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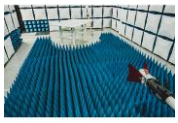

RF EXPOSURE EVALUATION
Maximum Permissible Exposure [MPE]

Applicant Name:
Telit Communications S.p.A
Viale Stazione di Prosecco 5/b
34010, Trieste, Italy

Date of Testing:
05/12 - 06/01/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2106040065-03.RI7

FCC ID:	**RI7LE910CXWWX**
IC:	**5131A-LE910CXWWX**
APPLICANT:	**Telit Communications S.p.A**

Application Type:	Certification
Model/HVIN:	LE910C4-WWX
Additional Model/HVIN (s):	LE910C1-WWX
EUT Type:	Data Terminal Module
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part:	FCC Part 1 (§1.1310) and Part 2 (§2.1091)
ISED Specification:	RSS-102 Issue 5
Test Procedure(s):	KDB 447498 D01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC KDB 447498 D01. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

ACCREDITED
CERT #2041.01

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1.0 RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Introduction

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC Rules and Regulations and RSS-102 of Industry Canada.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310 and RSS-102: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	…	…	f/300	6
1500-100,000	…	…	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	…	…	f/1500	30
1500-100,000	…	…	1.0	30

Table 1-1. FCC Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
$0.003\text{-}10^{21}$	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	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Table 1-2. ISED Limits for Maximum Permissible Exposure (MPE)

1.2 EUT Description

The Equipment Under Test (EUT) is the **Telit Communications S.p.A Data Terminal Module FCC ID: RI7LE910CXWWX / IC:5131A-LE910CXWWX**. This MPE evaluation will cover RF Exposure for GSM/GPRS/EDGE, WCDMA/HSPA, and LTE operation.

This FCC and IC ID covers operations for two different versions of this module. The LE910C4-WWX is the Cat. 4 LTE version module and the LE910C1-WWX is the Cat. 1 LTE version of this module. Cat. 1 and Cat. 4 LTE only differ in the speed/throughput and have not been noted to have any impact on the RF itself. Both modules were investigated and the LE910C4-WWX was tested fully to represent both versions of the module."

1.3 Procedure

The procedure used to determine the RF power density was based upon a calculation for determining compliance with the MPE requirements.

The power generated by each transmitter used in this product was initially measured by a spectrum analyzer and the powers were recorded. Through use of the Friis transmission formula and knowledge of the maximum antenna gain to be used, the power density level is calculated at a distance of 20cm.

Friis Transmission Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4\pi r^2)$

Where,

P_d = Power Density (mW/cm^2) $\pi = 3.1416$
P_{out} = output power to antenna (mW) r = distance between observation point and center of the radiator (cm)
G = gain of antenna in linear scale

Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the source-based time averaged powers are determined by applying correction factor from max power.

Sample Calculations

(Max number of uplink slots for GSM mode: 2 slots)
Correction factor = 10log (max number of uplink slots/8)
= 10log (2/8)
= -6.02 dB

Calculated MPE

The power density limit for General Population/Uncontrolled Exposure at each frequency is determined based on the information in Table 1-1 & 1-2.

There is no co-location between the electric fields of any two transmitters therefore following power densities are calculated for each individual transmitter by frequency at 20cm spacing:

1.4 MPE Calculation based on Specific Antenna.

Frequency	824.2	MHz	
Limit	0.549	mW/cm^2	
Distance (cm), R =	20	cm	
Max Power (dBm)	33.5	dBm	2238.72 mW
Source Based Time Average Power (dBm), P =	27.5	dBm	562.34 mW
TX Ant Gain (dBi), G =	1.531	dBi	
Power Density (S) =	**0.159**	mW/cm^2	(at 20cm)

Table 1-3. Calculated MPE Data for GSM/GPRS Cell

Frequency:	824.2	MHz	
Limit:	0.549	mW/cm^2	
Distance (cm), R =	20	cm	
Max Power (dBm)	28	dBm	630.96 mW
Source Based Time Average Power (dBm), P =	22	dBm	158.49 mW
TX Ant Gain (dBi), G =	1.531	dBi	
Power Density (S) =	**0.045**	mW/cm^2	(at 20cm)

Table 1-4. Calculated MPE Data for EDGE Cell

Frequency	1880	MHz	
Limit	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Max Power (dBm)	30.5	dBm	1122.02 mW
Source Based Time Average Power (dBm), P =	24.5	dBm	281.84 mW
TX Ant Gain (dB), G =	1.684	dBi	
Power Density (S) =	**0.083**	mW/cm^2	(at 20cm)

Table 1-5. Calculated MPE Data for GSM/GPRS PCS

Frequency	1880	MHz	
Limit	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Max Power (dBm)	27	dBm	501.19 mW
Source Based Time Average Power (dBm), P =	21	dBm	125.89 mW
TX Ant Gain (dB), G =	1.684	dBi	
Power Density (S) =	**0.037**	mW/cm^2	(at 20cm)

Table 1-6. Calculated MPE Data for EDGE PCS

Frequency	826.4	MHz	
Limit	0.551	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	24.5	dBm	281.84 mW
TX Ant Gain (dBi), G =	1.531	dBi	
Power Density (S) =	**0.080**	mW/cm^2	(at 20cm)

Table 1-7. Calculated MPE Data for WCDMA Cell

Frequency:	1732.6	MHz	
Limit:	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	24.5	dBm	281.84 mW
TX Ant Gain (dBi), G =	2.258	dBi	
Power Density (S) =	**0.094**	mW/cm^2	(at 20cm)

Table 1-8. Calculated MPE Data for WCDMA AWS

Frequency	1880	MHz	
Limit	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	24.5	dBm	281.84 mW
TX Ant Gain (dB), G =	1.684	dBi	
Power Density (S) =	**0.083**	mW/cm^2	(at 20cm)

Table 1-9. Calculated MPE Data for WCDMA PCS

Frequency	1882.5	MHz	
Limit	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	24	dBm	251.19 mW
TX Ant Gain (dB), G =	1.684	dBi	
Power Density (S) =	**0.074**	mW/cm^2	(at 20cm)

Table 1-10. Calculated MPE Data for LTE BAND25/2

Frequency	1732.5	MHz	
Limit	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	24	dBm	251.19 mW
TX Ant Gain (dB), G =	2.258	dBi	
Power Density (S) =	**0.084**	mW/cm^2	(at 20cm)

Table 1-11. Calculated MPE Data for LTE BAND4

Frequency	824.7	MHz		
Limit	0.550	mW/cm^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	24	dBm	251.19	mW
TX Ant Gain (dB), G =	1.531	dBi		
Power Density (S) =	**0.071**	mW/cm^2	(at 20cm)	

Table 1-12. Calculated MPE Data for LTE BAND26/5

Frequency	2535	MHz		
Limit	1.000	mW/cm^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	24	dBm	251.19	mW
TX Ant Gain (dBi), G =	1.818	dBi		
Power Density (S) =	**0.076**	mW/cm^2	(at 20cm)	

Table 1-13. Calculated MPE Data for LTE BAND7

Frequency:	898.2	MHz		
Limit:	0.599	mW/cm^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	24	dBm	251.19	mW
TX Ant Gain (dBi), G =	0.07	dBi		
Power Density (S) =	**0.051**	mW/cm^2	(at 20cm)	

Table 1-14. Calculated MPE Data for LTE BAND8

Frequency	699.7	MHz		
Limit	0.466	mW/cm^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	24	dBm	251.19	mW
TX Ant Gain (dB), G =	0.412	dBi		
Power Density (S) =	**0.055**	mW/cm^2	(at 20cm)	

Table 1-15. Calculated MPE Data for LTE BAND12

Frequency	779.5	MHz		
Limit	0.520	mW/cm^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	24	dBm	251.19	mW
TX Ant Gain (dB), G =	0.864	dBi		
Power Density (S) =	**0.061**	mW/cm^2	(at 20cm)	

Table 1-16. Calculated MPE Data for LTE BAND13

Frequency	790.5	MHz	
Limit	0.527	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	24	dBm	251.19 mW
TX Ant Gain (dB), G =	0.864	dBi	
Power Density (S) =	**0.061**	mW/cm^2	(at 20cm)

Table 1-17. Calculated MPE Data for LTE BAND14

Frequency	814.7	MHz	
Limit	0.543	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	24	dBm	251.19 mW
TX Ant Gain (dB), G =	1.531	dBi	
Power Density (S) =	**0.071**	mW/cm^2	(at 20cm)

Table 1-18. Calculated MPE Data for LTE Band26(Part.90)

1.5 Maximum Permissive Antenna Gain Calculation

Band / Mode	Frequency [MHz]	Max Power [dBm]	EIRP Limit [dBm]	Maximum Antenna Gain from Power [dBi]	MPE for FCC		Maximum Antenna Gain from MPE [dBi]	Maximum Permissive Antenna Gain [dBi]
					Limit (mW/cm^2)	Limit [dBm]		
GSM/GPRS Cell	824.2 - 848.8	27.5	40.61	13.11	0.549	34.41	6.91	6.91
EDGE Cell	824.2 - 848.9	22	40.61	18.61	0.549	34.41	12.41	12.41
GSM/GPRS PCS	1850.2 - 1909.8	24.5	33.01	8.51	1.000	37.01	12.51	8.51
EDGE PCS	1850.2 - 1909.8	21	33.01	12.01	1.000	37.01	16.01	12.01
WCDMA Cell	826.4 - 846.6	24.5	40.61	16.11	0.551	34.42	9.92	9.92
WCDMA AWS	1712.4 - 1752.6	24.5	30.00	5.50	1.000	37.01	12.51	5.50
WCDMA PCS	1852.4 - 1907.6	24.5	33.01	8.51	1.000	37.01	12.51	8.51
LTE BAND25/2	1850.7 -1914.3	24	33.01	9.01	1.000	37.01	13.01	9.01
LTE BAND4	1710.7 - 1754.3	24	30.00	6.00	1.000	37.01	13.01	6.00
LTE BAND26/5	824.7 - 848.3	24	40.61	16.61	0.550	34.41	10.41	10.41
LTE BAND7	2502.5 - 2567.5	24	33.01	9.01	1.000	37.01	13.01	9.01
LTE BAND8	898.2 - 899.8	24	36.92	12.92	0.599	34.79	10.79	10.79
LTE BAND12	699.7 - 715.3	24	36.92	12.92	0.466	33.70	9.70	9.70
LTE BAND13	779.5 - 784.5	24	36.92	12.92	0.520	34.17	10.17	10.17
LTE BAND14	790.5 - 795.5	24	36.92	12.92	0.527	34.23	10.23	10.23
LTE Band26(Part.90)	814.7 - 823.3	24	40.61	16.61	0.543	34.36	10.36	10.36

Table 1-19. FCC Maximum Permissive Antenna Gain Calculation

Band / Mode	Frequency [MHz]	Max Power [dBm]	EIRP Limit [dBm]	Maximum Antenna Gain from Power [dBi]	MPE for ISED		Maximum Antenna Gain from MPE [dBi]	Maximum Permissive Antenna Gain [dBi]
					Limit (W/m^2)	Limit [dBm]		
GSM/GPRS Cell	824.2 - 848.8	27.5	40.61	13.11	2.576	31.12	3.62	3.62
EDGE Cell	824.2 - 848.9	22	40.61	18.61	2.576	31.12	9.12	9.12
GSM/GPRS PCS	1850.2 - 1909.8	24.5	33.01	8.51	4.526	33.57	9.07	8.51
EDGE PCS	1850.2 - 1909.8	21	33.01	12.01	4.526	33.57	12.57	12.01
WCDMA Cell	826.4 - 846.6	24.5	40.61	16.11	2.581	31.13	6.63	6.63
WCDMA AWS	1712.4 - 1752.6	24.5	30.00	5.50	4.280	33.33	8.83	5.50
WCDMA PCS	1852.4 - 1907.6	24.5	33.01	8.51	4.526	33.57	9.07	8.51
LTE BAND25/2	1850.7 -1914.3	24	33.01	9.01	4.530	33.57	9.57	9.01
LTE BAND4	1710.7 - 1754.3	24	30.00	6.00	4.280	33.33	9.33	6.00
LTE BAND26/5	824.7 - 848.3	24	40.61	16.61	2.577	31.12	7.12	7.12
LTE BAND7	2502.5 - 2567.5	24	33.01	9.01	5.552	34.46	10.46	9.01
LTE BAND8	898.2 - 899.8	24	36.92	12.92	2.732	31.38	7.38	7.38
LTE BAND12	699.7 - 715.3	24	36.92	12.92	2.303	30.64	6.64	6.64
LTE BAND13	779.5 - 784.5	24	36.92	12.92	2.480	30.96	6.96	6.96
LTE BAND14	790.5 - 795.5	24	36.92	12.92	2.504	31.00	7.00	7.00
LTE Band26(Part.90)	814.7 - 823.3	24	40.61	16.61	2.556	31.09	7.09	7.09

Table 1-20. ISED Maximum Permissive Antenna Gain Calculation

1.6 Summary of Results

Band / Mode	Frequency [MHz]	Maximum Antenna Gain [dBi]	MPE @ 20cm (mW/cm^2)	FCC Limit (mW/cm^2)	FCC TEST Result	MPE @ 0.2m (W/m^2)	ISED Limit (W/m^2)	ISED TEST Result
GSM/GPRS Cell	824.2 - 848.8	1.531	0.159	0.549	PASS	1.592	2.576	PASS
EDGE Cell	824.2 - 848.9	1.531	0.045	0.549	PASS	0.449	2.576	PASS
GSM/GPRS PCS	1850.2 - 1909.8	1.684	0.083	1.000	PASS	0.826	4.526	PASS
EDGE PCS	1850.2 - 1909.8	1.684	0.037	1.000	PASS	0.369	4.526	PASS
WCDMA Cell	826.4 - 846.6	1.531	0.080	0.551	PASS	0.798	2.581	PASS
WCDMA AWS	1712.4 - 1752.6	2.258	0.094	1.000	PASS	0.943	4.280	PASS
WCDMA PCS	1852.4 - 1907.6	1.684	0.083	1.000	PASS	0.826	4.526	PASS
LTE BAND25/2	1850.7 -1914.3	1.684	0.074	1.000	PASS	0.736	4.530	PASS
LTE BAND4	1710.7 - 1754.3	2.258	0.084	1.000	PASS	0.840	4.280	PASS
LTE BAND26/5	824.7 - 848.3	1.531	0.071	0.550	PASS	0.711	2.577	PASS
LTE BAND7	2502.5 - 2567.5	1.818	0.076	1.000	PASS	0.760	5.552	PASS
LTE BAND8	898.2 - 899.8	0.070	0.051	0.599	PASS	0.508	2.732	PASS
LTE BAND12	699.7 - 715.3	0.412	0.055	0.466	PASS	0.549	2.303	PASS
LTE BAND13	779.5 - 784.5	0.864	0.061	0.520	PASS	0.610	2.480	PASS
LTE BAND14	790.5 - 795.5	0.864	0.061	0.527	PASS	0.610	2.504	PASS
LTE Band26(Part.90)	814.7 - 823.3	1.531	0.071	0.543	PASS	0.711	2.556	PASS

Table 1-21. Maximum Permissible Exposure Summary Table based on Specific Antenna.

Band / Mode	Frequency [MHz]	Maximum Permissive Antenna Gain for FCC [dBi]	MPE @ 20cm (mW/cm^2)	FCC Limit (mW/cm^2)	FCC TEST Result	Maximum Permissive Antenna Gain for ISED [dBi]	MPE @ 0.2m (W/m^2)	ISED Limit (W/m^2)	ISED TEST Result
GSM/GPRS Cell	824.2 - 848.8	6.91	0.549	0.549	PASS	3.62	2.576	2.576	PASS
EDGE Cell	824.2 - 848.9	12.41	0.549	0.549	PASS	9.12	2.576	2.576	PASS
GSM/GPRS PCS	1850.2 - 1909.8	8.51	0.398	1.000	PASS	8.51	3.979	4.526	PASS
EDGE PCS	1850.2 - 1909.8	12.01	0.398	1.000	PASS	12.01	3.979	4.526	PASS
WCDMA Cell	826.4 - 846.6	9.92	0.550	0.551	PASS	6.63	2.581	2.581	PASS
WCDMA AWS	1712.4 - 1752.6	5.50	0.199	1.000	PASS	5.50	1.989	4.280	PASS
WCDMA PCS	1852.4 - 1907.6	8.51	0.398	1.000	PASS	8.51	3.979	4.526	PASS
LTE BAND25/2	1850.7 -1914.3	9.01	0.398	1.000	PASS	9.01	3.979	4.530	PASS
LTE BAND4	1710.7 - 1754.3	6.00	0.199	1.000	PASS	6.00	1.989	4.280	PASS
LTE BAND26/5	824.7 - 848.3	10.41	0.549	0.550	PASS	7.12	2.577	2.577	PASS
LTE BAND7	2502.5 - 2567.5	9.01	0.398	1.000	PASS	9.01	3.979	5.552	PASS
LTE BAND8	898.2 - 899.8	10.79	0.599	0.599	PASS	7.38	2.732	2.732	PASS
LTE BAND12	699.7 - 715.3	9.70	0.466	0.466	PASS	6.64	2.303	2.303	PASS
LTE BAND13	779.5 - 784.5	10.17	0.520	0.520	PASS	6.96	2.480	2.480	PASS
LTE BAND14	790.5 - 795.5	10.23	0.527	0.527	PASS	7.00	2.504	2.504	PASS
LTE Band26(Part.90)	814.7 - 823.3	10.36	0.543	0.543	PASS	7.09	2.556	2.556	PASS

Table 1-22. Maximum Permissible Exposure Summary Table based on Maximum Permissive Antenna Gain

2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 20cm separation distance as specified in §2.1091 of the FCC Rules and Regulations and Health Canada Safety Code 6. An appropriate RF exposure compliance statement will be placed in the user's manual.