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

TEST REPORT

Test report no.: 1-4254/12-59-21

Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

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-12076-01-01

Area of Testing: Radio/Satellite Communications

Applicant

Sony Mobile Communications AB

Nya Vattentornet

22188 Lund / SWEDEN

Phone: +46 46 19 30 00

Fax: +46 46 19 32 95

Contact: Håkan Sjöberg

e-mail: hakan.sjoberg@sonymobile.com

Phone: +46 46 19 35 59

Manufacturer

Sony Mobile Communications AB

Nya Vattentornet

22188 Lund / SWEDEN

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:

GSM Mobile Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/V/II/XIX; LTE FDD 1/19/21; WLAN a/b/g/n; BT 3.1; BT LE; RFID; FM Rx; GPS

Model name:

PM-0220-BV

FCC ID:

PY7PM-0220

IC:

-/-

Frequency:

13.56 MHz

Technology tested:

RFID

Antenna:

Integrated Antenna

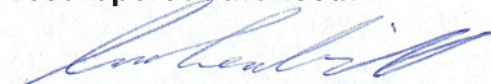
Power Supply:

3.7 V DC by Li - polymer battery

Temperature Range:

-20°C to +55 °C

Test report authorised:


2012-10-24 Andreas Luckenbill

Test performed:


2012-10-24 Marco Bertolino
Testing Manager

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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.

2.2 Application details

Date of receipt of order:	2012-10-12
Date of receipt of test item:	2012-10-12
Start of test:	2012-10-22
End of test:	2012-10-23
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

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+55 °C during high temperature tests
	T_{min}	-20 °C during low temperature tests
Relative humidity content:		51 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.7 V DC by Li - polymer battery
	V_{max}	4.1 V
	V_{min}	3.3 V

5 Test item

Kind of test item	:	GSM Mobile Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/V/VI/XIX; LTE FDD 1/19/21; WLAN a/b/g/n; BT 3.1; BT LE; RFID; FM Rx; GPS	
Type identification	:	PM-0220-BV	
S/N serial number	:	Radiated units:	CB5A1LN611, CB5A1LN61J
HW hardware status	:	AP1	
SW software status	:	10.1.D.0.51	
Frequency band [MHz]	:	13.56	
Type of radio transmission	:	Modulated carrier	
Use of frequency spectrum	:		
Number of channels	:	1	
Antenna	:	Integrated antenna	
Power supply	:	3.7 V DC by Li - polymer battery	
Temperature range	:	-20 °C to +55 °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	Passed	2012-12-12	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Remark
§ 15.35 (c)/	Timing of the transmitter (Duty cycle correction factor)	Nominal	Nominal	☒	☐	☐	☐	complies
§ 15.225 (a)/	Fieldstrength of Fundamental	Nominal	Nominal	☒	☐	☐	☐	complies
§ 15.209/	Fieldstrength of harmonics and spurious	Nominal	Nominal	☒	☐	☐	☐	complies
§ 15.225 (e)/	Frequency tolerance	Nominal	Extreme	☒	☐	☐	☐	complies
		Extreme	Nominal	☒	☐	☐	☐	

Note: NA = Not Applicable; NP = Not Performed

8 RF measurements

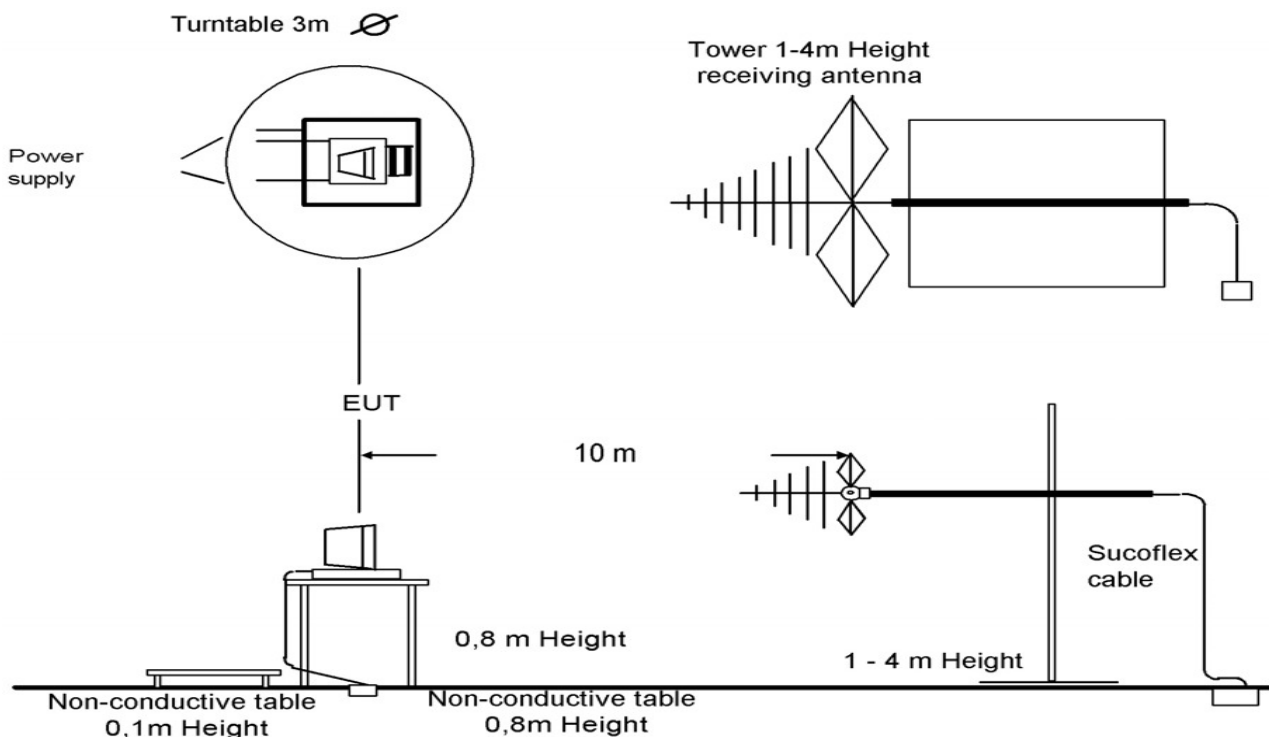
8.1 Description of test setup

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



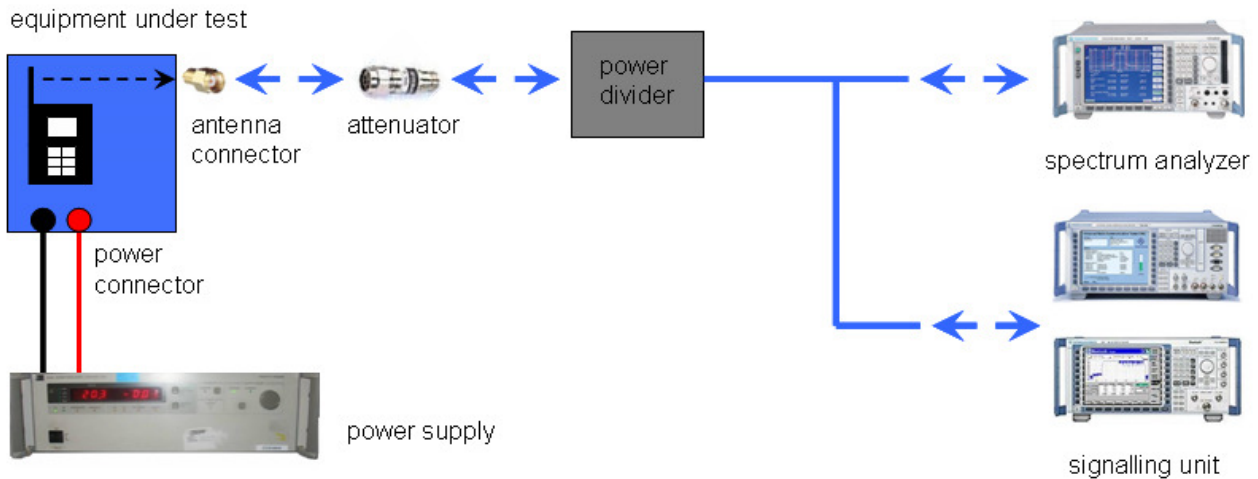
Picture 1: Diagram radiated measurements

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

9 Measurement results

9.1 Timing of the transmitter

Measurement:

Measurement parameter	
Detector:	Positive Peak
Sweep time:	100 ms
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	Zero-Span
Trace-Mode:	Clear-Write / Single Sweep

Limits:

FCC	IC
CFR Part SUBCLAUSE § 15.35 (c)	-/-
Timing of the transmitter	
(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.	

Duty cycle 100 %

Result: **passed**

9.2 Field strength of the fundamental

Measurement:

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

Limits:

FCC		IC
CFR Part SUBCLAUSE § 15.225 (b)		-/-
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 part 15.31 (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}	39	19*
Measurement uncertainty		±3dB	

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

Result: passed

9.3 Field strength of the harmonics and spurious

Measurement:

Measurement parameter	
Detector:	Quasi Peak / Average
Sweep time:	Auto
Resolution bandwidth:	120 kHz
Video bandwidth:	300 kHz
Span:	Steps
Trace-Mode:	Max Hold

Limits:

FCC		IC
SUBCLAUSE § 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

Result:

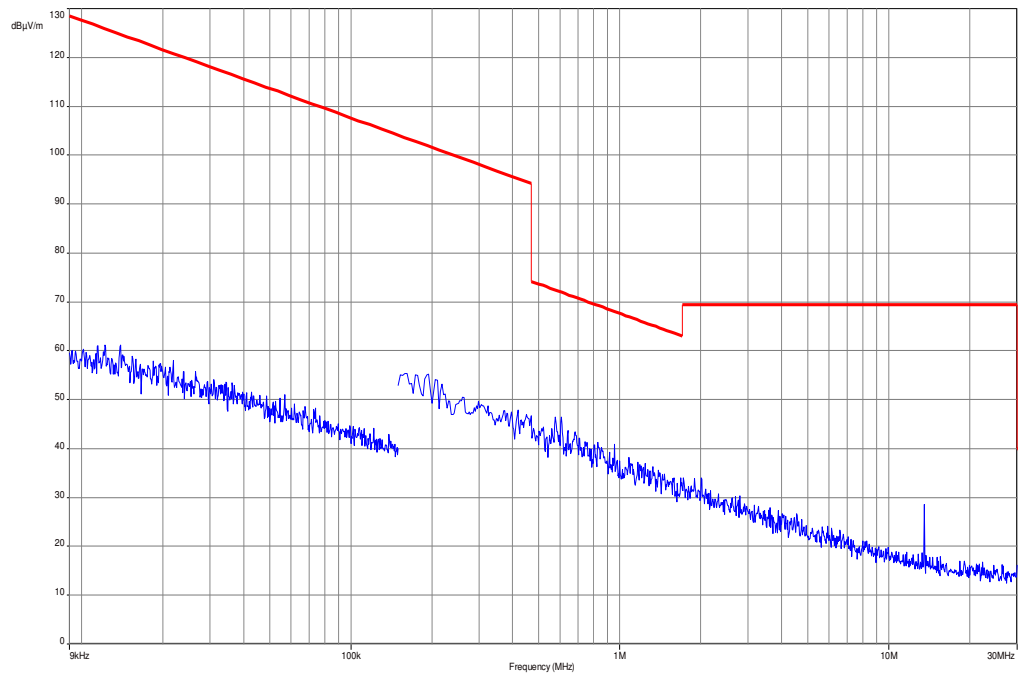
EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results
See plots!				

Result: **passed**

Plots of the measurements

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

Transmit frequency 13.56 MHz



Plot 2: 30 MHz – 1000 MHz

Transmit frequency 13.56 MHz

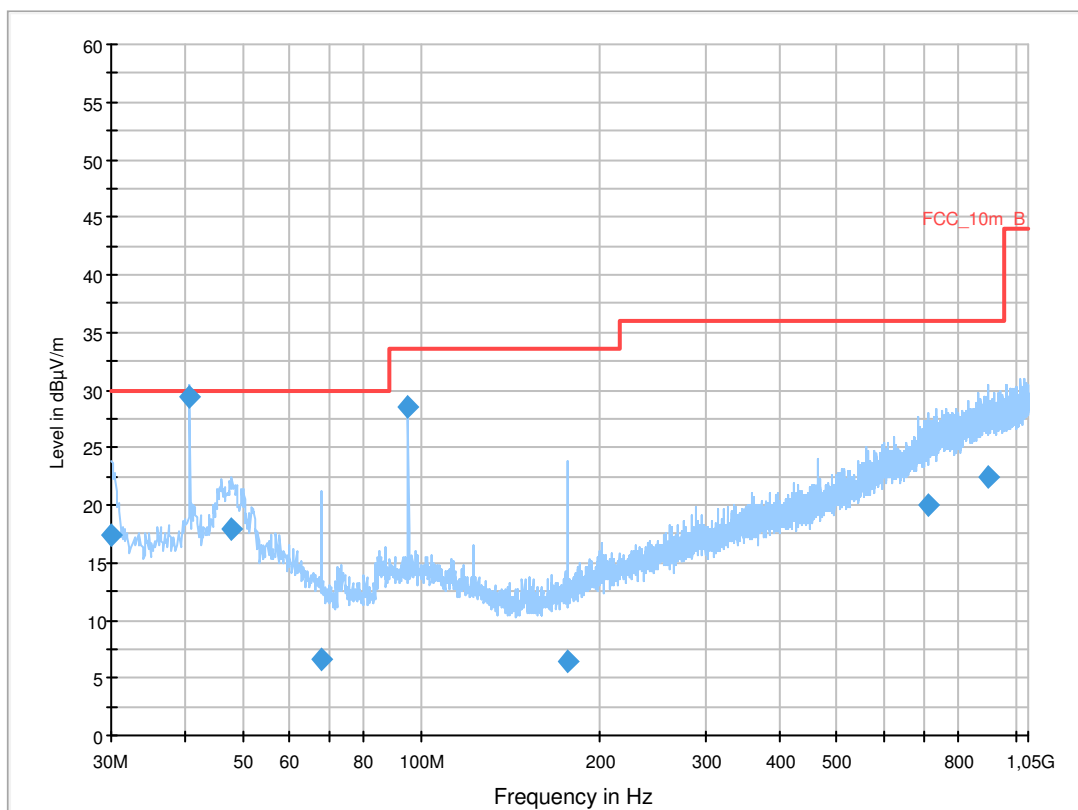
Common Information

EUT: PM-0220-BV
 Serial Number: CB5A1LN611
 Test Description: FCC part 15 C class B @ 10 m
 Operating Conditions: NFC testmode, Tx
 Operator Name: Medrow
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

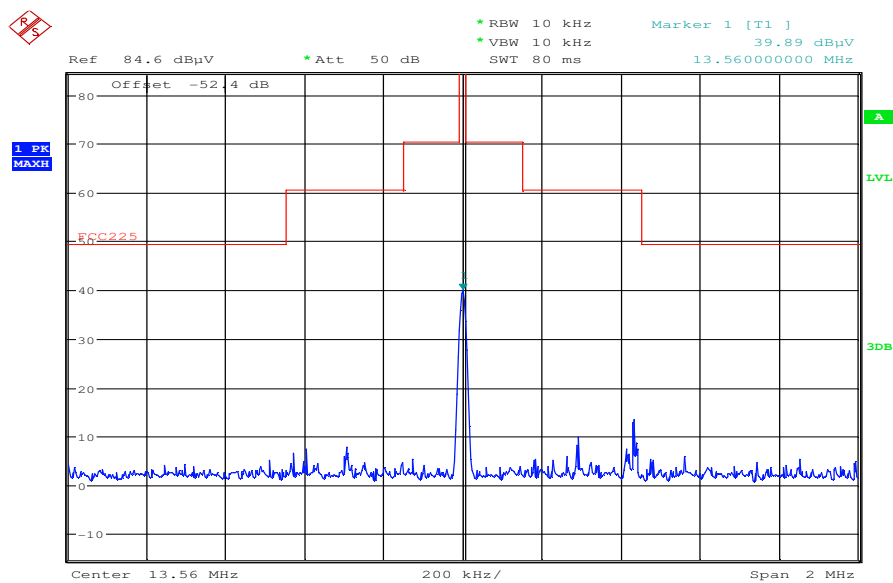


Final Result 1

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
30.095475	17.3	1000.0	120.000	112.0	V	314.0	12.5	12.7	30.0	
40.674900	29.4	1000.0	120.000	106.0	V	265.0	13.4	0.6	30.0	
47.912850	18.0	1000.0	120.000	100.0	V	236.0	13.3	12.0	30.0	
67.813500	6.6	1000.0	120.000	311.0	V	230.0	9.8	23.4	30.0	
94.917450	28.5	1000.0	120.000	106.0	V	260.0	11.2	5.0	33.5	
176.289600	6.3	1000.0	120.000	400.0	H	81.0	10.2	27.2	33.5	
...	...	...	...	...	...	...	...	...	...	...

Plot 3: Spectrum mask part 15.225 (a, b, c, d)

Limits recalculated from 30m to 3m with 40 dB/decade according to FCC 15.31 (f2)



Date: 22.OCT.2012 12:32:50

The transmitter holds the requirements of FCC 15.225 (a, b, c and d)

9.4 Frequency tolerance

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	10 Hz
Video bandwidth:	1 MHz
Span:	1 kHz
Trace-Mode:	Clear-Write

Limits:

FCC	IC
SUBCLAUSE § 15.225	-/-
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: passed

Frequency tolerance								
Over temperature variation			Over voltage variation					
Limit is +/- 1.356 kHz			Limit is +/- 1.356 kHz			-/-		
T (°C)]	Frequency	result	Power voltage	Frequency	result	F [MHz]	Detector	Level [µV/m]
-20°	13.560 561	Pass	3.3	13.560 194	Pass	-/-		
-10°	13.560 561	Pass	3.4	13.560 201	Pass			
0°	13.560 547	Pass	3.5	13.560 189	Pass			
10°	13.560 561	Pass	3.6	13.560 209	Pass			
20°	13.560 208	Pass	3.7	13.560 208	Pass			
30°	13.560 208	Pass	3.8	13.560 217	Pass			
40°	13.560 216	Pass	3.9	13.560 229	Pass			
50°	13.560 216	Pass	4.0	13.560 231	Pass			
			4.1	13.560 211	Pass			
Measurement uncertainty			±100 Hz					

9.5 AC line conducted

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

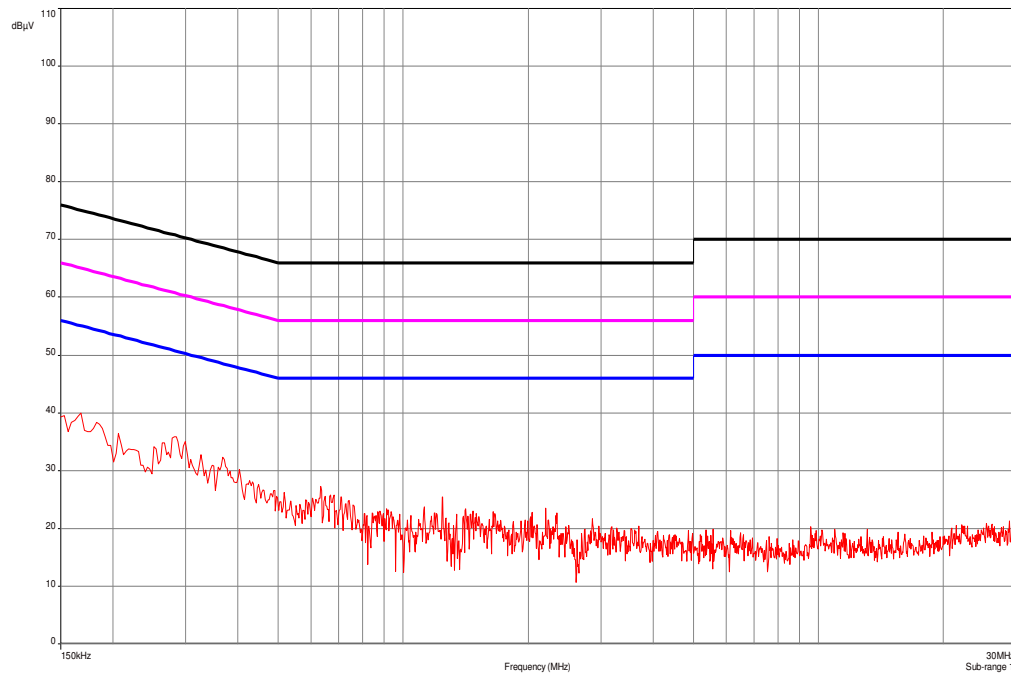
Limits:

FCC	IC	
SUBCLAUSE § 15.107 / 15.207	-/-	
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

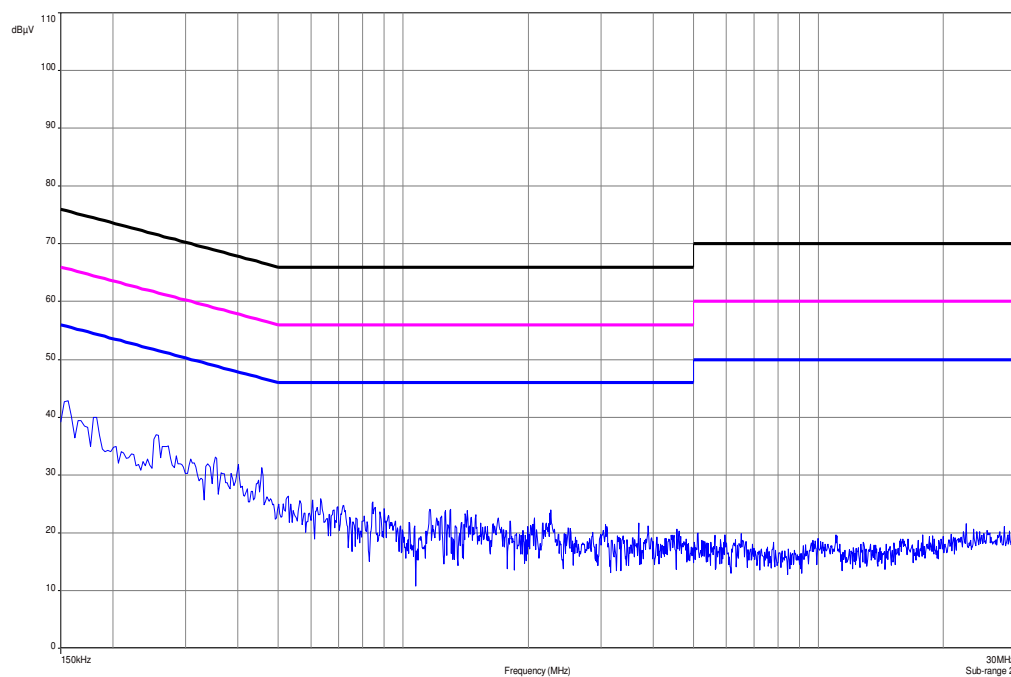
Result: passed

Plots:

Plot 1: phase line



Plot 2: neutral line



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	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	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 1166.5950.03	R&S	100083	300003312	k	04.01.2012	04.01.2013
5	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2011	14.07.2013
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	12.04.2012	12.04.2014
11	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	06.01.2012	06.01.2014
12	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
13	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	11.05.2011	11.05.2013
14	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
15	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
16	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
17	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
18	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
19	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
20	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKI!	14.10.2011	14.10.2014
21	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	19.12.2011	19.12.2012
22	n. a.	Test Receiver	ESH2	R&S	871921/095	300002505	Ve	12.01.2012	12.01.2014
23	n. a.	Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824	vIKI!	09.03.2012	09.03.2015
24	n. a.	Power Supply	LA30/5GA	Zentro Elektronik	2046	300000711	NK!		

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

11 Observations

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