







TEST REPORT

Test report no.: 1-7693/14-01-34-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-12076-01-00

Applicant

Huf Hülsbeck und Fürst

Steeger Str. 17

42551 Velbert / GERMANY
Phone: +49 (0) 2051 272-434
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Contact: Klaus-Dieter Kulik

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Manufacturer

Huf Portuguesa, Lda

Aptd. 89, ZIM Tondela

3460-070 Tondela / PORTUGAL

Test standard/s

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

devices

RSS - 210 Issue 8 Spectrum Management and Telecommunications Radio Standards Specification -

Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

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

Test Item

Kind of test item: Car-Key 433 MHz

 Model name:
 HUF8423

 FCC ID:
 YGOHUF8423

 IC:
 4008C-HUF8423

 Frequency:
 433 MHz Band

Technology tested: WLAN

Antenna: Integrated PCB loop antenna

Power supply: 3.0V DC by battery
Temperature range: -20°C to +65°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:		
Stefan Bös	David Lang		
Radio Communications & EMC	Radio Communications & EMC		



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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.

This test report replaces the test report with the number 1-7693/14-01-34-A and dated 2015-01-21.

2.2 Application details

Date of receipt of order: 2014-04-09
Date of receipt of test item: 2014-12-01
Start of test: 2014-12-03
End of test: 2014-12-18

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
RSS - 210 Issue 8	01.12.2010	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment



4 Test environment

T_{nom} +22 °C during room temperature tests

Temperature: T_{max} +65 °C during high temperature tests

T_{min} -20 °C during low temperature tests

Relative humidity content: 54 %

Barometric pressure: not relevant for this kind of testing

V_{nom} 3.0 V DC by battery

Power supply: V_{max} 3.3 V

 V_{min} 2.3 V

5 Test item

Kind of test item	•	Car-Key 433 MHz
	•	
Type identification	:	HUF8423
S/N serial number	:	Not available!
HW hardware status	:	002 (A0)
SW software status	:	1.26
Frequency band [MHz]	:	433 MHz Band
Type of radio transmission	:	
Use of frequency spectrum		single carrier
Type of modulation	•	FSK
• •	•	
Number of channels	:	2
Antenna	:	Integrated PCB loop antenna
Power supply	:	3.0 V DC by battery
Temperature range	:	-20°C to +65 °C

5.1 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-7693/14-01-46_AnnexA

1-7693/14-01-46_AnnexB 1-7693/14-01-46_AnnexD

6 Test laboratories sub-contracted

None



7 Summar	Summary of measurement results				
\boxtimes	No deviations from the technical	al specification	ons were ascerta	ined	
	☐ There were deviations from the technical specifications ascertained				
TC Identifier	Description	Verdict	Date	Remark	

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8, Annex 8	Passed	2015-01-26	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Remark
§ 15.35 (c)/ RSS-GEN	Timing of the transmitter (Duty cycle correction factor)	Nominal	Nominal					-/-
§ 15.231 (a) (1)/ RSS-210 Issue 8	Switch off time	Nominal	Nominal					-/-
§ 15.231 (3) (c)/ RSS-210 Issue 8	Emission Bandwidth	Nominal	Nominal	\boxtimes				-/-
§ 15.231 (b)/ RSS-210 Issue 8	Fieldstrength of Fundamental	Nominal	Nominal	\boxtimes				-/-
§ 15.209/ RSS-210 Issue 8	Fieldstrength of harmonics and spurious	Nominal	Nominal	\boxtimes				-/-
§ 15.209/ RSS-GEN	Receiver spurious emissions (radiated)	Nominal	Nominal			\boxtimes		Transmitter only.

Note: NA = Not Applicable; NP = Not Performed



8 RF measurements

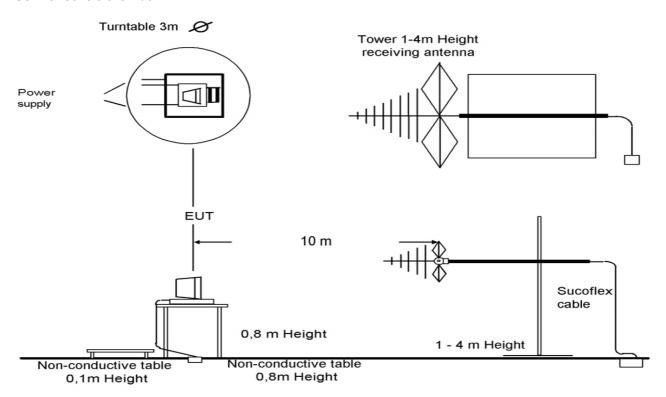
8.1 Description of test setup

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

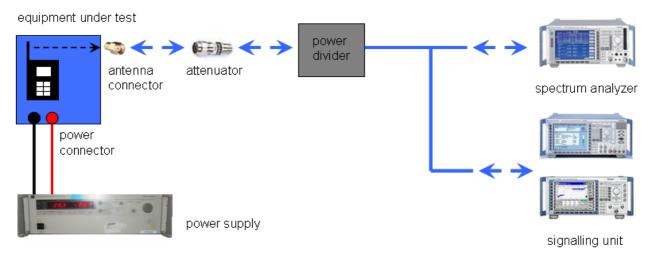
30 MHz – 1 GHz: tri-log antenna

> 1 GHz: horn antenna



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 Timing of the transmitter

Measurement:

Measurement parameter		
Detector:	Peak	
Sweep time:	1s	
Resolution bandwidth:	3MHz	
Video bandwidth:	10MHz	
Span:	Zero Span	
Trace-Mode:	Max-Hold	

Limits:

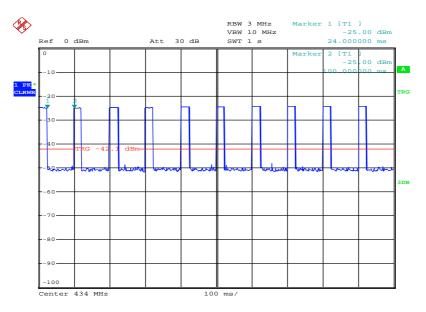
FCC	IC		
Timing of the transmitter			

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



Result:

Plot 1: Timing of the Tranmitter



Date: 18.DEC.2014 09:32:00

Transmit time (Tx on) = 24msTx on + Tx off = 76ms

The peak-to-average correction factor is calculated with 20Log [Tx on/(Tx on + Tx off)]. Hereby the peak-to-average correction factor is -12.4dB.



9.2 Switch off time

Measurement:

Measurement parameter		
Detector:	Peak	
Sweep time:	1s	
Resolution bandwidth:	3MHz	
Video bandwidth:	10MHz	
Span:	Zero Span	
Trace-Mode:	Max-Hold	

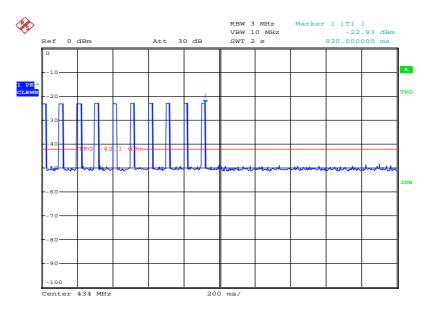
Limits:

FCC	IC
Switch	off time
A constant of the constant to the constant of	

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Results:

Plot 1: Transmit burst



Date: 18.DEC.2014 09:28:53

The EUT automatically ceases transmission within not more than 920 ms after releasing the switch.



9.3 Emission bandwidth

Measurement:

Measurement of the 20 dB bandwidth of the modulated signal

Measurement parameter		
Detector:	Peak	
Sweep time:	Auto	
Resolution bandwidth:	3 kHz	
Video bandwidth:	10 kHz	
Span:	200 kHz	
Trace-Mode:	Max-Hold	

Limits:

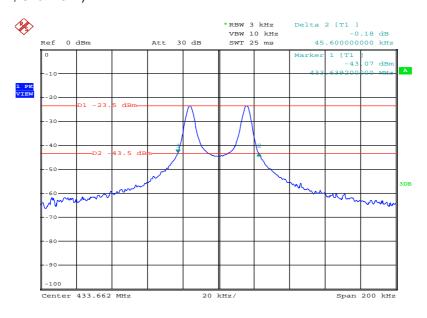
FCC	IC	
Emission bandwidth		
The OBW shall not be wider than 0.25% of the centre frequency, here maximum 787.5 kHz.		

Result:

Emission bandwidth [kHz]						
Frequency	Frequency Channel 1 Channel 2					
20 dB bandwidth	45.6	45.6				
99 % bandwidth 48.8 46.8						
Measurement uncertainty: ± RBW						

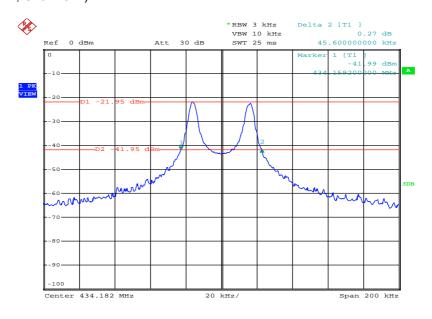


Plot 1: (20dB BW, Channel 1)



Date: 18.DEC.2014 09:41:00

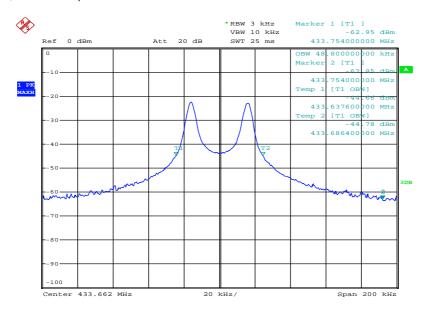
Plot 2: (20dB BW, Channel 2)



Date: 18.DEC.2014 09:43:50

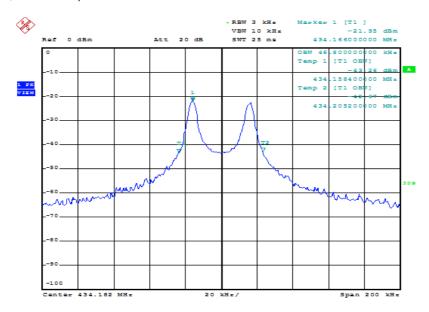


Plot 3: (99% BW, Channel 1)



Date: 18.DEC.2014 09:38:12

Plot 4: (99% BW, Channel 2)



Date: 18.DEC.2014 09:44:57



9.4 Field strength of the fundamental

Measurement:

Measurement parameter		
Detector:	Peak	
Sweep time:	Auto	
Video bandwidth:	120 kHz	
Resolution bandwidth:	300 kHz	
Span:	See Plot	
Trace-Mode:	Max-Hold	

Limits:

FCC	IC	
Field strength of the fundamental		

Field strength of the fundamental.

In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field strength of Fundamental (µV/m)	Measurement distance (m)
40.66 – 40.70	2,250	3
70-130	1,250	3
130-174	1,250 to 3,750	3
174-260	3,750	3
260-470	3,750 to 12,500	3
Above 470	12,500	3

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

- for the band 130-174 MHz, μ V/m at 3 meters = 56.81818(F) 6136.3636;
- for the band 260-470 MHz, μ V/m at 3 meters = 41.6667(F) 7083.3333.



Result:

TEST CONDITIONS		MAXIMUM POWER (dBμV/m at 3 m distance)	
Freq	uency	MHz	MHz
Mo	ode	Peak	Average
Channel 1 T _{nom} = 20 °C	V _{nom} = 3 V DC	90.4	78.0
Channel 2 T _{nom} = 20 °C	V _{nom} = 3 V DC	90.0	77.6
Measurement uncertainty		±3dB	

^{*}Value recalculated from Peak-to-Average correction factor described in 9.1



9.5 Field strength of the harmonics and spurious

Measurement:

Measurement parameter		
Detector: Average / Quasi Peak		
Sweep time:	Auto	
Resolution bandwidth:	9kHz / 120kHz / 1MHz	
Video bandwidth:	3x RBW	
Span:	See plots	
Trace-Mode:	Max-Hold	

<u>Limits:</u>

FCC	IC	
Field strength of the fundamental.		
In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators		

In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field strength of spurious (μV/m)	Measurement distance (m)
40.66 – 40.70	225	3
70-130	125	3
130-174	125 to 375	3
174-260	375	3
260-470	375 to 1,250	3
Above 470	1,250	3

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

FCC			IC
SUBCLAUSE § 15.209			
Fi	eld strength of the ha	armonics and spu	ırious.
Frequency (MHz)	Field strength (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		30
30 – 88	100		3
88 – 216	150		3
216 – 960	200		3
above 960	50	0	3



Results:

Channel 1

EMISSION LIMITATIONS					
f [MHz]	f [MHz] Detector Limit max. allowed Amplitude of emission [dBμV/m] [dBμV/m] Results				
3903	Average*	54	47	Passed	
-/-	-///-				

^{*}Since the measured Peak value is below the Average limit no duty cycle correction has been performed.

Channel 2

EMISSION LIMITATIONS				
f [MHz]	Limit max. allowed Amplitude of emission [dBµV/m] [dBµV/m]			
3903	Average*	54	48	Passed
4776	Average	54	47	Passed
-/-	-/-	-/-	-/-	-/-

^{*}Since the measured Peak value is below the Average limit no duty cycle correction has been performed.

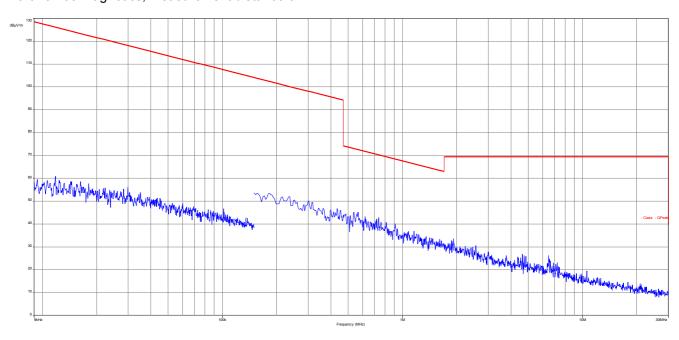
Verdict: Passed

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)

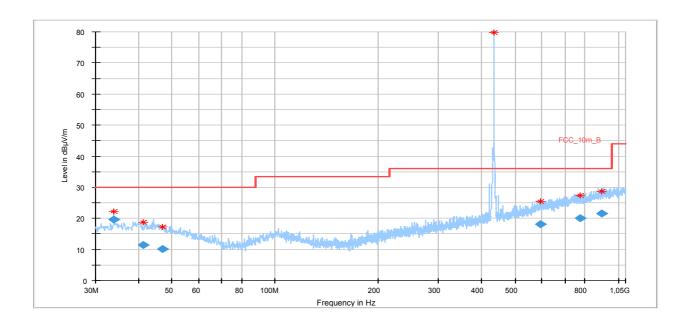


Plots of the measurements (Channel 1)

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

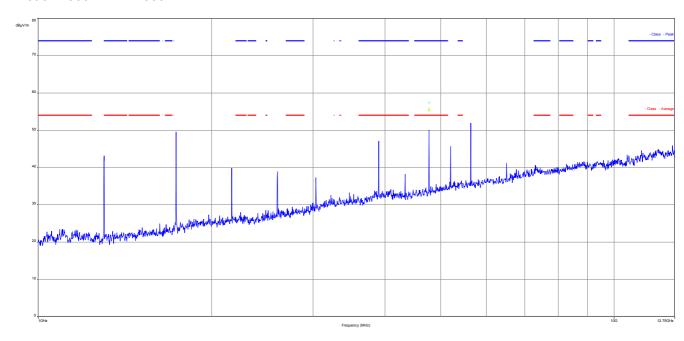


Plot 2: 30 MHz - 1000 MHz





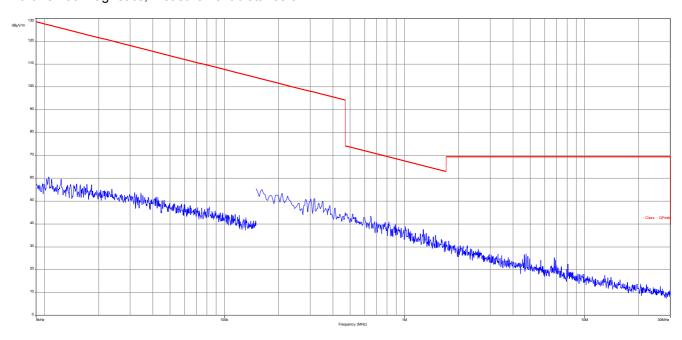
Plot 3: 1000 MHz – 4000 MHz



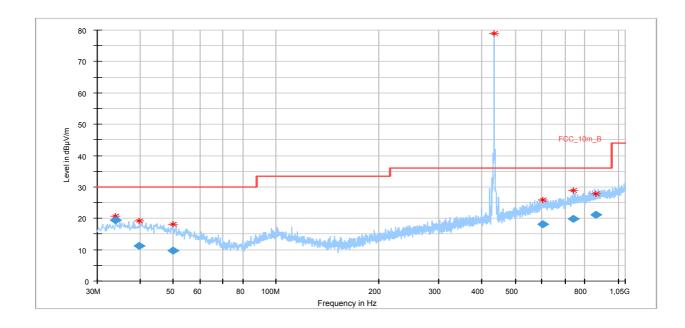


Plots of the measurements (Channel 2)

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

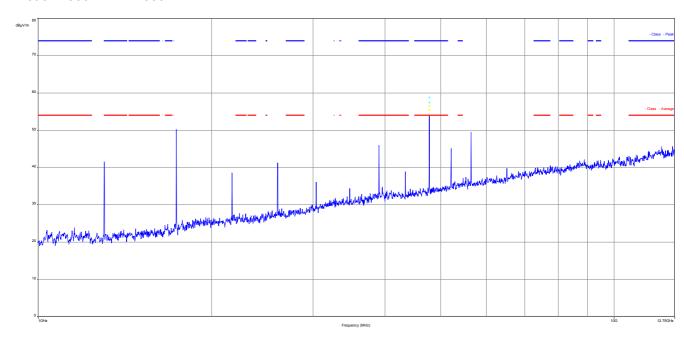


Plot 2: 30 MHz - 1000 MHz





Plot 3: 1000 MHz – 4000 MHz





1 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.	EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	k	24.01.2014	24.01.2015
2	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
3	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
4	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
5	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
6	n. a.	Turntable Interface- Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
7	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
8	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKl!	08.05.2013	08.05.2015
9	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
10	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
11	n. a.	Amplifier	js42-00502650-28- 5a	Parzich GMBH	928979	300003143	ne		
12	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	13.03.2014	13.03.2015
13	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		

Agenda: Kind of Calibration

k calibration / calibrated EK limited calibration not required (k, ev, izw, zw not required) zw cyclical maintenar

ne not required (k, ev, izw, zw not required) zw cyclical maintenance (external cyclical maintenance) ev periodic self verification izw internal cyclical maintenance

Ve long-term stability recognized g blocked for accredited testing vlkl! Attention: extended calibration interval

K! Attention: not calibrated
*) next calibration ordered / currently in progress

2 Observations

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



Annex A Document history

Version	Applied changes	Date of release	
	Initial release	2014-12-19	
-A	FCC ID corrected	2015-01-21	
-B	Model name corrected	2015-01-26	

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



Accreditation Certificate Annex C

Front side of certificate

Back side of certificate

(DAkkS

Deutsche Akkreditierungsstelle GmbH

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

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH

Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

durchzuführen:

Drahtgebundene Kommunikation einschileßlich xDSL
volP und DECT
Akustik
Funk einschileßlich WLAN
Short Range Devices (SRD)
RFID
WIMAX und Richtfunk
Mobiltunk (GSM / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
Produktsichen alt Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth
Wi-Fi- Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheld vom 07.03 2014 mit der Akkreditierungsnummen 0-Pl-12076-01 und ist giltig 17.01.2018. Sie besteht aus diesem Deckblart, der Rückseite des Deckblart, sund der folgenden Anlage mit Insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-00

Frankfurt om Main, 07.03.2014

Deutsche Akkreditierungsstelle GmbH

Standort Frankfurt am Main Gartenstraße 6 60594 Frankfurt am Main

Standort Braunschweig Bundesallee 100 38116 Braunschweig

Die auszugweise Veröffentlichung der Akkreditierungsurfunde betarf der verherigen schriftlichen Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAkKS). Ausgimmennen davon ist die segan Weiter veroreitung des Decklästists durch die umseitig genomme Kanformitällsbewertungsstelle in unseitä detrete Form.

Die Akkreditionung erfolgte gemöß das Graches über die Akkreditionungsstells (AkkstelleC) vom 31. Juli 2009 (Roffil. 1.5.2675) sowie der Veronfrung (FG) (Nr. 7857-2008 des Europsischen Parlament und des Rates vom 9. Juli 2008 (Bare die Versachfullen Geit des Akkreditionung und Martichberwachung im Zusammenhang mit der Vermanktung von Produkten (Abl. 1.218 vom 9. Juli 2008, S. 30). Die DAkk Sist Utstrechtwersi der Auffaltenstellen Akkremmen ung aggente Signen Areiferenung der European ers operation für Auszeitskins (EA), des Heinrastlens Accenditation form (IAA) und der International laberature Auszeitskins (EA), des Heinrastlens Accenditation form (IAA) und der International laberature Auszeitskins (EA), des Heinrastlens Accenditation form (IAA) und der International laberature Auszeitskins Cooperation (IAAC). De Untersächner eileser Abkommen erkomen ihre Akkrad Lierungen gegenstellig an.

Der aktue in Stand der Wilgliedschaft kann folgenden Webselten entmommen werden: FA: www.muropean.accred tation.org IACC www.idec.org IAC www.idec.org

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