183 49299	Uncertainty	4.9 dB



Polarization Horizontal and vertical

Comments Average





Polarization	Horizontal and vertical										
Comments Peak											
Test result	<p>The measured average field strengths are below the average limit.</p> <p>The measured peak field strengths are below the peak limit (Peak limit = Average limit + 20 dB). The average field strengths are below the average limit.</p>										
Test Port	Enclosure										
Test frequency	2478 MHz										
Test mode	Continuous Tx - normal modulation - hopping on										
Condition Norm	al										
Compliant Yes											
Comments (Avg/Pk)	<p>Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization.</p> <p>Measured level at band edge</p> <table><tr><td>Band edge</td><td>2400 MHz</td><td>2483.5 MHz</td></tr><tr><td>Average</td><td>30 dBμV/m</td><td>32.1 dBμV/m</td></tr><tr><td>Peak</td><td>37.9 dBμV/m</td><td>40.9 dBμV/m</td></tr></table>		Band edge	2400 MHz	2483.5 MHz	Average	30 dBμV/m	32.1 dBμV/m	Peak	37.9 dBμV/m	40.9 dBμV/m
Band edge	2400 MHz	2483.5 MHz									
Average	30 dBμV/m	32.1 dBμV/m									
Peak	37.9 dBμV/m	40.9 dBμV/m									



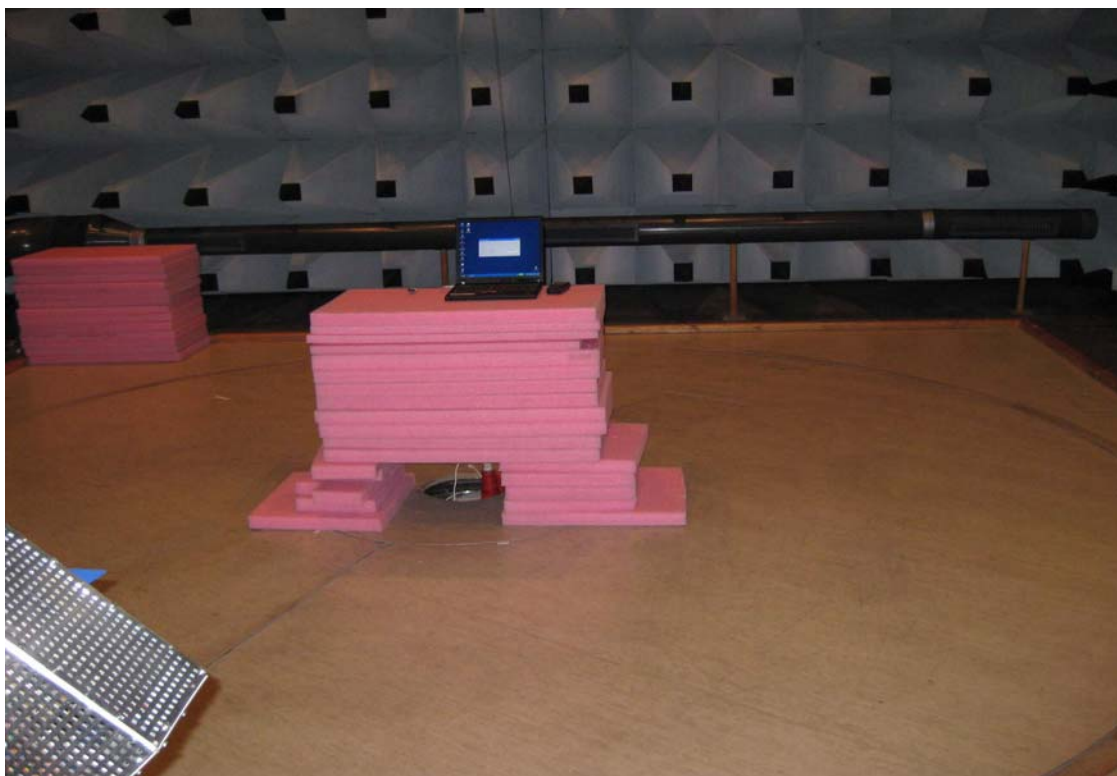


Photo 4.6.1 Test setup regarding measurement of radiated emission.



Photo 4.6.2 Test setup regarding measurement of radiated emission.



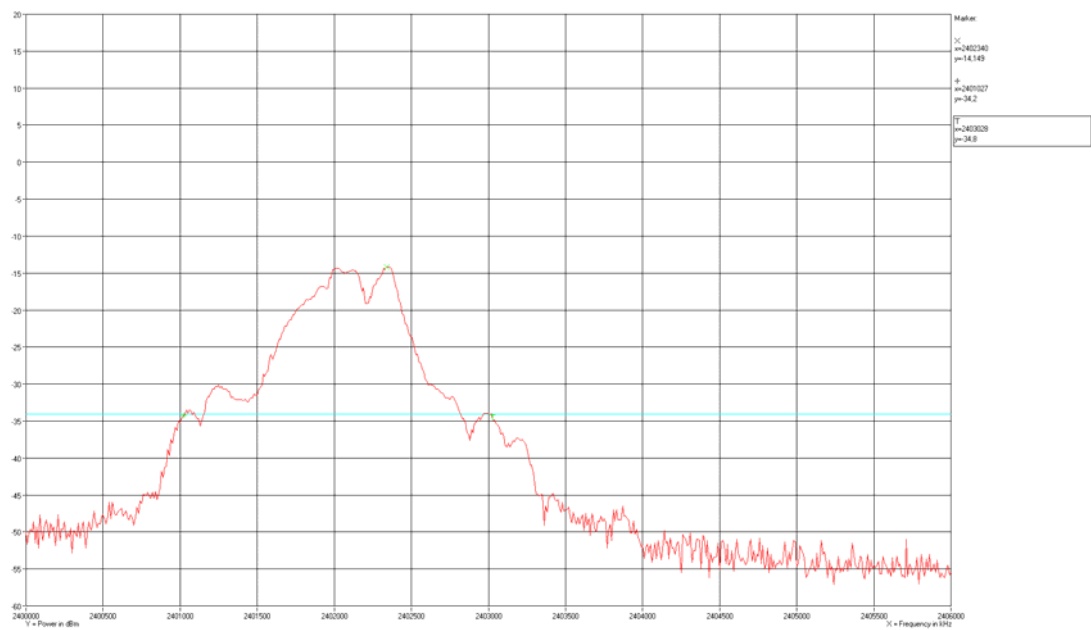
4.7 Measurement of band edge compliance

Test object	FD-1	Sheet	PROF-1
Type	FD-1	Project no.	A506404-2
Serial no.	FD-002	Date	18 Mar. 2010
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.215(c)		

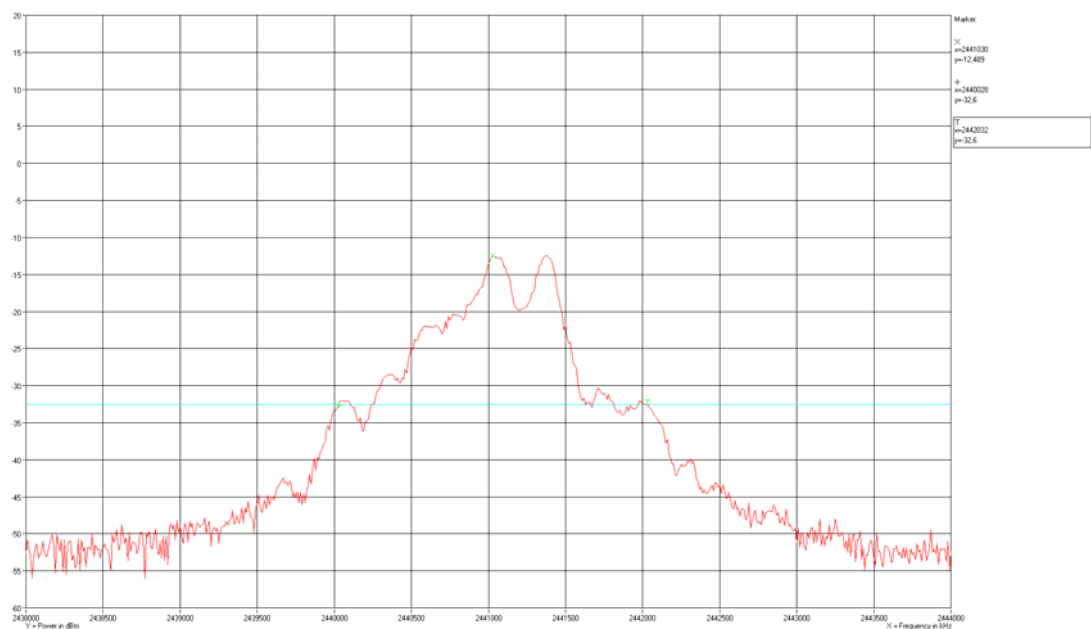
Test method	ANSI C63.4:2003		
Characteristics	Temperature: 22 °C. Test voltage: 5.0 V DC		
Test equipm.	49321 49183 49299 Uncertainty: 1•10-7		
SA Settings	RBW: 100 KHz VBW: 300 kHz SPAN: 4 MHz DET: Peak CF: 2403 MHz, 2440 MHz, 2478 MHz Trace: Max Hold		
	Measured	Limit	Comment
Operating frequency:	2404 MHz		
Lowest frequency	2401.027MHz	2400.0 MHz	Ok
Highest frequency	2403.028 MHz	2483.5 MHz	Ok
Operating frequency:	2441 MHz		
Lowest frequency	2440.028 MHz	2400.0 MHz	Ok
Highest frequency	2440.032 MHz	2483.5 MHz	Ok
Operating frequency:	2478 MHz		
Lowest frequency	2477.030 MHz	2400.0 MHz	Ok
Highest frequency	2478.853 MHz	2483.5 MHz	Ok
Note 1:			

Band edge criteria	20 dB bandwidth
Test result	The measured 20 dB bandwidth was within the frequency band designated in 15.249.
Test modulation	Continuous Tx - normal modulation - hopping on
Compliant	Yes
Comments	Conducted measurement



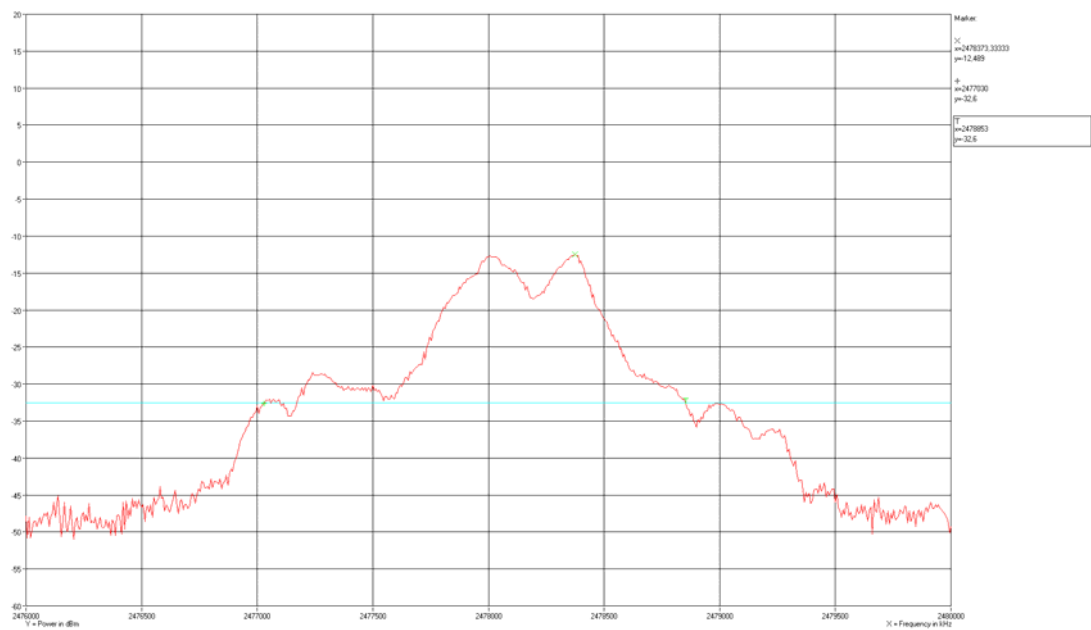


Test frequency 2404 MHz



Test frequency 2441 MHz





Test frequency 2478 MHz



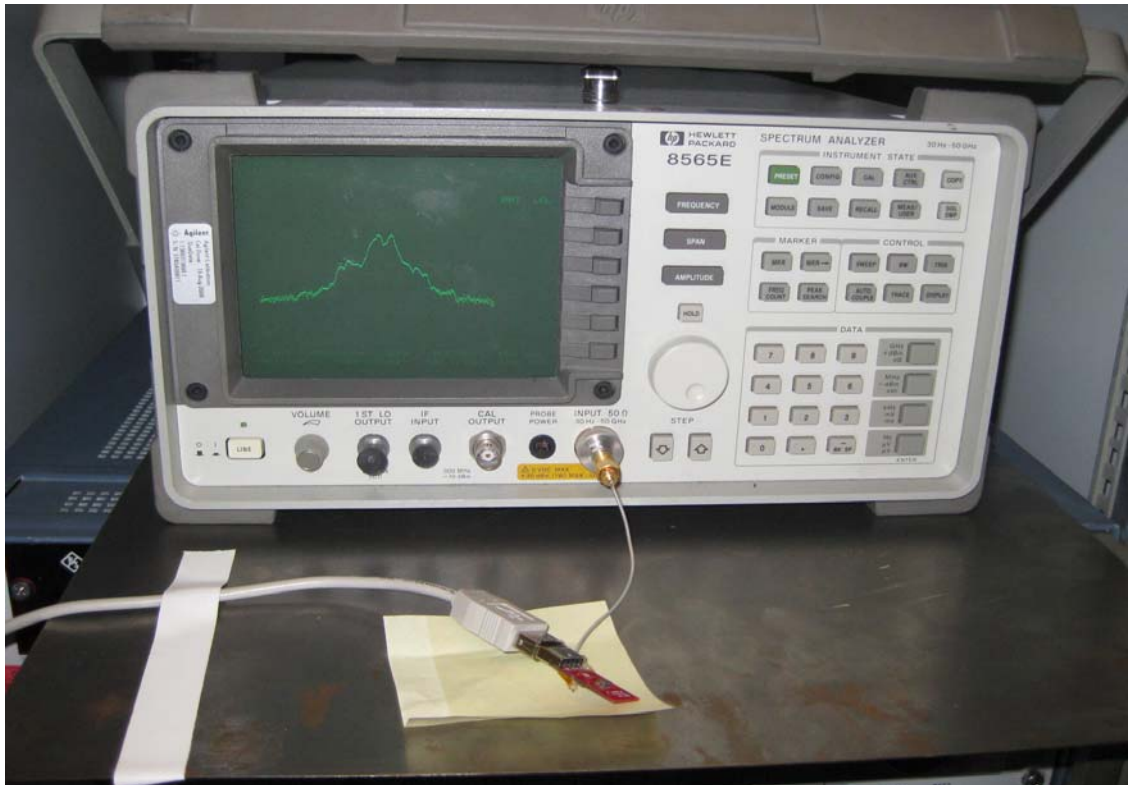


Photo 4.7.1 Test setup regarding measurement of band edge compliance.

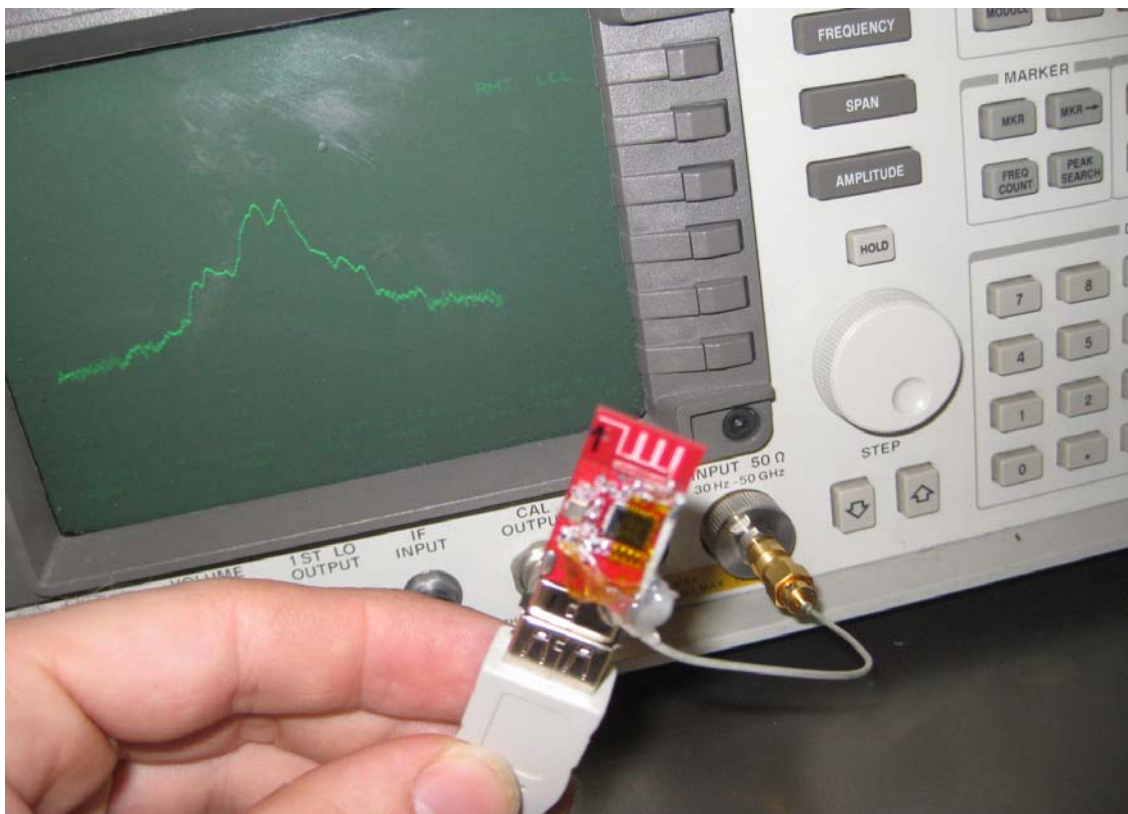


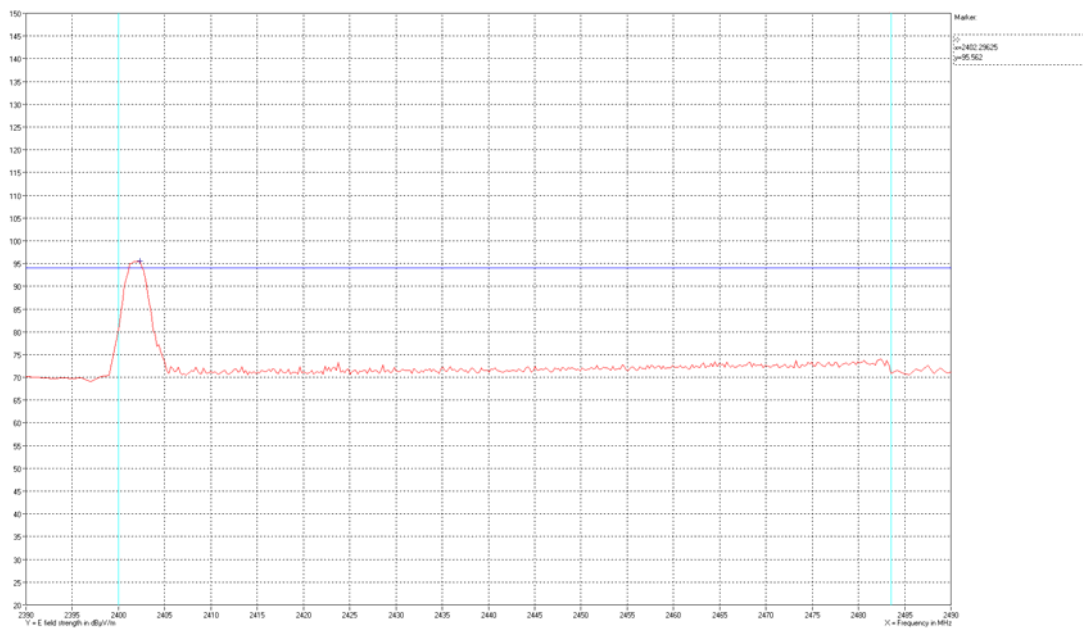
Photo 4.7.2 Test setup regarding measurement of band edge compliance.



4.8 Measurement of field strength of fundamental

Test object	FD-1	Sheet	RE_Spur-53
Type	FD-1	Project no.	A506404-2
Serial no.	FD-001	Date	6 Nov. 2009
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.249(a)	Frequency	2400-2483.5 MHz

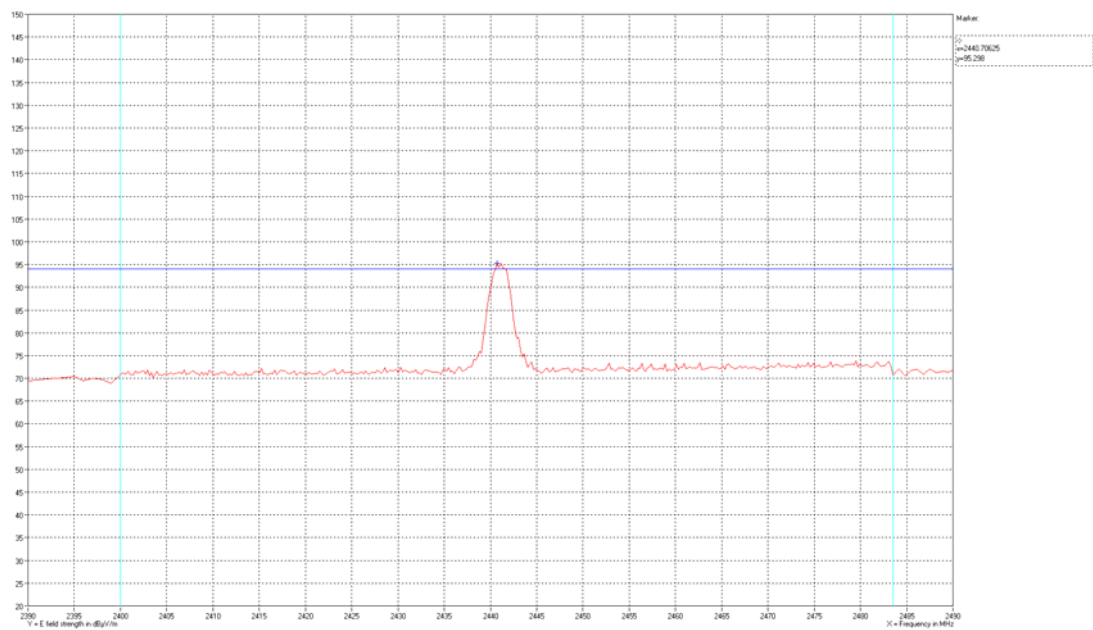
Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	29 % RH
Detector	Peak for 2390 MHz to 2490 MHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty	4.9 dB



Test frequency 2404 MHZ

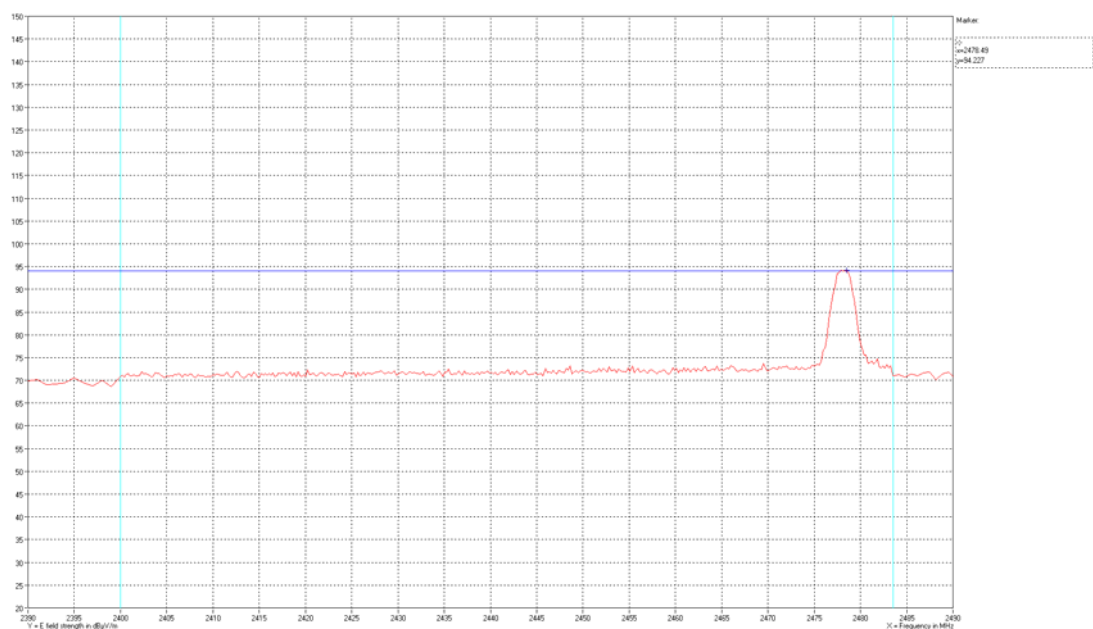
Comments Peak
 Horizontal and vertical





Test frequency 2441 MHz

Comments Peak
 Horizontal and vertical



Test frequency 2478 MHz

Comments
 Peak
 Horizontal and vertical



Frequency Peak		PACF	Corrected Average	Limit
2404 MHz	95.6 dB μ V/m	15.1 dB	80.5 dB μ V/m	94 dB μ V/m
2441 MHz	95.3 dB μ V/m	15.1 dB	80.2 dB μ V/m	94 dB μ V/m
2478 MHz	94.2 dB μ V/m	15.1 dB	79.1 dB μ V/m	94 dB μ V/m
Test result	The corrected average field strengths are below the average limit. Corrected Average value = Peak value - PACF			
Test Port	Enclosure			
Test mode	Continuous Tx - normal modulation, hopping on			
Condition Norm	al			
Compliant	Yes			
Comments	Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization			





Photo 4.8.1 Test setup regarding measurement of field strength of fundamental.

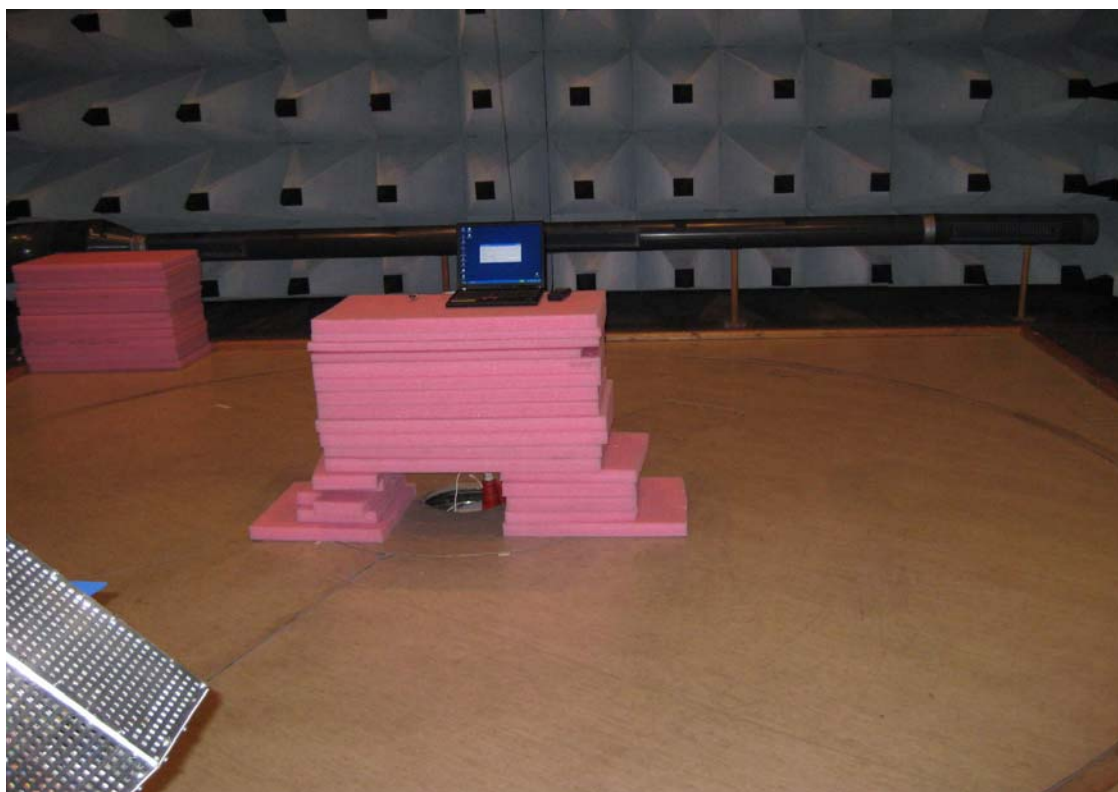


Photo 4.8.2 Test setup regarding measurement of field strength of fundamental.



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 T-1549
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: IC4187 A-5

Facilities: EMI room Hørsholm (EMC-5)



6. List of instruments

No.	Description	Manufacturer	Type No.	Cal. date	Cal. interval
29301	ARTIFICIAL MAINS NETWORK	ROHDE & SCHWARZ	ESH2-Z5	05-01-2010	1 year
29680	IMPULSE VOLTAGE LIMITER	ROHDE & SCHWARZ	ESH3/Z2	06-11-2009	1 year
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A	16-07-2008	2 years
29861	EMI-SOFTWARE VER. 1.60	ROHDE & SCHWARZ	ES-K1, PART: 1026.6790.02	-	-
49183	POWER SUPPLY	TTI	PL 320	-	-
49299	MULTIMETER	Fluke	87-4	03-03-2010	1 year
49321	SPECTRUM ANALYZER, 50 GHz WITH OPTION 006	HEWLETT-PACKARD	8565E	13-10-2009	1 year
49550	SIGNAL ANALYZER	ROHDE & SCHWARZ	FSQ8	07-08-2009	1 year
49600	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESU40	18-03-2010	1 year
49622	CABLE 3.25 M PC3.5 MALE-FEMALE SU-COFLEX 104	HUBER+SUHNER		07-02-2010	1 year
49623	CABLE 16 M PC3.5 MALE-MALE SU-COFLEX 104PB	HUBER+SUHNER		07-02-2010	1 year
49624	DUAL RIDGE HORN ANTENNA – 1 GHz - 26GHz (2 GHz – 32 GHz)	SATIMO	SH2000	08-11-2009	2 years
49625	SRD COAX SWITCH MATRIX USED IN 1GHZ TO 26GHZ SRD ANTENNASYSTEM	DELTA	COAX SWITCH MATRIX	07-02-2010	1 year
29332	ACTIVE LOOP ANTENNA	ROHDE & SCHWARZ	HFH-Z2	08-05-2008	2 years

