

Prüfbericht-Nr.: Test Report No.:	50315831 003	Auftrags-Nr.: Order No.:	168126583	Seite 1 von 18 Page 1 of 18
Kunden-Referenz-Nr.: Client Reference No.:	N/A	Auftragsdatum: Order date:	07.08.2019	
Auftraggeber: Client:	Telit Communications S.p.A., Viale Stazione di Prosecco 5/b, 34010, Trieste, Italy			
Prüfgegenstand: Test item:	Data Terminal Module			
Bezeichnung / Typ-Nr.: Identification / Type No.:	ME310G1-W1			
Auftrags-Inhalt: Order content:	Test Report			
Prüfgrundlage: Test specification:	47 CFR FCC Part 2.1091	RSS-102 Issue 5		
Wareneingangsdatum: Date of receipt:	12.11.2019	Refer to Photo Documentation		
Prüfmuster-Nr.: Test sample No.:	A001023542-001			
Prüfzeitraum: Testing period:	20.11.2019 - 17.01.2020			
Ort der Prüfung: Place of testing:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
19.01.2020 Lin Lin / Senior Project Manager 		06.02.2020 Sam Lin / Technical Certifier 		
Datum Date	Name / Stellung Name / Position	Unterschrift Signature	Datum Date	Name / Stellung Name / Position
Sonstiges / Other: FCC ID: R17ME310G1W1; IC: 5131A-ME310G1W1 This report is for RF exposure evaluation.				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

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TEST SUMMARY

5.1.1 RF EXPOSURE COMPLIANCE

RESULT: Pass

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1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-Up

2. Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

(FCC Registration No.: 694916 & IC Registration Number: 25069)

Address: No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, P.R. China

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until (YYYY-MM-DD)
Radio Spectrum Test				
Spectrum Analyzer	Rohde&Schwarz	FSV40	101440	2020-08-29
Wideband Radio Communication Tester	Rohde& Schwarz	CMW500	165339	2020-08-29

2.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table,

Items		Extended Uncertainty
Radio Spectrum	Output Power (dBm)	U=0.5dB, k=2, σ =95%

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. facility located at No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, P.R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3. General Product Information

3.1 Product Function and Intended Use

The EUT is wireless module which supports NB-IoT and eMTC wireless technology.
 For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

Technical Specification	Value
Kind of Equipment:	Data Terminal Module
Type Designation:	ME310G1-W1
FCC ID:	RI7ME310G1W1
IC:	5131A-ME310G1W1
Type of Equipment:	Single Module
Equipment Class:	PCB
Wireless Technology:	eMTC and NB-IoT
Operating Frequency Range:	eMTC: Band 2/4/5/12/13/25/26/66/85 NB-IoT: Band 2/4/5/12/13/25/26/66/71/85
Rated RF Output Power:	20 dBm $\pm$ 2 dB
Power Class:	Class 5
Type of Modulation:	eMTC: QPSK, 16QAM NB-IoT: BPSK, QPSK
Operating Voltage:	DC 3.8V via DC power supply
Antenna Type:	External Antenna
Number of Antenna:	1

Table 3: Marketed Antenna List

Description	Manufacturer	Model	S/N	Rating
LTE Magnetic Antenna	ATEL-CAB	T-AT305	N/A	Frequency Range: 700-960 MHz / 1710-2700 MHz Omnidirectional antenna Gain: 2.14 dBi (Max.) Cable: RG 174mm 2500

3.3 Independent Operation Modes

The basic operation modes are:

- A. Transmitting
 - 1. eMTC
 - a. Lowest channel
 - b. Middle channel
 - c. Highest channel
 - 2. NB-IoT
 - a. Lowest channel
 - b. Highest channel
 - c. Hopping mode
- B. Receiving
 - 1. eMTC
 - a. Lowest channel
 - b. Middle channel
 - c. Highest channel
 - 2. NB-IoT
 - a. Lowest channel
 - b. Highest channel
 - c. Hopping mode
 - 3. GNSS
 - a. GPS
 - b. Beidou
 - c. Galileo
 - d. GLONASS
- C. Standby
- D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Bill of Material	- Circuit Diagram
- PCB Layout	- Instruction Manual
- Photo Document	- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

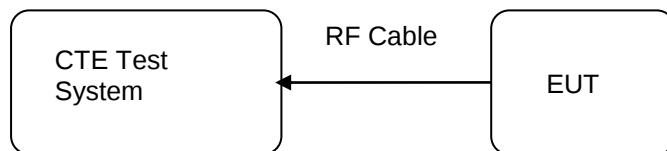
Name	Model	Manufacturer	S/N
Evaluation Kit	EVK2	Telit	N/A

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Equipment Configuration for Transmitter Measurement



5. Test Results

5.1 Transmitter Requirements & Test Suites

5.1.1 RF Exposure Compliance

RESULT:**Pass**

Test date	:	20.11.2019 - 17.01.2020
Test standard	:	47 CFR FCC Part 2.1091 RSS-102 Issue 5
Limit	:	Table 1 of 47 CFR FCC Part 1.1310 Table 4 of RSS-102 Issue 5
Kind of test site	:	Shielded room

TEST SETUP

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	23 °C
Relative humidity	:	49%
Atmospheric pressure	:	101.0 kPa

This device is mobile device, and the applicant declares that the minimum separation distance is greater than 20cm. Therefore MPE measurement or computational modeling should be used to determine compliance.

MPE Calculation is based on the conducted power, and considering maximum power and antenna gain. The following formula is used to MPE evaluation.

$$P_d = \frac{P_{out} * G}{4R^2\pi}$$

Where

P_d = power density in mW/cm² or W/m²

P_{out} = output power to antenna in mW or W

G_{num} = Antenna gain in numeric

π = 3.14159

R = Distance between observation point and the center of radiator in cm or m

Table 5: Permissive Gain Calculations for FCC

Operating Mode	Band	Maximum Conducted Output Power		E.I.R.P /ERP Limit (dBm)	Allowed Antenna Gain_Power (dBi)	MPE		Allowed Antenna Gain_MPE (dBi)	Permissive Antenna Gain (dBi)
		Measured Power (dBm)	Max. Power incl. tune-up (dBm)			Limit (mW/cm²)	Limit (dBm)		
NB-IoT	2	21.59	22	33.01	11.0	1.0	37.01	15.01	11.00
	4	21.56	22	30.00	8.0	1.0	37.01	15.01	8.00
	5	21.01	22	40.60	18.6	0.5	34.41	12.41	12.40
	12	21.04	22	36.92	14.9	0.5	33.70	11.70	11.60
	13	21.11	22	36.92	14.9	0.5	34.16	12.16	12.10
	25	21.52	22	33.01	11.0	1.0	37.01	15.01	11.00
	26	21.01	22	40.60	18.6	0.5	34.36	12.36	12.30
	66	21.27	22	30.00	8.0	1.0	37.01	15.01	8.00
	71	21.52	22	36.92	14.9	0.4	33.47	11.47	11.40
	85	21.13	22	36.92	14.9	0.5	33.69	11.69	11.60
eMTC	2	21.99	22	33.01	11.0	1.0	37.01	15.01	11.00
	4	21.86	22	30.00	8.0	1.0	37.01	15.01	8.00
	5	21.40	22	40.60	18.6	0.5	34.41	12.41	12.40
	12	21.97	22	36.92	14.9	0.5	33.70	11.70	11.60
	13	21.39	22	36.92	14.9	0.5	34.16	12.16	12.10
	25	21.66	22	33.01	11.0	1.0	37.01	15.01	11.00
	26	21.33	22	40.60	18.6	0.5	34.36	12.36	12.30
	66	21.99	22	30.00	8.0	1.0	37.01	15.01	8.00
	85	21.76	22	36.92	14.9	0.5	33.69	11.69	11.60

Table 6: Permissive Gain Calculations for ISED

Operating Mode	Band	Maximum Conducted Output Power		E.I.R.P /ERP Limit (dBm)	Allowed Antenna Gain_Power (dBi)	MPE		Allowed Antenna Gain_MPE (dBi)	Permissive Antenna Gain (dBi)
		Measured Power (dBm)	Max. Power incl. tune-up (dBm)			Limit (mW/cm ²)	Limit (dBm)		
NB-IoT	2	21.59	22	33.01	11.01	4.5	33.52	11.52	11.00
	4	21.56	22	30.00	8.00	4.2	33.29	11.29	8.00
	5	21.01	22	42.75	20.75	2.6	31.12	9.12	9.10
	12	21.04	22	36.92	14.92	2.3	30.63	8.63	8.60
	13	21.11	22	36.92	14.92	2.5	30.95	8.95	8.90
	25	21.52	22	33.01	11.01	4.5	33.52	11.52	11.00
	26	21.01	22	42.75	20.75	2.6	31.09	9.09	9.00
	66	21.27	22	30.00	8.00	4.2	33.29	11.29	8.00
	71	21.52	22	36.92	14.92	2.2	30.48	8.48	8.40
	85	21.13	22	36.92	14.92	2.3	30.63	8.63	8.60
eMTC	2	21.99	22	33.01	11.01	4.5	33.52	11.52	11.00
	4	21.86	22	30.00	8.00	4.2	33.29	11.29	8.00
	5	21.40	22	42.75	20.75	2.6	31.12	9.12	9.10
	12	21.97	22	36.92	14.92	2.3	30.63	8.63	8.60
	13	21.39	22	36.92	14.92	2.5	30.95	8.95	8.90
	25	21.66	22	33.01	11.01	4.5	33.52	11.52	11.00
	26	21.33	22	42.75	20.75	2.6	31.09	9.09	9.00
	66	21.99	22	30.00	8.00	4.2	33.29	11.29	8.00
	85	21.76	22	36.92	14.92	2.3	30.63	8.63	8.60

Table 7: Summary of Maximum Permissive Gain

Operating Mode	Band	Permissive Antenna Gain based on Operating Mode (dBi)				Max. Permissive Antenna Gain (dBi)
		NB-IoT		eMTC		
		FCC	ISED	FCC	ISED	
NB-IoT/eMTC	2	11.00	11.00	11.00	11.00	11.0
	4	8.00	8.00	8.00	8.00	8.0
	5	12.40	9.10	12.40	9.10	9.1
	12	11.60	8.60	11.60	8.60	8.6
	13	12.10	8.90	12.10	8.90	8.9
	25	11.00	11.00	11.00	11.00	11.0
	26	12.30	9.00	12.30	9.00	9.0
	66	8.00	8.00	8.00	8.00	8.0
	71	11.40	8.40	--	--	8.4
	85	11.60	8.60	11.60	8.60	8.6

Table 8: Test Results of RF Exposure Calculations based on Specific Antenna for FCC

Operating Mode	Band	Maximum Conducted Output Power (P_{out})		Antenna Gain (dBi)	Numeric Gain G_{num} (dB)	Distance R (cm)	MPE P_d (mW/cm ²)	Limit (mW/cm ²)	Verdict
		dBm	mW						
NB-IoT	2	21.59	144.21	2.14	1.64	20	0.047	1.0	Pass
	4	21.56	143.22	2.14	1.64	20	0.047	1.0	Pass
	5	21.01	126.18	2.14	1.64	20	0.041	0.55	Pass
	12	21.04	127.06	2.14	1.64	20	0.041	0.47	Pass
	13	21.11	129.12	2.14	1.64	20	0.042	0.52	Pass
	25	21.52	141.91	2.14	1.64	20	0.046	1.0	Pass
	26	21.01	126.18	2.14	1.64	20	0.041	0.54	Pass
	66	21.27	133.97	2.14	1.64	20	0.044	1.0	Pass
	71	21.52	141.91	2.14	1.64	20	0.046	0.44	Pass
	85	21.13	129.72	2.14	1.64	20	0.042	0.47	Pass
eMTC	2	21.99	158.12	2.14	1.64	20	0.052	1.0	Pass
	4	21.86	153.46	2.14	1.64	20	0.050	1.0	Pass
	5	21.40	138.04	2.14	1.64	20	0.045	0.55	Pass
	12	21.97	157.40	2.14	1.64	20	0.051	0.47	Pass
	13	21.39	137.72	2.14	1.64	20	0.045	0.52	Pass
	25	21.66	146.55	2.14	1.64	20	0.048	1.0	Pass
	26	21.33	135.83	2.14	1.64	20	0.044	0.54	Pass
	66	21.99	158.12	2.14	1.64	20	0.052	1.0	Pass
	85	21.76	149.97	2.14	1.64	20	0.049	0.47	Pass

Table 9: Test Results of RF Exposure Calculations based on Maximum Permissive Gain for FCC

Operating Mode	Band	Maximum Conducted Output Power (P_{out})		Antenna Gain (dBi)	Numeric Gain G_{num} (dB)	Distance R (cm)	MPE P_d (mW/cm ²)	Limit (mW/cm ²)	Verdict
		dBm	mW						
NB-IoT	2	21.59	144.21	11.00	12.59	20	0.361	1.0	Pass
	4	21.56	143.22	8.00	6.31	20	0.180	1.0	Pass
	5	21.01	126.18	12.40	17.38	20	0.436	0.55	Pass
	12	21.04	127.06	11.60	14.45	20	0.366	0.47	Pass
	13	21.11	129.12	12.10	16.22	20	0.417	0.52	Pass
	25	21.52	141.91	11.00	12.59	20	0.356	1.0	Pass
	26	21.01	126.18	12.30	16.98	20	0.427	0.54	Pass
	66	21.27	133.97	8.00	6.31	20	0.168	1.0	Pass
	71	21.52	141.91	11.40	13.80	20	0.390	0.44	Pass
eMTC	85	21.13	129.72	11.60	14.45	20	0.373	0.47	Pass
	2	21.99	158.12	11.00	12.59	20	0.396	1.0	Pass
	4	21.86	153.46	8.00	6.31	20	0.193	1.0	Pass
	5	21.40	138.04	12.40	17.38	20	0.477	0.55	Pass
	12	21.97	157.40	11.60	14.45	20	0.453	0.47	Pass
	13	21.39	137.72	12.10	16.22	20	0.445	0.52	Pass
	25	21.66	146.55	11.00	12.59	20	0.367	1.0	Pass
	26	21.33	135.83	12.30	16.98	20	0.459	0.54	Pass
	66	21.99	158.12	8.00	6.31	20	0.199	1.0	Pass
	85	21.76	149.97	11.60	14.45	20	0.431	0.47	Pass

Table 10: Test Results of RF Exposure Calculations based on Specific Antenna for ISSED

Operating Mode	Band	Maximum Conducted Output Power (P_{out})		Antenna Gain (dBi)	Numeric Gain G_{num} (dB)	Distance R (m)	MPE P_d (W/m ²)	Limit (W/m ²)	Verdict
		dBm	W						
NB-IoT	2	21.59	0.144	2.14	1.64	0.2	0.469	4.5	Pass
	4	21.56	0.143	2.14	1.64	0.2	0.466	4.2	Pass
	5	21.01	0.126	2.14	1.64	0.2	0.411	2.6	Pass
	12	21.04	0.127	2.14	1.64	0.2	0.414	2.3	Pass
	13	21.11	0.129	2.14	1.64	0.2	0.420	2.5	Pass
	25	21.52	0.141	2.14	1.64	0.2	0.459	4.5	Pass
	26	21.01	0.126	2.14	1.64	0.2	0.411	2.6	Pass
	66	21.27	0.133	2.14	1.64	0.2	0.433	4.2	Pass
	71	21.52	0.141	2.14	1.64	0.2	0.459	2.2	Pass
	85	21.13	0.129	2.14	1.64	0.2	0.420	2.3	Pass
eMTC	2	21.99	0.158	2.14	1.64	0.2	0.515	4.5	Pass
	4	21.86	0.153	2.14	1.64	0.2	0.498	4.2	Pass
	5	21.40	0.138	2.14	1.64	0.2	0.450	2.6	Pass
	12	21.97	0.157	2.14	1.64	0.2	0.512	2.3	Pass
	13	21.39	0.137	2.14	1.64	0.2	0.446	2.5	Pass
	25	21.66	0.146	2.14	1.64	0.2	0.476	4.5	Pass
	26	21.33	0.135	2.14	1.64	0.2	0.440	2.6	Pass
	66	21.99	0.158	2.14	1.64	0.2	0.515	4.2	Pass
	85	21.76	0.149	2.14	1.64	0.2	0.485	2.3	Pass

Table 11: Test Results of RF Exposure Calculations based on Maximum Permissive Gain for ISSED

Operating Mode	Band	Maximum Conducted Output Power (P_{out})		Antenna Gain (dBi)	Numeric Gain G_{num} (dB)	Distance R (m)	MPE P_d (W/m ²)	Limit (W/m ²)	Verdict
		dBm	W						
NB-IoT	2	21.59	0.144	11.00	12.59	0.2	3.61	4.5	Pass
	4	21.56	0.143	8.00	6.31	0.2	1.80	4.2	Pass
	5	21.01	0.126	9.10	8.13	0.2	2.04	2.6	Pass
	12	21.04	0.127	8.60	7.24	0.2	1.83	2.3	Pass
	13	21.11	0.129	8.90	7.76	0.2	1.99	2.5	Pass
	25	21.52	0.141	11.00	12.59	0.2	3.53	4.5	Pass
	26	21.01	0.126	9.00	7.94	0.2	1.99	2.6	Pass
	66	21.27	0.133	8.00	6.31	0.2	1.67	4.2	Pass
	71	21.52	0.141	8.40	6.92	0.2	1.94	2.2	Pass
eMTC	85	21.13	0.129	8.60	7.24	0.2	1.86	2.3	Pass
	2	21.99	0.158	11.00	12.59	0.2	3.96	4.5	Pass
	4	21.86	0.153	8.00	6.31	0.2	1.92	4.2	Pass
	5	21.40	0.138	9.10	8.13	0.2	2.23	2.6	Pass
	12	21.97	0.157	8.60	7.24	0.2	2.26	2.3	Pass
	13	21.39	0.137	8.90	7.76	0.2	2.12	2.5	Pass
	25	21.66	0.146	11.00	12.59	0.2	3.66	4.5	Pass
	26	21.33	0.135	9.00	7.94	0.2	2.13	2.6	Pass
	66	21.99	0.158	8.00	6.31	0.2	1.98	4.2	Pass
	85	21.76	0.149	8.60	7.24	0.2	2.15	2.3	Pass

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