

TEST REPORT

Test report no.: 1-5344/12-01-04-A



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH
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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS). The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01
Area of Testing: Radio/Satellite Communications

Applicant

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Laubisrütistrasse 28
8712 Stäfa / SWITZERLAND
Phone: -/-
Fax: +41 5 89 28 20 11
Contact: Valentina Shcherba
e-mail: valentina.shcherba@phonak.com
Phone: +41 5 89 28 01 01

Manufacturer

Phonak AG
Laubisrütistrasse 28
8712 Stäfa / SWITZERLAND

Test standard/s

47 CFR Part 15 Title 47 of the Code of Federal Regulations; Chapter I
Part 15 - Radio frequency devices
RSS - 210 Issue 8 Spectrum Management and Telecommunications - Radio Standards Specification
Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands):
Category I Equipment

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item: Wireless Hearing Instrument
Model name: Phonak Bolero Q90-M13
Phonak Bolero Q70-M13
Phonak Bolero Q50-M13
FCC ID: KWC-WHSSANQ
IC: 2262A-WHSSANQ
Frequency: 10.6 MHz
Technology tested: Magnetic coupling
Antenna: Integrated coil antenna
Power Supply: 1.45 V DC by Zink - Air battery P13
Temperature Range: Not needed!



This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

Stefan BöS
Senior Testing Manager

Test performed:

Marco Bertolino
Testing Manager

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2012-09-17
Date of receipt of test item:	2012-09-17
Start of test:	2012-09-17
End of test:	2012-09-18
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2010-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	2010-12	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	-/- °C during high temperature tests
	T_{min}	-/- °C during low temperature tests
Relative humidity content:		48 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	1.45 V DC by Zink - Air battery P13
	V_{max}	-/- V
	V_{min}	-/- V

5 Test item

Kind of test item	:	Wireless Hearing Instrument
Type identification	:	Phonak Bolero Q90-M13
Variants	:	Difference in audiological Features / same RF part: Phonak Bolero Q70-M13 Phonak Bolero Q50-M13
S/N serial number	:	TX: 1219H07EK; 1219H07EJ RX: 1219H07EG
HW hardware status	:	Hybrid WH22
SW software status	:	1.0.8.0
Frequency band [MHz]	:	10.6 MHz
Type of radio transmission	:	F1D inductive
Use of frequency spectrum	:	
Channel access method	:	-/-
Type of modulation	:	FSK
Number of channels	:	1
Antenna	:	Integrated coil antenna
Power supply	:	1.45 V DC by Zink - Air battery P13
Temperature range	:	Not needed!

6 Test laboratories sub-contracted

None

7 Summary of measurement results



No deviations from the technical specifications were ascertained



There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8	Passed	2012-09-20	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Results
§ 15.35 (c) / RSS-GEN Issue 3 Section 4.5	Timing of the transmitter (Duty cycle correction factor)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
RSS-GEN Issue 3	Bandwidth of the modulated carrier	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.223 / RSS-210 Issue 8	Fieldstrength of fundamental	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.209 (a) / RSS-210 Issue 8	Fieldstrength of harmonics and spurious	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.109 / RSS-210 Issue 8	Receiver spurious emissions	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.107 / § 15.207	Conducted limits	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	-

Note: NA = Not Applicable; NP = Not Performed

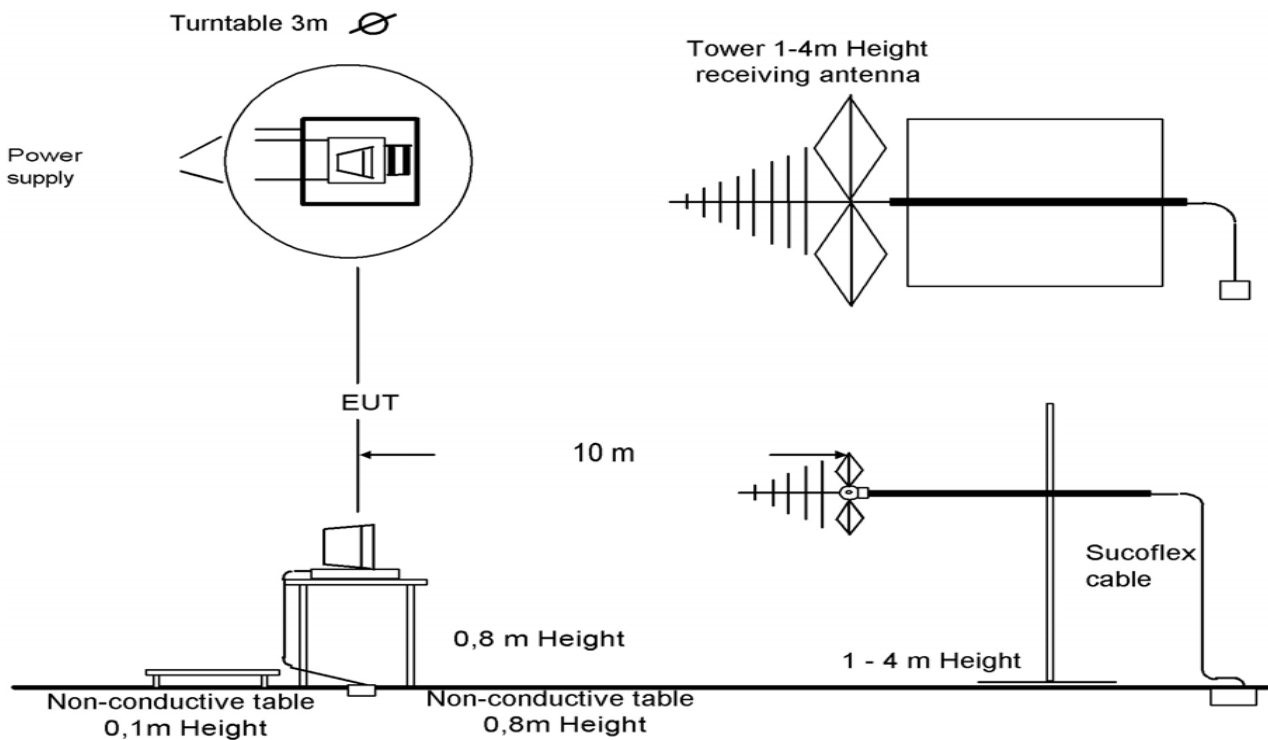
8 RF measurements

8.1 Description of test setup

8.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63.2-1996 and ANSI C63.4-2009. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-2003. Antennas are confirmed with ANSI C63.2-1996 item 15.

Semi anechoic chamber



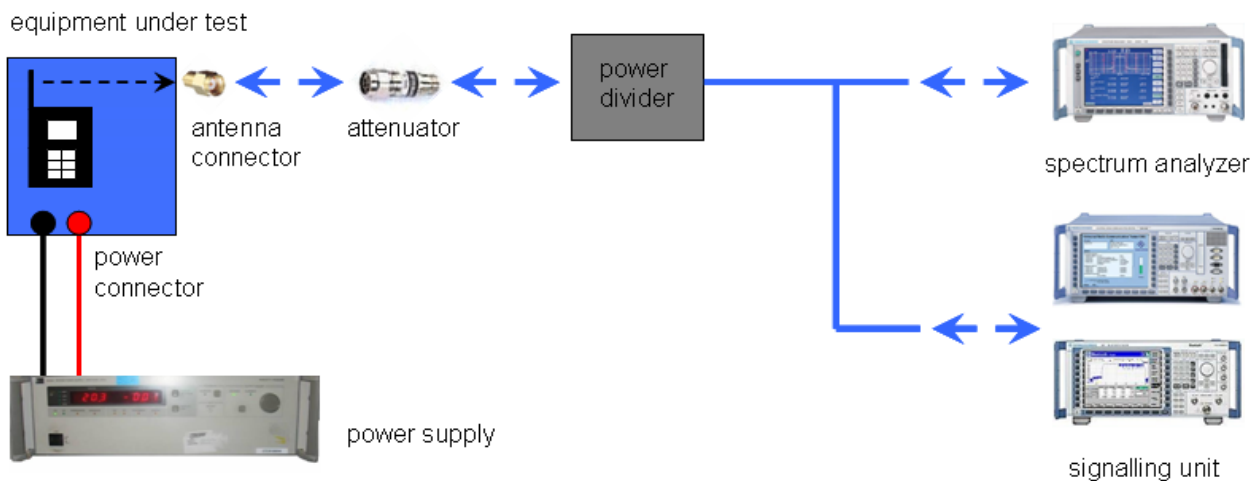
Picture 1: Diagram radiated measurements

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

The EUT is powered by an external power supply with nominal voltage. The signalling (if needed) is performed from outside the chamber with a signalling unit by air link using signalling antenna.

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, and the spectrum analyzer are impedance matched on 50 Ohm.



Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: User_Guide_Bolero_Q_92x125_GB_V1.01_029-0235-02

Test Instructions_Phonak Bolero Q90 - M13

Special test descriptions: Phonak Bolero Q90-M13 version was tested!

Configuration descriptions: None

8.3 RSP100 test report cover sheet / performance test data

Test Report Number	:	1-5344/12-01-04-A
Equipment Model Number	:	Phonak Bolero Q90-M13 Phonak Bolero Q70-M13 Phonak Bolero Q50-M13
Certification Number	:	2262A-WHSSANQ
Manufacturer (complete Address)	:	Phonak AG Laubisrütistrasse 28 8712 Stäfa / SWITZERLAND
Tested to radio standards specification no.	:	RSS 210, Issue 8, Annex 8
Open Area Test Site IC No.	:	IC 3462C-1
Frequency Range or fixed frequency	:	10.6 MHz
Field Strength [dBµV/m] (at which distance)	:	34 @ 1 m
Occupied bandwidth (99%-BW) [kHz]	:	546
Type of modulation	:	F1D
Emission Designator (TRC-43)	:	546KF1D
Antenna Information	:	Integrated coil antenna
Transmitter Spurious (worst case) [dBµV/m @ 3m]:		32 @ 1 GHz (noise floor)
Receiver Spurious (worst case) [dBµV/m @ 3m]:		32 @ 1 GHz (noise floor)

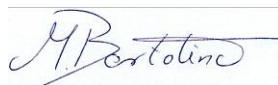
ATTESTATION:**DECLARATION OF COMPLIANCE:**

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory Manager:

2012-09-20

Marco Bertolino



Signature

9 Measurement results

9.1 Timing of the transmitter

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	See plots
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	Zero span
Trace-Mode:	Single sweep

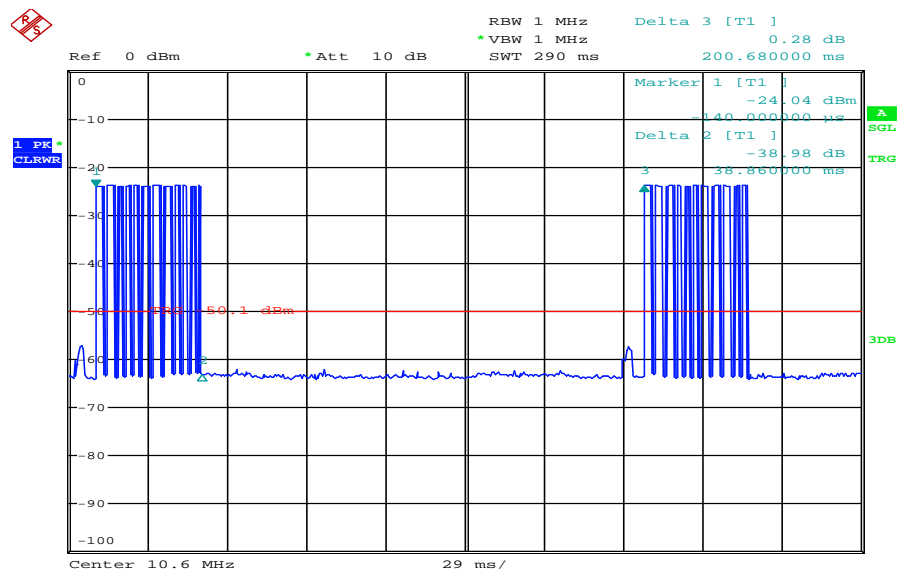
Limits:

FCC	IC
Timing of the transmitter	
(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.	

Result: Passed.

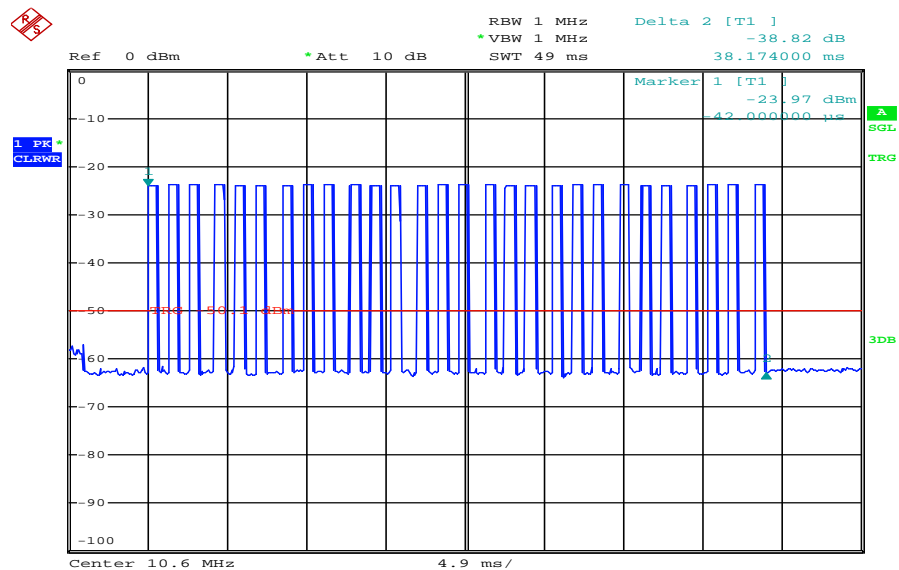
Plots:

Plot 1:



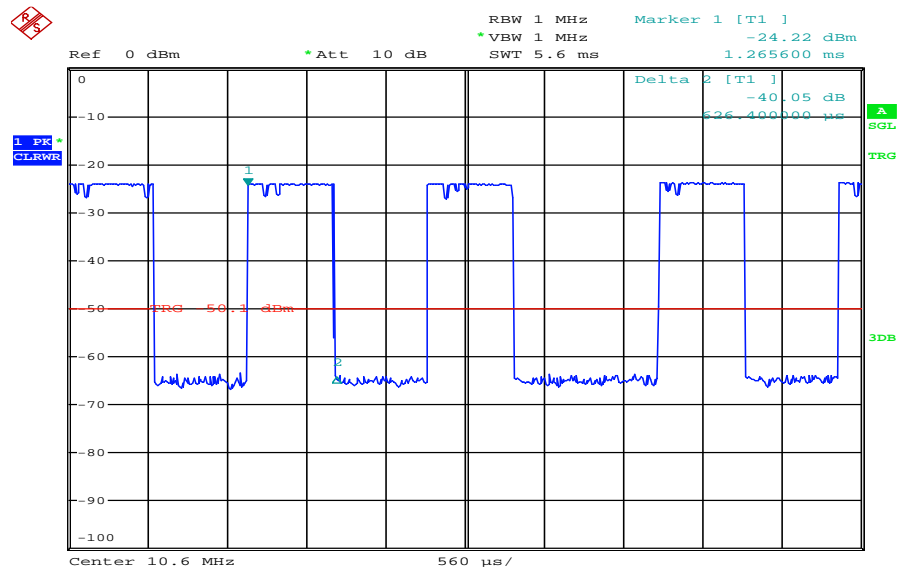
Date: 18.SEP.2012 10:59:15

Plot 2:



Date: 18.SEP.2012 11:00:13

Plot 3:



Date: 18.SEP.2012 11:01:47

TXon (Burst): 626.4 μ s

Burst @ pulse train: 28

Time complete: 200.68 ms

28 x 626.4 μ s = 17.54 ms

Duty cycle: 8.74 %

9.2 Bandwidth of the modulated carrier

Limits:

FCC	IC
Bandwidth of the modulated carrier	

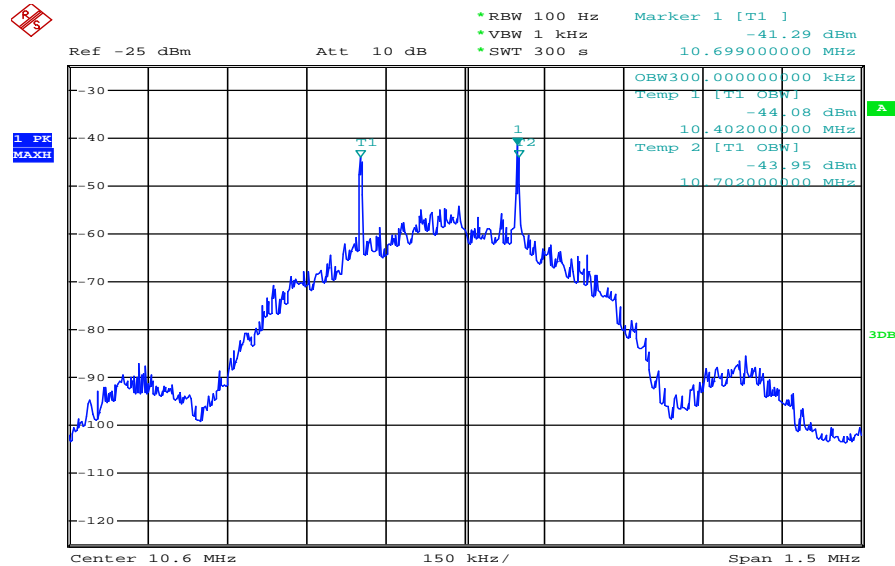
Measured with the integrated OBW-function of the spectrum analyser Rohde & Schwarz (measurement criteria is the integrated power in %)

Result:

	Occupied Bandwidth (kHz)
6 dB (75%)	300
20 dB (99%)	546

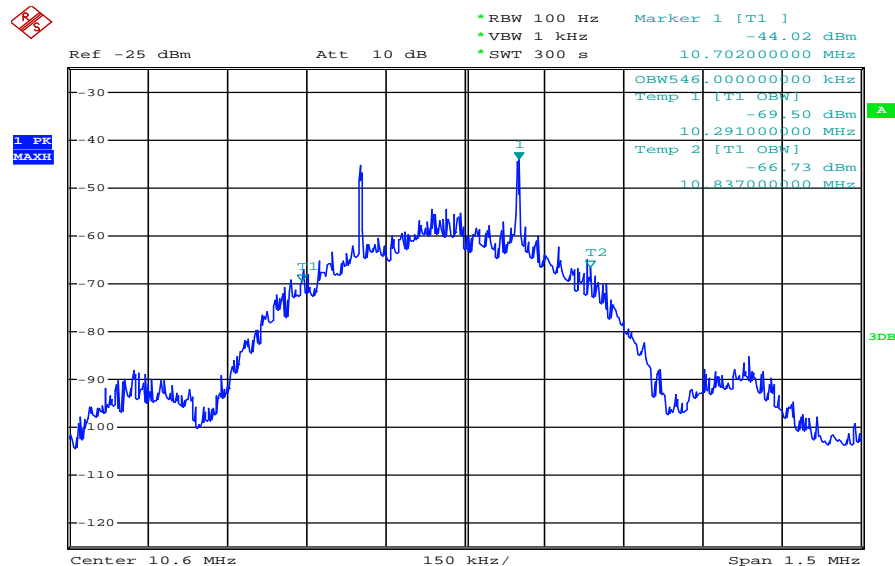
Plots:

Plot 1: 6dB (75%) – bandwidth



Date: 18.SEP.2012 10:40:11

Plot 2: 20dB (99%) - bandwidth



Date: 18.SEP.2012 10:19:17

9.3 Field strength of the fundamental

Measurement:

Measurement parameter	
Detector:	Quasi Peak (CISPR)
Resolution bandwidth:	10kHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
Fundamental Frequency (MHz)	Field strength of Fundamental ($\mu\text{V/m}$)	Measurement distance (m)
1.705 – 30.0	30	30

Result:

TEST CONDITIONS		MAXIMUM POWER ($\text{dB}\mu\text{V/m}$)	
Frequency		10.6 MHz	10.6 MHz
Mode		at 1 m distance	at 30 m distance
T_{nom}	V_{nom}	34	-26
Measurement uncertainty		$\pm 3\text{dB}$	

Recalculation to a measurement distance of 30m with a correction of 40 dB/decade.

Result: **Passed.**

Noise floor: 26.5 dB μ V/m

***Note:**

- Calculation: Measured maximum field strength @ 1 m distance: 34.0 dB μ V/m

Correction factor from 1 m to 10 m: -40 dB (40 dB / decade)

34.0 dB μ V/m @ 1 meter - 40 dB = -6.0 dB μ V/m @ 10 meter

Correction factor from 1 m to 30 m: -60 dB (40 dB / decade)

34.0 dB μ V/m @ 1 meter - 60 dB = -26.0 dB μ V/m @ 30 meter

9.4 Field strength of the harmonics and spurious

Measurement:

Measurement parameter	
Detector:	Average / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	3 kHz – 120 kHz
Video bandwidth:	Comparable to RBW
Span:	Max hold
Trace-Mode:	Average / Quasi Peak

Limits:

FCC		IC
Field strength of the harmonics and spurious.		
Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dB $\mu\text{V/m}$)	30
30 – 88	100 (40 dB $\mu\text{V/m}$)	3
88 – 216	150 (43.5 dB $\mu\text{V/m}$)	3
216 – 960	200 (46 dB $\mu\text{V/m}$)	3

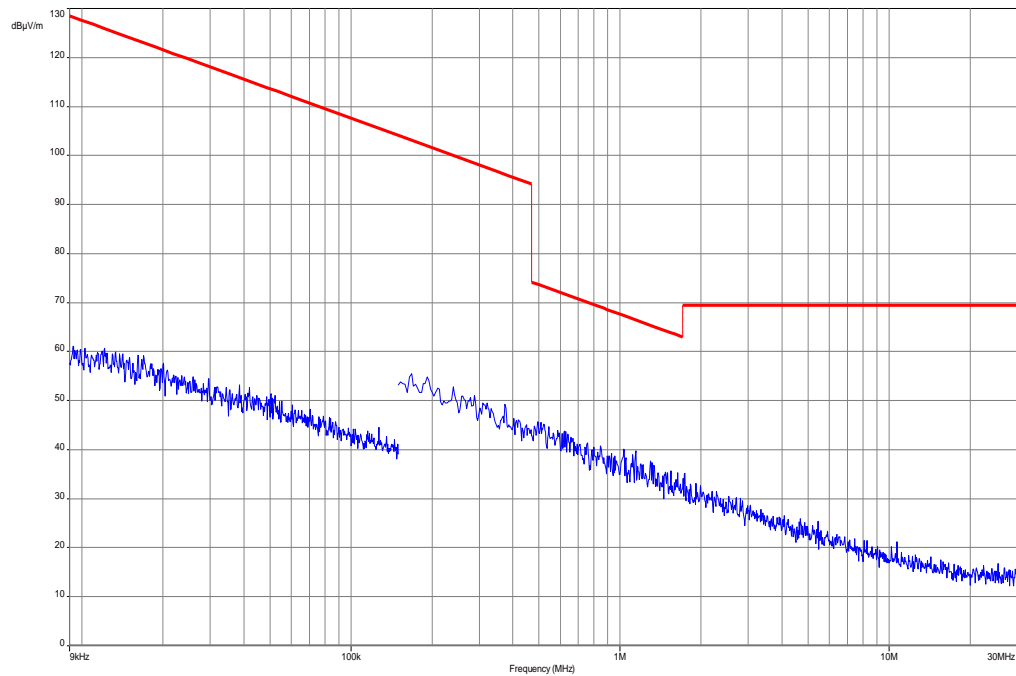
Result:

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dB $\mu\text{V/m}$]	Amplitude of emission [dB $\mu\text{V/m}$]	Results
No critical peaks detected. All detected emissions are below the limit!				

Result: **Passed.**

Plots:

Plot 1: 9 kHz – 30 MHz, magnetic



Plot 2: 30 MHz – 1000 MHz, vertical & horizontal polarization

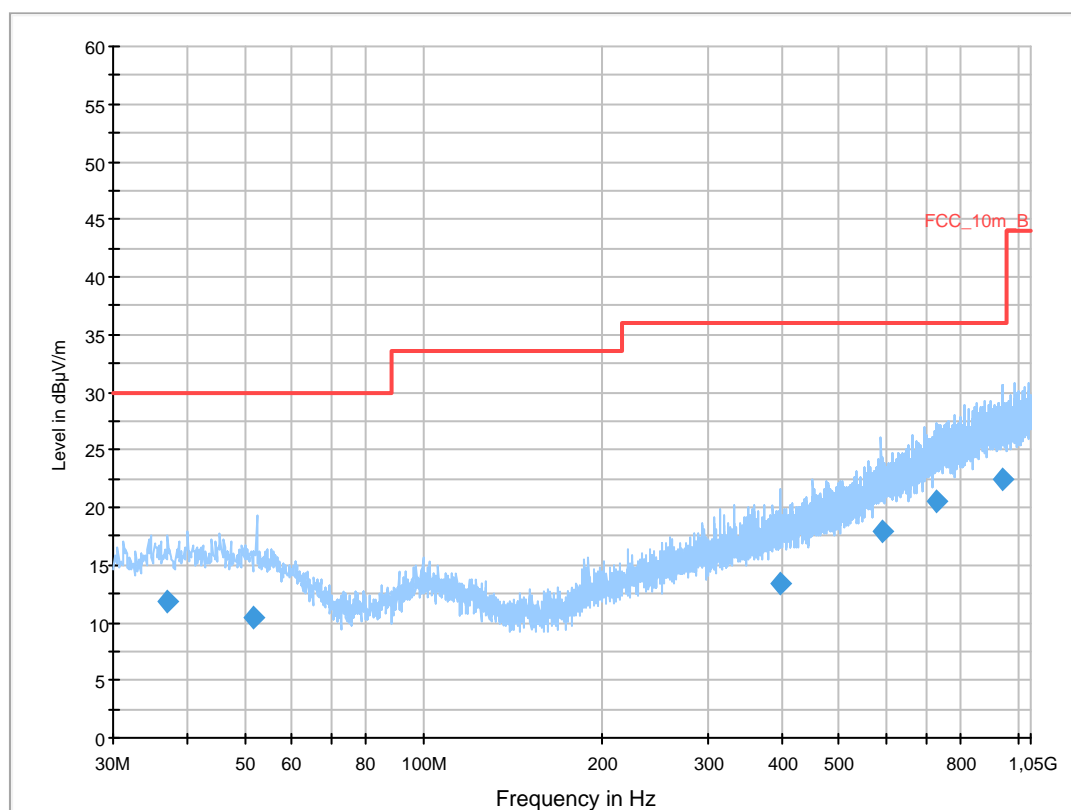
Common Information

EUT: Bolero Q90-M13
 Serial Number: 1219H07EK
 Test Description: FCC part 15 B class B @ 10 m
 Operating Conditions: tx mode
 Operator Name: Wolsdorfer
 Comment: bat powered

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
37.135950	11.8	1000.0	120.000	143.0	V	0.0	13.2	18.2	30.0	
51.820650	10.4	1000.0	120.000	98.0	V	270.0	13.2	19.6	30.0	
398.584200	13.3	1000.0	120.000	162.0	V	264.0	16.9	22.7	36.0	
589.277550	17.8	1000.0	120.000	170.0	V	81.0	20.5	18.2	36.0	
730.502250	20.4	1000.0	120.000	170.0	H	10.0	23.2	15.6	36.0	
941.274300	22.4	1000.0	120.000	170.0	V	190.0	25.3	13.6	36.0	

9.5 Receiver spurious emissions

Measurement:

Measurement parameter	
Detector:	Average / Quasi peak
Sweep time:	Auto
Resolution bandwidth:	3 kHz – 120 kHz
Video bandwidth:	Comparable to RBW
Span:	Max hold
Trace-Mode:	Average / Quasi peak

Limits:

FCC		IC
Field strength of the harmonics and spurious.		
Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dB $\mu\text{V/m}$)	30
30 – 88	100 (40 dB $\mu\text{V/m}$)	3
88 – 216	150 (43.5 dB $\mu\text{V/m}$)	3
216 – 960	200 (46 dB $\mu\text{V/m}$)	3

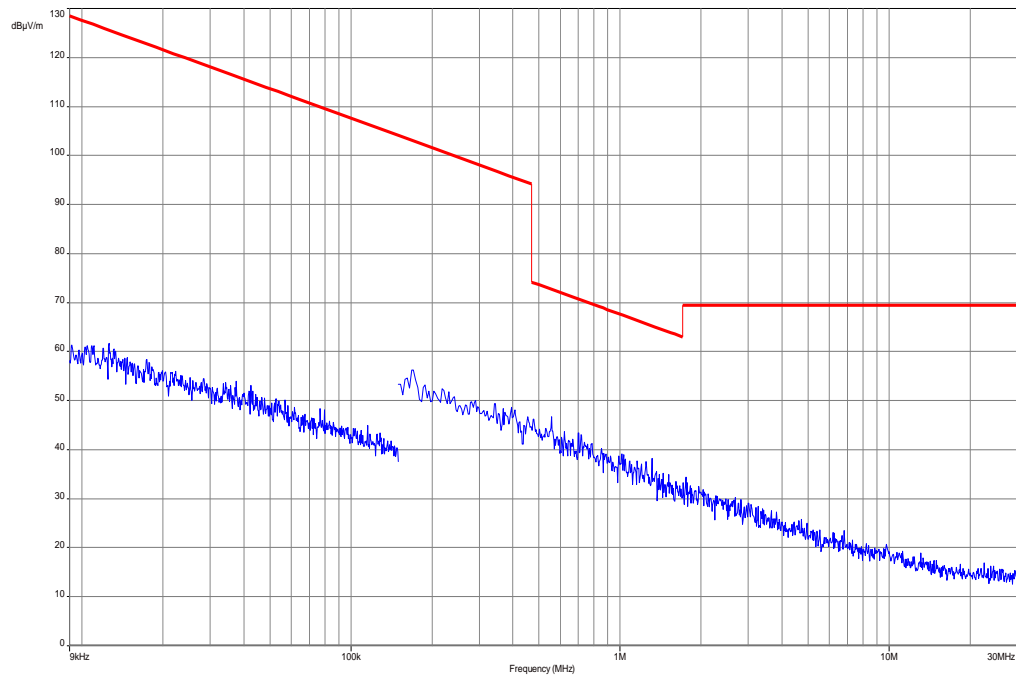
Result:

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dB $\mu\text{V/m}$]	Amplitude of emission [dB $\mu\text{V/m}$]	Results
No critical peaks detected. All detected emissions are below the limit!				

Result: Passed.

Plots:

Plot 1: 9 kHz – 30 MHz, magnetic



Plot 2: 30 MHz – 1000 MHz, vertical & horizontal polarization

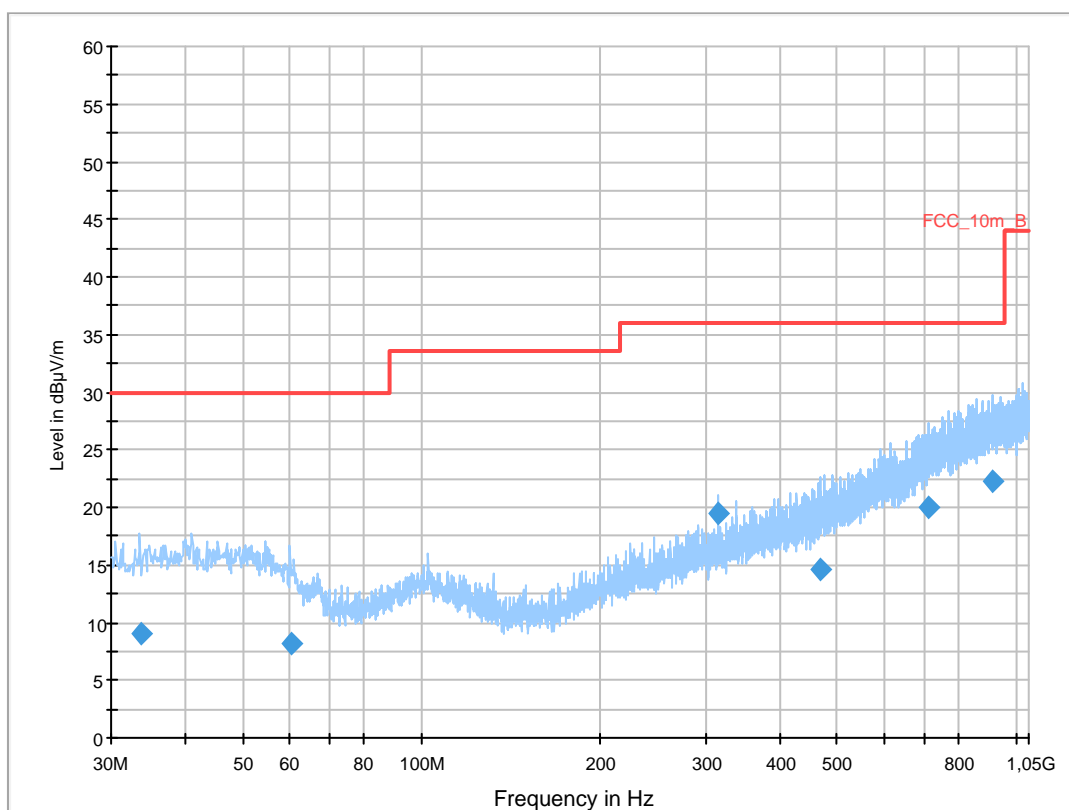
Common Information

EUT: Bolero Q90-M13
 Serial Number: 1219H07EG
 Test Description: FCC part 15 B class B @ 10 m
 Operating Conditions: rx mode
 Operator Name: Wolsdorfer
 Comment: bat powered

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
33.831750	9.0	1000.0	120.000	146.0	H	100.0	12.9	21.0	30.0	
60.526200	8.2	1000.0	120.000	170.0	H	88.0	11.5	21.8	30.0	
315.002700	19.6	1000.0	120.000	98.0	V	85.0	15.0	16.4	36.0	
467.208600	14.5	1000.0	120.000	170.0	V	273.0	18.0	21.5	36.0	
711.957750	19.9	1000.0	120.000	170.0	V	-5.0	22.8	16.1	36.0	
915.561600	22.2	1000.0	120.000	98.0	H	190.0	25.2	13.8	36.0	

9.6 Conducted limits

Not applicable!

The EUT is battery powered only!

No possibility to connect the mains power supply!

10 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Labor/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
3	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B597 9	300000210	ne		
4	n. a.	EMI Test Receiver	ESCI 1166.5950. 03	R&S	100083	300003312	k	04.01.2012	04.01.2013
5	n. a.	Analyzer- Reference- System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2011	14.07.2013
6	n. a.	Amplifier	JS42- 00502650- 28-5A	MITEQ	1084532	300003379	ev		
7	n. a.	Antenna Tower	Model 2175	ETS- LINDGREN	64762	300003745	izw		
8	n. a.	Positioning Controller	Model 2090	ETS- LINDGREN	64672	300003746	izw		
9	n. a.	Turntable Interface-Box	Model 105637	ETS- LINDGREN	44583	300003747	izw		
10	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbe ck	295	300003787	k	12.04.2012	12.04.2014
11	n. a.	Spectrum- Analyzer	FSU26	R&S	200809	300003874	k	06.01.2012	06.01.2014
12	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
13	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
14	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2012	06.01.2014
15	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
16	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologi es	MY51210197	300004405	k	19.12.2011	19.12.2012
17	n. a.	EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	k	22.08.2012	22.08.2013

Agenda: Kind of Calibration

k calibration / calibrated
 ne not required (k, ev, izw, zw not required)
 ev periodic self verification
 Ve long-term stability recognized
 vlkl! Attention: extended calibration interval
 NK! Attention: not calibrated

EK limited calibration
 zw cyclical maintenance (external cyclical maintenance)
 izw internal cyclical maintenance
 g blocked for accredited testing
 *) next calibration ordered / currently in progress

11 Observations

No observations exceeding those reported with the single test cases have been made.

Annex A Photographs of the test setup

Photo documentation:

Photo 1:



Photo 2:



Photo 3:



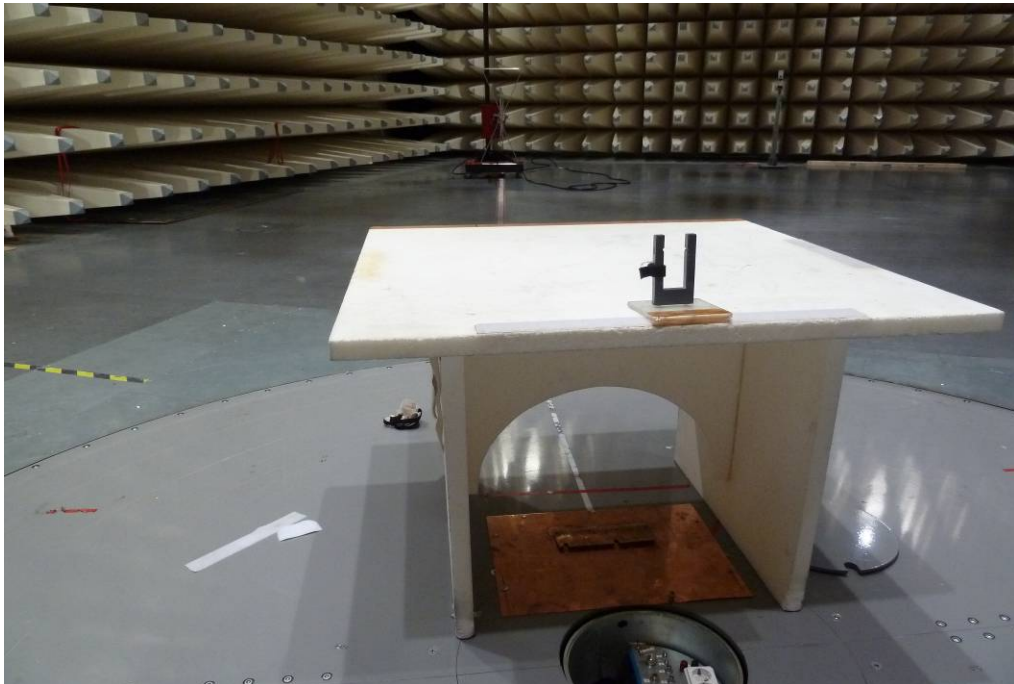
Photo 4:



Photo 5:



Photo 6:



Annex B External photographs of the EUT

Photo documentation:

Photo 1:



Photo 2:



Photo 3:



Photo 4:

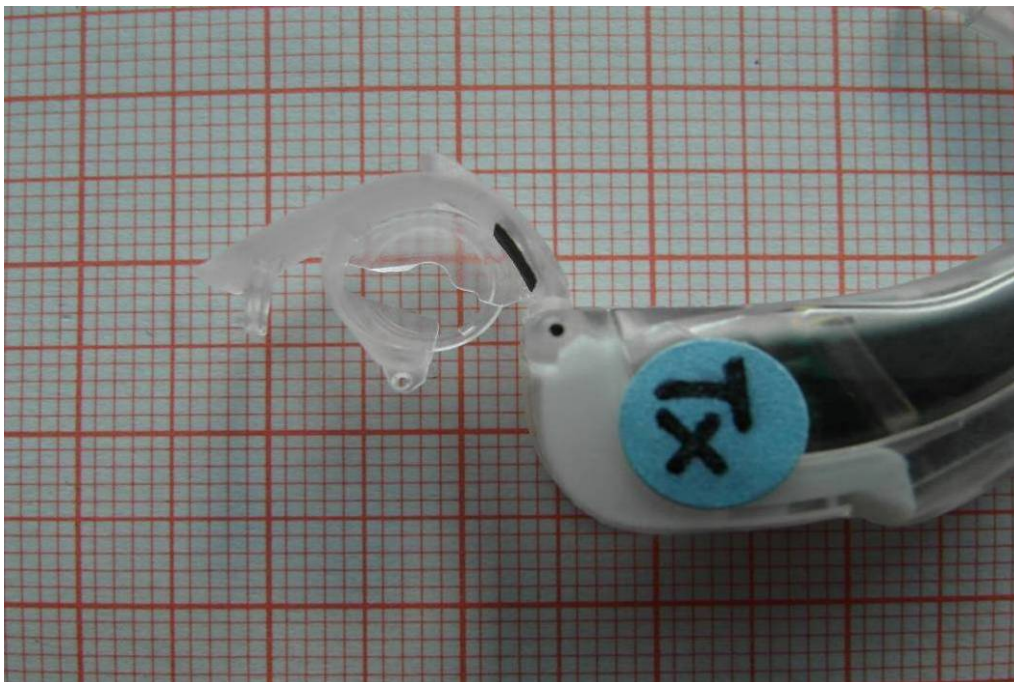
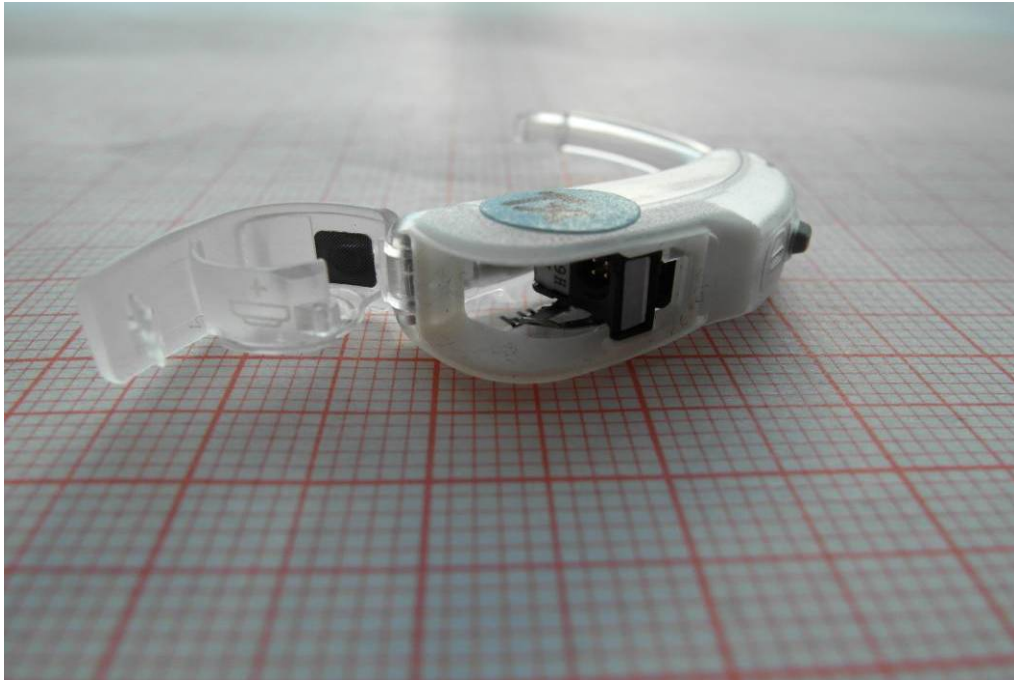


Photo 5:



Annex C Internal photographs of the EUT

Photo documentation:

Photo 1:

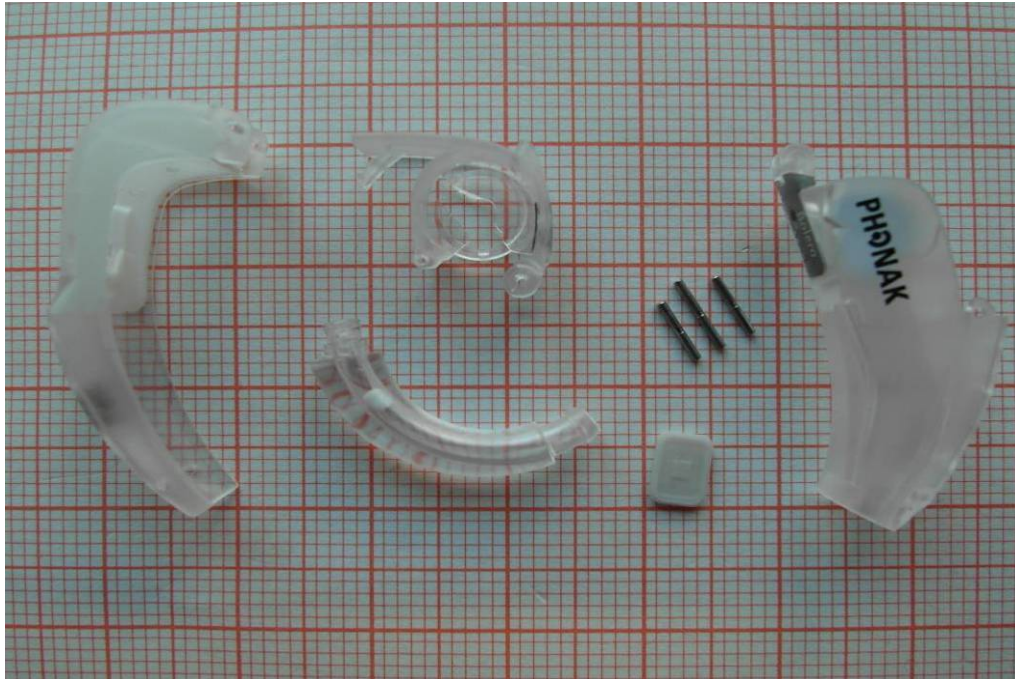


Photo 2:

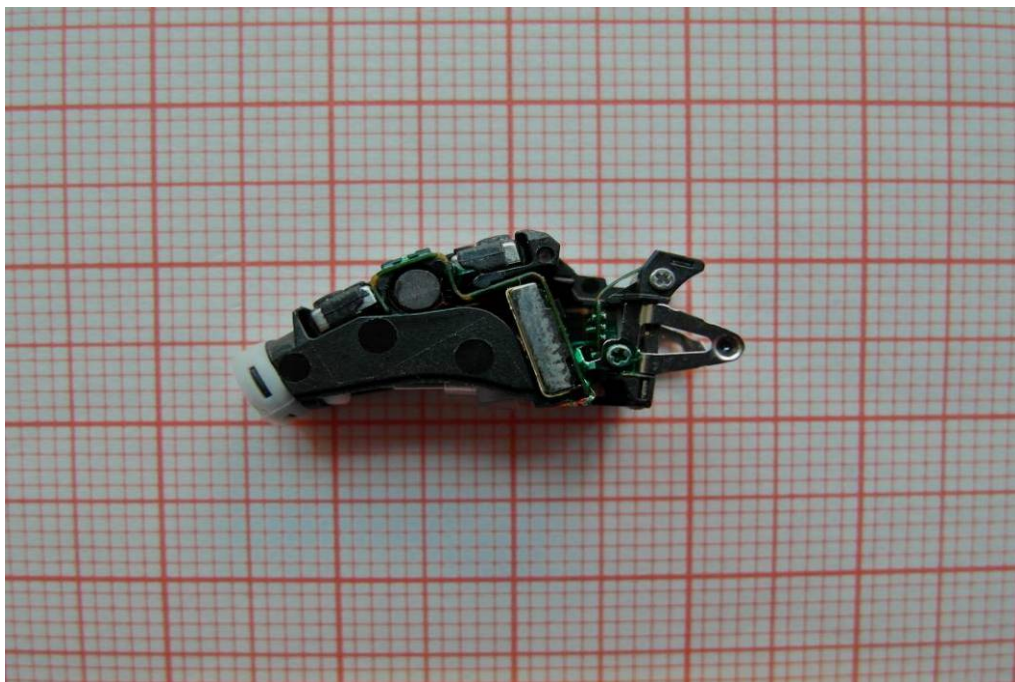


Photo 3:

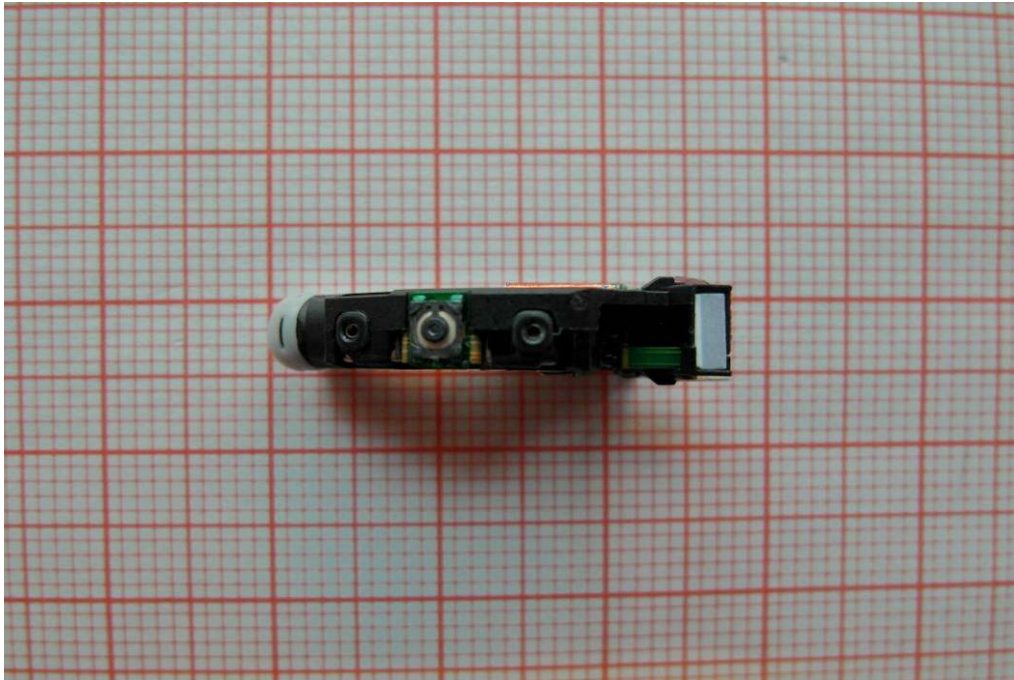


Photo 4:

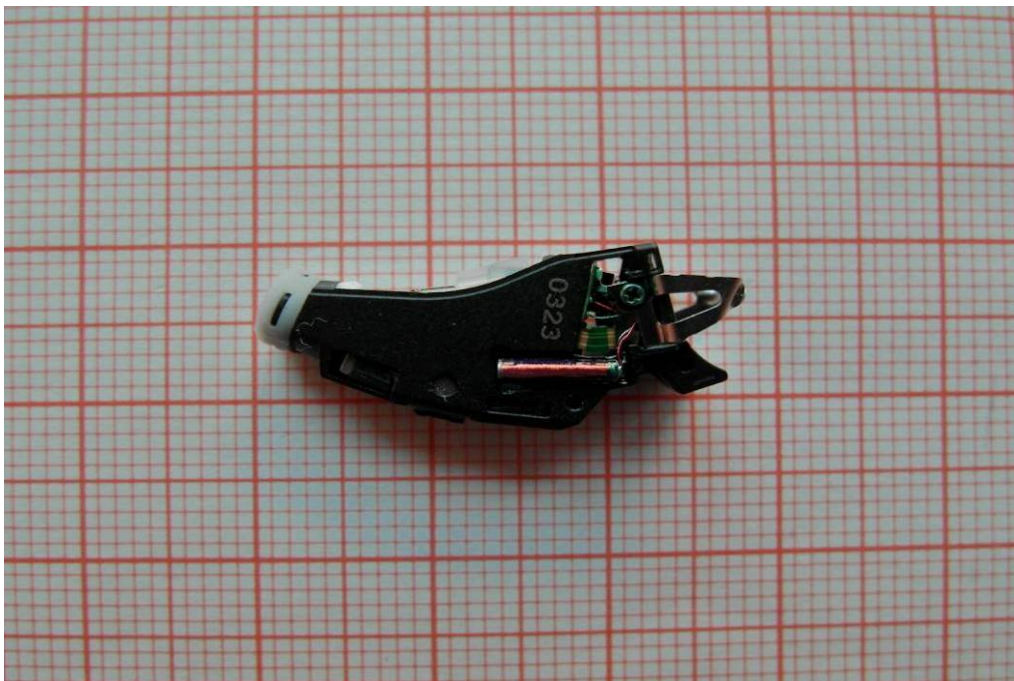


Photo 5:

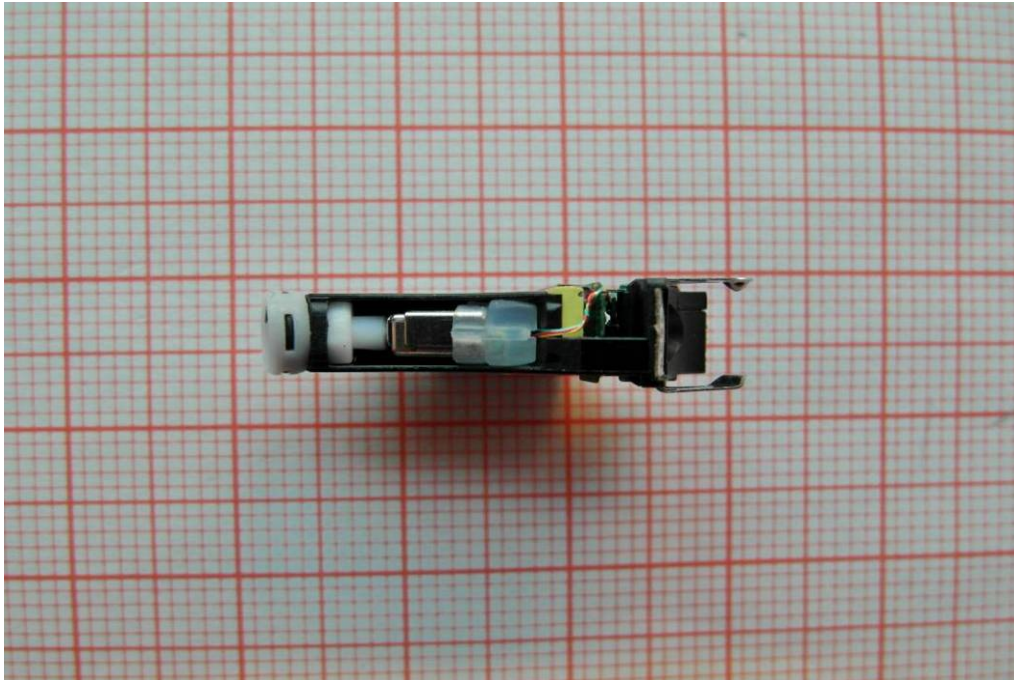


Photo 6:

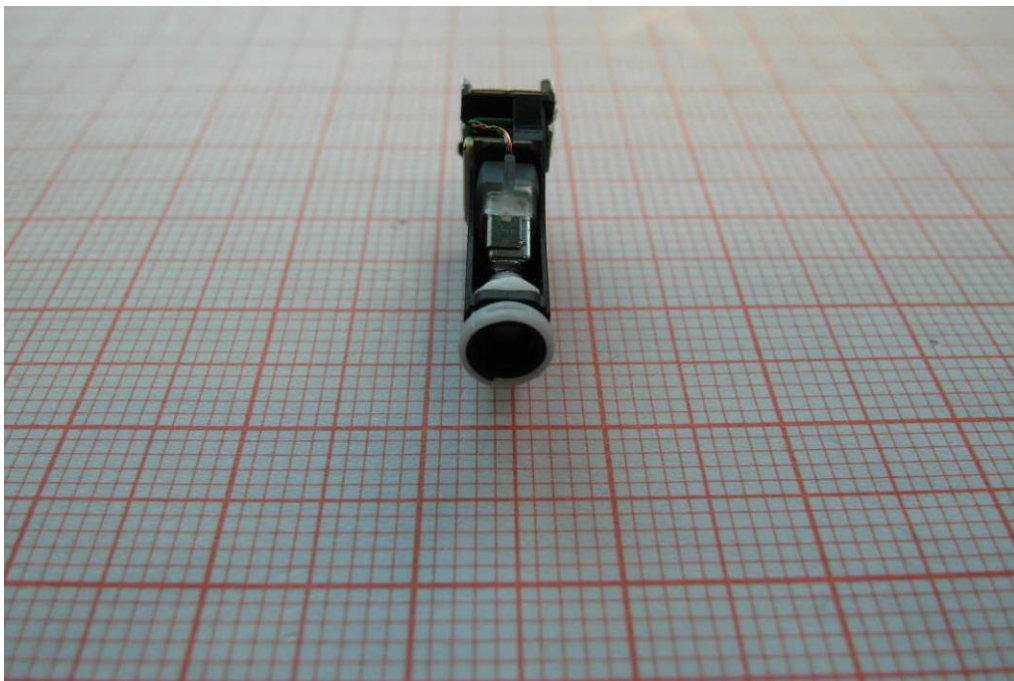


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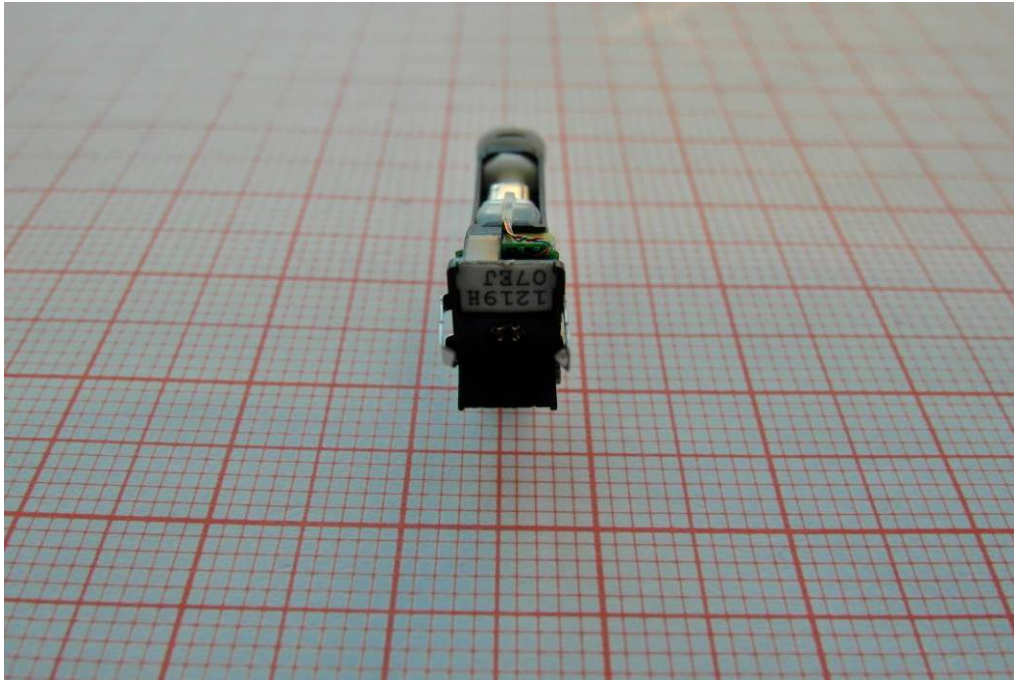


Photo 8:

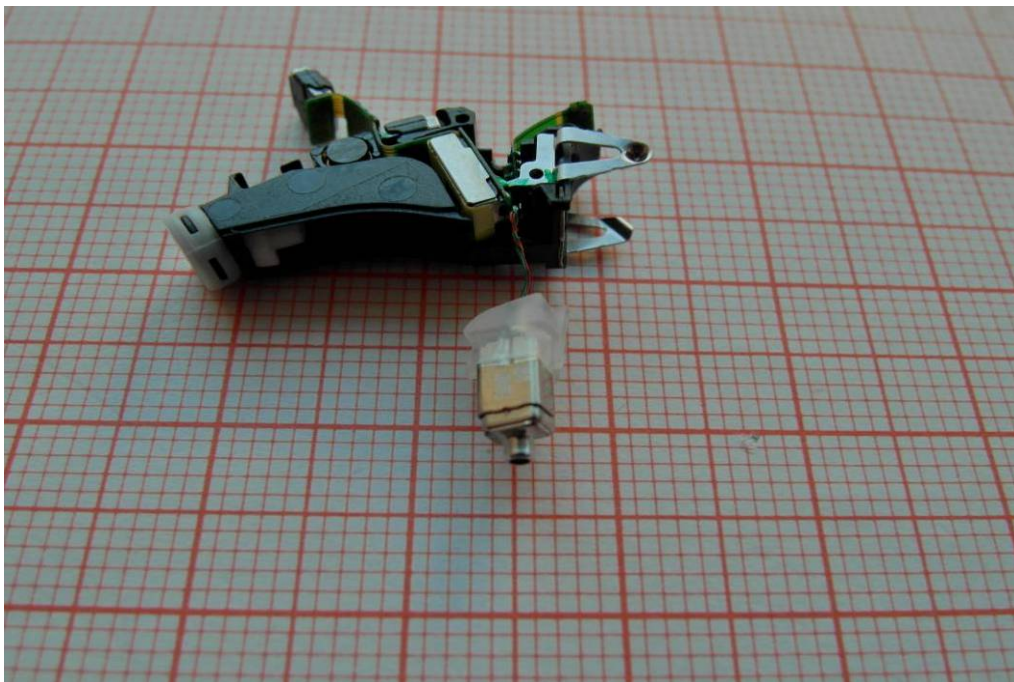
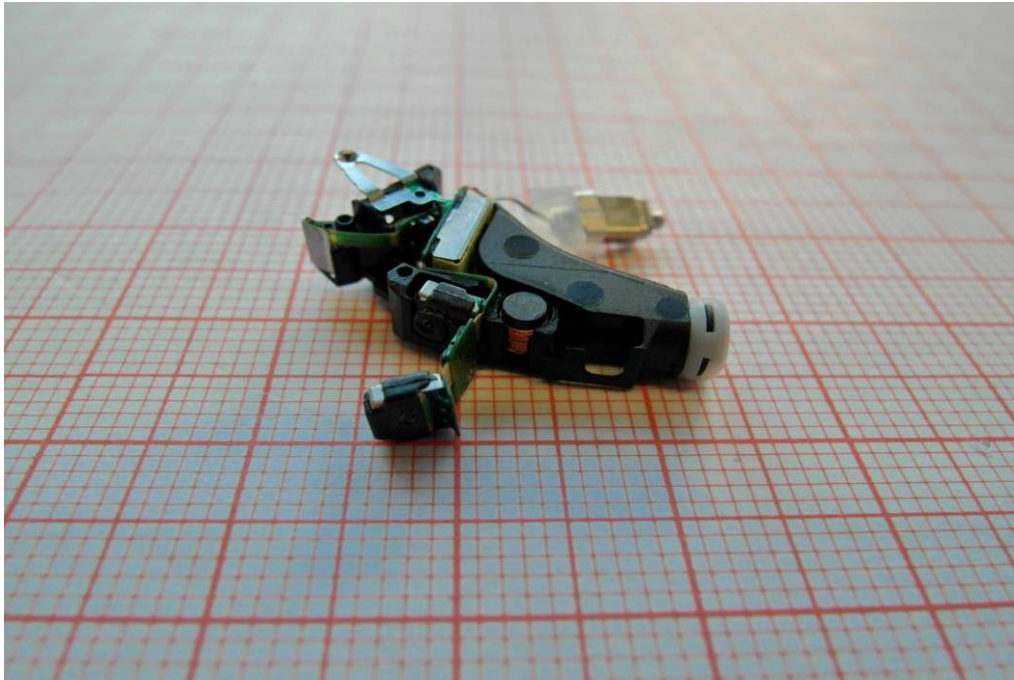


Photo 9:



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2012-09-19
-A	Editorial Changes	2012-09-20

Annex E Further information**Glossary**

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software

Annex F Accreditation Certificate



Front side of certificate



Back side of certificate

Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

http://www.cetecom.com/fileadmin/de/CETECOM_D_Saarbruecken/accreditations_Jan_2010/DAKKS_Akkredi_Urk_EN17025-En_incl_Annex.pdf