

DELTA Test Report



TEST Reg. no. 19

Radio parameter test of PH13 according to FCC and IC requirements

Performed for GN Hearing A/S

DANAK-1911580

Project no.: T200361-6

Page 1 of 53

Including 1 annex

14 September 2011

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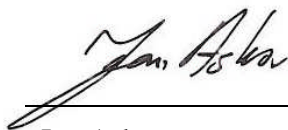
VAT No. 12275110

Title	Radio parameter test of PH13 according to FCC and IC requirements
Test object	PH13
Report no.	DANAK-1911580
Project no.	T200361-6
Test period	9 August - 12 September 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	<ul style="list-style-type: none">• 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 Jan Askov Claus Momme Thomsen



Date 14 September 2011

Project Manager



Jan Askov
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Responsible



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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 27 x 40 x 21 mm).

Test object 2.1.1

Name of test object	PH13
Model / type	PH13
Part no.	PH13
Serial no.	08
FCC ID	X26PH13
IC ID	6941C-PH13
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Delta Test App 2.2 : 01.06.11
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	PH13
Model / type	PH13
Part no.	PH13
Serial no.	09
FCC ID	X26PH13
IC ID	6941C-PH13
Manufacturer	GN Hearing A/S
Supply voltage	1.3 VDC (Zinc Air battery)
Software version	Spurious emission firmware: Tx and Rx Delta Test App 2.2 : 01.06.11
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

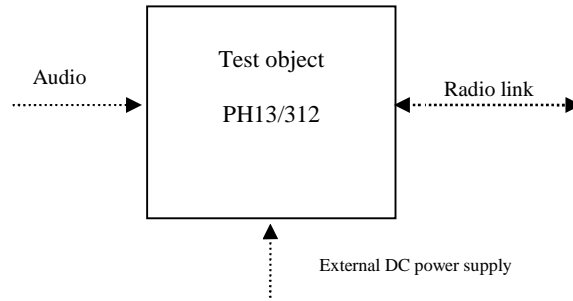


Figure 3.1.1 Block diagram of test object with external cables.

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 supply is not used under intended use.

Intended use

PH13 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
8. Peak average correction factor (PACF)

3.3 Radio specifications, receiver and transmitter

Test object	PH13	Sheet	Radio-1
Type	PH13	Project no.	T200361-6
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	:	0 dB
Transmit power, max peak	:	-3.3 dBm EIRP
Field Strength, max peak	:	91.9 dB μ V/m (39.4 mV/m) @ 3 meter
Power level	:	No
No of channels	:	20
Bandwidth	:	
Occupied bandwidths (99%)	:	3.397 MHz (Measured)
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	:	372 (μ V/m) @ 3 meter (Field Strength, PACF corrected)
Max. RX spurious emission, peak	:	230 (μ V/m) @ 3 meter (Field Strength)



4. Test results

4.1 Antenna requirement

Test object	PH13	Sheet	ANT-1
Type	PH13	Project no.	T200361-6
Serial no.	All	Date	
Client	GN Hearing A/S	Initials	
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 PH13 has one permanent attached PCB antenna.	



4.2 Peak average correction factor (PACF)

Test object	PH13	Sheet	ANT-1
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	12 Sep. 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		

Characteristics	Temperature: 24 °C. Test voltage: 1.3 V
Test equipm.	49550 49183 49299 Uncertainty: 1•10 ⁻⁷ sec.
SA Settings	RBW: 2 MHz VBW: 5 MHz SPAN: Zero-1ms DET: Peak CF: 2440 MHz Trace: Max Hold

The measured value for the duty cycle (DC):

Max. Tx on time: 198.72 µs – Delta 2 (T1)

Period: 482.37 µs – Delta 3 (T1).

The calculated duty cycle is:

DC: $(198.72 \mu\text{s} / 482.37 \mu\text{s}) \cdot 100\% = 41.2 \%$.

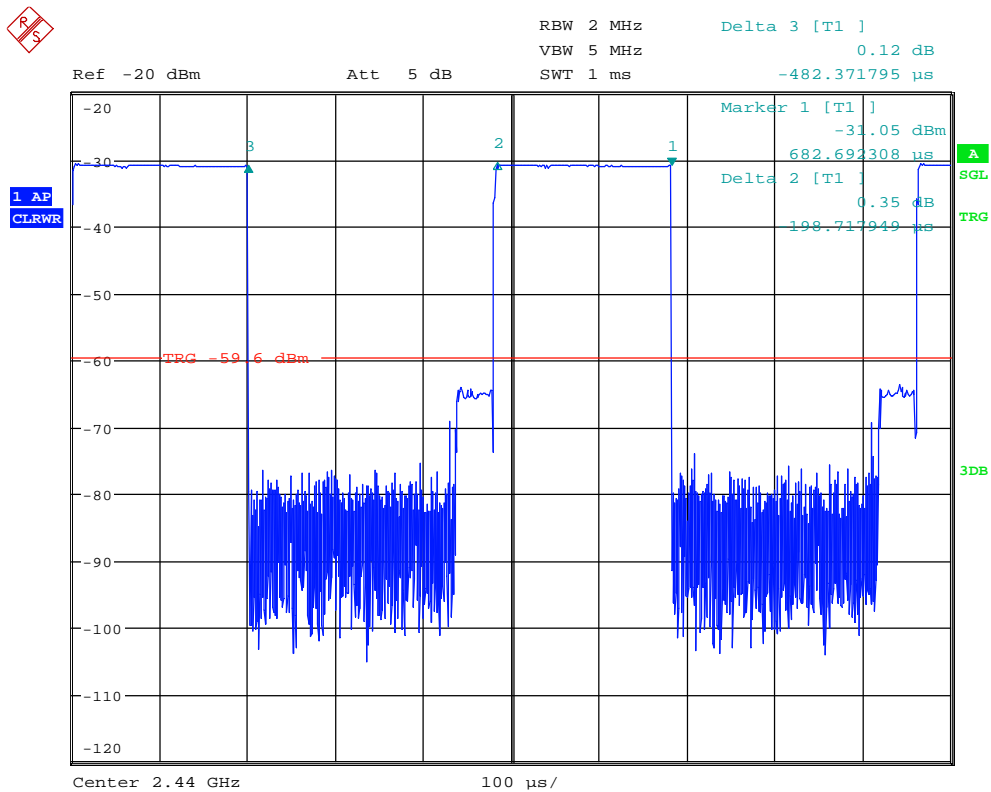
This corresponds to a Peak to Average Correction Factor of:

PACF: $20 \log (0.412) = 7.7 \text{ dB}$

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 or the average limit line can be corrected with the PACF from 54 dBµV/m to 61.7 dBµV/m at the peak measurement plots.





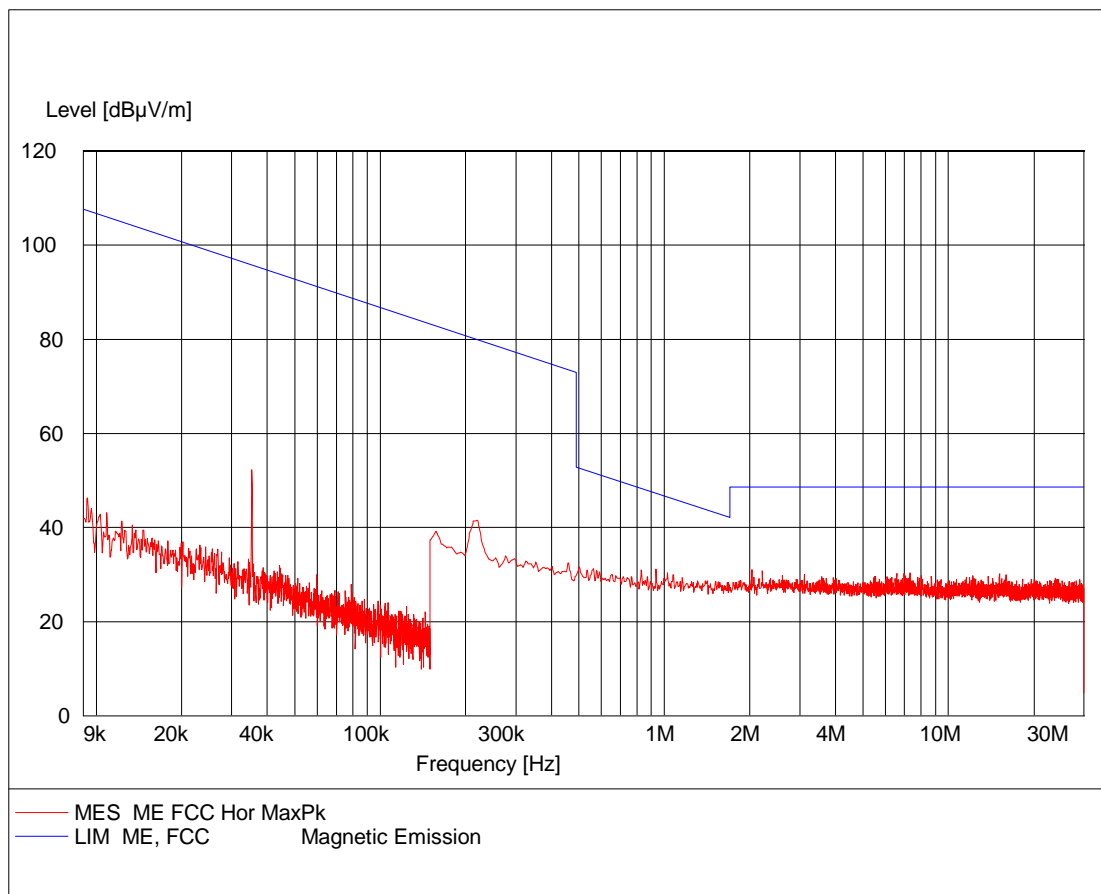
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4.3 Measurement of radiated emission

Test object	PH13	Sheet	RE Loop-1
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	11 Aug 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	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Scan, Loop Antenna at 10 m, 1 m Height, Horizontal.	Humidity	61 % RH
Detector	Peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29332	Uncertainty	4 dB



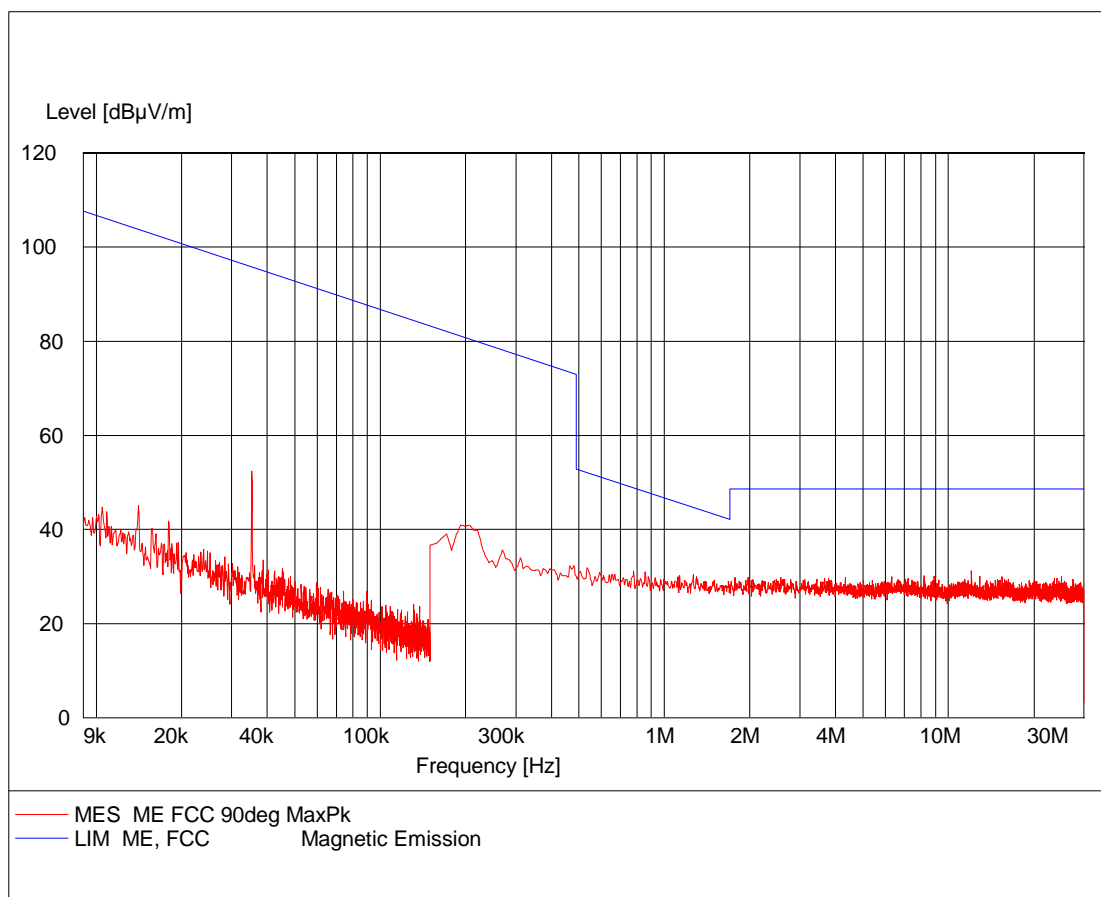
Comments

The limit has been extrapolated to 10 m using an extrapolation factor of 40 dB/decade as specified in § 15.31(f)(2). $L2 = L1 + 40 \log_{10} (D1/D2)$.



Test object	PH13	Sheet	RE Loop-2
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	11 Aug. 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	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Scan, Loop Antenna at 10 m, 1 m Height, 90 deg.	Humidity	61 % RH
Detector	Peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29332	Uncertainty	4 dB



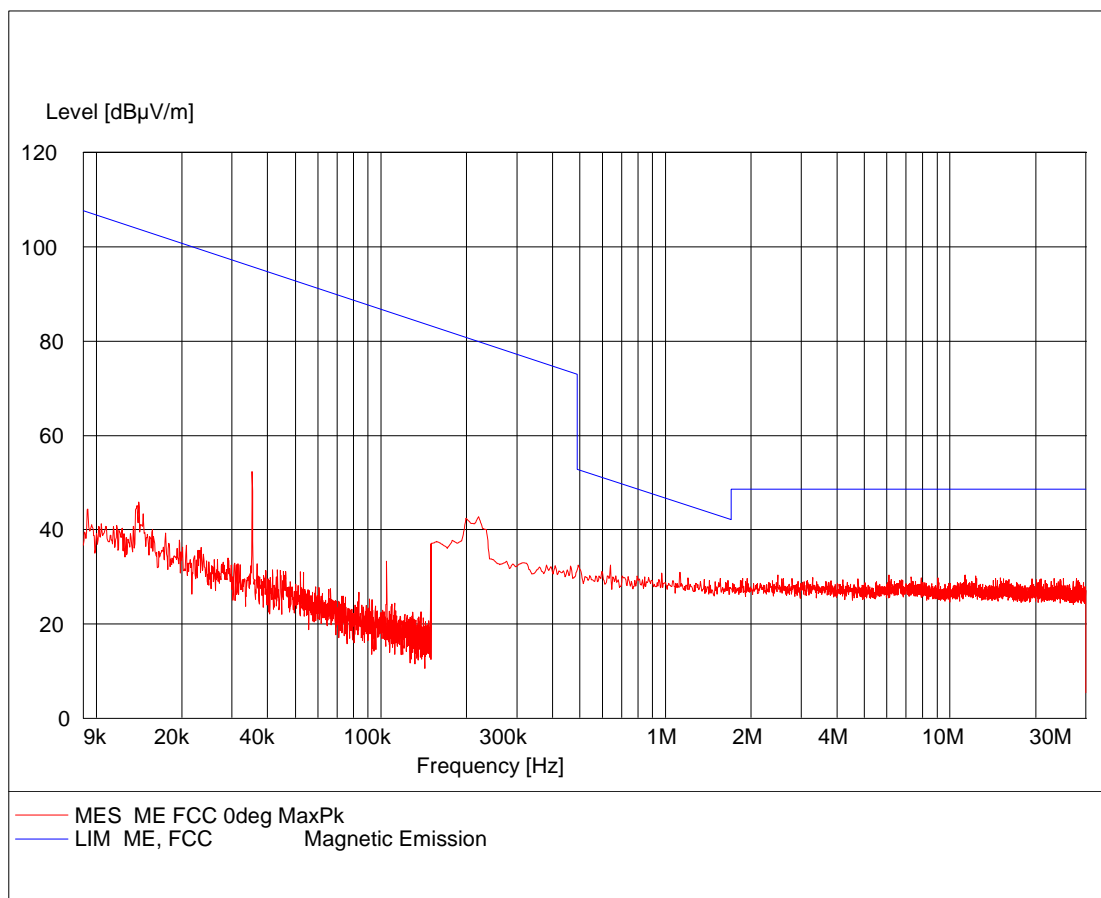
Comments

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	PH13	Sheet	RE Loop-3
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	11 Aug. 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	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Scan, Loop Antenna at 10 m, 1 m Height, 0 deg.	Humidity	61 % RH
Detector	Peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29332	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	2404/2440/2478 MHz
Test mode	Continuous Tx - normal modulation Hopping low-middle-high channel
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

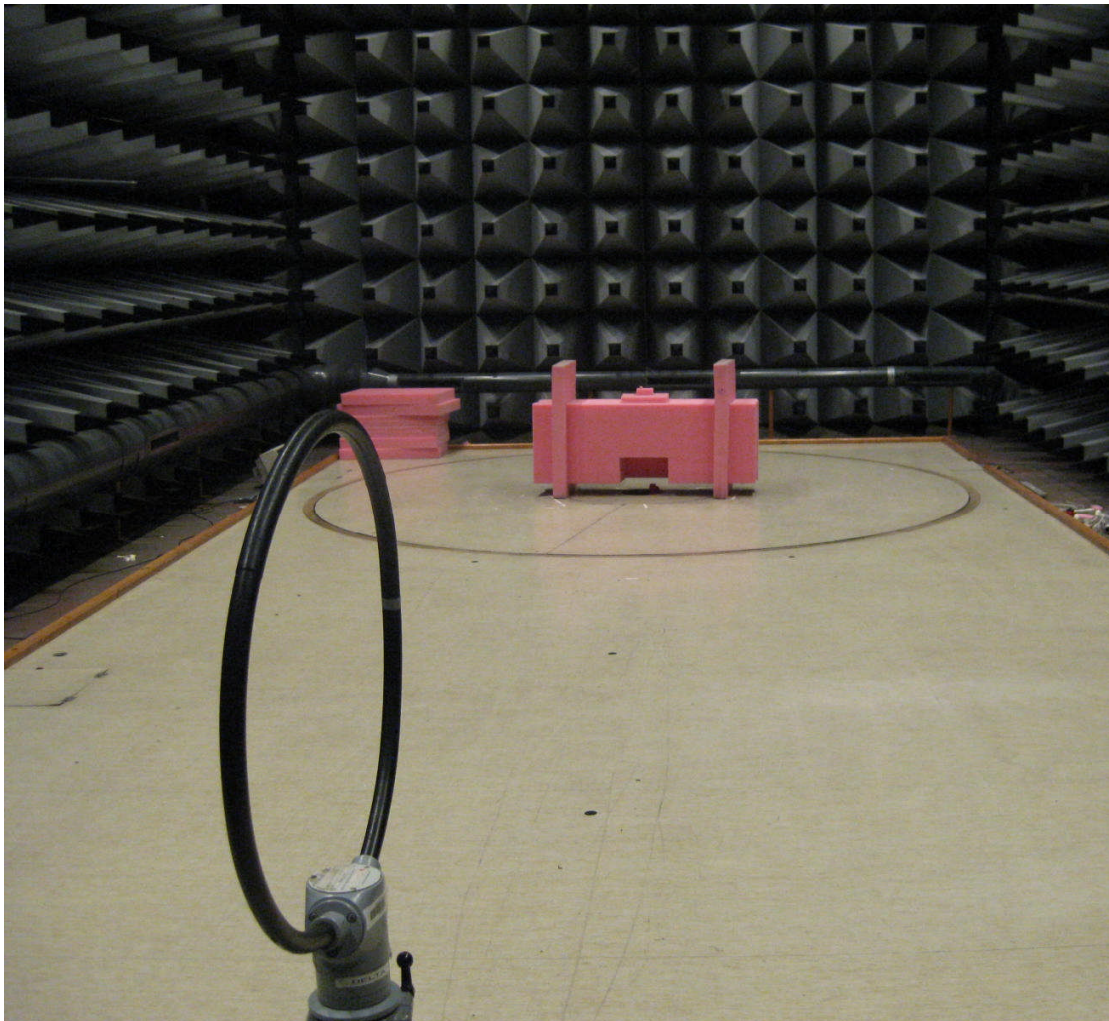
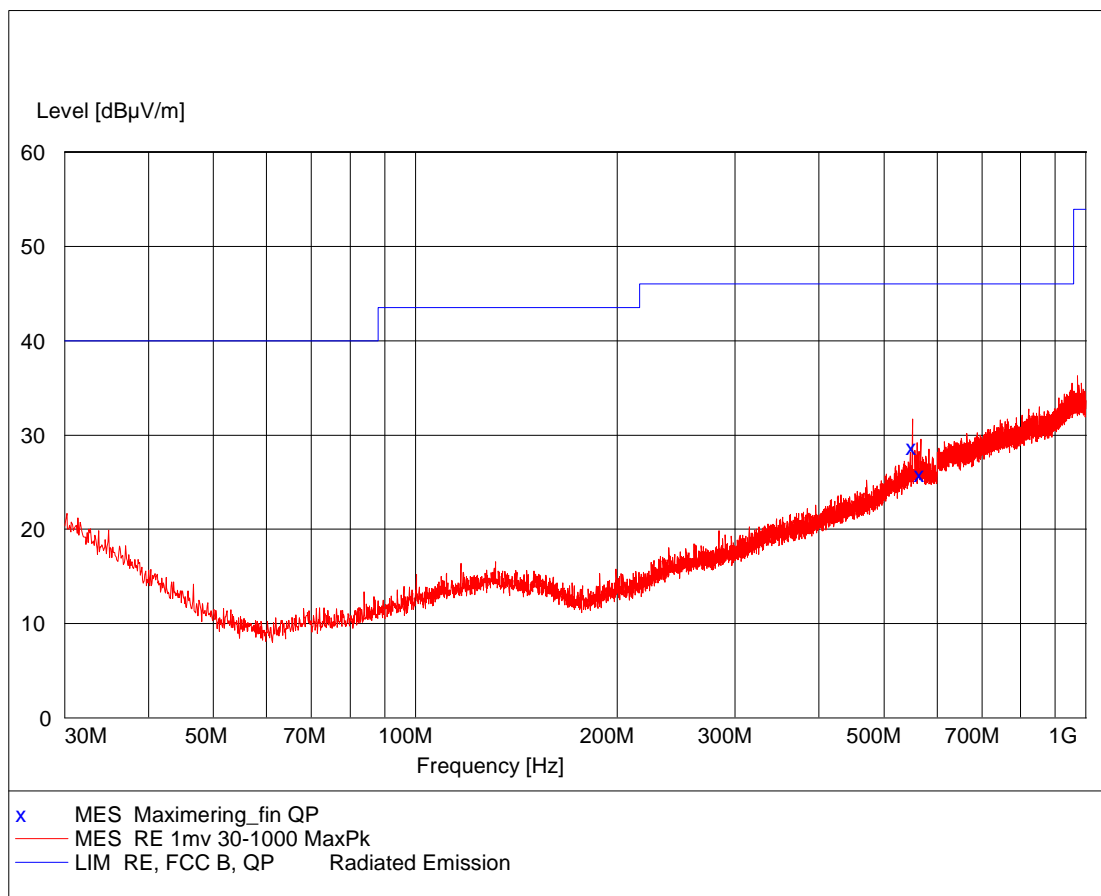


Photo 4.3.1 Test setup regarding measurement of radiated emission.

Test object	PH13	Sheet	RE_Spur-1
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	10 Aug 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	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Humidity	50 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29797	Uncertainty	4.9 dB



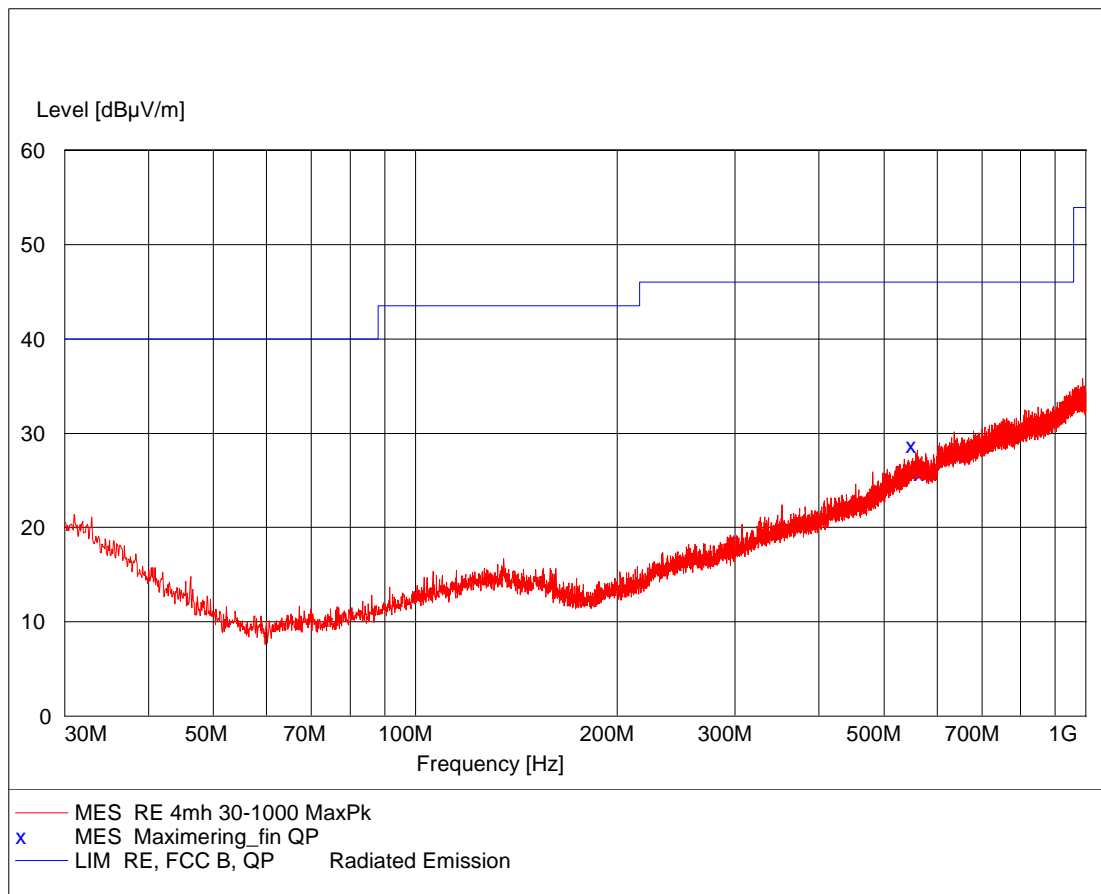
Comments

Continuous Tx - normal modulation
Hopping low-middle-high channel



Test object	PH13	Sheet	RE_Spur-2
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	10 Aug 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	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Pre-scan, Antenna at 3 m, 3 m height, hor. pol.	Humidity	50 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29797	Uncertainty	4.9 dB



Comments

Continuous Tx - normal modulation
Hopping low-middle-high channel



Test object	PH13	Sheet	RE_Spur-3
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	10 Aug 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	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	50 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29797	Uncertainty	4.9 dB

Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
552.000000	28.70	23.6	46.0	17.3	101.0	1.00	VERTICAL
568.000000	25.80	23.6	46.0	20.2	104.0	354.00	VERTICAL

Test result The measured field strengths are below the limit

Test Port Enclosure

Test frequency 2404/2440/2478 MHz

Test mode Continuous Tx - normal modulation
Hopping low-middle-high channel

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.

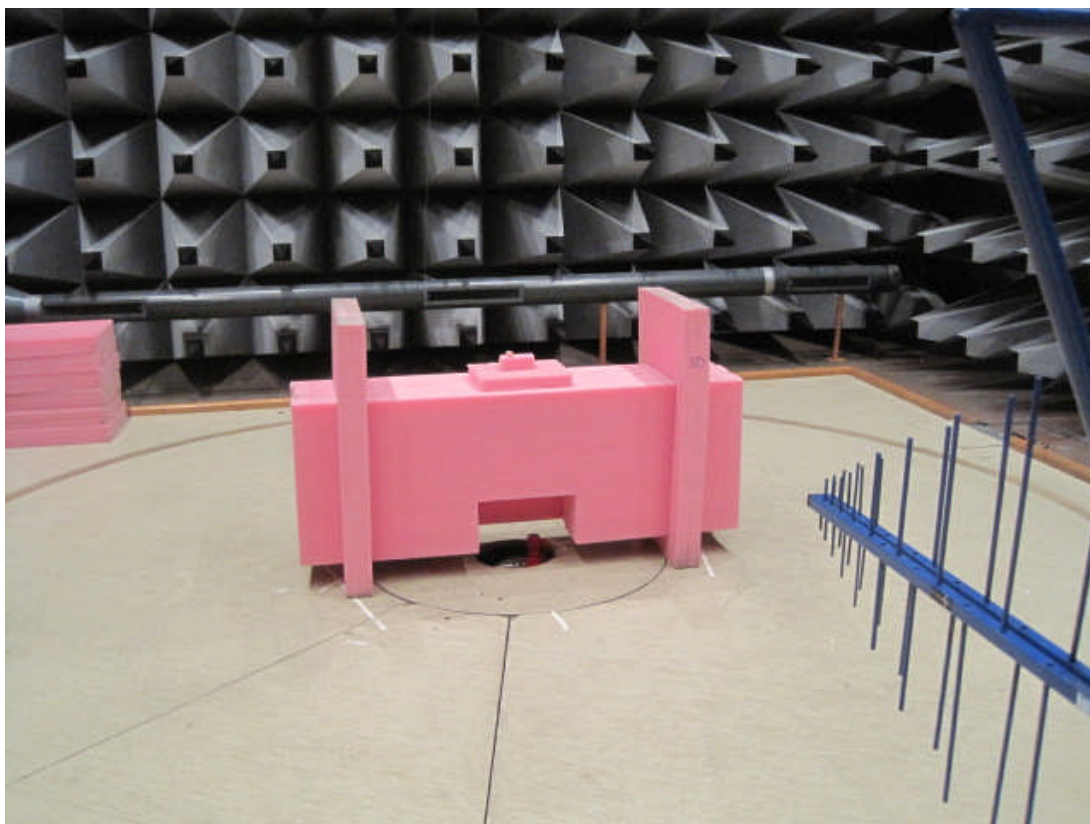


Photo 4.3.2 Test setup regarding measurement of radiated emission.

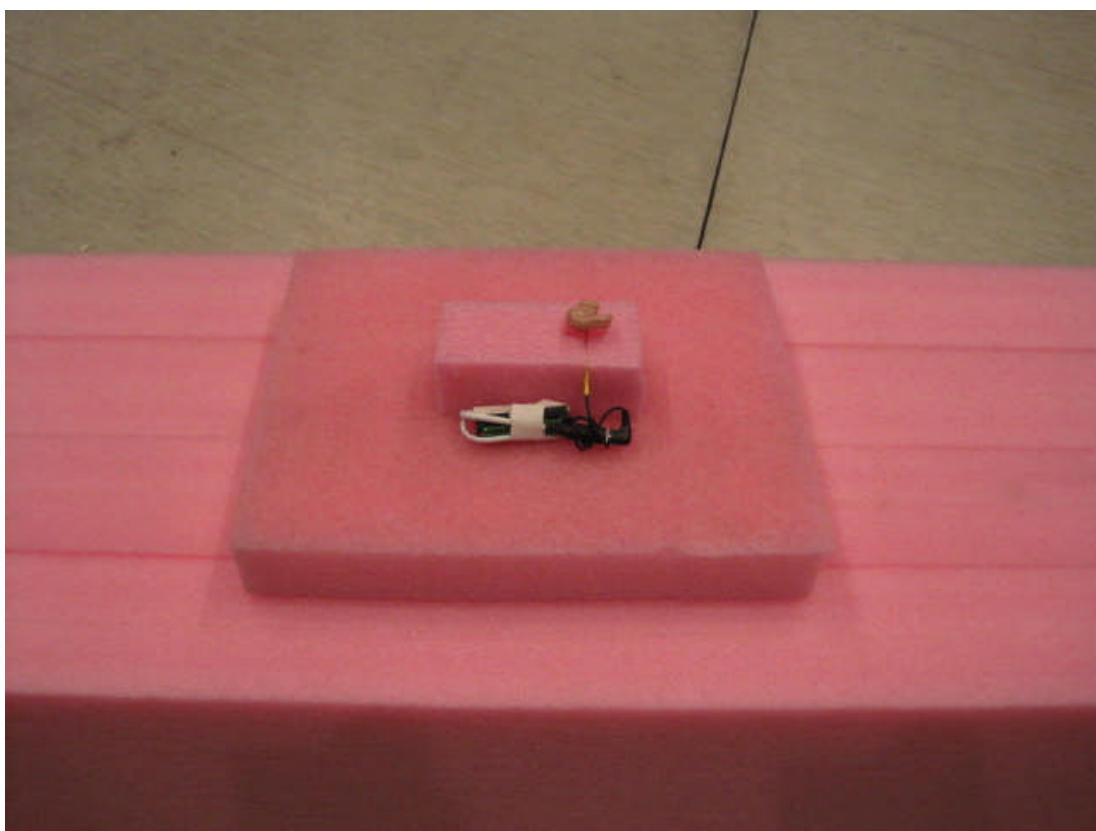
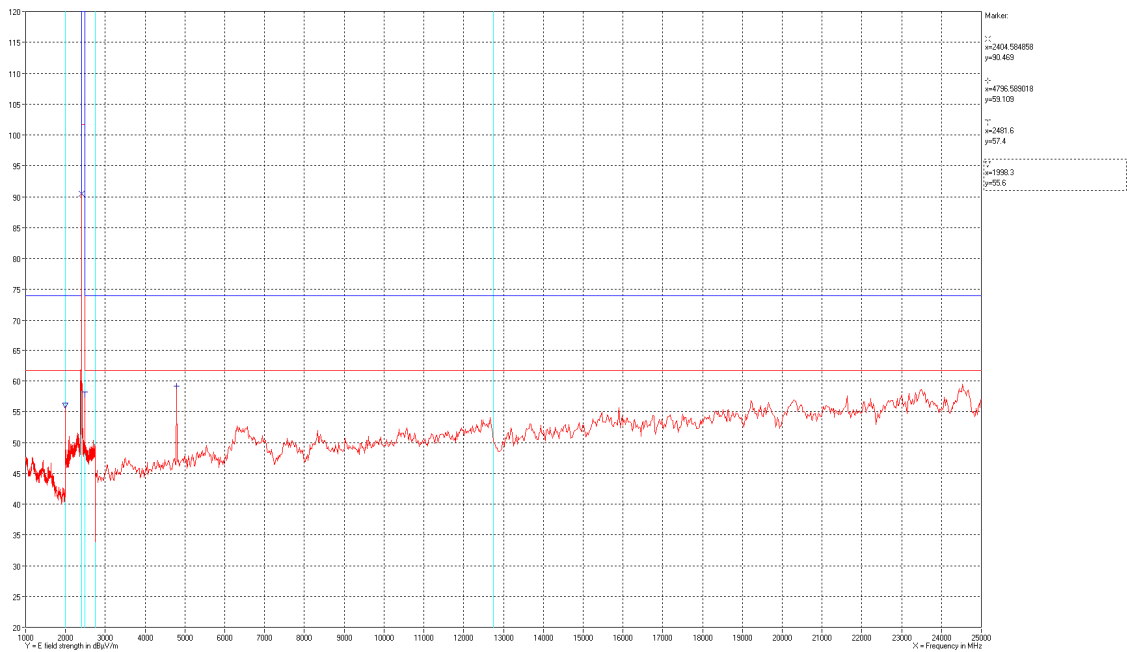


Photo 4.3.3 Test setup regarding measurement of radiated emission.



Test object	PH13	Sheet	RE_Spur-4
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	9 Aug 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	ANSI C63.4:2003	Temperature	24 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	56 % RH
Detector	Peak and Average for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49086	Uncertainty	4.9 dB



Polarization Vertical and horizontal peak measurements

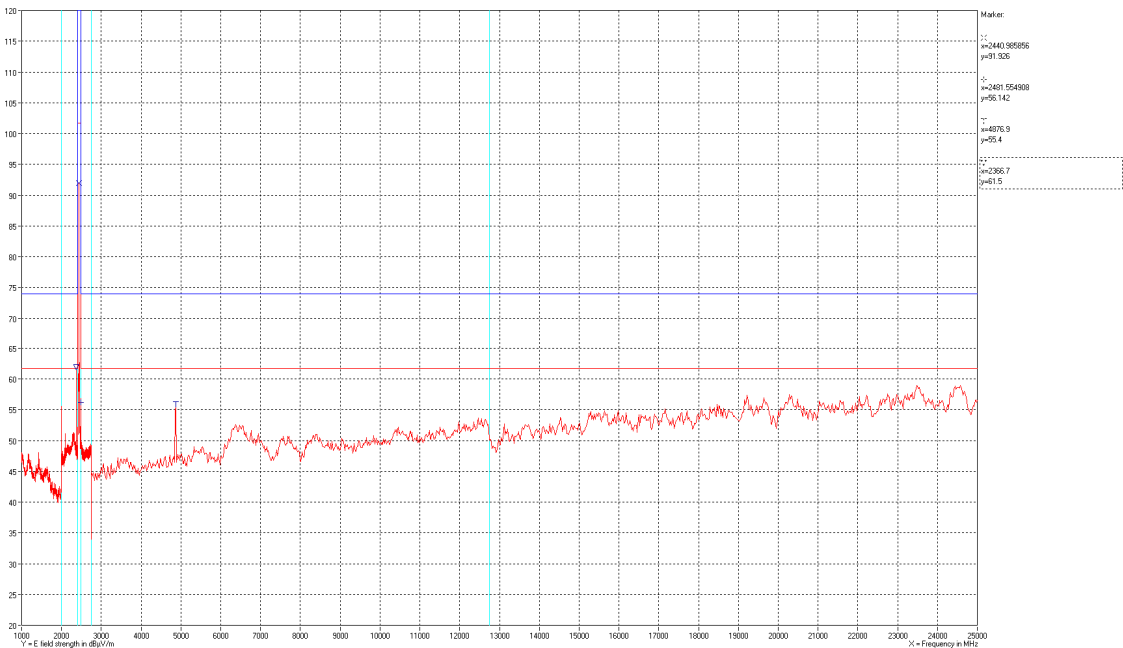
Comments Continuous Tx - normal modulation - hopping off
Average limit line (red) is corrected with the PACF at 7.7 dB



Test result	The measured peak field strengths are below the peak limit. The measured peak field strengths are below the corrected average limit. Average limit is corrected with the PACF.
Test Port	Enclosure
Test frequency	2404 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Full scan with final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 1.3 VDC. Average limit line (red) is corrected with the PACF at 7.7 dB.



Test object	PH13	Sheet	RE_Spur-5
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	10 Aug 2011
Client	GN Hearing A/S	Initials	JAS
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	ANSI C63.4:2003	Temperature	23 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	57 % RH
Detector	Peak and Average for 1GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49086	Uncertainty	4.9 dB



Polarization

Comments

Vertical and horizontal average measurements

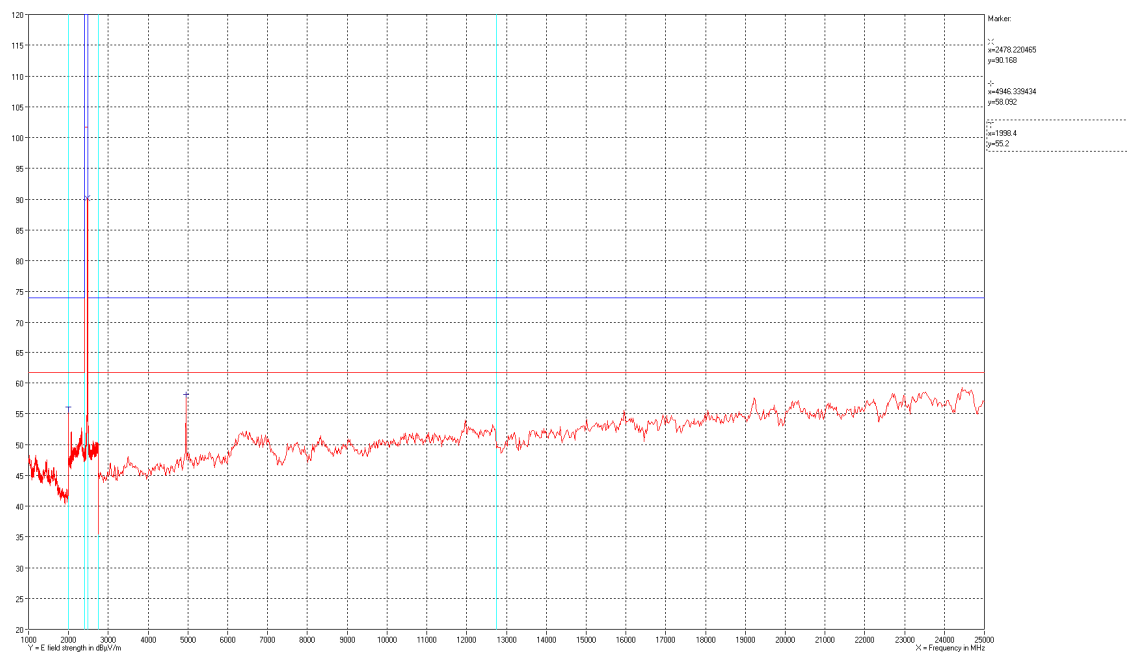
Continuous Tx - normal modulation - hopping off
Average limit line (red) is corrected with the PACF at 7.7 dB.



Test result	The measured peak field strengths are below the peak limit. The measured peak field strengths are below the corrected. average limit. Average limit is corrected with the PACF.
Test Port	Enclosure
Test frequency	2440 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Full scan with final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 1.3 VDC. Average limit line (red) is corrected with the PACF at 7.7 dB.

Test object	PH13	Sheet	RE_Spur-6
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	10 Aug 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	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	61 % RH
Detector	Peak and Average for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49086	Uncertainty	4.9 dB



Polarization

Vertical and horizontal average measurements

Comments

Continuous Tx - normal modulation - hopping off
Average limit line (red) is corrected with the PACF at 7.7 dB.



Test result	The measured peak field strengths are below the peak limit. The measured peak field strengths are below the corrected. average limit. Average limit is corrected with the PACF.
Test Port	Enclosure
Test frequency	2478 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Full scan with final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 1.3 VDC. Average limit line (red) is corrected with the PACF at 7.7 dB.

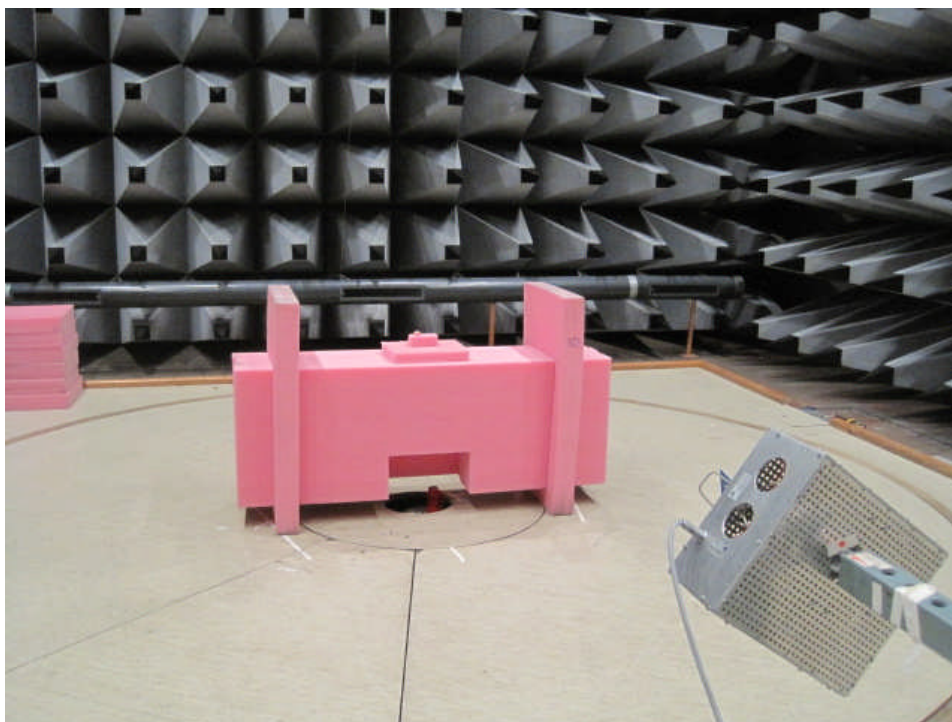


Photo 4.3.4 Test setup regarding measurement of radiated emission.

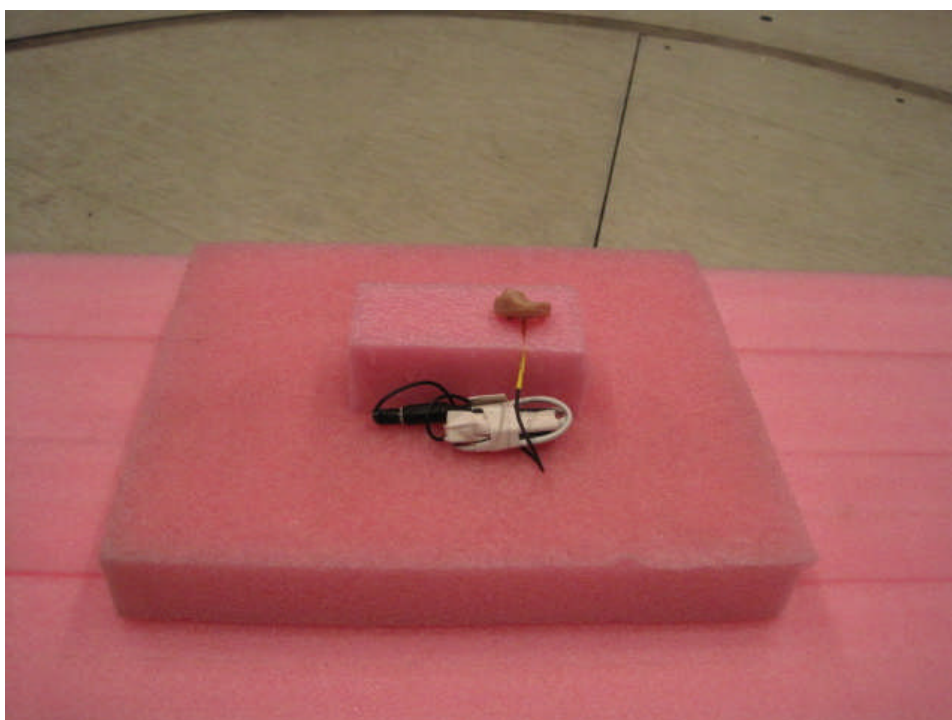


Photo 4.3.5 Test setup regarding measurement of radiated emission.

4.4 Measurement of field strength of fundamental

Test object	PH13	Sheet	RE_Spur-7
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	See section 4.3
Client	GN Hearing A/S	Initials	See section 4.3
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	ANSI C63.4:2003	Temperature	See
Characteristics	Complete search, Antenna distance 3 m	Humidity	section 4.3
Detector	Peak for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625 49086	Uncertainty	4.9 dB

Operating frequency	Peak Measurement	PACF	Corrected average	Limit (Av)	Comment
2404	90.5	-	-	94	Passed
2440	91.9	-	-	94	Passed
2478	90.2	-	-	94	Passed
MHz	dBµV/m	dB	dBµV/m	dBµV/m	
Note:					

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



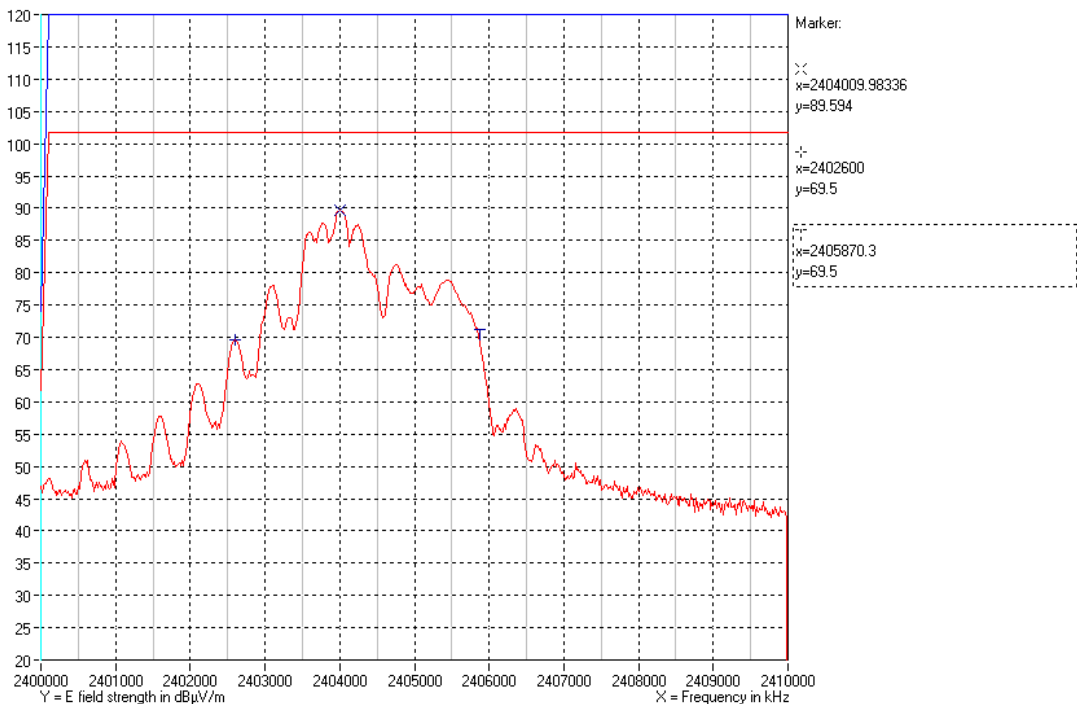
4.5 Measurement of 20 dB bandwidth

Test object	PH13	Sheet	PROF-1
Type	PH13	Project no.	T200361-6
Serial no.	10	Date	10 Aug 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.215(c)		

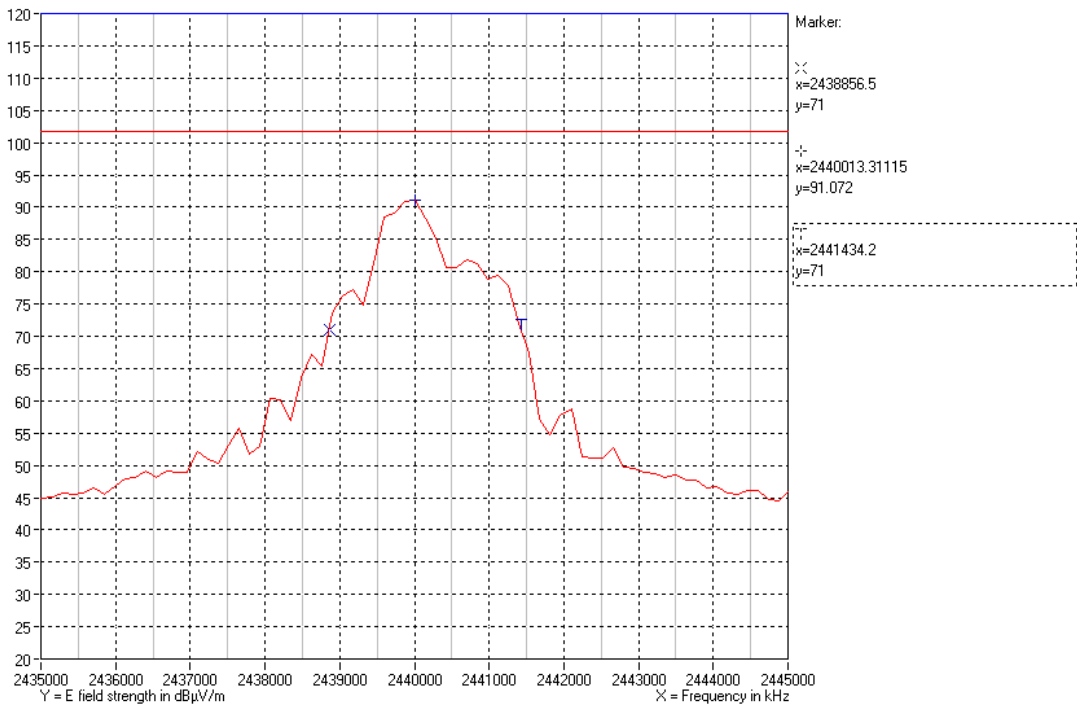
Test method	ANSI C63.4:2003		
Characteristics	Temperature: 22 °C. Test voltage: External power supply at 1.3 VDC		
Test equipm.	Climatic chamber 49184 49550 49299		Uncertainty: 10 kHz
SA Settings	RBW:100kHz VBW:300kHz SPAN:26/40/26MHz DET:Peak CF:Operating freq. Trace:Max hold		
Operating frequency	Low frequency	High frequency	Comment
2404	2402.600	2405.870	-
2440	2438.857	2441.434	-
2478	2476.802	2479.034	-
MHz	MHz	MHz	-
	Measured	Limit	Comment
Lowest frequency	2402.600	2400.00	Passed
Highest frequency		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	Enclosure
Test mode	Continuous Tx - normal modulation - hopping off
Comments	None



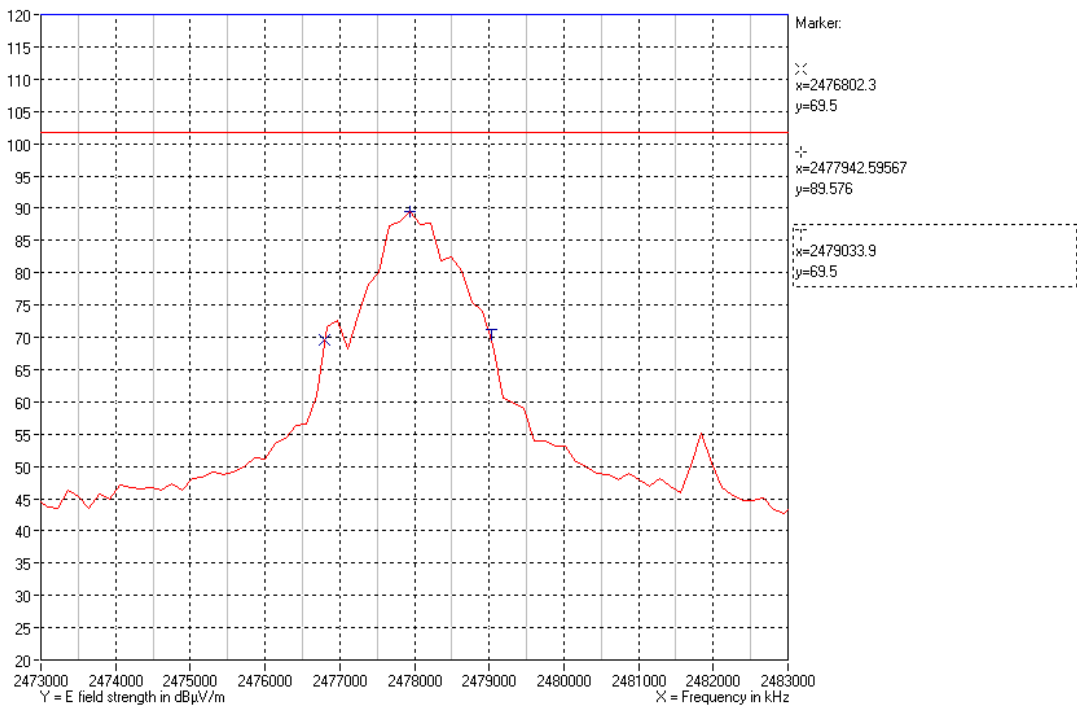


Comments 2404 MHz



Comments 2440 MHz





Comments

2478 MHz



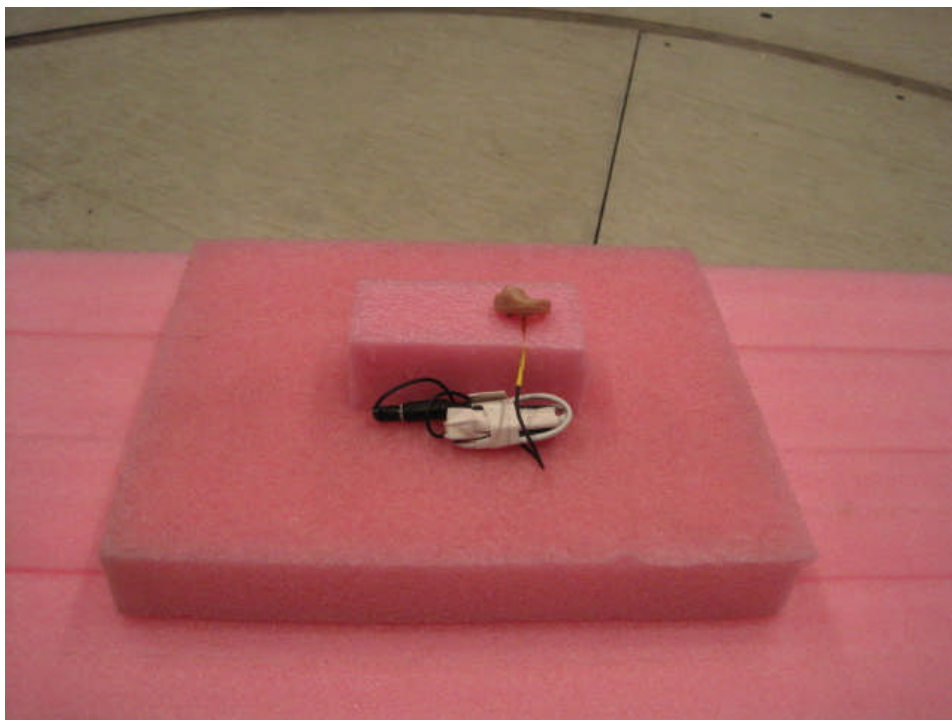


Photo 4.5.1 Test setup regarding measurement of 20 dB bandwidth.

4.6 Measurement of band edge compliance

Test object	PH13	Sheet	PROF-2
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	See section 4.3
Client	GN Hearing A/S	Initials	See section 4.3
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	ANSI C63.4:2003	Temperature	See section 4.3
Characteristics	Complete search, Antenna distance 3 m.	Humidity	See section 4.3
Detector	Peak and average for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm	Uncertainty:	4.9 dB
SA Settings	RBW:100 kHz VBW:300 kHz SPAN:100 MHz DET:Peak CF:2400/2450MHz Trace:Max hold		

Band Edge frequency	Operating frequency	Average / Peak	Measured Band Edge peak field strengths	PACF	Corrected average	Limit at Band Edge	Comment
2400	2404	Average	46.9	7.7	39.2	54	Passed
2400	2404	Peak	46.9	-	-	74	Passed
2483.5	2478	Average	41.8	7.7	34.1	54	Passed
2483.5	2478	Peak	41.8	-	-	74	Passed
MHz	MHz	-	dBμV/m	dB	dBμV/m	dBμV/m	-
Note:							

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

Test Port Enclosure

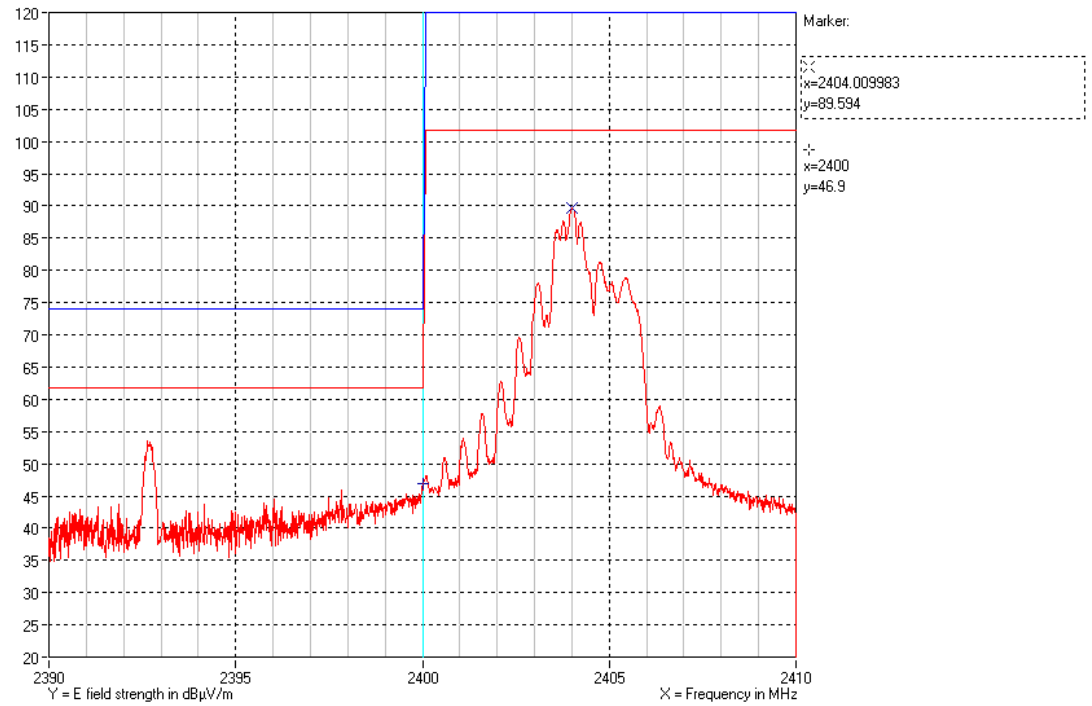
Test mode Continuous Tx - normal modulation - hopping off

Condition Normal

Compliant Yes

Comments Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.
Average limit line (red) is corrected with the PACF at 7.7 dB.
Test voltage: External power supply at 1.3 VDC.





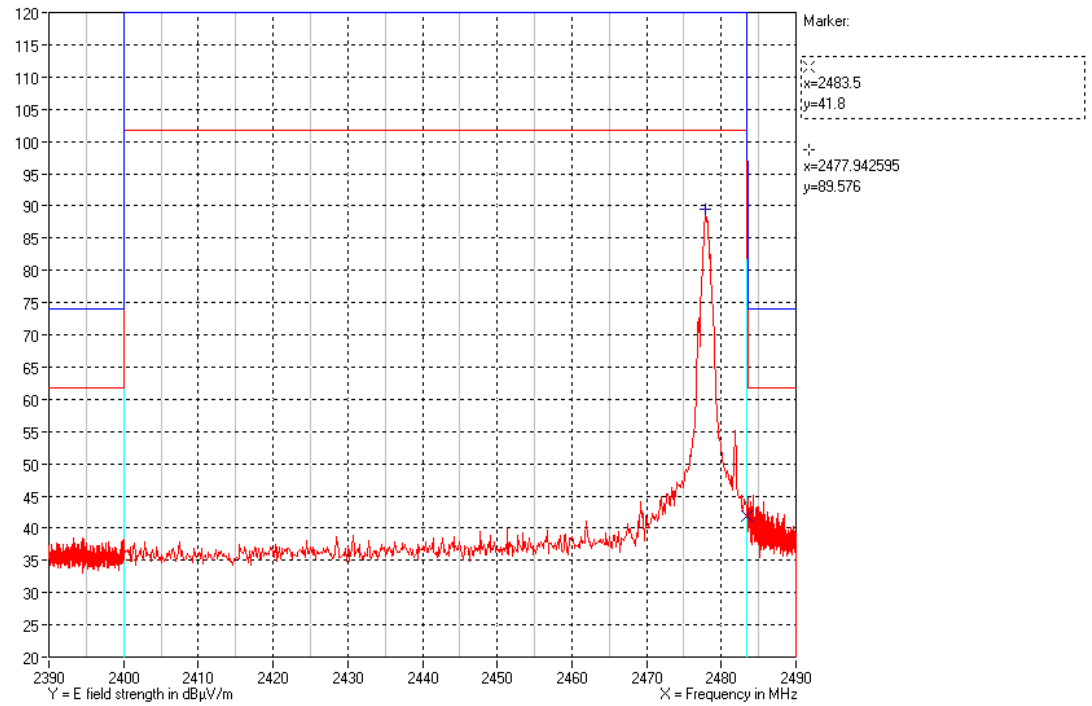
Comments

2404 MHz, Peak measurements

Measurement bandwidth: RBW=100kHz, VBW=300kHz

Average limit line (red) is corrected with the PACF at 7.7 dB.





Comments

2478 MHz, Peak measurements

Measurement bandwidth: RBW = 1 MHz

Average limit line (red) is corrected with the PACF at 7.7 dB



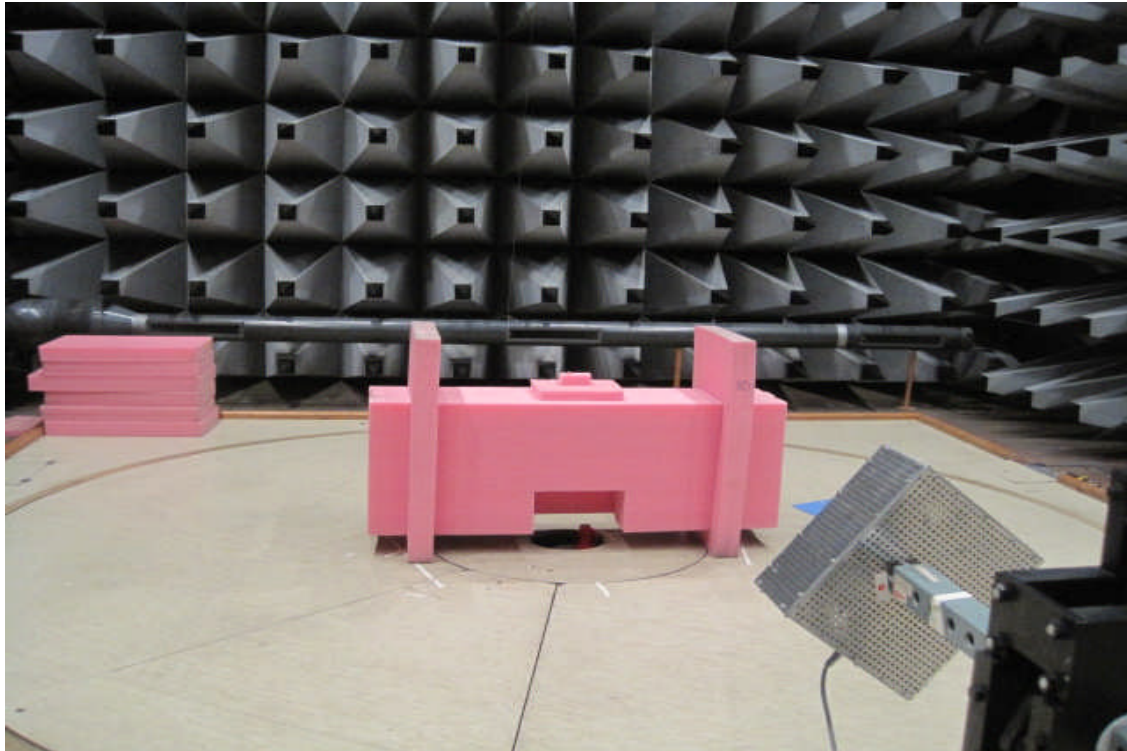


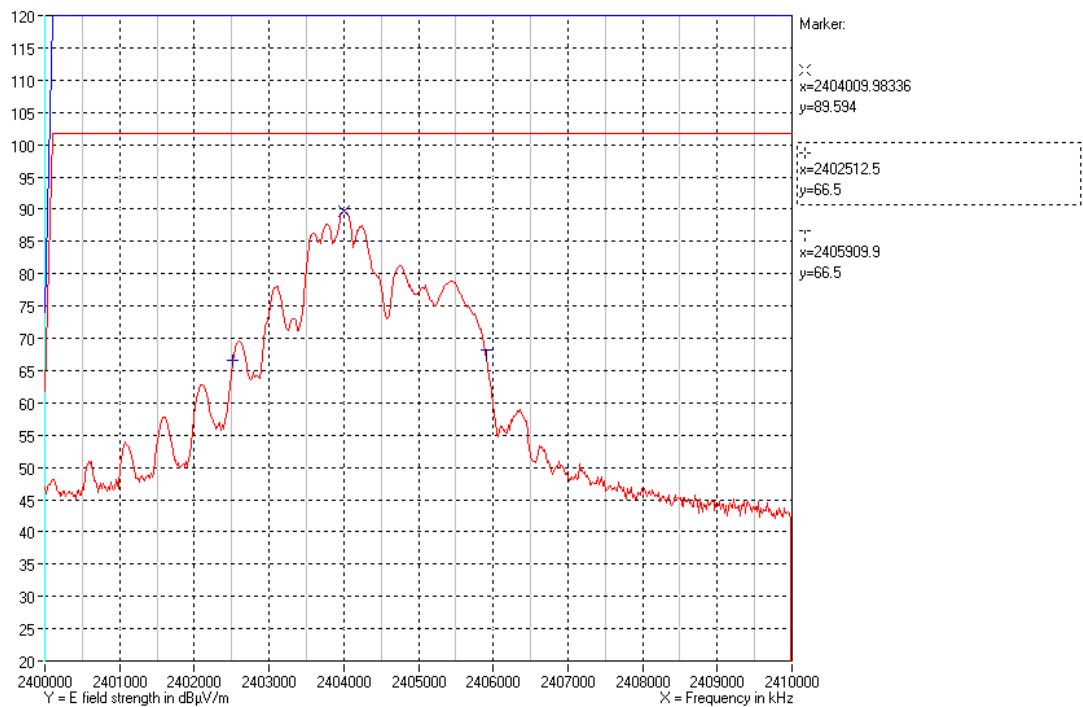
Photo 4.6.1 Test setup regarding measurement of band edge compliance.

4.7 Measurement of occupied bandwidth, IC

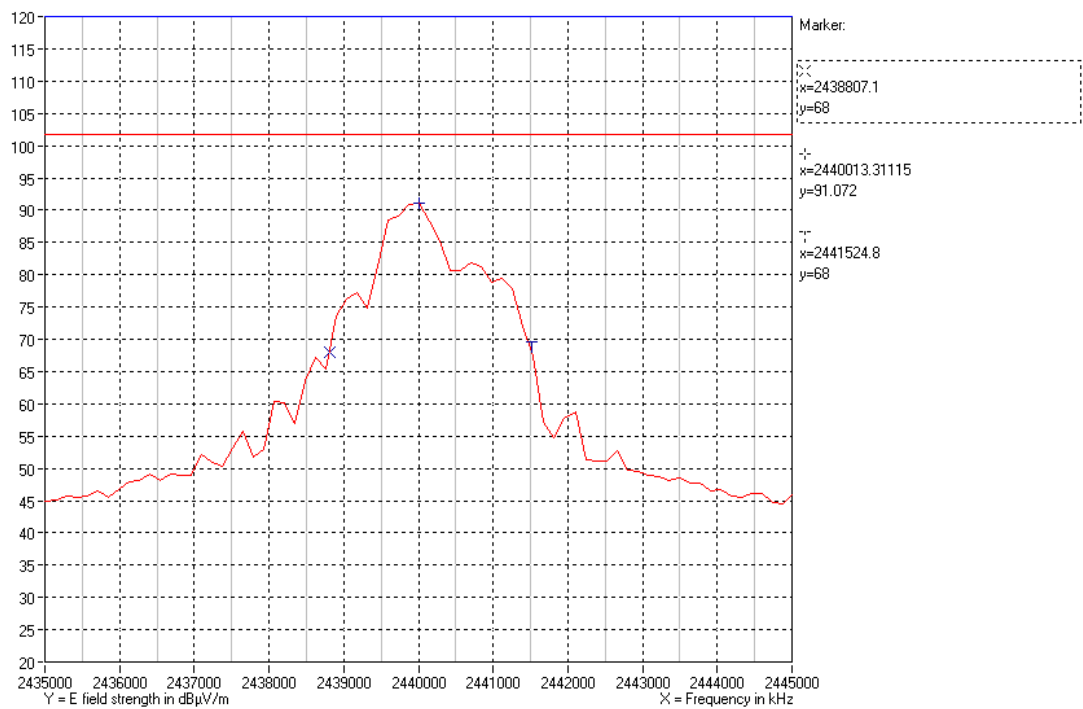
Test object	PH13	Sheet	PROF-3
Type	PH13	Project no.	T200361-6
Serial no.	08	Date	10 Aug 2011
Client	GN Hearing A/S	Initials	CMT
Specification	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1		

Test method	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1		
Characteristics	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:100kHz VBW:300kHz SPAN:10MHz DET:Peak CF:Operating freq. Trace:Max hold		
Operating frequency	Low frequency	High frequency	Measured 99% emission bandwidth
2404	2402.513	2405.910	3.397
2440	2438.807	2441.525	2.718
2478	2476.765	2479.092	2.327
MHz	MHz	MHz	MHz
Note:			

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

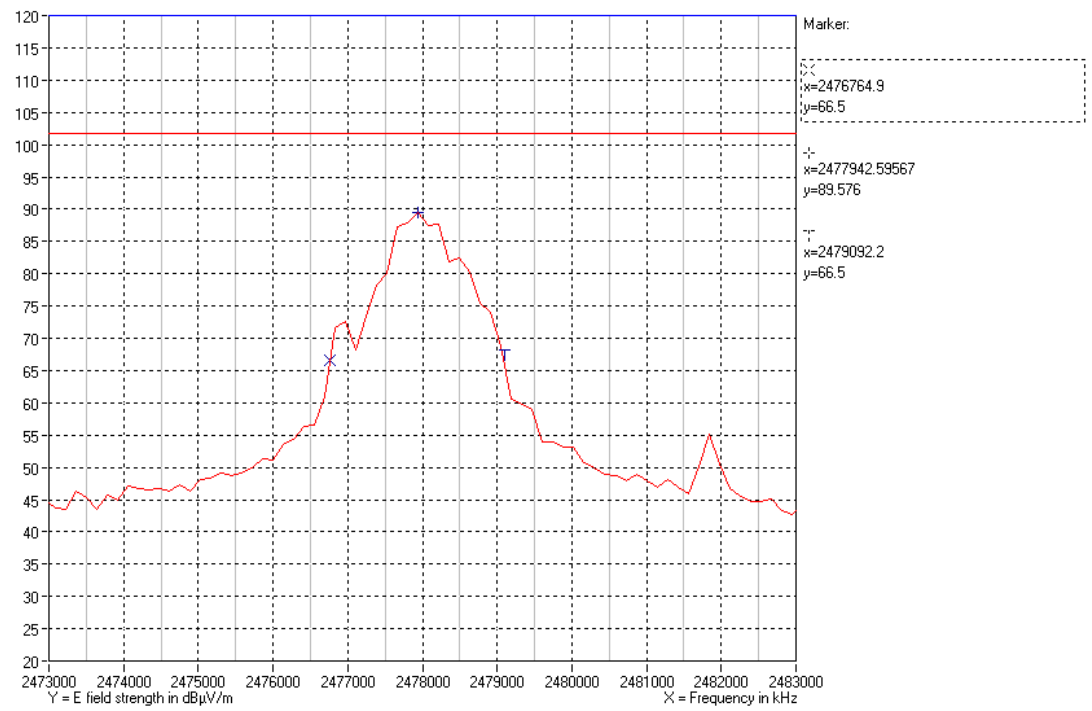


Comments 2404 MHz



Comments 2440 MHz





Comments

2478 MHz



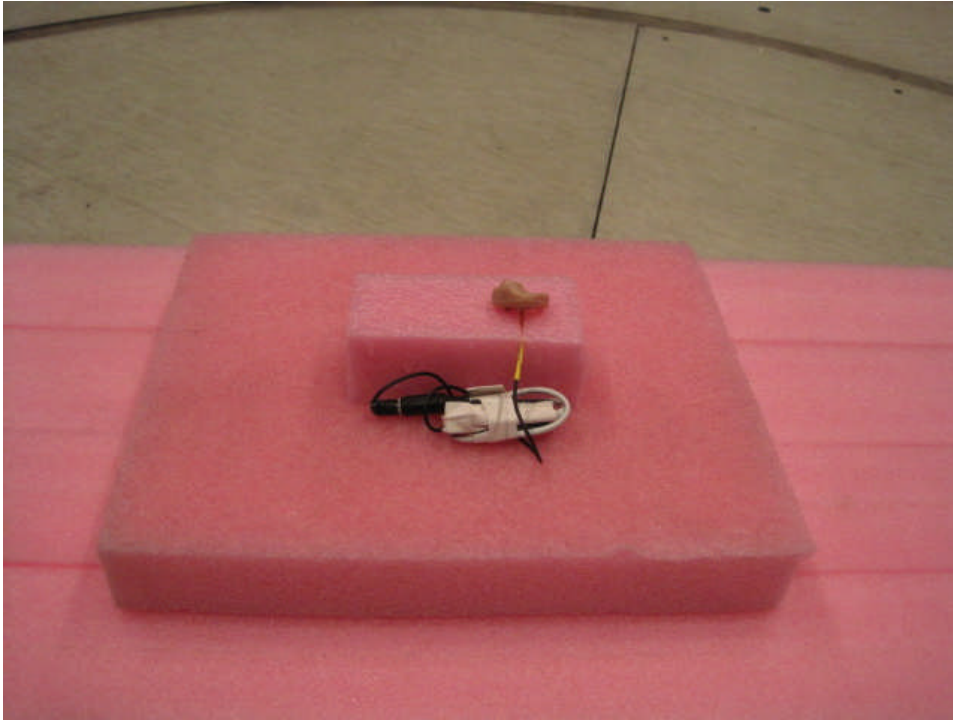
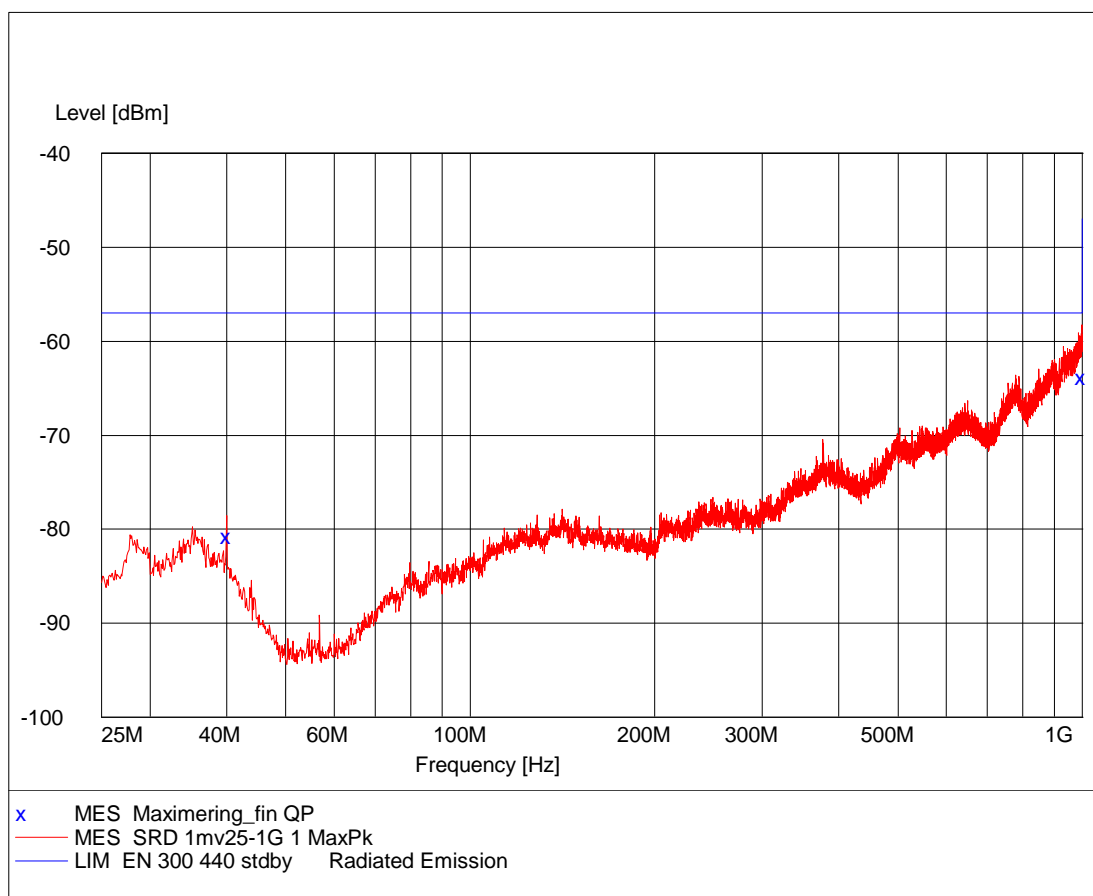


Photo 4.7.1 Test setup regarding measurement of occupied bandwidth, IC.

4.8 Measurement of radiated emission, Rx, IC

Test object	PH13	Sheet	RE_Spur-4
Type	PH13	Project no.	T200361-6
Serial no.	08 and 09	Date	11 Aug 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	EN 300 440-1 V1.5.1:2009	Temperature	21 °C
Characteristics	Pre-scan, Antenna at 10 m, 1 m height, vert. pol.	Humidity	60 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29797 29499	Uncertainty	4.9 dB



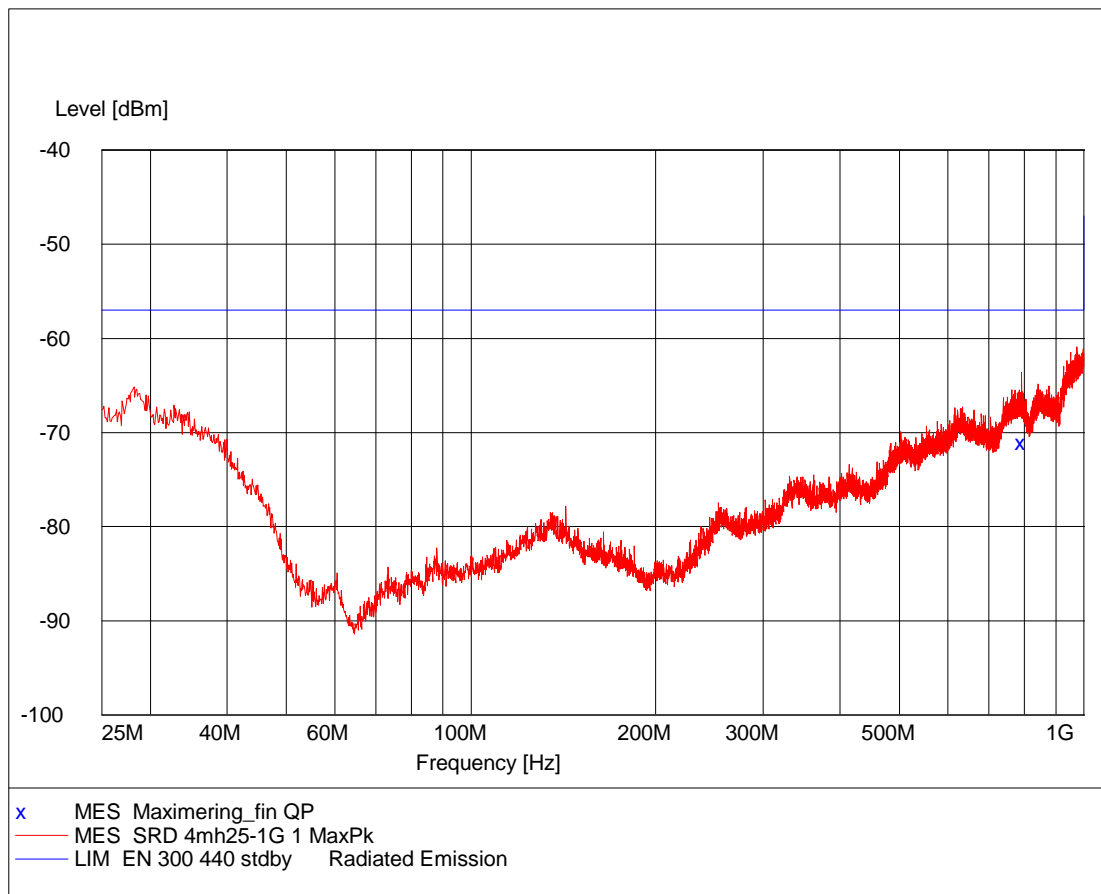
Comments

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



Test object	PH13	Sheet	RE_Spur-5
Type	PH13	Project no.	T200361-6
Serial no.	08 and 09	Date	11 Aug 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	EN 300 440-1 V1.5.1:2009	Temperature	21 °C
Characteristics	Pre-scan, Antenna at 10 meter, 4 m height, hor pol	Humidity	60 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29797 29499	Uncertainty	4.9 dB



Comments

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



Test object	PH13	Sheet	RE_Spur-6
Type	PH13	Project no.	T200361-6
Serial no.	08 and 09	Date	11 Aug 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	EN 300 440-1 V1.5.1:2009	Temperature	21 °C
Characteristics	Peak search ant at 10 m. height 1-4 m. v/h pol.	Humidity	60 % RH
Detector	Quasi Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29797 29499	Uncertainty	4.9 dB

MEASUREMENT RESULT: "Maximering_fin QP"

Frequency MHz	Level dBm	Transd dB	Limit dBm	Margin dB	Height cm	Azimuth deg	Polarisation
40.000000	-80.80	-97.7	-57.0	23.8	104.0	219.00	VERTICAL
998.600000	-63.90	-76.7	-57.0	6.9	101.0	283.00	VERTICAL

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. Limit line is at -57 dBm at 10 meter (38.23 dBμV/m at 3 meter)



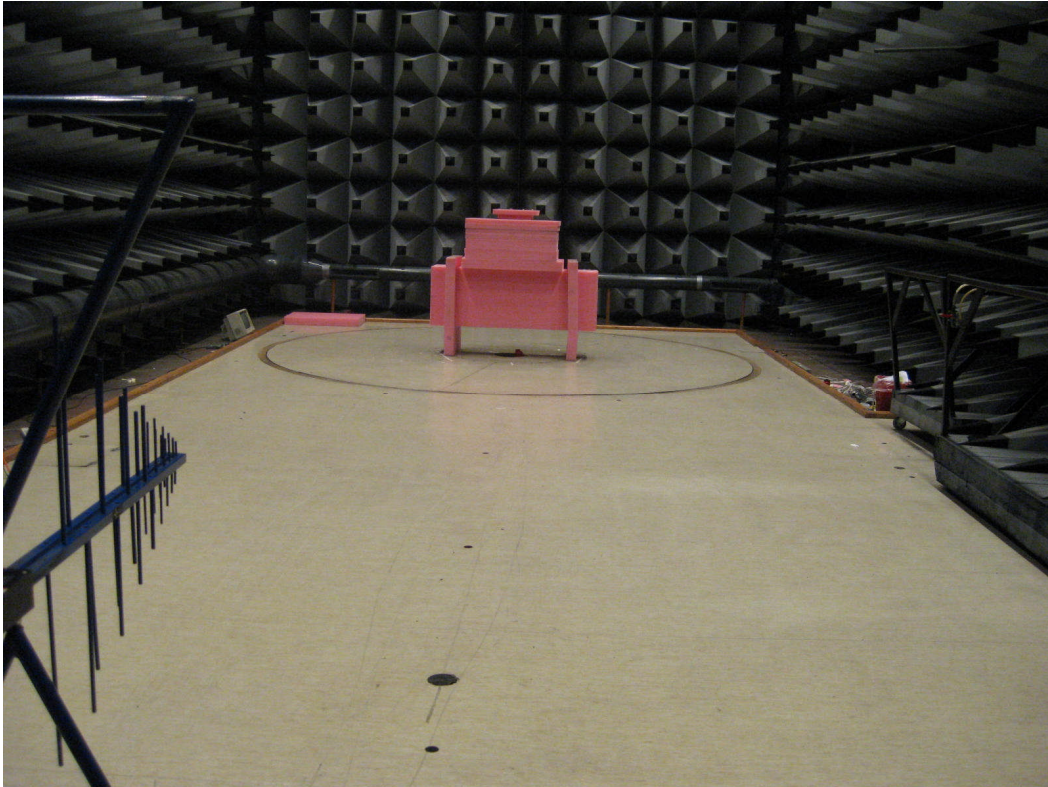


Photo 4.8.1 Test setup regarding measurement of radiated emission, Rx, IC.

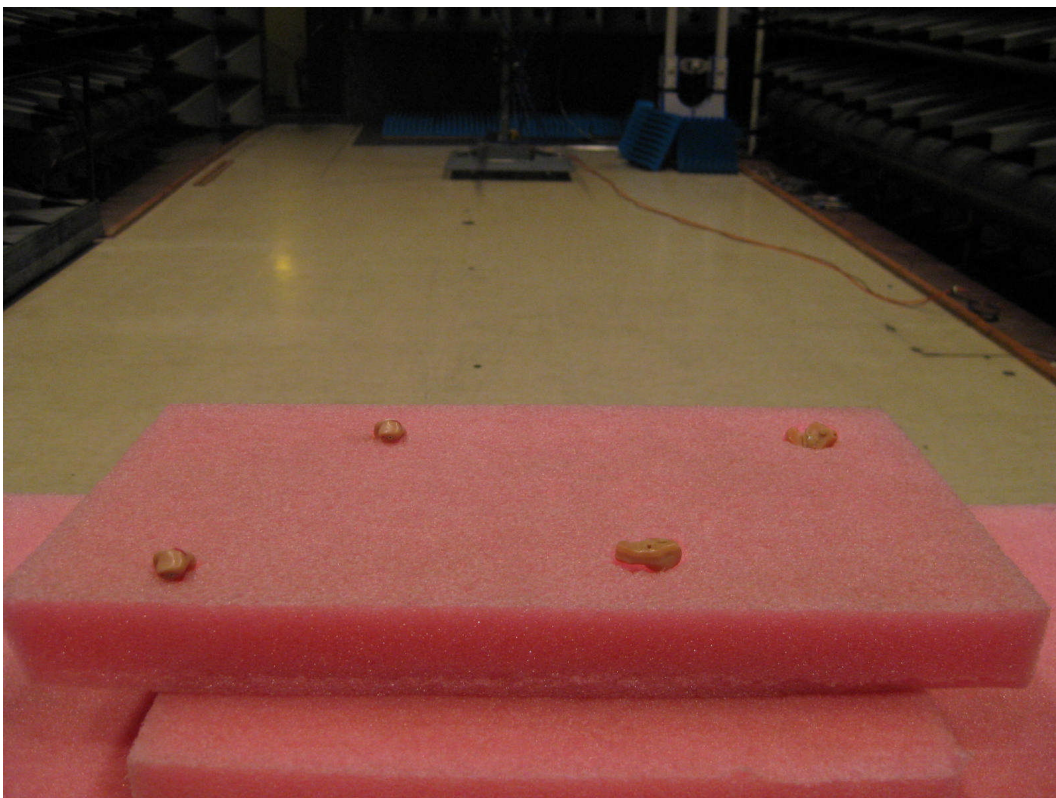
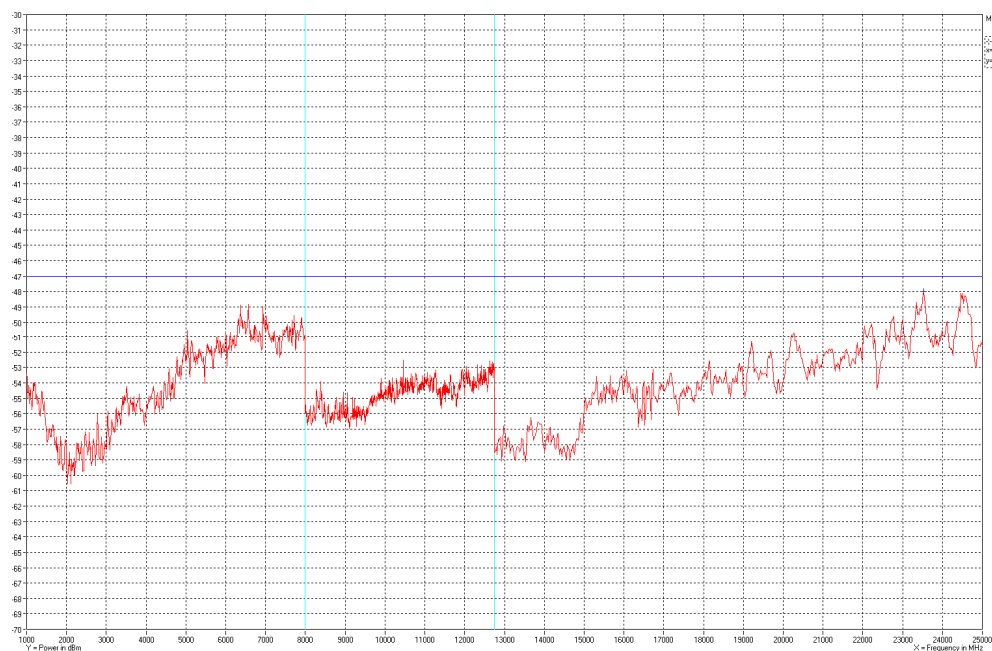


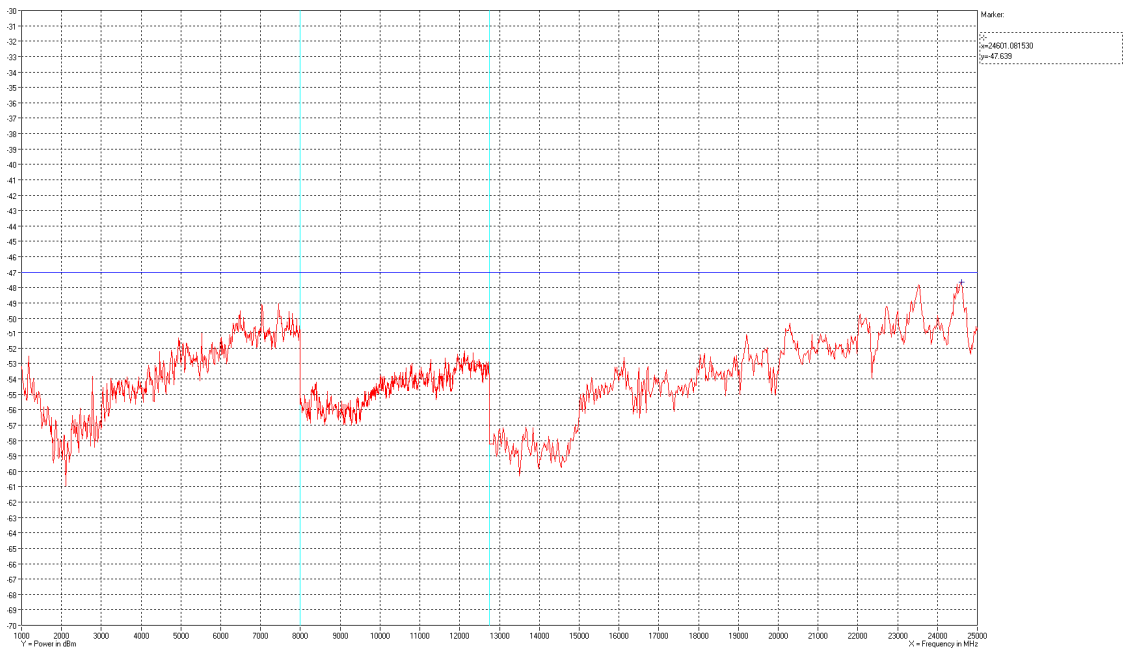
Photo 4.8.2 Test setup regarding measurement of RX radiated emission, Rx, IC.



Test object	PH13	Sheet	RE_Spur-7
Type	PH13	Project no.	T200361-6
Serial no.	08 and 09	Date	11 Aug 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	1GHz-25GHz

Test method	EN 300 440-1 V1.5.1:2009	Temperature	21 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	50 % 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	Uncertainty	4.9 dB





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	Full scan with 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. Limit line is at -47 dBm (48.23 dBμV/m)



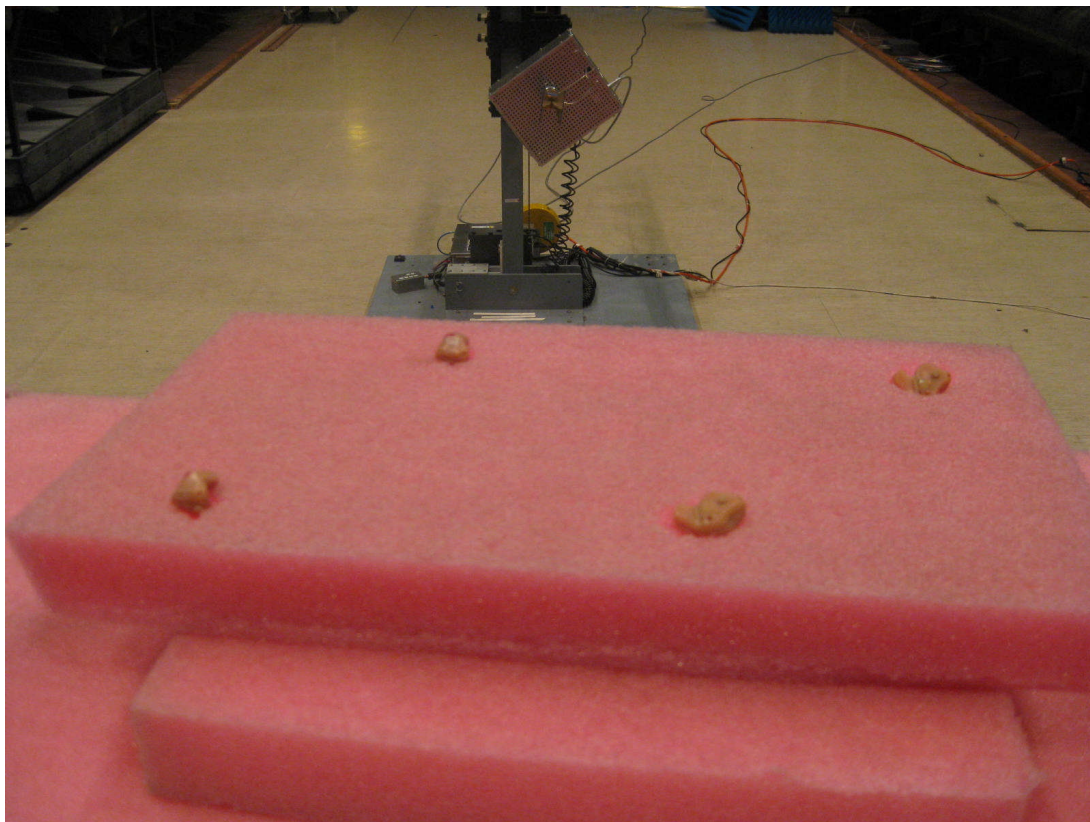


Photo 4.8.3 Test setup regarding measurement of radiated emission, Rx, IC.

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 ANALYZER	ROHDE & SCHWARZ	FSQ8
49600	SPECTRUM ANALYZER / MEASUREMENT 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 MATRIX



Annex 1

Out of band emission table



Transmitter out-of-band Emission Table									
Project No.	T200361-5								
Client	GN Hearing								
Product	PH13								
Specification:	FCC CFR 47 Part 15, Subpart C, §15.247(d) RSS-210, Issue 8:2010, A8.5								
Requirement:	Any out-of-band emission shall be at least 30 dB below the highest in-band emission.								
The table below lists all out-of-band emissions exceeding the general emission limit of 500 uV/m (54 dBuV/m) as well 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] (Max. in-band emission - 30 dB)	Margin [dB] (Limit - Result)	Pass/Fail	Note
56	2404	87.3	29.3	32.5	90.5	In-band	-	-	Tx @ 2404 MHz, Fundamental, Pk
56	4796.6	90.3	68.2	37.0	59.1	61.9	2.8	P	Tx @ 2404 MHz, 2nd harmonic, Pk
56	7212	*	*	*	*	*	*	P	Tx @ 2404 MHz, 3rd harmonic
56	9616	*	*	*	*	*	*	P	Tx @ 2404 MHz, 4th harmonic
54	2440	87.9	29.1	33.1	91.9	In-band	-	-	Tx @ 2440 MHz, Fundamental, Pk
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	84.9	29.1	34.4	90.2	In-band	-	-	Tx @ 2478 MHz, Fundamental, Pk
52	4956	*	*	*	*	*	*	P	Tx @ 2478 MHz, 2nd harmonic
52	7434	*	*	*	*	*	*	P	Tx @ 2478 MHz, 3rd harmonic
52	9912	*	*	*	*	*	*	P	Tx @ 2478 MHz, 4th harmonic
*: The result is below the general limit (54 dBuV/m)									
Max. in-band emission:		91.9 dBuV/m, AV @ 3 m							
Test result:	All measured out-of-band emissions are at least 30 dB below the highest measured ind-band emission.								
Compliant:	Yes.								