

PART 22 MEASUREMENT REPORT**Applicant Name:**

Telit Communications S.p.A.
Via Stazione di Prosecco 5/b
34010 Trieste
Italy

Date of Testing:

11/11/2024 - 11/12/2024

Test Report Issue Date:

12/10/2024

Test Site/Location:

Element Lab., Columbia, MD, USA

Test Report Serial No.:

1M2410230100-01.RI7

FCC ID:

RI7LE910CXNF

APPLICANT:

Telit Communications S.p.A.

Application Type:

Class II Permissive Change

Model:

LE910C4-NFX

Additional Model(s):

LE910C1-NFX, LE910C1-NFXD, LE910C4-NFXD

EUT Type:

Module

FCC Classification:

PCS Licensed Transmitter (PCB)

FCC Rule Part:

22

Test Procedure(s):

ANSI C63.26-2015KDB 648474 D03 v01r04

Permissive Change Description:

Updates to several components as specified in the filing

Original Grant Date:

10/22/2018

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 §2.947. 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.



RJ Ortanez
Executive Vice President



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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 Element Test Location

Measurements were conducted at the Element laboratory(ies) indicated in Section 1.3 below. All measurement facilities are compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A. (“MD”)

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Telit Module FCC ID: RI7LE910CXNF**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 22.

Test Device Serial No.: 355337249997849, 355337249997864

2.2 Device Capabilities

This device contains the following capabilities:

Multi-band LTE

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Section 6.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 Software and Firmware

Testing was performed on device(s) using the following software/firmware version installed on the EUT.

MODEL:	HW	FW
LE910C4-NFX	1.00	M0F.763007
LE910C4-NFXD	1.00	M0F.933007
LE910C1-NFX	1.00	M0F.193007
LE910C1-NFXD	1.00	M0F.863007

Table 2-1. HW/FW Version

2.5 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

2.6 Antenna Information

The following antenna was used for testing:

Antenna Type: Dipole Antenna

Antenna Gain: 1.5 dBi

Antenna Input Impedance: 50 ohms

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the “American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services” (ANSI C63.26-2015) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]};$$

where P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{\text{[dB}\mu\text{V/m]}} = \text{Measured amplitude level}_{\text{[dBm]}} + 107 + \text{Cable Loss}_{\text{[dB]}} + \text{Antenna Factor}_{\text{[dB/m]}}$$

And

$$\text{EIRP}_{\text{[dBm]}} = E_{\text{[dB}\mu\text{V/m]}} + 20\log D - 104.8; \text{ where } D \text{ is the measurement distance in meters.}$$

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

Table 4-1. Measurement Uncertainty Budget

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	ETS-001	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	ETS-001
-	ETS-002	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	ETS-002
-	AP1-002	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	AP1-002
	AP2-001	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	AP2-001
Rohde & Schwarz	TC-TA18	Vivaldi Antenna	2/23/2023	Biennial	2/23/2025	101072
ETS Lindgren	3115	Double Ridged Guide Horn 750MHz - 18GHz	6/7/2024	Biennial	6/7/2026	150693
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and spectrum analyzer	3/8/2024	Annual	3/8/2025	103187
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	11/11/2023	Annual	11/11/2024	100348
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6262150000
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	N/A			165450
Sunol	JB5	Bi-Log Antenna (30M-5GHz)	9/11/2024	Biennial	9/11/2026	A082816

Table 5-1. Test Equipment Calibration Table

Notes:

- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
- Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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6.0 TEST RESULTS

6.1 Summary

Company Name: Telit Communications S.p.A.
 FCC ID: RI7LE910CXNF
 FCC Classification: PCS Licensed Transmitter (PCB)
 Mode(s): LTE

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
RADIATED	Radiated Spurious Emissions	2.1053, 22.917(a)	$> 43 + 10 \log_{10} (P[\text{Watts}])$ for all out-of-band emissions	PASS	Section 6.2

Table 6-1. Summary of Test Results

Notes:

All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst-case emissions.

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6.2 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an external antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

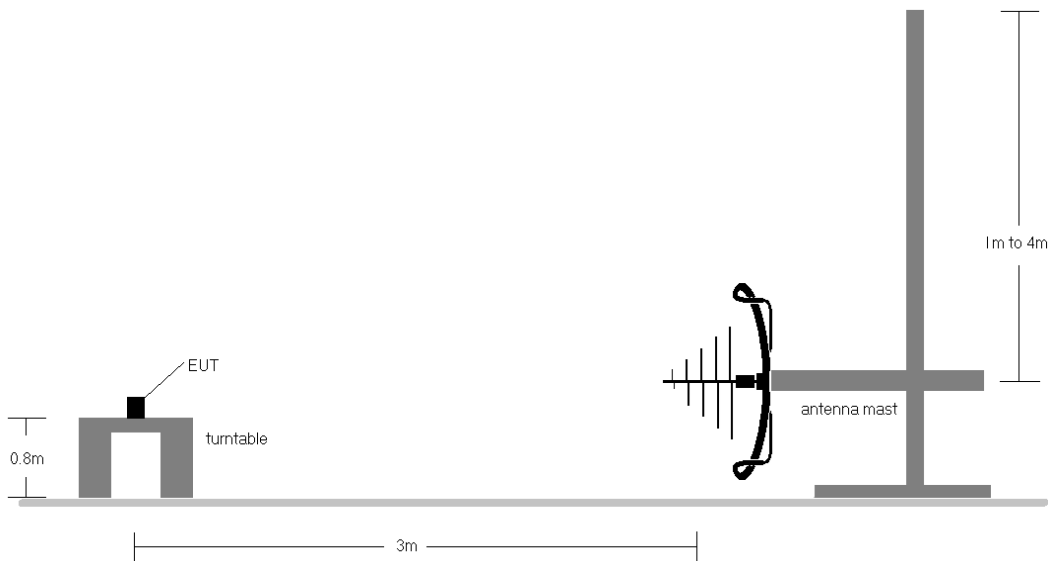


Figure 6-1. Test Instrument & Measurement Setup < 1GHz

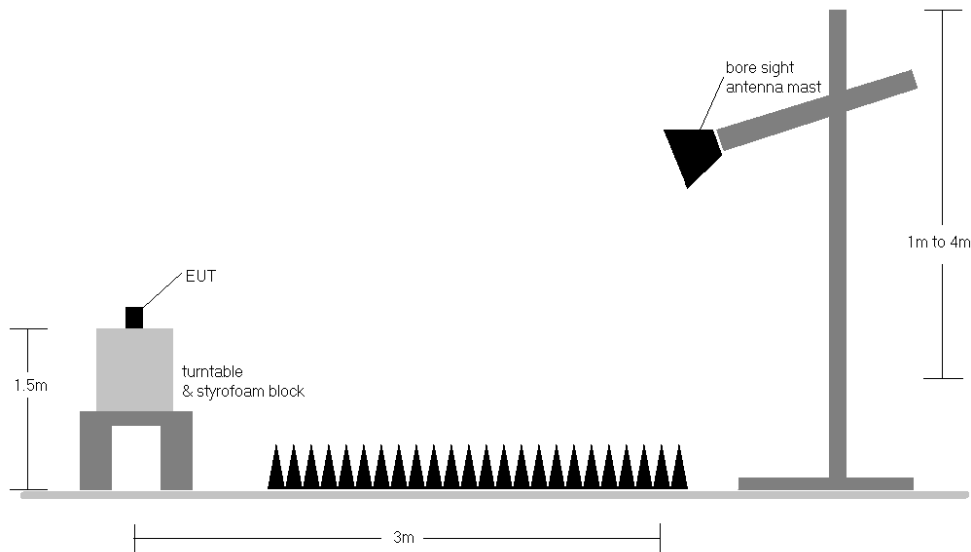


Figure 6-2. Test Instrument & Measurement Setup > 1GHz

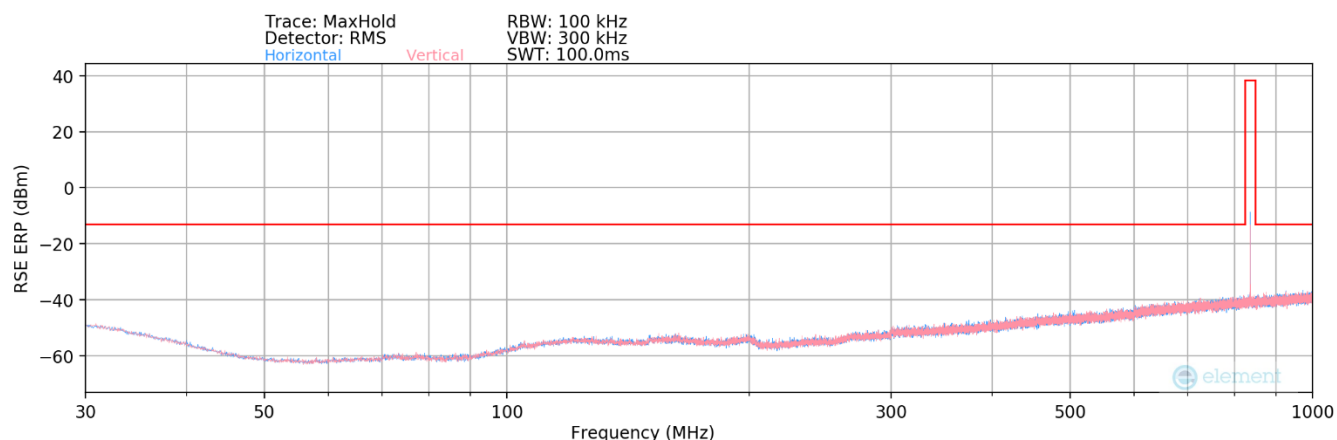
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Test Notes

- 1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
 - a) $E(\text{dB}\mu\text{V/m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
 - b) $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V/m}) + 20\log D - 104.8$; where D is the measurement distance in meters.
- 2) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 3) This unit was tested with a DC power supply

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LTE Band 5



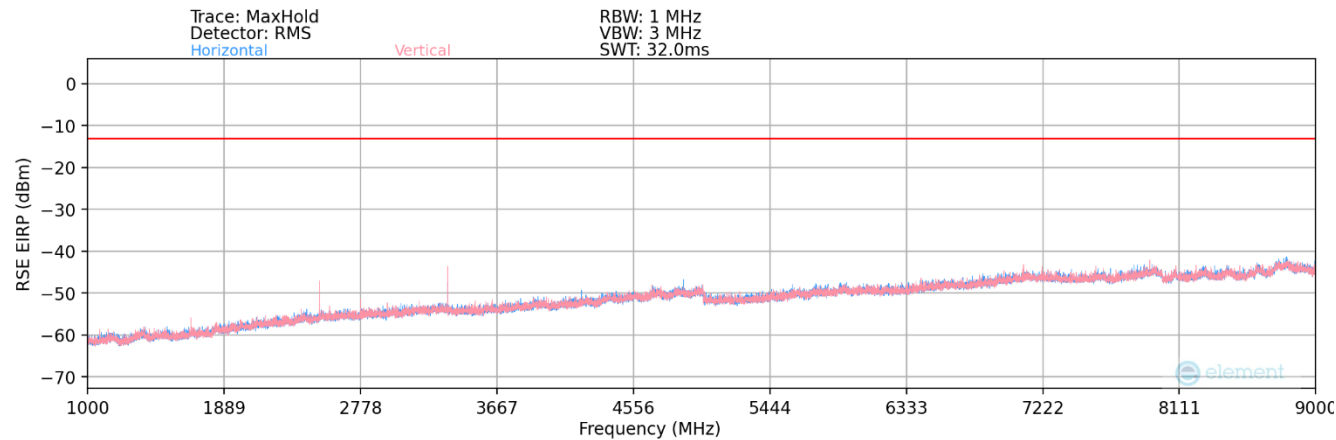
Plot 6-1. Radiated Spurious Plot (LTE Band 5 – Mid Channel – Below 1GHz)

Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
76.39	H	-	-	-108.04	14.71	13.67	-83.74	-13.00	-70.74
148.51	H	-	-	-106.85	19.72	19.87	-77.54	-13.00	-64.54
513.99	H	-	-	-107.60	26.20	25.60	-71.81	-13.00	-58.81

Table 6-1. Radiated Spurious Data (LTE Band 5 – Mid Channel – Below 1GHz)

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Plot 6-2. Radiated Spurious Plot (LTE Band 5 – Mid Channel – Above 1GHz)

Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.00	H	116	279	-75.56	0.43	31.87	-63.39	-13.00	-50.39
2509.50	H	185	309	-70.06	4.07	41.01	-54.25	-13.00	-41.25
3346.00	H	183	132	-64.73	6.78	49.05	-46.21	-13.00	-33.21
4182.50	H	176	259	-75.79	8.24	39.45	-55.81	-13.00	-42.81
5019.00	H	-	-	-81.75	10.55	35.80	-59.46	-13.00	-46.46
5855.50	H	-	-	-81.92	11.77	36.85	-58.40	-13.00	-45.40
6692.00	H	-	-	-83.18	13.86	37.68	-57.57	-13.00	-44.57

Table 6-2. Radiated Spurious Data (LTE Band 5 – Mid Channel – Above 1GHz)

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7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Telit Module FCC ID: RI7LE910CXNF** complies with all the requirements of Part 22 of the FCC rules.

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