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CETECOM ICT Services
consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-4014/11-01-05-B



DAkkS
Deutsche
Akreditierungsstelle
D-PL-12076-01-01

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/Satellite Communications

Applicant

CPAC Systems AB
Falkenbergsgatan 3
SE-412 85 Göteborg / SWEDEN
Phone: +46 31 734 2196
Fax: +46 3 17 34 21 90
Contact: Lars-Gunnar Sundin
e-mail: lars-gunnar.sundin@cpacsystems.se
Phone: +46 3 17 34 21 96

Manufacturer

CPAC Systems AB
Falkenbergsgatan 3
SE-412 85 Göteborg / SWEDEN

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 Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

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

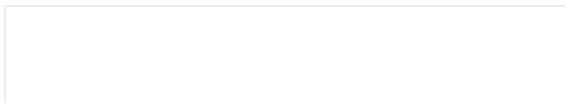
Test Item

Kind of test item: **RFID Reader**
Model name: **EKS Panel (Electronic Key System)**
FCC ID: **AHV-EKSP**
IC: **10111A-EKSP**
Frequency [MHz]: **13.56 MHz**
Technology tested: **RFID**
Antenna: **Integrated antenna**
Power Supply: **12.00 V DC by Power Supply**
Temperature Range: **-20°C to +50 °C**



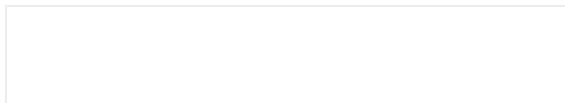
This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:



Stefan Bös
Senior Testing Manager

Test performed:



Jakob Reschke
Testing Manager

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
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
8.1.2	Conducted measurements.....	7
8.2	Additional comments.....	7
8.3	RSP100 test report cover sheet / performance test data	8
9	Measurement results.....	9
9.1	Field strength of the fundamental	9
9.2	Field strength of the harmonics and spurious	10
9.3	Frequency tolerance	14
10	Test equipment and ancillaries used for tests.....	15
11	Observations	16
Annex A	Photographs of the test setup.....	17
Annex B	External photographs of the EUT.....	19
Annex C	Internal photographs of the EUT	23
Annex D	Document history	27
Annex E	Further information.....	27
Annex F	Accreditation Certificate	28

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 replaces the test report with the number 1-4014/11-01-05 and dated 2012-01-16

2.2 Application details

Date of receipt of order:	2011-10-17
Date of receipt of test item:	2011-12-23
Start of test:	2011-12-23
End of test:	2012-01-03
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2010-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	2010-12	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+50 °C during high temperature tests
	T_{min}	-20 °C during low temperature tests
Relative humidity content:		46 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	12.00 V DC by Power Supply
	V_{max}	14.00 V
	V_{min}	10.00 V

5 Test item

Kind of test item	:	RFID Reader
Type identification	:	EKS Panel (Electronic Key System)
S/N serial number	:	N/A
HW hardware status	:	C-prot
SW software status	:	N/A
Frequency band [MHz]	:	13.56 MHz
Type of modulation	:	ASK
Number of channels	:	1
Antenna	:	Integrated antenna
Power supply	:	12.00 V DC by Power Supply
Temperature range	:	-20°C to +50 °C

6 Test laboratories sub-contracted

None

7 Summary of measurement results



No deviations from the technical specifications were ascertained



There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8, Annex 2.6	Passed	2012-03-12	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Results (max.)
§ 15.225 (a)/ RSS-210 Issue 8 Annex 2.6	Fieldstrength of Fundamental	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.209/ RSS-210 Issue 8 Annex 2.6	Fieldstrength of harmonics and spurious	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.225 (e)/ RSS-210 Issue 8 Annex 2.6	Frequency tolerance	Nominal	Extreme	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
		Extreme	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Note: NA = Not Applicable; NP = Not Performed

8 RF measurements

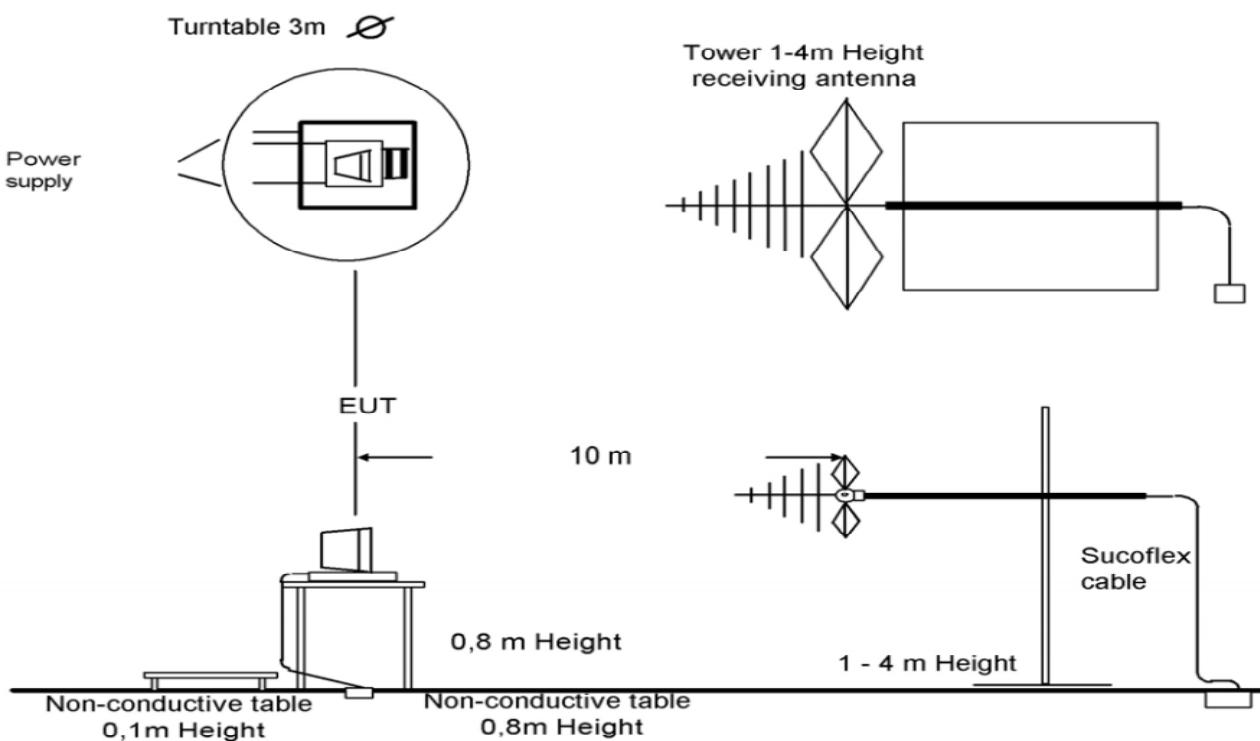
8.1 Description of test setup

8.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-2009 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.4-2009 clause 4.2.

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

Semi anechoic chamber



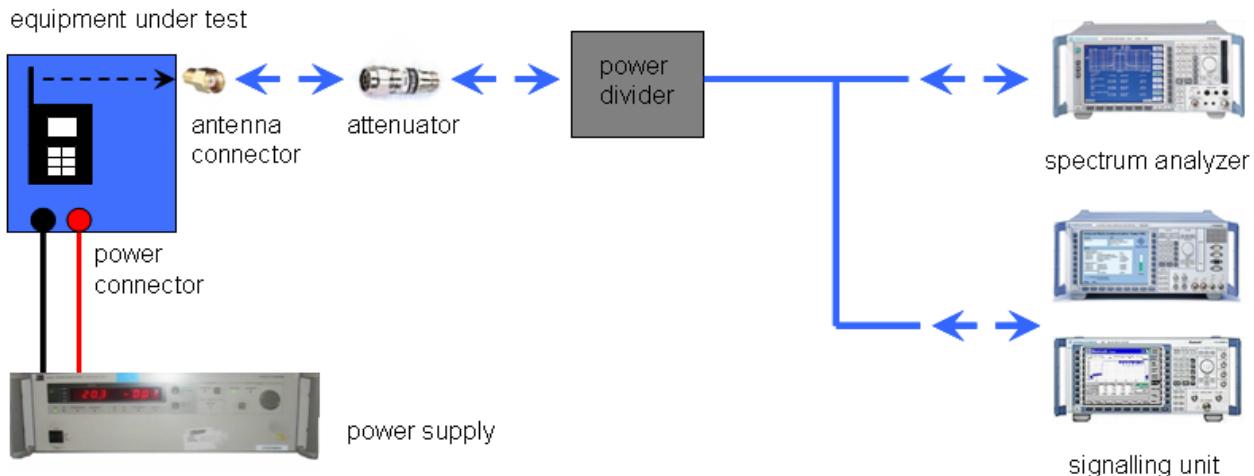
Picture 1: Diagram radiated measurements

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

The EUT is powered by an external power supply with nominal voltage. The signalling is performed from outside the chamber with a signalling unit (CMU200 or other) by air link using signalling antenna.

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal paths is connected to the communication base Station (CMU200 or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm.



Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

8.3 RSP100 test report cover sheet / performance test data

Test Report Number	:	1-4014/11-01-05-B
Equipment Model Number	:	EKS Panel (Electronic Key System)
Certification Number	:	10111A-EKSP
Manufacturer (complete Address)	:	CPAC Systems AB Falkenbergsgatan 3 SE-412 85 Göteborg / SWEDEN
Tested to radio standards specification no.	:	RSS 210, Issue 8, Annex 8
Open Area Test Site IC No.	:	IC 3462C-1
Frequency Range or fixed frequency	:	13.56 MHz
Field Strength [dBμV/m] (at which distance)	:	51.0 dB μ V/m at 10m
Occupied bandwidth (99%-BW) [kHz]	:	600 Hz
Type of modulation	:	ASK
Emission Designator (TRC-43)	:	600HA1D
Antenna Information	:	Integrated antenna
Transmitter Spurious (worst case)[μV/m @ 3m]:		22 μ V/m @ 406.80 MHz
Receiver Spurious (worst case) [μV/m @ 3m]:		Not applicable

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:

2012-03-12
Date

Jakob Reschke
Name



John H.

9 Measurement results

9.1 Field strength of the fundamental

Measurement:

Measurement parameter	
Detector:	Quasi Peak
Sweep time:	-/-
Resolution bandwidth:	200 Hz up to 150 kHz, 9 kHz up to 30 MHz, 120 kHz up to 1 GHz
Video bandwidth:	≥ RBW
Span:	-/-
Trace-Mode:	Max Hold

Limits:

FCC	IC	
CFR Part SUBCLAUSE § 15.225 (a)	RSS-210 Issue 8 Section A1.1.2 / 2.7 Table 4	
Fundamental Frequency (MHz)	Field strength of Fundamental (µV/m)	Measurement distance (m)
13.553 to 13.567	15848 µV/m (84 dBµV/m)	30
	158489 µV/m (104 dBµV/m)	10 (Recalculated acc. to FCC part15.31 (f2))

Result:

TEST CONDITIONS		MAXIMUM POWER (dBµV/m)	
Frequency		13.56 MHz	13.56 MHz
Mode		at 10 m distance	at 30 m distance
T _{nom}	V _{nom}	51.0	*31.0
Measurement uncertainty		±3dB	

* calculated acc. 15.31

Result: The result of the measurement is passed.

9.2 Field strength of the harmonics and spurious

Measurement:

Measurement parameter	
Detector:	Average / Quasi Peak / Peak
Sweep time:	Auto
Resolution bandwidth:	Below 1 GHz: 100 kHz Above 1 GHz: 1 MHz
Video bandwidth:	Below 1 GHz: 100 kHz Above 1 GHz: 1 MHz
Span:	100 MHz Steps
Trace-Mode:	Max Hold

Limits:

FCC	IC	
SUBCLAUSE § 15.209		
Field strength of the harmonics and spurious.		
Frequency (MHz)	Field strength (μ 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 μ V/m)	30
30 – 88	100 (40 dB μ V/m)	3
88 – 216	150 (43.5 dB μ V/m)	3
216 – 960	200 (46 dB μ V/m)	3

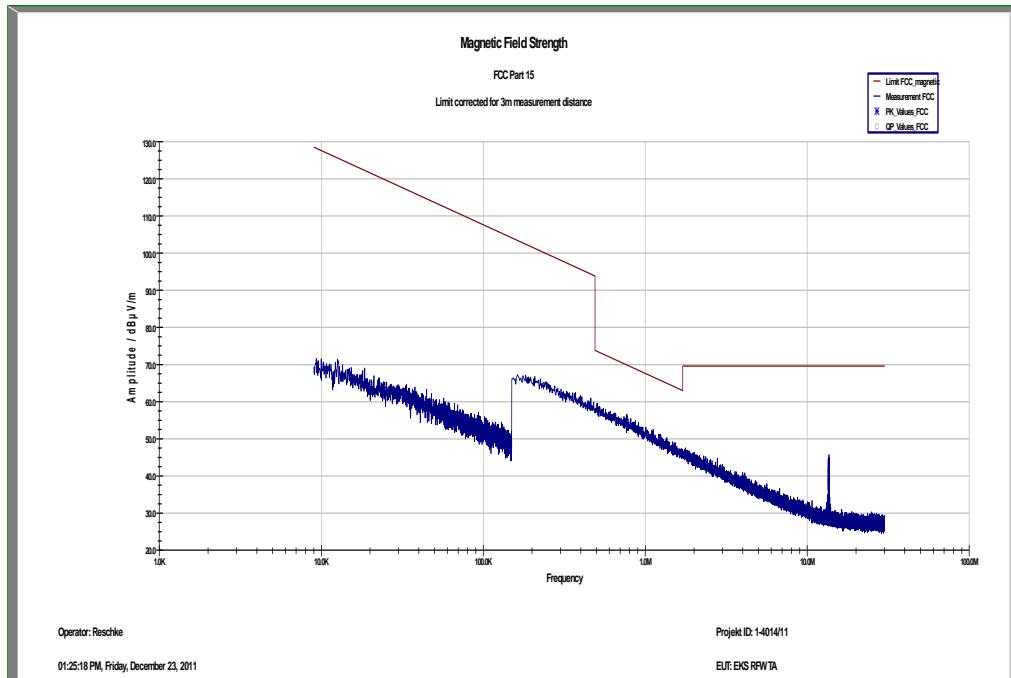
Result:

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dB μ V/m]	Amplitude of emission [dB μ V/m]	Results
No critical peaks found See Table at Plot 2 for more information				

Result: The result of the measurement is passed.

Plots of the measurements

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



Plot 2: 30 MHz – 1000 MHz

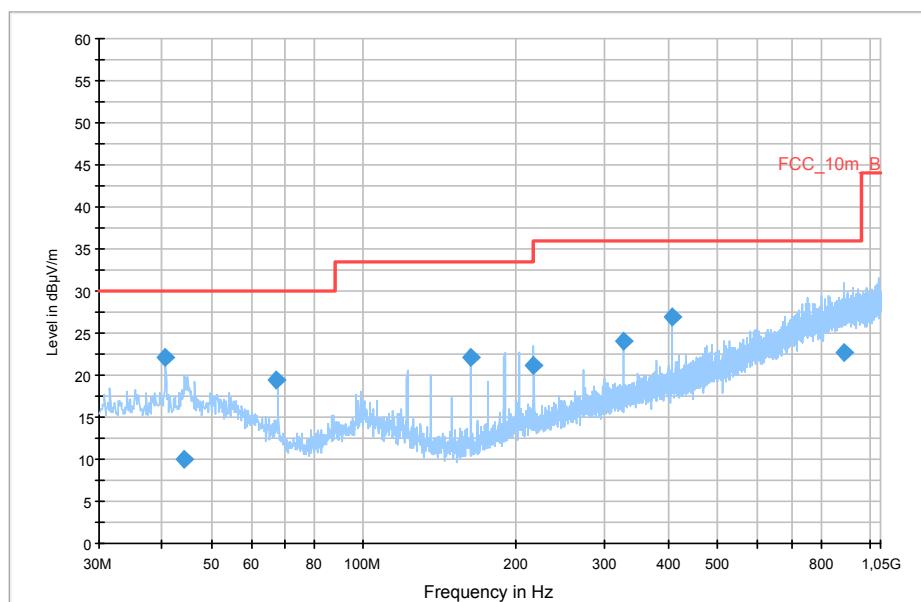
Common Information

EUT: EKS Panel - Twin
 Serial Number: S024D
 Test Description: FCC class B @ 10 m
 Operating Conditions: RFID Tag detected (RFID - TX)
 Operator Name: Hennemann
 Comment: DC: 12 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m
Subrange 30 MHz - 2 GHz **Step Size** 60 kHz **Detectors** QPK **IF BW** 120 kHz **Meas. Time** 1 s **Preampl** 20 dB

FCC_10m(B)

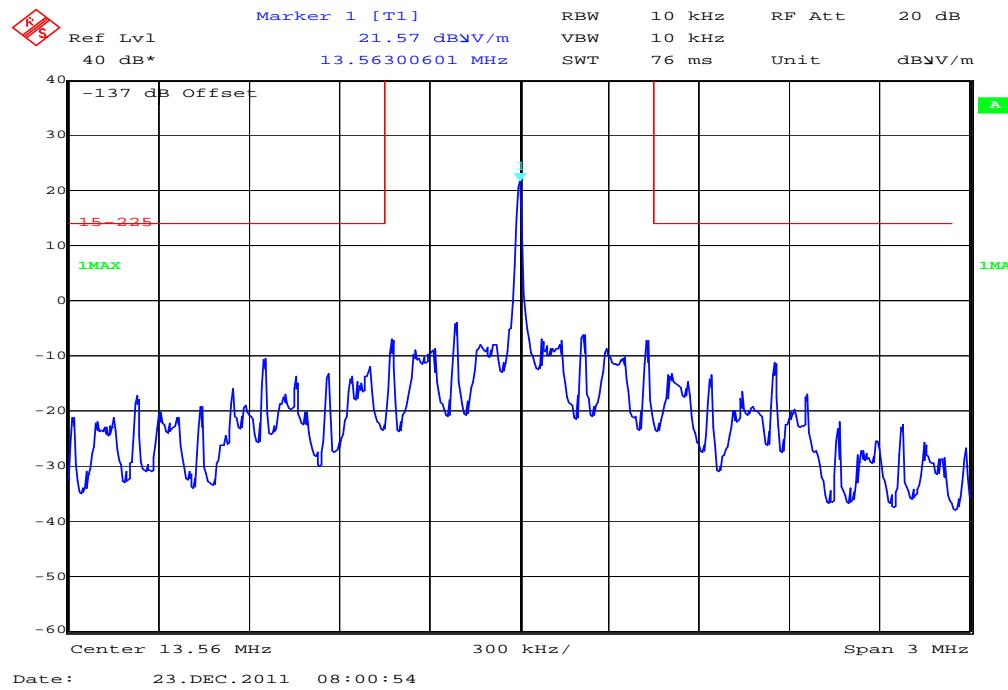


Final Result 1

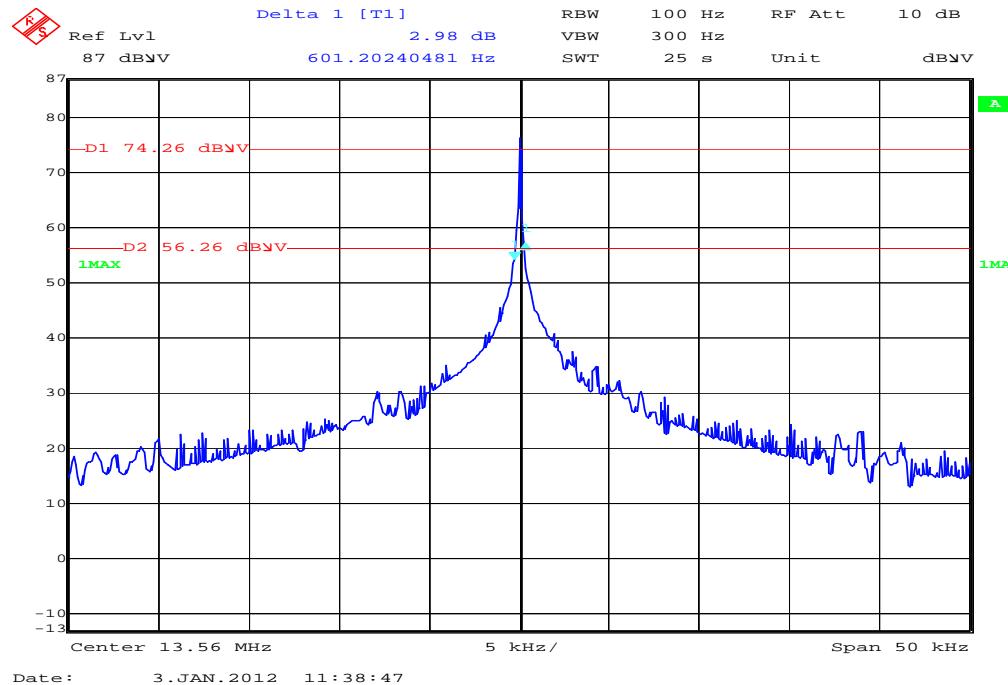
Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
40.498350	22.1	1000.0	120.000	200.0	V	136.0	13.4	7.9	30.0	
44.131800	10.0	1000.0	120.000	200.0	V	289.0	13.3	20.0	30.0	
67.383900	19.5	1000.0	120.000	400.0	V	170.0	9.9	10.5	30.0	
162.222900	22.2	1000.0	120.000	200.0	V	324.0	9.3	11.3	33.5	
216.941550	21.1	1000.0	120.000	114.0	V	269.0	12.3	14.9	36.0	
325.706700	24.1	1000.0	120.000	107.0	V	146.0	15.3	11.9	36.0	
...

Plot 3: Spectrum mask part15.225 (a,b,c,d)

Limits recalculated from 10m to 30m with 40 dB/decade according to FCC 15.31 (f2)



Plot 4: 20dB Bandwidth



9.3 Frequency tolerance

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 Hz
Video bandwidth:	300 Hz
Span:	1 kHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
SUBCLAUSE § 15.225	RSS-210 Issue 8 Annex 2.6
The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.	

Result: The result of the measurement is passed.

Frequency tolerance								
Over temperature variation			Over voltage variation			MHz		
Limit is +/- 1.356 kHz			Limit is +/- 1.356 kHz			MHz		
T (°C)	Frequency (MHz)	result	Power voltage	Frequency	result	F [MHz]	Detector	Level [µV/m]
-20°	13.5603	Pass	10.0V	13.5602	Pass			
-10°	13.5602	Pass	10.7V	13.5601	Pass			
0°	13.5602	Pass	11.4V	13.5601	Pass			
10°	13.5602	Pass	12.0V	13.5602	Pass			
20°	13.5602	Pass	12.7V	13.5602	Pass			
30°	13.5602	Pass	13.4V	13.5602	Pass			
40°	13.5602	Pass	14.0V	13.5602	Pass			
50°	13.5602	Pass						
Measurement uncertainty			±100 Hz					

10 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

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

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
2	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
3	n. a.	Coaxial Attenuator 30dB/500W	8325	Bird	1530	300001595	ev		
4	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	11.05.2011	11.05.2013
5	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
6	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
7	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
8	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
9	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
10	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
11	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
12	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
13	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
14	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
15	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
16	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
17	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
18	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
19	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
20	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
21	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	08.09.2010	08.09.2012
22	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	13.09.2010	13.09.2012
23	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vIKI!	08.09.2010	08.09.2012
24	n. a.	TRILOG Broadband	VULB9163	Schwarzbeck	371	300003854	vIKI!	14.10.2011	14.10.2014

		Test-Antenna 30 MHz - 3 GHz							
25	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04590	300001041	Ve	08.01.2009	08.01.2012
26	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/83761	300002326	Ve	20.09.2011	20.09.2013
27	n. a.	Signal Analyzer 20Hz- 26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve	04.11.2010	04.11.2012
28	n. a.	Test Receiver	ESH2	R&S	871921/095	300002505	Ve	12.02.2010	12.02.2012
29	n. a.	Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824	vlKI!	18.11.2008	18.03.2012
30	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
31	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
32	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
33	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	05.01.2011	05.01.2013
34	n. a.	Analyzer- Reference- System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2011	14.07.2013
35	n. a.	Amplifier	JS42-00502650- 28-5A	MITEQ	1084532	300003379	ev		
36	n. a.	Antenna Tower	Model 2175	ETS- LINDGREN	64762	300003745	izw		
37	n. a.	Positioning Controller	Model 2090	ETS- LINDGREN	64672	300003746	izw		
38	n. a.	Turntable Interface-Box	Model 105637	ETS- LINDGREN	44583	300003747	izw		
39	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	01.04.2010	01.04.2012
40	n. a.	Spectrum- Analyzer	FSU26	R&S	200809	300003874	k	10.01.2011	10.01.2013

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
 vkl! 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.