

TEST REPORT

Test report no.: 1-6353/13-01-07



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

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 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

Sonic Innovations Inc.

2501 Cottontail Lane
Somerset, NJ 08873 / UNITED STATES
Contact: Joe Lugara
e-mail: joe@sonici.com
Phone: +1 73 25 60 32 20

Manufacturer

Bernafon AG

Morgenstraße 131
3018 Bern / SWITZERLAND

Test standard/s

47 CFR 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
RSS Gen Issue 3	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

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

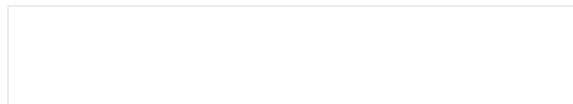
Test Item

Kind of test item:	BTE Hearing Aid
Model name:	BL100 BTE, BL80 BTE, CH60 BTE
FCC ID:	ZTOBTE01
IC:	9799A-BTE01
Frequency:	3.84 MHz
Technology tested:	proprietary
Antenna:	Integrated antenna
Power supply:	1.4V DC by Zinc Air Button Cell Hearing Aid Battery
Temperature range:	0°C to +40°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 report authorised:



Andreas Luckenbill
Expert

Test performed:



p.o.
Christoph Schneider
Expert

1 Table of contents

1	Table of contents	2
2	General information	3
2.1	Notes and disclaimer	3
2.2	Application details	3
3	Test standard/s	3
4	Test environment	4
5	Test item	4
5.1	Additional information	4
6	Test laboratories sub-contracted	4
7	Summary of measurement results	5
8	RF measurements	6
8.1	Description of test setup	6
8.1.1	Radiated measurements	6
8.2	Additional comments	7
8.3	RSP100 test report cover sheet / performance test data	8
9	Measurement results	9
9.1	Bandwidth of the modulated carrier	9
9.2	Field strength of the fundamental	11
9.3	Fieldstrength of the harmonics and spurious	12
9.4	Receiver spurious emissions	15
10	Test equipment and ancillaries used for tests	18
11	Observations	18
Annex A	Document history	19
Annex B	Further information	19
Annex C	Accreditation Certificate	20

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.

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.

The testing service provided by CETECOM ICT Services GmbH has been rendered under the current "General Terms and Conditions for CETECOM ICT Services GmbH".

CETECOM ICT Services GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.

Under no circumstances does the CETECOM ICT Services GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.

Under no circumstances does the CETECOM ICT Services GmbH test report include or imply any product or service warranties from CETECOM ICT Services GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CETECOM ICT Services GmbH.

All rights and remedies regarding vendor's products and services for which CETECOM ICT Services GmbH has prepared this test report shall be provided by the party offering such products or services and not by CETECOM ICT Services GmbH.

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:	2013-06-03
Date of receipt of test item:	2013-07-26
Start of test:	2013-08-05
End of test:	2013-08-06
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR 15	01.10.2012	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	01.12.2010	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
RSS Gen Issue 3	01.12.2010	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

4 Test environment

Temperature:	T_{nom}	+22	°C during room temperature tests
	T_{max}	+40	°C during high temperature tests
	T_{min}	0	°C during low temperature tests
Relative humidity content:		53 %	
Barometric pressure:		not relevant for this kind of testing	
Power supply:	V_{nom}	1.4 V	DC by Zinc Air Button Cell Hearing Aid Battery
	V_{max}	1.5 V	
	V_{min}	1.1 V	

5 Test item

Kind of test item	:	BTE Hearing Aid
Type identification	:	BL100 BTE, BL80 BTE, CH60 BTE
S/N serial number	:	Rad. 22867797
HW hardware status	:	Accord 129262, PCB Rev. 0
SW software status	:	n.a.
Frequency [MHz]	:	3.84 MHz
Type of radio transmission	:	single carrier
Use of frequency spectrum	:	
Type of modulation	:	On-Off Keying
Number of channels	:	1
Antenna	:	Integrated antenna
Power supply	:	1.4 V DC by Zinc Air Button Cell Hearing Aid Battery
Temperature range	:	0°C to +40 °C

5.1 Additional information

Test setup- and EUT-photos are included in test report 1-6353/13-01-01_AnnexA

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	2013-08-23	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Results
§ 15.223 / RSS-210 Issue 8	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

Note: NA = Not Applicable; NP = Not Performed

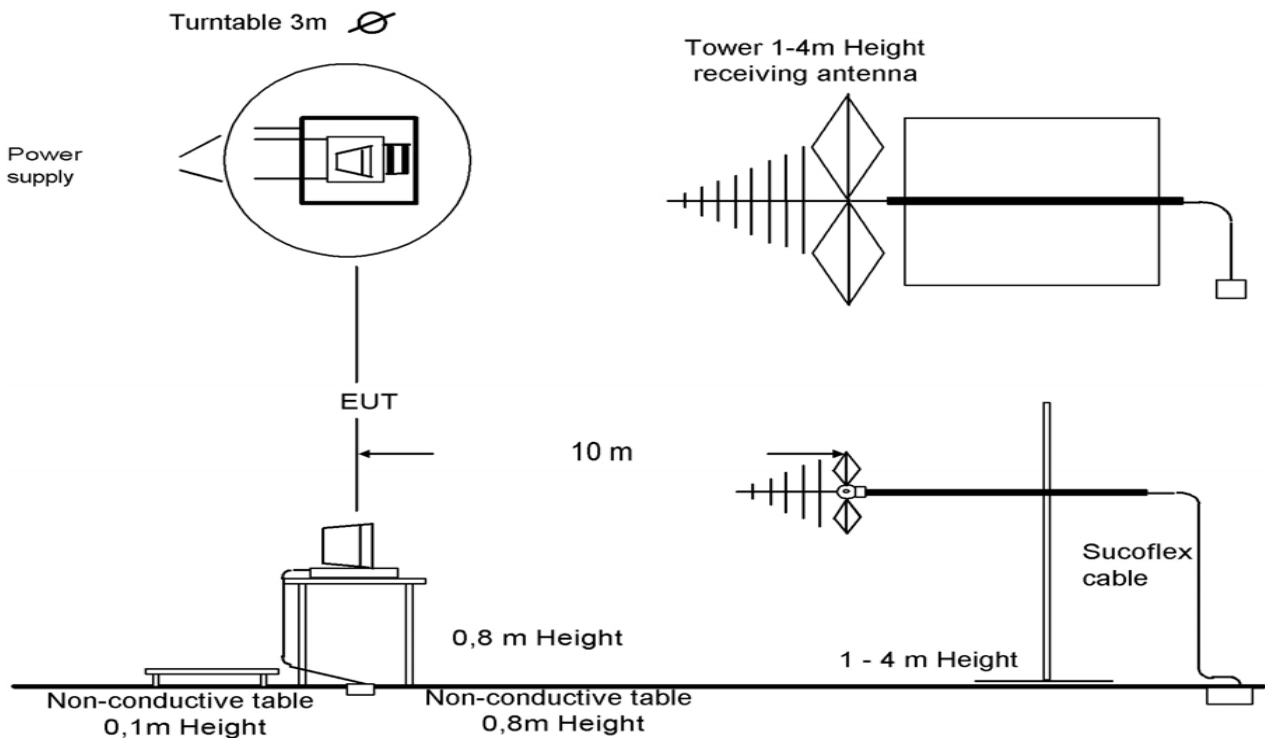
8 RF measurements

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.

8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

8.3 RSP100 test report cover sheet / performance test data

Test Report Number	:	1-6353/13-01-07
Equipment Model Number	:	BL100 BTE, BL80 BTE, CH60 BTE
Certification Number	:	9799A-BTE01
Manufacturer (complete Address)	:	Bernafon AG Morgenstraße 131 3018 Bern / SWITZERLAND
Tested to radio standards specification no.	:	RSS 210, Issue 2.3
Open Area Test Site IC No.	:	IC 3462C-1
Frequency Range or fixed frequency	:	3.84 MHz
Field Strength [dBµV/m] (at which distance)	:	46 dBµV/m @ 1 m
Occupied bandwidth (99%-BW) [kHz]	:	211.0 kHz
Type of modulation	:	N0N
Emission Designator (TRC-43)	:	211KN0N
Antenna Information	:	Integrated coil antenna
Transmitter Spurious (worst case) [dBµV/m @ 10m]	:	18.5 dBµV/m @ 10m @ 38.4 MHz (Quasi Peak)

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:

2013-08-23

Date

Christoph Schneider

Name

p.o.

Signature

9 Measurement results

9.1 Bandwidth of the modulated carrier

Limits:

FCC	IC
Bandwidth of the modulated carrier	

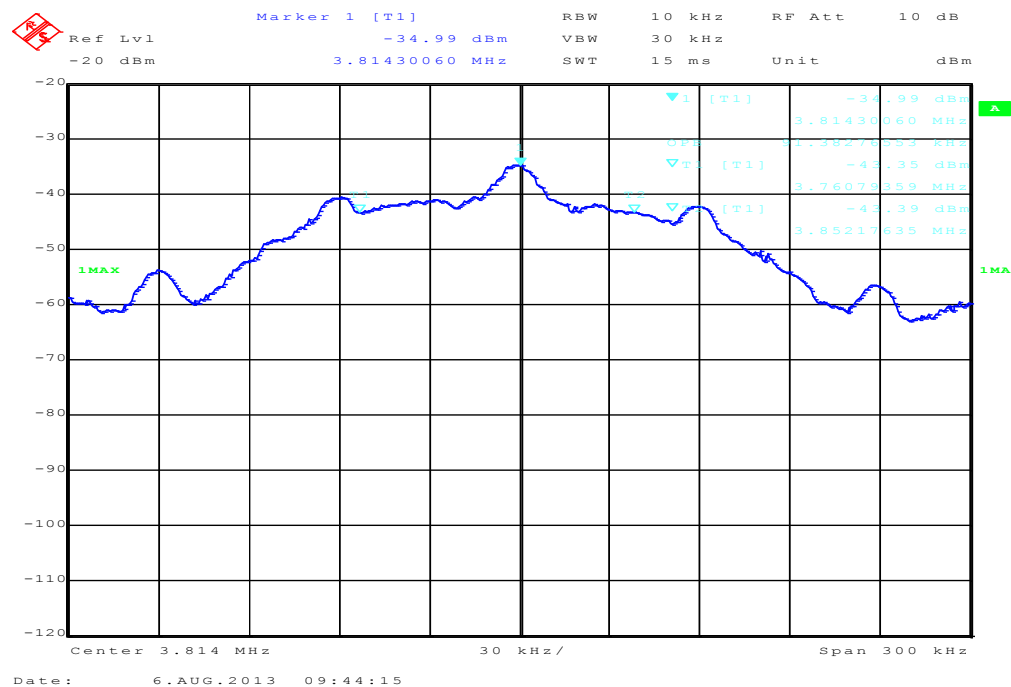
Measured with the integrated OBW-function of the spectrum analyser Rohde&Schwarz FSIQ26 (measurement criteria is the integrated power in %)

Result:

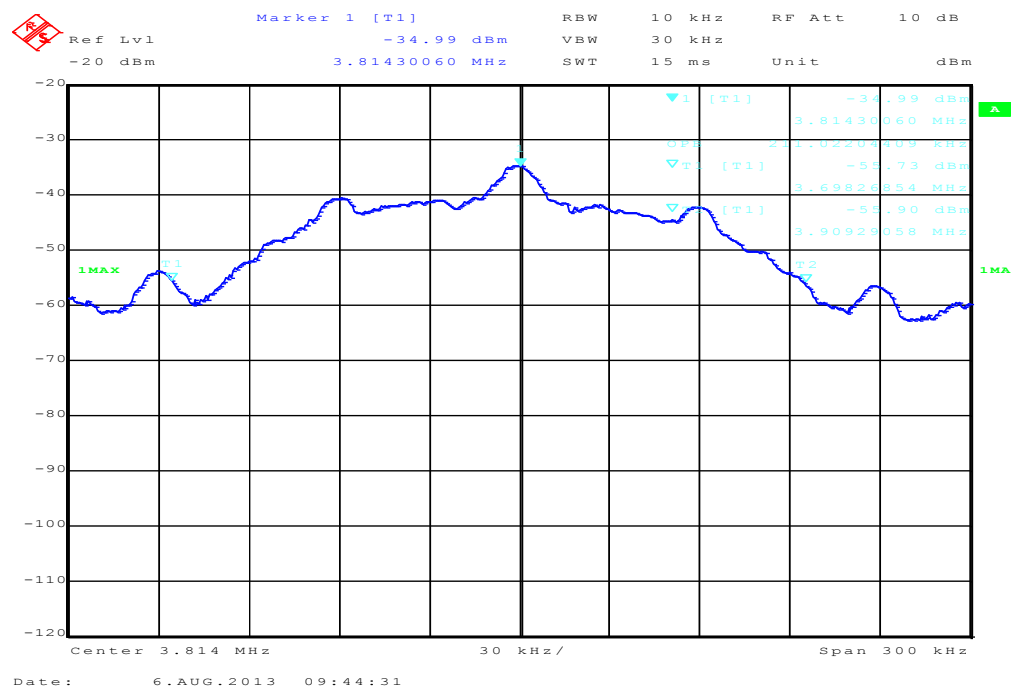
	Occupied Bandwidth (kHz)
6 dB (75%)	91.4
20 dB (99%)	211.0

Plots of the measurement

Plot 1: 6dB (75%) – bandwidth



Plot 2: 20dB (99%) - bandwidth



9.2 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 – 10.0	[15] or [6dB-BW(kHz) / F(MHz)] Whichever is higher	30

Result:

TEST CONDITIONS		MAXIMUM POWER (dB $\mu\text{V/m}$)	
Frequency		3.8 MHz	3.8 MHz
Mode		at 1 m distance	at 30 m distance
T_{nom}	V_{nom}	46	-14
Measurement uncertainty		$\pm 3\text{dB}$	

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

Result: **passed**

9.3 Fieldstrength 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:	See plots
Trace-Mode:	Max Hold

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

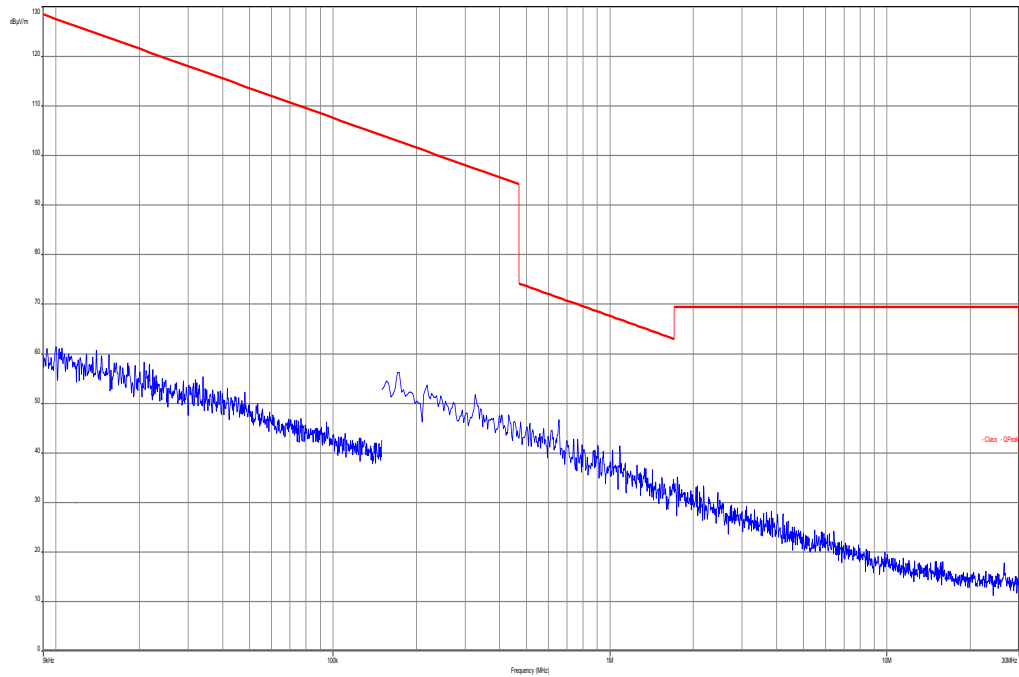
Result:

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!				

Result: passed

Plots of the measurements

Plot 1: 9 kHz – 30 MHz



Plot 2: 30 MHz – 1000 MHz

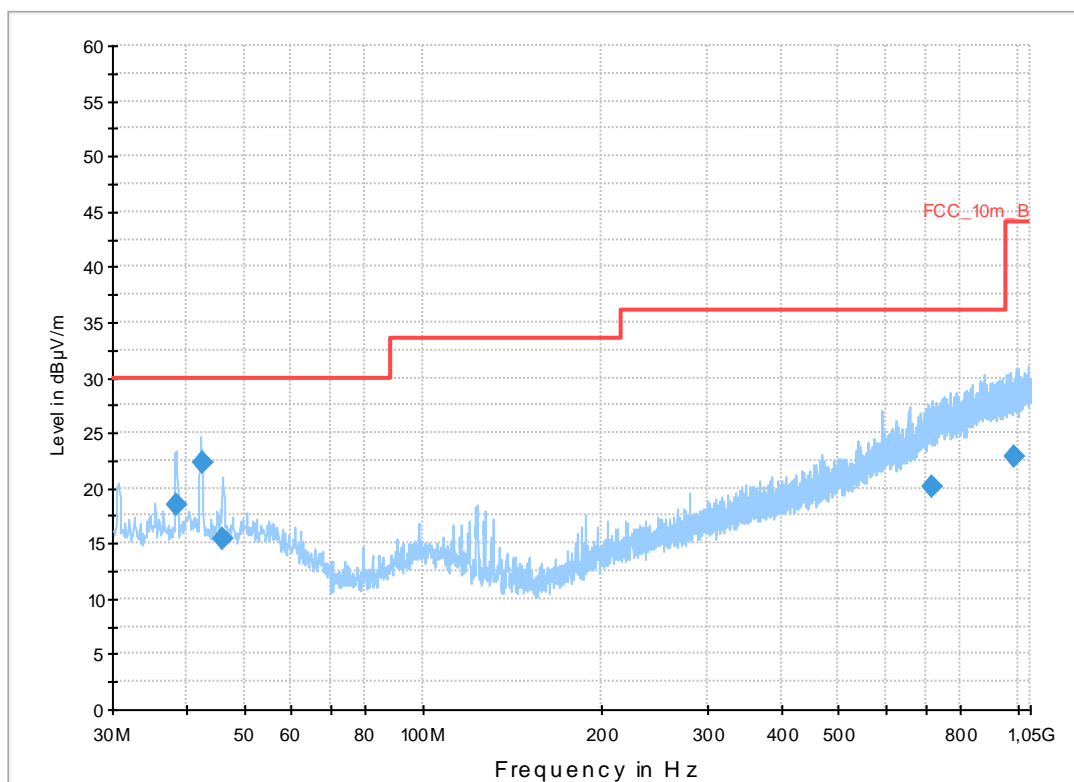
Common Information

EUT: ST BTE Fusion 2
 Serial Number: 22866819 (Ref: 136303)
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: audio streaming
 Operator Name: Hennemann
 Comment: battery 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
55022 B					

**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
38.442700	18.5	1000.0	120.000	143.0	V	266.0	13.3	11.5	30.0	
42.489600	22.4	1000.0	120.000	98.0	V	-8.0	13.3	7.6	30.0	
45.907800	15.4	1000.0	120.000	198.0	V	271.0	13.3	14.6	30.0	
718.649700	20.2	1000.0	120.000	246.0	V	283.0	22.9	15.8	36.0	
990.493500	22.9	1000.0	120.000	400.0	H	221.0	25.7	21.1	44.0	

9.4 Receiver spurious emissions

Measurement:

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

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	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	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

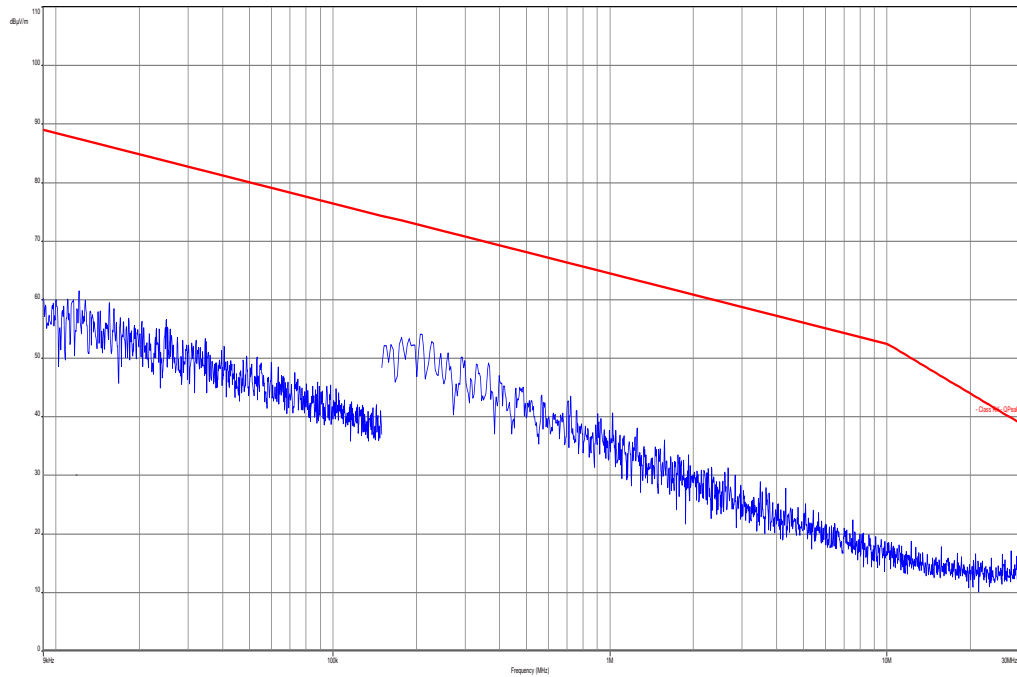
Result:

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!				

Result: **passed**

Plots of the measurements

Plot 1: 9 kHz – 30 MHz



Plot 2: 30 MHz – 1000 MHz

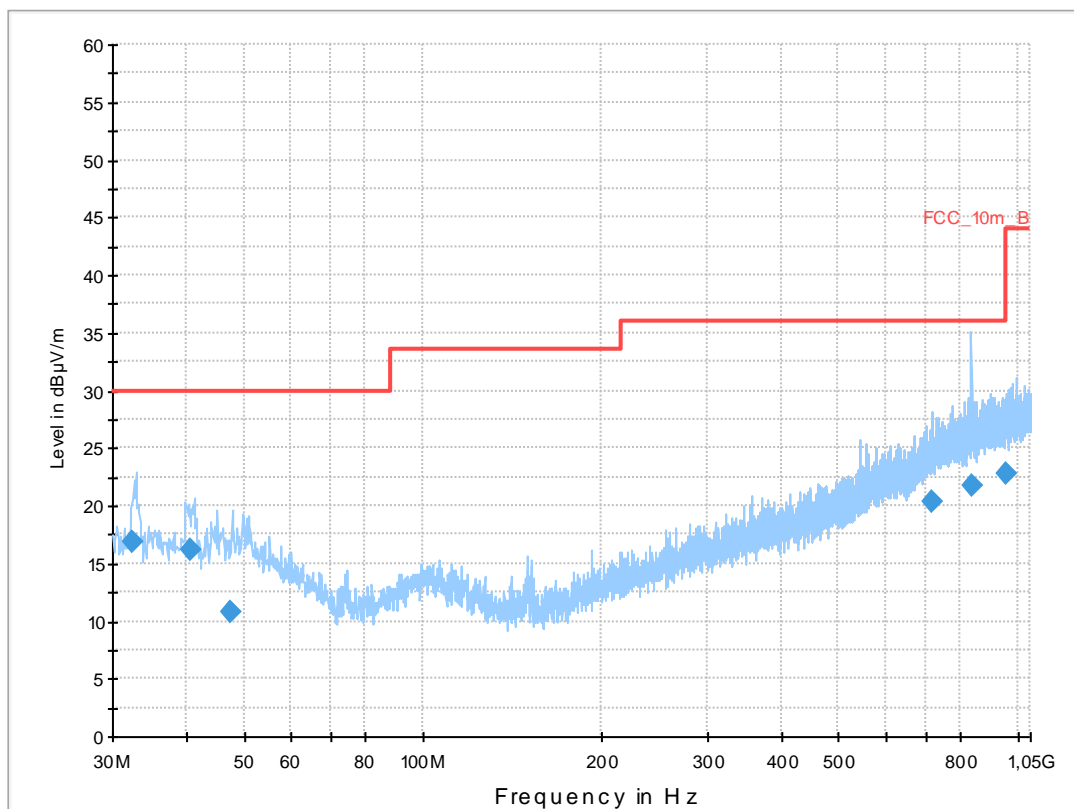
Common Information

EUT: ST BTE Fusion 2
 Serial Number: 22866819 (Ref: 136303)
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: idle
 Operator Name: Hennemann
 Comment: battery 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
32.301150	16.9	1000.0	120.000	161.0	V	261.0	12.8	13.1	30.0	
40.522800	16.1	1000.0	120.000	120.0	V	280.0	13.4	13.9	30.0	
47.597400	10.8	1000.0	120.000	98.0	V	180.0	13.3	19.2	30.0	
716.130750	20.3	1000.0	120.000	170.0	V	81.0	22.9	15.7	36.0	
835.110750	21.8	1000.0	120.000	170.0	V	280.0	24.3	14.2	36.0	
958.911600	22.7	1000.0	120.000	152.0	V	180.0	25.4	13.3	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.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
2	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
3	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
4	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
5	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
6	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	21.02.2013	21.02.2014
7	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
8	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	09.01.2013	09.01.2014
9	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	12.04.2012	12.04.2014
10	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
11	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
12	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		

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
 v/k! 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 Document history

Version	Applied changes	Date of release
1.0	Initial release	2013-08-23

Annex B 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

Front side of certificate



Bellehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

- Drabtraggebundene Kommunikation einschließlich xDSL
- VoIP und DECT
- Akustik
- Funk einschließlich WLAN
- Short Range Devices (SRD)
- RFID
- WiMax und Richtfunk
- Mobilefunk (GSM / DCS, Over the Air (OTA) Performance)
- Elektromagnetische Verträglichkeit (EMV) einschließlich
- Produktionsreife
- SAR und Hearing Aid Compatibility (HAC)
- Umweltsimulation
- Smart Card Terminals
- Bluetooth
- Wi-Fi Services

Registrierungsnummer der Urkunde: D-PL-12076-01-01

Frankfurt am Main, 18.01.2013

Im Auftrag
Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

Standort Braunschweig
Rundesallee 100
38116 Braunschweig

Die Akkreditierung erfolgt gemäß des Gesetzes über die Akkreditierungsstelle (AkkStellG) vom 31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung im Zusammenhang mit der Vermarktung von Produkten (ABl. L 218 vom 9. Juli 2008, S. 30). Die DAKS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

<http://www.cetecom.com/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html>