

TEST REPORT

Test report no.: 1-3130-01-02/11



Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: <http://www.cetecom.com>
e-mail: ict@cetecom.com

Accredited test laboratory:

The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025
DAkkS registration number: D-PL-12076-01-01

Area of Testing: Radio/Satellite Communications

Applicant

Hansaton Akustik GmbH
Stückenstraße 48
22081 Hamburg / GERMANY
Phone: +49-40 29 80 11 0
Fax: +49 40 29 80 11-28
Contact: Martin Seidel
e-mail: m.seidel@hansaton.de
Phone: +49 40 29 80 11-62

Manufacturer

Hansaton Akustik GmbH
Stückenstraße 48
22081 Hamburg / GERMANY

Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I
Part 15 - Radio frequency devices

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

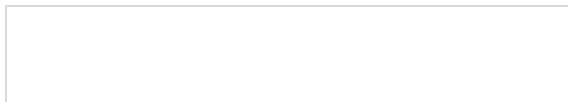
Test item

Kind of test item: AQ X-Mini
Model name: Hearing Aid
FCC ID: WU7-WL005BTE
IC: -/-
Frequency: 3.28 MHz
Power supply: 1.20 V DC by p13accu
Temperature range: 24 °C



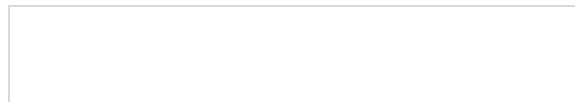
This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test performed:



Jakob Reschke

Test report authorised:



Stefan Bös

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2 General information

2.1 Notes

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 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 CETECOM ICT Services GmbH.

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.

2.2 Application details

Date of receipt of order:	2011-02-18
Date of receipt of test item:	2011-04-28
Start of test:	2011-04-28
End of test:	2011-06-15
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Version	Test standard description
47 CFR Part 15	2009-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices

4 Test environment

Temperature:	T_{nom}	24	°C during room temperature tests
	T_{max}	-/-	°C during high temperature test
	T_{min}	-/-	°C during low temperature test
Relative humidity content:		40	%
Air pressure:			not relevant for this kind of testing
Power supply:	V_{nom}	1.20 V	DC by p13accu
	V_{max}	-/-	V
	V_{min}	-/-	V

5 Test item

Kind of test item	:	AQ X-Mini
Type identification	:	Hearing Aid
S/N serial number	:	Not defined
HW hardware status	:	Not defined
SW software status	:	Not defined
Frequency band [MHz]	:	3.28 MHz
Type of modulation	:	A1D
Number of channels	:	1
Antenna	:	Integrated antenna
Power supply	:	1.20 V DC by p13accu
Temperature range	:	24 °C

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	Passed	2011-06-20	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Results (max.)
§ 15.223(a)	Fieldstrength of Fundamental	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.223(a)	Emission bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.209	Fieldstrength of harmonics and spurious	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.209	Receiver spurious emissions (radiated)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Note: NA = Not Applicable; NP = Not Performed

8 RF measurements

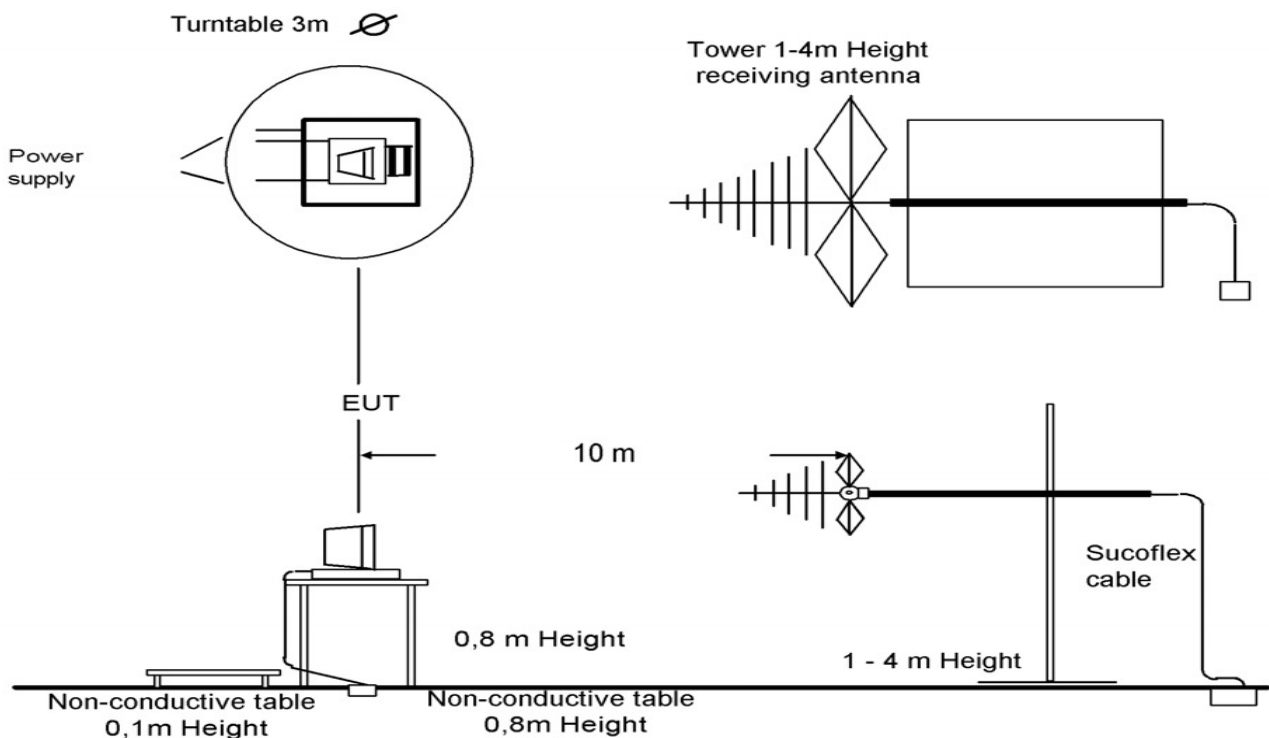
8.1 Description of test setup

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 clause 15 and ANSI C63.4-2009 clause 4.1.5. 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 C63-4-2009 clause 4.2.

Antennas are confirmed with ANSI C63.2-1996 item 15.

Semi anechoic chamber



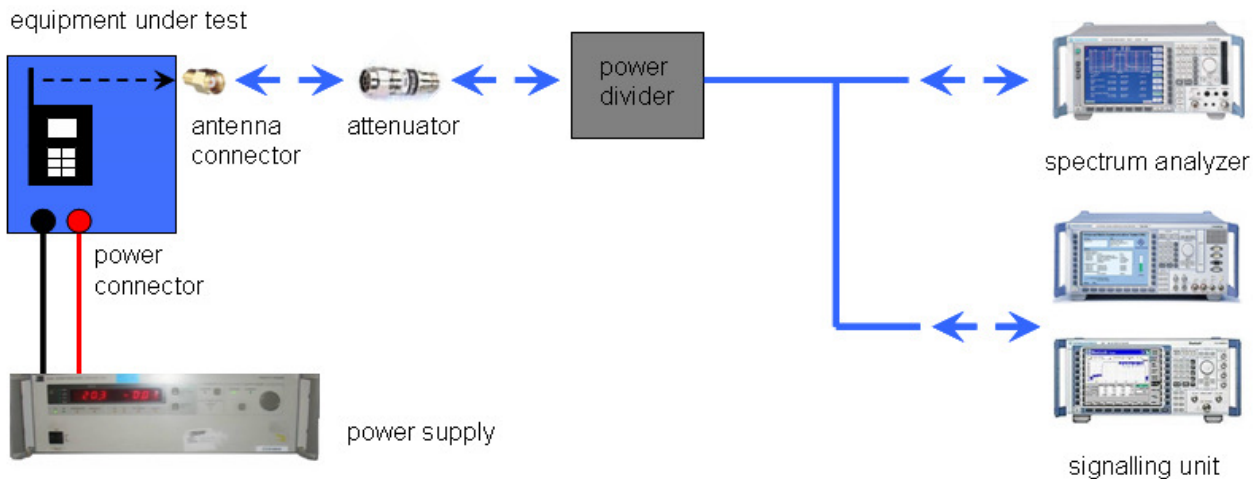
Picture 1: Diagram radiated measurements

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 is performed from outside the chamber with a signalling unit (CMU200 or other) 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). One of the signal paths is connected to the communication base Station (CMU200 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.



Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

9 Measurement results

9.1 Fieldstrength of the fundamental

Measurement:

Measurement parameter	
Detector:	Quasi Peak
Sweep time:	-/-
Resolution bandwidth:	1 MHz
Video bandwidth:	≥ RBW
Span:	-/-
Trace-Mode:	Max Hold

Limits:

FCC
The field strength of any emission within the band 1.705-10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level

Max. field strength = bandwidth in kHz / center frequency in MHz

Max. field strength = 43 kHz / 3.28 MHz

Max. field strength = 13.11 microvolts/meter @ 30 m

Max. field strength = 22.35 dBμV/m @ 30 m

Result:

TEST CONDITIONS		MAXIMUM POWER (dBμV/m)	
Frequency		3.28 MHz	3.28 MHz
Mode		at 1 m distance	at 30 m distance
T _{nom}	V _{nom}	34.5	22 (noise floor) *-25.5
Measurement uncertainty		±3dB	

*Re-calculated from 30m to 3m with 40 dB/decade according to FCC 15.31 (f2)

Result: The result of the measurement is passed.

9.2 Emission Bandwidth

Measurement:

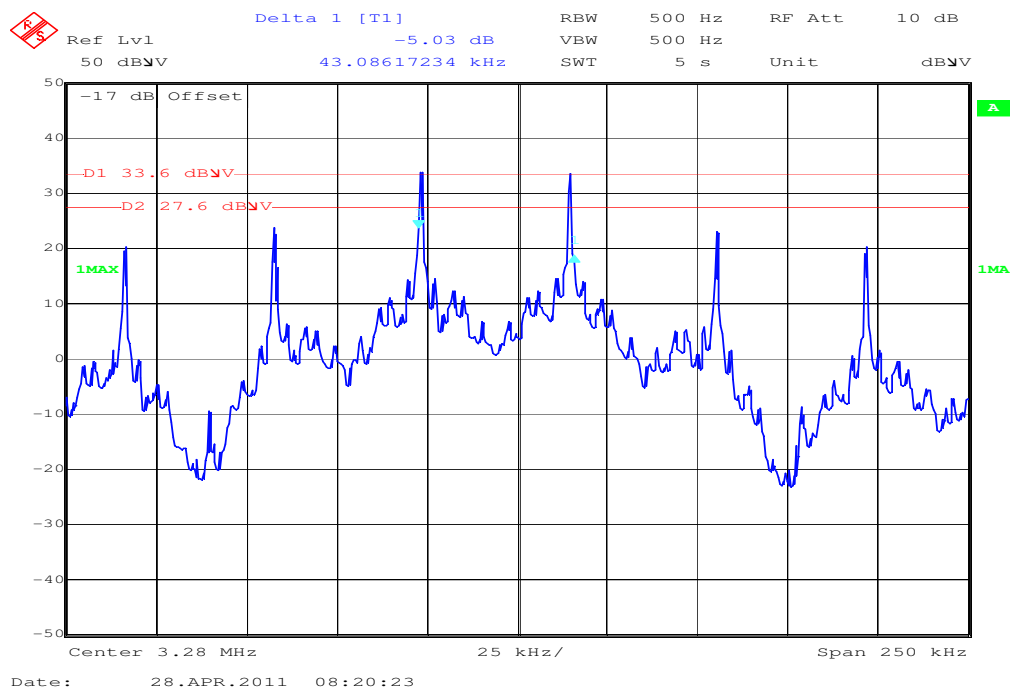
Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	500 Hz
Video bandwidth:	500 Hz
Span:	250 kHz
Trace-Mode:	Max Hold

Limits:

FCC

For the purposes of this Section, bandwidth is determined at the points 6 dB down from the modulated carrier

Plot 1:



Result:

TEST CONDITIONS		6dB BADNWIDTH
Frequency		3.28 MHz
T _{nom}	V _{nom}	43 kHz
Measurement uncertainty		±500Hz

Result: The result of the measurement is passed.

9.3 Fieldstrength of the harmonics and spurious

Measurement:

Measurement parameter	
Detector:	Peak / Quasi peak
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		
SUBCLAUSE § 15.209		
Fieldstrength of the harmonics and spurious.		
Frequency (MHz)	Fieldstrength (µV/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 dBµV/m)	30
30 – 88	100 (40 dBµV/m)	3
88 – 216	150 (43.5 dBµV/m)	3
216 – 960	200 (46 dBµV/m)	3

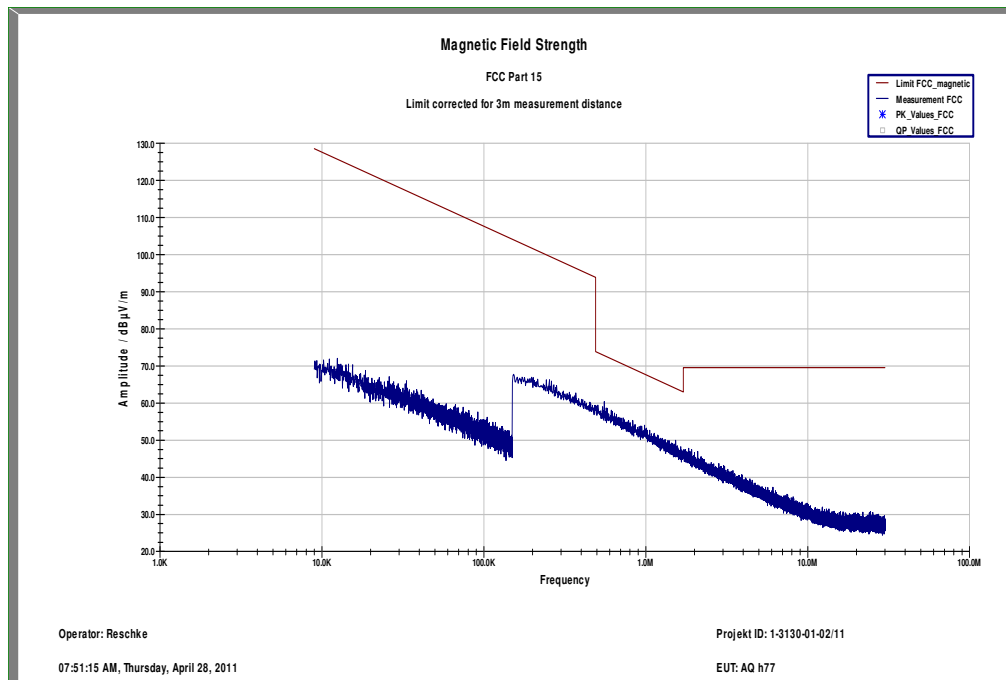
Result:

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results
No critical peaks found				

Result: The result of the measurement is passed.

Plots of the measurements

Plot 1: 9 kHz – 30 MHz;
Part 15.209 Magnetics, Measurement distance 3m



Plot 2: 30 MHz – 1000 MHz

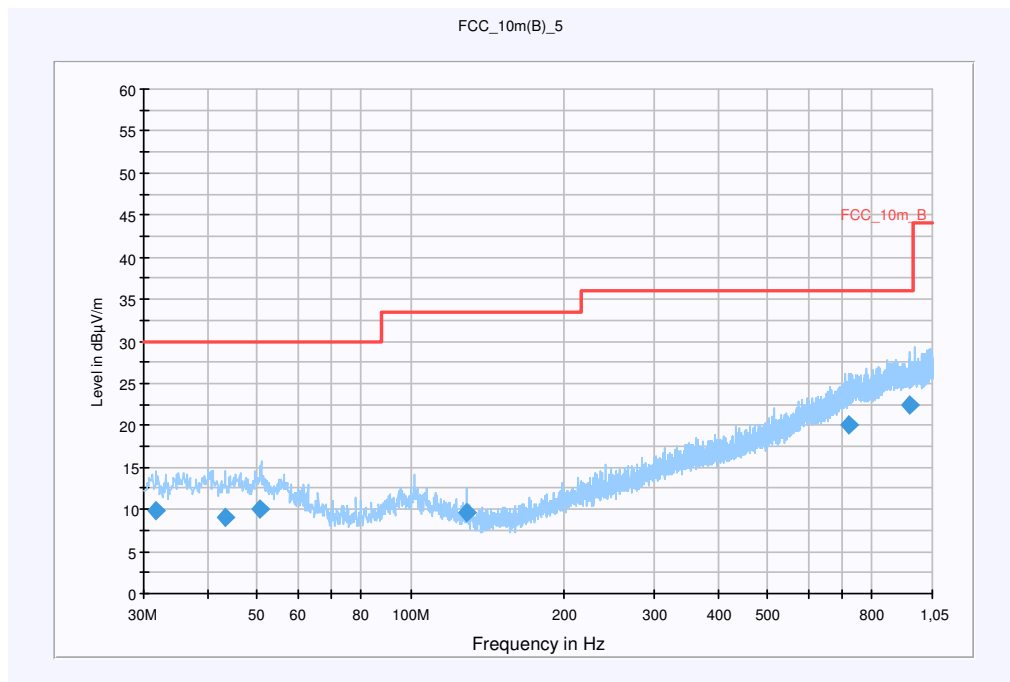
Common Information

EUT: AQ h77
 Serial Number:
 Test Description: FCC Part 15
 Operating Conditions: TX
 Operator Name: Kraus
 Comment: bat powered

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Level Unit: dB μ V/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 2 GHz	QuasiPeak	120 kHz	15 s	Receiver

**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
31.800000	9.8	15000.000	120.000	203.0	V	91.0	12.7	20.2	30.0	
43.320000	9.1	15000.000	120.000	270.0	V	170.0	13.3	20.9	30.0	
50.760000	10.1	15000.000	120.000	236.0	H	153.0	13.3	19.9	30.0	
129.000000	9.6	15000.000	120.000	270.0	V	314.0	9.5	23.9	33.5	
719.760000	20.1	15000.000	120.000	109.0	H	108.0	23.0	15.9	36.0	
944.880000	22.3	15000.000	120.000	251.0	H	8.0	25.3	13.7	36.0	

9.4 Receiver spurious emissions

Measurement:

Measurement parameter	
Detector:	Peak / Quasi peak
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		
SUBCLAUSE § 15.209		
Fieldstrength of the harmonics and spurious.		
Frequency (MHz)	Fieldstrength (µV/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 dBµV/m)	30
30 – 88	100 (40 dBµV/m)	3
88 – 216	150 (43.5 dBµV/m)	3
216 – 960	200 (46 dBµV/m)	3

Result:

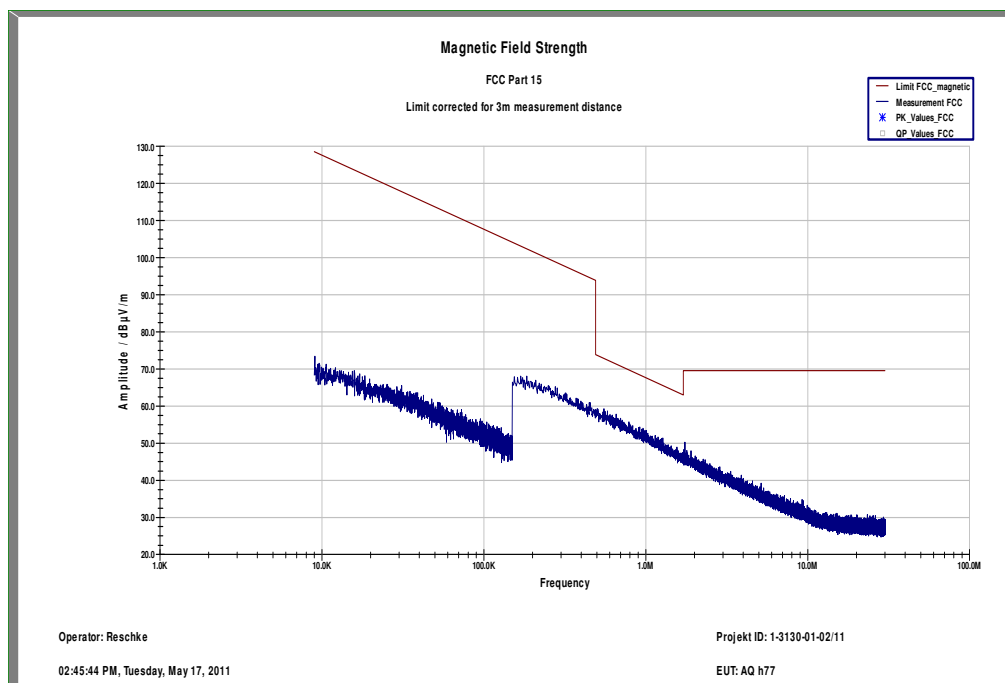
EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results
No critical peaks found				

Result: The result of the measurement is passed.

Plots of the measurements

Plot 1: 9 kHz – 30 MHz;

Part 15.209 Magnetics, Measurement distance 3m



Plot 2: 30 MHz – 1000 MHz

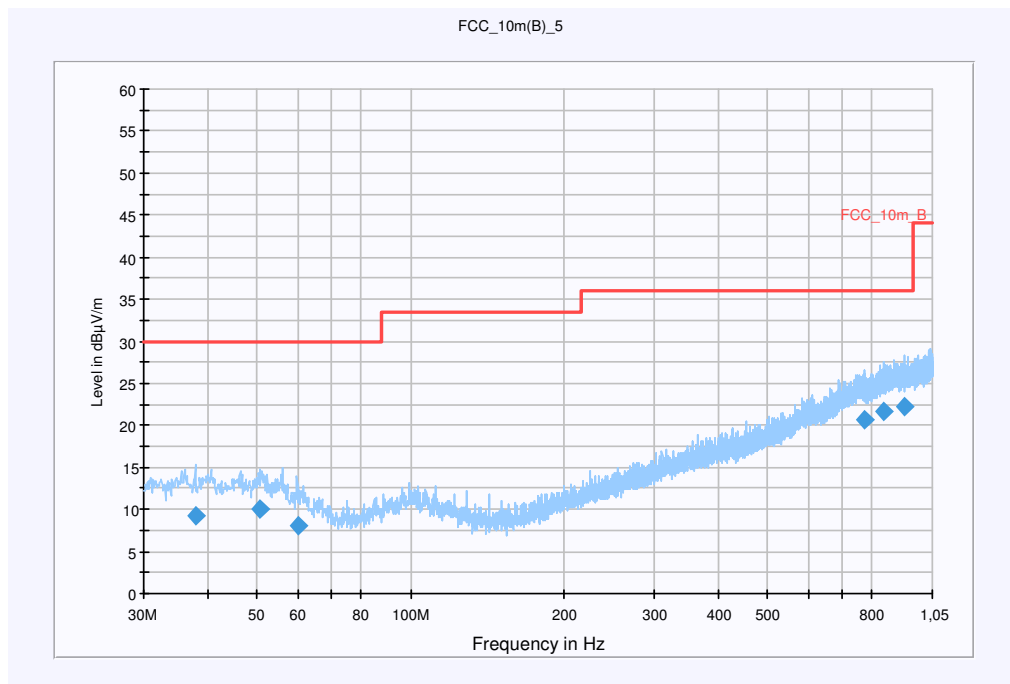
Common Information

EUT: AQ h77
 Serial Number:
 Test Description: FCC Part 15
 Operating Conditions: RX
 Operator Name: Kraus
 Comment: bat powered

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Level Unit: dB μ V/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 2 GHz	QuasiPeak	120 kHz	15 s	Receiver

**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
37.800000	9.2	15000.000	120.000	98.0	V	305.0	13.3	20.8	30.0	
50.640000	10.1	15000.000	120.000	270.0	H	-2.0	13.3	19.9	30.0	
60.000000	8.1	15000.000	120.000	262.0	V	141.0	11.6	21.9	30.0	
775.560000	20.7	15000.000	120.000	200.0	V	102.0	23.7	15.3	36.0	
843.120000	21.6	15000.000	120.000	270.0	V	252.0	24.5	14.4	36.0	
924.360000	22.3	15000.000	120.000	270.0	V	116.0	25.3	13.7	36.0	

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	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
2	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
3	n. a.	Coaxial Attenuator 30dB/500W	8325	Bird	1530	300001595	ev		
4	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKI!	05.03.2009	05.09.2011
5	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
6	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
7	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
8	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
9	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
10	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
11	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
12	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
13	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
14	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
15	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
16	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
17	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
18	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
19	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
20	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
21	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	08.09.2010	08.09.2012
22	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	13.09.2010	13.09.2012
23	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vlKI!	08.09.2010	08.09.2012
24	n. a.	TRILOG	VULB9163	Schwarzbeck	371	300003854	vlKI!	17.12.2008	17.12.2011

		Broadband Test-Antenna 30 MHz - 3 GHz							
25	n. a.	Test Receiver	ESH2	R&S	871921/095	300002505	Ve	12.02.2010	12.02.2012
26	n. a.	Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824	vlKI!	18.11.2008	18.11.2011
27	n. a.	Signal Analyzer 20Hz- 26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve	04.11.2010	04.11.2012

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
 vlKI! 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

Annex A Photographs of the test setup

Photo documentation

Photo 1:

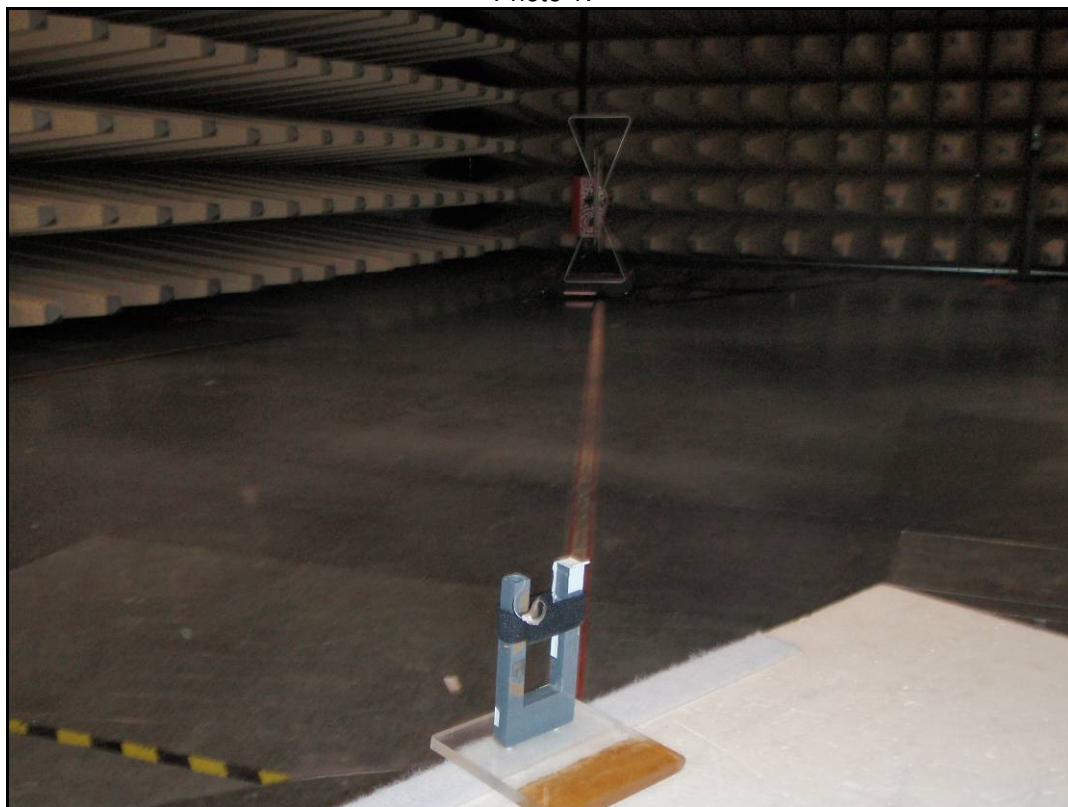
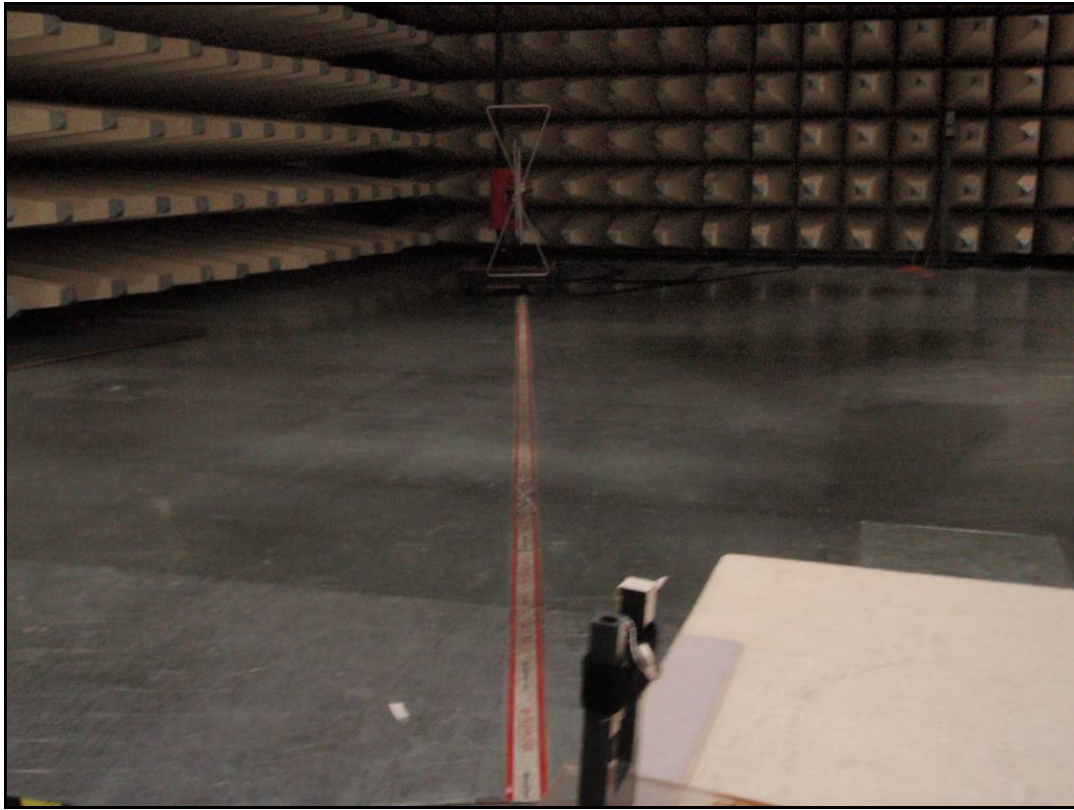


Photo 2:



Annex B External photographs of the EUT

Photo documentation

Photo 3:



Photo 4:



Photo 5:



Photo 6:



Annex C Internal photographs of the EUT

Photo documentation

Photo 7:



Photo 8:

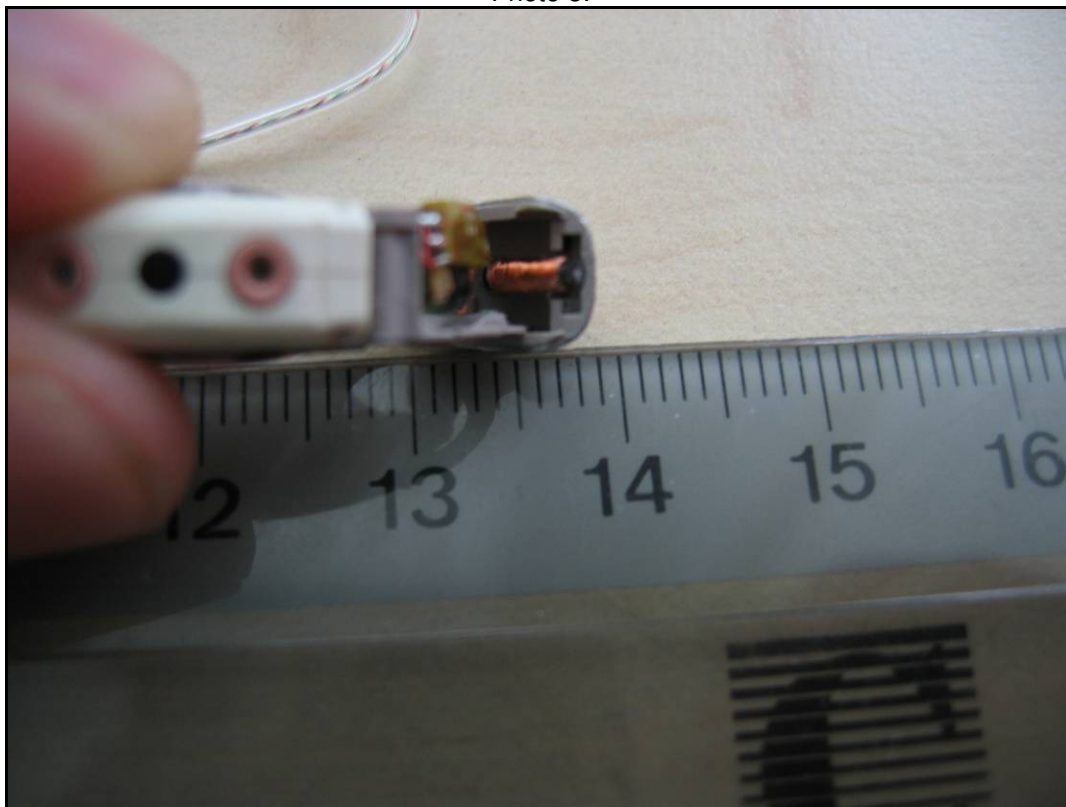


Photo 9:

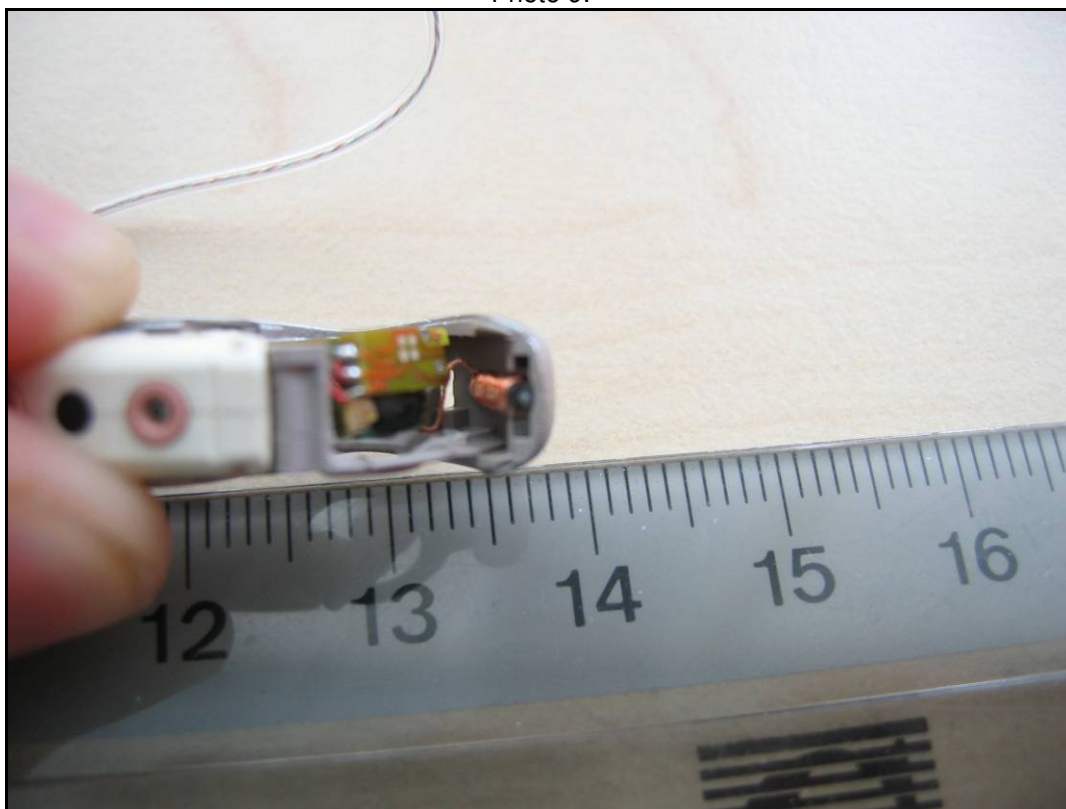


Photo 10:



Photo 11:



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2011-06-20

Annex E Further information**Glossary**

DUT	-	Device under Test
EMC	-	Electromagnetic Compatibility
EUT	-	Equipment under Test
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	not applicable
S/N	-	Serial Number
SW	-	Software