

PARTIAL TEST REPORT
No.: 3-0071-13-6-4a-C1

According to:
FCC Regulations
Part 15.109, Part 15.247
Part 1.1310, Part 2.1091

IC-Regulations
RSS-Gen, Issue 3, RSS-210, Issue 8
RSS-102, Issue 4

for

Harman Becker Automotive Systems, Inc.

Automotive Infotainment Head Unit VP4 GT
(Bluetooth®)

FCC-ID: QNG-BE2810
IC: 6434C-BE2810

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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Table of contents

1. SUMMARY OF TEST RESULTS.....	3
1.1. Tests overview of US FCC and Canada IC (RSS) Standards	3
2. ADMINISTRATIVE DATA	5
2.1. Identification of the testing laboratory	5
2.2. Test location	5
2.3. Organizational items	5
2.4. Applicant's details	5
2.5. Manufacturer's details	5
3. EQUIPMENT UNDER TEST (EUT).....	6
3.1. Technical data of main EUT declared by applicant	6
3.2. EUT: Type, S/N etc. and short descriptions used in this test report	6
3.3. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions	7
3.4. EUT set-ups	7
3.5. EUT operating modes	7
3.6. Configuration of cables used for testing	8
4. DESCRIPTION OF TEST SYSTEM SET-UP'S	9
4.1. Test system set-up for radiated magnetic field measurements below 30 MHz	9
4.2. Test system set-up for radiated electric field measurement 30 MHz to 1 GHz	10
4.3. Test system set-up for radiated electric field measurement above 1 GHz	11
5. MEASUREMENTS	12
5.1. General Limit - Radiated field strength emissions below 30 MHz	12
5.2. General Limit - Radiated field strength emissions, 30 MHz - 1 GHz.....	14
5.3. General Limit - Radiated emissions, above 1 GHz.....	16
5.4. Radiated Band-Edge compliance, field strength measurements accord. §15.205.....	18
5.5. RF-Parameter - Radiated measurement max. E.I.R.P. power	20
5.6. Radio frequency exposure evaluation	21
5.7. Measurement uncertainties	22
6. ABBREVIATIONS USED IN THIS REPORT	22
7. ACCREDITATION DETAILS OF CETECOM'S LABORATORIES AND TEST SITES	23
8. INSTRUMENTS AND ANCILLARY.....	24
8.1. Used equipment "CTC"	24
9. VERSIONS OF TEST REPORTS (CHANGE HISTORY)	29

Table of annex

Total pages

Annex 1: External photographs of EUT, document TR3-0071-13-6-4a_A1-C1	5
Annex 2: Test set-up photographs, document TR3-0071-13-6-4a_A2-C1	4
Annex 3: Internal photographs of EUT, document TR3-0071-13-6-4a_A3-C1	8
Annex 4: Measurement diagrams, document TR3-0071-13-6-4a_A4-C1	17

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.

A RF module unit with W-LAN and Bluetooth functionality, manufactured by Wistron NeWeb Corporation (WNC) is integrated into the EUT and declared by the applicant as FCC certified with FCC-identifier NKRUWMWBT-CWM01 (referenced to test report No.FR1D0821AA, No. FR1D0821AB issued by SPORTON International Inc. on 2011-12-22). Based on this already single modular certification, a partial test is considered for the tested unit.

The presented Equipment Under Test (in this report, hereinafter referred as EUT) integrates a Bluetooth® transceiver. Other implemented wireless technologies are not considered within this test report.

Following test cases have been performed to show compliance with applicable FCC Part 2 and Part 15 rules of the FCC CFR 47 Rules, Edition 1th October 2013 and IC RSS-210 Issue 8/ RSS-Gen Issue 3 standards.

1.1. Tests overview of US FCC and Canada IC (RSS) Standards

Test cases	Port	References and Limits			EUT set-up	EUT op. mode	Result
		FCC Standard	RSS Section	Test limit			
TX-Mode							
20 dB bandwidth	Antenna terminal (conducted)	§15.247 (a)(1)	RSS-210, Issue 8: A8.1 (a) (b)	At least 25 kHz or 2/3 of 20 dB bandwidth	--	--	Not tested within this test report 1.)
Channel carrier frequency separation					--	--	
*99% occupied bandwidth	Antenna terminal (conducted)	§2.1049	RSS-Gen, Issue 3: Chapter 4.6.1	99% Power bandwidth	--	--	Not tested within this test report 1.)
Channel use, average channel use, input bandwidth and synchronization between signals	--	§15.247 (a)(1)	RSS-210, Issue 8: A8.1	See specification	--	--	Not tested within this test report 1.)
Channel average Occupancy time and number of channels	Antenna terminal (conducted)	§15.247 (a)(1) (iii)	RSS-210, Issue 8: A8.1 (d)	0.4 seconds	--	--	Not tested within this test report 1.)
Transmitter Peak output power	Antenna terminal (conducted)	§15.247 (b)(1)	RSS-210, Issue 8: A8.4 (2)	< 125 mW	--	--	Not tested within this test report 1.)
Transmitter frequency stability	Antenna terminal (conducted)	--	RSS-Gen, Chapter 4.7	Operation within designated operational band	--	--	--
Transmitter Peak output power radiated	Cabinet (radiated)	§15.247 (b)(4)	RSS-210, Issue 8: A8.4 (4)	< 125 mW (EIRP) for antenna with directional gain less 6 dBi	1	1	Passed
Out-Of-Band RF- emissions Band-Edge emissions	Antenna terminal (conducted)	§15.247 (d)	RSS-210, Issue 8: A8.5	20 dBc	--	--	Not tested within this test report 1.)

General field strength emissions + restricted bands	Cabinet + Interconnecting cables (radiated)	§15.247 (d) §15.205 §15.209	RSS-210, Issue 3, Chapter 2.5 RSS-Gen: Issue 3: §7.2.5	FCC: Emissions in restricted bands must meet the general field-strength radiated limits as §15.205&15.209 IC: Table 3+5+6	1	1	passed
AC-Power Lines Conducted Emissions	AC-Power lines (conducted)	§15.207	RSS-Gen, Issue 3: Chapter 7.2.4	FCC §15.107 class B limits §15.207 limits IC: Table 4, Chapter 7.2.4	--	--	Not tested within this test report 1.)
RX Mode							
RECEIVER Radiated emissions	Cabinet + Inter-connecting cables (radiated)	§15.109 §15.33 §15.35	RSS-Gen, Issue 3: Chapter 6.1	FCC 15.109 class B limits IC-limits: Table 2, Chapter 6	1	2	passed

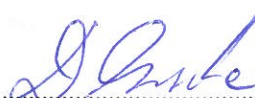
Remark: 1.) This is a partial report due an already certified integrated module in the device, please see comments on page 3.

TX-Mode							
Radio frequency Exposure EVALUATION (MPE)	Cabinet	§1.1310 §2.1091	RSS-102 Issue 4	§1.1310 Table 1B, Limits for General Population Exposure Limits and Exemptions: Chapter 2.5 & Chapter 4.2	--	--	Pass (based on calculations)

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.

The current version of the test report 3-0071-13-6-4a-C1, dated 2014-09-08 replaces the test report 3-0071-13-6-4a dated 2014-07-23.


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Responsible for test section


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

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:	2014-02-10
Date(s) of test:	2014-02-21 to 2014-03-05
Date of report:	2014-09-08

Version of template:	13.02 Lorenz

2.4. Applicant's details

Applicant's name:	Harman Becker Automotive Systems, Inc.
Address:	39001 West Twelve Mile Road Farmington Hills MI 48331 USA
Contact person:	Mr. Shain E. Chmura

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. Technical data of main EUT declared by applicant

Main function	Automotive Infotainment Unit with integrated Bluetooth® Transceiver		
Frequency range and channels (US/Canada -bands)	2402 MHz to 2480 MHz ☒ Ch. 0 to Ch. 78 ☐ Ch. 0 to Ch. 40		
Type of modulation (packet types)	☒ BT 1.0 / BT 1.1: DH1/DH3/DH5 – GFSK ☒ BT 2.0 / BT 2.1: DH1/2DH3/2DH5 – Pi/4 DQPSK ☒ BT 3.0: 3DH1/3DH3/3DH5 – 8DPSK ☐ BT 4.0: DH1/DH3/DH5 – GFSK		
Number of channels (USA/Canada -bands)	☒ 0 to 78 ☐ 0 to 40		
Antenna Type	☐ Integrated ☐ External, no RF- connector ☒ External, separate RF-connector		
Antenna Gain	Maximum 2 dBi gain according applicants information in 2.4 GHz band (<6dB accord. §15.247 and RSS-210: Issue 8)		
FCC-ID	FCC-ID: QNG-BE2810		
IC:	IC: 6434C-BE2810		
Installed options	☐ Cellular: GSM/(E)-GPRS/W-CDMA/LTE ☒ W-LAN, Bluetooth® ☐ battery charging option ☒ GPS (not tested within this test report) ☒ FM-Radio (Receiver only)		
Power supply	☐ Internal battery Li-Io, range 3.3V to 4.3 V (nominal 3.7 V) ☐ over AC/DC adapter: 120V/60 Hz ☒ 12V DC		
Special EMI components	--		
Firmware	☐ for normal use	☒ Special version for test execution	
FCC label attached	☐ yes	☒ no	

3.2. 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	Automotive Infotainment Head Unit	VP4 GT	SN-2	F149M 6163USA	trunk

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

3.3. 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	Always on Module FE120V14 (Harman Automotive CAN-Bus)	CCCRGW	0025795	035816	-
AE 2	CAN Gateway Harness	F149M Harman	-	-	-
AE 3	Main Wiring Harness	F149M	-	8.12.12a	-
AE 4	Bluetooth Antenna	F152 (25127)	286160	-	-
AE 5	Vehicle WiFi antenna	F152 (25127)	286161	ST.093	-
AE 6	USB cable	mini	1225-7196.1	-	-
AE 7	Belkin Ethernet cable	Cat5E	-	-	-
AE 8	USB-Ethernet Adapter	USB 300M	C4906N105122	-	-
AE 9	Notebook	D2120	#CTC062011	-	Windows 7+ Terminal Prg. + USB Driver

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

3.4. EUT set-ups

EUT set-up no. *)	Combination of EUT and AE	Remarks
set. 1	EUT A + AE 1 + AE 2 + AE 3 + AE 4 + AE 5 + (AE6) + (AE7) + (AE8) + (AE9)	Used for radiated tests. AE 6, AE7, AE8 and AE9 disconnected after successful establishment of communication link.

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

3.5. EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
op. 1	TX-Mode hopping off	With help of special test firmware <i>Tera Term</i> and provided commands a continuous traffic mode could be established with a Bluetooth base simulator from R&S CBT32. EUT switched to Test Mode in order to facilitate the testing.
op. 2	RX-Mode	With help of special test firmware <i>Tera Term</i> and provided commands RX-mode was set-up.

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

3.6. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	USB cable	mini	1225-7196.1	-	-
Cable 2	Belkin Ethernet cable	Cat5E	-	-	-
Cable 3	Main Wiring Harness	F149M	-	8.12.12a	-
Cable 4	CAN Gateway Harness	F149M Harman	-	-	-

4. Description of test system set-up's

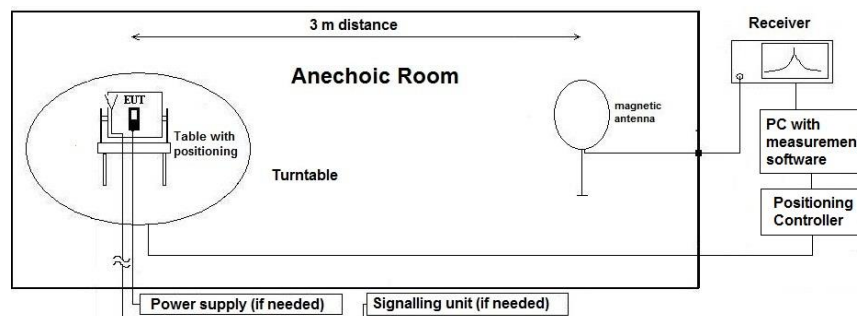
4.1. Test system set-up for radiated magnetic field measurements below 30 MHz

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

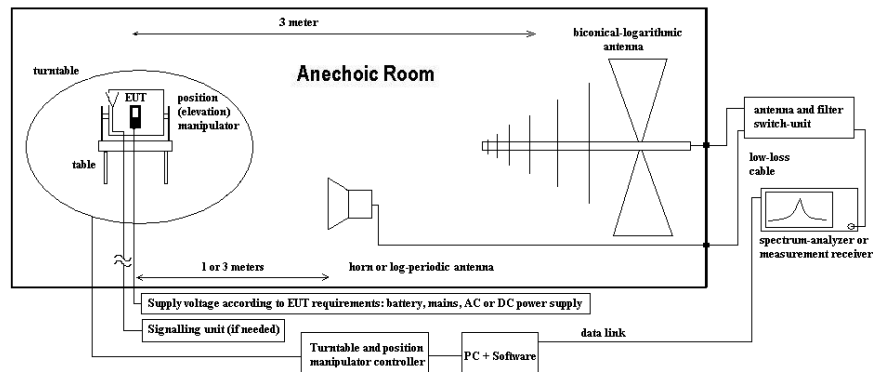
"Extrapolating Near-field emissions of low frequency loop transmitters".

4.2. 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

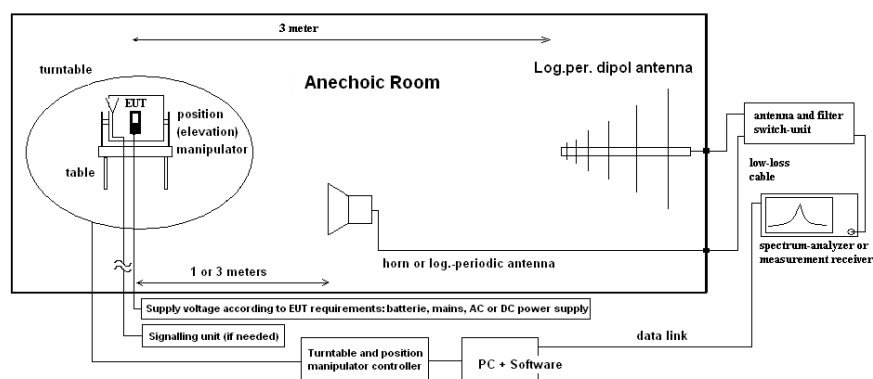
All units are dB-units, positive margin means value is below limit.

4.3. Test system set-up for radiated electric field measurement above 1 GHz

Specification: ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.6

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 CISPR 16-4 compliant fully anechoic room (FAR) recognized by the regulatory commissions. The measurement distance was set to 3 meter for frequencies up to 20 GHz and 1 meter above 20 GHz. The horn antenna is used for frequency range 1 GHz to 40 GHz. Due to use of a fully anechoic room the measurement antennas are set to fixed antenna height of 1.55 m (no height scan necessary) and the site validation criteria accord. ANSI63.10:2009 is fulfilled. The EUT is aligned within 3 dB beam width of the measurement antenna, on big EUTs several surface measurements are performed.

Schematic:



Testing method:

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.55 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 45°) 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.

The measurements are performed in horizontal and vertical polarization of the measurement antennas. 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 is fixed to 1.55 m.

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

Formula:

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

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

E_C = Electrical field – corrected value

E_R = Receiver reading

M = Margin

L_T = Limit

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor (if used)

G_A = Gain of pre-amplifier (if used)

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

5. Measurements

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

5.1.1. Test location and 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	☐ 347 Radio.lab.		☐	☐	
receiver	☐ 377 ESCS30	☒ 001 ESS	☐	☐	☐	☐	
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐	
antenna	☐ 574 BTA-L	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☒ 030 HFH-Z2	☐ 477 GPS	
signaling	☒ 371 CBT32	☐ 436 CMU	☐ 547 CMU	☐ 594 CMW			
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☐ 482 Filter Matrix	☐ 378 RadiSense		
DC power	☒ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40	
line voltage	☐ 230 V 50 Hz via public mains			☐ 060 120 V 60 Hz via PAS 5000			

5.1.2. Requirements

FCC	Part 15, Subpart C, §15.205 & §15.209			
IC	RSS-Gen., Issue 3: §7.2.5			
ANSI	C63.10-2009			
Frequency [MHz]	Field strength limit		Distance [m]	Remarks
	[μV/m]	[dBμV/m]		
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

5.1.3. Test condition and test set-up

Signal link to test system (if used):		☒ air link	☐ cable connection	☐ none
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 or Analyzer Settings	Scan data	☒ 9 – 150 kHz RBW/VBW = 200 Hz Scan step = 80 Hz ☒ 150 kHz – 30 MHz RBW/VBW = 9 kHz Scan step = 4 kHz ☐ other:		
	Scan-Mode	☒ 6 dB EMI-Receiver Mode ☐ 3dB Spectrum analyser Mode Peak (pre-measurement) and Quasi-PK/Average (final if applicable)		
	Detector Mode:	Repetitive-Scan, max-hold		
	Sweep-Time	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"		

5.1.4. Measurement Results

The results are presented below in summary form only. The EUT performed on middle channel. If critical peaks found (Margin <10 dB) the lowest and highest channels will be performed too. For more information please see the diagrams.

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	
2.01	Low	0	9 kHz-30 MHz	1	1	DH5 packet type	☒	☐	☐	Passed
2.02	High	78	9 kHz-30 MHz	1	1	3-DH5 packet type	☒	☐	☐	Passed

Remark: --

5.1.5. 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*”.

[illegible]

5.1.6. VERDICT: PASS

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

5.2.1. Test location and 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		
receiver	☐ 377 ESCS30 ☒ 001 ESS	☐ 489 ESU 40 ☐ 620 ESU 26	
spectr. analys.	☐ 584 FSU ☐ 120 FSEM	☐ 264 FSEK	
antenna	☒ 574 BTA-L ☐ 133 EMCO3115	☐ 302 BBHA9170 ☐ 289 CBL 6141	☐ 030 HFH-Z2 ☐ 477 GPS
signaling	☒ 371 CBT32 ☐ 298 CMU 200	☐ 547 CMU ☐ 594 CMW	
otherwise	☐ 400 FTC40x15E ☐ 401 FTC40x15E	☐ 110 USB LWL ☒ 482 Filter Matrix	
DC power	☒ 456 EA 3013A ☐ 457 EA 3013A	☐ 459 EA 2032-50 ☐ 268 EA- 3050	☐ 494 AG6632A ☐ 498 NGPE
line voltage	☐ 230 V 50 Hz via public mains	☐ 060 120 V 60 Hz via PAS 5000	

5.2.2. Requirements/Limits

FCC		☐ Part 15 Subpart B, §15.109, class B ☒ Part 15 Subpart C, §15.209 @ frequencies defined in §15.205	
IC		RSS-Gen., Issue 3: §7.2.5	
ANSI		☐ C63.4-2009 ☒ C63.10-2009	
Limit	Frequency [MHz]	Radiated emissions limits, 3 meters	
		QUASI Peak [µV/m]	QUASI-Peak [dBµV/m]
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	above 960	500	49.0

5.2.3. 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

5.2.4. Test condition and measurement test set-up

Signal link to test system (if used):		☒ air link	☐ cable connection	☐ none
EUT-grounding		☒ none	☐ with power supply	☐ additional connection
Equipment set up		☒ table top 0.8m height	☐ floor standing	
Climatic conditions		Temperature: (22±3°C)		Rel. humidity: (40±20)%
EMI-Receiver (Analyzer) Settings	Scan frequency range:	☒ 30 – 1000 MHz ☐ other:		
	Scan-Mode	☒ 6 dB EMI-Receiver Mode ☐ 3 dB spectrum analyser mode		
	Detector	Peak / Quasi-peak		
	RBW/VBW	100 kHz/300 kHz		
	Mode:	Repetitive-Scan, max-hold		
		80 kHz		
		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"		

5.2.5. MEASUREMENT RESULTS

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

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	
3.01	Low	0	30 MHz – 1 GHz	1	1	DH5 packets	☒	☐	☒	passed
3.02	Middle	39		1	1	2DH5 packets	☒	☐	☒	passed
3.03	High	78		1	1	3DH5 packets	☒	☐	☒	passed

Remark: --

5.2.6. VERDICT: PASS

5.3. General Limit - Radiated emissions, above 1 GHz

5.3.1. Test location and equipment FAR

test site	☐ 441 EMI SAR	☐ 348 EMI cond.	☒ 443 EMI FAR	☐ 347 Radio.lab.	☐ 337 OATS	☐
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☒ 489 ESU 40	☐	☐
antenna meas	☐ 574 BTA-L	☐ 289 CBL 6141	☐ 608 HL 562	☒ 549 HL025	☒ 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	☐	☐
multimeter	☐ 341 Fluke 112	☐	☐	☐	☐	☐
signaling	☒ 371 CBT32	☐ 298 CMU 200	☐ 547 CMU	☐ 594 CMW	☐	☐
DCpower	☐ 086 LNG50-10	☒ 087 EA3013	☐ 354 NGPE 40	☐ 349 car battery	☐ 350 Car battery	☐
line voltage	☐ 230 V 50 Hz via public mains		☐ 060 120 V 60 Hz via PAS 5000			

5.3.2. Requirements/Limits Tx-Mode

FCC	☐ Part 15 Subpart B, §15.109 class B ☒ Part 15 subpart C, §15.209 @ frequencies defined in §15.205			
IC	RSS-Gen., Issue 3: §7.2.5			
ANSI	☐ C63.4-2009 ☒ C63.10-2009			
Frequency [MHz]	Limits, 3 meters			
	AV [µV/m]	AV [dBµV/m]	Peak [µV/m]	Peak [dBµV/m]
above 1 GHz	500	54.0	5000	74.0

5.3.3. Test condition and measurement test set-up

Signal link to test system (if used):		☒ air link	☐ cable connection
EUT-grounding		☒ none	☐ with power supply
Equipment set up		☒ table top 1.5m height	☐ floor standing
Climatic conditions		Temperature: (22±3°C) Rel. humidity: (40±20)%	
Spectrum-Analyzer settings	Scan frequency range:	☒ 1 – 18 GHz ☐ 18 – 25 GHz ☐ 18 – 40 GHz ☐ other:	
	Scan-Mode	☒ 6 dB EMI-Receiver Mode ☐ 3 dB Spectrum analyser Mode	
	Detector	Peak and Average	
	RBW/VBW	1 MHz / 3 MHz	
	Mode:	Repetitive-Scan, max-hold	
Scan step		400 kHz	
Sweep-Time		Coupled – calibrated display if CW signal otherwise adapted to EUT's individual duty-cycle	
General measurement procedures		Please see chapter "Test system set-up for radiated electric field measurements above 1 GHz"	

5.3.4. Measurement Results Tx-Mode

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

Diagram no.	Carrier Channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Range	No.					PK	AV	QP	
4.01	Low	0	1-18GHz	1	1	DH5 packets	☒	☒	☐	passed
4.02	Middle	39		1	1	2DH5 packets	☒	☒	☐	passed
4.03	High	78		1	1	3DH5 packets	☒	☒	☐	passed

Remark: No critical emissions found within frequency range 18 – 25GHz during exploratory measurements, therefore no final test.

5.3.5. Requirements/Limits RX-Mode

FCC	☒ Part 15 Subpart B, §15.109 class B ☐ Part 15 subpart C, §15.209 @ frequencies defined in §15.205			
IC	RSS-Gen., Issue 3: §6.1			
ANSI	☒ C63.4-2009 ☐ C63.10-2009			
Frequency [MHz]	Limits, 3 meters			
	AV [μV/m]	AV [dBμV/m]	Peak [μV/m]	Peak [dBμV/m]
above 1 GHz	500	54.0	5000	74.0

5.3.6. Measurement Results Rx-Mode

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

Diagram no.	Carrier Channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Range	No.					PK	AV	QP	
4.04	Middle	39	1-16GHz	1	2	DH5 packets	☒	☒	☒	passed

Remark: --

5.3.7. Verdict: PASS

5.4. Radiated Band-Edge compliance, field strength measurements accord. §15.205

5.4.1. Test location and equipment FAR

test site	☐ 441 EMI SAR	☐ 348 EMI cond.	☒ 443 EMI FAR	☐ 347 Radio.lab.	☐ 337 OATS	☐
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☒ 489 ESU 40	☐	☐
antenna meas	☐ 574 BTA-L	☐ 289 CBL 6141	☐ 608 HL 562	☒ 549 HL025	☐ 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	☐	☐
multimeter	☐ 341 Fluke 112	☐	☐	☐	☐	☐
signaling	☒ 371 CBT32	☐ 298 CMU 200	☐	☐	☐	☐
DCpower	☐ 086 LNG50-10	☐ 087 EA3013	☐ 354 NGPE 40	☐ 349 car battery	☐ 350 Car battery	☐
line voltage	☐ 230 V 50 Hz via public mains		☐ 060 120 V 60 Hz via PAS 5000			

5.4.2. Requirements/Limits

FCC	☐ Part 15 Subpart B, §15.109 class B ☒ Part 15 subpart C, §15.209 @ frequencies defined in §15.205			
IC	RSS-Gen, Issue 3: §7.2.5			
ANSI	☐ C63.4-2009 ☒ C63.10-2009			
Frequency [MHz]	Right Band-Edge Limits beginning on 2483.5MHz@3 meters			
	AV [µV/m]	AV [dBµV/m]	Peak [µV/m]	Peak [dBµV/m]
above 1 GHz	500	54.0	5000	74.0

5.4.3. MEASUREMENT METHOD FOR BAND-EDGE:

For uncritical results where a measurement bandwidth of 1MHz can clearly show the compliance without influencing the results, a field strength measurement was performed only.

For critical results a Marker-Delta marker method was used for showing compliance to restricted bands according §15.205. The method is according ANSI 63.10:2009 “Marker-Delta method”, §6.9.3. The method consists of three independent steps:

1. **Step:** Prior to the measurement the fundamental radiated In-Band field strength was performed. The determined value is used as reference value.
2. **Step:** Second step consist of finding the relative attenuation between the fundamental emission and the maximum local out-of-band emission (within 2 MHz range around the band edge either on the band-edge directly or some modulation product if the level is greater than that on the band-edge) when measured with lower resolution bandwidth.
3. **Step:** The delta value recorded in step 2 will be subtracted from value recorded in step 1, thus giving the required field strength at the band-edge. This value must fulfil the requirements for radiated spurious emissions in restricted bands in §15.205 with the general limits of §15.209.

5.4.4. RESULTS – LEFT BAND-EDGE

Set-up: 1 Op. Mode: 1				
$T_{\text{NOM}} = 21^{\circ}\text{C}$, $V_{\text{NOM}} = 5\text{V}$	Field strength value at Band-Edge [dBµV/m]	Limit for field strength at the band edge	Remark	Verdict
Channel 0	50,2218 (PK) 39,974 (AV)	> 20dBc	packet type DH5	Pass

Remark: see diagrams 9.01 in Annex A4

5.4.5. RESULTS – RIGHT BAND-EDGE

Set-up: 1				
Op. Mode: 1				
$T_{NOM} = 21^{\circ}C$, $V_{NOM} = 5V$	Field strength value at Band-Edge [dB μ V/m]	Limit for field strength-at the band-edge	Remark	Verdict
Channel 78	56.946 (Peak) 45.009 (AV)	74 dB μ V/m (Peak) 54 dB μ V/m (AV)	packet type 3DH5	Pass

Remark: see diagrams 9.02 in Annex A4

5.4.6. Verdict: PASS

5.5. RF-Parameter - Radiated measurement max. E.I.R.P. power

5.5.1. 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	☐
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☒ 489 ESU 40	☐	☐
antenna meas	☐ 574 BTA-L	☐ 289 CBL 6141	☐ 608 HL 562	☒ 549 HL025	☐ 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	☐	☐
multimeter	☐ 341 Fluke 112	☐	☐	☐	☐	☐
signaling	☒ 371 CBT32	☐ 298 CMU 200	☐	☐	☐	☐
DCpower	☐ 086 LNG50-10	☐ 087 EA3013	☐ 354 NGPE 40	☐ 349 car battery	☐ 350 Car battery	☐
line voltage	☐ 230 V 50 Hz via public mains		☐ 060 120 V 60 Hz via PAS 5000			

5.5.2. Requirements and Limit

FCC	☒ §15.247(b)(4)
IC	☒ RSS-210, Issue 8
ANSI	☒ C63.10-2009 (6.3.1)
Limit	1 Watt (30 dBm) Peak

5.5.3. EUT Settings:

For DSSS-systems were three different channels measured. 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.

5.5.4. Measurement method:

A field strength measurement was performed in 3m distance to the EUT. General measurement procedures as shown in chapter 4.3 applies therefore. The transformation formula between field strength and e.i.r.p. power as shown in ANSI C63.10: 2009, chapter 7.8.2 and is used for conversion.

5.5.5. Measurement of the maximum field strength at a distance of 3m and calculations of corresponding e.i.r.p. value

Set-up no.: 1 Op. Mode: 1	Units	Low channel = 0 2402 MHz	Middle channel = 39 2441 MHz	High channel = 78 2480 MHz
Actual declared gain of antenna by applicant]	[dBi]	Max. 2 dBi		
Max. field strength@3m:	[dBuV/m]	98.5	97.1	96.9
Maximum e.i.r.p.	[dBm]	3.27	1.87	1.67
Max. conducted power	[dBm]	--	--	--
Resulting gain	[dBi]	-- ^{1.)}	-- ^{1.)}	-- ^{1.)}

Remark: only radiated tests performed, compare original module's test report

5.5.6. Verdict:

Maximum power value	3.27 dBm (measured)	Pass
Max. Antenna gain	< 6 dBi (according applicant's declaration)	Pass

5.6. Radio frequency exposure evaluation

5.6.1. REFERENCES:

FCC	§1.1310, §2.1091
IC	RSS-102, Issue 4

§2.1091

(c)(1) Mobile devices that operate in the Commercial Mobile Radio Services pursuant to part 20 of this chapter; the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Services pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; and the Specialized Mobile Radio Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if:

(i) They operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or

(ii) They operate at frequencies above 1.5 GHz and their ERP is 3 watts or more.

(2) Unlicensed personal communications service devices, unlicensed millimeter wave devices and unlicensed NII devices authorized under §§15.253(f), 15.255(g), 15.257(g), 15.319(i), and 15.407(f) of this chapter are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if their ERP is 3 watts or more or if they meet the definition of a portable device as specified in §2.1093(b) requiring evaluation under the provisions of that section.

(3) All other mobile and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§1.1307(c) and 1.1307(d) of this chapter.

RSS-102: Assumption that distance between user and device's radiating element is greater than 20cm:

RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

If the device in question meets the exemption from routine evaluation limits of sections 2.5.1 or 2.5.2, only a signed declaration of compliance needs to be submitted (see Annex C).

In addition, submission of the RF exposure technical brief is now required for certification. It shall be accompanied by the completed RF technical brief cover sheet.

5.6.2. Method of evaluation:

The E.I.R.P value is derived from the conducted Peak Power (grant value & original test report) and applicant's declared antenna gain. Pls. consult applicant's documents therefore.

Operational Bands	Channel no.	Channel Freq.	Max. Power-Value (conducted)			
			Peak value	Antenna gain	Resulting power	Converted
			[dBm]	[dBi]	[dBm]	[mWatt]
Bluetooth-Mode	0	2402	6,12	2,00	8,12	6,49
	39	2441	6,35	2,00	8,35	6,84
	78	2480	5,30	2,00	7,30	5,37

Remark: Peak power values taken from original module's test report no. FR1D0821AB page 14

5.6.3. Verdict:

As the resulting E.I.R.P value is far from minimum 3Watt (FCC) or 5Watt (IC) a signed Annex C of RSS-102: Issue 4 is submitted.

5.7. 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 its contribution to the overall uncertainty according to its 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, Documents 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 Measurem.	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 Measurem.	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

20. Dez. 13

8.1. Used equipment "CTC"

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

8.1.1. 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	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)

8.1.2. 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	-	31.03.2015
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
011	Insertion Unit (EMS-radiated)	URV5-Z2	864169/004	Rohde & Schwarz	24 M	-	31.03.2015
012	Signal Generator (EMS-cond.)	SMY 01	839069/027	Rohde & Schwarz	24/12 M	-	31.03.2015
013	Power Meter (EMS cond.)	NRVD	839111/003	Rohde & Schwarz	24 M	-	31.03.2015
014	Insertion Unit (EMS cond.)	URV5-Z2	838519/029	Rohde & Schwarz	24 M	-	31.03.2015
015	Insertion Unit (EMS cond.)	URV5-Z4	838570/024	Rohde & Schwarz	24 M	-	31.03.2015
016	Line Impedance Simulating Network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	31.03.2016
017	Digital Radiocommunication Tester	CMD 60 M	844365/014	Rohde & Schwarz	pre-m	3	
020	Horn Antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36/12 M	-	31.03.2014
021	Loop Antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	31.03.2015
022	Audio Measurement Amplifier	2636C	1537643	Brüel & Kjaer	24 M	-	31.03.2016
030	Loop Antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2015
031	Absorbing Clamp	MDS-21	863325/015	Rohde & Schwarz	36 M	-	31.03.2015
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	31.03.2015
049	Current Clamp (injection)	F-120-2	48	FCC	24 M	-	31.03.2016
050	3-ph Coupling Decoupling Netw. (Burst)	CDN 300	176	Schaffner	36 M	-	31.03.2015
051	VHF-Current Probe 20-300 MHz	ESV-Z1	872421	Rohde & Schwarz	36 M	-	31.03.2015
052	Notch Filter DECT	WRCB 1887,82/1889,55SS	12	Wainwright Industries	pre-m	2	
053	Audio Analyzer	UPA3	860612/022	Rohde & Schwarz	36 M	-	31.03.2017
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	pre-m	1a	
058	capacitive clamp (Burst)	IP 4	99	Haefely	36 M	-	31.03.2015
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
065	attenuator, (6 dB) 50 Ohm, 250W	AT 50-6-250	521057	BNOS Electronics	12 M	1b	31.03.2014
066	notch filter (WCDMA; FDD1)	WRCF 1900/2200-5/40-10EEK	5	Wainwright GmbH	12 M	1g	30.06.2014
067	coupling decoupling-network	CDN 801-M2/M3	272	Lüthi	36 M	-	31.03.2017
068	coupling decoupling-network	CDN 801-M5	95226	Lüthi	36 M	-	31.03.2017
069	EM - clamp	EM101	9535159	Lüthi	36 M	-	31.03.2016
072	coupling decoupling-network	CDN 801-M2/M3	276	Lüthi	36 M	-	31.03.2017
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	Helmholtz coil: 2x10 coils in	-	RWTÜV	12 M	4	31.03.2015
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	-	31.03.2015
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
121	notch filter GSM 1900	WRCB 1879,5/1880,5EE	15	Wainwright GmbH	12 M	1d	30.06.2014
122	notch filter GSM 1800	WRCB 1747/1748	12	Wainwright GmbH	12 M	1c	30.06.2014
131	RF-Current Probe	F-52	19	FCC	36 M	-	31.03.2017
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	pre-m	-	31.03.2014
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
142	attenuator (6 dB) 2 W, 8 GHz	DGL N	-	Radiall	12 M	1b	31.03.2014
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	
254	high pass GSM1800/1900/DECT	5HC 2600/12750-1.5KK	23042	Trilithic	12 M	1c	30.06.2014
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	
284	coupling decoupling network	CDN 801-M1	1661	Lüthi	36 M	-	31.03.2017
285	coupling decoupling network	CDN 801-S1	1642	Lüthi	36 M	-	31.03.2017
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	1c	30.06.2014
290	notch filter GSM 900	WRCA 901,9/903,1SS	3RR	Wainwright GmbH	12 M	1c	30.06.2014
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH	12 M	1c	30.06.2014
295	Racal Digital Radio Test Set	6103	1572	Racal	pre-m	3	
296	audio measurement amplifier	2636C (Reserve)	R=316568/004 B=1537541	Brüel & Kjaer	pre-m	2	
298	Univ. Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	pre-m	3	
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	-	31.03.2015
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
304	fix dipole antenna 1,6 GHz	EMCO 3125-307	9907-1001	ETS	pre-m	-	
305	fix dipole antenna 1,8-2,0 GHz	EMCO 3125-306	9907-1001	ETS	pre-m	-	
306	fix dipole antenna 2,45 GHz	EMCO 3125-308	9907-1001	ETS	pre-m	-	
307	fix dipole antenna 3 GHz	EMCO 3125-309	9907-1001	ETS	pre-m	-	
317	1000 Hz calibrator 94 dB SPL	4230 94dB	1542286	Brüel & Kjaer	12 M	-	
323	Digital Radiocommunication Tester	CMD 55	825878/0034	Rohde & Schwarz	pre-m	3	
331	Climatic Test Chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	30.11.2014
335	CTC-EMS-Conducted	System EMS Conducted	-	Rohde & Schwarz	12 M	5	31.03.2014
337	System CTC OATS NSA	System EMI OATS NSA	-	HD GmbH	36 M	5	31.08.2013
340	Digital Radiocommunication Tester	CMD 55	849709/037	Rohde & Schwarz	pre-m	3	
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
344	adaptor 150/50 Ohm	150/50	-	Krohne	36 M	-	31.03.2017
345	adaptor 150/50 Ohm	150/50	-	Krohne	36 M	-	31.03.2017
347	laboratory site	radio lab.	-	-	-	5	
348	laboratory site	EMI conducted	-	-	-	5	
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	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
358	Power Amplifier 10 kHz-220MHz	AR75A220M1	15860	Amplifier Research	12 M	1b	30.03.2011
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Rohde & Schwarz	24 M	-	31.03.2016
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	EM-Test	12 M	-	31.03.2015
367	audio measurement amplifier	2636	316832/001	Brüel & Kjaer	24/12 M	-	31.03.2015
369	insertion unit (SAR-EMS, Ch. A)	URV5-Z2	100301	Rohde & Schwarz	24 M	-	31.03.2015
370	insertion unit (SAR-EMS, Ch. B)	URV5-Z2	100302	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
374	Power Amplifier 0,8-3 GHz	60S1G3	306528	Amplifier Research	-	1a	02.08.2014
375	Directional Coupler	DC7144M1	306498	Amplifier Research	-	1a	30.07.2014
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
378	Broadband RF Field Monitor	RadiSense III	03D00013SNO-08	DARE B.V.	24 M	-	28.02.2014
383	Signal Generator	SME 03	842 828 /034	Rohde & Schwarz	36 M	-	31.03.2016
386	Coupling Decoupling Network	CDN USB/p	19397	Schaffner	36 M	-	31.03.2017
387	Coupling Decoupling Network	CDN L-801 M2	2051	Lüthi	36 M	-	31.03.2017
388	Coupling Decoupling Network	CDN L-801 T2	1929	Lüthi	36 M	-	31.03.2017
389	Digital Multimeter	Keithley 2000	0583926	Keithley	24 M	-	31.03.2015
390	Industry Acoustic System	MO 2000 Set	2127100123	Sennheiser	pre-m	2	
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	31.03.2015
394	Power Amplifier 80-1000 MHz	BLWA 0810-250/200	045610	Bonn-Elektronik	-	1a	30.07.2014
399	Sound Calibrator	Sound Calibrator 4231	2665101	Brüel & Kjaer	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
440	CDN for Datacable	CDN-UTP	CDN-UTP 029	EMC Partner AG, CH	24 M	-	31.03.2016
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR) Cable	-	CETECOM	12 M	5	31.10.2014
442	CTC-SAR-EMS	System EMS field (SAR)	-	ETS-Lindgren / CETECOM	12 M	5	30.07.2014
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren / CETECOM	12 M	5	15.07.2014
444	CTC-FAR-EMS field	System-EMS-Field (FAR)	-	ETS Lindgren/CETECOM	12 M	5	30.09.2014
448	notch filter WCDMA_FDD II	WRCT 1850.0/2170.0-5/40-	5	Wainwright Instruments GmbH	12 M	1c	30.06.2014
449	notch filter WCDMA_FDD V	WRCT 824.0/894.0-5/40-8SSK	1	Wainwright	12 M	1c	30.06.2014
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 0-5 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
462	AF-Generator	MX-2020	-	Conrad	-	4	

463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	31.03.2016
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	-	30.06.2014
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
491	ESD Simulator dito	ESD dito	dito307022	EM-Test	24 M	-	31.03.2015
498	Power Supply	NGPE 40/40	402	Rohde & Schwarz	pre-m	2	
500	Industry Acoustic System	MO 2000 Set	100048	Sennheiser	pre-m	2	
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	30.06.2014
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
524	Voltage Drop Simulator	VDS 200	0196-16	EM Test	24 M	-	31.03.2015
525	CDN coupling network	CNA 200	1196-01	EM Test	24 M	-	31.03.2015
526	Burst Generator	EFT 200 A	0496-06	EM Test	24 M	-	31.03.2015
527	Micro Pulse Generator	MPG 200 B	0496-05	EM Test	24 M	-	31.03.2015
528	Load Dump Simulator	LD 200B	0496-06	EM Test	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	
533	Impedance Stabilization Network	ISN T200A	25706	Teseq	36 M	-	31.03.2017
534	Impedance Stabilization Network	ISN T400A	24881	Teseq	36 M	-	31.03.2017
535	Impedance Stabilization Network	ISN T800	26321	Teseq	36 M	-	31.03.2017
536	Impedance Stabilization Network	ISN ST08	25867	Teseq	36 M	-	31.03.2017
541	Impedance Stabilization Network	ISN T8-Cat6	26373	Teseq Berlin	36 M	-	31.03.2017
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
550	System CTC S-VSWR Verification SAR-EMI	System EMI Field SAR S-VSWR	-	ETS Lindgren/CETECOM	24 M	-	30.06.2015
552	high pass filter 2,8-18GHz	WHKX 2.8/18G-10SS	4	Wainwright	12 M	1c	30.06.2014
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	-	
592	CDN-HDMI	CDN-HDMI	A3029004	Frankonia / Dr.Hubert	36 M	-	31.03.2017
595	Analog Adder	TS8910	-	Rohde & Schwarz	pre-m	2	
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
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	
615	Analog Adder	TS8920	-	Rohde & Schwarz	pre-m	2	
616	Digitalmultimeter	Fluke 177	88900339	Fluke	24 M	-	31.03.2016
620	EMI Test Receiver	ESU 26	100362	Rohde-Schwarz	12 M	-	31.03.2015
625	Generic Test Load USB	Generic Test Load USB	-	CETECOM	-	2	
627	data logger	OPUS 1	201.0999.9302.6.4.1.43	G. Lufft GmbH	24 M	-	30.05.2014
636	Thermal Imaging camera	Ti32	Ti32-12060213	Fluke Corporation	24 M	-	31.07.2014
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	Amplifier	ZX60-2534M+	SN865701299	Mini-Circuits	-	-	
645	Power Amplifier	CBA 230M-080	T44236	TESEQ	-	1g	
671	DC-power supply 0-5 A	EA-3013S	-	Elektro Automatik	pre-m	2	
672	Digitalmultimeter	Keithley 2700	1182075	Keithley	pre-m	-	
673	Digitalmultimeter	Keithley 2700	1181408	Keithley	pre-m	-	
674	Digitalmultimeter	Keithley 2700	1182090	Keithley	pre-m	-	
675	Digitalmultimeter	Keithley 2700	1162865	Keithley	pre-m	-	
676	Digitalmultimeter	Keithley 2700	1182092	Keithley	pre-m	-	
677	Digitalmultimeter	Keithley 2700	1182089	Keithley	pre-m	-	
678	Power Meter	NRP	101638	Rohde&Schwarz	pre-m	-	
679	Power Supply	High Speed Power Supply	0783417	Keithley	pre-m	-	
680	Power Sensor	NRP-Z21	100622	Rohde & Schwarz	pre-m	-	
682	Vector Signal Generator	SMU 200A	101319	Rohde & Schwarz	pre-m	-	
683	Spectrum Analyzer	FSU 26	200571	Rohde & Schwarz	12 M	-	26.11.2014
684	Widerstand 100 Ohm	SL 403-403	72973	Teseq	pre-m	-	
685	Widerstand 100 OHM	SL 403-403	72974	Teseq	pre-m	-	

686	Field Analyzer	EHP-200A	160WX30702	Narda Safety Test Solutions	24 M	-	18.07.2015
687	Signal Generator	SMF 100A	102073	Rohde&Schwarz	12 M	-	27.11.2014
692	Bluetooth Tester	CBT 32	100236	Rohde & Schwarz	12 M	-	31.03.2015

8.1.3. 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-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)

Name of report	Date	Remarks:
TR3-0071-13-6-4a	2014-07-23	--
TR3-0071-13-6-4a-C1	2014-09-08	Canadian standards enclosed MPE Exposure considered
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