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DELTA Test Report

TEST Reg. no. 19

Radio parameter test of SY312e according to FCC and IC requirements

Performed for GN Hearing A/S

DANAK-19/12290
Project no.: T202419-15
Page 1 of 44
including 1 Annex

30 July 2012

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Title	Radio parameter test of SY312e according to FCC and IC requirements
Test object	SY312e
Report no.	DANAK-19/12290
Project no.	T202419-15
Test period	15 May - 24 July 2012
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 Peter Wolf Frandsen
Test site(s)	DELTA, Venlighedsvej 4, 2970 Hørsholm, Denmark

Date 30 July 2012

Project Manager

Peter Wolf Frandsen
Specialist, EMC
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Responsible

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DELTA

Table of contents

1. Summary of tests

Tests	Test methods	Rule Section	Results
Antenna requirement	Visual inspection	15.203 RSS-Gen, 7.1.2	Passed
Measurement of radiated emission	ANSI C63.10:2009	15.209 RSS-210, 2.5 & A2.9	Passed
Measurement of 20 dB bandwidth	ANSI C63.10:2009	15.215(c)	Passed
Measurement of band edge compliance	ANSI C63.10:2009	15.209(a) & 15.249(d)(e) RSS-210, 2.5 & A2.9	Passed
Measurement of field strength of fundamental	ANSI C63.10:2009	15.249(a) RSS-210, 2.5 & A2.9	Passed
Measurement of occupied bandwidth	ANSI C63.10:2009	RSS-Gen, 4.6.1	Passed
Measurement of radiated emission, receiver	EN 300 440-1 V1.6.1:2010	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 standards 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 and auxiliary equipment

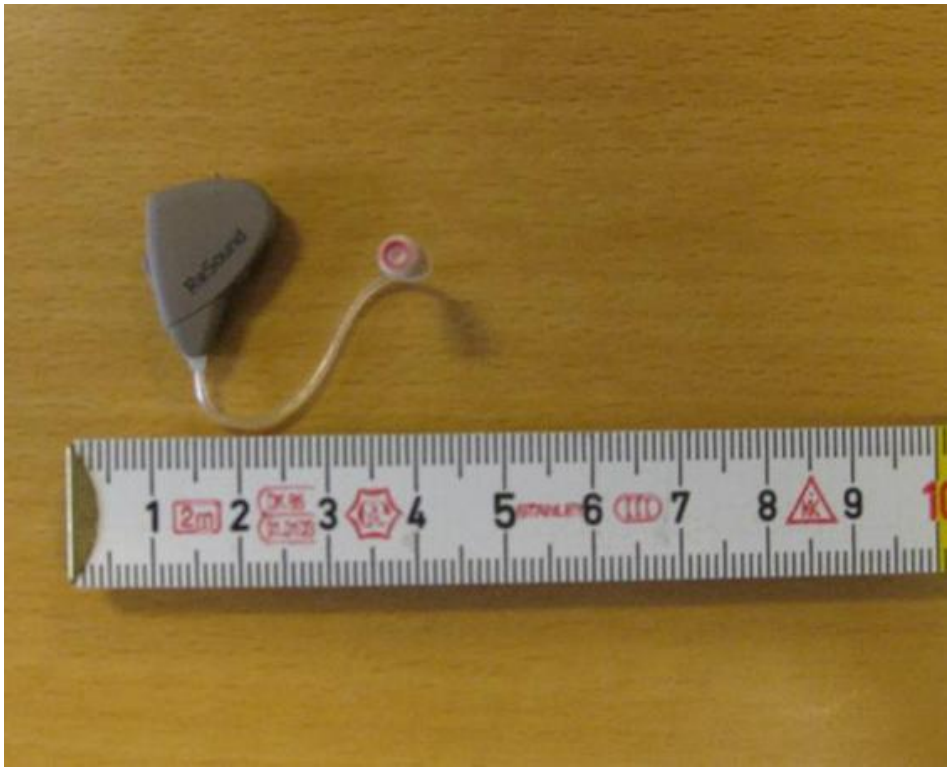


Photo 2.1.1 Test object.

2.1 Test objects

Test object 2.1.1

Name of test object	SY312e
Model / type	SY312e
Part no.	SY312e
Serial no.	V0961-DRW 12 00806005
FCC ID	X26SY312e
IC ID	6941C-SY312e
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 / 4.5 ms
Comment	Supplied by external power supply or battery. Wire antennas with a unique antenna connector Antenna NP left model 16470500.

Test object 2.1.2

Name of test object	SY312e
Model / type	SY312e
Part no.	SY312e
Serial no.	V0961-DRW 12 00806090
FCC ID	X26SY312e
IC ID	6941C-SY312e
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 / 4.5 ms
Comment	Supplied by external power supply or battery. Wire antennas with a unique antenna connector. Antenna NP left model 16470500.

Test object 2.1.3

Name of test object	SY312e
Model / type	SY312e
Part no.	SY312e
Serial no.	V0961-DRW 12 00806035
FCC ID	X26SY312e
IC ID	6941C-SY312e
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 / 4.5 ms
Comment	Supplied by external power supply or battery. External antenna connector.

Test object 2.1.4

Name of test object	SY312e
Model / type	SY312e
Part no.	SY312e
Serial no.	V0961-DRW 12 00806011
FCC ID	X26SY312e
IC ID	6941C-SY312e
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	1.5 ms
Comment	Supplied by external power supply or battery. Wire antennas with a unique antenna connector. Antenna NP left model 17002900, antenna with maximum gain.

3. General test conditions

3.1 Test setup during test

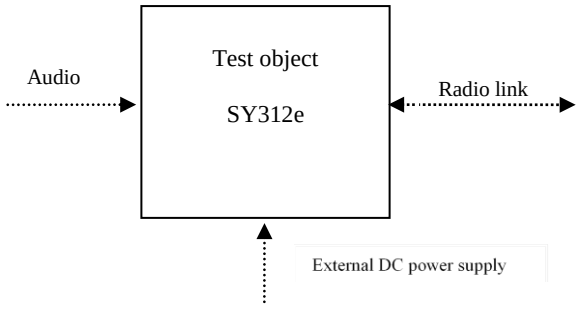


Figure 3.1.1 Block diagram of test object with external cables.

3.1.1 Description and intended use of test object

SY312e is a hearing aid used for alleviation of hearing loss. It can receive audio signals and be configured via the radio link.

3.1.2 Test modes during tests

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 during normal use.

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 radiated emission
5. Measurement of band edge compliance
6. Inspection of antenna requirement
7. Measurement of field strength of fundamental
8. Peak average correction factor (PACF).

3.3 Radio specifications, receiver and transmitter

Test object	SY312e	Sheet	Radio-1
Type	SY312e	Project no.	T202419-15
Serial no.	All, see Section 2.1	Date	24 July 2012
Client	GN Hearing A/S	Initials	PWF
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	:	Wire antennas with a unique antenna connector
Maximum gain	:	2.36 dBi (Antenna no.: 17002900)
Transmit power, max peak	:	1.97 dBm EIRP
Field Strength, max peak	:	97.2 dBµV/m (72 mV/m) @ 3 meter
Power level	:	No
No of channels	:	20
Bandwidth	:	
Occupied bandwidths (99%)	:	4.276 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 VDC Zinc Air battery
Specified min voltage	:	1.19 VDC
Specified max voltage	:	1.4 VDC
Temperature category	:	-20 to +55 ºC.
Emission Designator	:	3M43F7E
Max. TX spurious emission, average	:	205 (µV/m) @ 3 meter (Field Strength)
Max. RX spurious emission, peak	:	163 (µV/m) @ 3 meter (Field Strength)

4. Test results

4.1 Antenna requirement

Test object	SY312e	Sheet	ANT-2
Type	SY312e	Project no.	T202419-15
Serial no.	All, see Section 2.1	Date	14 June 2012
Client	GN Hearing A/S	Initials	PWF
Specification	FCC CFR 47 Part 15, Subpart C, Specific rule part 15.249 IC Standard RSS-Gen, Issue 3:2010		

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 SY312e has a series of wire antenna with a unique type of connector designed by GN Hearing A/S. The test object meets criteria (b).

4.2 Peak average correction factor (PACF)

Test object	SY312e	Sheet	ANT-3
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806011	Date	24 July 2012
Client	GN Hearing A/S	Initials	PWF
Specification	FCC CFR 47 Part 15, Subpart C, Specific rule part 15.249 IC Standard RSS-Gen, Issue 3:2010		

Characteristics	Temperature: 24 °C. Test voltage: 1.3 VDC
Test equipm.	49550 49183 49299 Uncertainty: 1•10-7 sec.
SA Settings	RBW: 2 MHz VBW: 5 MHz SPAN: Zero-2ms DET: Peak CF: 2478 MHz Trace: Max Hold

The measured value for the duty cycle (DC):

Max. Tx on time: 192.30 µs – Delta 2 (T1)

Period: 1490.50 µs – Delta 3 (T1).

The calculated duty cycle is:

DC: ((Max. Tx) µs / (period) µs) • 100% = 12.9 %.

This corresponds to a Peak to Average Correction Factor of:

PACF:20 log (DC/100) = -17.79 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.

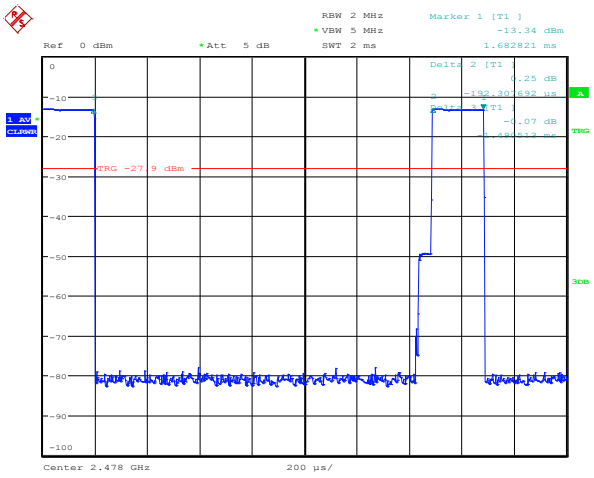
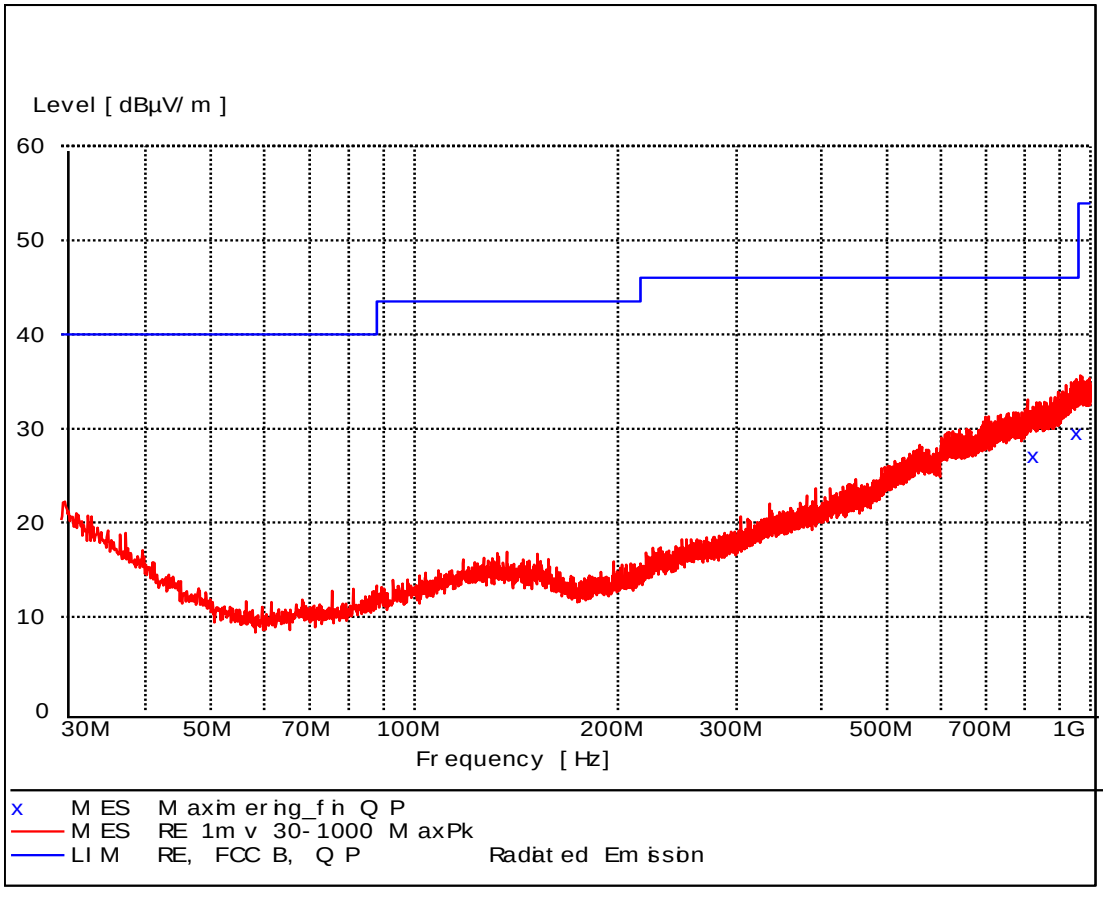


Photo 4.2.1 Peak measurement plot.

4.3 Measurement of radiated emission below 1 GHz

Test object	SY312e	Sheet	RE_Spur-1
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806005	Date	15 May 2012
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

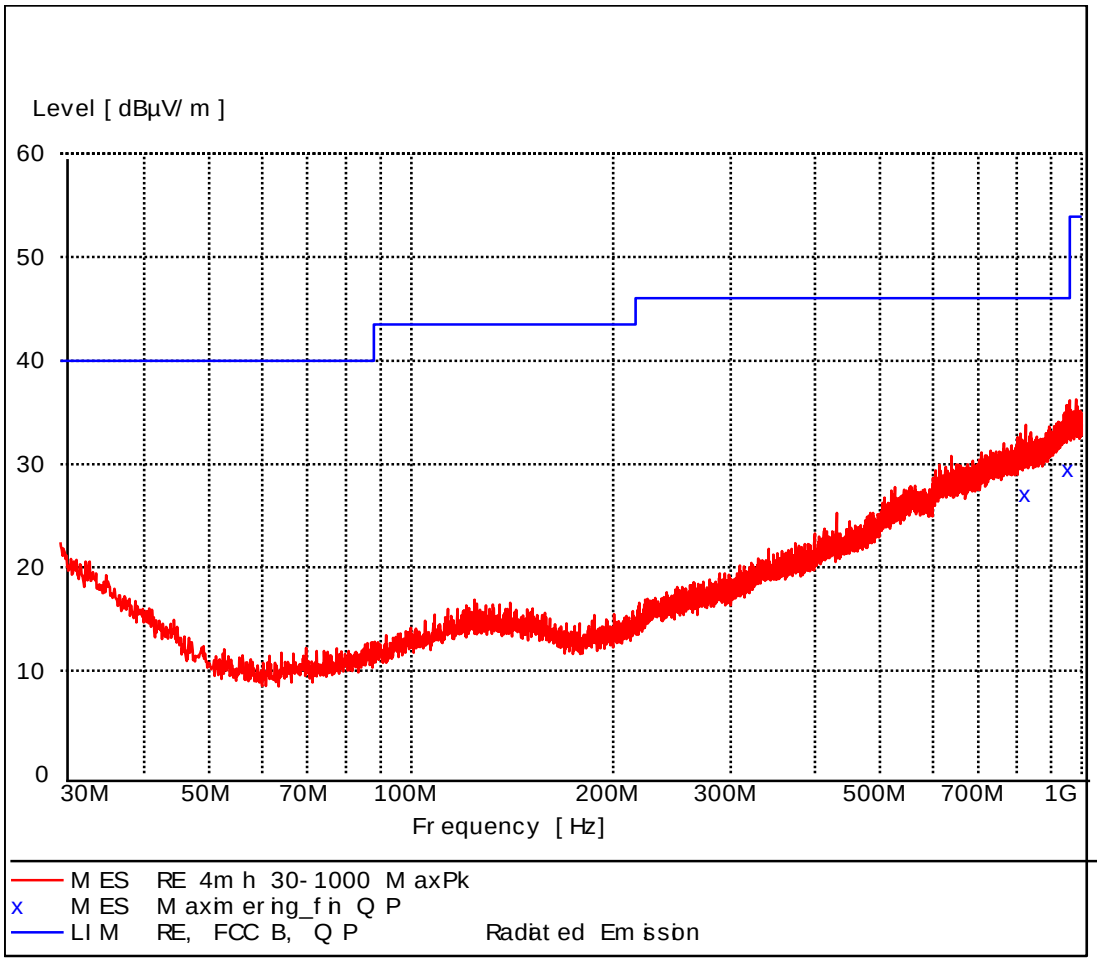
Test method Characteristics	ANSI C63.10:2009 Pre-scan, Antenna at 3 m, 1 m height, vert. pol.	Temperature Humidity	22 °C 38 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 29861 49600 29797	Uncertainty	4.9 dB



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

Test object	SY312e	Sheet	RE_Spur-2
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806005	Date	15 May 2012
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 C63.10:2009 Pre-scan, Antenna at 3 m, 4 m height, hor. pol.	Temperature Humidity	22 °C 38 % RH
Detector	Peak and quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 29861 49600 29797	Uncertainty	4.9 dB



Comments

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

Test object	SY312e	Sheet	RE_Spur-3
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806005	Date	15 May 2012
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 C63.10:2009 Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Temperature Humidity	22 °C 38 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 29861 49600 29797	Uncertainty	4.9 dB

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
825.200000	27.10	27.0	46.0	18.9	257.0	307.00	HORIZONTAL
955.000000	29.50	29.4	46.0	16.5	400.0	94.00	VERTICAL

Test result	The measured field strengths were 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.

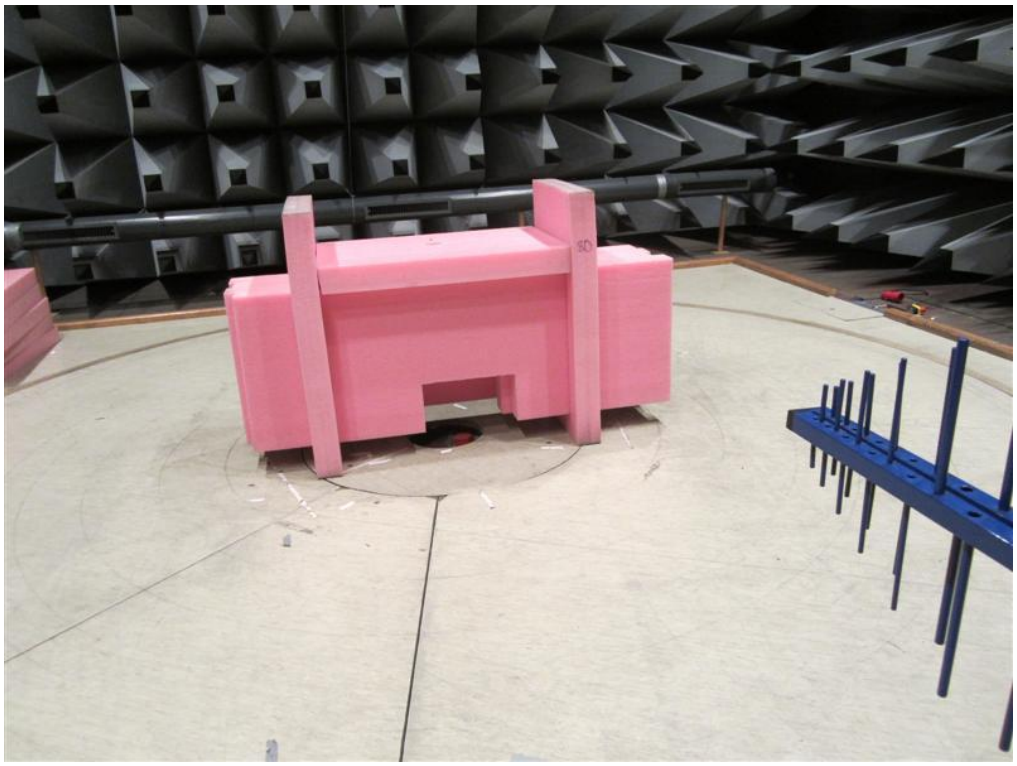


Photo 4.3.1 Test setup regarding measurement of radiated emission below 1 GHz.

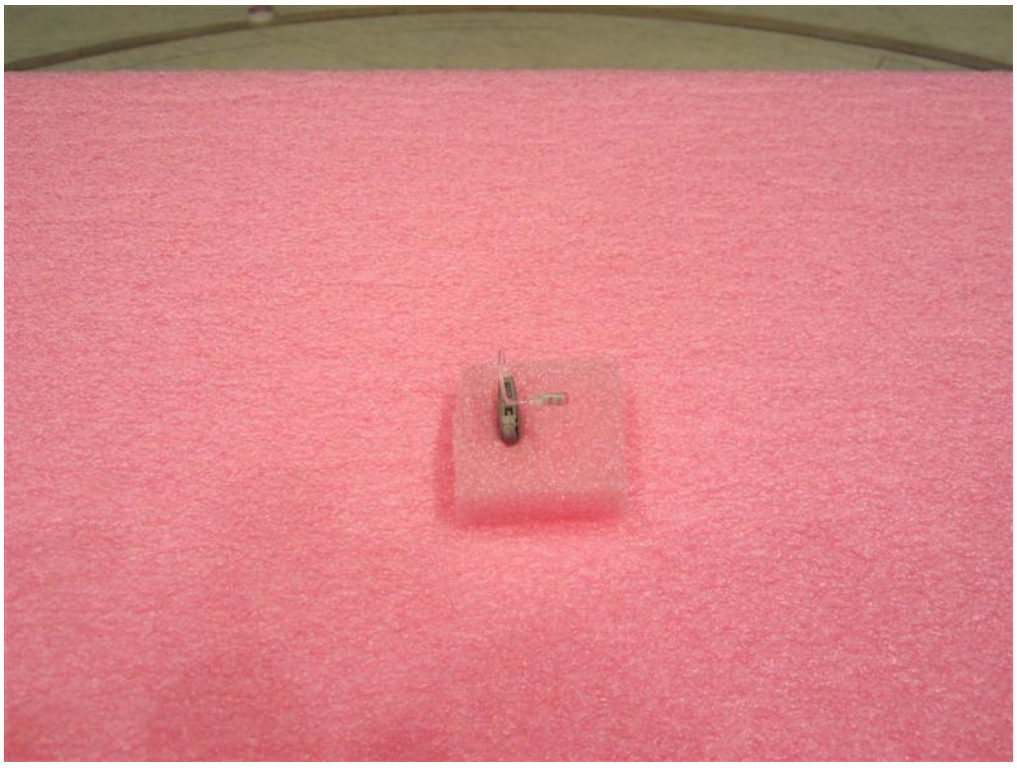
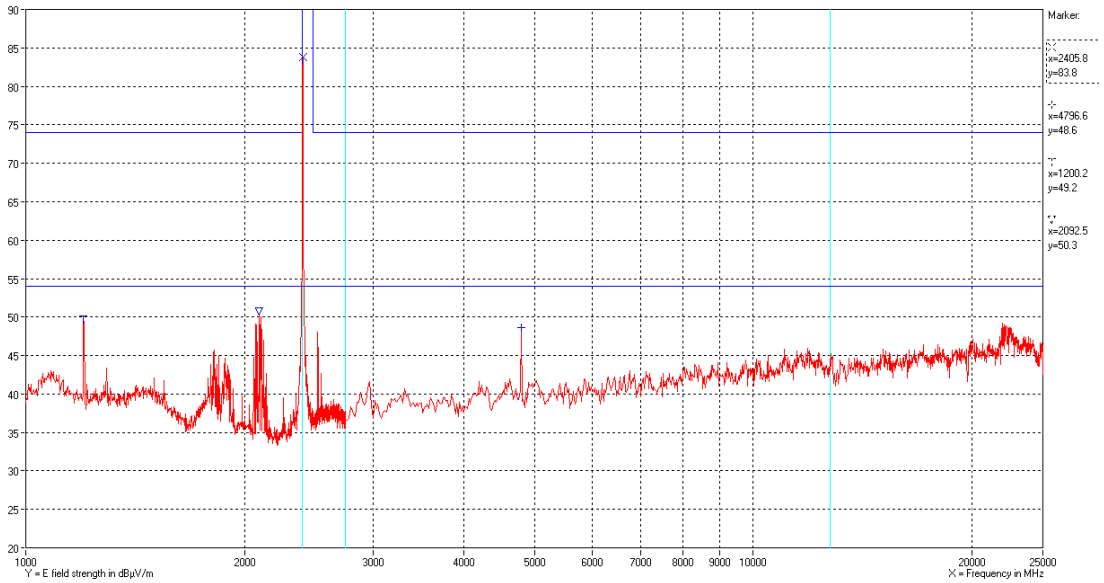


Photo 4.3.2 Test setup regarding measurement of radiated emission below 1 GHz.

4.4 Measurement of radiated emission above 1 GHz

Test object	SY312e	Sheet	RE_Spur-4
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806005	Date	26 May 2012
Client	GN Hearing A/S	Initials	CMT
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 C63.10:2009 Complete search, Antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB



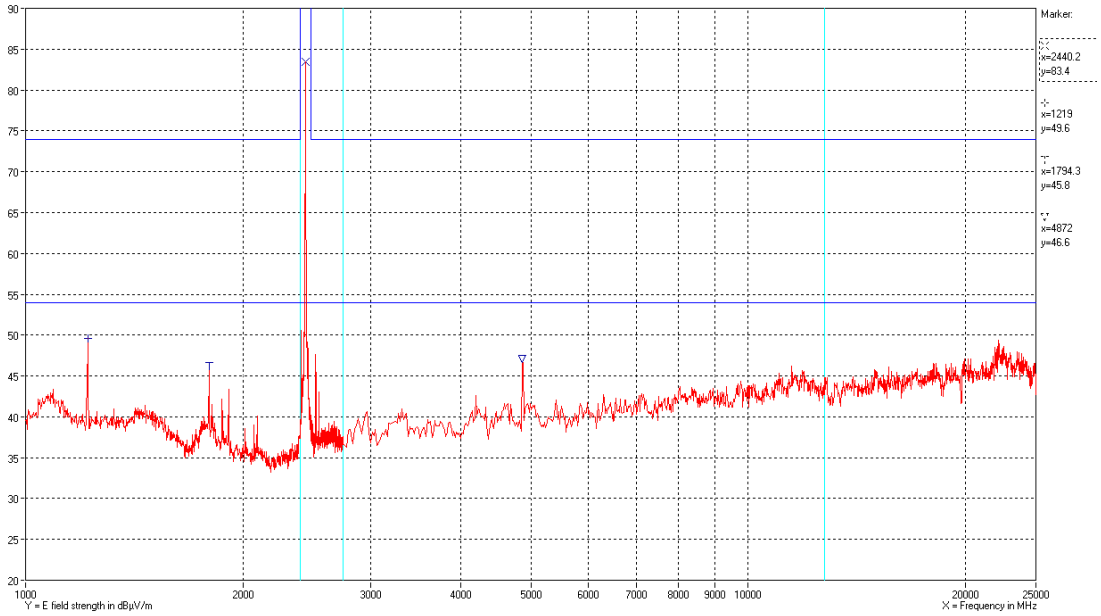
Polarization Vertical and horizontal peak measurements

Comments Continuous Tx - normal modulation - hopping off

Test result	The measured peak field strengths were below the peak and average limits
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 polarization. Test voltage: External power supply at 1.3 VDC.

Test object	SY312e	Sheet	RE_Spur-5
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806005	Date	26 May 2012
Client	GN Hearing A/S	Initials	CMT
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 C63.10:2009 Complete search, Antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB

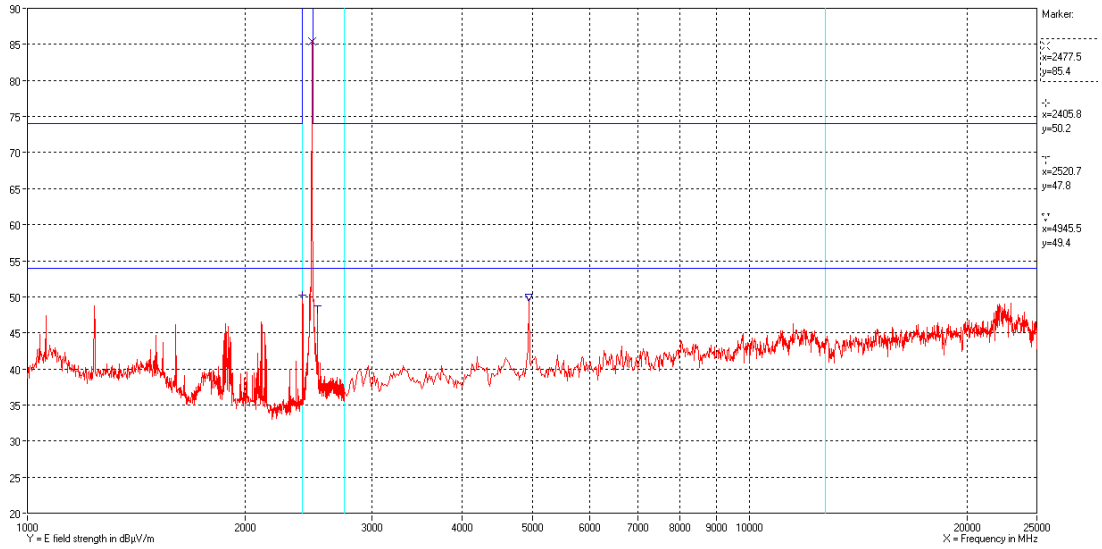


Polarization	Vertical and horizontal peak measurements
Comments	Continuous Tx - normal modulation - hopping off

Test result	The measured peak field strengths were below the peak and average limits
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 polarization. Test voltage: External power supply at 1.3 VDC.

Test object	SY312e	Sheet	RE_Spur-6
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806005	Date	26 May 2012
Client	GN Hearing A/S	Initials	CMT
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 C63.10:2009 Complete search, Antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak for 1 GHz to 25 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB



Polarization Vertical and horizontal peak measurements

Comments Continuous Tx - normal modulation - hopping off

Test result	The measured peak field strengths were below the peak and average limits
Test Port	Enclosure
Test frequency	2478 MHz
Test mode	Continuous Tx - normal modulation – hopping of
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization. Test voltage: External power supply at 1.3 VDC.

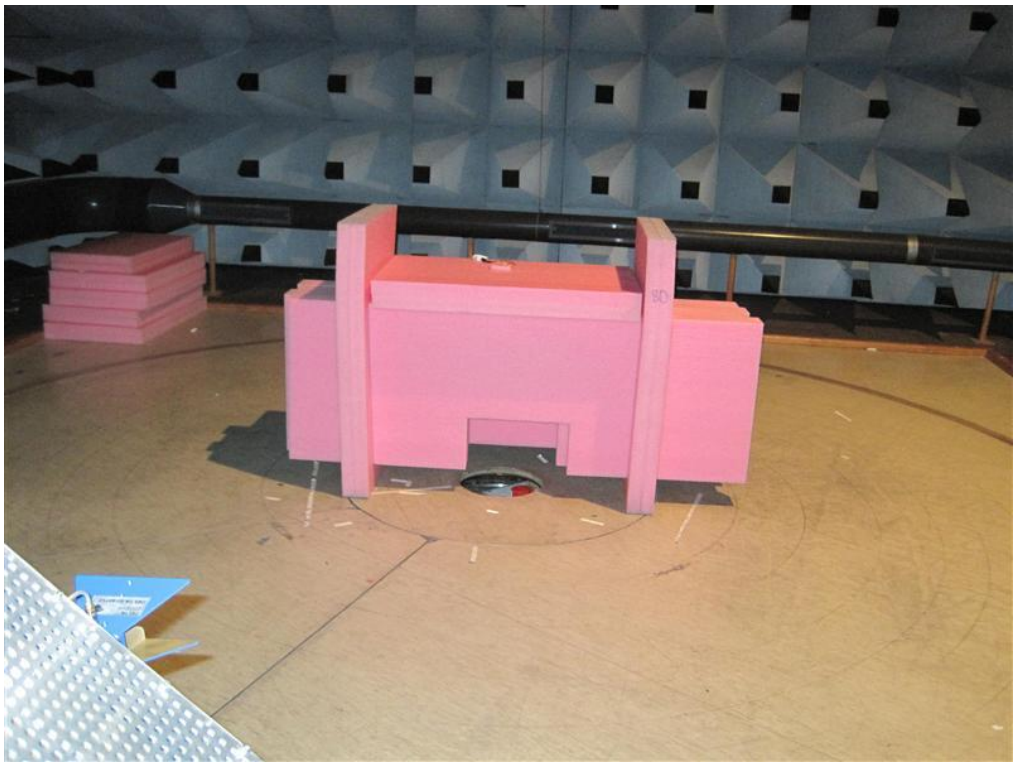


Photo 4.4.1 Test setup regarding measurement of radiated emission above 1 GHz.

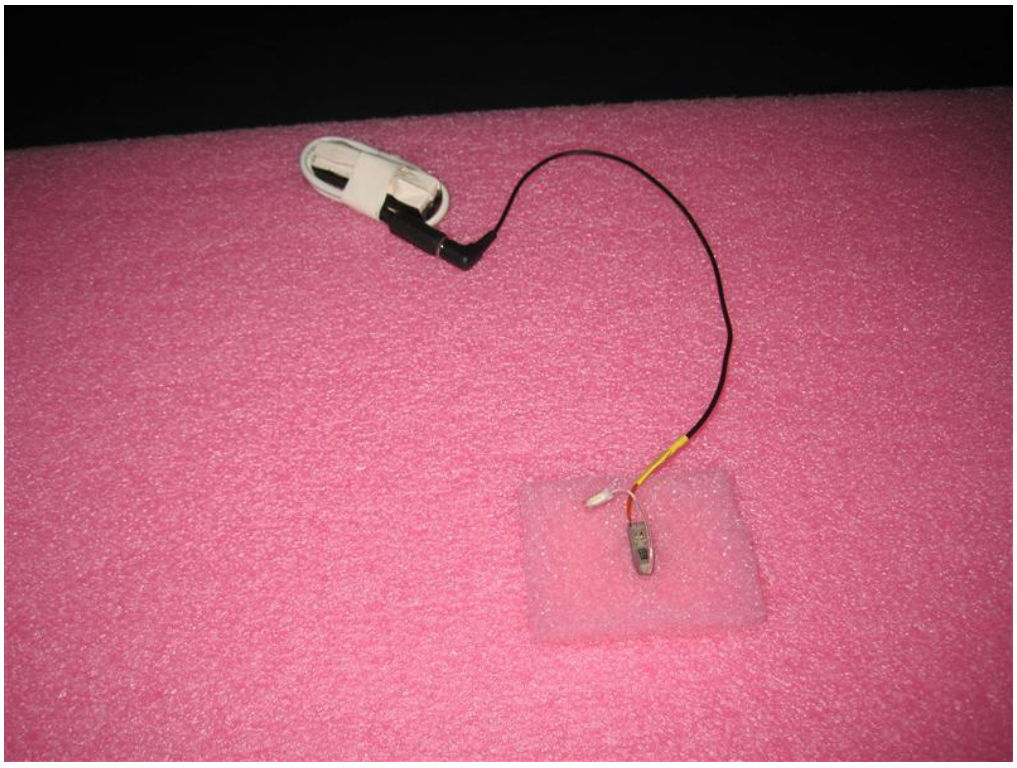


Photo 4.4.2 Test setup regarding measurement of radiated emission above 1 GHz.

4.5 Measurement of field strength of fundamental

Test object	SY312e	Sheet	RE_Spur-7
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806005	Date	14 May 2012
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Specific rule part 15.249(a) IC Standard RSS-210, Issue 8:2010, Section 2.5 & A2.9	Frequency	1-25 GHz

Test method Characteristics	ANSI C63.10:2009 Complete search, Antenna distance 3 m.	Temperature Humidity	23 °C 39 % RH
Detector	Peak for 1 GHz to 2.75 GHz	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB

Operating frequency [MHz]	Peak Measurement [dBµV/m]	PACF [dB]	Corrected average [dBµV/m]	Limit [dBµV/m]	Peak / Average	Comment
2404	97.2	-17.79	79.41	94	Average	-
2404	97.2	-	-	114	Peak	-
2440	94.2	-17.79	76.41	94	Average	-
2440	94.2	-	-	114	Peak	-
2478	93.4	-17.79	75.61	94	Average	-
2478	93.4	-	-	114	Peak	-

Test result: The measured peak field strengths of fundamental were below the peak limit.
The measured peak field strengths of fundamental are corrected with the PACF and are below the average limit.
Corrected average: ($P_{Average(resulting)} = P_{peak} + PACF$).

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.
Antenna with maximum gain.

4.6 Measurement of 20 dB bandwidth

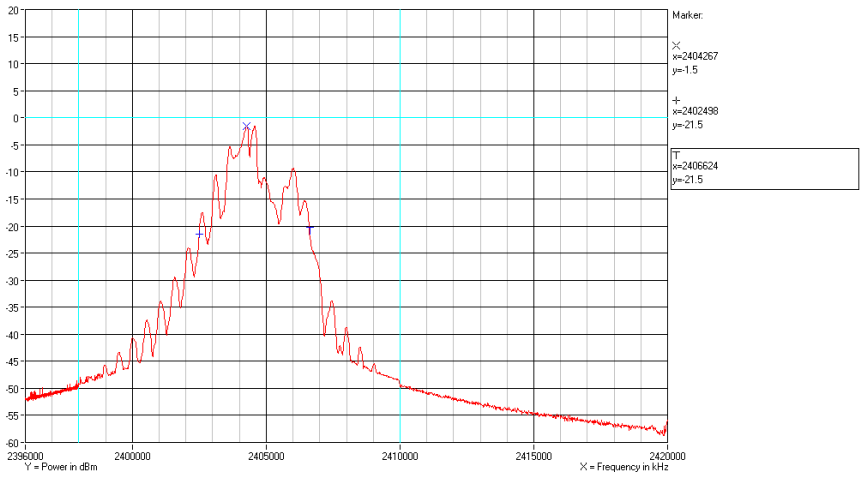
Test object	SY312e	Sheet	PROF-1
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806035	Date	22 May 2012
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Specific rule part 15.215 (c)		

Test method	ANSI C63.10:2009	
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: 100 kHz VBW: 300 kHz SPAN: 26/40/26 MHz DET: Peak CF: Operating freq. Trace: Max. hold	

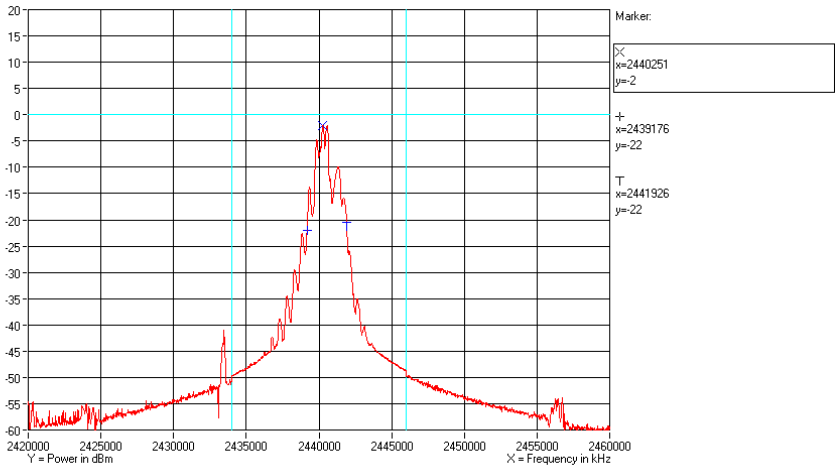
Operating frequency [MHz]	Low frequency [MHz]	High frequency [MHz]	Comment
2404	2402.498	2406.624	-
2440	2439.176	2441.926	-
2478	2477.458	2478.984	-

	Measured [MHz]	Limit [MHz]	Comment
Lowest frequency	2402.498	2400.00	Passed
Highest frequency	2478.984	2483.50	Passed

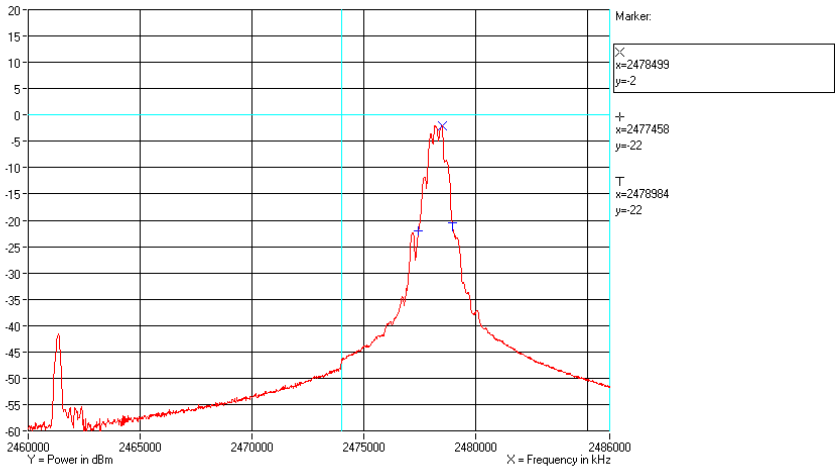
Band edge criteria	20 dB bandwidth
Test result	The measured 20 dB bandwidth was within limit designated in 15.215(c)
Compliant	Yes
Test port	Antenna connector
Test mode	Continuous Tx - normal modulation - hopping off
Comments	Test voltage: External power supply at 1.3 VDC



Comments Operating frequency: 2404 MHz



Comments Operating frequency: 2440 MHz



Comments Operating frequency: 2478 MHz

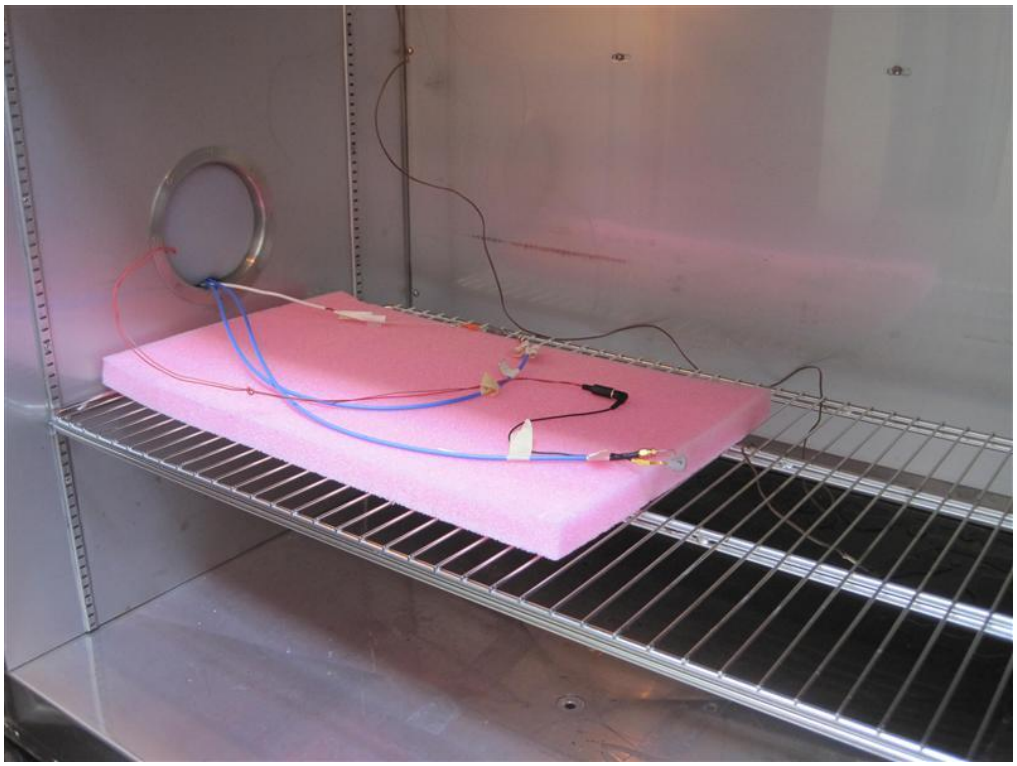


Photo 4.6.1 Test setup regarding measurement of 20 dB bandwidth.

4.7 Measurement of band edge compliance

Test object	SY312e	Sheet	PROF-8
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806005	Date	26 May 2012
Client	GN Hearing A/S	Initials	CMT
Specification	FCC CFR 47 Part 15, Subpart C, Specific rule part 15.249(d)(e) IC Standard RSS-210, Issue 8:2010, Section 2.5 & A2.9	Frequency	1-25 GHz

Test method Characteristics	ANSI C63.10:2009 Complete search, Antenna distance 3 m.	Temperature Humidity	23 °C 39 % RH
Detector	Peak for 2.396 GHz to 2.42 GHz and 2.460 GHz to 2.486 GHz	Bandwidth	30 kHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB

Band Edge frequency [MHz]	Operating frequency [MHz]	Peak / Average	Fundamental field strengths [dBµV/m]	Correction factor [dB]	Results [dBµV/m]	Limit at Band Edge [dBµV/m]	Comment
2400	2404	Average	79.4	46.6	32.8	54	-
2400	2404	Peak	97.2	46.6	50.6	74	-
2483.5	2478	Average	75.6	55.7	19.9	54	-
2483.5	2478	Peak	93.4	55.7	37.7	74	-

Test result: The measured and corrected peak and average field strengths at the band edge were below the peak and average limits.
Results: $(P_{(Pk/Avg)corrected} = P_{(Pk/Avg)} - P_{Correction\_factor(f_{low}/f_{high})})$.

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.
Marker-delta method for band-edge measurements was used to correct the measurements for the peak and average field strengths at band edge according to ANSI C63.10:2009 Section 6.9.3.

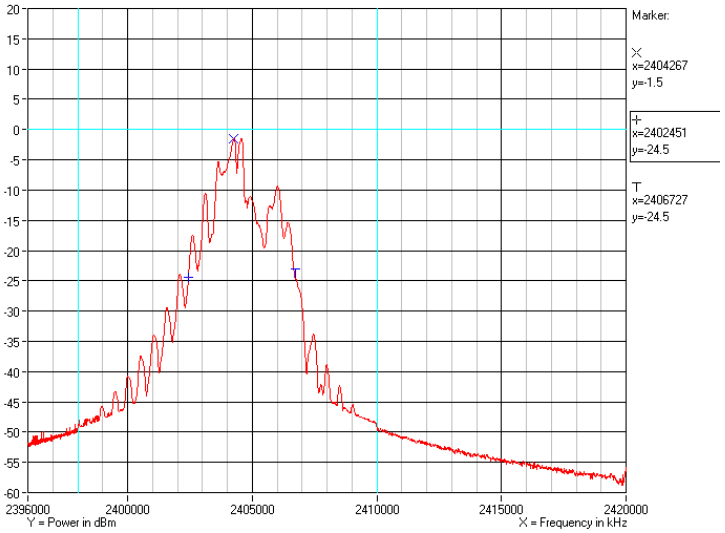
4.8 Measurement of occupied bandwidth, IC

Test object	SY312e	Sheet	PROF-2
Type	SY312e	Project no.	T202419-15
Serial no.	V0961-DRW 12 00806035	Date	22 may 2012
Client	GN Hearing A/S	Initials	CMT
Specification	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1		

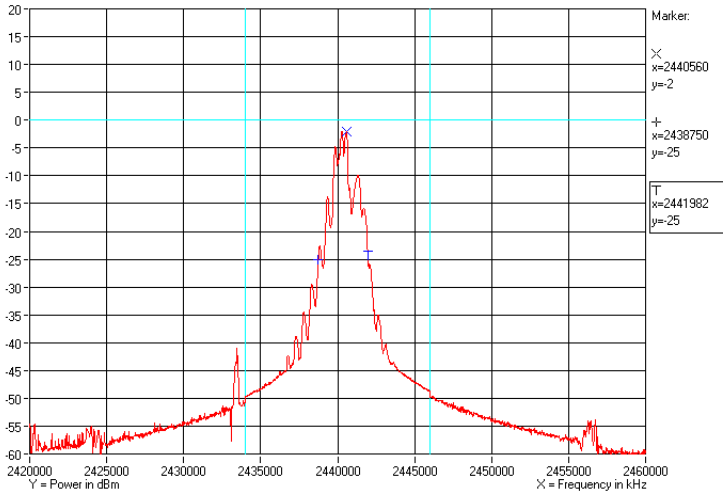
Test method	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1	
Characteristics	Temperature: 22 °C. Test voltage: External power supply at 1.3 VDC	
Test equipm.	Climatic chamber 49184 49550 49299	Uncertainty: 10 kHz
SA Settings	RBW:100 kHz VBW:300 kHz SPAN:24/40/26 MHz DET:Peak CF:Operating freq. Trace:Max hold	

Operating frequency (MHz)	Low frequency (MHz)	High frequency (MHz)	Measured 99% emission bandwidth (MHz)
2404	2402.451	2406.727	4.276
2440	2438.750	2441.982	3.232
2478	2477.092	2479.281	2.189

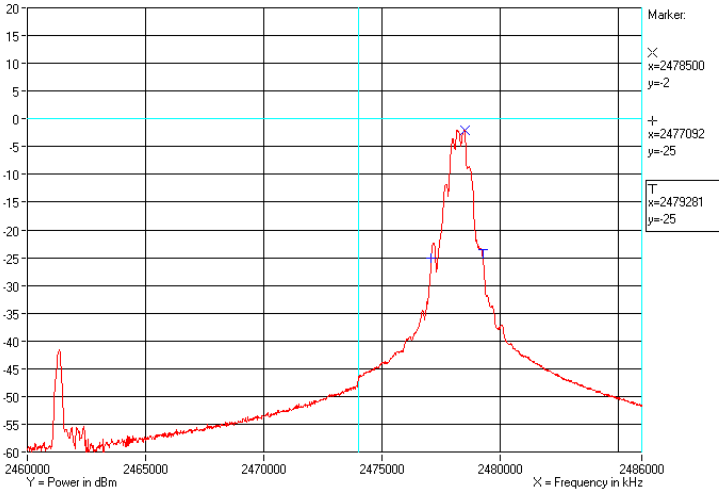
Band edge criteria	Measured 99 % emission bandwidth
Test port	Antenna connector
Test mode	Continuous Tx - normal modulation - hopping off
Comments	None



Comments Operating frequency: 2404 MHz



Comments Operating frequency: 2440 MHz



Comments Operating frequency: 2478 MHz

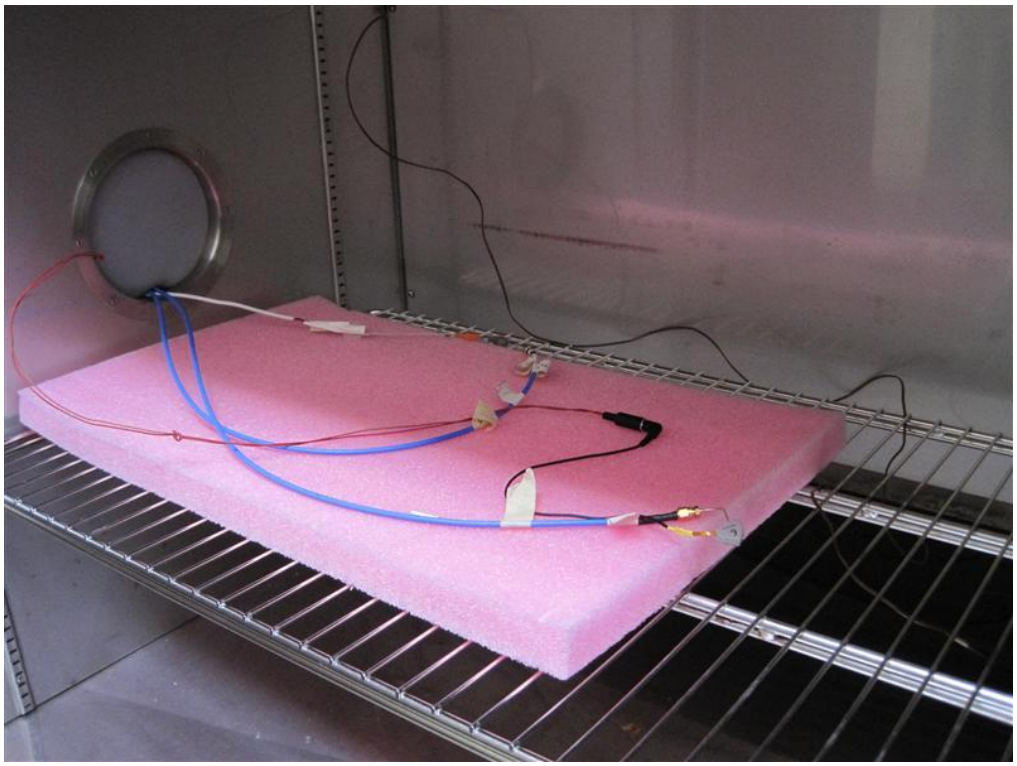
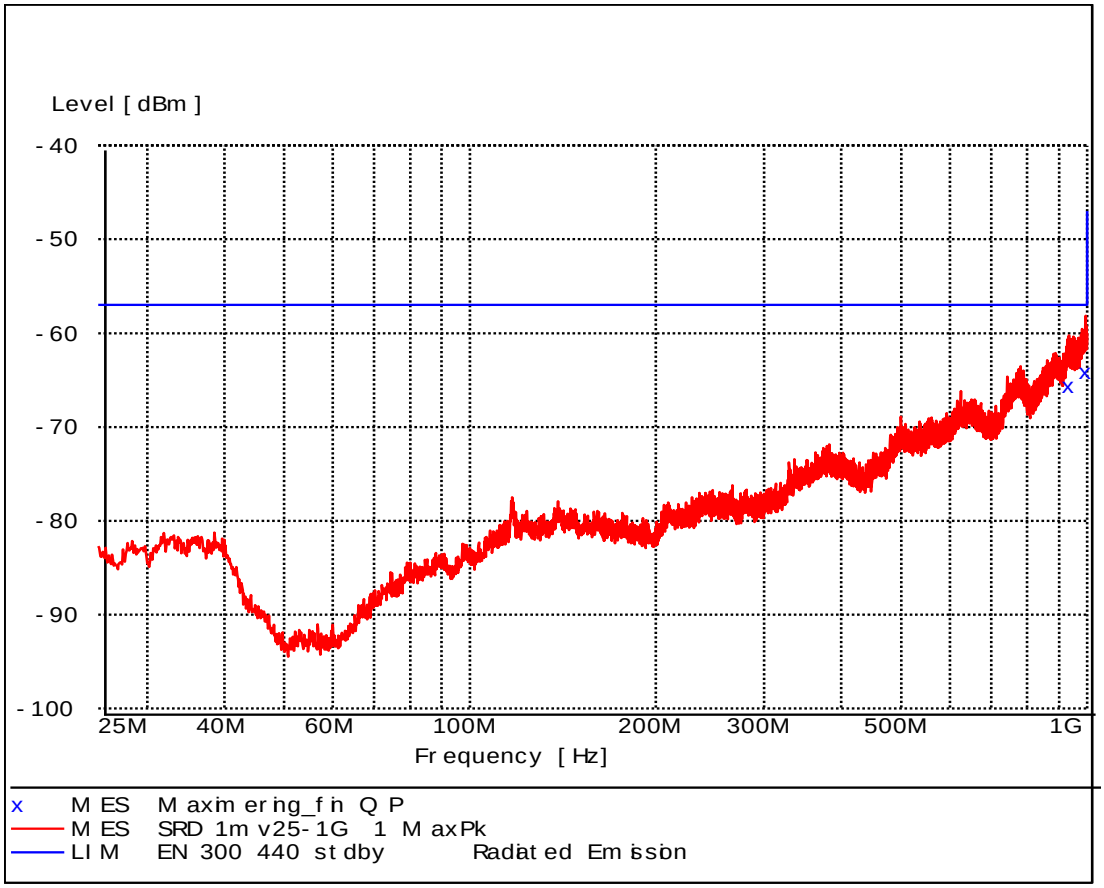


Photo 4.8.1 Test setup regarding measurement of occupied bandwidth, IC.

4.9 Measurement of radiated emission, Rx, IC below 1 GHz

Test object	Combination of 2.1.1: SY312e 2.1.2: SY312e	Sheet	RE_Spur-9
Type	See Section 2	Project no.	T202419-15
Serial no.	See Section 2	Date	15 May 2012
Client	GN Hearing A/S	Initials	HEN
Specification	IC Standard RSS-210, Issue 8:2010, Section 2.5 IC Standard RSS-Gen, Issue 3:2010, Section 6	Frequency	25 MHz–1 GHz

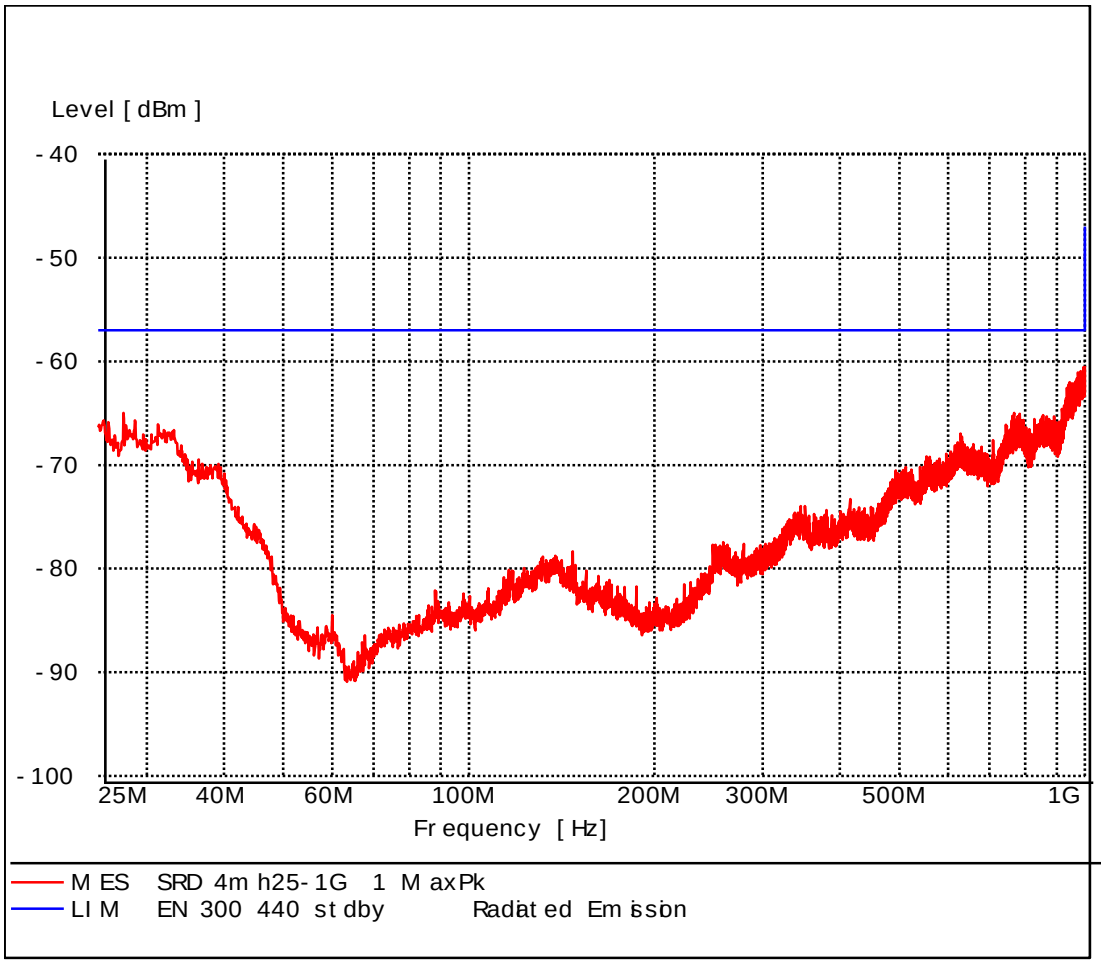
Test method Characteristics	EN 300 440-1 V1.5.1:2009 Pre-scan, Antenna at 10 m, 1 m height, vert. pol.	Temperature Humidity	22 °C 38 % RH
Detector	Peak and quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29797 29499	Uncertainty	4.9 dB



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

Test object	Combination of 2.1.1: SY312e 2.1.2: SY312e	Sheet	RE_Spur-10
Type	See Section 2	Project no.	T202419-15
Serial no.	See Section 2	Date	15 May 2012
Client	GN Hearing A/S	Initials	HEN
Specification	IC Standard RSS-210, Issue 8:2010, Section 2.5 IC Standard RSS-Gen, Issue 3:2010, Section 6	Frequency	25 MHz–1 GHz

Test method Characteristics	EN 300 440-1 V1.6.1:2010 Pre-scan, Antenna at 10 m, 4 m height, hor. pol.	Temperature Humidity	22 °C 38 % 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	Combination of 2.1.1: SY312e 2.1.2: SY312e	Sheet	RE_Spur-11
Type	See Section 2	Project no.	T202419-15
Serial no.	See Section 2	Date	15 May 2012
Client	GN Hearing A/S	Initials	HEN
Specification	IC Standard RSS-210, Issue 8:2010, Section 2.5 IC Standard RSS-Gen, Issue 3:2010, Section 6	Frequency	25 MHz–1 GHz

Test method Characteristics	EN 300 440-1 V1.6.1:2010 Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Temperature Humidity	22 °C 38 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29861 29797 29499	Uncertainty	4.9 dB

Frequency MHz	Level dBm	Transd dB	Limit dBm	Margin dB	Height cm	Azimuth deg	Polarisation
934.500000	-65.60	-78.4	-57.0	8.6	396.0	17.00	Vertical
995.800000	-64.10	-76.8	-57.0	7.1	355.0	207.00	Vertical

Test result	The measured field strengths were below the limit
Polarization	Horizontal and vertical
Test Port	Enclosure
Test frequency	2404 MHz / 2478 MHz
Test mode	Continuous Tx - 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). RSS-Gen most stringent limit is 40 dBµV/m at 3 meter.

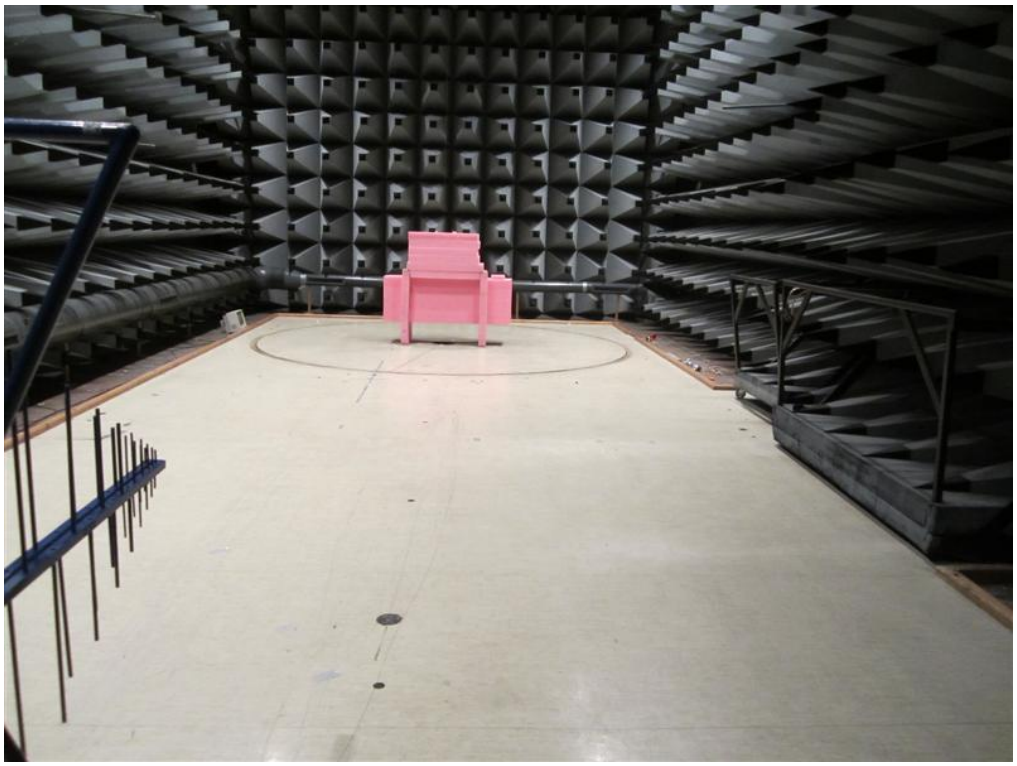


Photo 4.9.1 Test setup regarding measurement of radiated emission, Rx, IC below 1 GHz.

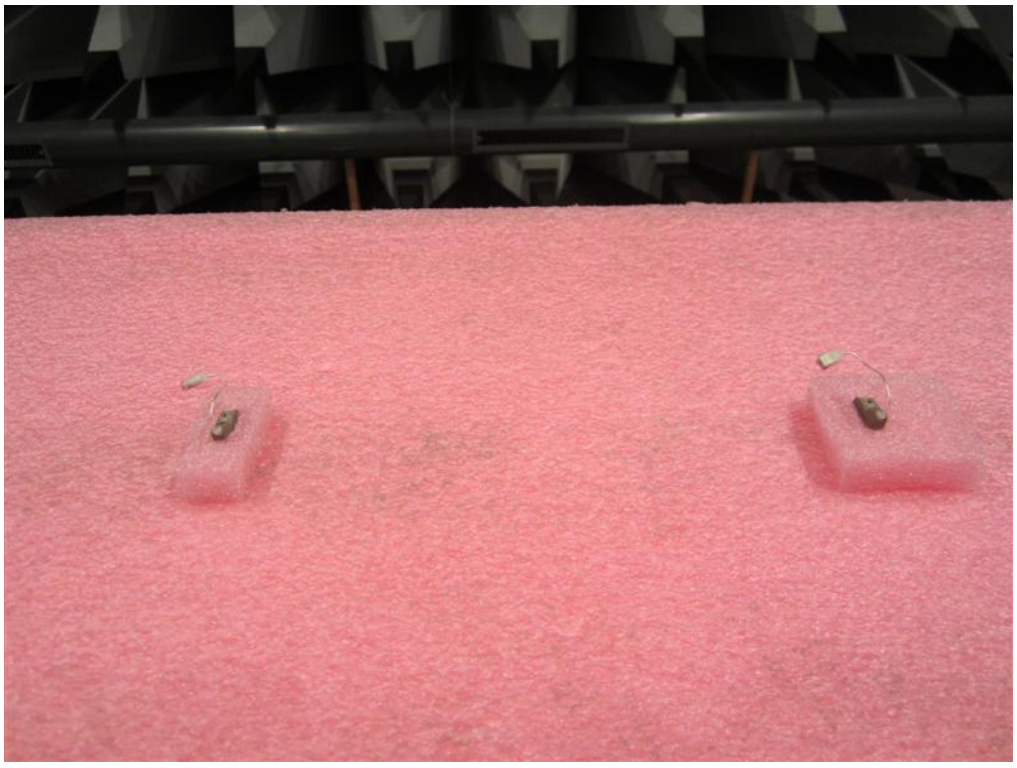
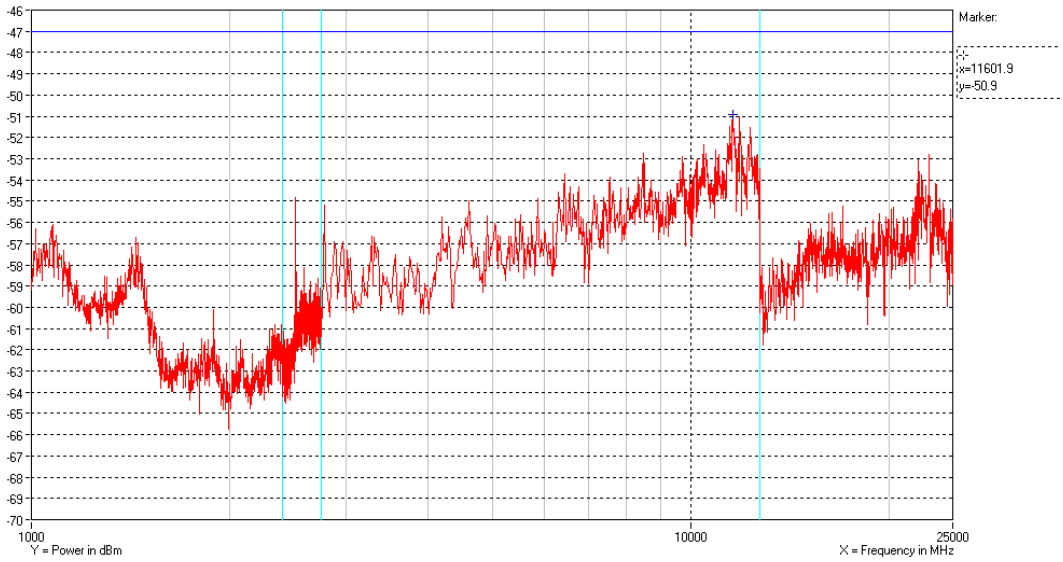


Photo 4.9.2 Test setup regarding measurement of radiated emission, Rx, IC below 1 GHz.

4.10 Measurement of radiated emission, Rx, IC above 1 GHz

Test object	Combination of 2.1.1: SY312e 2.1.2: SY312e	Sheet	RE_Spur-12
Type	See Section 2	Project no.	T202419-15
Serial no.	See Section 2	Date	16 May 2012
Client	GN Hearing A/S	Initials	CMT
Specification	IC Standard RSS-210, Issue 8:2010, Section 2.5 IC Standard RSS-Gen, Issue 3:2010, Section 6	Frequency	1-25 GHz

Test method Characteristics	EN 300 440-1 V1.6.1:2010 Complete search, Antenna distance 3 m.	Temperature Humidity	24 °C 36 % RH
Detector	Peak for 1 GHz to 12.75 GHz	Bandwidth	1 MHz
Detector	Peak for 12.75 GHz to 18 GHz	Bandwidth	300 kHz
Detector	Peak for 18 GHz to 25 GHz	Bandwidth	100 kHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB

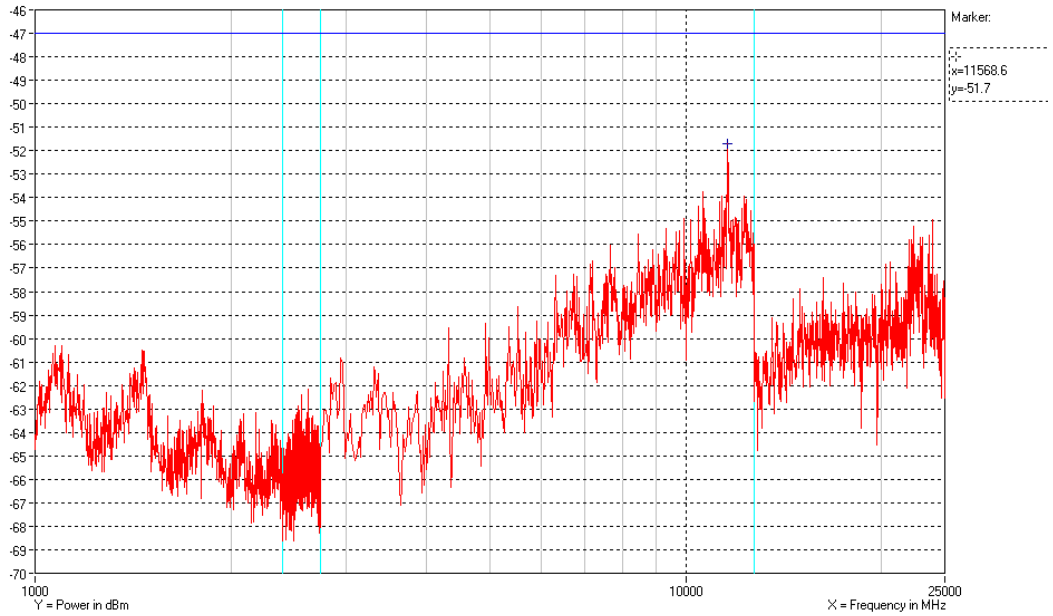


Polarization Vertical peak measurements

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

Test object	Combination of 2.1.1: SY312e 2.1.2: SY312e	Sheet	RE_Spur-13
Type	See Section 2	Project no.	T202419-15
Serial no.	See Section 2	Date	16 May 2012
Client	GN Hearing A/S	Initials	CMT
Specification	IC Standard RSS-210, Issue 8:2010, Section 2.5 IC Standard RSS-Gen, Issue 3:2010, Section 6	Frequency	1-25 GHz

Test method Characteristics	EN 300 440-1 V1.6.1:2010 Complete search, Antenna distance 3 m.	Temperature Humidity	24 °C 36 % RH
Detector	Peak for 1 GHz to 12.75 GHz	Bandwidth	1 MHz
Detector	Peak for 12.75 GHz to 18 GHz	Bandwidth	300 kHz
Detector	Peak for 18 GHz to 25 GHz	Bandwidth	100 kHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB



Polarization Horizontal peak measurements

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

Test result	The measured field strengths were below the limit
Test Port	Enclosure
Test frequency	None
Test mode	Continuous Tx - 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. EN 300 440 limit is -47 dBm (48.23 dBµV/m at 3 meter peak). RSS-Gen limit is 54 dBµV/m at 3 meter average.

Photo 4.10.1 Test setup regarding measurement of radiated emission, Rx, IC above 1 GHz.

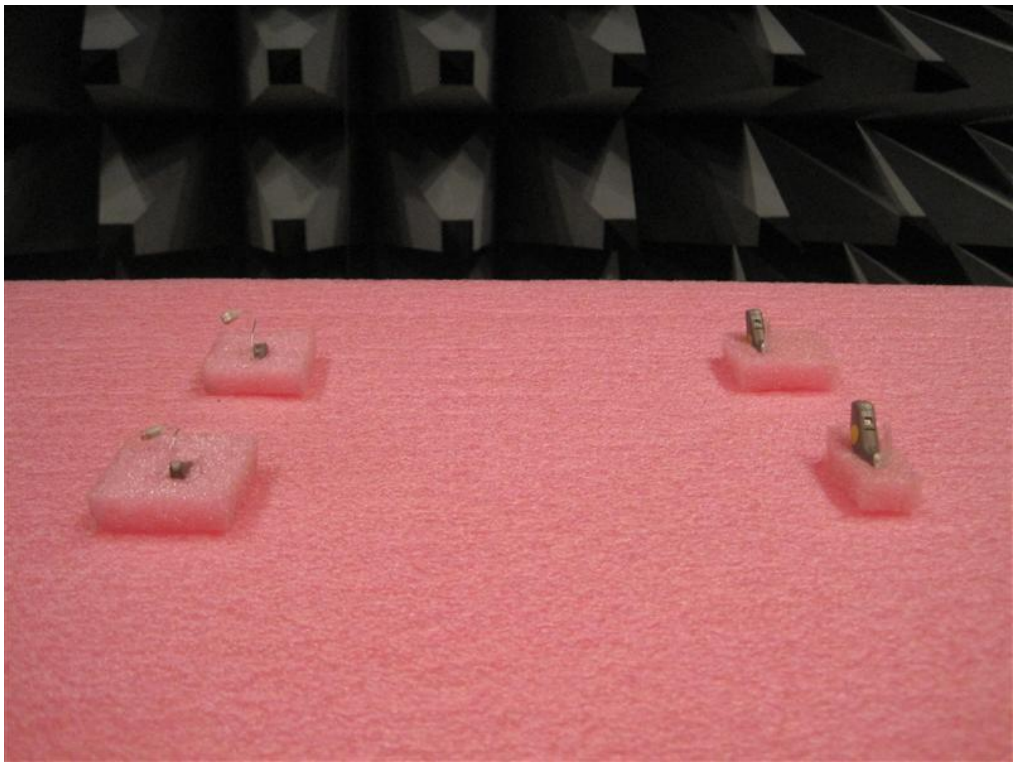


Photo 4.10.2 Test setup regarding measurement of radiated emission, Rx, IC above 1 GHz.

5. National registrations and accreditations

5.1 DANAK Accreditation

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

Registration Number: 19

Area Number: C

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

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

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

5.2 FCC Registrations

Organization: Federal Communications Commission, USA

Registration Number: 90529

Facilities: 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:

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, G-470

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/model No.	Cal. Date	Cal. Due
29499	BROADBAND RF PREAMPLIFIER	EC/MTS TELEMETER	TVV 711	Dec. 11	Dec. 12
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A	Oct.10	Oct. 12
29861	EMI-SOFTWARE Ver. 1.60	ROHDE & SCHWARZ	ES-K1, PART: 1026.6790.02	N.A.	N.A.
49086	REMI EMISSION SOFTWARE PACKAGE v. 2.133, ROOM 5	NeWeTec	REMI	N.A.	N.A.
49183	POWER SUPPLY	TTI	PL 320	N.A.	N.A.
49184	POWER SUPPLY	TTI	CPX200	N.A.	N.A.
49299	DIGITAL MULTIMETER	Fluke	87-4	Aug. 11	Aug. 12
49550	SIGNAL ANLYZER	ROHDE & SCHWARZ	FSQ8	Feb. 12	Feb 13
49600	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESU40	Dec. 11	Dec. 12
49624	DUAL RIDGE HORN ANTENNA – 1GHZ-26GHZ (2GHZ-32GHZ)	SATIMO	SH2000	Sep. 11	Sep. 12
49625	SRD COAX SWITCH MATRIX USED IN 1GHZ TO 26GHZ SRD ANTENNASYSTEM	DELTA	COAX SWITCH MATRIX	May 12	May 13

Annex 1

Out of band emission table

Transmitter out-of-band Emission Table

Project No.	T202419-15
Client	GN Hearing
Product	SY312e

Specification:	FCC CFR 47 Part 15, Subpart C, §15.249 RSS-210, Issue 8:2010, A8.5
Requirement:	All out-of-band emission shall be below the general limit (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] (Max. in-band emission - 30 dB)	Margin [dB] (Limit - Result)	Pass/Fail	Note
56	2404	76.2	29.3	32.5	79.4	In-band	-	-	Tx @ 2404 MHz, Fundamental, Pk
56	4807.8	79.8	68.2	37.0	48.6	54.0	5.4	PASS	Tx @ 2404 MHz, 2nd harmonic
56	7212	*	*	*	*	*	*	PASS	Tx @ 2404 MHz, 3rd harmonic
56	9616	*	*	*	*	*	*	PASS	Tx @ 2404 MHz, 4th harmonic
54	2440	72.4	29.1	33.1	76.4	In-band	-	-	Tx @ 2440 MHz, Fundamental, Pk
54	4880	77.8	68.2	37.0	46.6	54.0	7.4	PASS	Tx @ 2440 MHz, 2nd harmonic
54	7320	*	*	*	*	*	*	PASS	Tx @ 2440 MHz, 3rd harmonic
54	9760	*	*	*	*	*	*	PASS	Tx @ 2440 MHz, 4th harmonic
52	2478	70.3	29.1	34.4	75.6	In-band	-	-	Tx @ 2478 MHz, Fundamental, Pk
52	4956	80.6	68.2	37.0	49.4	54.0	4.6	PASS	Tx @ 2478 MHz, 2nd harmonic
52	7434	*	*	*	*	*	*	PASS	Tx @ 2478 MHz, 3rd harmonic
52	9912	*	*	*	*	*	*	PASS	Tx @ 2478 MHz, 4th harmonic

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

Max. in-band emission:	79.4 dBuV/m, AV @ 3 m

Test result:	All out-of-band emission is below the general limit (54 dBuV/m)
Compliant:	Yes.