**CETECOM™****CETECOM ICT Services**
consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-9632/15-01-02

Deutsche
Akkreditierungsstelle
D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH

Untertuerkheimer Strasse 6 – 10

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Internet: <http://www.cetecom.com>e-mail: ict@cetecom.com**Accredited Testing Laboratory:**

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

GATSOMETER BV

Claes Tillyweg 2

2003 2031 CW Haarlem / NETHERLANDS

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Manufacturer

GATSOMETER BV

Claes Tillyweg 2

2003 2031 CW Haarlem / NETHERLANDS

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

RSS-210 — 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

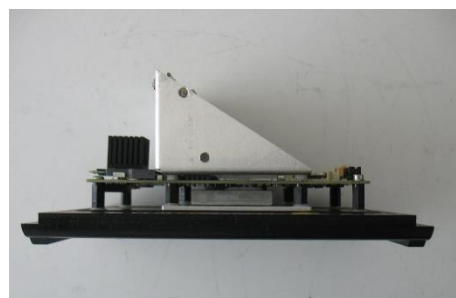
Kind of test item: 24 GHz radar**Model name:** RT4**FCC ID:** TVO-RT4**IC:** 6271A-RT4

Frequency: 24.075 – 24.175 GHz

Antenna: Integrated patch antenna

Power supply: 12.0 V DC by Battery

Temperature range: -25°C to +60°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 authorized:

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2015.07.09 14:46:14 +02'00'Meheza Walla
Lab Manager
Radio Communications & EMC

Test performed:

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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.

2.2 Application details

Date of receipt of order:	2015-04-02
Date of receipt of test item:	2015-05-04
Start of test:	2015-05-04
End of test:	2015-05-06
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2014-10	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS-210, Issue 8	2010-12	RSS-210 — Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
Relative humidity content:		55 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	12.0 V DC by Battery
	V_{max}	-/- V
	V_{min}	-/- V

5 Test item

Kind of test item	:	24 GHz radar
Type identification	:	RT4
HMN	:	-/-
PMN	:	RT4
HVIN	:	RT4
FVIN	:	-/-
S/N serial number	:	DUT 201503000019
HW hardware status	:	RT4
SW software status	:	RT4 version 1 (build 1.4-4)
Frequency band	:	24.075 – 24.175 GHz
Type of modulation	:	FMCW
Number of channels	:	1
Antenna	:	Integrated patch antenna
Power supply	:	12.0 V DC by Battery
Temperature range	:	-25 °C to +60 °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:

1-9632_15-01-02_AnnexA
 1-9632_15-01-02_AnnexB
 1-9632_15-01-02_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 signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

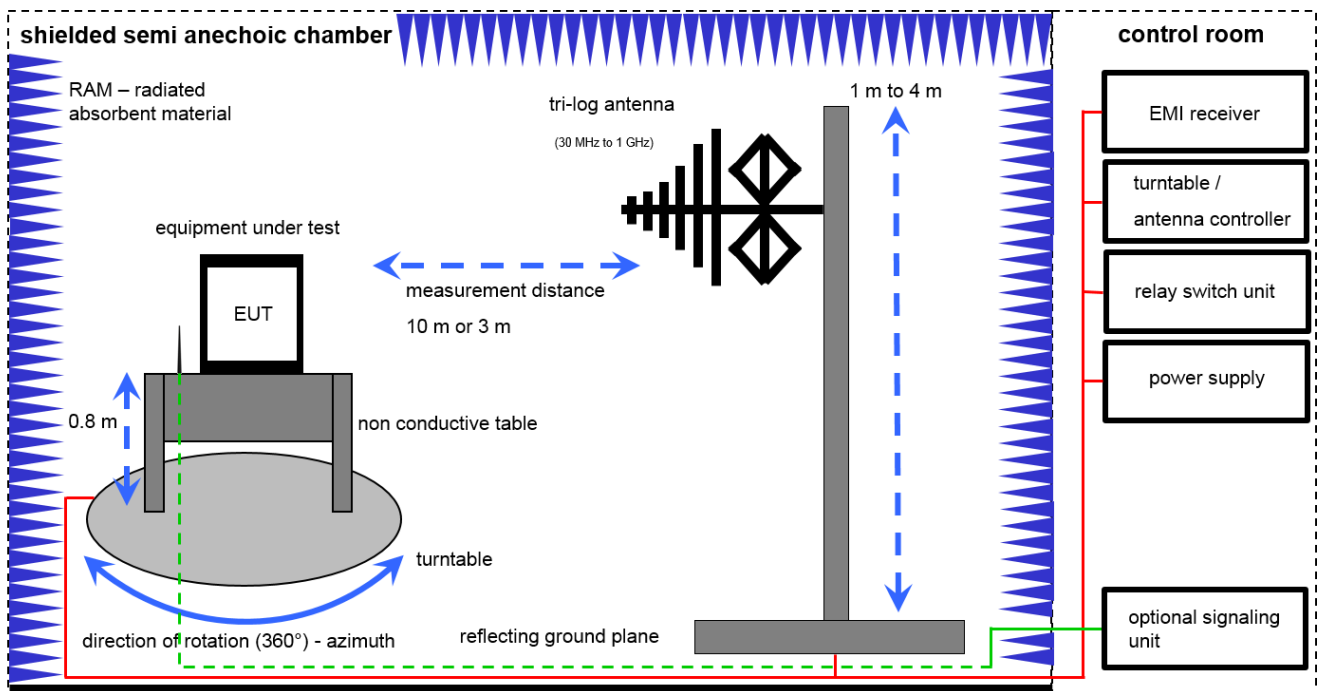
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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
v/k!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded semi anechoic chamber

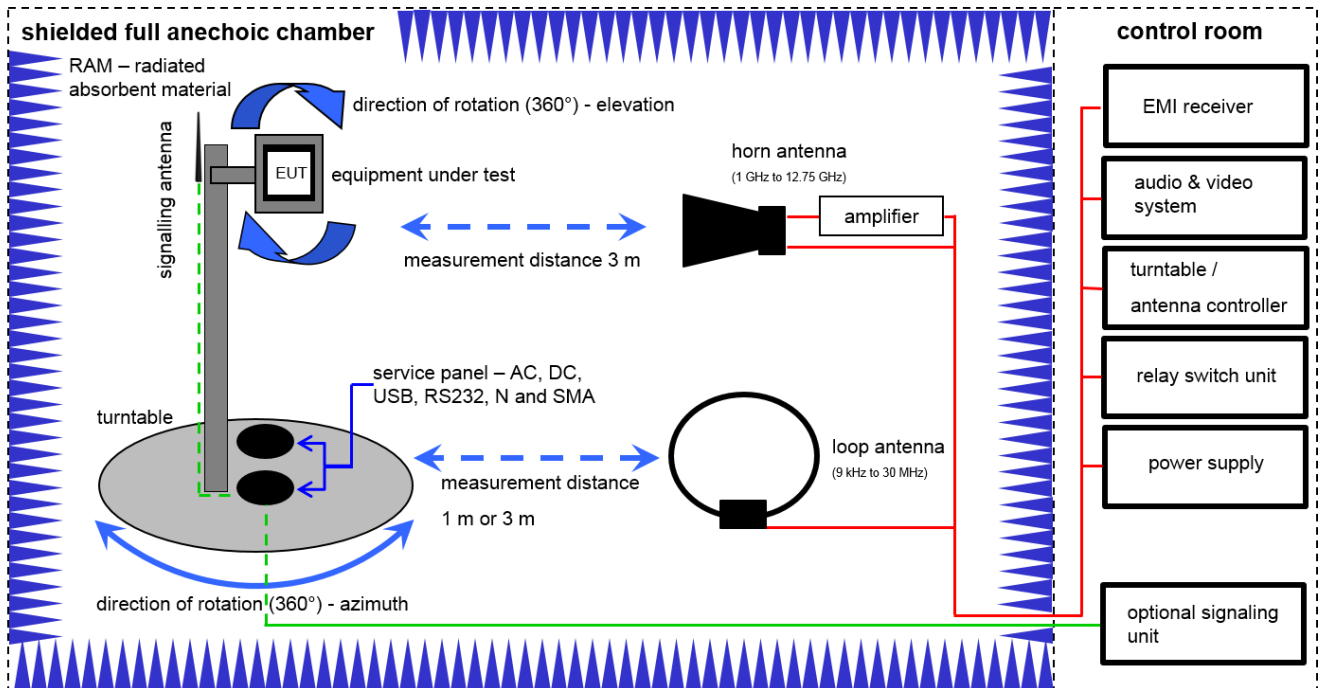
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas 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 analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne		
3	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081; B5979	300000210	ne		
4	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2015	26.01.2016
5	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	11.02.2014	11.02.2016
6	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
7	n. a.	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw		
8	n. a.	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw		
9	n. a.	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw		
10	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
11	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	26.01.2015	26.01.2016

7.2 Shielded full anechoic chamber

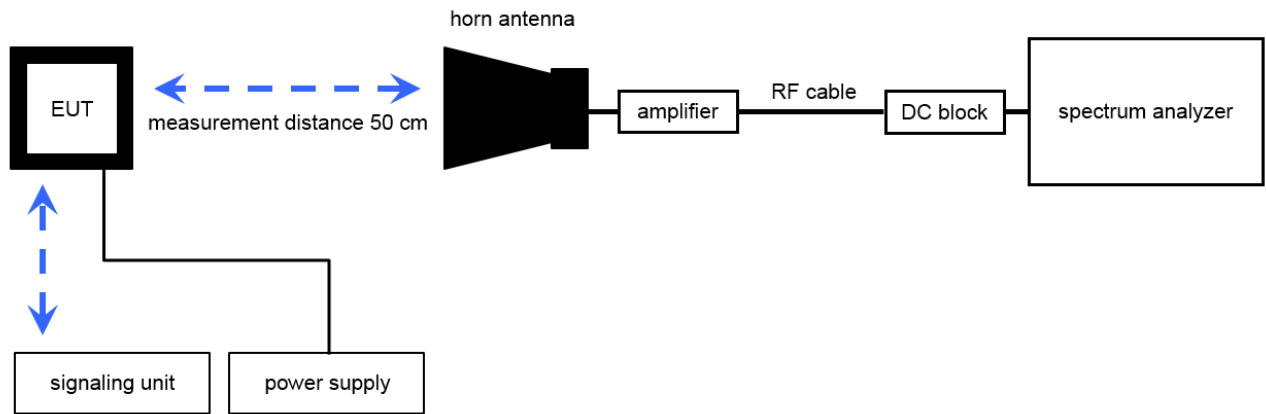


Equipment table:

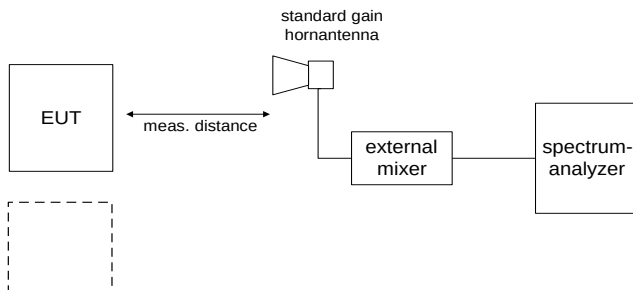
No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	Ve	20.01.2015	20.01.2018
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKII	08.05.2013	08.05.2015
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	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
6	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
7	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
8	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
9	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
10	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKII	29.10.2014	29.10.2017
11	n. a.	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
12	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		

7.3 Radiated measurements > 12.75 GHz

Radiated measurements > 12.75 GHz



Radiated measurements > 50 GHz



Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	CR 79	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751	ne		
2	11b	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP	00419	300002268	ev		
3	A025	Std. Gain Horn Antenna 49.9-75.8 GHz	2524-20	Flann	*	300001983	ne		
4	A028	Std. Gain Horn Antenna 73.8-112 GHz	2724-20	Flann	*	300001991	ne		
5	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
6	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
7	A029	Power Supply	LA30/5GA	Zentro	2046	300000711	NK!		
8	A029	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	Ve	02.10.2014	02.10.2016
9	A029	Harmonic mixer 50 - 75 GHz for spectrum analyzers	FS-Z75	R&S	100099	300003949	k	06.03.2015	06.03.2016
10	A029	Spectrum Analyzer Mixer 2-Port, 75-110 GHz	SAM-110-7	Radiometer Physics GmbH	002	300004155	k	31.01.2014	31.01.2016
11	A029	Broadband Low Noise Amplifier 18-50 GHz	CBL18503070-XX	CERNEX	19338	300004273	ne		
12	A029	Std. Gain Horn Antenna 33.0-50.1 GHz	2324-20	Flann	57	400000683	ne		

8 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	47 CFR Part 15 RSS 210, Issue 8, Annex 8	Passed	2015-07-09	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Pass	Fail	NA	NP	Results (max.)
§15.245(b) RSS 210 / A7.1	Field strength of emissions (wanted signal)	Nominal	Nominal	☒	☐	☐	☐	118.5 dBµV
§2.1049	Occupied bandwidth (99% bandwidth)	Nominal	Nominal	☒	☐	☐	☐	83.6 MHz
§15.209(a) / §15.245(b)(1)(2)(3) RSS 210 / A7.1-4	Field strength of emissions (spurious)	Nominal	Nominal	☒	☐	☐	☐	complies

Note: NA = Not Applicable; NP = Not Performed

9 Measurement results

9.1 Field strength of emissions (wanted signal)

Description:

Measurement of the maximum radiated field strength of the wanted signal.

Measurement:

Measurement parameter	
Detector:	Pos-Peak
Sweep time:	Auto
Video bandwidth:	Auto
Resolution bandwidth:	1 MHz
Span:	max. 100 MHz
Trace-Mode:	Max Hold

Limits:

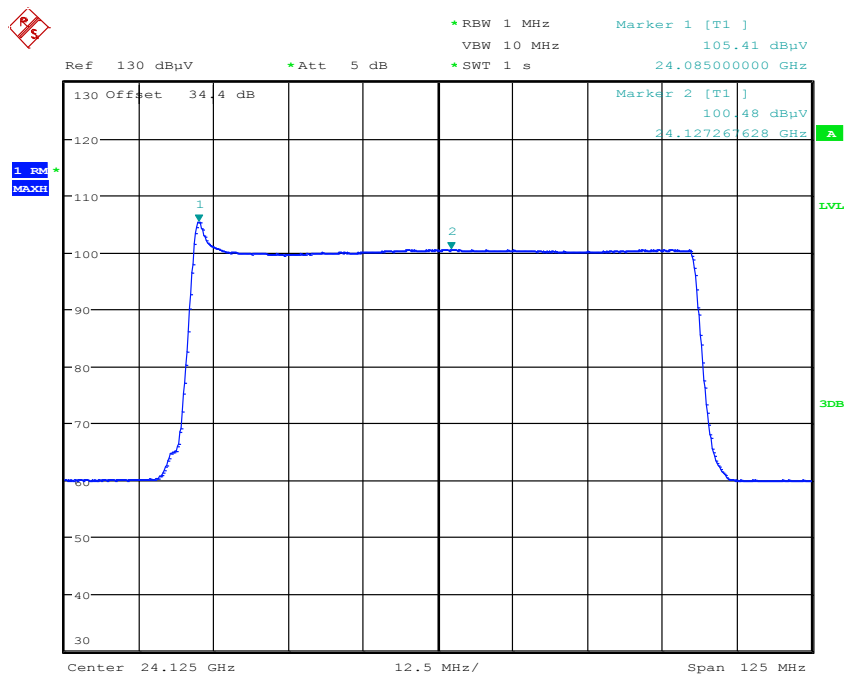
FCC		IC	
CFR Part 15.245(b)		RSS - 210, Annex 7	
Field strength of emissions			
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:			
Frequency [GHz]	Field Strength [dBμV/m]	Measurement distance	
24.075 – 24.175	128	3	

Result:

Test condition t = 22 °C	Maximum field strength [dB μ V/m]			
	Normal mode	Lowest	Middle	Highest
U _{DC} = 12 V	105.4	118.4	118.5	118.5
Measurement uncertainty	± 3 dB			

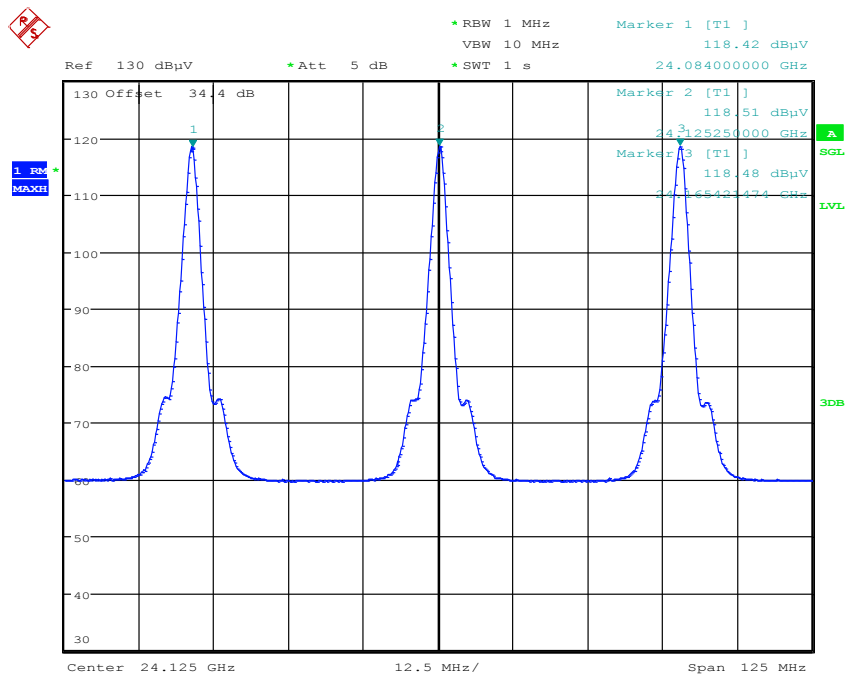
Result: The measurement is passed.

Plot 1: Normal mode



Date: 4.MAY.2015 16:51:50

Plot 2: Stop mode



Date: 5.MAY.2015 09:32:21

9.2 Occupied bandwidth (99% bandwidth)

Description:

Measurement of the 99% bandwidth of the wanted signal.

Measurement:

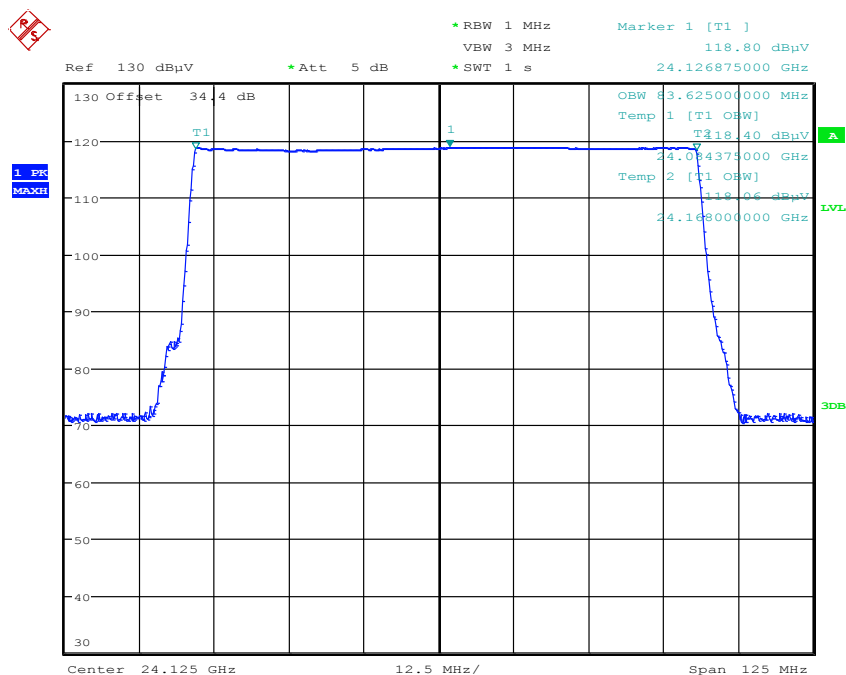
Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	8 MHz
Trace-Mode:	Max Hold

Results:

Test condition $t = 22\text{ °C}$	Occupied bandwidth [MHz]			
	Normal mode	Lowest	Middle	Highest
$U_{DC} = 12\text{ V}$	83.6	3.35	3.35	3.35
Measurement uncertainty	1E-7			

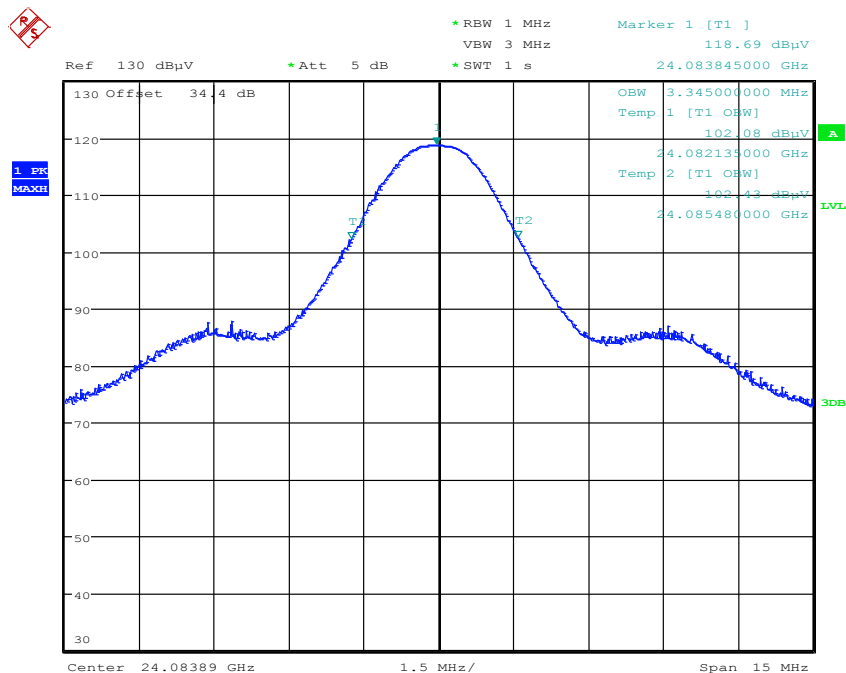
Result: The measurement is passed.

Plot 3: Normal mode



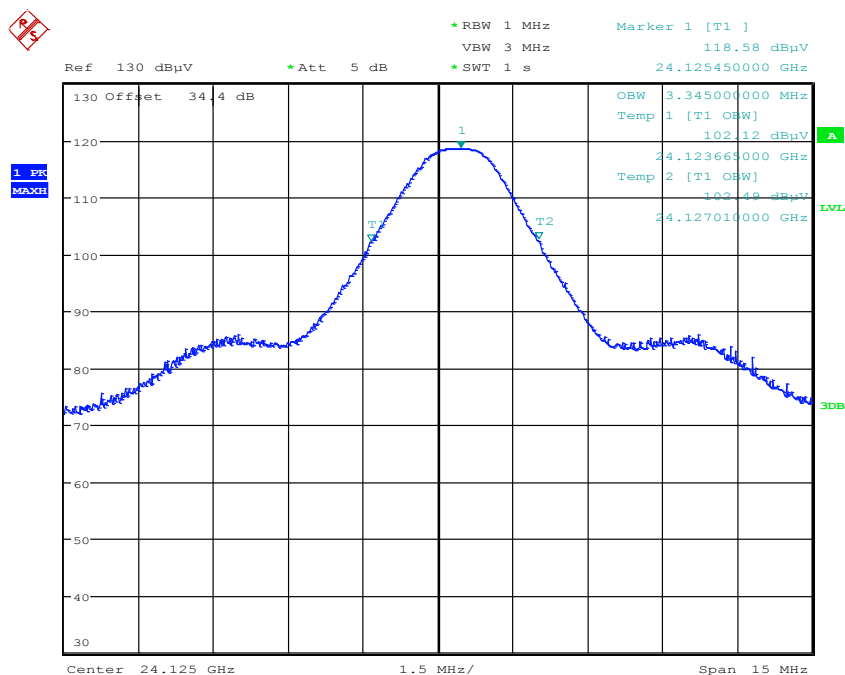
Date: 4.MAY.2015 16:54:29

Plot 4: Lowest frequency



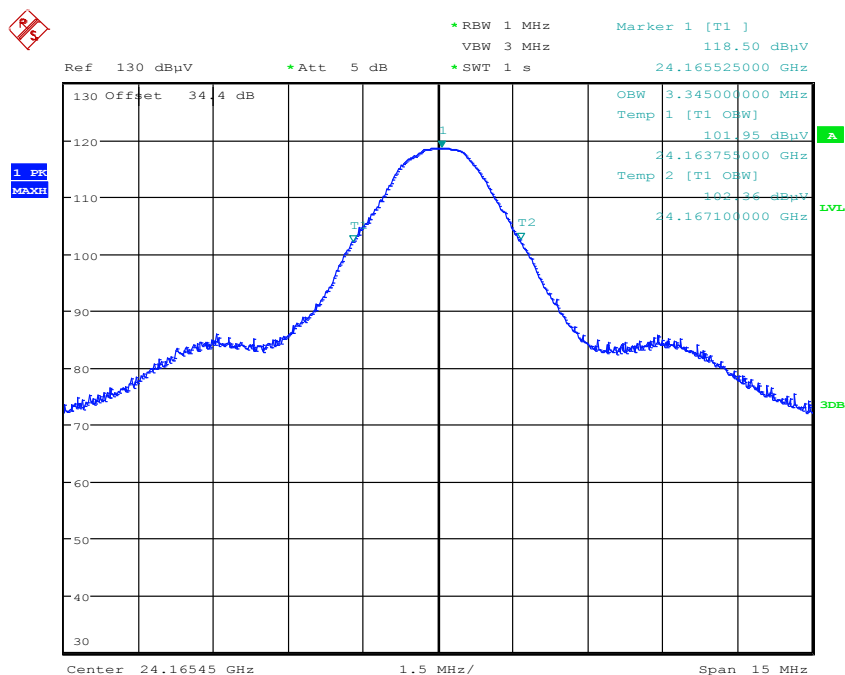
Date: 5.MAY.2015 09:37:38

Plot 5: Middle frequency



Date: 5.MAY.2015 09:40:05

Plot 6: Highest frequency



Date: 5.MAY.2015 09:41:52

9.3 Field strength of emissions (radiated spurious)

Description:

Measurement of the radiated spurious emissions in transmit mode.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Frequency range:	30 MHz to 100 GHz
Trace-Mode:	Max Hold

Limits:

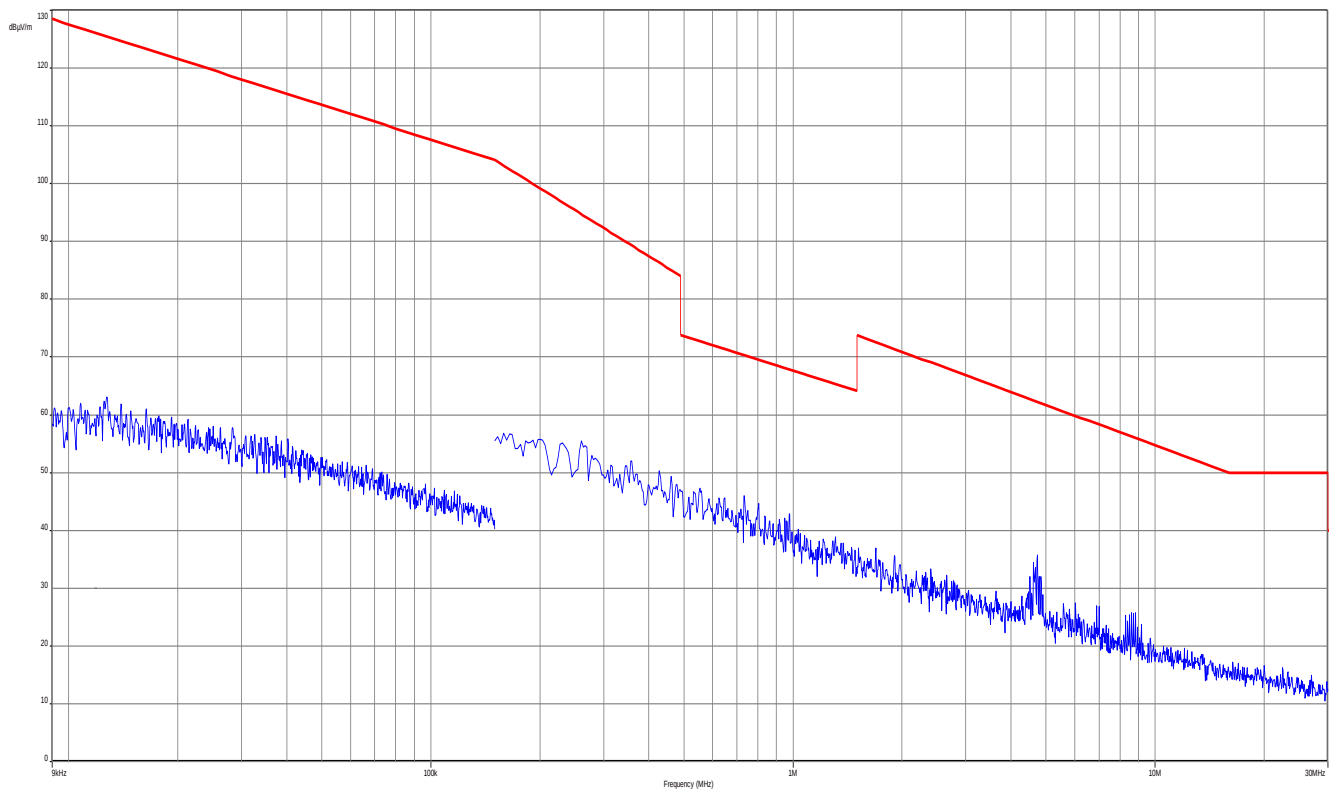
FCC		IC
CFR Part 15.209(a)		RSS - GEN
Radiated Spurious Emissions		
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

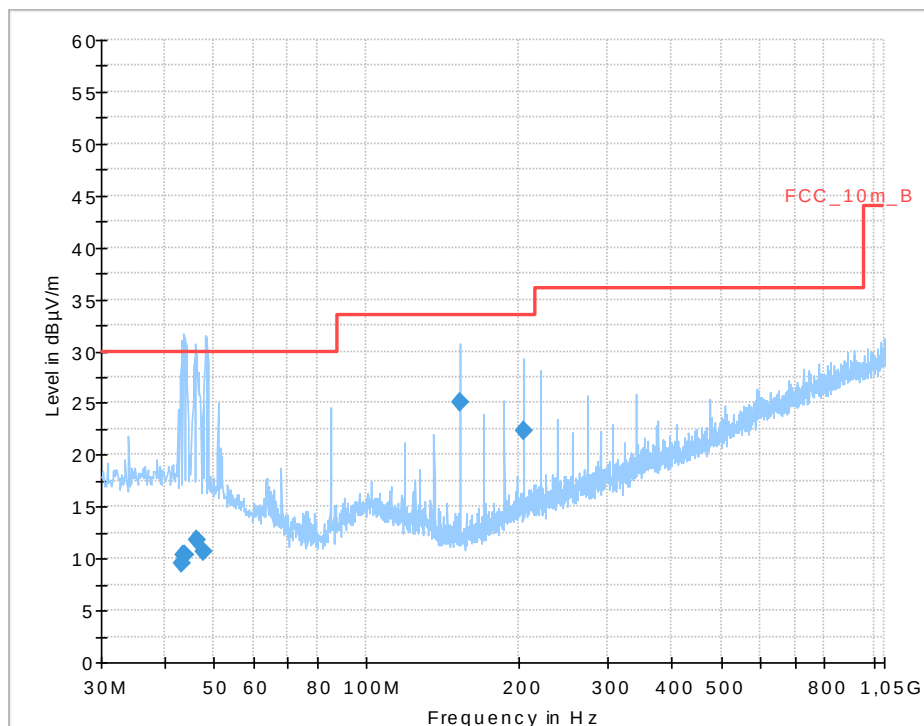
TX Spurious Emissions Radiated [dB μ V/m]								
Lowest			Middle			Highest		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
No critical peaks found			No critical peaks found			No critical peaks found		
Measurement uncertainty			± 3 dB					

Result: The measurement is passed.

Plot 7: 9 kHz to 30 MHz, TX magnetic

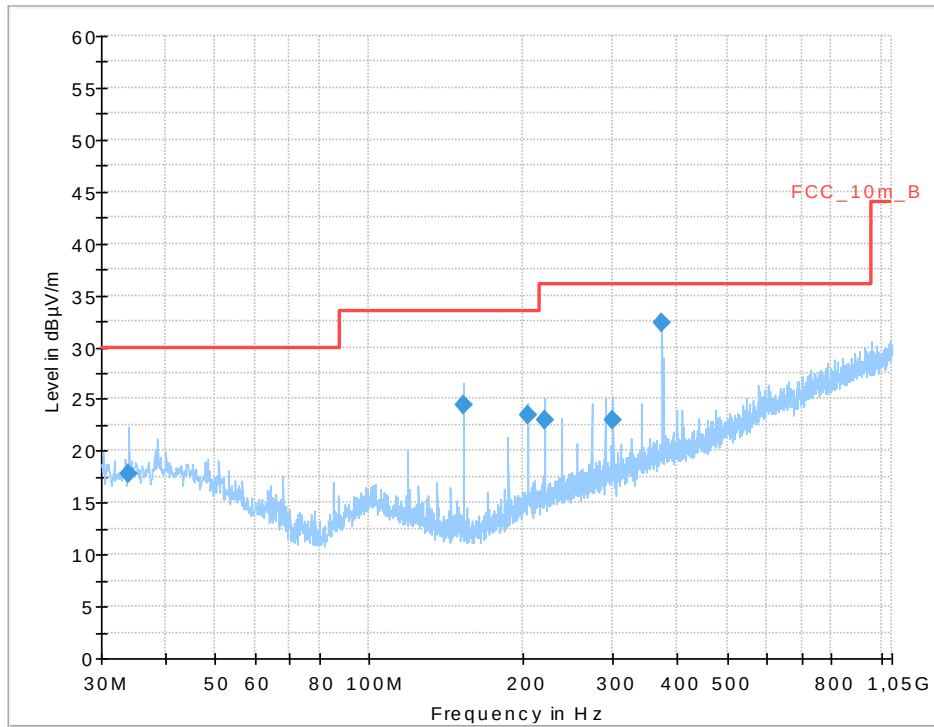


Plot 8: 30 MHz to 1 GHz, lowest frequency



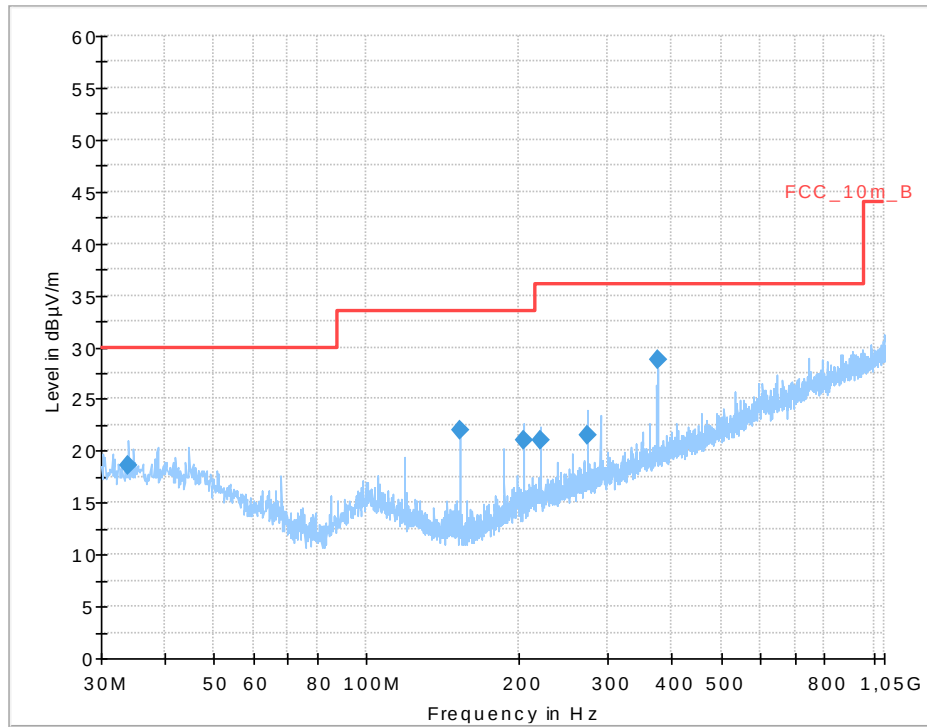
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
43.371750	9.60	30.00	20.40	1000.0	120.000	170.0	V	252	13.9
43.603350	10.38	30.00	19.62	1000.0	120.000	172.0	V	254	13.9
44.031000	10.34	30.00	19.66	1000.0	120.000	174.0	V	175	13.9
46.230150	11.83	30.00	18.17	1000.0	120.000	103.0	V	233	13.5
47.888100	10.63	30.00	19.37	1000.0	120.000	200.0	V	175	13.1
152.991000	25.09	33.50	8.41	1000.0	120.000	100.0	V	140	8.9
203.987850	22.30	33.50	11.20	1000.0	120.000	100.0	V	32	11.8

Plot 9: 30 MHz to 1 GHz, middle frequency



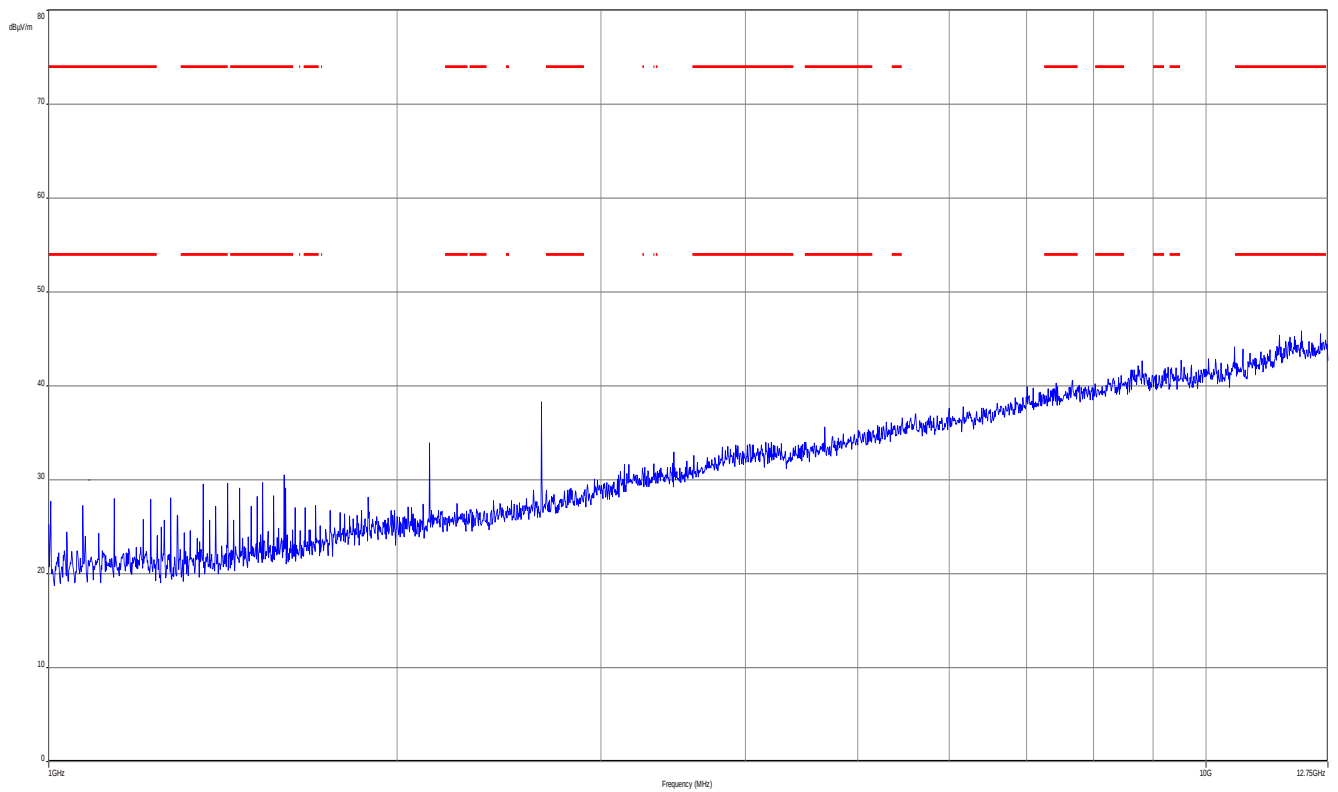
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.996750	17.86	30.00	12.14	1000.0	120.000	172.0	V	5	13.7
152.994150	24.49	33.50	9.01	1000.0	120.000	100.0	V	97	8.9
203.995200	23.53	33.50	9.97	1000.0	120.000	100.0	V	7	11.8
220.984800	22.95	36.00	13.05	1000.0	120.000	100.0	V	162	12.4
300.001500	23.00	36.00	13.00	1000.0	120.000	400.0	H	232	14.4
374.003250	32.30	36.00	3.70	1000.0	120.000	272.0	H	278	16.4

Plot 10: 30 MHz to 1 GHz, highest frequency

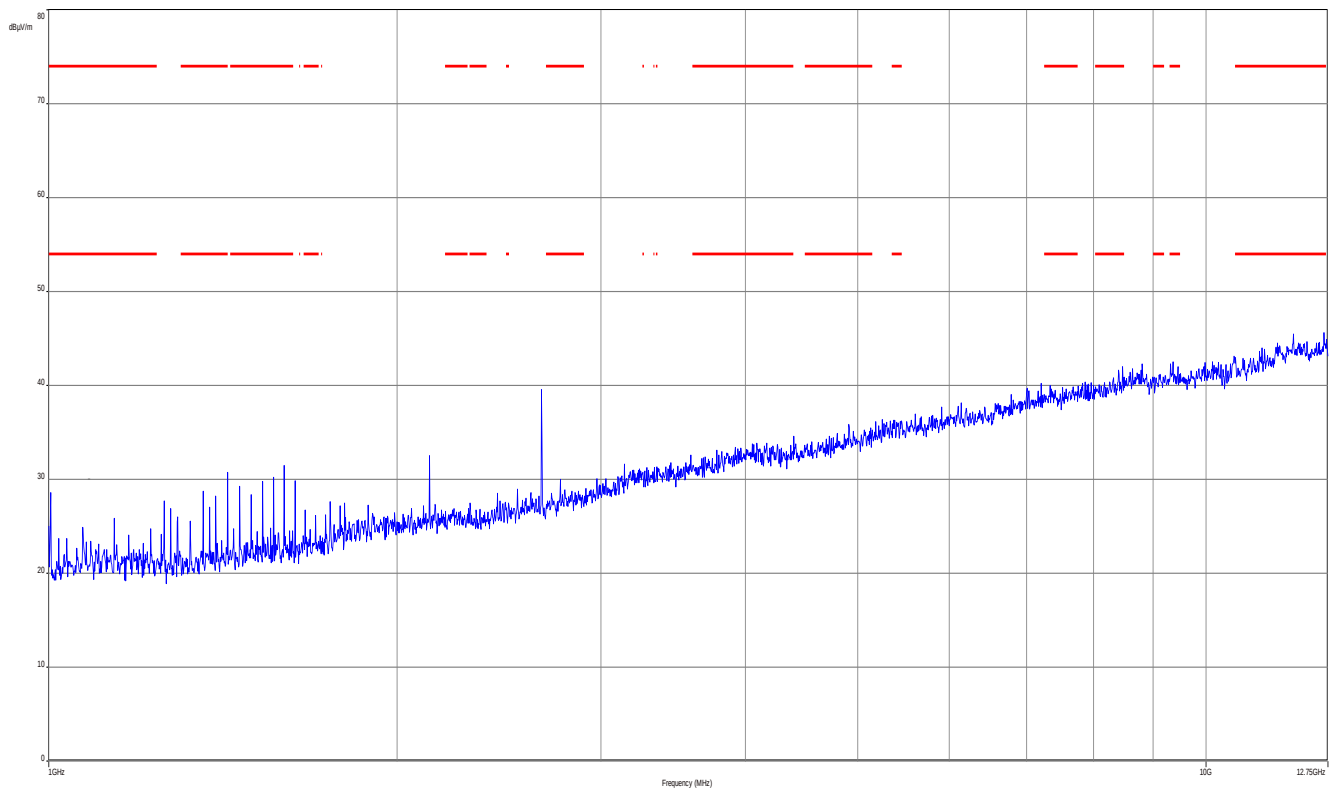


Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.986250	18.57	30.00	11.43	1000.0	120.000	102.0	V	32	13.7
152.992800	22.02	33.50	11.48	1000.0	120.000	100.0	V	72	8.9
204.012600	20.95	33.50	12.55	1000.0	120.000	101.0	V	1	11.8
221.004450	21.00	36.00	15.00	1000.0	120.000	101.0	V	142	12.4
271.977000	21.43	36.00	14.57	1000.0	120.000	275.0	H	53	13.9
374.984550	28.84	36.00	7.16	1000.0	120.000	101.0	V	208	16.5

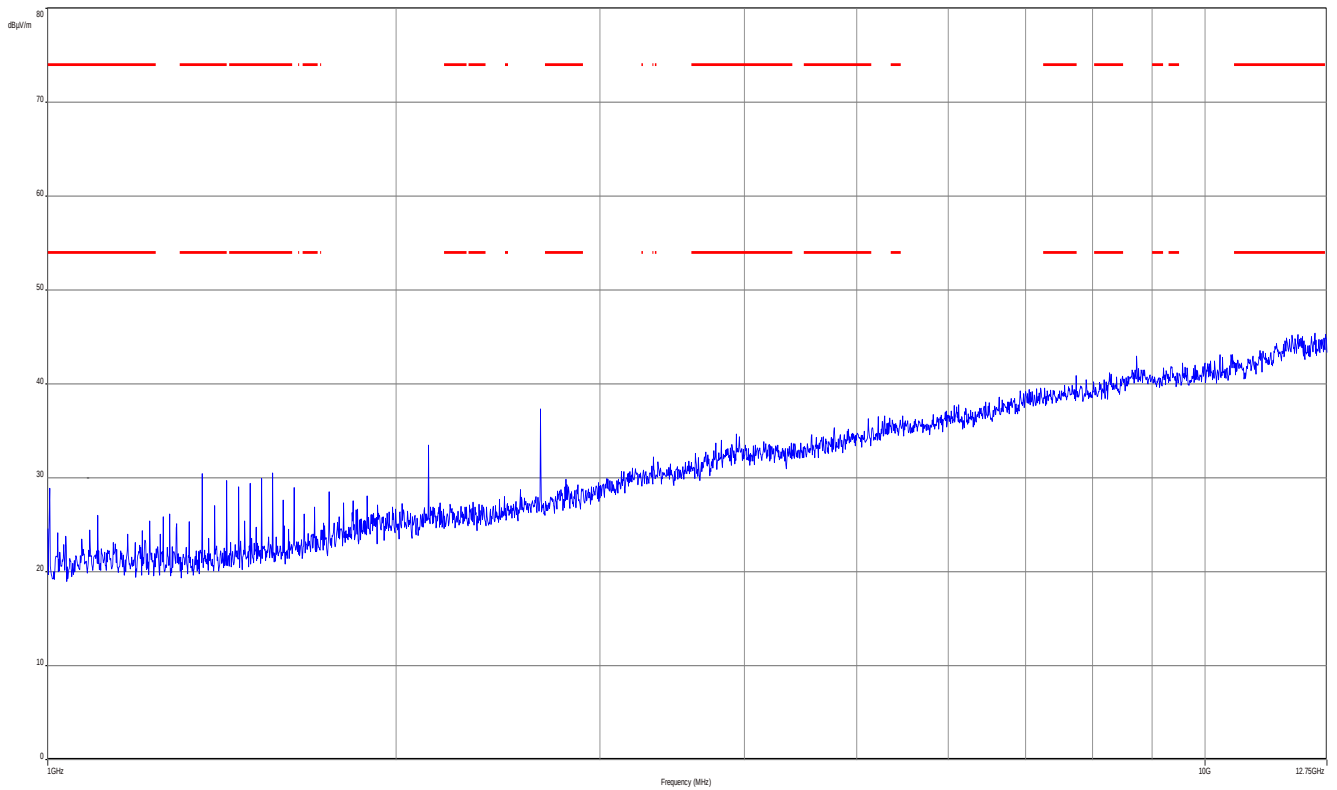
Plot 11: 1 GHz to 12.75 GHz, lowest frequency



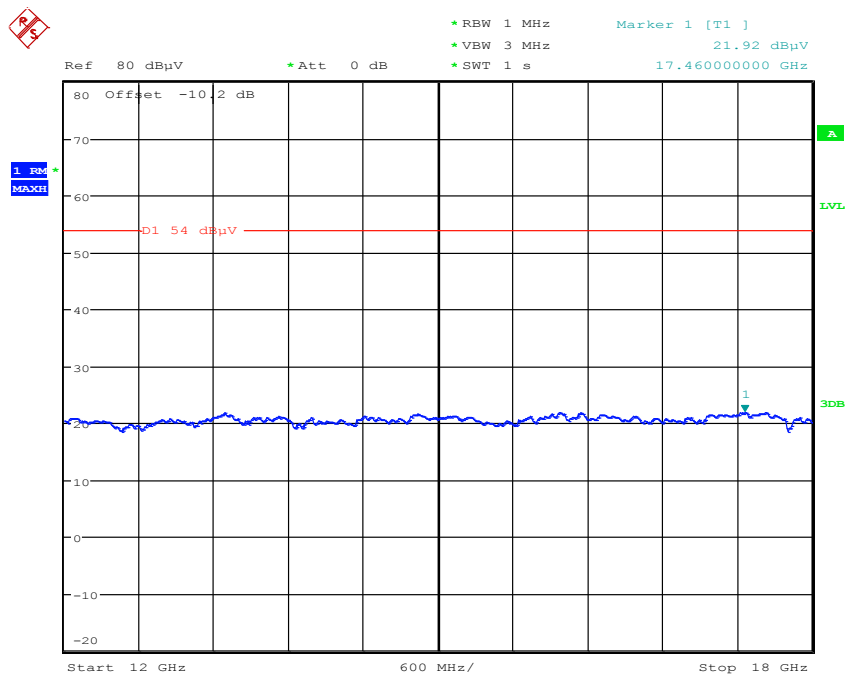
Plot 12: 1 GHz to 12.75 GHz, middle frequency



Plot 13: 1 GHz to 12.75 GHz, highest frequency

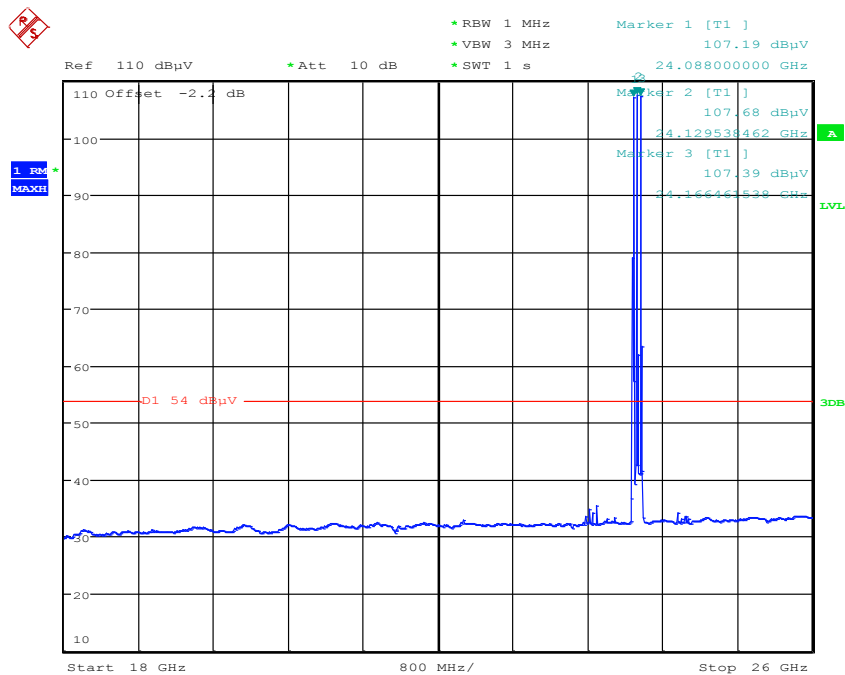


Plot 14: 12 GHz to 18 GHz



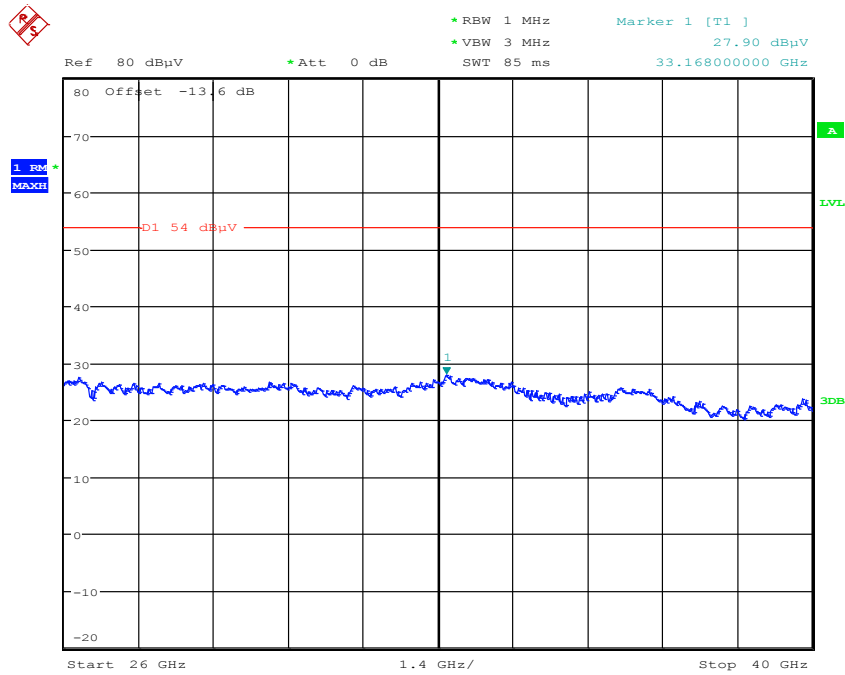
Date: 5.MAY.2015 16:12:37

Plot 15: 18 GHz to 26 GHz



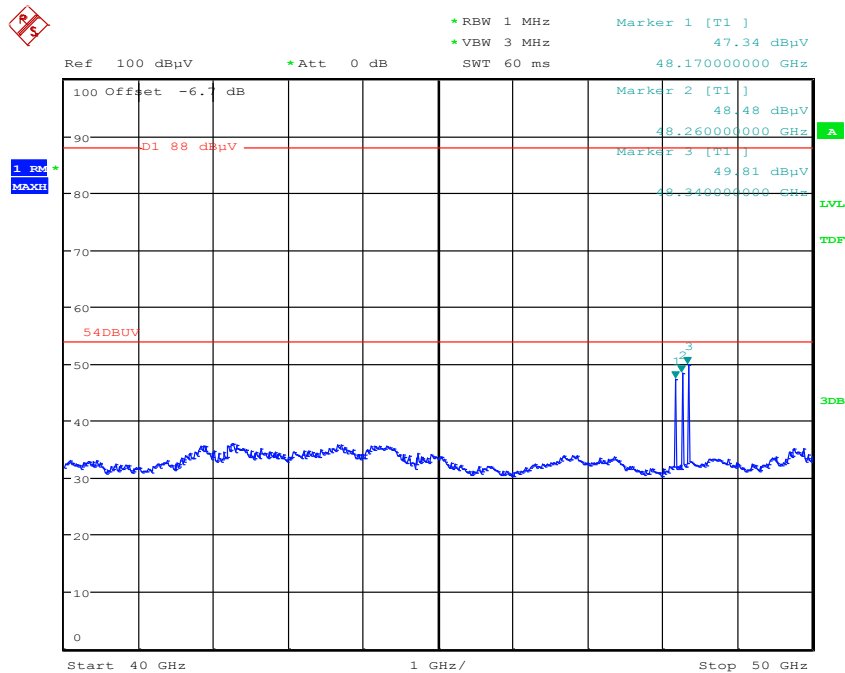
Date: 5.MAY.2015 16:21:07

Plot 16: 26 GHz to 40 GHz



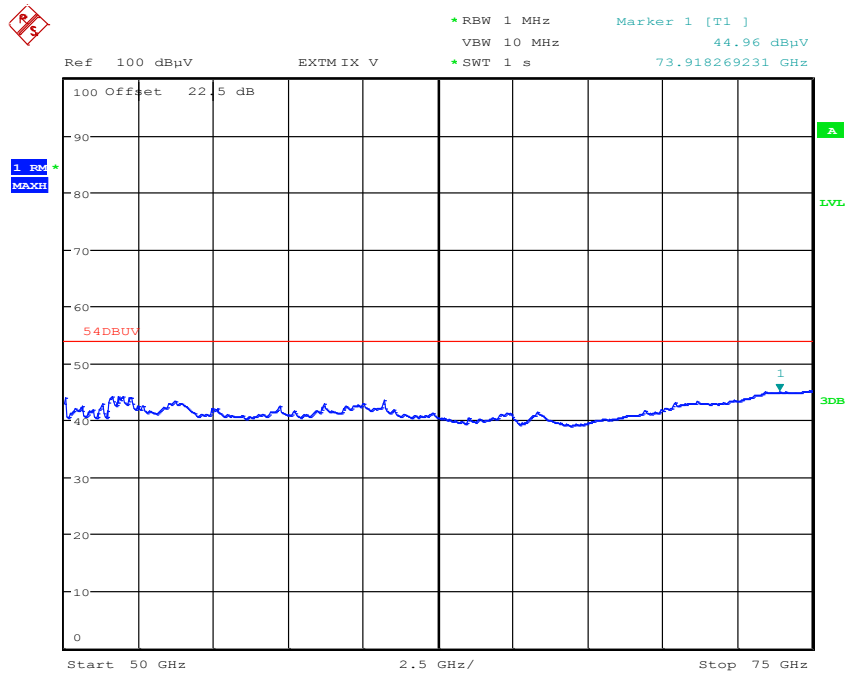
Date: 5.MAY.2015 16:27:57

Plot 17: 40 GHz to 50 GHz



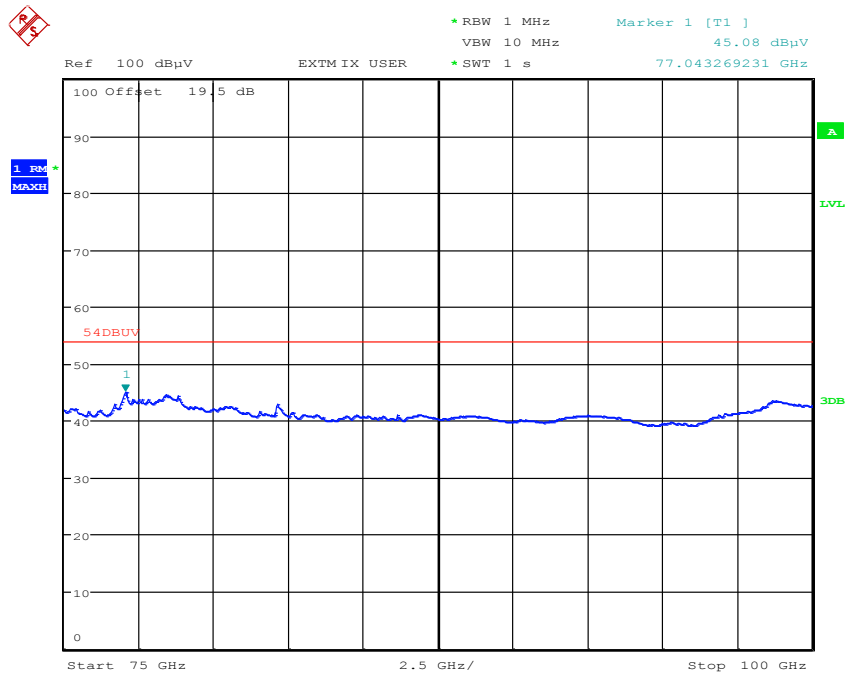
Date: 6.MAY.2015 11:09:58

Plot 18: 50 GHz to 75 GHz



Date: 6.MAY.2015 14:40:15

Plot 19: 75 GHz to 100 GHz



Date: 6.MAY.2015 15:20:21

Annex A Document history

Version	Applied changes	Date of release
DRAFT	Initial release – DRAFT	2015-05-20
	minor changes based on manufacturer's information	2015-07-09

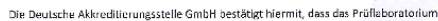
Annex B Further information**Glossary**

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

Front side of certificate



Akkreditierung



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

Frankfurt am Main, 07.03.2014

Im Auftrag (Vpl.) von: (H); Ralf Eigner
Abteilungsleiter

Back side of certificate

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

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