CETECOM ICT Services GmbH
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RSC-Laboratory

Accredited testing-laboratory

DAR registration number: DGA-PL-176/94-D1

Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97

Recognized by the Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3462C-1 (IC)
Certification ID: DE 0001
Accreditation ID: DE 0002

Accredited Bluetooth® Test Facility (BQTF)

Test report no.	**:**	**1-2222-01-02/10**
Type identification	**:**	**Phonak Ambra 312 UZ**
Applicant	**:**	**Phonak AG**
Test standards	**:**	**ETSI EN 300 330-1 V1.5.1**
		ETSI EN 300 330-2 V1.3.1

Table of contents

1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 3.1.1. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Test laboratory manager:

cn=Marco Bertolino, o=CETECOM ICT Services GmbH, ou=BTL-100121, email=Marco.Bertolino@ict.cetecom.de, c=DE 2010.05.31 07:03:28 +02'00'

2010-05-19	**Marco Bertolino**	
Date	Name	Signature

Technical responsibility for area of testing:

cn=Stefan Boes, o=Cetecom ICT Services GmbH, ou=BOE-100120, email=Stefan.Boes@ict.cetecom.de, c=DE 2010.05.31 08:55:01 +02'00'

2010-05-19	**Stefan Bös**	
Date	Name	Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH

Address:	**Untertürkheimer Straße 6 - 10** **66117 Saarbrücken** **Germany**
Phone:	**+ 49 681 5 98 - 0**
Fax:	**+ 49 681 5 98 - 9075**
e-mail:	**info@ICT.cetecom.de**
Internet:	**http://www.cetecom-ict.de**

State of accreditation:	**The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025** **DAR registration number: DGA-PL-176/94-D1**
Accredited by:	**Federal Motor Transport Authority (KBA)** **DAR registration number: KBA-P 00070-97**

Testing location, if different from CETECOM ICT Services GmbH:

Name	**:**
Street	**:**
Town	**:**
Country	**:**
Phone	**:**
Fax	**:**

1.3 Details of applicant

Name:	**Phonak AG**
Street:	**Laubisrütistrasse 28**
Town:	**8712 Stäfa**
Country:	**Schweiz**
Telephone:	**-/-**
Fax:	**+41 (0) 58 928 20 11**
Contact:	**Valentina Shcherba**
E-mail:	**valentina.shcherba@phonak.com**
Telephone:	**+41 (0) 58 928 01 01**

1.4 Application details

Date of receipt of order:	**2010-04-29**
Date of receipt of test item:	**2010-05-11**
Date of start test:	**2010-05-11**
Date of end test:	**2010-05-19**
Persons(s) who have been present during the test:	**Mr. Christof Rüegg**

2 Test standard/s

ETSI EN 300 330-1 V1.5.1	**2006-04**	**Electromagnetic compatibility and Radio spectrum Matters (ERM);Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz Part 1: Technical characteristics and test methods**
ETSI EN 300 330-2 V1.3.1	**2006-04**	**Electromagnetic compatibility and Radio spectrum Matters (ERM);Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz Part 2: Harmonized EN under article 3.2 of the R&TTE Directive**

3 Technical tests

3.1 Details of manufacturer

Name:	**Phonak AG**
Street:	**Laubisrütistrasse 28**
Town:	**8712 Stäfa**
Country:	**Schweiz**

3.1.1 Test item

Kind of test item	:	**Hearing Aid with 10.6 MHz radio interface**
Type identification	:	**Phonak Ambra 312 UZ**
S/N serial number	:	**Phonak WiMo 2030 ITC 26UA L_035** **Phonak WiMo 2030 ITC 26UA R_034**
HW hardware status	:	**WH2X**
SW software status	:	**0.3.2.0**
Frequency Band	:	**10.2 MHz – 11 MHz**
Frequencies of the EUT	:	**10.6 MHz**
Number of channels	:	**1**
Type of Modulation	:	**FSK – F1D inductive**
Channel separation	:	**Not mandatory → one channel only!**
Antenna	:	**Integrated ferrite coil antenna → for more information, please take a look at sub-clause 8 – photos of the EUT**
Product Class	:	**1**
Duty cycle Class	:	**Class 4 - up to 100%**
Power Supply	:	**1.3 V DC by Zinc-Air battery**
Temperature Range	:	**0°C to +35 °C**

The equipment is compliant to recommendation
CEPT/ERC/REC 70-03, Annex 9, Inductive Applications

3.1.2 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature / humidity	T_{nom}	°C / %	**+20 / 50**
Low Temperature	T_{low}	°C	**0**
High Temperature	T_{high}	°C	**+35**
Nominal Power Source	V_{nom}	V	**1.3**
Low Power Source	V_{low}	V	**1.1**
High Power Source	V_{high}	V	**1.4**

Type of power source: DC by Zinc-Air battery

Deviations from these values are reported in chapter 2

4 Summary of Measurement Results and list of all performed test cases

☒ **No deviations from the technical specifications were ascertained**

☐ There were deviations from the technical specifications ascertained

TC identifier	Description	verdict	date	Remark
RF-Testing	ETSI EN 300 330 V1.5.1 (2006-04)	Passed	2010-05-19	-/-

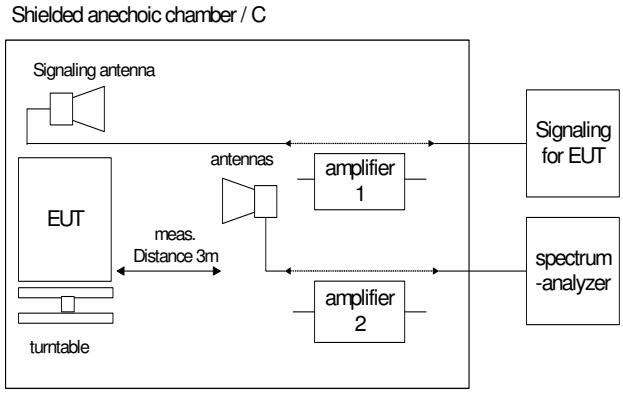
Test Specification Clause	Test Case	temperature conditions	power source voltages	Pass	Fail	Not applicable	Not performed
7.2	H-Field strength	Nominal	Nominal	Yes			
7.3	Permitted range of operating frequencies	Nominal	Nominal	Yes			
7.4.2 (class 3 only)	Conducted spurious emissions (<30 MHz)	Nominal	Nominal			Yes	
7.4.3	Transmitter spurious emission radiated (< 30 MHz)	Nominal	Nominal	Yes			
7.4.4.1	Transmitter spurious emission radiated (≥ 30 MHz)	Nominal	Nominal	Yes			
7.5	Duty cycle	Nominal	Nominal	Yes			
8.1 (class 1 only)	Adjacent channel selectivity-in band	Nominal	Nominal			Yes	
8.2 (class 1 & 2)	Blocking or desensitization	Nominal	Nominal			Yes	
8.3	Receiver spurious emissions radiated	Nominal	Nominal	Yes			

5 RF measurement testing

5.1 Description of test set-up

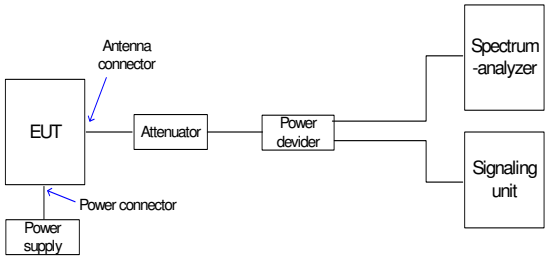
5.1.1 Radiated measurements

The radiated emissions from the EUT are performed in a fully anechoic chamber. The EUT is placed on a non conductive turntable. The EUT is powered with nominal voltage. The signalling is performed either from outside the chamber with a signalling unit (AP or other) by air link using signalling antenna or directly by special software from the customer.



5.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10 dB attenuated before it is power divided (~6 dB loss per branch). One of the signal paths is connected to the signalling unit (AP or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm. If special software is used, there is no power divider necessary.



5.2 Referenced documents

None

5.3 Additional comments

None

5.4 Transmitter Test Results

5.4.1 H-Field strength — Subclause 7.2

Results:

TEST CONDITIONS		Transmitter field strength (dBµA/m)
T nom	**V nom**	-24.5 dBµA/m @ 10 m (noise floor)
Measurement uncertainty		± 3 dB

LIMITS — **Subclause 7.2.1.3**

Frequency range (MHz)	H-field field strength limit (Hf)dBµA/m at 10 m
0.009 ≤ 0.315	30
0.009 < f < 0.03	72 or according to note 1
0.03 ≤ f < 0.05975 0.06025 ≤ f < 0.07 0.119 ≤ f < 0.135	72 at 0.03 MHz descending 3 dB/oct or according to note 1
0.05975 ≤ f < 0.06025 0.07 ≤ f < 0.119 0.135 ≤ f < 0.140	42
0.140 ≤ f < 0.1485	37.7
0.1485 ≤ f < 30	-5 (see note 4)
0.315 ≤ f < 0.600	-5
3.155 ≤ f < 3.400	13.5
7.400 ≤ f < 8.800	9
10.2 ≤ f < 11.00	**9**
6.765 ≤ f ≤ 6.795 (ISM) 13.553 ≤ f ≤ 13.567 (ISM) 26.957 ≤ f ≤ 27.283 (ISM)	42 (see note 3)
13.553 ≤ f < 13.567	60 (see notes 2 and 3)
NOTE 1: For the frequency ranges 9 to 70 kHz and 119 to 135 kHz, the following additional restrictions apply to limits above 42 dBµA/m: - for loop coil antennas with an area ≥ 0.16 m² table 4 applies directly; - for loop coil antennas with an area between 0.05 m² and 0.16 m² table 4 applies with a correction factor. The limit is: table value + 10 log (area/0.16 m²); - for loop coil antennas with an area < 0.05 m² the limit is 10 dB below table 4 NOTE 2: For RFID and EAS applications only. NOTE 3: Spectrum mask limit, see annex G NOTE 4: For further information see annex H	

5.4.2 Permitted range of operating frequencies Subclause 7.3

Carrier frequencies below 135 kHz:	30 dB below the carrier
Carrier frequencies in the range of 135 kHz to 30 MHz:	15 dB below the carrier

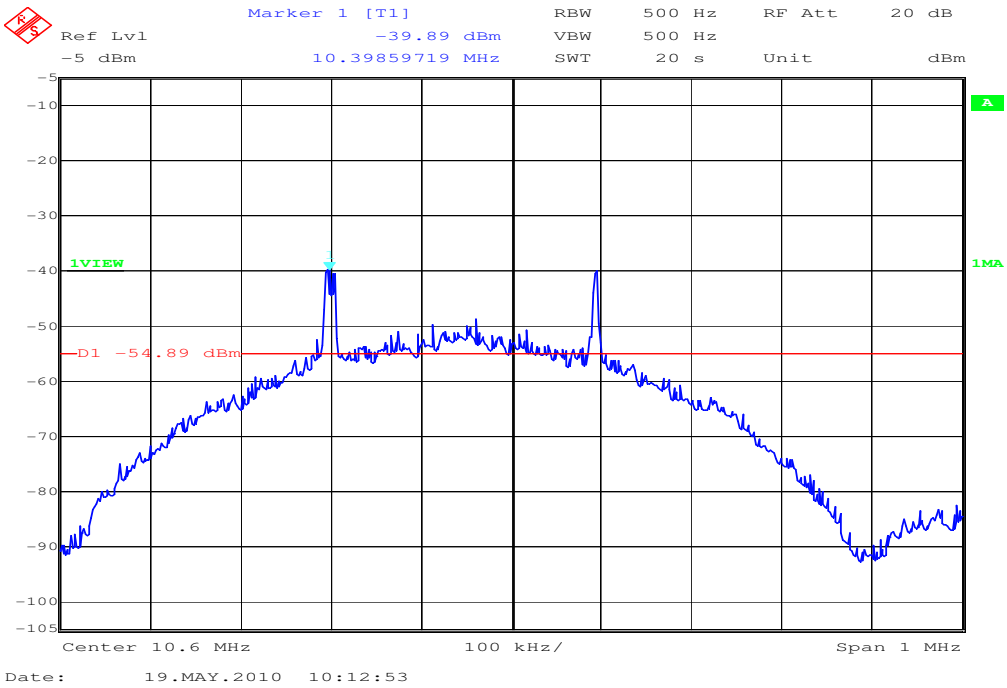
Results:

TEST CONDITIONS		Frequency (kHz)	
T nom	**V nom**	FL	10378.557
		FH	10705.210
T min	**V min**	FL	10420.734
		FH	10741.179
	V max	FL	10422.645
		FH	10743.287
T max	**V min**	FL	10363.937
		FH	10692.029
	V max	FL	10362.525
		FH	10695.190
Measurement uncertainty	± 1x10-7		

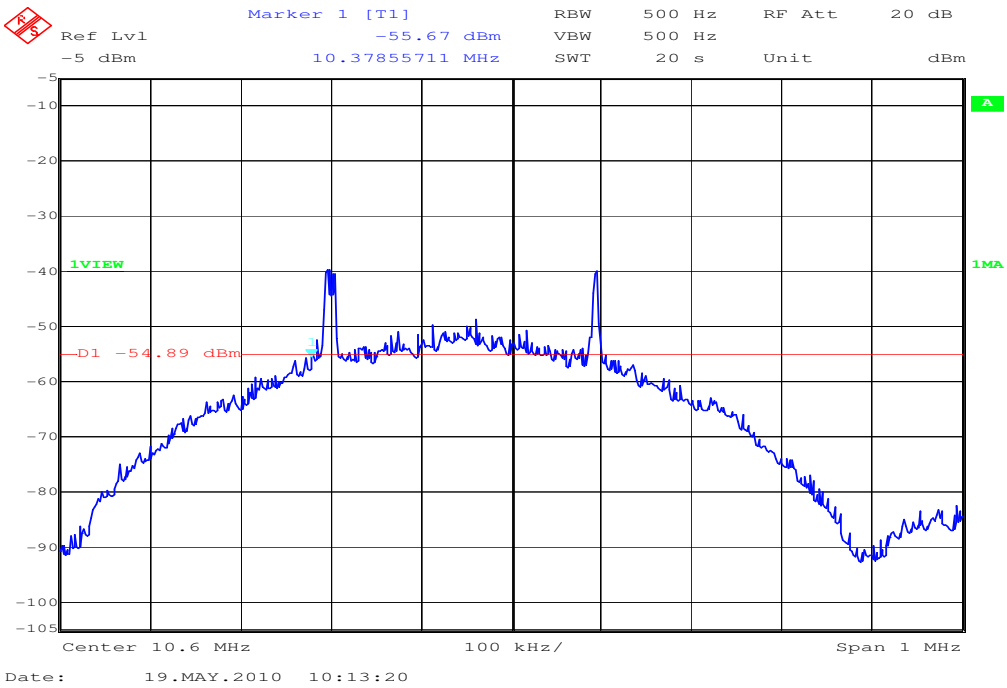
Where F_L = Lowest frequency at the appropriate spurious emission level
F_H = Highest frequency at the appropriate spurious emission level

Band edge limits:	**Lowest measured**	**FL = 10362.525 kHz**
	and	
	Highest measured	**FH = 10743.287 kHz**

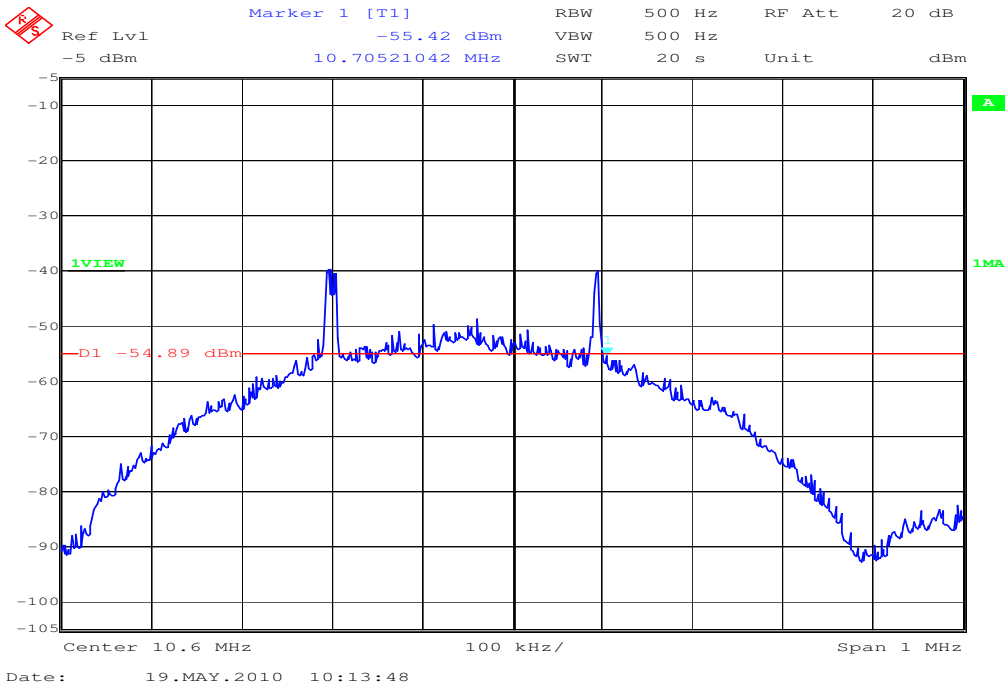
Plot 1: T_{nom} & V_{nom}



Plot 2: T_{nom} & V_{nom}**, low side**



Plot 3: T_{nom} & V_{nom}**, high side**



5.4.3 Conducted spurious emissions (<30 MHz - Product class 3 only)Subclause 7.4.2

Not applicable

Transmitter operating / ~~standby~~* **Modulated/~~Unmodulated~~***
*** (Delete whichever is inappropriate)**

Results:

SPURIOUS EMMISSION LEVEL (dBµA/m)								
Channel 1			Channel 2			Channel 3		
F (kHz)	BW (kHz)	Result	F (kHz)	BW (kHz)	Result	F (kHz)	BW (kHz)	Result
Measurement uncertainty			± 3dB					

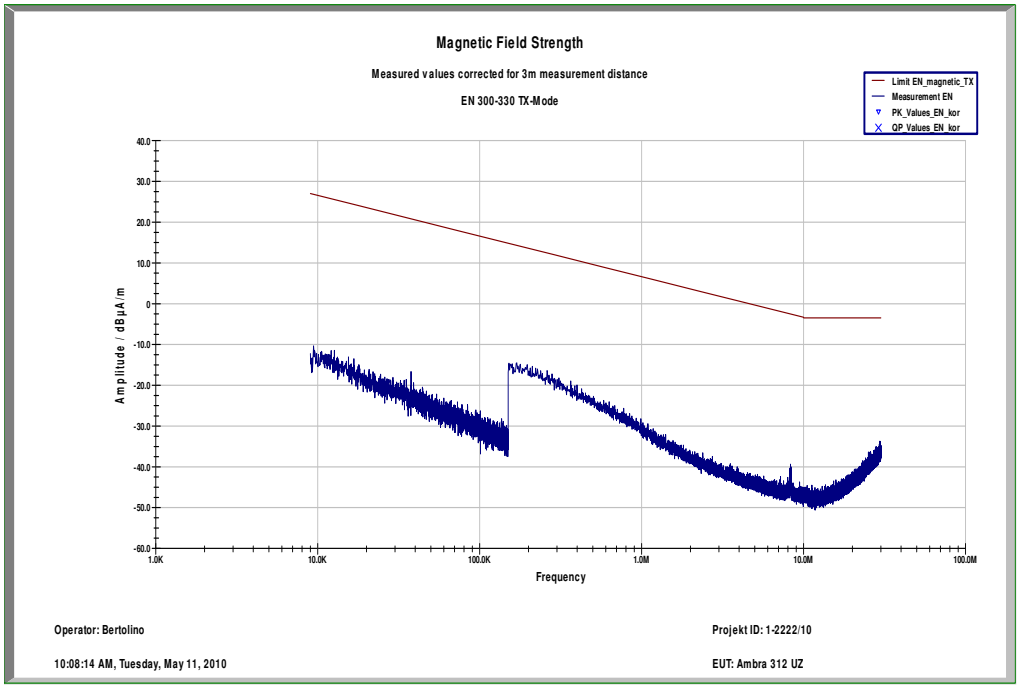
LIMITS **Subclause 7.4.2.2**

(Ic – Is) ≥ (Hc – Hs)

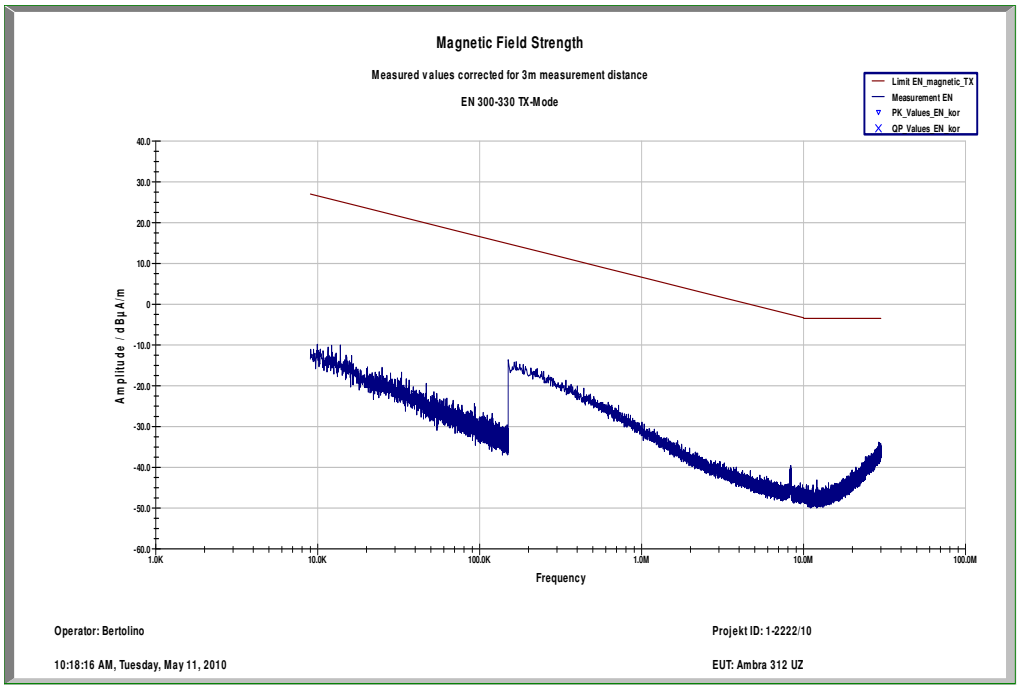
Is is the measured transmitter conducted spurious output current expressed in dBµA;
Ic is the measured transmitter RF carrier output current expressed in dBµA, see clause 7.2.2.3;
Hc is the radiated limit for the transmitter generated H-field expressed in dBµA/m, see clause 7.2.1.3;

5.4.4 Transmitter spurious emission radiated (< 30 MHz) Subclause 7.4.3

Plot 1: TX mode, 9 kHz – 30 MHz, EUT 1 – right side



Plot 2: TX mode, 9 kHz – 30 MHz, EUT 2 – left side



Results:

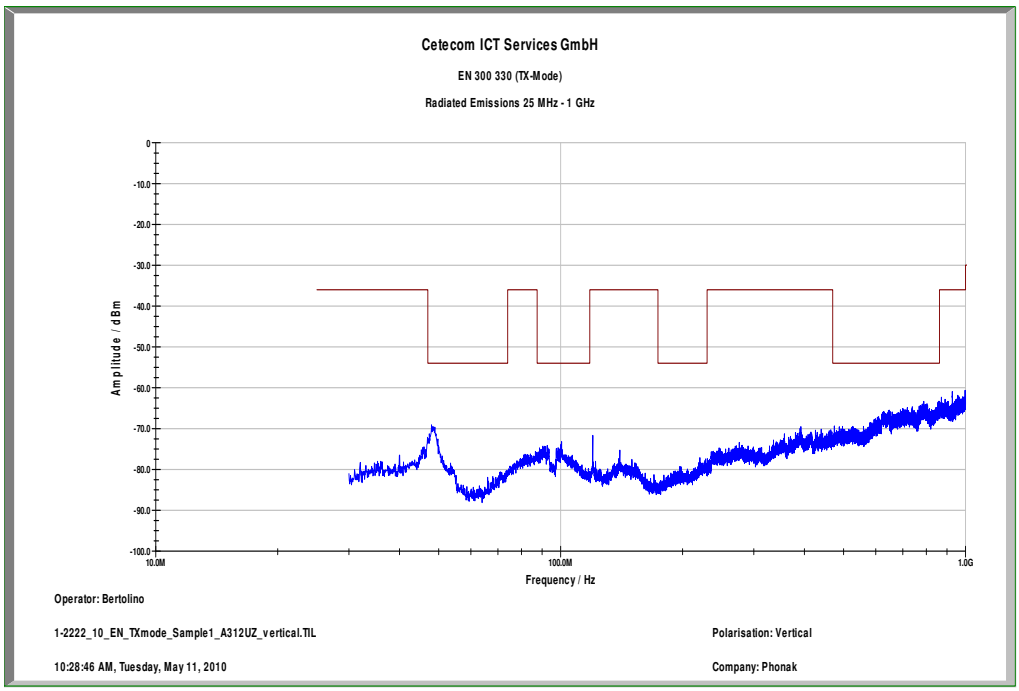
SPURIOUS EMMISSION LEVEL (dBµA/m)								
Channel 1			Channel 2			Channel 3		
EUT 1 / EUT 2								
F (kHz)	BW (kHz)	Level (dBµA/m)	F (kHz)	BW (kHz)	Level (dBµA/m)	F (kHz)	BW (kHz)	Level (dBµA/m)
No critical peaks detected. All detected emissions are below the limit.								
Measurement uncertainty			± 3dB					

LIMIT **SUBCLAUSE 7.4.3.2**

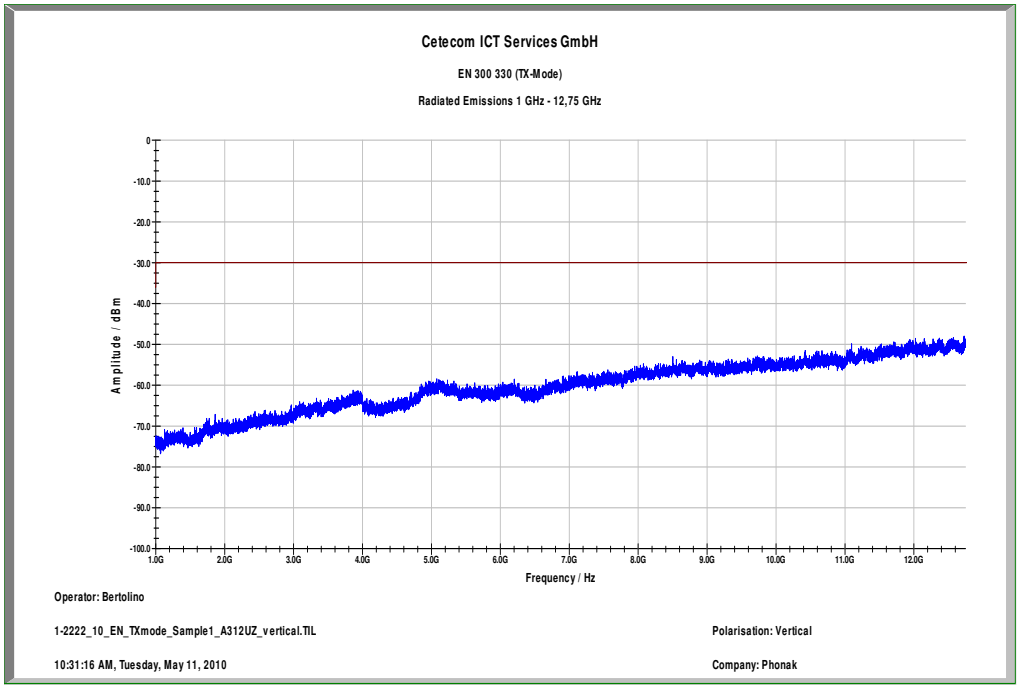
State	Frequency 9 kHz < f < 10 MHz	Frequency 10 MHz < f < 30 MHz
Transmit	27 dBµA/m at 9 kHz descending 3 dB/oct	-3.5 dBµA/m
Standby	5.5 dBµA/m at 9 kHz descending 3 dB/oct	-22 dBµA/m

5.4.5 Transmitter spurious emission radiated (≥ 30 MHz) Subclause 7.4.4

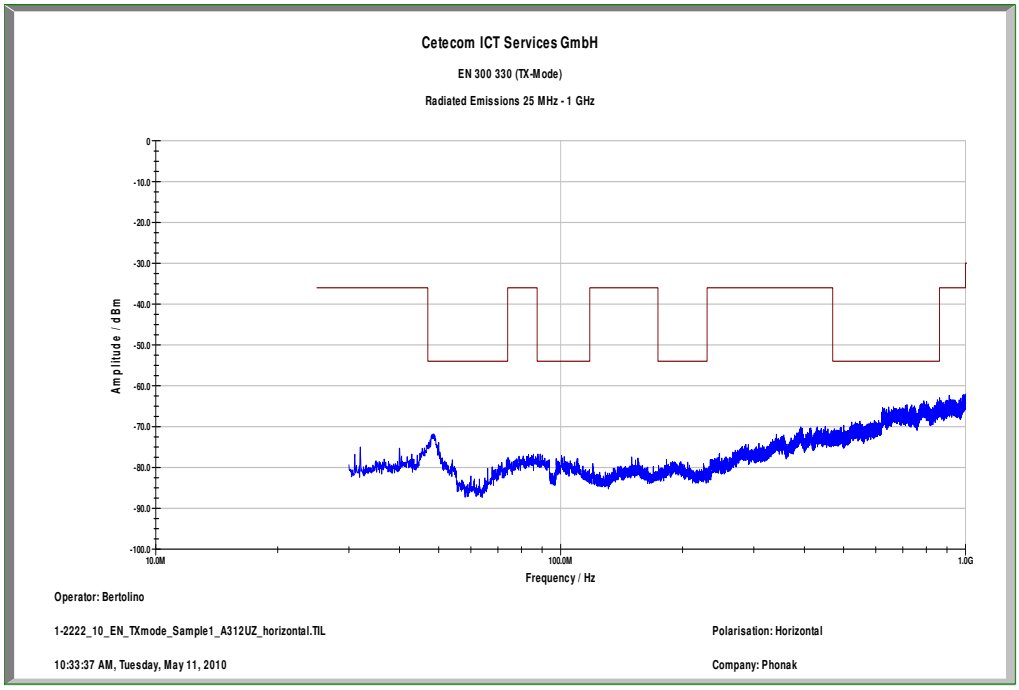
Plot 1: TX mode, 30 MHz – 1 GHz, vertical polarisation, EUT 1 – right side



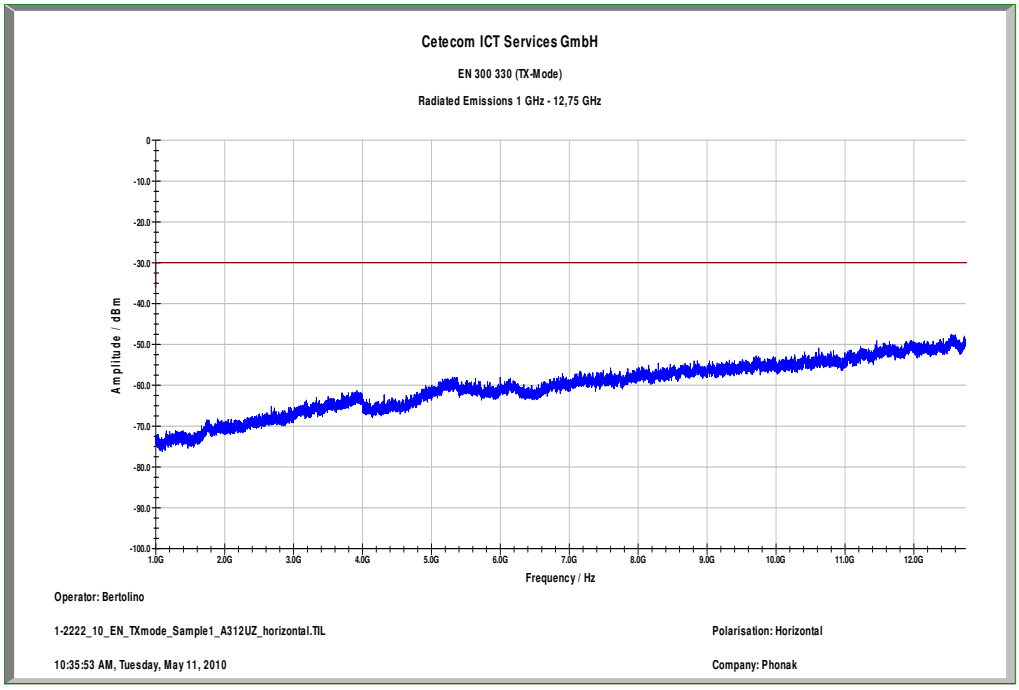
Plot 2: TX mode, 1 GHz – 12.75 GHz, vertical polarisation, EUT 1 – right side



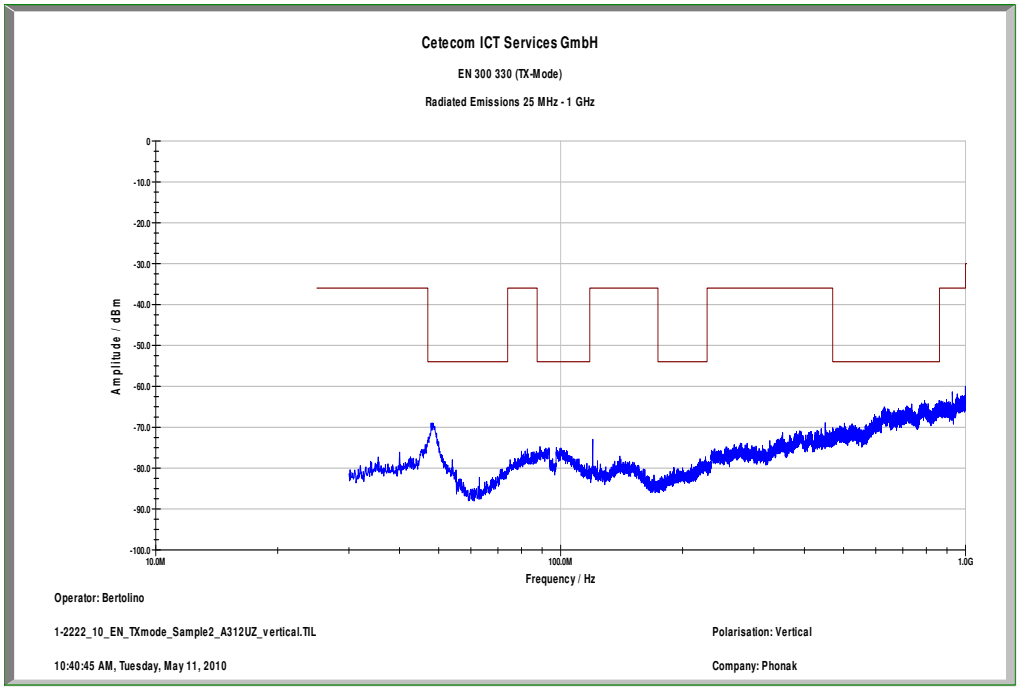
Plot 3: TX mode, 30 MHz – 1 GHz, horizontal polarisation, EUT 1 – right side



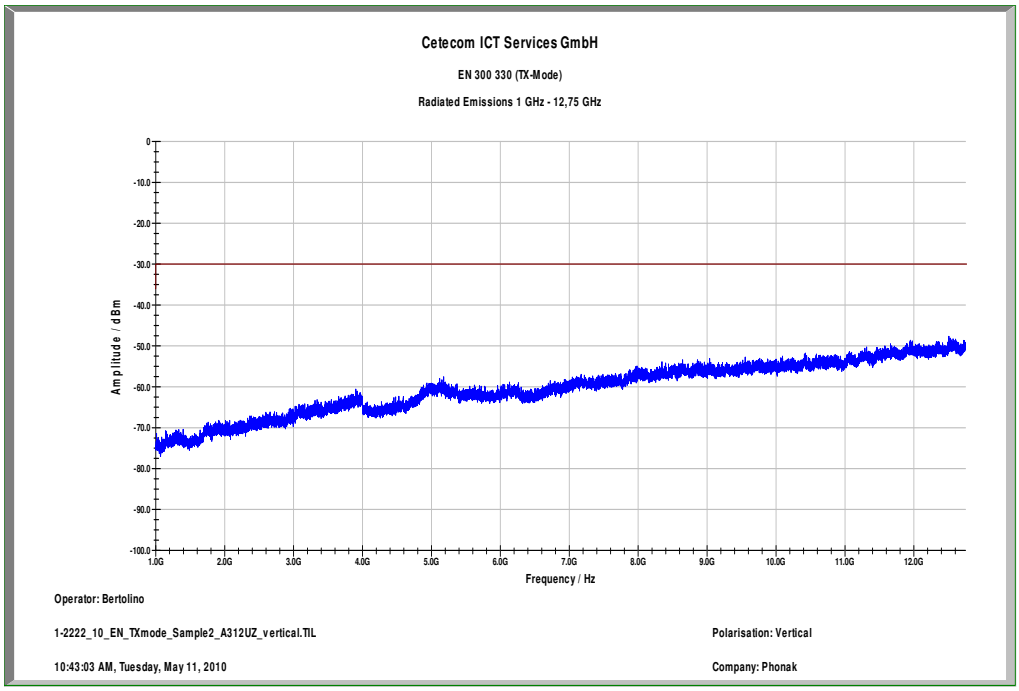
Plot 4: TX mode, 1 GHz – 12.75 GHz, horizontal polarisation, EUT 1 – right side



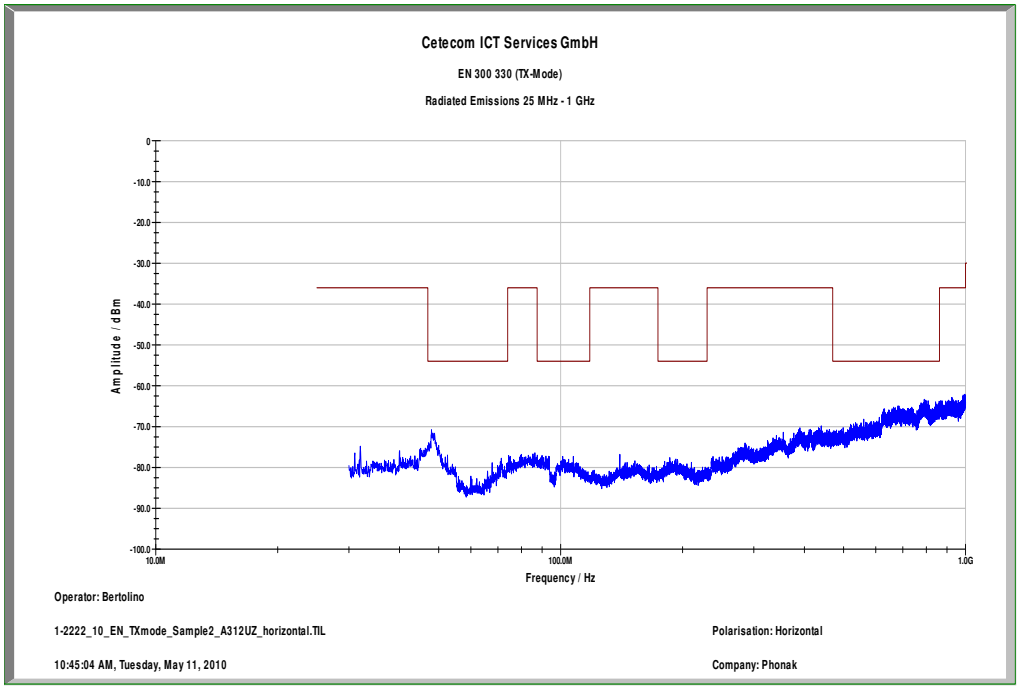
Plot 5: TX mode, 30 MHz – 1 GHz, vertical polarisation, EUT 1 – left side



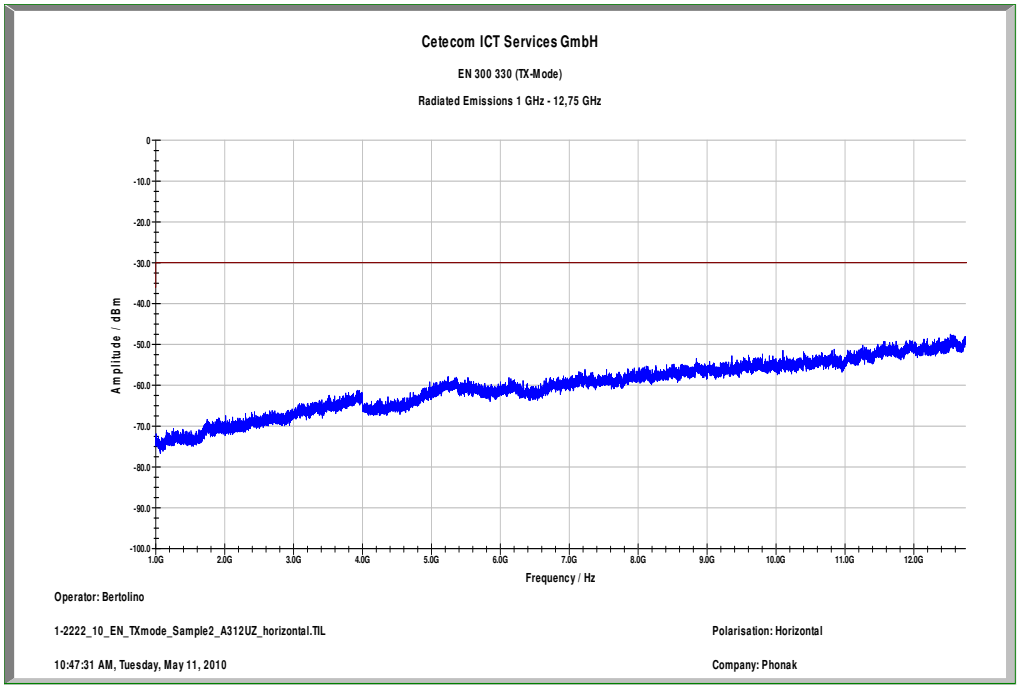
Plot 6: TX mode, 1 GHz – 12.75 GHz, vertical polarisation, EUT 1 – left side



Plot 7: TX mode, 30 MHz – 1 GHz, horizontal polarisation, EUT 1 – left side



Plot 8: TX mode, 1 GHz – 12.75 GHz, horizontal polarisation, EUT 1 – left side



Results:

SPURIOUS EMMISSION LEVEL (nW)								
Channel 1			Channel 2			Channel 3		
EUT 1 / EUT 2								
F (MHz)	BW (kHz)	Level (nW)	F (MHz)	BW (kHz)	Level (nW)	F (MHz)	BW (kHz)	Level (nW)
No critical peaks detected. All detected emissions are below the limit.								
Measurement uncertainty			± 3dB					

LIMITS **Subclause 7.4.4.2**

State	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies between 30 to 1000 MHz
Transmit	4 nW	250 nW
Standby	2 nW	2 nW

5.4.6 Duty cycle — Subclause 7.5

Results:

Duty cycle Class:	4

LIMITS — Subclause 7.5.3

In a period of 1 hour the duty cycle shall not exceed the values

Duty cycle Class	Duty cycle ratio
1	< 0.1 %
2	< 1.0 %
3	< 10 %
4	Up to 100 %

5.5 Receiver Test Results

5.5.1 Adjacent channel selectivity-in band Subclause 8.1

Not applicable
(Receiver Class 1 only)

This measurement is required where a frequency plan with standard channel spacing is stated.

The measurement shall not be performed if:

a) The transmitter cannot be switched off and the spacing between the transmit and the receiver frequency is less than ten times the declared receiver 3 dB bandwidth; or

b) The transmitter and receiver are operating at the same frequency and the transmitter cannot be switched off as the carrier is used as receiver injection signal.(e.g. for homodyne systems).

LIMITS **Subclause 8.1.3**

Receiver class	Channel spacing ≤ 25 kHz	Channel spacing > 25 kHz
1	60 dB	70 dB

5.5.2 Blocking or desensitization Subclause 8.2

Not applicable
(Receiver Class 1 & 2 only)

Results:

TEST CONDITIONS		BLOCKING (dBm)		
		Channel 1	Channel 2	Channel 3
T nom	V nom			
Measurement uncertainty		±3dB		

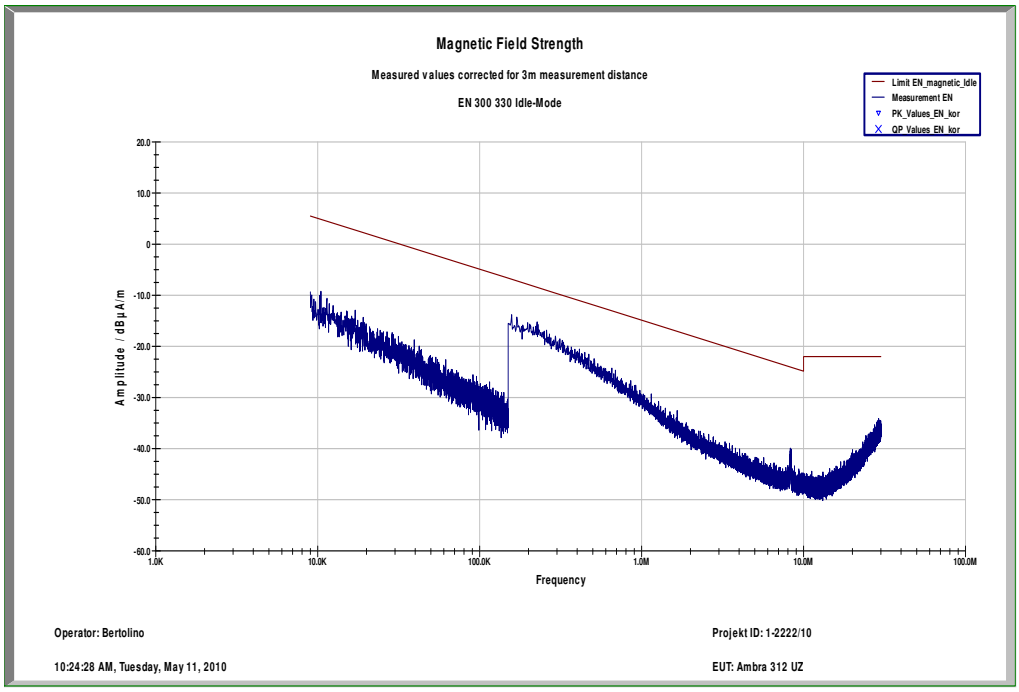
LIMITS Subclause 8.2.3

Receiver Class	Generator B frequency offset, |fA- fB|, either by a) or b) whichever is greater (see note 3)			Limit (dB)
	a) per clause 8.2.2, indent a)		b) per clause 8.2.2, indent b)	
	fA < 500 kHz	fA ≥ 500 kHz	value of N, see below	
1	For all offset frequencies	For all offset frequencies	2, 4, 8 and 20	Reference Limit (see note 1)
2	± 100 kHz	± 500 kHz	2	Reference Limit × 1/2 (see note 2)
	± 200 kHz	± 1 MHz	4	Reference Limit × 2/3 (see note 2)
	± 300 kHz	± 2 MHz	8	Reference Limit × 5/6 (see note 2)
	± 500 kHz	± 5 MHz	20	Reference limit, (see note 1)

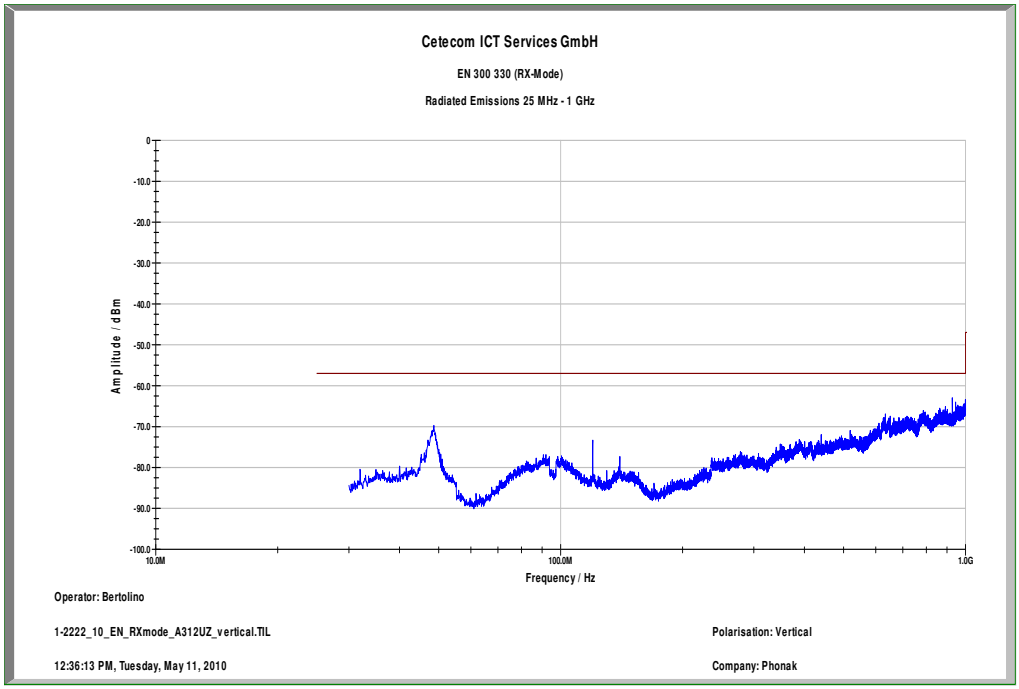
NOTE 1: Reference limit (Ref) = 30 dB at 9 kHz increasing with 10 dB/decade to 65,2 dB at 30 MHz.
NOTE 2: The limit is a fractional dB value of the reference limit.
NOTE 3: Generator B frequencies below 9 kHz are not specified.

5.5.3 Receiver spurious emissions radiated Subclause 8.3

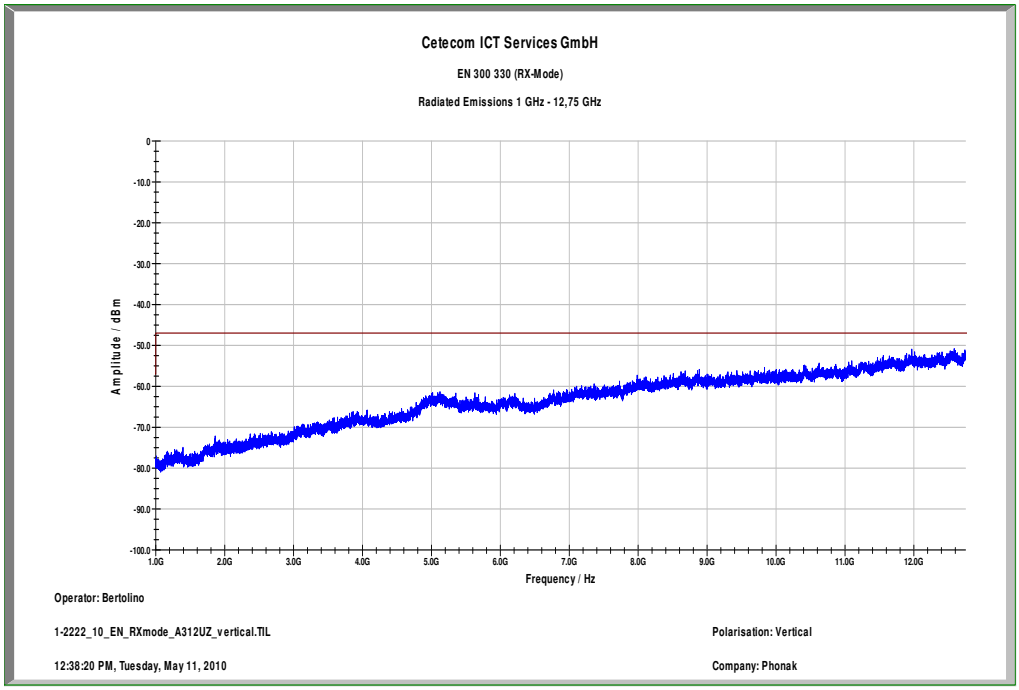
Plot 1: RX mode, 9 kHz – 30 MHz, EUT 1 / EUT 2



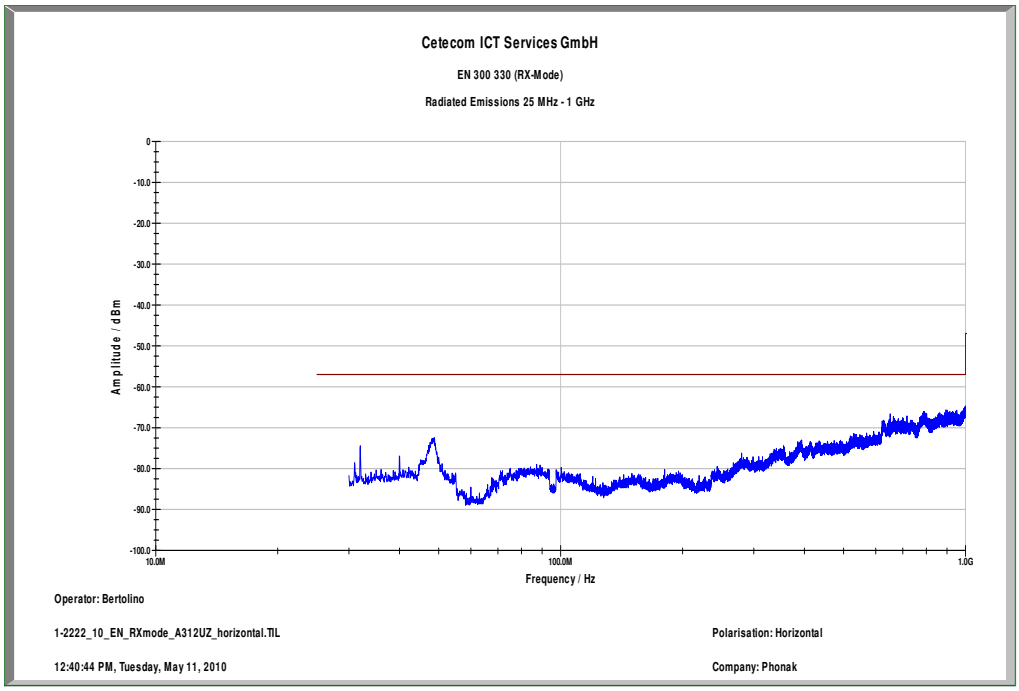
Plot 2: RX mode, 30 MHz – 1 GHz, vertical polarisation, EUT 1 / EUT 2



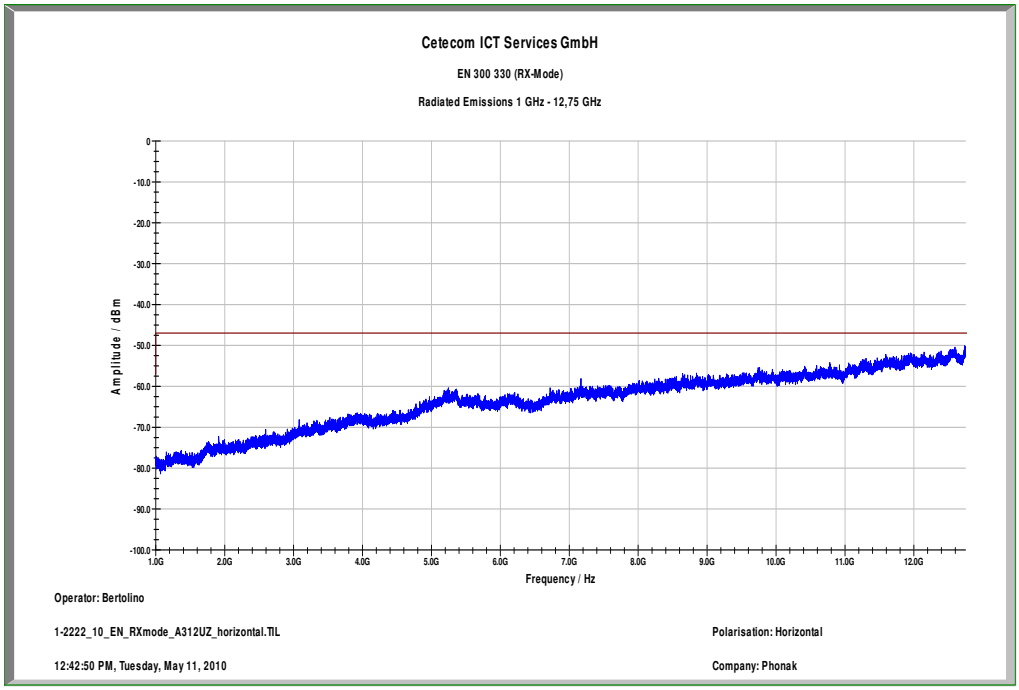
Plot 3: RX mode, 1 GHz – 12.75 GHz, vertical polarisation, EUT 1 / EUT 2



Plot 4: RX mode, 30 MHz – 1 GHz, horizontal polarisation, EUT 1 / EUT 2



Plot 5: RX mode, 1 GHz – 12.75 GHz, horizontal polarisation, EUT 1 / EUT 2



Results:

SPURIOUS EMMISSION LEVEL (nW)								
Idle Mode			-/-			-/-		
F	BW	p	F	BW	p	F	BW	p
No critical peaks detected. All detected emissions are below the limit.								
Measurement uncertainty			± 3dB					

Where F = Frequency of spurious (MHz)
BW = Measurement receiver bandwidth (kHz)
p = Level of spurious (µW , nW)

LIMITS Subclause 8.3.3

State	Frequency 9 kHz < f < 10 MHz	Frequency 10 MHz < f < 30 MHz
Standby	5.5 dBµA/m at 9 kHz descending 3 dB/oct	-22 dBµA/m

6 Test equipment and ancillaries used for tests

In order to simplify the identification of the equipment used at each specific test, each item of test equipment and ancillaries are provided with an identifier or number in the equipment list below.

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).

No.	Labor / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kal. Art	Last Calibration	Next Calibration
1	n. a.	Double-Ridged Waveguide Horn Antenna 1-26.5GHz	3115	EMCO	8812-3088	300001032	vlKI!	05.03.2009	05.03.2011
2	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
3	n. a.	Anechoic chamber		MWB	87400/02	300000996			
4	Spec.A.2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
5	9	Artificial Mains 9 kHz to 30 MHz, 4 x 25	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
6	n. a.	Ampere Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
7	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
8	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
9	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
10	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
11	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
12	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
13	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-	EMCO	none	300003451	ne		

14	n. a.	Highpass Filter	ICS/FULL WHKX2.9/18 G-12SS	Wainwright	1	300003 492	ev		
15	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003 255	ev		
16	n. a.	Highpass Filter	WHKX7.0/18 G-8SS	Wainwright	18	300003 789	ne		
17	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY4825 0080	300003 812	k	05.08. 2008	05.08. 2010
18	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY4742 0220	300003 813	k	06.08. 2008	06.08. 2010
19	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY4826 0003	300003 825	vlKI!	19.08. 2008	19.08. 2010
20	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003 854	vlKI!	17.12. 2008	17.12. 2010
21	n. a.	Test Receiver	ESH2	R&S	871921/ 095	300002 505	Ve	12.02. 2010	12.02. 2012
22	n. a.	Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/ 61	300001 824	vlKI!	18.11. 2008	18.11. 2011
23	n. a.	Power Supply	LA30/5GA	Zentro Elektronik	2046	300000 711	NK!		
24	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/837 61	300002 326	Ve	28.05. 2009	28.05. 2011
25	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSIQ26	R&S	835540/ 018	300002 681-0005	k	07.01. 2010	07.01. 2012

7 Photographs of the Test Set-up

Photo documentation:

Photo 1:

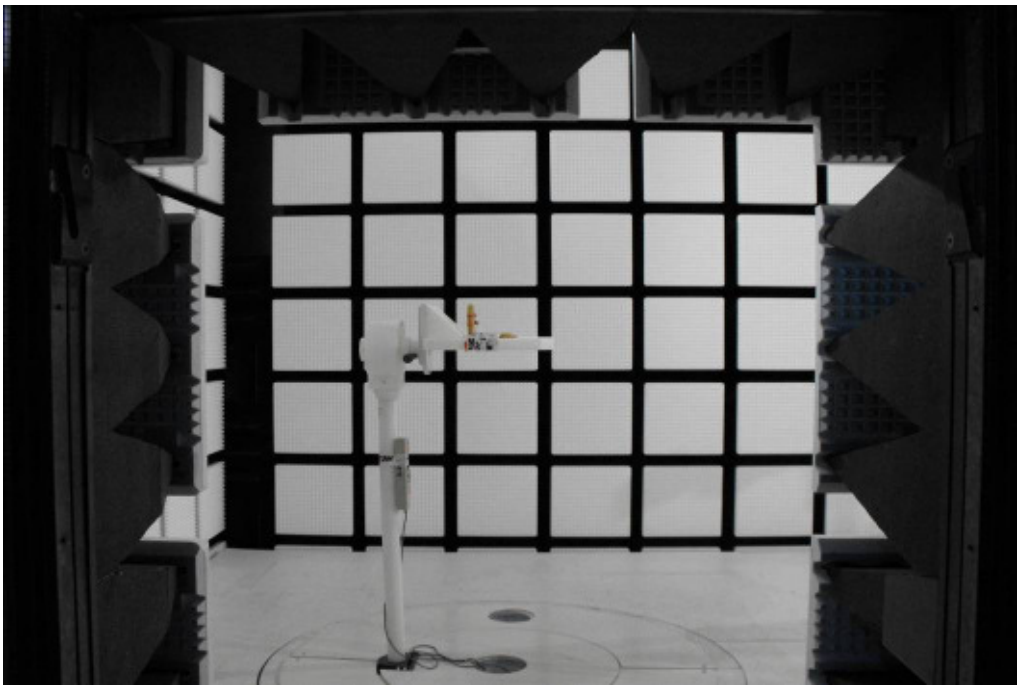
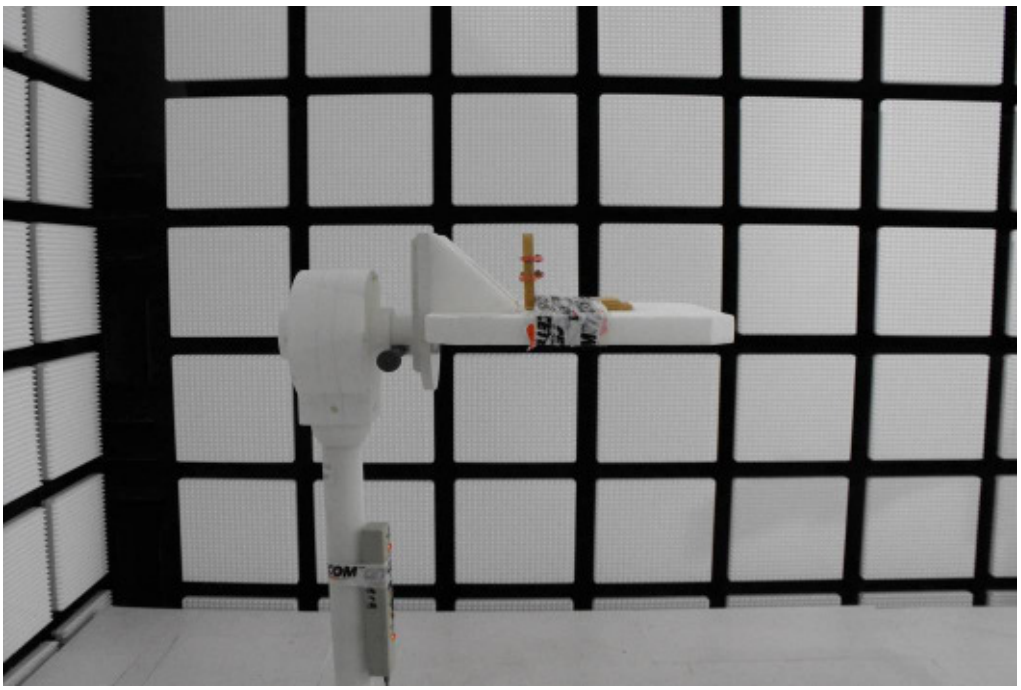


Photo 2:



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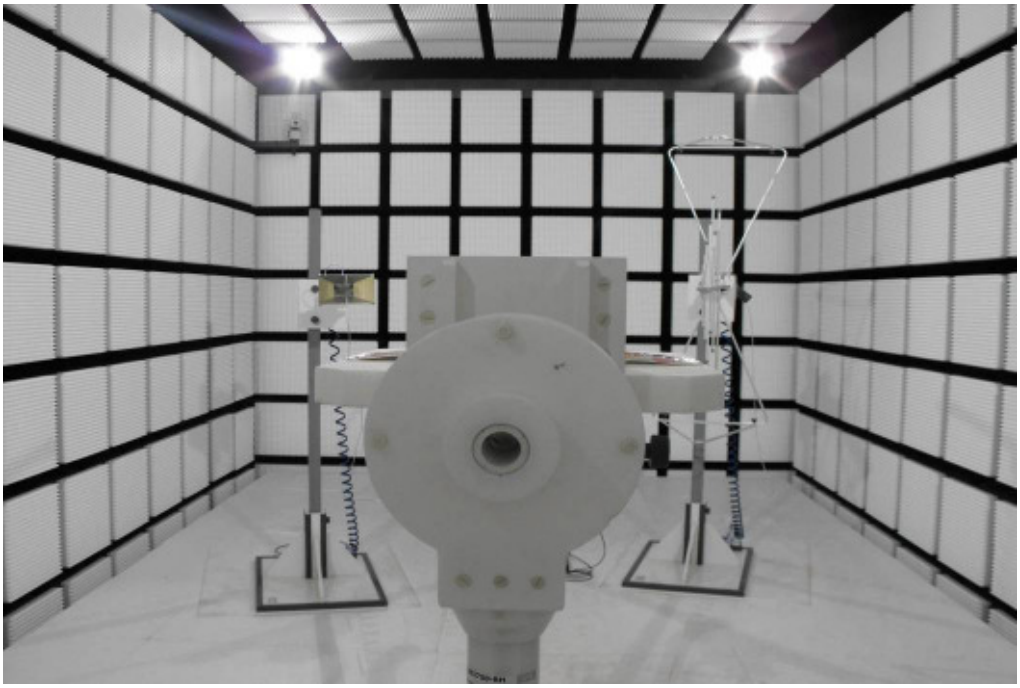

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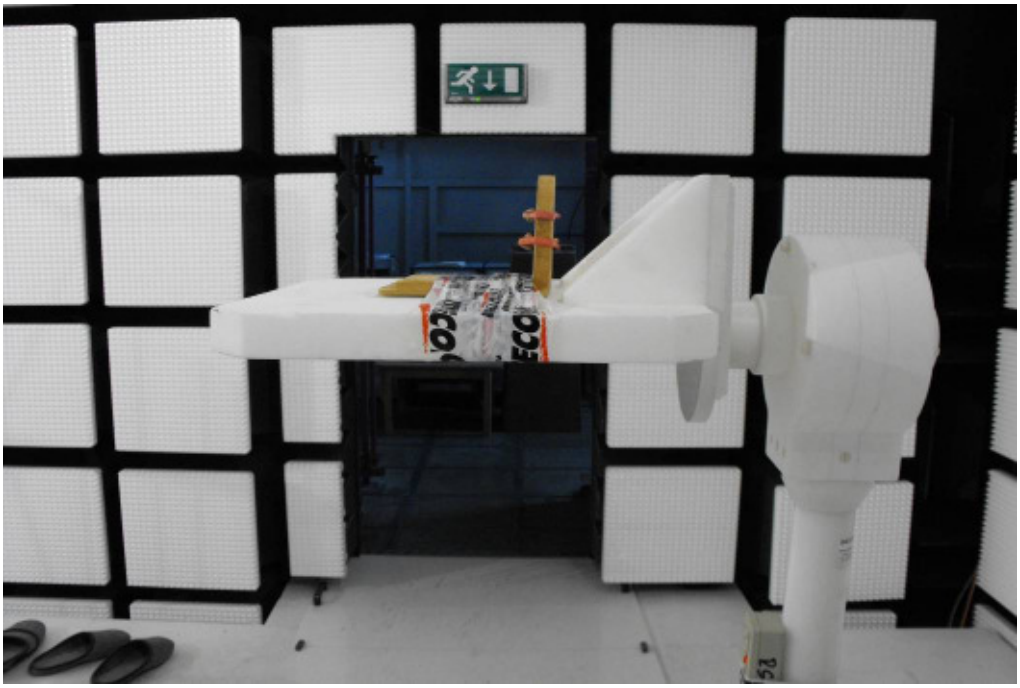


Photo 5:

Photo 6:

Photo 7:

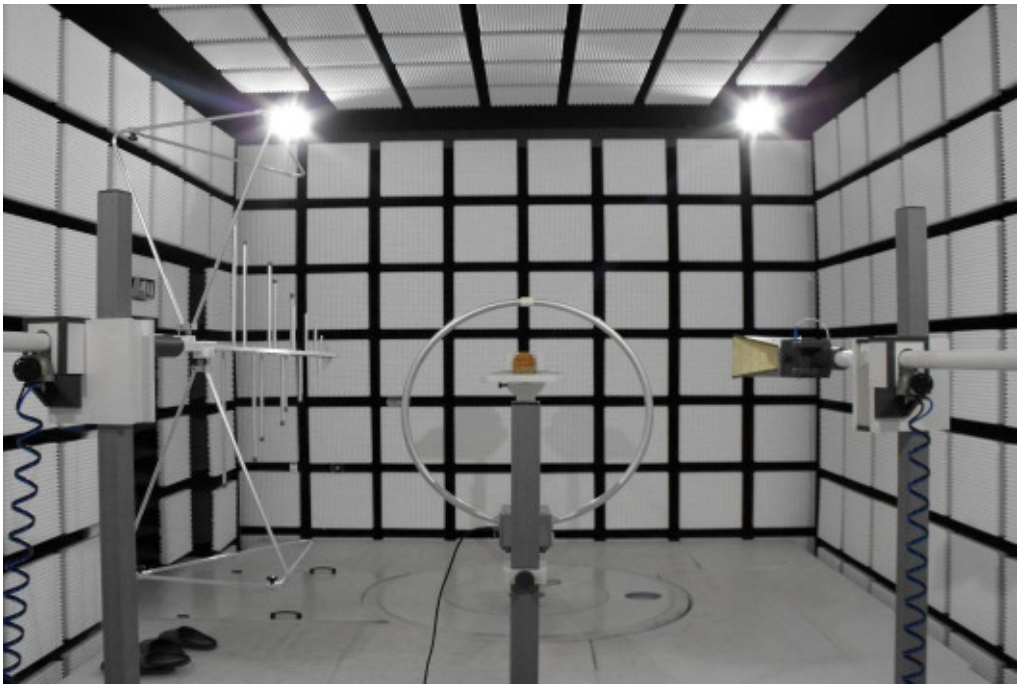
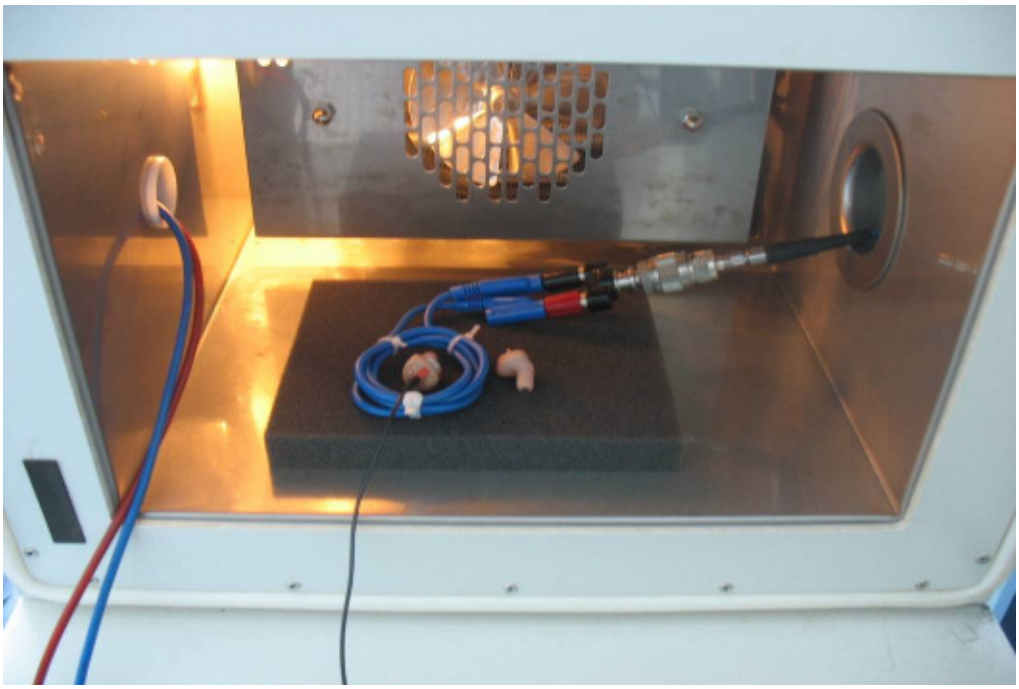


Photo 8:



8 Photographs of the EUT

Photo documentation: external photos

Photo 1: Sample 1

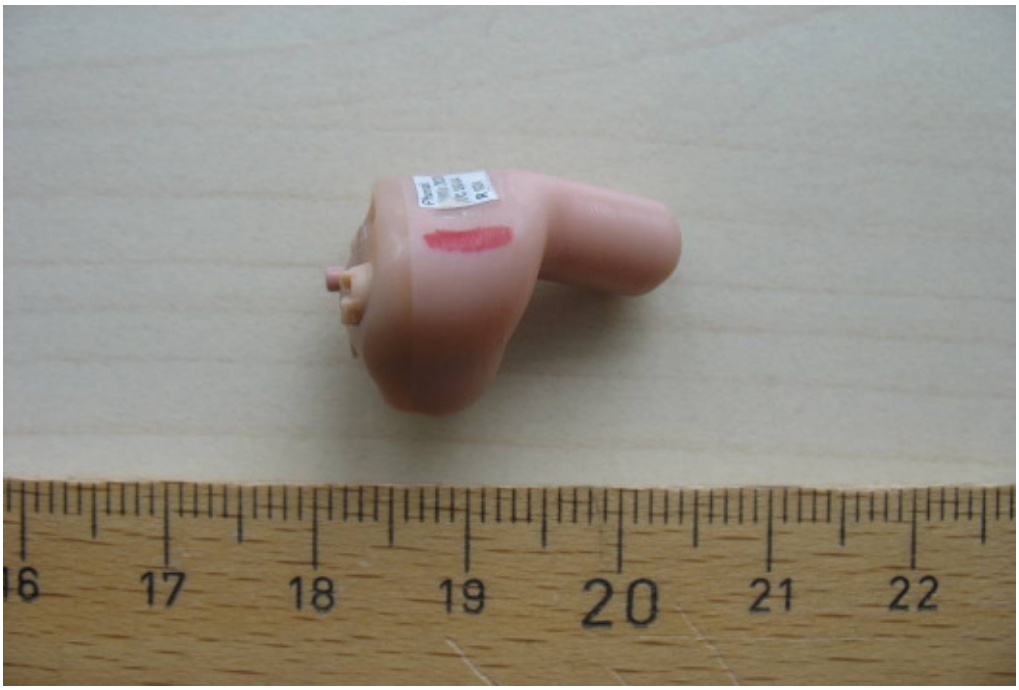
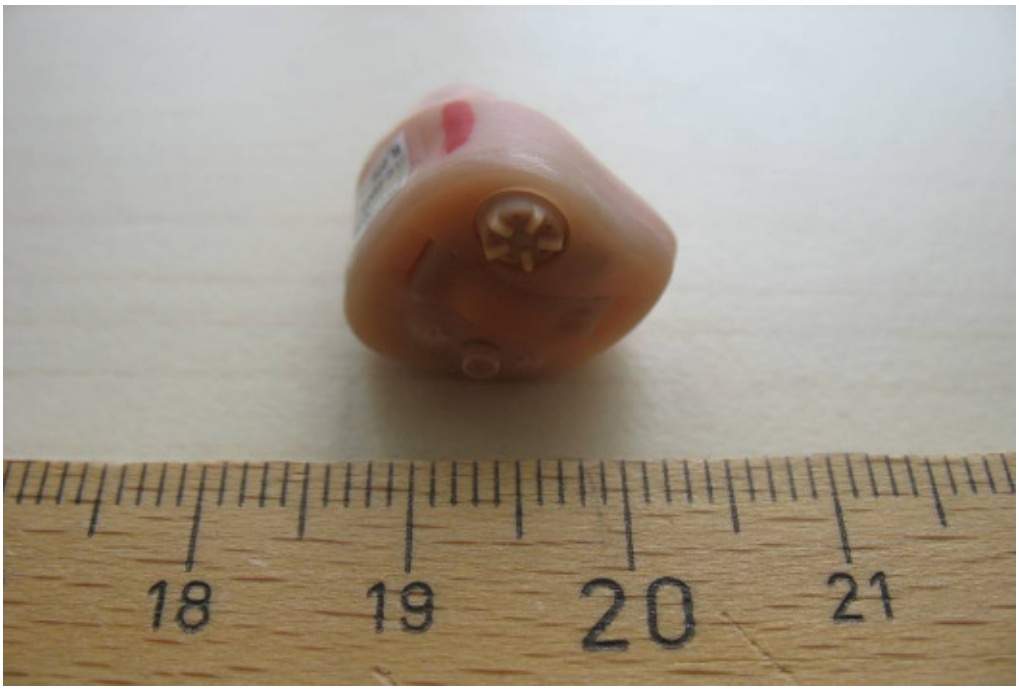


Photo 2: Sample 1



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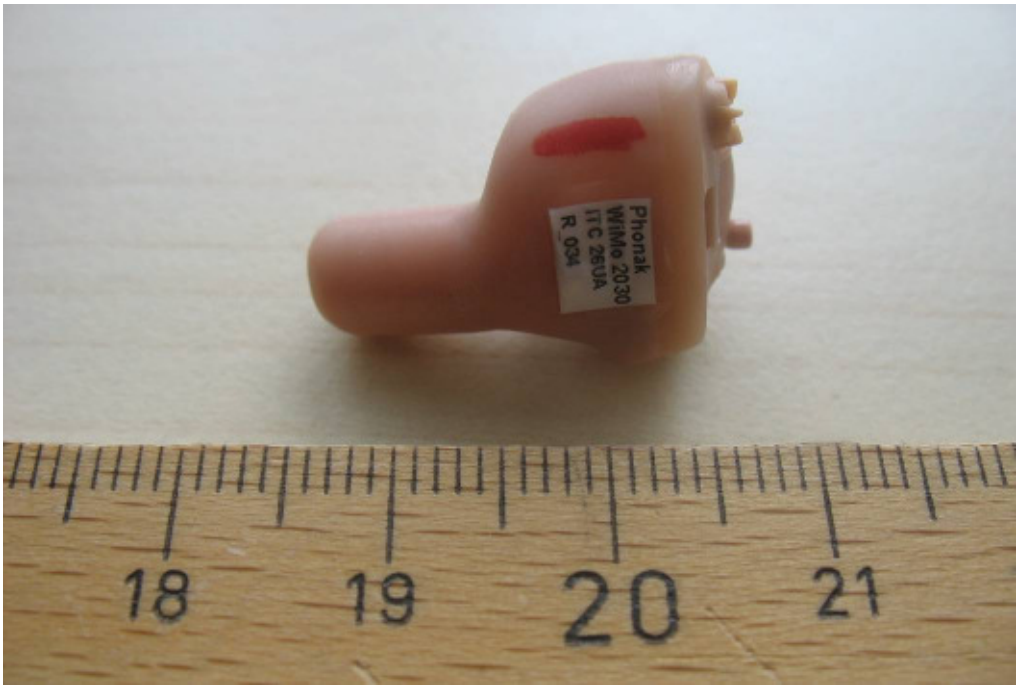


Photo 4: Sample 1

Photo 5: Sample 1

Photo 6: Sample 2

Photo 7: Sample 2

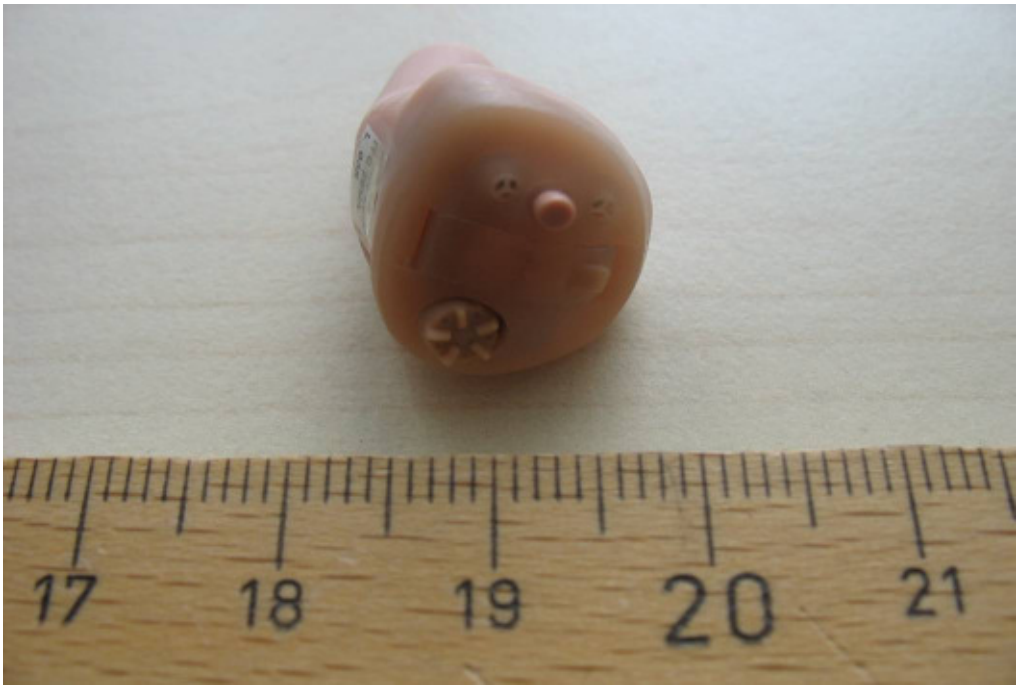


Photo 8: Sample 2

Photo 9: Sample 2

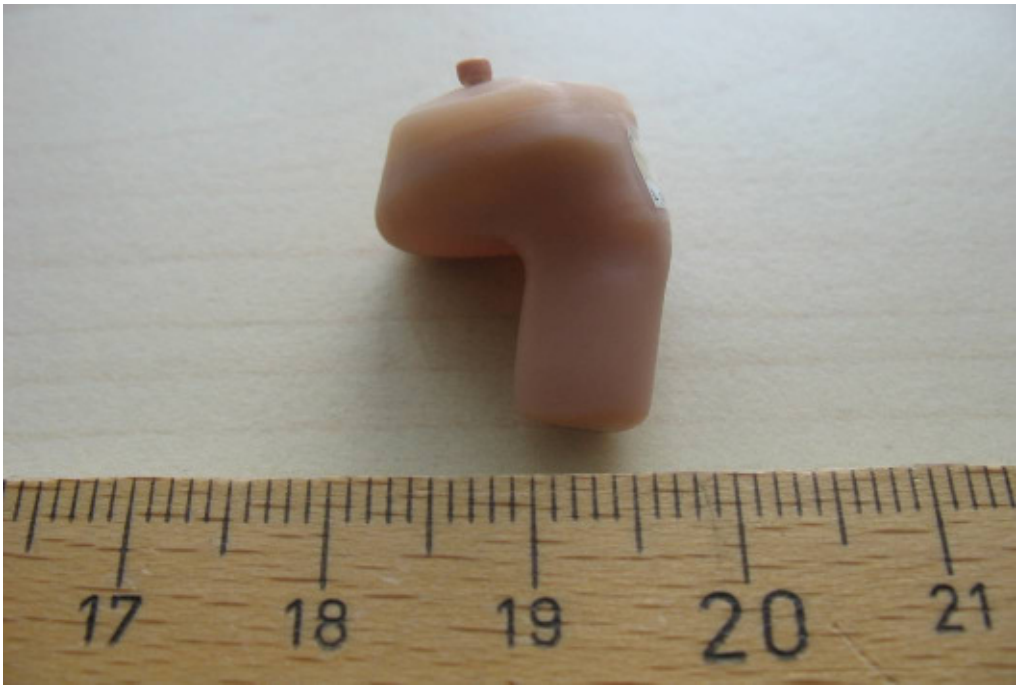


Photo 10: Sample 2

Photo 11: Sample 2

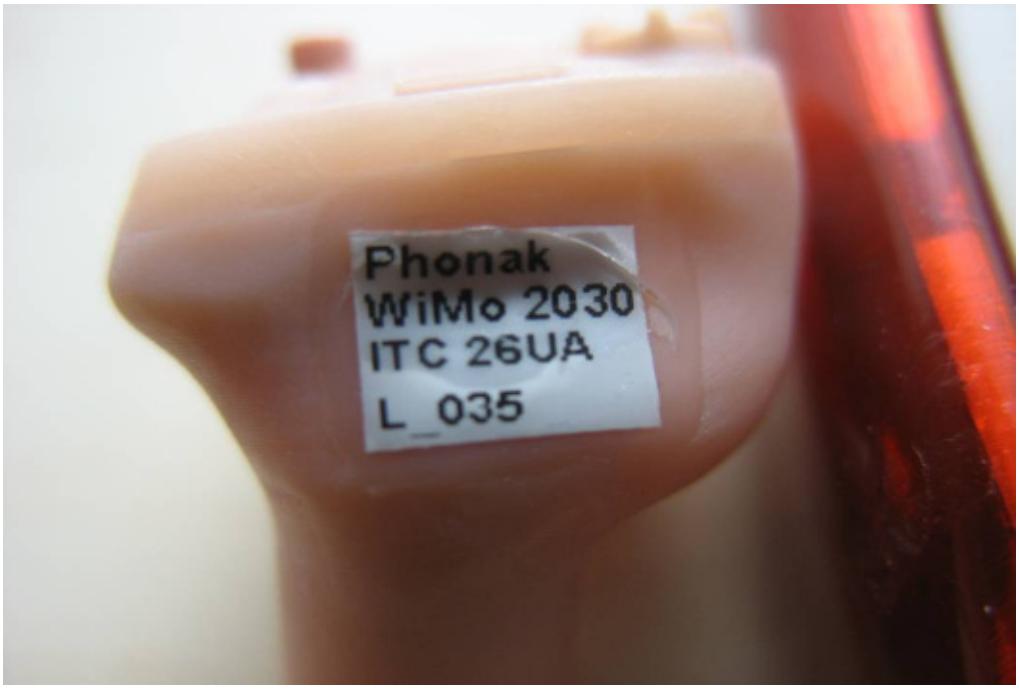
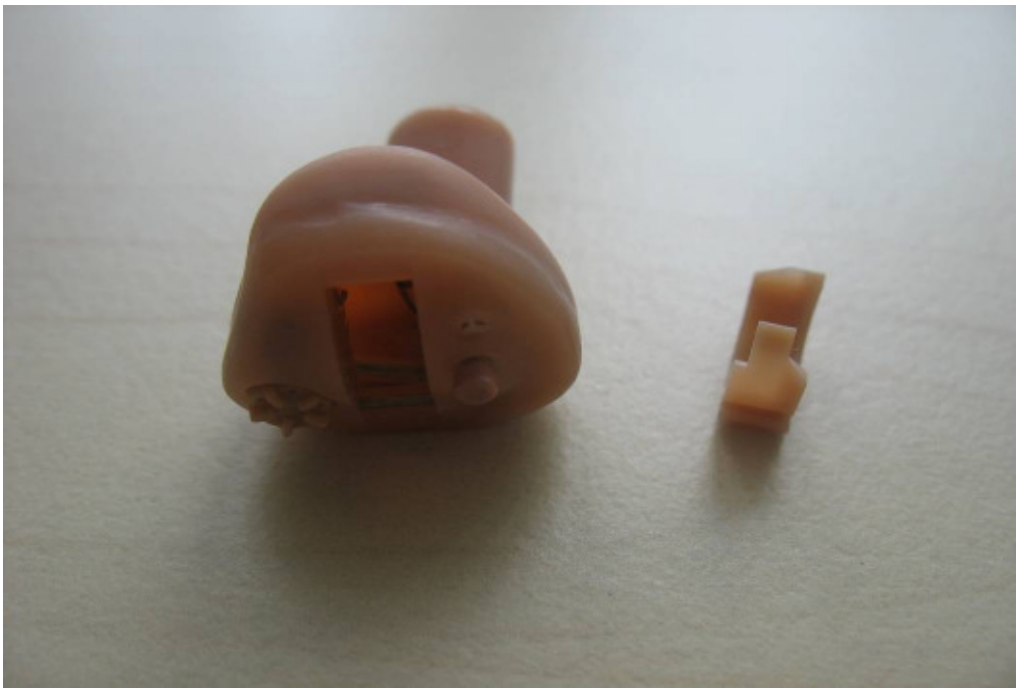


Photo documentation: internal photos

Photo 1:



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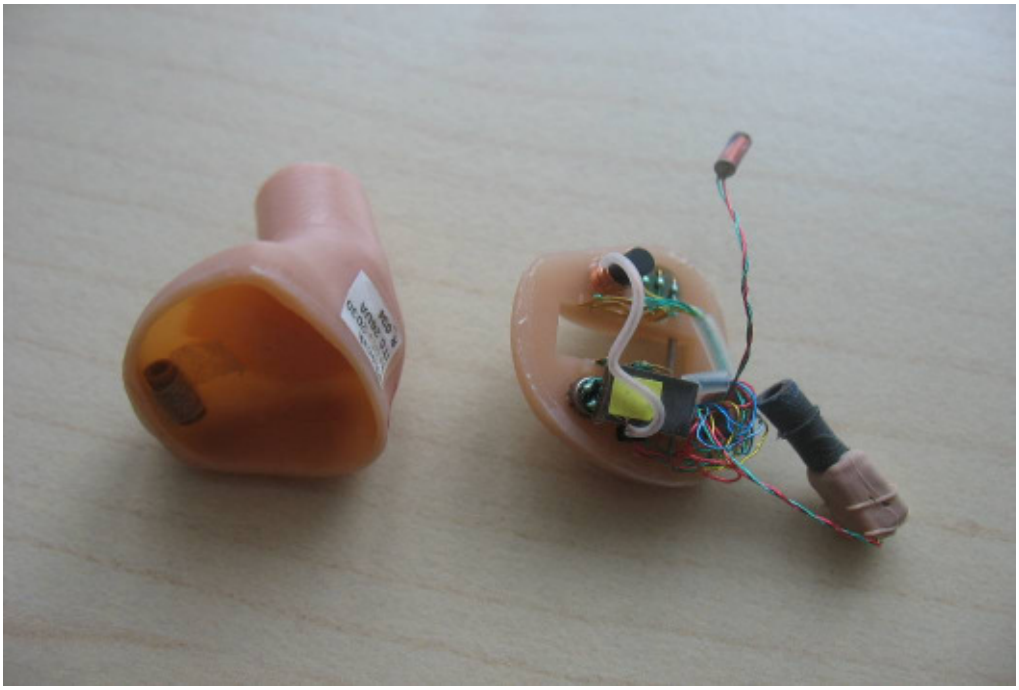
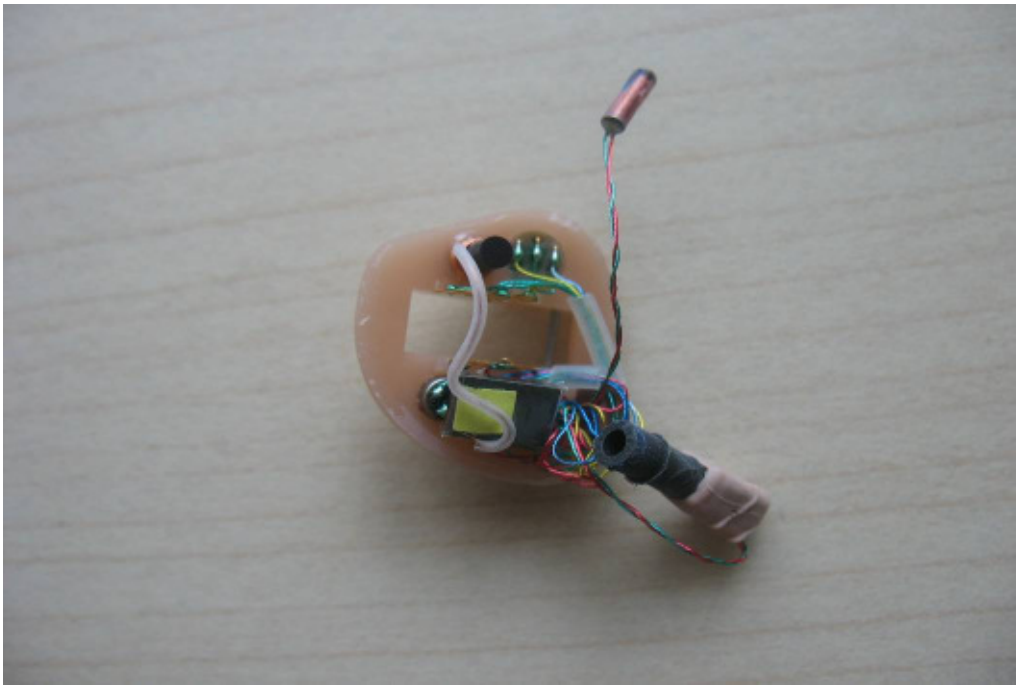


Photo 3:

Photo 4:

Photo 5:



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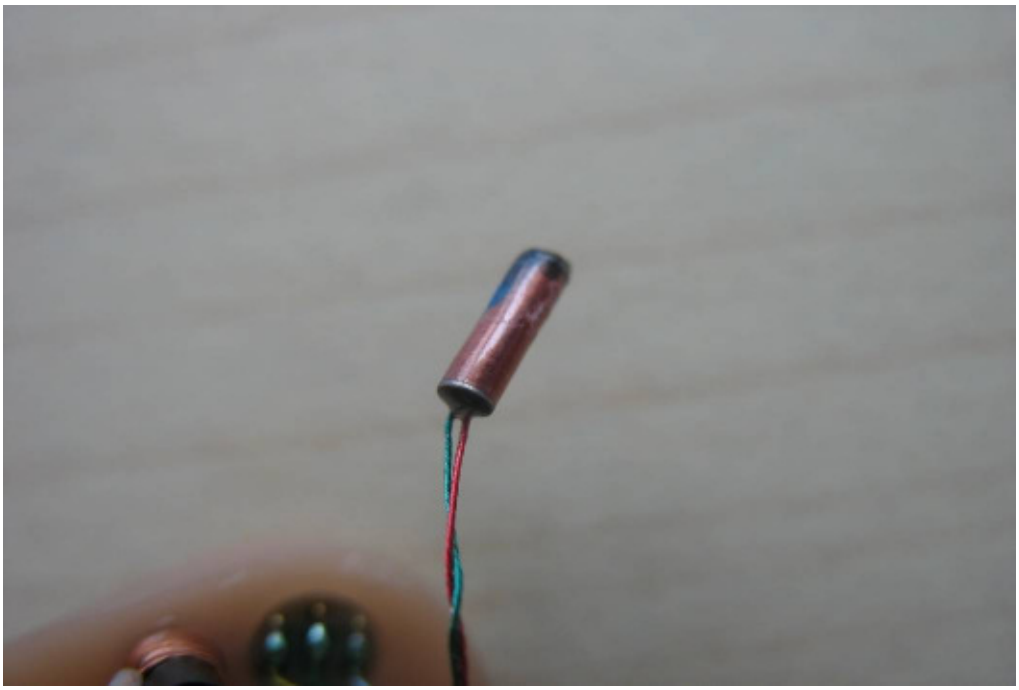

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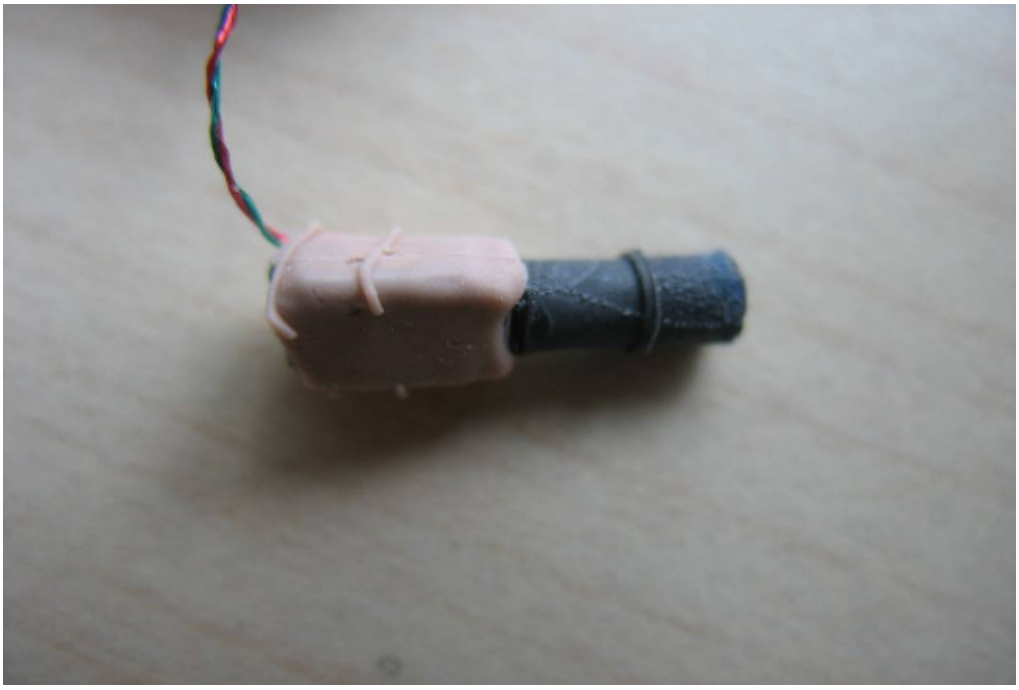

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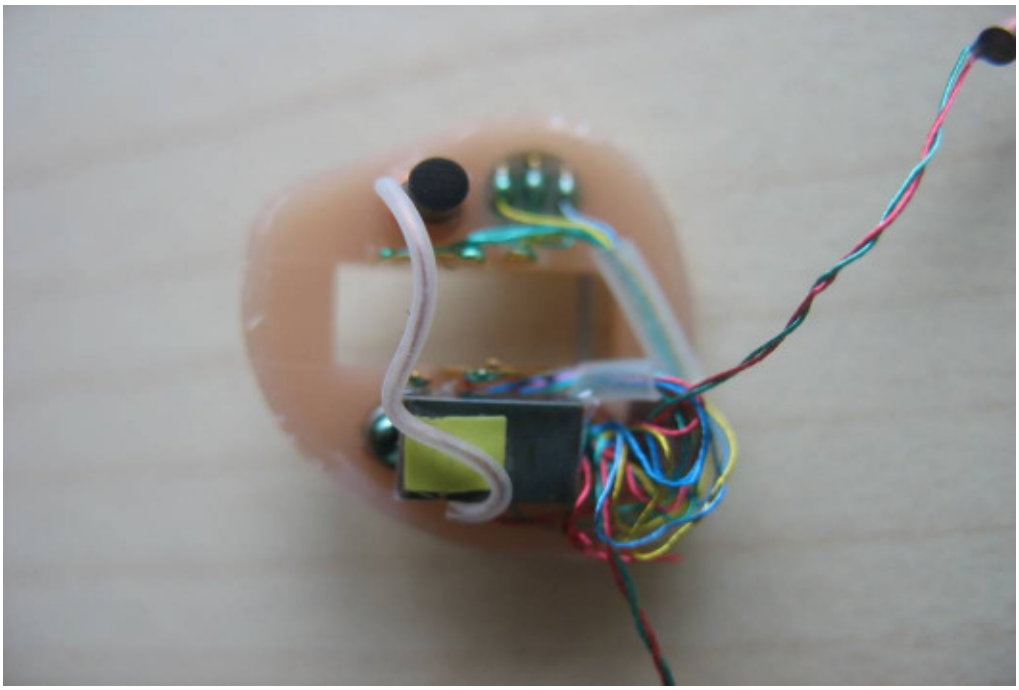

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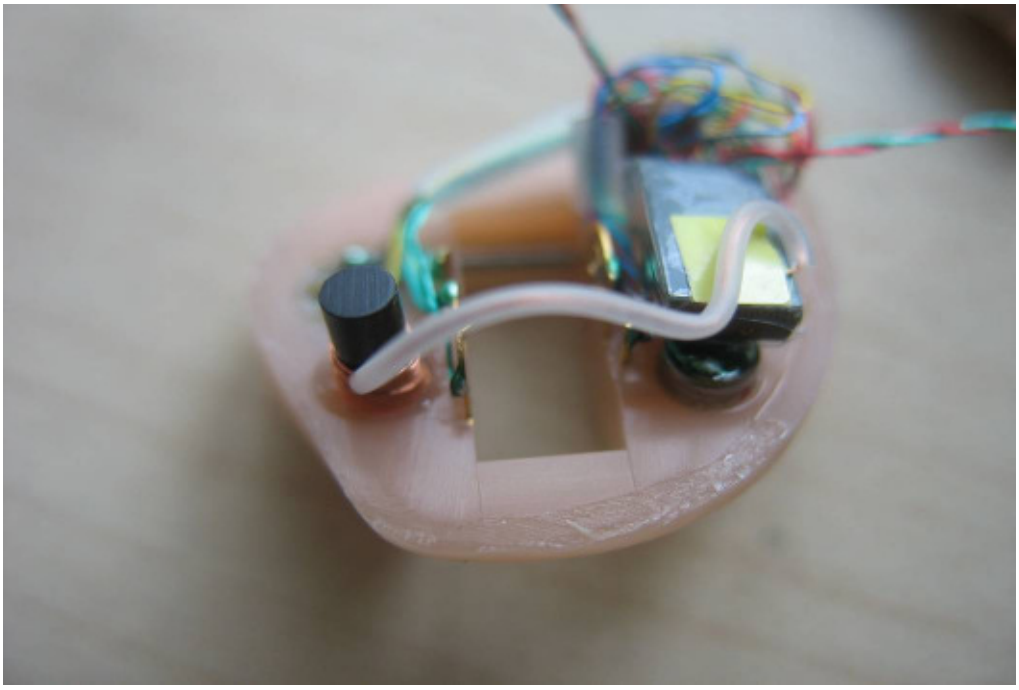

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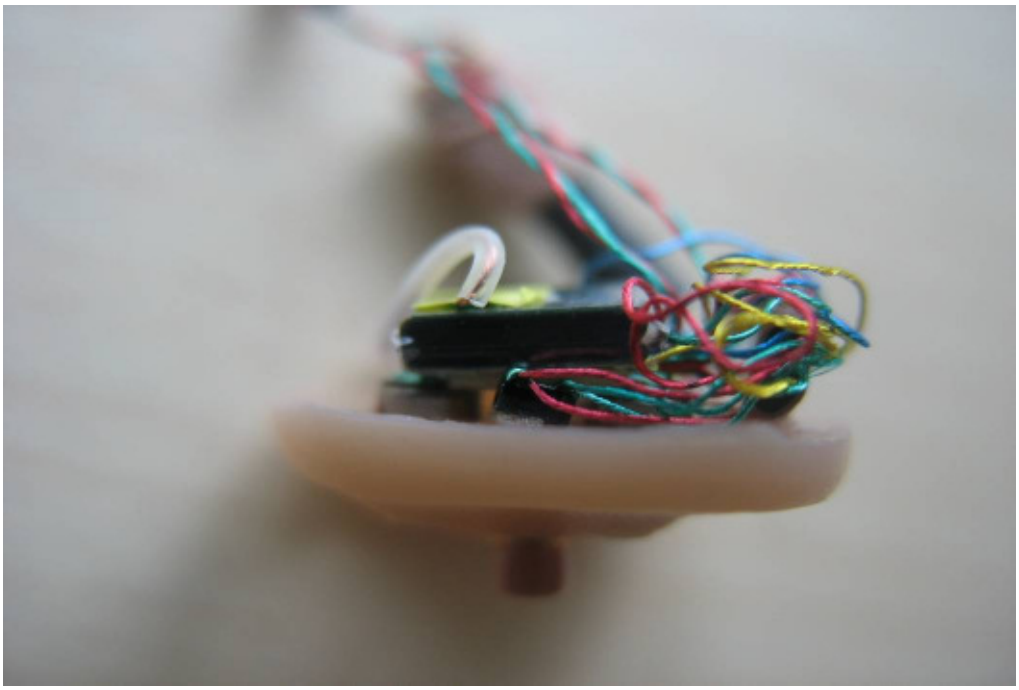

Photo 11:

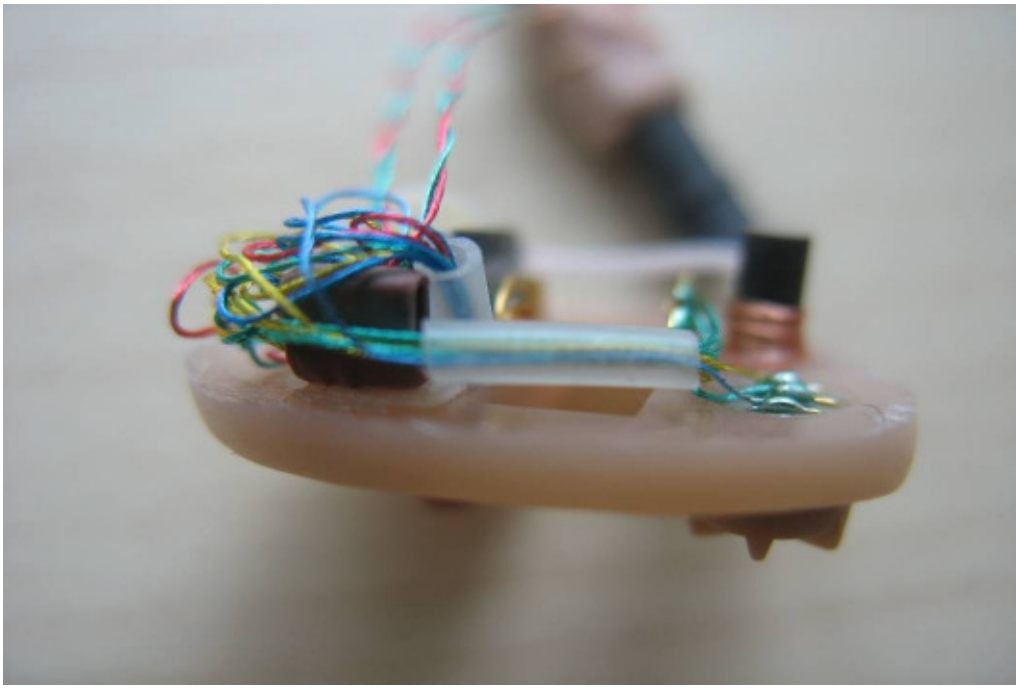

Photo 12: