



# **TEST REPORT**

Test report no.: 1-7410/13-01-07-B



### **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 Communications & EMC (RCE)

### **Applicant**

### Oticon A/S

Kongebakken 9

2765 Smørum / DENMARK Phone: +45 39 17 71 00

Fax: -/-

Contact: Jørgen Peter Hanuscheck

e-mail: <a href="mailto:inp@oticon.dk">inp@oticon.dk</a> Phone: +45 39 13 85 38

### Manufacturer

### Oticon A/S

Kongebakken 9

2765 Smørum / DENMARK

### 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: WireLess Programming device (WLP) for hearing aids

Model name: WLP Special FCC ID: U28WLPS10

IC: -/-

Frequency: 3.84 MHz

Technology tested: Modulated carrier

Antenna: External loop antenna

Power supply: 5.00 V DC by USB power supply PSAC05R-050T

Temperature: +20 °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:	Test performed:
p.o.	
Stefan Bös Senior Testing Manager	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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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: 2014-03-31
Date of receipt of test item: 2014-04-01
Start of test: 2014-04-01
End of test: 2014-04-01

Person(s) present during the test: -/-

### 3 Test standard/s

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

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## 4 Test environment

T<sub>nom</sub> +22 °C during room temperature tests

Temperature: +35 °C during high temperature tests

T<sub>min</sub> +5 °C during low temperature tests

Relative humidity content: 24 %

Barometric pressure: not relevant for this kind of testing

V<sub>nom</sub> 5.00 V DC by USB power supply PSAC05R-050T

Power supply:  $V_{max}$  5.25 V

V<sub>min</sub> 4.75 V

## 5 Test item

Kind of test item	:	WireLess Programming device (WLP) for hearing aids
Model name	:	WLP Special
		FittingLINK WP-1
		EUT 1: 00000015
S/N serial number	:	EUT 2: 00000006
		EUT 3: 00000010
HW hardware status	:	Rev. 3
Firmware status	:	1.0.0
Frequency [MHz]	:	3.84
Type of radio transmission	:	ainela akannal DE aguiar
Use of frequency spectrum	:	single channel RF carrier
Type of modulation	:	ASK
Number of channels	:	1
Antenna	:	External loop antenna (neck loop antenna)
Power supply	:	5.00 V DC by USB power supply PSAC05R-050T

## 5.1 Additional information

Test setup- and EUT-photos are included in test report: 1-7410/13-01-01\_AnnexB

1-7410/13-01-01\_AnnexD

### 6 Test laboratories sub-contracted

None

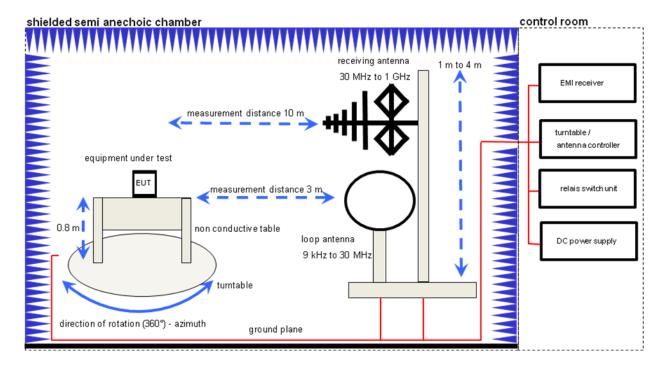
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## 7 Description of the test setup

### 7.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 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. 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.



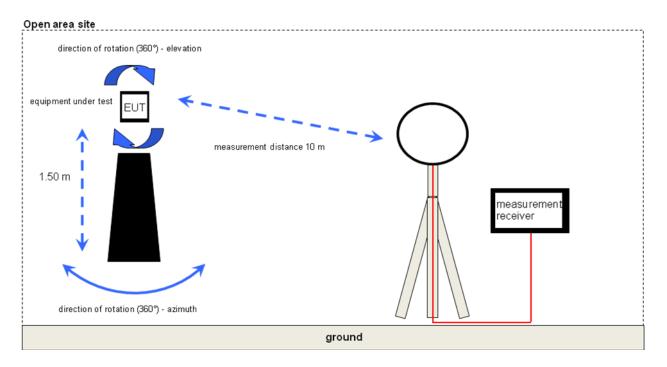
### **Equipment table:**

Equipment	Туре	Manufacturer	Serial No.	INV. No Cetecom	
Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	
EMI Test Receiver	ESCI 3	R&S	100083	300003312	
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	
TRILOG Broadband Test- Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	
Test Receiver	ESH2	R&S	871921/095	300002505	
Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824	
EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	

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# 7.2 Open area site



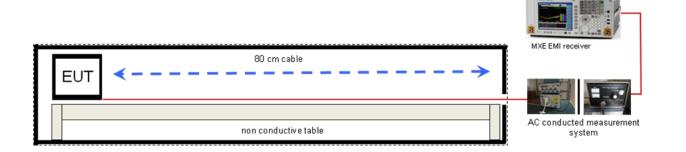
## **Equipment table:**

Equipment Type Manufacturer		Manufacturer	Serial No.	INV. No Cetecom
Test Receiver	ESH2	R&S	871921/095	300002505
Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824

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# 7.3 AC conducted



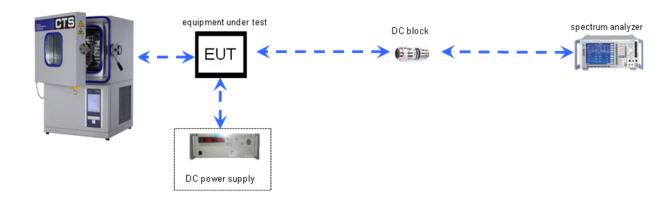
## **Equipment table:**

Equipment	Туре	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168
Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210

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# 7.4 Conducted measurements



## **Equipment table:**

Equipment	Туре	Manufacturer	Serial No.	INV. No Cetecom
DC Power Supply 0 – 32V 1108-32 Heiden		001802	300001383	
Temperature Test Chamber	perature Test Chamber T-40/50 CTS GmbH		064023	300003540
Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443

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8	Summar	y of measurement results
	$\boxtimes$	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	2014-04-10	-/-	

Test case	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Remark
11.1	Fieldstrength of Fundamental	Nominal	Nominal	$\boxtimes$				complies
11.2	Emission bandwidth	Nominal	Nominal	$\boxtimes$				complies
11.3	Occupied bandwidth	Nominal	Nominal	$\boxtimes$				complies
11.4	Fieldstrength of harmonics and spurious	Nominal	Nominal	$\boxtimes$				complies
	·							
11.4	Receiver spurious emissions (radiated)	Extreme	Nominal	$\boxtimes$				complies
11.5	Conducted limits	Nominal	Nominal	$\boxtimes$				complies

Note: NA = Not Applicable; NP = Not Performed

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## 9 Additional comments

Reference documents: None

Special test descriptions: We perform the radiated pre-scans in different spherical positions and

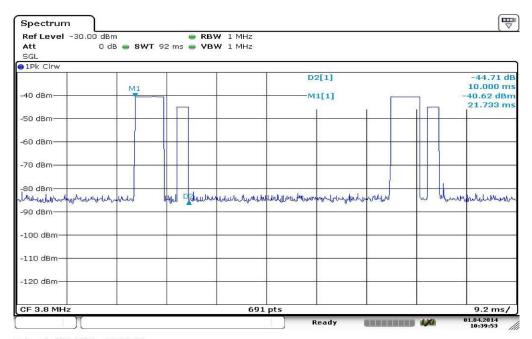
consolidate the results in one result plot. The test procedure includes scans in the theta axes every 120° and in phi axes @ 0° and 90° for both polarizations

vertical & horizontal or magnetic emissions.

Configuration descriptions: None

Additional information:

Plot 1: Timing of the transmitter; TX and RX packets



Date: 1.APR.2014 10:39:53

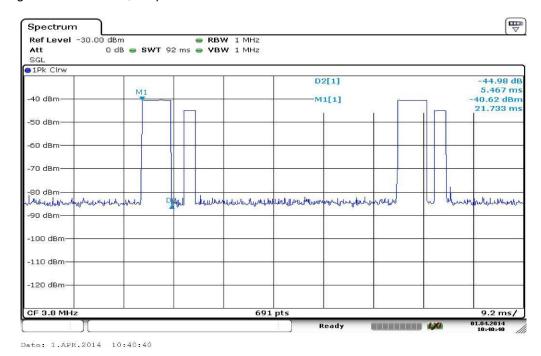
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Plot 2: Timing of the transmitter; TX interval



Plot 3: Timing of the transmitter; TX packet from WLP



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Plot 4: Timing of the transmitter; RX packet from hearing aid



### Measured TX duty cycle:

DC = TX packet length / TX interval \* 100 % = DC = 5.467 / 47.067 ms \* 100 % = 11.6 %

NB: The manufacturer declares that under normal operation the wireless programming device will not transmit all the time as during this test, so the normal average TX duty cycle will be much lower; typically less than a few percent.

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## 10 Measurement results

## 10.1 Field strength of the fundamental

### **Measurement:**

Measurement parameter			
Detector:	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

### Results:

TEST CONDITIONS	Field strengt	h (dBµV/m)			
Frequency	3.84 MHz	3.84 MHz			
EUT	at 1 m distance	at 30 m distance			
EUT 1: 00000015	72.0	12.0 *			
EUT 2: 00000006	75.0	15.0 *			
EUT 3: 00000010	75.5	15.5 *			
Measurement uncertainty	± 3 dB				

<sup>\*</sup>Re-calculated from 1 m to 30m with 40 dB/decade according to FCC 15.31 (f2)

**Result: Passed** 

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# 10.2 Emission bandwidth

# Measurement:

Measurement parameter					
Detector:	Peak				
Sweep time:	60 s				
Resolution bandwidth:	500 Hz				
Video bandwidth:	500 Hz				
Span:	3 MHz				
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

## Results:

TEST CONDITIONS	6 dB bar	ndwidth		
Frequency	3.84 MHz	3.84 MHz		
EUT				
EUT 1: 00000015	83.5 kHz			
EUT 2: 00000006	84.7 kHz			
EUT 3: 00000010	86.8 kHz			
Measurement uncertainty	± 500	) Hz		

Result: Passed

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# 10.3 Occupied bandwidth

## Measurement:

Measurement parameter					
Detector:	Peak				
Sweep time:	1 s				
Resolution bandwidth:	1 kHz				
Video bandwidth:	3 kHz				
Span:	500 – 600 kHz				
Trace-Mode:	Trace AVG				

# Limits:

IC
-/-

## Results:

TEST CONDITIONS	99 % bandwidth			
Frequency	3.84 MHz	3.84 MHz		
EUT				
EUT 1: 00000015	370 k	кНz		
EUT 2: 00000006	342 k	кНz		
EUT 3: 00000010	361 kHz			
Measurement uncertainty	± 500	)Hz		

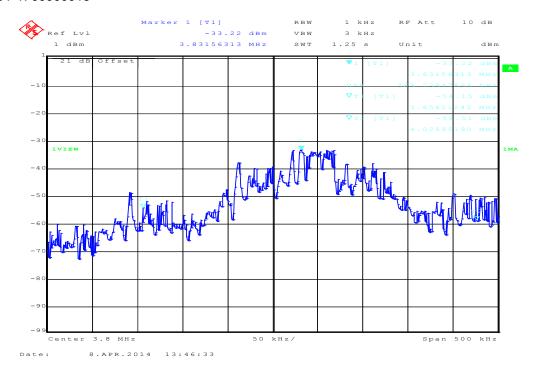
Result: Passed

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### Plots:

## Plot 1: EUT 1: 00000015



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# 10.4 Field strength of the harmonics and spurious

## **Measurement:**

Measurement parameter				
Detector:	Average / Quasi Peak			
Sweep time:	Auto			
Resolution bandwidth:	F < 150 kHz: 200 Hz 150 kHz > F > 30 MHz: 9 kHz F > 30 MHz: 120 kHz			
Video bandwidth:	F < 150 kHz: 1 kHz 150 kHz > F > 30 MHz: 100 kHz F > 30 MHz: 300 kHz			
Span:	See plots!			
Trace-Mode:	Max hold			

## Limits:

FCC	IC			
Fi	eld strength of the ha	armonics and spu	urious.	
Frequency (MHz)	Frequency (MHz) Field streng			nce (m)
0.009 - 0.490	2400/F	(kHz)	300	
0.490 – 1.705	24000/F	(kHz)	30	
1.705 – 30	30 (29.5 c	lBμV/m)	30	
30 – 88	100 (40 c	lΒμν/m)	3	
88 – 216	150 (43.5	dBµV/m)	3	
216 – 960	200 (46 d	BμV/m)	3	

## **Result:**

	EMISSION LIMITATIONS							
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results				
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.								

**Result: Passed** 

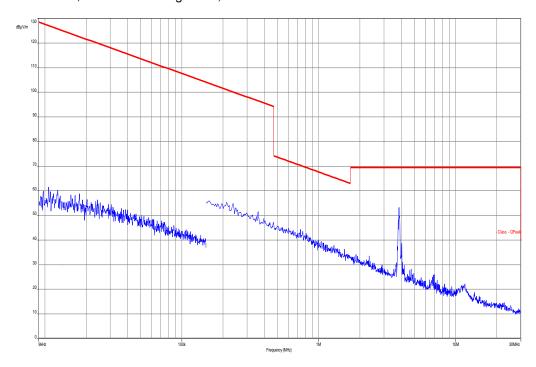
**Note:** The limit was recalculated with 20 dB/decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

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# Plots of the measurements: TX mode

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



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**Plot 2:** 30 MHz – 1000 MHz

## **Common Information**

EUT: WP-1 Serial Number: 00000010

Test Description: FCC part 15 class B @ 10 m

Operating Conditions: cont. TX + charging

Operator Name: Hennemann

Comment: battery powerd (charged via USB)

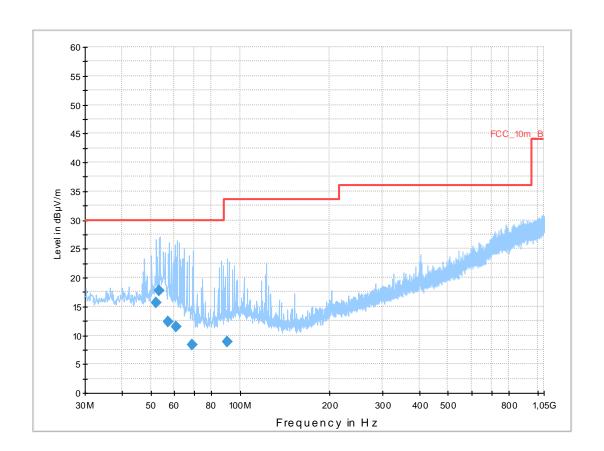
# Scan Setup: STAN\_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)

Receiver: [ESCI 3] Level Unit: dBµV/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**

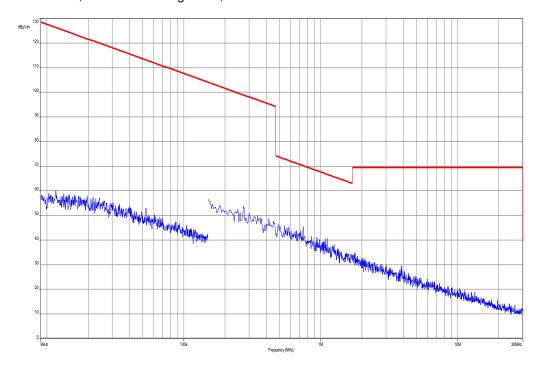
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
51.987000	15.6	1000.0	120.000	100.0	V	207.0	13.2	14.4	30.0	
53.343900	17.7	1000.0	120.000	107.0	V	224.0	13.0	12.3	30.0	
57.074100	12.4	1000.0	120.000	200.0	V	95.0	12.3	17.6	30.0	
60.852900	11.4	1000.0	120.000	200.0	V	47.0	11.4	18.6	30.0	
68.833800	8.4	1000.0	120.000	234.0	V	139.0	9.5	21.6	30.0	
90.508050	8.8	1000.0	120.000	132.0	V	230.0	10.6	24.7	33.5	

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## Plots of the measurements: Idle mode

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



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**Plot 2:** 30 MHz – 1000 MHz

## **Common Information**

EUT: WP-1 Serial Number: 00000010

Test Description: FCC part 15 class B @ 10 m

Operating Conditions: cont. RX + charging

Operator Name: Hennemann

Comment: battery powerd (charged via USB)

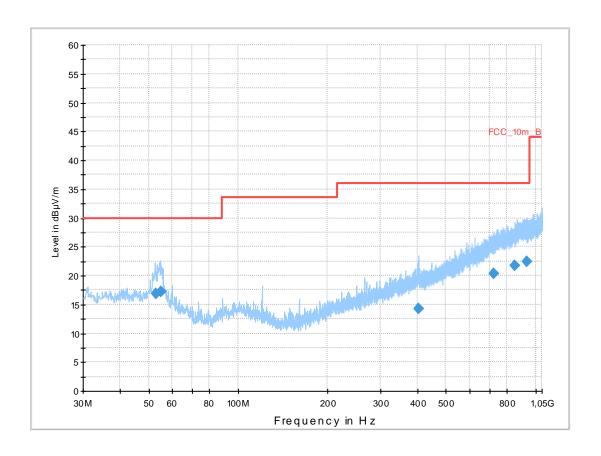
# Scan Setup: STAN\_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)

Receiver: [ESCI 3] Level Unit: dBµV/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 (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
52.676550	16.9	1000.0	120.000	100.0	V	248.0	13.1	13.1	30.0	
54.949350	17.2	1000.0	120.000	308.0	V	255.0	12.9	12.8	30.0	
404.260650	14.2	1000.0	120.000	113.0	V	152.0	17.0	21.8	36.0	
726.125550	20.3	1000.0	120.000	200.0	V	124.0	23.1	15.7	36.0	
849.311250	21.8	1000.0	120.000	389.0	Н	56.0	24.5	14.2	36.0	
936.966000	22.4	1000.0	120.000	166.0	Н	95.0	25.3	13.6	36.0	

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## 10.5 Spurious emissions conducted < 30 MHz

### **Description:**

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to single channel mode and the transmit channel is channel 39. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 78 will be measured too. The measurement is performed in the mode with the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

### Measurement:

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

### Limits:

FCC		IC			
TX spurious emissions conducted < 30 MHz					
Frequency (MHz)	Quasi-peak (dBµV/m)		Average (dBμV/m)		
0.15 – 0.5	66 to 56*		56 to 46*		
0.5 – 5	56		46		
5 – 30.0	60		50		

<sup>\*</sup>Decreases with the logarithm of the frequency

### Results:

TX spurious emissions conducted < 30 MHz [dBμV/m]					
F [MHz] Detector Level [dBµV/m]					
No peaks detected					
Measurement uncertainty	± 3 dB				

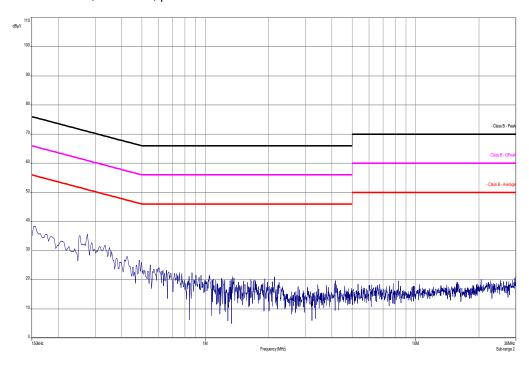
**Result: Passed** 

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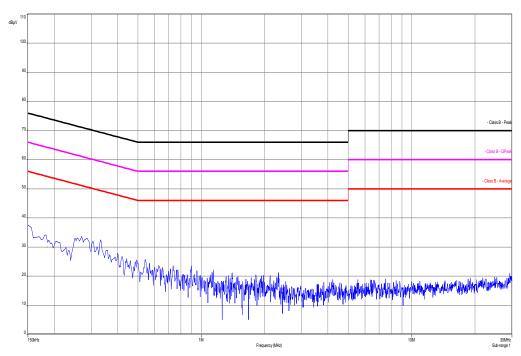


Plots: EUT 3: 00000010

Plot 1: 150 kHz to 30 MHz, TX mode, phase line



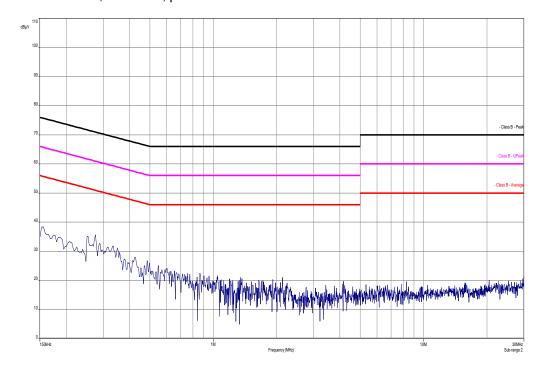
Plot 2: 150 kHz to 30 MHz, TX mode, neutral line



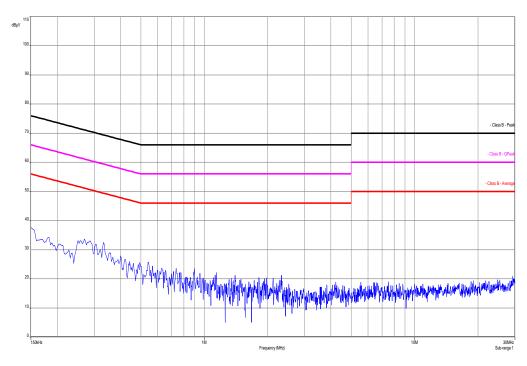
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Plot 3: 150 kHz to 30 MHz, RX mode, phase line



Plot 4: 150 kHz to 30 MHz, RX mode, neutral line



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## 11 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 (Lab/Item).

No.	Lab / Item	Equipment	Туре	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	9	Isolating Transformer	MPL IEC625 Bus Regeltrennt ravo	Erfi	91350	300001155	ne		
5	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
6	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
7	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologi es	MY51210197	300004405	k	13.03.2014	13.03.2015
8	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
9	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
10	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
11	n. a.	Antenna Tower	Model 2175	ETS- LINDGREN	64762	300003745	izw		
12	n. a.	Positioning Controller	Model 2090	ETS- LINDGREN	64672	300003746	izw		
13	n. a.	Turntable Interface-Box	Model 105637	ETS- LINDGREN	44583	300003747	izw		
14	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbe ck	295	300003787	k	12.04.2012	12.04.2014
15	n. a.	Test Receiver	ESH2	R&S	871921/095	300002505	Ve	24.01.2014	24.01.2016
16	n. a.	Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824	vIKI!	09.03.2012	09.03.2015
17	n. a.	EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	k	24.01.2014	24.01.2015
18	n. a.	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2014	21.01.2015
19	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/84193	300003889	Ve	26.09.2013	26.09.2015

**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

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# 12 Observations

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

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# Annex A Document history

Version	Applied changes	Date of release	
	Initial release	2014-04-04	
А	Editorial changes, updated values 10.3	2014-04-08	
В	External Annex A information removed Front page photo changed	2014-04-10	

## 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

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### Annex C Accreditation 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/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html

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