PARTIAL T E S T R E P O R T
No.: 18-1-0026601T05b

According to:

FCC Regulations
Part 20, Section 20.21

ISED-Regulations
RSS-131, Issue 3

for

Kathrein Automotive GmbH

LTE Kompensator US
Compensator US

FCC-ID: 2ACC7LTECOMPB1
ISED: 11980A-LTECOMPB1

Laboratory Accreditation and Listings		
ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-01 D-PL-12047-01-04 Accredited EMC-Test Laboratory	Industry Canada Reg. No.: 3462D-1 Reg. No.: 3462D-2 Reg. No.: 3462D-3	VCCI Voluntary Controls for Electromagnetic Emissions Reg. No.: R-4452, C-20009, T-20006, G-20013
Wi Fi ALLIANCE AUTHORIZED RF LABORATORY	ctia Authorized™ Test Lab Lab Code: 20011130-00	FEDERAL COMMUNICATIONS COMMISSION FC USA MRA US-EU 0003
accredited according to DIN EN ISO/IEC 17025		

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The listed attachments are an integral part of this report.

1. Summary of test results

The test results apply exclusively to the test samples as presented in this Report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests. Also we refer on special conditions which the applicant should fulfill according §2.927 to §2.948, special focus regarding modification of the equipment and availability of sample equipment for market surveillance tests.

The presented EUT is a wideband consumer signal booster for mobile car use.
Following tests have been performed to show compliance with applicable US and Canadian standards.

1.1. TEST OVERVIEW ACCORDING FCC PART 20, SECTION 20.21 AND RSS-131 STANDARD

Page	KDB Test Case	Reference to FCC part 20 for a consumer wideband booster, cradle type	Reference to ISED	Limit	Verdict
--	7.1 Authorized frequency band verification test	§ 20.21(e)(3) Frequency Bands	Operational description	--	Separate test report
--	7.2 Maximum power measurement test procedure	§ 20.21(e)(8)(i)(D) Power Limits § 20.21(e)(8)(i)(B) Bidirectional Capability § 20.21(e)(8)(ii)(B) Gain Control	RSS-131, Issue 3, Chapter 5.1.3.3	17 < p < 30 dBm	
--	7.3 Gain		RSS-131, Issue 3, Chapter 5.1.3.2	< 23 dB	
--	7.4 Intermodulation product test procedure	§ 20.21(e)(8)(i)(F) Intermodulation	RSS-131, Issue 3, Chapter 5.1.3.5	-19 dBm	
--	7.5 Out-of-band emissions test procedure	§ 20.21(e)(8)(i)(E) Out of Band Emission	RSS-131, Issue 3, Chapter 5.1.3.4	-19 dBm	
--	7.6 Conducted spurious emissions test procedure	§ 2.1051 Spurious emissions at antenna terminals	RSS-131, Issue 3, Chapter 5.1.3.4	-19 dBm	
--	7.7 Noise limits test	§ 20.21(e)(8)(i)(A) Noise Limits § 20.21(e)(8)(i)(H) Tr. Power Off	RSS-131, Issue 3, Chapter 5.1.3.6	< -70 dBm	
--	7.8 Uplink Inactivity	§ 20.21(e)(8)(i)(A) Noise Limits § 20.21(e)(8)(i)(H) Tr. Power Off	RSS-131, Issue 3, Chapter 5.1.3.7	< 15 s	
--	7.9 Variable booster gain test procedure	§ 20.21(e)(8)(i)(C)(1) Gain Limits § 20.21(e)(8)(ii)(B) Gain Control	RSS-131, Issue 3, Chapter 5.1.1.2, 5.1.1.3 and 5.1.3.2	6 …23 dB	
--	7.10 Occupied bandwidth test procedure	§ 2.1049 Occupied bandwidth	RSS-Gen.	compiled	
--	7.11 Oscillation detection test procedure	§ 20.21(e)(8)(ii)(A) Anti-Oscillation	RSS-131, Issue 3, Chapter 5.1.1.1	--	
12	7.12 Radiated spurious emissions test procedure	§ 2.1053 Field strength of spurious radiation	RSS-131, Issue 3, Chapter 5.1.3.4	Part 22, 24 and 27 Limits for mobile equipment – 6dB	pass
--	7.13 Spectrum block filtering test procedure	§ 20.21(e)(3) Frequency Bands	Operational description	--	Separate test report

1.2. 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.

.....	Digital signiert von: Christian Lorenz Datum: 2018.11. 29 16:15:44 + 01'00' .....
Dipl.-Ing. Niels Jeß	Dipl. Ing. Christian Lorenz
Responsible for test section	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

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 and project leader:	Dipl.-Ing. C. Lorenz
Receipt of EUT:	2018-08-21
Date(s) of test:	2018-09-13 / 2018-11-15
Date of report:	2018-11-29
Version of template: 13.02	

2.4. Applicant's details

Applicant's name:	Kathrein Automotive GmbH
Address:	Römerring 1 31137 Hildesheim Germany
Contact person:	Mr. Thomas Schuhbeck

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. Summary of supported frequency bands

Frequency Band	Supported signal types
Band 2: 1900 MHz (PCS)	GSM / CDMA / WCDMA / LTE
Band 4: 1.7 GHz	WCDMA / LTE
Band 5: 850 MHz (cell band)	GSM / CDMA/ WCDMA / LTE
Band 12/17: 700 MHz	LTE
Band 13: 800 MHz	LTE

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

Short description*)	EUT	Type	Sample no.	S/N serial number	HW hardware status	SW software status
EUT A	LTE Kompensator US	Compensator US	S03	S/N: 190	13611825_B03V06	9408752_F01_RC03
EUT B	LTE Kompensator US	Compensator US	S32	18B234GK0010	13611825_B03V07	9408752_F01_ RC14

*) 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	Antenna	Shark fine (9350090-01)	19081710 (S08)	A	1.0
AE 2	Mobile craddle	9 387 208-02	133997 10 (S19)	17.03.15	--
AE 3	10dB Bi-Directional coupler	KRYTAR Model 1851	#109891	0.5-18.5GHz	--
AE 4	10dB Bi-directional coupler	Weinschel 1539R-10	#1259	0.6-4GHz	--
AE 5	Rounded metal plane for AE 1	--	#1	32cm diameter	--
AE 6	DC power cable	--	S10	3.76m	--

*) 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 + AE 6	Radiated tests performed AE3 used at Donor Part of the booster AE4 used at Server Part of the booster Connections of AE1: Tel 1 – to EUT Tel 2 – cable + 50 Ohm terminated GPS – cable /open SDARS – cable / open
set. 2	EUT B + AE 1 + AE 2 + AE 3 + AE 4 + AE 5 + AE 6	Radiated tests performed AE3 used at Donor Part of the booster AE4 used at Server Part of the booster Connections of AE1: Tel 1 – to EUT Tel 2 – cable + 50 Ohm terminated GPS – cable /open SDARS – cable / open

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

3.5. EUT operating modes GSM-Signal feed

EUT operating mode no.*)	Description of operating modes	Additional information	
op. 1	Operating Band 2: 1900 MHz (PCS) GSM Signal / GMSK 1 Slot active	Bi-direction Booster mode. In order to supply the necessary RF-signals at both input ports (server/donor) bi-directional couplers were used at the input of the device. Two signal generators supply RF-signals on defined frequencies and at defined level at both input ports of the device. Over coupled port of the bi-directional coupler the power was set prior starting tests to a defined level. The power level was set to reach Pin as determined prior to tests accord. KDB 935210D03 V04r02, subchapter 7.2. Pls. find the test method description in test report 18-1-0026601T05a, Chapter 5.2. EUT was powered with 12 V DC. Power consumption around 250mA dependable of the operational band.	
		Input Uplink Frequency /Level:-2.1 dBm Downlink Input frequency/Level: -52.6 dBm	1881.3MHz / dBm (remark 1) 1978.3MHz / dBm (remark 1)
op. 2	Operating Band 4: 1.7 GHz GSM Signal / GMSK 1 Slot active	Bi-direction Booster mode. Signals were supplied at defined level at both input Ports as below:	
		Input Uplink Frequency/ Level: -1.3 dBm Downlink Input frequency/Level: -54.1 dBm	1734.3MHz / dBm (remark 1) 2113.4 MHz / dBm (remark 1)
op. 3	Operating Band 5: 850 MHz GSM Signal / GMSK 1 Slot active	Bi-direction Booster mode. Signals were supplied at defined level at both input Ports as below:	
		Input Uplink Frequency/ Level: -0.4 dBm Downlink Input frequency/Level: -52.7 dBm	839.1MHz / dBm (remark 1) 877.8MHz / dBm (remark 1)
op. 4	Operating Band 12: Lower 700 MHz GSM Signal / GMSK 1 Slot active	Bi-direction Booster mode. Signals were supplied at defined level at both input Ports as below:	
		Input Uplink Frequency/ Level: -0.1 dBm Downlink Input frequency/Level: -53.6 dBm	708.3MHz / dBm (remark 1) 733.3MHz / dBm (remark 1)
op. 5	Operating Band 13: Upper 800 MHz GSM Signal / GMSK 1 Slot active	Bi-direction Booster mode. Signals were supplied at defined level at both input Ports as described as below:	
		Input Uplink Frequency/ Level: 1.0 dBm Downlink Input frequency/Level: -51.9 dBm	780.3MHz / dBm (remark 1) 748.8MHz / dBm (remark 1)

*) EUT operating mode no. is used to simplify the test report.
Pls. see results in test report test report 18-1-0026601T05a, Chapter 5.2 for P_{IN} RF-measurements

3.6. EUT operating modes AWGN-Signal feed

EUT operating mode no.*)	Description of operating modes	Additional information	
op. 6	Operating Band 2: 1900 MHz (PCS) AWGN Signal 4.1MHz OBW	Bi-direction Booster mode. In order to supply the necessary RF-signals at both input ports (server/donor) bi-directional couplers were used at the input of the device. Two signal generators supply RF-signals on defined frequencies and at defined level at both input ports of the device. Over coupled port of the bi-directional coupler the power was set prior starting tests to a defined level. The power level was set to reach Pin as determined prior to tests accord. KDB 935210D03 V04r02, subchapter 7.2. Pls. find the test method description in test report 18-1-0026601T05a, Chapter 5.2. EUT was powered with 12 V DC. Power consumption around 250mA dependable of the operational band.	
		Input Uplink Frequency/ Level: -1.9 dBm Downlink Input frequency/Level: -51.9 dBm	1881.3MHz / dBm (remark 1) 1978.3MHz / dBm (remark 1)
op. 7	Operating Band 4: 1.7 GHz AWGN Signal 4.1MHz OBW	Bi-direction Booster mode. Signals were supplied at defined level at both input Ports as below:	
		Input Uplink Frequency/ Level: -1.4 dBm Downlink Input frequency/Level: -53.6 dBm	1734.3MHz / dBm (remark 1) 2113.4 MHz / dBm (remark 1)
op. 8	Operating Band 5: 850 MHz AWGN Signal 4.1MHz OBW	Bi-direction Booster mode. Signals were supplied at defined level at both input Ports as below:	
		Input Uplink Frequency/ Level: -0.1 dBm Downlink Input frequency/Level: -51.9 dBm	839.1MHz / dBm (remark 1) 877.8MHz / dBm (remark 1)
op. 9	Operating Band 12: Lower 700 MHz AWGN Signal 4.1MHz OBW	Bi-direction Booster mode. Signals were supplied at defined level at both input Ports as below:	
		Input Uplink Frequency/ Level: 0.5 dBm Downlink Input frequency/Level: -51.5dBm	708.3MHz / dBm (remark 1) 733.3MHz / dBm (remark 1)
op. 10	Operating Band 13: Upper 800 MHz AWGN Signal 4.1MHz OBW	Bi-direction Booster mode. Signals were supplied at defined level at both input Ports as described as below:	
		Input Uplink Frequency/ Level: 1.5 dBm Downlink Input frequency/Level: -51.3 dBm	780.3MHz / dBm (remark 1) 748.8MHz / dBm (remark 1)

*) EUT operating mode no. is used to simplify the test report.
Pls. see results in test report 18-1-0026601T05a, Chapter 5.2for Pin RF-measurements

3.7. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	Rosenberger RF-cable (for feeding Downlink signal on AE3)	Shielded	2808 Radio-Lab K6	shielded	1.98m
Cable 2	Rosenberger RF-cable (for feeding Uplink signal on AE4)	SMA-shielded	5104-38096-1	shielded	2.47m
Cable 3	FAKRA	RTK031	S20	shielded	2.54m
Cable 4	Power DC cable	Non-shielded	S10	--	3.76m
Cable 5	Power DC cable for AE2 (red)	Non-shielded	S29	Non-shielded	0.93m
Cable 6	Power DC cable for AE2 (black)	Non-shielded	S30	Non-shielded	0.93m
Cable 7	FAKRA	RTK031	S23	Shielded	1.04m
Cable 8	FAKRA	RTK031	S09	Shielded	1.04m
Cable 9	FAKRA	RTK031	S22	Shielded	1.04m

Remark1: for feeding the RF-signals from generator to Bi-directional couplers

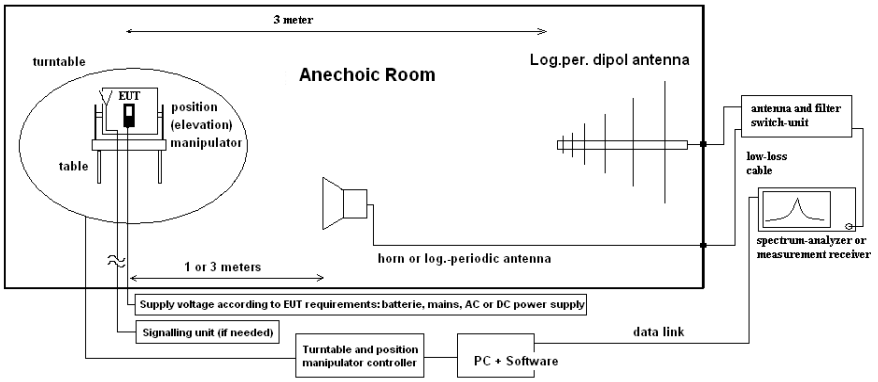
4. Description of test system set-up's

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

Specification: ANSI C63.4-2014 chapter 8.3, ANSI C63.10-2013 chapter 6.6.3.3 & 6.6.4

General Description: Evaluating the 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 16-1-4:2010 compliant fully anechoic room (FAR) recognized by the regulatory commission. The measurement distance was set to 3 meter for frequencies up to 18 GHz and 2 meter above 18 GHz. A logarithmic periodic antenna is used for the frequency range 30 MHz to 1 GHz. Horn antennas are used for frequency range 1 GHz to 40 GHz. The EUT is aligned within 3 dB beam width of the measurement antenna with three orthogonal axis measurements on the EUT.

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 15°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and it's 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 over 3-orthogonal axis and the height for EUT with large dimensions.

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

Formula:

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

$M = L_T - E_C$ (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. RF-Parameter - Radiated out of Band RF emissions and Band Edge

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

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☒ 443 FAR	☐ 347 Radio.lab.1	☐ 347 Radio.lab.2	
receiver	☐ 377 ESCS30	☐ 001 ESS	☐ 489 ESU 40	☐ ESU 26		
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☒ 264 FSEK			
antenna	☒ 439 HL 562	☒ 549 HL 025	☐ 302 BBHA9170	☐ 289 CBL 6141	☐ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 017 CMD 65	☐ 323 CMD 55	☐ 340 CMD 55			
signaling	☐ 392 MT8820A	☒ 546 CMU	☐ 547 CMU			
power supply	☒ 611 E3636A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒ -- High Pass KL4IH10-1375/U-12750-0/-0		☒ 559 SMU200A	☒ 263 SMP-04	☒ 357 NRV-Z1 Power sensor	☒ 600 NRVD power meter
line voltage	☐ 230 V 50 Hz via public mains		☐ 060 110 V/ 60 Hz via PAS 5000			

5.1.2. Requirements and limits

FCC	General: §2.1053(a) , §2.1057(a) ☒ LTE Band 5: Part 22: §22.917(a)(b) ☒ LTE Band 2: Part 24: §24.238(a)(b) ☒ LTE Band 4: Part 27: §27.53(h) ☒ LTE Band 12: Part 27: §27.53(g) ☒ LTE Band 13: Part 27: §27.53(c), §27.53(f)
ANSI	C63.10:2013, C63.26: 2015, KDB 935210D03 V04r02
FCC-Limit	***§20.21:*** *(E) Out of Band Emission Limits. Booster out of band emissions (OOBE) shall be at least 6 dB below the FCC's mobile emission limits for the supported bands of operation.*
IC-Limit:	See corresponding RSS-standards with general limits without further reduction

5.1.3. Test condition and test set-up

link to test system (if used):	☐ air link	☐ cable connection	☐
EUT-grounding	☒ none	☐ with power supply	☐ additional connection
Equipment set up	☒ table top		☐ floor standing
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%
Test system set-up	Please see chapter “Test system set-up for radiated spurious emission measurements up to 20 GHz”		
Measurement method	The spectrum was scanned from 9 kHz to the 10th harmonic of the highest frequency generated within the equipment. A PEAK detector was used.		
EUT settings	Pls. see chapter Operating mode, page 8		

Spectrum-Analyzer settings for GSM1900/W-CDMA/LTE band 2

	Start freq. MHz	Stop freq. MHz	R-BW MHz	V-BW MHz	Sweep time sec.	Att. [dB]	Detector
Sweep 1 (subrange 1)	30	1000	1	1	10	10	MaxH-PK
Sweep 1 (subrange 2)	1000	2800	1	1	15	0	MaxH-PK
Sweep 1 (subrange 3)	2800	20000	1	1	60	10	MaxH-PK

Spectrum-analyzer settings for W-CDMA/LTE Band 4

	Start freq. MHz	Stop freq. MHz	R-BW MHz	V-BW MHz	Sweep time sec.	Att.	Detector
Sweep 1 (subrange 1)	30	1000	1	10	10	10	MaxH-PK
Sweep 1 (subrange 2)	1000	2800	1	10	15	0	MaxH-PK
Sweep 1 (subrange 3)	2800	18000	1	10	160	10	MaxH-PK

Spectrum-analyzer settings for GSM1900/W-CDMA/LTE Band 5

	Start freq. MHz	Stop freq. MHz	R-BW MHz	V-BW MHz	Sweep time sec.	Att.	Detector
Sweep 1 (subrange 1)	30	1000	0.1	1	10	10	MaxH-PK
Sweep 1 (subrange 2)	1000	2800	0.1	1	15	0	MaxH-PK
Sweep 1 (subrange 3)	2800	9000	0.1	1	160	10	MaxH-PK

Spectrum-Analyzer settings for LTE band 12

	Start freq. MHz	Stop freq. MHz	R-BW MHz	V-BW MHz	Sweep time sec.	Att. [dB]	Detector
Sweep 1 (subrange 1)	30	1000	0.1	1	10	10	MaxH-PK
Sweep 1 (subrange 2)	1000	2800	0.1	1	15	0	MaxH-PK
Sweep 1 (subrange 3)	2800	9000	0.1	1	60	10	MaxH-PK

Spectrum-Analyzer settings for LTE band 13

	Start freq. MHz	Stop freq. MHz	R-BW MHz	V-BW MHz	Sweep time sec.	Att. [dB]	Detector
Sweep 1 (subrange 1)	30	1000	1	1	10	10	MaxH-PK
Sweep 1 (subrange 2)	1000	2800	1	1	15	0	MaxH-PK
Sweep 1 (subrange 3)	2800	9000	1	1	60	10	MaxH-PK
	763	775	0.01	0.1	2	10	
	775	793	0.1	1	0.5	10	
Sweep 2 (§27.53c2/3/4)	793	805	0.01	0.1	2	10	MAXH-PK
Sweep 3 (§27.53(f))	1559	1610	1	3	1.5	10	MAX-H-PK

5.1.4. Results

The results are presented below in summary form only. For more information please see each diagram in annex 1.

5.1.4.1. FDD Band 2: Op. Mode 1, Set-up 1 (GSM)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.05	1881.3	1978.3	30MHz to 18.0 GHz	1	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: 18-20GHz tested as preliminary only – no emissions detected for final tests

5.1.4.2. FDD Band 2: Op. Mode 1, Set-up 2 (GSM)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.15	1881.3	1978.3	30MHz to 20.0 GHz	1	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: --

5.1.4.3. FDD Band 2: Op. Mode 6, Set-up 1 (AWGN)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.06	1881.3	1978.3	30MHz to 18.0 GHz	6	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: 18-20GHz tested as preliminary only – no emissions detected for final tests

5.1.4.4. FDD Band 4: Op. Mode 2, Set-up 1 (GSM)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.04	1734.3	2113.4.5	30 MHz to 18 GHz	2	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: 18-21.5GHz tested as preliminary only – no emissions detected for final tests

5.1.4.5. FDD Band 4: Op. Mode 7, Set-up 1 (AWGN)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.07	1734.3	2113.4.5	30 MHz to 18 GHz	7	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: 18-21.5GHz tested as preliminary only – no emissions detected for final tests

5.1.4.6. FDD Band 5: Op. Mode 3, Set-up 1 (GSM)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.03	839.1	877.8	30 MHz to 9 GHz	3	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: --

5.1.4.7. FDD Band 5: Op. Mode 3, Set-up 2 (GSM)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.16	839.1	877.8	30 MHz to 9 GHz	3	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: --

5.1.4.8. FDD Band 5: Op. Mode 8, Set-up 1 (AWGN)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.08	839.1	877.8	30 MHz to 9 GHz	8	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: --

5.1.4.9. FDD Band 12: Op. Mode 4, Set-up 1 (GSM)

Dia-gram no.	Operating Frequencies		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.01	708.3 MHz	733.3 MHz	30 MHz to 9 GHz	4	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: --

5.1.4.10. FDD Band 12: Op. Mode 9, Set-up 1 (AWGN)

Dia-gram no.	Operating Frequencies		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.09	708.3 MHz	733.3 MHz	30 MHz to 9 GHz	9	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed

Remark: --

5.1.4.11. FDD Band 13: Op. Mode 5, Set-up 1 (GSM)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.02	780.3 MHz	748.8 MHz	30 MHz to 9 GHz	5	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed
8.11			763 MHz to 805MHz	5	Carrier visible on diagram.	☒	☐	☐	passed
8.12			1559 to 1610 MHz	5	Harmonic of Uplink Channel at 1564MHz. Bandwidth 817kHz Wideband limit of -70dBW/MHz (-46dBm/MHz) applicable	☒	☒	☐	Passed

5.1.4.12. FDD Band 13: Op. Mode 10, Set-up 1 (AWGN)

Dia-gram no.	Operating Frequencies [MHz]		Frequency range	OP-mode no.	Remark	Used detector			Result
	Uplink	Downlink				PK	AV	QP	
8.10	780.3 MHz	748.8 MHz	30 MHz to 9 GHz	10	Carrier visible on diagram. Not relevant for results	☒	☐	☐	passed
8.13			763 MHz to 805MHz	10	Carrier visible on diagram.	☒	☐	☐	passed
8.14			1559 to 1610 MHz	10	Harmonic of Uplink Channel at 1564MHz. LTE Bandwidth at least 1.4MHz, wideband limit of -70dBW/MHz (-46dBm/MHz) applicable	☒	☒	☐	Passed

5.2. 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	0.7	0.25	N/A	--	-
		12.75 - 26.5GHz	N/A	0.82	--	N/A	N/A	--	
Conducted emissions on RF-port	-	9 kHz - 2.8 GHz	0.70	N/A	0.70	N/A	0.69	--	N/A - not applicable
		2.8 GHz - 12.75GHz	1.48	N/A	1.51	N/A	1.43	--	
		12.75 GHz - 18GHz	1.81	N/A	1.83	N/A	1.77	--	
		18 GHz - 26.5GHz	1.83	N/A	1.85	N/A	1.79	--	
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

6. Abbreviations used in this report

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

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

Ref.-No.	Accreditation Certificate	Valid for laboratory area or test site	Accreditation Body
-	D-PL-12047-01-01	All laboratories and test sites of CETECOM GmbH, Essen	DAkkS, Deutsche Akkreditierungsstelle GmbH
337 487 558 348 348	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)	ISED, 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

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

8.0.1. Test software and firmware of equipment

Ref.-No.	Equipment	Type	Serial-No.	Version of Firmware or Software during the test
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
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	Firm.= V 3.1DHG
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
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
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=
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
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)
699	Audio Analyzer	UPL16	833494/005	3.06

8.0.2. Single instruments and test systems

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	16.05.2019
007	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	16.05.2019
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
020	Horn Antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36/12 M	-	31.07.2021
021	Loop Antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	30.05.2021
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	-	30.05.2021
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	30.05.2021
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
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	-	30.05.2020
262	Power Meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	30.05.2019
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	30.05.2020
266	Peak Power Sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	30.05.2020
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	-	17.05.2019
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
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	30.05.2020
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	
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	-	17.05.2019

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
377	EMI Test Receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	30.05.2019
389	Digital Multimeter	Keithley 2000	0583926	Keithley	pre-m	-	
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	30.06.2019
405	Thermo-/Hygrometer	OPUS 10 THI	126.0604.0003.3.3.3.22	LUFFT Mess u. Regeltechnik GmbH	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	-	06.03.2019
439	UltraLog-Antenna	HL 562	100248	Rohde & Schwarz	36 M	-	10.03.2020
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
456	DC-Power supply 0-5 A	EA 3013 S	207810	Elektro Automatik	pre-m	2	
459	DC -Power supply 0-5 A , 0-32 V	EA-PS 2032-50	910722	Elektro Automatik	pre-m	2	
460	Univ. Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	30.05.2019
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	30.05.2020
467	Digital Multimeter	Fluke 112	89680306	Fluke USA	36 M	-	30.05.2019
468	Digital Multimeter	Fluke 112	90090455	Fluke USA	36 M	-	30.04.2021
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	-	31.03.2019
489	EMI Test Receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	30.06.2019
502	band reject filter	WRCG 1709/1786-1699/1796-	SN 9	Wainwright	pre-m	2	
503	band reject filter	WRCG 824/849-814/859-60/10SS	SN 5	Wainwright	pre-m	2	
517	relais switch matrix	HF Relais Box Keithley System	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	-	30.07.2019
547	Univ. Radio Communication Tester	CMU 200	835390/014	Rohde & Schwarz	12 M	-	30.07.2019
549	Log.Per-Antenna	HL025	1000060	Rohde & Schwarz	36/12 M	-	31.07.2021
550	System CTC S-VSWR Verification SAR-EMI	System EMI Field SAR S-VSWR	-	ETS Lindgren/CETECOM	24 M	-	30.03.2019
558	System CTC FAR S-VSWR	System CTC FAR S-VSWR	-	CTC	24 M	-	08.08.2019
574	Biconilog Hybrid Antenna	BTA-L	980026L	Frankonia	36/12 M	-	31.03.2019
584	Spectrum Analyzer	FSU 8	100248	Rohde & Schwarz	pre-m	-	
594	Wideband Radio Communication Tester	CMW 500	101757	Rohde & Schwarz	12 M	-	30.05.2019
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	-	30.05.2020
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	-	30.05.2019
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 1,5m	-	Reichelt	-	2	

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
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	24 M	-	24.05.2019
644	Amplifierer	ZX60-2534M+	SN865701299	Mini-Circuits	-	-	
670	Univ. Radio Communication Tester	CMU 200	106833	Rohde & Schwarz	24 M	-	30.05.2020
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	-	30.05.2019
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	-	30.05.2019
688	Pre Amp	JS-18004000-40-8P	1750117	Miteq	pre-m	-	
690	Spectrum Analyzer	FSU	100302/026	Rohde&Schwarz	24 M	-	16.05.2019
691	OSP120 Base Unit	OSP120	106833	Rohde & Schwarz	12 M	-	30.05.2019
692	Bluetooth Tester	CBT 32	100236	Rohde & Schwarz	36 M	-	29.05.2020
697	Power Splitter	ZN4PD-642W-S+	165001445	Mini-Circuits	-	2	
701	CMW500 wide. Radio Comm.	CMW500	158150	Rohde & Schwarz	12 M	-	30.07.2019
703	INNCO Antennen Mast	MA 4010-KT080-XPET-ZSS3	MA4170-KT100-XPET-ZSS3	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	36 M	-	22.02.2020
712	Harmonic Mixer 75 GHz - 110GHz	FS-Z110	101468	Rohde & Schwarz	36 M	-	22.02.2020
713	Harmonic Mixer, 50 GHz - 75GHz	FS-Z75	101022	Rohde & Schwarz	36 M	-	22.05.2020
714	Signal Analyzer 67GHz	FSW67	104023	Rohde & Schwarz	24 M	-	28.02.2020
715	Harmonic Mixer, 140 GHz - 220GHz	FS-Z220	101009	RPG Radiometer Physics	36 M	-	03.08.2020
716	Harmonic Mixer 220 GHz to 325 GHZ	FS-Z325	101005	RPG Radiometer Physics	36 M	-	13.02.2020
747	Spectrum Analyzer	FSU 26	200152	Rohde & Schwarz	12 M	-	30.05.2019
748	Pickett-Potter Horn Antenna	FH-PP 4060	010001	Radiometer Physiscs	36 M	-	
749	Pickett-potter Horn Antenna	FH-PP 60-90	010003	Radiometer Physics	-	-	
750	Pickett-Potter Horn Antenna	FH-PP 140-220	010011	Radiometer Physics	-	-	
751	Digital Optical System	optoCAN-FD Transceiver	17-010416	mk-messtechnik GmbH	-	-	
752	Digital Optical System	optoCAN-FD Transceiver	17-010083	mk-messtechnik GmbH	-	-	
753	Digital Optical System	optoCAN-FD Transceiver	17-010084	mk-messtechnik GmbH	-	-	
754	Digital Optical System	optoCAN-FD Transceiver	17-010415	mk-messtechnik GmbH	-	-	
755	Digital Optical System	optoLAN-100-MAX Transceiver	17-010795	mk-messtechnik GmbH	-	-	
758	Signal Generator	SMU 200A	100754	Rohde & Schwarz	24 M	-	11.10.2019
780	Spectrum Analyzer	FSH3	101726	Rohde & Schwarz	24 M	-	19.07.2019
781	Power Supply	PS 2042-10 B	2815450369	Elektro-Automatik GmbH &Co.KG	-	-	
782	Power Supply	PS 2042-10 B	2815450348	lektro-Automatik GmbH &Co.KG	-	-	
783	Spectrum Analyzer	FSU 26	100414	Rohde & Schwarz	12 M	-	30.05.2019
784	Power Supply	NGSM 32/10	00196	Rohde & Schwarz	12 M	-	
785	RSP	RF Step Attenuator 0…139.9dB	860712/012	Rohde & Schwarz	12 M	-	
786	SAR Probe	ES3DV3	3340	Speag	36 M	-	14.02.2021
787	OSP	OSP B157WX	101264	Rohde & Schwarz	12 M	-	30.05.2019
788	Precision Omnidirectional Dipole	POD 618	6182558/Q	Seibersdorf Labaratories	36 M	-	30.06.2021
789	Precision Omnidirectional Dipole	POD 16	162496/Q	Seibersdorf Laboratories	36 M	-	30.06.2021

8.0.3. Legend

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

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

9. Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2018-11-29

End Of Report