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DELTA Test Report

TEST Reg. no. 19

Radio parameter test of MRIE according to FCC and IC requirements

Performed for GN Hearing A/S

DANAK-1911488
Project no.: A507260-8

28 July 2011

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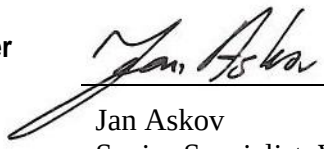
Title	Radio parameter test of MRIE according to FCC and IC requirements
Test object	MRIE
Report no.	DANAK-1911488
Project no.	A507260-8
Test period	24 May to 14 June 2011
Client	GN Hearing A/S Lautrupbjerg 7 2750 Ballerup Denmark Tel.: +45 45 75 11 11
Contact person	Vinnie Nørager E-mail: vnoerager@gnresound.dk
Manufacturer	GN Hearing A/S
Specifications	- FCC CFR 47 Part 15, Subpart C Specific rule part 15.249 - IC Standard RSS-210, Issue 8:2010 - IC Standard RSS-Gen, Issue 3:2010
Results	The test objects were found to be in compliance with the specifications, as listed in Section 1
Test personnel	Henrik Egeberg Nielsen Claus Momme Thomsen

Date 28 July 2011

Project Manager



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1. Summary of tests

Tests SRD	Test methods	Rule Section	Results
Antenna requirement	Visual inspection	15.203 RSS-Gen, 7.1.2	Passed
Measurement of radiated emission	ANSI C63.4:2003	15.209 RSS-210, 2.5 & A2.9	Passed
Measurement of 20 dB bandwidth	ANSI C63.4:2003	15.215(c)	Passed
Measurement of band edge compliance	ANSI C63.4:2003	15.209(a)&15.249(d)(e) RSS-210, 2.5 & A2.9	Passed
Measurement of field strength of fundamental	ANSI C63.4:2003	15.249(a) RSS-210, 2.5 & A2.9	Passed
Measurement of occupied bandwidth	IC RSS-Gen:2010	RSS-Gen, 4.6.1	Passed
Measurement of radiated emission, receiver	EN 300 440-1 V1.5.1:2009	RSS-Gen, 6 RSS-210, 2.5	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 Standard RSS-210, Issue 8:2010
- IC Standard RSS-Gen, Issue 3:2010.

The test results relate only to the objects tested.

2. Test objects

2.1 Test objects

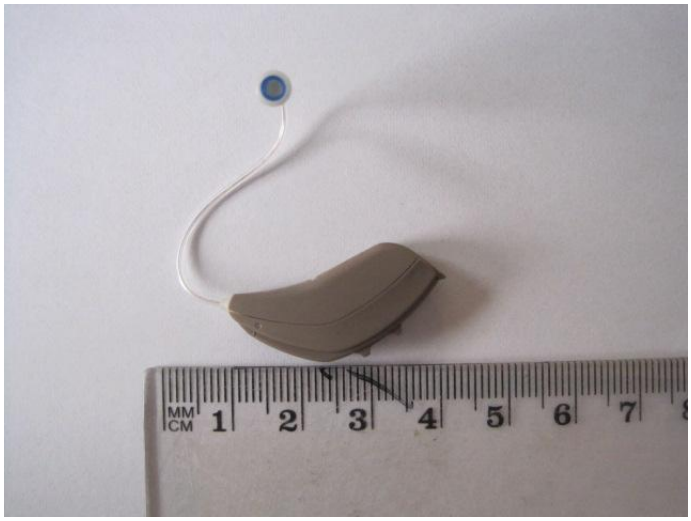


Photo 2.1.1 Picture of test object (measures 40 x 30 x 7 mm including transducer).

Test object 2.1.1

Name of test object	MRIE
Model / type	MRIE
Part no.	MRIE
Serial no.	E15
FCC ID	X26MRIE
IC ID	6941C-MRIE
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Delta Test App 2.0 : 09.11.10
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	MRIE
Model / type	MRIE
Part no.	MRIE
Serial no.	E13
FCC ID	X26MRIE
IC ID	6941C-MRIE
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Delta Test App 2.0 : 09.11.10
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	MRIE
Model / type	MRIE
Part no.	MRIE
Serial no.	E11
FCC ID	X26MRIE
IC ID	6941C-MRIE
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Delta Test App 2.0 : 09.11.10
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	MRIE
Model / type	MRIE
Part no.	MRIE
Serial no.	E27
FCC ID	X26MRIE
IC ID	6941C-MRIE
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Delta Test App 2.0 : 09.11.10
Cycle time	0.5 ms / 1.0 ms
Comments	Supplied by external power supply or battery

3. General test conditions

3.1 Test setup during test

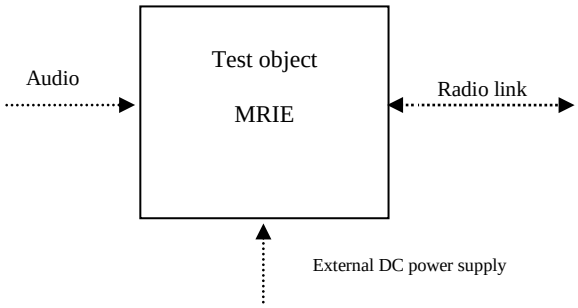


Figure 3.1.1 Block diagram of test object with external cables.

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 supple is not used under intended use.

Intended use

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

3.2 Test sequence

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

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

3.3 Radio specifications, receiver and transmitter

Test object	MRIE	Sheet	Radio-1
Type	MRIE	Project no.	A507260-8
Serial no.	All		
Client	GN Hearing A/S		
Specification	FCC CFR 47 Part 15, Subpart C IC standard RSS-210, Issue 8:2010 IC standard RSS-Gen, issue 3:2010		

The radio of the test object has the following specified RF parameters. The below mentioned 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 PCB antenna
Maximum gain	:	-1.6 dB
Transmit power, max peak	:	-4.4 dBm EIRP
Field Strengh, max peak	:	90.8 dBµV/m (35 mV/m) @ 3 meter
Power level	:	No
No of channels	:	20
Bandwidth	:	
Occupied bandwidths (99%)	:	3.260 MHz (Measured)
Necessary bandwidth	:	3.260 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 ºC.
Emission Designator	:	3M43F7E
Max. TX spurious emission, average	:	393.6 (µV/m) @ 3 meter (Field Strength)
Max. RX spurious emission, peak	:	240 (µV/m) @ 3 meter (Field Strength)

4. Test results

4.1 Antenna requirement

Test object	MRIE	Sheet	ANT-1
Type	MRIE	Project no.	A507260-8
Serial no.	E11	Date	14 June 2011
Client	GN Hearing A/S	Initials	JAS
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.203 IC Standard: RSS-Gen, Issue 3:2010, Section 7.1.2		

Test method	Visual inspection	

Evaluation criteria

Section 15.203 of the FCC rules and 7.1.2 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.

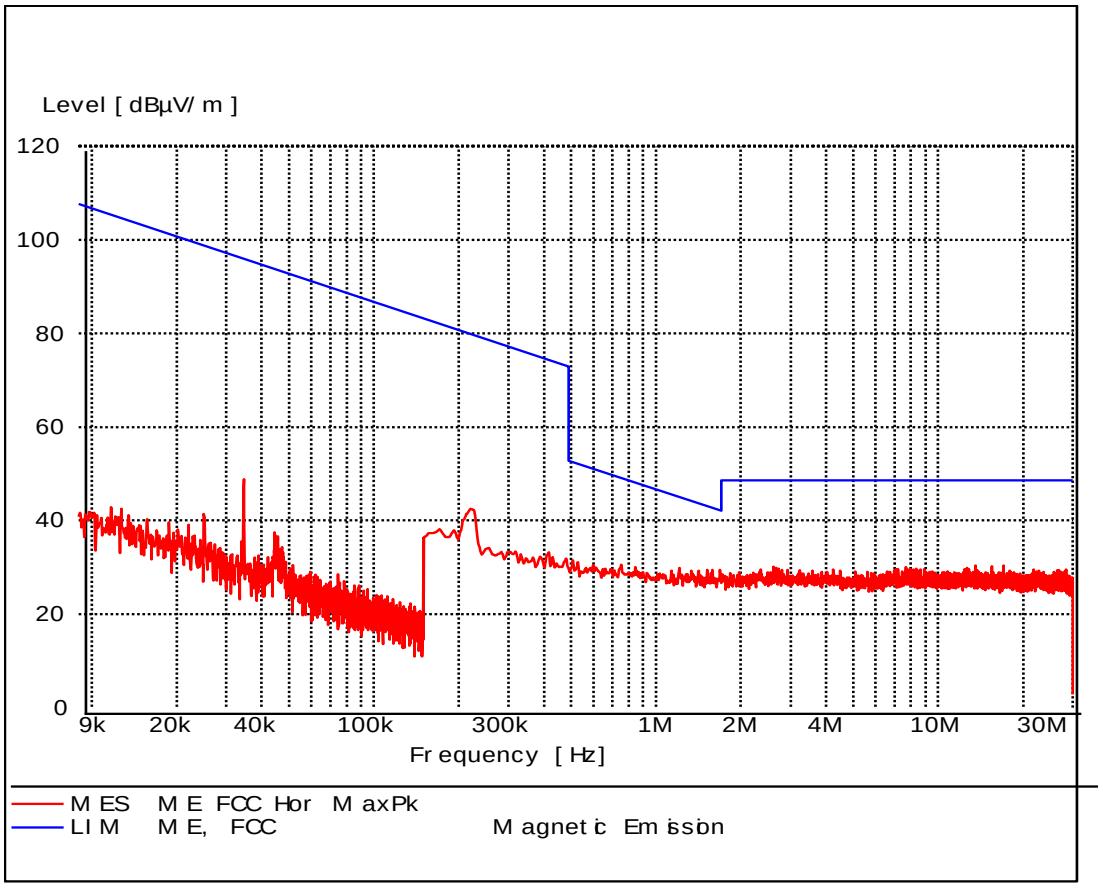
Evaluation result

The MRIE has one permanent attached PCB antenna.

4.2 Measurement of radiated emission

Test object	MRIE	Sheet	RE Loop-1
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	25 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	0.009-30MHz

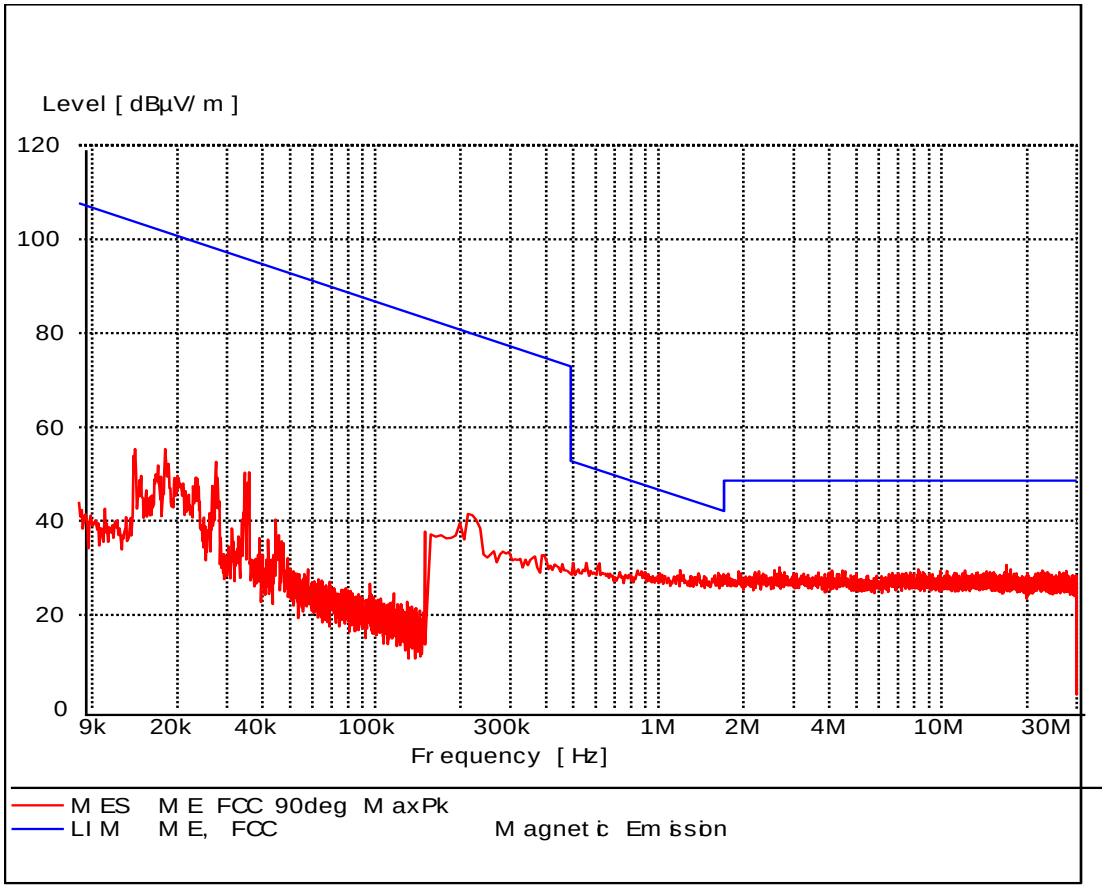
Test method Characteristics	ANSI C63.4:2003 Scan, Loop Antenna at 10 m, 1 m Height, Horizontal.	Temperature Humidity	22 °C 37 % RH
Detector	Peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 29332 29503 49600 29494	Uncertainty 4 dB	



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 object	MRIE	Sheet	RE Loop-2
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	25 May. 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	0.009-30MHz

Test method Characteristics	ANSI C63.4:2003 Scan, Loop Antenna at 10 m, 1 m Height, 90 deg.	Temperature Humidity	22 °C 37 % RH
Detector	Peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 29332 29503 49600 29494	Uncertainty 4 dB	

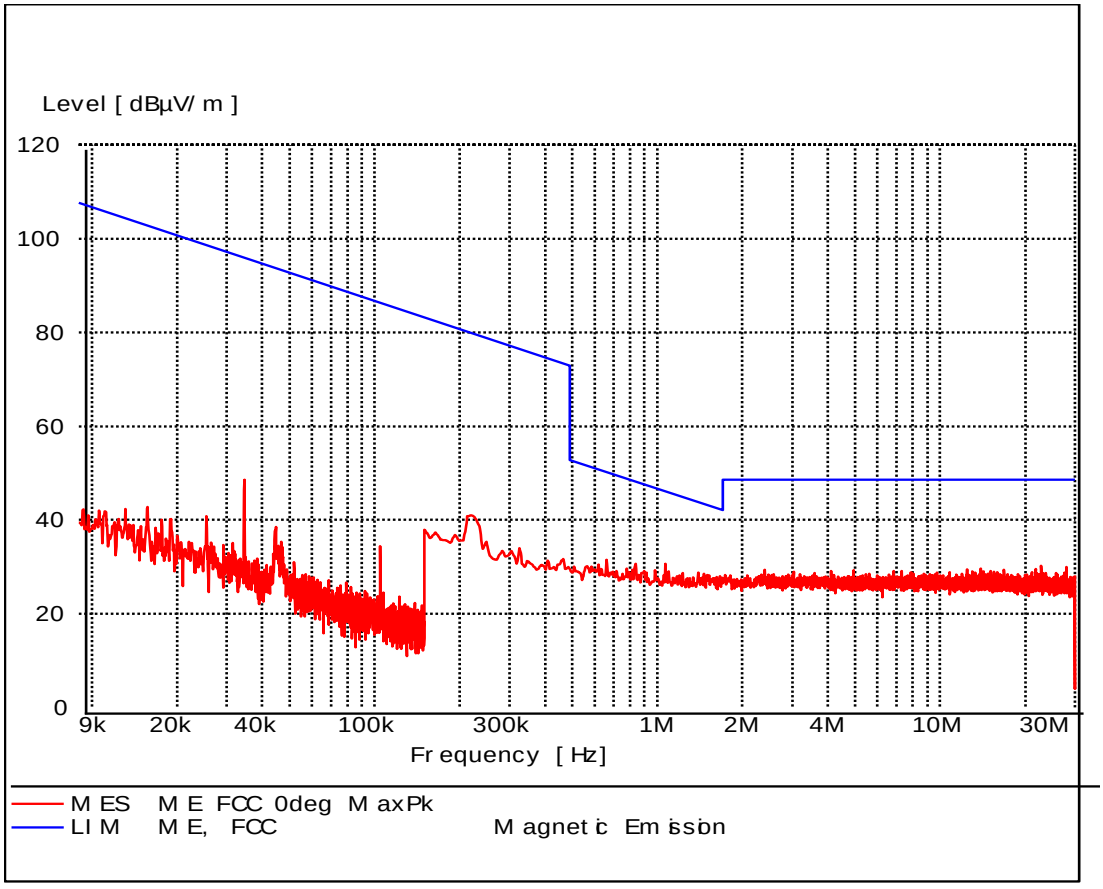


Comments

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 object	MRIE	Sheet	RE Loop-3
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	25 May. 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	0.009-30MHz

Test method Characteristics	ANSI C63.4:2003 Scan, Loop Antenna at 10 m, 1 m Height, 0 deg.	Temperature Humidity	22 °C 37 % RH
Detector	Peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 29332 29503 49600 29494	Uncertainty 4 dB	



Comments

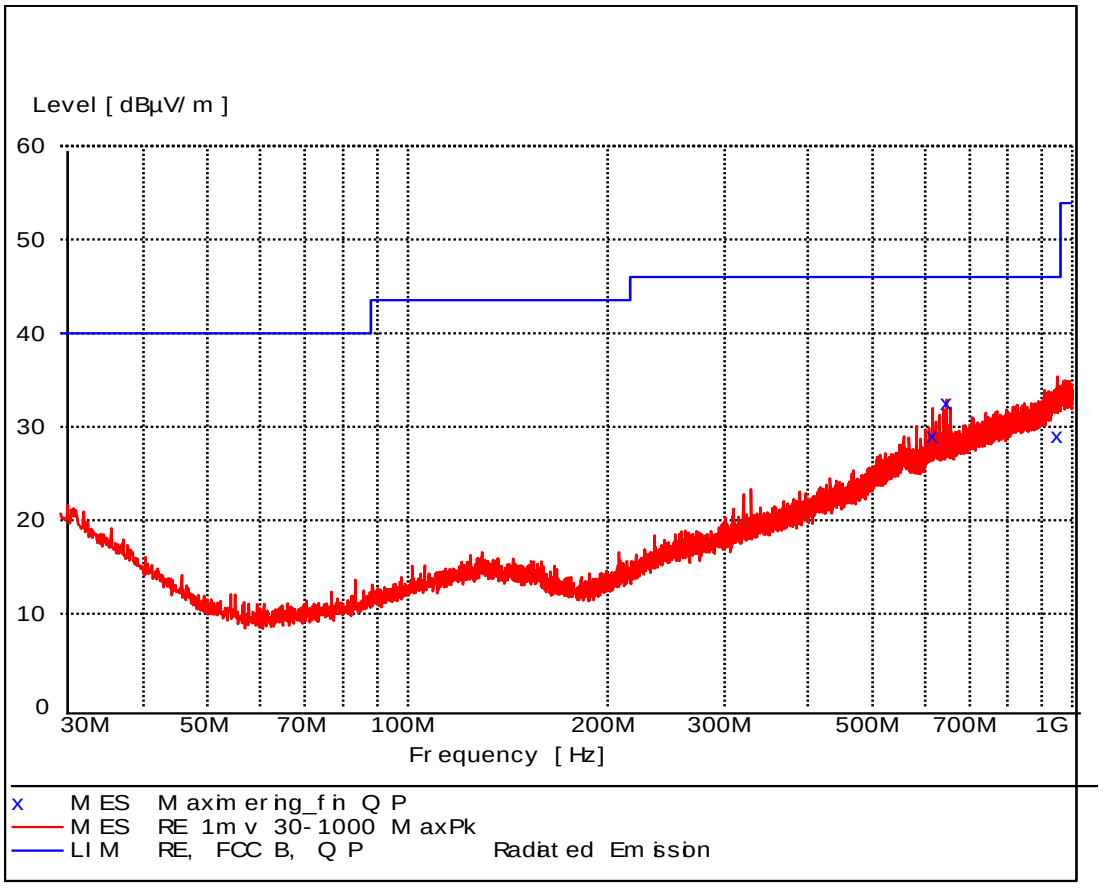
The limit has been extrapolated to 10 m using an extrapolation factor of 40 dB/decade as specified in § 15.31(f)(2). $L_2 = L_1 + 40 \log_{10} (D_1/D_2)$.

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 4.2.1 Test setup regarding measurement of radiated emission.

Test object	MRIE	Sheet	RE_Spur-1
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

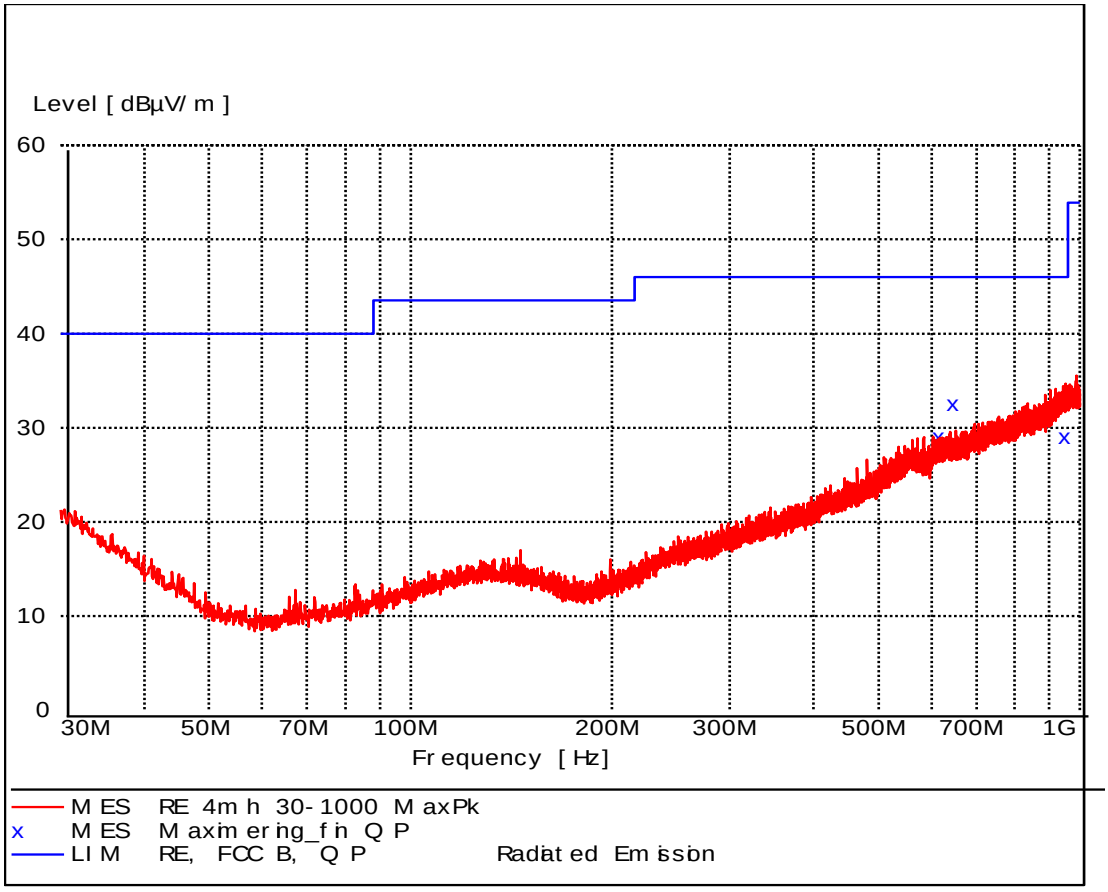
Test method Characteristics	ANSI C63.4:2003 Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Temperature Humidity	23 °C 43 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty 4.9 dB	



Comments Continuous Tx - normal modulation - hopping off

Test object	MRIE	Sheet	RE_Spur-2
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.4:2003 Pre-scan, Antenna at 3 m, 3 m height, hor. pol.	Temperature Humidity	23 °C 43 % 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	MRIE	Sheet	RE_Spur-3
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

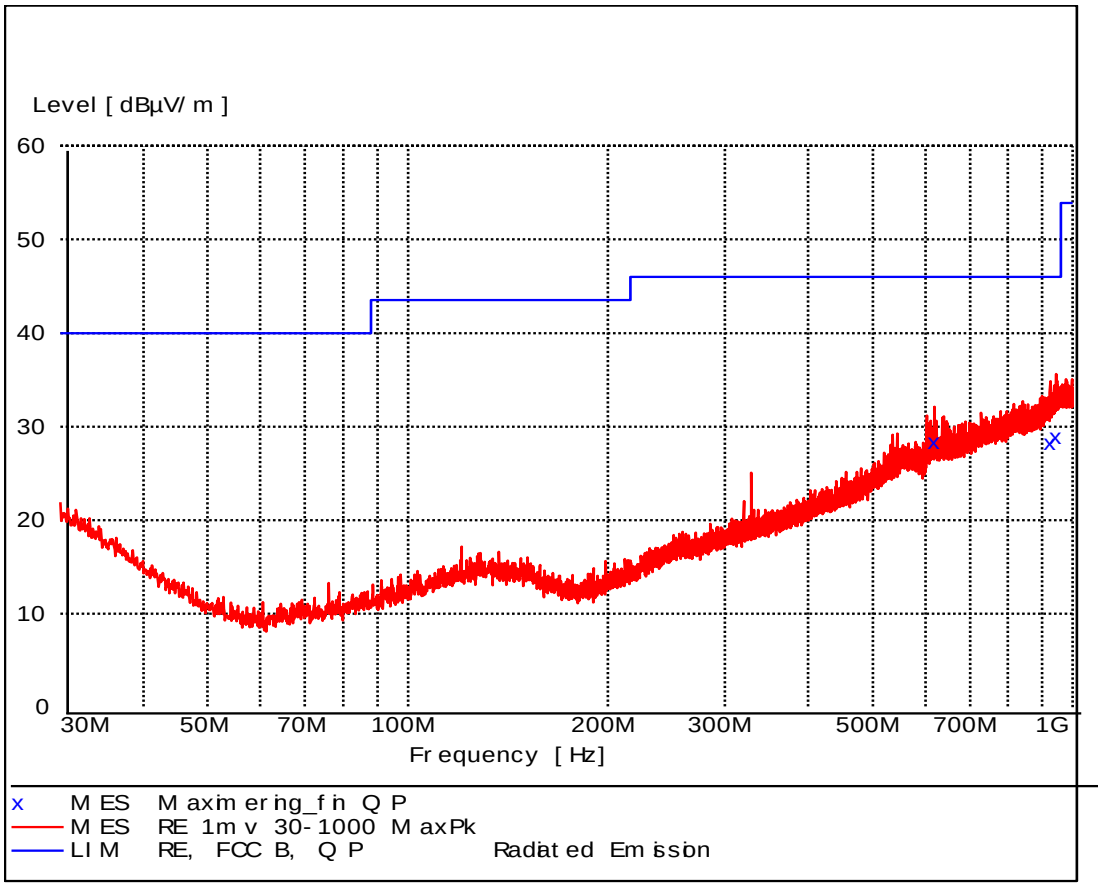
Test method Characteristics	ANSI C63.4:2003 Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Temperature Humidity	23 °C 43 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty 4.9 dB	

Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
616.000000	29.00	23.8	46.0	17.0	101.0	1.00	VERTICAL
648.000000	32.60	24.1	46.0	13.4	159.0	27.00	VERTICAL
950.200000	29.00	29.3	46.0	17.0	322.0	218.00	VERTICAL

Test result	The measured field strengths are below the limit
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	MRIE	Sheet	RE_Spur-4
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

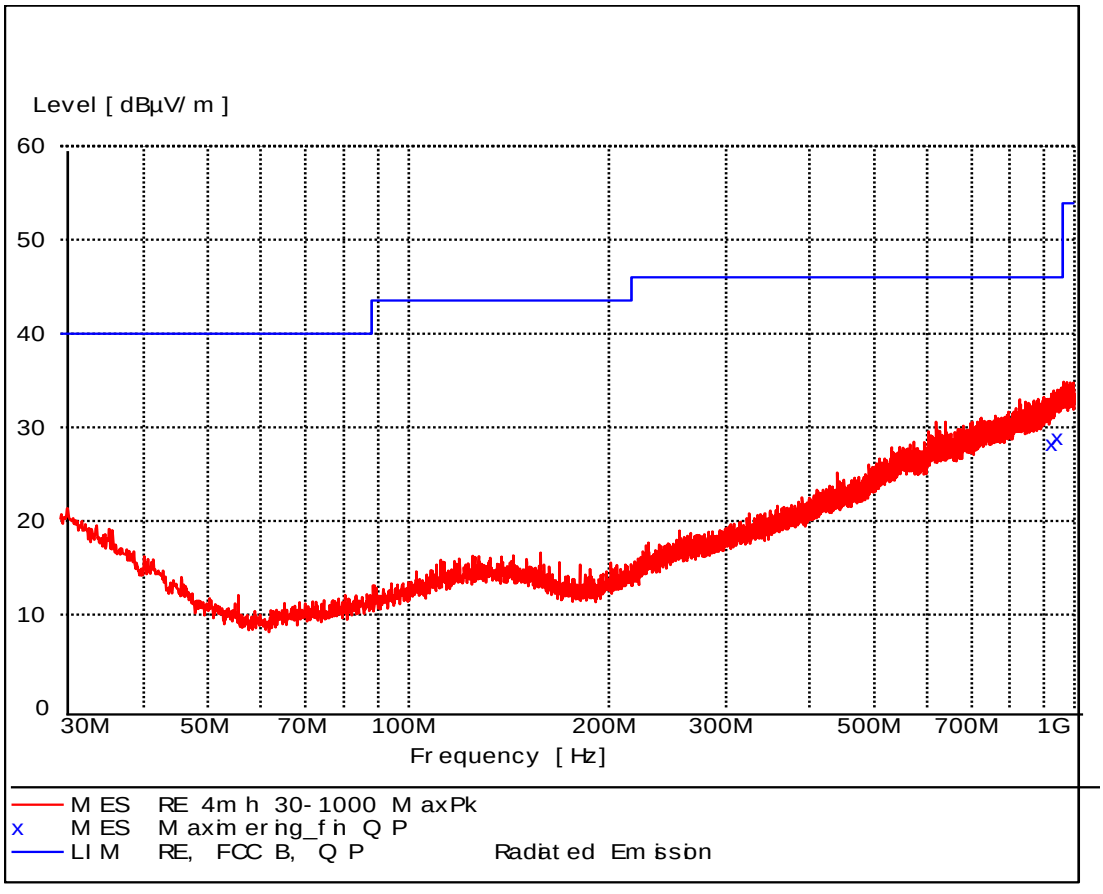
Test method Characteristics	ANSI C63.4:2003 Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Temperature Humidity	23 °C 43 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty 4.9 dB	



Comments Continuous Tx - normal modulation - hopping off

Test object	MRIE	Sheet	RE_Spur-5
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.4:2003 Pre-scan, Antenna at 3 m, 3 m height, hor. pol.	Temperature Humidity	23 °C 43 % 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	MRIE	Sheet	RE_Spur-6
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

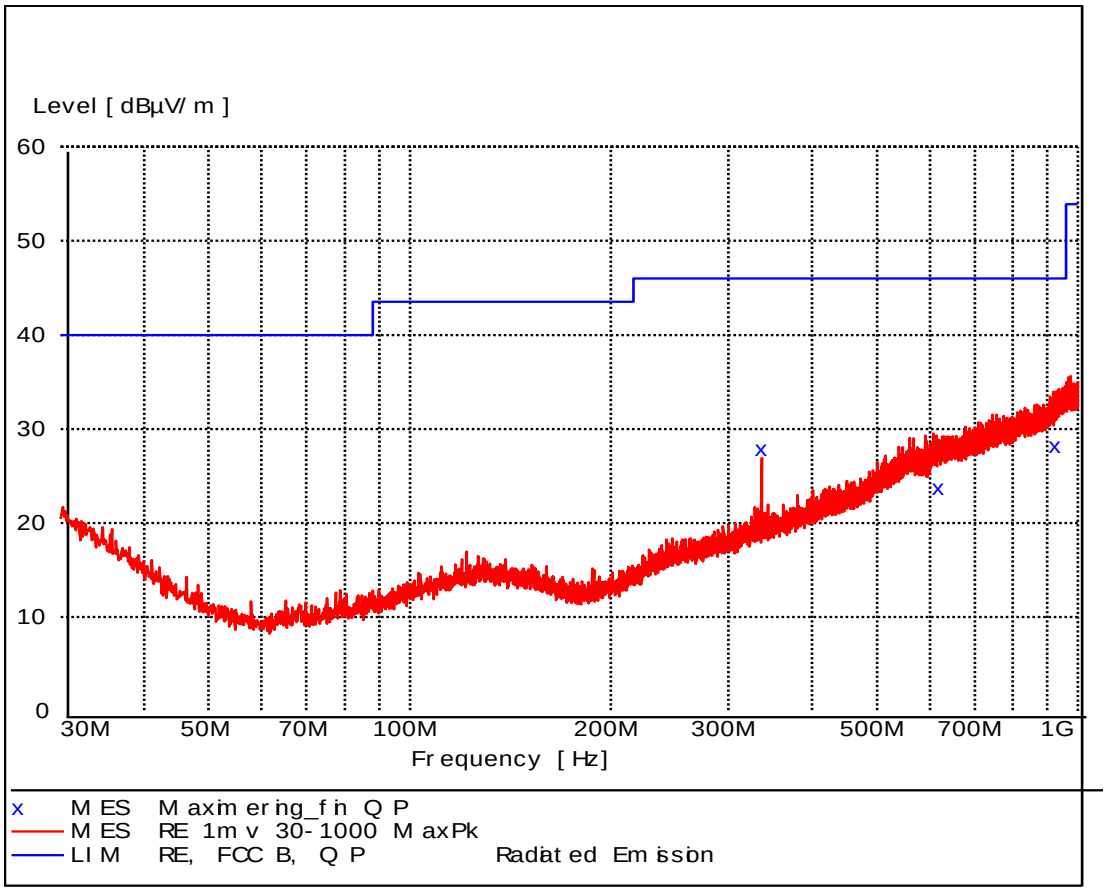
Test method Characteristics	ANSI C63.4:2003 Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Temperature Humidity	23 °C 43 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty 4.9 dB	

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
620.000000	28.30	23.8	46.0	17.7	105.0	6.00	VERTICAL
925.700000	28.20	28.6	46.0	17.8	145.0	1.00	VERTICAL
945.700000	28.90	29.2	46.0	17.1	214.0	50.00	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 VDC

Test object	MRIE	Sheet	RE_Spur-7
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

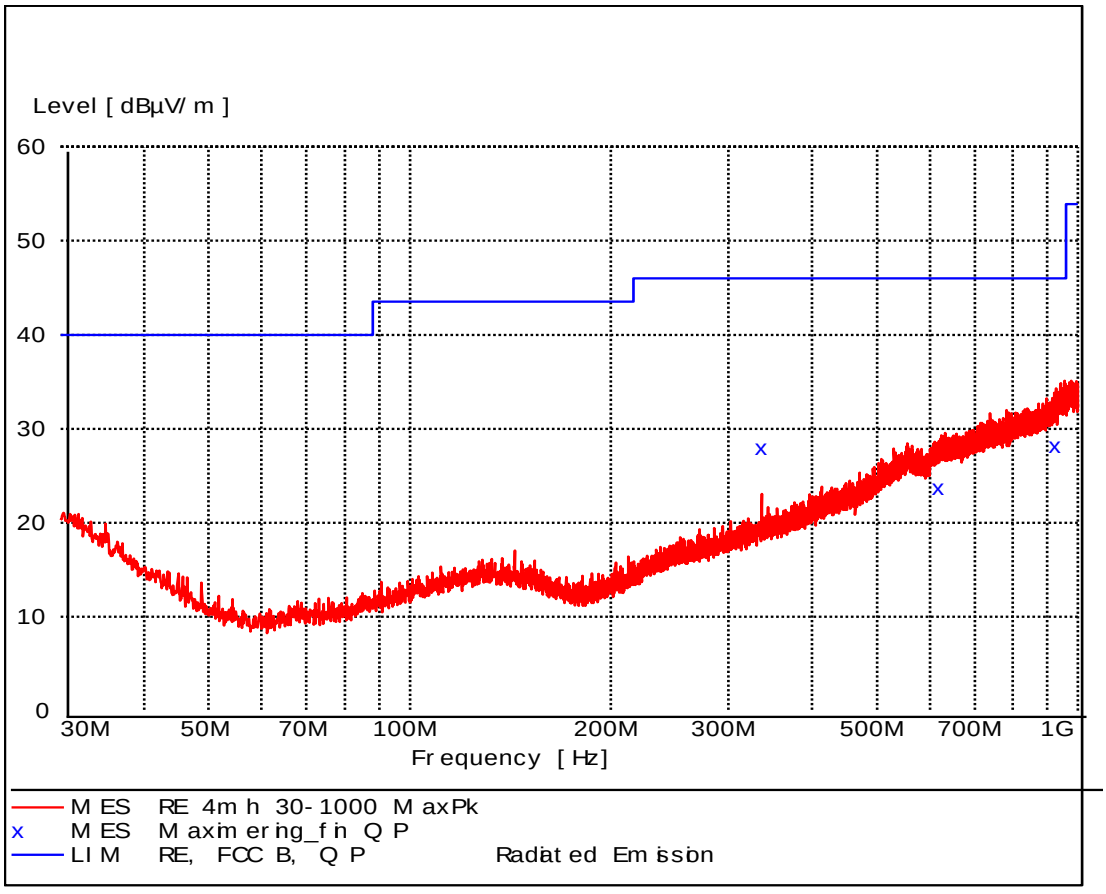
Test method Characteristics	ANSI C63.4:2003 Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Temperature Humidity	23 °C 43 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty 4.9 dB	



Comments Continuous Tx - normal modulation - hopping off

Test object	MRIE	Sheet	RE_Spur-8
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.4:2003 Pre-scan, Antenna at 3 m, 3 m height, hor. pol.	Temperature Humidity	23 °C 43 % 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	MRIE	Sheet	RE_Spur-9
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.4:2003 Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Temperature Humidity	23 °C 43 % 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
336.000000	27.90	17.2	46.0	18.1	144.0	23.00	VERTICAL
620.000000	23.70	23.8	46.0	22.3	241.0	243.00	VERTICAL
925.700000	28.20	28.6	46.0	17.8	104.0	27.00	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 VDC.

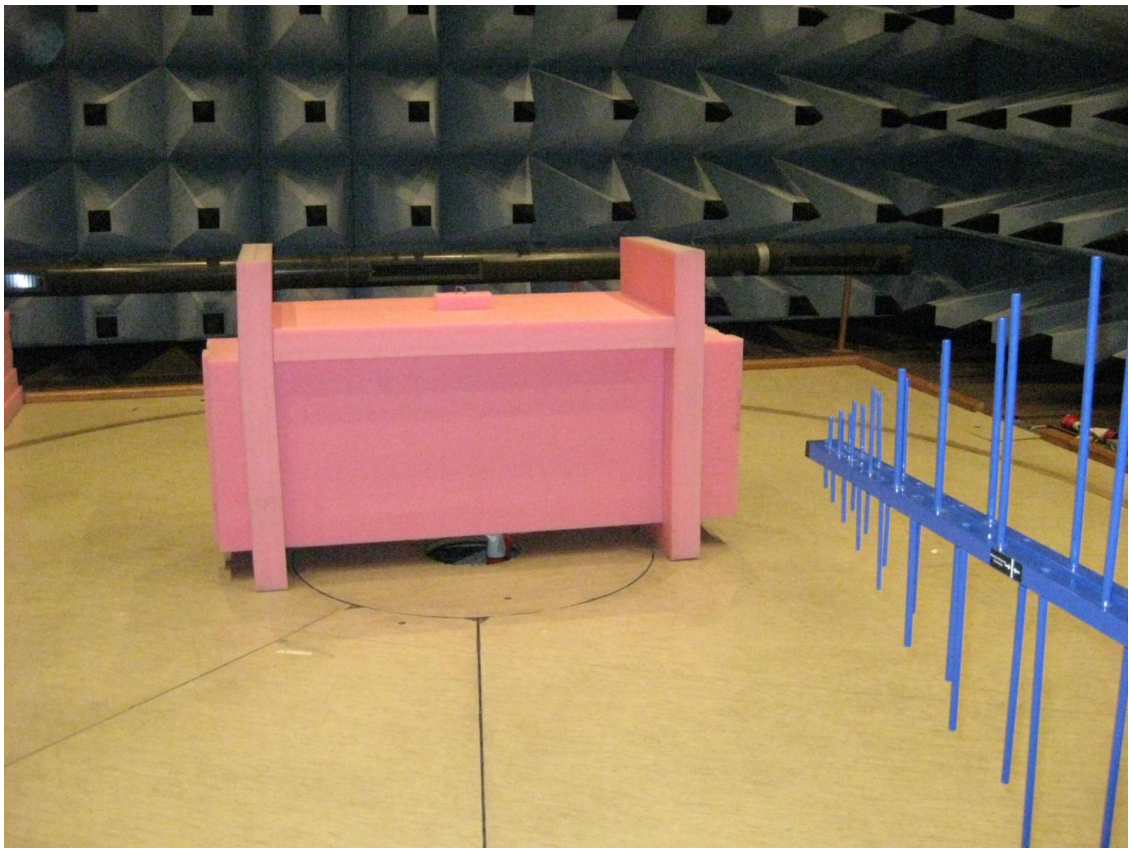


Photo 4.2.2 Test setup regarding measurement of radiated emission.

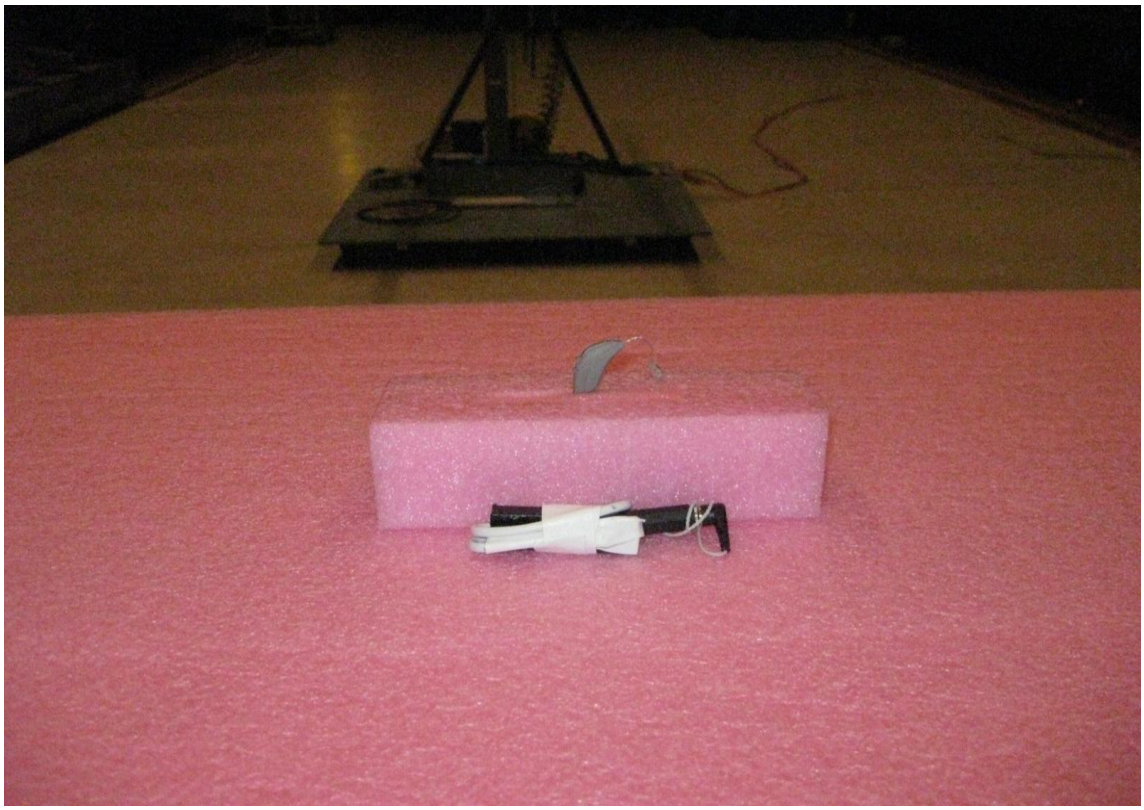
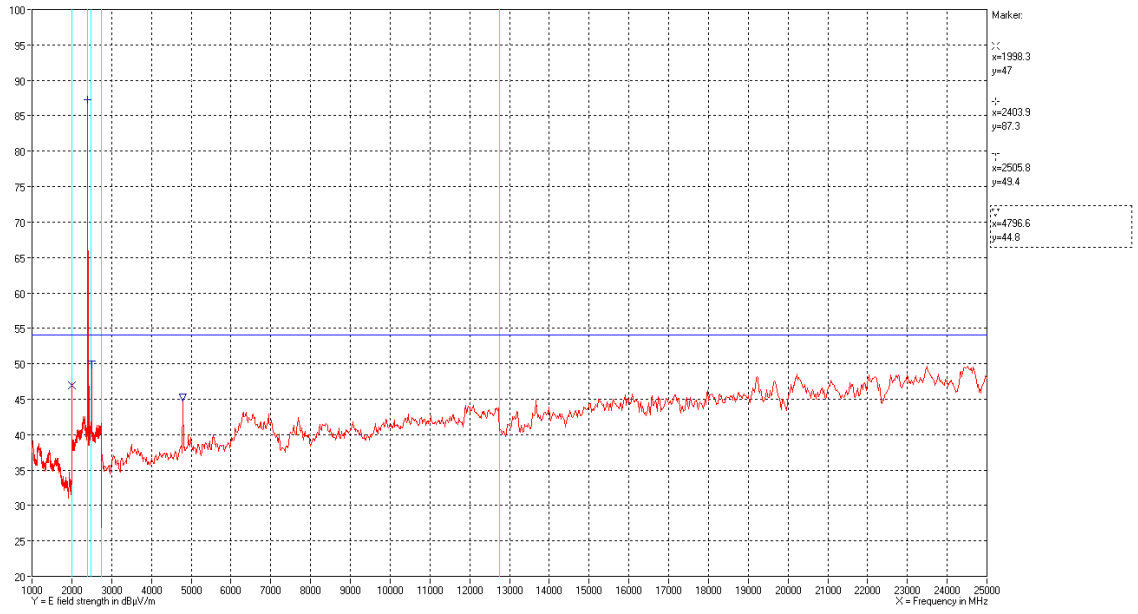


Photo 4.2.3 Test setup regarding measurement of radiated emission.

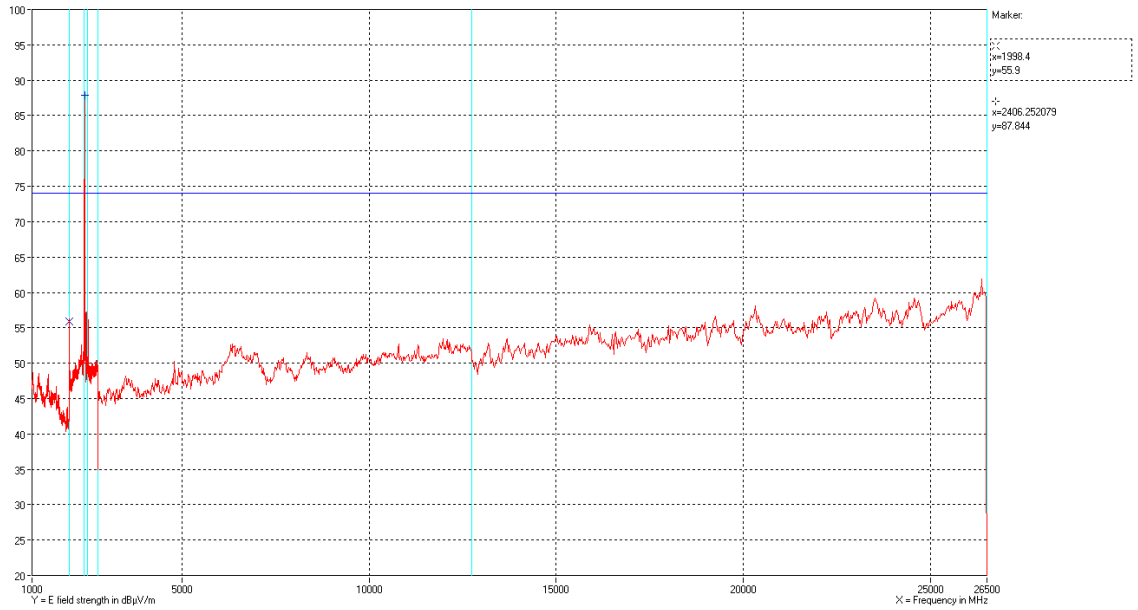
Test object	MRIE	Sheet	RE_Spur-10
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	1 June 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	1 –25 GHz

Test method Characteristics	ANSI C63.4:2003 Complete search, Antenna distance 3 m.	Temperature Humidity	20 °C 40 % 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 Vertical and horizontal average measurements

Comments Continuous Tx - normal modulation - hopping off

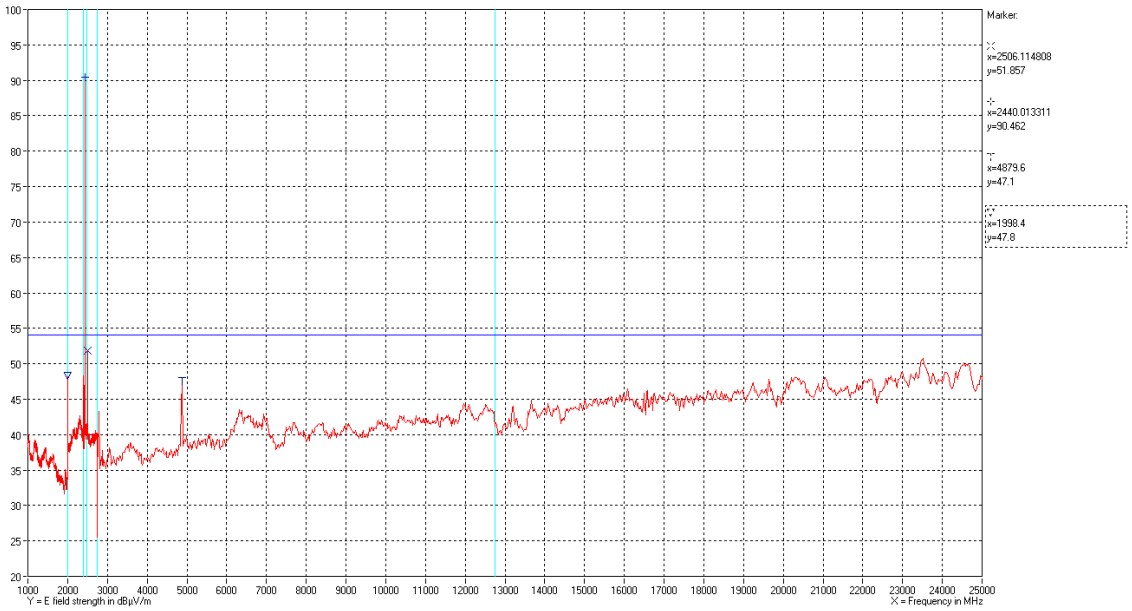


Polarization	Vertical and horizontal peak measurements
Comments	Continuous Tx - normal modulation - hopping off

Test result	The measured field strengths are below the limit
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 VDC.

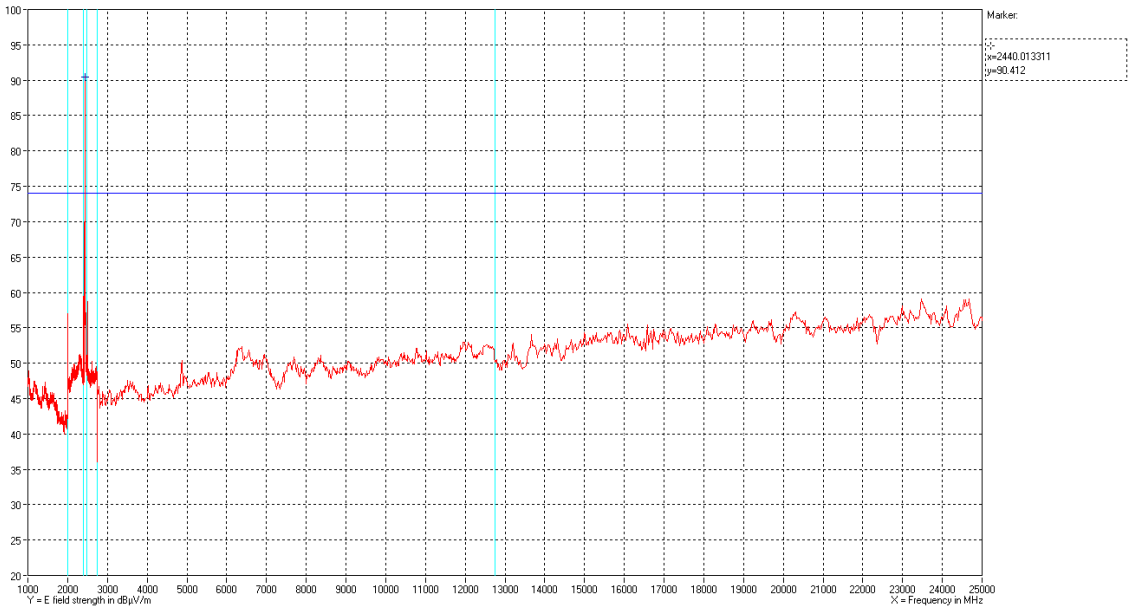
Test object	MRIE	Sheet	RE_Spur-11
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	1–25 GHz

Test method Characteristics	ANSI C63.4:2003 Complete search, Antenna distance 3 m.	Temperature Humidity	21 °C 42 % RH
Detector	Peak and Average 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

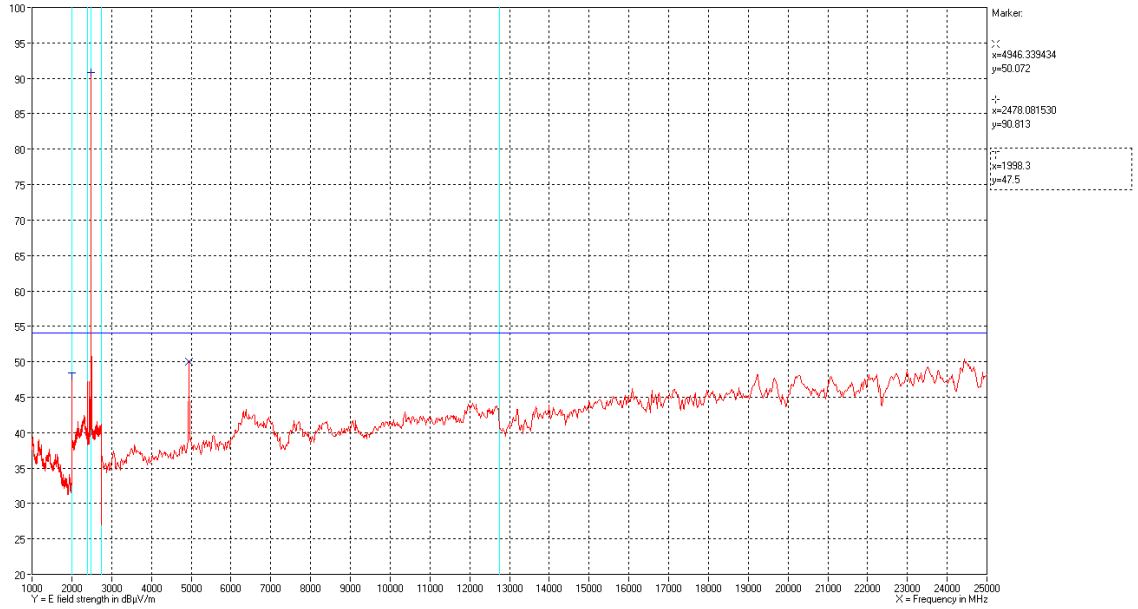


Polarization	Vertical and horizontal peak measurements
Comments	Continuous Tx - normal modulation - hopping off

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 VDC.

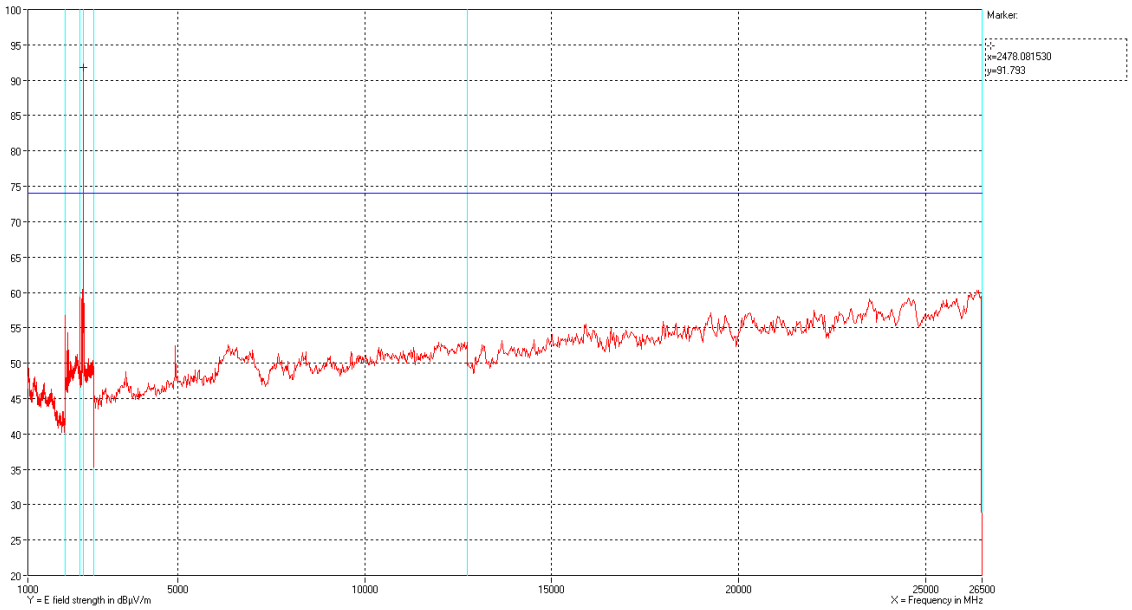
Test object	MRIE	Sheet	RE_Spur-12
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	31 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC standard RSS-210, Issue 8:2010 IC standard RSS-Gen, Issue 3:2010	Frequency	1 GHz–25 GHz

Test method Characteristics	ANSI C63.4:2003 Complete search, Antenna distance 3 m.	Temperature Humidity	23 °C 45 % 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 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

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 VDC.

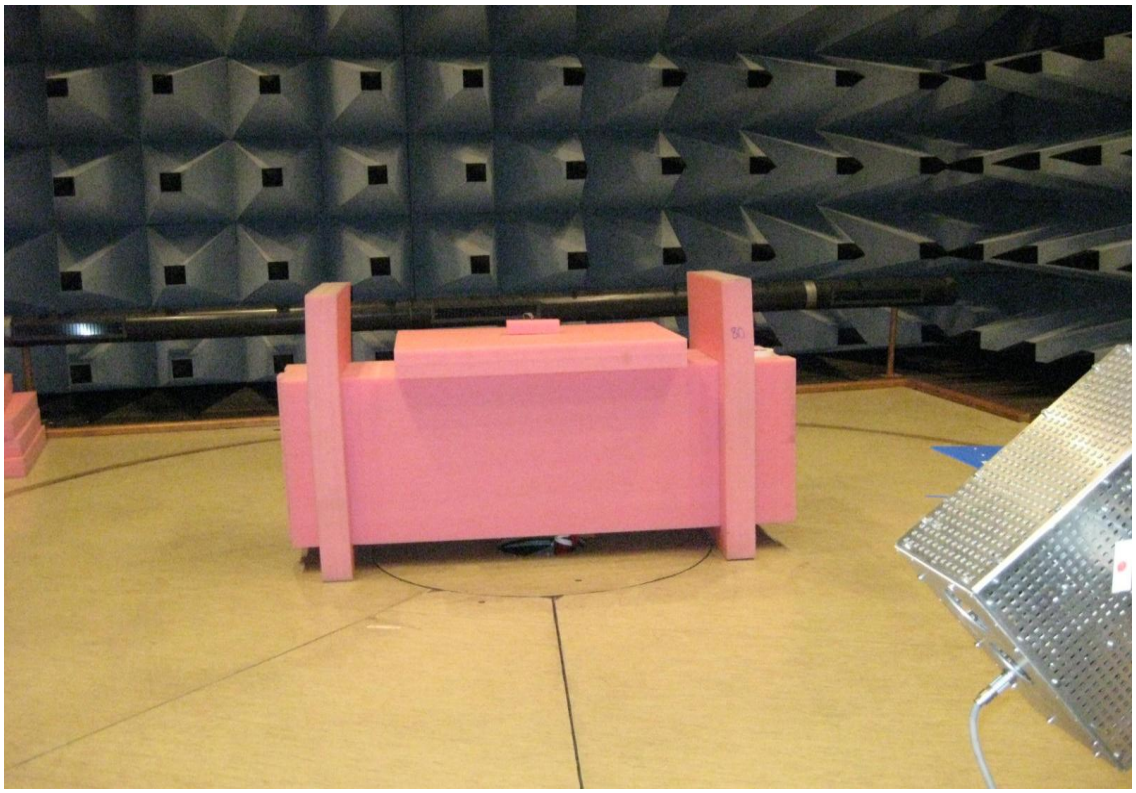


Photo 4.2.4 Test setup regarding measurement of radiated emission.

Photo 4.2.5 Test setup regarding measurement of radiated emission.

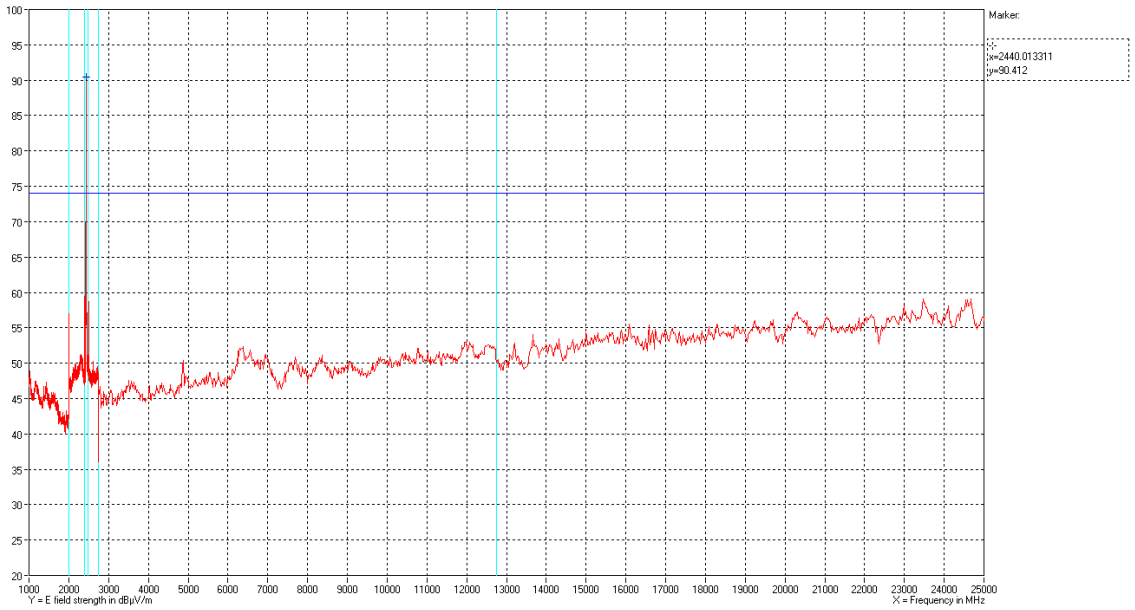
4.3 Measurement of field strength of fundamental

Test object	MRIE	Sheet	RE_Spur-13
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	See section 4.2
Client	GN Hearing A/S	Initials	See section 4.2
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.249(a) IC standard RSS-210, Issue 8:2010, Section 2.5 & A2.9	Frequency	1–25 GHz

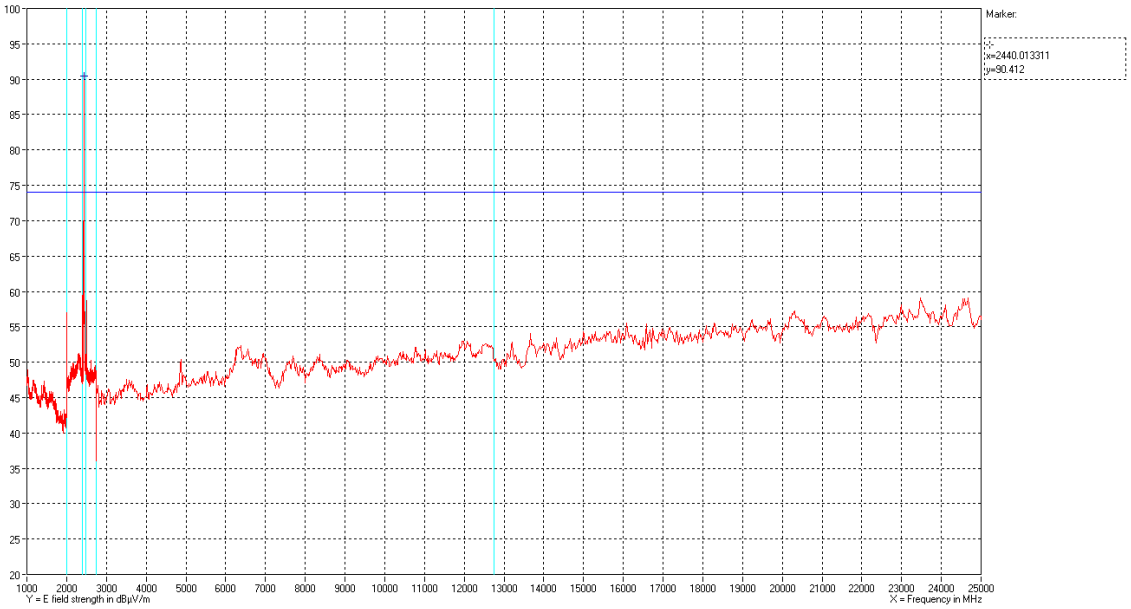
Test method Characteristics	ANSI C63.4:2003 Complete search, Antenna distance 3 m	Temperature Humidity	See section 4.2
Detector	Peak for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49183 49299	Uncertainty 4.9 dB	

Operating frequency	Peak Measurement	PACF	Corrected average	Limit	Comment
2404	87.8	-	-	94	Passed
2440	90.4	-	-	94	Passed
2478	90.8	-	-	94	Passed
MHz	dBµV/m	dB	dBµV/m	dBµV/m	
Note:					

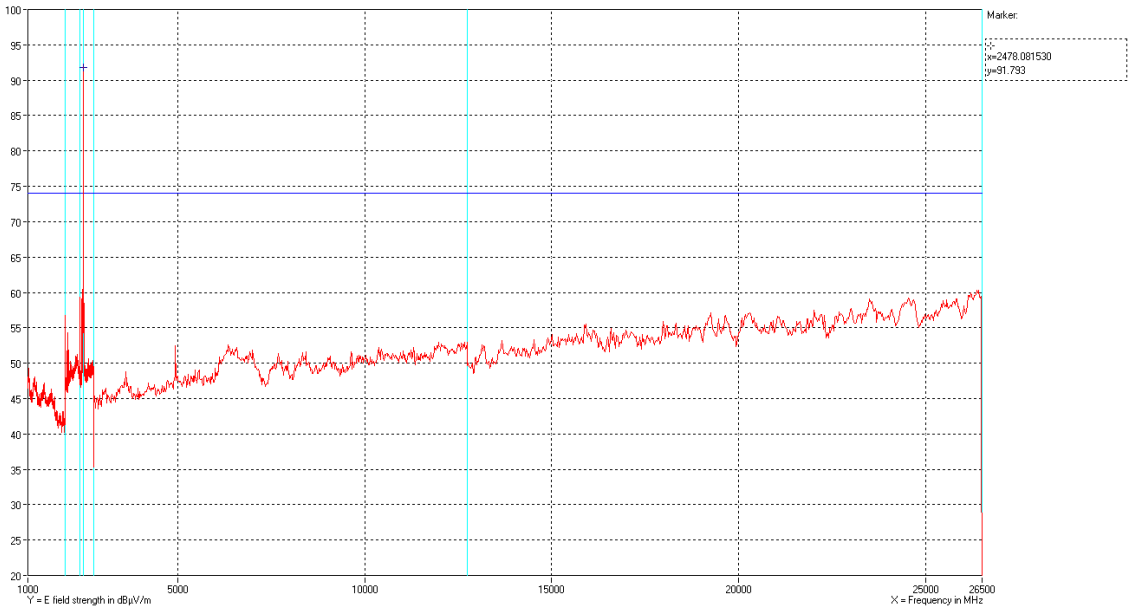
Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External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



Comments 2404 MHz



Comments 2440 MHz



Comments 2478 MHz

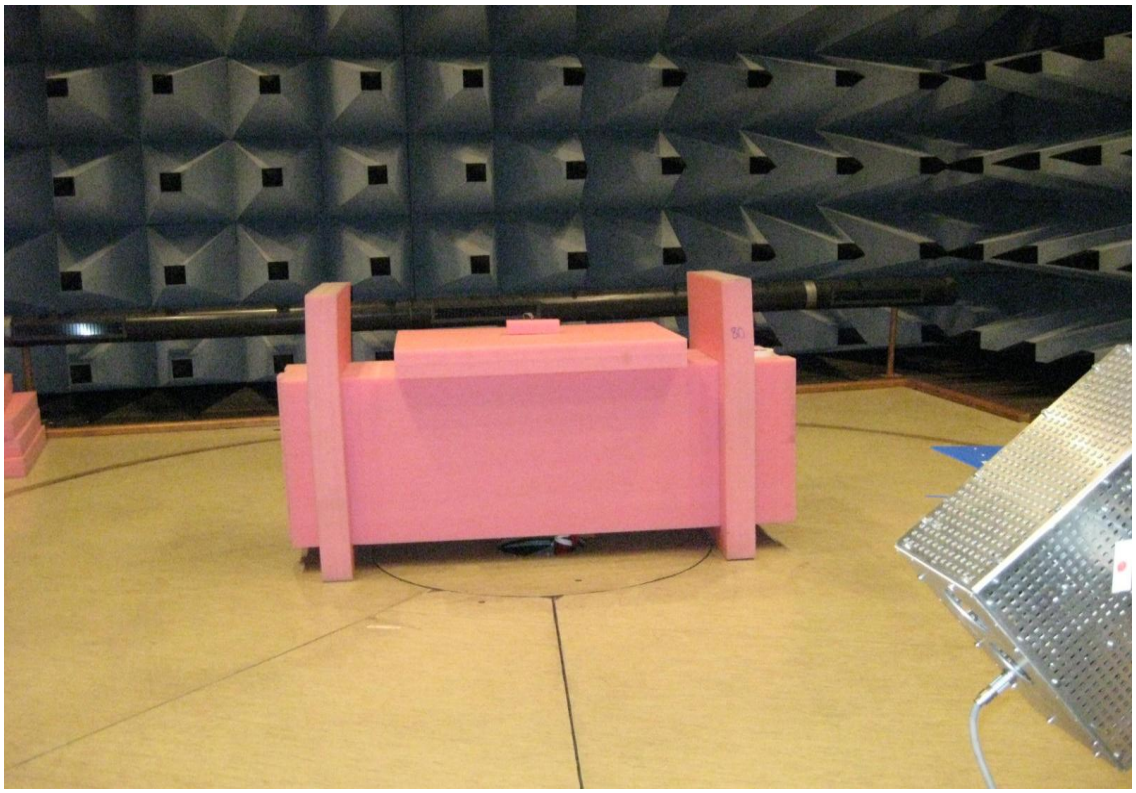


Photo 4.3.1 Test setup regarding measurement of field strength of fundamental.

Photo 4.3.2 Test setup regarding measurement of field strength of fundamental.

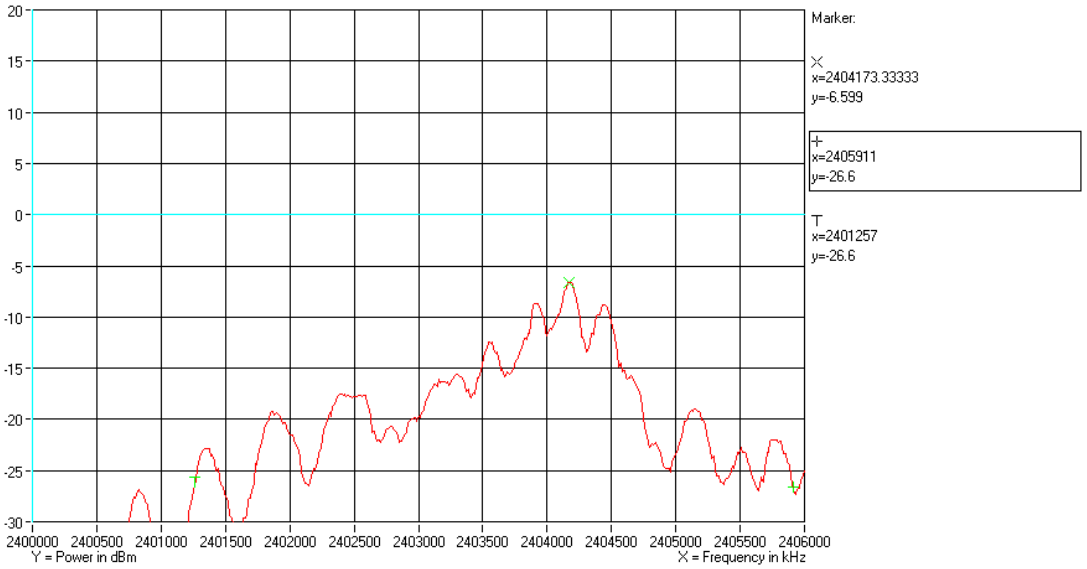
4.4 Measurement of 20 dB bandwidth

Test object	MRIE	Sheet	PROF-1
Type	MRIE	Project no.	A507260-8
Serial no.	E27	Date	25 May 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.215(c)		

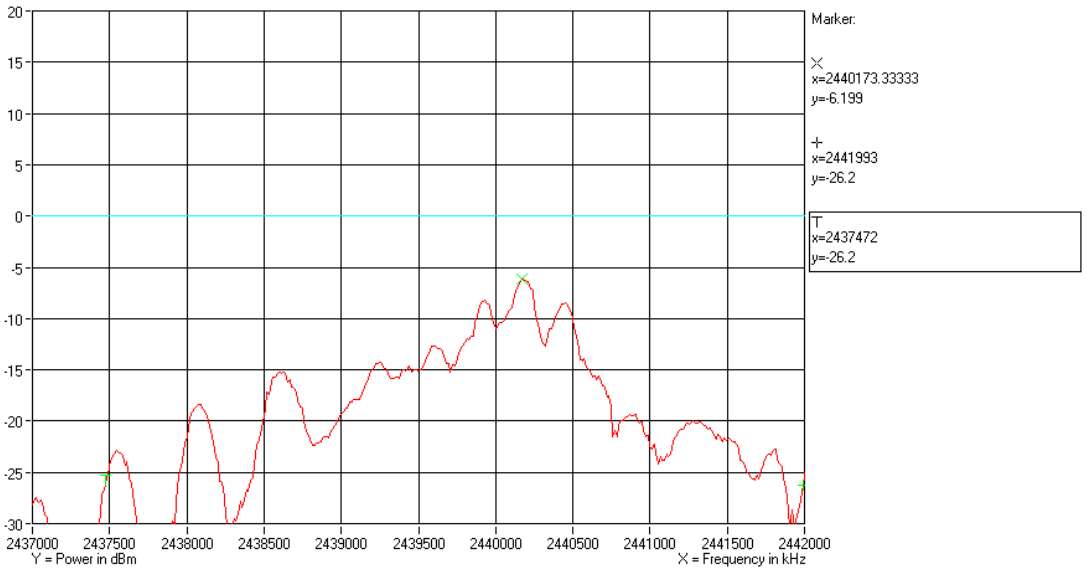
Test method Characteristics	ANSI C63.4:2003 Temperature: 22 °C. Test voltage: External power supply at 1.3 VDC	
Test equipm.	Climatic chamber 49184 49550 49299	Uncertainty: 10 kHz
SA Settings	RBW:100 kHz VBW:300 kHz SPAN:4 MHz DET:Peak CF:Operating freq. Trace:Max hold	

Operating frequency	Low frequency	High frequency	Comment
2404	2401.257	2405.911	-
2440	2437.472	2441.993	-
2478	2476.278	2480.683	-
MHz	MHz	MHz	-
	Measured	Limit	Comment
Lowest frequency	2401.257	2400.00	Passed
Highest frequency	2480.683	2483.50	Passed
	MHz	MHz	-

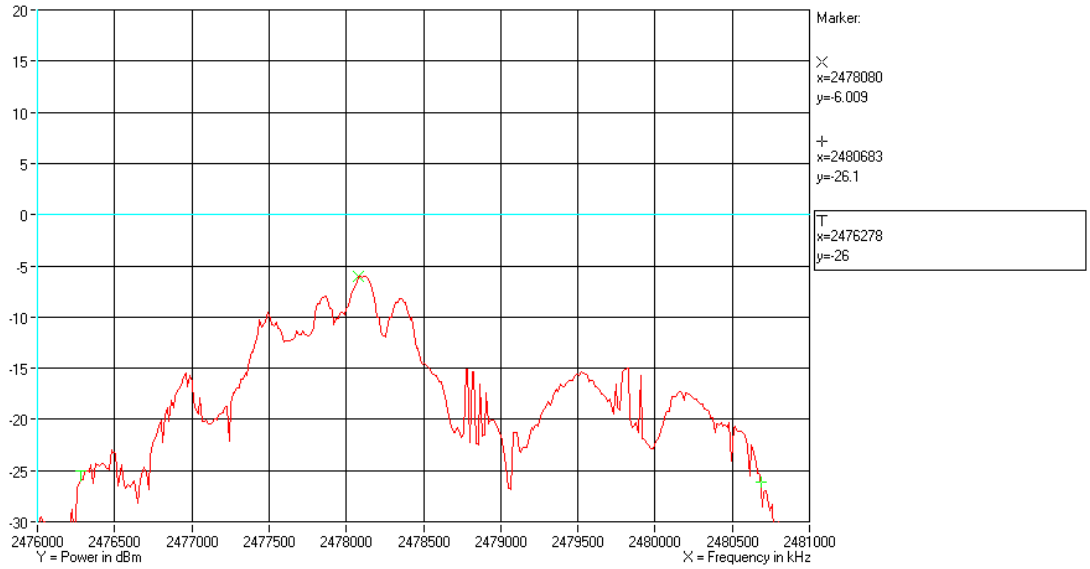
Band edge criteria	20 dB bandwidth
Test result	The measured 20 dB bandwidth was within limit designated in 15.215(c)
Compliant	Yes
Test Port	Conducted - SMA connector
Test mode	Continuous Tx - normal modulation - hopping off
Comments	None



Comments 2404 MHz



Comments 2440 MHz



Comments 2478 MHz

Photo 4.4.1 Test setup regarding measurement of 20 dB bandwidth.

Photo 4.4.2 Test setup regarding measurement of 20 dB bandwidth.

4.5 Measurement of band edge compliance

Test object	MRIE	Sheet	PROF-2
Type	MRIE	Project no.	A507260-8
Serial no.	E15	Date	See section 4.2
Client	GN Hearing A/S	Initials	See section 4.2
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.249(d)(e) IC Standard RSS-210, Issue 8:2010, Section 2.5 & A2.9	Frequency	1–25 GHz

Test method Characteristics	ANSI C63.4:2003 Complete search, Antenna distance 3 m.	Temperature Humidity	See section 4.2
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	
SA Settings	RBW:1000 kHz VBW:1000 kHz SPAN:100 MHz DET:Peak CF:2400/2450MHz Trace:Max hold		

Band Edge frequency	Operating frequency	Average / Peak	Measured Band Edge field strengths	Limit at Band Edge	Comment
2400	2404	Average	46.0	54	Passed
2400	2404	Peak	65.1	74	Passed
2483.5	2478	Average	42.6	54	Passed
2483.5	2478	Peak	62.2	74	Passed
MHz	MHz	-	dBµV/m	dBµV/m	-

Test result — The measured field strengths at band edge are below the limit.

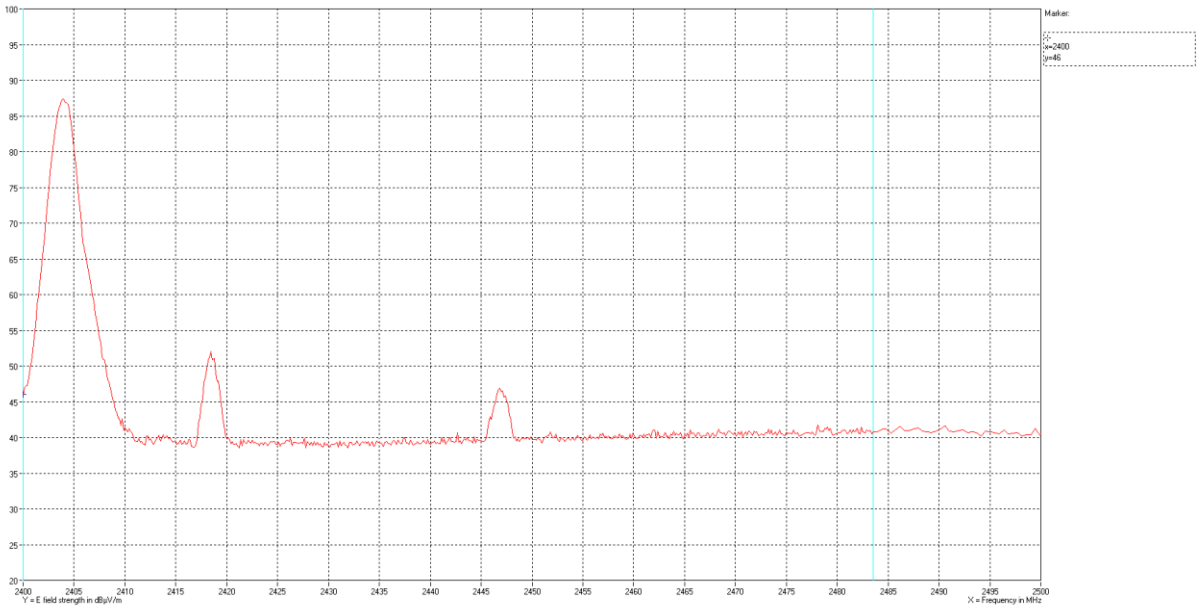
Test Port — Enclosure

Test mode — Continuous Tx - normal modulation - hopping off

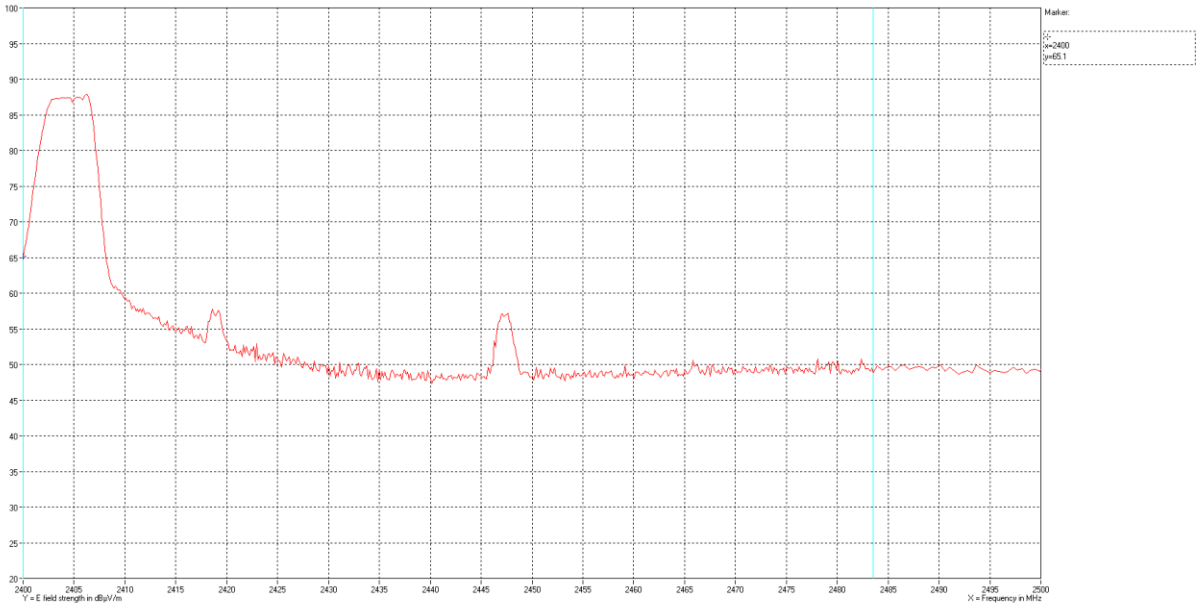
Condition — Normal

Compliant — Yes

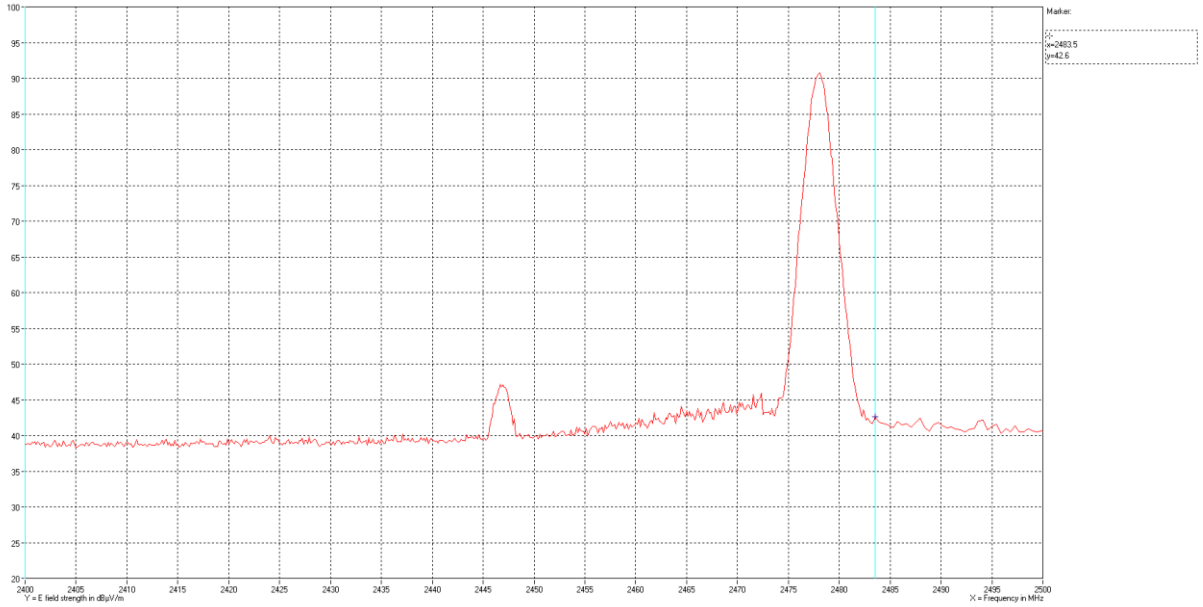
Comments — Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.
Test voltage: External power supply at 1.3 VDC.



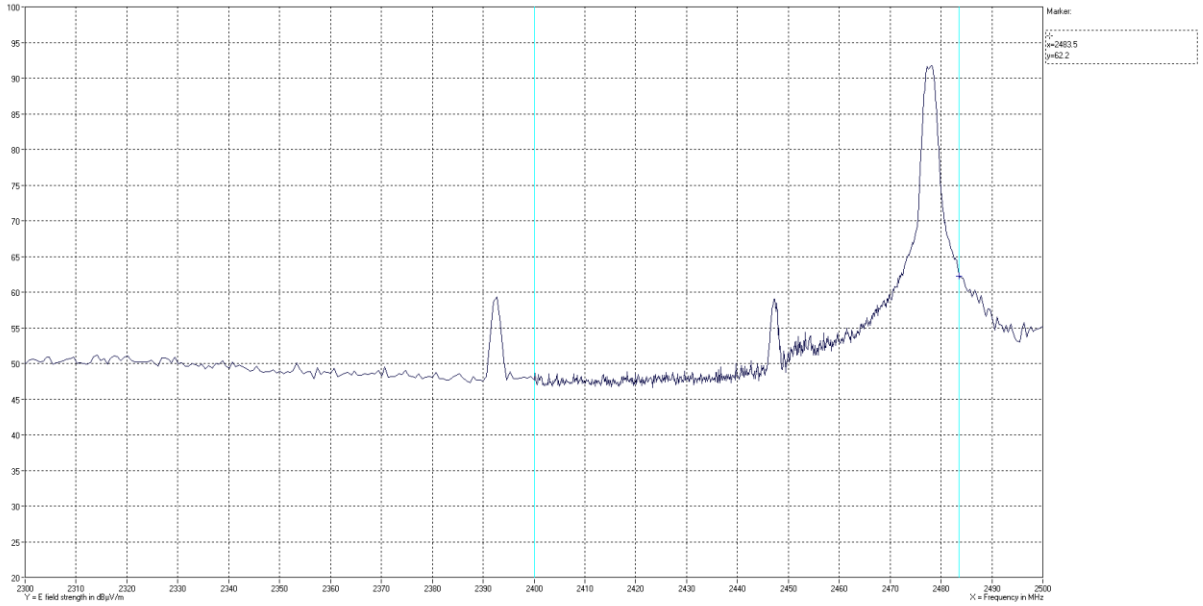
Comments 2404 MHz, Average measurements



Comments 2404 MHz, Peak measurements



Comments 2478 MHz, Average measurements



Comments 2478 MHz, Peak measurements

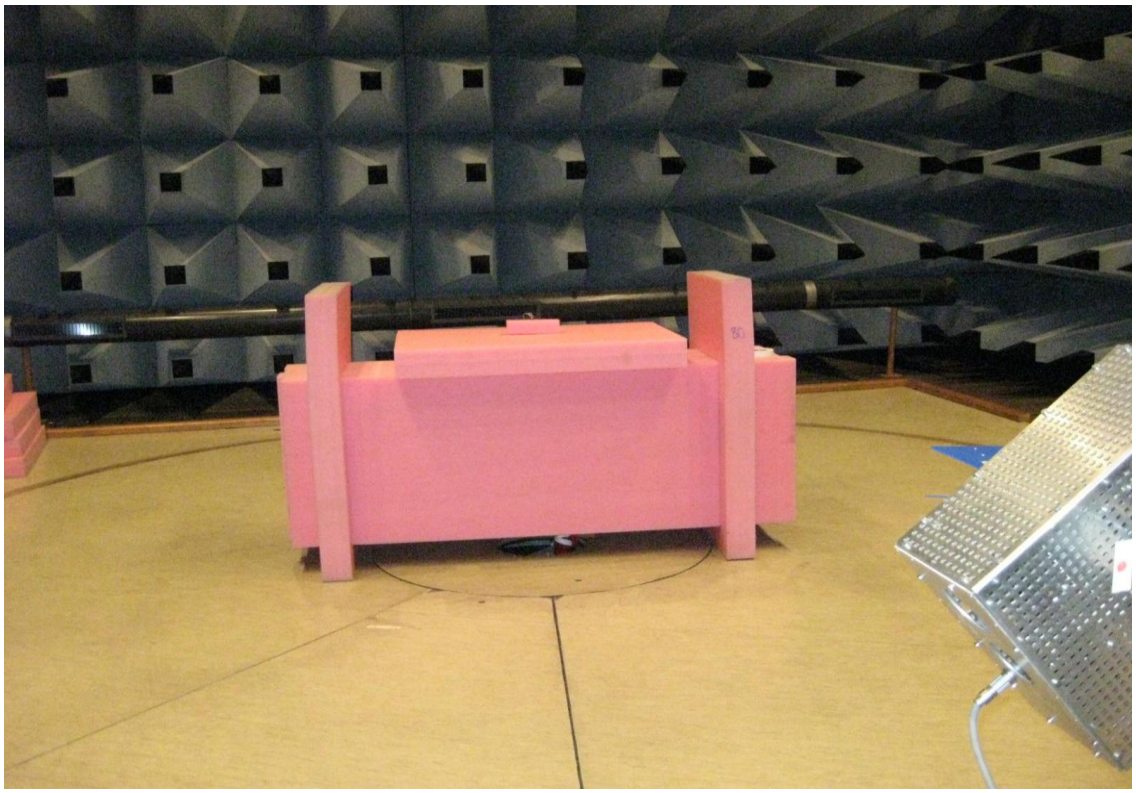


Photo 4.5.1 Test setup regarding measurement of band edge compliance.

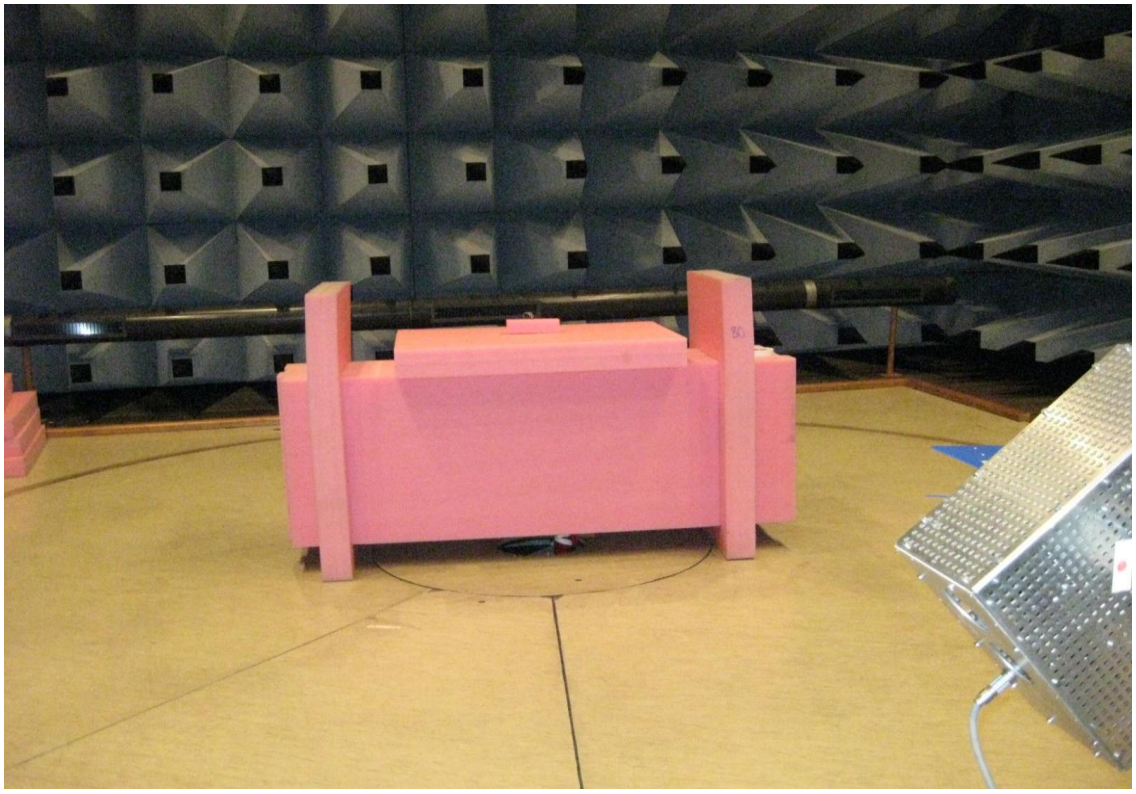


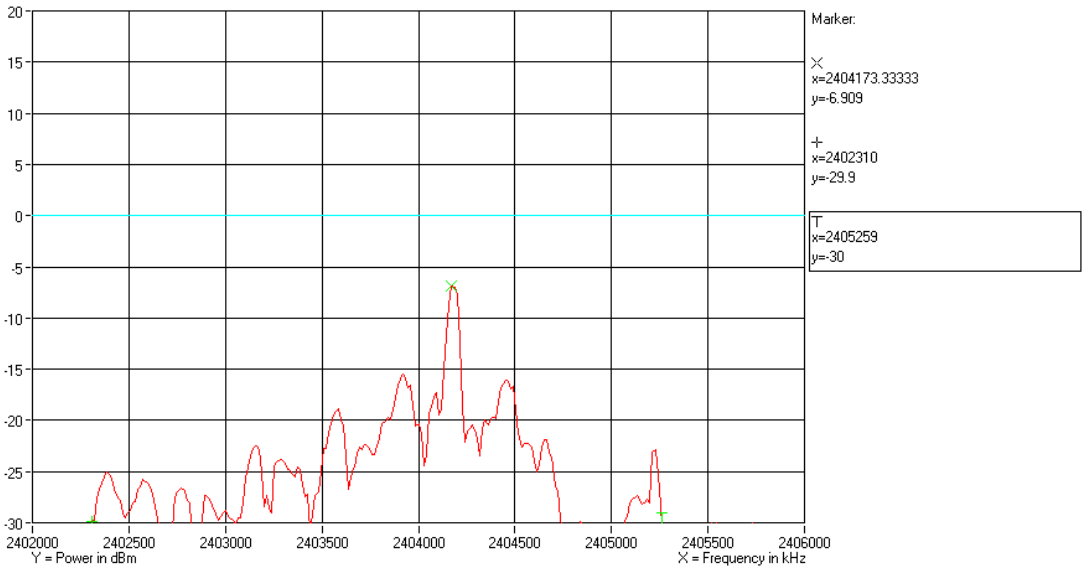
Photo 4.5.2 Test setup regarding measurement of band edge compliance.

4.6 Measurement of occupied bandwidth, IC

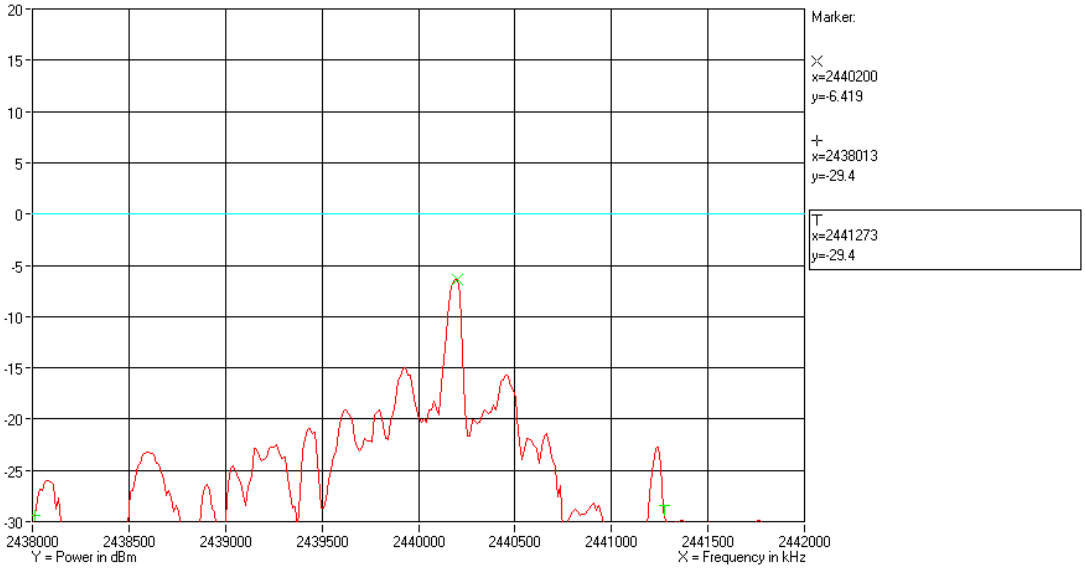
Test object	MRIE	Sheet	PROF-3
Type	MRIE	Project no.	A507260-8
Serial no.	E27	Date	25 May 2011
Client	GN Hearing A/S	Initials	CMT
Specification	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1		

Test method Characteristics	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1 ?????? Temperature: 22 ºC. Test voltage: External power supply at 1.3 VDC		
Test equipm.	Climatic chamber 49184 49550 49299		Uncertainty: 10 kHz
SA Settings	RBW:30kHz VBW:100kHz SPAN:4MHz DET:Peak CF:Operating freq. Trace:Max hold		
Operating frequency	Low frequency	High frequency	Measured 99% emission bandwidth
2404	2402.310	2405.259	2.949
2440	2438.013	2441.273	3.260
2478	2476.820	2479.963	3.143
MHz	MHz	MHz	MHz
Note:			

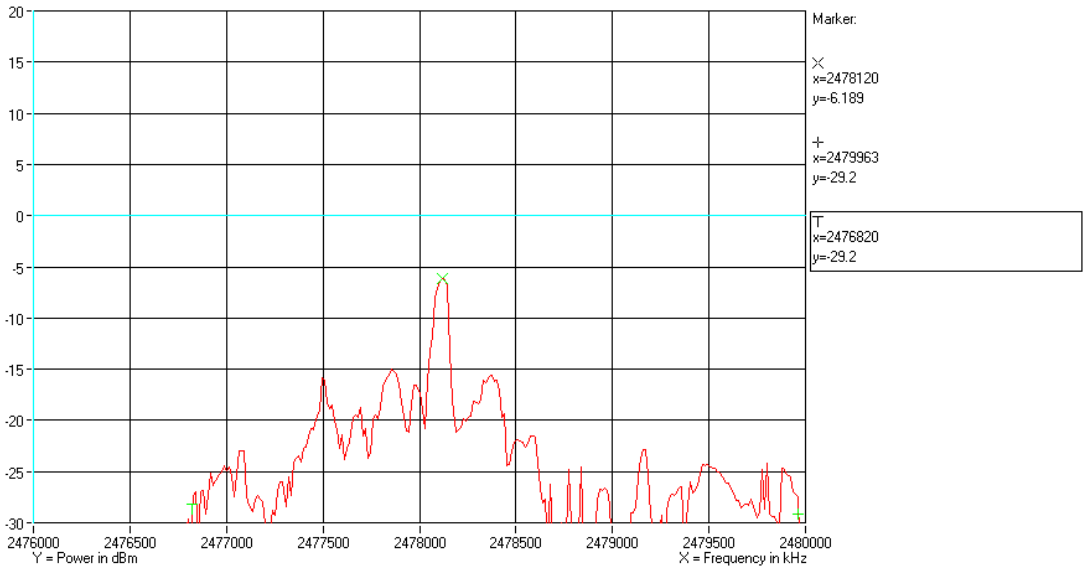
Band edge criteria	Measured 99 % emission bandwidth
Test Port	Conducted - SMA connector
Test mode	Continuous Tx - normal modulation - hopping off
Comments	None



Comments 2404 MHz



Comments 2440 MHz



Comments 2478 MHz

Photo 4.6.1 Test setup regarding measurement of occupied bandwidth, IC.

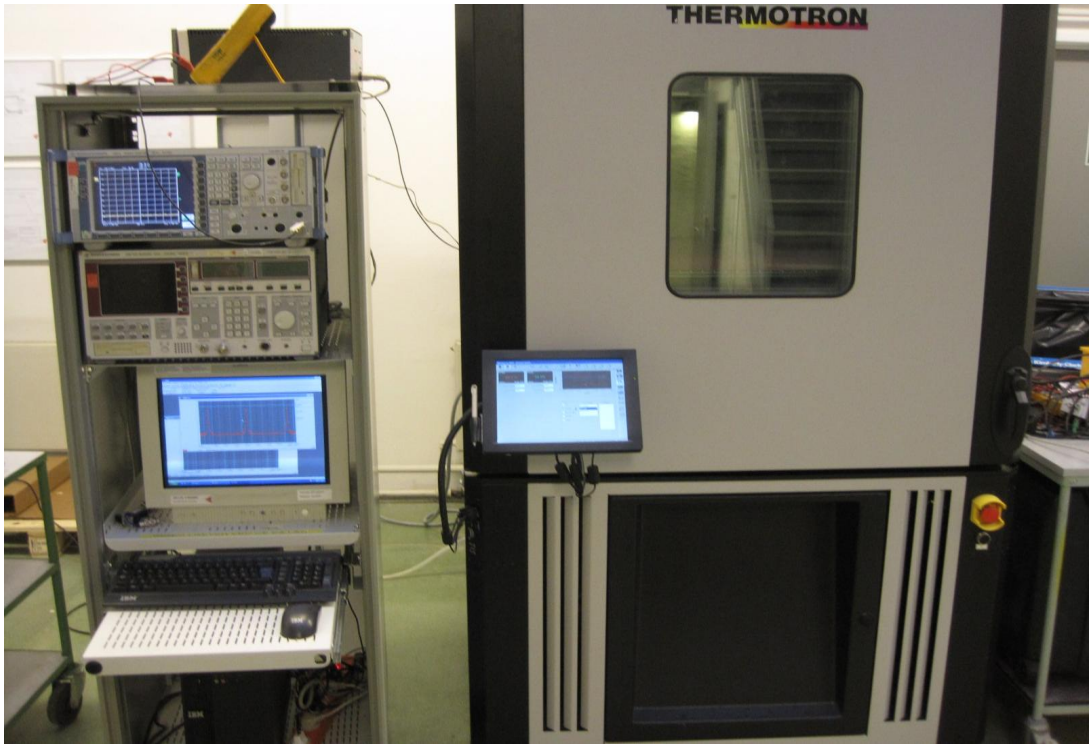
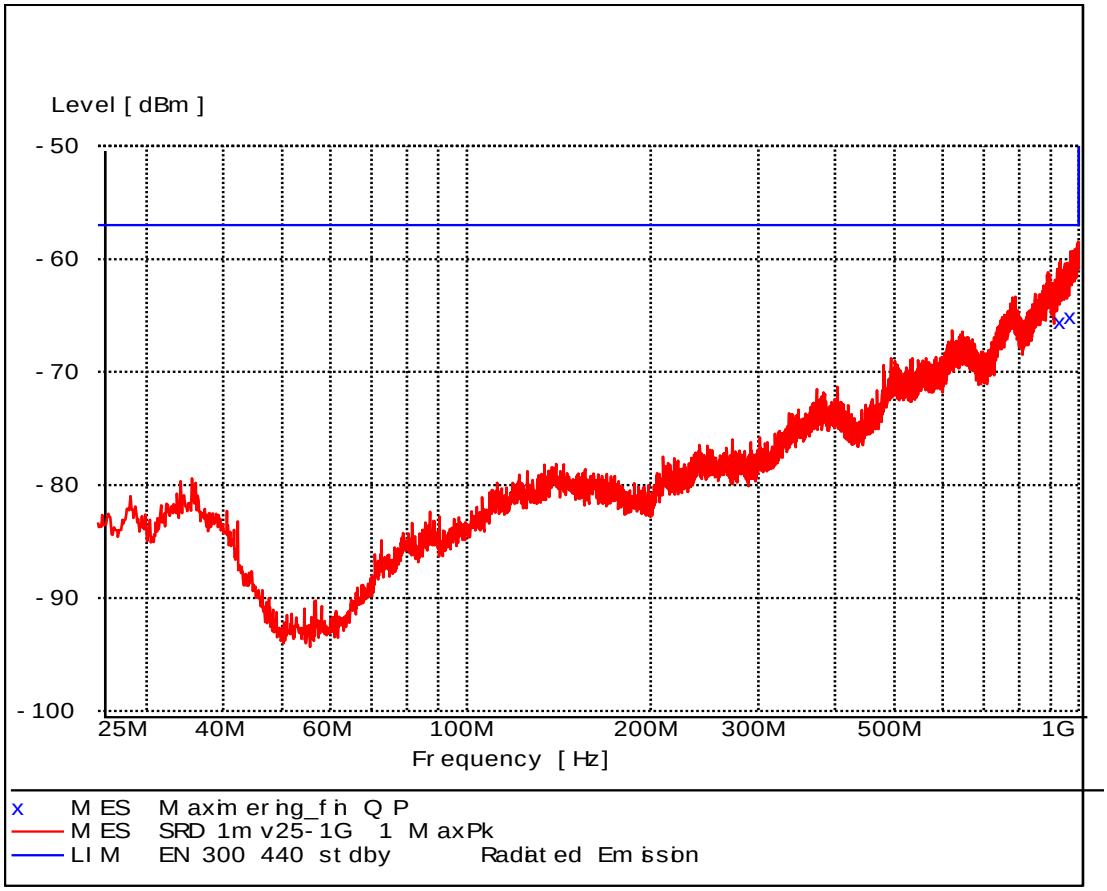


Photo 4.6.2 Test setup regarding measurement of occupied bandwidth, IC.

4.7 Measurement of radiated emission, Rx, IC

Test object	Combination of 2.1.2: MRIE 2.1.3: MRIE	Sheet	RE_Spur-14
Type	See section 2	Project no.	A507260-8
Serial no.	See section 2	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	IC Standard RSS-210, Issue 8:2010, 2.5 IC Standard RSS-Gen, issue 3:2010, 6	Frequency	25MHz–1GHz

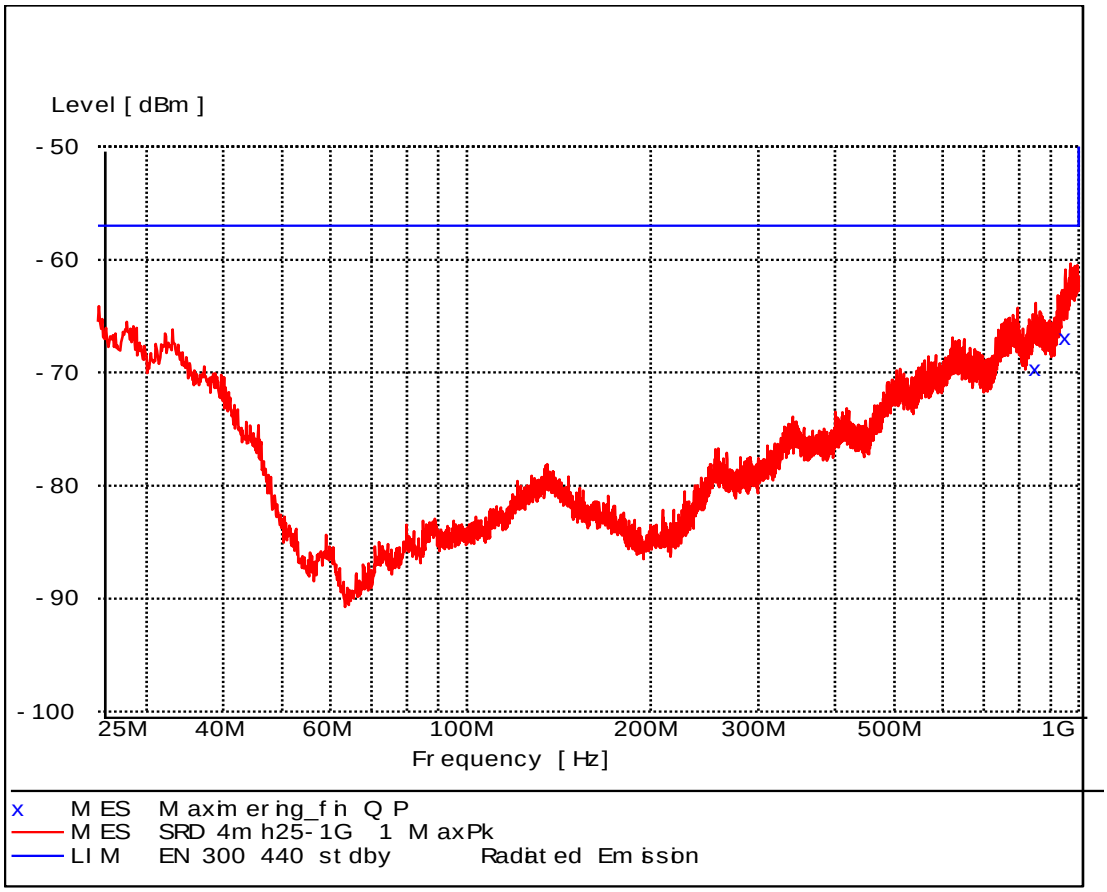
Test method Characteristics	EN 300 440-1 V1.5.1:2009 Pre-scan, Antenna at 10 m, 1 m height, vert. pol.	Temperature Humidity	21 °C 42 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299 29499	Uncertainty 4.9 dB	



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

Test object	Combination of 2.1.2: MRIE 2.1.3: MRIE	Sheet	RE_Spur-15
Type	See section 2	Project no.	A507260-8
Serial no.	See section 2	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	IC Standard RSS-210, Issue 8:2010, 2.5 IC Standard RSS-Gen, issue 3:2010, 6	Frequency	25MHz–1GHz

Test method Characteristics	EN 300 440-1 V1.5.1:2009 Pre-scan, Antenna at 10 m, 4 m height, hor. pol.	Temperature Humidity	21 °C 42 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299 29499	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: MRIE 2.1.3: MRIE	Sheet	RE_Spur-16
Type	See section 2	Project no.	A507260-8
Serial no.	See section 2	Date	24 May 2011
Client	GN Hearing A/S	Initials	HEN
Specification	IC Standard RSS-210, Issue 8:2010, 2.5 IC Standard RSS-Gen, issue 3:2010, 6	Frequency	25MHz–1GHz

Test method Characteristics	EN 300 440-1 V1.5.1:2009 Peak search ant. at 10 m, height: 1-4 m, v/h pol.	Temperature Humidity	21 °C 42 % 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"

Frequency MHz	Level dBm	Transd dB	Limit dBm	Margin dB	Height cm	Azimuth deg	Polarisation
933.200000	-65.60	-78.3	-57.0	8.6	142.0	36.00	ver
969.300000	-65.10	-78.0	-57.0	8.1	400.0	308.00	ver
850.000000	-69.60	-81.8	-57.0	12.6	353.0	258.00	hor
951.100000	-66.90	-79.5	-57.0	9.9	270.0	299.00	hor

Test result	The measured field strengths are below the limit
Polarization	Horizontal and vertical
Test Port	Enclosure
Test frequency	2404 MHz / 2478 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 6.

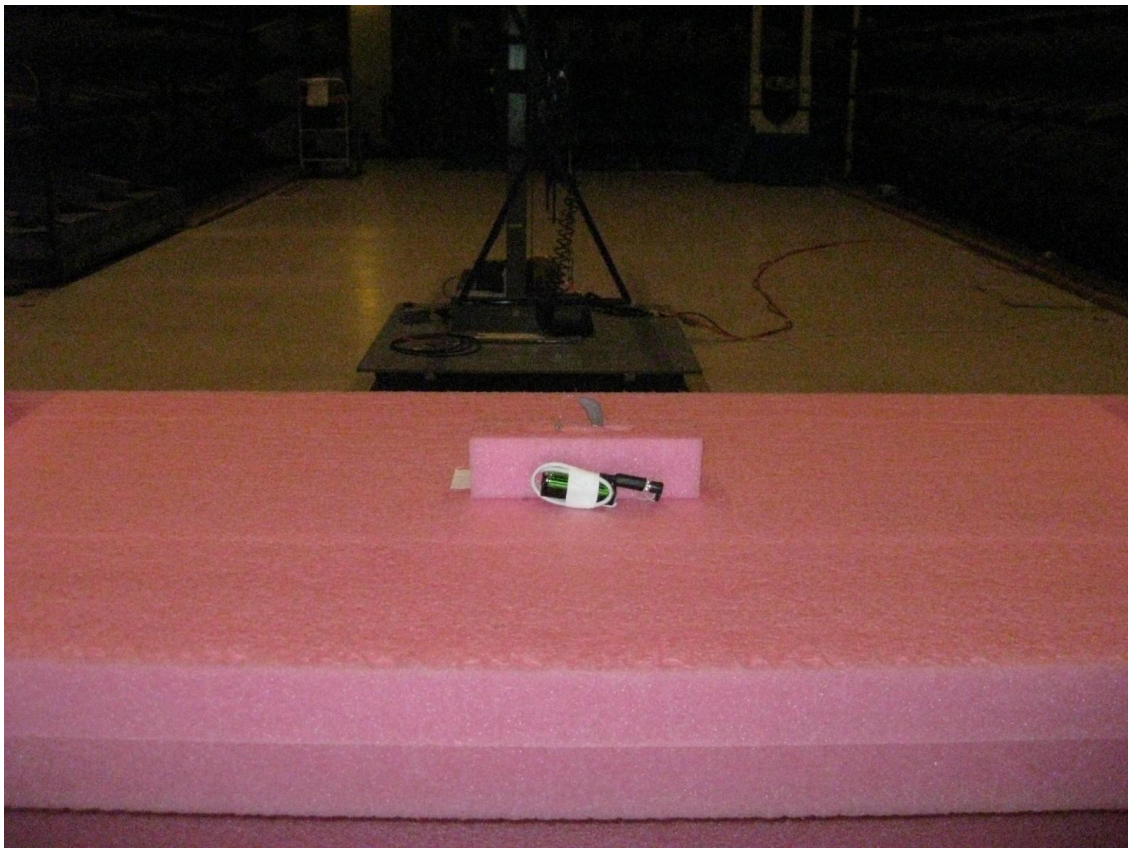


Photo 4.7.1 Test setup regarding measurement of radiated emission, Rx, IC.

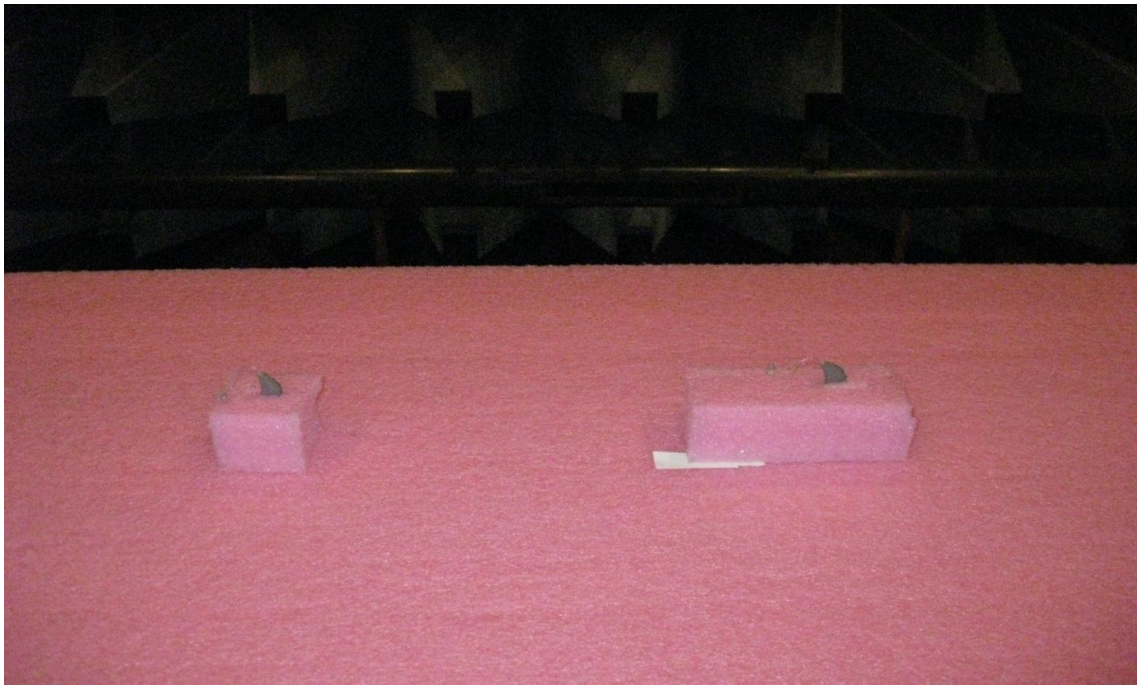
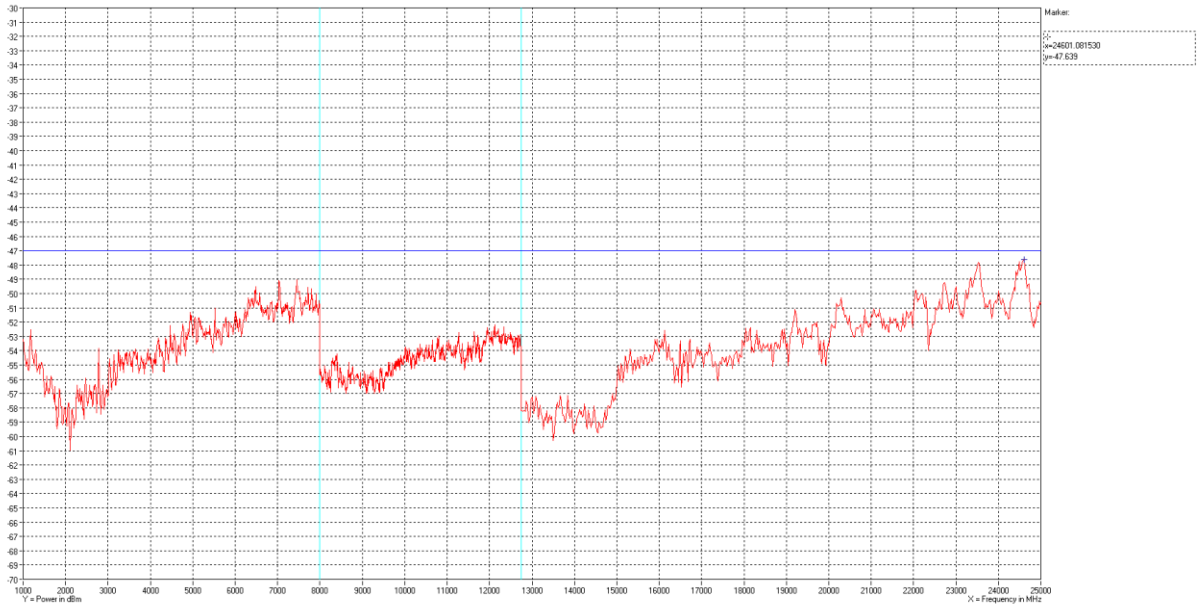


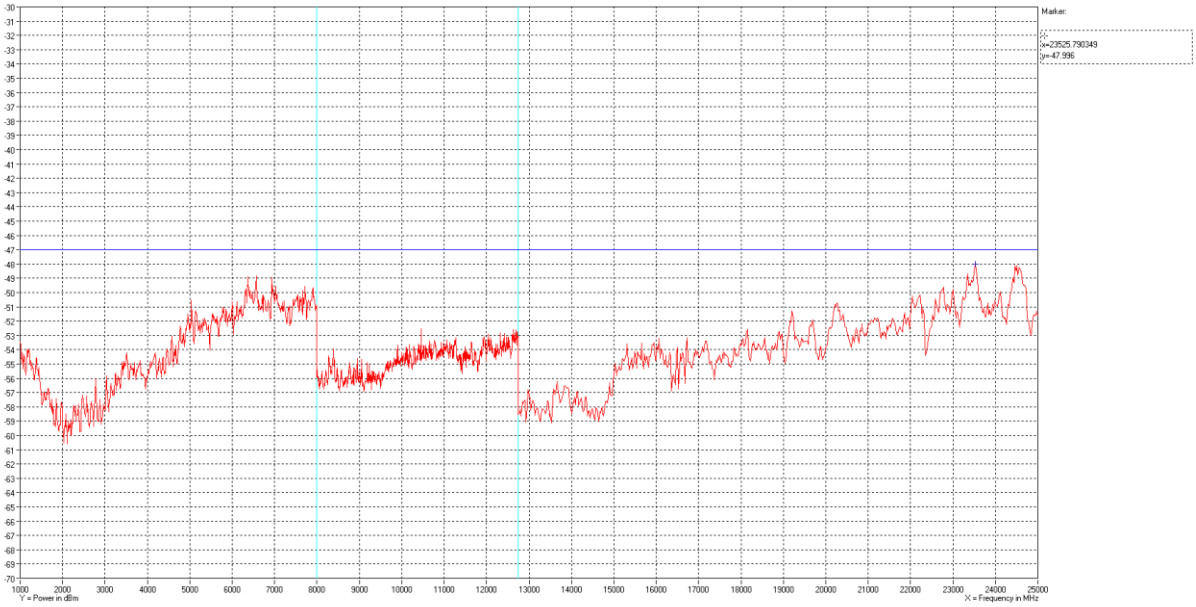
Photo 4.7.2 Test setup regarding measurement of RX radiated emission, Rx, IC.

Test object	Combination of 2.1.2: MRIE 2.1.3: MRIE	Sheet	RE_Spur-17
Type	See section 2	Project no.	A507260-8
Serial no.	See section 2	Date	14 June 2011
Client	GN Hearing A/S	Initials	CMT
Specification	IC Standard RSS-210, Issue 8:2010, 2.5 IC Standard RSS-Gen, issue 3:2010, 6	Frequency	1GHz–25GHz

Test method Characteristics	EN 300 440-1 V1.5.1:2009 Complete search, Antenna distance 3 m.	Temperature Humidity	20 °C 63 % RH
Detector	Peak for 1 GHz to 8 GHz	Bandwidth	1 MHz
Detector	Peak for 8 GHz to 12.75 GHz	Bandwidth	300 kHz
Detector	Peak for 12.75 GHz to 25 GHz	Bandwidth	100 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	2404 MHz / 2478 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 6.

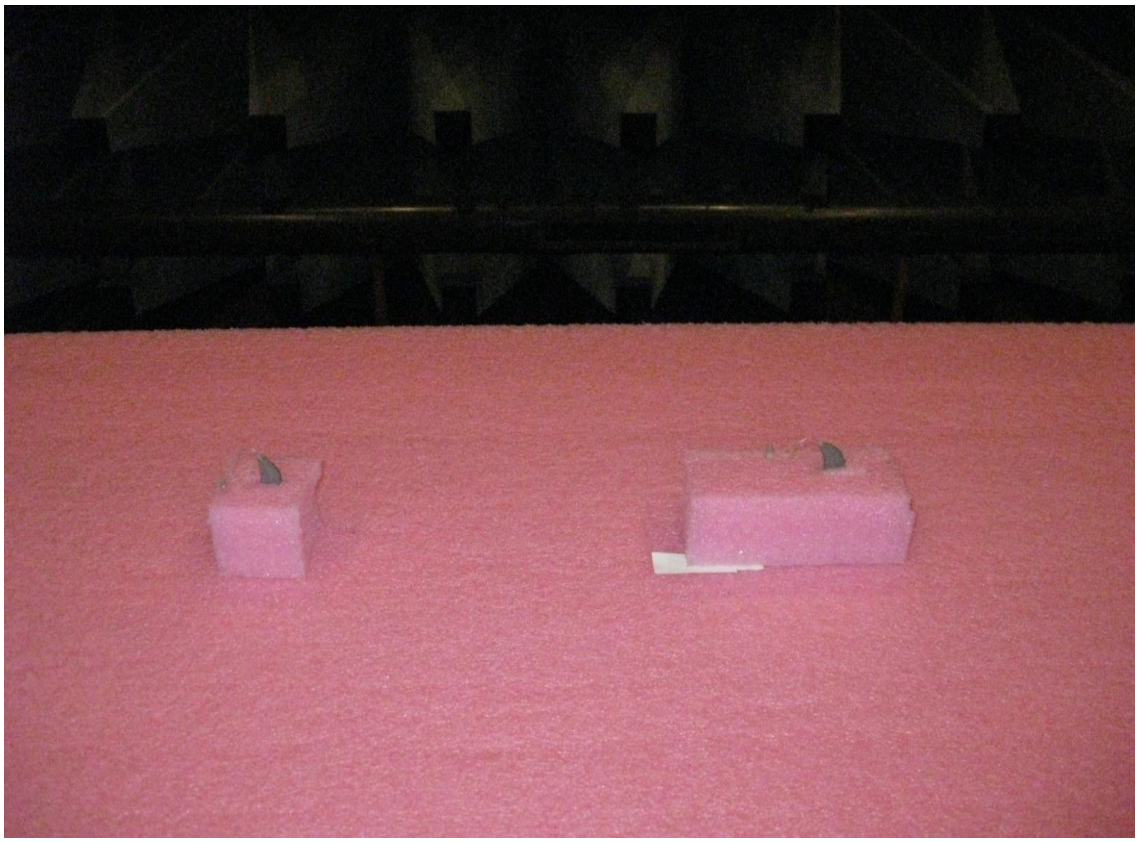


Photo 4.7.3 Test setup regarding measurement of radiated emission, Rx, IC.

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
29499	BROADBAND RF PREAMPLIFIER	EC/MTS TELEME-TER	TVV 711
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
49183	POWER SUPPLY	TTI	PL 320
49184	POWER SUPPLY	TTI	CPX200
49299	DIGITAL MULTIMETER	Fluke	87-4
49550	SIGNAL ANLYZER	ROHDE & SCHWARZ	FSQ8
49600	SPECTRUM ANALYZER / MEASURE-MENT RECEIVER	ROHDE & SCHWARZ	ESU40
49624	DUAL RIDGE HORN ANTENNA – 1GHz – 26 GHz (2 GHz – 32 GHz)	SATIMO	SH2000
49625	SRD COAX SWITCH MATRIX USED IN 1 GHz – 26 GHz SRD ANTENNASYSTEM	DELTA	COAX SWITCH MA-TRIX

Annex 1

Out of band emission table

Transmitter out-of-band Emission Table

Project No. A507260
Client GN Hearing
Product MRIE

Specification:	FCC CFR 47 Part 15, Subpart C, §15.249(d) RSS-210, Issue 8:2010, A2.9
Requirement:	Any out-of-band emission shall be at least 50 dB below the highest in-band emission or below the general emission limit of 500 uV/m (54 dBuV/m)

The table below lists all out-of-band emissions exceeding the general emission limit of 500 uV/m (54 dBuV/m) as wells as the measured in-band emissions for reference.
The data is an extract of the measurement results reported in chapter 4 of the main report.

Meas. Ref. No.	Frequency [MHz]	Reading [dBuV, Av] (BW: 1 MHz)	Transducer Factor [dB] (Cables and Amplifiers)	Antenna Correction Factor [dB]	Result [dBuV/m, AV] (Reading - TF + AF)	Limit [dBuV/m, AV]	Margin [dB] (Limit - Result)	Pass/Fail	Note
56	2403.9	84.1	29.4	32.6	87.3	In-band	-	-	Tx @ 2404 MHz, Fundamental
56	4807.8	*	*	*	*	*	*	P	Tx @ 2404 MHz, 2nd harmonic
56	7211.7	*	*	*	*	*	*	P	Tx @ 2404 MHz, 3rd harmonic
56	9615.6	*	*	*	*	*	*	P	Tx @ 2404 MHz, 4th harmonic
54	2440	86.5	29.1	33.1	90.5	In-band	-	-	Tx @ 2440 MHz, Fundamental
54	4880	*	*	*	*	*	*	P	Tx @ 2440 MHz, 2nd harmonic
54	7320	*	*	*	*	*	*	P	Tx @ 2440 MHz, 3rd harmonic
54	9760	*	*	*	*	*	*	P	Tx @ 2440 MHz, 4th harmonic
52	2478.1	85.4	28.9	34.3	90.8	In-band	-	-	Tx @ 2478 MHz, Fundamental
52	4956.2	*	*	*	*	*	*	P	Tx @ 2478 MHz, 2nd harmonic
52	7434.3	*	*	*	*	*	*	P	Tx @ 2478 MHz, 3rd harmonic
52	9912.4	*	*	*	*	*	*	P	Tx @ 2478 MHz, 4th harmonic
54	2506.1	47.0	29.1	34.0	51.9	54.0	2.1	P	Maximum out of band emission

** : The result is below the general limit (54 dBuV/m)*

Max. in-band emission:	90.8 dBuV/m, AV @ 3 m

Test result:	All measured out-of-band emissions are below the general emission limit of 500 uV/m (54 dBuV/m)
Compliant:	Yes.