

PARTIAL TEST REPORT

No.: 6-0347-13-2-2g-C1

According to:
FCC Regulations
 Part 15.207, Part 15.225, Part 15.209

IC-Regulations
 RSS-Gen, Issue 4
 RSS-210, Issue 8
 ICES-003, Issue 5

for

Hach Lange GmbH

Benchtop device (ISO) TU5200 / LPG 442.99.03022

Contains FCC-ID: YUH-QR15HL
 Contains IC: 9278A-QR15HL







Laboratory Accreditation and Listings			
 Deutsche Akkreditierungsstelle D-PL-12047-01-01	 Reg. No.: 736496 MRA US-EU 0003	 Industry Canada Reg. No.: 3462D-1 Reg. No.: 3462D-2 Reg. No.: 3462D-3	 Voluntary Controls for Electromagnetic Emissions Reg. No.: R-2666 C-2914, T-1967, G-301
 AUTHORIZED RF LABORATORY	 LAB CODE 20011130-00		
accredited according to DIN EN ISO/IEC 17025			
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The listed attachments are an integral part of this report.

1. Summary of test results

The test results apply exclusively to the test samples as presented in this Report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests.

The Equipment Under Test (in this report, hereinafter referred as EUT) is a analytical apparatus including a digital device for data exchange and which integrates an already certified RFID-Module with FCC-ID YUH-QR15HL and IC 9278A-QR15HL. Typical operating mode was tested according intended use of the equipment as described by the applicant.

Following tests have been performed to show compliance with applicable FCC Part 15, Subpart C and Subpart B of the CFR 47 Rules, Edition 4th November 2013 and Canadian RSS-210, RSS-Gen and ICES-003 standard.

1.1. Test overview according FCC and Canadian RSS- or ICES Standards

No. of Diagram group	Test Cases	Port	References, Standards & Limits			EUT set-up	EUT op-mode	Result
			FCC	IC	Limits			
1	AC Power Lines Conducted emissions 0,15 – 30 MHz	AC Power lines	§15.107, Class B	ICES-003, Issue 5 (ANSI C63.4)	<input type="checkbox"/> Table-1: Class A <input checked="" type="checkbox"/> Table 2 - Class B	1	1+2+3 +4	Passed
			§15.207	-	§15.207			
			--	RSS-Gen., Issue 4	Chapter 8.8 Table 3	1	1+2+3 +4	Passed
2	Radiated emissions 9 kHz - 30 MHz	Cabinet + Inter-connecting cables	§15.209	RSS-Gen., Issue 4 Chapter 8.9 Table 5	2400/F(kHz) µV/m 24000/F(kHz) µV/m 30 µV/m	1	1+2+3 +4	passed
2	Radiated emissions Field Strength	Cabinet + Inter-connecting cables	§15.2225	RSS-210, Issue 8	A2.6 Mask according Spec.	1	1+2+3 +4	passed
3	Radiated emissions 30 MHz-1 GHz	Cabinet + Inter-connecting cables	§15.109 Class B	ICES-003, Issue 5 (ANSI C63.4) Chapter 6.2.1	<input type="checkbox"/> Table 4- Class A <input checked="" type="checkbox"/> Table 5- Class B	1	1+2+3 +4	passed
				RSS-Gen., Issue 4	Chapter 7.1.2 Table 2			
			§15.209	RSS-Gen., Issue 4	Chapter 8.9 Table 4			
--	Frequency stability	Cabinet + Inter-connecting cables	§15.225 (e)	RSS-Gen., Issue 4, Chapter 6.11/8.11	0.01% of f _c	--	--	See initial certification of module
--	Occupied bandwidth	Cabinet + Inter-connecting cables	§2.202(a) §2.1049	RSS-Gen., Issue 4 Chapter 4.6.1	99% Power bandwidth	--	--	n.p. see test report TR6-0347-13-2-2e-C1

Remark:

Test report 6-0347-13-2-2g-C1 issued on 2014-12-11 substitutes report 6-0347-13-2-2g issued 2014-11-12. The substituted report gets herewith invalid.

Dipl.-Ing. Rachid Acharkaoui
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2. Administrative Data

2.1. Identification of the testing laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Responsible for testing laboratory:	Dipl.-Ing. Niels Jeß
Deputy:	Dipl.-Ing. Rachid Acharkaoui

2.2. Test location

2.2.1. Test laboratory "CTC"

Company name:	see chapter 2.1. Identification of the testing laboratory
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2.3. Organizational items

Responsible for test report and project leader:	Dipl.-Ing. C. Lorenz
Receipt of EUT:	2014-10-27
Date(s) of test:	2014-10-27 to 2014-10-31
Date of report:	2014-12-11

Version of template:	13.02

2.4. Applicant's details

Applicant's name:	Hach Lange GmbH
Address:	Königsweg 10 14163 Berlin Germany
Contact person:	Mr. Christian Jost

2.5. Manufacturer's details

Manufacturer's name:	please see Applicant's details
Address:	please see Applicant's details

3. Equipment under test (EUT)

3.1. EUT: Type, S/N etc. and short descriptions used in this test report

Short description*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	Benchtop device (ISO)	TU5200 / LPG 442.99.03022	1561142 (Nr. 7 ISO)	See chapter 15 of TR	See chapter 15 of TR
EUT B	RFID Key fob	NXP I-Code SLI	#1	13.56MHz	ISO15693

*) EUT short description is used to simplify the identification of the EUT in this test report.

3.2. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

AE short description *)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	AC/DC Power supply	TYT251500200UV	--	In: 100-240V AC, 50/60Hz, 0.75A Out: 15V DC 2000mA	--
AE 2	Liquid turbidity (Probe)	GELEX Secondary	--	--	--
AE 3	Notebook	Dell Latitude E5440	8501YY1	Core i7 vPro	Windows 7
AE 4	OCZ USB Stick	Diesel 4GB	--	--	--
AE 5	LAN cable	Conetka S/FTP 4x2AWG26/7	--	Cat5e	--
AE 6	Belkin USB cable	Belkin High Speed 28AWG/1P+22AWG/ 2C	E329056	Revision 2.0	--
AE 7	USB cable	Belkin High Speed 28AWG/1P + 22AWG/2C	E101344-C	Revision 2.0	--

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report.

3.3. EUT set-ups

EUT set-up no. *)	Combination of EUT and AE	Remarks
set. 1	EUT A + EUT B + AE 1 + AE 2 + AE 3 + AE 4 + AE 5 + AE 6 + AE 7	Full functional set-up

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

3.4. EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
op. 1	TX-on	Carrier on, Continuous Read-Mode of RFID.
op. 2	Processing Mode	Processing data (intended use): analysing turbidity probe
op. 3	LAN Traffic	Continuous data exchange (Ping) from EUT A over LAN-connection to an PC (AE3)
op. 4	Data log	Continuous data logging on connected USB Stick (AE4) over USB line

*) EUT operating mode no. is used to simplify the test report.

3.5. Additional declaration and description of EUT

(Applicant's declaration, = not selected, = selected)

EUT A	<input type="checkbox"/> table-top <input type="checkbox"/> floor-standing <input type="checkbox"/> wall-mounted <input checked="" type="checkbox"/> not defined	typical use <input type="checkbox"/> portable use <input checked="" type="checkbox"/> fixed use <input type="checkbox"/> vehicular use	typical operating cycle of EUT. <input checked="" type="checkbox"/> < 0,5 sec. <input type="checkbox"/> :	
Place of use	<input checked="" type="checkbox"/> Residential, commercial and light industry <input type="checkbox"/> Industrial environment <input type="checkbox"/> vehicular use			
Highest frequency generated or used in the device or on which the device operates or tunes	<input type="checkbox"/> below 1.705 MHz -> up to 30 MHz <input checked="" type="checkbox"/> 1.705 MHz – 108 MHz -> up to 1 GHz <input type="checkbox"/> 108 MHz -500 MHz -> up to 2 GHz <input type="checkbox"/> 500MHz 1000 MHz -> up to 5 GHz <input type="checkbox"/> Above 1000 MHz -> 5 th harmonic or 40 GHz			
Power line:	EUT-grounding:			
<input checked="" type="checkbox"/> AC <input checked="" type="checkbox"/> L1, <input type="checkbox"/> L2, <input type="checkbox"/> L3, <input checked="" type="checkbox"/> N _____ Hz <input checked="" type="checkbox"/> DC	<input checked="" type="checkbox"/> none <input type="checkbox"/> with power supply <input type="checkbox"/> additional:			
(in case of deviation during tests the single details are described on chapter 4)				
Other Ports (description of interconnecting cables)	Connector	possible total cable length	shielding	connected during test
1. AC-Power line	specific	<input checked="" type="checkbox"/> < 3m <input type="checkbox"/> > 3m <input type="checkbox"/> : other	<input type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no
2. USB line to USB Stick	USB A	<input checked="" type="checkbox"/> < 3m <input type="checkbox"/> > 3m <input type="checkbox"/> : other	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no
3. USB line to Notebook	USB B	<input type="checkbox"/> < 3m <input checked="" type="checkbox"/> > 3m <input type="checkbox"/> : other	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no
4. CAT5e LAN Cable (Ethernet)	RJ45	<input checked="" type="checkbox"/> < 3m <input type="checkbox"/> > 3m <input type="checkbox"/> : other	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no
Does EUT contain devices susceptible to magnetic fields, e.g. Hall elements, electrodynamics microphones, etc.?				<input checked="" type="checkbox"/> yes <input type="checkbox"/> no
Is mounting position / usual operating position defined?				<input checked="" type="checkbox"/> yes <input type="checkbox"/> no

3.6. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	Power Cable	specific	-	-	1.3m
Cable 2	USB Cable for USB Stick	Shielded	--	--	2m
Cable 3	USB Cable for notebook connection	Shielded	--	--	2m
Cable 4	LAN Cable	CAT5e	--	--	1.5m

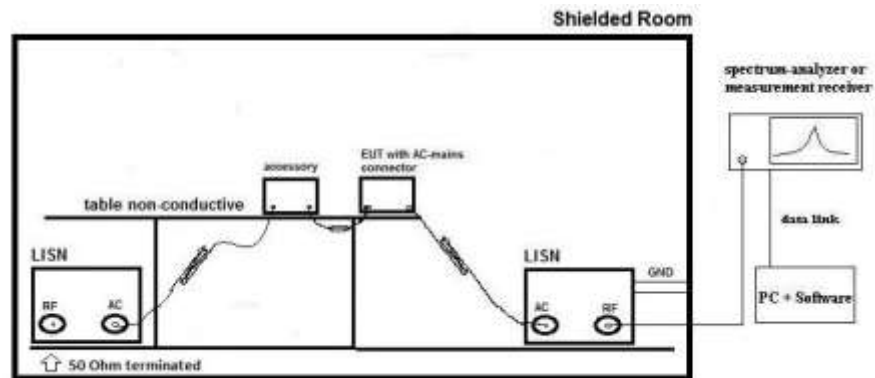
4. Description of test system set-up's

4.1. Test system set-up for AC power-line conducted emission measurements

Specification: ANSI C63.4-2009 chapter 7, ANSI C63.10-2009 chapter 6.2

General Description: The radio frequency voltage conducted back into the AC power line in the frequency range 150 kHz to 30 MHz has to be investigated. Compliance should be tested by measuring the radio frequency voltage between each power line and ground at the power terminals in the stated frequency range. A 50 Ohm / 50 μH line impedance stabilization network (LISN) is used coupling the interface to the measurement equipment. The EUT power input leads are connected through the LISN to the AC-power source. The LISN enclosure is electrically connected to the ground plane. The measuring instrument is connected to the coaxial output of the LISN. Tabletop devices were set-up on a 80 cm height above reference ground plane, floor standing equipment 10 cm raised above ground plane. Measurements have been performed on each phase line and neutral line of the devices AC-power lines. The EUT was power supplied with 110 V/60 Hz. The EUT was tested in the defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

Schematic:



Only schematic view, we refer to figure 6, 7 and 8 of ANSI C63.4-2009 for more details.

Testing method: **Exploratory, preliminary measurements** as a first step, determines the worst-case phase line (neutral or phase) as well as the most critical operating mode of the equipment. A complete frequency-sweep with PK-Detector is performed on each current-carrying conductor. **Final testing** for power phases and critical frequencies (Margin to AV- or QP limit lower than 3 dB) as a second step includes measurements with receivers detector set to Quasi-Peak and Average.

Formula:

$$V_C = V_R + C_L \quad (1)$$

$$M = L_T - V_C \quad (2)$$

V_C = measured Voltage –corrected value
 V_R = Receiver reading
 C_L = Cable loss
 M = Margin
 L_T = Limit

Values are in dB, positive margin means value is below limit.

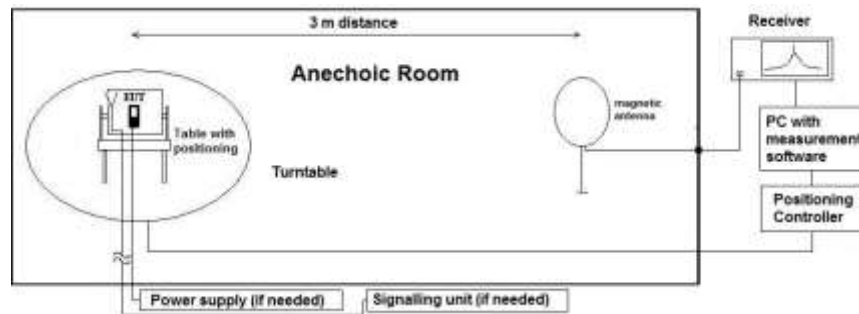
4.2. Test system set-up for radiated magnetic field measurements below 30 MHz

Specification: ANSI C63.4-2009 chapter 8.2.1, ANSI C63.10-2009 chapter 6.4

General Description: Evaluating the radiated field emissions are done first by an exploratory emission measurement and a final measurement for most critical frequencies determined.

The loop antenna was placed at 1 m height above ground plane and 3 m measurement distance from set-up for investigations. Because of reduced measurement distance, correction data were applied, as stated in chapter “General Limit - Radiated field strength emissions below 30 MHz“. The tests are performed in the semi anechoic room recognized by the regulatory commission.

Schematic:



Testing method:

Exploratory, preliminary measurement

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (step 90°, range 0° to 360°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT), the emission spectrum was recorded. The loop antenna was moved at least to 2-perpendicular axes (antenna vector in direction of EUT and parallel to EUT) in order to maximize the emissions. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a data reduction table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position).

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A$$

$$M = L_T - E_C$$

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor

E_C = Electrical field – corrected value

E_R = Receiver reading

G_A = Gain of pre-amplifier (if used)

L_T = Limit

M = Margin

All units are dB-units, positive margin means value is below limit.

Distance correction:

Reference for applied correction (extrapolating) factors:

IEEC Transaction EMC, Vol. 47, No. 3, Aug. 2005, Journal Paper

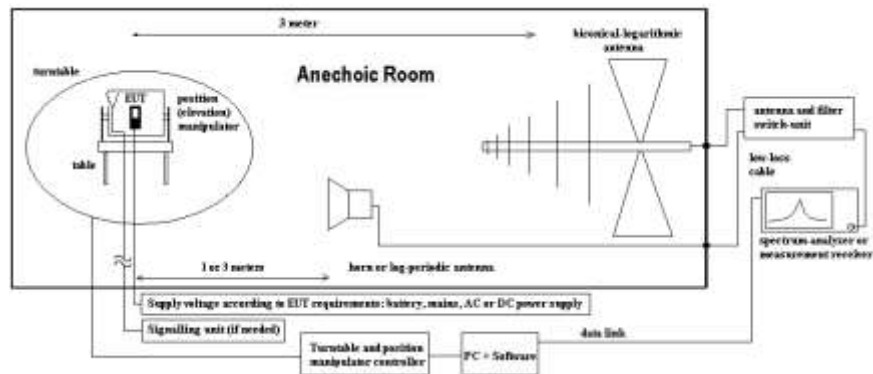
“Extrapolating Near-field emissions of low frequency loop transmitters”.

4.3. Test system set-up for radiated electric field measurement 30 MHz to 1 GHz

Specification: ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.5

General Description: Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a NSA-compliant semi anechoic room (SAR) recognized by the regulatory commissions.

Schematic:



Testing method:

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 90°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its characteristics was recorded with an EMI-receiver, broadband antenna and software.

Measurement antenna: horizontal and vertical, heights: 1,0 m and 1,82 m as worst-case determined by an exploratory emission measurements. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurement antenna height between 1 m and 4 m.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

- AF = Antenna factor
- C_L = Cable loss
- D_F = Distance correction factor (if used)
- E_C = Electrical field – corrected value
- E_R = Receiver reading
- G_A = Gain of pre-amplifier (if used)
- L_T = Limit
- M = Margin

All units are dB-units, positive margin means value is below limit.

5. Measurements

5.1. General Limit - Conducted emissions on AC-Power lines

5.1.1. Test location and equipment

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter 2.2.1)	<input type="checkbox"/> Please see Chapter 2.2.2	<input type="checkbox"/> Please see Chapter 2.2.3
test site	<input type="checkbox"/> 333 EMI field	<input checked="" type="checkbox"/> 348 EMI cond.	
receiver	<input type="checkbox"/> 001 ESS	<input checked="" type="checkbox"/> 377 ESCS 30	<input type="checkbox"/> 489 ESU 40 <input type="checkbox"/> 620 ESU 26
LISN	<input checked="" type="checkbox"/> 005 ESH2-Z5	<input type="checkbox"/> 007 ESH3-Z6	<input type="checkbox"/> 300 ESH3-Z5 & 50Ω used for AE <input type="checkbox"/> no LISN for AE
signaling	<input type="checkbox"/> 392 MT8820A	<input type="checkbox"/> 436 CMU	<input type="checkbox"/> 547 CMU <input type="checkbox"/> 594 CMW
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains <input checked="" type="checkbox"/> 060 120 V 60 Hz via PAS 5000		

5.1.2. Requirements

FCC	Part 15 - Subpart B, §15.107; Subpart C, 15.207				
IC	RSS-Gen., Issue 4, § 8.8, ICES-003, Issue 5				
ANSI	C63.10-2009, §6.2 C63.4-2009, § 5.2, 6, 7				
Limit	Frequency [MHz]	<input checked="" type="checkbox"/> Conducted limit Class B		<input type="checkbox"/> Conducted limit Class A	
		QUASI-Peak [dBµV]	AVERAGE [dBµV]	QUASI-Peak [dBµV]	AVERAGE [dBµV]
	0.15 – 0.5	66 to 56*	56 to 46*	79	66
	0.5 – 5	56	46	73	60
	5 – 30	60	50	73	60
Remark: * decreases with the logarithm of the frequency					

5.1.3. Test condition and test set-up

Signal link to test system (if used):	<input type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/>
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top (40 cm distance to reference ground plane (wall))	<input type="checkbox"/> floor standing EUT stands isolated on reference ground plane (floor)	
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%
EMI-Receiver or Analyzer settings	Scan data	<input type="checkbox"/> 9 – 150 kHz, RBW = 200 Hz, Step = 61 Hz <input checked="" type="checkbox"/> 150 kHz – 30 MHz RBW = 9 kHz, Step = 4 kHz <input type="checkbox"/> other:	
	Scan-Mode	6 dB EMI-Receiver Mode	
	Pre-measurement Final measurement	Peak detector, Repetitive-Scan, max-hold, sweep-time 50 µs per frequency point Average & Quasi-peak detector at critical frequencies	
General measurement procedures	Please see chapter “Test system set-up for AC power line conducted emissions measurements”		

5.1.4. Measurement results

The results are presented below in summary form only. For more information please see the diagrams

EUT set-up no.:			set-up 1		
Diagram No.	EUT operating mode no. or commend	Used Detector	Power line	Additional (scan-) information or remarks	Result
1.01	EUT operating mode 1+2+3+4	<input checked="" type="checkbox"/> Peak (pre-scan) <input type="checkbox"/> CAV (final) <input type="checkbox"/> QP (final)	L1/ N	RFID Carrier on 13.56 MHz on diagram	passed

5.2. Radiated field strength emission mask at 13.110-14.010MHz

5.2.1. TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)	<input type="checkbox"/> Please see Chapter. 2.2.2	<input type="checkbox"/> Please see Chapter. 2.2.3
test site	<input checked="" type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 487 SAR NSA	<input type="checkbox"/> 337 OATS
receiver	<input type="checkbox"/> 377 ESCS30	<input checked="" type="checkbox"/> 001 ESS	<input type="checkbox"/> 347 Radio.lab.
spectr. analys.	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	<input type="checkbox"/>
antenna	<input type="checkbox"/> 048 EMCO3143	<input type="checkbox"/> 133 EMCO3115	<input type="checkbox"/> 302 BBHA9170
power supply	<input type="checkbox"/> 456 EA 3013A	<input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 459 EA 2032-50
otherwise	<input type="checkbox"/> 400 FTC40x15E	<input type="checkbox"/> 401 FTC40x15E	<input type="checkbox"/> 110 USB LWL

5.2.2. STANDARDS AND LIMITS: CFR 47, §15.225(a)(b)(c)(d), RSS-210, Chapter A2.6

Frequency [MHz]	Field strength		Measurement distance [meters]	Remarks
	[µV/m]	[dBuV/m]		
13.553 - 13.567 (allocated band)	15.848	84.00	30	Correction factor used due to measurement distance of 3m
13.410-13.710	334	50.47	30	
13.110-14.010	106	40.50	30	
Outside band 13.110-14.010	30	29.5	30	

5.2.3. TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	<input type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/>
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top	<input type="checkbox"/> floor standing	
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%
EMI-Receiver (Analyzer) Settings	Span/Range: 9kHz to 150kHz; 150 kHz to 30 MHz RBW/VBW: 200Hz/auto; 10 kHz/ auto (ANSI63.10/CISPR#16) Detector/ Mode: PEAK, TRACE max-hold mode, repetitive scan for exploratory measurements Quasi-Peak, for final measurement on critical frequencies (f<1GHz)		

5.2.4. GENERAL MEASUREMENT PROCEDURES:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2009

The **Equipment under Test (EUT)** was set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

The measurement loop antenna was situated in 3m distance to the EUT. Between EUT and measurement antenna absorbers are covering the GND-Plane. With these absorbers the chamber fulfills CIPR16-1-4 site VSWR-criteria. Radiated magnetic emission measurements were made with the antenna situated in 1 meter height. The loop antenna was moved at least to 2-perpendicular axes (antenna vector in direction of EUT and parallel to EUT) in order to maximize the emissions, the EUT itself either over 3-orthogonal axes (no defined usage position) or 2-orthogonal axis (defined usage position) by the position manipulator.

According the standard the compliance should be checked in 30m measurement distance. Therefore a additional extrapolation factor was used in order to normalize the measurement data as shown in chapter 5.3.5

5.2.5. MEASUREMENT RESULTS: RADIATED FIELD STRENGTH (SPURIOUS)

Table of measurement results:

Diagram No.	Carrier Channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Range	No.					PK	AV	QP	
2.05 2.05b	nominal	1	12 - 15 MHz	1	1+2+3+ 4	Intended use position is Worst-Case = 50.4 dBuV/m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	passed

5.2.6. VERDICT: Pass

5.3. General Limit - Radiated field strength emissions below 30 MHz

5.3.1. Test location and equipment

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)	<input type="checkbox"/> Please see Chapter. 2.2.2	<input type="checkbox"/> Please see Chapter. 2.2.3
test site	<input checked="" type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 487 SAR NSA	<input type="checkbox"/> 347 Radio.lab.
receiver	<input type="checkbox"/> 377 ESCS30	<input checked="" type="checkbox"/> 001 ESS	<input type="checkbox"/>
spectr. analys.	<input type="checkbox"/> 584 FSU	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK
antenna	<input type="checkbox"/> 574 BTA-L	<input type="checkbox"/> 133 EMCO3115	<input type="checkbox"/> 302 BBHA9170
signaling	<input type="checkbox"/> 392 MT8820A	<input type="checkbox"/> 371 CBT32	<input type="checkbox"/> 547 CMU
otherwise	<input type="checkbox"/> 400 FTC40x15E	<input type="checkbox"/> 401 FTC40x15E	<input type="checkbox"/> 110 USB LWL
DC power	<input type="checkbox"/> 456 EA 3013A	<input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 459 EA 2032-50
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains	<input checked="" type="checkbox"/> 060 120 V 60 Hz	via PAS 5000

5.3.2. Requirements

FCC	Part 15, Subpart C, §15.205 & §15.209			
IC	RSS-Gen., Issue 4, Chapter 8.9, Table 5			
ANSI	C63.10-2009			
Frequency [MHz]	Field strength limit [dBµV/m]		Distance [m]	Remarks
0.009 – 0.490	2400/f (kHz)	67.6 – 20Log(f) (kHz)	300	Correction factor used due to measurement distance of 3 m
0.490 – 1.705	24000/f (kHz)	87.6 – 20Log(f) (kHz)	30	Correction factor used due to measurement distance of 3 m
1.705 – 30	30	29.5	30	Correction factor used due to measurement distance of 3 m

5.3.3. Test condition and test set-up

Signal link to test system (if used):	<input type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/> none
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top	<input type="checkbox"/> floor standing	
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%
EMI-Receiver or Analyzer Settings	Scan data	<input checked="" type="checkbox"/> 9 – 150 kHz RBW/VBW = 200 Hz	Scan step = 80 Hz
	Scan-Mode	<input checked="" type="checkbox"/> 150 kHz – 30 MHz RBW/VBW = 9 kHz	Scan step = 4 kHz
Detector Mode:	<input checked="" type="checkbox"/> 6 dB EMI-Receiver Mode <input type="checkbox"/> 3dB Spectrum analyser Mode		
Sweep-Time	Peak (pre-measurement) and Quasi-PK/Average (final if applicable) Repetitive-Scan, max-hold Coupled – calibrated display if continuous signal otherwise adapted to EUT’s individual transmission duty-cycle		
General measurement procedures	Please see chapter “Test system set-up radiated magnetic field measurements below 30 MHz”		

5.3.4. Measurement Results

The results are presented below in summary form only. The EUT is put on operation on nominal channel.

Table of measurement results:

Diagram No.	Carrier Channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Range	No.					PK	AV	QP	
2.06	Nominal	1	9 kHz-30 MHz	1	1+2+3+4	Carrier frequency component on diagram-> not relevant for results	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	passed

Remark: Carrier on 13.56MHz can be observed on the diagram, not relevant for the final results

5.3.5. Correction factors due to reduced meas. distance (f < 30 MHz)

The used correction factors when the measurement distance is reduced, are taken from IEEC Transaction EMC, Vol 47, No.3, Aug. 2005, Journal Paper "EXTRAPOLATING NEAR-FIELD EMISSIONS OF LOW-FREQUENCY LOOP TRANSMITTERS".

Used Transducer factors (f < 30 MHz)						
	1	2	3	4	5	6
						=2+3+4+5
Frequency	Antenna factor	Corection factor		Cable loss	Transducer factor	
		300m to 3m	30m to 3m			
kHz	dB μV/m	dB	dB	dB	dB μV/m	
9,0	20,0	-116,7		0,0	-96,7	
10,6	20,0	-116,7		0,0	-96,7	
12,6	20,0	-116,7		0,0	-96,7	
14,8	20,0	-116,7		0,0	-96,7	
17,5	20,0	-116,6		0,0	-96,6	
20,7	20,0	-116,6		0,0	-96,6	
24,4	20,0	-116,6		0,0	-96,6	
28,9	20,0	-116,6		0,0	-96,6	
34,1	20,0	-116,5		0,0	-96,5	
40,3	20,0	-116,4		0,0	-96,4	
47,6	20,0	-116,3		0,0	-96,3	
56,2	20,0	-116,2		0,0	-96,2	
66,4	20,0	-116,0		0,0	-96,0	
78,4	20,0	-115,8		0,0	-95,8	
92,7	20,0	-115,4		0,0	-95,4	
109,4	20,0	-115,0		0,0	-95,0	
129,3	20,0	-114,5		0,0	-94,5	
152,7	20,0	-113,9		0,0	-93,9	
180,4	20,0	-113,1		0,0	-93,1	
213,1	20,0	-112,2		0,0	-92,2	
251,7	20,0	-111,3		0,0	-91,3	
297,3	20,0	-108,3		0,0	-88,3	
351,2	20,0	-105,2		0,0	-85,2	
414,8	20,0	-102,1		0,0	-82,1	
490,0	20,0	-99,1		0,0	-79,1	
490,0	20,0		-56,4	0,1	-36,3	
582,0	20,0		-56,2	0,1	-36,1	
690,0	20,0		-56,0	0,2	-35,8	
820,0	20,0		-55,7	0,2	-35,5	
973,0	20,0		-55,4	0,2	-35,2	
1.155,0	20,0		-54,9	0,3	-34,6	
1.371,0	20,0		-54,4	0,3	-34,1	
1.627,0	20,0		-53,7	0,3	-33,4	
1.931,0	20,0		-52,9	0,4	-32,5	
2.292,0	20,0		-52,0	0,4	-31,6	
2.721,0	20,0		-49,8	0,5	-29,3	
3.230,0	20,0		-46,6	0,5	-26,1	
3.834,0	20,0		-43,3	0,6	-22,7	
4.551,0	20,0		-40,1	0,6	-19,5	
5.402,0	20,0		-36,8	0,7	-16,1	
6.412,0	20,0		-33,5	0,7	-12,8	
7.612,0	20,0		-30,3	0,8	-9,5	
9.035,0	20,0		-27,0	0,8	-6,2	
10.725,0	20,0		-23,9	0,9	-3,0	
12.730,0	20,0		-21,2	0,9	-0,3	
15.111,0	20,0		-19,3	1,0	1,7	
17.937,0	20,0		-18,4	1,0	2,6	
21.292,0	20,0		-18,2	1,1	2,9	
25.274,0	20,0		-18,3	1,1	2,8	
30.000,0	20,0		-18,4	1,2	2,8	

5.4. General Limit - Radiated field strength emissions, 30 MHz - 1 GHz

5.4.1. Test location and equipment

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)	<input type="checkbox"/> Please see Chapter. 2.2.2	<input type="checkbox"/> Please see Chapter. 2.2.3
test site	<input checked="" type="checkbox"/> 441 EMI SAR <input checked="" type="checkbox"/> 487 SAR NSA		
receiver	<input type="checkbox"/> 377 ESCS30 <input checked="" type="checkbox"/> 001 ESS	<input type="checkbox"/> 489 ESU 40 <input type="checkbox"/> 620 ESU 26	
spectr. analys.	<input type="checkbox"/> 584 FSU <input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	
antenna	<input checked="" type="checkbox"/> 574 BTA-L <input type="checkbox"/> 133 EMCO3115	<input type="checkbox"/> 302 BBHA9170 <input type="checkbox"/> 289 CBL 6141	<input type="checkbox"/> 030 HFH-Z2 <input type="checkbox"/> 477 GPS
signaling	<input type="checkbox"/> 392 MT8820A <input type="checkbox"/> 371 CBT32	<input type="checkbox"/> 547 CMU <input type="checkbox"/> 594 CMW	
otherwise	<input type="checkbox"/> 400 FTC40x15E <input type="checkbox"/> 401 FTC40x15E	<input type="checkbox"/> 110 USB LWL <input checked="" type="checkbox"/> 482 Filter Matrix	
DC power	<input type="checkbox"/> 456 EA 3013A <input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 459 EA 2032-50 <input type="checkbox"/> 268 EA- 3050	<input type="checkbox"/> 494 AG6632A <input type="checkbox"/> 498 NGPE
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains	<input checked="" type="checkbox"/> 060 120 V 60 Hz via PAS 5000	

5.4.2. Requirements/Limits

FCC		<input checked="" type="checkbox"/> Part 15 Subpart B, §15.109, class B <input checked="" type="checkbox"/> Part 15 Subpart C, §15.209 @ frequencies defined in §15.205	
IC		RSS-Gen., Issue 4, Chapter 8.9, Table 4 ICES-003, Issue 5	
ANSI		<input checked="" type="checkbox"/> C63.4-2009 <input checked="" type="checkbox"/> C63.10-2009	
Limit	Frequency [MHz]	Radiated emissions limits, 3 meters	
		QUASI Peak [μ V/m]	QUASI-Peak [dB μ V/m]
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	above 960	500	49.0

5.4.3. Restricted bands of operation, §15.205

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.20725-4.20775	37.5-38.25	1645.5-1646.5	9.3-9.5
6.215-6.218	73-74.6	1660-1710	10.6-12.7
6.26775-6.26825	74.8-75.2	1718.8-1722.2	13.25-13.4
6.31175-6.31225	108-121.94	2200-2300	14.47-14.5
8.291-8.294	123-138	2310-2390	15.35-16.2
8.362-8.366	149.9-150.05	2483.5-2500	17.7-21.4
8.37625-8.38675	156.52475-156.52525	2690-2900	22.01-23.12
8.41425-8.41475	156.7-156.9	3260-3267	23.6-24.0
12.29-12.293	162.0125-167.17	3332-3339	31.2-31.8
12.51975-12.52025	167.72-173.2	3345.8-3358	36.43-36.5
12.57675-12.57725	240-285	3600-4400	--
13.36-13.41	322-335.4	--	--

Remark: only spurious emissions are allowed within these frequency bands not exceeding the limits per §15.209

5.4.4. Test condition and measurement test set-up

Signal link to test system (if used):		<input type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/> none
EUT-grounding		<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up		<input checked="" type="checkbox"/> table top 0.8m height		<input type="checkbox"/> floor standing
Climatic conditions		Temperature: (22±3°C)		Rel. humidity: (40±20)%
EMI-Receiver (Analyzer) Settings	Scan frequency range:	<input checked="" type="checkbox"/> 30 – 1000 MHz <input type="checkbox"/> other:		
	Scan-Mode	<input checked="" type="checkbox"/> 6 dB EMI-Receiver Mode <input type="checkbox"/> 3 dB spectrum analyser mode		
	Detector	Peak / Quasi-peak		
	RBW/VBW	100 kHz/300 kHz		
	Mode:	Repetitive-Scan, max-hold		
Scan step	80 kHz			
Sweep-Time	Coupled – calibrated display if continuous tx-signal otherwise adapted to EUT’s individual duty-cycle			
General measurement procedures		Please see chapter “Test system set-up for electric field measurement in the range 30 MHz to 1 GHz”		

5.4.5. MEASUREMENT RESULTS

The results are presented below in summary form only. For more information please see diagrams.

Table of measurement results:

Dia-gram no.	Carrier Channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Range	No.					PK	AV	QP	
3.01	nominal	1	30-1000 MHz	1	1+2+3+4	--	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	passed

Remark:

5.5. RF-Parameter - 99% occupied Bandwith

5.5.1. Test location and equipment (for reference numbers please see chapter 'List of test equipment')

test site	<input type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 348 EMI cond.	<input type="checkbox"/> 443 EMI FAR	<input checked="" type="checkbox"/> 347 Radio.lab.	<input type="checkbox"/> 337 OATS	<input type="checkbox"/>
spectr. analys.	<input type="checkbox"/> 584 FSU	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	<input checked="" type="checkbox"/> 489 ESU	<input type="checkbox"/>	<input type="checkbox"/>
attenuator	<input checked="" type="checkbox"/> 530 10 dB	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
signaling	<input type="checkbox"/> 392 MT8820A	<input type="checkbox"/> 436 CMU	<input type="checkbox"/> 547 CMU			
DCpower	<input type="checkbox"/> 463 Power source	<input type="checkbox"/> 087 EA3013	<input type="checkbox"/> 354 NGPE 40	<input type="checkbox"/> 086 LNG50-10	<input type="checkbox"/>	<input type="checkbox"/>
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input checked="" type="checkbox"/> 060 120 V 60 Hz via PAS 5000			

5.5.2. Test condition and measurement test set-up

link to test system (if used):	<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/>
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%

5.5.3. Reference

FCC	<input checked="" type="checkbox"/> §15.247(a) (2)
IC	<input checked="" type="checkbox"/> RSS-210: A8.2
ANSI	<input checked="" type="checkbox"/> 63.10:2009

5.5.4. EUT Settings:

The EUT was instructed to send with maximum power (if adjustable) according applicants instructions. Different modulation characteristics have been checked, e.g. data rates which EUT can operate.

5.5.5. Measurement method:

The measurement was performed with the RBW set to 20 kHz. The span was set to approx. 2 to 3 times the expected bandwidth.

Two markers are placed on frequency points such that left to lower f-marker and right to higher f-marker only 1% of the TX-power is contained. Between the markers, 99% of the power is laying. The RBW value is readjusted and the measurement repeated until the RBW/EBW ratio is around 1%.

5.5.6. Spectrum-Analyzer Settings:

Span	Set as to fully display the emissions and at least 30dB below the PEAK level
Resolution Bandwidth (RBW)	Set to approx 1% of the expected emission width
Video Bandwidth (VBW)	10 times the resolution bandwidth
Sweep time	Coupled
Detector	RMS
Sweep mode	Repetitive Mode, MAX-HOLD

5.5.7. Results:

See test performed in test report TR6-0347-13-2-2e-C1 which should be considered also valid for this EUT, due to same RF-Module which is build in.

5.5.8. Verdict:

Test Result: pass according TR6-0347-13-2-2e-C1

5.6. Measurement uncertainties

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved.

For uncertainty determination, each component used in the concrete measurement set-up was taken in account and it's contribution to the overall uncertainty according it's statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

RF-Measurement	Frequency range	Calculated uncertainty based on a confidence level of 95%	Remarks:
Power Output conducted	9 kHz .. 20 GHz	1.0 dB	--
Power Output radiated	30 MHz .. 4 GHz	3.17 dB	Substitution method
Conducted emissions on antenna ports	9 kHz .. 20 GHz	1.0 dB	--
Radiated emissions enclosure	150 kHz .. 30 MHz	5.0 dB	Magnetic field
	30 MHz .. 1 GHz	4.2 dB	E-Field
	1 GHz .. 20 GHz	3.17 dB	Substitution method
Occupied bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker)	Frequency error
		1.0 dB	Power
Emission bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker)	Frequency error
		1.0 dB	Power
Frequency stability	9 kHz .. 20 GHz	0.0636 ppm	--
Conducted emissions on AC-mains port (U _{CISPR})	9 kHz .. 150 kHz	4.0 dB	--
	150 kHz .. 30 MHz	3.6 dB	--

Table: measurement uncertainties, valid for conducted/radiated measurements

6. Abbreviations used in this report

The abbreviations	
ANSI	American National Standards Institute
AV , AVG, CAV	Average detector
EIRP	Equivalent isotropically radiated power, determined within a separate measurement
EGPRS	Enhanced General Packet Radio Service
EUT	Equipment Under Test
FCC	Federal Communications Commission, USA
IC	Industry Canada
n.a.	not applicable
Op-Mode	Operating mode of the equipment
PK	Peak
RBW	resolution bandwidth
RF	Radio frequency
RSS	Radio Standards Specification, Dokuments from Industry Canada
Rx	Receiver
TCH	Traffic channel
Tx	Transmitter
QP	Quasi peak detector
VBW	Video bandwidth
ERP	Effective radiated power

7. Accreditation details of CETECOM's laboratories and test sites

Ref.-No.	Accreditation Certificate	Valid for laboratory area or test site	Accreditation Body
-	D-PL-12047-01-01	All laboratories and test sites of CETECOM GmbH, Essen	DAkkS, Deutsche Akkreditierungsstelle GmbH
337 487 558 348 348	736496	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measur.	FCC, Federal Communications Commission Laboratory Division, USA (MRA US-EU 0003)
337 487 550 558	3462D-1 3462D-2 3462D-2 3462D-3	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR)	IC, Industry Canada Certification and Engineering Bureau
487 550 348 348	R-2666 G-301 C-2914 T-1967	Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measur.	VCCI, Voluntary Control Council for Interference by Information Technology Equipment, Japan
OATS = Open Area Test Site, SAR = Semi Anechoic Room, FAR = Fully Anechoic Room			

8. Instruments and Ancillary

The “Ref.-No” in the left column of the following tables allows the clear identification of the laboratory equipment.

8.0.1. Test software and firmware of equipment

Ref.-No.	Equipment	Type	Serial-No.	Version of Firmware or Software during the test
001	EMI Test Receiver	ESS	825132/017	Firm.= 1.21 , OTP=2.0, GRA=2.0
012	Signal Generator (EMS-cond.)	SMY 01	839069/027	Firm.= V 2.02
013	Power Meter (EMS cond.)	NRVD	839111/003	Firm.= V 1.51
017	Digital Radiocommunication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT = D2.87 13.01.99
053	Audio Analyzer	UPA3	860612/022	Firm. V 4.3
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	Firm.= V 3.1DHG
140	Signal Generator	SMHU	831314/006	Firm.= 3.21
261	Thermal Power Sensor	NRV-Z55	825083/0008	EPROM-Datum 02.12.04, SE EE 1 B
262	Power Meter	NRV-S	825770/0010	Firm.= 2.6
263	Signal Generator	SMP 04	826190/0007	Firm.=3.21
264	Spectrum Analyzer	FSEK 30	826939/005	Bios=2.1, Analyzer= 3.20
295	Racal Digital Radio Test Set	6103	1572	UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04, SW-DSP=1.02, Hardboot=1.02, Softboot=2.02
298	Univ. Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f. all band used
323	Digital Radiocommunication Tester	CMD 55	825878/0034	Firm.= 3.52 .22.01.99
331	Climatic Test Chamber -40/+80 Grad	HC 4055	43146	TSI 1.53
335	CTC-EMS-Conducted	System EMS Conducted	-	EMC 32 V 8.52
340	Digital Radiocommunication Tester	CMD 55	849709/037	Firm.= 3.52 .22.01.99
355	Power Meter	URV 5	891310/027	Firm.= 1.31
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Eprom Data = 31.03.08
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	Firm. UCS 500=001925/3.06a02, rc=ISMIEC 4.10
371	Bluetooth Tester	CBT32	100153	CBT V5.30+ SW-Option K55, K57
377	EMI Test Receiver	ESCS 30	100160	Firm.= 2.30, OTP= 02.01, GRA= 02.36
378	Broadband RF Field Monitor	RadiSense III	03D00013SNO-08	Firm.= V.03D13
383	Signal Generator	SME 03	842 828 /034	Firm.= 4.61
389	Digital Multimeter	Keithley 2000	0583926	Firm. = A13 (Mainboard) A02 (Display)
392	Radio Communication Tester	MT8820A	6K00000788	Firm.= 4.50 #005, IPL=4.01#001,OS=4.02#001, GSM=4.41#013, W-CDMA= 4.54#004, scenario= 4.52#002
436	Univ. Radio Communication Tester	CMU 200	103083	R&S Test Firmware Base=5.14, Mess-Software= GSM:5.14 WCDMA:5.14 (current Testsoftw. F. all band
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	EMC 32 Version 8.52
442	CTC-SAR-EMS	System EMS field (SAR)	-	EMC 32 Version 8.40
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	Spuri 7.2.5 or EMC 32 Ver. 8.53
444	CTC-FAR-EMS field	System-EMS-Field (FAR)	-	EMC 32 Version 8.40
460	Univ. Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used,
489	EMI Test Receiver	ESU40	1000-30	Firmware=4.43 SP3, Bios=V5.1-16-3, Spec. =01.00
491	ESD Simulator dito	ESD dito	dito307022	V 2.30
524	Voltage Drop Simulator	VDS 200	0196-16	Software Nr: 000037 Version V4.20a01
526	Burst Generator	EFT 200 A	0496-06	Software Nr. 000034 Version V2.32
527	Micro Pulse Generator	MPG 200 B	0496-05	Software-Nr. 000030 Version V2.43
528	Load Dump Simulator	LD 200B	0496-06	Software-Nr. 000031 Version V2.35a01
546	Univ. Radio Communication Tester	CMU 200	106436	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used
547	Univ. Radio Communication Tester	CMU 200	835390/014	R&S Test Firmware Base=V5.1403 (current Testsoftw., f. all band used, GSM = 5.14 WCDMA: = 5.14
584	Spectrum Analyzer	FSU 8	100248	2.82_SP3
597	Univ. Radio Communication Tester	CMU 200	100347	R&S Test Firmware Base=5.01, GSM=5.02 WCDMA= not installed, Mainboard= µP1=V.850
598	Spectrum Analyzer	FSEM 30 (Reserve)	831259/013	Firmware Bios 3.40 , Analyzer 3.40 Sp 2
620	EMI Test Receiver	ESU 26	100362	4.43_SP3
642	Wideband Radio Communication Tester	CMW 500	126089	Setup V03.26, Test programm component V03.02.20
692	Bluetooth Tester	CBT 32	100236	CBT V 5.40, FW: V.2.41 (FPGA Digital, V. 3.09 FPGA RF)

8.0.2. Single instruments and test systems

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
001	EMI Test Receiver	ESS	825132/017	Rohde & Schwarz	12 M	-	31.03.2015
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	31.03.2015
007	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	31.03.2015
009	Power Meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	24 M	-	31.03.2015
016	Line Impedance Simulating Network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	31.03.2016
020	Horn Antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36/12 M	-	31.03.2017
021	Loop Antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	31.03.2015
030	Loop Antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2015
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	31.03.2015
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	pre-m	1a	
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-10EEK	5	Wainwright GmbH	12 M	1g	31.07.2015
086	DC - power supply, 0 -10 A	LNG 50-10	-	Heinzinger Electronic	pre-m	2	
087	DC - power supply, 0 -5 A	EA-3013 S	-	Elektro Automatik	pre-m	2	
090	Helmholtz coil: 2x10 coils in series	Helmholtz coil: 2x10 coils in	-	RWTÜV	12 M	4	31.03.2015
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	31.03.2015
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	31.03.2015
110	USB-LWL-Converter	OLS-1	-	Ing. Büro Scheiba	-	4	
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	BOCONSULT	36 M	-	31.03.2016
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	36 M	-	31.03.2015
140	Signal Generator	SMHU	831314/006	Rohde & Schwarz	24 M	-	31.03.2016
248	attenuator	SMA 6dB 2W	-	Radiall	pre-m	2	
249	attenuator	SMA 10dB 10W	-	Radiall	pre-m	2	
252	attenuator	N 6dB 12W	-	Radiall	pre-m	2	
256	attenuator	SMA 3dB 2W	-	Radiall	pre-m	2	
257	hybrid	4031C	04491	Narda	pre-m	2	
260	hybrid coupler	4032C	11342	Narda	pre-m	2	
261	Thermal Power Sensor	NRV-Z55	825083/0008	Rohde & Schwarz	24 M	-	31.03.2016
262	Power Meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	31.03.2016
263	Signal Generator	SMP 04	826190/0007	Rohde & Schwarz	36 M	-	31.03.2016
264	Spectrum Analyzer	FSEK 30	826939/005	Rohde & Schwarz	12 M	-	31.03.2015
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	31.03.2016
266	Peak Power Sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	31.03.2016
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH	pre-m	2	
270	termination	1418 N	BB6935	Weinschel	pre-m	2	
271	termination	1418 N	BE6384	Weinschel	pre-m	2	
272	attenuator (20 dB) 50 W	Model 47	BF6239	Weinschel	pre-m	2	
273	attenuator (10 dB) 100 W	Model 48	BF9229	Weinschel	pre-m	2	
274	attenuator (10 dB) 50 W	Model 47 (10 dB) 50 W	BG0321	Weinschel	pre-m	2	
275	DC-Block	Model 7003 (N)	C5129	Weinschel	pre-m	2	
276	DC-Block	Model 7006 (SMA)	C7061	Weinschel	pre-m	2	
279	power divider	1515 (SMA)	LH855	Weinschel	pre-m	2	
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	1c	31.07.2015
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH	12 M	1c	31.07.2015
298	Univ. Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	pre-m	3	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	12 M	-	31.03.2015
301	attenuator (20 dB) 50W, 18GHz	47-20-33	AW0272	Lucas Weinschel	pre-m	2	
302	horn antenna 40 GHz (Meas 1)	BBHA9170	155	Schwarzbeck	36 M	-	31.03.2017
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	36 M	-	31.03.2017
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	31.03.2016
342	Digital Multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	24 M	-	31.03.2015
347	laboratory site	radio lab.	-	-	-	5	
348	laboratory site	EMI conducted	-	-	-	5	
354	DC - Power Supply 40A	NGPE 40/40	448	Rohde & Schwarz	pre-m	2	
355	Power Meter	URV 5	891310/027	Rohde & Schwarz	24 M	-	31.03.2016
356	power sensor	NRV-Z1	882322/014	Rohde & Schwarz	24 M	-	31.03.2015
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24 M	-	31.03.2015
371	Bluetooth Tester	CBT32	100153	R&S	24 M	-	31.03.2016
373	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	100535	Rohde & Schwarz	24 M	-	31.03.2016
376	Horn Antenna 6 GHz	BBHA9120 E	BBHA 9120 E 179	Schwarzbeck	12 M	-	31.03.2015
377	EMI Test Receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	31.03.2015
389	Digital Multimeter	Keithley 2000	0583926	Keithley	24 M	-	31.03.2015
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	31.03.2015
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
436	Univ. Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	31.03.2015
439	UltraLog-Antenna	HL 562	100248	Rohde & Schwarz	36 M	-	31.03.2017
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR) Cable	-	CETECOM	12 M	5	31.03.2015
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-	-	ETS-Lindgren /	12 M	5	31.07.2015

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
		RSE		CETECOM			
448	notch filter WCDMA_FDD II	WRCT 1850.0/2170.0-5/40-	5	Wainwright Instruments GmbH	12 M	1c	31.07.2015
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-8SSK	1	Wainwright	12 M	1c	31.07.2015
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
456	DC-Power supply 0-5 A	EA 3013 S	207810	Elektro Automatik	pre-m	2	
459	DC -Power supply 0-5 A , 0-32 V	EA-PS 2032-50	910722	Elektro Automatik	pre-m	2	
460	Univ. Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	31.03.2015
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	31.03.2016
467	Digital Multimeter	Fluke 112	89680306	Fluke USA	36 M	-	31.03.2015
468	Digital Multimeter	Fluke 112	90090455	Fluke USA	36 M	-	31.03.2015
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
480	power meter (Fula)	NRVS	838392/031	Rohde & Schwarz	24 M	-	31.03.2015
482	filter matrix	Filter matrix SAR 1	-	CETECOM (Brl)	-	1d	
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-10P	1244554	Miteq	12 M	-	31.07.2015
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR) NSA	-	ETS Lindgren / CETECOM	24 M	-	30.06.2015
489	EMI Test Receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	31.03.2015
502	band reject filter	WRCG 1709/1786-1699/1796-	SN 9	Wainwright	pre-m	2	
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright	pre-m	2	
512	notch filter GSM 850	WRCA 800/960-02/40-6EEK	SN 24	Wainwright	12 M	1c	31.07.2015
517	relais switch matrix	HF Relais Box Keithley	SE 04	Keithley	pre-m	2	
523	Digital Multimeter	L4411A	MY46000154	Agilent	24 M	-	31.03.2015
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	pre-m	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	pre-m	2	
546	Univ. Radio Communication Tester	CMU 200	106436	R&S	12 M	-	12.02.2015
547	Univ. Radio Communication Tester	CMU 200	835390/014	Rohde & Schwarz	12 M	-	31.03.2015
548	Digital-Barometer	GBP 2300	without	Greisinger GmbH	36 M	-	30.06.2015
549	Log-Per-Antenna	HL025	1000060	Rohde & Schwarz	36/12 M	-	31.03.2015
552	high pass filter 2,8-18GHz	WHKX 2.8/18G-10SS	4	Wainwright	12 M	1c	31.07.2015
558	System CTC FAR S-VSWR	System CTC FAR S-VSWR	-	CTC	24 M	-	31.07.2015
574	Biconilog Hybrid Antenna	BTA-L	980026L	Frankonia	36/12 M	-	31.03.2016
584	Spectrum Analyzer	FSU 8	100248	Rohde & Schwarz	pre-m	-	
594	Wideband Radio Communication Tester	CMW 500	101757	Rohde & Schwarz	12 M	-	31.03.2015
597	Univ. Radio Communication Tester	CMU 200	100347	Rohde & Schwarz	36 M	-	31.03.2016
598	Spectrum Analyzer	FSEM 30 (Reserve)	831259/013	Rohde & Schwarz	24 M	-	13.01.2015
600	power meter	NRVD (Reserve)	834501/018	Rohde & Schwarz	24 M	-	31.03.2015
601	medium-sensitivity diode sensor	NRV-Z5 (Reserve)	8435323/003	Rohde & Schwarz	24 M	-	31.03.2015
602	peak power sensor	NRV-Z32 (Reserve)	835080	Rohde & Schwarz	24 M	-	31.03.2015
611	DC power supply	E3632A	KR 75305854	Agilent	pre-m	2	
612	DC power supply	E3632A	MY 40001321	Agilent	pre-m	2	
613	Attenuator	R416120000 20dB 10W	Lot. 9828	Radiall	pre-m	2	
616	Digitalmultimeter	Fluke 177	88900339	Fluke	24 M	-	31.03.2016
617	Power Splitter/Combiner	ZFSC-2-2-S+	S F987001108	Mini Circuits	-	2	
618	Power Splitter/Combiner	50PD-634	600994	JFW Industries USA	-	2	
619	Power Splitter/Combiner	50PD-634	600995	JFW Industries, USA	-	3	
620	EMI Test Receiver	ESU 26	100362	Rohde-Schwarz	12 M	-	31.03.2015
621	Step Attenuator 0-139 dB	RSP	100017	Rohde & Schwarz	pre-m	2	
625	Generic Test Load USB	Generic Test Load USB	-	CETECOM	-	2	
627	data logger	OPUS 1	201.0999.9302.6.4.1.4 3	G. Luft GmbH	36 M	-	30.05.2015
634	Spectrum Analyzer	FSM (HF-Unit)	826188/010	Rohde & Schwarz	pre-m	2	
636	Thermal Imaging camera	Ti32	Ti32-12060213	Fluke Corporation	36 M	-	31.07.2015
637	High Speed HDMI with Ethernet 1m	HDMI cable with Ethernet 1m	-	KogiLink	-	2	
638	HDMI Kabel with Ethernet 1,5 m flach	HDMI cable with Ethernet	-	Reichelt	-	2	
640	HDMI cable 2m rund	HDMI cable 2m rund	-	Reichelt	-	2	
641	HDMI cable with Ethernet	Certified HDMI cable with	-	PureLink	-	2	
642	Wideband Radio Communication Tester	CMW 500	126089	Rohde&Schwarz	12 M	-	31.03.2015
644	Amplifierer	ZX60-2534M+	SN865701299	Mini-Circuits	-	-	
670	Univ. Radio Communication Tester	CMU 200	106833	Rohde & Schwarz	12 M	-	31.03.2015
671	DC-power supply 0-5 A	EA-3013S	-	Elektro Automatik	pre-m	2	
678	Power Meter	NRP	101638	Rohde&Schwarz	pre-m	-	
686	Field Analyzer	EHP-200A	160WX30702	Narda Safety Test Solutions	24 M	-	18.07.2015
688	Pre Amp	JS-18004000-40-8P	1750117	Miteq	pre-m	-	
692	Bluetooth Tester	CBT 32	100236	Rohde & Schwarz	12 M	-	31.03.2015

8.0.3. Legend

Note / remarks		Calibrated during system calibration:
	1a	System CTC-SAR-EMS (Ref.-No. 442)
	1b	System-CTC-EMS-Conducted (Ref.-No. 335)
	1c	System CTC-FAR-EMI-RSE (Ref.-No . 443)
	1d	System CTC-SAR-EMI (Ref.-No . 441)
	1e	System CTC-OATS (EMI radiated) (Ref.-No. 337)
	1 f	System CTC-CTIA-OTA (Ref.-No . 420)
	1 g	System CTC-FAR-EMS (Ref.-No . 444)
	2	Calibration or equipment check immediately before measurement
	3	Regulatory maintained equipment for functional check or support purpose
	4	Ancillary equipment without calibration e.g. mechanical equipment or monitoring equipment
	5	Test System

Interval of calibration	12 M	12 month
	24 M	24 month
	36 M	36 month
	24/12 M	Calibration every 24 months, between this every 12 months internal validation
	36/12 M	Calibration every 36 months, between this every 12 months internal validation
	Pre-m	Check before starting the measurement
	-	Without calibration

9. Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2014-11-12
C1	RSS-210 standard included, split of photos into separate annexes	2014-12-11

10. Measurement diagrams

10.1. Diagrams of conducted emissions on AC-Power lines (Diagram group 01)

Diagram No. 1.01

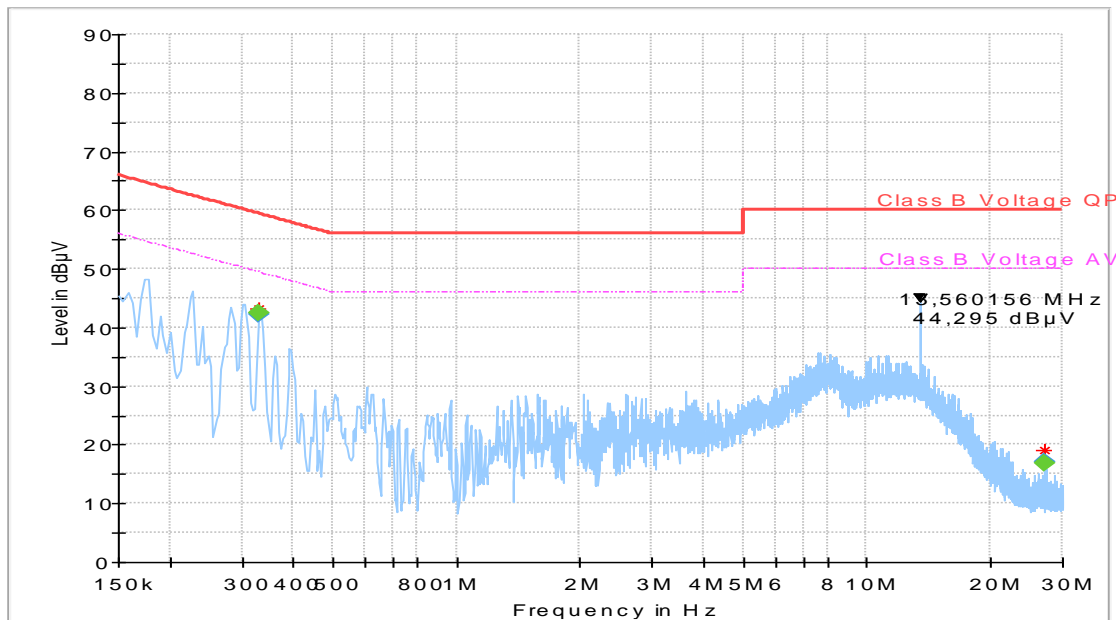
Common Information

Test Description:	Conducted Voltage Measurement Class B
Test Site & Location:	Conducted Emission, CETECOM GmbH Essen
Test Software:	R&S EMC32 v9.15
Test Specification:	FCC 15.107, FCC 15.207, RSS-Gen, Issue 4
Operating Mode:	RFID TX continuous on + Ping to PC + Prozess Reading of DUT
Measured on line:	N/L1
Diagram details:	Shows the peak values as a sum of measured ports in maxhold mode
Environmental Conditions:	Humidity: 53%RH; Temperature: 21°C
Operator:	KTa
Comments:	

EUT Information

Manufacturer:	Hach Lange GmbH
EuT:	TU5200LPG442.99.03022
-----	-----
HW Version:	See chapter 15
SW Version:	See chapter 15
Serial Number:	EMV Gerät NR. 7 ISO
Connected Interfaces:	AC/DC Power Supply + Lan cable + 2 x USB cable
Power Supply:	120V AC
Comments:	

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)
0.331094	42.33	---	59.42
0.331094	---	42.50	49.42
27.121250	17.08	---	60.00
27.121250	---	16.80	50.00

Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)
0.331094	42.33	---	59.42
0.331094	---	42.50	49.42
27.121250	17.08	---	60.00
27.121250	---	16.80	50.00

10.2. Radiated Magnetic Field Strength measurements (f<30MHz) (Diagram group 02)

Diagram No. 2.05

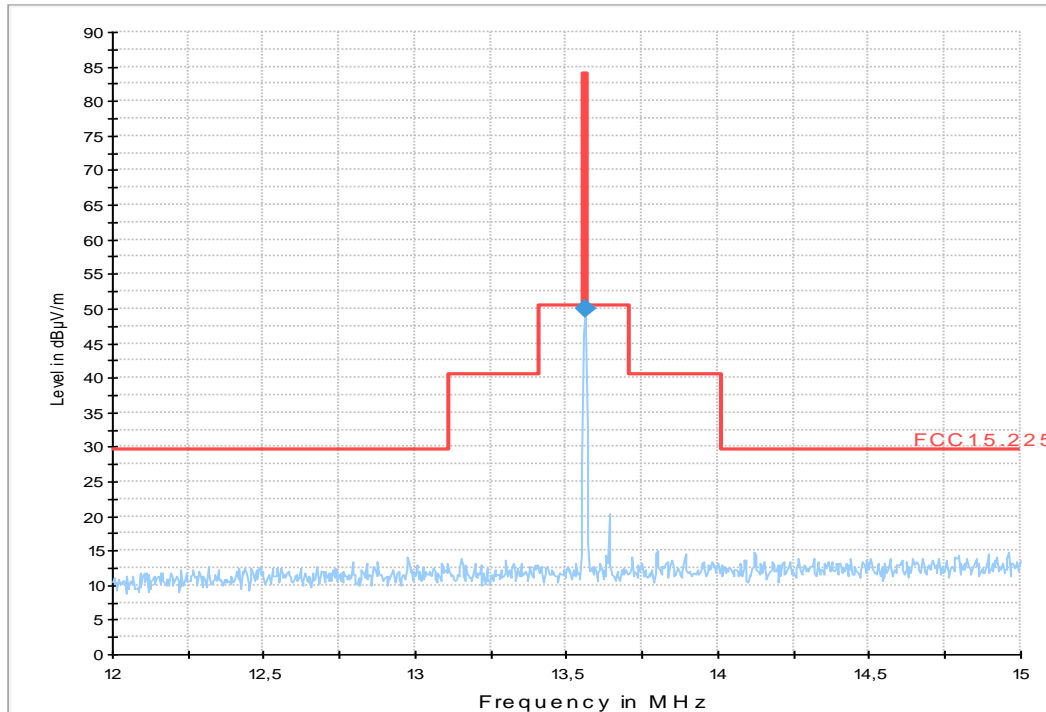
Date:	30.10.2014	Page 1 of 2
Test description:	Magnetic Field Strength Measurement related to 30 m distance	
Test site and distance:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance	
Version of Testsoftware:	EMC32 V8.51.0	
Distance correction:	used accord. table, pls. see test report	
Technical Data:	Please see page 2 for detailed data of measurement setup	
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation	
Used filter:	bypass	
Test specification:	FCC 15.225; RSS-210, Issue 8	
Operator:	Kmo	
Operating conditions:	TX-on - nominal channel, continuous, modulation on	
Power during tests:	120V/60Hz	
Comment 1:	nominal channel	

EUT Information

Manufacturer:	Hach Lange GmbH
EuT:	TU5200LPG442.99.03022

HW Version:	See chapter 15
SW Version:	See chapter 15
Serial Number:	EMV Gerät NR. 7 ISO
Connected Interfaces:	AC/DC Power Supply + Lan cable + 2 x USB cable
Power Supply:	120V AC
Comments:	

01_FCC15.209_magn hor+vert_In_Band_13.56MHz_no_kipp



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
13.561000	50.0	1000.0	10.000	H	36.0	0.4	34.00	84.00

Diagram No. 2.05b

Date: 30.10.2014 Page 1 of 2
 Test description: Magnetic Field Strength Measurement related to 30 m distance
 Test site and distance: Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
 Version of Test software: EMC32 V8.51.0
 Distance correction: used accord. table, pls. see test report
 Technical Data: Please see page 2 for detailed data of measurement setup
 Rec. antenna (pre-scan): height 1.00 m, parallel and 90° to EUT polarisation
 Used filter: bypass
 Test specification: FCC 15.225; RSS-210, Issue 8

Operator: Kmo
 Operating conditions: TX-on - nominal channel, continuous, modulation on
 Power during tests: 120V/60Hz
 Comment 1: nominal channel

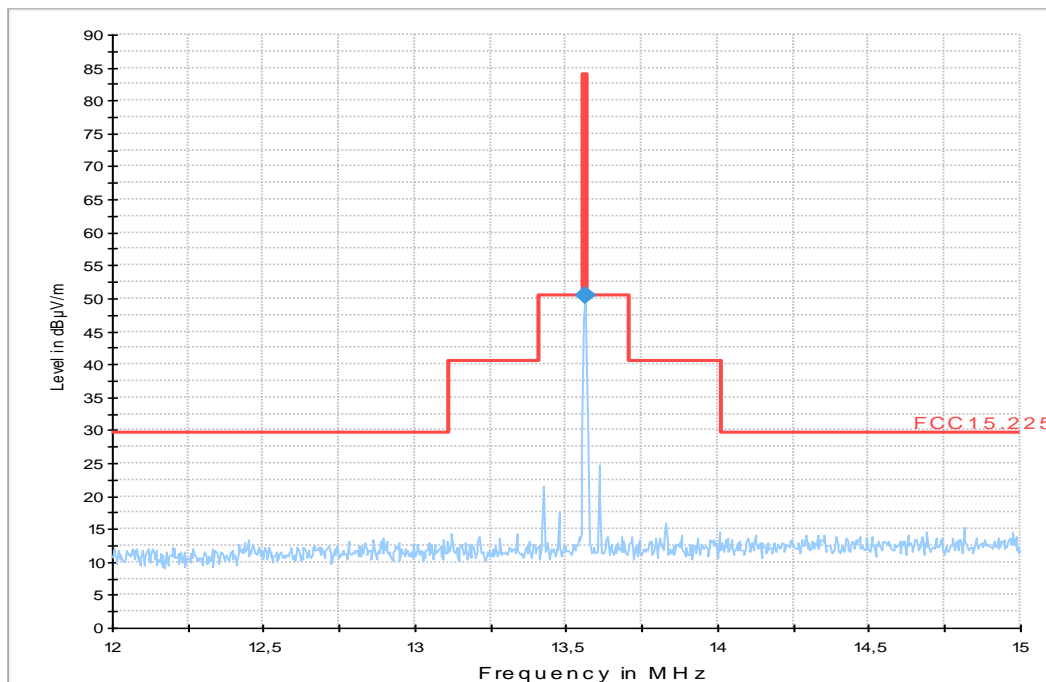
EUT Information

Manufacturer: Hach Lange GmbH
 EuT: TU5200LPG442.99.03022

HW Version: See chapter 15

SW Version: See chapter 15
 Serial Number: EMV Gerät NR. 7 ISO
 Connected Interfaces: AC/DC Power Supply + Lan cable + 2 x USB cable
 Power Supply: 120V AC
 Comments:

01_FCC15.209_magn hor+vert_In_Band_13.56MHz_no_kipp



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
13.561000	50.4	1000.0	10.000	H	306.0	0.4	33.60	84.00

Diagram No. 2.06

Common Information

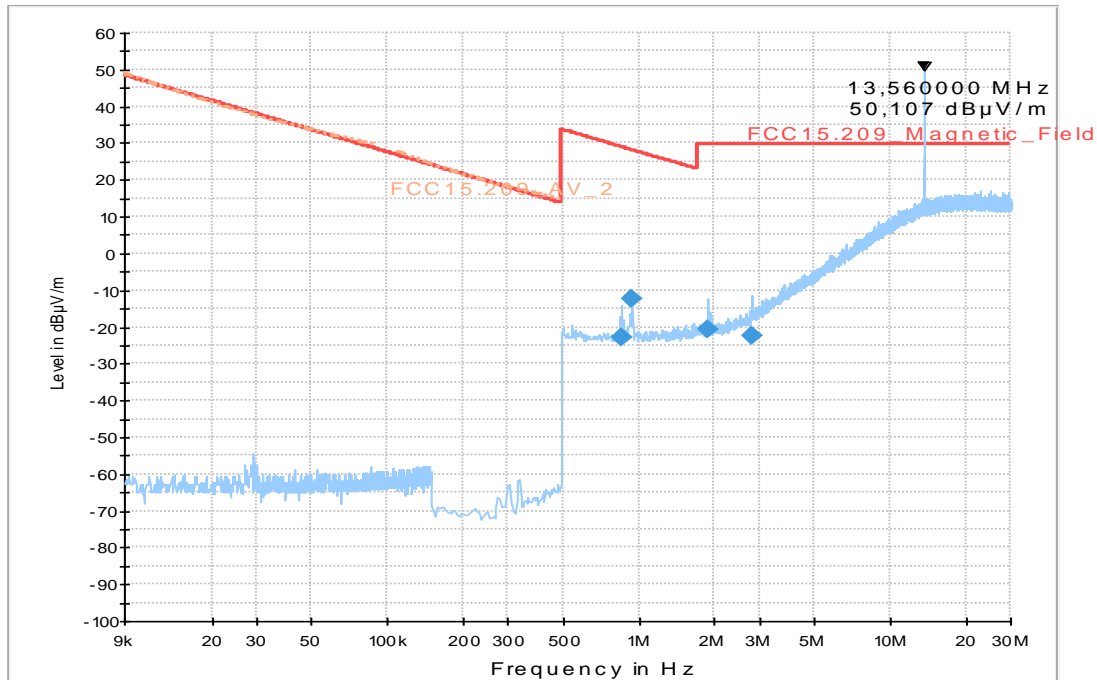
Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test site and distance:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Version of Testsoftware:	EMC32 V8.51.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test specification:	FCC 15.205 § 15.209; RSS-Gen: Issue 4
Operator:	Kmo/Lor
Operating conditions:	TX-on
Power during tests:	120V/60Hz
Comment 1:	Channel low/middle/high
Comment 2:	Carrier RFID on diagram -> not relevant for results

EUT Information

Manufacturer:	Hach Lange GmbH
EuT:	TU5200LPG442.99.03022

HW Version:	See chapter 15
SW Version:	See chapter 15
Serial Number:	EMV Gerät NR. 7 ISO
Connected Interfaces:	AC/DC Power Supply + Lan cable + 2 x USB cable
Power Supply:	120V AC 60 Hz
Comments:	

FCC 15.209_magn hor+vert



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.852000	-23.0	1000.0	10.000	H	106.0	-35.4	52.10	29.00
0.940000	-12.2	1000.0	10.000	H	135.0	-35.3	40.40	28.20
1.872000	-20.8	1000.0	10.000	H	128.0	-32.7	50.40	29.50
2.828000	-22.3	1000.0	10.000	H	123.0	-28.6	51.80	29.50

10.3. Diagrams of radiated field strength emissions, 30 MHz - 1 GHz (Diagram group 03)

Diagram No. 3.01_TX_RSE

31.10.2014 Page 1 of 1
 Test description: Electric Fieldstrength Measurement
 Test site and distance: Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
 Version of Test software: EMC32 V8.51.0
 Distance correction: not used
 Used filter: not used
 Technical Data: please see page 2 for detailed data of measurement setup
 Test specification.: FCC 15.209; RSS-Gen: Issue 4

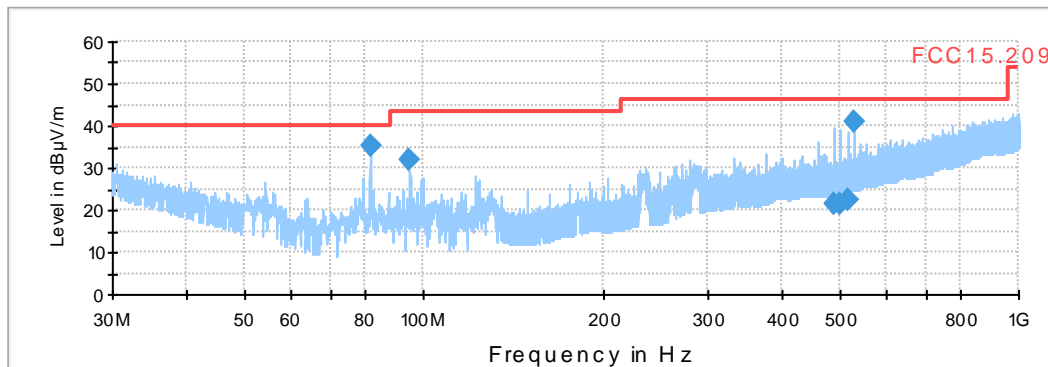
Operator: YZH
 Operating conditions: RFID TX-continuous on
 Power during tests: 120V/60Hz
 Comment 1: EUT standing position (intended use)

EUT Information

Manufacturer: Hach Lange GmbH
 EuT: TU5200LPG442.99.03022

HW Version: See chapter 15
 SW Version: See chapter 15
 Serial Number: EMV Gerät NR. 7 ISO
 Connected Interfaces: AC/DC Power Supply + Lan cable + 2 x USB cable
 Power Supply: 120V AC
 Comments:

01_FCC15.209_hor+vert_KP0



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
81.350000	35.2	1000.0	120.000	215.0	H	24.0	8.1	4.80	40.00
94.930000	32.0	1000.0	120.000	368.0	H	158.0	8.8	11.50	43.50
488.170000	21.6	1000.0	120.000	298.0	H	251.0	19.7	24.40	46.00
501.800000	21.6	1000.0	120.000	281.0	H	0.0	20.0	24.40	46.00
515.360000	22.6	1000.0	120.000	182.0	H	186.0	20.6	23.40	46.00
528.860000	40.8	1000.0	120.000	166.0	H	80.0	20.9	5.20	46.00

11. Annex: Information from customer regarding HW and SW

TU 5200 (Laborgerät):

P/N LPG442.99.03022 (ISO) ; S/N 1561346 (EMV-Gerät Nr. 7 ISO)

Hardware:

P/N Leiterplatte, bestückt	P/N Leiterplatte, Layout	Bezeichnung
ZBB034 F05	XMF845 Rev. F	Mainboard AU
ZBB036 F03	XMF848 Rev. E	Lid Detection
ZBB055 F01	XMF858 Rev. B	Heating Board
ZBB033 F02 *mod	XMF844 Rev. C	Mainboard TU 5200
ZBB040 F01	XMF850 Rev. A	Rechnermodul HL SODIMM
ZBB037 F01	XMF849 Rev. A	USB-Board BTL
ZBA975 Rev. 09 (RD-Q15-HL / Metratec)		RFID-Modul 13,56 MHz
LZV798 / XMU454 Rev. 04	External Power Supply	
XQB091 Rev. 02	Display 7" TFT LCD	
ZDA555 Rev. 02	FFC cable, folded	
HFK042 Rev. 01	EMI Spring backside	
HFK043 Rev. 01	EMI Spring frontside	
BVQ969.99.01210 Rev. 01	Analytical Unit (EPA/LAB/Autoverif)	bzw.
BVQ969.99.01220 Rev. 01	Analytical Unit (ISO/LAB/Autoverif)	

*mod = zweiter Ferrit WMR012 in Parallelschaltung ergänzt

Software:

P/N Software	Bezeichnung
YYX759 V0.83	Software AU Ladeprogramm
YYX760 V0.83	Software AU Gerätesoftware
YYX699 V6	Software DR3900/DR6000

VAP208 V0.05a (7/38/10/2/-/4/1) Testprogramm TU5200