TEST REPORT
No.: 2-20789055b/10

According to:
FCC Regulations
Part 15.209 & 15.247
IC Regulations
RSS-210, Issue 7
RSS-Gen, Issue 2

for

Everon Oy/AB

GSM/GPRS/GPS Watch helping device URG-BRA-002
+ Battery pack URG-BAT-002
FCC ID: YLO201001
IC: 9150A-201001

Laboratory Accreditation and Listings			
Deutscher Akkreditierungs Rat DAR DGA-PL-176/94-03	FCC Reg. No.: 99538 MRA US-EU 0003	Industry Canada Reg. No.: 3462D-1 3462D-2	VCCI Reg. No.: R-2665, R-2666 C-2914, T-339
accredited according to DIN EN ISO/IEC 17025			

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1. Summary of test results

The presented GSM/GPRS/GPS watch helping device, type URG-BRA-002, incorporates a already certified GSM/GPRS module from TELIT company with FCC-ID RI7GE864. In addition it incorporates also a transceiver working on one frequency (921.4MHz) within the 902-928MHz ISM frequency band. Pls. refer to the operating manual for further details.

The test results apply exclusively to the test samples as presented in chapter 3.1. 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.

Following tests have been performed to show compliance with applicable FCC Part 2 and Part 15 rules of the FCC CFR 47 (2010-1-09) and Industry Canada RSS-210 and RSS-Gen regulations.

1.1. Tests overview FCC Part 15 and Canada IC standards (RSS-210)

TEST CASES	PORT	REFERENCES & LIMITS			EUT set-up	EUT operating mode	Result
		FCC Standard	RSS Section	TEST LIMIT			
TX-Mode							
6dB Bandwidth	Antenna terminal (conducted)	§15.247(a)(1)	RSS-210, Issue 7: A8.2 (a)	Minimum 500kHz	4	1	Passed
99% occupied bandwidth	Antenna terminal (conducted)	--	RSS-210, Issue 7	99% Power bandwidth	4	1	Passed
Transmitter output power (conducted)	Antenna terminal (conducted)	§15.247(b)(1)	RSS-210, Issue 7: A8.4 (4)	0.125 Watt Peak	4	1	Passed
Transmitter Output power radiated	Cabinet (radiated)	§15.247(b)(4)	RSS-210, Issue 7: A8.4 (4)	< 4 Watt (EIRP) for antenna with directional gain less 6dBi	2	1	Passed
Out-Of-Band RF- emissions Band-Edge emissions (conducted)	Antenna terminal (conducted)	§15.247 (d)	RSS-210, Issue 7: A8.5	20 dBc	4	1	Passed
Power spectral density	Antenna terminal (conducted)	§15.247(e)	RSS-210, Issue 7: A8.2 (b)	8dBm in any 3kHz band	4	1	Passed

AC-Power Lines Conducted Emissions	AC-Power lines	§15.207	RSS-Gen, Issue 2, Chapter 7.2.2	FCC §15.207 limits IC: Table 2, Chapter 7.2.2	1	1+2	Passed
General field strength emissions + restricted bands (radiated)	Cabinet + Interconnecting cables (radiated)	§15.247 (d) §15.205 §15.209	RSS-210, Issue 7 §2.6 + §2.7, Table 1,2	Emissions in restricted bands must meet the general field-strength radiated limits	1+2+3	1+2	Passed

RX Mode							
AC-Power Lines Conducted Emissions	AC-Power lines	§15.107	RSS-Gen, Issue 2: Chapter 7.2.2	FCC §15.107 class B limits §15.207 limits IC: Table 2, Chapter 7.2.2	--	--	Passed, remark 1
RECEIVER Radiated emissions	Cabinet + Interconnecting cables (radiated)	§15.109 §15.33 §15.35	RSS-Gen, Issue 2, Chapter 6(a)	FCC 15.109 class B limits IC-limits: Table 1, Chapter 6	--	--	Passed Remark 1
RECEIVER Conducted emissions	Antenna terminal (conducted)	§2.1051 §15.111	RSS-Gen, Issue 2, Chapter 6(b)	FCC: < 2nW IC: < 2 nW/4kHz (30<f<1000 MHz) < 5nW/4kHz (f> 1GHz)	--	--	Not applicable

Remark: 1.) See separate test report 2_20789055d_10 for measurements according Part 15, Subpart B.

ATTESTATION: I declare that all measurements were performed by me or under my supervision and that all measurements have been performed and are correct to my best knowledge and belief to Industry Canada standards. All requirements as shown in above table are met in accordance with enumerated standards.

.....
Dipl.-Ing. W. Richter
Responsible for testsection

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.....
Dipl.-Ing. C. Lorenz
Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

Company name: Address:	CETECOM GmbH Im Teelbruch 116 45219 Essen - Kettwig Germany
Laboratory accreditations/Listings:	DAR-Registration No. DGA-PL176/94-03 FCC-Registration No. 99538, MRA US-EU 0003 IC-Registration No. 3462D-1, 3462D-2 VCCI Registration No. R-2665,R-2666,C-2914,T-339
Responsible for testing laboratory:	Dipl.-Ing. W. Richter
Deputy:	Dipl.-Ing. J. Schmitt

2.2. Test location

2.2.1. Test laboratory "CTC"

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

2.3. Organizational items

Order No.:	20789055
Responsible for test report and project leader:	Dipl.-Ing. C. Lorenz
Receipt of EUT:	2010-07-05
Date(s) of test:	2010-07-05 to 2010-7-28
Date of report:	2010-08-12
Version of template: 09.06 _All.Dotm	

2.4. Applicant's details

Applicant's name:	Everon Oy/AB
Address:	Vakiotie 9 21420 Lieto Finland
Contact person:	Mr. Alain Moisan

2.5. Manufacturer's details

Manufacturer's name:	Varitron Technologies Inc.
Address:	4811 Chemin de la Savane St-Hubert, Quebec Canada, J3Y 9G1

3. Equipment under test (EUT)

3.1. Additional declaration and description of main EUT

Main function	GSM/GPRS/GPS watch helping device		
Type	URG-BRA-002		
GSM Frequency range (US/Canada -bands)	GSM 850: 824 – 849MHz (Uplink), 869-894MHz (Downlink) GSM1900: 1850-1910MHz (Uplink), 1930-1990MHz (Downlink)		
ISM Band frequency range	ISM Band 924.1 MHz transmitter, one channel, bandwidth>500kHz		
Type of modulation	GSM operating mode: GMSK 924.1MHz TX operating mode: FSK		
Number of channels (USA/Canada -bands)	GSM 850: 128 – 251, 125 channels GSM1900: 512 – 810, 300 channels		
EMISSION DESIGNATOR(S)	300KGXW (GSM) 921KF1D (TX at 921.4MHz)		
GSM Antenna	Integrated, no other information available		
921.4MHz TX antenna	Integrated, no other information available		
GPS antenna	Integrated, no other information available		
MAX PEAK Output Power: GSM 850 Radiated GSM1900	17.86 dBm 26.51 dBm		
MAX PEAK Output Power: GSM 1900 Conducted EDGE1900	Not tested, see initial certification/test report of the GSM/GPRS module with FCC-ID RI7GE864		
FCC-ID	YLO201001		
IC	9150A-YLO201001		
Installed option	☒ GSM900 and GSM1800 Bands ☒ battery charging option ☒ GPS receiver		
Power supply	1. Over integrated Li-Io battery 2. Operates while connected to a AC/DC adaptor		
Special EMI components	--		
EUT sample type	☐ Production	☒ Pre-Production	☐ Engineering

3.2. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	Power cable from AE1	DC-cable	--	--	1.86 m

3.3. 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	GSM/GPRS/GPS Watch helping device	URG-BRA-002	10-25-05-F1-01004608 IMEI: 357023006091327	05	1205
EUT B	GSM/GPRS/GPS Watch helping device	URG-BRA-002	10-25-05-F1-01004609	05	1205
EUT C	Battery pack (modified**)	URG-BAT-002	--	--	--

*) EUT short description is used to simplify the identification of the EUT in this test report.
**) modified chase in order not no influence the emissions

3.4. 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	Helms-Man AC/DC Adaptor	SCP0601200P	N20429	--	--

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

3.5.EUT set-ups

EUT set-up no.*)	Combination of EUT and AE	Remarks
Set. 1	EUT A + EUT C + AE 1	Measurements while connected to AC/DC adaptor and battery pack
Set. 2	EUT A	Measurements of EUT stand alone, powered by integral battery
Set. 3	EUT B + EUT C + AE 1	Measurements while connected to AC/DC adaptor and battery pack
Set. 4	EUT A	Conducted rf-measurements on antenna port

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

3.6. EUT operating modes

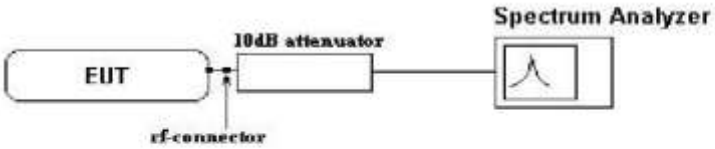
EUT operating mode no.*)	Description of operating modes	Additional information
op. 1	Transmit mode (TX)	Nominal channel = 921.4MHz Data rate=100kBps, FSK modulated Maximum possible duty-cycle set (approx 50%)
op. 2	Charging battery	Charging standard battery. This operating mode is combined with other op. modes.

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

4. DESCRIPTION OF TEST SET-UP's

4.1. Test Set-up for conducted measurements

The EUT was modified in order to facilitate for requested conducted measurements. The customer installs a suitable connector in order to make conducted measurements possible. EUT's RF-signal is first attenuated by 10dB before it is feed to the spectrum analyzer. The specific attenuation losses for the RF-signal path is determined within a path-loss calibration and the spectrum-analyzer readings corrected.



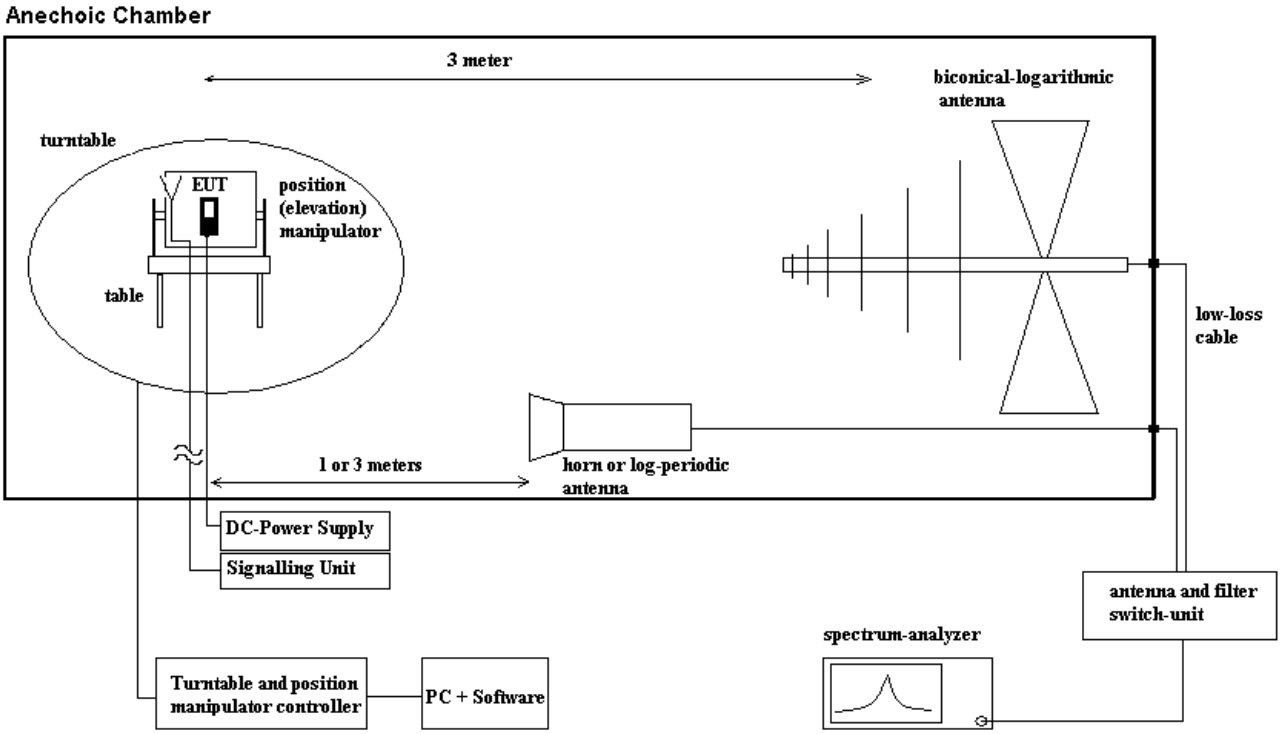
Test set-up: conducted for RF-tests

4.2. Test set-up for radiated measurements

Pls. see above description and schematic for the radiated measurements set-up.

The EUT and accessories are placed on a non-conducting tipping table of 0.8 meter height (semi-anechoic chamber) or 1.55m height (fully-anechoic chamber) which is situated in the middle of the turntable. The turntable can rotate the device under test 360 degree, the tipping table can rotate the device from laid to standing position. This way the device under test can be rotated in all three orthogonal planes in order to maximize the detected emissions. The turn- and tipping table are controlled by a controller unit. All positions manipulations are software controlled from a operator PC.
The measurements are performed for both receiving antenna polarisations: vertical and horizontal.

Up to 18GHz a measurement distance of 3 meters is used, above 18GHz the distance is 1 meter. A biconical-logarithmic antenna up to 1 GHz and a horn antenna for frequencies above 1 GHz used. (see equipment list)



Schematic: radiated measurements test set-up

5. Measurements

5.1. Conducted emissions on AC-Power lines §15.207, RSS-Gen 7.2.2

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

test location	☒ CETECOM Essen (Chapter 2.2.1)		☐ Please see Chapter 2.2.2		☐ Please see Chapter 2.2.3	
test site	☐ 333 EMI field	☒ 348 EMI cond.	☐ 334 EMS-field	☐ 335 EMS cond	☐ 347 Radio.lab.	☐ 337 OATS
receiver	☐ 001 ESS	☒ 377 ESCS 30	☐	☐	☐	☐
LISN	☒ 005 ESH2-Z5	☐ 007 ESH3-Z6	☐ 300 ESH3-Z5 & 50Ω used for AE		☐ no LISN for AE	☐
signaling	☐ 017 CMD 65	☐ 323 CMD 55	☐ 340 CMD 55			
signaling	☐ 298 CMU	☐ 460 CMU	☐ 295 RACAL	☐ 392 MT8820A		

STANDARDS AND LIMITS: PART 15, SUBPART B, §15.107, §15.207, CANADA: RSS-GEN:7.2.2, ANSI C63.10:2009

Frequency [MHz]	Conducted limit [dBµV] Class B	
	QUASI-Peak	AVERAGE
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50
Remark: * decreases with the logarithm of the frequency		

TEST CONDITION AND MEASUREMENT PROCEDURES TEST SET-UP

link to test system (if used):	☐ air link	☐ cable connection	
EUT-grounding	☒ none	☐ with power supply	☐ additional connection
Equipment set up	☒ table top (40 cm distance to reference ground plane (wall)		☐ floor standing EUT stands isolated on reference ground plane (floor)
Climatic conditions	Temperature: (23°C)		Rel. humidity: (54)%
EMI-Receiver (Analyzer) Settings	Span/Range: 150 kHz to 30 MHz RBW: 9 kHz Detector/Mode: Max PEAK-hold, repetitive scan for preliminary testing Quasi-Peak Detector and Average-Detector for final measurement according ANSI 63.10: 2009		

Devices which can be connected to the public AC-power network, should be tested against the radio frequency voltage conducted back into the AC-power line in the frequency range 150kHz to 30 MHz. 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 50Ohm/50µH line impedance stabilization network (LISN) is used therefore. The EUT power input leads are connected through the LISN to the AC-power source. The LISN enclosure is electrically connected to the GND-plane. The measuring instrument is connected to the coaxial output of the LISN.
Tabletop devices were set-up on a 80 cm height over 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/60Hz.
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.
Preliminary testing as a first step, determines the worst-case phase line (neutral or phase) as well as the most critical amplitude by changing the operating mode. A complete frequency-sweep is performed with PK-Detector.

Final testing for power phases and critical frequencies (Margin to AV- or QP limit lower than 3dB) as a second step includes measurements either on discrete frequency components with receivers detector set to Quasi-Peak and Average per frequency component or a complete sweet with corresponding detector.

MEASUREMENT RESULTS

EUT Type and S/N or EUT set-up no.		1			
EUT operating mode		1+2			
Diagram No.	Command or EUT operating mode or operating mode no.	Detector (Peak, CISPR AV, CISPR QP)	Power line (L1, L2, L3, N)	Additional (scan-) information (e.g. Pre-test Fast scan, Maxhold, Final measurement)	Result (passed / failed /final measurem . necessary)
1.05	EUT operating mode 1+2	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed

Remarks: pls. see annex A1 for detailed diagram

Margin to Limit for verdict: $M = L_T - R_R + C_{Loss}$

Abbreviations used:
- R_R : Receiver readings in dBµV
- C_{Loss}: cable loss
- L_T : Limit in dBµV

VERDICT

Passed

5.2. Radiated emissions, below 30 MHz §15.205 and §15.209, RSS210, RSS-gen

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

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☒ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☐ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☒ 001 ESS	☐	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
antenna	☐ 048 EMCO3143	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☒ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 298 CMU	☐ 460 CMU	☐ 295 RACAL	☒ 392 MT8820A		
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☐ 482 Filter Matrix		

STANDARDS AND LIMITS: CFR 47, PART 15, SUBPART B, §15.205, §15.209, ANSI C63.10: 2009

Frequency [MHz]	Field strength [µV/m]	Field strength [dBuV/m]	Measurement distance [meters]	Remarks
0.009 – 0.490	2400/f (kHz)	67.6 – 20Log(f) (kHz)	300	Correction factor used due to measurement distance of 3m
0.490 – 1.705	24000/f (kHz)	87.6 – 20 Log(f) (kHz)	30	Correction factor used due to measurement distance of 3m
1.705 – 30	30	29.54	30	Correction factor used due to measurement distance of 3m
Remark: * decreases with the logarithm of the frequency				

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	☐ air link	☐ cable connection	☐
EUT-grounding	☒ none	☐ with power supply	☐ additional connection
Equipment set up	☒ table top		☐ 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 (CISPR#16) Detector/ Mode: PEAK, TRACE max-hold mode, repetitive scan for exploratory measurements Quasi-Peak, for final measurement on critical frequencies (f<1GHz)		

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. 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 and 300m measurement distance. Therefore a additional extrapolation factor was used in order to normalize the measurement data. The frequency dependent extrapolation factor used for this reduced measurement distance, can be found in the chapter annexes.

MEASUREMENT RESULTS

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
3.02	16.915000	20.9	1000.0	10.000	1m	H	122.0	2.3	8.64	29.54 (QP)

Remark: see plots enclosed in annex A1

Margin to Limit:

$$M = L_T - R_R + C_F + D_F$$
$$= L_T - R_R + AF_{ANTENNA} + Cable_{LOSS} + D_F$$

Remark: positive margin means passed result

Abbreviations used:

- R_R : Receiver readings in dBµV/m
- C_F: Transducer in dB = AF (antenna factor) + CL (cable loss)
- D_F : distance correction factor (if different measurement distance used than specified in the standard
- L_T : Limit in dBµV/m

VERDICT

Summary of measurement results for radiated frequencies below 30 MHz: Passed

5.3. Radiated emissions, 30 MHz - 1 GHz §15.205 , §15.209, RSS210, RSS-Gen

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

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☒ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☐ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☒ 001 ESS	☐	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
antenna	☒ 048 EMCO3143	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☐ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 298 CMU	☐ 460 CMU	☐ 295 RACAL	☒ 392 MT8820A		
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☒ 482 Filter Matrix		

STANDARDS AND LIMITS: CFR 47, PART 15, SUBPART B, §15.109 (CLASS B), §15.209, ANSI C63.10:2009

Frequency [MHz]	Radiated emission limits, Class B, 3 meters		Radiated emission limits, Class A, 10 meters	
	QUASI-Peak [microvolts/meter]	QUASI-Peak [dBµV/m]	QUASI-Peak [microvolts/meter]	QUASI-Peak [dBµV/m]
30-88	100	40	90	39,0
88-216	150	43,5	150	43,5
216-960	200	46,0	210	46,4
above 960	500	54,0	300	59,5

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	☐ air link	☐ cable connection	☐
EUT-grounding	☒ none	☐ with power supply	☐ additional connection
Equipment set up	☒ table top 0.8m height		☐ floor standing
Climatic conditions	Temperature: (27°C)		Rel. humidity: (41)%
EMI-Receiver (Analyzer) Settings	Span/Range: 30 MHz to 1 GHz RBW/VBW: 120 kHz / (auto) Detector/ Mode: PEAK, TRACE max-hold mode, repetitive scan Quasi-Peak, for final measurement for critical measurements		

§15.205 - RESTRICTED BANDS OF OPERATION

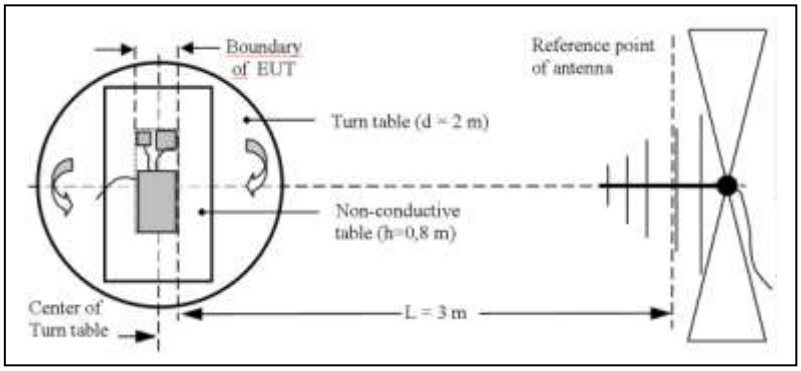
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825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

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

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) set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

MEASUREMENT METHOD (30 MHz<f <1 GHz):
A EMI analyzer together with a broadband antenna was used in order to identify the emissions from the EUT by positioning the antenna close to the EUT surfaces. The interconnecting cables and equipment position were varied in order to maximize the emissions. Then most critical frequencies are recorded for further investigations. Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's operating mode, cable position, etc. The EUT was placed on a non-conductive support of 0.8 m height. By rotating the turntable angle 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) and the measurement antenna height from 1 meter to 4 meters, the maximized emissions are recorded. The measurements are performed for both polarizations of the measuring antenna: horizontal and vertical.



RESULTS

a.) Restricted band of operation: spurious emissions falling <u>inside</u> restricted bands of operation (limits accord. §15.209 applicable)

Channel 921.4MHz

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.02	30..1000	<37.5 (PK) no peaks detected	10.0	120	1..4m	H/V	0..360	--	3.)	15.209 (QP)
2.03	30..1000	<37.5 (PK) no peaks detected	10.0	120	1..4m	H/V	0..360	--	3.)	15.209 (QP)

Remark:
1.) see also plots enclosed in Annex A1
2.) Wanted transmission signal on 921.4MHz on diagram
3.) All frequencies in the measurement range are with a level below the general limit of §15.209

Channel 921.4MHz

Set-up No.		1								
Operating Mode		1+2								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.30	30..1000	<28.52 (PK)	10.0	120	1..4m	H/V	0..360	--	3.)	15.209 (QP)
2.31	30..1000	<23.83 (PK)	10.0	120	1..4m	H/V	0..360	--	3.)	15.209 (QP)

Remark:
1.) see also plots enclosed in Annex A1
2.) Wanted transmission signal on 921.4MHz on diagram
3.) All frequencies in the measurement range are with a level below the general limit of §15.209

b.) Spurious emissions <u>outside</u> restricted bands of operation

Maximum field strength for set-up 2 in 3 m distance: 89.77 dBuV/m (PK) therefore limit is 20dBc: 69.77 dBuV/m

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.02	30..1000	<37.5 (PK) no peaks detected	10.0	120	1..4m	H/V	0..360	--	>20	69.77
2.03	30..1000	<37.5 (PK) no peaks detected	10.0	120	1..4m	H/V	0..360	--	>20	

Remark:
1.) see also plots enclosed in Annex A1
2.) Wanted transmission signal on 921.4MHz on diagram

Maximum field strength for set-up 1 in 3 m distance: 94.86 dBuV/m (PK value), therefore limit is 20dBc: 74.86 dBuV/m

Set-up No.		1								
Operating Mode		1+2								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.30	145.0	28.52 (PK)	10.0	120	1..4m	H/V	0..360	--	>20	74.86
2.31	56.90	22.40 (PK)	10.0	120	1..4m	H/V	0..360	--	>20	
	145.80	23.83 (PK)	10.0	120	1..4m	H/V	0..360	--	>20	

Remark:
1.) see also plots enclosed in Annex A1
2.) Wanted transmission signal on 921.4MHz on diagram

Margin to Limit:

$$M = L_T - R_R + C_F + D_F$$
$$= L_T - R_R + AF_{ANTENNA} + Cable_{LOSS} + D_F$$

Remark: positive margin means passed result

Abbreviations used:

- R_R : Receiver readings in dBµV/m
- CF: Transducer in dB = AF (antenna factor) + CL (cable loss)
- D_F : distance correction factor (if different measurement distance used than specified in the standard
- L_T : Limit in dBµV/m

VERDICT

Passed

5.4. Radiated emissions, above 1GHz §15.205, §15.209, RSS-210, RSS-Gen

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

test site	☐ 441 EMI SAR	☐ 348 EMI cond.	☒ 443 EMI FAR	☐ 347 Radio.lab.	☐ 337 OATS	☐
equipment	☐ 331 HC 4055	☐	☐	☐	☐	☐
Spectr. analys.	☐ 138 139 FSBS	☐ 120 FSEM	☐ 264 FSEK	☒ 489 ESU	☐	☐
antenna meas	☒ 549 HL025	☐ 289 CBL 6141	☐ 439 HL 562	☐ 133 EMCO3115	☒ 302 BBHA9170	☐ 477 GPS
antenna meas	☐ 123 HUF-Z2	☐ 132 HUF-Z3	☐ 030 HFH-Z2	☐	☐	☐
antenna subst	☐ 071 HUF-Z2	☐ 020 EMCO3115	☐ 063 LP 3146	☐ 303 BBHA9170	☐	☐
power meter	☐ 009 NRV	☐ 010 URV5-Z2	☐ 011 URV5-Z2	☐	☐	☐
Signalgener.	☐ 008 SMG	☐ 140 SMHU	☐ 263 SMP04	☐	☐	☐
power meter	☐ 262 NRV-S	☐ 266 NRV-Z31	☐ 265 NRV-Z33	☐ 261 NRV-Z55	☐ 356 NRV-Z1	☐
DCpower	☐ 086 LNG50-10	☐ 087 EA3013	☐ 354 NGPE 40	☐ 349 car battery	☐ 350 Car battery	☐
multimeter	☐ 341 Fluke 112	☐	☐	☐	☐	☐
signaling	☐ 298 CMU	☐ 460 CMU	☐ 295 RACAL	☐ 392 MT8820A		

STANDARDS AND LIMITS: CFR 47, PART 15, SUBPART B, §15.109 (CLASS B), §15.209, ANSI C63.10: 2009

Frequency [MHz]	Radiated emission limits, 3 meters measurement distance			
	AV [microvolts/meter]	AV [dBµV/m]	Peak [microvolts/meter]	Peak [dBµV/m]
above 1GHz	500	54.0	5000	74.0

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	☐ air link	☐ cable connection	☐
EUT-grounding	☒ none	☐ with power supply	☐ additional connection
Equipment set up	☒ table top 1.5m height		☐ floor standing
Climatic conditions	Temperature: (26,8°C)		Rel. humidity: (43)%
Spectrum-Analyzer settings	Span/Frequency range :	1..10 GHz +single frequencies determined in step 1	
	RBW/VBW:	1 MHz / 3 MHz	
	Detector/ Mode:	Peak/AV, MAX-hold, repetitive scan for exploratory measurement	
		PEAK/ AVERAGE, for final measurement for critical frequencies	
	Antenna Polarisation	Horizontal / Vertical	

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 placed on a non-conductive positioning table of 0.8 or 1.5 meter height depending from the frequency range. The measuring distance was set to 3 meter for frequencies up to 18GHz and 1 meter above 18GHz.
The EUT was set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

1. **Step exploratory measurement**: see above description as in the frequency range lower 1GHz.
2. **Step Final Measurement(1 GHz<f <18 GHz)**: On the Worst-Case EUT configuration, frequency components with a margin lower than 6 dB to the limits, will be re-measured by maintaining the EUT's operating mode, cable position, etc.. For find the worst-case emission, the turntable was changed in the range 0 to 360 degree and the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurements are performed for both polarizations of the measuring antenna: horizontal and vertical.

RESULTS:

c.) **Spurious emissions <u>outside restricted bands of operation</u> accord. §15.205**

Channel 921.4MHz: Maximum field strength for set-up 1 in 3 m distance: 94.86 dBuV/m (Peak value), therefore Limit is 20dBc: 74.86 dBuV/m

Set-up No.		3								
Operating Mode		1+2								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.11	1842.90	60.1 (PK)	100.0	1000.0	155.0	V	256.0°	32.7	14.76	74.86
	1960.5	55.76 (PK)	10.0	1000.0	155.0	H/V	0..360°	--	19.1	
	1842.9	47.89 (AV)	10.0	1000.0	155.0	H/V	0..360°	--	--	
2.13	1757.5	55.13 (PK)	10.0	1000.0	155.0	H/V	0..360°	--	19.73	
	1842.4	60.8 (PK)	10.0	1000.0	155.0	H	310°	32.7	14.06	
	1842.9	49.2 (AV)	100.0	1000.0	155.0	H	307.0°	32.7	--	
	2432.5	62.83 (PK)	10.0	1000.0	155.0	H/V	0..360°	--	12.03	
	2561.0	62.69 (PK)	10.0	1000.0	155.0	H/V	0..360°	--	12.17	
2.12	5527.5	53.43 (PK)	10.0	1000.0	155.0	H	0..360°	--	21.43	
	5527.5	42.71 (AV)	10.0	1000.0	155.0	H	0..360°	--	--	
	6448.5	50.52 (PK)	10.0	1000.0	155.0	H	0..360°	--	>20	
	6449.0	37.37 (AV)	10.0	1000.0	155.0	H	0..360°	--	--	
	9215.5	39.41 (AV)	10.0	1000.0	155.0	H	0..360°	--	--	
2.14	5529.5	50.55 (PK)	10.0	1000.0	155.0	H	0..360°	--	>20	
	5527.5	40.07 (AV)	10.0	1000.0	155.0	H	0..360°	--	--	

Remark: 1.) diagrams shows PK/AV detector measurements
2.) see plots enclosed in annex A1

d.) Restricted band of operation: spurious emissions <u>falling inside</u> restricted bands of operation (limits accord. §15.209 applicable)

Channel 921.4MHz

Set-up No.		3								
Operating Mode		1+2								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (CF)	Margin (dB) (M)	Limit (dBµV/m) (LT)
2.11	1415.50	53.1 (PK)	100.0	1000.0	155.0	V	67.0°	29.6	>20	74.0 (PK)
	1563.60	53.4 (PK)	100.0	1000.0	155.0	V	106.0°	30.7	>20	
2.13	1387.0	50.93 (PK)	10.0	1000.0	155.0	H/V	0..360°	--	>20	
2.12	4095.0	44.09 (PK)	10.0	1000.0	155.0	H/V	0..360°	--	>20	74.0 (PK)
	4606.5	47.89 (PK)	10.0	1000.0	155.0	H/V	0..360°	--	>20	
	9487.0	52.84 (PK)	10.0	1000.0	155.0	H/V	0..360°	--	>20	
	3686.5	32.61 (AV)	10.0	1000.0	155.0	H	0..360°	--	>20	54.0 (AV)
	4608.0	34.12 (AV)	10.0	1000.0	155.0	H	0..360°	--	19.88	
	7372.5	37.62 (AV)	10.0	1000.0	155.0	H	0..360°	--	16.38	
2.14	4606.5	34.59 (PK)	10.0	1000.0	155.0	H	0..360°	--	>20	74.0 (PK)

Remark: 1.) diagrams shows PK/AV detector measurements
2.) see plots enclosed in annex A1

Margin to Limit:

$$M = L_T - R_R + C_F + D_F$$
$$= L_T - R_R + AF_{ANTENNA} + Cable_{LOSS} + D_F$$

Remark: positive margin means passed result

Abbreviations used:

- R_R : Receiver readings in dBµV/m
- CF: Transducer in dB = AF (antenna factor) + CL (cable loss)
- D_F : distance correction factor (if different measurement distance used than specified in the standard
- L_T : Limit in dBµV/m

VERDICT

Passed

5.5. 6-dB Bandwidth FCC 15.247 (2), RSS-210: A8.2(a)

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

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
otherwise	☒530 10dB Attenuator			☒ Radio lab cable K15		

REFERENCES: §15.247(2), RSS210: A8.2(a)

(1) *Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.*

(2) *DSSS Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.*

EUT SETTINGS:

The EUT was instructed to send with maximum power (if adjustable) according applicants instructions. A modified software was used to give the maximum possible duty-cycle.
Different modulation characteristics have been checked, e.g. data rates which EUT can operate.

MEASUREMENT METHOD:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2009
The measurement was performed with the RBW set to 10kHz. The span was set to cover the complete carrier. A DELTA Marker method was set to measure the bandwidth compared to the reference level.

Also the **99% emission bandwidth** was measured in order to verify the calculated emission class and necessary bandwidth. At first approximation the necessary bandwidth and 99% bandwidth should be equal. 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.

SETTINGS ON SPECTRUM-ANALYZER:

Span	Set as to fully display the emissions and approximate 20dB below the PEAK level
Resolution Bandwidth (RBW)	Set to approx 1% to 3% of the emission width = 10kHz chosen
Video Bandwidth (VBW)	3 times the resolution bandwidth = 30kHz
Sweep time	Coupled and low enough to have no gaps within power envelope
Detector	Sample (if bin width: Span/no. of frequency points SA < 0.5*RBW SA otherwise Peak detector)
Sweep mode	Repetitive Mode, MAX-HOLD

RESULTS:

Set-up no.: 4 Op. Mode: 1	**6-dB BANDWIDTH** **@** 921.4MHz channel
T_{NOM} =24°C V_{NOM} = 4.2 V	
Results	525.64 kHz

Remark: see diagrams in annex A1

Set-up no.: 4 Op. Mode: 1	**99% EMISSION BANDWIDTH** @ 921.4MHz channel
T_{NOM} =24°C V_{NOM} = 4.2 V	
Results	921.15kHz

Remark: see diagrams in annex A1

VERDICT: pass

5.6. Power specification FCC 15.247 (b)(3), RSS-210: A8.4(4)

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

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☒ 443 System CTC-FAR-EMI-		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 489 ESU	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒ 530 10dB Attenuator			☒ Radio lab cable K15		

REFERENCE: §15.247(B)(3)

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(1) For frequency hopping systems (FHHS) operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
(3) For systems using digital modulation (DSSS) in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ANTENNA CHARACTERISTICS:

☒ Directional Gain < 6 dBi (measured: difference between measured conducted and radiated eirp. power)
☐ Directional Gain > 6 dBi (measured / applicant's declaration) -> conducted power reduction necessary

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.

MEASUREMENT METHOD:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2009
The power was also checked for different data rates, modulation scheme or packet types if applicable.

SETTINGS ON SPECTRUM-ANALYZER:

Center Frequency	Nominal channel frequency
Span	25 MHz
Resolution Bandwidth (RBW)	5 MHz > 6dB-Bandwidth of the signal
Video Bandwidth (VBW)	10MHz
Sweep time	coupled
Detector	Peak, Max hold mode
Sweep Mode	Repetitive mode

5.6.1. **CONDUCTED MEASUREMENT: MAX. PEAK POWER**

- Maximum declared antenna gain [isotropical]: no information available

RESULTS

MAX PEAK POWER (conducted)	
Set-up no.: 4 Op. Mode: 1	@921.4MHz nominal
Measured Peak power [dBm]	5.94dBm
Correction factor- Path loss: [dB] 10dB Attenuator+ Cable attenuation	10.02dB (set as offset in SA)
Limit	1 Watt (30dBm)

VERDICT: passed

5.6.2. RADIATED MEASUREMENT: MAX. E.I.R.P POWER

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

test site	☐ 441 EMI SAR	☐ 348 EMI cond.	☒ 443 EMI FAR	☐ 347 Radio.lab.	☐ 337 OATS	☐
equipment	☐ 331 HC 4055	☐	☐	☐	☐	☐
Spectr. analys.	☐ 489 ESU	☐ 120 FSEM	☒ 264 FSEK	☐ 489 ESU	☐	☐
antenna meas	☐ 048 3143	☐ 289 CBL 6141	☐ 439 HL 562	☐ 133 EMCO3115	☐ 302 BBHA9170	☒ 549 HL025
antenna meas	☐ 123 HUF-Z2	☐ 132 HUF-Z3	☐ 030 HFH-Z2	☐	☐	☐
antenna subst	☐ 071 HUF-Z2	☐ 020 EMCO3115	☐ 063 LP 3146	☐ 303 BBHA9170	☐	☐
power meter	☐ 009 NRV	☐ 010 URV5-Z2	☐ 011 URV5-Z2	☐	☐	☐
Signalgener.	☐ 008 SMG	☐ 140 SMHU	☐ 263 SMP04	☐	☐	☐
power meter	☐ 262 NRV-S	☐ 266 NRV-Z31	☐ 265 NRV-Z33	☐ 261 NRV-Z55	☐ 356 NRV-Z1	☐
DCpower	☐ 086 LNG50-10	☐ 087 EA3013	☐ 354 NGPE 40	☐ 349 car battery	☐ 350 Car battery	☐

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 if applicable.

MEASURING METHOD 1: The method is according ANSI/TIA/EIA-603-C-2004 and consist of two steps.

First step: The maximum power was recorded by turning the EUT continuously 360 degree steps, the EUT in horizontal (laying) and vertical (standing) position. Measurements have been performed with the measurement antenna set to horizontal and vertical polarisation. The spectrum analyzer was set to MAX-PEAK Detector, MAX-Hold Mode. The RBW used was bigger than the 20-dB bandwidth of the EUT and set to 3 MHz. VBW set to 10MHz with coupled sweep time. The maximum trace peak value was recorded.

Second step: a horn antenna was set instead of the EUT and connected to the signal generator. The level was adjusted such as the same level as in step 1 could be reached. The conducted power delivered to the antenna was measured and the value corrected with the known antenna eirp gain.

RADIATED MEASUREMENT: MAX. EIRP POWER

Transmitting nominal frequency = 921.4MHz	
Set-up no.: 2 Op. Mode: 1	-7.14 dBm ERP

Remark:--

The difference between the conducted and radiated Max. PK-Power gives the antenna gain at the investigated channel/frequency.

Measured antenna gain (rough approximation) = -7.14 dBm ERP - 5.94dBm = - 13.08dB ERP = - 10.94dBi

VERDICT: pass, (antenna gain < 6 dBi)

5.7. 20dBc Emission specification FCC 15.247 (d), RSS-210: A8.5

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

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 489 ESU	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒ 530 10dB Attenuator			☒ Radio lab cable K15		

REFERENCES: §15.247, §15.205, RSS-210e: A8.5

(d) *In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.*

EUT SETTINGS:

The EUT was instructed to send continuous mode, with maximum power (if adjustable) according applicants instructions.

MEASUREMENT METHOD:

The frequency spectrum was investigated for **conducted** spurious emissions values lower than 20dB related to the RF-carrier power value. The detector were chosen according §15.209(d). The video bandwidth (VBW) was chosen 10 times the resolution bandwidth (RBW). The frequency scan was up to 10 times the highest channel frequency within the operational mode. The spectrum-analyzer was set to MAX-PEAK Detector, MAX-Hold Mode.

The EUT was instructed to send with maximum power (if adjustable) according applicants instructions.

Set-up no.: 4 Op. Mode: 1	**RF-CONDUCTED TEST: 20 dBc SPURIOUS EMISSIONS**	
Frequency Range	Nominal channel@921.4MHz Level Reference (In-Band) = 112.50 dBµV/m	
	Frequency [MHz]	Margin to 20dBc-limit (=92.50dBuV/m) [dB]
30 .. 925MHz	52.03 53.1 52.55	> 59.4
0.92 GHz .. 10 GHz	1839.42	> 20.22

Remark: for results please see diagrams enclosed in annex A1

The limit on the diagrams is 20dB under the reference level measured In-Band

VERDICT: pass

5.8. Power Spectral Density (PSD) FCC 15.247(e), RSS-210: A8.3

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

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 489 ESU	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒ 530 10dB Attenuator			☒ Radio lab cable K15		

REFERENCES: §15.247(E), RSS-210:A8.3

(e) *For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.*

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.

MEASUREMENT METHOD:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2009, chapter 6.11.2.3.
First a frequency sweep around nominal carrier frequency is performed over the complete power envelope of the signal with PEAK detector, MAX hold mode. The maximum peak is located and the frequency recorded. With the nominal frequency set to the determined frequency in the step before, a new frequency sweep is performed with a lower span, increased sweep time and a resolution bandwidth of 3kHz. External path loss was set as an offset in the spectrum-analyzer. Therefore the measured value is corrected due to external set-up and the resulting value is compared with the standard requirement.

RESULTS

Set-up no.: 4 Op. Mode: 1	**POWER SPECTRAL DENSITY** [dBm/3Khz]
	Nominal channel@921.4MHz nominal
Measured Level [dBm/3kHz]	1.21dBm/3kHz @921.163141026MHz
Correction factor- Path loss: [dB] Cable attenuation 10dB attenuator	10.02dB (set as offset in SA)
Limit	< 8dBm/3kHz

Remark: see diagrams enclosed in Annex A1

VERDICT: pass

5.9. Band-Edge compliance measurements, FCC 15.247(d), RSS-210: A8.5

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

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☒ 443 System CTC-FAR-EMI-		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 489 ESU	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒ 530 10dB Attenuator			☒ Radio lab cable K15		

MEASUREMENT METHOD:

At the Band-Edges at 902/928MHz the value should be at least 20dB under the Reference Value as determined In-Band. This was verified both conducted and radiated. RBW was set to 100kHz and the peak values recorded.

EUT SETTINGS:
For DTS systems the measurement was performed with different modulation, e.g. data rates to find worst-case, if applicable.

RESULTS

Conducted

Set-up no. : 4 Op. Mode: 1			
T_{NOM} = 24°C V_{NOM} = 4.2V	Fundamental value IN-BAND [dBµV]	Value at Band-Edges (not restricted accord. §15.205) [dBµV]	Verdict
Nominal channel@921.4MHz	112.50 (PK)	902MHz: 56.34 (PK) 928 MHz: 64.51 (PK)	Passed

Radiated

Set-up no.: 2 Op. Mode: 1			
T_{NOM} = 24°C V_{NOM} = 4.2V	Fundamental field strength value IN-BAND [dBµV/m]	Value at Band-Edges (not restricted accord. §15.205) [dBµV/m]	Verdict
Nominal channel@921.4MHz	89.77 (PK)	902MHz: 46.54 (PK) 30.2 (QP) 928 MHz: 46.05 (PK) 33.1 (QP)	Passed

Remark: compare diagram 2.02a and 2.03a enclosed in annex A1

VERDICT: passed

5.10. 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.

Measurement	Frequency range	Calculated uncertainty based on a confidence level of 95%	Remarks:
RF-Power Output conducted	9 kHz .. 20 GHz	1.0 dB	--
RF-Power Output radiated	30 MHz .. 4 GHz	3.17 dB	Substitution method
Conducted RF-emissions on antenna ports	9 kHz .. 20 GHz	1.0 dB	--
Radiated RF-emissions enclosure	150 kHz .. 30 MHz	5.0 dB	Magnetic field
	30 MHz .. 1 GHz	4.2 dB	E-Field
	1 GHz .. 18GHz	4.8 dB	E-Field
	1 GHz .. 20 GHz	3.17 dB	Substitution method
Occupied bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker method)	Frequency error
		1 dB	Power
Emission bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker method)	Frequency error
		1 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. Instruments and Ancillary

6.1. Used equipment "CTC"

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

6.1.1. 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	Communication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT Firmware D2.87
053	audio analyzer	UPA3	860612/022	Firm. V 4.3
119	RT harmonics analyser/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,
298	Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f.
323	Communication 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	System-CTC-EMS-Conducted	System EMS Conducted	-	EMS-K1 Immunity Test-Software 1.20SR10
340	Communication 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 V4.6.1 + SW-Option K55
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,
441	System CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	EMC 32 Version 8.10,10
442	System CTC-SAR-EMS	System EMS field (SAR)	-	EMS-K1 Immunity-Software 1.20SR10
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	Spuri 7.2.5
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	EMS-K1 Immunity-Software 1.20SR10
460	Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=5.14/Messsoftware=
489	emi test receiver	ESU40	1000-30	Firmware=4.33, Bios=V5.1-16-3, Specification=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

6.1.2. 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	-	31.03.2011
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	31.03.2011
007	DC - LISN (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	31.03.2011
009	power meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	12 M	-	31.03.2011
012	signal generator (EMS-cond.)	SMY 01	839069/027	Rohde & Schwarz	36/12 M	-	31.03.2011
013	power meter (EMS cond.)	NRVD	839111/003	Rohde & Schwarz	24 M	-	31.03.2011
014	insertion unit (EMS cond.)	URV5-Z2	838519/029	Rohde & Schwarz	24 M	-	31.03.2011
015	insertion unit (EMS cond.)	URV5-Z4	838570/024	Rohde & Schwarz	24 M	-	31.03.2011
016	line impedance simulating network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	31.03.2013
017	Communication Tester	CMD 60 M	844365/014	Rohde & Schwarz	12 M	-	31.03.2011
021	loop antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	31.03.2013
022	audio measurement amplifier	2636C	1537643	Brüel & Kjaer	12 M	-	31.03.2011
030	loop antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2012
031	absorbing clamp	MDS-21	863325/015	Rohde & Schwarz	24 M	-	31.03.2011
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	31.03.2011
048	bicon. - log. antenna (SAR)	3143	1108	EMCO	36/12 M	-	30.04.2011
049	current clamp (injection)	F-120-2	48	FCC	12 M	-	31.03.2011
050	3-ph coupling-decoupling-netw. (Burst)	CDN 300	176	Schaffner	12 M	-	31.03.2011
051	VHF-current probe 20-300 MHz	ESV-Z1	872421	Rohde & Schwarz	36 M	-	31.03.2012
052	notch filter DECT	WRCB 1887,82/1889,55SS	12	Wainwright Industries	pre-m	-	
053	audio analyzer	UPA3	860612/022	Rohde & Schwarz	36 M	-	31.03.2011
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	-	1a	30.05.2011
058	capacitive clamp (Burst)	IP 4	99	Hafely	-	4	
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
063	log.-per. antenna (Subst 1)	3146	860941/007	EMCO	36/12 M	-	31.10.2010
067	coupling decoupling-network	CDN801-M2/M3	272	Lüthi	12 M	-	31.03.2011
068	coupling decoupling-network	CDN 801-M5	95226	Lüthi	12 M	-	31.03.2011
069	EM - clamp	EM101	9535159	Lüthi	36 M	-	31.03.2013
071	biconical antenna (Subst 1)	HUF-Z2	863.029/010	Rohde & Schwarz	36/12 M	-	31.10.2010
072	coupling decoupling-network	CDN801-M2/M3	276	Lüthi	12 M	-	31.03.2011
083	AC - power supply, 0-10 A	EAC/MT 27010	910502096	EURO TEST	pre-m	2	
084	AC - power supply, 0-5 A	ELABO-8-34214	-	ELABO	pre-m	2	
085	AC - power supply, 0-10 A	R250	-	Schunterm.&Benningh.	pre-m	2	
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	-	-	RWTÜV	pre-m	4	
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
094	artificial head (No.1)	4905	1566990	Brüel & Kjaer	pre-m	2	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	31.03.2012
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	31.03.2012
110	USB-LWL-Converter	OLS-1	-	Extreme USB	-	4	
119	RT harmonics analyser/dig. flickermeter	B10	G60547	BOCONSULT	36 M	-	31.03.2013
123	biconical antenna (Subst 2)	HUF-Z2,	860941/007	Rohde & Schwarz	36/12 M	-	30.09.2010
131	RF-Current Probe	F-52	19	FCC	12 M	-	31.03.2011
132	log.-per. antenna (Subst 2)	HUF-Z3	860862/014	Rohde & Schwarz	36/12 M	-	31.10.2010
133	horn antenna 18 GHz (Meas 1)	3115	9012-3629	EMCO	36/12 M	-	31.03.2010
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	12 M	-	31.03.2011
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	12 M	-	31.03.2012
140	signal generator	SMHU	831314/006	Rohde & Schwarz	24 M	-	31.03.2012
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	24/12 M	-	31.03.2012
262	power meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	31.03.2012
263	signal generator	SMP 04	826190/0007	Rohde & Schwarz	36 M	-	31.03.2013
264	spectrum analyzer	FSEK 30	826939/005	Rohde & Schwarz	12 M	-	31.03.2011
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	31.03.2012
266	peak power sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	31.03.2012
268	AC/DC power supply	EA 3050-A	9823636	-	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	
284	coupling decoupling network	CDN 801-M1	1661	Lüthi	12 M	-	31.03.2011
285	coupling decoupling network	CDN 801-S1	1642	Lüthi	12 M	-	31.03.2011
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	-	31.03.2011
289	bicon. - log. antenna (OATS)	CBL 6141	4107	Schaffner Chase	36/12 M	-	31.10.2010
295	Racal Digital Radio Test Set	6103	1572	Racal	24 M	3	30.11.2010
296	audio measurement amplifier	2636C	R=316568/004	Brüel & Kjaer	18 M	-	31.03.2011
298	Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	12 M	-	31.03.2011
299	audio microphone	134	-	Brüel & Kjaer	pre-m	2	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	12 M	-	31.03.2011

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
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	-	31.03.2011
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	36 M	-	31.03.2011
304	fix dipole antenna 1,6 GHz	EMCO 3125-307	9907-1001	ETS	24/12 M	-	31.03.2011
305	fix dipole antenna 1,8-2,0 GHz	EMCO 3125-306	9907-1001	ETS	24/12 M	-	31.03.2011
306	fix dipole antenna 2,45 GHz	EMCO 3125-308	9907-1001	ETS	24/12 M	-	31.03.2011
307	fix dipole antenna 3 GHz	EMCO 3125-309	9907-1001	ETS	24/12 M	-	31.03.2011
317	1000 Hz calibrator 94 dB SPL	4230 94dB	1542286	Brüel & Kjaer	12 M	-	31.03.2011
323	Communication Tester	CMD 55	825878/0034	Rohde & Schwarz	12 M	-	31.03.2011
331	climatic test chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	31.10.2010
335	System-CTC-EMS-Conducted	System EMS Conducted	-	Rohde & Schwarz	12 M	5	30.05.2010
340	Communication Tester	CMD 55	849709/037	Rohde & Schwarz	12 M	-	31.03.2011
341	digital multimeter	Fluke 112	81650455	Fluke	24 M	-	31.03.2012
342	digital multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	24 M	-	31.03.2011
344	adaptor 150/50 Ohm	150/50	-	Krohne	12 M	-	31.03.2011
345	adaptor 150/50 Ohm	150/50	-	Krohne	12 M	-	31.03.2011
347	laboratory site	radio lab.	-	-	-	3	
348	laboratory site	EMI conducted	-	-	-	3	
349	car battery 12 V	car battery 12 V	without	-	-	3	
350	car battery 12 V	car battery 12 V	without	-	-	3	
354	DC - power supply 40A	NGPE 40/40	448	Rohde & Schwarz	pre-m	-	
355	power meter	URV 5	891310/027	Rohde & Schwarz	12 M	-	31.03.2011
356	power sensor	NRV-Z1	882322/014	Rohde & Schwarz	24 M	-	31.03.2011
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24 M	-	31.03.2011
358	Power Amplifier 10 kHz-220MHz	AR75A220M1	15860	Amplifier Research	12 M	1b	30.04.2011
362	TOSM Calibration Kit 50 Ohm	ZV-Z21/ZV-Z11	without	Rohde&Schwarz	12 M	-	31.03.2011
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Rohde & Schwarz	24 M	-	31.03.2012
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	EM-Test	12 M	-	31.03.2011
367	audio measurement amplifier	2636	316832/001	Brüel & Kjaer	12 M	-	31.03.2011
369	insertion unit (SAR-EMS, Ch. A)	URV5-Z2	100301	Rohde & Schwarz	24 M	-	31.03.2011
370	insertion unit (SAR-EMS, Ch. B)	URV5-Z2	100302	Rohde & Schwarz	24 M	-	31.03.2011
371	Bluetooth Tester	CBT32	100153	R&S	12 M	-	31.03.2011
373	V-Network 5µH/50 Ohm	ESH3-Z6	100535	Rohde & Schwarz	12 M	-	31.03.2011
374	power amplifier 0,8-3 GHz	60S1G3	306528	Amplifier Research	-	1a	30.05.2011
375	directional coupler	DC7144M1	306498	Amplifier Research	-	1a	30.05.2011
376	horn antenna 6 GHz	BBHA9120 E	BBHA 9120 E 179	Schwarzbeck	12 M	-	31.03.2011
377	emi test receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	31.03.2011
378	broadband RF field monitor	RadiSense III	03D00013SNO-08	DARE B.V.	12 M	-	31.03.2011
383	signal generator	SME 03	842 828 /034	Rohde & Schwarz	36 M	-	31.03.2013
386	coupling decoupling network	CDN USB/p	19397	Schaffner	12 M	-	31.03.2011
387	coupling decoupling network	CDN L-801 M2	2051	Lüthi	12 M	-	31.03.2011
388	coupling decoupling network	CDN L-801 T2	1929	Lüthi	12 M	-	31.03.2011
389	digital multimeter	Keithley 2000	0583926	Keithley	24 M	-	31.03.2011
390	Industry Acoustic System	MO 2000 Set	2127100123	Sennheiser	-	4	
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	31.03.2011
394	power amplifier 80-1000 MHz	BLWA 0810-250/200	045610	Bonn-Elektronik	-	1a	30.05.2011
399	Sound Calibrator	Sound Calibrator 4231	2665101	Bruel & Kjaer	12 M	-	31.03.2011
400	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5559	Lüthi	36 M	-	31.03.2012
401	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5560	Lüthi	36 M	-	31.03.2012
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
439	UltraLog-Antenna	HL 562	100248	Rohde + Schwarz	12 M	-	30.04.2011
440	CDN for Datacable	CDN-UTP	CDN-UTP 029	EMC Partner AG,	24 M	-	31.03.2012
441	System CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	ETS	12 M	5	31.08.2010
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	ETS-Lindgren/Cetecom	12 M	5	30.03.2011
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	ETS Lindgren/Cetecom	12 M	5	30.05.2011
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
455	Oscilloscope	HP 54602B	US 350 336 45	Hawlett Packard	-	4	
456	DC-Power supply 0-5A	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	Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	31.03.2011
462	AF-Generator	MX-2020	-	Conrad	-	4	
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	digital multimeter	Fluke 112	89210157	Fluke USA	24 M	-	31.03.2012
467	digital multimeter	Fluke 112	89680306	Fluke USA	24 M	-	31.03.2012
468	digital multimeter	Fluke 112	90090455	Fluke USA	24 M	-	31.03.2012
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
480	power meter (Fula)	NRVS	838392/031	Rohde & Schwarz	24 M	31	
482	filtermatrix	FilterMatrix SAR 1	-	CETECOM (Brl)	-	1d	
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR)	-	ETS	12 M	-	31.10.2010
489	emi test receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	31.03.2011
491	ESD Simulator dito	ESD dito	dito307022	EM-Test	24 M	-	31.03.2011
498	Power Supply	NGPE 40/40	402	Rohde & Schwarz	-	2	
500	industry Acoustic System	MO 2000 Set	100048	Sennheiser	-	4	
502	band reject filter	WRCG 1709/1786-	SN 9	Wainwright	-	2	
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright	-	2	
517	relais switc matrix	HF Relais Box Keithley	SE 04	-	2		
523	Digitalmultimeter	L4411A	MY46000154	Agilent	24 M	-	31.03.2011
524	Voltage Drop Simulator	VDS 200	0196-16	EM Test	24 M	-	31.03.2011
525	Koppelnetzwerk	CNA 200	1196-01	EM Test	24 M	-	31.03.2011
526	Burst Generator	EFT 200 A	0496-06	EM Test	24 M	-	31.03.2011
527	Micro Pulse Generator	MPG 200 B	0496-05	EM Test	24 M	-	31.03.2011
528	Load Dump Simulator	LD 200B	0496-06	EM Test	24 M	-	31.03.2011
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	-	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	pre-m	2	
531	H-field system	Lackman System	without	Lackmann	-	2	

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
533	Impedance Stabilization Network	ISN T200A	25706	Teseq	12 M	-	31.03.2011
534	Impedance Stabilization Network	ISN T400A	24881	Teseq	12 M	-	31.03.2011
535	Impedance Stabilization Network	ISN T800	26321	Teseq	12 M	-	31.03.2011
536	Impedance Stabilization Network	ISN ST08	25867	Teseq	12 M	-	31.03.2011
541	Impedance Stabilization Network	ISN T8-Cat6	26373	Teseq Berlin	12 M	-	31.03.2011
549	Logarithmic-Per. Antenna	HL025	100060	Rohde & Schwarz	36/12M		10.03.2012
558	System CTC FAR S-VSWR	System CTC FAR S-	-	12 M	-	-	31.08.2010

6.1.3. 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-spurious emission (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

7. Annex – 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