PARTIAL Test Report
20-1-0060701T68a-C1

DAkkS Deutsche Akkreditierungsstelle
D-PL-12047-01-01
D-PL-12047-01-03
D-PL-12047-01-04

Number of pages:	35	**Date of Report:**	2021-Jul-27
Testing company:	CETECOM GmbH Im Teelbruch 116 45219 Essen Germany Tel. + 49 (0) 20 54 / 95 19-0 Fax: + 49 (0) 20 54 / 95 19-150	**Applicant:**	VALEO Telematik und Akustik GmbH
Product: **Model:**	**Telematic Device** **ATM-02-MEX-R1**		
FCC ID:	QWY-ATM2-R-11	**IC:**	--
Testing has been carried out in accordance with:	Title 47 CFR, Chapter I FCC Regulations, Subchapter B Part 22 Subpart H, Part24 Subpart E, Part 27 Subpart C Part 15, Subpart C, §15.209 Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		
Tested Technology:	LTE		
Test Results:	**☒ The EUT complies with the requirements in respect of selected parameters subject to the test.** The test results relate only to devices specified in this document		
Signatures:	Ninovic Perez 2021.07.28 08:01:37 + 02'00'		Digitally signed by: Al-Amin DN: CN = Al-Amin email = Al-Amin.Hossain@cetecom.com C = AD Date: 2021.07.27 14:31:43 +02'00'
	Dipl.-Ing. Ninovic Perez Test Lab Manager Authorization of test report		B.Sc. Al-Amin Hossain Test manager Responsible of test report

Table of Contents

Table of Annex....3
1 General information....4
1.1 Disclaimer and Notes....4
1.2 Disclaimer and Notes....4
1.3 Summary of Test Results....5
1.4 Summary of Test Methods....10
2 Administrative Data....11
2.1 Identification of the Testing Laboratory....11
2.2 General limits for environmental conditions....11
2.3 Test Laboratories sub-contracted....11
2.4 Organizational Items....11
2.5 Applicant's details....11
2.6 Manufacturer's details....11
2.7 EUT: Type, S/N etc. and short descriptions used in this test report....12
2.8 Auxiliary Equipment (AE): Type, S/N etc. and short descriptions....12
2.9 Connected cables....12
2.10 Software....12
2.11 EUT set-ups....12
2.12 EUT operation modes....13
3 Equipment under test (EUT)....15
3.1 General Data of Main EUT as Declared by Applicant....15
3.2 Detailed Technical data of Main EUT as Declared by Applicant....16
3.3 Worst case identification....16
3.4 Modifications on Test sample....16
4 Measurements....17
4.1 Conducted RF output power....17
4.2 Peak to Average ratio (PAPR)....20
4.3 Radiated field strength emissions below 30 MHz....21
4.4 Radiated spurious emissions....25
4.5 Radiated Band Edge....28
4.6 Results from external laboratory....32
4.7 Opinions and interpretations....32
4.8 List of abbreviations....32
5 Equipment lists....32
6 Measurement Uncertainty valid for conducted/radiated measurements....34
7 Versions of test reports (change history)....35

Table of Annex			
Annex No.	**Contents**	**Reference Description**	**Total Pages**
Annex 1	Test result diagrams	**CETECOM_TR20-1-0060701T68a_C1_A1**	50
Annex 2	Internal photographs of EUT	**Not available**	--
Annex 3	External photographs of EUT	**CETECOM_TR20-1-0060701T68a_C1_A3**	10
Annex 4	Test set-up photographs	**CETECOM_TR20-1-0060701T68a_C1_A4**	6
The listed attachments are separate documents.			

1 General information

1.1 Disclaimer and Notes

The test results of this test report relate exclusively to the test item specified in this test report as specified in chapter 2.7. CETECOM does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM.
The testing service provided by CETECOM has been rendered under the current "General Terms and Conditions for CETECOM".
CETECOM will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.
Under no circumstances does the CETECOM test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.
Under no circumstances does the CETECOM test report include or imply any product or service warranties from CETECOM, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CETECOM.
All rights and remedies regarding vendor's products and services for which CETECOM has prepared this test report shall be provided by the party offering such products or services and not by CETECOM.
In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at CETECOM.

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.

1.2 Disclaimer and Notes

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 of the above requirements are met in accordance with enumerated standards.

1.3 Summary of Test Results

Test case in LTE 2 band	Reference Clause FCC ☒	Reference Clause ISED ☐	Page	Remark	Result
AC-Power Lines Conducted Emissions	§15.207(a)	RSS-Gen Issue 5:§8.8	--	N/A	--
Conducted RF output power	§2.1046(a)	RSS-133 4.1/6.4 + SRSP-510 :5.1.2	18	--	PASSED
Radiated RF output power	§24.232(b)	6.4	--	Calculated	PASSED
Occupied Channel Bandwidth 99%	§24.238(b), §2.202(a), §2.1049(h)	RSS-Gen, Issue 4: §6.7	--	NP	--
26dB Emission bandwidth	§24.238(b), §2.202(a), §2.1049(h)	RSS-Gen, Issue 4: §6.7	--	NP	--
Radiated Band Edge	§2.1053(a), §2.1057(a)(1) §24.238(a)(b)	RSS-133, Issue 6: 6.5.1(i)(ii)	22	--	PASSED
Conducted RF Band Edge	§24.238(a)(b)(c)(d) §2.1051, §2.1057(a)(1)	RSS-133, Issue 6: 6.5.1(i)(ii)	--	NP	--
Peak to Average ratio (PAPR)	§2.1046(a)	RSS-133 4.1/6.4 + SRSP-510 :5.1.2	20	Calculated	PASSED
Radiated field strength emissions below 30 MHz	§15.205, §15.209	RSS-Gen: Issue 5:	24	--	PASSED
Spurious emissions at antenna terminals	§24.238(a)(b)(c)(d) §2.1051, §2.1057(a)(1)	RSS-133, Issue 6: 6.5.1(i)(ii)	--	NP	--
Radiated spurious emissions	§2.1053(a), §2.1057(a)(1) §24.238(a)(b)	RSS-133, Issue 6: 6.5.1(i)(ii)	27	--	PASSED
Frequency stability, temperature variation	§24.235, §2.1055(a)(1) (d)	RSS-Gen, Issue 5 RSS-133: 6.3	--	NP	--
Frequency stability, voltage variation	§24.235, §2.1055(a)(1) (d)	RSS-Gen, Issue 5 RSS-133: 6.3	--	NP	--

Test case in LTE 4 band	Reference Clause FCC ☒	Reference Clause ISED ☐	Page	Remark	Result
AC-Power Lines Conducted Emissions	§15.207(a)	RSS-Gen, Issue 5:§8.8	--	N/A	--
Conducted RF output power	§27.50(d)(4), §2.1046	RSS-139, Issue 3:§6.5	18	--	PASSED
Radiated RF output power	§27.50(d)(4), §2.1046(a)	RSS-139, Issue 3: 6.5 + SRSP-513	--	Calculated	PASSED
26dB Emission bandwidth	§27.53(h)(3), §2.202(a)	RSS-Gen, Issue 5:§6.6	--	NP	--
Occupied Channel Bandwidth 99%	§27.53(h)(3), §2.202(a)	RSS-Gen, Issue 5:§6.6	--	NP	--
Radiated Band Edge	§27.53(h), §2.1053(a) §2.1057(a)	RSS-139, Issue 3: 6.6 (i)(ii)	22	--	PASSED
Conducted RF Band Edge	§27.53(h), §2.1051	RSS-139, Issue 3: §6.6 (i)(ii)	--	NP	--
Peak to Average ratio (PAPR)	§27.50(d)(4), §2.1046	RSS-139, Issue 3:§6.5	20	Calculated	PASSED
Radiated field strength emissions below 30 MHz	§15.205, §15.209	RSS-Gen: Issue 5: §8.9 Table 6	24	--	PASSED
Spurious emissions at antenna terminals	§27.53(h), §2.1051	RSS-139, Issue 3: §6.6 (i)(ii)	--	NP	--
Radiated spurious emissions	§27.53(h), §2.1053(a)	RSS-139, Issue 3: §6.6 (i)(ii)	27	--	PASSED
Frequency stability, temperature variation	§27.54, §2.1055(a)(1)	RSS-139, Issue 3:§6.4	--	NP	--
Frequency stability, voltage variation	§27.54, §2.1055(a)(1)	RSS-139, Issue 3:§6.4	--	NP	--

Test case in LTE 5 band	Reference Clause FCC ☒	Reference Clause ISED ☐	Page	Remark	Result
AC-Power Lines Conducted Emissions	§15.207(a)	RSS-Gen, Issue 5:§8.8	--	N/A	--
Conducted RF output power	§22.913(a)(5), §2.1046	RSS-132:5.4 + SRSP 503:5.1.3	18	--	PASSED
Radiated RF output power	§22.913, §2.1046(a)	RSS-132: 5.4 + SRSP 503:5.1.3	--	Calculated	PASSED
26dB Emission bandwidth	§22.917(b), §2.1049(h)	RSS-Gen, Issue 5:§6.6	--	NP	--
Occupied Channel Bandwidth 99%	§22.917(b), §2.1049(h)	RSS-Gen, Issue 5:§6.6	--	NP	--
Radiated Band Edge	§22.917(a)(b), §2.1053(a), §2.1057(a)	RSS-132, Issue 3: §5.5(i)(ii)	22	--	PASSED
Conducted RF Band Edge	§22.917(a)(b), §2.1051	RSS-132, Issue 3: §5.5(i)(ii)	--	NP	--
Peak to Average ratio (PAPR)	§22.913(a)(5), §2.1046	RSS-132:5.4 + SRSP 503:5.1.3	20	Calculated	PASSED
Radiated field strength emissions below 30 MHz	§15.205, §15.209	RSS-Gen: Issue 5: §8.9 Table 6	24	--	PASSED
Spurious emissions at antenna terminals	§22.917(a)(b), §2.1051	RSS-132, Issue 3: §5.5(i)(ii)	--	NP	--
Radiated spurious emissions	§22.917(a)(b), §2.1053(a)	RSS-132, Issue 3: §5.5(i)(ii)	27	--	PASSED
Frequency stability, temperature variation	§22.355, §2.1055(a)(1)	RSS-132: 5.3	--	NP	--
Frequency stability, voltage variation	§22.355, §2.1055(a)(1)	RSS-132: 5.3	--	NP	--

Test case in LTE 7 band	Reference Clause FCC ☒	Reference Clause ISED ☐	Page	Remark	Result
AC-Power Lines Conducted Emissions	§15.207(a)	RSS-Gen, Issue 5:§8.8	--	N/A	--
Conducted RF output power	§27.50(h)(2), §2.1046	RSS-139, Issue 3:§6.5	18	--	PASSED
Radiated RF output power	§27.50(d)(4) §2.1046(a)	RSS-139, Issue 3: 6.5 + SRSP-513	--	Calculated	PASSED
26dB Emission bandwidth	§27.53(h)(3) §2.202(a)	RSS-Gen, Issue 5: §6.6	--	NP	--
Occupied Channel Bandwidth 99%	§27.53(h)(3), §2.202(a)	RSS-Gen, Issue 5:§6.6	--	NP	--
Radiated Band Edge	§27.53(m)(4), §2.1053(a) §2.1057(a)	RSS-139, Issue 3:§ 6.6 (i)(ii)	22	--	PASSED
Conducted RF Band Edge	§27.53(m)(4), §2.1051	RSS-139, Issue 3: §6.6 (i)(ii)	--	NP	--
Peak to Average ratio (PAPR)	§27.50(h)(2), §2.1046	RSS-139, Issue 3:§6.5	20	Calculated	PASSED
Radiated field strength emissions below 30 MHz	§15.205, §15.209	RSS-Gen: Issue 5: §8.9 Table 6	24	--	PASSED
Spurious emissions at antenna terminals	§27.53(m)(4), §2.1051	RSS-139, Issue 3: §6.6 (i)(ii)	--	NP	--
Radiated spurious emissions	§27.53(m)(4), §2.1053(a)	RSS-139, Issue 3: §6.6 (i)(ii)	27	--	PASSED
Frequency stability, temperature variation	§27.54, §2.1055(a)(1)	RSS-139, Issue 3:§6.4	--	NP	--
Frequency stability, voltage variation	§27.54, §2.1055(a)(1)	RSS-139, Issue 3:§6.4	--	NP	--

Test case in LTE 12 band	Reference Clause FCC ☒	Reference Clause ISED ☐	Page	Remark	Result
AC-Power Lines Conducted Emissions	§15.207(a)	RSS-Gen, Issue 5:§8.8	--	N/A	--
Conducted RF output power	§27.50(c)(10), §2.1046	RSS-130, Issue 2: §4.6.1/ §4.6.3	18	--	PASSED
Radiated RF output power	§27.50(c)(10), §2.1046(a)	RSS-130, Issue 2: §4.6.1/ §4.6.3	--	Calculated	PASSED
26dB Emission bandwidth	§2.202(a)	RSS-Gen, Issue 5:§6.7	--	NP	--
Occupied Channel Bandwidth 99%	§2.202(a)	RSS-130, Issue 1:§4.5 RSS-Gen, Issue 5:§6.7	--	NP	--
Radiated Band Edge	§27.53(g), §2.1053(a) §2.1057(a)	RSS-130, Issue 1:§4.7.1	22	--	PASSED
Conducted RF Band Edge	§27.53(g), §2.1053(a) §2.1057(a)	RSS-130, Issue 1:§4.7.1	--	NP	--
Peak to Average ratio (PAPR)	§27.50(c)(10), §2.1046	RSS-130, Issue 2: §4.6.1	20	Calculated	PASSED
Radiated field strength emissions below 30 MHz	§15.205, §15.209	RSS-Gen: Issue 5: §8.9 Table 6	24	--	PASSED
Spurious emissions at antenna terminals	§27.53(g), §2.1051, §2.1057(a)	RSS-130, Issue 2: §4.7.1	--	NP	--
Radiated spurious emissions	§27.53(g), §2.1053(a) §2.1057(1)	RSS-130, Issue 2: §4.7.1	27	--	PASSED
Frequency stability, temperature variation	§27.54 §2.1055(a)(1)	RSS-130, Issue 2:§4.5	--	NP	--
Frequency stability, voltage variation	§27.54 §2.1055(a)(1)	RSS-130, Issue 2:§4.5	--	NP	--

PASSED	The EUT complies with the essential requirements in the standard.
FAILED	The EUT does not comply with the essential requirements in the standard.
NP	The test was not performed by the CETECOM Laboratory.

*The calculation of the measurement uncertainty shows compliance with the "maximum measurement uncertainties" of the tested standard and therefore for result evaluation the stated uncertainties will not be additionally added to the measured results.

1.4 Summary of Test Methods

Test case	Test method
AC-Power Lines Conducted Emissions	ANSI C63.4-2014 § 7, ANSI C63.10-2013 § 6.2
Conducted RF output power	ANSI C63.26:2015, §5.2, KDB 971168 D01 v03r01
Radiated RF output power	ANSI C63.26:2015, §5.2.7, KDB 971168 D01 v03r01
Occupied Channel Bandwidth 99%	ANSI C63.26:2015, §5.4.4, KDB 971168 D01 v03r01
26dB Emission bandwidth	ANSI C63.26:2015, §5.4.3, KDB 971168 D01 v03r01
Modulation characteristics	ANSI C63.26:2015, §5.3
Radiated Band Edge	ANSI C63.26:2015, §5.5, KDB 971168 D01 v03r01
Conducted RF Band Edge	ANSI C63.26:2015, §5.7, KDB 971168 D01 v03r01
Peak to Average ratio (PAPR)	ANSI C63.26:2015, §5.2.6
Radiated field strength emissions below 30 MHz	ANSI C63.4-2014 §5.3, §8.2.1, §8.3.1.1+§8.3.2.1
Spurious emissions at antenna terminals	ANSI C63.26:2015, §5.7, KDB 971168 D01 v03r01
Radiated spurious emissions	ANSI C63.26:2015, §5.5, KDB 971168 D01 v03r01, ANSI C63.26.1:2018
AC-Power Lines Conducted Emissions	ANSI C63.4-2014 § 7, ANSI C63.10-2013 § 6.2

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. Ninovic Perez
Accreditation scope:	**DAkkS Webpage: FCC ISED**
Test location:	CETECOM GmbH; Im Teelbruch 116; 45219 Essen - Kettwig

2.2 General limits for environmental conditions

Temperature:	22±2 °C
Relative. humidity:	45±15% rH

2.3 Test Laboratories sub-contracted

Company name:	--

2.4 Organizational Items

Responsible test manager:	B.Sc. Al-Amin Hossain
Responsible for test report:	Dipl.-Ing. Christian Lorenz
Receipt of EUT:	2020-Nov-05
Date(s) of test:	2021-Apr-16 – 2021-Jul-12
Version of template:	14.7

2.5 Applicant’s details

Applicant’s name:	VALEO Telematik und Akustik GmbH
Address:	Max-Planck-Str. 28-32 61381 Friedrichsdorf Hessen Germany
Contact Person:	Martin Fleckenstein
Contact Person’s Email:	martin.fleckenstein@valeo.com

2.6 Manufacturer’s details

Manufacturer’s name:	VALEO Telematik und Akustik GmbH
Address:	Max-Planck-Str. 28-32 61381 Friedrichsdorf Germany

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

Short description*)	PMT Sample No.	Product	Model	Type	S/N	HW status	SW status
EUT 01	20-1-00607S216_C01	Telematic Device	ATM-02-MEX-R1	--	0000964697	103.006.006	010.003.001
EUT 02	20-1-00607S218_C01	Telematic Device	ATM-02-MEX-R1	--	0000964696	103.006.006	010.003.001

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

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

Short description*)	PMT Sample No.	Auxiliary Equipment	Type	S/N	HW status	SW status
AE 01	20-1-00607S28_C01	Automotive Antenna Roof-Pod	64177 / DA WAVE LOW 5G-ROW	29-07-20 0828	AI04	--
AE 02	20-1-00607S53_C01	Metal Plate	--	--	--	--
AE 03	21-1-00251S12_C01	EMV Testbox ATM-01 / ATM-02	--	S12	--	--
AE 04	20-1-00607S224_C01	EMC Switchbox	--	97	--	--
AE 05	20-1-00607S40_C01	Antenna	--	--	--	--
AE 06	20-1-00607246_C01	Automotive Antenna Roof-Pod	64177 / DA WAVE LOW 5G-ROW	18-05-21 0068	AI04	--
AE 07	20-1-00607253_C01	Antenna Plastic Cover	Black Big	--	--	--
AE 08	20-1-00607254_C01	Ground Plane	Partial car roof	--	--	--

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

2.9 Connected cables

Short description*)	PMT Sample No.	Cable type	Connectors	Length
CAB 01	20-1-00607S125_C01	Cable Harness	--	<3 m
CAB 02	20-1-00607S169_C01	Power Cable	--	<3 m

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

2.10 Software

Short description*)	PMT Sample No.	Software	Type	S/N	HW status	SW status
--	--	--	--	--	--	--

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

2.11 EUT set-ups

set-up no.*)	Combination of EUT and AE	Description
1	EUT 01 + AE 01 + AE 02 + AE 03+ AE 04 + CAB 01 + CAB 02	Used for Radiated measurements
2	EUT 02 + AE 03+ AE 04 + AE 06 + AE 07 + AE 08 + CAB 01 + CAB 02	Used for Radiated measurements
3	EUT 01 + AE 03 + AE 04 + AE 05 + CAB 01 + CAB 02	Used for Conducted measurements

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

2.12 EUT operation modes

EUT operating mode no.*)	Operating modes	Additional information
Operating mode 1	LTE FDD Band 2 Traffic	Frequency / channel range: UL: 1850.0 to 1909.9 MHz, DL: 1930.0 to 1989.9 MHz / Channel: UL: 18600 to 19199, DL: 600 to 1199. A Communication link has been established between Wideband Radio Communication Tester CMW500 and EUT, Uplink Channel: 18700, Uplink frequency: 1860.0 MHz, RB: 1, BW:20 MHz, Downlink Frequency: 1940.0 MHz, Uplink Channel: 19100, Uplink frequency: 1900.0 MHz, RB: 1, BW:20 MHz, Downlink Frequency: 1980.0 MHz
Operating mode 2	LTE FDD Band 4 Traffic	Frequency / channel range: UL: 1710.0 to 1754.9 MHz, DL: 2110.0 to 2154.9 MHz / Channel: UL: 19950 to 20399, DL: 1950 to 2399. A Communication link has been established between Wideband Radio Communication Tester CMW500 and EUT, Uplink Channel: 20000, Uplink frequency: 1715.0 MHz, RB: 1, BW:10 MHz, Downlink Frequency: 2115.0 MHz, Uplink Channel: 20350, Uplink frequency: 1750.0 MHz, RB: 1, BW:10 MHz, Downlink Frequency: 2150.0 MHz
Operating mode 3	LTE FDD Band 5 Traffic	Frequency / channel range: UL: 824.0 to 848.9 MHz, DL: 869.0 to 893.9 MHz / Channel: UL: 20400 to 20649, DL: 2400 to 2649. A Communication link has been established between Wideband Radio Communication Tester CMW500 and EUT, Uplink Channel: 20425, Uplink frequency: 826.5 MHz, RB: 1, BW:5 MHz, Downlink Frequency: 871.5 MHz, Uplink Channel: 20525, Uplink frequency: 836.5 MHz, RB: 1, BW:5 MHz, Downlink Frequency: 881.5 MHz, Uplink Channel: 20642, Uplink frequency: 848.2 MHz, RB: 1, BW:15 MHz, Downlink Frequency: 893.2 MHz
Operating mode 4	LTE FDD Band 7 Traffic	Frequency / channel range: UL:2500 to 2569.90 MHz, DL: 2620 to 2689.90 MHz / Channel: UL: 20750 to 21449, DL: 2750 to 3449. A Communication link has been established between Wideband Radio Communication Tester CMW500 and EUT, Uplink Channel: 20800, Uplink frequency: 2505 MHz, RB:1, Start RB:Low, BW:10 MHz, Downlink Frequency: 2625 MHz, Uplink Channel: 21400, Uplink frequency: 2565 MHz, RB:1, Start RB:high, BW:10 MHz, Downlink Frequency: 2685 MHz

Operating mode 5	LTE FDD Band 12 Traffic	Frequency / channel range: UL: 699 to 715.90 MHz, DL: 729 to 745.90 MHz / Channel: UL: 23010 to 23179, DL: 5010 to 5179. A Communication link has been established between Wideband Radio Communication Tester CMW500 and EUT, Uplink Channel: 23035, Uplink frequency: 701.5 MHz, RB:1, Start RB:High, BW:5 MHz, Downlink Frequency: 731.5 MHz Uplink Channel: 23155, Uplink frequency: 713.5 MHz, RB:1, Start RB:High, BW: 5 MHz, Downlink Frequency: 743.5 MHz

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

3 Equipment under test (EUT)

3.1 General Data of Main EUT as Declared by Applicant

Product name	Telematic Device		
Kind of product	ATM-02-MEX-R1		
Firmware	☐ for normal use	☒ Special version for test execution	
	☐ AC Mains	-	
	☒ DC Mains	12 V	
	☐ Battery	-	
Operational conditions	T_{nom} =21 °C	T_{min} =-40 °C	T_{max} =90 °C
EUT sample type	**Production**		
Weight	--		
Size [LxWxH]	--		
Interfaces/Ports	--		
For further details refer Applicants Declaration & following technical documents *[Annex 1 Specification + add tech docs] 11_ATM-02_Test_setup_instruction* *[Annex 1 Specification + add tech docs] 01_ATM-02_Product specification sheet*			

3.2 Detailed Technical data of Main EUT as Declared by Applicant

TX Frequency range [MHz] and Number of channels	☒ LTE 2	1850 - 1910 (UL), 1930 - 1990 (DL)	UARFCN range 18600 - 19199
	☒ LTE 4	1710 - 1755 (UL), 2110 - 2155 (DL)	UARFCN range 19950 - 20399
	☒ LTE 5	824 - 849 (UL), 869 -894 (DL)	UARFCN range 20400 - 20649
	☒ LTE 7	2505 - 2565 (UL), 2625 - 2685 (DL)	UARFCN range 20775 - 21350
	☒ LTE 12	699 - 716 (UL), 2625 - 2685 (DL	UARFCN range 23010 - 23179
	☐ LTE 13	782 - 782 (UL), 751 - 751 (DL	UARFCN range 23205 - 23230
	☐ LTE 17	704 - 716 (UL), 734 - 746 (DL	UARFCN range 23755 - 23800
	☐ LTE 26	814 – 848.9 (UL), 859 – 893.9 (DL)	UARFCN range 26690 - 27039
	☐ LTE 28	708 - 743 (UL), 763 - 798 (DL)	UARFCN range 27225 - 27645
	☐ LTE 41	2501 - 2685 (UL), 2501 - 2685 (DL)	UARFCN range 39675 - 41490
Type of modulation			
Data rates	Downlink Max XX kbps	Uplink Max XXlkbps	
Emission designator	Nominal CBW	See initial certification of the module:	
Antenna Type	☐ Integrated ☐ External, no RF- connector ☒ External, separate RF-connector		
Antenna gain	LTE band 2 **max. 2.8** dBi	LTE band 12: **max. -0.2** dBi	
	LTE band 4: **max. 1.6** dBi	LTE band 13: **--** dBi	
	LTE band 5: **max. -0.6** dBi	LTE band 17: **--** dBi	
	LTE band 7: **max. 5.0** dBi	LTE band 26: **--** dBi	
	LTE band 41: **--** dBi	LTE band 28: **--** dBi	
FCC label attached	No		
Test firmware / software and storage location	EUT		
For further details refer Applicants Declaration & following technical documents			
Description of Reference Document (supplied by applicant)	**Version**	**Total Pages**	
Datasheet_WAVE_ROW_Low_9825130_04_20210125	**2021-01-25**	**32**	

3.3 Worst case identification

LTE mode	Data rate
--	--

3.4 Modifications on Test sample

Additions/deviations or exclusions	--

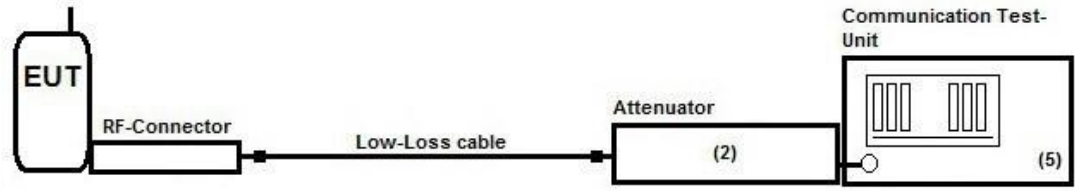
4 Measurements

4.1 Conducted RF output power

4.1.1 Description of the general test setup and methodology, see below example:

Following modified test set-up apply for tests performed inside the climatic chamber (frequency stability) or conducted RF-carrier power-measurement. The EUT RF-Signal is directly connected over suitable RF-connector over low-loss cable and an attenuator (2) to the cellular radio communication test-unit. (5).
The measurements were performed with the integrated power measurement function of the communication test-unit. (5).

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

EUT settings
The EUT was instructed to send with maximum power (if adjustable) according applicants instructions.
The measurements were made at the low, middle and high carrier frequencies of each of the supported operating band within the designated range within the allowed channel bandwidths. Choosing three TX-carrier frequencies of the mobile phone, should be sufficient to demonstrate compliance

4.1.2 Measurement Location

Test site	120910 - Radio Laboratory 1 (TS 8997)

4.1.3 Limit

Operation band	Frequency Range [MHz]	FCC Limit [W] ☒	ISED Limit [W] ☒
LTE2	1850 - 1910	2 EiRP (33 dBm)	2 EiRP (33 dBm)
LTE4	1710 - 1755	1 EiRP (30dBm)	1 EiRP (30dBm)
LTE5	824 - 849	7 ERP (38.5 dBm)	7 ERP (38.5 dBm)
LTE7	2502.5 - 2567.5	2 EiRP (33 dBm)	2 EiRP (33 dBm)
LTE12	699 - 712	2 ERP (33 dBm)	5 ERP (37 dBm)

4.1.4 Result

LTE Band 2				
Signal-BW	QPSK		16-QAM	
	Peak	RMS	Peak	RMS
1.4	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00
20	22.89	18.71	22.90	18.26

Only Worst-Case of modules nominal bandwidth tested

LTE Band 4				
Signal-BW	QPSK		16-QAM	
	Peak	RMS	Peak	RMS
1.4	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
10	22.58	18.20	22.56	17.67
15	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00

Only Worst-Case of modules nominal bandwidth tested

LTE Band 5				
Signal-BW	QPSK		16-QAM	
	Peak	RMS	Peak	RMS
1.4	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
5	25.98	21.63	26.00	21.18
10	0.00	0.00	0.00	0.00

Only Worst-Case of modules nominal bandwidth tested

LTE Band 7				
Signal-BW	QPSK		16-QAM	
	Peak	RMS	Peak	RMS
5	0.00	0.00	0.00	0.00
10	22.00	18.38	21.91	17.89
15	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00

Only Worst-Case of modules nominal bandwidth tested

LTE Band 12				
Signal-BW	QPSK		16-QAM	
	Peak	RMS	Peak	RMS
1.4	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
5	25.80	21.48	25.92	21.15
10	0.00	0.00	0.00	0.00

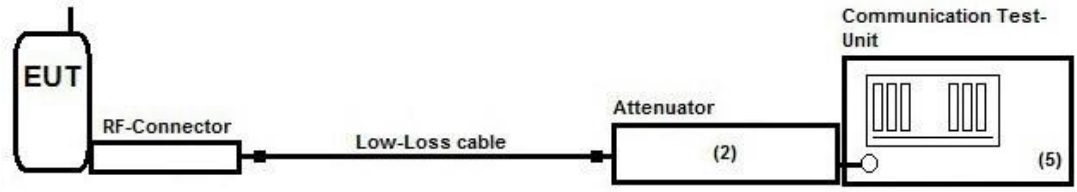
Only Worst-Case of modules nominal bandwidth tested

4.2 Peak to Average ratio (PAPR)

4.2.1 Description of the general test setup and methodology, see below example:

Following modified test set-up apply for tests performed inside the climatic chamber (frequency stability) or conducted RF-carrier power-measurement. The EUT RF-Signal is directly connected over suitable RF-connector over low-loss cable and an attenuator (2) to the cellular radio communication test-unit. (5).
The measurements were performed with the integrated power measurement function of the communication test-unit. (5).

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

EUT settings
The EUT was set to highest transmit power condition.

4.2.2 Measurement Location

Test site	120910 - Radio Laboratory 1 (TS 8997)

4.2.3 Limit

Peak to average power ratio [dB]
≤ 13

4.2.4 Result

Band	Mode	PAPR [dB] Limit	Result
LTE B2	LTE B2 QPSK / 16-QAM	13	Passed
LTE B4	LTE B4 QPSK / 16-QAM	13	Passed
LTE B5	LTE B5 QPSK / 16-QAM	13	Passed
LTE B7	LTE B7 QPSK / 16-QAM	13	Passed
LTE B12	LTE B12 QPSK / 16-QAM	13	Passed

Remark: for more information and graphical plot see annex A1,chapter 4.1.4, **CETECOM_TR20-1-0060701T68a_C1_A1**

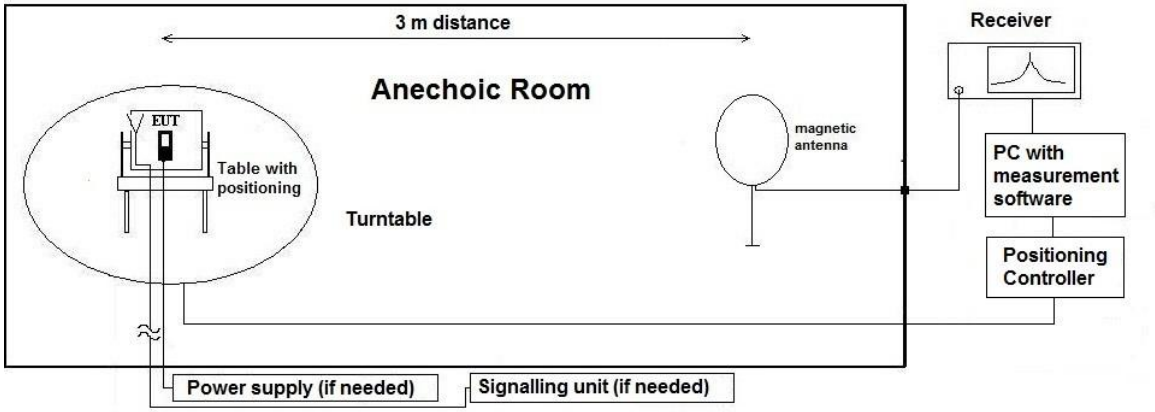
4.3 Radiated field strength emissions below 30 MHz

4.3.1 Description of the general test setup and methodology, see below example:

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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Exploratory, preliminary measurements
The EUT and it's 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 main-taining 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 (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.

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

The used correction factors when the measurement distance is reduced compared to regulatory measurement distance, are calculated according Extrapolation formulas valid for EUT's with maximum dimension of 0.625xLambda. Formula 2+3+4 as presented in ANSI C63.10, Chapter 6.4.4 are used for the calculations of proper extrapolation factors

Frequency Range	f [kHz/MHz]	Lambda [m]	Far-Field Point [m]	Distance Limit accord. 15.209 [m]	1st Condition (dmeas < Dnear-field)	2nd Condition (Limit distance bigger dnear-field)	Distance Correction accord. Formula
kHz	9	33333.33	5305.17	300	fullfilled	not fullfilled	-80.00
	10	30000.00	4774.65		fullfilled	not fullfilled	-80.00
	20	15000.00	2387.33		fullfilled	not fullfilled	-80.00
	30	10000.00	1591.55		fullfilled	not fullfilled	-80.00
	40	7500.00	1193.66		fullfilled	not fullfilled	-80.00
	50	6000.00	954.93		fullfilled	not fullfilled	-80.00
	60	5000.00	795.78		fullfilled	not fullfilled	-80.00
	70	4285.71	682.09		fullfilled	not fullfilled	-80.00
	80	3750.00	596.83		fullfilled	not fullfilled	-80.00
	90	3333.33	530.52		fullfilled	not fullfilled	-80.00
	100	3000.00	477.47		fullfilled	not fullfilled	-80.00
	125	2400.00	381.97		fullfilled	not fullfilled	-80.00
	200	1500.00	238.73		fullfilled	fullfilled	-78.02
	300	1000.00	159.16		fullfilled	fullfilled	-74.49
	400	750.00	119.37		fullfilled	fullfilled	-72.00
	490	612.24	97.44		fullfilled	fullfilled	-70.23
	500	600.00	95.49	30	fullfilled	not fullfilled	-40.00
	600	500.00	79.58		fullfilled	not fullfilled	-40.00
	700	428.57	68.21		fullfilled	not fullfilled	-40.00
	800	375.00	59.68		fullfilled	not fullfilled	-40.00
	900	333.33	53.05		fullfilled	not fullfilled	-40.00
MHz	1.00	300.00	47.75		fullfilled	not fullfilled	-40.00
	1.59	188.50	**30.00**		fullfilled	not fullfilled	-40.00
	2.00	150.00	23.87		fullfilled	fullfilled	-38.02
	3.00	100.00	15.92		fullfilled	fullfilled	-34.49
	4.00	75.00	11.94		fullfilled	fullfilled	-32.00
	5.00	60.00	9.55		fullfilled	fullfilled	-30.06
	6.00	50.00	7.96		fullfilled	fullfilled	-28.47
	7.00	42.86	6.82		fullfilled	fullfilled	-27.13
	8.00	37.50	5.97		fullfilled	fullfilled	-25.97
	9.00	33.33	5.31		fullfilled	fullfilled	-24.95
	10.00	30.00	4.77		fullfilled	fullfilled	-24.04
	10.60	28.30	4.50		fullfilled	fullfilled	-23.53
	11.00	27.27	4.34		fullfilled	fullfilled	-23.21
	12.00	25.00	3.98		fullfilled	fullfilled	-22.45
	13.56	22.12	3.52		fullfilled	fullfilled	-21.39
	15.00	20.00	3.18		fullfilled	fullfilled	-20.51
	15.92	18.85	**3.00**		fullfilled	fullfilled	-20.00
	17.00	17.65	2.81		not fullfilled	fullfilled	-20.00
	18.00	16.67	2.65		not fullfilled	fullfilled	-20.00
	20.00	15.00	2.39		not fullfilled	fullfilled	-20.00
	21.00	14.29	2.27		not fullfilled	fullfilled	-20.00
	23.00	13.04	2.08		not fullfilled	fullfilled	-20.00
	25.00	12.00	1.91		not fullfilled	fullfilled	-20.00
	27.00	11.11	1.77		not fullfilled	fullfilled	-20.00
	29.00	10.34	1.65		not fullfilled	fullfilled	-20.00
	30.00	10.00	1.59		not fullfilled	fullfilled	-20.00

4.3.3 Measurement Location

Test site	120901 - SAC - Radiated Emission <1GHz

4.3.4 Limit

Radiated emissions limits (3 meters)					
Frequency Range [MHz]	Limit [µV/m]	Limit [dBµV/m]	Distance [m]	Detector	RBW [kHz]
0.009 – 0.09	2400 / f [kHz]	67.6 – 20Log(f) (kHz)	300	Pk & Avg	0.2
0.09 – 0.11	2400 / f [kHz]	67.6 – 20Log(f) (kHz)	300	Quasi peak	0.2
0.11 – 0.15	2400 / f [kHz]	67.6 – 20Log(f) (kHz)	300	Pk & Avg	0.2
0.15 – 0.49	2400 / f [kHz]	67.6 – 20Log(f) (kHz)	300	Pk & Avg	9
0.49 – 1.705	24000 / f [kHz]	87.6 – 20Log(f) (kHz)	30	Quasi peak	9
1.705 - 30	30	29.5	30	Quasi peak	9

*Remark: In Canada same limits apply, just unit reference is different

4.3.5 Result

Diagram	Band	Mode	Maximum Level [dBµV/m] Frequency Range 0.009 – 30 MHz	Result
2.201	LTE2	LTE_FDD_B02_CH_18700_RB_1_high	No peaks found	Passed
2.202	LTE2	LTE_FDD_B02_CH_18700_RB_1_high	No peaks found	Passed
2.401	LTE4	LTE_FDD_B04_CH_20350_RB_1_low	No peaks found	Passed
2.501	LTE5	LTE_FDD_B05_CH_20525_RB_1_low	No peaks found	Passed
2.701	LTE7	LTE_FDD_B07_CH_20800_RB_1_low	No peaks found	Passed
2.1201	LTE12	LTE_FDD_B12_CH_23155_RB_1_high	No peaks found	Passed

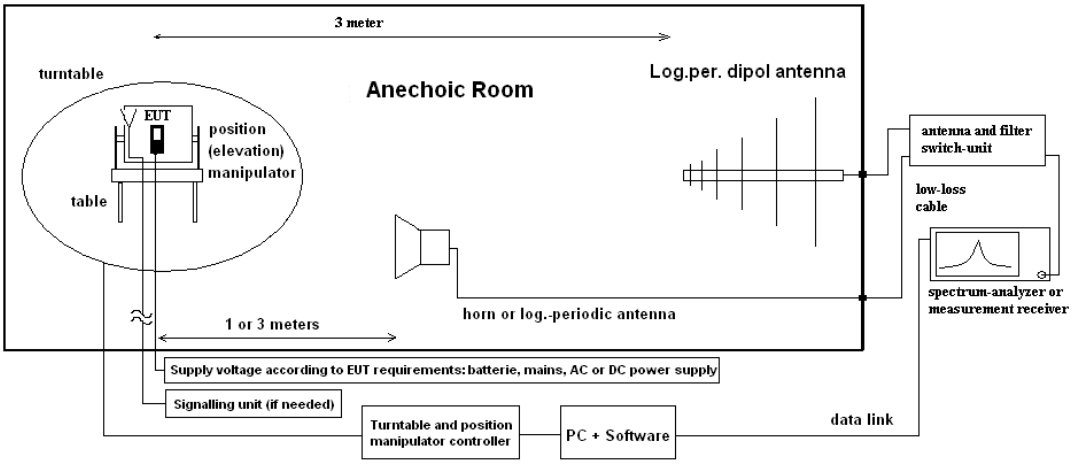
Remark: for more information and graphical plot see annex A1 **CETECOM_TR20-1-0060701T68a_C1_A1**

4.4 Radiated spurious emissions

4.4.1 Description of the general test setup and methodology, see below example:

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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Exploratory, preliminary measurements
The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.50 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 45°) and the EUT itself on 3-orthogonal axis (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 main-taining 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.
The readings on the spectrum analyzer are corrected with conversion value between field strength and E(I)RP, so the readings shown are equivalent to ERP/EIRP values. Critical measurements near the limit are re-measured with a substitution method accord. ANSI/TIA/EIA 603 C/D

Formula:

$P_{EIRP} = P_{MEAS} + C_L + FSL - G_{PreA} – G_{ANT}$ (1)

P_{MEAS} = measured power at instrument
M = Margin
L_T = Limit

FSL = Free Space loss = Function(frequency, measurement distance)

$M = L_T - P_{EIRP}$

C_L= cable loss
G_{PreA} = Gain of pre-amplifier (if used)
G_{ANT} = Gain of antenna in [dBi]

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

4.4.2 Measurement Location

Test site	120904 - FAC1 - Radiated Emissions

4.4.3 Limit

Operation band	Frequency Range [MHz]	Limit [dBm]	Detector [MaxHold]	RBW / VBW [MHz]
LTE2	30 - 19100	-13	Peak	3 / 3
LTE4	30 - 17500	-13	Peak	3 / 3
LTE5	30 - 8500	-13	Peak	3 / 3
LTE7	30 - 25700	-13	Peak	3 / 3
LTE12	30 - 7200	-13	Peak	3 / 3

4.4.4 Result

Diagram	Band	Mode	30 to 1000 MHz	1 to 2.8 GHz	2.8 to 10th Harmonics	Stop Freq [MHz]	Result
8.01	LTE2	1	No peaks found	No peaks found	No peaks found	19100	Passed
8.02	LTE2	1	No peaks found	10.81	No peaks found	19100	Passed
8.03	LTE4	2	No peaks found	No peaks found	-40.02	17500	Passed
8.04	LTE4	2	No peaks found	13.64	No peaks found	17500	Passed
8.05	LTE5	3	No peaks found	No peaks found	No peaks found	8500	Passed
8.06	LTE5	3	18.94 (Carrier)	No peaks found	No peaks found	8500	Passed
8.07 8.08 8.10	LTE7	4	No peaks found	No peaks found	-32.46	18000	Passed
remark2	LTE7	4	--	--	No peaks found	26000	
8.09	LTE7	4	No peaks found	No peaks found	No peaks found	25700	Passed
8.11	LTE12	5	No peaks found	No peaks found	-50.62	7200	Passed
8.12	LTE12	5	14.87 (Carrier)	No peaks found	No peaks found	7200	Passed

Remark:

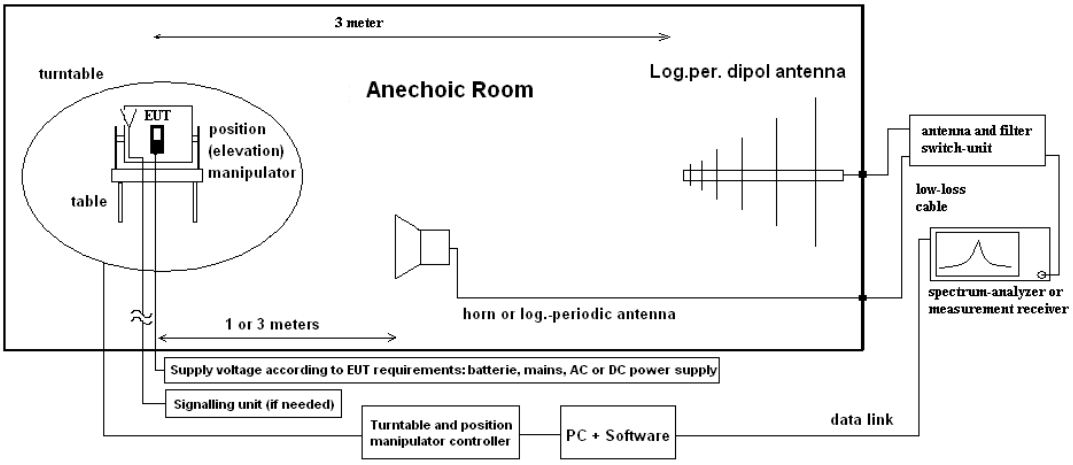
1. for more information and graphical plot see annex A1 **CETECOM_TR20-1-0060701T68a_C1_A1**
2. no diagram enclosed, just pre-scan overview measurement in close distance to EUT

4.5 Radiated Band Edge

4.5.1 Description of the general test setup and methodology, see below example:

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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

See chapter Radiated Spurious Emission forTest method.

4.5.2 Measurement Location

Test site	120904 - FAC1 - Radiated Emissions

4.5.3 Limit

Operation band	Frequency Range [MHz]	Limit [dBm]	Detector [MaxHold]	RBW / VBW [MHz]
LTE2	Below 1850 and above 1910	-13	RMS	0.03 / 0.3
LTE4	Below 1710 and above 1755	-13	RMS	0.03 / 0.3
LTE5	Below 824 and above 849	-13	RMS	0.02 / 0.2
LTE7	2496 - 2499 2499 – 2500 2570 – 2571 2571 – 2575	-10 -13 -25	RMS	1 / 3
LTE12	698.9 – 699.0 and 716.0 – 716.1 Below 698.9 and above 716.1	-13 (RBW = 30 kHz, VBW = 100 kHz) -13 (RBW = 100 kHz, VBW = 300 kHz)	RMS	0.03 / 0.3

4.5.4 Result

Diagram	Band	Remark	Edge [Low / High]	Value [dBm]	Result
9.201	LTE2	LTE_FDD2 | BW=20MHz | CH_18700 | RB_1 | RB_Start low | QPSK	Low	-35.20	Passed
9.202	LTE2	LTE_FDD2 | BW=20MHz | CH_18700 | RB_100 | RB_Start low | QPSK	Low	-36.35	Passed
9.203	LTE2	LTE_FDD2 | BW=20MHz | CH_19100 | RB_1 | RB_Start high | QPSK	High	-36.28	Passed
9.204	LTE2	LTE_FDD2 | BW=20MHz | CH_19100 | RB_100 | RB_Start high | QPSK	High	-37.67	Passed
9.401	LTE4	LTE_FDD4 | BW=10MHz | CH_20000 | RB_1 | RB_Start low | QPSK	Low	-30.51	Passed
9.402	LTE4	LTE_FDD4 | BW=10MHz | CH_20000 | RB_50 | RB_Start low | QPSK	Low	-30.73	Passed
9.403	LTE4	LTE_FDD4 | BW=10MHz | CH_20350 | RB_1 | RB_Start high | QPSK	High	-30.63	Passed
9.404	LTE4	LTE_FDD4 | BW=10MHz | CH_20350 | RB_100 | RB_Start high | QPSK	High	-30.72	Passed
9.501	LTE5	LTE_FDD5 | BW=5MHz | CH_20425 | RB_1 | RB_Start low | QPSK	Low	No peaks found	Passed
9.502	LTE5	LTE_FDD5 | BW=5MHz | CH_20425 | RB_25 | RB_Start low | QPSK	Low	No peaks found	Passed
9.503	LTE5	LTE_FDD5 | BW=5MHz | CH_20425 | RB_1 | RB_Start high | QPSK	High	No peaks found	Passed
9.504	LTE5	LTE_FDD5 | BW=5MHz | CH_20625 | RB_25 | RB_Start high | QPSK	High	No peaks found	Passed
9.1201	LTE12	LTE_FDD12 | BW=5MHz | CH_23035 | RB_1 | RB_Start low | QPSK	Low	No peaks found	Passed
9.1202	LTE12	LTE_FDD12 | BW=5MHz | CH_23035 | RB_25 | RB_Start low | QPSK	Low	No peaks found	Passed
9.1203	LTE12	LTE_FDD12 | BW=5MHz | CH_23155 | RB_1 | RB_Start high | QPSK	High	-36.76	Passed
9.1204	LTE12	LTE_FDD12 | BW=5MHz | CH_23155 | RB_25 | RB_Start high | QPSK	High	-42.02	Passed
EUT standing					
D9.7_001 D9.7_002	LTE7	LTE_FDD7 | BW=10MHz | CH_20800 | RB_50 | RB_Start low | QPSK	Low	-28.98 -18.33	PASSED
D9.7_003 D9.7_004	LTE7	LTE_FDD7 | BW=10MHz | CH_20800 | RB_1 | RB_Start low | QPSK	Low	-20.50 -32.34	PASSED
EUT laying					
D9.7_009 D9.7_010	LTE7	LTE_FDD7 | BW=10MHz | CH_20800 | RB_50 | RB_Start low | QPSK	Low	-32.56 -21.84	PASSED
D9.7_011 D9.7_004	LTE7	LTE_FDD7 | BW=10MHz | CH_20800 | RB_1 | RB_Start low | QPSK	Low	-25.27 -32.34 (remark2, Method 2 only worst-Case position of EUT tested)	PASSED

EUT standing					
D9.7_005 D9.7_006	LTE7	LTE_FDD7 | BW=10MHz | CH_21400 | RB_1 | RB_Start high | QPSK	High	-29.79 -17.25	PASSED
D9.7_007 D9.7_008	LTE7	LTE_FDD7 | BW=10MHz | CH_21400 | RB_50 | RB_Start high | QPSK	High	-23.00 -31.65	PASSED
EUT laying					
D9.7_013 D9.7_014	LTE7	LTE_FDD7 | BW=10MHz | CH_21400 | RB_50 | RB_Start low | QPSK	High	-32.18 -22.33	PASSED
D9.7_015 D9.7_008	LTE7	LTE_FDD7 | BW=10MHz | CH_21400 | RB_1 | RB_Start low | QPSK	High	-26.20 -31.65 (remark2, Method 2 only worst-Case position of EUT tested)	PASSED

Remark:

1. for more information and graphical plot see annex A1 **CETECOM_TR20-1-0060701T68a_C1_A1**
2. a bandwidth integrated method measurement was used with a measurement bandwidth lower then reference bandwith (1MHz) and the results re-calculated. Details can be found on the diagram.

4.6 Results from external laboratory

None	-

4.7 Opinions and interpretations

None	-

4.8 List of abbreviations

None	-

5 Equipment lists

ID	Description	Manufacturer	SerNo	Cal due date
	120901 - SAC - Radiated Emission <1GHz			**2025-Jul-21**
20574	Biconilog Hybrid Antenna BTA-L	Frankonia GmbH	980026L	2022-May-03
20487	CETECOM Semi Anechoic Chamber < 1GHz	ETS-Lindgren Gmbh	-	2025-Jul-15
20620	EMI Test Receiver ESU26	Rohde & Schwarz Messgerätebau GmbH	100362	2022-May-21
20482	filter matrix Filter matrix SAR 1	CETECOM GmbH	-	
25038	Loop Antenna HFH2-Z2	Rohde & Schwarz Messgerätebau GmbH	879824/13	2022-Apr-07
20885	Power Supply EA3632A	Agilent Technologies Deutschland GmbH	75305850	
	120904 - FAC1 - Radiated Emissions			
20341	Digital Multimeter Fluke 112	Fluke Deutschland GmbH	81650455	2022-May-25
20291	High Pass Filter WHJ 2200-4EE	Wainwright Instruments GmbH	14	
20020	Horn Antenna 3115 (Subst 1)	EMCO Elektronik GmbH	9107-3699	2021-Jul-19
20302	Horn Antenna BBHA9170 (Meas 1)	Schwarzbeck Mess-Elektronik OHG	155	2023-Apr-15
20549	Log. Per. Antenna HL025	Rohde & Schwarz Messgerätebau GmbH	1000060	2021-Jul-31
20720	Measurement Software EMC32 [FAC]	Rohde & Schwarz Messgerätebau GmbH	V10.xx	--
20700	PC ctc662012 [FAC]	Dell Inc.	--	--
20611	Power Supply E3632A	Agilent Technologies Deutschland GmbH	KR 75305854	--
20338	Pre-Amplifier 100MHz - 26GHz JS4-00102600-38-5P	Miteq Inc.	838697	--
20484	Pre-Amplifier 2,5GHz - 18GHz AMF-5D-02501800-25-10P	Miteq Inc.	1244554	--
20594	Radio Communication Tester CMW500	Rohde & Schwarz Messgerätebau GmbH	101757	2022-Mai-01
20690	Spectrum Analyzer FSU	Rohde & Schwarz Messgerätebau GmbH	100302/026	2023-May-19

20439	Ultrabroadband-Antenna HL562	Rohde & Schwarz Messgerätebau GmbH	100248	2023-Mar-10
20866	Signal Analyzer FSV3030	Rohde & Schwarz Messgerätebau GmbH	101247	2021-Sep-09

6 Measurement Uncertainty valid for conducted/radiated measurements

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 contribution to the overall uncertainty according its statistical distribution calculated.

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%						Remarks
Conducted emissions (U_{CISPR})	-	9 kHz - 150 kHz 150 kHz - 30 MHz	4.0 dB 3.6 dB						-
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 GHz - 26.5 GHz	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 - 12.75 GHz	1.48	N/A	1.51	N/A	1.43	--	
		12.75 GHz – 18 GHz	1.81	N/A	1.83	N/A	1.77	--	
		18 GHz - 26.5 GHz	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	5.01dB						Magnetic field strength
		30 MHz - 1 GHz 1 GHz - 18 GHz 18-26.5 GHz	5.83 dB 4.91 dB 5.06 dB						Electrical Field strength

7 Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2021-Jul-19
C1	➢ Chapter 3.2, Antenna gain has been corrected, ➢ Chapter 5, Equipment List(20620, ESU26) has been verified and Calibration date has been updated.	2021-Jul-27
--	--	--

End Of Test Report