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# DELTA Test Report



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## Radio parameter test of Baha4 according to FCC and IC specifications

### Performed for Cochlear Bone Anchored Solutions AB

DANAK-19/12920

Project no.: T204709-3

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including Annex 1

23 May 2013

#### DELTA

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<b>Title</b>	Radio parameter test of Baha4 according to FCC and IC specifications
<b>Test object</b>	Baha4
<b>Report no.</b>	DANAK-19/12920
<b>Project no.</b>	T204709-3
<b>Test period</b>	21 February to 11 March 2013
<b>Client</b>	Cochlear Bone Anchored Solutions AB PO Box 82 435 22 Mölnlycke Sweden Tel.: +46 31 792 46 85
<b>Contact person</b>	Sören Nilsson E-mail: snilsson@cochlear.com
<b>Manufacturer</b>	Cochlear Bone Anchored Solutions AB
<b>Specifications</b>	See Section 1, Summary of tests
<b>Results</b>	The test object was found to be in compliance with the specifications, as listed in Section 1
<b>Test personnel</b>	Jan Askov Claus Momme Thomsen
<b>Test site(s)</b>	DELTA, Venlighedsvej 4, 2970 Hørsholm, Denmark

**Date** 23 May 2013

**Project Manager**



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Senior Consultant  
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**Responsible**



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## 1. Summary of tests

The authorization procedures are: Certification by FCC Part 15 C.

Tests	Test methods	Rule Section
Measurement of radiated emission	ANSI C63.10:2009	FCC: 47 CFR Part 15.109 FCC: 47 CFR Part 15.209 FCC: 47 CFR Part 15.249(a)(d)(e) IC: RSS-210, 2.5 & A2.9
Measurement of field strength of fundamental	ANSI C63.10:2009	FCC: 47 CFR Part 15.249(a)(e) IC: RSS-210, 2.5 & A2.9
Measurement of band edge compliance	ANSI C63.10:2009	FCC: 47 CFR Part 15.209(a) FCC: 47 CFR Part 15.249(d)(e) IC: RSS-210, 2.5 & A2.9
Measurement of 20 dB bandwidth	ANSI C63.10:2009	FCC: 47 CFR Part 15.215(c)
Measurement of occupied bandwidth	RSS-Gen, Issue 3:2010	IC: RSS-Gen, 4.6.1

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.

#### USA (FCC)

- 47 CFR Part 15, Subpart C (Specific rule part §15.249)

#### Canada (IC)

- Standard RSS-210, Issue 8:2010
- Standard RSS-Gen, Issue 3:2010.

The test results relate only to the objects tested.



## 2. Test objects



Photo 2.1.1 Test objects

## 2.1 Test objects

### Test object 2.1.1

Name of test object	Baha4
Model / type	Baha4
Part no.	Baha4
Serial no.	3010120010245
FCC ID	QZ3BAHA4
IC	8039C-BAHA4
Manufacturer	Cochlear Bone Anchored Solutions AB
Supply voltage	1.45 VDC
Software version	001
Hardware version	001
Cycle time	0.5ms / 5ms / 20 ms
Highest frequency generated or used	2483.5 MHz
Comment	Battery used – normal Zinc Air – 1.45 VDC

### Test object 2.1.2

Name of test object	Baha4
Model / type	Baha4
Part no.	Baha4
Serial no.	3010120010191
FCC ID	QZ3BAHA4
IC	8039C-BAHA4
Manufacturer	Cochlear Bone Anchored Solutions AB
Supply voltage	1.45 VDC
Software version	001
Hardware version	001
Cycle time	0.5ms / 5ms / 20 ms
Highest frequency generated or used	2483.5 MHz
Comment	Antenna replaced by SMA connector and supplied by external power supply



### 3. General test conditions

#### 3.1 Test setup during test

Radio setup

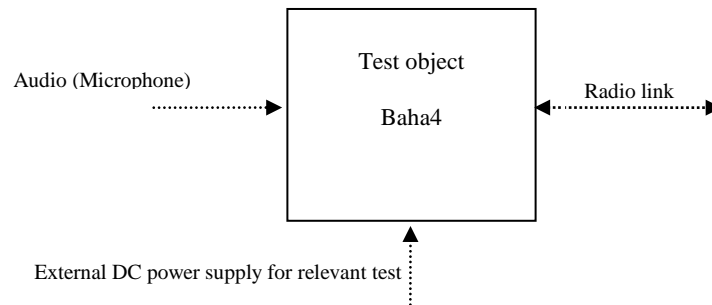


Figure 3.1.1 Block diagram of test object.

##### 3.1.1 Description and intended use of test object

Baha4 is a hearing instrument used for alleviation of hearing loss. It can receive audio signals and be configured via the radio link.

All hearing instruments are only powered from a zinc-air battery.

##### 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 (normal modulation, normal data packets with optimised repetition rate).

Tests were performed at three frequencies for the radio:

- Low frequency: 2404 MHz
- Middle frequency: 2440 MHz
- High frequency: 2478 MHz.

During relevant tests the external DC power supply was used.





### 3.2 Radio specifications, receiver and transmitter

Test object	Combination of 2.1.1: Baha4 2.1.2: Baha4	Sheet	Radio-1
Type	See Section 2	Project no.	T204709-3
Serial no.	See Section 2	Date	11 Mar. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1 Summary of tests		

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	:	One permanently attached PCB antenna, omnidirectional
Maximum gain	:	-8.1 dBi
Transmit power, max peak	:	-7.6 dBm peak EIRP
Field Strength, max avg.	:	67.6 dB $\mu$ V/m avg (2.4mV/m) @ 3 meter
Field Strength, max pk.	:	87.6 dB $\mu$ V/m pk (24mV/m) @ 3 meter
Conducted power, max avg.:	:	-9.5 dBm
Conducted power, max pk. :	:	0.5 dBm
Power level	:	No
No. of channels	:	20
Bandwidth, Occupied (99%)	:	3.3 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	:	Zinc-Air battery, 1.45 VDC
Specified min voltage	:	1.16 VDC
Specified max voltage	:	1.45 VDC
Power consumption, max	:	20 mW
Temperature category	:	-20 to +55 °C.
Canada:		
Emission Designator	:	3M33F7E
Max. TX spurious emission, avg.	:	45 $\mu$ V/m @ 3 meter (field strength)
Max. TX spurious emission, pk.	:	450 $\mu$ V/m @ 3 meter (field strength)



## 4. Test results

### 4.1 Duty cycle correction factor ( $\delta$ )

Test object	Baha4	Sheet	ANT-1
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	25 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	CMT
Specification	See Section 1, Summary of tests		

Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Test voltage: Zinc-air battery at 1.45 VDC	Humidity	21 % RH
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	1.1 dB
SA Settings	RBW: 1 MHz VBW: 1 MHz SPAN: Zero-1ms DET: Peak CF: 2440 MHz Trace: Max Hold		

The duty cycle correction factor ( $\delta$ ) can be applied to the peak pulse amplitude to find the average emission (Max. 20 dB). This is valid for one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

The duty cycle correction factor is determined as follows:

The measured value for the duty cycle (D) is:

Max. Tx on time: 227.6  $\mu$ s – Delta 3 (T1)

Period: 4916.0  $\mu$ s – Delta 2 (T1).

The calculated duty cycle expressed in % is:

$D(\%) = ((\text{Max. Tx on time}) \mu\text{s} / (\text{period}) \mu\text{s}) \cdot 100\% = 4.6 \%$ .

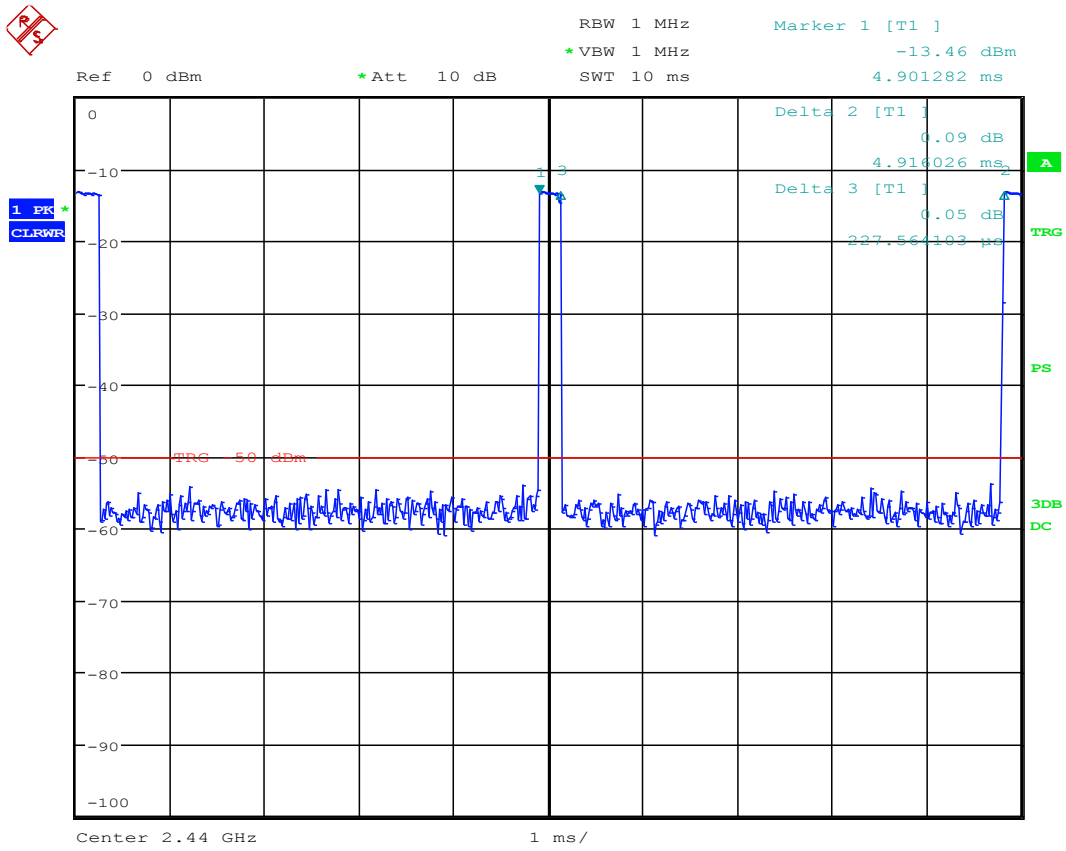
The calculated duty cycle correction factor expressed in dB is:

$\delta(\text{dB}) = 20 \log (\text{Max. Tx on time} (\mu\text{s}) / \text{period} (\mu\text{s})) = 26.7 \text{ dB} \rightarrow 20 \text{ dB}$ .

According to ANSI C63.10.2009 (Section 4.2.3.2.4), FCC CFR 47 Part 15 Subpart C (Section 15.35(c)) and RSS-Gen (Section 4.5) this correction factor can be applied for all emissions including the fundamental and harmonics above 1 GHz and max. 20 dB.

The corrected average is:  $P_{\text{Average}}(\text{resulting}) = P_{\text{peak}} + DCCF (\delta)$ .





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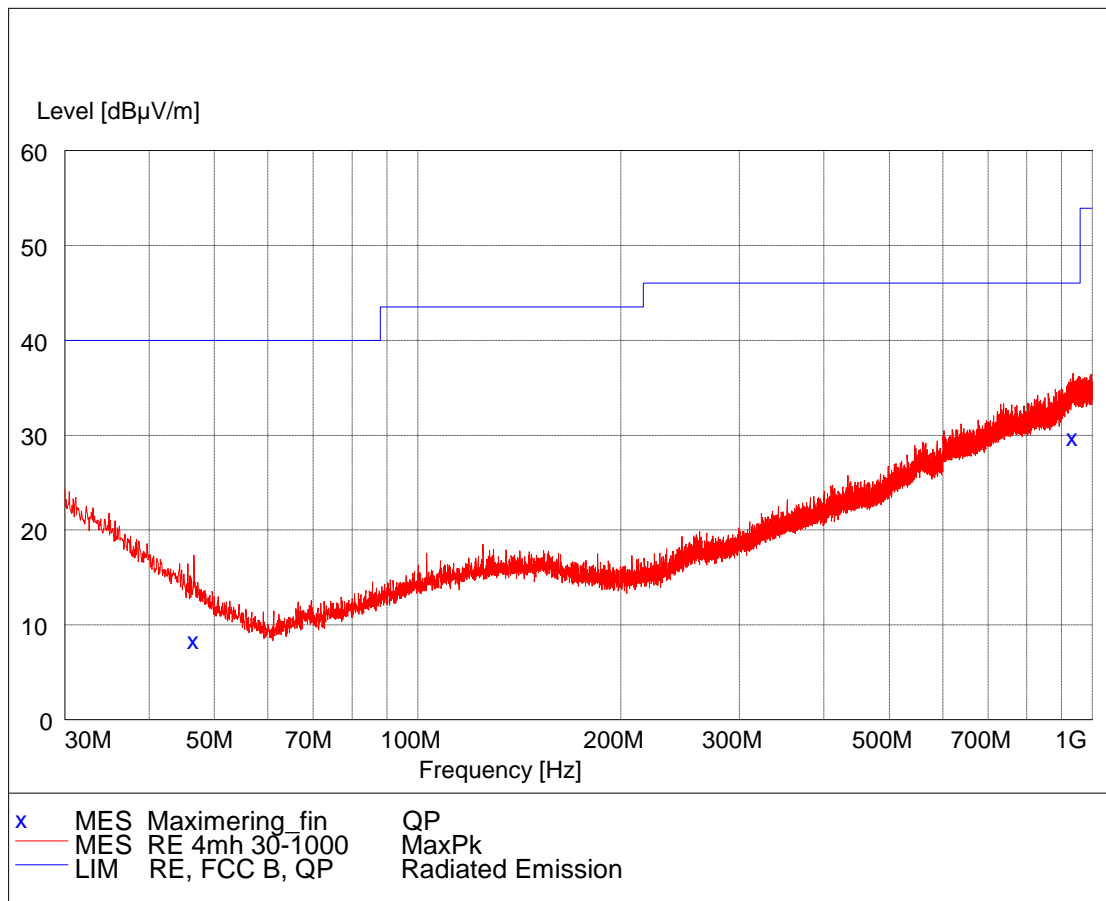
Photo 4.1.1 Peak measurement plot



## 4.2 Measurement of radiated emission below 1 GHz

Test object	Baha4	Sheet	RE_Spur-1
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010245	Date	21 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	CMT
Specification	See Section 1, Summary of tests	Frequency	30-1000 MHz

Test method	ANSI C63.10:2009	Temperature	24 °C
Characteristics	Pre-scan, antenna at 3 m, 1 m height, vert. pol.	Humidity	14 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797	Uncertainty	4.9 dB



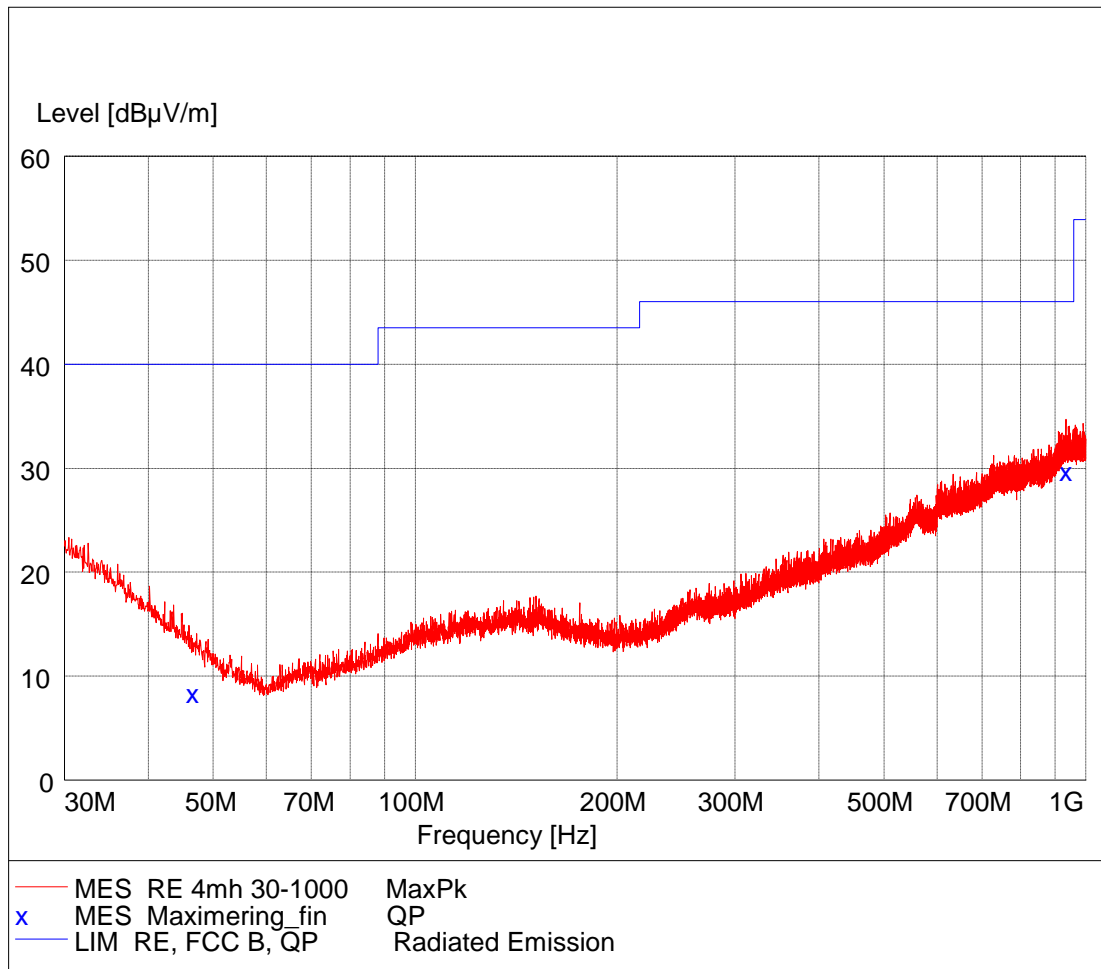
Comments

Continuous Tx - GFSK modulation - hopping between low, mid and high operating frequency



Test object	Baha4	Sheet	RE_Spur-2
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010245	Date	21 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	CMT
Specification	See Section 1 Summary of tests	Frequency	30-1000 MHz

Test method	ANSI C63.10:2009	Temperature	24 °C
Characteristics	Pre-scan, antenna at 3 m, 4 m height, hor. pol.	Humidity	14 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797	Uncertainty	4.9 dB



Comments Continuous Tx - GFSK modulation - hopping between low, mid and high operating frequency



Test object	Baha4	Sheet	RE_Spur-3
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010245	Date	21 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	CMT
Specification	See Section 1 Summary of tests	Frequency	30-1000 MHz

Test method	ANSI C63.10:2009	Temperature	24 °C
Characteristics	Peak search ant. at 3 m, height: 1-4 m, v/h pol.	Humidity	14 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797	Uncertainty	4.9 dB

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
46.620000	8.60	11.3	40.0	31.4	158.0	68.00	VERTICAL
935.220000	29.90	29.8	46.0	16.1	196.0	156.00	HORIZONTAL

Test result	The measured field strengths were below the limit
Test Port	Enclosure
Test frequency	2404, 2440 & 2478 MHz
Test mode	Continuous Tx - GFSK modulation - hopping between low, mid and high operating freq.
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation



Photo 4.2.1 Test setup regarding measurement of radiated emission below 1 GHz.

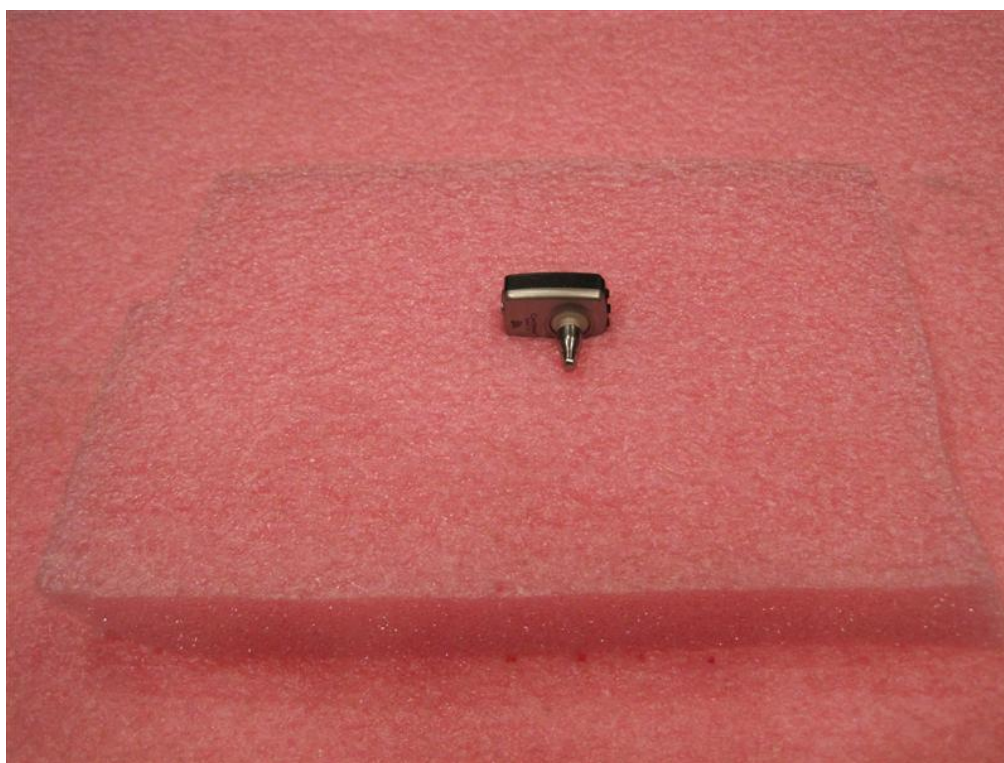
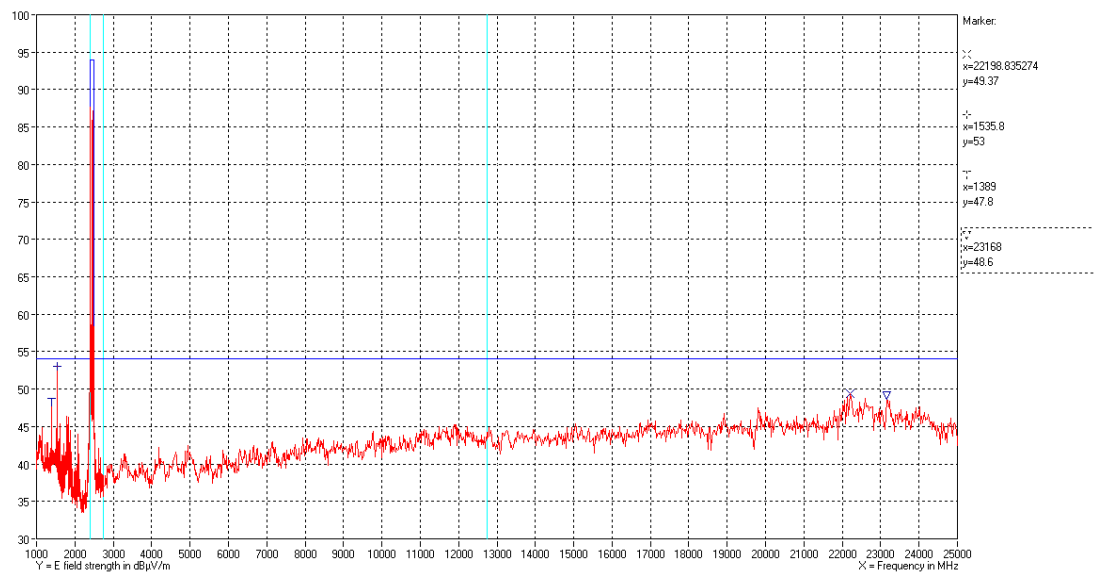


Photo 4.2.2 Test setup regarding measurement of radiated emission below 1 GHz.

### 4.3 Measurement of radiated emission above 1 GHz

Test object	Baha4	Sheet	RE_Spur-4
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010245	Date	23 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	CMT
Specification	See Section 1, Summary of tests	Frequency	1-25 GHz

Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Complete search, antenna distance 3 m	Humidity	15 % 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 - GFSK modulation - hopping between low, mid and high operating frequency



Test object	Baha4	Sheet	RE_Spur-5
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010245	Date	23 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	CMT
Specification	See Section 1, Summary of tests	Frequency	1-25 GHz

Test method	ANSI C63.4:2009	Temperature	23 °C
Characteristics	Complete search, antenna distance 3 m	Humidity	15 % 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

Test result	The measured peak field strengths were below the peak and average limits
Test Port	Enclosure
Test frequency	2404, 2440 & 2478 MHz
Test mode	Continuous Tx - GFSK modulation - hopping between low, mid and high operating frequency
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization at the peak measurement



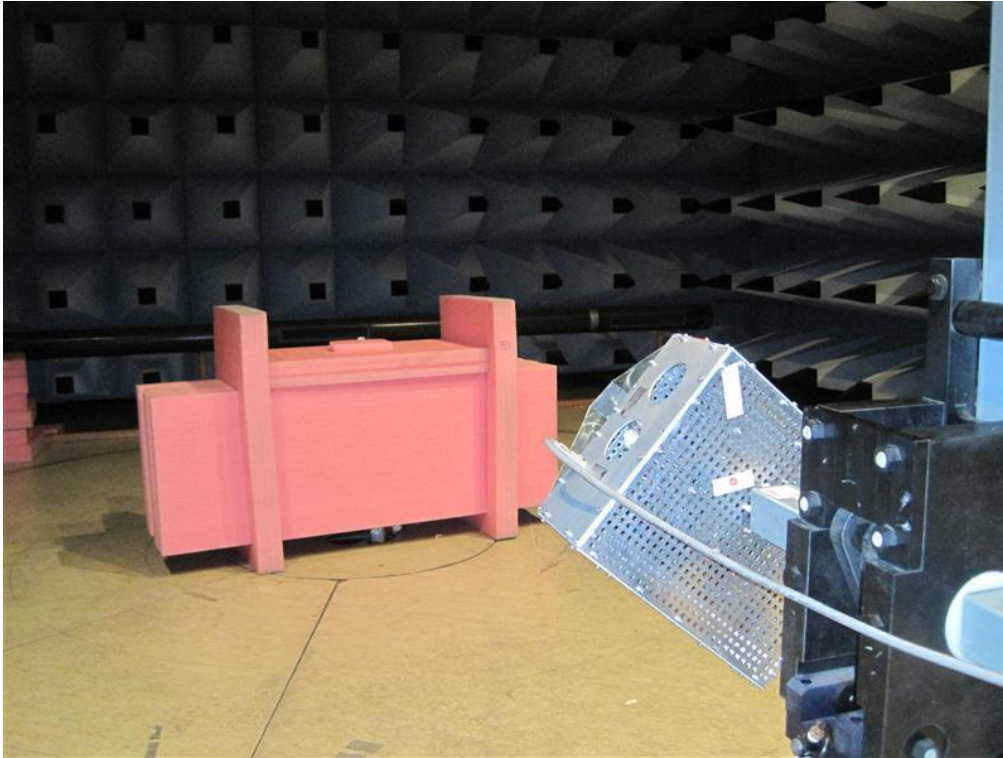


Photo 4.3.1 Test setup regarding measurement of radiated emission above 1 GHz.

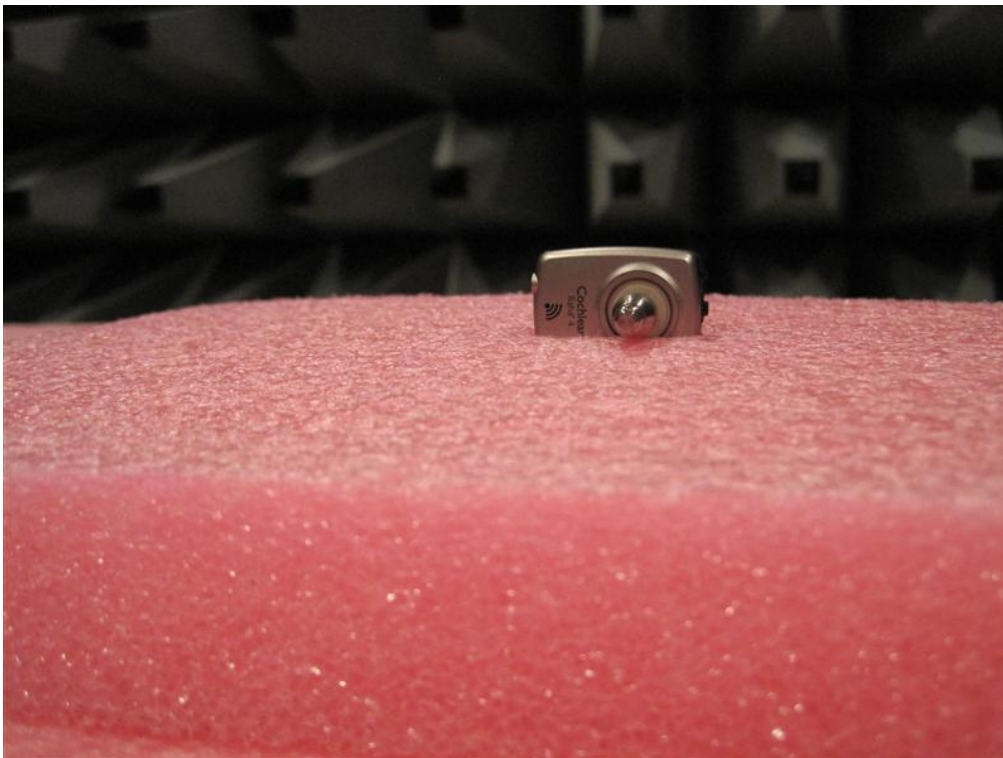


Photo 4.3.2 Test setup regarding measurement of radiated emission above 1 GHz.



#### 4.4 Measurement of field strength of fundamental

Test object	Baha4	Sheet	RE_Spur-6
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010245	Date	23 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	CMT
Specification	See Section 1, Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Complete search, antenna distance 3 m	Humidity	15 % RH
Detector	Peak and Average	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB

Frequency [MHz]	Peak measurement [dB $\mu$ V/m]	Peak limit [dB $\mu$ V/m]	DCCF ( $\delta$ ) [dB]	Corrected average measurement [dB $\mu$ V/m]	Average limit [dB $\mu$ V/m]	Remarks
2404	87.6	114	-	-	-	Passed
2404	87.6	-	20	67.6	94	Passed
2440	85.9	114	-	-	-	Passed
2440	85.9	-	20	65.9	94	Passed
2478	87.1	114	-	-	-	Passed
2478	87.1	-	20	67.1	94	Passed

Note 1: -

Test result	<p>The measured peak field strengths were below the peak and average limits.</p> <p>The measured peak field strengths corrected with the DCCF (<math>\delta</math>) were below the peak and average limits.</p> <p>Corrected average: <math>P_{\text{Average}}(\text{resulting}) = P_{\text{peak}} + \text{DCCF}(\delta)</math>.</p>
Test Port	Enclosure
Test frequency	2404, 2440 & 2478 MHz
Test mode	Continuous Tx - GFSK modulation - hopping between low, mid and high operating frequency
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization

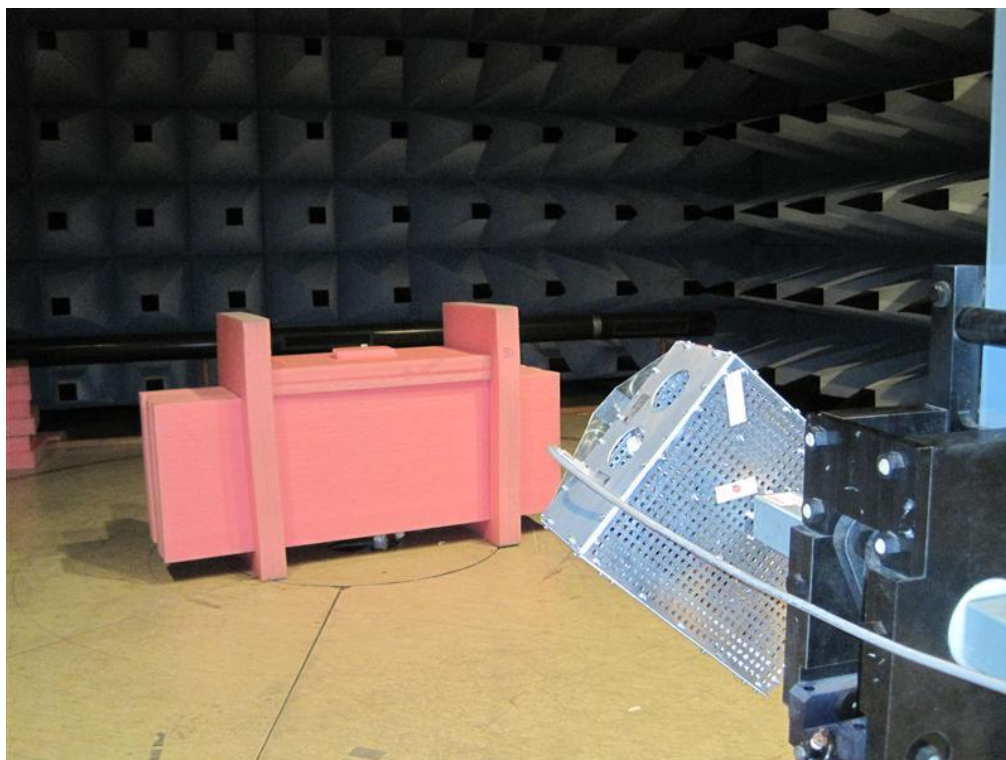


Photo 4.4.1 Test setup regarding measurement of field strength of fundamental.

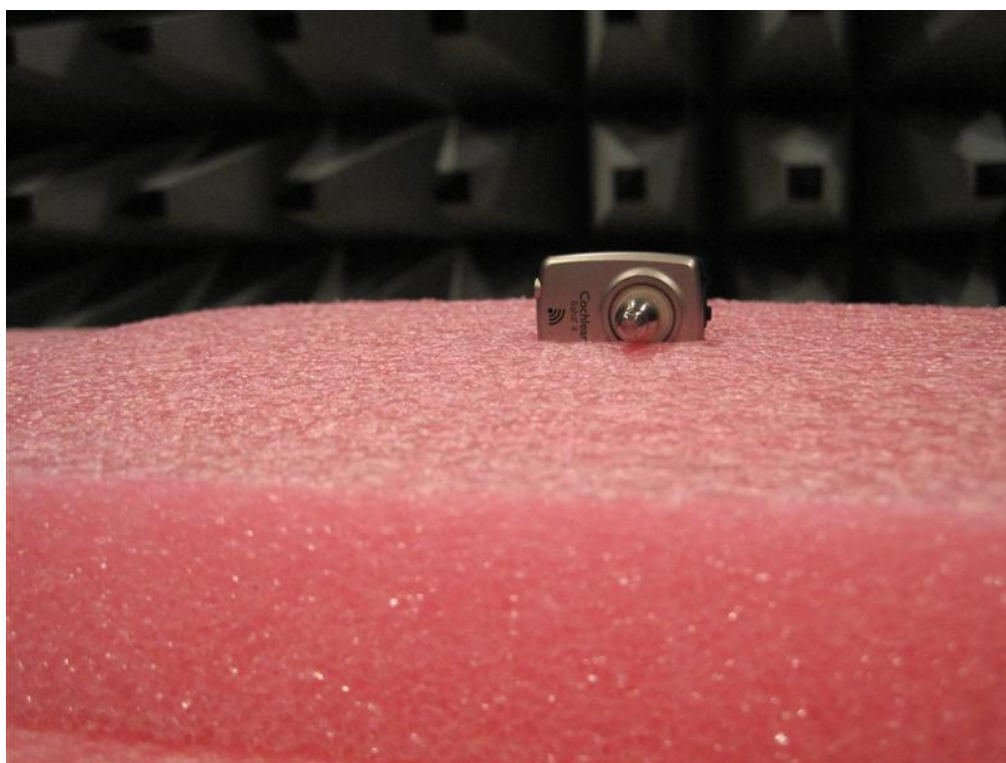


Photo 4.4.2 Test setup regarding measurement of field strength of fundamental.



#### 4.5 Measurement of band edge compliance

Test object	Baha4	Sheet	PROF-1
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	23 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	CMT
Specification	See Section, 1 Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Complete search, antenna distance 3 m.	Humidity	15 % RH
Detector	Peak and average for 1 GHz to 25 GHz	Bandwidth	100 kHz
Test equipm.	EMI room Hørsholm 49086 49600 49624 49625	Uncertainty	4.9 dB

Band Edge frequency [MHz]	Operating frequency [MHz]	Average / Peak	Fundamental field strengths [dB $\mu$ V/m]	Marker-delta method [dB]	Corrected [dB $\mu$ V/m]	Limit at Band Edge [dB $\mu$ V/m]	Remarks
2400	2404	Average	47.5	-	-	54	-
2400	2404	Peak	65.2	-	-	74	-
2483.5	2478	Average	31.3	-	-	54	-
2483.5	2478	Peak	57.1	-	-	74	-
Note 1: -							

Test result            The measured peak and average field strengths at the band edge were below the peak and average limits

Test Port             Enclosure

Test frequency      2404 and 2478 MHz

Test mode            Continuous Tx - GFSK modulation - hopping between low, mid and high operating frequency

Condition            Normal

Compliant            Yes

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



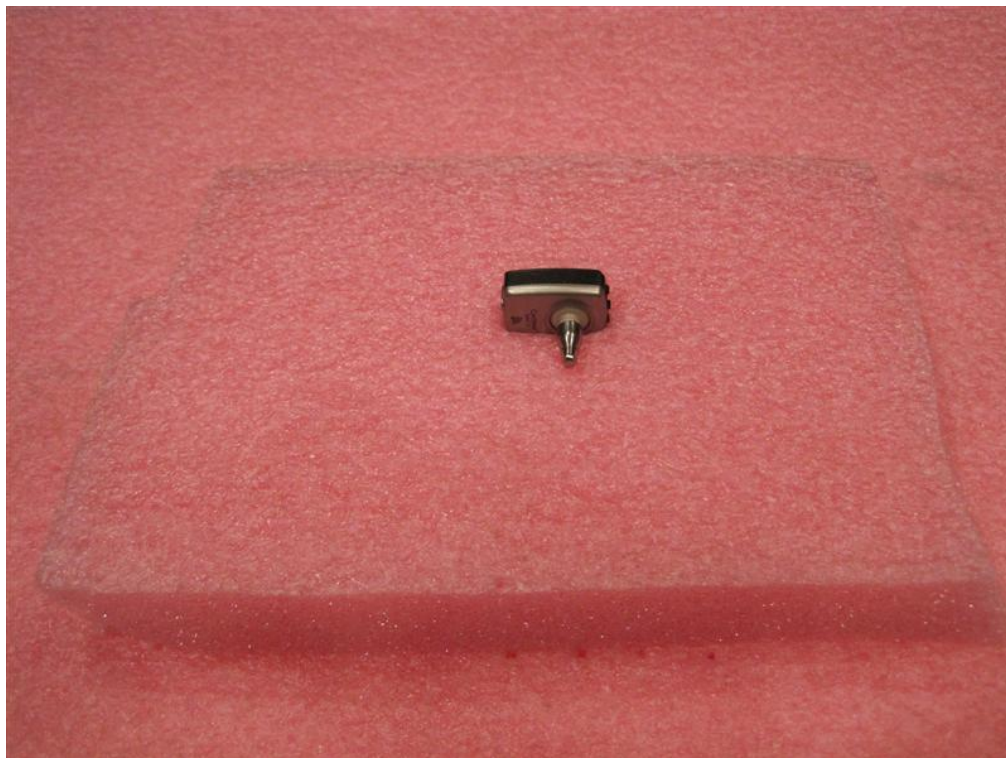


Photo 4.5.1 Test setup regarding measurement of band edge compliance.

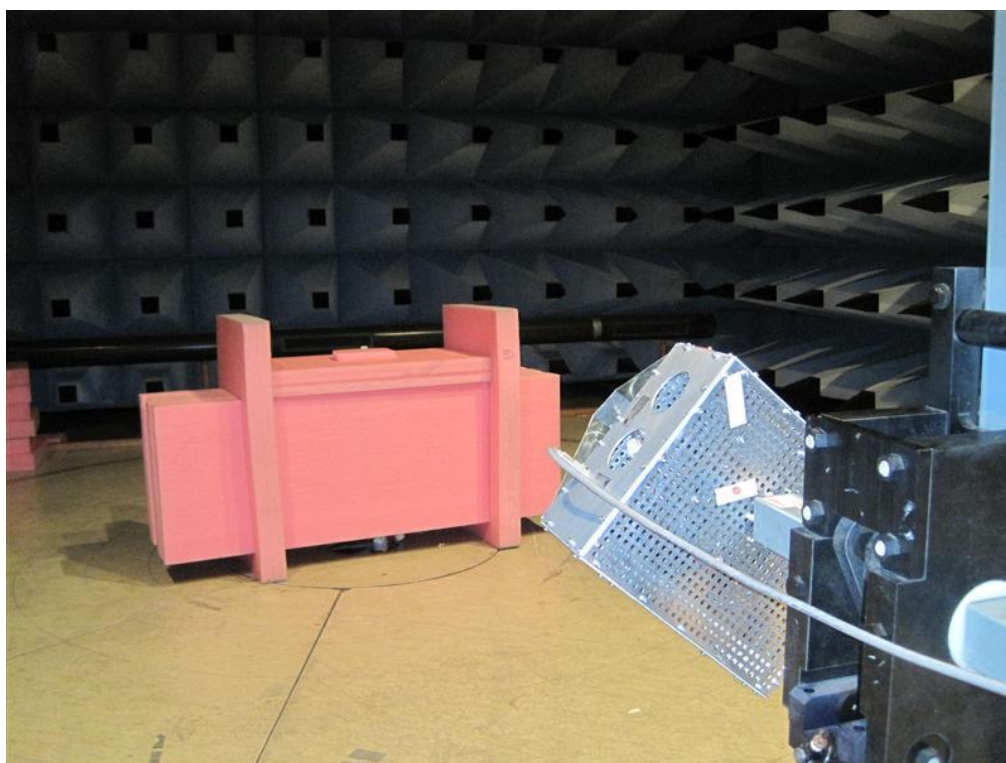
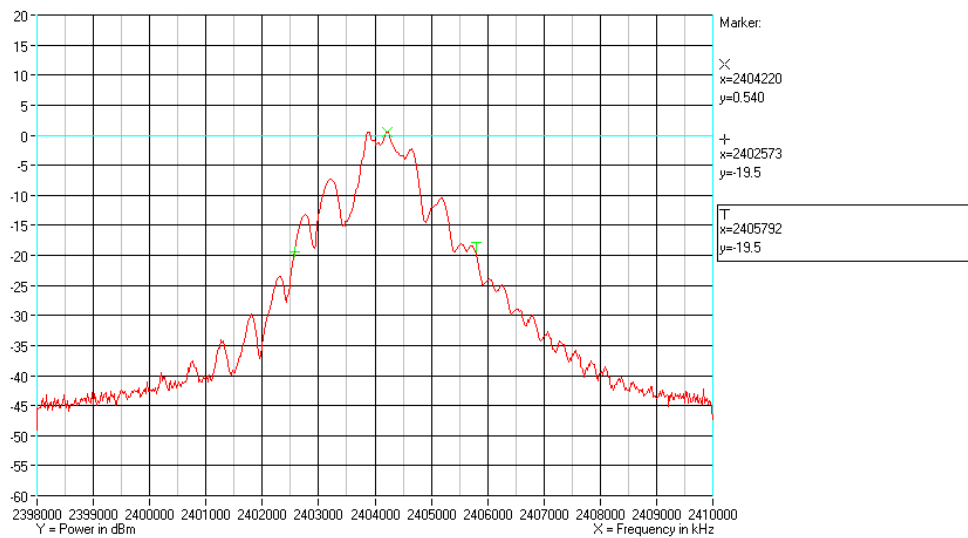


Photo 4.5.2 Test setup regarding measurement of band edge compliance.

#### 4.6 Measurement of 20 dB bandwidth

Test object	Baha4	Sheet	PROF-2
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	26 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1, Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Test voltage: External power supply at 1.45 VDC	Humidity	34 % RH
Test equipm.	Climatic chamber EVFGT-17 49550 49663	Uncertainty	1.1 dB
SA Settings	RBW: 100 MHz VBW: 100 MHz SPAN: 12 MHz DET: Peak CF: 2404 MHz Trace: Max Hold		



Comments

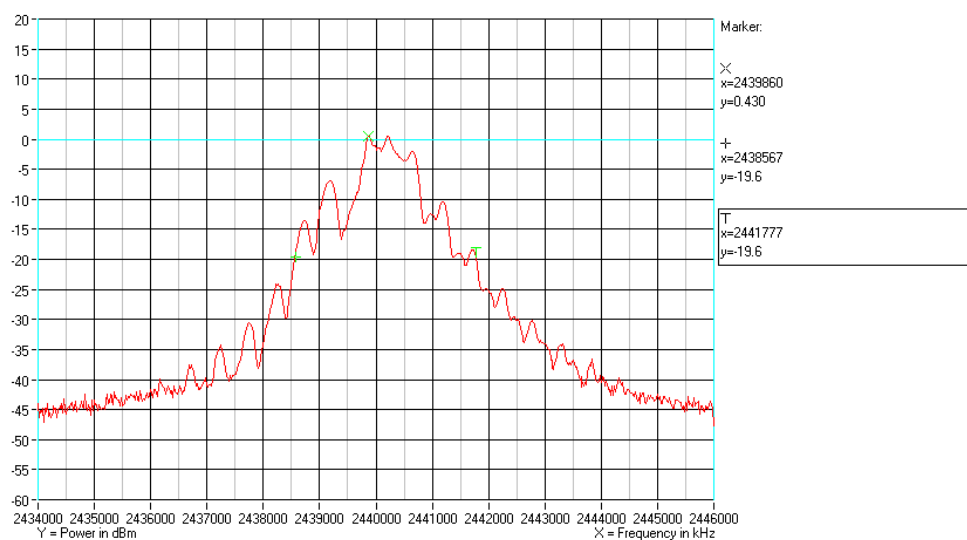
Operating frequency: 2404 MHz





Test object	Baha4	Sheet	PROF-3
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	26 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1, Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Test voltage: External power supply at 1.45 VDC	Humidity	34 % RH
Test equipm.	Climatic chamber EVFGT-17 49550 49663	Uncertainty	1.1 dB
SA Settings	RBW: 100 MHz VBW: 100 MHz SPAN: 12 MHz DET: Peak CF: 2440 MHz Trace: Max Hold		



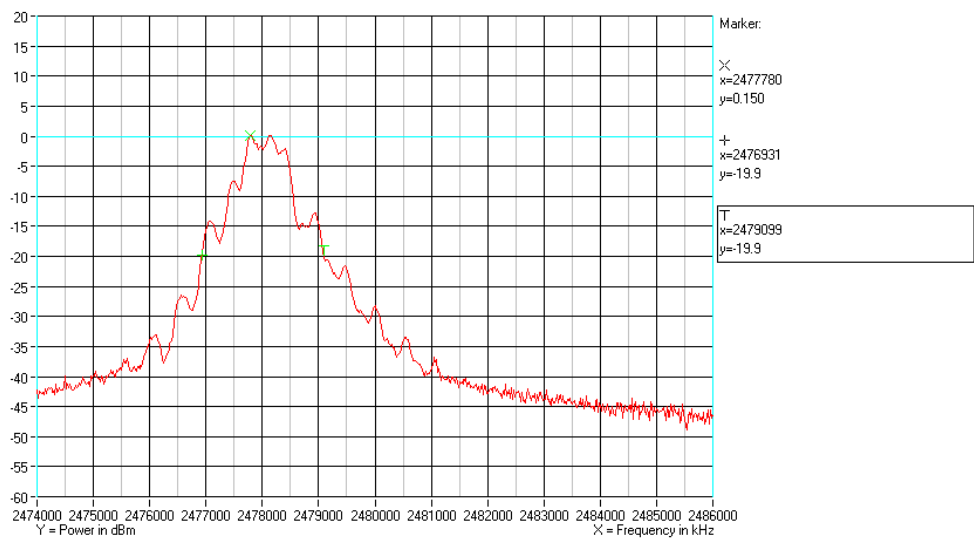
Comments

Operating frequency: 2440 MHz



Test object	Baha4	Sheet	PROF-4
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	26 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1, Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Test voltage: External power supply at 1.45 VDC	Humidity	34 % RH
Test equipm.	Climatic chamber EVFGT-17 49550 49663	Uncertainty	1.1 dB
SA Settings	RBW: 100 MHz VBW: 100 MHz SPAN: 12MHz DET: Peak CF: 2478 MHz Trace: Max Hold		



Comments

Operating frequency: 2478 MHz



Test object	Baha4	Sheet	PROF-5
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	26 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1, Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Test voltage: External power supply at 1.45 VDC	Humidity	34 % RH
Test equipm.	Climatic chamber EVFGT-17 49550 49663	Uncertainty	1.1 dB
SA Settings	RBW: 100 MHz VBW: 100 MHz SPAN: 12 MHz DET: Peak CF: 2404/2440/2478 MHz Trace: Max Hold		

Operating frequency [MHz]	Conducted peak measurement [dBc]	Low frequency [MHz]	High frequency [MHz]	20 dB BW [MHz]
2404	20	2402.573	2405.792	3.219
2440	20	2438.567	2441.777	3.210
2478	20	2476.931	2479.099	2.168

Note 1: -

Operating frequency [MHz]	Measured [MHz]	Limit [MHz]	Remarks
Lowest frequency	2402.573	2400.00	Passed
Highest frequency	2479.099	2483.50	Passed

Band edge criteria	20 dB bandwidth
Test result	The measured 20 dB bandwidth were within limit designated in 15.215(c)
Test port	Antenna replaced by SMA connector
Test frequency	2404, 2440 & 2478 MHz
Test mode	Continuous Tx - GFSK modulation - hopping between low, mid and high operating frequency
Condition	Normal
Compliant	Yes
Comments	None





Photo 4.6.1 Test setup regarding measurement of 20 dB bandwidth.

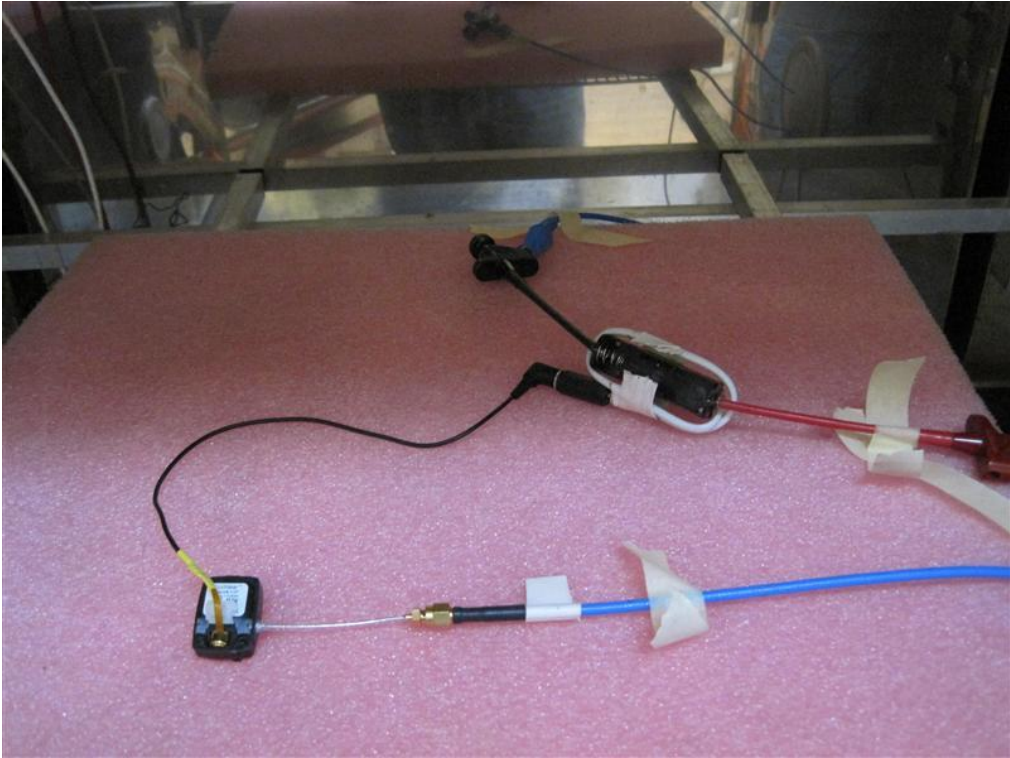


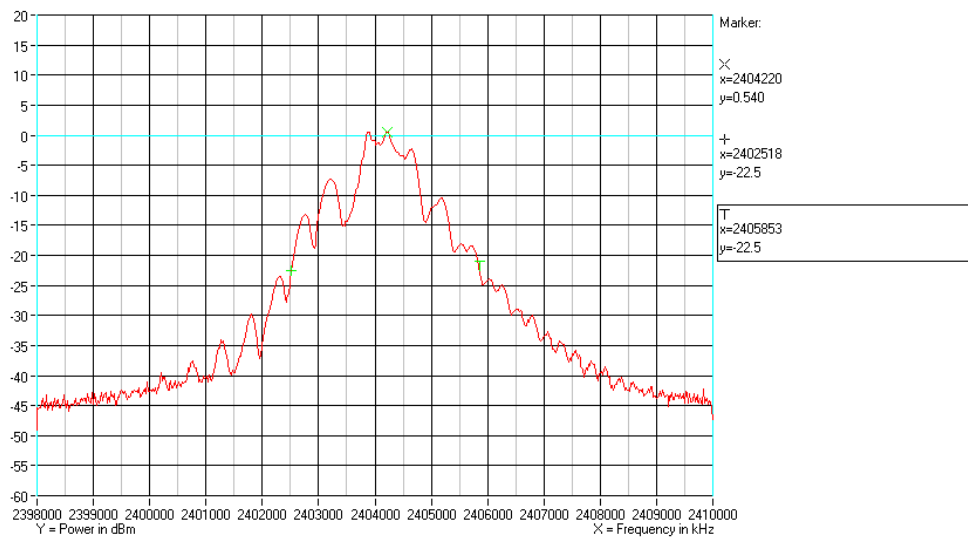
Photo 4.6.2 Test setup regarding measurement of 20 dB bandwidth.



#### 4.7 Measurement of occupied bandwidth, IC

Test object	Baha4	Sheet	PROF-6
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	26 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1, Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1	Temperature	23 °C
Characteristics	Test voltage: External power supply at 1.45 VDC	Humidity	34 % RH
Test equipm.	Climatic chamber EVFGT-17 49550 49663	Uncertainty	1.1 dB
SA Settings	RBW: 100 MHz VBW: 100 MHz SPAN: 12 MHz DET: Peak CF: 2404 MHz Trace: Max Hold		



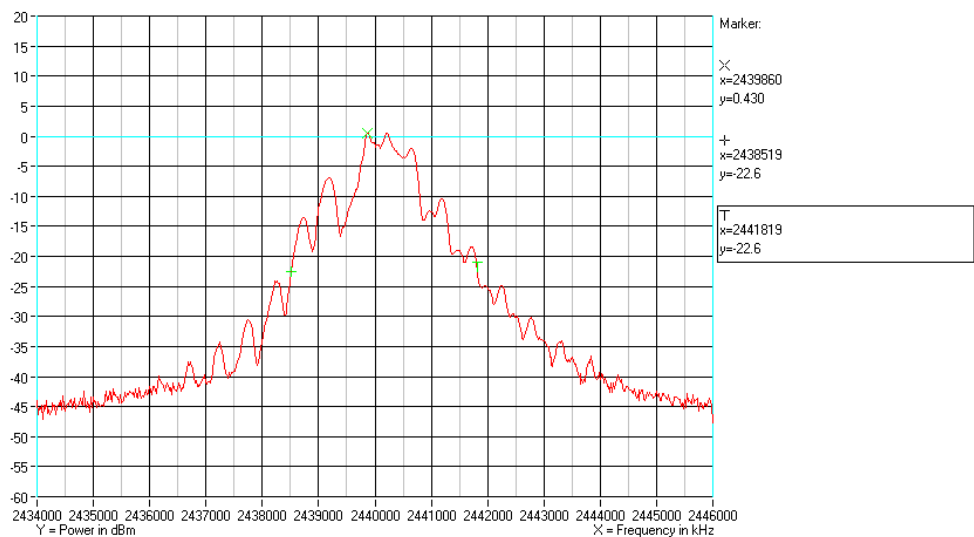
Comments

Operating frequency: 2404 MHz



Test object	Baha4	Sheet	PROF-7
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	26 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1 Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1	Temperature	23 °C
Characteristics	Test voltage: External power supply at 1.45 VDC	Humidity	34 % RH
Test equipm.	Climatic chamber EVFGT-17 49550 49663	Uncertainty	1.1 dB
SA Settings	RBW: 100 MHz VBW: 100 MHz SPAN: 12 MHz DET: Peak CF: 2440 MHz Trace: Max Hold		



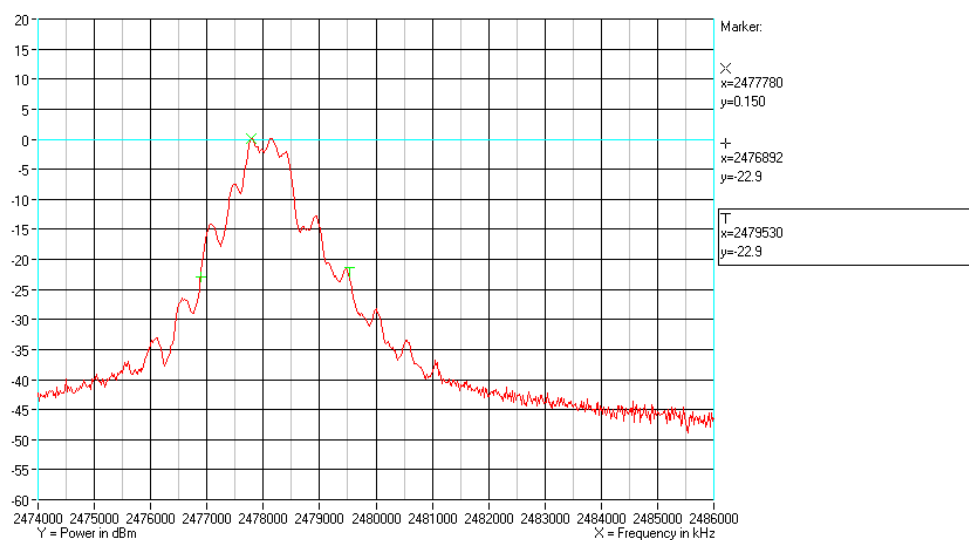
Comments

Operating frequency: 2440 MHz



Test object	Baha4	Sheet	PROF-8
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	26 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1 Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1	Temperature	23 °C
Characteristics	Test voltage: External power supply at 1.45 VDC	Humidity	34 % RH
Test equipm.	Climatic chamber EVFGT-17 49550 49663	Uncertainty	1.1 dB
SA Settings	RBW: 100 MHz VBW: 100 MHz SPAN: 12 MHz DET: Peak CF: 2478 MHz Trace: Max Hold		



Comments

Operating frequency: 2478 MHz

Test object	Baha4	Sheet	PROF-9
Type	Baha4	Project no.	T204709-3
Serial no.	3010120010191	Date	26 Feb. 2013
Client	Cochlear Bone Anchored Solutions AB	Initials	JAS
Specification	See Section 1, Summary of tests	Frequency	2400 to 2483.5 MHz

Test method	IC Standard RSS-Gen, Issue 3:2010 - Section 4.6.1	Temperature	23 °C
Characteristics	Test voltage: External power supply at 1.45 VDC	Humidity	34 % RH
Test equipm.	Climatic chamber EVFGT-17 49550 49663	Uncertainty	1.1 dB
SA Settings	RBW: 100M Hz VBW: 100 MHz SPAN: 12 MHz DET: Peak CF: 2404/2440/2478 MHz Trace: Max Hold		

Operating frequency [MHz]	Low frequency [MHz]	High frequency [MHz]	Measured 99% emission bandwidth [MHz]
2404	2402.518	2405.853	3.335
2440	2438.519	2441.819	3.300
2478	2476.892	2479.530	2.638

Note 1: -

Band edge criteria	Measured 99 % emission bandwidth (23 dBc)
Test port	Antenna replaced by SMA connector
Test frequency	2404, 2440 and 2478 MHz
Test mode	Continuous Tx - GFSK modulation - hopping between low, mid and high operating frequency
Condition	Normal
Comments	None







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

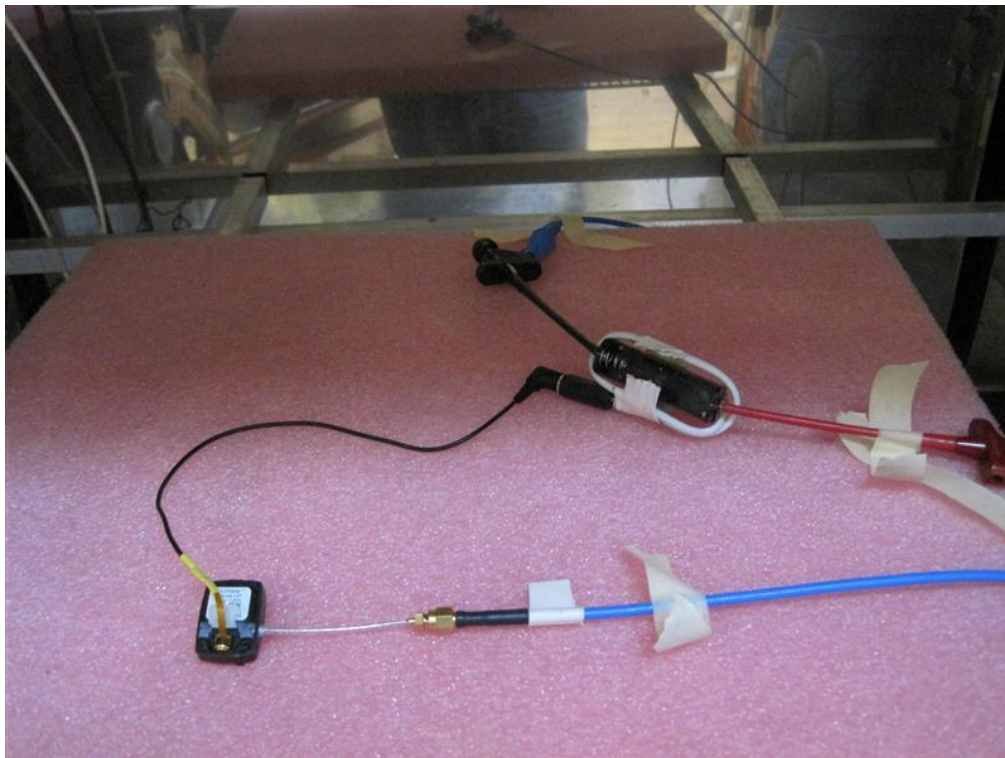


Photo 4.7.2 Test setup regarding measurement of occupied bandwidth, IC.



## 5. National registrations and accreditations

### 5.1 DANAK Accreditation

**Organization:** Danish Accreditation and Metrology Fund - DANAK, see [www.danak.dk](http://www.danak.dk) and [www.ilac.org](http://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 22:2008 is equivalent to CAN/CSA CISPR 22-10 specified in ICES-003:2012, 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 and T-1547  
EMC room 3 Hørsholm (EMC-3): C-2532 and T-1548  
EMC room 4 Hørsholm (EMC-4): C-2533 and T-1549  
EMI room Hørsholm (EMC-5): R-1180, C-706, T-1550  
and 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 No.	Cal. date	Cal. exp.
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A	26-10-2012	26-10-2014
29861	EMI-SOFTWARE VER. 1.60	ROHDE & SCHWARZ	ES-K1, PART: 1026.6790.02	-	-
49086	REMI EMISSION SOFTWARE PACKAGE v. 2.133, ROOM 5	NeWeTec	REMI	-	-
49550	SIGNAL ANALYZER	ROHDE & SCHWARZ	FSQ8	28-02-2012	28-02-2013
49600	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESU40	08-01-2013	08-01-2014
49624	DUAL RIDGE HORN ANTENNA – 1 GHz – 26 GHz (2 GHz – 32 GHz)	SATIMO	SH2000	19-09-2011	19-09-2014
49625	SRD COAX SWITCH MATRIX USED IN 1GHZ TO 26GHZ SRD ANTENNASYSTEM	DELTA	COAX SWITCH MATRIX	11-05-2012	11-05-2013
49663	DC POWER SUPPLY	Agilent	66319D	26-11-2012	26-11-2013



## Annex 1

### Transmitter out-of-band emission table

<b>Transmitter out-of-band Emission Table</b>										
Project No.	T204709-3									
Client	Cochlear Bone Anchored Solutions AB									
Product	Baha4									
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 500uV/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.										
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	Comments	
2404	64,4	29,3	32,5	67,6	In-band	-	-	Tx @ 2404 MHz, Fundamental	Noise floor	
4808	51,5	68,2	37,0	20,3	54,0	33,7	PASS	Tx @ 2404 MHz, 2nd harmonic	Noise floor	
7212	*	*	*	*	*	*	PASS	Tx @ 2404 MHz, 3rd harmonic		
9616	*	*	*	*	*	*	PASS	Tx @ 2404 MHz, 4th harmonic		
2440	61,9	29,1	33,1	65,9	In-band	-	-	Tx @ 2440 MHz, Fundamental	Noise floor	
4880	51,3	68,2	37,0	20,1	54,0	33,9	PASS	Tx @ 2440 MHz, 2nd harmonic	Noise floor	
7320	*	*	*	*	*	*	PASS	Tx @ 2440 MHz, 3rd harmonic		
9760	*	*	*	*	*	*	PASS	Tx @ 2440 MHz, 4th harmonic		
2478	61,8	29,1	34,4	67,1	In-band	-	-	Tx @ 2478 MHz, Fundamental	Noise floor	
4956	53,6	68,2	37,0	22,4	54,0	31,6	PASS	Tx @ 2478 MHz, 2nd harmonic	Noise floor	
7434	*	*	*	*	*	*	PASS	Tx @ 2478 MHz, 3rd harmonic		
9912	*	*	*	*	*	*	PASS	Tx @ 2478 MHz, 4th harmonic		
* : The result is below the general limit (54 dBuV/m)										
Max. in-band emission:	67,6 dBuV/m, AV @ 3 m									
Test result:	All out-of-band emission is below the general limit (54 dBuV/m)									
Compliant:	Yes.									

