



CETECOM ICT Services

consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-9422/15-01-04



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

ALLIGATOR Ventilfabrik GmbH

Richard-Steiff-Strasse 4 89537 Giengen / GERMANY

Phone:

Fax: +49 73 22 / 130 - 418 Contact: **Christian Markert**

christian.markert@alligator-ventilfabrik.de e-mail:

Phone: +49 73 22 / 130 - 392

Manufacturer

Bury GmbH & Co. KG

Robert-Koch-Str. 1-7 32584 Löhne / GERMANY

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 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: **Vehicle Router**

Model name: Alligator sens. it HD Router

FCC ID: YMY-030865 IC: 9157A-030865

Frequency: 433.5 MHz - 434.5 MHz Technology tested: **GFSK Transceiver** Antenna: Integrated antenna Power supply: 24.0 V DC by battery Temperature range: -40°C to +85°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.		
Tobias Wittenmeier	Rene Oelmann	

Testing Manager Radio Communications & EMC

Lab Manager 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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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: 2015-03-02
Date of receipt of test item: 2015-04-30
Start of test: 2015-04-30
End of test: 2015-06-19

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

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2015-06-29	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	2010-12-01	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment



4 Test environment

 $\begin{array}{ccc} & & & T_{nom} & +22 & ^{\circ}C \ during \ room \ temperature \ tests \\ Temperature: & & T_{max} & +85 & ^{\circ}C \ during \ high \ temperature \ tests \end{array}$

T_{min} -40 °C during low temperature tests

Relative humidity content: 40 %

Barometric pressure: not relevant for this kind of testing

V_{nom} 24.0 V DC by battery

Power supply: V_{max} 32.0 V

 V_{min} 8.0 V

5 Test item

Kind of test item :	Vehicle Router	
Type identification :	Alligator sens. it HD Router	
HMN :	-/-	
PMN :	sens.it HD Router	
HVIN :	030865	
FVIN :	V0.4.1	
C/N coriol mumber / Douter ID	Rad.: 101860	
S/N serial number / Router ID:	Cond.: 101901	
HW hardware status :	-/-	
SW software status :	V 1.01/	
Franceschand	433.5 MHz – 434.5 MHz	
Frequency band :	Carrier frequency: 433. MHz	
Type of radio transmission :	modulated carrier	
Use of frequency spectrum :	modulated carrier	
Type of modulation :	GFSK	
Number of channels :	1	
Antenna :	Integrated antenna	
Power supply :	24.0 V DC by battery	
Temperature range :	-40°C to +85°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: 1-9422/15-01-01_AnnexA

1-9422/15-01-01_AnnexB 1-9422/15-01-01_AnnexD

6 Test laboratories sub-contracted

None



7 Description of the test setup

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 analysers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

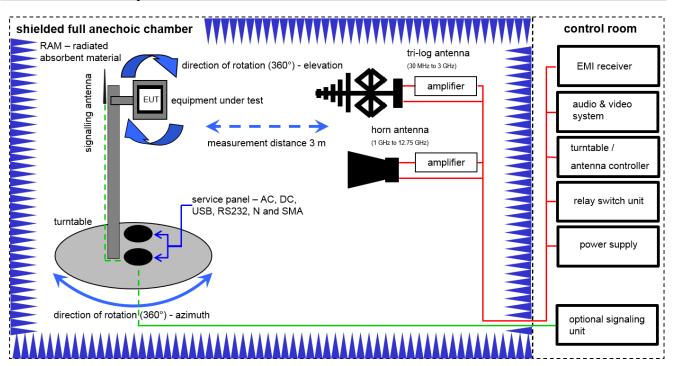
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
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		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress



7.1 Shielded fully anechoic chamber



 $SS = U_R + CA + AF$

(SS-signal strength; U_R-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:

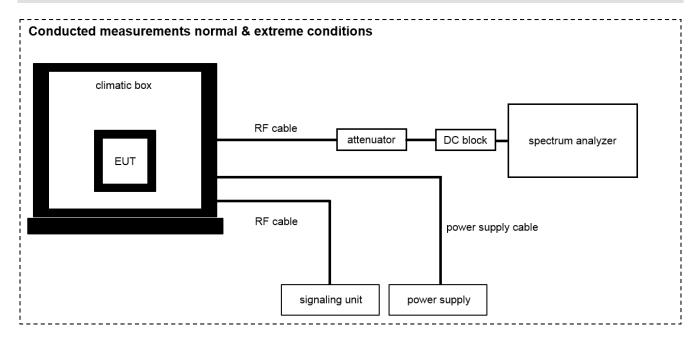
 $SS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-35.8) [dB] + 32.9 [dB\mu V/m] = 37.1 [dB\mu V/m] (71.61 \mu V/m)$

Equipment table:

No.	Lab / Item	Equipment	Туре	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	20.05.2015	20.05.2017
2	n.a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
3	n.a.	Switch / Control Unit	3488A	HP	*	300000199	ne		
4	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	30.01.2014	30.01.2016
5	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	24.06.2015	24.06.2017
6	90	Amplifier	js42-00502650-28- 5a	Parzich GMBH	928979	300003143	ne		
7	90	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
8	90	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKI!	29.10.2014	29.10.2017
9	90	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
10	90	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		
11	n. a.	Power supply GPIB dc power supply, 0- 50 Vdc, 0-2 A	6633A	НР	2851A01222	300001530	vIKI!	27.01.2014	27.01.2017



7.2 Conducted measurements normal and extreme conditions



Equipment table:

No.	Lab / Item	Equipment	Туре	Manufact.	l Serial No	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Spectrum Analyzer 9kHz - 30 GHz	FSP30	R&S	100623	300003464	Ve	29.01.2015	29.01.2017
2	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	Ve	20.01.2015	20.01.2018
3	n. a.	Temperature Test Chamber	T-40/50	CTS GmbH	064023	300003540	Ve	26.09.2013	26.09.2015



8 Summary of measurement results

No deviations from the technical specifications were ascertained
There were deviations from the technical specifications ascertained
This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8, Annex 8	See table!	2015-11-06	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	С	NC	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	\boxtimes				-/-
§ 15.231 (b) (3) (c) RSS-210 Issue 8	Emission bandwidth	Nominal	Nominal	\boxtimes				-/-
§ 15.231 (e) 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				-/-

Note: C = complies; NO = not complies; NA = not applicable; NP = not performed

8.1 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:	37 ms / 500 ms		
Resolution bandwidth:	1 MHz		
Video bandwidth:	3 MHz		
Span:	Zero		
Trace-Mode:	Single sweep		

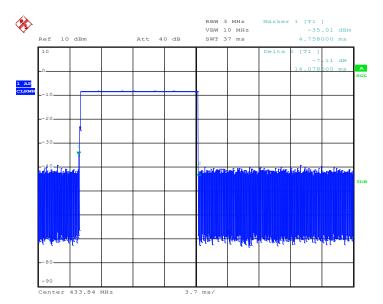
Limits:

FCC	IC
-----	----

(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:

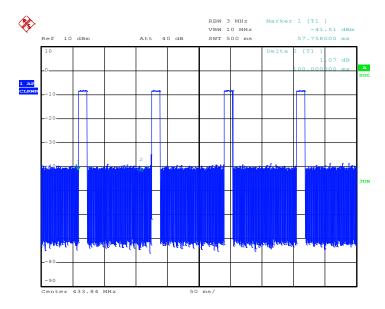
Plot 1: Transmit burst



Date: 2.JUL.2015 13:02:00



Plot 2: Timing of the transmitter



Date: 2.JUL.2015 13:02:51

Transmit time (Tx on) = 14.1 ms (Plot 1)

$$Tx \text{ on } + Tx \text{ off}$$
 = 100 ms (Plot 2)

The peak-to-average correction factor is calculated with 20Log [Tx on/(100 ms]. Hereby the peak-to-average correction factor is 17.02 dB $\,$



9.2 Switch off time

Measurement:

Measurement parameter				
Detector:	Peak			
Sweep time:	30s			
Resolution bandwidth:	300 kHz			
Video bandwidth:	1 MHz			
Span:	Zero			
Trace-Mode:	Single sweep			

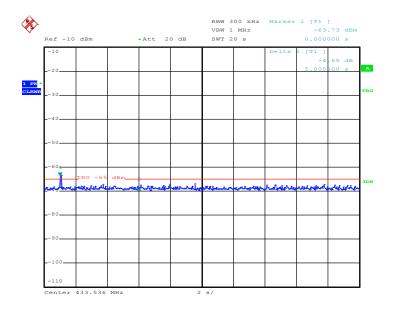
Limits:

FCC	IC

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: TX on time



Date: 6.NOV.2015 12:31:19

Verdict: compies



9.3 Emission bandwidth

Measurement:

Measurement of the 99 % bandwidth of the modulated signal

Measurement parameter				
Detector:	Peak			
Sweep time:	1 s			
Resolution bandwidth:	1 kHz			
Video bandwidth:	3 kHz			
Span:	1 MHz			
Trace-Mode:	Max. hold			

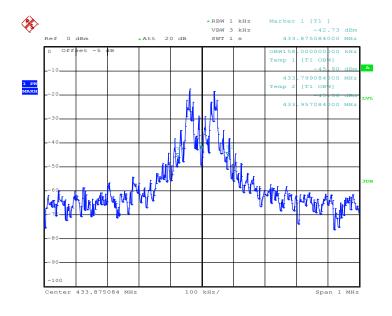
Limits:

FCC	IC

The OBW shall not be wider than 0.25% of the centre frequency, here maximum 1084.7 kHz.

Result:

Plot 1: Emissions bandwidth



Date: 7.MAY.2015 10:22:02

99 % emission bandwidth: 158.0 kHz

Verdict: complies



9.4 Field strength of the fundamental

Measurement:

Measurement parameter			
Detector: Peak			
Sweep time:	Auto		
Resolution bandwidth:	3 MHz		
Video bandwidth:	10 MHz		
Span:	10 MHz		
Trace-Mode:	Max. hold		

Limits:

FCC			IC		
	Field strength of	he fundamental.			
In addition to the provisions of S	Section 15.205, the f	ield strength of er	nissions from intentional radiators		
operated	under this Section s	hall not exceed th	e following:		
Fundamental Frequency (MHz)	Field strength ο (μV/		Measurement distance (m)		
40.66 – 40.70	2,250		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	12,5	00	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 CO	NDITIONS	MAXIMUM POWER (d	BμV/m at 3 m distance)	
Frequ	uency	MHz	MHz	
Mode		Peak	Average	
T _{nom}	V _{nom}	84.43	67.41 *	
Measurement uncertainty		±30	dB	

^{*}Value recalculated from Peak-to-Average correction factor described in 6.1

The maximum field strength is 2346.93 μ V/m.

Verdict: complies



9.5 Field strength of the harmonics and spurious

Measurement:

Measurement parameter			
Detector:	Peak / average / quasi peak		
Sweep time:	Auto		
Resolution bandwidth:	200 Hz / 9 kHz / 120 kHz		
Video bandwidth:	3 x RBW		
Span:	See plots		
Trace-Mode:	Max. hold		

Limits:

FCC		IC			
	Field strength of	the fundamental.			
In addition to the provisions of S	ection 15.205, the f	ield strength of er	nissions from intentional radiators		
operated (under this Section s	hall not exceed th	e following:		
Fundamental Frequency (MHz)	Field strength of spurious (µV/m)		Measurement distance (m)		
40.66 – 40.70	225		225		3
70-130	125		125		3
130-174	125 to 375		125 to 375		3
174-260	375		3		
260-470	375 to 1,250		3		
Above 470	1,2	50	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			
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:

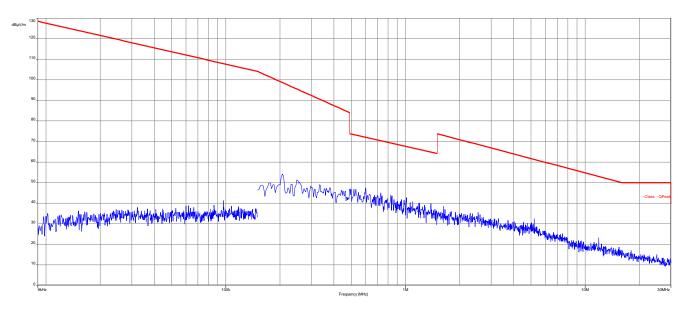
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results

Verdict: complies



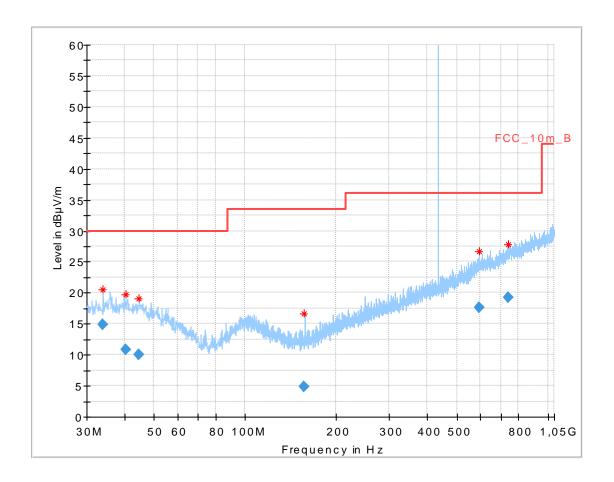
Plots:

Plot 1: 9 kHz to 30 MHz





Plot 2: 30 MHz to 1000 MHz, vertical & horizontal polarisation

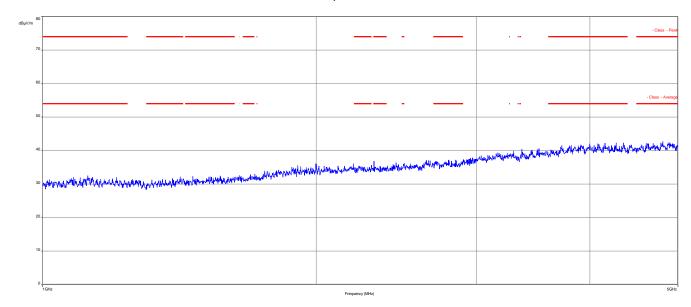


Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.005450	14.92	30.00	15.08	1000.0	120.000	174.0	٧	320	13.7
40.336050	10.81	30.00	19.19	1000.0	120.000	172.0	Н	266	14.0
44.500350	10.09	30.00	19.91	1000.0	120.000	172.0	Н	142	13.9
156.877950	4.87	33.50	28.63	1000.0	120.000	200.0	V	52	9.0
593.582550	17.55	36.00	18.45	1000.0	120.000	200.0	Н	211	20.5
740.737500	19.28	36.00	16.72	1000.0	120.000	400.0	V	282	22.5



Plot 3: 1000 MHz to 5000 MHz, vertical & horizontal polarisation





9.6 Receiver spurious emission

Measurement:

Measurement parameter					
Detector:	Peak / average / quasi peak				
Sweep time:	Auto				
Resolution bandwidth:	120 kHz				
Video bandwidth:	3 x RBW				
Span:	See plots				
Trace mode:	Max. hold				

Limits:

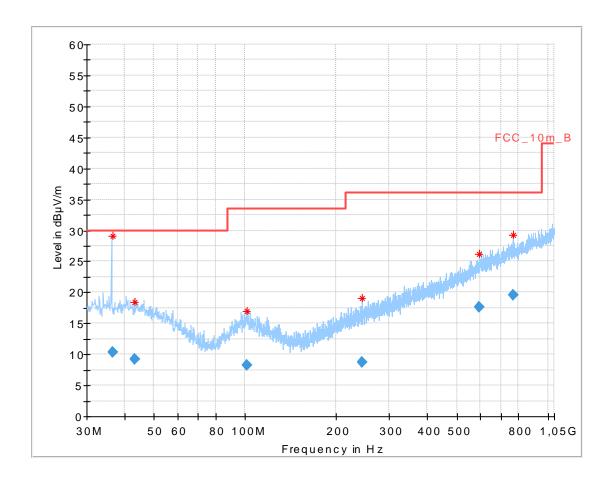
FCC		IC		
Frequency (MHz)	Field streng	ŋth (μV/m)	Measurement distance (m)	
30 - 88	10	0	3	
88 - 216	15	0	3	
216 - 960	20	0	3	
above 960	50	0	3	

Verdict: complies



Plots:

Plot 1: 30 MHz to 1000 MHz, vertical & horizontal polarisation

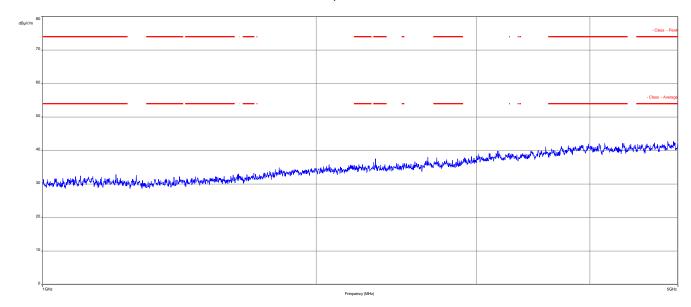


Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.695250	10.37	30.00	19.63	1000.0	120.000	275.0	Н	50	13.9
43.188750	9.29	30.00	20.71	1000.0	120.000	351.0	Н	297	13.9
101.525400	8.28	33.50	25.22	1000.0	120.000	272.0	Н	8	12.0
243.324150	8.70	36.00	27.30	1000.0	120.000	200.0	Н	172	13.1
593.932350	17.64	36.00	18.36	1000.0	120.000	100.0	Н	207	20.5
766.201950	19.49	36.00	16.51	1000.0	120.000	349.0	V	142	22.7



Plot 2: 1000 MHz to 5000 MHz, vertical & horizontal polarisation





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, rfgenerating 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.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	Ve	20.01.2015	20.01.2018
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	20.05.2015	20.05.2017
3	n.a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
4	n.a.	Switch / Control Unit	3488A	HP	*	300000199	ne		
5	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	30.01.2014	30.01.2016
6	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	24.06.2015	24.06.2017
7	90	Amplifier	js42-00502650-28- 5a	Parzich GMBH	928979	300003143	ne		
8	90	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
9	90	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKI!	29.10.2014	29.10.2017
10	90	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
11	90	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		
12	n. a.	Power supply GPIB dc power supply, 0- 50 Vdc, 0-2 A	6633A	НР	2851A01222	300001530	vIKI!	27.01.2014	27.01.2017
13	n. a.	Spectrum Analyzer 9kHz - 30 GHz	FSP30	R&S	100623	300003464	Ve	29.01.2015	29.01.2017

Agenda: Kind of Calibration

calibration / calibrated ΕK limited calibration k ne not required (k, ev, izw, zw not required) zw cyclical maintenance (external cyclical maintenance) internal cyclical maintenance periodic self verification izw ev long-term stability recognized blocked for accredited testing Ve g Attention: extended calibration interval vlkl! Attention: not calibrated next calibration ordered / currently in progress NK! *)



11 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	2015-11-06	

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

PMN Product marketing name HMN Host marketing name

HVIN Hardware version identification number FVIN Firmware version identification number



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, II.AC 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:

Drahtgebundene Kommunikation einschließlich xDSL VolP und DECT Akustik

Akurik
Funk einschließlich WLAN
Short Range Devices (SRD)
RFID
WIMAx und Richtfunk
Mobilfunk (S0M / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth
WI-FI- Services

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

Frankfurt om Main, 07.03.2014

Deutsche Akkreditierungsstelle GmbH

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Standort Frankfurt am Main Gartenstra 3e 6 60594 Frankfurt am Main

Standart Braunschweig Bundesallee 100 38116 Braunschweig

Die auszugsweise Veröffentlichung der Akkraditierungsufunde bedanf der verherigen schriftlichen Zuschmrung der Deutsche Akkraditierungsstelle GmbH (DAMS). Ausgenommen davon ist die separate Webs reterreitung des Decklattes durch die umseitig geneente Kunformittlichewertungsstelle in unwed detert Form.

Der aktuelle Stund der Välglindschaft kann folgenden Webseiten entnommen werden: Fäl: www.insrepean-aucheit tillon.org IIAC www.inschaft Jäk: www.inschaft

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