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DELTA Test Report



TEST Reg. no. 19

Radio parameter test of SM-1 according to FCC and IC requirements

Performed for GN Hearing A/S

DANAK-1911464 Rev. A

Project no.: A507420-3

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18 July 2011

DELTA

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Title	Radio parameter test of SM-1 according to FCC and IC requirements
Test object	SM-1
Report no.	DANAK-1911464 Rev. A
Project no.	A507420-3
Test period	26 May to 07 July 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 15.247 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 18 July 2011

Project Manager



Jan Askov
Senior Specialist, Wireless
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Responsible



Claus Rømer Andersen
Business Manager, Consulting
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This test report replaces previously issued test report DANAK-1911464 dated 12 July 2011.

The following has been corrected:

Page 11: "Maximum gain: 2.7 dB" has been changed to "Maximum gain: 1.8 dB".



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1. Summary of tests

SRD Tests	Test methods	Rule Section	Results
Antenna requirement	Visual inspection IC RSS-Gen:2010	15.203 RSS-Gen, 7.1.2	Passed
Radio frequency voltage on mains	ANSI C63.4:2003	15.207	Passed
Radiated emission	ANSI C63.4:2003	15.209	Passed
20 dB bandwidth	DA 00-705	15.247(a)(1) RSS-A8.1	Passed
Number of hopping channels	DA 00-705	15.247(a)(1) RSS-A8.1	Passed
Carrier frequency separation	DA 00-705	15.247(a)(1) RSS-A8.1	Passed
Time of occupancy (Dwell Time)	DA 00-705	15.247(a)(1) RSS-A8.1	Passed
Peak output power, conducted	DA 00-705	15.247(b)(1) RSS-A8.4	Passed
Spurious RF conducted emission	DA 00-705	15.247(d) RSS-A8.5	Passed
Band-edge compliance of RF conducted emission	DA 00-705	15.247(d) RSS-A8.5	Passed
Measurement of occupied bandwidth, IC	IC RSS-Gen:2010	RSS-Gen, 4.6.1	Passed
Measurement of radiated emission, receiver, IC	EN 300 440-1 V1.5	RSS-Gen, 6 RSS-210, 2.5	Passed

Test Method: DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum System, Released March 30, 2000.

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 standards stated below.

- FCC CFR 47 Part 15, Subpart C, Specific rule part 15.247
- 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 Test object. The test object measures 75 x 25 x 18 mm.

Test object 2.1.1

Name of test object	SM-1
Model / type	SM-1
Part no.	SM-1
Serial no.	77
FCC ID	X26SM-1
IC ID	6941C-SM1
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	SM-1
Model / type	SM-1
Part no.	SM-1
Serial no.	01
FCC ID	X26SM-1
IC ID	6941C-SM1
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	SM-1
Model / type	SM-1
Part no.	SM-1
Serial no.	11
FCC ID	X26SM-1
IC ID	6941C-SM1
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	SM-1
Model / type	SM-1
Part no.	SM-1
Serial no.	69
FCC ID	X26SM-1
IC ID	6941C-SM1
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

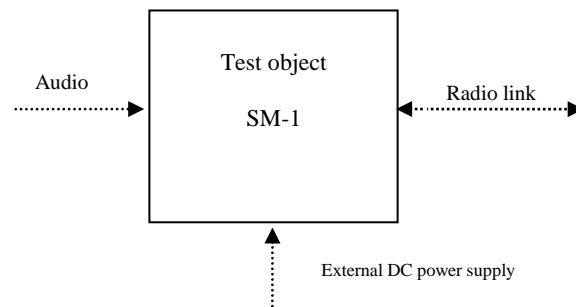


Figure 3.1.1 Block diagram of test object with external cables.

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 supply is not used under intended use.

4. Test results

4.1 Radio specifications, receiver and transmitter

Test object	SM-1	Sheet	Radio-1
Type	SM-1	Project no.	A507420-3
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	:	1.8 dB
Transmit power, max peak	:	14.2 dBm EIRP
Field Strength, max peak	:	109.4 dB μ V/m (300 mV/m) @ 3 meter
Power level	:	No
No of channels	:	16
Bandwidth	:	
Occupied bandwidths (99%)	:	3.260 MHz (Measured)
Necessary bandwidth	:	3.260 MHz
Channel separation	:	2 MHz
Modulation	:	GFSK
Data rate	:	2.16 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	:	545 (μ V/m) @ 3 meter (Field Strength)
Max. RX spurious emission, peak	:	270 (μ V/m) @ 3 meter (Field Strength).

During test, the test objects were running special test software.



4.2 Antenna requirement

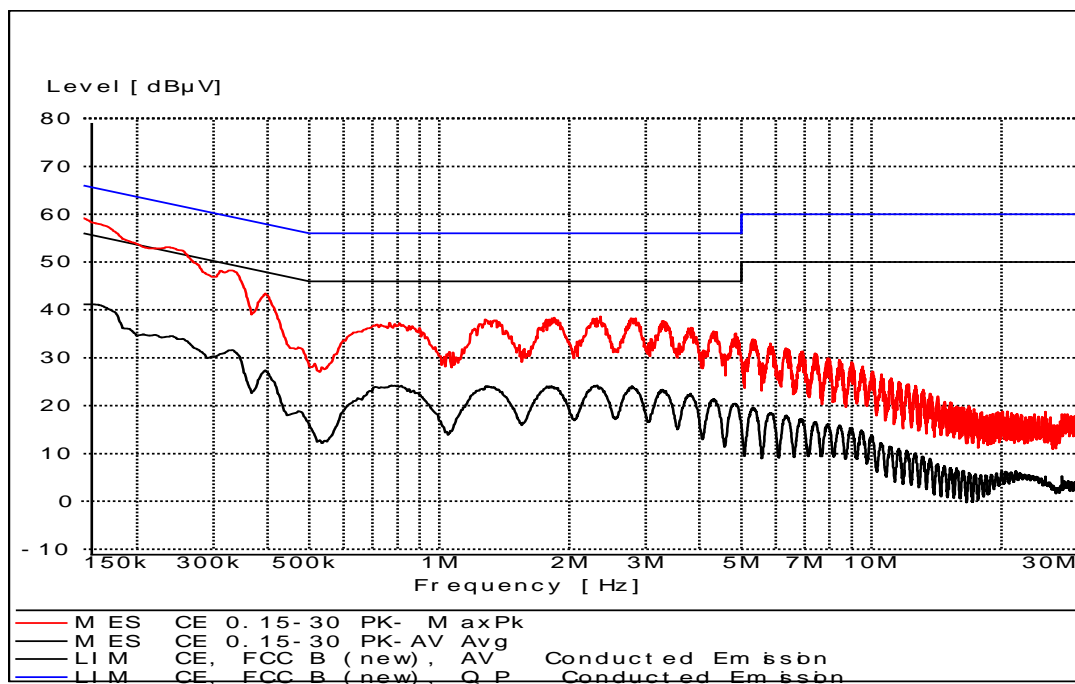
Test object	SM-1	Sheet	ANT-1
Type	SM-1	Project no.	A507420-3
Serial no.	A11	Date	07 July 2011
Client	GN Hearing A/S	Initials	JAS
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.203 IC Standard: RSS-Gen, Issue 3:2010, Section 7.1.2		

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 SM-1 has one permanent attached PCB antenna.	

4.3 Measurement of radio frequency voltage on mains

Test object	SM-1	Sheet	CE-1
Type	SM-1	Project no.	A507420-3
Serial no.	77	Date	14 June 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.207 and IC RSS-Gen	Frequency	0.15-30 MHz

Test method	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Artificial mains network: 50 Ω , 50 μ H	Humidity	52 % RH
Detector	Peak and average	Bandwidth	10 kHz
Test equipm.	EMI room Hørsholm 29301 29680 49600 29861	Uncertainty	4.9 dB

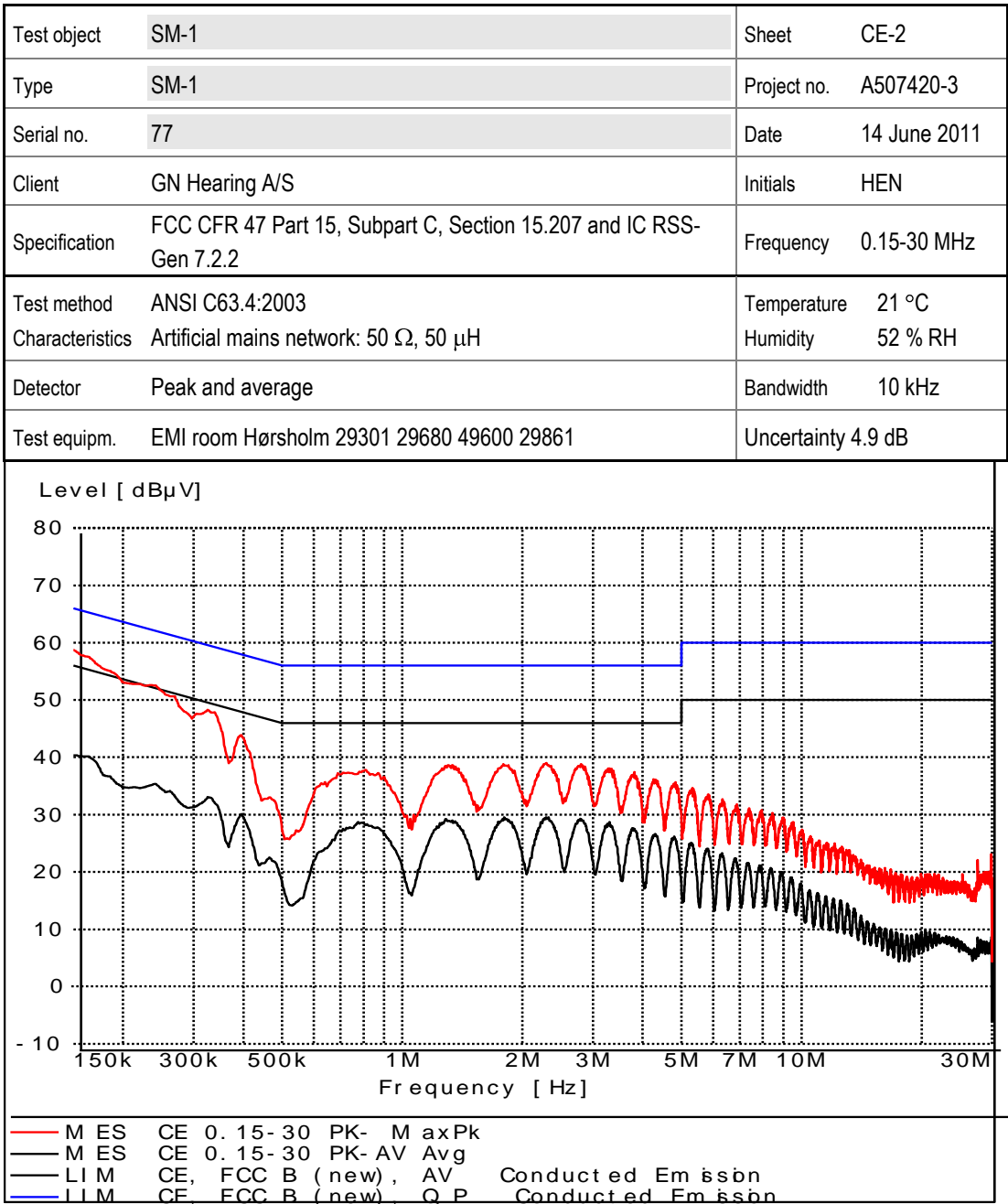


Line under test Neutral

Test result The measured voltages were below the limit

Comments Mains voltage: 120 VAC
 During test an artificial hand was not applied to the test object





Line under test	Line
Test result	The measured voltages were below the limit
Compliant	Yes
Comments	Mains voltage: 120 VAC During test an artificial hand was not applied to the test object.



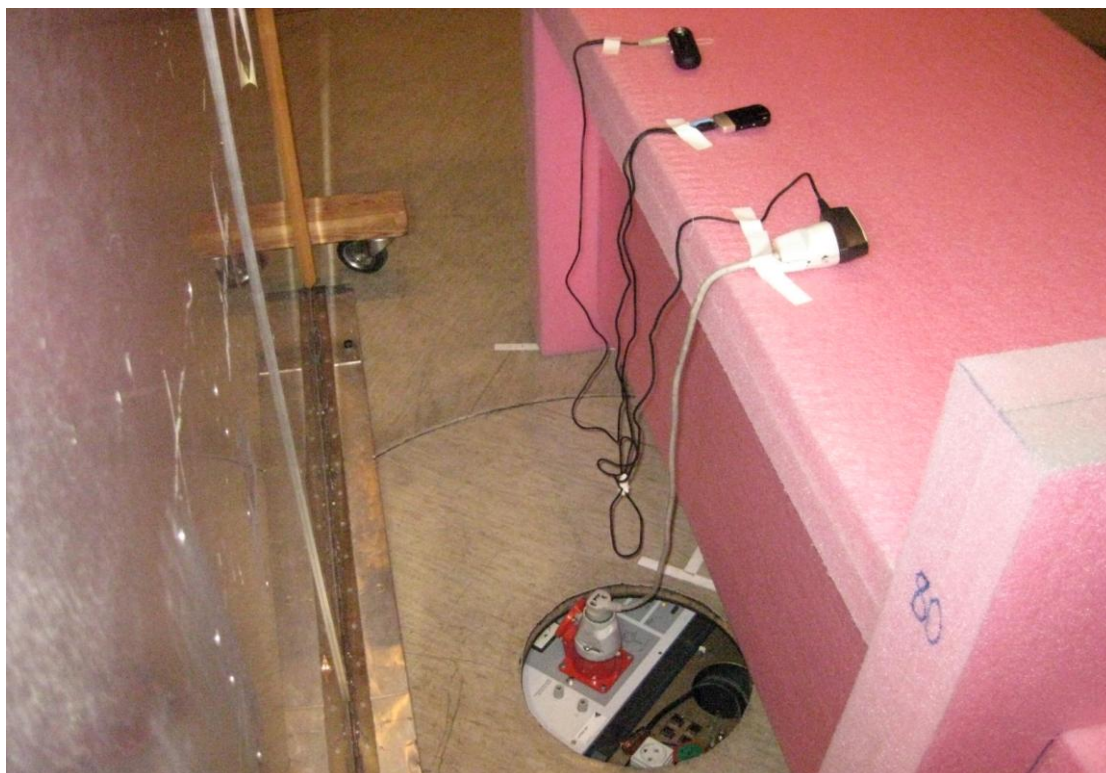


Photo 4.3.1 Test setup regarding measurement of radio frequency voltage on mains.

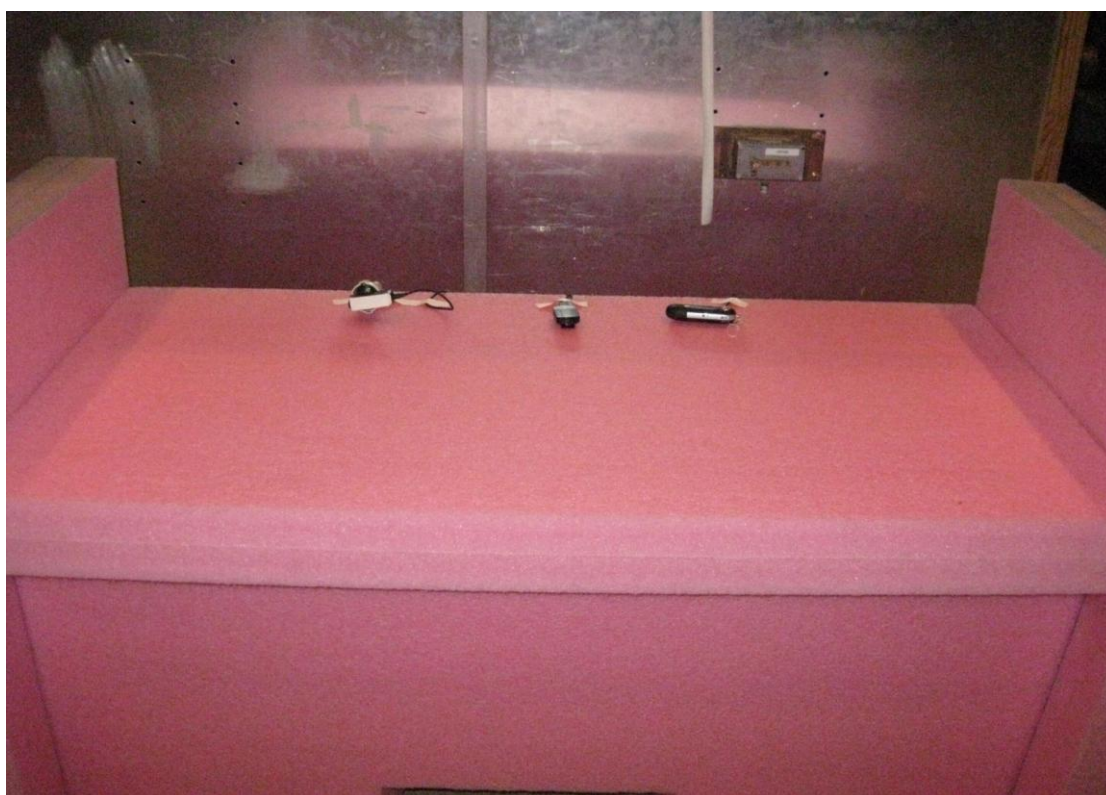
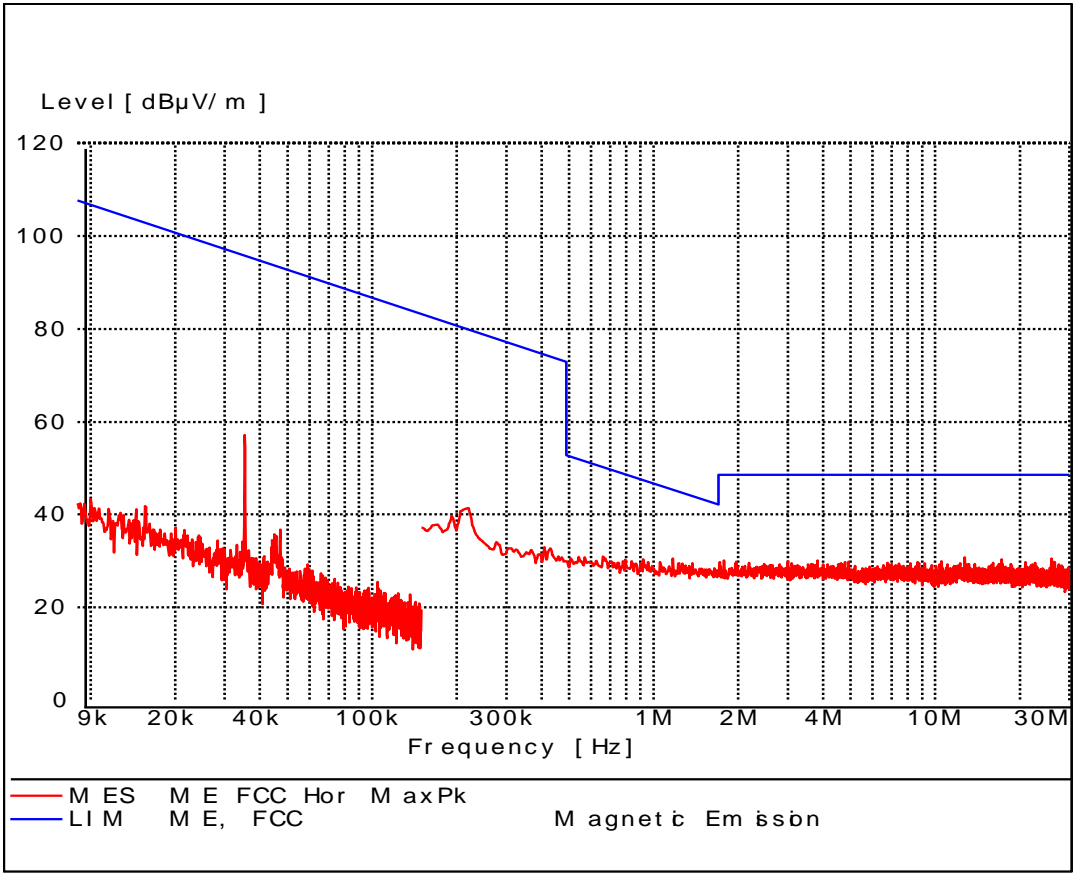


Photo 4.3.2 Test setup regarding measurement of radio frequency voltage on mains.



4.4 Measurement of radiated emission

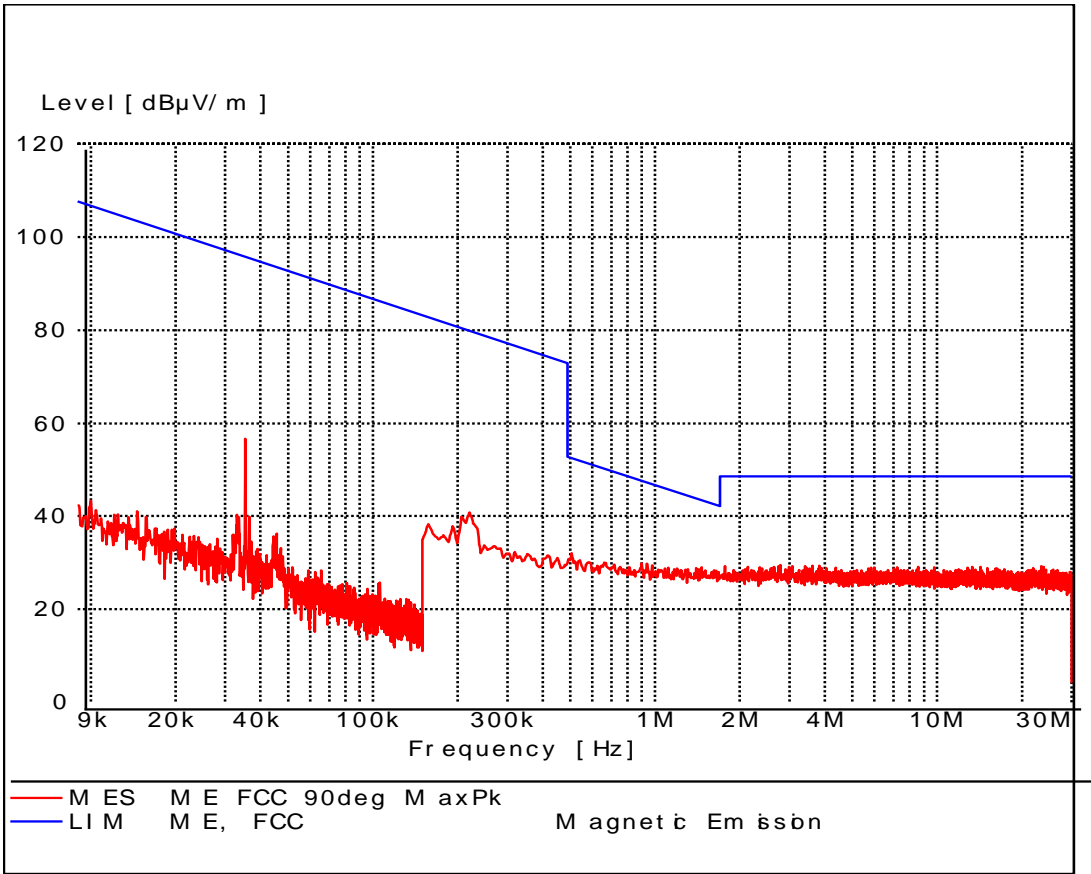
Test object	SM-1	Sheet	RE Loop-1
Type	SM-1	Project no.	A507420-3
Serial no.	77	Date	1 June 2011
Client	GN Hearing A/S	Initials	HEN
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 IC Standard RSS-Gen, Issue 3:2010	Frequency	0.009-30MHz
Test method	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Scan, Loop Antenna at 10 m, 1 m Height, Horizontal.	Humidity	45 % 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). $L_2 = L_1 + 40 \log_{10} (D_1/D_2)$.
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Test object	SM-1	Sheet	RE Loop-2
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	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	45 % RH
Detector	Peak	Bandwidth	0.2/9 KHz
Test equipm.	EMI room Hørsholm 29332 29503 49600 29494	Uncertainty	4 dB

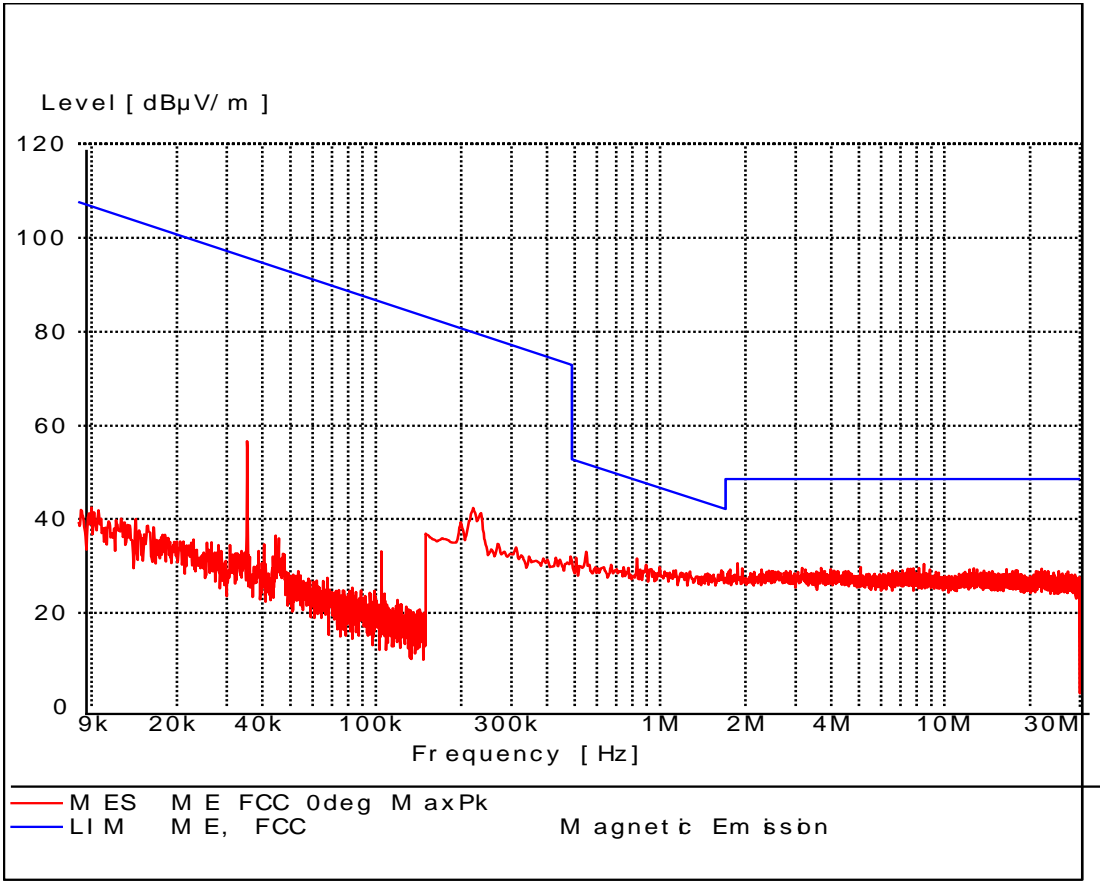


Comments

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	SM-1	Sheet	RE Loop-3
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	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	45 % RH
Detector	Peak	Bandwidth	0.2/9 KHz
Test equipm.	EMI room Hørsholm 29332 29503 49600 29494	Uncertainty	4 dB



Comments

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



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

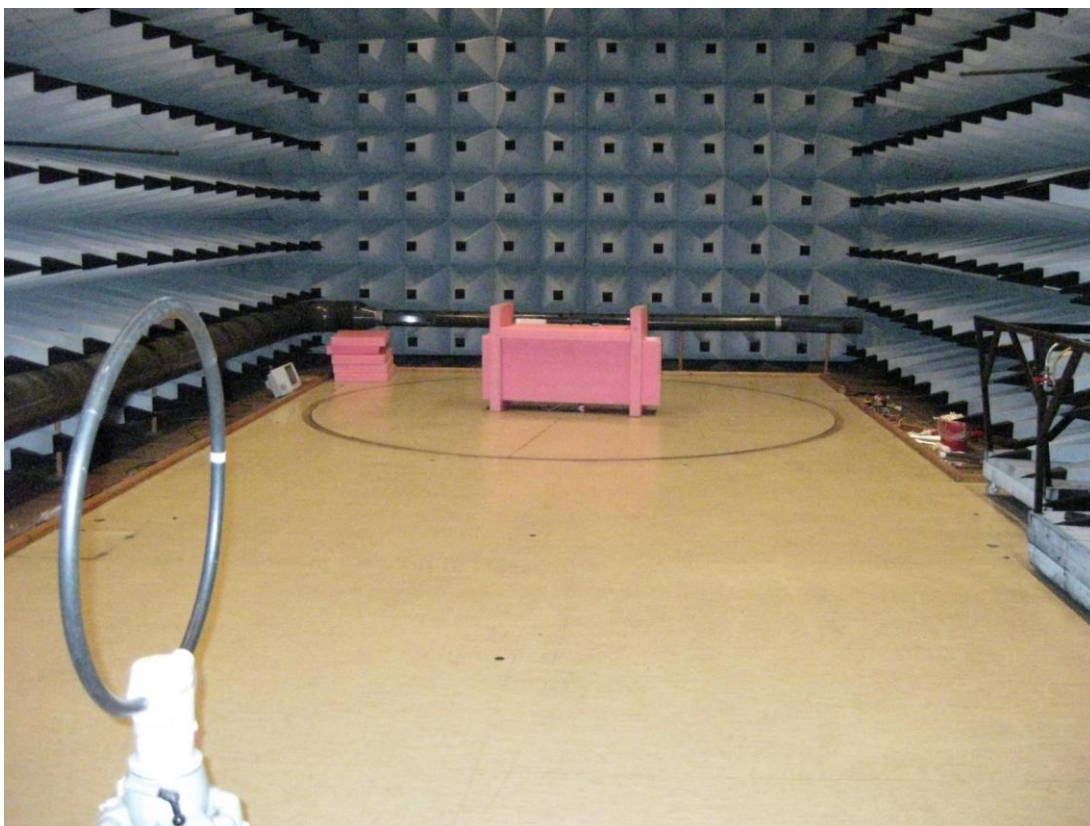
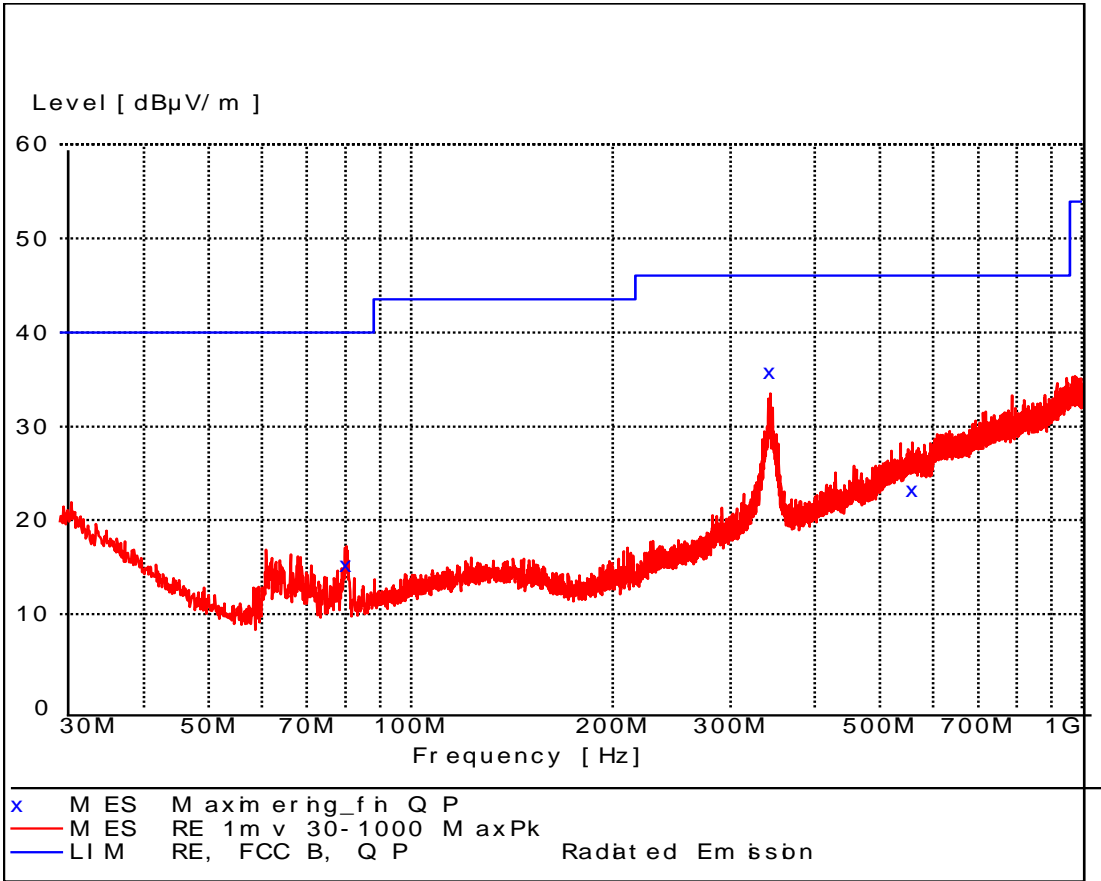


Photo 4.4.1 Test setup regarding measurement of radiated emission.

Test object	SM-1	Sheet	RE_Spur-1
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	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	67 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

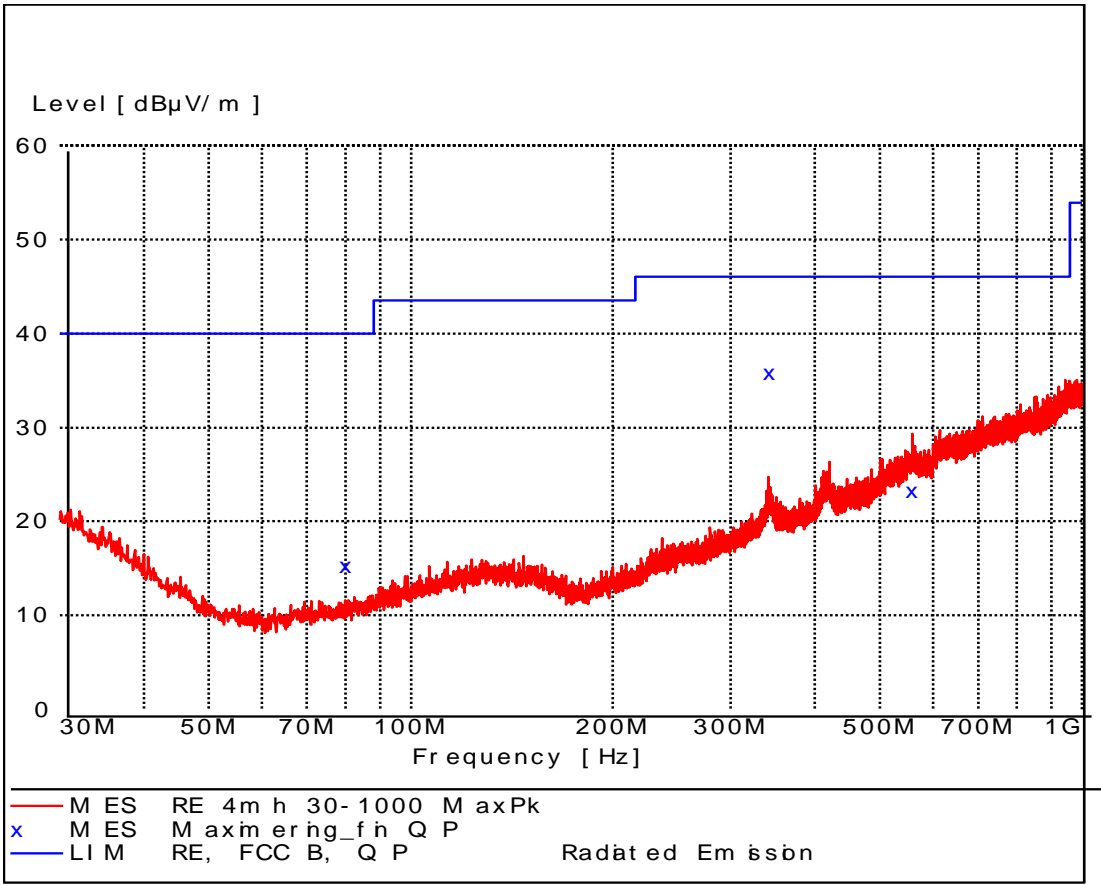


Comments Continuous Tx - normal modulation - hopping off



Test object	SM-1	Sheet	RE_Spur-2
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Pre-scan, Antenna at 3 m, 3 m height, hor. pol.	Humidity	67 % 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	SM-1	Sheet	RE_Spur-3
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	30-1000 MHz

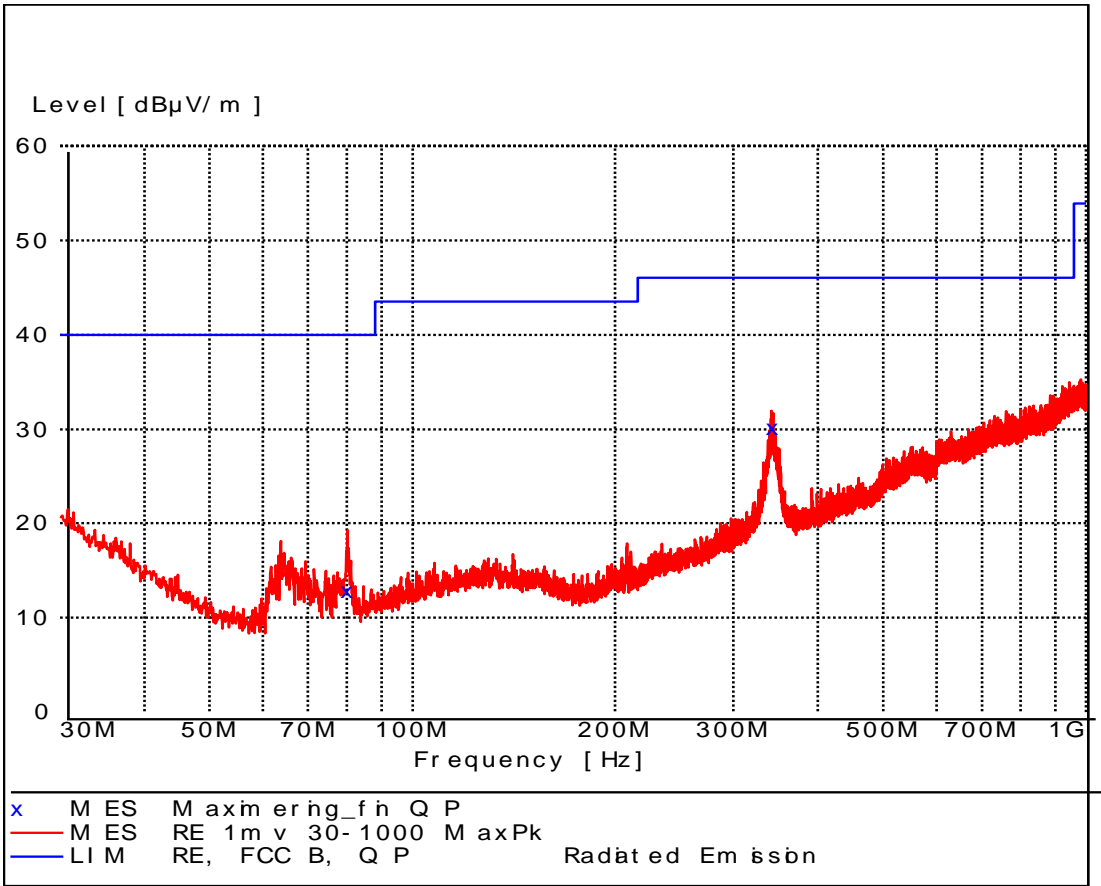
Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	67 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
80.070000	15.30	9.5	40.0	24.7	144.0	20.00	VERTICAL
343.400000	35.80	17.5	46.0	10.2	101.0	202.00	HORIZONTAL
559.400000	23.30	23.8	46.0	22.7	101.0	195.00	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 off
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation



Test object	SM-1	Sheet	RE_Spur-4
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	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	67 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

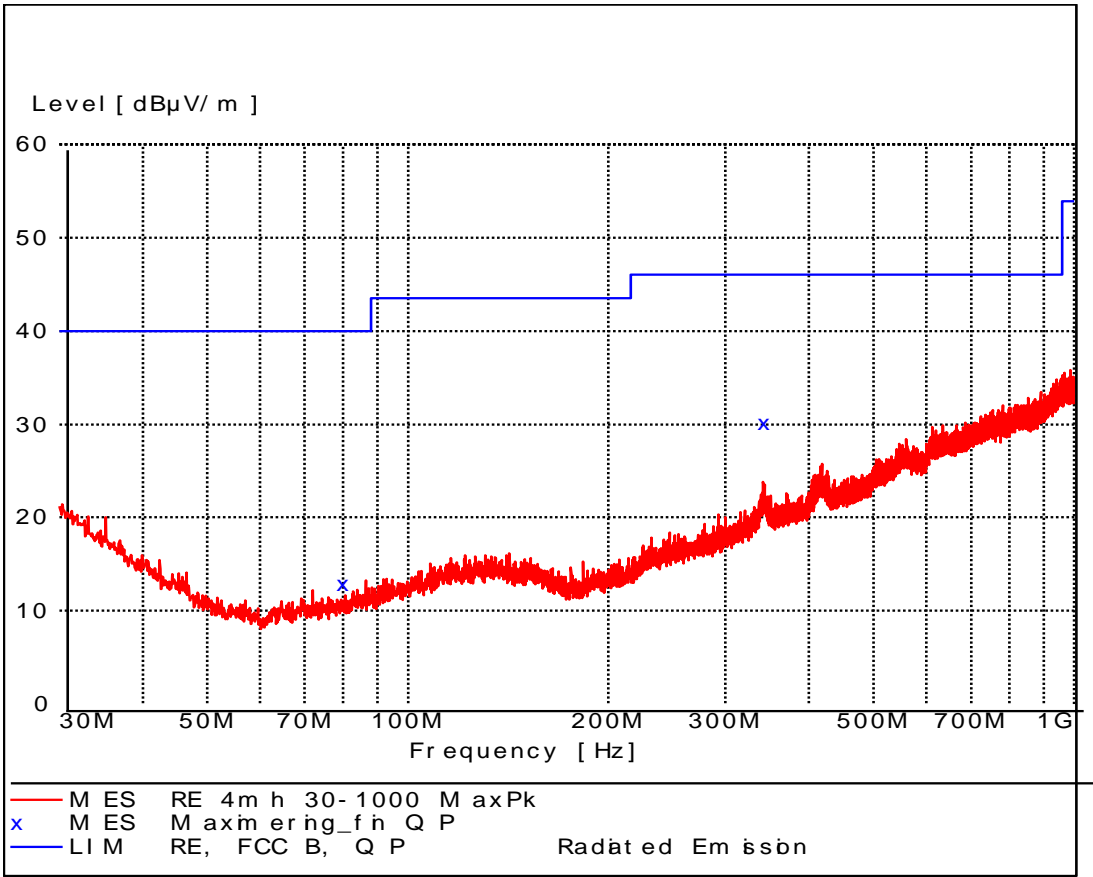


Comments Continuous Tx - normal modulation - hopping off



Test object	SM-1	Sheet	RE_Spur-5
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	30-1000 MHz

Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Pre-scan, Antenna at 3 m, 3 m height, hor. pol.	Humidity	67 % 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	SM-1	Sheet	RE_Spur-6
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	30-1000 MHz

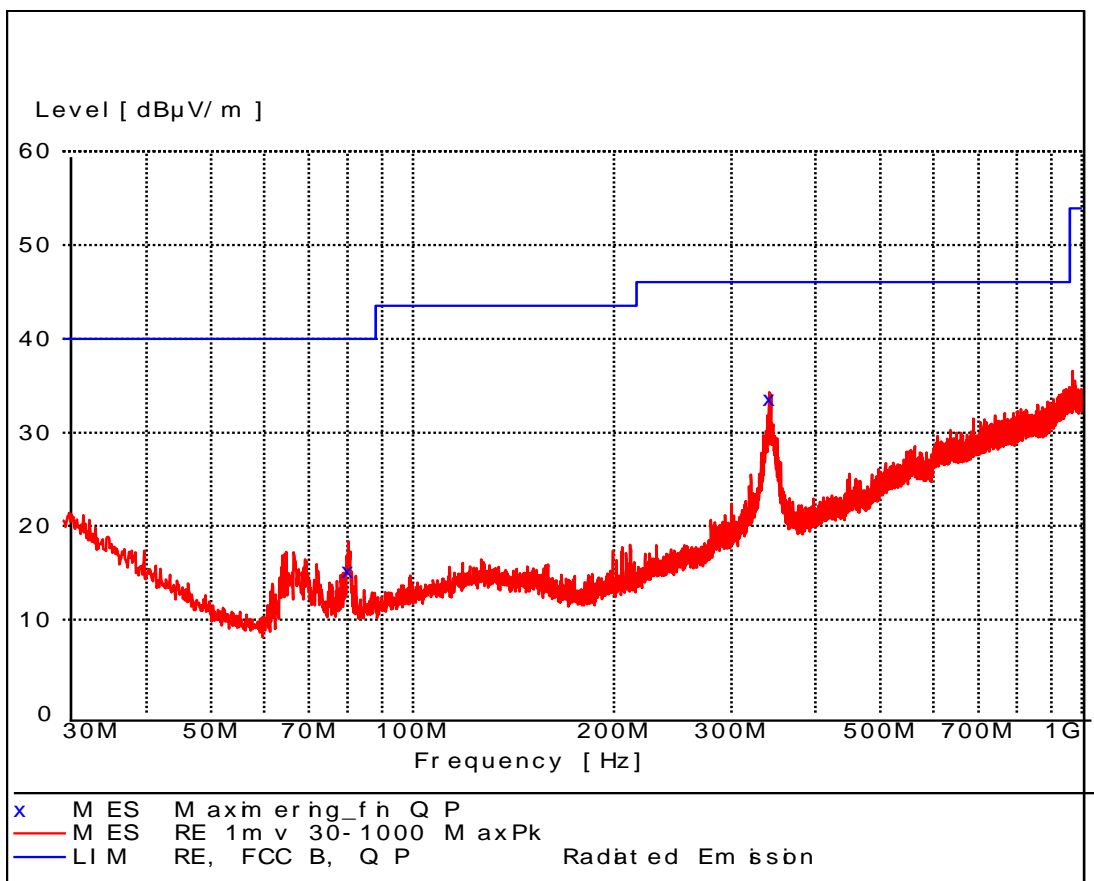
Test method	ANSI C63.4:2003	Temperature	22 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	67 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBµV/m	dB	dBµV/m	dB	cm	deg	
80.100000	12.80	9.5	40.0	27.2	117.0	164.00	VERTICAL
343.400000	30.20	17.5	46.0	15.8	101.0	202.00	HORIZONTAL

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 object	SM-1	Sheet	RE_Spur-7
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	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	45 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

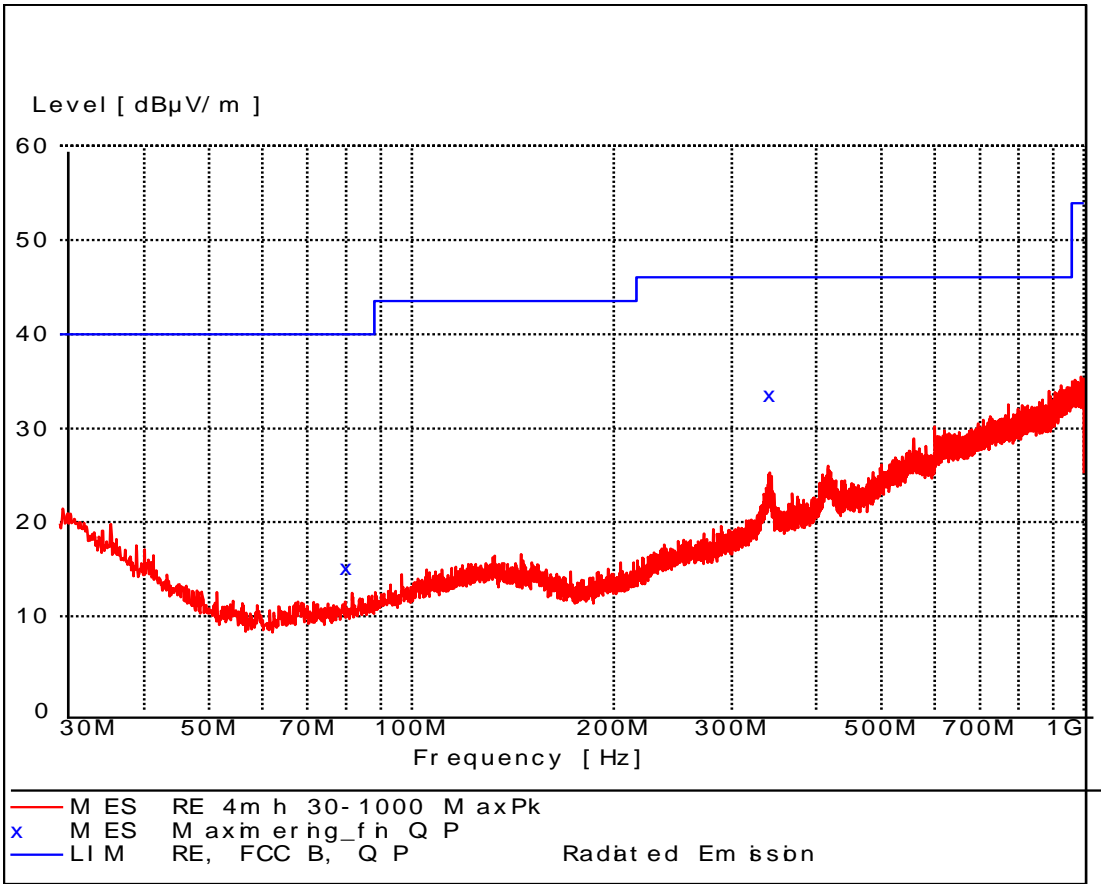


Comments

Continuous Tx - normal modulation - hopping off

Test object	SM-1	Sheet	RE_Spur-8
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	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	45 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB



Comments Continuous Tx - normal modulation - hopping off



Test object	SM-1	Sheet	RE_Spur-9
Type	SM-1	Project no.	A507420-3
Serial no.	77	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	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	45 % 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	
80.130000	15.20	9.5	40.0	24.8	119.0	164.00	VERTICAL
341.120000	33.60	17.4	46.0	12.4	101.0	201.00	HORIZONTAL

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



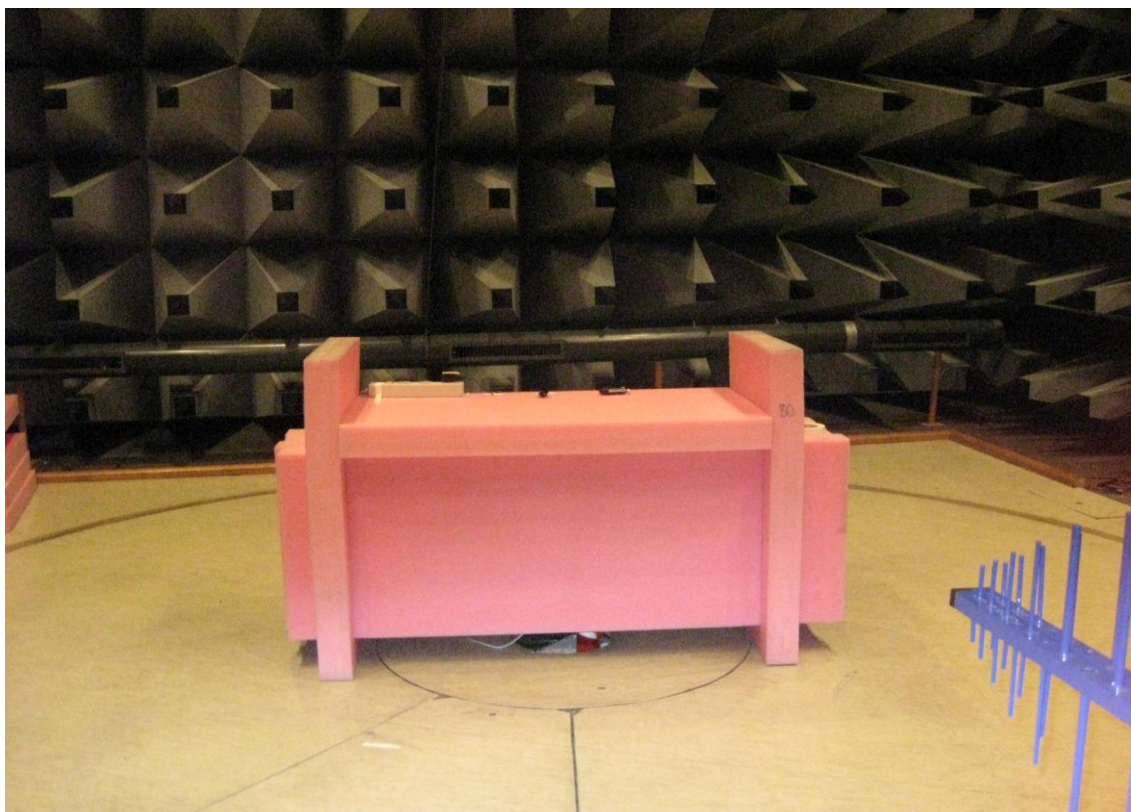


Photo 4.4.2 Test setup regarding measurement of radiated emission.

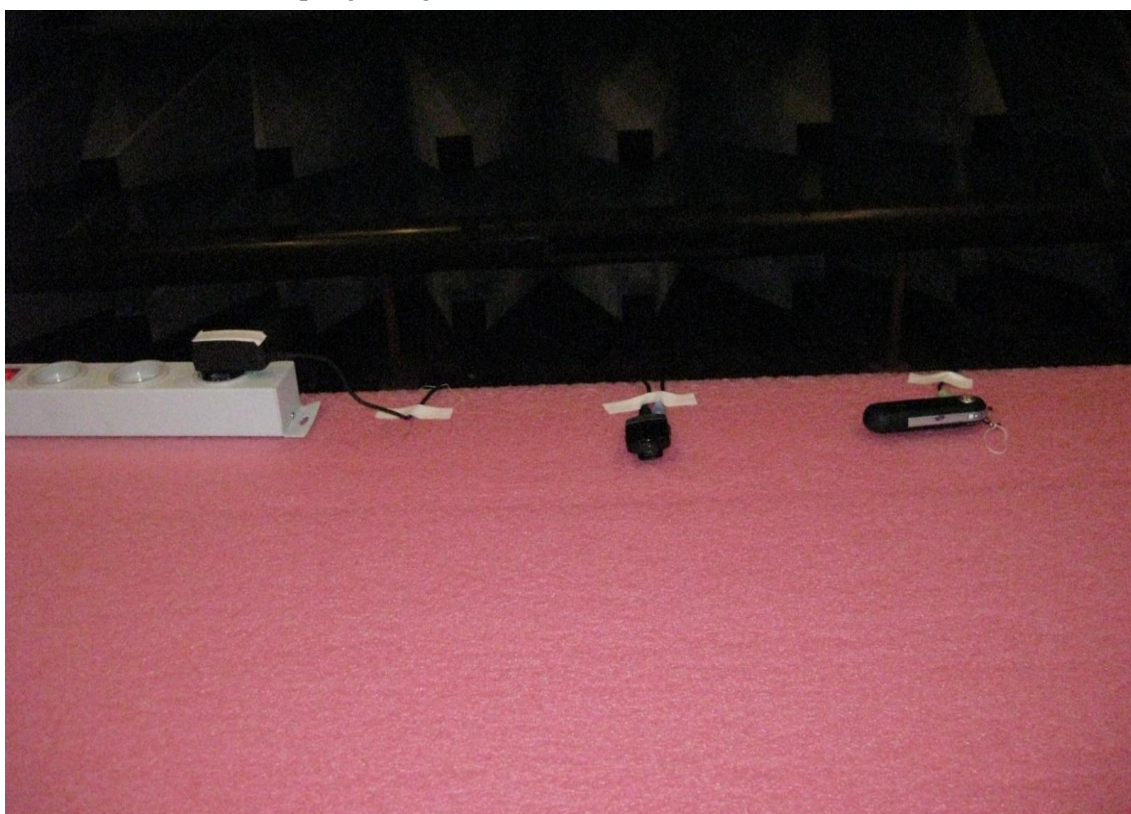
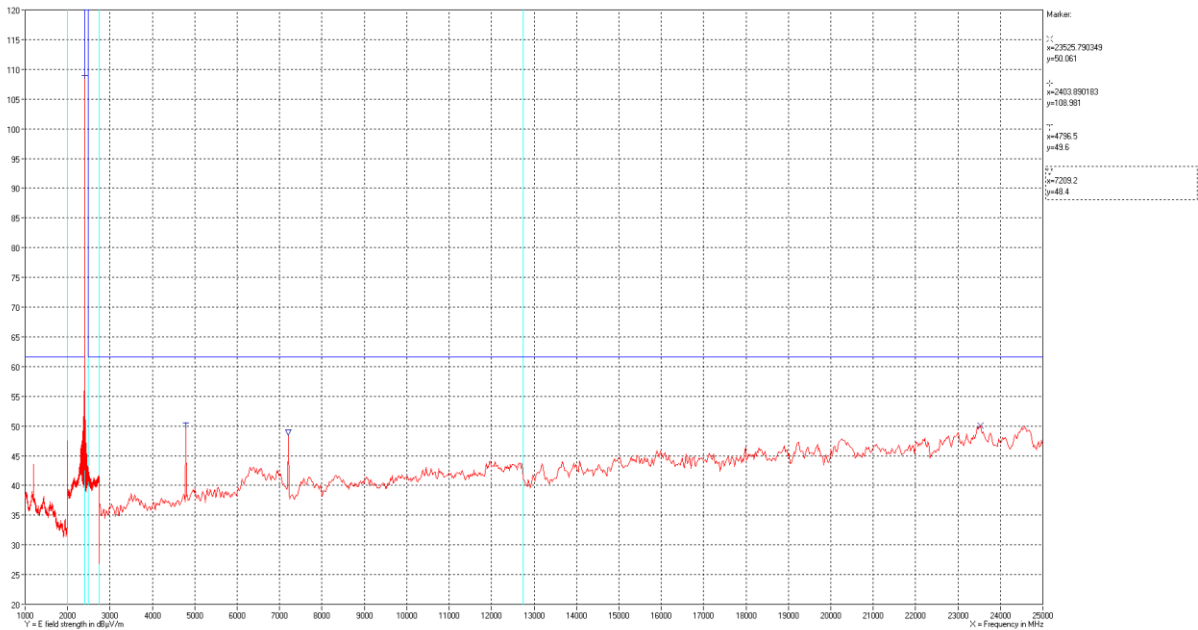


Photo 4.4.3 Test setup regarding measurement of radiated emission.



Test object	SM-1	Sheet	RE_Spur-10
Type	SM-1	Project no.	A507420-3
Serial no.	77	Date	16 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	ANSI C63.4:2003	Temperature	20°C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	57 % 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



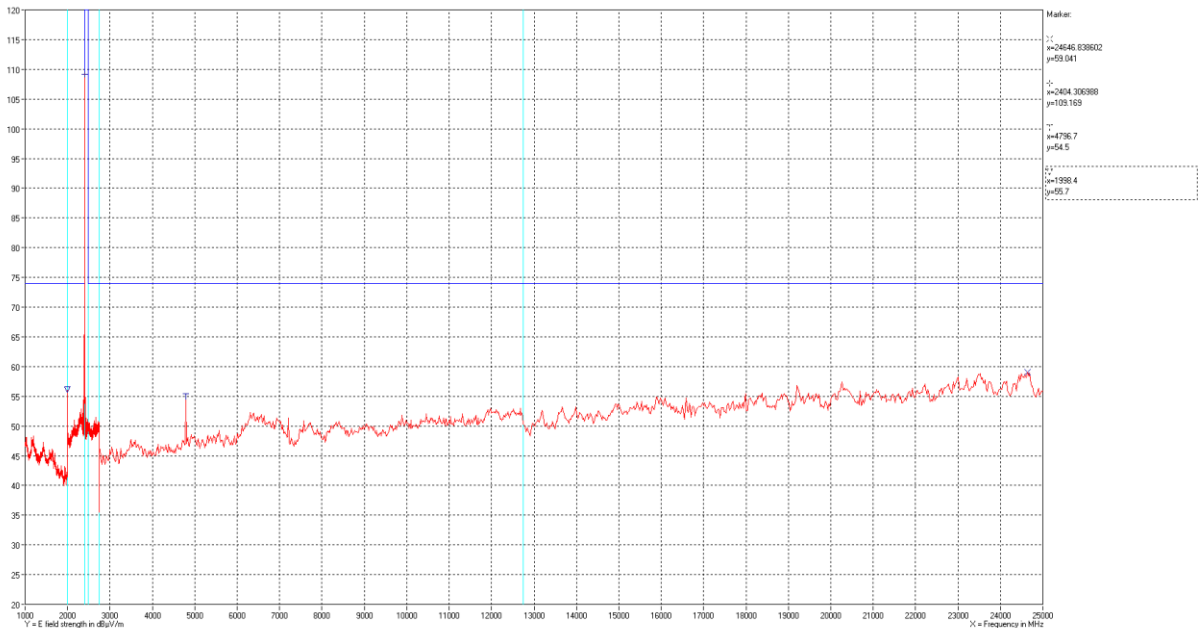
Polarization

Vertical and horizontal average measurements

Comments

Continuous Tx - normal modulation - hopping off

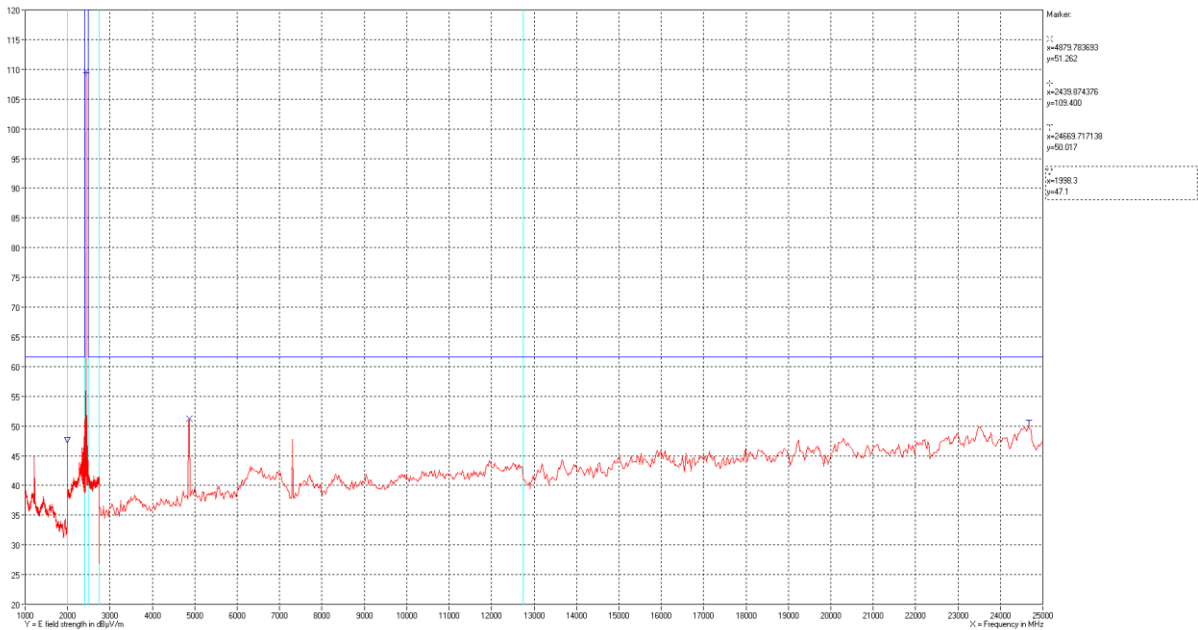




Polarization	Vertical and horizontal peak measurements
Comments	Continuous Tx - normal modulation - hopping off
Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test frequency	2404 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation



Test object	SM-1	Sheet	RE_Spur-11
Type	SM-1	Project no.	A507420-3
Serial no.	77	Date	15 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	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	45 % 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



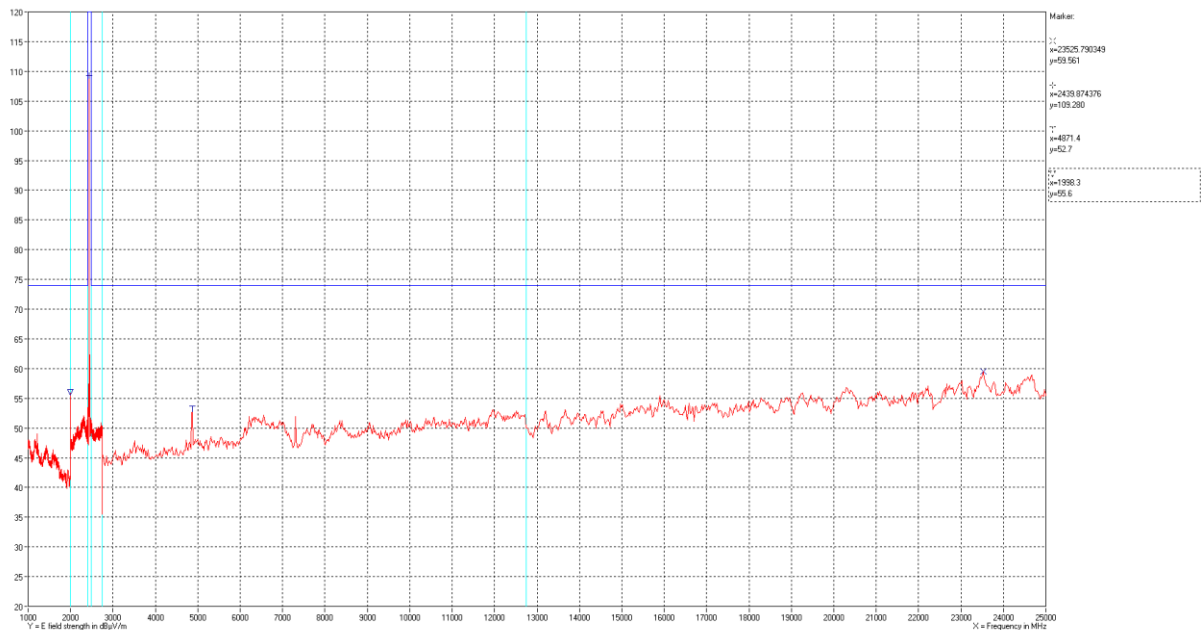
Polarization

Vertical and horizontal average measurements

Comments

Continuous Tx - normal modulation - hopping off



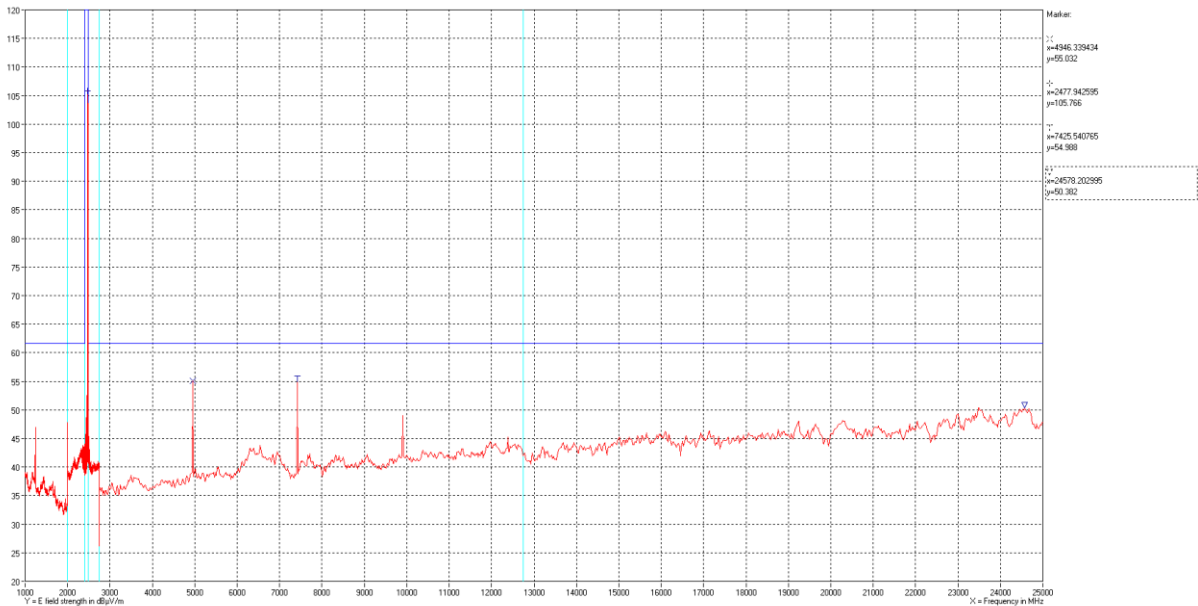


Polarization	Vertical and horizontal peak measurements
Comments	Continuous Tx - normal modulation - hopping off
Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test frequency	2440 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation



Test object	SM-1	Sheet	RE_Spur-12
Type	SM-1	Project no.	A507420-3
Serial no.	77	Date	04 July 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–25GHz

Test method	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	67 % 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



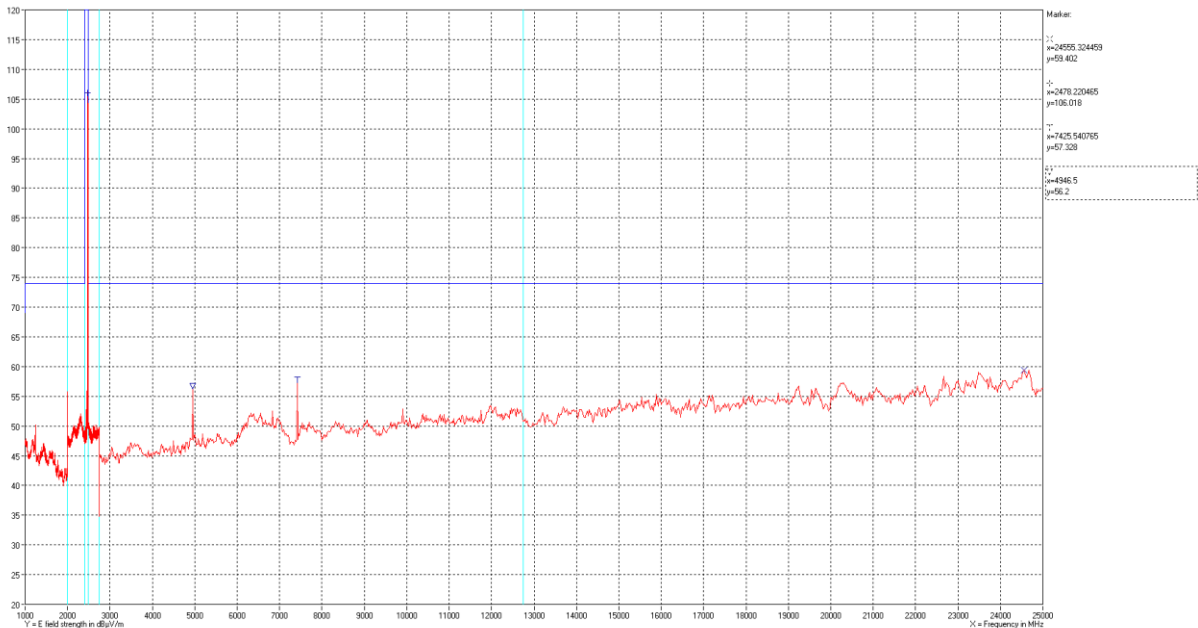
Polarization

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	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



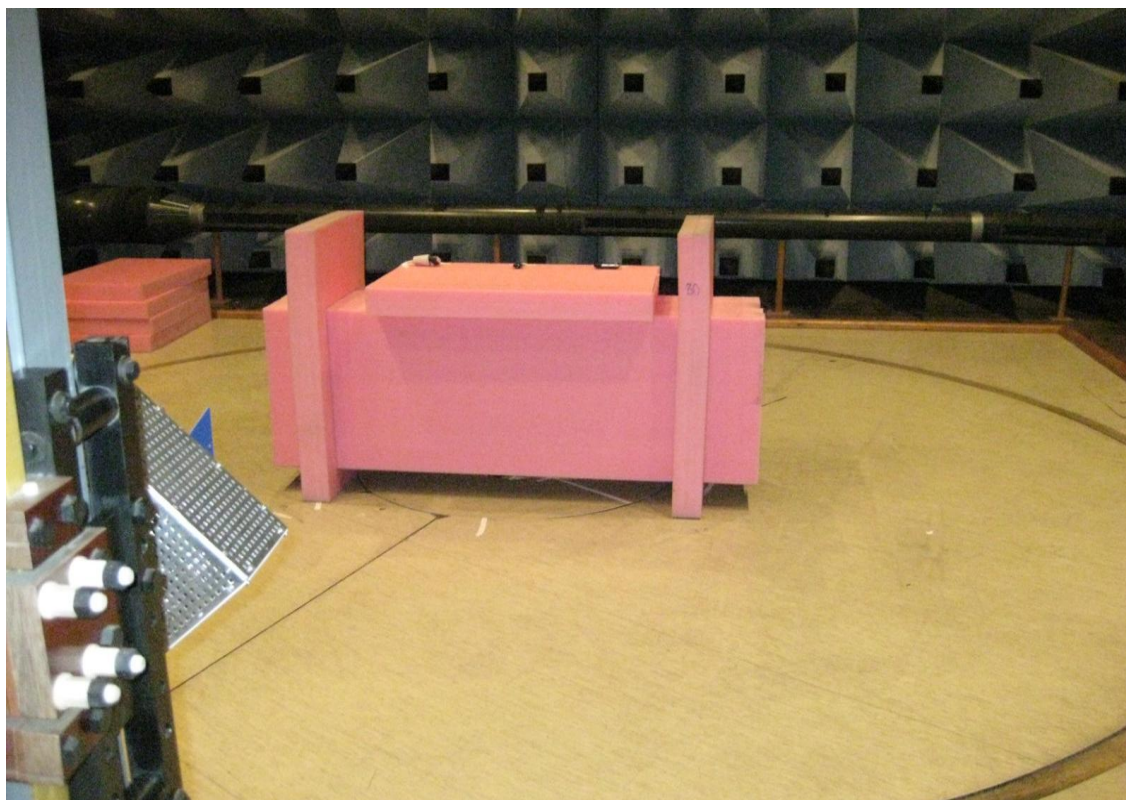


Photo 4.4.4 Test setup regarding measurement of radiated emission.



Photo 4.4.5 Test setup regarding measurement of radiated emission.



4.5 Measurement of 20 dB bandwidth

Test object	SM-1	Sheet	PROF-1
Type	SM-1	Project no.	A507420-3
Serial no.	69	Date	26 May 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.247(a)(1) IC RSS-210 A8.1		

Test method	DA 00-705 Released March 30, 2000				
Characteristics	Temperature: 23°C. Test voltage: External power supply				
Test equipm.	49321 49183 49299			Uncertainty 10 kHz	
SA Settings	RBW: 100 KHz VBW: 300 KHz SPAN: 4 MHz DET:Peak CF:2404 MHz, 2440 MHz, 2478 MHz Trace:Max Hold				
Test results					
Operation frequency	Measured Low frequency	Measured High frequency	Measured 20 dB bandwidth	Limit	Comment
2402 MHz	2402.947	2405.066	2.119 MHz	> 25 kHz	Passed
2440 MHz	2438.951	2441.072	2.121 MHz	> 25 kHz	Passed
2478 MHz	2476.958	2479.070	2.112 MHz	> 25 kHz	Passed
Note 1: System receiver input bandwidth: The manufacturer declares that the input bandwidth matches the bandwidth of the transmitter and system receiver hopping capability also matches the transmitter hopping.					

Band edge criteria 20 dB bandwidth

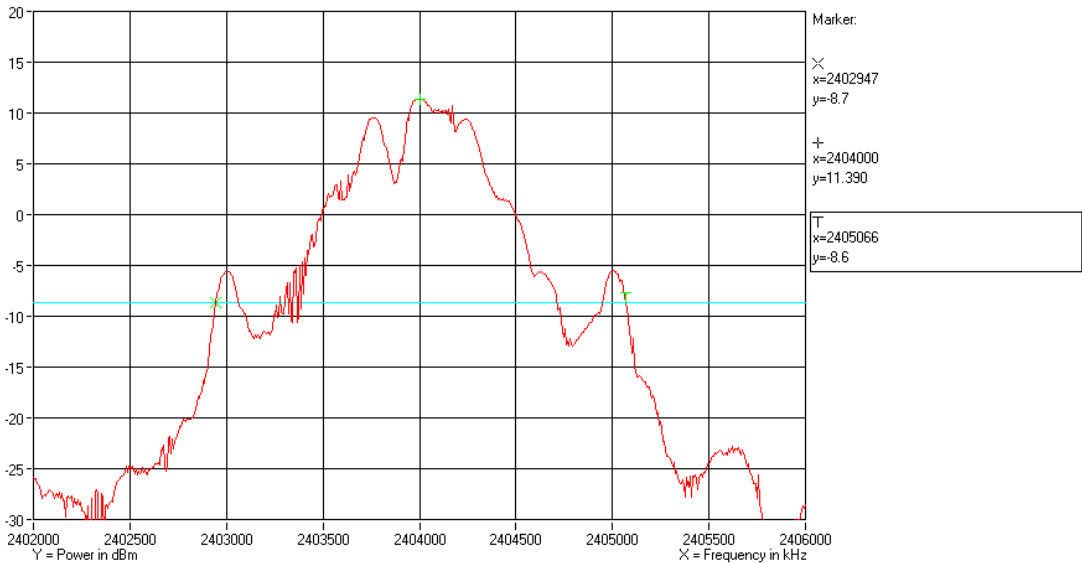
Test Port Conducted

Test mode Continuous Tx - normal modulation - hopping on

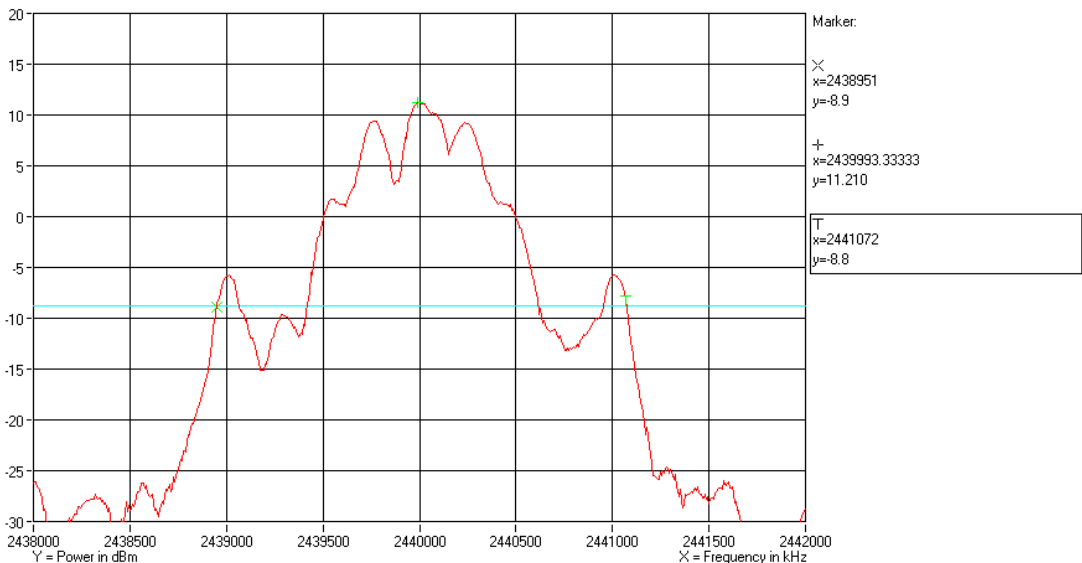
Compliant Yes

Comments The measured 20 dB bandwidth was within limit designated in 15.247(a)(1)



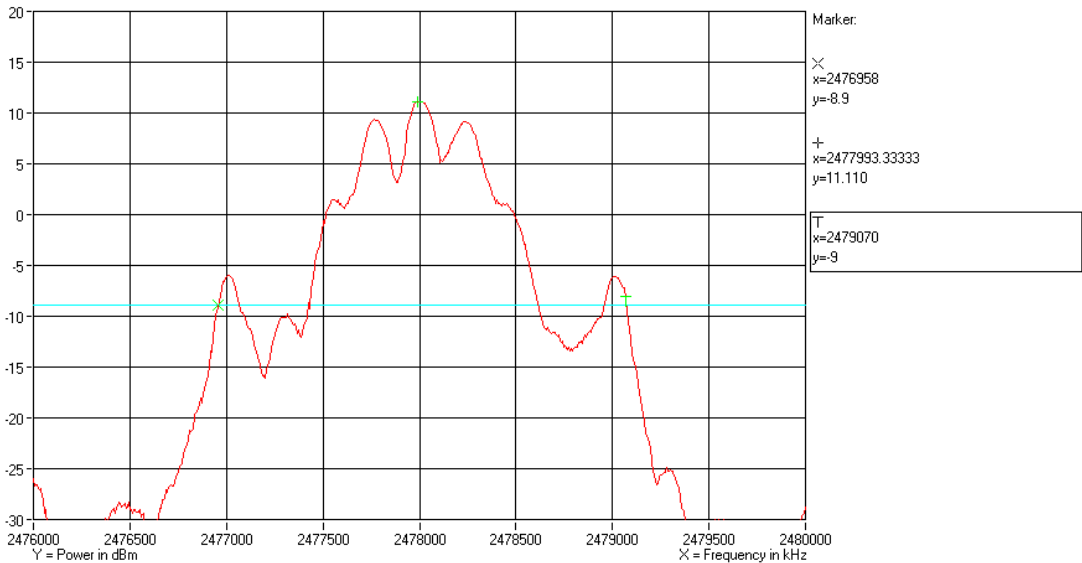


Comments 2404 MHz



Comments 2440 MHz





Comments 2478 MHz





Photo 4.5.1 Test setup regarding measurement of occupied bandwidth, IC.



Photo 4.5.2 Test setup regarding measurement of occupied bandwidth, IC.



4.6 Measurement of number of hopping channels

Test object	SM-1	Sheet	PROF-1
Type	SM-1	Project no.	A507420-3
Serial no.	69	Date	7 July 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.247(a)(1) IC RSS-210 A8.1		

Test method	DA 00-705 Released March 30, 2000		
Characteristics	Temperature: 23 °C. Test voltage: External power supply		
Test equipm.	49550		
SA Settings	RBW: 500 KHz VBW: 2 MHz SPAN: 41 & 42.5 MHz DET: Peak CF: 2420.5 MHz, 2462.25 MHz Trace: Max Hold		
Test results			
Number of channels	Limit	Comment	
16	> 15	Passed	

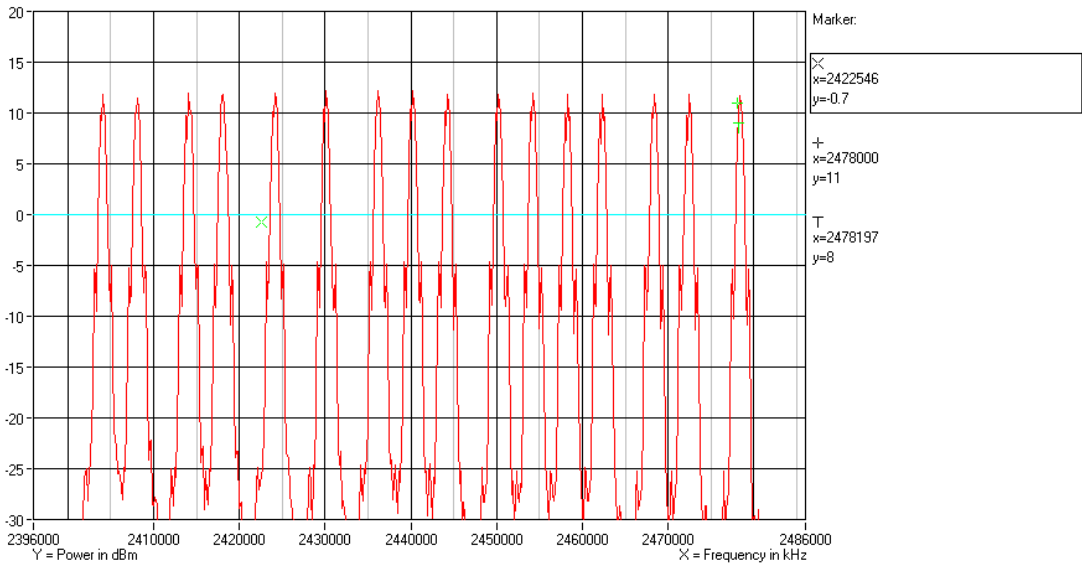
Test Port Conducted

Test mode Continuous Tx - normal modulation - hopping between all operating frequencies

Compliant Yes

Comments None





Comment

Plot of all hopping channels



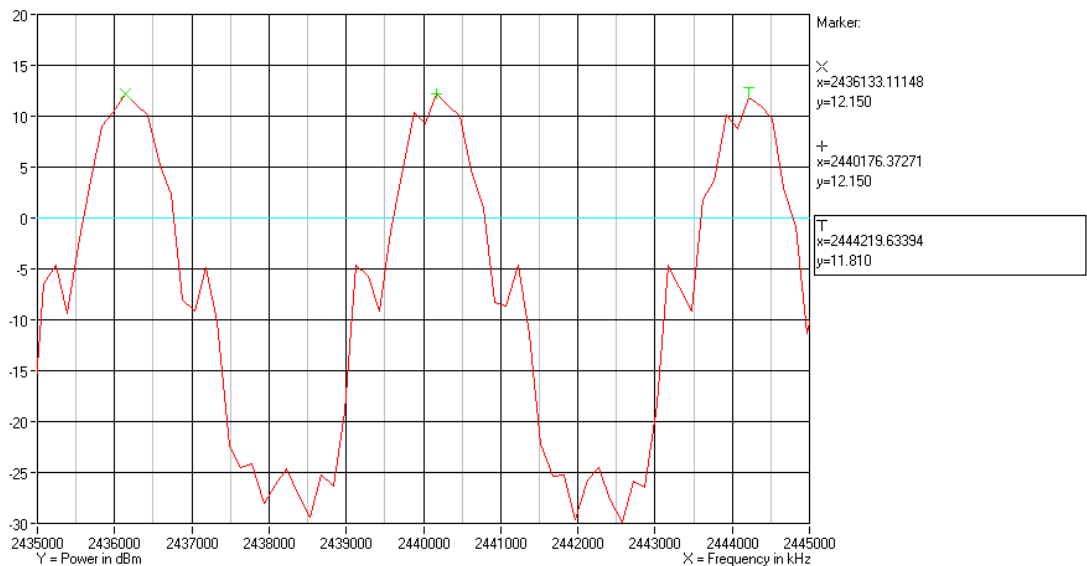


Photo 4.6.1 Test setup regarding measurement of number of hopping channels.

4.7 Measurement of carrier frequency separation

Test object	SM-1	Sheet	PROF-1
Type	SM-1	Project no.	A507420-3
Serial no.	69	Date	7 July 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.247(a)(1) & (2) IC RSS-210 A8.1		

Test method	DA 00-705 Released March 30, 2000		
Characteristics	Temperature: 23 °C. Test voltage: External power supply		
Test equipm.	49550		
SA Settings	RBW: 100 KHz VBW: 300 kHz SPAN: 10 MHz DET: Peak CF: 2440 MHz Trace: Max Hold		
Test results			
Frequency 1	Frequency 2	Measured channel Separation	Comment
2440.176	2436.133	4.043	None
2444.219	2440.176	4.043	None
MHz	MHz	MHz	
Note 1:			



Test Port	Conducted
Test mode	Continuous Tx - normal modulation - hopping between all operating frequencies
Limit	The measured channel separation shall be greater than two thirds of the 20 dB bandwidth Worst case (from section 4.xx): $2 * 2.121 \text{ MHz} / 3 = 1414 \text{ kHz}$
Compliant	Yes
Comments	None



Photo 4.7.1 Test setup regarding measurement of carrier frequency separation.

4.8 Measurement of time of occupancy (Dwell Time)

Test object	SM-1	Sheet	PROF-1
Type	SM-1	Project no.	A507420-3
Serial no.	69	Date	7 July 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.247(a)(1)(iii) IC RSS-210 A8.1		

Test method	DA 00-705 Released March 30, 2000					
Characteristics	Temperature: 23°C. Test voltage: External power supply					
Test equipm.	49550				Uncertainty: < 10 μs	
SA Settings	RBW: 1000 KHz VBW: 3000 KHz SPAN: Zero DET: Peak CF: 2440 MHz Trace: Max Hold					
Test results						
Frequency		Measurement period	Measured Tx on-time	Time of occupancy	Limit	Comments
2441 MHz		6.4 sec	1.90 μs	11.97 ms	400 ms	Passed
Note 1: 63 events						

Test Port	Conducted
Test mode	Continuous Tx - normal modulation - hopping between all operating frequencies
Limit	The time of occupancy shall be below 400 ms over the measurement period
Compliant	Yes
Comments	Measurement period = 0.4 sec * 16 channels Measured: Tx on-time per transmission Time of occupancy = No of events * Measured Tx on-time



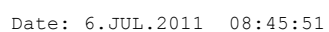




Photo 4.8.1 Test setup regarding measurement of time of occupancy (Dwell Time).

4.9 Measurement of peak output power, conducted

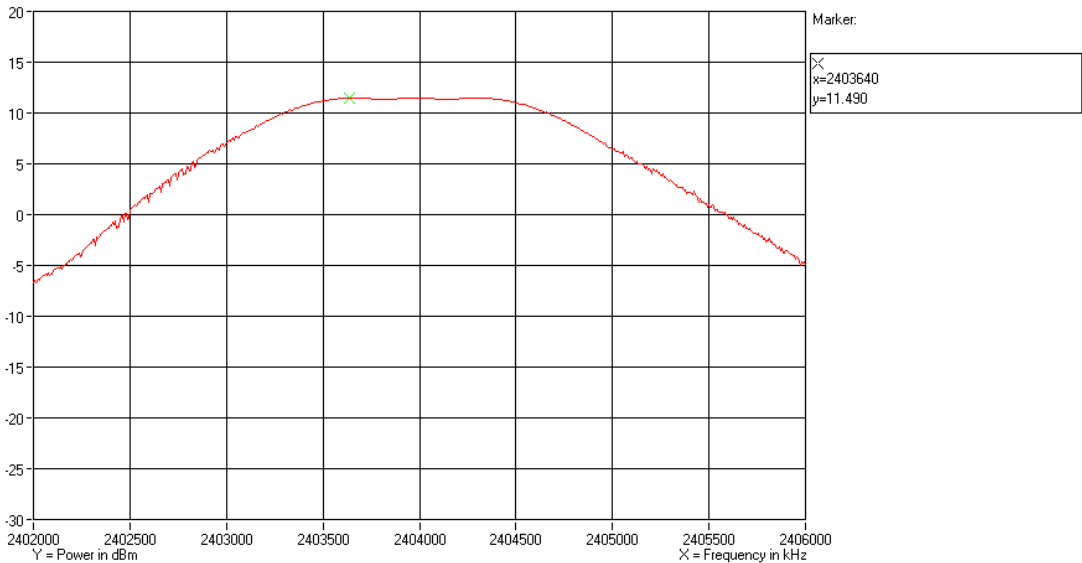
Test object	SM-1	Sheet	RE_Spur-13
Type	SM-1	Project no.	A507420-3
Serial no.	69	Date	26 May 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.247(b)(1) IC RSS-210 A8.4		

Test method	DA 00-705 Released March 30, 2000		
Characteristics	Temperature: 23°C. Test voltage: External power supply		
Test equipm.	Climatic chamber 49184 49550 49299		Uncertainty: 1.1 dB
SA Settings	RBW: 1 MHz VBW: 3 MHz SPAN:4 MHz DET:Peak CF:Operating freq. Trace:Max hold		

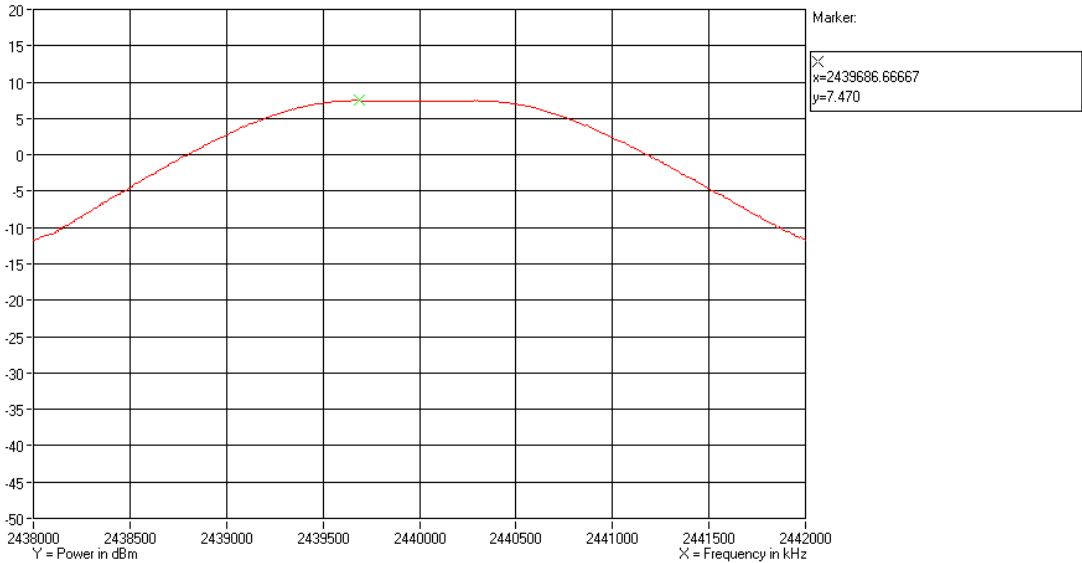
Operating frequency	Measurement			Limit	Comment
2404	11.49			< +20.97	Passed
2440	7.47			< +20.97	Passed
2478	11.30			< +20.97	Passed
MHz	dBm			dBm	
Note:					

Test result	The measured field strengths are below the limit
Test Port	Conducted - SMA connector
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.



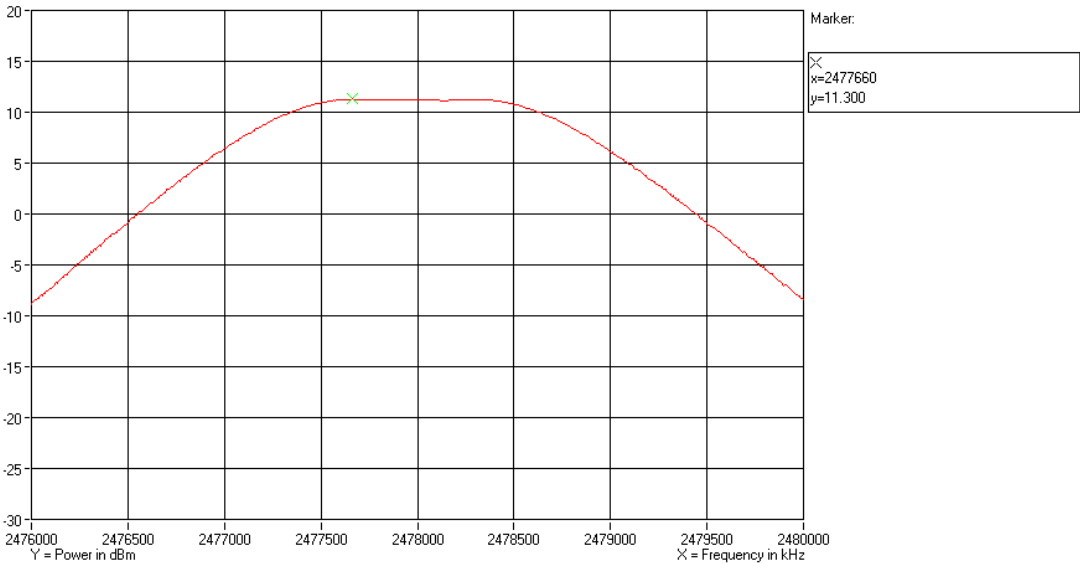


Comments 2404 MHz



Comments 2440 MHz





Comments 2478 MHz

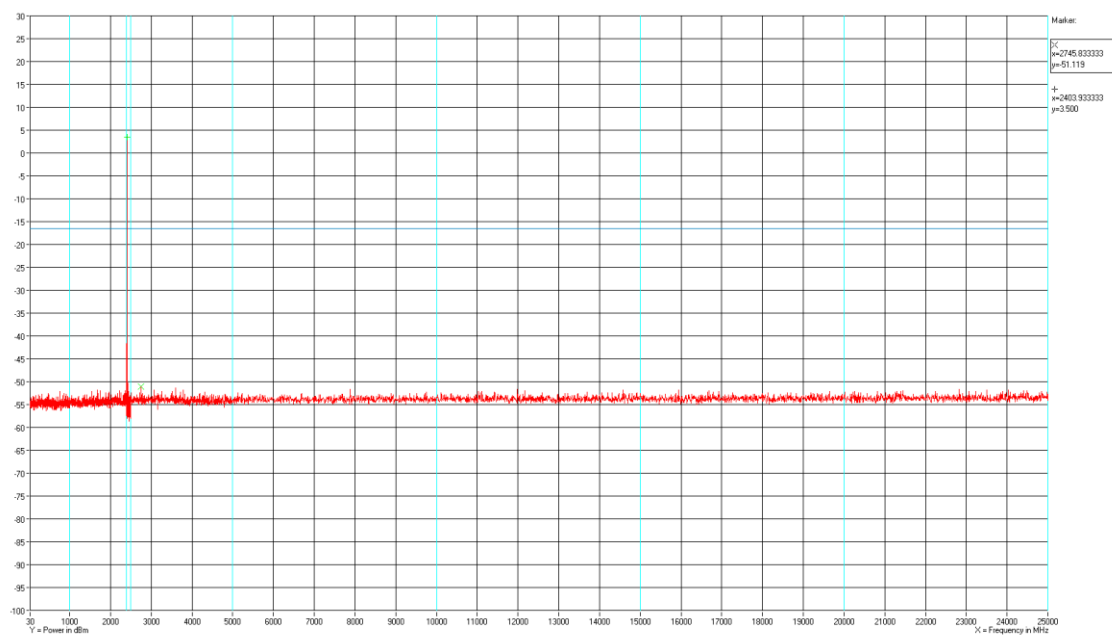




Photo 4.9.1 Test setup regarding measurement of peak output power, conducted.

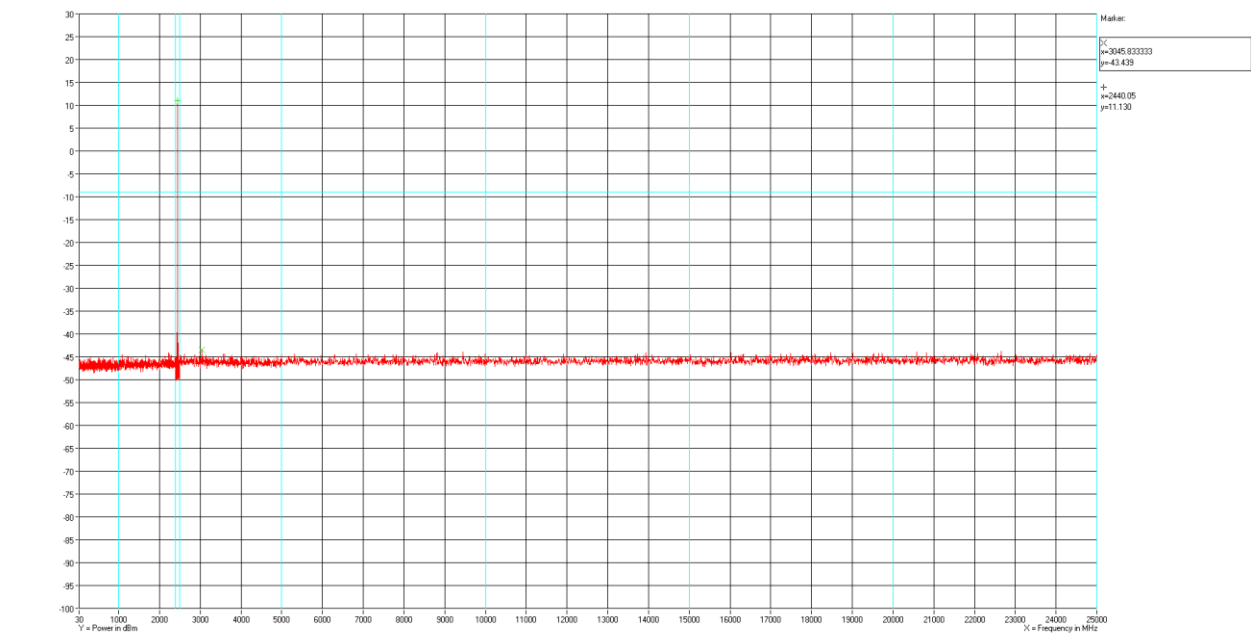
4.10 Measurement of spurious RF conducted emissions

Test object	SM-1	Sheet	RE Loop-3
Type	SM-1	Project no.	A507420-3
Serial no.	69	Date	26 May 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C IC Standard RSS-210, Issue 8:2010 – A8.5	Frequency	30-25000 MHz
Test method	ANSI C63.4:2003	Temperature	21 °C
Characteristics	Scan, Loop Antenna at 10 m, 1 m Height, Horizontal.	Humidity	45 % RH
Detector	Peak	Bandwidth	1000 kHz
Test equipm.	EMI room Hørsholm 29332 29503 49600 29494	Uncertainty	4 dB

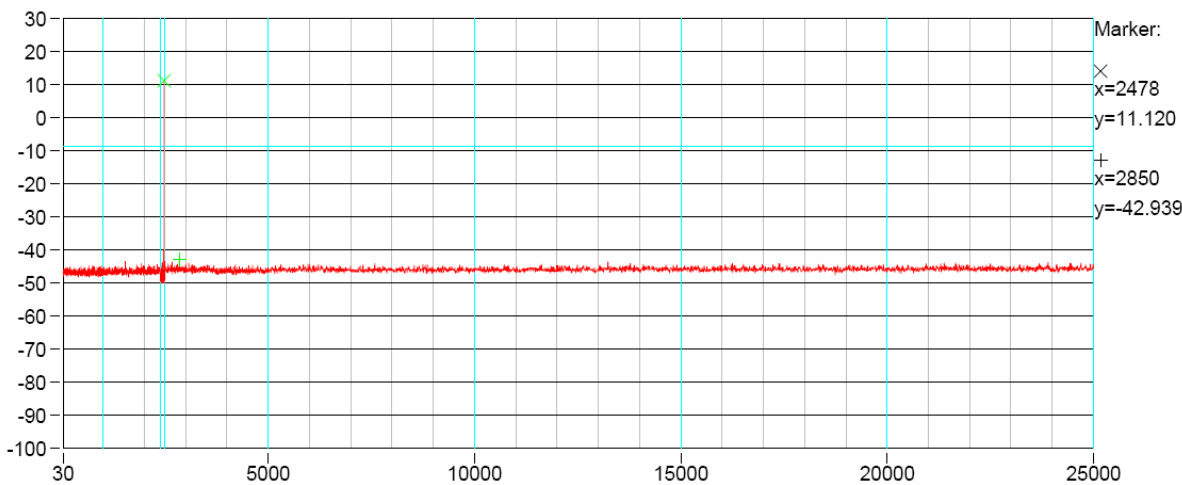


Comments

2404 MHz



Comments 2440 MHz



Comments 2478 MHz



Test result	The measured power levels are below the limit
Test Port	Enclosure
Test frequency	2404 MHz
Test mode	Continuous Tx - normal modulation - hopping off
Condition	Normal
Compliant	Yes
Comments	None



Photo 4.10.1 Test setup regarding measurement of spurious RF conducted emissions

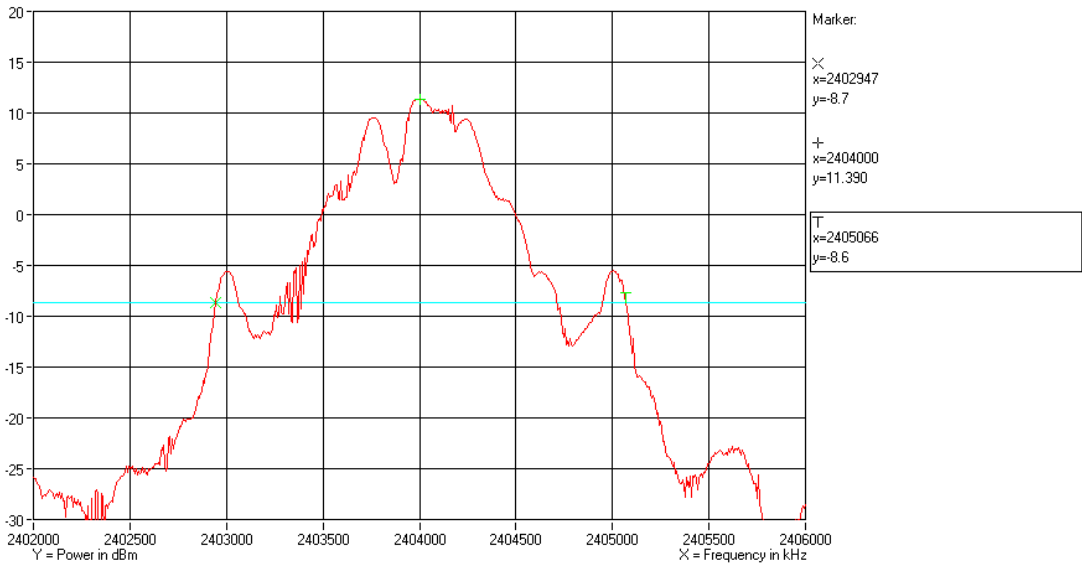
4.11 Measurement of band edge compliance of RF conducted emissions

Test object	SM-1	Sheet	PROF-1
Type	SM-1	Project no.	A507420-3
Serial no.	69	Date	26 May 2011
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Section 15.247(d) IC RSS-210 A8.4		

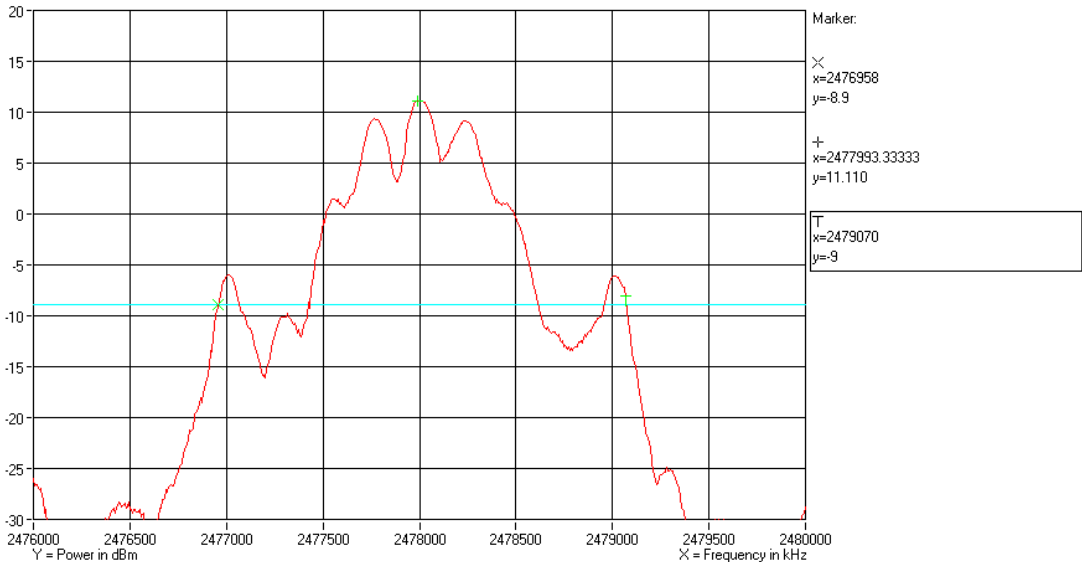
Test method	DA 00-705 Released March 30, 2000				
Characteristics	Temperature: 23 °C. Test voltage: External power supply				
Test equipm.	49321 49183 49299			Uncertainty: 10 kHz	
SA Settings	RBW: 100 KHz VBW: 300 KHz SPAN: 4 MHz DET:Peak CF:2404 MHz, 2478 MHz Trace:Max Hold				
Test results					
Operation frequency	Measured Low frequency	Measured High frequency		Limit	Comment
2402 MHz	2402.947	-		2400	Passed
2478 MHz	-	2479.070		2483.5	Passed
				MHz	
Note 1: System receiver input bandwidth: The manufacturer declares that the input bandwidth matches the bandwidth of the transmitter and system receiver hopping capability also matches the transmitter hopping.					

Band edge criteria	Band edge at 20 dBc
Test Port	Conducted
Test mode	Continuous Tx - normal modulation - hopping on
Compliant	Yes
Comments	The measured band edge was within limit designated in 15.247(d)





Comments 2404 MHz



Comments 2478 MHz





Photo 4.11.1 Test setup regarding measurement of band edge compliance of RF conducted emissions



Photo 4.11.2 Test setup regarding measurement of band edge compliance of RF conducted emissions



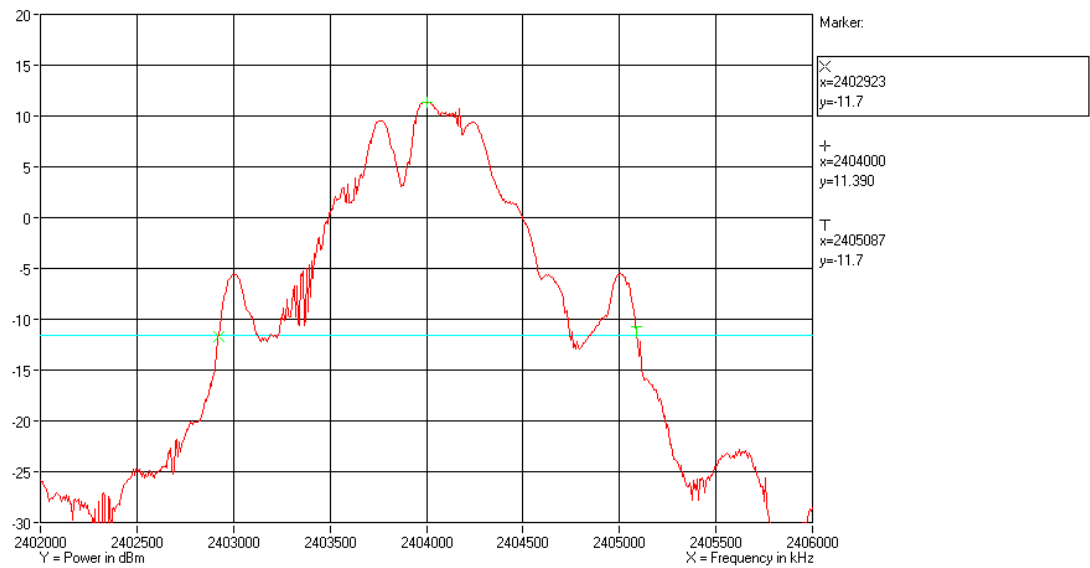
4.12 Measurement of occupied bandwidth, IC

Test object	SM-1	Sheet	PROF-3
Type	SM-1	Project no.	A507420-3
Serial no.	69	Date	26 May 2011
Client	GN Hearing A/S	Initials	CMT
Specification	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1		

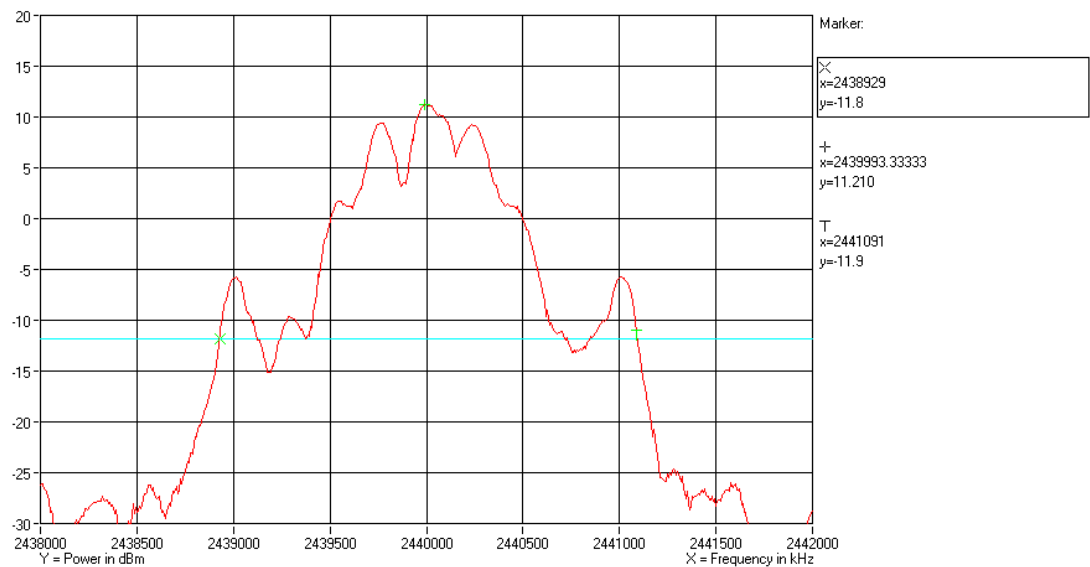
Test method	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1		
Characteristics	Temperature: 22 °C. Test voltage: External power supply at 1.3 VDC		
Test equipm.	Climatic chamber 49184 49550 49299		Uncertainty: 10 kHz
SA Settings	RBW:30kHz VBW:100kHz SPAN:4MHz DET:Peak CF:Operating freq. Trace:Max hold		
Operating frequency	Low frequency	High frequency	Measured 99% emission bandwidth
2404	2402.923	2405.087	2.164
2440	2438.939	2441.091	2.152
2478	2476.934	2479.091	2.157
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



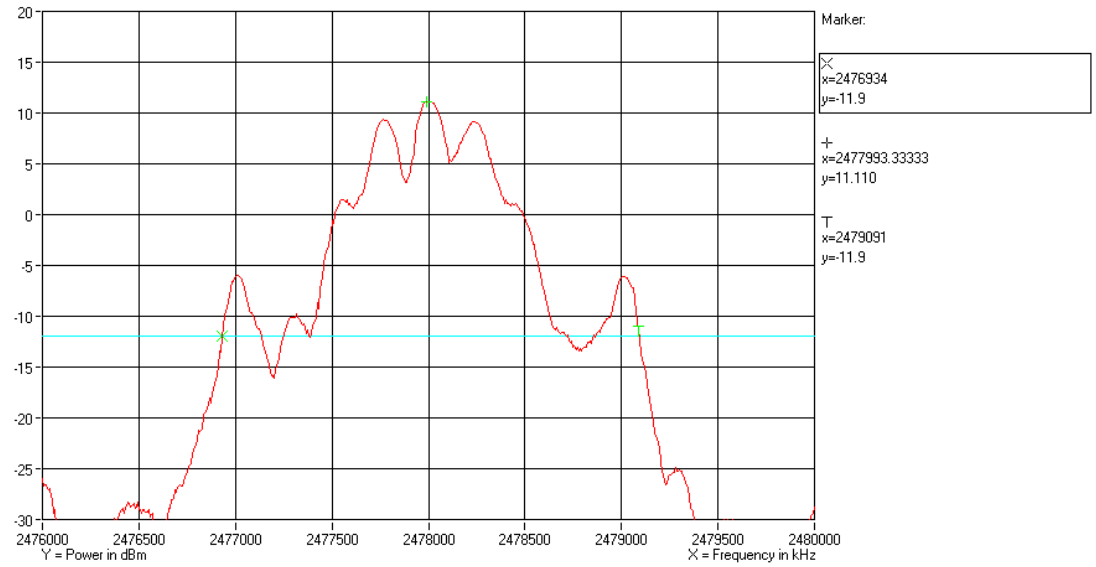


Comments 2404 MHz



Comments 2440 MHz





Comments

2478 MHz





Photo 4.12.1 Test setup regarding measurement of occupied bandwidth, IC.

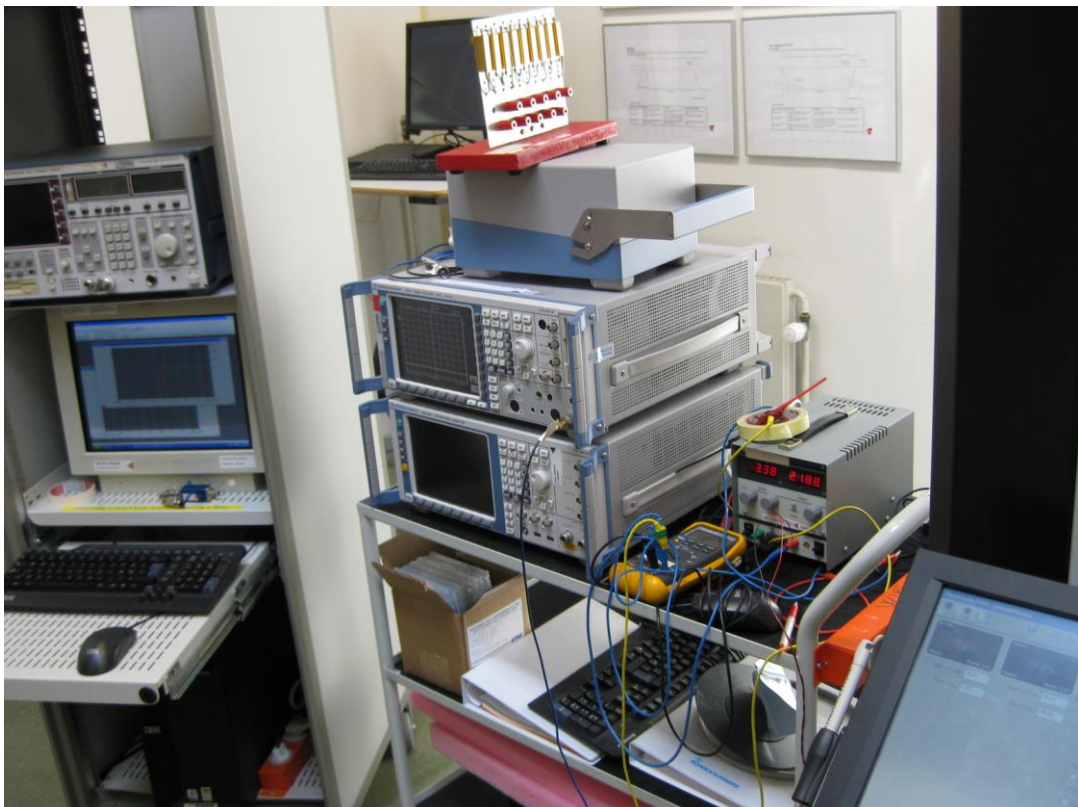
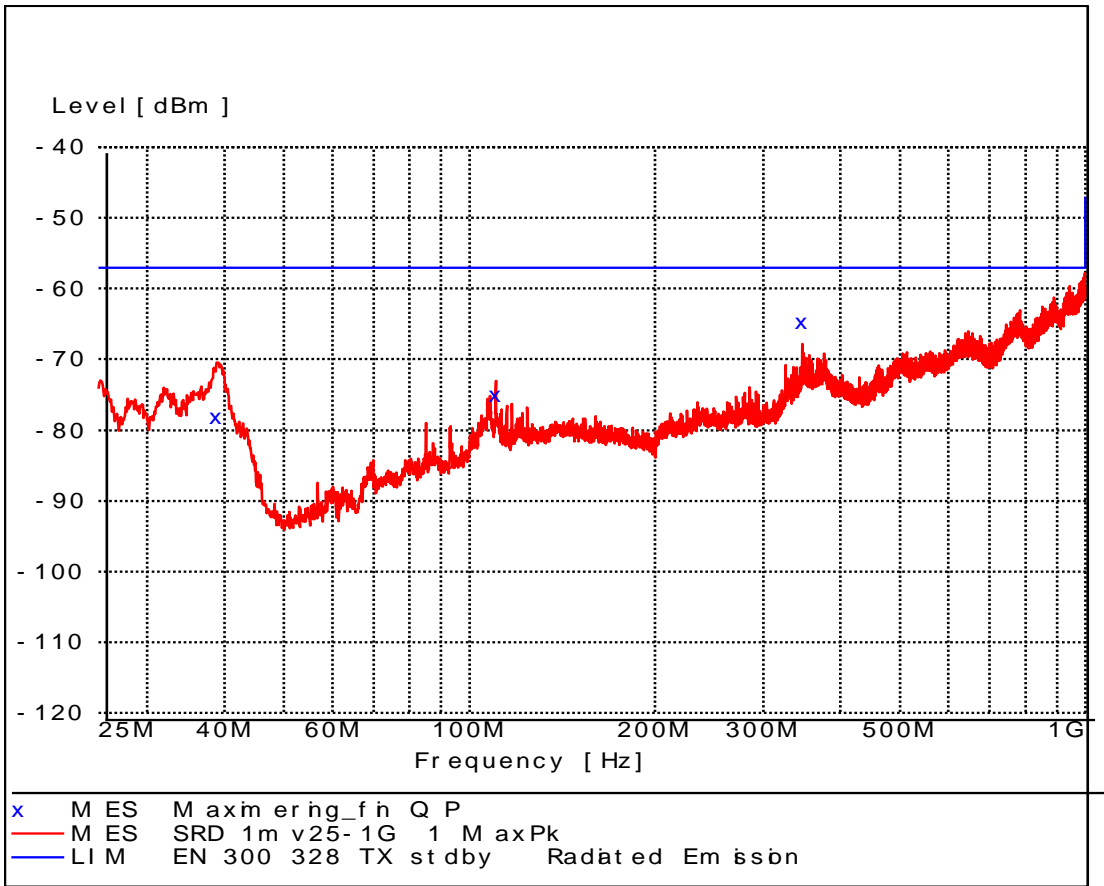


Photo 4.12.2 Test setup regarding measurement of occupied bandwidth, IC.

4.13 Measurement of radiated emission, receiver, IC

Test object	SM-1	Sheet	RE_Spur-14
Type	SM-1	Project no.	A507420-3
Serial no.	77	Date	1 June 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	45% RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299 29499	Uncertainty	4.9 dB



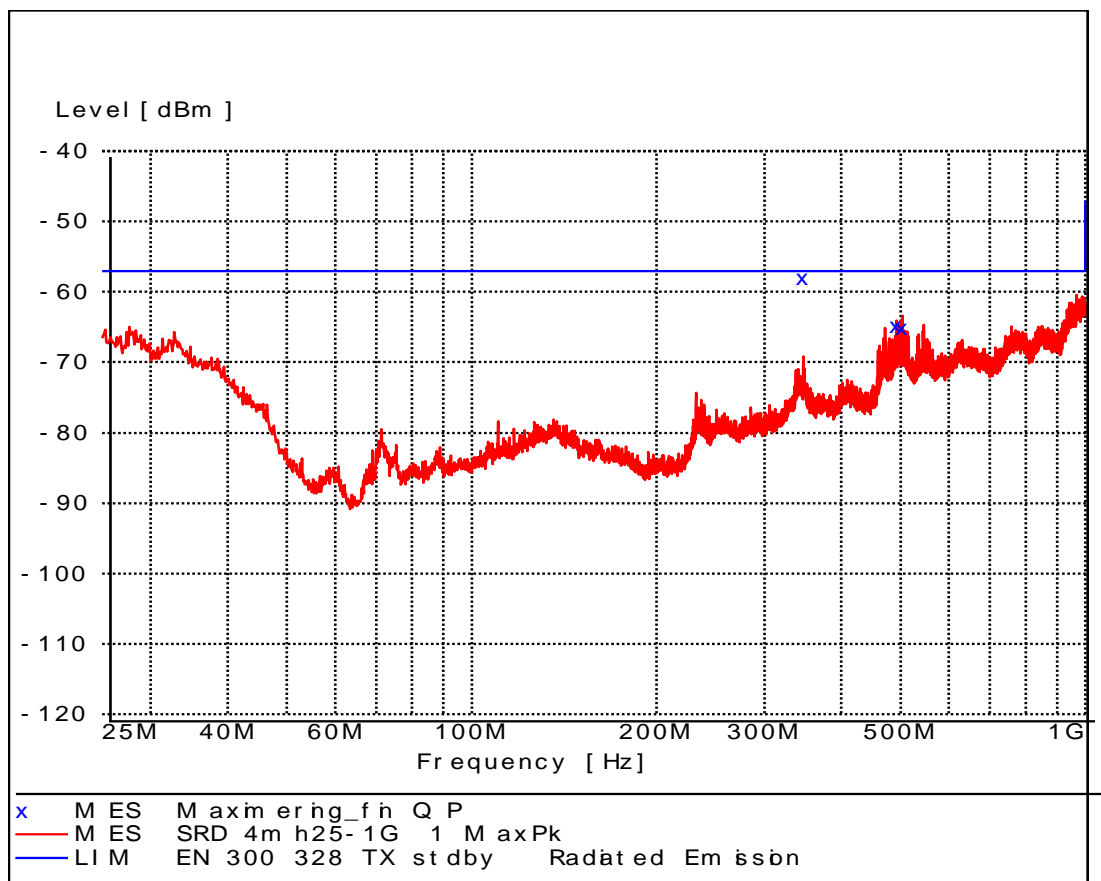
Comments

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



Test object	Combination of 2.1.2: SM-1 2.1.3: SM-1	Sheet	RE_Spur-15
Type	See section 2	Project no.	A507420-3
Serial no.	See section 2	Date	1 June 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, 4 m height, hor. pol.	Humidity	45 % 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: SM-1 2.1.3: SM-1	Sheet	RE_Spur-16
Type	See section 2	Project no.	A507420-3
Serial no.	See section 2	Date	1 June 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	45 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797 29861 49183 49299	Uncertainty	4.9 dB

MEASUREMENT RESULT: "Maximering_fin QP"

Frequency MHz	Level dBm	Transd dB	Limit dBm	Margin dB	Height cm	Azimuth deg	Polarisation
38.900000	-78.20	-96.6	-57.0	21.2	118.0	224.00	ver
110.360000	-75.10	-96.3	-57.0	18.1	101.0	86.00	ver
347.140000	-64.70	-90.0	-57.0	7.7	398.0	1.00	ver
347.000000	-58.00	-90.6	-57.0	1.0	132.0	210.00	hor
491.750000	-64.80	-87.8	-57.0	7.8	129.0	1.00	hor
503.210000	-65.10	-87.3	-57.0	8.1	101.0	357.00	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 azi- muth, 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



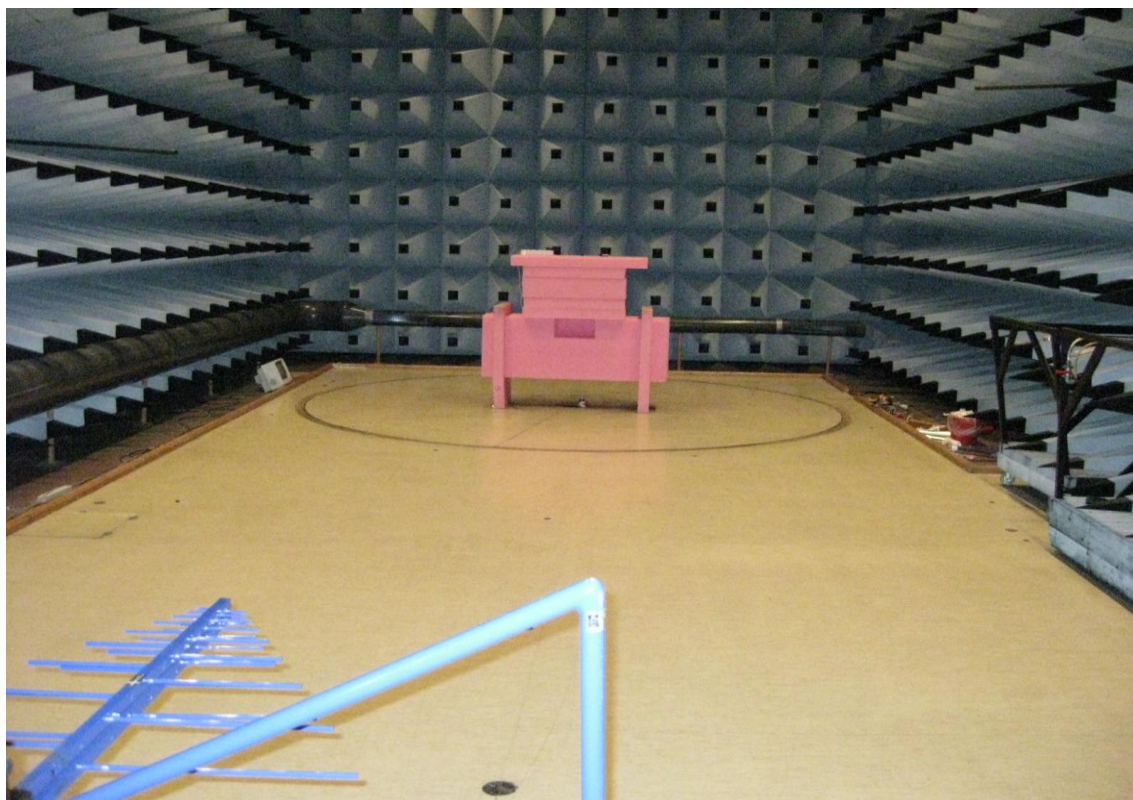


Photo 4.13.1 Test setup regarding measurement of radiated emission, Rx, IC.

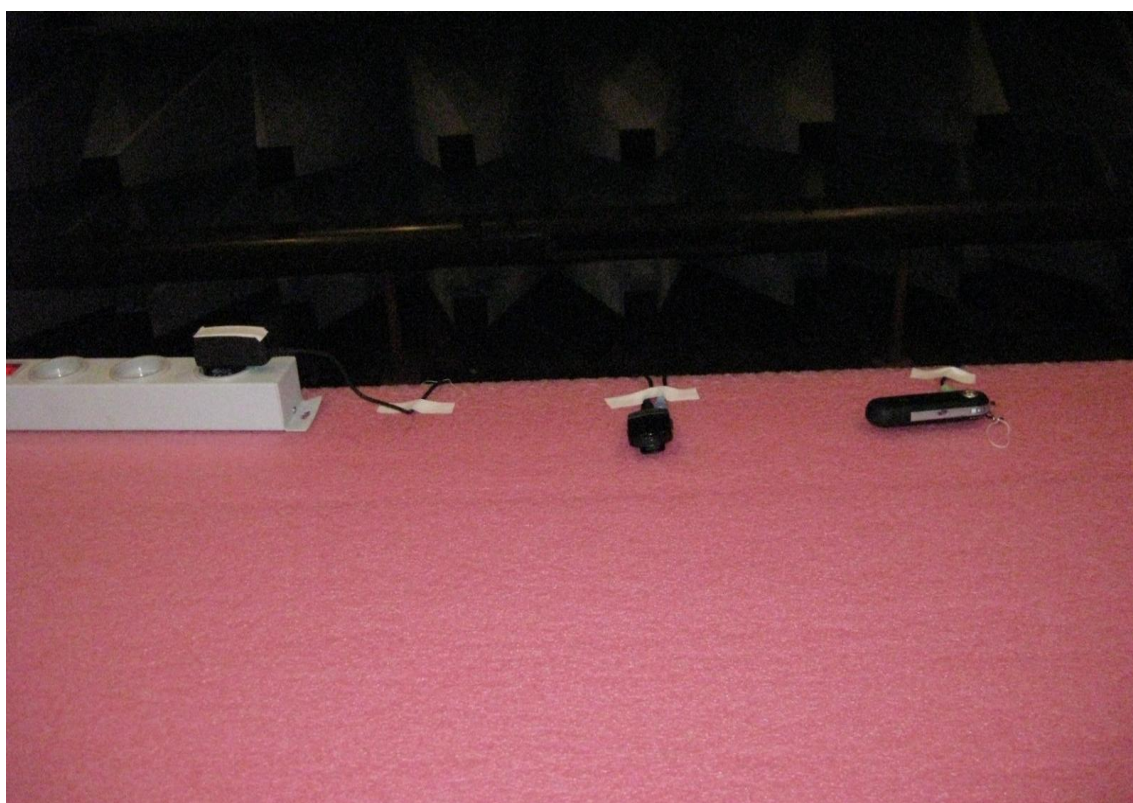
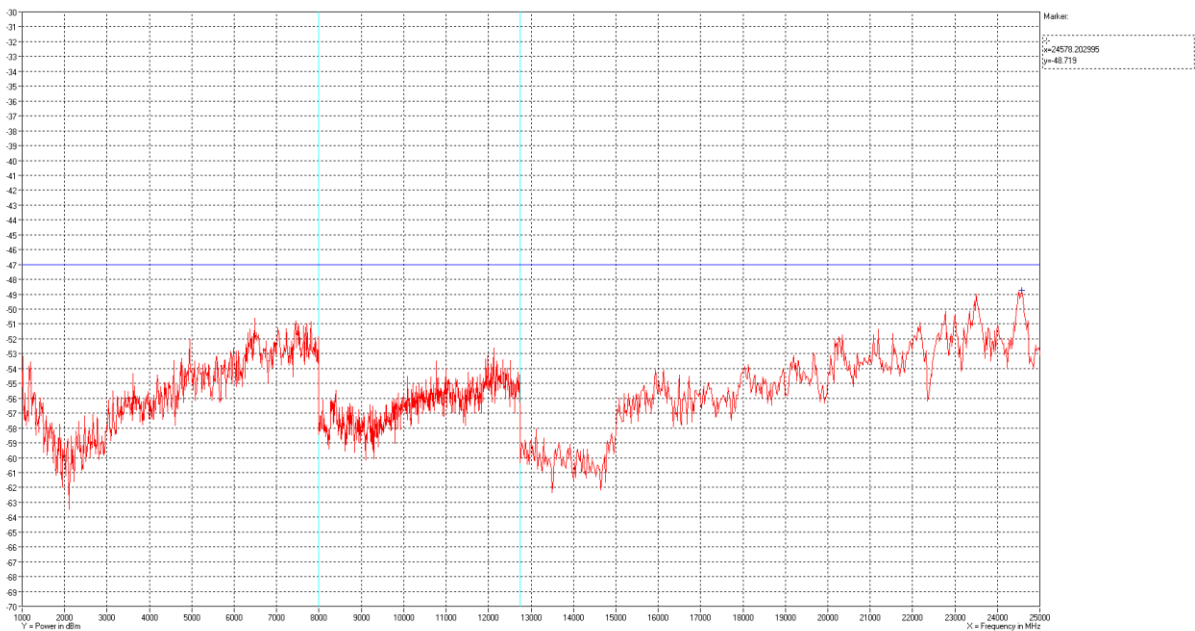


Photo 4.13.2 Test setup regarding measurement of RX radiated emission, Rx, IC.



Test object	Combination of 2.1.2: SM-1 2.1.3: SM-1	Sheet	RE_Spur-17
Type	See section 2	Project no.	A507420-3
Serial no.	See section 2	Date	15 June 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	23 °C
Characteristics	Complete search, Antenna distance 3 m.	Humidity	40 % 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



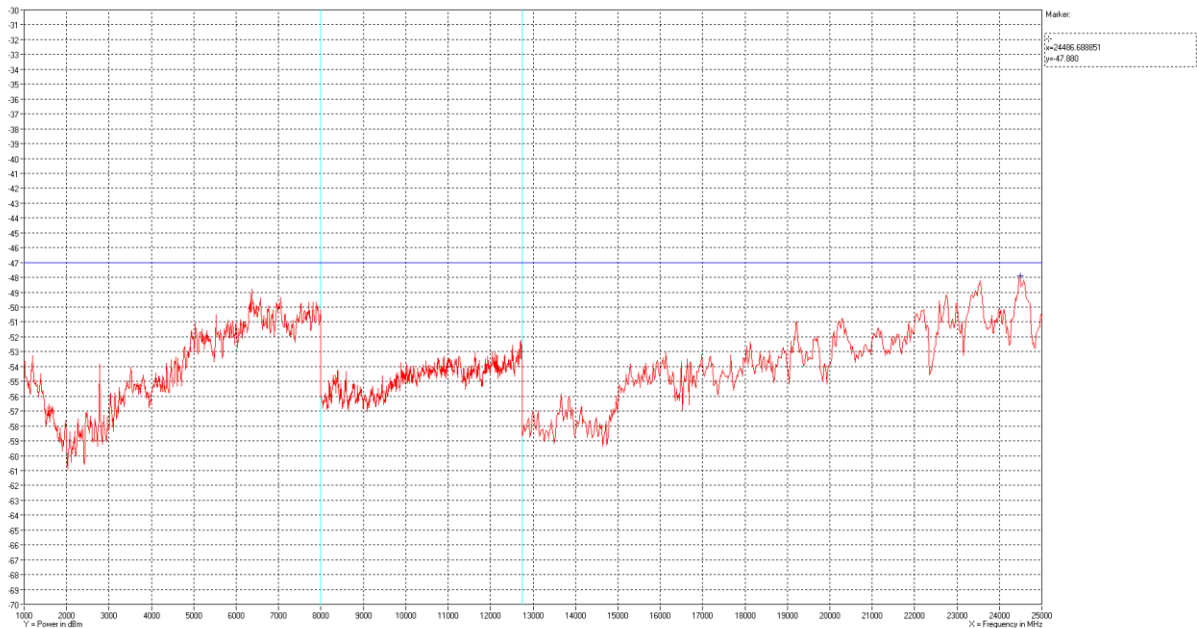
Polarization

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



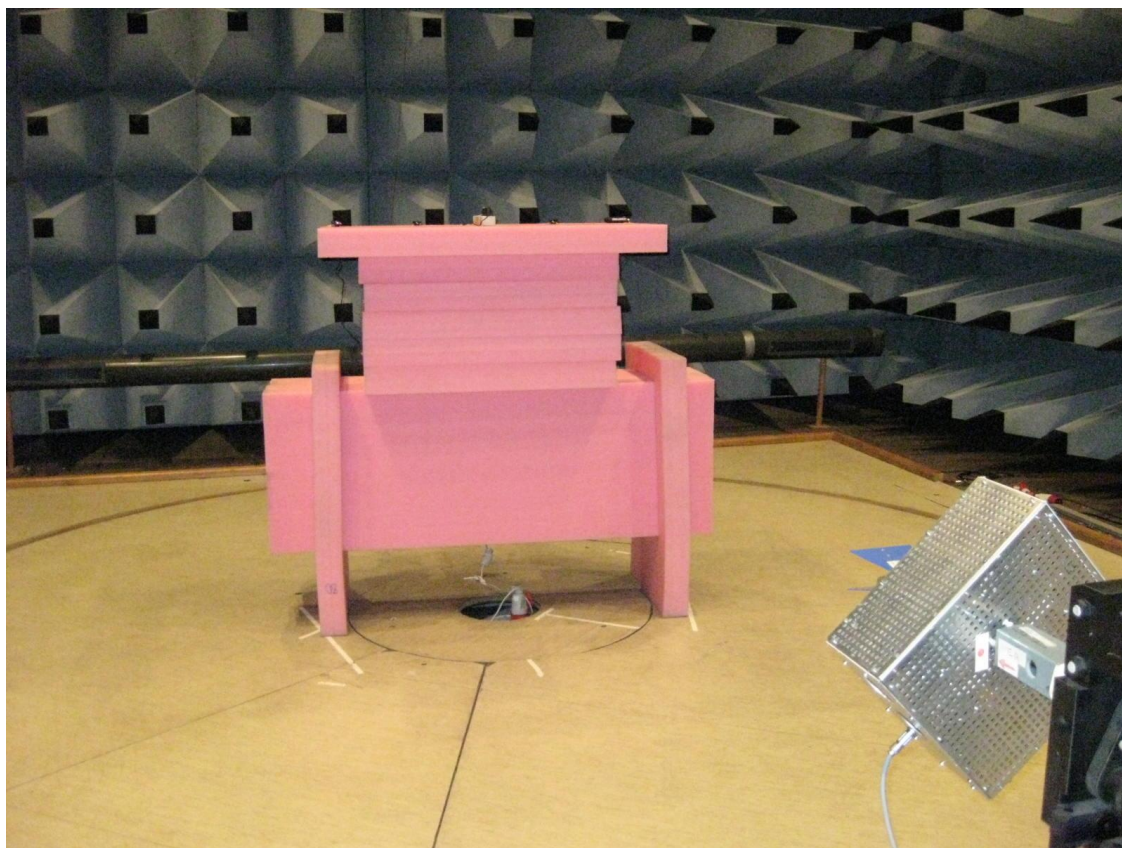


Photo 4.13.3 Test setup regarding measurement of radiated emission, Rx, IC.

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 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: 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

