

Prüfbericht-Nr.: <i>Test report no.:</i>	CN21N817 002	Auftrags-Nr.: <i>Order no.:</i>	168335486	Seite 1 von 13 <i>Page 1 of 13</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2021.09.22	
Auftraggeber: <i>Client:</i>	Telit Communications S.p.A. Viale Stazione di Prosecco 5/b, 34010, Trieste, Italy			
Prüfgegenstand: <i>Test item:</i>	Data Terminal Module			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	ME310G1-W3			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	47 CFR FCC Part 2.1091		RSS-102 Issue 5	
Wareneingangsdatum: <i>Date of sample receipt:</i>	2021.10.15	Refer to Photo Documentation		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003146834- 001/008~011/012~014			
Prüfzeitraum: <i>Testing period:</i>	2021.10.15~2021.11.09			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>			genehmigt von: <i>authorized by:</i>	
Datum: <i>Date:</i>	2021-11-26	Signed by: Bell Hu	Ausstellungsdatum: <i>Issue date:</i>	2021-11-26
Stellung / Position:	Project Manager		Stellung / Position:	Reviewer
Sonstiges / Other:	Sonstiges / Other: FCC ID: RI7ME310G1W3; IC: 5131A-ME310G1W3			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient 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. <i>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.</i>				

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TEST SUMMARY

3.1.1 RF EXPOSURE COMPLIANCE

RESULT: Pass

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1. TEST SITES

1.1 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

A2LA accredited certificate number: 5162.01

1.2 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Table 1: List of Test and Measurement Equipment

Description	Manufacturer	Model	Serial No.	Calibrated until (DD.MM.YYYY)
Radio Spectrum Testing				
Wireless Connectivity Tester	R&S	CMW270	101375	09.08.2022
Signal Analyzer	R&S	FSV 40	101441	09.08.2022

1.3 Traceability

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

1.4 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.

1.5 Location of Original Data

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

1.6 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.

2. GENERAL PRODUCT INFORMATION

2.1 GENERAL DESCRIPTION

The EUT is wireless module which supports eMTC wireless technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

2.2 RATING AND SYSTEM DETAILS

Table 2: Rating of EUT

General Information of EUT	Description
Kind of Equipment:	Data Terminal Module
Type Designation:	ME310G1-W3
FCC ID:	RI7ME310G1W3
IC:	5131A-ME310G1W3
HVIN:	ME310G1-W3
FVIN:	M0C.900004
Type of Equipment:	Single Module
Antenna Type:	External Antenna
Operating Voltage:	DC 3.8V
Operating Temperature Range:	-40°C ~ +85°C

Table 3: Technical Specification of EUT

Characteristic	Description
Operated Modes:	eMTC
Operational Frequency Band(s):	Band 2, Band 4, Band 5, Band 8, 39d, Band 12, Band 13, Band 14, Band 25, Band 26, Band 66, Band 85
Nominal RF Output Power:	23 dBm ± 2dB
Modulation Type:	16QAM, QPSK
Antenna Type:	External Antenna The EUT doesn't have antenna, The adapter and antenna used for testing in this report is the after-market accessory
Antenna Gain:	2.14 dBi
Device Category:	CAT-M1

Table 4: Operating Frequency Range of EUT

Frequency Band(s)	Frequency Range		Channel Bandwidth (MHz)
	Transmitting f_{UL} (MHz)	Receiving f_{DL} (MHz)	
Band 2	1850 ~ 1910	1930 ~ 1990	1.4, 3, 5, 10, 15, 20
Band 4	1710 ~ 1755	2110 ~ 2155	1.4, 3, 5, 10, 15, 20
Band 5	824 ~ 849	869 ~ 894	1.4, 3, 5, 10
Band 8_39d	897.5 ~ 900.5	936.5 ~ 939.5	1.4, 3
Band 12	699 ~ 716	729 ~ 746	1.4, 3, 5, 10
Band 13	777 ~ 787	746 ~ 756	5, 10
Band 14	788 ~ 798	758 ~ 768	5, 10
Band 25	1850 ~ 1915	1930 ~ 1995	1.4, 3, 5, 10, 15, 20
Band 26	814 ~ 849	859 ~ 894	1.4, 3, 5, 10, 15
Band 66	1710 ~ 1780	2110 ~ 2200	1.4, 3, 5, 10, 15, 20
Band 85	698 ~ 716	728 ~ 746	5, 10

3. Test Results

3.1 Transmitter Requirements & Test Suites

3.1.1 RF Exposure Compliance

RESULT: **Pass**

Test standard	:	RSS-102 Issue 5 FCC Part 1.1091
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.

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

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

FCC Part 1.1310

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

RSS-102 Exposure Limits

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ f ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ f ^{0.25}	0.1540/ f ^{0.25}	8.944/ f ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ f ^{1.2}
150000-300000	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/ f ^{1.2}
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

Table 5: Permissive Gain Calculations for FCC

Band	Maximum Conducted Output Power		E.I.R.P Limit (dBm)	Allowed Antenna Gain_Power (dBi)	MPE		Allowed Antenna Gain_MPE (dBi)	Final Permissive Antenna Gain (dBi)
	Meas. (dBm)	Max. incl. tune-up (dBm)			Limit (mW/cm ²)	Maximum Permitted EIRP (dBm)		
2	24.38	25	33.01	8.0	1.00	37.0	12.0	8.0
4	24.56	25	30.00	5.0	1.00	37.0	12.0	5.0
5	24.39	25	40.60	15.6	0.55	34.4	9.4	9.4
8	23.75	25	42.15	17.15	0.60	34.8	9.8	9.8
12	24.12	25	36.92	11.9	0.47	33.7	8.7	8.7
13	24.25	25	36.92	11.9	0.52	34.2	9.2	9.2
14	24.15	25	46.91	21.91	0.53	34.3	9.3	9.3
25	24.25	25	33.01	8.0	1.00	37.0	12.0	8.0
26	24.58	25	40.60	15.6	0.55	34.4	9.4	9.4
66	24.41	25	30.00	5.0	1.00	37.0	12.0	5.0
85	24.14	25	36.92	11.9	0.47	33.7	8.7	8.7

Table 6: Permissive Gain Calculations for ISSED

Band	Maximum Conducted Output Power		E.I.R.P Limit (dBm)	Allowed Antenna Gain_Power (dBi)	MPE		Allowed Antenna Gain_MPE (dBi)	Final Permissive Antenna Gain (dBi)
	Meas. (dBm)	Max. incl. tune-up (dBm)			Limit (W/m ²)	Maximum Permitted EIRP (dBm)		
2	24.38	25	33.01	8.0	4.5	33.5	8.5	8.0
4	24.56	25	30.00	5.0	4.2	33.2	8.2	5.0
5	24.39	25	40.60	15.6	2.6	31.2	6.2	6.2
12	24.12	25	36.92	11.9	2.3	30.6	5.6	5.6
13	24.25	25	36.92	11.9	2.5	31.0	6.0	6.0
14	24.15	25	44.77	19.77	2.5	31.0	6.0	6.0
25	24.25	25	33.01	8.0	4.5	33.5	8.5	8.0
26	24.58	25	40.60	15.6	2.6	31.2	6.2	6.2
66	24.41	25	30.00	5.0	4.2	33.2	8.2	5.0
85	24.14	25	36.92	11.9	2.3	30.6	5.6	5.6

Table 7: Summary of Maximum Permissive Gain

Operating Mode	Band	Permissive Antenna Gain (dBi)		Max. Permissive Antenna Gain (dBi) for both FCC and ISSED
		FCC	ISSED	
eMTC	2	8.0	8.0	8.0
	4	5.0	5.0	5.0
	5	9.4	6.2	6.2
	12	8.7	5.6	5.6
	13	9.2	6.0	6.0
	14	9.3	6.0	6.0
	25	8.0	8.0	8.0
	26	9.4	6.2	6.2
	66	5.0	5.0	5.0
	85	8.7	5.6	5.6

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

Operating Mode	Band	Max. incl. tune-up (dBm)		Antenna Gain (dBi)	Numeric Gain G_{num}	Distance R (cm)	MPE P_d (mW/cm ²)	Limit (mW/cm ²)	Verdict
		dBm	mW						
eMTC	2	24.38	274.16	2.14	1.64	20	0.09	1.0	Pass
	4	24.56	285.76	2.14	1.64	20	0.09	1.0	Pass
	5	24.39	274.79	2.14	1.64	20	0.09	0.55	Pass
	8	23.75	237.14	2.14	1.64	20	0.08	0.60	Pass
	12	24.12	258.23	2.14	1.64	20	0.08	0.47	Pass
	13	24.25	266.07	2.14	1.64	20	0.09	0.52	Pass
	14	24.15	260.02	2.14	1.64	20	0.08	0.53	Pass
	25	24.25	266.07	2.14	1.64	20	0.09	1.0	Pass
	26	24.58	287.08	2.14	1.64	20	0.09	0.54	Pass
	66	24.41	276.06	2.14	1.64	20	0.09	1.0	Pass
	85	24.14	259.42	2.14	1.64	20	0.08	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}	Distance R (cm)	MPE P_d (mW/cm ²)	Limit (mW/cm ²)	Verdict
		dBm	mW						
eMTC	2	24.38	274.16	8.0	6.31	20	0.344	1.0	Pass
	4	24.56	285.76	5.0	3.16	20	0.180	1.0	Pass
	5	24.39	274.79	9.4	8.71	20	0.476	0.55	Pass
	8	23.75	237.14	9.8	9.55	20	0.451	0.60	Pass
	12	24.12	258.23	8.7	7.41	20	0.381	0.47	Pass
	13	24.25	266.07	9.2	8.32	20	0.441	0.52	Pass
	14	24.15	260.02	9.3	8.51	20	0.440	0.53	Pass
	25	24.25	266.07	8.0	6.31	20	0.334	1.0	Pass
	26	24.58	287.08	9.4	8.71	20	0.498	0.54	Pass
	66	24.41	276.06	5.0	3.16	20	0.174	1.0	Pass
	85	24.14	259.42	8.7	7.41	20	0.383	0.47	Pass

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

Operating Mode	Band	Maximum Conducted Output Power (P_{out})		Antenna Gain (dBi)	Numeric Gain G_{num}	Distance R (m)	MPE P_d (W/m ²)	Limit (W/m ²)	Verdict
		dBm	mW						
eMTC	2	24.38	274.16	2.14	1.64	0.2	0.89	4.5	Pass
	4	24.56	285.76	2.14	1.64	0.2	0.93	4.2	Pass
	5	24.39	274.79	2.14	1.64	0.2	0.90	2.6	Pass
	12	24.12	258.23	2.14	1.64	0.2	0.84	2.3	Pass
	13	24.25	266.07	2.14	1.64	0.2	0.87	2.5	Pass
	14	24.15	260.02	2.14	1.64	0.2	0.85	2.5	Pass
	25	24.25	266.07	2.14	1.64	0.2	0.87	4.5	Pass
	26	24.58	287.08	2.14	1.64	0.2	0.94	2.6	Pass
	66	24.41	276.06	2.14	1.64	0.2	0.90	4.2	Pass
	85	24.14	259.42	2.14	1.64	0.2	0.85	2.3	Pass

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

Operating Mode	Band	Maximum Conducted Output Power (P_{out})		Antenna Gain (dBi)	Numeric Gain G_{num}	Distance R (m)	MPE P_d (W/m ²)	Limit (W/m ²)	Verdict
		dBm	mW						
eMTC	2	24.38	274.16	8.0	6.31	0.2	3.44	4.5	Pass
	4	24.56	285.76	5.0	3.16	0.2	1.80	4.2	Pass
	5	24.39	274.79	6.2	4.17	0.2	2.28	2.6	Pass
	12	24.12	258.23	5.6	3.63	0.2	1.87	2.3	Pass
	13	24.25	266.07	6.0	3.98	0.2	2.11	2.5	Pass
	14	24.15	260.02	6.0	3.98	0.2	2.06	2.5	Pass
	25	24.25	266.07	8.0	6.31	0.2	3.34	4.5	Pass
	26	24.58	287.08	6.2	4.17	0.2	2.38	2.6	Pass
	66	24.41	276.06	5.0	3.16	0.2	1.74	4.2	Pass
	85	24.14	259.42	5.6	3.63	0.2	1.87	2.3	Pass

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