
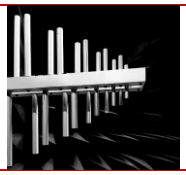
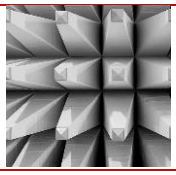

CETECOM™
CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test report no.: 1-8891/14-01-07-A

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
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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-12076-01-01

Applicant

KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
47058 Duisburg / GERMANY
Phone: +49 234 588 80-152
Fax: +49 234 588 80-101
Contact: Ouzounis Charalambos
e-mail: c.ouzounis@krohne.com
Phone: +49 234 588 80-152

Manufacturer

KROHNE SAS
2 allee des Ors – BP98
26103 Romans / FRANCE

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:	**Tank level probing radar**
Model name:	**OPTIWAVE 7400-80C**
FCC ID:	**Q6BFMCW80G74T**
Frequency:	78 GHz – 82 GHz
Antenna:	dielectric lens antenna
Power Supply:	14 – 36 V DC
Temperature Range:	-40 °C to +80 °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:

M. Walla
Digital unterschrieben von Meheza Walla
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Datum: 2016.06.09 15:46:27 +02'00'

Meheza Walla
Lab Manager
Radio Communications & EMC

Test performed:

Geraldy Karsten
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Datum: 2016.06.09 15:45:30 +02'00'

Karsten Geraldy
Lab Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

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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:	2014-11-26
Date of receipt of test item:	2015-01-12
Start of test:	2015-01-12
End of test:	2015-01-16
Person(s) present during the test:	-/-

3 Test standard/s and guideline/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

4 Test laboratories sub-contracted

None

5 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+50 °C
	T_{min}	-20 °C
Relative humidity content:		45 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	24.0 V DC
	V_{max}	36.0 V DC
	V_{min}	14.0 V DC

6 Test item

6.1 General Description

Kind of test item	:	Tank level probing radar
Type identification	:	OPTIWAVE 7400-80C
PMN	:	Optiwave X400-80 Series
HVIN	:	80G-TLPR-C
FVIN	:	-/-
HMN	:	-/-
S/N serial number	:	1 (radiated sample) / 2 (conducted sample)
HW hardware status	:	HW hardware status sensor: 4002581601 b-mod HW hardware status converter: 4002260701 c-mod
SW software status	:	Cetecom_RadioTesting_80GHz_Jan2015_Final_PV Rev. 11087
Frequency band	:	78 GHz – 82 GHz
Type of modulation	:	FMCW
Number of channels	:	1
Antenna	:	dielectric lens antenna
Power supply	:	14 – 36 V DC, < 30 mA
Temperature range	:	-40 °C to +85 °C

Note:
Following antennas are used as TLPR application:

Antenna	Maximum gain	Maximum 3 dB beam width	Maximum side lobe level > 60 deg
40 mm convex lens	26.1	8.0	-12.6 dBi
25 mm convex lens	22.1	10.7	-17.0 dBi

6.2 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: 1-8891/14-01-03_AnnexA
1-8891/14-01-03_AnnexB
1-8891/14-01-03_AnnexD

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).

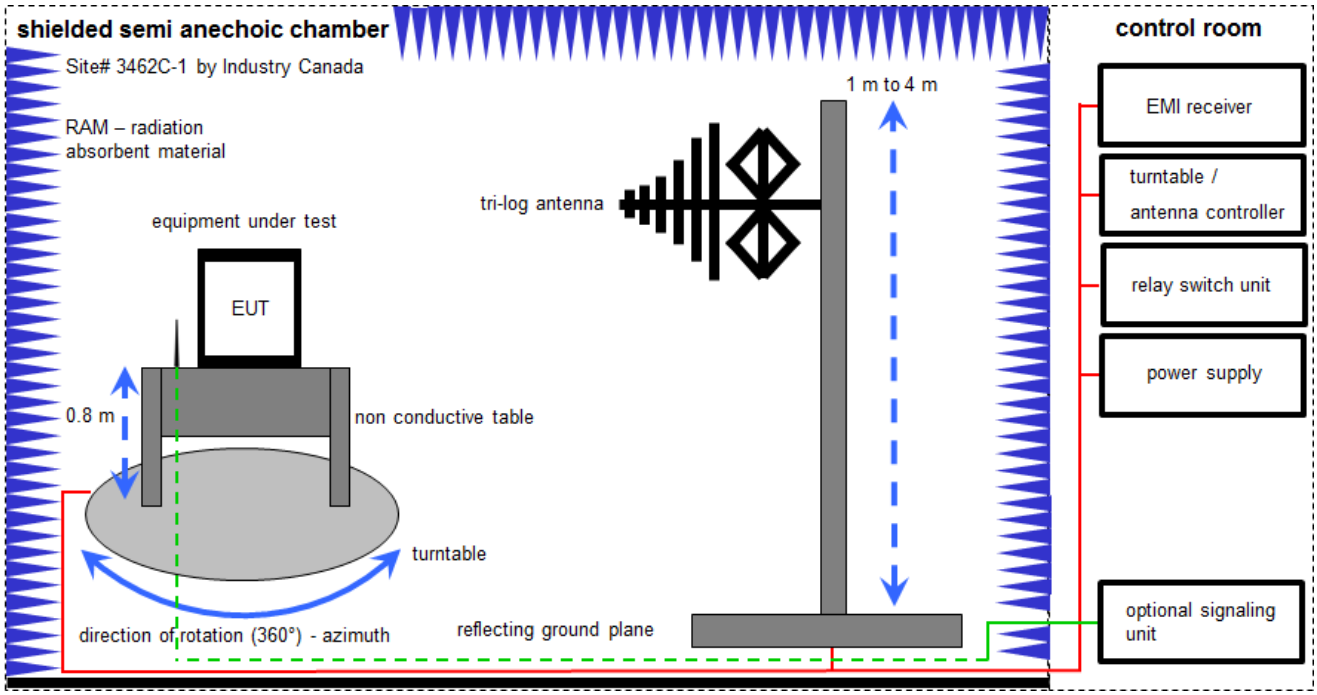
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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
vlkl!	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.



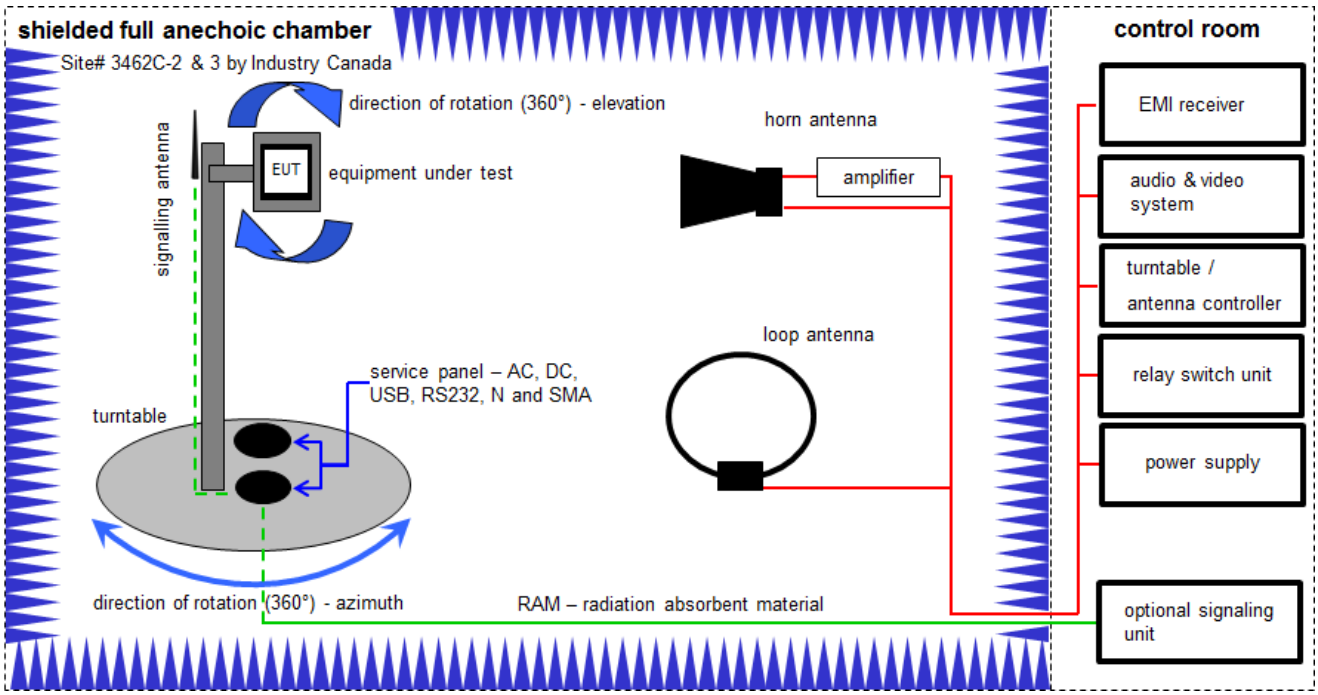
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP	2719A14505	300000368	ev		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne		
3	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2014	26.01.2015
4	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
5	n. a.	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw		
6	n. a.	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw		
7	n. a.	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw		
8	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2015
9	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	26.01.2014	26.01.2015

7.2 Shielded fully anechoic chamber



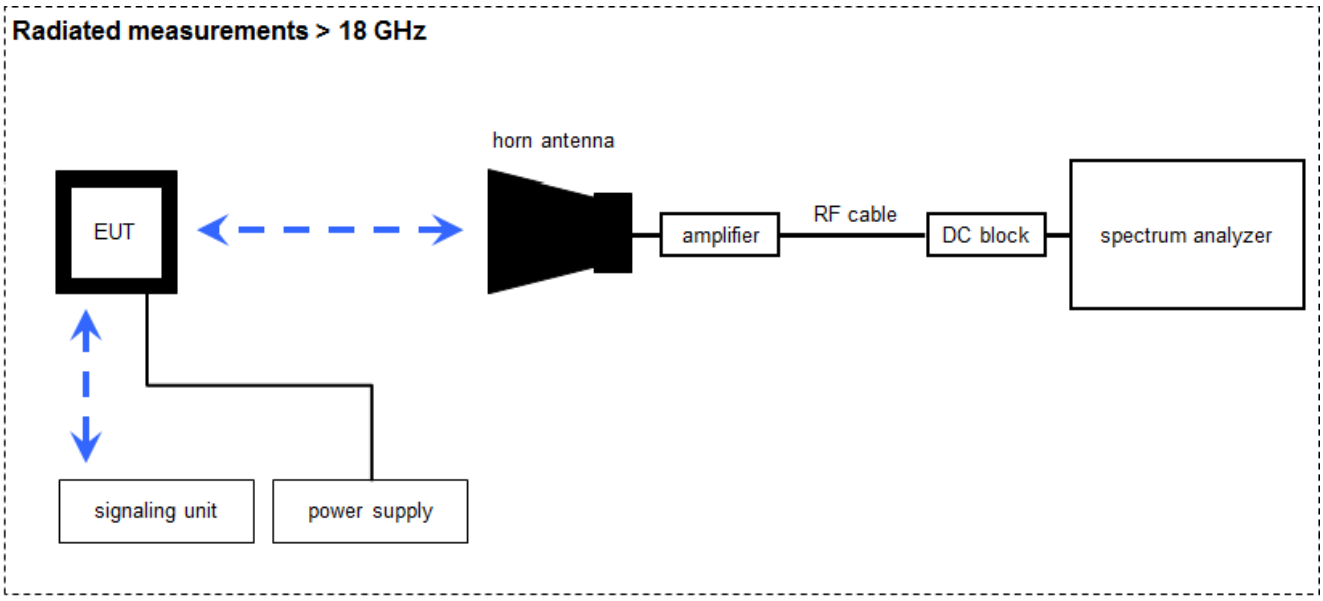
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

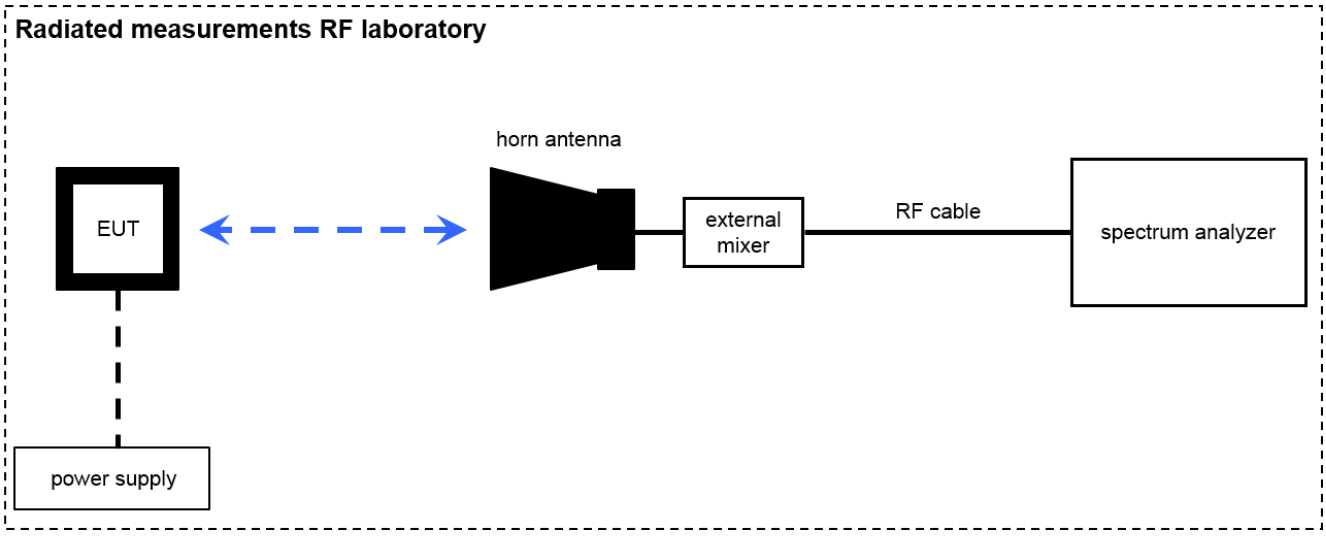
Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	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	20.01.2014	20.01.2015
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	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	9	Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155	ne		
6	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	24.06.2014	24.06.2015
7	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
8	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
9	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
10	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
11	n. a.	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2014	06.03.2015
12	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		

7.3 Radiated measurements > 18 GHz



7.4 Radiated measurements > 50 GHz

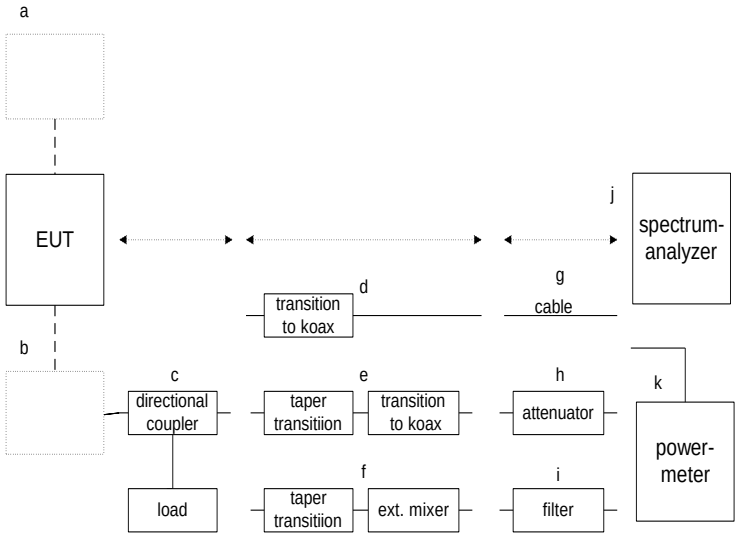


OP = AV + D - G
(OP-rad. output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain)

Example calculation:
OP [dBm] = -54.0 [dBm] + 64.0 [dB] - 20.0 [dBi] = -10 [dBm] (100 µW)

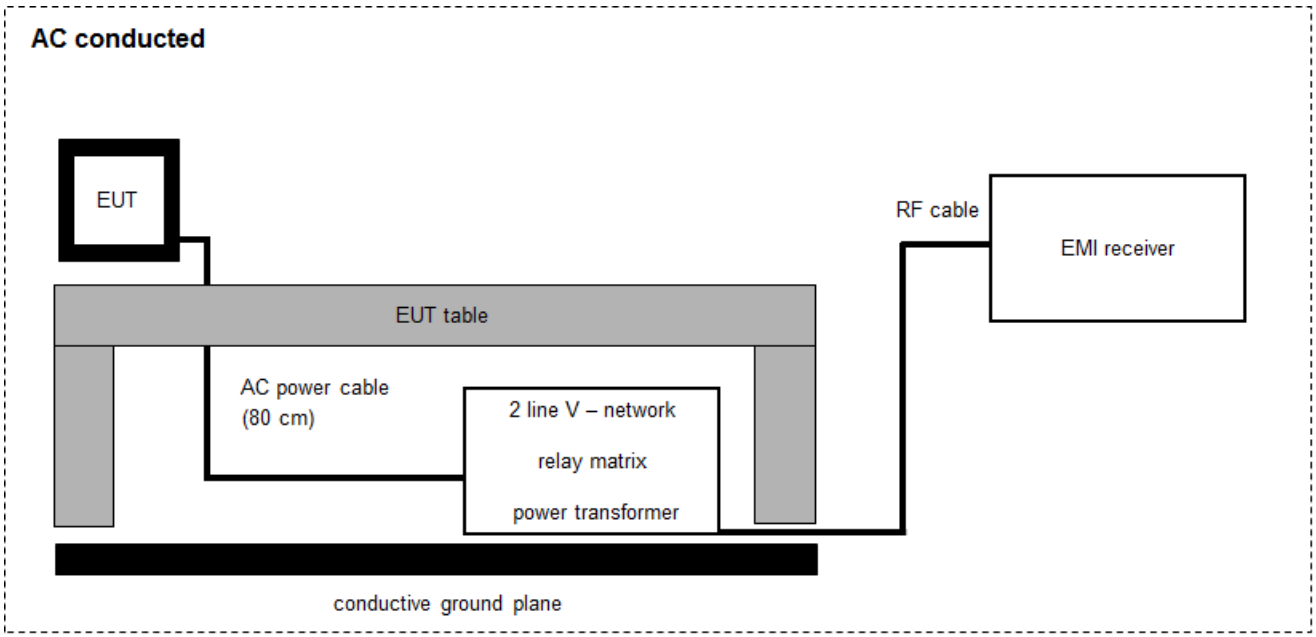
Note: conversion loss of mixer is already included in analyzer value.

7.5 Conducted measurements in test lab



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	A023	Std. Gain Horn Antenna 39.3-59.7 GHz	2424-20	Flann	75	300001979	ne		
4	A025	Std. Gain Horn Antenna 49.9-75.8 GHz	2524-20	Flann	*	300001983	ne		
5	A028	Std. Gain Horn Antenna 73.8-112 GHz	2724-20	Flann	*	300001991	ne		
6	A032	Std. Gain Horn Antenna 114-173 GHz	2924-20	Flann	*	300001999	ne		
7	A033	Std. Gain Horn Antenna 145-220 GHz	3024-20	Flann	*	300002000	ne		
8	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
9	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
10	A029	Power Supply	LA30/5GA	Zentro	2046	300000711	NK!		
11	A029	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	Ve	02.10.2014	02.10.2016
12	A029	Harmonic mixer 50 - 75 GHz for spectrum analyzers	FS-Z75	R&S	100099	300003949	k	06.03.2014	06.03.2016
13	A029	Spectrum Analyzer Mixer 2-Port, 75-110 GHz	SAM-110-7	Radiometer Physics GmbH	002	300004155	k	31.01.2014	31.01.2016
14	A029	Spectrum Analyzer Mixer 3-Port, 110-170 GHz	SAM-170	Radiometer Physics GmbH	100014	300004156	k	12.02.2014	12.02.2016
15	A029	Spectrum Analyzer Mixer 3-Port, 170-220 GHz	SAM-220	Radiometer Physics GmbH	200001	300004157	k	30.01.2014	30.01.2016
16	A029	Broadband Low Noise Amplifier 18-50 GHz	CBL18503070-XX	CERNEX	19338	300004273	ne		
17	A029	Harmonic mixer 60 - 90 GHz	FS-Z90	R&S	101555	300004691	k	21.10.2013	27.02.2016

7.6 AC conducted



FS = UR + CF + VC
(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:
FS [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Netznachbildung	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2014	17.06.2016
2	68	EMI-Receiver	8542E	HP	3617A00170	300000568	k	28.01.2014	28.01.2015
3	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	11.02.2014	11.02.2016

8 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Spectrum bandwidth	span/1000
Conducted output power	± 3 dB
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB

9 Sequence of testing

9.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

9.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

9.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

9.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

9.5 Sequence of testing radiated spurious above 50.0 GHz with external mixers

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate for far field (e.g. 0.25 m).
- The EUT is set into operation.

Premeasurement

- The test antenna with external mixer is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.
- Caution is taken to reduce the possible overloading of the external mixer.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- As external mixers may generate false images care is taken to ensure that any emission measured by the spectrum analyzer does indeed originate in the EUT. Signal identification feature of spectrum analyzer is used to eliminate false mixer images (i.e., it is not the fundamental emission or a harmonic falling precisely at the measured frequency).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

10 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	47 CFR Part 15	see below	2016-06-09	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Results
§15.209	Radiated emissions limits, general requirements	Nominal	Nominal	☒	☐	☐	☐	complies
§15.109	Radiated emissions limits	Nominal	Nominal	☒	☐	☐	☐	complies
§15.107/207	Conducted limits	Nominal	Nominal	☒	☐	☐	☐	complies

Note:
NA = Not applicable; NP = Not performed

11 Test results

11.1 Unwanted emissions limit (transmitter)

Description:

§15.209
(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table below.

Measurement parameters:

Resolution bandwidth: 100 kHz / 1 MHz
Video bandwidth: ≥ resolution bandwidth
Detector: Quasi Peak / Average (RMS)
Trace: Max hold

Limits:

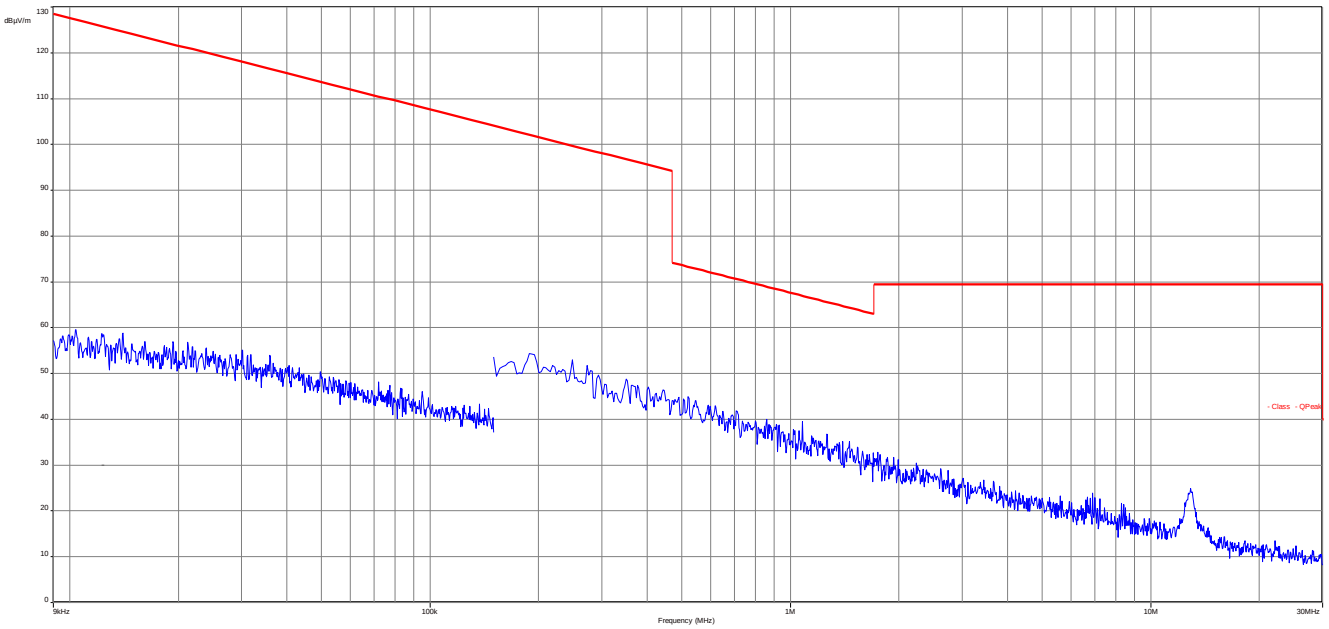
FCC §15.209		
Field strength of the harmonics and spurious.		
Frequency (MHz)	**Field strength (µV/m)**	**Measurement distance (m)**
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dBµV/m)	30
30 – 88	100 (40 dBµV/m)	3
88 – 216	150 (43.5 dBµV/m)	3
216 – 960	200 (46 dBµV/m)	3
>960	500 (54 dBµV/m)	3

Results:

Spurious emission level (dBm)								
-/-			-/-			-/-		
Frequency [GHz]	BW [kHz]	Level [dBm]	Frequency [GHz]	BW [kHz]	Level [dBm]	Frequency [GHz]	BW [kHz]	Level [dBm]
see plots								

Verdict: **Complies**

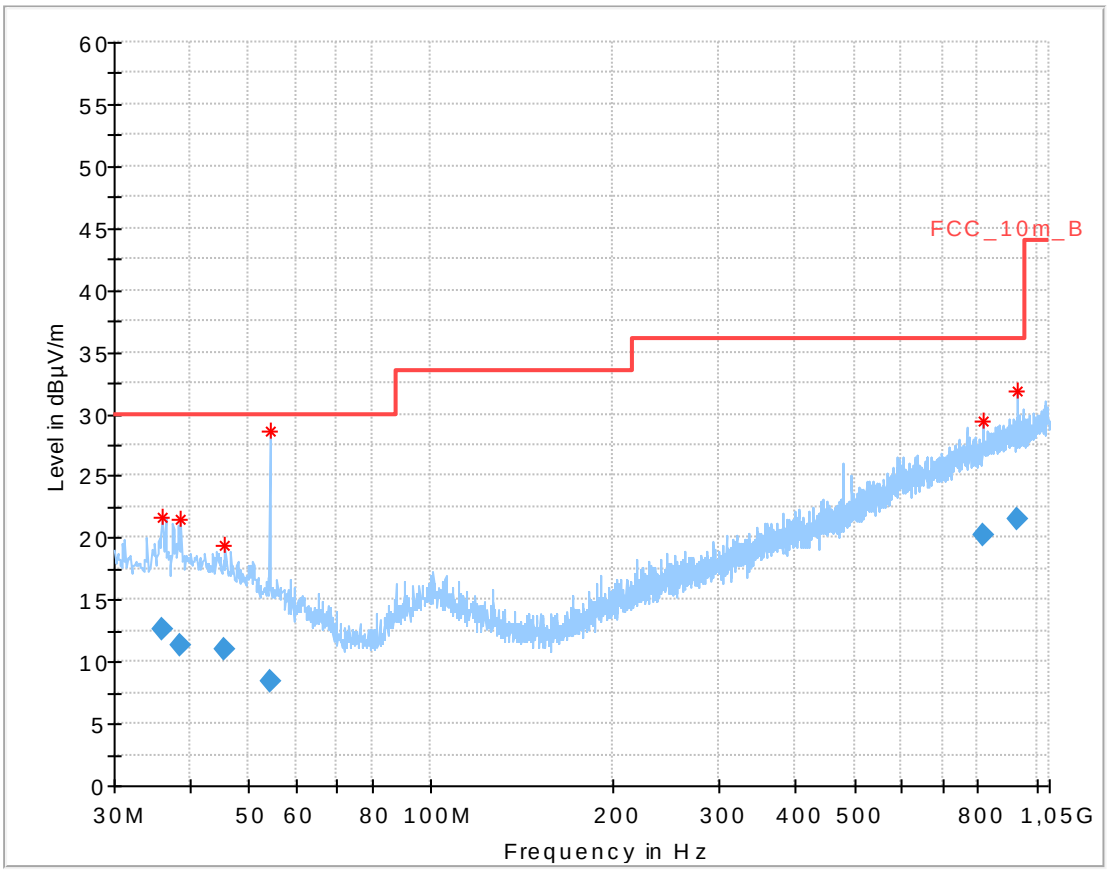
Plot 1: 9 kHz – 30 MHz, special test mode, frequency sweep stopped at $f_{low}/f_{mid}/f_{high}$



Plot 2: 30 MHz – 1000 MHz, special test mode, frequency sweep stopped at $f_{low}/f_{mid}/f_{high}$

Common Information

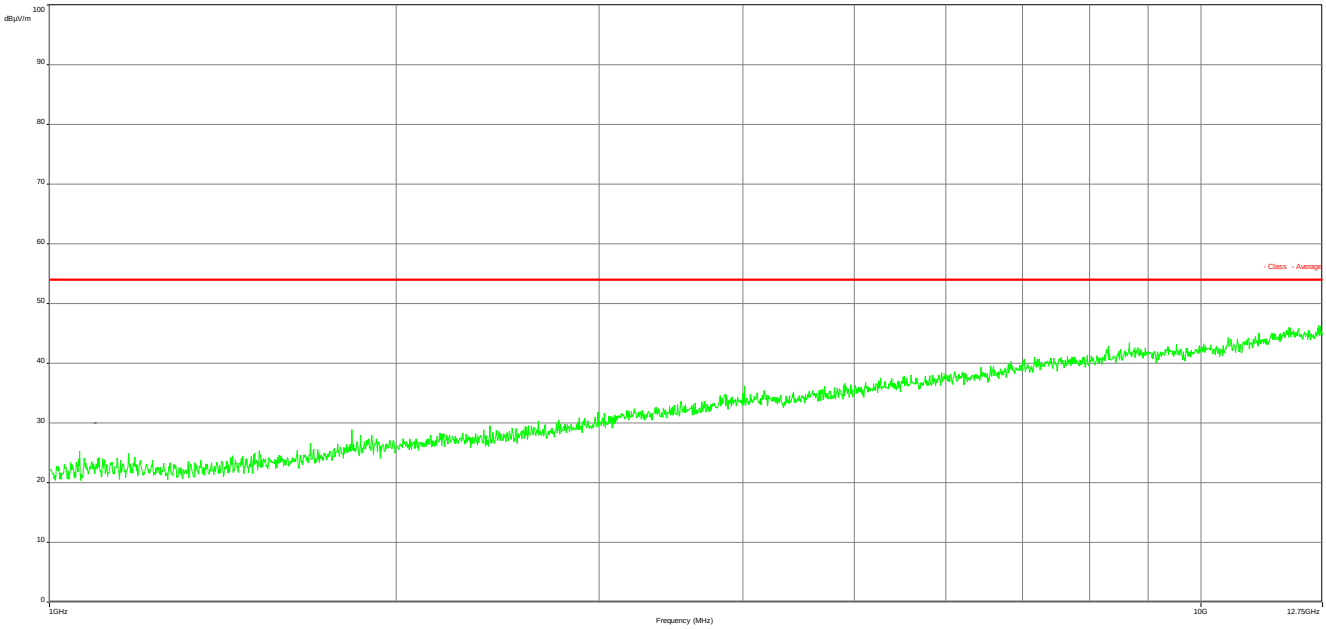
EUT:	Optiwave 7400-80
Serial number:	no 3
Test description:	FCC part 15 class B @ 10 m
Operating condition:	TX low/mid/high
Operator name:	Hennemann
Comment:	DC 24 V



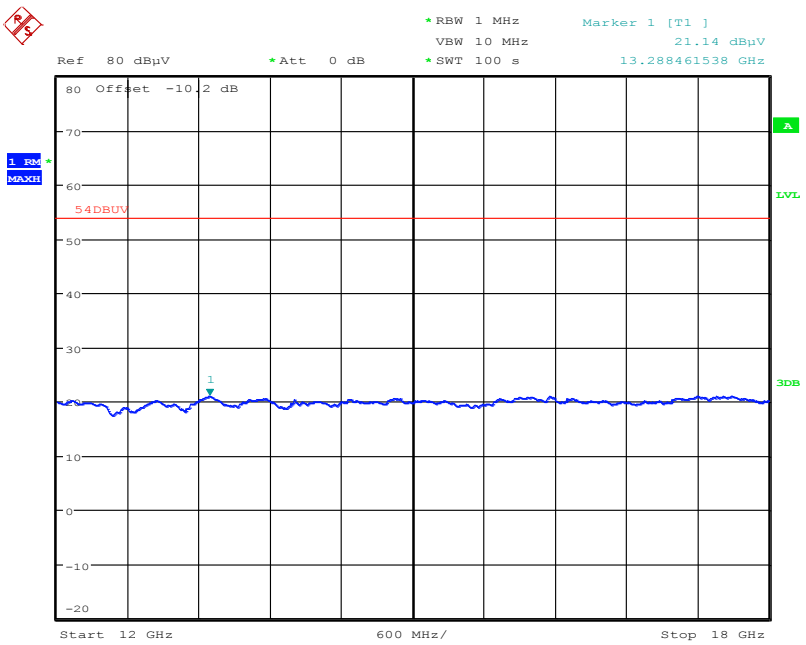
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.014100	12.59	30.00	17.41	1000.0	120.000	272.0	V	8	13.8
38.665050	11.26	30.00	18.74	1000.0	120.000	273.0	V	7	14.0
45.466650	10.93	30.00	19.07	1000.0	120.000	271.0	H	266	13.7
54.520950	8.47	30.00	21.53	1000.0	120.000	274.0	V	282	11.9
816.635550	20.18	36.00	15.82	1000.0	120.000	100.0	V	53	23.0
927.661650	21.45	36.00	14.55	1000.0	120.000	100.0	V	5	24.2

Plot 3: 1 GHz – 12.75 GHz, special test mode, frequency sweep stopped at $f_{low}/f_{mid}/f_{high}$

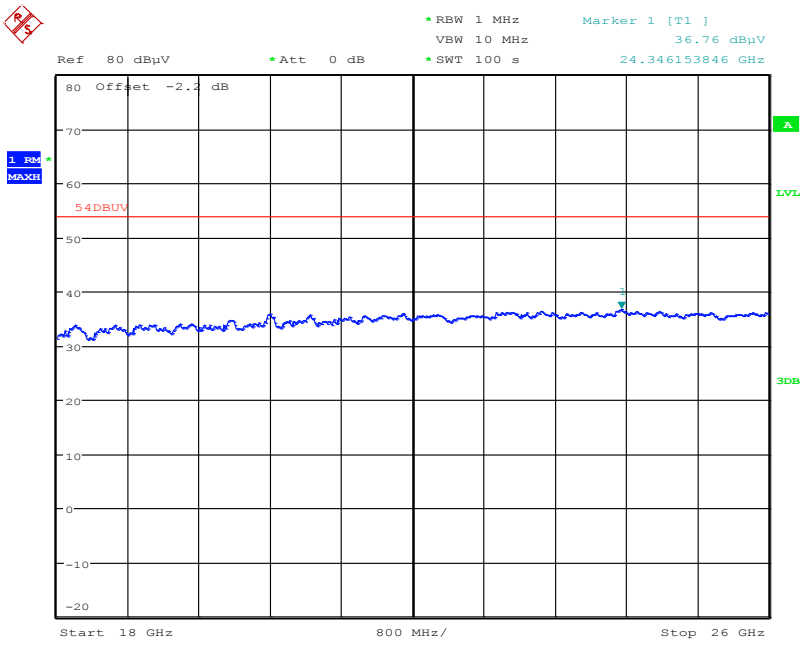


Plot 4: 12 GHz – 18 GHz, special test mode, $f_{low}/f_{mid}/f_{high}$



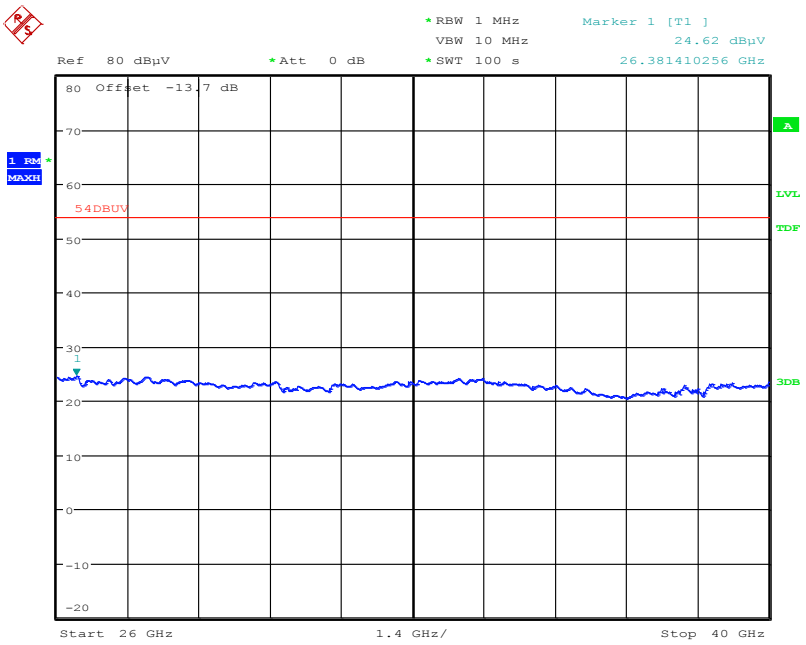
Date: 13.JAN.2015 15:17:31

Plot 5: 18 GHz – 26 GHz, special test mode, $f_{low}/f_{mid}/f_{high}$



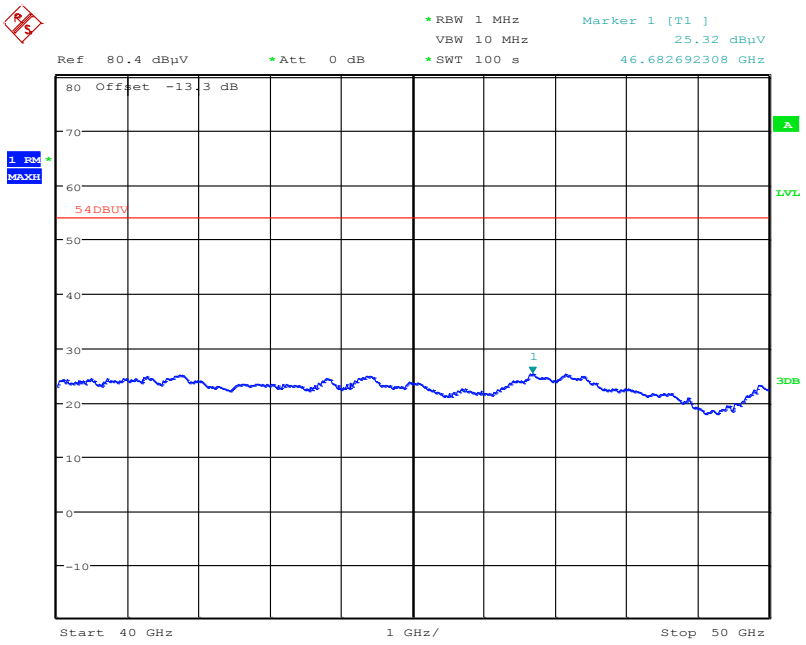
Date: 13.JAN.2015 15:28:10

Plot 6: 26 GHz – 40 GHz, special test mode, $f_{low}/f_{mid}/f_{high}$



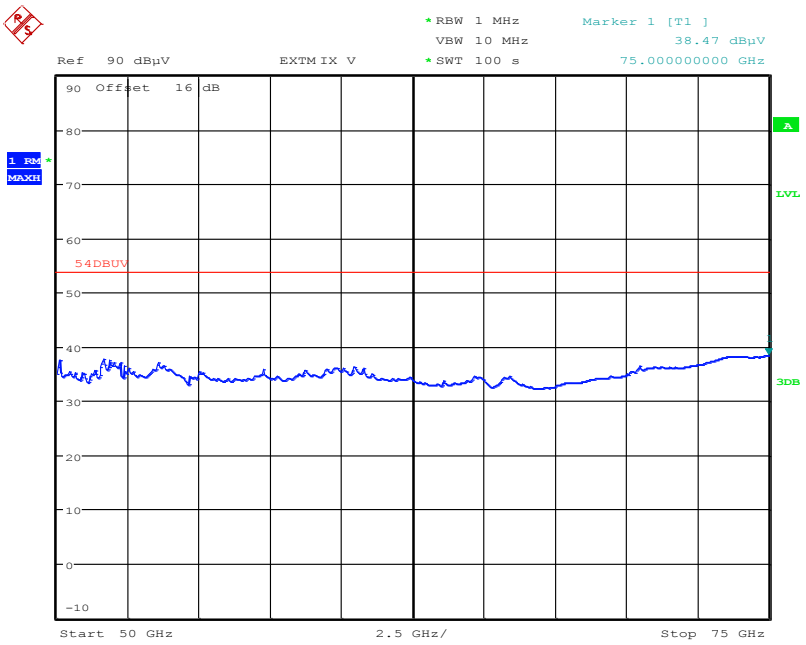
Date: 13.JAN.2015 15:48:40

Plot 7: 40 GHz – 50 GHz, special test mode, $f_{low}/f_{mid}/f_{high}$



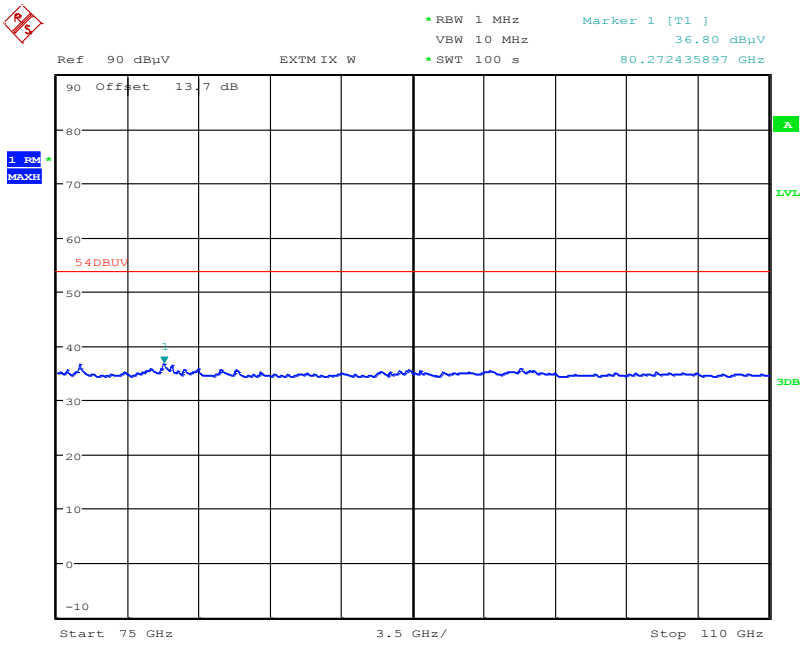
Date: 13.JAN.2015 15:55:13

Plot 8: 50 GHz – 75 GHz, special test mode, $f_{low}/f_{mid}/f_{high}$



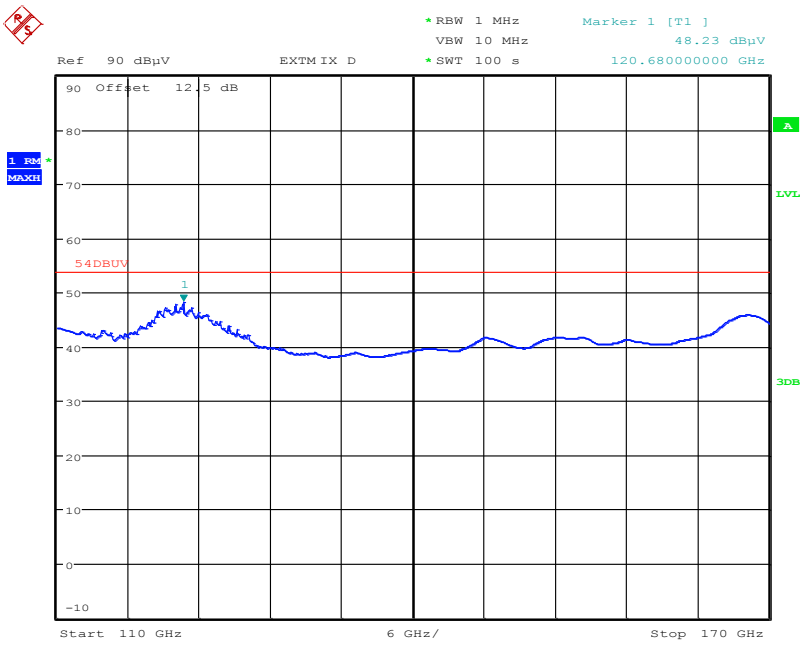
Date: 14.JAN.2015 17:00:34

Plot 9: 75 GHz – 110 GHz, special test mode, $f_{low}/f_{mid}/f_{high}$



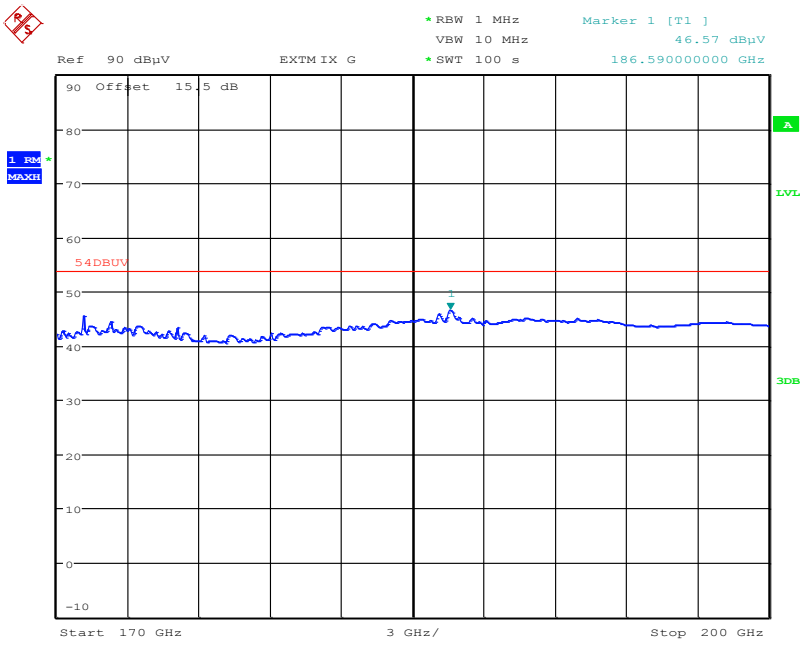
Date: 14.JAN.2015 17:08:15

Plot 10: 110 GHz – 170 GHz, special test mode, $f_{low}/f_{mid}/f_{high}$



Date: 14.JAN.2015 18:14:38

Plot 11: 170 GHz – 200 GHz, special test mode, $f_{low}/f_{mid}/f_{high}$



Date: 14.JAN.2015 18:19:24

11.2 Unwanted emission limits (receiver)

Description:

§15.109
(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values shown in table below.

Measurement:

Measurement parameter	
Detector:	Quasi Peak / Average (RMS)
Sweep time:	Auto
Resolution bandwidth:	100 kHz / 1 MHz
Video bandwidth:	> RBW
Trace-Mode:	Max-Hold

Limits:

FCC §15.109		
Field strength of the harmonics and spurious.		
Frequency (MHz)	**Field strength (µV/m)**	**Measurement distance (m)**
30 – 88	100 (40 dBµV/m)	3
88 – 216	150 (43.5 dBµV/m)	3
216 – 960	200 (46 dBµV/m)	3
>960	500 (54 dBµV/m)	3

Results:

See 11.1 Unwanted emissions limit (transmitter).

Verdict: **Complies**

11.3 Conducted limits

Description:

§15.107
(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

§15.207
(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Measurement:

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

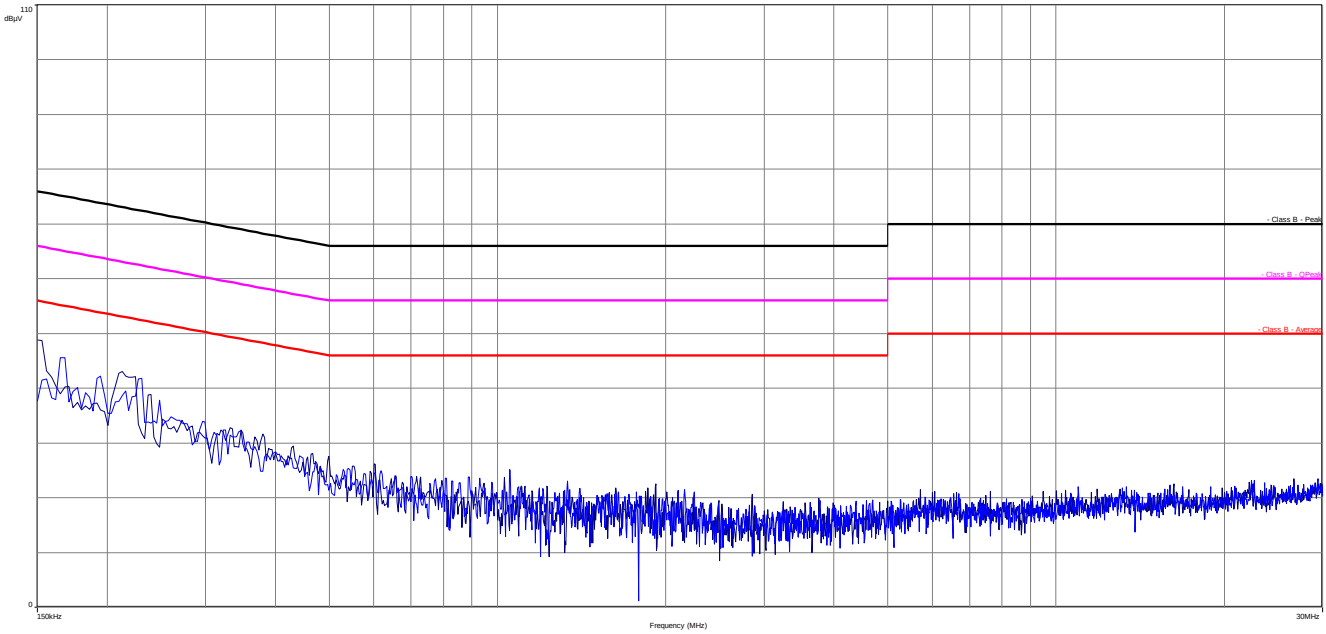
Limits:

FCC §15.107 / §15.207		
Conducted limits		
Frequency of Emission (MHz)	**Conducted Limit (dBµV)**	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 - 30	60	50

*Decreases with the logarithm of the frequency

Verdict: **Complies**

Plot 12: Phase & Neutral



12 Document history

Version	Applied changes	Date of release
	Initial release	2016-05-24
-A	plot no. 9 replaced, description of test procedure	2016-06-09

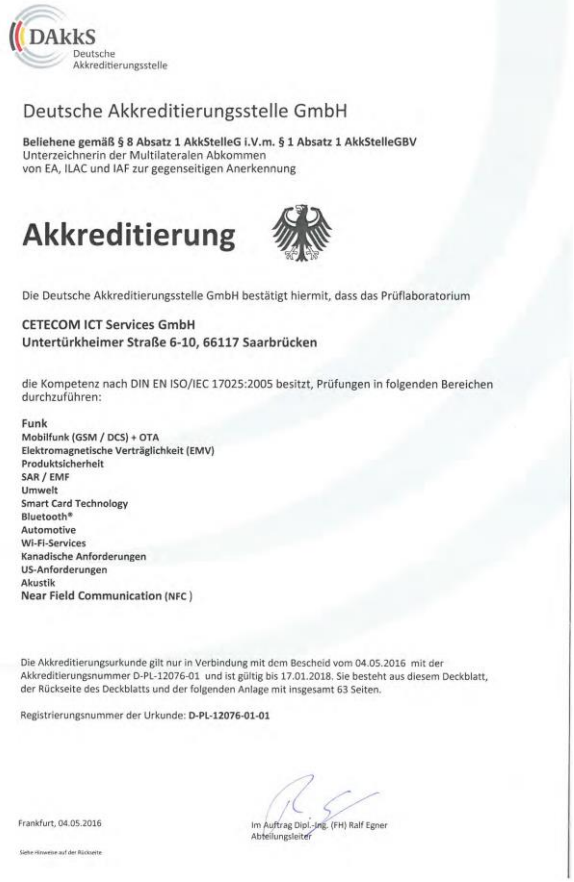
13 Further information

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

14 Accreditation Certificate

Front side of certificate



DAkkS
Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC 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

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Wi-Fi-Services
Kanadische Anforderungen
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Akustik
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Frankfurt, 04.05.2016

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

Siehe Hinweise auf der Rückseite

Back side of certificate

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10117 Berlin

Standort Frankfurt am Main
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60327 Frankfurt am Main

Standort Braunschweig
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