

ISED CABid: ES1909
Lab. Company Number: 4621A

Test Report No:
80540RRF.001

Partial Test Report

USA FCC Part 22

CANADA RSS-132

(*) Identification of item tested	Cat1 bis data only module
(*) Trademark	u-blox
(*) Model and/or type reference	LEXI-R10401D
Other identification of the product	FCC ID: XPYUBX23AD01 IC: 8595A-UBX23AD01
(*) Features	LTE Cat1 bis, Wi-fi Scan / Locate HW version: UBX-437C01 SW version: 01.06.A01.00
Applicant	u-blox AG Zürcherstrasse 68, CH-8800 Thalwil, Switzerland
Test method requested, standard	USA FCC Part 22 (10-1-23 Edition). CANADA RSS-132 Issue 4, Jan. 2023. ANSI C63.26-2015. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018.
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager
Date of issue	2025-01-14
Report template No	FDT08_25 (*) "Data provided by the client"

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Competences and guarantees

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DEKRA Testing and Certification is an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory, CABid: ES1909, Company Number: 4621A, with the appropriate scope of accreditation that covers the performed tests in this report.

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample model LEXI-R10401D is a Cat1 bis data only module for industrial IoT applications.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results. The laboratory is not responsible for such information and it is not covered by accreditation.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date Reception	of	Application
S/01	80540_33.1	Cat1 bis data only module	LEXI-R10401D	-	2024-11-05		Element Under Test
S/01	80540_34.1	Antenna	-	-	2024-11-05		Auxiliary Element
S/01	80540_35.1	Antenna GPS	-	-	2024-11-05		Auxiliary Element
S/01	80540_36.1	AC/DC	-	-	2024-11-05		Auxiliary Element
S/01	80540_37.1	USB Cable	-	-	2024-11-05		Auxiliary Element
S/01	80540_49.1	USB Cable	-	-	2024-11-05		Auxiliary Element
S/02	80540/033	Cat1 bis data only module	LEXI-R10401D	-	2024-11-05		Element Under Test
S/02	80540/036	AC/DC	-	-	2024-11-05		Auxiliary Element
S/02	80540/037	USB Cable	-	-	2024-11-05		Auxiliary Element
S/02	80540/049	USB Cable	-	-	2024-11-05		Auxiliary Element

Notes referenced to samples during the project:

Id	Type
S/01	Radiated tests.
S/02	Conducted tests.

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test		Shielded		
	USB	2	☒		☒		
	-		[]		[]		
Supplementary information to the ports..... :	-						
Rated power supply	Voltage and Frequency		Reference poles				
	[]	AC:	[]	[]	[]	[]	[]
	[X]	DC: Min: 3.3, Typical: 3.8, Max: 4.5					
Rated Power..... :	-						
Clock frequencies..... :	26 MHz						
Other parameters	-						
Software version..... :	01.06.A01.00						
Hardware version	UBX-437C01						
Dimensions in cm (W x H x D) ... :	1.6 x 0.2 x 1.6						
Mounting position	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Industrial modem component					
Modules/parts..... :	Module/parts of test item		Type	Manufacturer			
	-		-	-			
Accessories (not part of the test item)	Description		Type	Manufacturer			
	Power supply unit		UUX324-1215	Unifive			
	Antenna LTE		GSA.8835	Taoglass			
Documents as provided by the applicant	Description		File name	Issue date			
	-		-	-			

Identification of the client

u-blox AG
Zürcherstrasse 68, CH-8800 Thalwil, Switzerland

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2024-11-05
Date (finish)	2024-11-11

Document history

Report number	Date	Description
80540RRF.001	2025-01-14	First release.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the semi-anechoic chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Rafael Fernández, Valentín Andarias.

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
6165	EMI TEST RECEIVER 9 kHz-7 GHz	ESR7	ROHDE AND SCHWARZ	2025-12-27
4578	HYBRID BILOG ANTENNA 30 MHz - 6 GHz	3142E	ETS LINDGREN	2026-06-01
7692	ATTENUATOR 3 dB, 2 W, DC, 18 GHz	TWTS2G	TECHNIWAVE	2025-01-29
4716	SIGNAL AND SPECTRUM ANALYZER 2 Hz - 50 GHz	FSW50	ROHDE AND SCHWARZ	2026-08-02
5705	PRE-AMPLIFIER G>40dB, 1-18 GHz	BLMA 0118-1M	BONN ELEKTRONIK	2025-07-18
4611	HORN ANTENNA 1-18 GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2026-01-16
6157	SIGNAL AND SPECTRUM ANALYZER 10 Hz - 40 GHz	FSV40	ROHDE AND SCHWARZ	2025-01-18
4848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	N/A
9555	TWO CHANNEL POWER SUPPLY, 32V, 10/5A, 188W	HMP2020	ROHDE AND SCHWARZ	N/A
7794	SIGNAL AND SPECTRUM ANALYZER 10 Hz - 40 GHz	FSV40	ROHDE AND SCHWARZ	2025-04-21
8912	WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE AND SCHWARZ	2025-10-05
6791	SEMIANECHOIC ABSORBER LINED CHAMBER IV	FACT 3 200 STP	ETS LINDGREN	N/A
6792	SHIELDED ROOM	S101	ETS LINDGREN	N/A
7760	DIGITAL MULTIMETER	175	FLUKE	2025-11-07

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

LTE Cat 1bis Band 5:

FCC PART 22 / RSS-132 PARAGRAPH		
Requirement – Test case	Verdict	Remark
FCC 22.913 / RSS-132 5.4: RF Output Power	P	
FCC 2.1047 / RSS-132 5.2: Modulation Characteristics	N/M	(1)
FCC 22.355 / RSS-132 5.3: Frequency Stability	N/M	(1)
FCC 2.1049: Occupied Bandwidth	N/M	(1)
FCC 22.917 / RSS-132 5.5: Spurious Emissions at Antenna Terminals	N/M	(1)
FCC 22.917 / RSS-132 5.5: Spurious Emissions at Antenna Terminals at Block Edges	N/M	(1)
FCC 22.917 / RSS-132 5.5: Radiated Emissions	P	
<u>Supplementary information and remarks:</u> (1) Test not requested.		

Appendix A: Test results for FCC 22 / RSS-132

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TEST CONDITIONS

(*): Declared by the Applicant.

POWER SUPPLY (*):

Vnominal: 3.8 Vdc
Vminimum: 3.23 Vdc
Vmaximum: 4.5 Vdc
Type of Power Supply: DC External (USB).

ANTENNA (*):

MIDDLE BAND	GAIN	ANTENNA TYPE
LTE Cat 1bis Band 5	2.59 dBi	External (Taoglass GSA_8835 (standard reference antenna provided with EVK))

TEST FREQUENCIES:

LTE Cat 1bis Band 5. QPSK and 16QAM:

	Channel (Frequency MHz)			
	BW=1.4 MHz	BW=3 MHz	BW=5 MHz	BW=10 MHz
Low	20407 (824.70)	20415 (825.50)	20425 (826.50)	20450 (829.00)
Middle	20525 (836.50)	20525 (836.50)	20525 (836.50)	20525 (836.50)
High	20643 (848.30)	20635 (847.50)	20625 (846.50)	20600 (844.00)

RF Output Power

Limits

* FCC § 22.913: Licensees in the Cellular Radiotelephone Service are subject to the effective radiated power (ERP) limits and other requirements in this Section. See also § 22.169.

(a) Maximum ERP. The ERP of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts (38.45 dBm E.R.P.).

* FCC § 2.1046. Measurements required: RF power output.

* RSS-132 Issue 4, Clause 5.4.: The transmitter output power shall be measured in terms of average power. The equivalent radiated power (e.r.p.) shall not exceed 7 watts for mobile equipment and 3 watts for portable equipment.

The effective isotropic radiated power (e.i.r.p.) shall not exceed the limits specified in SRSP-503 for base station equipment.

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

Method

The conducted RF output power measurements were made at the RF output terminals of the EUT using the power meter of the Universal Radio Communication tester R&S CMW500, selecting maximum transmission power of the EUT and different modes of modulation.

The peak-to-average power ratio (PAPR) is measured using an attenuator, power splitter and spectrum analyser with a Complementary Cumulative Distribution Function implemented.

The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi).

The maximum effective radiated power e.r.p. is calculated from the maximum equivalent isotropically radiated power (e.i.r.p.) by subtracting 2.15 dB:

$$E.R.P. = E.I.R.P. - 2.15 \text{ dB}$$

Test Setup

1. CONDUCTED AVERAGE POWER:



Results

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)
1.4	Low 20407	824.7MHz	QPSK	1	0	23.19
1.4			QPSK	1	2	22.35
1.4			QPSK	1	5	23.31
1.4			QPSK	3	0	23.27
1.4			QPSK	3	1	23.28
1.4			QPSK	3	2	23.24
1.4			QPSK	6	0	22.25
1.4			16-QAM	1	0	22.19
1.4			16-QAM	1	2	22.26
1.4			16-QAM	1	5	22.25
1.4			16-QAM	3	0	22.28
1.4			16-QAM	3	1	22.27
1.4			16-QAM	3	2	22.25
1.4			16-QAM	6	0	22.31
1.4	Middle 20525	836.5 MHz	QPSK	1	0	22.91
1.4			QPSK	1	2	22.96
1.4			QPSK	1	5	23
1.4			QPSK	3	0	22.79
1.4			QPSK	3	1	22.82
1.4			QPSK	3	2	22.89
1.4			QPSK	6	0	21.9
1.4			16-QAM	1	0	22.1
1.4			16-QAM	1	2	22.15
1.4			16-QAM	1	5	22.22
1.4			16-QAM	3	0	21.92
1.4			16-QAM	3	1	21.94
1.4			16-QAM	3	2	21.93
1.4			16-QAM	6	0	21
1.4	High 20643	848.3 MHz	QPSK	1	0	22.7
1.4			QPSK	1	2	22.75
1.4			QPSK	1	5	22.67
1.4			QPSK	3	0	22.71
1.4			QPSK	3	1	22.72
1.4			QPSK	3	2	22.76
1.4			QPSK	6	0	21.89
1.4			16-QAM	1	0	21.64
1.4			16-QAM	1	2	21.61
1.4			16-QAM	1	5	21.66
1.4			16-QAM	3	0	21.86
1.4			16-QAM	3	1	21.87
1.4			16-QAM	3	2	21.9
1.4			16-QAM	6	0	21

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)
3	Low 20415	825.5 MHz	QPSK	1	0	23.01
3			QPSK	1	7	23.18
3			QPSK	1	14	22.69
3			QPSK	8	0	22.14
3			QPSK	8	4	22.09
3			QPSK	8	7	21.95
3			QPSK	15	0	22.01
3			16-QAM	1	0	21.96
3			16-QAM	1	7	22.07
3			16-QAM	1	14	21.61
3			16-QAM	8	0	21.43
3			16-QAM	8	4	21.32
3			16-QAM	8	7	21.14
3			16-QAM	15	0	20.97
3	Middle 20525	836.5 MHz	QPSK	1	0	22.71
3			QPSK	1	7	22.8
3			QPSK	1	14	22.69
3			QPSK	8	0	21.89
3			QPSK	8	4	21.98
3			QPSK	8	7	21.97
3			QPSK	15	0	21.93
3			16-QAM	1	0	21.62
3			16-QAM	1	7	21.61
3			16-QAM	1	14	21.44
3			16-QAM	8	0	20.91
3			16-QAM	8	4	21.02
3			16-QAM	8	7	21
3			16-QAM	15	0	20.87
3	High 20635	847.5 MHz	QPSK	1	0	22.67
3			QPSK	1	7	22.82
3			QPSK	1	14	22.61
3			QPSK	8	0	21.82
3			QPSK	8	4	21.85
3			QPSK	8	7	21.8
3			QPSK	15	0	21.84
3			16-QAM	1	0	21.72
3			16-QAM	1	7	21.89
3			16-QAM	1	14	21.7
3			16-QAM	8	0	20.95
3			16-QAM	8	4	20.97
3			16-QAM	8	7	20.94
3			16-QAM	15	0	20.91

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)
5	Low 20425	826.5 MHz	QPSK	1	0	23.38
5			QPSK	1	12	22.99
5			QPSK	1	24	22.81
5			QPSK	12	0	22.32
5			QPSK	12	6	22.11
5			QPSK	12	11	21.98
5			QPSK	25	0	22.13
5			16-QAM	1	0	22.63
5			16-QAM	1	12	22.27
5			16-QAM	1	24	22.12
5			16-QAM	12	0	21.4
5			16-QAM	12	6	21.2
5			16-QAM	12	11	21.08
5			16-QAM	25	0	21.21
5	Middle 20525	836.5 MHz	QPSK	1	0	23.06
5			QPSK	1	12	23
5			QPSK	1	24	23.27
5			QPSK	12	0	22.09
5			QPSK	12	6	22.09
5			QPSK	12	11	22.09
5			QPSK	25	0	22.1
5			16-QAM	1	0	22.16
5			16-QAM	1	12	22
5			16-QAM	1	24	22.28
5			16-QAM	12	0	21.25
5			16-QAM	12	6	21.24
5			16-QAM	12	11	21.13
5			16-QAM	25	0	21.07
5	High 20625	846.5 MHz	QPSK	1	0	23.33
5			QPSK	1	12	23.04
5			QPSK	1	24	23.23
5			QPSK	12	0	22.18
5			QPSK	12	6	22.14
5			QPSK	12	11	22.13
5			QPSK	25	0	22.17
5			16-QAM	1	0	22.38
5			16-QAM	1	12	22.14
5			16-QAM	1	24	22.22
5			16-QAM	12	0	21.3
5			16-QAM	12	6	21.25
5			16-QAM	12	11	21.24
5			16-QAM	25	0	21.25

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)
10	Low 20450	829 MHz	QPSK	1	0	23.44
10			QPSK	1	24	22.81
10			QPSK	1	49	23.16
10			QPSK	25	0	22.11
10			QPSK	25	12	21.94
10			QPSK	25	24	22.01
10			QPSK	50	0	22.04
10			16-QAM	1	0	22.37
10			16-QAM	1	24	21.82
10			16-QAM	1	49	22.14
10			16-QAM	25	0	21.16
10			16-QAM	25	12	21.02
10			16-QAM	25	24	21.09
10			16-QAM	50	0	N/A
10	Middle 20525	836.5 MHz	QPSK	1	0	22.94
10			QPSK	1	24	23.02
10			QPSK	1	49	23.15
10			QPSK	25	0	22.09
10			QPSK	25	12	22.16
10			QPSK	25	24	22.18
10			QPSK	50	0	22.16
10			16-QAM	1	0	21.68
10			16-QAM	1	24	21.83
10			16-QAM	1	49	21.93
10			16-QAM	25	0	21.18
10			16-QAM	25	12	21.25
10			16-QAM	25	24	21.28
10			16-QAM	50	0	N/A
10	High 20600	844 MHz	QPSK	1	0	23.55
10			QPSK	1	24	23.43
10			QPSK	1	49	23.21
10			QPSK	25	0	22.61
10			QPSK	25	12	22.48
10			QPSK	25	24	22.26
10			QPSK	50	0	22.49
10			16-QAM	1	0	22.65
10			16-QAM	1	24	22.47
10			16-QAM	1	49	22.21
10			16-QAM	25	0	21.57
10			16-QAM	25	12	21.43
10			16-QAM	25	24	21.29
10			16-QAM	50	0	N/A

Verdict: PASS

Radiated Emissions

Limits

- * FCC §2.1051 and §22.917: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.
- * RSS-132. 5.5: Mobile and base station equipment shall comply with the limits in (i) and (ii) below.
- i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} P$ (watts).
 - ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} P$ (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

Method

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the HIGH frequency generated within the equipment.

The EUT was placed on a 1 meter high non-conductive stand at a 3 meter distance from the measuring antenna. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the height and polarization of the measuring antenna. The maximum meter reading was recorded.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB, P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43+10\log (P_o)$, and the level in dBm relative P_o becomes:

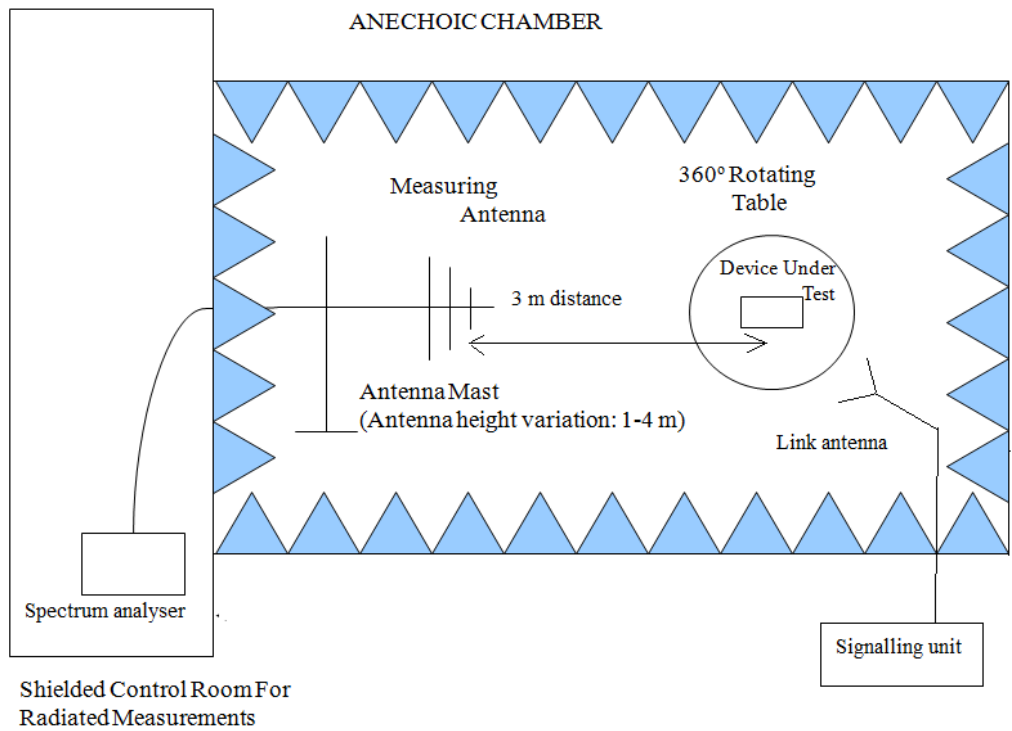
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = - 13 \text{ dBm}$$

The maximum field strength (dBμV/m) of each detected emission at less than 20 dB respect to the limit is converted to an equivalent EIRP level (dBm) according to ANSI C63.26 with the formula:

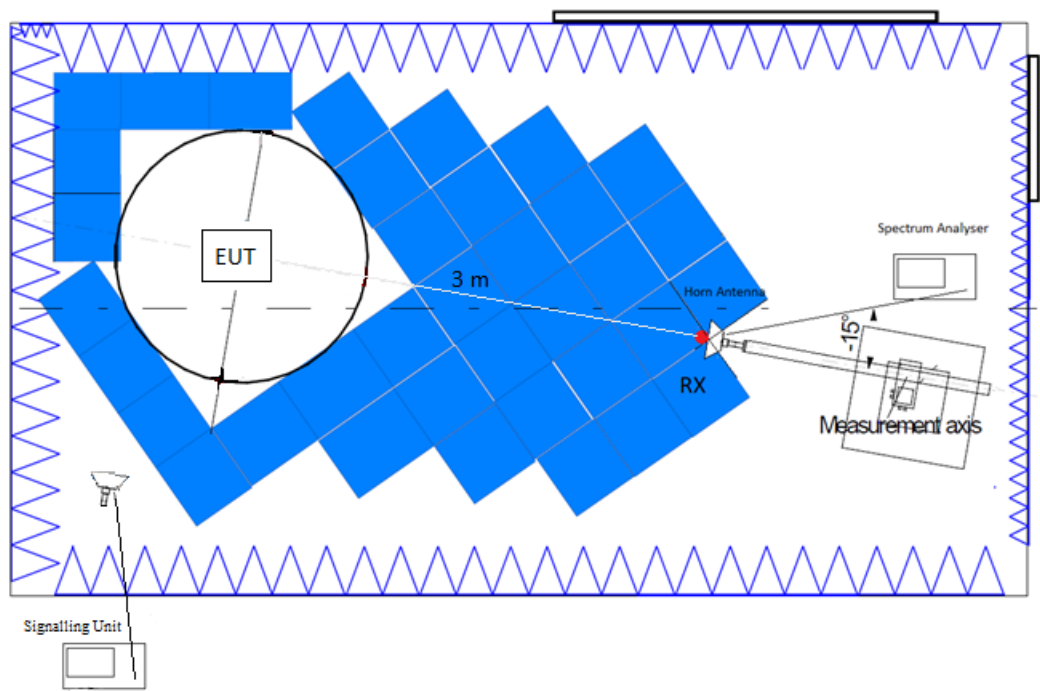
$EIRP \text{ (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log(D) - 104.8$; where D is the measurement distance (in the far field region) in m. $D = 3 \text{ m}$

Test Setup

Radiated measurements below 1 GHz:



Radiated measurements above 1 GHz:



Results

LTE Cat-M1 Band 5:

A preliminary scan determined the BW=10 MHz, QPSK, RB Size=1, RB Offset=0, Narrowband=0 as the worst case. The following results are for this worst-case configuration.

- HIGH CHANNEL:

Frequency range 30 MHz - 1 GHz:

Spurious frequencies at less than 20 dB below the limit:

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Polarization
857.197813	-31.35	-13.00	18.35	H

Frequency range 1 - 8.5 GHz:

Spurious frequencies at less than 20 dB below the limit:

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Polarization
1679.133333	-19.22	-13.00	6.22	H
3358.160000	-29.12	-13.00	25.83	V
8101.800000	-26.11	-13.00	14.51	V

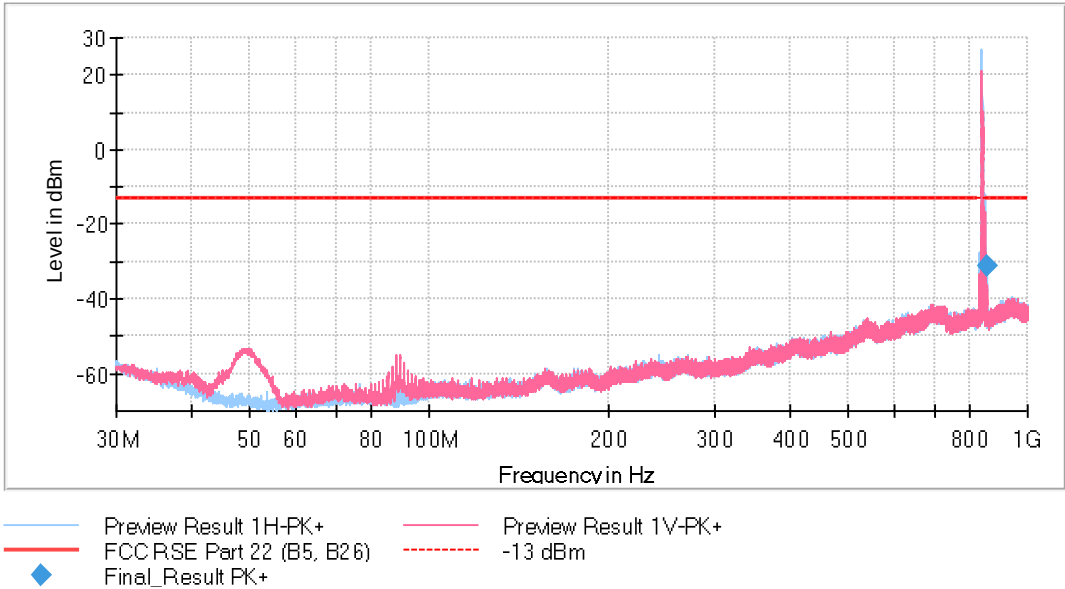
Measurement uncertainty (dB): $<\pm 5.03$ for $f \geq 30$ MHz up to 1 GHz
 $<\pm 4.32$ for $f \geq 1$ GHz up to 8.5 GHz

Verdict: PASS

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	30.312 kHz	PK+	100 kHz	Coupled	0 dB
1 GHz - 8.5 GHz	234.375 kHz	PK+	100 kHz	1 s	0 dB

FREQUENCY RANGE 30 MHz - 1 GHz:

- HIGH CHANNEL:



The peak above the limit is the carrier frequency.

FREQUENCY RANGE 1 - 8.5 GHz:

- HIGH CHANNEL:

