T E S T R E P O R T
No.: 18-1-0048401T05a

According to:
FCC Regulations
Part 1.1310
Part 2.1091

IC-Regulations
RSS-102, Issue 5

for

Robert Bosch Car Multimedia GmbH

Navigation System with Bluetooth and WLAN
AIVIL12F0

FCC-ID: YBN-AIVIL12F0
IC: 9595A-AIVIL12F0

Laboratory Accreditation and Listings			
DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-01	MRA US-EU 0003	Industry Canada Reg. No.: 3462D-2 Reg. No.: 3462D-3	Voluntary Controls for Electromagnetic Emissions Reg. No.: R-2666 C-2914, T-1967, G-301
Wi Fi ALLIANCE AUTHORIZED RF LABORATORY	ctia Authorized™ Test Lab Lab Code: 20011130-00		

accredited according to DIN EN ISO/IEC 17025

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Table of contents

Table of annex

Total pages

The listed attachments are an integral part of this report.

1. Summary of test results

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

The presented Equipment Under Test (in this report, hereinafter referred as EUT) integrates a BT BDR/EDR 2.4 GHz RF Transceiver (Hopping Mode), WLAN 2.4 GHz RF Transceiver and WLAN 5GHz RF Transceiver. Other implemented wireless technologies were not considered within this test report.
Following tests have been performed to show compliance with applicable FCC Part 2.1091 and FCC Part 1.1310 of the FCC CFR 47 Rules.

1.1. Summary of tests results

RF-Exposure Evaluation (separation distance user to RF-radiating element greater 20cm)								
Test cases	**Port**	**References & Limits**				**EUT set-up**	**EUT op. mode**	**Result**
		FCC Standard	Test Limit	RSS Standard	Test Limit			
Radio frequency radiation exposure Requirements	Cabinet + Inter-Connecting Cables (conducted)	§2.1091 §2.1093	RF-Field Strength Limits: FCC: "general population/ uncontrolled" environment	RSS-102, Issue 5	Chapter 4 Table4	1,2	1,2,3	Pass

Remark:

1.) See separate test reports & corresponding annexes for following installed technologies

WLAN 2.4GHz:	CETECOM_TR18-1-0048401T02a
BT BDR/EDR:	CETECOM_TR18-1-0048401T03a
WLAN 5GHz	CETECOM_TR18-1-0048401T01a

2.) Calculations based on Tune-Up Info delivered by applicant

Digital signiert von: rachid.acharkaoui@cetecom.com
Name: CN = rachid.acharkaoui@cetecom.com
Datum: 2018.07.27 07:05:29 +01'00'

Ninovic Perez 2018.07.26 14:08:11 + 01'00'

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Dipl.-Ing. Rachid Acharkaoui
Responsible for test section

Dipl.-Ing N. Perez
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

2.3. Organizational items

Responsible for test report:	Dipl.-Ing N. Perez
Responsible for project:	Dipl.-Ing N. Perez
Receipt of EUT:	2018-06-12
Date(s) of test:	2018-06-12 - 2018-07-18
Date of report:	2018-07-25
Version of template: 13.02	

2.4. Applicant's details

Applicant's name:	Robert Bosch Car Multimedia GmbH
Address:	Robert-Bosch-Straße 200 31137 Hildesheim Germany
Contact person:	Mr. Salvatore Mirgalia

2.5. Manufacturer's details

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

1.2 Summary of product description

FCC ID:	YBN-AIVIL12F0
Product name	AIVIL12F0
Exposure category	☒ General population/uncontrolled environment ☐ Occupational exposure/controlled environment
Output power	☒ Conducted ☐ ERP ☐ EIRP

	☐ Peak ☒ Source-based time-averaging	
Antenna gain	details refer Chapter 1.5	
Technology	☐ MIMO	☐ 2T2R ☐ 3T3R ☐ 4T4R
	☒ non-MIMO	☒ 1T1R ☐ 1T2R ☐ 2T1R
Evaluation type	☒ Standalone ☐ Simultaneous transmission	
Evaluation distance	☒ 20 cm	
	☐ XXX cm	declares by manufacturer
EUT type	☒ Production Unit ☐ Engineering Unit	
Device type	☒ Mobile device ☐ Fixed device	
Refer rules	☒ CFR 47 FCC Part 2.1091 ☒ CFR 47 FCC Part 1.1310 ☒ KDB 447497 D01v06 October 23, 2015 ☒ KDB 865664 D01v01r02 October 23, 2015	

1.3 Refer Rules

ANSI C95.1–1999	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
KDB 447498 D01 v06 October 23, 2015	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
KDB 865664 D01v01r02 October 23, 2015	RF Exposure Compliance Reporting and Documentation Considerations.
CFR 47 FCC Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.
CFR 47 FCC Part 1.1310	Radiofrequency radiation exposure limits.

1.4 EUT Technologies

Wireless Technologies	Frequency bands	Operation mode			Duty cycle
☐GSM	☐850 ☐1900	Voice (GMSK)	1 slot		☐12.5%
	☐Support DTM (Dual Transfer Mode)				
☐GPRS	☐850 ☐1900	GPRS (GMSK) Multi – Slot Class	☐ 8	1 slot (1 Up, 4 Down)	☐12.5%
			☐ 10	2 slots (2 Up, 4 Down)	☐12.5% ☐ 25%
			☐ 12	4 slots (4 Up, 4 Down)	☐12.5% ☐ 25% ☐37.5% ☐ 50%
☐EDGE	☐850 ☐1900	EDGE (8-PSK) Multi – Slot Class	☐ 8	1 slot (1 Up, 4 Down)	☐12.5%
			☐ 10	2 slots (2 Up, 4 Down)	☐12.5% ☐ 25%
			☐ 12	4 slots (4 Up, 4 Down)	☐12.5% ☐ 25% ☐37.5% ☐ 50%
☐WCDMA (UMTS)	☐Band II ☐Band IV ☐Band V	☐ UMTS Rel.99 (Voice & Data) ☐ HSDPA(Rel.5) ☐ HSUPA(Rel.6)			☐100%

		☐ DC-HSDPA(Rel.8) ☐ HSPA+(Rel.7)		
☐CDMA (CDMA2000)	☐BC0 ☐BC1 ☐BC10	☐ 1xRTT (Voice & Data) ☐ 1xEVDO Rel.0 ☐ 1xEVDO Rel.A ☐ 1xAdvanced		☐100%
	☐Support SV-DO (1xRTT-1xEVDO)			
☐LTE-FDD	☐Band 2 ☐Band 4 ☐Band 5 ☐Band 7 ☐Band 12 ☐Band 13 ☐Band 17 ☐Band 25 ☐Band 26 ☐Band 27 ☐Band 30	☐QPSK ☐16QAM		100%
		☐Rel.11 Carrier Aggregation	☐2 Uplinks 2 Downlinks ☐2 Uplinks 3 Downlinks ☐3 Uplinks 2 Downlinks ☐3 Uplinks 3 Downlinks	
	☐Supports SV-LTE (1xRTT-LTE)			
☐LTE-TDD	☐Band 38 ☐Band 39 ☐Band 40 ☐Band 41 ☐Band 42	☐QPSK ☐16QAM		63.3% This device supports uplink –downlink configuration 0-6. The configuration with highest duty cycle was used (configuration. 0 at 63.3%)
		☐Rel.11 Carrier Aggregation	☐2 Uplinks 2 Downlinks ☐2 Uplinks 3 Downlinks ☐3 Uplinks 2 Downlinks ☐3 Uplinks 3 Downlinks	
	☐Supports SV-LTE (1xRTT-LTE)			
☒Wi-Fi	☒2.4GHz	☒IEEE 802.11b	☒2412 – 2462 MHz ☐2412 – 2472 MHz	☒50%
		☒IEEE 802.11g	☒2412 – 2462 MHz ☐2412 – 2472 MHz	☒50%
		☒IEEE 802.11n HT20	☒2412 – 2462 MHz ☐2412 – 2472 MHz	☒50%
		☒IEEE 802.11n HT40	☒2422 – 2452 MHz	☒50%
	☐5GHz	☒IEEE 802.11a	☒5180 – 5240 MHz ☒5260 – 5320 MHz ☒5500 – 5700 MHz ☒5745 – 5825 MHz	☒50%
		☒IEEE 802.11n HT20	☒5180 – 5240 MHz ☒5260 – 5320 MHz ☒5500 – 5700 MHz ☒5745 – 5825 MHz	☒50%
		☒IEEE 802.11n HT40	☒5190 – 5230 MHz ☒5270 – 5310 MHz ☒5510 – 5670 MHz ☒5755 – 5795 MHz	☒50%
		☒IEEE 802.11ac VHT20	☒5180 – 5240 MHz ☒5260 – 5320 MHz ☒5500 – 5700 MHz ☒5745 – 5825 MHz	☒50%
		☒IEEE 802.11ac VHT40	☒5190 – 5230 MHz ☒5270 – 5310 MHz ☒5510 – 5670 MHz	☒50%

			☒5755 – 5795 MHz	
		☒IEEE 802.11ac VHT80	☒5210 – 5210 MHz ☒5290 – 5290 MHz ☒5530 – 5530 MHz ☒5775 – 5775 MHz	☒50%
	☐Supports Band gap channels			
☐Others	☐2.4GHz	☐ 1 MHz Bandwidth	☐2402 – 2472 MHz	☐100%
☐Bluetooth	☐2.4GHz	☐Version 2.1+EDR		☐77.5%
		☐Version 3.0+HS		☐77.5%
		☐Version 4.0		☐100%
		☐Version 4.1+EDR		☐77.5%
		☐Version 4.2+EDR		☐77.5%

1.5 Antenna Information

Wireless Technologies	Frequency bands	Antenna type	Maximum antenna gain	
☐GSM	☐850	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☐GSM	☐1900	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☐WCDMA (UMTS)	☐Band II	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band IV	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band V	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☐CDMA (CDMA2000)	☐CDMA800	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐CDMA1900	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB	☐Antenna 1	

		☐		
☐LTE-FDD	☐Band 2	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 4	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 5	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 7	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 12	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 13	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 17	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 25	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 26	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 27	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA	☐Antenna 1	

		☐PCB ☐		
☐LTE-TDD	☐Band 38	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 39	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 40	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 41	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 42	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☒Wi-Fi	☒2.4GHz	☐PIFA ☒PCB ☐	☒Antenna 0	-1.4dBi gain max
		☐PIFA ☐PCB ☐	☐Antenna 1	
		☐PIFA ☐PCB ☐	☐Antenna 2	
	☒5GHz	☐PIFA ☒PCB ☐	☒Antenna 0	3.5dBi gain max
		☐PIFA ☐PCB ☐	☐Antenna 1	
		☐PIFA ☐PCB ☐	☐Antenna 2	
☐Others	☐2.4GHz	☐PIFA ☐PCB	☐Antenna 0	
		☐PIFA ☐PCB	☐Antenna 1	
		☐PIFA ☐PCB	☐Antenna 2	
☒Bluetooth	☐2.4GHz	☐PIFA ☒PCB	☒Antenna 0	1dBi gain max

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

Short descrip-tion*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	AIVIL12F0	Navigation System with Bluetooth and WLAN	0007647	001	X317 (0539)
EUT B	AIVIL12F0	Navigation System with Bluetooth and WLAN	0007625	001	X317 (0539)

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

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

AE short descrip-tion *)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	Harness	Test Cable	--	--	--

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

2.8. EUT set-ups

EUT set-up no.*)	Combination of EUT and AE	Remarks
set. 1	EUT A + AE 1	Radiated measurement set-up
set. 2	EUT B + AE 1	Conducted measurement set-up

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

2.9. EUT operating modes

EUT operating mode no.*1)	Description of operating modes	Additional information
op. 1	TX-Mode Burst 20MHz	With help of special test firmware WLAN is switched to a bandwidth of 20MHz and a continuous traffic mode in burst mode (duty cycle >98%) was set-up *2)
op. 2	TX-Mode Burst 40MHz	With help of special test firmware WLAN is switched to a bandwidth of 40MHz and a continuous traffic mode in burst mode (duty cycle >98%) was set-up *2)
op. 3	TX-Mode Burst 80MHz	With help of special test firmware WLAN is switched to a bandwidth of 80MHz and a continuous traffic mode in burst mode (duty cycle >98%) was set-up *2)

*1) EUT operating mode no. is used to simplify the test report.
*2) Please refer to document “Instructions_RadioTypeApproval_9_6_2017” dated 2017-06-09 for additional information regarding operating mode setup and output power levels.

3. Measurements

3.1. Radio Frequency Exposure Evaluation §2.1091

3.1.Test location

test location	☒ CETECOM Essen	☐	☐
	For Evaluation instruments are not needed. Results are determined by calculation based on applicants delivered Tune-Up procedure.		

3.2 Evaluation Rules for FCC Standard

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.
In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3.3 Limits for FCC Standard

Table 1: LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

(A) Limits for Occupational/Controlled Exposure				
Frequency range [MHz)	Electric field strength [V/m]	Magnetic field strength [A/m]	Power density [mW/cm²]	Averaging time [minutes]
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--		6
1500-100,000	--	--		6
(B) Limits for General Population/Uncontrolled Exposure				
Frequency range [MHz)	Electric field strength [V/m]	Magnetic field strength [A/m]	Power density [mW/cm²]	Averaging time [minutes]
0.3-3.0	614	1.63	*(100)	30
3.0-30	824/f	2.19/f	*(180/f²)	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f=frequency in MHz
*Plane-wave equivalent power density

NOTE1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. These limits apply to amateur station licensees and members of their immediate household as discussed in the text.

NOTE2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. As discussed in the text, these limits apply to neighbours living near amateur radio stations.

3.4 Requirements and limits for RSS Standard

RSS-102, Issue 5	**2.5 Exemption Limits for Routine Evaluation** All transmitters are exempt from routine SAR and RF exposure evaluations provided that they comply with the requirements of sections 2.5.1 or 2.5.2. **If the equipment under test (EUT) meets the requirements of sections 2.5.1 or 2.5.2, applicants are only required to submit a properly signed declaration of compliance (see Annex C)**. The information contained in the RF exposure technical brief may be limited to the value(s) of the maximum output power, the information that demonstrates how the maximum output power of the transmitter was derived and the rationale for the separation distances applied (see Table 1), which must be based on the most conservative exposure condition for the applicable module or host platform test procedure requirements.
	2.5.2 Exemption Limits for Routine Evaluation — RF Exposure Evaluation RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows: • below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance); • at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz; • at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance); • **at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;** • at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance). 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.
	2.6 User Manual Requirements The applicant is responsible for providing proper instructions to the user of the radio device, and any usage restrictions, including limits of exposure durations. The user manual shall provide installation and operation instructions, as well as any special usage conditions (e.g. proper accessory required, including the proper orientation of the device in the accessory, maximum antenna gain in the case of detachable antenna), in order to ensure compliance with SAR and/or RF field strength limits. For instance, compliance distance shall be clearly stated in the user manual. The user manual of devices intended for controlled use shall also include information relating to the operating characteristics of the device; the operating instructions to ensure compliance with SAR and/or RF field strength limits; information on the installation and operation of accessories to ensure compliance with SAR and/or RF field strength limits; and contact information where the user can obtain Canadian information on RF exposure and compliance. Other related information may also be included.

3.5 MPE Calculation method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{EIRP}{4\pi R^2} = \frac{P * G}{4\pi R^2}$$

$$G_{NUMERIC} = \frac{S * 4\pi R^2}{P}$$

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the centre of radiation of the antenna

3.7 Evaluation Method

3.7.1 Standalone

Valid for WLAN/BT Mode:

• The peak power was checked on 3 frequencies (lowest/middle/highest) within each operable WiFi band and the results compared to applicant's declared power values (tune-up info).

• No duty-cycle correction factor is applicable

Please find in the following tables the calculations based on applicants tune-up information for the power values.

Results for FCC Standard

Operation Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Antenna Gain (dBi)	Declared maximum EIRP (Measured+ Tune-up) (dBm)	Duty cycle %	Declared Maximum conducted output power (W)	Equivalent conducted output power (output power x duty cycle) (mW)	MPE Limit (mW/cm^2)	MPE-Value (mW/cm^2)	Margin to Limit: (mW/cm^2)	Fraction for Co-Location calculations	Max. Fraction-Value within Frequency-Band
W-LAN 2.4GHz	2412,0	11,2	-1,4	9,8	100%	0,0095	9,5	1,0000	0,00190	0,9981	0,001900	0,0018999
	2437,0	11,2	-1,4	9,8		0,0095	9,5	1,0000	0,00190	0,9981	0,001900	
	2462,0	11,2	-1,4	9,8		0,0095	9,5	1,0000	0,00190	0,9981	0,001900	
Bluetooth BDR/ DER	2402,0	-1,30	1,0	-0,3	100%	0,0009	0,9	1,0000	0,00019	0,9998	0,000186	0,0001857
	2442,0	-1,30	1,0	-0,3		0,0009	0,9	1,0000	0,00019	0,9998	0,000186	
	2480,0	-1,30	1,0	-0,3		0,0009	0,9	1,0000	0,00019	0,9998	0,000186	

Operation Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Max. positive tolerance according manufacturer 's tune-up info (dB)	Declared Antenna Gain (dBi)	Path Loss to ext. antenna connector according manufacturer (dB)	EIRP (dBm)	Duty cycle (%)	Maximum EIRP (W)	Equivalent EIRP (EIRP x duty cycle) (mW)	MPE Limit (mW/cm^2)	MPE-Value (mW/cm^2)	Margin (mW/cm^2)	Fraction for Co-location calculations	Maximum Fraction Value within Frequency band
W-LAN 5GHz (20MHZ BW)	5180,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	0,0032
	5200,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	
	5240,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	
W-LAN 5GHz (20MHZ BW)	5260,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	0,0032
	5280,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	
	5320,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	
W-LAN 5GHz (20MHZ BW)	5500,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	0,0032
	5580,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	
	5700,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	
W-LAN 5GHz (20MHZ BW)	5745,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	0,0032
	5785,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	
	5825,0	8,53	0,00	3,50	0,00	12,03	100%	0,016	15,96	1,0000	0,00317	0,9968	0,0032	
W-LAN 5GHz (40MHz BW)	5190,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	0,0025
	5230,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	
W-LAN 5GHz (40MHz BW)	5270,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	0,0025
	5310,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	
W-LAN 5GHz (40MHz BW)	5510,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	0,0025
	5550,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	
	5670,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	
W-LAN 5GHz (40MHz BW)	5755,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	0,0025
	5795,0	7,44	0,00	3,50	0,00	10,94	100%	0,012	12,42	1,0000	0,00247	0,9975	0,0025	
W-LAN 5GHz (80MHz BW)	5270,0	7,49	0,00	3,50	0,00	10,99	100%	0,013	12,56	1,0000	0,00250	0,9975	0,0025	0,0025
	5310,0	7,49	0,00	3,50	0,00	10,99	100%	0,013	12,56	1,0000	0,00250	0,9975	0,0025	
W-LAN 5GHz (80MHz BW)	5510,0	7,49	0,00	3,50	0,00	10,99	100%	0,013	12,56	1,0000	0,00250	0,9975	0,0025	0,0025
	5550,0	7,49	0,00	3,50	0,00	10,99	100%	0,013	12,56	1,0000	0,00250	0,9975	0,0025	
	5670,0	7,49	0,00	3,50	0,00	10,99	100%	0,013	12,56	1,0000	0,00250	0,9975	0,0025	
W-LAN 5GHz (80MHz BW)	5755,0	7,49	0,00	3,50	0,00	10,99	100%	0,013	12,56	1,0000	0,00250	0,9975	0,0025	0,0025
	5795,0	7,49	0,00	3,50	0,00	10,99	100%	0,013	12,56	1,0000	0,00250	0,9975	0,0025	

1. Output power including tune-up tolerance;

2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;

3. MPE evaluate distance is 20cm from user manual provide by manufacturer;

4. Depending on output power and antenna gain only the worst case is reported;

Results for RSS Standard

Operation Mode	Frequency on channel (MHz)	Declared measured conducted output power (dBm)	Max. positive tolerance according manfacturer's tune-up info (dB)	Antenna Gain (dBi)	Path Loss to ext. antenna connector according manufacturer (dB)	Max. positive path loss uncertainty: (dB)	Calculated maximum EIRP (declared+ Tune-up+ antenna Gain+ path loss) (dBm)	Duty-Cycle	Maximum EIRP (W)	Equivalent EIRP (EIRP x duty cycle) (W)	MPE Limit accord. Table 4 (W/m^2)	MPE-Value (W/m^2)	Margin (W/m^2)	Fraction for Co-location calculations	Maximum Fraction Value within Frequency band	Exception from MPE if power exceeds: (W / eirp)	Exemption fullfiled ?
W-LAN 2.4GHz	2412,0	11,20	-1,40	9,80	0,00	0,00	19,60	100%	0,0912	0,091	5,3660	0,1814	5,1846	0,03381	0,03381	2,68	yes
	2437,0	11,20	-1,40	9,80	0,00	0,00	19,60	100%	0,0912	0,091	5,4040	0,1814	5,2225	0,03358		2,70	yes
	2462,0	11,20	-1,40	9,80	0,00	0,00	19,60	100%	0,0912	0,091	5,4418	0,1814	5,2604	0,03334		2,72	yes
Bluetooth BDR/ DER	2412,0	-1,30	1,00	-0,30	0,00	0,00	-0,60	100%	0,0009	0,001	5,3660	0,0000	5,3660	0,00000	0,00000	2,68	yes
	2437,0	-1,30	1,00	-0,30	0,00	0,00	-0,60	100%	0,0009	0,001	5,4040	0,0000	5,4040	0,00000		2,70	yes
	2462,0	-1,30	1,00	-0,30	0,00	0,00	-0,60	100%	0,0009	0,001	5,4418	0,0000	5,4418	0,00000		2,72	yes

Maximum calculated MPE value:		
	2.4GHz Band	
Lowest MPE-Limit:	5,3660	[W/m^2]
Highest MPE value:	0,1814	[W/m^2]
Lowest margin to limit	5,1846	[W/m^2]

Operation Mode	Frequency on channel (MHz)	Measured maximum conducted output power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	Duty cycle	Maximum EIRP (W)	Equivalent EIRP (EIRP x duty cycle) (mW)	MPE Limit accord. Table 4 (W/m^2)	MPE-Value (W/m^2)	Margin (W/m^2)	Exception from MPE if power exceeds: (W / eirp)	Exemption fullfiled ?
W-LAN 5GHz (20MHZ BW)	5180,0	8,53	3,50	12,03	100%	0,016	15,96	9,0471	0,0317	**9,0153**	4,53	yes
	5200,0	8,53	3,50	12,03		0,016	15,96	9,0709	0,0317	**9,0392**	4,54	yes
	5240,0	8,53	3,50	12,03		0,016	15,96	9,1186	0,0317	**9,0868**	4,56	yes
W-LAN 5GHz (20MHZ BW)	5260,0	8,53	3,50	12,03	100%	0,016	15,96	9,1423	0,0317	**9,1106**	4,57	yes
	5280,0	8,53	3,50	12,03		0,016	15,96	9,1661	0,0317	**9,1343**	4,58	yes
	5320,0	8,53	3,50	12,03		0,016	15,96	9,2135	0,0317	**9,1817**	4,61	yes
W-LAN 5GHz (20MHZ BW)	5260,0	8,53	3,50	12,03	100%	0,016	15,96	9,1423	0,0317	**9,1106**	4,57	yes
	5280,0	8,53	3,50	12,03		0,016	15,96	9,1661	0,0317	**9,1343**	4,58	yes
	5320,0	8,53	3,50	12,03		0,016	15,96	9,2135	0,0317	**9,1817**	4,61	yes
W-LAN 5GHz (20MHZ BW)	5745,0	8,53	3,50	12,03	100%	0,016	15,96	9,7103	0,0317	**9,6786**	4,86	yes
	5785,0	8,53	3,50	12,03		0,016	15,96	9,7565	0,0317	**9,7247**	4,88	yes
	5825,0	8,53	3,50	12,03		0,016	15,96	9,8025	0,0317	**9,7708**	4,90	yes
W-LAN 5GHz (40MHz BW)	5190,0	7,44	3,50	10,94	100%	0,012	12,42	9,0590	0,0247	**9,0343**	4,53	yes
	5230,0	7,44	3,50	10,94		0,012	12,42	9,1067	0,0247	**9,0820**	4,56	yes
W-LAN 5GHz (40MHz BW)	5270,0	7,44	3,50	10,94	100%	0,012	12,42	9,1542	0,0247	**9,1295**	4,58	yes
	5310,0	7,44	3,50	10,94		0,012	12,42	9,2016	0,0247	**9,1769**	4,60	yes
W-LAN 5GHz (40MHz BW)	5510,0	7,44	3,50	10,94	100%	0,012	12,42	9,4371	0,0247	**9,4124**	4,72	yes
	5550,0	7,44	3,50	10,94		0,012	12,42	9,4839	0,0247	**9,4592**	4,74	yes
	5670,0	7,44	3,50	10,94		0,012	12,42	9,6235	0,0247	**9,5988**	4,81	yes
W-LAN 5GHz (40MHz BW)	5755,0	7,44	3,50	10,94	100%	0,012	12,42	9,7219	0,0247	**9,6972**	4,86	yes
	5795,0	7,44	3,50	10,94		0,012	12,42	9,7680	0,0247	**9,7433**	4,89	yes
W-LAN 5GHz (40MHz BW)	5270,0	7,49	3,50	10,99	100%	0,013	12,56	9,1542	0,0250	**9,1292**	4,58	yes
	5310,0	7,49	3,50	10,99		0,013	12,56	9,2016	0,0250	**9,1766**	4,60	yes
W-LAN 5GHz (40MHz BW)	5510,0	7,49	3,50	10,99	100%	0,013	12,56	9,4371	0,0250	**9,4121**	4,72	yes
	5550,0	7,49	3,50	10,99		0,013	12,56	9,4839	0,0250	**9,4589**	4,74	yes
	5670,0	7,49	3,50	10,99		0,013	12,56	9,6235	0,0250	**9,5985**	4,81	yes
W-LAN 5GHz (40MHz BW)	5755,0	7,49	3,50	10,99	100%	0,013	12,56	9,7219	0,0250	**9,6969**	4,86	yes
	5795,0	7,49	3,50	10,99		0,013	12,56	9,7680	0,0250	**9,7430**	4,89	yes

Maximum calculated MPE value:		
5GHz		
Lowest MPE-Limit:	9,0471	[W/m^2]
Highest MPE value:	0,0317	[W/m^2]
Margin to limit	9,0153	[W/m^2]

3.7.3 Simultaneous Transmission MPE

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
∑ of MPE ratios ≤ 1.0

		W-LAN 2.4GHz	Bluetooth BDR/DER	WLAN 5GHz
	Ratio of MPE-Value/Limit	0,001899897	0,000185665	0
W-LAN 2.4GHz	0,001899897	--	0,002085562	0,001899897
Bluetooth BDR/DER	0,000185665	0,002085562	--	0,000185665
WLAN 5GHz	0,000000000	0,001899897	0,000185665	0,000000000
Maximum-Value				0,00208556

3.8 Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

The measurement results comply with the RSS-102, Issue 5.

3.2. Measurement uncertainties

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved.
For uncertainty determination, each component used in the concrete measurement set-up was taken in account and it's contribution to the overall uncertainty according it's statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%						Remarks
Conducted emissions (U_{CISPR})	CISPR 16-2-1	9 kHz - 150 kHz 150 kHz - 30 MHz	4.0 dB 3.6 dB						-
Radiated emissions Enclosure	CISPR 16-2-3	30 MHz - 1 GHz 1 GHz - 18 GHz	4.2 dB 5.1 dB						E-Field
Disturbance power	CISPR 16-2-2	30 MHz - 300 MHz	-						-
Power Output radiated	-	30 MHz - 4 GHz	3.17 dB						Substitution method
Power Output conducted	-	Set-up No.	Cel-C1	Cel-C2	BT1	W1	W2		
		9 kHz - 12.75 GHz	N/A	0.60	--	--	--		-
		12.75 - 26.5GHz	N/A	0.82	--	--	--		
Conducted emissions on RF-port	-	9 kHz - 2.8 GHz	0.70	N/A	--	--	--		N/A - not applicable
		2.8 GHz - 12.75GHz	1.48	N/A	--	--	--		
		12.75 GHz - 18GHz	1.81	N/A	--	--	--		
		18 GHz - 26.5GHz	1.83	N/A	--	--	--		
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
	-		See above: 0.70 dB						Power
Frequency stability	-	9 kHz - 20 GHz	0.0636 ppm						-
Radiated emissions Enclosure	-	150 kHz - 30 MHz 30 MHz - 1 GHz 1 GHz - 20 GHz	5.0 dB 4.2 dB 3.17 dB						Magnetic field E-field Substitution

Table: measurement uncertainties, valid for conducted/radiated measurements

4. Abbreviations used in this report

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

5. 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	MRA US-EU 0003	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
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			

6. Instruments and Ancillary

6.1. Used equiment "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	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
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
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
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. 9.15.00
444	CTC-FAR-EMS field	System-EMS-Field (FAR)	-	EMC 32 Version 9.15.00
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	831259/013	Firmware Bios 3.40 , Analyzer 3.40 Sp 2
607	Signal Generator	SMR 20	832033/011	V1.25
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
670	Univ. Radio Communication Tester	CMU 200	106833	µP1 =V8.50, Firmware = V.20
689	Vector Signal Generator	SMU200	100970	02.20.360.142
692	Bluetooth Tester	CBT 32	100236	CBT V 5.40, FW: V.2.41 (FPGA Digital, V. 3.09 FPGA RF)

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	-	16.05.2018
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	15.05.2018
007	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	17.05.2018
009	Power Meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	24 M	-	15.05.2019
016	Line Impedance Simulating Network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	30.05.2019
021	Loop Antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	30.04.2018
030	Loop Antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	30.04.2018
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	15.05.2019
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	pre-m	1a	
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
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	
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	30.04.2018
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	30.04.2018
110	USB-LWL-Converter	OLS-1	-	Ing. Büro Scheiba	-	4	
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	BOCONSULT	36 M	-	30.05.2019
133	horn antenna 18 GHz (Meas 1)	3115	9012-3629	EMCO	36 M	1c	10.03.2020
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	36 M	-	10.03.2020
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	36 M	-	30.04.2018
140	Signal Generator	SMHU	831314/006	Rohde & Schwarz	24 M	-	30.05.2018
248	attenuator	SMA 6dB 2W	-	Radiall	pre-m	2	
249	attenuator	SMA 10dB 10W	-	Radiall	pre-m	2	
252	attenuator	N 6dB 12W	-	Radiall	pre-m	2	
256	attenuator	SMA 3dB 2W	-	Radiall	pre-m	2	
257	hybrid	4031C	04491	Narda	pre-m	2	
260	hybrid coupler	4032C	11342	Narda	pre-m	2	
261	Thermal Power Sensor	NRV-Z55	825083/0008	Rohde & Schwarz	24 M	-	30.05.2018
262	Power Meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	30.05.2018
263	Signal Generator	SMP 04	826190/0007	Rohde & Schwarz	36 M	-	30.05.2019
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	30.05.2018
266	Peak Power Sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	30.05.2018
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	
298	Univ. Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	pre-m	3	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	12 M	-	17.05.2018
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	-	14.03.2020
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	36 M	-	20.03.2020
331	Climatic Test Chamber -40/+180 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	30.10.2018
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	30.05.2018
342	Digital Multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	24 M	-	17.05.2019
347	laboratory site	radio lab.	-	-	-	5	
348	laboratory site	EMI conducted	-	-	-	5	
354	DC - Power Supply 40A	NGPE 40/40	448	Rohde & Schwarz	pre-m	2	
355	Power Meter	URV 5	891310/027	Rohde & Schwarz	24 M	-	30.05.2018
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24 M	-	24.05.2019
371	Bluetooth Tester	CBT32	100153	R&S	36 M	-	30.05.2019
373	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	100535	Rohde & Schwarz	12 M	-	17.05.2018
377	EMI Test Receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	15.05.2018
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	18.05.2018
405	Thermo-/Hygrometer	OPUS 10 THI	126.0604.0003.3.3.3.22	LUFFT Mess u. Regeltechnik	24 M	-	30.03.2019
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
436	Univ. Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	24.05.2018
439	UltraLog-Antenna	HL 562	100248	Rohde & Schwarz	36 M	-	10.03.2020
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren / CETECOM	12 M	5	30.09.2017
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
456	DC-Power supply 0-5 A	EA 3013 S	207810	Elektro Automatik	pre-m	2	
459	DC -Power supply 0-5 A , 0-32 V	EA-PS 2032-50	910722	Elektro Automatik	pre-m	2	
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	30.05.2018

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
467	Digital Multimeter	Fluke 112	89680306	Fluke USA	36 M	-	30.04.2018
468	Digital Multimeter	Fluke 112	90090455	Fluke USA	36 M	-	30.04.2018
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
480	power meter (Fula)	NRVS	838392/031	Rohde & Schwarz	24 M	-	16.05.2019
482	filter matrix	Filter matrix SAR 1	-	CETECOM (Brl)	-	1d	
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR) NSA	-	ETS Lindgren / CETECOM	24 M	-	31.09.2017
489	EMI Test Receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	18.05.2019
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	
517	relais switch matrix	HF Relais Box Keithley	SE 04	Keithley	pre-m	2	
523	Digital Multimeter	L4411A	MY46000154	Agilent	24 M	-	18.05.2019
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	pre-m	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	pre-m	2	
546	Univ. Radio Communication Tester	CMU 200	106436	R&S	12 M	-	30.03.2018
547	Univ. Radio Communication Tester	CMU 200	835390/014	Rohde & Schwarz	12 M	-	30.04.2017
549	Log.Per-Antenna	HL025	1000060	Rohde & Schwarz	36/12 M	-	31.07.2018
574	Biconilog Hybrid Antenna	BTA-L	980026L	Frankonia	36/12 M	-	31.03.2019
584	Spectrum Analyzer	FSU 8	100248	Rohde & Schwarz	pre-m	-	
597	Univ. Radio Communication Tester	CMU 200	100347	Rohde & Schwarz	pre-m	-	
600	power meter	NRVD (Reserve)	834501/018	Rohde & Schwarz	24 M	-	17.05.2019
601	medium-sensitivity diode sensor	NRV-Z5 (Reserve)	8435323/003	Rohde & Schwarz	24 M	-	15.05.2019
602	peak power sensor	NRV-Z32 (Reserve)	835080	Rohde & Schwarz	24 M	-	
611	DC power supply	E3632A	KR 75305854	Agilent	pre-m	2	
612	DC power supply	E3632A	MY 40001321	Agilent	pre-m	2	
613	Attenuator	R416120000 20dB 10W	Lot. 9828	Radiall	pre-m	2	
616	Digitalmultimeter	Fluke 177	88900339	Fluke	24 M	-	30.05.2018
617	Power Splitter/Combiner	ZFSC-2-2-S+	S F987001108	Mini Circuits	-	2	
618	Power Splitter/Combiner	50PD-634	600994	JFW Industries USA	-	2	
619	Power Splitter/Combiner	50PD-634	600995	JFW Industries, USA	-	3	
620	EMI Test Receiver	ESU 26	100362	Rohde-Schwarz	12 M	-	16.05.2018
621	Step Attenuator 0-139 dB	RSP	100017	Rohde & Schwarz	pre-m	2	
625	Generic Test Load USB	Generic Test Load USB	-	CETECOM	-	2	
627	data logger	OPUS 1	201.0999.9302.6.4.1.43	G. Lufft GmbH	24 M	-	30.03.2019
634	Spectrum Analyzer	FSM (HF-Unit)	826188/010	Rohde & Schwarz	pre-m	2	
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	-	24.05.2018
644	Amplifierer	ZX60-2534M+	SN865701299	Mini-Circuits	-	-	
670	Univ. Radio Communication Tester	CMU 200	106833	Rohde & Schwarz	24 M	-	30.05.2018
671	DC-power supply 0-5 A	EA-3013S	-	Elektro Automatik	pre-m	2	
678	Power Meter	NRP	101638	Rohde&Schwarz	pre-m	-	
683	Spectrum Analyzer	FSU 26	200571	Rohde & Schwarz	12 M	-	17.05.2018
686	Field Analyzer	EHP-200A	160WX30702	Narda Safety Test Solutions	24 M	-	29.03.2019
687	Signal Generator	SMF 100A	102073	Rohde&Schwarz	12 M	-	17.05.2018
688	Pre Amp	JS-18004000-40-8P	1750117	Miteq	pre-m	-	
690	Spectrum Analyzer	FSU	100302/026	Rohde&Schwarz	12 M	-	16.05.2018
691	OSP120 Base Unit	OSP120	101183	Rohde & Schwarz	12 M	-	22.05.2018
692	Bluetooth Tester	CBT 32	100236	Rohde & Schwarz	36 M	-	29.05.2020
697	Power Splitter	ZN4PD-642W-S+	165001445	Mini-Circuits	-	2	
703	INNCO Antennen Mast	MA 4010-KT080-XPET-ZSS3	MA4170-KT100-XPET-	INNCO	pre-m	-	
704	INNCON Controller	CO 3000-4port	CO3000/933/38410516/L	INNCO Systems GmBh	pre-m	-	
711	Harmonic Mixer 90 GHz - 140GHz	RPG FS-Z140	101004	RPG	12 M	-	22.02.2018
712	Harmonic Mixer 75 GHz - 110GHz	FS-Z110	101468	Rohde & Schwarz	12 M	-	22.02.2018
713	Harmonic Mixer, 50 GHz - 75GHz	FS-Z75	101022	Rohde & Schwarz	12 M	-	22.05.2018
714	Signal Analyzer 67GHz	FSW67	104023	Rohde & Schwarz	24 M	-	03.03.2019
715	Harmonic Mixer, 140 GHz - 220GHz	FS-Z220	101009	RPG Radiometer Physics	12 M	-	03.08.2018
716	Harmonic Mixer 220 GHz to 325 GHZ	FS-Z325	101005	RPG Radiometer Physics	12 M	-	13.02.2018
747	Spectrum Analyzer	FSU 26	200152	Rohde & Schwarz	12 M	-	18.05.2018
748	Pickett-Potter Horn Antenna	FH-PP 4060	010001	Radiometer Physiscs	-	-	
749	Pickett-potter Horn Antenna	FH-PP 60-90	010003	Radiometer Physics	-	-	
750	Pickett-Potter Horn Antenna	FH-PP 140-220	010011	Radiometer Physics	-	-	

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

7. Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2018-08-25