



#### **CETECOM ICT Services**

consulting - testing - certification >>>

## **TEST REPORT**

Test report no.: 1-5922/13-17-06



### **Testing laboratory**

#### **CETECOM ICT Services GmbH**

Untertuerkheimer Strasse 6 – 10 66117 Saarbruecken / Germany Phone: + 49 681 5 98 - 0 Fax: + 49 681 5 98 - 9075 Internet: http://www.cetecom.com 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**

#### Leica Biosystems Nussloch GmbH

Heidelbergerstrasse 17-19 69226 Nussloch / GERMANY Phone: +49 62 24 14 30 Fax: +49-6224 143 5343

Contact: Marc Reiss

e-mail: marc.reiss@LeicaBiosystems.com

Phone: +49-6224 143 343

#### Manufacturer

#### Leica Biosystems Nussloch GmbH

Heidelbergerstrasse 17-19 69226 Nussloch / GERMANY

#### Test standard/s

47 CFR Part 15 Title 47 of the Code of Federal Regulations; Chapter I

Part 15 - Radio frequency devices

RSS - 210 Issue 8 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: Multistainer

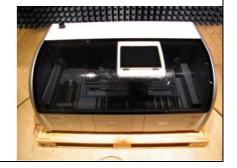
Model name: HistoCore SPECTRA ST FCC ID: 2AAPD-SPECTRAST IC: 12028A-SPECTRAST

Frequency: 13.56 MHz
Technology tested: RFID

Antenna: Integrated PCB loop antenna

Power supply: 115V AC
Temperature range: +18°C to +30°C

Radio Communications & EMC



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

Test report authorised:	Test performed:	
Marco Bertolino Specialist	p.o. Stefan Bös Professional	
Specialist	Professional	

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: 2014-01-30
Date of receipt of test item: 2014-07-17
Start of test: 2014-07-17
End of test: 2014-07-30

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

#### 3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15		Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	01.12.2010	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  $T_{max}$  +30 °C during high temperature tests

T<sub>min</sub> +18 °C during low temperature tests

Relative humidity content: 53 %

Barometric pressure: not relevant for this kind of testing

 $\begin{array}{cccc} & & V_{nom} & 115 \ V & AC \\ Power supply: & V_{max} & 140 \ V \end{array}$ 

 $V_{max}$  140 V  $V_{min}$  90 V

### 5 Test item

Kind of test item	:	Multistainer
Type identification	:	HistoCore SPECTRA ST
S/N serial number	:	1405120008
HW hardware status	:	Beta Site Baseline
SW software status	:	0.007
Firmware status	:	Rev.11
Frequency band [MHz]	:	13.56 MHz
Type of radio transmission	:	Single carrier
Use of frequency spectrum	:	Single carrier
Type of modulation	:	Modulated carrier
Number of channels	:	1
Antenna	:	Integrated PCB loop antenna
Power supply	:	115 V AC
Temperature range	:	+18°C to +30 °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: 1-5922/13-17-01\_AnnexA

1-5922/13-17-01\_AnnexB 1-5922/13-17-01\_AnnexE

### 6 Test laboratories sub-contracted

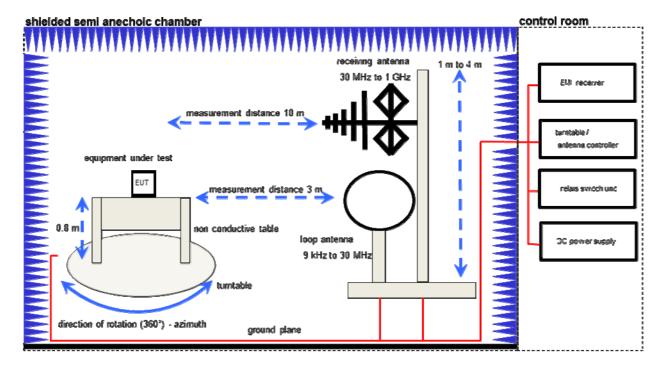
None



## 7 Description of the test setup

### 7.1 Radiated measurements

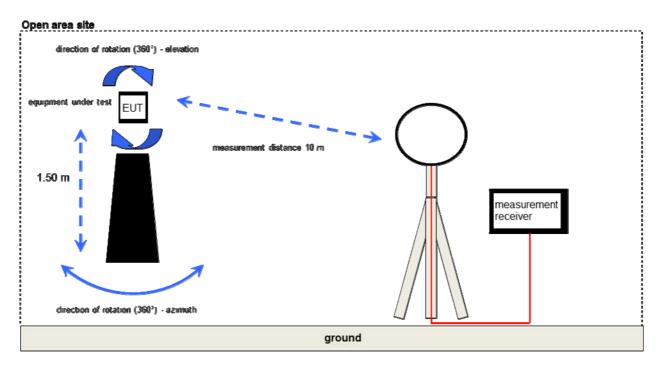
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas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



Equipment	Туре	Manufacturer	Serial No.	INV. No Cetecom
Software	EMC32 V.  9.12.05	R&S	-/-	-/-
Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	Model 2175 ETS-LINDGREN 64762 300003745		300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test- Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787
Test Receiver	ESH2	R&S	871921/095	300002505
Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824
EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059



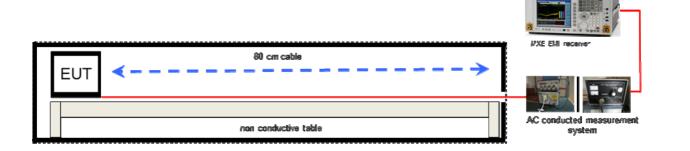
## 7.2 Open area site



Equipment	Туре	Manufacturer	Serial No.	INV. No Cetecom
Test Receiver	ESH2	R&S	871921/095	300002505
Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824



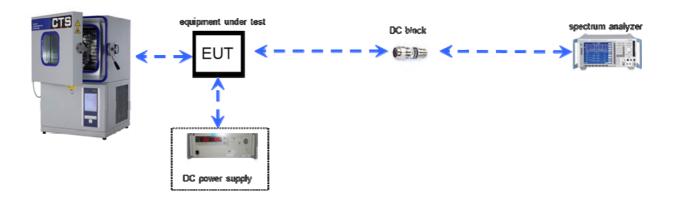
## 7.3 AC conducted



Equipment	Туре	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168
Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210



## 7.4 Conducted measurements



Equipment	Туре	e Manufacturer		INV. No Cetecom
DC Power Supply 0 – 32V	1108-32	Heiden	001802	300001383
Temperature Test Chamber	T-40/50	CTS GmbH	064023	300003540
Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443



8	Summary of measu	rement 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	2014-08-25	-/-	

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Remark
§ 15.35 (c)/ RSS-GEN Issue 3	Timing of the transmitter (Duty cycle correction factor)	Nominal	Nominal	$\boxtimes$				complies
RSS-GEN Issue 3	99 % emission bandwidth	Nominal	Nominal					complies
§ 15.225 (a)/ RSS-210 Issue 8 Annex 2.6	Fieldstrength of Fundamental	Nominal	Nominal	$\boxtimes$				complies
§ 15.209/ RSS-210 Issue 8 Annex 2.6	Fieldstrength of harmonics and spurious	Nominal	Nominal	$\boxtimes$				complies
§ 15.225 (e)/	Francisco de la recesa	Nominal	Extreme	$\boxtimes$				a a ma milia a
RSS-210 Issue 8 Annex 2.6	Frequency tolerance	Extreme	Nominal					complies
§15.107 §15.207	Conducted emissions < 30 MHz	Nominal	Nominal					complies

Note: NA = Not Applicable; NP = Not Performed



## 9 Additional comments

Reference documents: None

Special test descriptions: Special script used to activate and control the reader.

Configuration descriptions: None



#### 10 Measurement results

### 10.1 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:	Single sweep		

#### Limits:

FCC	IC			
Timing of the transmitter				

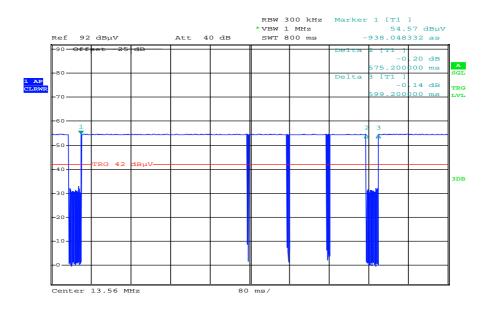
(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, 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 of the EUT: TX-time > 100 ms → 100% (see plot)



## Result:

Plot 1: Transmit burst



Date: 30.JUL.2014 11:09:28

Transmit time (Tx on) = 575.2 msTx on + Tx off = 599.2 ms

Result: Passed



# 10.2 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	
Fundamental Frequency (MHz)	Field strength of Fundamental (μV/m / dΒμV/m)		Measurement distance (m)
	15848 μV/m (84 dBμV/m)		30
13.553 to 13.567	158489 (104 dB		10 (Recalculated acc. to FCC part15.31 (f2)

### Result:

TEST CONDITIONS		MAXIMUM POWER (dBμV/m)		
Frequ	Frequency		13.56 MHz	
Mode		@ 10 m distance @ 30 m distance		
T <sub>nom</sub> V <sub>nom</sub>		53.1	13.1*	
Measurement uncertainty		±30	iB	

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

Result: Passed



### 10.3 99 % emission bandwidth

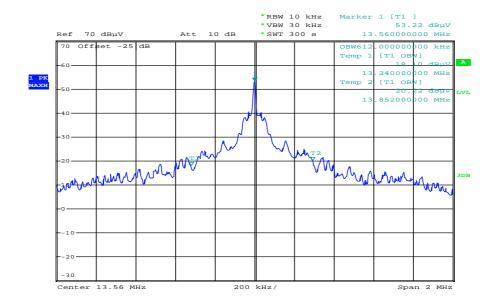
### **Measurement:**

Measurement parameter		
Detector:	Peak	
Resolution bandwidth:	> 1 % span	
Video bandwidth:	≥ RBW	
Trace-Mode:	Max Hold	

### Results:

TEST CONDITIONS		99 % emission bandwidth (kHz)
Frequency		13.56 MHz
T <sub>nom</sub>	V <sub>nom</sub>	612
Measurement uncertainty		± RBW

### Plot:



Date: 30.JUL.2014 11:23:26



## 10.4 Field strength of the harmonics and spurious

### **Measurement:**

Measurement parameter			
Detector:	Quasi Peak / Average		
Sweep time:	Auto		
Resolution bandwidth:	F < 150 kHz: 200 Hz 150 kHz > F > 30 MHz: 9 kHz F > 30 MHz: 120 kHz		
Video bandwidth:	F < 150 kHz: 1 kHz 150 kHz > F > 30 MHz: 100 kHz F > 30 MHz: 300 kHz		
Span:	See plots!		
Trace-Mode:	Max hold		

## **Limits:**

FCC			IC
Fi	eld strength of the ha	armonics and spu	rious.
Frequency (MHz)	Field streng	gth (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 c	lBμV/m)	30
30 – 88	100 (40 dBµV/m)		3
88 – 216	150 (43.5 dBµV/m)		3
216 – 960	200 (46 d	BμV/m)	3

### Result:

EMISSION LIMITATIONS					
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBμV/m]	Results	
No peaks found below 30 MHz. For emissions above 30 MHz see table below plot 2.					

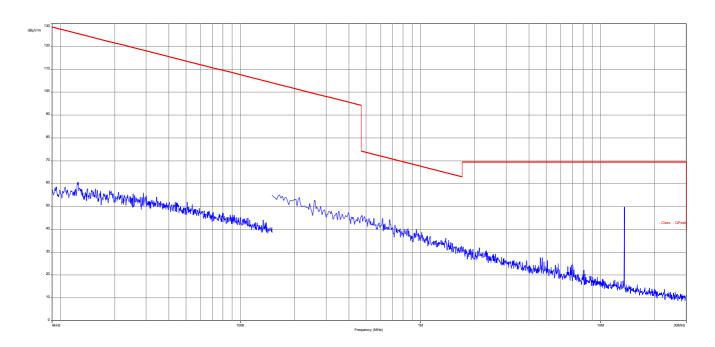
**Result:** Passed

**Note:** The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)



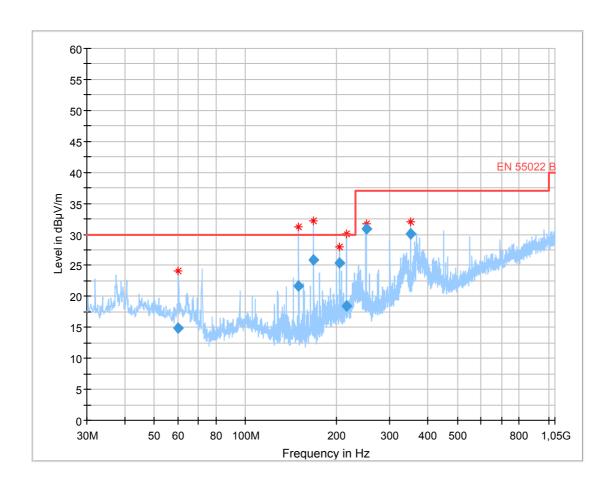
## Plots of the measurements:

**Plot 1:** 9 kHz – 30 MHz





Plot 2: 30 MHz – 1000 MHz, vertical & horizontal polarization



## Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
60.069900	14.95	30.00	15.05	1000.0	120.000	100.0	V	55	11.6
150.024600	21.69	30.00	8.31	1000.0	120.000	200.0	V	29	8.9
168.125850	25.94	30.00	4.06	1000.0	120.000	100.0	٧	-10	9.6
204.047550	25.33	30.00	4.67	1000.0	120.000	100.0	٧	-10	11.8
215.962650	18.42	30.00	11.58	1000.0	120.000	100.0	٧	291	12.3
250.017600	30.89	37.00	6.11	1000.0	120.000	100.0	٧	10	13.4
350.032800	30.16	37.00	6.84	1000.0	120.000	200.0	Н	5	16.0



## Hardware Setup: EMI radiated\VULP\_10\_m - [EMI radiated]

Subrange 1

Frequency Range: 30 MHz - 2 GHz

Receiver: Receiver [ESCI 3]

@ GPIB0 (ADR 20), SN 100083/003, FW 4.42

Signal Path: without Notch

FW 1.0

Antenna: VULB 9163

SN 9163-295, FW ---

Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113

Correction Table (vertical): Cable\_EN\_1GHz (1005) Correction Table (horizontal): Cable\_EN\_1GHz (1005)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]

@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]

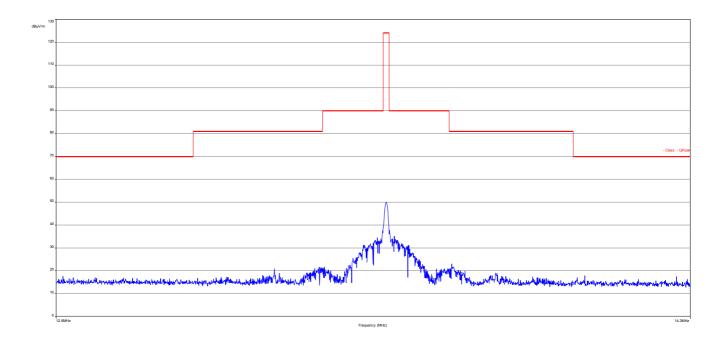
@ GPIB0 (ADR 9), FW REV 3.12

Software version: EMC32 V9.12.10



Plot 3: Spectrum mask

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





## 10.5 Frequency tolerance

### **Measurement:**

Measurement parameter			
Detector:	Positive peak		
Sweep time:	Auto		
Resolution bandwidth:	10 Hz		
Video bandwidth:	1 MHz		
Span:	1 kHz		
Trace-Mode:	Clear – write		

### Limits:

FCC	IC
	_

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			Ove	er voltage varia	ation					
Lir	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°	13.55976	Pass	3.3 V	13.55995	Pass					
-10°	13.55985	Pass	3.4 V	13.55995	Pass					
0°	13.55990	Pass	3.5 V	13.55995	Pass					
10°	13.55993	Pass	3.6 V	13.55995	Pass					
20°	13.55995	Pass	3.7 V	13.55995	Pass					
30°	13.56002	Pass	3.8 V	13.55995	Pass	,				
40°	13.56011	Pass	3.9 V	13.55995	Pass	-/-				
50°	13.56015	Pass	4.0 V	13.55995	Pass					
55°	13.56022	Pass	4.1 V	13.55995	Pass					
			4.2 V	13.55995	Pass					
			4.3 V	13.55995	Pass					
			4.4 V	13.55995	Pass					
Mea	surement unce	ertainty			±100	Hz				



## 10.6 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:

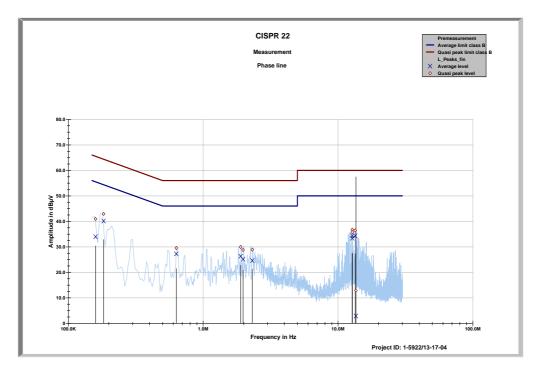
FCC	IC			
Frequency of Emission (MHz)	Conducted Limit (dBμV)			
	Quasi-peak	Average		
0.15 – 0.5	66 to 56 *	56 to 46 *		
0.5 – 5	56	46		
5 - 30	60	50		

Result: Passed

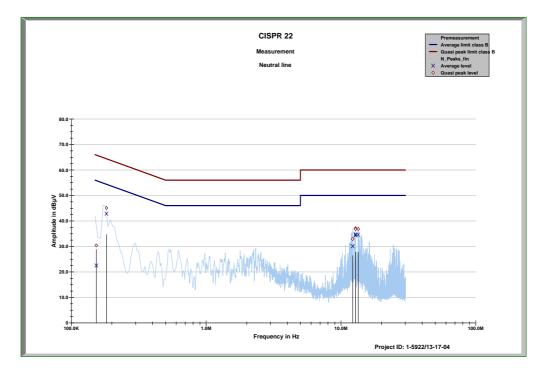


## Plots:

Plot 1: phase line



Plot 2: neutral line





### 11 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 (Lab/Item).

No.	Lab / Item	Equipment	Туре	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.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
4	n. a.	Funkstörmessempfä nger 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	28.02.2014	28.02.2015
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	22.04.2016
9	n. a.	Test Receiver	ESH2	R&S	871921/095	300002505	Ve	24.01.2014	24.01.2016
10	n. a.	Loop Antenna 9 KHz - 30 MHz	HFH2-Z2	R&S	872096/61	300001824	vlKI!	09.03.2012	09.03.2015
11	n. a.	EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	k	24.01.2014	24.01.2015
12	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	08.05.2013	08.05.2015

### 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
1.7.	in the factor of the 1990 contract of the discount of the disc		the first of the control of the cont

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

### 12 Observations

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



# Annex A Document history

Version	Applied changes	Date of release	
	Initial release	2014-08-05	

### Annex B Further information

### **Glossary**

SW

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

Software



#### Annex C **Accreditation Certificate**

Front side of certificate

Back side of certificate

( DAkkS

Deutsche Akkreditierungsstelle GmbH

Bellehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV Unterzeichnerin der Multilateralen Abkommen von EA, ILAC und IAF zur gegunseitigen Anerkennung

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

**CETECOM ICT Services GmbH** Untertürkheimer Straße 6-10, 66117 Saarbrücken

dir Kampetanz nach DIN EN ISO/IEC 17025;2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL VolP und DECT Akustik

Akustik

Funk einschließlich WLAN
Short Range Devices (SRD)

RFID

WIMAx und Richtfunk
Mobilfunk (SBM) / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Auto
Produktsicherheit

SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth

WI-FI- Services

Die Aldreditierungsurkunde gijt nur in Verbindung mit dem Bescheld vom 07.03.2014 mit der Akkreditierungsnurmen D-PI-12076-01 und ist gillig 17.01.2018. Sie besteht aus diesem Deckblatt, de Rückseite des Deckblatts und der folgenden Anlage mit Insgesamt 77 Seiten.

Frankfurt am Main, 07.03.2014

Deutsche Akkreditierungsstelle GmbH

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